



SPECIFICATION

CONTAINER, HEAT INSULATING CONTAINER, AND APPARATUS
AND METHOD USED FOR MANUFACTURE OF THESE CONTAINERS

TECHNICAL FIELD

The present invention relates to a paper based heat insulating container used for precooked foods by pouring hot water and foods heated and cooked by employing a micro-oven; and an apparatus suitable for manufacture of its heat insulating container or the like.

BACKGROUND ART

As a paper-based heat insulating container used for foods such as precooked noodles, there is known a container in which a paper based heat insulating material is mounted to the periphery of the trunk part of the paper based cup main body, thereby imparting heat insulation properties. As a heat insulating material, there is generally used a wave plate shaped material in which protrusion and recess stripes extending in the longitudinal direction are arranged alternately in the peripheral direction of the cup main body.

In Japanese Patent Application Laid-open No. 8-113274, there is proposed a heat insulating container in which the width of a recess stripe of a heat insulating material is decreased more significantly than that of a protrusion stripe,



thereby increasing a flat portion of a side face of a container. In Japanese Utility Model Application Laid-open No. 4-45216 or in Japanese Patent Application Laid-open No. 8-104372, there is proposed a heat insulating container in which a liner or thin paper is wound on a corrugated or embossed heat insulating material, thereby eliminating the ragged surface. In Japanese Utility Model Application Laid-open No. 4-45212, there is proposed a construction in which heat insulation properties are imparted by a space formed between double cups without using the wave plate shaped heat insulating material.

The above mentioned conventional heat insulating container has been limited to a cup-type shape in which the outer diameter of an opening is higher than the height thereof due to restriction of the physical strength of the container, and the upper limit of its capacitance has been about 750 cc. The reason for this limitation is because, if the outer diameter of the opening is increased without changing a paperboard being an element material of the heat insulating container, thereby increasing the capacitance, the entire container is likely to be deformed by stress such as pinch, lateral compression, folding or the like, which is dangerous when the container has hot water poured therein is held by hand.

In addition, the conventional paper based heat insulating container has an advantage that hot water supply and cooking is easy, and the container is easily held by one hand, whereas a user cannot have the feeling of dishes such

as china bowl, wooden bowl, bowl or the like. The conventional container is inferior to the cup shaped container in easiness of eating. It is not suitable for use in visually enjoying a variety of food materials at the time of meal.

Further, if a ragged heat insulating material is exposed to the side face of the container, it is difficult to provide a design with the feeling of high class on its side face, and characters, illustrations or the like printed on the side face is very hardly seen.

As a heat insulating container of cooked foods, in addition to the above mentioned cut type paper based heat insulating container, there is also used a china bowl shaped or wooden bowl shaped plastic based heat insulating container having an opening in which the outer diameter of the opening is greater and wider than the height thereof. However, in the plastic based container, there is a sanitary or environmental problem that, while hot water supply heating and cooking or micro-oven heating and cooking, a poisonous component is eluted from the plastic element material into hot water; or waster management or incineration is hardly performed compared with a paper based container.

DISCLOSURE OF THE INVENTION

A primary object of the present invention is to provide a paper based heat insulating container in which, the outer diameter of an upward opening is greater than the height

thereof, and is formed in a china bowl or wooden bowl like shape, stability concerning shape and heat insulation properties are high, and compactness is higher, design properties are superior, the degree of freedom in print expression is high, and further, sanitary level is high, and environmental impairment is reduced.

In order to achieve this object, a heat insulating container according to a first aspect of the invention comprises: a paper cup main body having a cylinder shaped trunk portion whose top part is opened and a bottom part for closing a lower part of the trunk portion, a polyolefin based resin layer being formed on at least an interior face; and a paper sleeve attached so as to form a gap between a peripheral face of the trunk portion of the paper cup, wherein the paper cup main body is formed to be greater than a height of the paper cup main body in outer diameter of an upper end opening of the trunk portion.

A rib may be formed in the paper cup main body in a direction in which the trunk portion is wound. The rib may be formed so as to continuously wind the trunk portion or may be formed so as to intermittently wind the trunk portion. An inwardly curled portion may be formed at the lower end of the paper sleeve, and the inwardly curled portion may abut against the peripheral face of the lower part of the trunk portion. A heat insulating member may be inserted into the gap. The paper cup main body functions as a container main body of the

heat insulating container, and its trunk portion constitutes a side wall of the container main body.

A second object of the present invention is to provide a heat insulating container with its low manufacturing cost, the container capable of be held by hand safely and cleanly without feeling hotness so much even in the case of a large scale container heated at a high temperature.

In order to achieve this object, a heat insulating container according to a second aspect of the invention is a heat insulating container with grip pieces, a polyolefin based resin being coated on an interior face, a bottomed paper cup main body having an outwardly curled portion formed at an upward opening end being combined with a reverse frustum shaped paper sleeve, a space being formed between an exterior face of the trunk portion of the paper cup main body and an interior face of the paper sleeve, wherein at least a pair of grip pieces are formed, the grip pieces each having a predetermined length, being partitioned by a folding line formed in the substantially peripheral direction of the side wall and a break line connecting both ends of the folding line, and being foldable to the outside by the folding line.

The folding line may be a straight line in the shortest distance connecting two points in the peripheral direction of the side wall, and may be curved more downwardly than its straight line. A connecting portion which is easily

detachable on the way of the break line may be formed. A cutout may be formed a part of the periphery of the grip pieces. A tip end of the grip piece can be folded by a small folding line. Both ends of the break line may be terminated with drawing an R. The paper cup main body functions as a container main body of the heat insulating container, and its trunk portion constitutes the side wall of the container main body.

In the above mentioned heat insulating container, it is required to ensure a sufficient interval between the paper cup main body and the sleeve in order to ensure predetermined heat insulation properties. On the other hand, in the case where the container is held by hand, it is required to grip the sleeve or its grip pieces, thereby supporting the entire container. Therefore, it is necessary to adhere the paper cup main body and the sleeve with sufficient strength. Thus, in order to adhere the paper cup main body and the sleeve with sufficient strength while ensuring a sufficient interval between both of them, it is required to consider relative shape or dimensional relationship between the paper cup main body and the sleeve. In addition, the relationship must smoothen the process of assembling both of them, and must fulfill the conditions for preventing failures.

A third object of the present invention is to provide a heat insulating container capable of adhering the container main body such as paper cup main body and the sleeve with

sufficient strength, the heat insulating container having superior assembling suitability of both of them.

In order to achieve this object, a third aspect of invention contains a group of heat insulating containers described below.

That is, a heat insulating container according to the third invention comprises: a container main body having a side wall (a trunk portion) and a bottom part disposed on a lower end side of the side wall; a sleeve consisting of a sheet shaped material, an inwardly curled portion having the sleeve material curled toward the center side of the container being formed at a lower end side, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at least partly between the inwardly curled portion and the adhesive portion while a space is ensured at the outside of the side wall, and at the inwardly curled portion, the sleeve material is wound until an orientation of a tip end of the sleeve material exceeds an upward direction along a center line of the container main body relevant to a plane including the center line of the container main body.

In addition, another heat insulating container of the third aspect of the invention comprises: a container main body having a side wall (a trunk portion) and a bottom part disposed on a lower end side of the side wall; a sleeve consisting of a sheet shaped material, an inwardly curled portion having the

sleeve material curled toward the center side of the container being formed at a lower end side, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at least partly between the inwardly curled portion and the adhesive portion while a space is ensured at the outside of the side wall, and a tip end of the sleeve material wound around the inwardly curled portion is positioned at the outside of the container rather than a site being the closest to the center line of the container main body at the inwardly curled portion.

A still another heat insulating container of the third invention comprises: a container main body having a side wall (a trunk portion), a bottom part disposed on a lower end side of the side wall, a bottom rim formed extending from the side wall to the lower end side thereof; a sleeve consisting of a sheet shaped material, an inwardly curled portion having the sleeve material curled toward the center side of the container being formed at a lower end side, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at least partly between the inwardly curled portion and the adhesive portion while a space is ensured at the outside of the side wall, and a gap between a tip end of the sleeve material wound around the inwardly curled portion and an interior wall face of the sleeve is 1 mm or less.

According to these heat insulating container, when the

container main body and sleeve are mutually assembled, the bottom rim is hardly caught by the inwardly curled portion, both of them can be assembled smoothly, and the yield can be improved.

A heat insulating container of the third invention may comprise: a container main body having a side wall (a trunk portion), a bottom part disposed on a lower end side of the side wall, a bottom rim formed extending from the side wall to the lower end side thereof; a sleeve consisting of a sheet shaped material, an inwardly curled portion having the sleeve material curled toward the center side of the container being formed at a lower end side, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at least partly between the inwardly curled portion and the adhesive portion while a space is ensured at the outside of the side wall, and a gap between a tip end of the sleeve material wound around the inwardly curled portion and an interior wall face of the sleeve may be smaller than thickness of the bottom rim.

According to this heat insulating container, when the container main body and sleeve are mutually assembled, there is no possibility that the bottom rim enters the inwardly curled portion, and pushes the inwardly curled portion away. Therefore, both of them can be assembled smoothly, and the yield can be improved.

The heat insulating container of the third invention

may comprise: a container main body having a side wall (a trunk portion), a bottom part disposed on a lower end side of the side wall, a bottom rim formed extending from the side wall to the lower end side thereof; a sleeve consisting of a sheet shaped material, an inwardly curled portion having the sleeve material curled toward the center side of the container being formed at a lower end side, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at least partly between the inwardly curled portion and the adhesive portion while a space is ensured at the outside of the side wall, and the bottom rim may be fallen down relevant to a cross section on a plane including the center line of the container main body so that the bottom rim is positioned inside of the container rather than a straight line extending an outer face of the side wall.

The heat insulating container of the third invention may comprise: a container main body having a side wall, a bottom part disposed on a lower end side of the side wall, a bottom rim formed extending from the side wall to the lower end side thereof; a sleeve consisting of a sheet shaped material, an inwardly curled portion having the sleeve material curled toward the center side of the container being formed at a lower end side, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at least partly between the

inwardly curled portion and the adhesive portion while a space is ensured at the outside of the side wall, and a burr of the bottom rim may be protruded inside of the container.

The heat insulating container of the third invention may comprise: a container main body having a side wall, a bottom part disposed on a lower end side of the side wall, a bottom rim formed extending from the side wall to the lower end side thereof; a sleeve consisting of a sheet shaped material, an inwardly curled portion having the sleeve material curled toward the center side of the container being formed at a lower end side, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at least partly between the inwardly curled portion and the adhesive portion while a space is ensured at the outside of the side wall, and a lower end peripheral position of the bottom rim is positioned closer to the center line of the container main body rather than a site being the closest to the center of the container main body at the inwardly curled portion.

In addition, a displacement quantity between the lower end peripheral position of the bottom rim and the site being the closest to the center line of the container main body at the inwardly curled portion may be set within the range of 0.01 to 1 mm.

According to these heat insulating container, when the container main body and the sleeve are mutually assembled, the

bottom rim is hardly caught by the inwardly curled portion, both of them can be assembled smoothly, and the yield can be improved.

The heat insulating container of the third invention may comprise: a container main body having a side wall and a bottom part disposed on a lower end side of the side wall; a sleeve consisting of a sheet shaped material, an inwardly curled portion having the sleeve material curled toward the center side of the container being formed at a lower end side, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at least partly between the inwardly curled portion and the adhesive portion while a space is ensured at the outside of the side wall, and a gap between the inwardly curled portion and an exterior face of the container main body facing the site may be formed.

According to this heat insulating container, a gap between the inwardly curled portion and the exterior face of the container main body facing this site is formed, and thus, no wrinkle occurs with the container main body.

The gap may be set within the range of 0.01 to 1 mm. In this case, no wrinkle occurs with the container main body, and the deformation of the heat insulating container can be sufficiently suppressed.

The heat insulating container of the third invention may comprise: a container main body having a side wall and a

bottom part disposed at the lower end side of the side wall; and a sleeve consisting of a sheet shaped sleeve material, the sleeve being disposed while a space is ensured at the outside of the side wall, and the lower end of the container main body may be protruded more downwardly than the lower end of the sleeve.

According to this heat insulating container, the lower end of the container main body comes into direct contact with a table or the like, distortion of the container occurring in the case where the lower end of the sleeve comes into contact with something is prevented from its occurrence, and thus, the heat insulating container can be placed constantly.

An inwardly curled portion having the sleeve material curled toward the center side of the sleeve is formed at the lower end side of the sleeve. An adhesive portion to be adhered to the side wall of the container main body is formed at the upper end side of the sleeve. The sleeve may be disposed at least partly between the inwardly curled portion and the adhesive portion while a space is ensured at the outside of the side wall. According to this heat insulating container, the lower end of the container main body comes into direct contact with a table or the like, the distortion of the container occurring in the case where the lower end of the inwardly curled portion comes into contact with something is prevented from its occurrence, and thus, the heat insulating container can be placed constantly.

A bottom rim extending from the side wall to the lower end may be formed on the container main body, and the lower end of the container main body may be constructed by the lower end of the bottom rim. According to this heat insulating container, the lower end of the hard bottom rim having good plane property comes into direct contact with a table or the like, and thus the heat insulating container can be placed constantly.

The lower end of the container main body may be protruded to the lower end of the sleeve with a protrusion quantity of a range within 0.01 to 5 mm. In this case, the protrusion of the container main body cannot be discriminated apparently, and the design of the container is not impaired.

The heat insulating container of the third invention may comprise: a container main body having a side wall and a bottom part disposed at the lower end side of the side wall, an outwardly curled portion curled toward the outside of the container being formed at the upper end side of the side wall; and a sleeve consisting of a sheet shaped sleeve material, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at the outside of the side wall while a space is ensured, and the side wall may be formed relevant to a cross section on a plane including the center line of the container main body, so that a site opposite to the adhesive portion is inclined inwardly of the container relevant to an extension

line at a downward site of the site.

According to this heat insulating container, the site wall and the sleeve come into intimate contact with each other at a site of the adhesive portion, whereby the adhesive strength can be improved. In addition, the side wall of the site of the adhesive portion is inclined, and thus, there is no need for curving the sleeve in order to bring into intimate contact with the side wall, and the appearance of the container is not affected.

The heat insulating container of the third invention may comprise: a container main body having a side wall and a bottom part disposed at the lower end side of the side wall, an outwardly curled portion curled toward the outside of the container being formed at the upper end side of the side wall; and a sleeve consisting of a sheet shaped sleeve material, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at the outside of the side wall while a space is ensured, and the wall may be formed relevant to a cross section on a plane including the center line of the container main body, so that a site opposite to the adhesive portion is curved along the sleeve material.

According to this heat insulating container, the side wall and the sleeve come into intimate contact with each other at a site of the adhesive portion, whereby the adhesive strength can be improved. In addition, the side wall is curved,

and thus, there is no need for curving the sleeve so as to come into intimate contact with the side wall, and the appearance of the container is not affected.

The heat insulating container of the third invention may comprise: a container main body having a side wall and a bottom part disposed at the lower end side of the side wall, an outwardly curled portion curled toward the outside of the container being formed at the upper end side of the side wall; and a sleeve consisting of a sheet shaped sleeve material, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at the outside of the side wall while a space is ensured, and the sleeve may be formed relevant to a cross section on a plane including the center line of the container main body, so that a site opposite to the adhesive portion is curved along the side wall.

According to this heat insulating container, the side wall and the sleeve comes into intimate contact with each other at a site of the adhesive portion, whereby the adhesive strength can be improved.

The heat insulating container of the third invention may comprise: a container main body having a side wall and a bottom part disposed at the lower end side of the side wall, an outwardly curled portion curled toward the outside of the container being formed at the upper end side of the side wall; and a sleeve consisting of a sheet shaped sleeve material, an

adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at the outside of the side wall while a space is ensured, and the container main body and the sleeve formed so that a difference between an outer diameter immediately beneath the outwardly curled portion of the container main body and an inner diameter of the sleeve at an opposite side immediately beneath the outwardly curled portion is within the range of -1.0 to +0.5 mm may be adhered to each other via the adhesive portion.

According to this heat insulating container, sufficient adhesive strength at the adhesive portion is ensured, and there is no danger that wrinkles is caused to occur with the side wall of the container main body.

The heat insulating container of the third invention may comprise: a container main body having a side wall and a bottom part disposed at the lower end side of the side wall, an outwardly curled portion curled toward the outside of the container being formed at the upper end side of the side wall; and a sleeve consisting of a sheet shaped sleeve material, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at the outside of the side wall while a space is ensured, and an upper end of the adhesive portion may be positioned by 1 mm or more downwardly distant from the lower end of the outwardly curled portion along the center line

direction of the container main body.

According to this heat insulating container, there is no danger that the adhesive of the adhesive portion adheres to the outwardly curled portion.

The heat insulating container of the third invention may comprise: a container main body having a side wall and a bottom part disposed at the lower end side of the side wall, an outwardly curled portion curled toward the outside of the container being formed at the upper end side of the side wall; and a sleeve consisting of a sheet shaped sleeve material, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at the outside of the side wall while a space is ensured, and the adhesive portion may be provided over a width of 3 mm or more relevant to the center line direction of the container main body.

According to this heat insulating container, sufficient adhesive strength of the adhesive portion can be ensured.

The heat insulating container of the third invention may comprise: a container main body having a side wall and a bottom part disposed at the lower end side of the side wall, an outwardly curled portion curled toward the outside of the container being formed at the upper end side of the side wall; and a sleeve consisting of a sheet shaped sleeve material, an adhesive portion to be adhered to the side wall of the container

main body being formed at the upper end side thereof, the sleeve being disposed at the outside of the side wall while a space is ensured, and an upper end of the adhesive portion may be positioned downwardly than that of the sleeve.

According to this heat insulating container, there is no danger that the adhesive of the adhesive portion comes out of the upper end of the sleeve.

In the above mentioned heat insulating container, since it is necessary for the sleeve to have a certain strength, a paperboard with a significantly thick element material must be used. However, it is not easy to process a thick paperboard and form an inwardly curled portion described above, and there is a danger that cracks occur with the paper, and the curl is deformed in shape. In addition, the sleeve is formed in cylindrical or frustum shape by adhering both ends of a blank cut in a predetermined shape. Therefore, at an adhesive portion at which both ends of the blank overlap with each other, the thickness is doubled, thus making it difficult to form a curl in particular, and making it impossible to form a curl of its proper shape.

A fourth object of the present invention is to provide a heat insulating container capable of easily forming an inwardly curled portion of a sleeve and obtain a curl of its proper shape.

In order to achieve this object, a heat insulating

container according to the fourth invention comprises: a container main body having a side wall and a bottom part disposed at the lower end side of the side wall; and a sleeve consisting of a sheet shaped sleeve material, an inwardly curled portion having the sleeve material curled toward the center side of the container being formed at a lower end side, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at the outside of the side wall while a space is ensured, wherein a radius of curvature of the sleeve material at the inwardly curled portion is set within the range of 0.6 to 2.0 mm. The radius of curvature is further preferable to be in the range of 1.1 to 1.5 mm. Paper may be employed as the sleeve material, and the weight of that paper may be set within the range of 150 to 400 g/m².

According to this heat insulating container, the possibility of cracks occur with the sleeve material can be reduced, and the container main body is hardly caught by the inwardly curled portion when the container main body and the sleeve are mutually assembled, thus making it possible to ensure smooth assembling.

Another heat insulating container of the fourth invention may comprise: a container main body having a side wall and a bottom part disposed at the lower end side of the side wall; and a sleeve consisting of a sheet shaped sleeve material, an inwardly curled portion having the sleeve

material curled toward the center side of the container being formed at a lower end side, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at the outside of the side wall while a space is ensured, and a friction reducing layer is formed on a surface of the sleeve material in a region corresponding to the inwardly curled portion.

According to this heat insulating container, when the inwardly curled portion is formed, the smoothness of the sleeve material is improved. The inwardly curled portion can be easily formed, and cracks hardly occur with the sleeve material.

As the friction reducing layer, a composite containing a cellulose based resin may be employed, and a composite containing acryl based resin may be employed. As the friction reducing layer, an overprint varnish for protecting a print face may be employed. In this case, the number of manufacturing processes can be reduced.

The friction reducing layer may be formed on a surface facing the outside of the container made of the sleeve material. In this case, if a print face is formed at the outside of the container made of the sleeve material, such overprint varnish can be used as a friction reducing layer.

Still another heat insulating container of the fourth invention comprises: a container main body having a side wall and a bottom part disposed at the lower end side of the side

wall; and a sleeve consisting of a sheet shaped sleeve material, an inwardly curled portion having the sleeve material curled toward the center side of the container being formed at a lower end side, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at the outside of the side wall while a space is ensured, and the sleeve is formed by mutually superimposing and adhering both ends of a band shaped sleeve material wound around the container main body to each other, a cut portion for reducing the superimposition area is formed at the sleeve material, and the cut portion is formed by cutting the sleeve material from a region corresponding to the inwardly curled portion over the other region.

Still another heat insulating container of the fourth invention comprises: a container main body having a side wall and a bottom part disposed at the lower end side of the side wall; and a sleeve consisting of a sheet shaped sleeve material, an inwardly curled portion having the sleeve material curled toward the center side of the container being formed at a lower end side, an adhesive portion to be adhered to the side wall of the container main body being formed at the upper end side thereof, the sleeve being disposed at the outside of the side wall while a space is ensured, and the sleeve is formed by mutually superimposing and adhering both ends of a band shaped sleeve material wound around the container main body to each other, a cut portion for reducing the superimposition area is

formed at the sleeve material, and the cut portion is formed by cutting the sleeve material so as to reduce a superimposition area in a region corresponding to the inwardly curled portion by 50 % or more.

According to these heat insulating container, an inwardly curled portion can be easily formed, and the inwardly curled portion can be improved in shape.

The cut portion may be formed at an end on a side arranged inside of the container of the both ends of the sleeve material. In this case, the cut end of the cut portion isn't exposed outside of the sleeve, and thus the appearance of the container is not affected.

The cut portion may be formed by cutting a corner of the sleeve material diagonally relevant to one end side of both the ends.

In a paper based container such as the above mentioned heat insulating container, a film shaped cover material constituted by laminating a metal or a resin is adhered to an outwardly curled portion of its opening end, and the inside of the container is occasionally sealed. However, the curled portion having the cover material adhered thereto is formed by pushing the opening end of the container by a mold member and winding it, and the sectional shape after the molding is substantially close to true circle. Therefore, the adhesive portion between the cover material and the curled portion is

close to linear contact, and there is a danger that an adhesive area becomes insufficient, and its bonding strength cannot be sufficiently ensured.

In addition, in a conventional container filling line, a pressure plate with its large area is utilized, whereby the cover material are pressed to a respective one of a number of containers, and are adhered. In this case, although the position accuracy of the pressure plate relevant to each container is not high, the pressure applied to each container is uniformed by elastic container deformation, whereby the cover material is adhered in a relatively uniform state. However, if a conventional manufacturing line is employed for a container with its poor elasticity such as paper based container, the container is not fully deformed, and thus, the cover material cannot be adhered uniformly.

A fifth object of the present invention is to provide a container having a curled portion suitable to adhere a cover material.

In order to achieve this object, a container according to a fifth invention comprises: a side wall (a trunk portion) in which a curled portion is formed at the peripheral edge of an opening; and a bottom part opposite to the opening, wherein when the width in the container axial direction of the curled portion is defined as "A", the width in the container radian direction of the curled portion is defined as "B", and the thickness of the side wall is defined as "t", the condition

of $2t < A < B$ is met.

In addition, another heat insulating container of the fifth invention comprises: a container main body having side wall on which a curled portion is formed at the peripheral edge of an opening; and a bottom part opposite to the opening; and a sleeve, an adhesive portion to be adhered to the side wall of the container main body being formed on one end side, the sleeve being disposed at the outside of the side wall while a space is ensured, and when a width in the container axis direction of the curled portion is represented by "A", a width in the container radial direction of the curled portion is represented by "B", and the thickness of the side wall is represented by "t", a condition of $2t < A < B$ is met.

According to these containers, when a cover material is adhered to the curled portion, the width to be bonded via adhesive is expanded, whereby the cover material can be securely bonded at a predetermined strength. In addition, when the cover material is pressed, the curled portion is easily deformed in the container axis direction. Thus, even in the case where the container is made of a hardly elastically deformed material such as paper, a conventional line for adhering the cover material to the container made of a styrene foam or the like can be employed as is, which is economical.

A film shaped cover material for closing the opening is adhered to the curled portion, and the cover material may be adhered with adhesive force such that exfoliation force

against the curled portion is within the range of 400 to 900 gf/15 mm in width. In this case, the cover material bonded via adhesive and the bonding width of the curled portion are expanded, whereby the cover material can be securely bonded at a predetermined strength. In addition, in the case where hot water is poured while the cover material is partly exfoliated, and the cover material is removed after a predetermined period of time has elapsed, preferable exfoliation force is achieved. The side wall may be formed of paper.

A sleeve employed for the heat insulating container of the present invention is manufactured by pasting both ends thereof while a fan shaped blank is wound at the periphery of a predetermined mandrel. In this manufacture, it is required to supply a blank immediately beneath the mandrel after adhesive has been applied to its paste portion or process a curled portion at an axial end of the sleeve on the mandrel, and it is expected to develop an apparatus capable of efficiently performing such processing. Moreover, since a sleeve is thin and low in strength, care must be taken for processing of the curled portion. The sleeve may come into rigid contact with the top of the mandrel due to processing of the curled portion. Even in such state, it is required to consider the sleeve so as to be removed from the apparatus without damaging the sleeve.

A sixth object of the present invention is to provide an apparatus capable of rationally and efficiently performing a variety of operations with the manufacture of a sleeve of a heat insulating container.

In order to achieve this object, the sixth invention provides a sleeve manufacturing apparatus, a blank feeder, and a sleeve ejector as described below.

That is, the sleeve manufacturing apparatus according to the sixth invention is a heat insulating container sleeve manufacturing apparatus for forming a tapered-cylinder shaped sleeve used as a sheath of a heat insulating container from a fan shaped blank, the apparatus comprising: a mandrel having a tapered-shaft shaped trunk portion capable of being engaged with an inner periphery of the sleeve; a carrying device for carrying the mandrel along a predetermined round path; a blank feeder for feeding the blank immediately beneath the mandrel led to a predetermined position on the round path by applying the adhesive to one end thereof; a winding device for winding the blank supplied from the blank feeder around the mandrel so that adhesive applied to the one end is superimposed on the other end; a sealing device for mutually pressing a joint portion of the sleeve formed on the mandrel; a plurality of curl processing devices arranged along the round path, the curl processing devices pressing a processing jig to a protrusion portion of the sleeve from the mandrel, thereby processing a curled portion; and a sleeve ejector for removing the sleeve

having the curled portion processed from the mandrel, wherein at least one of the plurality of curl processing devices presses the processing jig to the protrusion portion of the sleeve with heating the processing jig.

According to this sleeve manufacturing apparatus, a sleeve is softened due to a heat of the processing jig, and thus, a curled portion can be processed with a smaller force compared with a case in which no heating is caused. If the force required for processing becomes small, a load applied to the sleeve on the mandrel is decreased. When a sleeve is removed from the mandrel after manufacture, the work can be easily performed, and a construction of the apparatus can be simplified.

At least two of the plurality of curl processing devices may be constructed so as to press the processing jig to the protrusion of the sleeve with heating the processing jig. Of these processing jigs to be heated, the processing jigs at the downstream side of the carrying path may be set to be lower in temperature than that at the upstream side thereof. In general, in the case where the curled portions of the sleeve are processed in several steps, the processing in the subsequent steps is easier than that in the preceding steps because the sleeve is easily folded. As described above, the heating temperature of the processing jig is lowered in the subsequent steps, whereby an effect of heat against sleeve printing or the like can be minimized without affecting

processing properties of the curled portion.

Of the plurality of curl processing devices, the curl processing device disposed on the most upstream side of the carrying path may be constructed so as to press the processing jig to the protrusion of the sleeve while rotating the processing jig.

In this case, a processing jig is rotated in the first step in which a resistance to processing of the curled portions is the greatest, whereby a need for heating the processing jig is eliminated or otherwise the heating temperature can be reduced. In this manner, a thermal load on the sleeve can be reduced. In the case where a preprocessing material such as silicon liquid is applied for the preparation for curl processing, the preprocessing material can be broadened uniformly at the full periphery of the sleeve by rotation of the processing jig.

A blank feeder of the sixth invention is a blank feeder for carrying a fan shaped blank for forming a sleeve of a heat insulating container immediately beneath a mandrel having a tapered-shaft shaped trunk portion, the blank feeder comprising: a first carrying device for carrying the blank while one end to be pasted is held in parallel to a carrying direction set in the center line direction of the mandrel; an adhesive applying device for applying an adhesive to a lower face side of the one end of the blank carried by the first carrying device; an inverting device for rotating the blank

applied by the adhesive around a rotational axis extending in a direction orthogonal to the carrying direction, thereby vertically inverting the blank; and a second carrying device for carrying the inverted blank in symmetrical posture relevant to the center line of the mandrel.

According to this blank feeder, the inversion in the vertical direction is applied to blank operation after the adhesive has been applied, and thus, it takes long for the blank to reach a lower part of the mandrel. In this manner, redundant water of the adhesive applied to the blank evaporates, and the optimal adhesive strength can be obtained. As a result, the failure rate of products due to the shortage of the adhesive strength decreases. There is provided an advantage that roller array or the like can be constructed more simply than a case in which the top face side is first adhered. The carrying directions of the first and second carrying devices are parallel to the center line of the mandrel, and thus, the blank feeder can be laid out straightly relevant to the center line of the mandrel.

The reversing device may comprise a pair of wheels capable of being swiveled around the rotation axis, and a slit capable of fetching the blank to be fed by the first carrying device may be provided at a respective one of the pair of wheels. Further, the second carrying device may carry the blank immediately beneath the mandrel after the blank has been removed from the slit.

In this case, the blank can be easily reversed by utilizing wheel rotation. The blank is movable in the slit, and there can be provided a chance that the posture of the blank is modified by utilizing gravity.

The pair of wheels may be disposed symmetrically with respect to the center line of the mandrel. In that case, it is preferable that a distance from the rotation axis to the end of the internal periphery side of the slit of each wheel be equal to another one. With such construction, when a blank taken in the slit is scooped up together with wheel rotation, the blank can be aligned in the radial direction of the wheel at the end of the internal periphery side of the slit. In this manner, the blank positioned can be positioned symmetrically with respect to the center line of the mandrel.

At each of the pair of wheels, the slit may be provided in plurality in the peripheral direction of the wheel with constant intervals. In this manner, a number of blanks to which adhesive is applied can be properly dried by taking them in the wheel one after another.

The rotational direction of the wheel may be set so that the blank fetched by the slit of the wheel from the first carrying device is fed to the second carrying device so as to be lifted up from the carrying face of the first carrying device. In this manner, the blank taken in the slit can be reversed vertically by rotating it by 180 degrees without slip-off from the wheel.

Another blank feeder of the sixth invention is a blank feeder for carrying a fan shaped blank for forming a sleeve of a heat insulating container immediately beneath a mandrel having a tapered-shaft shaped trunk portion, the blank feeder comprising: a first carrying device for carrying the blank while one end to be pasted is held in parallel to a carrying direction set in the center line direction of the mandrel; an adhesive applying device for applying adhesive to the one end of the blank carried by the first carrying device; a detour device for detouring the blank applied by the adhesive in the carrying direction of the first carrying device; and a second carrying device for receiving the blank from the detouring device and carrying the blank immediately beneath the mandrel.

According to this blank feeder, redundant water evaporates while the blank is detoured by the detour device.

In the above blank feeder also, the detour device may comprise a pair of wheels capable of being swiveled around a rotation axis extending in a direction orthogonal to the carrying direction of the first carrying device; and a slit capable of fetching the blank to be fed by the first carrying device may be provided at a respective one of the pair of wheels. Further, the second carrying device may remove the blank from the slit and carries the blank immediately beneath the mandrel.

A sleeve ejector of the sixth invention is a sleeve ejector for removing the sleeve wound around a tapered-shaft shaped trunk portion of a mandrel from the mandrel, the sleeve

ejector comprising: a roller mechanism for pressing a rotating roller to the sleeve on the trunk portion and releasing the sleeve from an end of a small diameter side of the trunk portion; and a sleeve holder comprising a sleeve receiving portion for receiving the sleeve removed by the roller mechanism from an inner periphery side thereof.

According to this sleeve ejector, there is no need for receiving the periphery of the sleeve ejected from the top of the mandrel, and there is no danger that the print at the periphery of the sleeve is damaged. The sleeve can be firmly held even in a state in which the sleeve receiving portion is gently inserted into the internal periphery of the sleeve, and thus, a load on the sleeve can be reduced by reducing the rotation speed of the roller. In this respect also, a danger of sleeve damage is reduced.

The sleeve holder may be rotatable along a predetermined rotation axis, and the sleeve receiving portion may be provided in plurality along the rotation axis with constant intervals. In this case, the sleeve holder is rotated, and sleeves are received one after another, whereby the sleeves can be corrected efficiently.

In the case of manufacture of the above mentioned heat insulating container, it is required to perform a variety of processes such as processing of ribs for reinforcing a Peter line indicative of a proper liquid level of injections such

as hot water or reinforcing the container main body; or processing a curled portion of the container main body in shape suitable to the adhering of the film shaped cover material. It is expected to develop an apparatus capable of efficiently performing a series of these operations.

A seventh object of the present invention is to provide an apparatus capable of efficiently manufacturing the above mentioned heat insulating container and an inspection apparatus suitable for that manufacturing apparatus.

In order to achieve this object, the seventh invention includes the apparatus for manufacturing the heat insulating container and inspection apparatus therefor, as described below.

That is, an apparatus for manufacturing heat insulating containers of the seventh invention is a manufacturing apparatus for manufacturing a heat insulating container by combining a sleeve at an outer periphery of a container main body, the manufacturing apparatus comprising: a container holder comprising a curl receiving member for receiving a curled portion provided at an end edge of the container main body and a side wall receiving member for receiving a side wall of the container main body from an inside thereof; a curl processing device for pressing the curled portion of the container main body to the curl receiving member, thereby deforming the curled portion; a rib processing device for pressing the side wall of the container main body to the

side wall receiving member, thereby deforming the side wall; an adhesive applying device for applying adhesive to the outer periphery of the container main body subjected to processing of the curl processing device and the rib processing device, respectively; and a sleeve feeder for covering the sleeve over the outer periphery of the container main body applied by the adhesive.

According to this manufacturing apparatus, processing of a curled portion of the container main body or processing of ribs or the like for a side wall and pasting of the container main body and sleeve subjected to these processes are sequentially performed in the same apparatus, and thus, the heat insulating container can be manufactured efficiently.

At the manufacturing apparatus, there may be provided a sleeve alignment device for pushing a sleeve fed by the sleeve feeder toward the container main body held on the container holder. In this case, a sleeve is mounted to the container main body at its correct position, whereby both of them can be securely bonded.

After the processing has been completed by the sleeve alignment device, at the manufacturing apparatus, there may be provided a combination inspection apparatus for inspecting whether or not combination between the container main body and the sleeve is proper. In this case, adequate countermeasure can be taken by detecting a sleeve assembling failure.

The manufacturing apparatus may be provided with a

sleeve inspection apparatus for inspecting whether or not a sleeve is formed properly after processing of the sleeve alignment device. In this case, adequate countermeasure can be taken by detecting a sleeve molding failure.

The manufacturing apparatus may comprise a carrying device for carrying the container holder along a predetermined carrying path; and the curl processing device, the rib processing device, the adhesive applying device, and the sleeve feeder may be provided along the carrying path. In this case, the curl processing device, rib processing device, adhesive applying device, and sleeve feeder are disposed along the carrying path so as to interfere with each other, whereby a process by each device can be efficiently linked with another.

Another manufacturing apparatus of the seventh invention is a manufacturing apparatus for manufacturing a heat insulating container by combining a sleeve at an outer periphery of a container main body, the manufacturing apparatus comprising: a container holder for holding the container main body with the main body being vertically reversed; a sleeve feeder for covering the sleeve over the container main body at the outer periphery of the container main body held on the container holder; and a sleeve alignment device for pressing the sleeve covered over the container main body toward the container main body, wherein the sleeve alignment device comprises a alignment jig opposite to an upper

end of the sleeve covered over the container main body, and jig driving means for driving the alignment jig toward the container holder; the alignment jig is provided with a jig main body having a push-in portion capable of abutting against an upper end of the sleeve, and an alignment member engaged with the sleeve prior to press-in of the sleeve by the push-in portion, thereby displacing the sleeve in the radial direction so that the sleeve and the container main body are aligned with each other; the alignment member is provided coaxially with the jig main body and movably in the push-in direction of the sleeve; and a centering face with a diameter decreasing toward the sleeve side is provided at an outer periphery of an end opposite to the sleeve of the alignment member.

According to this manufacturing apparatus, a sleeve sheathed at the periphery of the container main body is displaced in the radial direction of the container main body by a centering face of the alignment member to be aligned with the container main body. Then, the aligned sleeve can be pushed into the container main body side. In this manner, a possibility that a manufacturing failure is caused by a sleeve being pushed with an alignment between the sleeve and the container main body being displaced will be reduced. An alignment member is provided coaxially to the jig main body of the alignment member, and the alignment member is smoothly guided to the jig main body, whereby reliability of the alignment action can be enhanced.

Still another manufacturing apparatus of the seventh invention is a manufacturing apparatus for manufacturing a heat insulating container by combining a sleeve at the periphery of a container main body, the manufacturing apparatus comprising: a container holder having a rotor rotatable around the axis of the container main body with holding the container main body; and an adhesive applying device comprising nozzle means for blowing an adhesive toward the outer periphery of the container main body held on the container holder, wherein the adhesive applying device is additionally provided with photography means for photographing an image of a photography area set between the nozzle means and an adhesive area of the side wall of the container main body; and a judgment means for judging whether or not the adhesive is blown properly based on a rate of which a region for tone corresponding to the adhesive occupies within the image of the photography area.

According to this manufacturing apparatus, while the container main body supported on the rotor is rotated, adhesive is blown at the periphery of the container main body, whereby the adhesive can be supplied to the periphery of the container main body uniformly along the peripheral direction thereof. In the case where a quantity of adhesive blown from the nozzle means is excessively large or small or in the case where the quantity is adequate, but the ejection direction is inadequate, a rate of which a region of tone corresponding to the adhesive

occupies the inside of an image of the region of interest becomes abnormal. Thus, adequate countermeasure can be taken by reliably detecting a supply failure of the adhesive.

An inspection apparatus of the seventh invention is an inspection apparatus for inspecting a heat insulating container in which a sleeve is combined at an outer periphery of a container main body, the inspection apparatus comprising: a container holder comprising a rotor for rotatably holding the heat insulating container around an axis thereof with the container being vertically reversed; rotation driving means for rotationally driving the rotor; height information detecting means for detecting a change in height of an upper end of the heat insulating container at a predetermined position around the container holder together with the driving of the rotor, and outputting information according to the detection result; and judgment means for judging whether or not the combination is proper based on information outputted by the height information detecting means.

According to this inspection apparatus, when a sleeve is inadequately sheathed to the container main body, the sleeve rides on a part of the container main body, and the height of the container main body changes from a normal value at a place at which the sleeve has rid. This change is detected based on information from the height detecting means during rotation, whereby adequate countermeasure can be taken by reliably detecting a failure of combination between the container main

body and the sleeve.

The height information detecting means including light emitting portion and a light receiving portion disposed oppositely with sandwiching the upper end of the heat insulating container held on the container holding jig, inspection light with a predetermined width may be emitted from the light emitting portion to the light receiving portion, and a signal according to the light reception quantity of the inspection light may be outputted. In this case, if the height of the heat insulating container changes, a quantity of interruption of the inspection light increases or decreases at the upper end of the heat insulating container accordingly, and a change occurs with an output signal from the light receiving portion.

The inspection apparatus may be provided with: distance information detecting means for detecting a change in distance from a predetermined position of the outer periphery of the container holder to the outer periphery of the sleeve of the heat insulating container together with the driving of the rotor, thereby outputting information according to the detection result; and forming judgment means for judging whether or not the forming of the sleeve is proper based on the information that the distance information detecting means outputs. In this case, if a sleeve is distorted due to a failure of the adhering portion or the like, a change in distance according to the distortion is detected by the

distance information detecting means. Therefore, adequate countermeasure can be taken by reliably detecting a mold failure of the sleeve.

As described above, in the case where a cover material is mounted to a curled portion at the opening end of the heat insulating container, processing for crushing the full periphery of the curled portion simultaneously is performed, and the processing is practical only in the case of a container with its relatively small aperture. If an attempt is made to flatly crush a curled portion of a container (about 140 mm ϕ) with its large aperture employed for precooked noodles or the like in the similar manner, a very large press force is required, making it difficult to ensure practical use. Moreover, If the press force is large, it is required to strengthen each part of the press apparatus. As a result, equipment cost is increased.

An eighth object of the present invention is to provide a processing apparatus and method capable of processing a curled portion of a container with relatively gentle force in shape suitable to adhering of the cover material.

In order to achieve this object, the container processing apparatus according to the eighth invention comprises: a press member capable of contacting a part of a curled portion provided at an end edge of a container; a curl receiving member provided so as to be opposed to the press

member by sandwiching the curled portion; press driving means for driving the press member or the curl receiving member toward the curled portion so that the curled portion is sandwiched between the press member and the curl receiving member; and rotation driving means for rotationally driving the press member or the container so that a position at which the curled portion is sandwiched between the press member and the curl receiving member changes in the peripheral direction of the container.

According to this processing apparatus, a part of the curled portion is merely sandwiched between the press member and the curl receiving member, and thus, the curled portion can be processed in a predetermined shape with gentle force in comparison with a case in which the entire curled portion is crushed simultaneously. A position at which the curled portion is processed changes in the peripheral direction depending on rotation of the press member or container, and the curled portion is processed in a desired shape all over the full periphery.

The curl receiving member may be provided so as to receive the curled portion all over the full periphery. In this case, the curled portion of the container can be stably held at the curl receiving member.

The processing apparatus may comprise a container holder for holding the container, and the container holder may be provided with a rotor which is rotatable around the axis

of the container with holding the container. Further, the curl receiving member may be provided on the rotor, and the rotation driving means may drive the rotor rotationally. In this case, while the container is held at a constant posture by the container holding, rotation is applied to the rotor of the container holder, whereby the container can be rotated around the axis. Processing other than that of the curled portion can be performed by utilizing this rotation.

The rotation driving means may include a drive wheel to be brought into contact with an outer periphery of the rotor and a drive source for rotationally driving the drive wheel. In this case, the container can be rotated only by bringing the drive wheel into contact with the rotor. In addition, transmission of rotation to the container can be interrupted only by releasing the drive wheel from the rotor.

The press member may be a roller which is rotatable around the axis extending in the radial direction of the container. In this case, a frictional resistance caused when the press member and the curled portion of the container relatively rotate each other is reduced, and the curled portion can be smoothly processed.

In the processing apparatus, when the curled portion is pressed by the press member and the curl receiving member, the press member or the curl receiving member is displaceable in a direction distant from the curled portion against the press force supplied from the press driving means. In this

case, even if a step occurs with the curled portion due to container pasting or the like, the press member or curl receiving member is released according to the step, whereby the step portion is not crushed excessively.

An air cylinder may be provided as the press driving means. In this case, the air sealed in the air cylinder functions as a cushion, and thus, the press member or curl receiving member driven by the air cylinder can be displaced according to the step of the curled portion.

On the rotor, there may be provided a side wall receiving member for receiving the side wall (the trunk portion) of the container all over the full periphery from its interior face side. By a side of the container holder, there may be provided a mold press member which is opposite to the side wall receiving member and which is capable of contacting a part of the side wall in the peripheral direction thereof; and mold driving means for driving the mold press member toward the side wall. In this case, the side wall of the container is sandwiched between the mold press member and the side wall receiving member together with processing of the curled portion, whereby the side wall of the container can be processed along its peripheral direction.

A contact position between the press member and the curled portion may be set to an opposite side in the radial direction of the container relevant to the contact position between the mold press member and the side wall. In this case,

the container is floated from its holder together with the processing action caused by the press member or mold press member, and an occurrence of a processing failure is eliminated.

In the processing apparatus, there may be provided slip-off prevention means for pressing the bottom side of the container toward the container holder. In this case, the container is floated from its holder together with the processing action caused by the press member or mold press member, and an occurrence of a processing failure is eliminated.

The container may be a heat insulating container having a container main body provided with the curled portion and a sleeve covered over an outer periphery thereof, and processing of the curled portion by the press member and the curl receiving member may be carried out for the container main body before mounting the sleeve. In this case, the curled portion can be processed without being interfered by the sleeve.

According to the processing method of the eighth invention, a part of the curled portion provided at the end edge of the container is sandwiched between the press member and the receiving member; the sandwiched position is gradually changed along the peripheral direction of the curled portion; and the full periphery of the curled portion is processed in a predetermined shape.

According to this processing method, the curled portion can be processed in a predetermined shape all over the full periphery with gentle force, compared with a case in which the entire curled portion is crushed simultaneously.

Further objects, features, operation and advantageous effects of the present invention will become apparent through preferred embodiments of the invention described below.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view showing a heat insulating container of a first embodiment according to the present invention;

FIG. 2 is a view showing a heat insulating container of a second embodiment according to the present invention;

FIG. 3 is a bottom face view of a cup main body provided at the heat insulating container of FIG. 1 and FIG. 2;

FIG. 4 is a dimensional view of a sample according to an example of the heat insulating container of FIG. 1;

FIG. 5 is a view showing a heat insulating container with grip pieces of a third embodiment according to the present invention;

FIG. 6 is an exploded view showing a blank of a sleeve used for the heat insulating container of FIG. 5;

FIG. 7 is an enlarged view showing a grip piece provided on the blank of FIG. 6;

FIG. 8 is a view showing a use state of the heat insulating container with grip pieces of the FIG. 5;

FIG. 9 is a dimensional view showing an embodied sample of the heat insulating container with grip pieces of FIG. 5;

FIG. 10 is a view showing a heat insulating container of a fourth embodiment according to the present invention;

FIG. 11 is a view showing a manufacturing process of the heat insulating container of FIG. 10;

FIG. 12 is an enlarged sectional view showing an inwardly curled portion of the sleeve of FIG. 10;

FIG. 13(a) to FIG. 13(c) are views showing various shapes of the inwardly curled portion provided at the sleeve of FIG. 10;

FIG. 14(a) to FIG. 14 ((c) are views showing further various shaped of the inwardly curled portion provided at the sleeve of FIG. 10;

FIG. 15 is an enlarged sectional view of a bottom rim portion provided at a cup main body of FIG. 10;

FIG. 16 is an enlarged sectional view showing a vicinity of an adhesive portion between the cup main body and the sleeve;

FIG. 17 is a sectional view showing another example when the lower end of the sleeve is positioned more upwardly than the bottom rim;

FIG. 18 is a sectional view showing a shape of the inwardly curled portion of the sleeve.

FIG. 19 is a plan view showing a part of a blank for forming the sleeve;

FIG. 20 is a view showing a heat insulating container of a fifth embodiment according to the present invention;

FIG. 21 is a view showing the manufacturing steps of the heat insulating container of FIG. 20;

FIG. 22 is an enlarged sectional view of a curled portion of a cup main body constituting the heat insulating container of FIG. 20;

FIG. 23 is a plan view showing an apparatus for manufacturing the sleeve of FIG. 20;

FIG. 24 is a side view taken along the arrow XXIV of the manufacturing apparatus of FIG. 23;

FIG. 25 is an enlarged view taken along the line XXV of FIG. 23;

FIG. 26 is a view showing a mandrel and a main sealing device provided at the manufacturing apparatus of FIG. 23;

FIG. 27 is a side view showing a first half of a blank feeder provided at the manufacturing apparatus of FIG. 23;

FIG. 28 is a plan view showing the first half of the blank feeder;

FIG. 29 is a sectional view showing a first half taken along the line XXIX-XXIX of FIG. 27;

FIG. 30 is a side view showing a latter half of the blank feeder;

FIG. 31 is a plan view showing the latter half of the blank feeder;

FIG. 32 is a detailed view showing a winding device

provided at the manufacturing apparatus of FIG. 23;

FIG. 33 is a view showing essential parts of an auxiliary sealing device provided at the manufacturing apparatus of FIG. 23;

FIG. 34 is a detailed view showing a curl processing device provided at the manufacturing apparatus of FIG. 23;

FIG. 35 is a view showing a modification of FIG. 34;

FIG. 36 is a detailed view showing a sleeve ejector provided at the manufacturing apparatus of FIG. 23;

FIG. 37 is a plan view showing the sleeve ejector;

FIG. 38 is a view showing an example of a curled portion of the sleeve;

FIG. 39 is a plan view showing a paper cup manufacturing apparatus of FIG. 20;

FIG. 40 is a side view showing the apparatus taken along the arrow XXXX of FIG. 39;

FIG. 41 is a side view showing the apparatus taken along the arrow XXXXI of FIG. 40;

FIG. 42 is a sectional view showing a cup feeder provided at the apparatus of FIG. 39;

FIG. 43 is a plan view showing the cup feeder of FIG. 42;

FIG. 44 is a view showing essential parts of the processing apparatus provided at the apparatus of FIG. 39;

FIG. 45 is a rear view taken along the arrow XXXXV of FIG. 44;

FIG. 46 is a view showing how a rib is processed on the side wall of the cup main body by means of the apparatus of FIG. 44;

FIG. 47 is a view showing how a curled portion of the cup main body is processed by the processing apparatus of FIG. 44;

FIG. 48 is a view showing an example when the curled portion of the cup main body is processed by using a plurality of press rollers;

FIG. 49 is a view showing essential parts of a gluing device provided at the apparatus of FIG. 39;

FIG. 50 is a view showing essential parts of a sleeve feeder provided at the apparatus of FIG. 39;

FIG. 51 is an entire view showing a sleeve alignment device provided at the apparatus of FIG. 39;

FIG. 52 is a view showing essential parts of the device of FIG. 51;

FIG. 53 is a view showing a construction of an inspection apparatus provided at the apparatus of FIG. 39;

FIG. 54 is a view showing a construction of an ejector provided at the apparatus of FIG. 39; and

FIG. 55 is a side view showing the ejector taken along the arrow XXXXXV of FIG. 54.

BEST MODE FOR CARRYING OUT THE INVENTION

FIG. 1 shows a heat insulating container of a first

embodiment according to the present invention, wherein the right side viewed from the center line shown in FIG. 1(a) to FIG. 1(c) shows a side face, and the left side shows a sectional view, respectively. This applies to FIG. 2(a) to FIG. 2(c).

A heat insulating container 10 of FIG. 1 is constructed by combining a paper cup main body 10A shown in FIG. 1(a) and a paper sleeve (a paper cylinder) 10B shown in FIG. 1(b). The cup main body 10A has a cylindrical trunk portion (a side wall) 11 having its upper part opened; and a bottom part (a bottom plate) 12 for closing the lower part of the trunk portion 11. A polyolefin based resin layer is formed at least on an interior face of the cup main body 10A. The sleeve 10B is mounted on the cup main body 10A so as to form a gap between the trunk portion 11 and a peripheral face. The heat insulating container 10 as shown in FIG. 1(c) is formed so that the outer diameter of the opening at the upper end of the trunk portion 11 is greater than the height thereof, and is formed in china bowl, wooden bowl or bowl like shape.

In order to enhance the rigidity of the cup main body 10A, as shown in FIG. 1(a), at least one of an outwardly protruding horizontal rib 13 or an inwardly protruding horizontal rib 13' is formed at the trunk portion 11 of the cup main body 10A. A plurality of horizontal ribs 13 or horizontal ribs 13' may be formed. The horizontal ribs 13 and 13' may coexist in the same cup main body 10A.

An outward top curled portion 14 is formed at the upper

end of the cup main body 10A. The bottom part 12 and the trunk portion 11 are wound and bonded with each other at the lower end of the cup main body 10A.

The top curled portion 14 reinforces the strength of the cup main body 10A, and provides a heat seal face when a cup material (not shown) is bonded. The sectional shape of the top curled portion 14 may be shaped to be crushed in the vertical direction without being limited to a circular shape.

As shown in FIG. 1(b), the sleeve 10B has a reverse frustum shaped side wall 15. An inwardly curled portion 16 is formed at the lower end of the sleeve 10B.

The sleeve 10B is mounted on the above cup main body 10A, whereby a heat insulating space A is formed between both of them.

The internal periphery of the inwardly curled portion 16 of the sleeve 10B mounted on the cup main body 10A abuts against the lower end of the trunk portion 11 of the cup main body 10A. The upper end of the sleeve 10B comes into direct contact with the upper end of the trunk portion 11 of the cup main body 10A or comes into contact with the same via a heat insulating material as shown in FIG. 2. An embodiment in FIG. 2 will be described below in detail. The cup main body 10A and the sleeve 10B are fixedly adhered to either of the contact parts of these upper and lower ends thereof so that the sleeve 10B doesn't slip off.

In the above heat insulating container 10, the

outwardly protruding horizontal rib 13 or the inwardly protruding horizontal rib 13' plays an important role on reinforce of the strength of the cup main body 10A together with a winding portion around the bottom part 12.

The number of ribs 13, the position at which these ribs are formed, the height or depth thereof, or sectional shape thereof or the like may be determined considering the size of the cup main body 10A, the rigidity of the paperboard element material or the like. One rib 13 or 13' may be provided at a position at which the rib functions as a line indicative of an optimum level of a hot water supply quantity relevant to the cup main body 10A, i.e., hot water liquid level (Peter line).

In the heat resisting container 10 of FIG. 1, the outwardly protruding horizontal rib 13 plays an important role on forming the heat insulating space A. This is because, when the side wall (the trunk portion 11) of the container 10 is held by hand, the horizontal rib 13 supports a side wall 15 of the sleeve 10B, whereby the inward slackness of the side wall 15 can be restricted.

While the sleeve 10B is combined with the cup main body 10A, the sleeve 10B and the outwardly protruding rib 13 may abut against each other or may be distant from each other. In the latter case, the heat insulating space A is expanded, the air convects vertically in the heat insulating space A, and a heat is easily to be diffused. Therefore, when the trunk

portion 11 is held by hand after hot water supply, the side wall 15 of the sleeve 10B slightly slackens inwardly; however, the surface temperature of the side wall 15 is lowered, and the side wall is easily to be held compared with a case in which the sleeve 10B and the rib 13 abut against each other prior to holding the container 10 by hand.

FIG. 2 shows a heat insulating container of a second embodiment to which the present invention is applied.

After hot water supply or in the case where a user holds the wooden shaped vessel after micro-oven heating by hand, it is general to hold the upper half of the container trunk portion so as to support it on both sides by fingers of both hands. In the heat insulating container of FIG. 2, an effect and stabilization of the heat insulating properties of a portion at which the user's fingers touch is achieved. That is, in the heat insulating container 10 of FIG. 2, a heat insulating member 17 is wound in advance and adhered to the upper part of the trunk portion 11 of the cup main body 10A, over which the sleeve 10B is mounted.

For the heat insulating member 17, there can be used a paperboard piece corrugated like a middle core paper of corrugated board, the protrusion and recess stripes being arranged alternately or a paperboard piece of its predetermined width at which the ragged shape is formed by emboss processing.

When the heat insulating member 17 is provided between

the cup main body 10A and the sleeve 10B, heat heating properties of the top part of the trunk portion narrowing the heat insulating space A can be improved and stabilized.

Therefore, after hot water supply or micro-oven heating and cooking, the heat insulating container 10 can be reliably held by hand. The heat insulating container 10 of FIG. 2 is particularly effective when hot water is supplied to the top part of the heat insulating container.

In order to prevent the slip-off of the sleeve 10B mounted on the cup main body 10A, the internal periphery of an inwardly curled portion 16 and the cup main body 10A are adhered to each other or the interior and exterior faces of the heat insulating member 17 are adhered to the cup main body 10A and the sleeve 10B, respectively.

FIG. 3 is a bottom view of the cup main body 10A used for the heat insulating container of FIG. 1 or FIG. 2.

As described above, the cup main body 10A, as shown in FIG. 3, is provided with a horizontal rib 13 or 13' so as to wind the trunk portion 11 at a predetermined position of the trunk portion 11. The horizontal ribs 13 and 13' can be provided so as to continuously wind the trunk portion 11 as shown in FIG. 3(a). As shown in FIG. 3(b), the horizontal ribs 13 and 13' may be provided so as to wind the trunk portion 11 while these ribs are being intermitted by the cutout portion 19.

In the case of the heat insulating container 10 of FIG.

1, if the number of horizontal ribs 13 is constant, in the case where the ribs 13 are wound intermittently, it is slightly inferior to a case in which continuous ribs 13 are provided in that the side wall 15 of the sleeve 10B is prevented from slackness. However, a heat insulating space is extended, the heat insulating space communicates with the top end bottom, whereby the heated air in the entire heat insulating space is easily moved. Therefore, a temperature rise is uniformed. As a result, there is provided an effect that heat insulating properties are improved. In the case where the ribs 13 are intermitted, it is preferable to divide one rib 13 into 4 or 8 sections relevant to the full periphery of the trunk portion 11. It is preferable that the rate of which one rib 13 occupies the full periphery of the trunk portion 11 is 30 % or less.

FIG. 3 shows a bottom rim portion 18. An internally curled portion 16 functions to compensate for a space of the bottom rim portion 18 (an opening on the lower end side of the heat insulating space A). Therefore, there is no worrying about dust entry from the bottom rim portion 18 or water invasion, and a sanitary heat insulating container can be provided.

With the construction of the above heat insulating container 10, there can be provided a wooden paper heat insulating container having the outer diameter of the opening ranging from 120 to 200 mm, using the same paperboard element material as a conventional paper based heat container. The

internal capacitance can be set within the range of 600 to 1500 cc.

As a paperboard element material used for molding the heat insulating container 10, a material whose weight is substantially identical to a conventional material can be used. That is, a cup original paper weighing 190 to 450 g/m² can be used for molding the cup main body 10A. In addition, card based or coat bowl based paperboard weighing 230 to 450 g/m² can be used for molding the sleeve 10B. If the original paper of the sleeve 10B is less than this limit, there is a danger that the rigidity of the sleeve 10B is lowered, and slackness becomes too large during heating, whereby required heat insulating properties cannot be obtained. In addition, if the weighing of the original paper of the sleeve 10B exceeds the above limit, the rigidity is increased; however, the processing aptitude of the inwardly curled portion 16 is impaired, and the material cost is increased, which is not preferable.

A resin coat or resin impregnation processing and the like may be applied to the element material of the sleeve 10B. In this case, the rigidity, pressure resistance compressibility, and pressure resistance crush properties of the entire heat insulating container 10 are increased, and the heat insulating container 10 can be functioned so as to protect the capacitance from external force applied during material distribution.

In general, on the interior face of the cup original

paper, there are extrusion-coated and formed a polyolefin based resin layer made of a low density polyethylene resin, a middle density polyethylene resin, a high density polyethylene resin, or linear low density polyethylene resin and the like within the range of 20 to 80 μm . The polyolefin based resin layer prevents the capacitance from permeating into the paperboard (the element material of the cup main body 10A); improves the protective aptitude of the capacitance; improves cup molding properties at the bottom part, curled portion, and trunk pasting portion; and improves sealing properties due to a heat seal at the top curled portion of the cover member (not shown).

In the above heat insulating container 10, there is no protrusion and recess on the side wall (the peripheral wall), and the inwardly curled portion 16 of the sleeve 10B forms a proper R at the bottom part of the container, and thus, the appearance and design properties are improved.

The surface of the side wall of the heat insulating container 10 is flat, and the degree of freedom in print to the sleeve 10B is high. Not only publicly known printing such as offset, gravure, flexography printing but also post-printing processing such as various over-coating, foil pressing, embossing can be arbitrarily applied to the sleeve 10B. Therefore, an over-coating layer such as OP varnish is provided on the side wall face of the sleeve 10B or the surface of the internally curled portion 16, whereby these faces can

be reformed to be hardly wet or dirty.

An over-coating layer such as OP varnish is provided on the side wall face of the sleeve 10B and the surface of the inwardly curled portion 16, whereby their faces can be improved so as to be hardly wet and stained.

In general, in the case where hot water comes into contact with a plastic face or plastic layer on the interior face of the container, it must be fully considered that elution of the residual monomer in the plastic, heavy metals or the like used for polymeric catalyzing, and the other additives or the like is likely to occur, thereby causing food contamination. Of course, a container must be constructed so that the elution quantities of these does not exceed the reference value defined by the food sanitation law. Even if there is a very fine quantity of such elution, which is equal to or less than this limit, for example, it is desirable to avoid using resins which elutes environmental hormones (exogenous internal secretion disturbance substances) which are considered as having a danger of disturbing internal secretion of organisms such as bisphenol A eluted from a polycarbonate resin frequently used for feeding bottles or food vessels for school feeding or styrene oligomer eluted from polystyrene foam containers from the viewpoint of the principle of preventing food poisoning.

In the above mentioned heat insulating container 10, an additive-free resin is selected from among such low-risk

polyolefin based resins, and is used for coating an interior face, which is safe.

Now, a method for manufacturing the heat insulating container 10 of FIG. 1 or FIG. 2 will be described.

First, a frustum shaped trunk portion 11 is formed from a fan shaped blank by a paper cup molder, and the lower part of the trunk portion 11 is wound by a bottom plate, thereby molding a bottom part 12. In addition, an outwardly top curled portion 14 is molded at the top end of the trunk 11. Then, outwardly, or inwardly protruding rib 13 or 13' are molded at a predetermined position of the trunk portion 11, thereby manufacturing a cup main body 10A.

The method for processing outwardly protruding rib 13 can be implemented inline or off-line relevant to the cup molder. That is, the molded cup main body 10A is engaged in a die cavity at which a portion corresponding to the horizontal rib 13 is precut in groove shape, and the cup main body 10A is rotated. In this state, a rotation roller is strongly pressed from the inside of the cup main body 10A toward the above mentioned groove shaped portion by means of an expander. In this manner, the outwardly protruding rib 13 shown in FIG. 3(b) is formed.

In that case, the rotation roller is pressed all around the cup main body 10A, whereby a continuously winding rib 13 shown in FIG. 3(a) is obtained. The rotation roller is pressed to the cup main body 10A intermittently, whereby an

intermittently winding rib 13 can be formed.

In the above molding method, it is required to pull out the cup main body 10A from the die cavity after the rib 13 has been processed. In FIG. 1 or FIG. 2, in the case where an upside slope is formed more gently than the downside slope from the top of the horizontal rib 13, the cup main body 10A can be easily pulled out from the cavity. The rib 13 can be formed by throttle processing using male and female mold.

The rib 13' in the heat insulating container 10 of FIG. 2 is formed using the following procedure. The molded cup main body 10A is engaged in the periphery of a mandrel in which a portion corresponding to the rib 13' is precut in groove shape. Next, while the cup main body 10A is rotated together with the mandrel, the rotation roller is strongly pressed from the outside of the cut toward the above mentioned groove shaped portion. In this manner, an inwardly protruding rib 13' can be formed. A frustum shaped sleeve 10B is formed from the fan shaped blank, and an inwardly curled portion 16 is molded at the lower part thereof. This sleeve 10B and the molded cup main body 10A are combined while both of them are adhered to each other at a mutually abutment position, whereby the heat insulating container 10 can be obtained. The completed heat insulating container 10 according to the present invention is stacked, thereby making it possible to supply it to the user.

As samples of the heat insulating container 10 of FIG. 1 according to Examples, two types of samples A and B shown

in FIG. 4 were prepared in accordance with the following specification. In addition, the embodied samples A and B and samples A' and B' (not shown) according to Comparative Example were prepared in accordance with the same specification.

Sample A

Specification of the Cup Main Body 10A

Content: 804. 2 cc (full)

499.7 cc (22.5 mm full from the top)

Outer diameter of opening: 143.5 mm ϕ

Inner diameter of opening: 135.0 mm ϕ

Bottom plate diameter: 115.2 mm ϕ

Height: 72.1 mm

Number of horizontal ribs: 2

Upper stage width of horizontal rib: 2 mm

Lower stage width of horizontal rib: 6 mm

Constitution of element material: Polyethylene 25 μ m / cup
original paper 280 g/m²

Specification of Sleeve 10B

Outer diameter of inwardly curled portion: 119.4 mm

Thickness of inwardly curled portion: 2.6 mm

Outer diameter of upper end portion: 135.0 mm

Constitution of element material: OP varnish later / print
layer / coat bowl 310 g/m²

Sample B

Specification of Cut Main Body 10A

Content: 1045. 1 cc (full)

659. 5 cc (30.9 mm full from the top)

Outward diameter of opening: 139.5 mm ϕ

Inner diameter of opening: 131.0 mm ϕ

Diameter of bottom plate: 101.2 mm ϕ

Height: 105.0 mm

Number of horizontal ribs: 2

Upper stage width of horizontal rib: 2 mm

Lower stage width of horizontal rib: 6 mm

Constitution of element material: Polyethylene 2.5 μ m / cup
original paper 280 g/m²

Specification of Sleeve 10B

Outer diameter of inwardly curled portion: 105.6 mm

Thickness of inwardly curled portion: 2.6 mm

Outer diameter of upper end portion: 131.0 mm

Constitution of element material: OP varnish layer / print
layer / coat bowl 310 g/m²

The above sleeve 10B was mounted to the periphery of the above cup main body 10A, and the abutment site of the bottom part 12 was adhered by acrylic emulsion type additive, whereby samples A and B according to Examples having side faces and cross sections shown in FIG. 4(a) and FIG. 4(b) were prepared.

In addition, samples A' and B' according to Comparative Examples without horizontal ribs 13 and 13' were prepared, and the samples A and B according to Examples were compared with samples A' and B' according to Comparative Examples, respectively, as follows.

Hot waters of 500 cc and 95 °C were poured into samples A and A', respectively, and hot waters of 600 cc were poured into samples B and B', respectively. After 3 minutes, the upper stage of the trunk portion was held on both sides by both hands, and the external surface temperatures was functionally compared with each other. As a result, it was found that the samples A and B according to Examples are deformed lesser than samples A' and B' according to Comparative Example, are superior in heat insulating properties, and are easier to hold. In addition, as the trunk portion was held more firmly, the hotness of the samples according to Comparative Examples was felt strongly.

The above heat insulating container 10 is formed in wooden bowl shape in which the outer diameter of the opening molded by employing paperboard element material in accordance with the substantially same specification as the conventional one is greater than the height thereof, and moreover, the capacitance is greater than a case of the conventional cup shape. However, even if hot water is fully supplied, the container is less deformed, and good heat insulation properties can be provided.

Therefore, hot water supply cooking with the container or micro-oven heat cooking makes it possible to serve a variety of foods enjoyably and eatably during meal as a wide-opening tableware in place of wooden bowl or bowl, and makes it possible to provide barrier-free goods to general consumers, in particular, aged people, physically handicapped people, children or the like.

In addition, the heat insulating container 10 is free of protrusions or recesses on the exterior wall of the trunk portion; provides good design properties and the degree of freedom for printing; achieves a print effect for wide-opening cup material is achieved; and can achieve a superior sales promotion effect at storefront.

From the polyolefin based resin layer on the interior face of the heat insulating container 10, there is no elution of suspected substances such as environmental hormones seen in polystyrene foam used for the conventional heat insulating container. The inwardly curled portion 16 compensates for a space between the cup main body 10A and the sleeve 10B at the bottom rim portion 8 of the bottom face; prevents the invasion of dust or foreign object into the trunk portion or absorption of liquid from the end face of paperboard; and can prevent dirt from the bottom part. Therefore, the safety and reliability from the sanitary aspect can be improved.

Even if the capacitance is increased, the paperboard element material in accordance with the substantially

conventional specification as the conventional one can be used, an increase in material cost and manufacturing cost can be suppressed, and a heat insulating container can be provided at a reasonable and economical cost.

The heat insulating container 10 is discarded as a paper product after use, the capacitance can be easily decreased, and thus, waste management properties are good. Further, recycling is possible, which can contribute to the reduction of an environmental impairment.

FIG. 5 shows a heat insulating container of a third embodiment according to the present invention. The right side from the center line shown in FIG. 5(a) to FIG. 5(c) shows a side face, and the left side shows a cross section, respectively.

A heat insulating container 20 of FIG. 5 is constituted by combining a reverse frustum shaped paperboard sleeve 20A and a paper cup main body 20B with each other. The cup main body 20B includes a cylindrical trunk portion 31 and a bottom part 32 fixed to be wound around the lower part of the trunk portion 31. An outwardly curled portion 33 is formed at the upper opening edge of the trunk portion 31, and an outwardly protruding horizontal rib 34 and an inwardly protruding horizontal rib 35 are formed at the trunk portion 31. A heat insulating space is formed between the interior face of the side wall 21 of the sleeve 20A and the exterior face of the trunk portion 31 of the cup main body 20B. A polyolefin based

resin is coated on the interior face of the cup main body 20A. A pair of grip pieces 23, 23 are provided so as to be opposite to each other on the side wall 21 of the sleeve 20A. In FIG. 5, one grip piece 23 is shown. The outer diameter of the upper end opening of the cup main body 20B is set to be greater than the height of the container 20.

The heat insulating space of the heat insulating container 20, as shown in FIG. 5, is formed by the outwardly protruding horizontal rib 34 provided at the trunk portion 31 of the cup main body 20B and an inwardly curled portion 22 formed at the lower part of the sleeve 20A. However, in a free state (a state in which the container is placed on a table or the like without being held by hand), there is no need for the side wall 21 of the sleeve 20A abutting against the outwardly protruding horizontal rib 34.

The primary role of the horizontal rib 34 is to reinforce the trunk portion 31 of the cup main body 20. In addition, the horizontal rib 35 serves to reinforce the trunk portion 31 and impart a milestone for a proper quantity of hot water to be poured into the cup main body 20.

FIG. 6 is an exploded view of a blank for manufacturing the sleeve 20A.

A blank 20A' of the sleeve 20A, as shown in FIG. 6, is formed by punching a paperboard in fan shape. At both left and right ends of the blank 20A', there are provided trunk pasting portions N, and at the lower end, there is provided

a curl molding portion C of the inwardly curled portion 22. A portion other than the curl molding portion C is where the side wall 21 of the sleeve 20A is formed.

The trunk pasting portions N of the blank 20A' are adhered to each other, and the reverse frustum shaped sleeve 20A is formed. At the blank 20A', a pair of grip pieces 23, 23 partitioned by folding line 25 and break line 24 are punched, and these grip pieces are positioned so as to be opposite to each other when they are molded at the sleeve 20A. In addition, the folding line 25 is provided along an arc of the blank 20A'.

FIG. 7 is an enlarged view of a grip piece 23 on the blank 20A'.

FIG. 7(a) shows one aspect of the grip piece 23. The grip piece 23 is partitioned by a linear folding line 25 connecting two points p1 and p2 on an arc parallel to the periphery of the blank 20A', in another word, on the arc extending with a predetermined distance relevant to the periphery of the blank 20A' or a curved folding line 25 curved at the lower side than the straight line; and a break line 24 connecting both sides (p1, p2) of the folding line 25 and curved at the lower part than the folding line 25. The grip piece 23 can be folded back to the outside by the folding line 25.

In addition, a connecting portion 26 is formed on the way of the break line 24.

The connecting portion 26 is provided to connect the grip piece 23 to the side wall 21 until the blank 20A' is molded

at the sleeve 20A to be assembled at the cup main body 20B, thereafter the grip piece 23 is used. The connecting portion 26 preferably has a width of about 0.3 to 1.0 mm (in the case where the thickness of paperboard is 0.2 to 0.5 mm) so that the connecting portion 26 can be destroyed with slight force of the finger tip during use of the grip piece 23. In general, in the case where paper is cut by tearing it into pieces, the required force for cutting the paper in a direction orthogonal to the paper grain becomes stronger than that for cutting it in the direction of paper grain. Therefore, in the case where a plurality of connecting portions 26 are provided at one side of the break line 24, it is desirable that, as the widthwise direction of each connecting portion 26 is closer to a direction parallel to a direction of break line indicated by the arrow in the figure, the width of the connecting portion 26 is increased. In this manner, the cutting force of each connecting portion 26 can be uniformed.

A cutout 27 is formed around the lower part of the grip piece 23. The cutout 27 is used to rise up the grip piece 23 when the grip piece 23 is formed. The cutout 27 may be of size such that the user's finger tip or nail can be entered. In addition, it is preferable that the cutout 27 is at the lowest part of the grip piece 23.

FIG. 7(b) shows another aspect of the grip piece. In this aspect, a small folding line 25' is provided around the lower part of the grip piece 23 instead of the cutout 27. With

this construction, the lower part of the grip piece 23 can be easily folded along the small folding line 25', and the entire grip piece 23 can be pulled out while that folded portion is employed as a grip piece.

At the end of the break line 24, as shown in FIG. 7(b), it is preferable to provide an R portion 24a which draws an arc so as to return to the lower part of the grip piece 23. The extending direction at the end of the break line 24 is close to a direction parallel to the paper grain, and thus, there is a danger that, when the grip piece 23 is pulled out, the blank 20A' is torn upwardly from the final ends p1 and p2 of the break line 24. This danger can be eliminated by addition of an R portion 24a.

All of the above folding line 25, small folding line 25', break line 24, connecting portion 26, and cutout 27 can be formed at the same time as punching process of the blank 20A'. Therefore, processing of these elements does not contribute to increase the manufacturing cost of the heat insulating container 20.

In addition, an area for the blank 20A' is almost printed before processing the blank 20A'. Although this area functions as an information medium, a print effect or a design effect is not significantly prevented by processing the above grip piece 23.

FIG. 8 shows a use state of the heat insulating container 20 with the above grip piece.

FIG. 8(a) is a side view showing a state in which the grip piece 23 of the heat insulating container 20 according to the present invention is risen up.

The grip piece 23 is provided on the reverse frustum shaped curved face with the folding line 25 being upside. Here, assuming a double container free of a space between the side wall 21 of the sleeve 20A and the trunk portion 31 of the paper cup main body 20B, the grip piece 23 must be risen up from the lowest part with strong force, and the risen grip piece 23 is wrinkled. If a paperboard with its weak tear strength is used for the sleeve 20A, the paperboard is likely to be torn at both ends of the folding line 25.

However, in the case of the heat insulating container 20 with grip pieces of FIG. 5, there exists a space between the side wall 21 of the sleeve 20A and the trunk portion 31 of the cup main body 20B. Thus, when the grip piece 23 is pulled out, the side wall 21 at the center part of the folding line 25 is deformed in the direction indicated by the arrow in FIG. 8(a), and the grip piece 23 can be easily risen up with gentle force. It is preferable that the folding line 25 is slightly curved in the downward direction more than a line connecting the shortest distance between the two points p1 and p2 in the horizontal direction of the reverse frustum face in view of easiness of opening. For example, in the case of a folding line of 50 mm in length, it is desirable that the folding line is curved downward by 0.5 to 2.0 mm at its center portion.

In the case where the grip piece 23 is risen up along this folding line 25, the side wall 21 is deformed as described above, and the left and right of the grip piece 23 is slightly lifted up and deformed so as to be warped. As a result, the grip piece 23 is held at a position substantially vertical to the side wall 21 as shown in FIG. 8(a). The grip piece 23 is pushed down, whereby it can be restored to its original state (a state in which the grip piece substantially faces the side wall 21 of the sleeve 20A).

FIG. 8(b) is a perspective view showing a state immediately before heating and cooking of a heat insulating container 20 with grip pieces.

The heat insulating container 20 is preferably available for use in both of hot water supply cooking and heating and micro-oven heating. In the case of the grip piece 23 shown in FIG. 7(a), prior to heating and cooking, the finger tip or nail is inserted into a cutout 27, thereby lifting the grip piece 23 upwardly. In the case of the grip piece 23 shown in FIG. 7(b), prior to heating and cooking, the tip end of the grip piece 23 is folded back at the small folding line 25' to form a pinch piece, and this pinch piece is pinched by fingers to lift the grip piece 23 upwardly. The thus lifted grip piece 23 is held substantially horizontally as shown in FIG. 8, and heating and cooking may be performed in this state.

In the case of hot water supply cooking and heating, a cover material L is temporarily opened, and hot water is

supplied. Then, the cover material L is closed again, and is left for 3 or 4 minutes. In the case of micro-oven cooking, heating and cooking may be performed while the cover material L is slightly opened.

After cooking, the grip piece 23 is held by both hands, whereby the user can carry cooked food safely to a predetermined position together with the heated and cooked food without feeling hotness.

When a general wooden bowl shaped container is used, it is required to carry the container by hooking fingers at its edges. There is a sanitary problem that the fingers touch the foods inside the container. This problem is solved when the container is carried utilizing the grip piece 23.

The grip piece 23 may be prevented from slip-off by a method for embossing the grip piece 23 in advance or partially coating a slip proof agent in advance.

In the above heat insulating container 20, there can be provided a wooden bowl shaped paper based heat insulating container having the outer diameter of an opening in the range of 120 to 200 mm ϕ , using the same material as a paperboard element material used for the conventional paper based heat insulating container. In addition, the present invention is applicable to a heat insulating container having its internal capacitance in the range of 600 to 1500 cc during full injection.

As a paperboard element material used for molding the

heat insulating container 20, there can be used a material whose weight is substantially the same as the conventional one in spite of its increased internal capacitance.

In general, on the interior face of the cup original paper, there is extrusion-coated and formed a polyolefin based resin layer made of a low density polyethylene resin, a middle density polyethylene resin, a high density polyethylene resin, a linear low density polyethylene resin or the like in the range of 20 to 80 μm .

According to this polyolefin based resin layer, there is provided an effect that the layer prevents the capacitance from permeating into a paperboard; improves an aptitude for protecting the capacitance; improves cup molding properties at the bottom part, curled portion or trunk pasting portion; and improved sealing properties with a heat seal at the top curled portion of the cover material (not shown).

The original paper of the cup main body 20B weighs about 190 to 450 g/m^2 .

On the other hand, a card based or coat bowl based paperboard weighing 230 to 450 g/m^2 can be used for weighing the original paper of the sleeve 20A. If the weight is less than this limit, the rigidity of the sleeve 20A is insufficient, and there is a danger that slackness becomes too large during heating, and the required heat insulating properties cannot be obtained. In addition, if the weight exceed the above limit, the rigidity is increased, but the aptitude for processing the

inward curl 22 is impaired, and material cost is increased, which is not preferable.

With respect to surface processing of the sleeve 20A, in the case of the conventional heat insulating container, OP varnish processing has sufficed. However, in the case of the heat insulating container 20 with grip pieces, it is preferable to provide tear resistance by surface processing in order to mount the grip piece 23. In addition, in the case where the food contained in the heat insulating container with grip pieces is distributed in chilled state and frozen state, it is preferable to provide water resistance.

Therefore, the surface of the container can provide the following layered construction.

PE 30 μm / paper 270 g/m^2

PE 20 μm / paper 270 g/m^2 / PE 20 μm

OPP 30 μm / PE 15 μm / paper 270 g/m^2

PET 12 μm / PE 15 μm / 270 g/m^2

OPP 30 μm / PE 15 μm / paper 270 g/m^2 / PE 15 μm

PET 12 μm / PR 15 μm / paper 270 g/m^2 / PE 15 μm

In addition, a water resistance double face coat bowl may be used at the stage of paper manufacturing.

Preprint is possible for a flat paperboard before punching the blank 20A', the degree of freedom for printing the surface of the sleeve 20A is high. Not only publicly known printing such as offset, gravure, flexography but also post-print processing such as various over-coatings, foil

press, embossing can be arbitrary applied. After printing, although processing of the grip piece 23 as described previously is applied, this processing does not inhibit flatness, and a beauty effect due to printing and functions of an information medium are maintained intact.

In the heat insulating container 20 of FIG. 5 also, an additive-free resin is further selected from among polyolefin based resins, and is used for coating the interior face, which is safe as in the heat insulating container 10 of the first and second embodiments.

The heat insulating container 20 with grip pieces of FIG. 5 can be manufactured by the procedure same as that in the case of the heat insulating container 10 of the first and second embodiments described above. However, when a paperboard as a raw material of the sleeve 20A is punched in fan shape, it is required to prepare the blank 20' by performing processing of the grip piece 23 simultaneously.

FIG. 9 shows the external dimensions of samples of the heat insulating container 20 with grip pieces of FIG. 5 according to Examples. The detailed specification is as follows. In addition, other samples according to Comparative Example in accordance with the completely same specification is prepared except that the grip piece 23 is not formed.

Samples according to Examples

Specification of Cup Main Body 20B

*

Content: 804.2 cc (full)

500.0 cc (22.5 mm full from the top)

Outer diameter of opening: 143.5 mm ϕ

Inner diameter of opening: 135.0 mm ϕ

Outer diameter of bottom: 113.8 mm ϕ

Height: 72.1 mm

Number of horizontal ribs: 2

Upper stage width of horizontal rib: 2 mm

Lower stage width of horizontal rib: 6 mm

Constitution of element material: PE 25 μm / cup original
paper 280 g/m²

Specification of Sleeve 20A

Outer diameter of internally curled portion: 119.4 mm

Thickness of internally curled portion: 2.6 mm

Inner diameter of upper end: 135.0 mm

Constitution of element material: PE 20 μm / coat bowl 270
g/m² / PE 20 μm

Specification of Grip Piece

Length of folding line: 50 mm

Curving degree of folding line: 1 mm in distance between the
shortest straight line connecting both ends of folding line
and the center part of folding line

Hot waters of 95 °C and 500 cc were poured into samples

according to Examples in which grip pieces 23 were risen up in advance and other samples according to Comparative Examples, respectively. After 3 minutes, a case in which the grip pieces 23 of the samples according to Examples were held on both sides by both hands was functionally compared with a case in which the upper parts of the trunk portions of the samples according to Comparative Examples were held by both hands. It was found that the samples according to Examples can be held much more easily than those according to Comparative Example, and can be handled safely.

In the heat insulating container with grip pieces of the present invention, various modifications can occur without departing from the spirit of the present invention without being limited to the above embodiments.

For example, a heat insulating space between the cup main body 20B and the sleeve 20A is not limited to that defined by the inwardly curled portion 22 of the sleeve 20A and the horizontal rib 34 of the cup main body 20B. A heat insulating member may be intervened between the trunk portion 31 of the cup main body 20B and the side wall 21 of the sleeve 20A. However, it is desirable that a free space is provided at the upper part of the grip piece 23.

The heat insulating container 20 with grip pieces according to the present invention is provided with two grip pieces 23 at a position opposite to the side wall 21 of the sleeve 20A which sheaths the container. Thus, even if the

container has a large capacitance, and is formed in wooden bowl or pan shape, for example, the user can hold it easily without feeling hotness after hot water supply or micro-oven heating and cooking. Therefore, it is possible to serve a variety of precooked foods safely and sanitarily on the spot, and make them pleasurable and eatable. This effect makes it possible to provide barrier-free goods to aged people, physically handicapped persons, children or the like.

The heat insulating container 20 according to the present invention is free of protrusions and recesses on the exterior wall of the trunk portion, high in degree of freedom for printing, enables beautiful, fine printing, and serves as a superior printing medium. In the case of a wide-opening container, a superior sales promotion effect at storefront can be achieved due to an print effect for the cover material.

From the polyolefin based resin layer on the interior face of the heat insulating container 20 with grip pieces according to the present invention, there is no elution of suspected substances such as environmental hormones seen in a polystyrene form used in the conventional heat insulating container, which is safe on the sanitary aspect.

There is almost no cost increase due to provision of the grip piece 23, and there can be provided a heat insulating container at a reasonable, economical cost.

The heat insulating container according to the present invention is discarded as a paper product after use, and the

capacitance can be easily decreased, thus making it to improve waste management properties. Further, recycling is possible, which can contribute to the reduction of environmental impairment.

FIG. 10 shows a paper cup as a heat insulating container of a fourth embodiment according to the present invention; and FIG. 11 shows an outline of the procedure for manufacturing the paper cup.

As shown in FIG. 10, a paper cup 41 is constituted by combining a paper cup main body 42 as a container main body and a sleeve 43 covering the periphery thereof. The cup main body 42 is formed in a substantial frustum shape having a trunk portion (a side wall) 42a and a bottom part 42b. The bottom part 42b is throttle-processed so as to bend its peripheral end in FIG. 10, whereby the bottom part 42b is formed in a substantial lateral U-letter shape in which the sectional shape opens downwardly in FIG. 10. The trunk portion 42a is adhered at the bending portion of the periphery of this bottom part 42b so as to envelope the bending portion from the outside. In this manner, a bottom rim 42f of the cup main body 42 is formed.

An outwardly curled curled portion 42c is provided at an opening of the cup main body 42. Ribs 42d and 42e are provided so as to wind the trunk portion 42a, respectively, at the trunk portion 42a of the cup main body 42. The rib 42d is protruded inside of the trunk portion 42a, and the rib 42e

is protruded outside of the trunk portion 42a. The cup main body 42 is reinforced by these ribs 42d and 42e. The upside rib 42d functions as a Peter line indicative of a proper liquid level of injections (for example, hot water) into the cup main body 42. The downward rib 42e is formed to be somewhat greater than the rib 42b. The ribs 42d and 42e have their respective protrusion quantity defined so as not to come into contact with the interior face of a sleeve 43.

The rib 42d may be protruded outside of the cup main body 42, and the rib 42e may be protruded inside of the cup main body 42.

As an element material of the cup main body 42, for example, paper weighing 150 to 400 g/m² (for example, paper of about 0.3 to 0.34 mm in thickness) is used. At least the interior face of the cup main body 42 is covered with a covering layer (for example, polyethylene layer) for improving heat resistance or water resistance. As in each of the above mentioned embodiments, it is desirable to further select an additive-free resin from among polyolefin based resins and use the resin for the covering layer of the cup main body 42.

The sleeve 43 is provided for improving heat resistance properties of the paper cup 41. As shown in FIG. 10, an inwardly curled portion 43a is formed at the lower end of the sleeve 43. An upper end 43b of the sleeve 43 is adhered to the trunk portion 42a of the cup main body 42, and the curled portion 43a is opposite to the side face of a bottom

rim 42f of the cup main body 42. The curled portion 43a functions as a spacer, and the sleeve 43 is separated from the cup main body 42, whereby a space functioning as a heat insulating layer is ensured between the trunk portion 42a of the cup main body 42 and the sleeve 43. As an element material of the sleeve 43, for example, paper weighing 150 to 400 g/m² is used. The sleeve 43 does not come into contact with hot water or water in particular, and thus, a covering layer such as cup main body 42 may be eliminated.

As shown in FIG. 11, after the trunk portion 42a and the bottom part 42b has been adhered to each other, the ribs 42d and 42e are formed, and the cup main body 42 is formed. In addition, both ends 43c and 43c of a fan shaped blank 43' is pasted with each other, and the inwardly curled portion 43a is formed at the lower end thereof, and the sleeve 43 is formed. Then, adhesive is splay-coated on a predetermined adhesive range (hatching region of FIG. 11) set downward of the curled portion 42c of the cup main body 42, thereby combining the cup main body 42 and the sleeve 43 with each other. The upper end 43b of the sleeve 43 and the trunk portion 42a of the cup main body 42 are adhered to each other, and the paper cup 41 is formed (refer to FIG. 16 for the adhesive range BD).

In the case where the rib 42d expands outwardly in the radial direction of the cup main body 42, the adhesive range BD is set so as not to include the rib 42d.

FIG. 12 is an enlarged sectional view showing the

periphery of the curled portion 43a of the sleeve 43; and FIG. 13 and FIG. 14 are sectional views illustrating the shape of the curled portion 43a. FIG. 12 to FIG. 14 are vertically sectional views showing a case in which a center line CL of the cup main body 42 is set in the vertical direction.

As shown in FIG. 12, the lower end of the bottom rim 42f, i.e., the lower end of the cup main body 42 is protruded more downwardly than the lower end of the curled portion 43a, i.e., the lower end of the sleeve 43. Therefore, in the case where the paper cup 41 is placed on a table or the like, the cup main body 42 having the capacitance contained therein comes into direct contact with a table or the like. The bottom rim 42f of the cup main body 42 is rigid, and the flatness (levelness) of its lower end is relatively good. Therefore, the paper cup 41 is stabilized. "A" in FIG. 12 denotes a protrusion quantity of the cup main body 42 from the curled portion 43a.

In contrast, in the case where the lower end of the curled portion 43a comes into contact to a table or the like, the flatness of the lower end of the curled portion 43a is inferior to that of the bottom rim 42f, and moreover, the cup main body 42 is supported via the sleeve 43, thereby causing the sleeve 43 to be deformed. Thus, the stability of the paper cup 41 is impaired.

It is desirable that the lower end of the bottom rim 42f is protruded relevant to the lower end of the curled portion

43a in protrusion quantity of 0.01 to 5 mm. Within this range, the protrusion of the cup main body 42 is not visually outstanding, and moreover, the bottom rim 42f reliably comes into contact with a table or the like, and the paper cup 41 is stabilized.

A construction in which the lower end of the container main body is protruded more downwardly than that of the sleeve is applicable to a case in which an inwardly curled portion is not formed at the sleeve or a heat insulating container in which a bottom rim is not formed at the cup main body.

As shown in FIG. 12, the peripheral position of the lower end of the bottom rim 42f is set to the center line CL side of the cup main body 42 rather than a site which is the closest to the center line CL of the cup main body 42 in the curled portion 43a (an end on the internal periphery of the curled portion 43a). "B" of the FIG. 12, denotes a displacement quantity in the radial direction of the cup main body 42 between the lower end of the periphery of the bottom rim 42f and the curled portion 43a. This displacement quantity is set within the range of 0.01 to 1 mm, whereby the deformation of the paper cup 41 can be suppressed while smooth assembling is ensured. In addition, there is formed a gap between a site which is the closest to the center line CL of the cup main body 42 in the curled portion 43a and a side face of the bottom rim 42f facing this site. This gap ("D" of FIG. 12) is set within the range of 0.01 to 1 mm, whereby the deformation of the paper

cup 41 can be suppressed while smooth assembling is ensured.

In FIG. 12 and FIG. 13, "X" denotes a vertical axis direction (equal to the center line direction of the cup main body 42); and "Y" denotes a direction indicated by the tip end of paper wound by the curled portion 43a (a direction in which the tip end of the curled portion 43a is extended). As shown in FIG. 12, at the curled portion 43a, there is wound a tip end of paper at which the orientation of the tip end of the wound paper exceeds a vertically upward direction, and the paper rotates clockwise. In this manner, when the cup main body 42 and the sleeve 43 are assembled, the bottom rim 42f is hardly caught by the tip end of paper of the curled portion 43a, whereby both of them can be assembled smoothly.

In contrast, in FIG. 13(a), the tip end of paper is not wound so that the orientation of the tip end of paper is in the vertically upward direction. Thus, in the case where the curled portion 43a is opened upwardly without the tip end of paper being in the vertically upward direction, when the cup main body 42 and the sleeve 43 are assembled, the bottom rim 42f of the cup main body 42 is caught by the curled portion 43a, and the curled portion 43a is easily pressed to be opened, which is not preferable.

In FIG. 13(b), there is shown an example of the state in which the tip end of paper is wound to rotate over the vertically upward direction, wherein the bottom rim 42f is hardly caught by the curled portion 43a. In addition, in FIG.

12, there is shown a state in which the tip end of paper of the curled portion 43a is further wound in the clockwise direction from the state shown in FIG. 13(b), wherein the bottom rim 42f is more hardly caught by the curled portion.

Further, in FIG. 13(c), the orientation of the tip end of paper in the curled portion 43a does not reach the vertically upward direction, but the tip end of this paper is positioned in the outward direction of the container rather than a site which is the closest to the center line CL of the cup main body 42 in the curled portion 43a. "P" of FIG. 13(c) denotes a vertical line inscribing the inner periphery face of the curled portion 43a, i.e., a horizontal position in which the curled portion 43a is the closest to the center line CL of the cup main body 42.

In this manner, if there is met a requirement that the tip end of this paper is positioned in the outward direction of the container rather than a site which is the closest to the center line CL of the cup main body 42 in the curled portion 43a, the bottom rim 42f is hardly caught by the curled portion 43a. FIG. 12 and FIG. 13(b) show cases when the above requirement is met. On the other hand, in FIG. 13(a), the tip end of paper is the closest to the center line CL of the cup main body 42, which does not meet the above requirement. In this case, the bottom rim 42f is easily caught by the tip end of paper of the curled portion 43a.

Further, a gap between the tip end of paper wound by

the curled portion 43a and the interior wall face of the sleeve 43 is set to 1 mm or less, whereby the bottom rim 42f is hardly caught by the curled portion 43a when the cup main body 42 and the sleeve 43 are assembled. In addition, this gap is set to be smaller than the thickness of the bottom rim 42f, whereby there is significantly decreased a danger that the bottom rim 42f enters the inside of the curled portion 43a from this gap, and the curled portion 43a is pushed to be opened. FIG. 14(a), FIG. 14(b), and FIG. 14(c) show cases in which this gap is C1, C2, and C3 ($C1 > C2 > C3$), respectively, wherein C2 of FIG. 14(b) is coincident with the thickness of the bottom rim 42f. In addition, C3 of FIG. 14(c) corresponds to the curled portion 43a of FIG. 12.

FIG. 15(a) is a sectional view showing the vicinity of the bottom rim 42f. As shown in FIG. 15(a), the bottom rim 42f is fallen down to the inside of the container so as to be positioned inside of the container rather than an extension line R obtained by extending the exterior wall face of the upward trunk portion 42a more than the bottom rim 42f. The yarn 42f is thus inclined to the inside of the container, whereby the bottom rim 42f is hardly caught by the curled portion 43a when the cup main body 42 and the sleeve 43 are assembled.

In addition, as shown in FIG. 15(a), burr 42g is protruded toward the inside of the container at the tip end of the bottom rim 42f. In the manufacturing process of the

cup main body 42, the curled portion 42c is formed after the bottom rim 42f has been formed. In the process of forming the curled portion 42c, the bottom rim 42f is strongly pressed to an abutment member in order to fix the cup main body 42, and thus, burr inevitably occurs at the tip end of the bottom rim 42f. However, the burr is protruded toward the inside of the container as shown in FIG. 15(a) so as to prevent an occurrence of the burr protruded to the outside of the container, whereby the yarn 42f is more hardly caught by the curled portion 43a.

In FIG. 15(b), the bottom rim extends along the extension line R of the trunk portion (the side wall), and burr 42h is protruded to the outside of the container. This shape corresponds to a general paper cup. In the case where the cup main body 42 is formed in such shape, the burr 42h is protruded to the outside of the extension line R, and thus, the bottom rim is easily caught by the curled portion 43a.

In order to form the bottom rim 42f so as to be fallen down to the inside of the container, when the bottom part 42b and the trunk portion 42a are superimposed, thereby forming the bottom rim 42f, the bottom part 42b and the trunk portion 42a may be adhered to each other while a pressure is applied such that the bottom rim 42f is fallen down to the inside of the container. For example, in the case of knurl roll adhering, the receiving face of a receiving member for receiving the bottom rim 42f from the outside is inclined to the inside of the container, and the side face of a rotor for pressing the

bottom rim 42f from the inside may be a tapered face tailored for the receiving member. In the case where the bottom rim 42f is inclined in advance to the inside, in the subsequent process, for example, in the process of forming the curled portion 42c, the burr occurring at the tip end of the bottom rim 42f is protruded to the inside, and thus, the bottom rim 42f of such shape as shown in FIG. 15(a) can be formed.

In addition, after the bottom rim has been formed, a pressure is applied to the bottom rim before forming the curled portion 42c, whereby the bottom rim may be processed in such shape as shown in FIG. 15(a) or the cup main body 42 may be fixed by employing a abutment member of such shape that the tip end of the bottom rim is throttled to the inside when the curled portion 42c is formed. In the latter case, the entire bottom rim or the tip end of the bottom rim can be fallen down to the inside at the same time when the curled portion 42c is formed.

FIG. 16(a) is a vertically sectional view showing an adhesive portion between the cup main body 42 and the sleeve 43 in the case where the center line CL of the cup main body 42 is placed in the vertical direction. As shown in FIG. 16(a), the trunk portion 42a is formed to be curved, and a site opposite to the adhesive range BD is inclined in the inward direction of the container relevant to the extension line (straight line "S" of FIG. 16) at a site which is more downward than this site. In this manner, the direction of the trunk portion 42a in the

adhesive range BD is coincident with that of the sleeve 43, and both of them come into contact with each other, whereby sufficient adhesive strength can be obtained. A straight line "T" of FIG. 16 denotes a direction of the trunk portion 42a in the adhesive range BD. Instead of curving the trunk portion 42a, as shown in the vertical sectional view of FIG. 16(b), the sleeve 43 may be curved to come into contact with the trunk portion 42a.

In FIG. 16(a), a straight line "U" denotes a horizontal face passing through the lower end of the curled portion 42c; a straight line "V" denotes a horizontal face passing through the upper end of the adhesive range BD; and a straight line "W" denotes a horizontal face passing through the lower end of the adhesive range BD, respectively. Here, the vertical width of the adhesive range BD, i.e., a distance between the straight lines "V" and "W" in FIG. 16(a) is set to 3 mm or more, whereby sufficient adhesive strength is obtained. In addition, a distance between the upper end of the adhesive range BD and the lower end of the curled portion 42c, a distance between the straight lines "V" and "U" in FIG. 16(a) is set to 1 mm or more, whereby consideration is taken so that adhesive does not adhere to the curled portion 42c that is a site that the user's lip touches. Further, the upper end of the adhesive range BD shown in the straight line "V" is positioned downwardly than the upper end 43c of the sleeve. In this manner, there is a danger that adhesive comes out from the upper end

43c side of the sleeve 43.

When a paper cup 41 is manufactured in accordance with the process shown in FIG. 11, the cup main body 42 and the sleeve 43 are formed in advance so that a distance between the outer diameter immediately beneath the curled portion 42c of the cup main body 42 (a site indicated by "E" in FIG. 10) and the inner diameter of the sleeve 43 in the site is within the range of -1.0 to $+0.5$ mm, thereby adhere both of them via the adhesive range BD. By adopting such dimensional relationship, the sufficient adhesive force in the adhesive range BD is ensured, and there is no danger that a wrinkle occurs at the trunk portion 42a of the cup main body 42.

As shown in FIG. 17, the curled portion 43a of the sleeve 43 may be opposed to the trunk portion 42a which is more upward than the bottom rim 42f. In this case, a gap (D') between the curled portion 43a and the trunk portion 42 is set within the range of 0.01 to 1 mm, whereby the deformation of the paper cup 41 can be suppressed, and no wrinkle occurs at the trunk portion 42a.

In the paper cup 41 of the embodiment, it is desirable that the radius of curvature of paper forming the curled portion 43a (radius of curvature in the sectional view of FIG. 12) is within the range of 0.6 to 2.0 mm. By setting the radius within this range, paper is not torn, and moreover, the bottom rim 42f of the cup main body 42 is prevented from being caught by the curled portion 43a when the cup main body 42 and the

sleeve 43 are assembled, making it possible to ensure smooth assembling. A further preferable range of the radius of curvature is 1.1 to 1.5 mm. In FIG. 18(a) to FIG. 18(c), there is shown examples of the shape of the curled portion 43a whose radiuses of curvature are reduced in order, respectively. That is, a condition of $R1 > R2 > R3 > R4$ is obtained. The shape of the curled portion 43a shown in FIG. 12 corresponds to that shown in FIG. 18(d).

FIG. 19(a) and FIG. 19(b) are partially enlarged views showing a fan shaped blank 43'. Reference numeral 51 of FIG. 19(a) denotes a superposition region to be adhered to be superimposed with the other end of the blank 43'; and reference numeral 52 denotes a region in which the curled portion 43a is formed, respectively (refer to FIG. 11). As shown in FIG. 19(a), the regions 51 and 52 are superimposed with each other at the corner of the blank 43'. At a duplicate portion thereof, a cut portion 53 at which the corners of the blank 43' are linearly cut out is formed. The cut portion 53 is provided at the end of a side arranged inside of the container of both ends of the blank 43' to be adhered so as not to be apparently outstanding.

As shown in FIG. 19(a), a region cut out by the cut portion 53 extends upwardly over the region 52 corresponding to the curled portion 43a. In addition, as shown in FIG. 19(b), an superposition area in the region 52 corresponding to the curled portion 43a is decreased by 50 % or more due to the cut

portion 53. That is, in FIG. 19(b), reference numeral 54 denotes a region cut by forming the cut portion 53 of the superposition area in which the regions 52 and 51 are superimposed with each other, wherein the region 54 occupies an area of 50 % or more of the entire superposition region.

By providing such cut portion 53, a continuous curl shape can be formed for a portion at which the blanks 43' are superimposed with each other, and a proper shape can be obtained all over the curled portion 43a.

In an area 52 corresponding to the curled portion 43a, an OP varnish (over-print varnish) is applied to the peripheral face of the sleeve 43. This OP varnish serving as a protective layer of the print face formed on the periphery of the sleeve 43 is applied over a print face by means of printing or the like. For example, in the case of gravure printing, OP varnish or the like consisting essentially of a cellulose based resin is employed; and in the case of offset printing, OP varnish or the like consisting essentially of an acrylic resin is employed. The thickness is about 2 to 3 μm in the case of gravure printing, and is about 1 micron in the case of offset printing.

A protective layer made of such OP varnish functions as a friction reducing layer to improve smoothness of the blank 43' when the curled portion 43a is formed. Thus, the curled portion 43a can be easily formed by providing the protective layer.

In the foregoing embodiment, although there has been described a case in which an OP varnish for protecting a print face is used as a friction reducing layer, a friction reducing layer other than the protective layer of the print layer may be provided in a region 52. In addition, in the case where the protective layer of the print layer is not formed, a friction reducing layer may be formed in the region 52. Further, the friction reducing layer may be formed on the interior face of the sleeve 43 (a face which faces the center of the container) or may be formed both of the interior and exterior faces.

In FIG. 10, although the paper cup 41 is shown as a cup type of which the outer diameter of the opening is smaller than the height, as in the above described first to third embodiments, the paper cup 41 may be formed in a wooden bowl or bowl shape in which the outer diameter of the opening is greater than the height. A grip piece may be provided at the sleeve 43.

FIG. 20 shows a paper cup serving as a heat insulating container of a fifth embodiment according to the present invention; an FIG. 21 shows an outline of the procedure for manufacturing the paper cup.

As shown in these figures, a paper cup 61 is constructed by combining a paper cup main body 62 serving as a container main body and a sleeve 63 covering the periphery thereof with each other. The cup main body 62 is formed in a substantially

frustum shape having a trunk portion (a side wall) 62a and a bottom part 62b. A curled portion 62c is formed outwardly at an opening of the cup main body 62. After molding the curled portion 62c, ribs 62d and 62e are formed at the trunk portion 62a so as to extend to the inside or outside in the radian direction of the cup main body 62. The rib 62d is provided as a Peter line indicative of a proper liquid level of injections (for example, hot water) into the cup main body 62. On the other hand, the rib 62e is provided for reinforcing the cup main body 62. The rib 62e is formed to be somewhat greater than the rib 62d. The ribs 62d and 62e are defined in their respective protrusion quantity so as not to come into contact with the interior face of the sleeve 63. A paper weighing 150 to 400 g/m², for example is used for an element material of the cup main body 62, and at least its interior face is covered with a covering layer (for example, polyethylene layer) for improving heat resistance or water resistance. The rib 62d may be protruded to the outside of the cup main body 62, and the rib 62e may be protruded to the inside of the cup main body 62.

The sleeve 63 is provided for improving heat insulating properties of the paper cup 61. As is evident from FIG. 21, both ends 63c and 63c of a fan shaped blank 63' are pasted with each other, an inwardly curled portion 63a is formed at the lower end thereof, and the sleeve 63 is formed. Adhesive 64 is applied to a predetermined adhesive range (a

hatching region of FIG. 21) BD set immediately beneath a curled portion 62c of the cup main body 62, thereby combining the cup main body 62 and the sleeve 63 with each other, and an upper end 3b of the sleeve 63 and the trunk portion 62a of the cup main body 62 are adhered to each other, whereby the paper cup 61 is formed. In the case where the rib 62d extends to the outside in the radial direction of the cup main body 62, the adhesive range BD is set so as not to include the rib 62d. A paper weighing 150 to 400 g/m², for example, is employed for an element material of the sleeve 63. In the case where there is no danger that the sleeve 63 touches hot water or water, there is no need for providing a covering layer such as the cup main body 62 at the sleeve 63.

As shown in FIG. 22, the sectional shape of the curled portion 62c is formed in a shape as if a true circle were crushed in the axial direction of the cup main body 62 (the vertical direction of FIG. 22), in other words, in a flat shape in a direction orthogonal to the axial direction of the cup main body 62, and a ruling 62f is thinly produced at its peripheral end. When the thickness of the cup main body 62 is represented by "t", a relationship shown in formula (1) below is met between a height "A" in the axial direction of the curled portion 62c and a width "B" orthogonal thereto.

$$2t < A < B \quad (1)$$

That is, the height "A" of the curled portion 62c is greater than twice of the thickness "t" of the cup main body

62, and is smaller than the width "B" of the curled portion 62c. If the curled portion 62c is thus formed in a flat shape, when a film shaped cover material 66 is pasted to the curled portion 62c, a width "C" at which the curled portion 62c and the cover material 66 are bonded with each other via adhesive 65 is expanded, whereby the cover material 66 can be securely bonded at a predetermined strength. A preferable range of the bonding strength changes according to type of articles housed inside of the cup main body 62. As an example, in the case where hot water is poured into the cup main body 62 while the cover material 66 is partially exfoliated like precooked noodles, and the cover material 66 is removed after a predetermined period of time has elapsed, the bonding strength may be set so that force of exfoliating the cover material 66 is 400 to 900 gf/15 mm in width.

In FIG. 20, the paper cup 61 is drawn in a wooden bowl shape in which the outer diameter of an opening is greater than the height, but the paper cup 61 may be constructed as a cup type heat insulating container in which the outer diameter of the opening is smaller than the height. A print such as trade mark is applied to the peripheral face of the sleeve 63, and the printing is performed at the stage of the blank 63'. Hereinafter, a face onto which printing is applied is referred to as a surface of the blank 63', and the opposite face is referred to as a back face.

FIG. 23 to FIG. 25 are views of an apparatus for

manufacturing the above mentioned sleeve 63; FIG. 23 is a plan view thereof; FIG. 24 is a side view taken along the line XXIV of FIG. 23; and FIG. 25 is an enlarged view of a section taken along the line XXV of FIG. 23. As shown in these figures, a manufacturing apparatus 1010 includes a frame 1011 placed on a floor face of factory; and a driving device 1012. The driving device 1012 distributes rotation of a motor 1120 serving as a driving source to each section of the manufacturing apparatus 1010 via a known transmission element such as chain and gear. At the upper part of the frame 1011, a turn table 1013 is turnably provided around a vertically rotary shape 1130. At the periphery of the turn table 1013, eight mandrels 1014..., 1014 for winding the blank 63' are mounted in the rotational direction of the turn table 1013 with equal intervals (45 degrees).

As shown in FIG. 26, the mandrel 1014 includes a trunk portion 1140 which comprises a tapered-shaft shaped peripheral face whose diameter decreases toward the tip end. The center line of the trunk portion 1140 is oriented in the radial direction of the turn table 1013. The trunk portion 1140 is changed in accordance with external dimensions of the sleeve 63; however, its full length is shorter than the height in the axial direction of the sleeve 63. The center shaft 1130 of the turn table 1013 is connected to the driving device 1012 via an intermittent driving mechanism 1015. The intermittent driving mechanism 1015 converts continuous rotational

movement guided from the driving device 1012 into intermittent rotational movement of the turn table 1013. As such intermittent driving mechanism 1015, for example, a known mechanism such as a Geneva stop can be employed.

The turn table 1013 is rotationally driven intermittently in a direction indicated by the arrow F in FIG. 25 at a rate of 45 degrees per turn by the intermittent driving mechanism 1015. In this manner, at the periphery of the turn table 1013, stations ST..., ST whose number is the same as mandrels 1014 are defined as a stop position of the mandrels 1014. At the periphery of the turn table 1013, as devices required for manufacture of the sleeve 63, there are provided a winding device 1030, an auxiliary sealing device 1050, a curl preparation device 1060, curl processing devices 1070A, 1070B, and 1070C, and a sleeve ejector 1080 so as to be distributed at each station ST. In addition, a blank feeder 1020 is provided laterally of the winding device 1030 (refer to FIG. 23 and FIG. 24). Further, a main sealing device 1040 is provided upwardly of the turn table 1013. The outline of each device is as follows:

The blank feeder 1020 applies adhesive to one end 63c of the blank 63', thereby feeding winding devices 1030 one by one. The winding device 1030 winds the fed blanks 63' around the mandrel 1014. The main sealing device 1040 constrains a joint portion 63d (refer to FIG. 21) of the sleeve 63 wound around the mandrel 1014, thereby promoting its adhesion. The

auxiliary sealing device 1050 press a portion coming out of the tip end of the mandrel 1014 of the joint portion 63d, thereby promoting its adhesion. The curl preparation device 1060 coats the end of the sleeve 63 with a curl promoting material (for example, silicon liquid) for processing of the curled portion 63a. The curl processing device 1070A, 1070B, and 1070C process the curled portion 63a at the axial end of the sleeve 63. The sleeve ejector 1080 removes the sleeve 63 from the mandrel 1014, and carries it out of the apparatus 1010.

FIG. 27 to FIG. 31 are detailed views showing the blank feeder 1020. As shown in FIG. 27 and FIG. 28, at the first half of the blank feeder 1020, there are provided a blank holder 1021, a blank remover 1022, a conveyor (a first carrying device) 1023, and an adhesive applying device 1024. In addition, as shown in FIG. 30 and FIG. 31, at the latter half of the blank feeder 1024, there are provided a wheel device (an inverting device or a detouring device) 1025 and a blank feeding device (a second carrying device) 1026.

As shown in FIG. 27 to FIG. 29, the blank holder 1021 includes a base 1210 supported by a frame 1011; and a number of rods 1211 mounted on the periphery of a takeout port 1211a of the base 1210. An expansion portion 1211a is provided at the lower end of the rod 1211, and a number of blanks 63' are laminated upwardly with its surface (printed surface) being upside.

The blank remover 1022 includes a suction unit 1220

disposed downwardly of the takeout port 1210 of the blank holder 1021; and an air cylinder 1211 for vertically driving the suction unit 1220. The suction unit 1220 comprises a plurality of suckers 1222..., 1222 at the upper end thereof. During operation of the apparatus 1010, the air cylinder 1221 reciprocally drives the suction unit 1220 at a predetermined cycle. When the suction unit 1220 rises, the sucker 1222 is pressed to the lower face of the blank 63' at the lower end of the blank holder 1021, air is suctioned from a sucking face of the sucker 1222 by sucking means (not shown) in synchronism therewith, and the blank 63' is suctioned to the sucker 1222. The sucked blank 63' overpasses the expansion portion 1211a of the rod 1211 together with the lowering of the suction unit 1220, and is transferred onto guide rails 1230 and 1231 of a conveyor 1023. When the blank 63' is removed onto the guide rails 1230 and 1231, the suctioning of the air from the suckers 1222 stops, and the suckers 1222 are spaced downwardly of the blank 63'. The blanks 63' are removed to be fed to the conveyor 1023 one by one by repeating this operation. The suckers 1222 suck the back face of the blank 63', and thus, there is no danger that a print is damaged.

The conveyor 1023 includes the above mentioned guide rails 1230 and 1231; and a pair of chains 1233, 1233 which are wound between sprockets 1232a and 1232b and which run in parallel to the guide rail 1230. A plurality of claws 1234..., 1234 engaged with the blank 63' are mounted to each chain 1233

with predetermined intervals. Each chain 1233 is continuously driven at a predetermined speed in a direction indicated by the arrow "F" in FIG. 27 by means of rotational movement transmitted to a driving section 1235 via chain 1121 or the like of the above mentioned driving device 1012. In this manner, the removed blank 63' on the guide rail 1230 or 1231 is fed to the wheel device 1025 at a predetermined speed. As is evident from FIG. 28, the blank 63' is carried so that its one end 63c is parallel to the carrying direction of the conveyor 1023. As is evident from FIG. 23, the carrying direction of the conveyor 1023 is parallel to the center line CL of the mandrel 1014 led out immediately above the winding device 1030.

As shown in FIG. 27 and FIG. 28, the adhesive applying device 1024 includes a glue plate 1240 for storing adhesive; a coating roller 1241 whose lower part is immersed in the adhesive on the glue plate 1240; a press roller 1242 disposed opposite to the upper part of the coating roller 1241; and an air cylinder 1243 for vertically driving the roller 1242. The coating roller 1241 is rotationally driven at a predetermined speed in synchronism with the carrying of the blank 63' by the conveyor 1023 through power transmitted from the driving section 1235 of the conveyor 1023 via the chain 1244, shaft 1245, chain 1246 or the like.

One end 63c of the blank 63 carried by the chain 1233 moved from a carrying face 1230a of the guide rail 1230 to an

upper end of the roller 1241, the roller 1242 is pushed to the roller 1241 side by means of the air cylinder 1243, and one end 63c of the blank 63' is sandwiched between the rollers 1241 and 1242. In this manner, the adhesive stored on the glue plate 1240 is applied to the back face side of one end 63c of the blank 63' via the periphery of the coating roller 1241. The blank 63' after the adhesive has been applied is fed to the wheel device 1025 by means of the conveyor 1023.

As shown in FIG. 30 and FIG. 31, the wheel device 1025 includes a wheel shaft 1250 rotatably supported around an axis orthogonal to the carrying direction of the conveyor 1023; and a pair of wheels 1251, 1251 parallel to each other, which are rotatably mounted integrally with the wheel shaft 1250. The wheel shaft 1250 is supported at the substantially same height as the carrying face 1230a of the blank 63' by means of the conveyor 1023. In addition, at each wheel 1251, slits 1252..., 1252 for receiving the blank 63' are formed in the peripheral direction with predetermined pitches. The wheels 1251 are equal to each other in diameter, and are equal to each other in the number of slits 1250 and the radial depth. In other words, a distance from the center of the wheel shaft 1250 to the end on the internal periphery side of each slit 1252 is equal to another. In addition, each of the wheels 1251, 1251 is disposed symmetrically relevant to the center line CL of the mandrel 1014 led out immediately above the winding device 1030 when the apparatus 1010 is seen from the upside.

As is evident from FIG. 31, an intermittent rotational movement removed from the intermittent driving mechanism 1015 is inputted to one end of the wheel shaft 1250 via chains 1253 and 1254, and a worm mechanism 1255. A relationship between rotation of the turn table 1013 and rotation of the wheel 1252 is set so that the wheel 1252 is rotationally driven in a direction indicated by the arrow "R" in FIG. 30 by pitch angle of the slit 1252 synchronously when the turn table 1013 rotates by 45 degrees.

Therefore, at the terminal (the right end of FIG. 30) of the conveyor 1023, every time the turn table 1013 rotates by a predetermined angle, an empty slit 1252 is identified so as to be substantially horizontal. The blank 63' having adhesive applied thereto is carried into the thus identified slit 1252. The blank 63' carried in the slit 1252 is gradually carried to the rear end side of the blank feeder 1023 by means of further rotation of the wheel 1251.

The blank 63' carried to the periphery of the wheel shaft 1250 by 180 degrees by means of the wheel 1251 is removed from the slit 1252 by means of a blank feeding device 1026, and is fed to the winding device 1030. At this stage, the blank 63' is reversed so that its surface (print face) is downward. Moreover, a relationship between the blank 63' and the center line CL of the mandrel 1014 on the winding device 1030 changes so that the blank 63' is symmetrical relevant to the center line CL compared with a state prior to feeding to the wheel

1251. This is because the blank 63' slips off from the inside of the slit 1252 in a process in which the blank 63' rises together with rotation of the wheel 1251, and an end edge 63f (refer to FIG. 21) on the small diameter side of the blank 63' is supported in contact with the end on the internal periphery side of each of the wheel 1251 and slit 1252. While the blank is carried by 180 degrees by means of the wheel 1251, the adhesive applied to the end of the blank 63' is properly dried. Therefore, the adhesive strength of a joint portion 63d of the blank 63' wound around the mandrel 1014 is increased at the winding device 1030.

The feeding device 1026 includes a pair of guide rails 1260, 1260 for receiving the blank 63' carried by the wheel 1251; a pair of carriers 1261, 1261 extending in parallel to these guide rail 1260; an air cylinder 1262 for vertically driving these carriers 1261; a slider 1263 for supporting the air cylinder 1262; and a linear guide device 1264 for movably supporting the slider 1263 in parallel to the guide rail 1260. A vertically extending cum groove 1263a is formed at the slider 1263, and the cum groove 1263a is engaged with a cum follower 1265a mounted to a cum wheel 1265.

The cum wheel 1265 is rotationally driven at a predetermined speed in a predetermined direction by means of rotational movement transmitted via the chain 1122 or the like from the driving device 1012. The rotation of this cum wheel 1265 is converted into linear movement of the slider 1263 by

means of the cam follower 1265a and the cam groove 1263a, whereby the carrier 1261 reciprocally moves in a direction parallel to the guide rail 1260.

When the carrier 1261 advances toward the winding device 1030, the carrier 1261 is lifted by the air cylinder 1262, and the claw 1261a at the rear end (the left end of FIG. 30) of the carrier 1261 is engaged with the blank 63' received by the guide rail 1260. Thus, the blank 63' is fed out from the wheel 1251 with the advancement of the carrier 1261. When the carrier 1261 returns to the wheel 1251 side, the carrier 1261 is lowered. In this manner, the claw 1261a is returned to the internal periphery side of the blank 63' without interference with the next blank 63' which is fallen on the guide rail 1260 by the next rotation.

The blank 63' removed from the wheel 1251 by means of the claw 1261a is engaged with the claw 1261b of the tip end thereof and fed immediately above the winding device 1030 when the next carrier 1261 advances. At this time, the blank 63' is abutted against a predetermined positioning reference face (not shown), and is accurately positioned in the direction of the center line CL. The cycle of reciprocate movement of the carrier 1261 is equal to that of intermittent rotational movement of the turn table 1013. When the turn table 1013 rotates, and the mandrel 1014 around which the sleeve 63 is not wound is led out immediately above the winding device 1030, the carrier 1261 advances, and the blank 63' is fed to the

winding device 1030.

FIG. 32 is a detailed view showing the winding device 1030. The winding device 1030 includes a base 1031 fixed to a frame 1011; a pair of arms 1032, 1032 turnably mounted on the base 1030 via a shaft 1310; a driving mechanism 1033 for driving these arms 1032, 1032 around the shaft 1310; and a center push device 1034 mounted on the base 1031 so as to be superimposed on the shaft 1310. To the arm 1032, there is mounted a winding fitting 1320 having an internal periphery face 1320a curved along the peripheral face of the axis portion 1140 of the mandrel 1014.

The driving mechanism 1033 comprises a horizontal driving shaft 1330. A sprocket 1330a is provided at the axial end of the driving shaft 1330, and continuous rotational movement of the driving device 1012 is inputted to the sprocket 1330a via the chain 1126 (refer to FIG. 24). Rotation guided by the driving shaft 1330 is converted into reciprocal vertical movement of push rods 1332, 1332 by means of crank mechanisms 1331, 1331. Each push rods 1332 is guided merely in the vertical direction by means of a guide 1311 of the base 1031.

The upper end of the push rod 1332 is connected to the arm 1032 via a pin 1333, a link 1334, and a pin 1335. In this manner, the arm 1032 swings the shaft 1310 around the shaft 1310 at a predetermined cycle in relation to the vertical movement of the push rod 1332. The cycle of the swinging movement of the arm 1032 is equal to that of the intermittent

rotational movement of the turn table 1013. A center push device 1034 includes a tap fitting 1340 disposed so as to be opposite to the lower end of the mandrel 1014; and an air cylinder 1341 for pressing the tap fitting 1340 to the lower end of the mandrel 1014.

When the blank 63' and the mandrel 1014 are fed upward of the winding device 1030, the arm 1032 is retracted more downwardly than the blank 63' as indicated by a virtual line. When the blank 63' is fed, the tap fitting 1340 is pushed up by the air cylinder 1341, and the center of the blank 63' is pressed to the lower end of the mandrel 1014. Subsequently, the arm 1032 turns toward the mandrel 1014, and the blank 63' is gradually wound around the trunk portion 1140 of the mandrel 1014. When the push rod 1332 moves to the upper end of the movement range thereof, as indicated by solid line in FIG. 32, the winding fitting 1320 of the arm 1032 encompasses substantially completely the periphery of the mandrel 1014. In this manner, the blank 63' is wound substantially completely around the periphery of the trunk portion 1140. At this time, the trunk portions 63c, 63' of the blank 63' superimposes on each other at the upper end of the mandrel 1014, and the joint portion 63d (refer to FIG. 21) is formed. The operation timing of the arms 1032, 1032 is slightly shifted so that the end 63c having adhesive applied onto the back face is positioned at the outside of the joint portion 63d rather than the opposite end 63c.

Thereafter, the push rod 1332 is lowered, the arm 1032 is distant from the mandrel 1014, and the tap fitting 1340 is fed downwardly by means of the air cylinder 1341. The turn table 1013 rotates accordingly, and the mandrel 1014 and the blank 63' are carried into the winding device 1030. The push rod 1332 restarts rising, and the blank 63' is wound in the same manner as above.

The joint portion 63d of the sleeve 63 formed on the mandrel 1014 at the winding device 1030 is pressed into the mandrel 1014 at the main sealing device 104.

As shown in FIG. 26, the main sealing device 1040 includes an air cylinder 1041 disposed upwardly of the mandrel 1014; and trowel 1042 suspended from a movable section 1410 of the air cylinder 1041. The air cylinder 1041 and the trowel 1042 are provided at each mandrel 1014 one by one, and the air cylinder 1041 is mounted on the turn table 1013 via a support 1043. Therefore, the air cylinder 1041 and the trowel 1042 suspended therefrom rotate integrally with the mandrel 1014 according to the driving of the turn table 1013.

The movable section 1410 of the air cylinder 1041 is operable in the vertical direction. The trowel 1042 is inclined along the peripheral face of the mandrel 1014, and its length is substantially equal to the full length of the mandrel 1014. The trowel 1042 is heated at a proper temperature (for example 100 °C) by an incorporated heater (not shown) in order to promote adhesion of the joint portion 63d.

When the blank 63' is wound around the mandrel 1014 by means of winding device 1030, the trowel 1042 is held at a position distant upwardly from the mandrel 1014 by means of the air cylinder 1041. When the blank 63' is wound around the mandrel 1014 by means of winding fittings 1320 of the winding device 1030, the trowel 1042 is pressed to the joint portion 63d by means of the air cylinder 1041 more earlier than when these winding fittings 1320 are distant from the mandrel 1014. In this manner, the joint portion 63d is heated and pressed, and the adhesion due to the adhesive is promoted. The joint portion 63d is continuously heated and pressed by the trowel 1042 until the mandrel 1014 has reached a sleeve ejector 1080 (refer to FIG. 25). When the mandrel 1014 is carried into the ejector 1080, the trowel 1042 is separated upwardly of the mandrel 1014 by means of the air cylinder 1041.

At the upper part of the support 1043, a direction switch valve 1044 for switching a direction in which compression air is fed to the air cylinder 1041 is provided for each air cylinder 1041. The direction switch valve 1044 incorporates a detent type spool (not shown). The position of that spool is switched by operation for alternately pushing push buttons 1440 and 1441 protruded at both ends of the direction switch valve 1044. When the push button 1440 is pushed, the position of the direction switch valve 1044 is changed so as to downwardly drive the air cylinder 1041. When the push button 1441 is pushed, the position of the direction

switch valve 1044 is changed so as to upwardly drive the air cylinder 1041. In the vicinity of the winding device 1030, there is provided an air cylinder 1045 having a movable section 1450 for operating the direction switch valve 1044 to be pushed (refer to FIG. 25). The air cylinder 1045 is driven in synchronism with a timing of winding the blank 63' around the mandrel 1014 by the winding device 1030, and the movable section 1450 operates the push button 1440 to be pushed. In response thereto, the air cylinder 1041 is driven downwardly, and the trowel 1042 is pressed to the joint portion 63d of the sleeve 63. In addition, as indicated by virtual line in FIG. 26, a rod 1046 for operating the push button 1441 to be pushed is provided in the vicinity of the ejector 1080. The rod 1046 has a bearing 1460 at its tip end. When the mandrel 1014 is carried into the ejector 1080, the push button 1441 is pushed in contact with the bearing 1460, whereby the trowel 1042 is separated from the mandrel 1014 prior to ejecting operation of the sleeve 63 by the ejector 1080.

FIG. 33 shows essential parts of an auxiliary sealing device 1050. The auxiliary sealing device 1050 includes a pair of vertically arranged pinch fittings 1051, 1051; and an actuator 1052 such as air cylinder for driving these pinch fitting 1051, 1051 so as to proximal to or distant from each other. The actuator 1052 and the pinch fitting 1051 supported thereby is driven as follows by the power supplied from the above mentioned driving device 1012.

First, when the turn table 1013 is inactive, the actuator 1052 is deactivated at the position shown in FIG. 33 (b). At this time, the pinch fittings 1051, 1051 are driven in a direction in which these fittings approach each other by means of the actuator 1052. In this manner, of the joint portion 63d of the sleeve 63, a portion included in the protrusion 63e from the mandrel 1014 is mutually pinched between the pinch fittings 1051, 1051. The pinch fitting 1051 is heated at a proper temperature (higher than the heating temperature of the main sealing device 1040) by means of the incorporated heater (not shown). The adhesion of the protrusion portion from the mandrel 1014 of the joint portion 63d is promoted by heating and pressurization caused by the pinch fitting 1051.

When the turn table 1013 rotates, the pinch fittings 1051 are held in a direction in which they are distant from each other by means of the actuator 1052 as shown in FIG. 33 (a). By power from the driving device 1012, the actuator 1052 is temporarily retracted to the outside in the radial direction of the turn table 1013, and the next mandrel 1014 is allowed to be carried-in. When a half rotation of the turn table 1013 is exceeded, the operating direction of the actuator 1052 is inverted, and the pinch fitting 1051 advances to the mandrel 1014 side. When the rotation of the turn table 1013 stops, the actuator 1052 returns to the position shown in FIG. 33 (b). Then, the actuator 052 is driven in synchronism therewith, and

the pinching of the joint portion 63d by the pinch fittings 1051 is started.

As shown in FIG. 25, the curl preparation device 1060 includes a pad 1061 opposite to the mandrel 1014. A silicon liquid serving as a material for promoting the above mentioned curl is impregnated in the pad 1061. The pad 1061 is driven in the radial direction of the turn table 1013 by the power supplied from the driving device 1012. When the turn table 1013 rotates, the pad 1061 is distant from the sleeve 63 on the mandrel 1014. When the turn table 1013 stops, the pad 1061 is pressed to the protrusion 63e of the sleeve 63, and a silicon liquid is applied.

As shown in FIG. 34, a curl processing device 1070A includes a slider 1071 which is movable in the radial direction of the turn table 1013; and a processing jig 1073 mounted to the side opposite to the turn table 1013 of that slider 1071 via a plurality of springs 1072..., 1072. The processing jig 1073 is heated by a predetermined temperature (for example, 170 to 190 °C) by means of the incorporated heater (not shown). The slider 1071 is repeatedly driven in the radial direction in relation to rotation of the turn table 1013 by the power supplied from the driving device 1012. When the turn table 1013 rotates, the processing jig 1073 is distant from the sleeve 63 on the mandrel 1014. When the turn table 1013 is inactive, the processing jig 1073 is pressed to the protrusion 63e of the sleeve 63. The protrusion 63e of the sleeve 63 is

gradually curled inwardly by heating and pressurization caused by the processing jig 1073. A groove 1730 for setting the curling direction of the protrusion 63e is provided on a face opposite to the mandrel 1014 of the processing jig 1073.

The curl processing devices 1070B and 1070C also include the same construction as the curl processing device 1070A. However, in order to gradually mold a curled portion 67a as the sleeves 63 are carried into the processing devices 1070A, 1070B, and 1070C in order, the grooves 1730 of the processing jig 1073 of each of the processing devices 1070A, 1070B, and 1070C are different from each other. In addition, the temperature of the processing jig 1073 of the first processing device 1070A may be set to be higher than that of the processing jig 1073 of the other processing devices 1070B and 1070C. In the processing device 1070A, since the protrusion 63e of the sleeve 63 is not curled, the processing resistance is greater than that of the other devices 1070B and 1070C, thus making it necessary to facilitate processing by increasing a heating quantity. On the other hand, in the processing devices 1070B and 1070C in which the processing resistance is relatively decreased, it is desirable to reduce the heating temperature, thereby suppressing an effect of the sleeve 63 on printing or the like.

In at least one of the processing devices 1070A, 1070B, and 1070C, as shown in FIG. 35, the processing jig 1073 may be rotated around the axis of the mandrel 1014 by mounting the

jig on an output shaft 1740 of a motor 1074. In this case, the heating of the processing jig 1073 may be eliminated. In the case where the processing jig 1073 of the processing device 1070A is constructed as shown in FIG. 35, there is an advantage that curling can be performed so that the curled portion 63a can be produced without heating the protrusion 63e of the sleeve 63. Moreover, if the processing jig 1073 is rotated by the first processing device 1070A, the silicon liquid applied to the protrusion 63e of the sleeve 63 using the preparation device 1060 is uniformly distributed to the entire periphery of the protrusion 63e through rotation of the processing jig 1073.

The sleeve 63 is completed by processing of the curl processing device 1070C. The completed sleeve 63 is ejected from the manufacturing apparatus 1010 by means of the sleeve ejector 1080. As shown in FIG. 36 and FIG. 37, the sleeve ejector 1080 includes a roller mechanism 1081 for pressing a roller 1810 from its downside to the sleeve 63 on the mandrel 1014 and removing the sleeve 63 to be fed laterally of the mandrel 1014; and a delivery mechanism 1083 for receiving the sleeve 63 removed by the roller mechanism 1081 and delivering the sleeve whose top and bottom is reversed onto an ejection conveyor 1082.

The roller 1810 is rotationally driven by means of a motor 1811 in the counterclockwise direction (CCW direction indicated by the arrow) shown in FIG. 36 at a predetermined

speed. The motor 1811 is mounted on an elevating base 1812. The elevating base 1812 is repeatedly driven vertically in relation to rotation of the turn table 1013 by the power supplied from the driving device 1012. When the turn table 1013 rotates, the elevating base 1812 is lowered as indicated by solid line in FIG. 36, and the roller 1810 is distant downwardly of the mandrel 1014. When the turn table 1013 is inactive, the roller 1810 is pressed to the sleeve 63 on the mandrel 1014 (refer to the vertical line in FIG. 36), whereby the sleeve 63 is fed to the delivery mechanism 1083 so as to taken up from the mandrel 1014.

The delivery mechanism 1083 includes a horizontally extending drive shaft 1084; and a sleeve holder 1085 mounted to a shaft end 1840 of the drive shaft 1084. The sleeve holder 1085 forms two set of cross frames 1851, 1851 by combining four plate materials 1850, 1850 in cross shape two by two. The cross frames 1851 each are constructed to be fixed onto the drive shaft 1084 by a bolt 1853 passing through the inside of a spacer 1852 while they is superimposed on each other in the axial direction of the drive shaft 1084 by hollow spacers 1852, 1852.

By a pair of cross frames 1851, 1851, at the sleeve holder 1085, four sleeve receiving portions 1086..., 1086 are formed in the peripheral direction of the drive shaft 1084 with intervals of 90 degrees. The drive shaft 1084 is rotationally driven by 90 degrees in the direction indicated by the arrow R in FIG. 36 in synchronism with rotation of the turn table

1013 by intermittent rotational movement removed from the intermittent drive mechanism 1015. When the turn table 1013 is inactive, one sleeve receiving portion 1086 is led out at a position opposite to the mandrel 1014, and the sleeve 63 removed by the roller mechanism 1081 is thrown at the periphery of the sleeve receiving portion 1086. The thrown sleeve 63 rotates the periphery of the drive shaft 1084 together with rotation of the sleeve holder 1085 while the sleeve is supported from the internal periphery side by means of the sleeve receiving portion 1086.

At a part of the periphery of the sleeve holder 1085, there is provided a guide 1087 for preventing the slip-off of the sleeve 63 held at the sleeve receiving portion 1086. When the sleeve receiving portion 1086 moves to a position at which the receiving portion is oriented beneath it, the sleeve 63 comes out from the guide 1087, and drops onto the conveyor 1082. The dropped sleeve 63 is carried from the manufacturing apparatus 1010 by means of the conveyor 1082.

In the above mentioned sleeve manufacturing apparatus, the driving device 1012 functions as a carrying device in the sleeve manufacturing apparatus according to the sixth embodiment; the conveyor 1023 functions as a first carrying device, the wheel device 1025 functions as an inverting device and a detour device, and the blank feeder 1026 functions as a second carrying device, respectively.

The sleeve manufacturing apparatus according to the

present invention may be employed in various modes without being limited to the above mentioned embodiments. For example, the sleeve manufacturing apparatus according to the present invention can be used for manufacture of sheaths of various containers without being limited to the sleeve 63 of the paper cup 61 in FIG. 20. The processing of a curled portion using the heated processing jig is applicable to any of the examples shown in FIG 38.

FIG. 38(a) shows an example of processing an inwardly curled portion 62a at the end of a small diameter side of the sleeve 63; FIG. 38(b) shows an example of processing an outwardly curled portion 63g at the end of a small diameter side of the sleeve 63; FIG. 38(c) shows an example of processing an inwardly curled portion 63h at the end of a large diameter side of the sleeve 63; and FIG. 38(d) shows an outwardly curled portion 63i at the end of a large diameter side of the sleeve 63, respectively. Similarly, the curled portion of the cup main body 62 may be processed by pressing the heated processing jig.

According to the above sleeve manufacturing apparatus, the sleeve is softened by the heated processing jig, the curled portion can be processed with gentle force, and thus, a burden on the sleeve on the mandrel can be reduced. In this manner, a sleeve manufacturing failure is reduced, and a yield is improved. When the sleeve is removed from the mandrel after manufacturing, the work can be easily performed, and the

construction of the apparatus can be simplified.

In addition, according to the above blank feeder, a redundant water of the adhesive applied to a blank is evaporated in the blank feeder, whereby the optimal adhesive strength can be obtained. As a result, the failure rate of products due to insufficient adhesive strength decreases. Since the adhesive is applied to the lower face side of the blank, a roller array or the like can be constructed more simply than a case in which the adhesive is applied from the upper face side. The blank feeder can be laid out straightly relevant to the center line of the mandrel.

Further, according to the above sleeve ejector, there is no need for receiving the periphery of the sleeve ejected from the top of the mandrel. Thus, there is no danger that the print at the periphery of the sleeve is damaged, and the yield of sleeve manufacturing can be improved. The rotation speed of the roller can be reduced, and a burden of the sleeve can be reduced, whereby a danger that the sleeve is damaged is further reduced.

FIG. 39 to FIG. 41 show an apparatus for molding ribs 62d and 62e for a cup main body 62 of the manufacturing process of a paper cup 61 shown in FIG. 21 and assembling the sleeve 63 for the cup main body 62, wherein FIG. 39 is a plan view thereof; FIG. 40 is a side view in the XXXX direction of FIG. 39; and FIG. 41 is a side view in the XXXXI direction of FIG. 40.

The apparatus 2010 includes a frame 2011 set on a floor face of a factory; a turn table 2012 supported on a frame 2011; and a driving mechanism 2013 for horizontally rotating the turn table 2012 around the center line thereof. A driving mechanism 2013 transmits rotational movement of a motor 2014 to the turn table 2012 by employing transmitting means such as chain or gear while the rotational movement is decelerated. At the periphery of the turn table 2012, 12 cup holders 2100, 2100 are mounted as a container holder with equal intervals in the peripheral direction. The cup holder 2100 is held while the cup main body 62 is vertically reversed from its inside. A detailed description will be given later.

The driving mechanism 2013 intermittently drives the turn table 2012 at a rate of 30 degrees per turn in the direction indicated by the arrow F of FIG. 39. In this manner, stations (stop position of the holder 2100) ST, ST whose number is the same as the cup holder 2100 are defined at the periphery of the turn table 2012. At some stations ST, as devices required for manufacture of the cup 61, there are provided a cup feeder 2020, a processing device 2030A and 2030B, a gluing device 2040, a sleeve feeder 2050, a sleeve alignment device 2060, an inspection apparatus 2070, and ejector 2080. Each of these devices 2020 to 2080 executes the work assigned to a respective one of these devices in synchronism with rotational drive of the turn table 2012. An outline of each device will be described as follows.

When the turn table 2012 is inactive, and the cup holder 2100 is led out downwardly of the table, the cup feeder 2020 fetches one cup main body 62 from a lower end of a magazine 2021 (refer to FIG. 41) in synchronism therewith. The cup main body 62 to be attached to the magazine 2021 is free of the ribs 62d and 62e, and has a sectional shape in which the curled portion 62c is substantially true circle.

When the turn table 2012 is inactive, the processing devices 2030A and 2030B form the rib 62d or 62e for the cup main body 62 on the holder 2100 supplied in front of this table. In addition, the processing device 2030A performs processing of the curled portion 62c. The gluing device 2040 blows adhesive 64 (refer to FIG. 21) for bonding the cup main body 62 and the sleeve 63 with each other at a predetermined position of the periphery of the cup main body 62. The sleeve feeder 2050 feeds the sleeve 63 to the periphery of the glued cup main body 62. The sleeve alignment device 2060 pushes the sleeve 63 covered over the cup main body 62 to an opening end side of the cup main body 62 while the sleeve is centered relevant to the cup main body 62. The inspection apparatus 2070 inspects whether or not the cup main body 62 and the sleeve 63 are correctly combined with each other and whether or not the sleeve 63 is correctly molded. The ejector 2080 is fed to the outside after the paper cup 61 has been removed from the cup holder 2100.

FIG. 42 and FIG. 43 are detailed view showing the cup

feeder 2020. The cup feeder 2020 includes the above mentioned magazine 2021 for storing the cup main body 62; three takeout rollers 2022..., 2022 disposed at the lower end of the magazine 2121; and a driving mechanism 2023 for rotationally driving each of the rollers 2022 around a respective one of the axes. The magazine 2021 is constructed by mounting six rods 2211..., 2211 to the periphery of through hole 2210a of a base 2210, and the cup main body 62 is housed therein to be superimposed with the body being reversed in the vertical direction (refer to FIG. 41). A roller 2022 is mounted on the base 2210 while a part of the roller is protruded from the through hole 2210a (refer to FIG. 43). The curled portion 62c of the cup main body 62 housed in the lower end of the magazine 2021 is rolled on the top face of the roller 2022, and the cup main body 62 in the magazine 2021 is supported in the vertical direction.

A driving mechanism 2023 includes a motor 2230 serving as a drive source; a primary pulley 2231 mounted on an output shaft 2230a of the motor 2230; and a secondary pulley 2232 and an idler which are rotatably mounted on the base 2210. A belt 2234 is wound between the pulleys 2231 and 2232 and the idler 2233, and the secondary pulley 2232 is linked coaxially with the roller 2022 via a link shaft 2235 rotatably supported on the base 2210.

When the turn table 2012 rotates, and an empty cup holder 2100 are led out downwardly of the feeder 2020, the output shaft 2230a of the motor 2230 is rotationally driven

in a predetermined quantity. The rollers 2022 each constantly rotate in the same speeds and in the same directions together with this rotation. When the roller 2022 rotates, the curled portion 62c of the cup main body 62 supported on each of these rollers 2022 is engaged with a spiral groove 2220 formed at the periphery of each roller 2022, whereby the cup main body 62 is pulled out from the magazine 2021, and is fed from the through hole 221a to the downward cup holder 2100.

FIG. 44 is a detailed view showing the processing device 2030A and the cup holder 2100. The cup holder 2100 includes a support shaft 2101 which is mounted to the periphery of the turn table 2012 and which is extended in the vertical direction; a rotary cylinder (a rotor) 2102 mounted to the periphery of the support shaft 2101; a spacer 2103 and collars 2104 and 2105 which are mounted to the periphery of the rotary cylinder 2102. The rotary cylinder 2102 is mounted on the support shaft 2101 via a bearing (not shown), and can be arbitrary rotated around the support shaft 2101. The collars 2104 and 2105 can be rotated integrally with the rotary cylinder 2102. At the lower end of the rotary cylinder 2102, a disc-shaped wheel 2106 functioning as a curl receiving member is provided integrally. The curled portion 62c of the cup main body 62 abuts against the top face of the wheel 2106, and the cup main body 62 is supported in the vertical direction. At the periphery of the collars 2104 and 2105, flanges 2104a and 2105a are provided integrally. The peripheries of the flanges

2104a and 2105a substantially come into contact with the trunk portion 62a of the cup main body 62 at a position at which the ribs 62d and 62e are formed, whereby the cup main body 62 is supported in the radial direction. That is, the flanges 2104a and 2105a function as side wall receiving members, respectively. The upper end of the support shaft 2101 is protruded upwardly of the rotary cylinder 2102. An air flow path (not shown) penetrating the support shaft 2101 in the axial direction is formed at the center of the support shaft 2101.

As shown in FIG. 44 and FIG. 45, at the processing device 2030A, there are provided a rotation drive mechanism 2031 for rotating the cup main body 62 attached to the cup holder 2100; a rib processing mechanism 2032 for pushing the rotating cup main body 62 to the flange 2105a, thereby processing the rib 62e; a slip-off proof mechanism 2033 for preventing the slip-off of the cup main body 62 being processed; and a curled portion processing mechanism 2034 for pressing the curled portion 62c to the wheel 2106, thereby deforming the curled portion as shown in FIG. 22.

The rotation drive mechanism 2031 comprises a motor 2310 serving as a drive source; and a drive wheel 2311 to be rotationally driven thereby. When the turn table 2012 rotates and the cup holder 2100 is led to the front face of the processing device 2030A, the drive wheel 2311 comes into contact with the wheel 2106 of the cup holder 2100, and the

rotary cylinder 2102 of the cup holder 2100 is rotationally driven around the support shaft 2101.

The rib processing mechanism 2032 comprises an air cylinder 2320 serving as die driving means; and a die press roller (a die pressing member) 2321 driven in the radial direction of the cup holder 2100 by the air cylinder 2320. The die press roller 2321 is rotatably supported around a vertical shaft 2323 by means of a holder 2322 mounted to a piston rod 2320a of the air cylinder 2320. As shown in FIG. 46 (a), a recess group 2321a having its sectional shape complementary to the periphery of the flange 2105 is provided at the periphery of the die press roller 2321.

When the rotary cylinder 2102 of the cup holder 2100 is rotationally driven by means of the rotation drive mechanism 2031, the die press roller 2321 is synchronously driven by the air cylinder 2320, and is pressed to the trunk portion 62a of the cup main body 62. In this manner, as shown in FIG. 46 (a), a part of the trunk portion 62a is sandwiched between the flange 2105a and the die press roller 2321, and the rib 62e is formed at the trunk portion 62a. When the die press roller 2321 rolls the trunk portion 62a by at least one turn, the die press roller 2321 is separated from the cup main body 62, and processing of the rib 62e terminates.

The slip-off proof mechanism 2033 comprises an air cylinder 2330 and a slip-off proof plate 2331 driven in the vertical direction by the air cylinder 2330. The slip-off

proof plate 2331 is mounted to the piston rod 2330a of the air cylinder 2330 via the bearing 2332, and is rotatable around the center line of the piston rod 2330a. When the die press roller 2321 of the rib processing mechanism 2032 is driven toward the cup main body 62, the slip-off proof plate 2331 is synchronously driven downwardly, thereby abutting against the bottom rim 62g (refer to FIG. 20) of the cup main body 62. In this manner, while the rib 62e is formed by the rib processing mechanism 2032, the cup main body 62 is prevented from floating against the cup holder 2100. When the rib 62e has been formed, the slip-off proof plate 2331 is driven upwardly.

The curled portion processing mechanism 2034 includes an air cylinder 2340 serving as press driving means and a press roller 2341 serving as a press member vertically driven by the air cylinder 2340. A roller holder 2342 is mounted on the piston rod 2340a of the air cylinder 2340. By means of this roller holder 2342, the press roller 2341 is rotatably supported around the axis extending in the radial direction of the cup main body 62 on the holder 2100. A contact position between the press roller 2341 and the curled portion 62c is shifted by substantially 180 degrees in the peripheral direction of the cup main body 62 relevant to a contact position between the die press roller 2321 and the trunk portion 62a. In other words, the contact position between the press roller 2341 and the curled portion 62c is set oppositely in the radial direction of the cup main body 62 relevant to the contact

position between the die press roller 2321 and the trunk portion 62a.

When the die press roller 2321 of the rib processing mechanism 2032 is pressed to the trunk portion 62a of the cup main body 62, the press roller 2341 is synchronously driven downwardly by means of the air cylinder 2340 as shown in FIG. 47, and is pressed to the curled portion 62c. In this manner, the curled portion 62c is sandwiched between the press roller 2341 and the wheel 2106. The cup main body 62 rotates in this state, whereby the curled portion 62c is gradually deformed in the sectional shape shown in FIG. 22. When the press roller 2341 rolls the curled portion 62c by one turn or more, the press roller 2341 is driven upwardly by means of the air cylinder 2340, and the processing of the curled portion 62c terminates.

The press roller 2341 may be provided in plurality as shown in FIG. 48. The press roller 2341 may be rotationally driven by driving means such as motor. The press roller 2341 may be rotationally driven by die driving means other than the air cylinder 2340. However, in the case where the air cylinder 2340 is utilized as press driving means, while the press roller 2341 rolls over a step of the curled portion 62c communicating with a pasting portion of the trunk portion 62a of the cup main body 62, the air accumulated inside of the air cylinder 2340 functions as a cushion relevant to the piston rod 2340a, whereby the press roller 2341 can be displaced in fine quantity in a direction distant from the curled portion 62c. Thus,

excessive press force does not act to the step portion of the curled portion 62c, and there is no danger that the curled portion 62c is crushed more significantly than necessary. Therefore, in the case where the press roller 2341 is driven by means other than the air cylinder 2340, a spring or the like is intervened in a transmission path for that driving force, whereby it is desirable to a displacement caused when the press roller 2341 rolls over the step of the curled portion 62c is allowed.

The processing device 2030B is the same as the processing device 2030A except that the die press roller 2321 of the rib processing mechanism 2032 is adjusted so as to form the rib 62d by pressing the cup main body 62 to a flange 2104a, and a curled portion processing mechanism 2034 is eliminated. The rib 62d is expanded inside of the cup main body 62. Thus, as shown in FIG. 46 (b), a protrusion stripe 2321b for forming the rib 62d is formed at the periphery of the die press roller 2321 of the pressing device 2030B, and a recess groove 2104b having its sectional shape complementary to the protrusion stripe 2321b is formed at the periphery of the flange 2104a, respectively.

FIG. 49 is a detailed view showing the gluing device 2040. The gluing device 2040 includes a spray gun 2041 for blowing adhesive 64 (refer to FIG. 21) toward the adhesive range BD of the trunk portion 62a of the cup main body 62; and an inspection apparatus 2042 for inspecting whether or not the

adhesive 64 is normally sprayed from a nozzle 2410 of the spray gun 2041. In FIG. 49, the curled portion 62c of the cup main body 62 is drawn to be simplified in a true circle shape.

The inspection apparatus 2042 includes a camera 2421 for photographing a spray pattern in a photography range 2420 set between the nozzle 2410 and the trunk portion 62a of the cup main body 62; an AD converter 2422 for converting an analog signal outputted from the camera 2421 into a digital signal in accordance with a predetermined condition; a calculation circuit 2423 for performing predetermined calculation based on the signal outputted from the AD converter 2422; a judgment circuit 2424 for judging whether or not a spray pattern is proper based on the calculation result of the calculation circuit 2423 and a monitor 2425 for displaying the judgment result of the judgment circuit 2424.

Since the adhesive 64 ejected from the spray gun 2041 is white, a blank background plate (not shown) is placed at the rear of the photography range 2420. In the AD converter 2422, image data of the photography range 2420 outputted from the camera 2421 is two-valued at a proper threshold, the images of the background plate and the adhesive 64 are discriminated as blank and white, respectively, and is inputted to the calculation circuit 2423. The calculation circuit 2423 calculates a rate of a white portion that occupies within the image of the photography range 2420 photographed by the camera 2421.

Here, in the case in which the adhesive 64 is ejected from the nozzle 2410 in an inadequate direction, it is detected as a failure. Thus, the photography range 2420 is set to be slightly greater than the spray width so that an area for the white portion is reduced when adhesive 6420 is shifted vertically to the normal ejection direction. Therefore, in the case where a proper amount of the adhesive 64 is ejected from the nozzle 2410, a rate of the white portion calculated by the calculation circuit 2423 becomes in a proper range. In the other case, the rate of the white portion becomes insufficient or excessive. The judgment circuit 2424 judges that, when the rate of the white portion is within the predetermined range, the spray pattern is proper. Otherwise, it is judged that the spray pattern is improper. In the case where the spray pattern is judged to be improper, the cup main body 62 fed to the gluing device 2040 at that point is eliminated from a production line of the cup 61 by an NG item eliminator located at the rear.

If the adhesive 64 adhered to the nozzle 2410 or the cup main body 62 is included in the photography range 2420, a detection error occurs. Thus, it is desirable that the photography range 2420 is set distant from these. A mechanism for rotating the rotary cylinder 2102 of the cup holder 2100 is not provided at the gluing device 2040. This is because, after the cup holder 2100 has been carried from the processing device 2030B to the gluing device 2040, the rotary cylinder

2102 rotates for a while with inertia, whereby the adhesive 64 can be blown uniformly to the entire periphery of the adhesive range BD by utilizing the inertial rotation.

As shown in FIG. 50, a sleeve feeder 2050 includes a conveyor 2051 for carrying the sleeve 63 with the sleeve being vertically reversed; a pair of shutter mechanisms 2052, 2052 provided at the terminal of the conveyor 2051; and an extruding mechanism 2053. In the shutter mechanism 2052, a pair of shutters 2520, 2520 held so as to be protruded on an ejection port 2510 at the terminal of the conveyor 2051 are operated by air cylinders 2521, 2521 in a direction orthogonal to the carrying direction of the conveyor 2051, thus opening and closing the ejection port 2510. The extruding mechanism 2053 includes an air cylinder 2530 and a disc-shaped extruding member 2531 mounted to the piston rod 2530a. FIG. 50(a) is a sectional view; and FIG. 50(b) is a plan view showing the vicinity of the terminal of the conveyor 2051.

When the cup main body 62 having the adhesive 64 applied thereto by the gluing device 2040 is carried immediately beneath the ejection port 2510 by rotation of the turn table 2012, the shutters 2520, 2520 are opened by the air cylinder 2521, 2521, and the air cylinder 2530 is activated, whereby the extruding member 2531 is driven downwardly. In this manner, the sleeve 63 carried to the terminal of the conveyor 2051 is extruded downwardly, and drops so that the sleeve 63 covers the periphery of the cup main body 62 supported by a cup holder

2100. After the sleeve 63 has fed, the shutters 2520, 2520 are closed momentarily. The extruding member 2531 is free of moving more downwardly than the shutter 2520. Therefore, there is no danger that the extruding member 2531 and the shutter 2520 interfere with each other.

FIG. 51 is a detailed view showing the sleeve alignment device 2060. The sleeve alignment device 2060 includes an alignment jig 2061 disposed in opposite to the bottom rim 62g of the cup main body 62 held on the cup holder 2100; and an air cylinder 2062 for vertically driving the alignment jig 2061. As shown in FIG. 52, the alignment jig 2061 includes a cylinder shaped jig main body 2610 whose lower end is opened; a guide shaft 2611 mounted at the center of the jig main body 2610; a disc shaped alignment member 2612 which is housed in a hollow portion 2610a of the jig main body 2610 and which is slidable along the guide shaft 2611; and a coil spring 2613 which is attached to the periphery of the guide shaft 2611 and which presses the alignment member 2612 to a stopper 2611a at the lower end of the guide shaft 2611. A flange 2610b is provided at the lower end of the jig main body 2610. At the lower end periphery of the alignment member 2612, there are provided a tapered-face shaped centering face 2612a; and a stepped portion 2612b provided so as to encompass a proximal end (an upper end in the figure) of the centering face 2612a. An expansion portion 2611b is provided at the upper end of the guide shaft 2611, and the expansion portion 2611b and the jig

main body 2610 are fixed to a movable section 2620 (refer to FIG. 51) of the air cylinder 2062.

When the cup main body 62 and the sleeve 63 are led out downward of the sleeve alignment device 2060 by rotation of the turn table 2012, the air cylinder 2062 is activated, and the alignment jig 2061 is driven downwardly. At this stage, the alignment member 2612, as shown on the right side of the center line CL, is pressed to the stopper 2611a, and the peripheral centering face 2612a and the stepped portion 2612b protrude downward of the flange 2610b of the jig main body 2610. Therefore, as indicated by virtual line in FIG. 52, the sleeve 63 is covered over the cup main body 62 with the axis thereof being displaced. Even if the curled portion 63a rolls over the bottom rim 62g of the cup main body 62, the centering face 2612a of the alignment member 2612 first comes into contact with the curled portion 63a, and the sleeve 63 is aligned with the cup main body 62.

Thereafter, the alignment jig 2061 is further lowered, whereby the stepped portion 2612b abuts against the bottom rim 62g of the cup main body 62, and the alignment member 2612 is pushed into the jig main body 2610. The flange 2610b of the jig main body 2610 comes into contact with the curled portion 63a of the sleeve 63, and the sleeve 63 is pushed to the curled portion 62c side of the cup main body 62 by a proper quantity. In this manner, the cup main body 62 and the sleeve 63 reliably come into contact with each other within the adhesive range

BD, and they are correctly bonded with each other. When the alignment jig 2061 is lowered to a predetermined position, the jig alignment jig 2061 is pulled up to its original position for combination between the next cup main body 62 and the sleeve 63. In order to position the curled portion 63a of the sleeve 63 more upwardly (at the side of the curled portion 62c) than the bottom rim 62g of the cup main body 62, when the alignment member 2612 is pushed into the jig main body 2612 to the maximum, the stepped 2612b is retracted more upwardly than the flange 2610b.

FIG. 53 is a detailed view showing an inspection apparatus 2070. The inspection apparatus includes a rotation driving mechanism 2071; a transparent photo-sensor 2072 for inspecting whether or not the sleeve 63 is correctly attached to the cup main body 62; and a laser macro-meter sensor 2073 for inspecting whether or not the sleeve 63 is correctly assembled. The rotation driving mechanism 2071 is similar to that of the above mentioned processing device 2030A; and a drive wheel 2711 rotationally driven by a motor 2710 is brought into contact with the wheel 2106 of the cup holder 2100, thereby rotating the rotary cylinder 2102 of the cup holder 2100.

The photo-sensor 2072 includes a pair of light emitting portions 2720 disposed in opposite to the radial direction of the cup main body 62; and a light receiving portion 2721. The light emitting portion 2720 emits a band shaped inspection light of its predetermined width (hatching portion

in the figure) toward the bottom rim 62g of the cup main body 62. The light receiving portion 2721 outputs to a judgment device 2074 a signal according to the light reception quantity of the inspection light. If the alignment of the sleeve 63 by the above mentioned alignment device 2060 fails, the sleeve 63 is protruded more significantly than the bottom rim 62g, and the inspection light from the light emitting portion 2720 is greatly interrupted in the case where the light is normal. The judgment device 2074 monitors a change in light reception quantity of the inspection light based on a signal from the light receiving portion 2721. If that change is greater than a predetermined allowable range, it is judged that the assembling of the sleeve 63 has failed, and the result is displayed on a monitor 2075.

In addition, the laser macro-meter sensor 2073 emits laser light finely collimated toward the periphery of the sleeve 63, and outputs a signal according to a time lag for the reflection light to be detected. If the sleeve 63 is not formed in a predetermined tapered shape due to failure or the like to paste a blank 63', distortion occurs at the periphery. Thus, a time required for the laser light to return back greatly varied due to rotation of the sleeve 63. The judgment device 2074 monitors a change in time for reflection of laser light to be detected. If that change is greater than a predetermined allowable range, it is judged that the molding of the sleeve 63 has failed, and the result is displayed on the monitor 2075.

In the case where it is judged that assembling or molding of the sleeve 63 had failed by the inspection apparatus 2070, the cup 61 fed to the inspection apparatus 2070 at that time is eliminated from a production line of the cup 61 by means of an NG item eliminator located at the rear.

FIG. 54 and FIG. 55 are detailed views showing an ejector 2080. The ejector 2080 includes a gear box 2081 and a magazine 2082 rotatable around an output shaft 2810 of the gear box 2081. A pot 2820 having a tapered hole 2820a in which the cup 61 can be engaged is mounted to the magazine 2082 by 90 degrees in the rotational direction of the magazine 2082 with intervals. A sprocket 2812 is mounted to an input shaft 2811 of the gear box 2081. The sprocket 2812 is linked with the driving mechanism 2013 of the turn table 2012 via the transmission mechanism 2084 combined with a chain 2840 or the like (refer to FIG. 40 and FIG. 41). When the turn table 2012 is rotationally driven by 30 degrees, the magazine 2082 rotates by 90 degrees in the direction indicated by the arrow R in FIG. 54. Then, rotations of the turn table 2021 and magazine 2082 are associated with each other so that the empty pot 2820 is led out immediately above the cup holder 2100.

Immediately beneath the pot 2820, there is provided an air feeder (not shown) connected to the lower end opening of an air flow path provided on the center line of the support shaft 2101 of the cup holder 2100, the air feeder feeding compressed air to the air flow path. The compressed air fed

into the support shaft 2101 is blown from the upper end of the support shaft 2101, and the cup 61 is fed into the tapered hole 2820a of the pot 2820 led out upwardly thereof. In this manner, the cup 61 is transferred from the cup holder 2100 to the pot 2820.

The cup 61 held on the pot 2820 is fed to a cup collector 2085 by the magazine 2082 rotating by 90 degrees for three turns. In the cup collector 2085, a claw 2850 engaged with the curled portion 62c of the cup 61 is operated horizontally by an actuator 2851, whereby the cup 61 is removed from the pot 2820, and is collected in the magazine 2853.

As shown in FIG. 54, for the cup collector device 2085 of the magazine 2082, an interior face inspection apparatus 2090 for the cup 61 is provided at an opposite position sandwiching the magazine 2082. The interior face inspection apparatus 2090 light-emits the interior face of the cup 61 held in the pot 2820 by a ring shaped illumination lamp 2091, while that image is photographed by the camera 2092. Image data outputted from the camera 2092 is subjected to a predetermined processing by means of an image processing apparatus 2093, and the dirt on the interior face of the cup 61 and the presence or absence of a dimensional failure is inspected.

In the apparatus for manufacturing above mentioned heat insulating container, a turn table 2012 and a driving mechanism 2013 function as carrying devices in the manufacturing apparatus of a seventh invention; a rotation

drive mechanism 2013 functions as rotation driving means; a rib processing mechanism 2032 functions as a rib processing device; a curled portion processing mechanism 2034 functions as a curled processing device; an air cylinder 2062 functions as jig driving means; an inspection apparatus 2070 functions as a combination inspection apparatus and a sleeve inspection apparatus; a photo-sensor 2072 functions as information detecting means; a laser macro-meter sensor 2073 functions as distance information detecting means; a judgment device 2074 functions as judgment means and mold judgment means; a cup holder 2100 functions as a container holder; a rotary cylinder 2102 functions as a rotor; a flange 2610b functions as a pushing portion, respectively. In addition, as compared with an eighth aspect of the invention; a rotation driving mechanism 2031 functions as rotation driving means; a cup holder 2100 functions as a container holder; a rotary cylinder 2102 functions as a rotor; a flange 2105b functions as a side wall receiving member; a wheel 2106 functions as a curl receiving member; an air cylinder 2320 functions as a die driving means; a die press roller 2321 functions as a die press member; an air cylinder 2340 functions as press driving means; and a press roller 2341 functions as a press member, respectively.

The container manufacturing apparatus according to the present invention may be used in various modes without being limited to the above embodiments. For example, the rib processing mechanism 2032 and the curled portion processing

mechanism 2034 may be provided at separate stations. The inspection apparatus 2042 or 70 may be eliminated.

According to the above manufacturing apparatus, processing of the curled portion of the container main body or processing of ribs or the like for a side wall; and pasting of the container main body and sleeve subject to processing thereof is continuously performed using the same apparatus, thus making it possible to efficiently manufacture a heat insulating container. In addition, in the case where a sleeve alignment device is provided, a combination failure due to a displacement between the sleeve and the container main body is eliminated, whereby the manufacturing yield can be improved. Further, there is provided means for inspecting whether or not combination between the sleeve and the container main body is proper; whether or not the sleeve is properly molded; or whether or not the adhesive is properly blown, whereby the reliability of the manufacturing apparatus can be improved.

CLAIMS

1. A heat insulating container comprising:

A paper cup main body having: a cylinder shaped trunk portion whose top part is opened and a bottom part for closing a lower part of the trunk portion, a polyolefin based resin layer being formed on at least an interior face, an outward top curled portion being formed at the upper end of the paper cup main body; and a paper sleeve having a reverse frustum shaped side wall and inwardly curled portion at its lower end so as to be mounted on the trunk portion of the paper cup main body to form a gap between the trunk portion of the cup main body and the paper sleeve, the upper end of the paper sleeve being fixedly adhered to the upper portion of the trunk portion of the cup main body so that the sleeve does not slip off from the paper cup main body.

2. A heat insulating container according to claim 1, wherein said paper cup main body has a rib formed in a direction in which said trunk portion is wound.

3. A heat insulating container according to claim 2, wherein said rib is formed so as to be continuously wound around said trunk portion.

4. A heat insulating container according to claim 2, wherein said rib is formed so as to be intermittently wound around said trunk portion.

5. A heat insulating container according to any one of claims 1 to 4, wherein said paper sleeve has an inwardly curled portion formed at a lower end thereof, and said inwardly curled portion abuts against a peripheral face at the lower part of said trunk portion.

6. A heat insulating container according to any one of claims 1 to 5, wherein an outer diameter of an upper end opening of said trunk portion of said paper cup main body is greater than a height of said paper cup main body.

7. A heat insulating container according to any one of claims 1 to 6, wherein at least a pair of grip pieces are formed, the grip pieces each having a predetermined length, being partitioned by a folding line formed in the substantially peripheral direction of said side wall and a break line connecting both ends of the folding line and being foldable to the outside by said folding line.
8. A heat insulating container according to claim 7, wherein said folding line is a straight line of the shortest distance connecting two points in the peripheral direction of said side wall.
9. A heat insulating container according to claim 7, wherein said folding line is curved downwardly.
10. A heat insulating container according to any one of claims 7 to 9, wherein a easily detachable joint portion is formed on the way of said break line.
11. A heat insulating container according to any one of claims 7 to 10, wherein a cutout is formed at least a part of the periphery of said grip pieces.
12. A heat insulating container according to any one of claims 7 to 10, wherein a tip end of said grip pieces is foldable by a small folding time.
13. A heat insulating container according to any one of claims 7 to 12, wherein both ends of said break line are curved.
14. A heat insulating container according to claim 1, wherein at said inwardly curled portion, sleeve material is wound until an orientation of a tip end of said sleeve material exceeds an upward direction along a center line of said container main body relevant to a plane including the center line of said cup main body.

15. A heat insulating container according to claim 1, wherein a tip end of sleeve material wound around said inwardly curled portion is positioned at the outside of the container rather than a site being the closest to the center line of said cup main body at said inwardly curled portion.

16. A heat insulating container according to claim 1, wherein a gap between a tip end of sleeve material wound around said inwardly curled portion and an interior wall face of said sleeve is 1mm or less.

17. A heat insulating container according to claim 1, wherein a yarn tail formed so as to extend from said side wall of the cup main body to the lower end side thereof, and a gap between a tip end of sleeve material wound around said inwardly curled portion and an interior wall face of said sleeve is smaller than thickness of said yarn tail.

18. A heat insulating container according to claim 1, wherein a yarn tail formed so as to extend from said side wall of the main body to the lower end side thereof, and said yarn tail is fallen down relevant to a cross section on a plane including the center line of said container main body so that said yarn tail is positioned inside of the container rather than a straight line extending an outer face of said side wall.

19. A heat insulating container according to claim 1, wherein a yarn tail formed so as to extend from said side wall of the main body to the lower end side thereof, a burr of said yarn tail is protruded inside of the container.

20. A heat insulating container according to claim 1, wherein a yarn tail formed so as to extend from said side wall of the cup main body to the lower end side thereof, and a lower end peripheral position of said yarn tail is positioned closer to the center line of said container main body rather than a site being the closest to the center of said cup main body at the inwardly curled portion.

21. A heat insulating container according to claim 20, wherein a displacement quantity between a lower end peripheral position of said yarn tail and the site being the closest to the center line of said container main body at said inwardly curled portion is set within a range of 0.01 to 1 mm.
22. A heat insulating container according to claim 1, wherein a gap between said inwardly curled portion and an exterior face of said cup main body is formed.
23. A heat insulating container according to claim 22, wherein said gap is set within a range of 0.01 to 1 mm.
24. A heat insulating container according to claim 1, wherein a lower end of said cup main body is protruded more downwardly than the lower end of said sleeve.
25. A heat insulating container according to claim 24, wherein said cup main body has a yarn tail formed extending from said side wall of the main body to the lower end side thereof and the lower end of said yarn tail constitutes the lower end of said cup main body.
26. A heat insulating container according to any one of claims 24 to 25, wherein the lower end of said cup main body is protruded to the lower end of said sleeve in a protrusion quantity within a range of 0.01 to 5 mm.
27. A heat insulating container according to claim 1, wherein said upper portion of the trunk portion of the cup main body is curved inwardly along sleeve at an adhesive portion formed by sticking the upper end of the sleeve to the upper end of the cup main body.
28. A heat insulating container according to claim 1, wherein said upper end of the sleeve is curved outwardly along the upper end of the cup main body at an adhesive portion formed by the upper end of the sleeve to the upper end of the cup main body.

29. A heat insulating container according to claim 1, wherein said cup main body and said sleeve is stuck to each other so that a difference between an outer diameter immediately beneath said outwardly curled portion of said cup main body and an inner diameter of said sleeve at an opposite side immediately beneath said outwardly curled portion is within a range of -1.0 to $+0.5$ mm.
30. A heat insulating container according to claim 1, wherein an upper end of an adhesive portion formed by sticking the upper end of the sleeve to the trunk portion of the cup main body is positioned by 1 mm or more downwardly distant from the lower end of said outwardly curled portion along the center line direction of the container main body.
31. A heat insulating container according to claim 1, wherein an adhesive portion formed by sticking the upper end of the sleeve to the trunk portion of the cup main body is provided over a width of 3 mm or more relevant to the center line direction of the cup main body.
32. A heat insulating container according to claim 1, wherein an upper end of an adhesive portion formed by sticking the upper end of the sleeve to the trunk portion of the cup main body is positioned downwardly than that of said sleeve.
33. A heat insulating container according to claim 1, wherein a radius of curvature of said inwardly curled portion is set within a range of 0.6 to 2.0 mm.
34. A heat insulating container according to claim 33, wherein said radius of curvature is set within a range of 1.1 to 1.5 mm.
35. A heat insulating container according to claim 33, wherein a weight of paper for the cup main body and the sleeve is set within a range of 150 to 400 g/m².

36. A heat insulating container according to claim 1, wherein a friction reducing layer is formed on a surface of said sleeve in a region corresponding to said inwardly curled portion.
37. A heat insulating container according to claim 36, wherein a composition containing a cellulose based resin is employed as said friction reducing layer.
38. A heat insulating container according to claim 36, wherein a composition containing an acryl based resin is employed as said friction reducing layer.
39. A heat insulating container according to any one of claims 36 to 38, wherein an over-print varnish for protecting a print face is employed as said friction reducing layer.
40. A heat insulation container according to any one of claims 36 to 39, wherein said friction reducing layer is formed on a surface facing outwardly of said sleeve.
41. A heat insulating container according to claim 1, wherein said sleeve is formed by mutually superimposing and sticking both ends of a band shaped sleeve material wound around said cup main body to each other, a cut portion for reducing the superimposition area is formed at said sleeve, and said cut portion is formed by cutting said sleeve material from a region corresponding to said inwardly curled portion over the other region.
42. A heat insulating container according to claim 41, wherein said cut portion is formed by cutting said sleeve so as to reduce a superimposition area in a region corresponding to the inwardly curled portion by 50% or more.
43. A heat insulating container according to claim 41 or 42, wherein said cut portion is formed at an end on a side arranged inside of the container of said both ends of said sleeve.

44. A heat insulating container according to any one of claims 41 to 43, wherein said cut portion is formed by diagonally cutting corners of said sleeve relevant to one end side of said both ends.

45. A heat insulating container according to any one of claim 1, wherein when a width in the container axle direction of said outward top curled portion is represented by "A", a width in the container radial direction of said outward top curled portion is represented by "B", and thickness of said trunk portion is represented by "t", a condition of $2t < A < B$ is met.

46. A heat insulating container according to claim 45, wherein a film shaped cover material for closing and opening of the cup main body is stuck to said outward top curled portion, and said cover material is stuck to said outward top curled portion with adhesive force such that exfoliation force is within a range of 400 to 900 gf/15 mm in width.