

PATENT SPECIFICATION

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(54) MULTIPLE CONTAINER CARRIERS AND PACKAGES

(71) We, ILLINOIS TOOL WORKS INC., a corporation organised under the laws of the State of Delaware, United States of America, of 8501 West Higgins Road, Chicago, Illinois 60631, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention pertains to packages of a plurality of containers held together by a carrier. Such containers are commonly cylindrical cans, and such carriers are commonly made from an unsupported sheet of a resiliently deformable plastics material such as low density polyethylene. Various prior forms of carriers and the resulting packages may be seen in our British Patent No. 914 202.

The present invention is concerned with cylindrical containers, particularly cans the upper portions of which are necked-in. Basically, such necked-in cans have chimes which do not extend radially outwards beyond the body of the can.

The essential features of the present invention are a carrier and a plurality of pairs of cylindrical containers, each container having an upper chime, the containers being all of the same container radius immediately below the respective upper chime, the carrier comprising a plurality of pairs of bands, first webs and second webs, there being a respective one of the first webs interconnecting the outer peripheries of the bands of each pair of bands, and there being a respective second web interconnecting the outer peripheries of each of the bands of adjacent pairs of bands, the bands and the webs being formed from a resiliently deformable plastics sheet material with the bands and the webs lying in the plane of the sheet material when

unstressed, the inner periphery of each of the bands being uninterrupted and shaped to define a closed loop of four arcuate sections, the first arcuate section being contiguous to the respective first web and having a radius of curvature substantially greater than the said container radius, the second and third arcuate sections extending from each end of the first arcuate section, and one or both of the second and third arcuate sections being contiguous to a respective second web, the second and third arcuate sections having substantially equal radii of curvature, these radii of curvature being substantially less than the said container radius, the fourth arcuate section extending between the second and third arcuate sections and having a radius of curvature no greater than the said container radius, the total arcuate extent of the four arcuate sections being substantially less than the circumferential dimension of the containers immediately below the upper chime.

The invention will be more fully explained in the course of the following description of two embodiments of the invention, which are shown by way of example in the accompanying drawings. In these drawings:—

Figure 1 is a plan view of one carrier;

Figure 2 is a plan view of another carrier;

Figure 3 is an enlarged fragmentary view of a portion of the carrier shown in Figure 2;

Figure 4 is a plan view of a package comprising the carrier of Figure 1 and six necked-in cans;

Figure 5 is a side elevation of the package of Figure 4;

Figure 6 is a fragmentary end elevation of the package of Figure 4.

To enable a firmly constricted compact package to be made, the carrier 10 of Figure 1, or II of Figure 2, is made from a

resiliently deformable, unsupported plastics sheet material such as low density polyethylene. In one embodiment of the invention, the material used was a low density polyethylene having a sheet thickness of 0.018 inches, and a secant modulus at 2% elongation of approximately 36,000 p.s.i. That material had the desired elasticity and stiffness. However, other plastics materials having substantially similar resiliency and elastic memory characteristics may be used.

The carrier 10 of Figures 1, 4, 5 and 6 comprises a longitudinal series of transversely arranged pairs of container-encircling bands 12 and 13. The directions "longitudinal" and "transverse" are used to aid in the description of the invention and are not used to define the direction in which a large number of pairs 12 and 13 may be formed and arranged to produce a carrier stock. Commonly in the machine application of such carrier stock, a large number of containers and the carrier stock are simultaneously fed through the applying machine, and after application of the carrier to the containers, the machine selectively severs the webs interconnecting the pairs 12 and 13 to produce a plurality of packages of two or more containers. A common commercial type of package is the well known 6-pack for beverages. Two or more pairs of bands 12 and 13 may alternatively be formed and arranged in a carrier stock so that each pair of bands 12 and 13 is aligned either transversely or longitudinally of the length of the stock. It is desirable to maintain the integral webs which interconnect adjacent pairs of bands 12 and 13 of effective lengths such that they cooperate with the bands 12 and 13 to permit firm gripping of the bands about the containers with the necessary band elongation when the carrier is stretched and applied to the containers.

There are two different sets of webs in the carrier, the webs which integrally interconnect band 12 and a band 13 as a pair, and the webs which integrally interconnect bands 12, 12 and 13, 13 of adjacent pairs.

The web which interconnects a band 12 and a band 13 as a pair may have different end shapes. In the embodiment of Figures 1, 4, 5 and 6, the web 14 in question has convex ends which may be folded downwards by a person carrying the package, to function as finger gripping handle means. In Figures 2 and 3 the web 15 in question has concave ends. The different end construction of the webs 14 and 15 is the only substantial difference between the carriers of Figures 1, 4, 5 and 6, and of Figures 2 and 3.

The webs which integrally interconnect

bands 12, 12 and 13, 13 of adjacent pairs are indicated at 16 in Figures 1, 4, 5 and 6, and at 17 in Figures 2 and 3.

In the embodiment of Figures 2 and 3, the container-encircling bands are indicated at 18 and 19, and those bands are substantially respectively identical in construction and arrangement to the bands 12 and 13 of Figures 1, 4, 5 and 6.

The carrier shown is intended particularly for use with the particular containers shown in Figures 4 to 6, namely cans 26 which are necked-in below an upper chime 26a, so that the chimes do not extend radially outwards beyond the body of the can. The lower ends of the cans are visible in Figure 5 and have the same necked-in shape 26b above a lower chime 26c.

Figure 3 in an enlarged view shows the shape and size of the container encircling bands relative to the cans intended to be assembled with the carrier. The inner periphery of the band 19, which defines the aperture, is shaped to have four arcuate sections 19a, 19b, 19c and 19d. The outer periphery, over the portions clear of webs, and also over its imaginary extensions X, Y through the webs 15 and 17, is substantially uniformly spaced from the inner periphery.

The size of the outer surface of the can 26 substantially immediately below the chime 26a, relative to the size of band 19, is shown in Figure 3 by the dotted line arrows 20, 21 and 22. Each of the arrows 20, 21 and 22 are of the same length and represent the radius of curvature of the exterior of the can 26 substantially immediately below the chime thereof. As used hereinafter that radius is referred to as "the radius of curvature" of the can. The size of the diameter of the container, equal to twice this radius, is indicated in Figure 3 by the double-headed arrow 29.

The first arcuate section 19a is formed to have a radius of curvature substantially greater than the radius of curvature of the can. That radius of curvature is shown by the arrow 23.

The second and third arcuate sections 19b and 19c have substantially equal radii of curvature, and that radius of curvature, which is substantially smaller than the radius of curvature of the can, is shown by the arrow 24.

The fourth arcuate section 19d has a radius of curvature which is substantially equal to or slightly smaller than the radius of curvature of the can, and that radius of curvature is shown by the arrow 25. More broadly expressed, the fourth arcuate section 19d preferably has a radius of curvature in the range between the radius of curvature of the containers immediately below the upper chime, and a radius of

curvature 20% less than the said radius of curvature of the containers.

As shown in the drawings, one end of each of the second and third sections 19b and 19c is connected at A, A to one end of the first section 19a, and fourth section 19d is connected to the other ends C, C of the sections 19b and 19c to define the continuous uninterrupted inner periphery of the band 19.

The total length of the inner periphery of the band 19 is substantially less than the circumferential dimension, measured immediately below the chime, of the can 26 intended to be associated therewith, i.e. corresponding to the diameter 29. Thus it may be seen that the inner periphery of the band 19 must be stretched when the band 19 is applied to the can. The larger circumferential dimension of the can in cooperation with the described shape of the bands, and with the arrangement and shape of the webs, causes the carrier package to assume a tight compact configuration. The firm compact arrangement of the package is apparent by the close spacing between adjacent cans 26 and by the extreme folding of the webs as may be seen in Figures 5 and 6.

In width the webs vary from a substantially zero width at their longitudinal centres V, W (Figure 3) to varying widths which are a result of their lengths and the curvature of the outer peripheries of the bands. The concept of zero width of web between the imaginary extensions X, Y of the outer periphery can be otherwise expressed by saying that the inner and outer peripheries of the bands, where not connected with the webs, are spaced apart by a substantially uniform width, and that the distance between the inner peripheries of adjacent bands across the longitudinal centre of each web is substantially equal to twice the said uniform width. The distance S between the end connections of the web 15 to the band 19 is substantially greater than the length of a straight line extending between the ends A, A of the first arcuate section 19a and less than the diameter 29 of the cans. It should be noted that webs 14 of Figure 1 and 15 of Figure 2 have substantially the same effective length by virtue of their connection points to the adjacent bands. The convex ends of webs 14 do not add to the effective length of webs 14. The distance T between the end connections of the webs 17 to the band 19 is substantially less than the length U of a straight line drawn between the points B, B of widest spacing on the inner peripheries of the first and fourth sections 19a, 19d. This is true also of the webs 16 in Figure 1. If the webs are made substantially longer than as described, the longer webs

will cause the remaining band portions to be excessively stressed when applied to a can. Excessive stress in the remaining band portions will result in exceeding the elastic limit of the plastics material, and the remaining band portions will experience a necking down, with a loose band as a result.

In an attempt to aid in understanding the invention, the carrier of Figure 1 has been drawn with substantially equally spaced grid lines thereon, and the resulting distortion of those grid lines when the carrier is applied to the appropriate cans is shown in Figures 4, 5 and 6. Note in Figure 4 that there is very little variance in actual spacing between grid lines 27 in the webs 14. Some visual distortion occurs because that view is a plan view of a concave surface. From those grid lines it is apparent that the adjacent band sections corresponding to 19a of Figure 3 are being caused to fold upwards against the cans somewhat in the manner a sheet of paper will tend to fold when a straight edge thereof is urged against a cylindrical surface. The webs 14 do not interfere in the downward folding action of those sections and will not cause excessive elongation in sections 19b, 19c or 19d.

Note should next be taken of the distortion of the grid lines 28 in the bands 12, 13 in Figure 6. Again, some visual distortion occurs because the curved surfaces are shown projected into the plane of the drawing. The grid lines 28 are greatly stretched at their upper portions with very little stretching at their lower ends. From that distortion it is apparent that the adjacent band sections, corresponding to band sections 19b and 19c of Figure 3, are being caused to fold upwards against the cans because the high stretching of the inner periphery of the sections is causing those sections to assume a frusto-conical configuration. The webs 16 do not interfere in the upward deflection of those sections and will not cause excessive elongation in the sections 19b, 19c or 19d.

We further believe that the sections corresponding to sections 19d of Figure 3 are, and should function substantially merely as, an interconnecting member to produce the action described in the other sections of each band. Those sections are shown in Figure 5. Some substantial stretching of the inner periphery of those sections occurs because of the pull of the other sections. However, in practicing the invention, one should avoid high stretching of the inner periphery of those sections to the detriment of the stretching needed in the sections corresponding to sections 19b and 19c of Figure 3. To that end the radius of curvature of the section 19d more closely ap-

proximates the radius of curvature of the cans than the radii of curvature of sections 19a, 19b and 19c.

Although it is believed that one skilled in the subject art can practice the invention from the foregoing description, mention of the actual differences in the radii of curvature for a specific successful embodiment of the invention may be meaningful. The section 19a had a radius of curvature 52% larger than the radius of curvature of the exterior of the can immediately below the chime. The sections 19b and 19c had a radius of curvature 50% smaller than that of the can, and the section 19d had a radius of curvature 16% smaller than that of the can. Further, the total length of the sections 19a, 19b, 19c and 19d was 22% smaller than the circumferential dimension of the can immediately below the chime.

In measuring the elongation that had occurred in the various sections when applied to pairs of necked-in cans, it was found that a 10% elongation had occurred in the inner periphery of the first section 19a, a 40% elongation had occurred in the inner periphery of each of sections 19b and 19c, and a 25 to 30% elongation had occurred in the inner periphery of the fourth section 19d. In any particular incremental circumferential portion the elongation varies from a maximum at the upper edge of the bands immediately below the can chime, i.e. at what was the inner periphery of the bands, to a minimum at the lower edge of the bands.

Practical use of the invention has established that carriers embodying the invention use substantially less material than previously known can carriers made from sheet. In particular the thickness of the sheet can be markedly less.

With carriers as described above, it has been found that a firmly constricted compact package is formed when the carrier is applied to a plurality of necked-in cans. While all of the reasons why the carriers embodying the invention perform as described may not be easily perceived, it is believed that the grid lines shown in the drawing can help one to understand why the firm compact package is formed.

In our British Patent Application No. 9517/75 (Serial No. 1458277), divided from the present application, we claim:—

"A package of a plurality of pairs of cylindrical containers, each having an upper chime, and a carrier, the carrier comprising a plurality of pairs of frusto-conical bands encircling respective ones of the containers immediately below the upper chime thereof, first webs and second webs, there being a respective one of the first webs integrally interconnected

between opposed lower edges of the bands of each pair of bands, and there being a respective second web interconnecting the outer peripheries of each of the bands of adjacent pairs of bands, each of the bands being in a circumferentially stretched condition; each of the bands having four circumferential sections in states of elongation at their upper edges, the first of the sections being contiguous to the respective first web, the second and third sections extending circumferentially about the container from the ends of the first section, and the fourth section being connected between the ends of the second and third sections; the second and third sections being elongated at their upper edges to a substantially greater percentage extent than the first and fourth sections, and the fourth section being elongated at its upper edge to a substantially greater percentage extent than the first section."

WHAT WE CLAIM IS:—

1. A carrier and a plurality of pairs of cylindrical containers, each container having an upper chime, the containers being all of the same container radius immediately below the respective upper chime, the carrier comprising a plurality of pairs of bands, first webs and second webs, there being a respective one of the first webs interconnecting the outer peripheries of the bands of each pair of bands, and there being a respective second web interconnecting the outer peripheries of each of the bands of adjacent pairs of bands, the bands and the webs being formed from a resiliently deformable plastics sheet material with the bands and the webs lying in the plane of the sheet material when unstressed, the inner periphery of each of the bands being uninterrupted and shaped to define a closed loop of four arcuate sections, the first arcuate section being contiguous to the respective first web and having a radius of curvature substantially greater than the said container radius, the second and third arcuate sections extending from each end of the first arcuate section, and one or both of the second and third arcuate sections being contiguous to a respective second web, the second and third arcuate sections having substantially equal radii of curvature, these radii of curvature being substantially less than the said container radius, the fourth arcuate section extending between the second and third arcuate sections and having a radius of curvature no greater than the said container radius, the total arcuate extent of the four arcuate sections being substantially less than the circumferential dimension of the containers immediately below the upper chime.

proximates the radius of curvature of the cans than the radii of curvature of sections 19a, 19b and 19c.

Although it is believed that one skilled in the subject art can practice the invention from the foregoing description, mention of the actual differences in the radii of curvature for a specific successful embodiment of the invention may be meaningful. The section 19a had a radius of curvature 52% larger than the radius of curvature of the exterior of the can immediately below the chime. The sections 19b and 19c had a radius of curvature 50% smaller than that of the can, and the section 19d had a radius of curvature 16% smaller than that of the can. Further, the total length of the sections 19a, 19b, 19c and 19d was 22% smaller than the circumferential dimension of the can immediately below the chime.

In measuring the elongation that had occurred in the various sections when applied to pairs of necked-in cans, it was found that a 10% elongation had occurred in the inner periphery of the first section 19a, a 40% elongation had occurred in the inner periphery of each of sections 19b and 19c, and a 25 to 30% elongation had occurred in the inner periphery of the fourth section 19d. In any particular incremental circumferential portion the elongation varies from a maximum at the upper edge of the bands immediately below the can chime, i.e. at what was the inner periphery of the bands, to a minimum at the lower edge of the bands.

Practical use of the invention has established that carriers embodying the invention use substantially less material than previously known can carriers made from sheet. In particular the thickness of the sheet can be markedly less.

With carriers as described above, it has been found that a firmly constricted compact package is formed when the carrier is applied to a plurality of necked-in cans. While all of the reasons why the carriers embodying the invention perform as described may not be easily perceived, it is believed that the grid lines shown in the drawing can help one to understand why the firm compact package is formed.

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"A package of a plurality of pairs of cylindrical containers, each having an upper chime, and a carrier, the carrier comprising a plurality of pairs of frusto-conical bands encircling respective ones of the containers immediately below the upper chime thereof, first webs and second webs, there being a respective one of the first webs integrally interconnected

between opposed lower edges of the bands of each pair of bands, and there being a respective second web interconnecting the outer peripheries of each of the bands of adjacent pairs of bands, each of the bands being in a circumferentially stretched condition; each of the bands having four circumferential sections in states of elongation at their upper edges, the first of the sections being contiguous to the respective first web, the second and third sections extending circumferentially about the container from the ends of the first section, and the fourth section being connected between the ends of the second and third sections; the second and third sections being elongated at their upper edges to a substantially greater percentage extent than the first and fourth sections, and the fourth section being elongated at its upper edge to a substantially greater percentage extent than the first section."

WHAT WE CLAIM IS:—

1. A carrier and a plurality of pairs of cylindrical containers, each container having an upper chime, the containers being all of the same container radius immediately below the respective upper chime, the carrier comprising a plurality of pairs of bands, first webs and second webs, there being a respective one of the first webs interconnecting the outer peripheries of the bands of each pair of bands, and there being a respective second web interconnecting the outer peripheries of each of the bands of adjacent pairs of bands, the bands and the webs being formed from a resiliently deformable plastics sheet material with the bands and the webs lying in the plane of the sheet material when unstressed, the inner periphery of each of the bands being uninterrupted and shaped to define a closed loop of four arcuate sections, the first arcuate section being contiguous to the respective first web and having a radius of curvature substantially greater than the said container radius, the second and third arcuate sections extending from each end of the first arcuate section, and one or both of the second and third arcuate sections being contiguous to a respective second web, the second and third arcuate sections having substantially equal radii of curvature, these radii of curvature being substantially less than the said container radius, the fourth arcuate section extending between the second and third arcuate sections and having a radius of curvature no greater than the said container radius, the total arcuate extent of the four arcuate sections being substantially less than the circumferential dimension of the containers immediately below the upper chime.



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2. A carrier and containers as defined in claim 1, wherein the radius of curvature of each of the fourth arcuate sections is not less than a radius 20% less than the said container radius.

3. A carrier and containers as defined in claim 1 or claim 2, wherein the distance between the end connections of each first web to the respective bands is substantially greater than the length of a straight line extending between the ends of the first arcuate section and less than twice the said container radius.

4. A carrier and containers as defined in any of claims 1 to 3, wherein the inner and outer peripheries of the bands, where not connected with the webs, are spaced apart by a substantially uniform width.

5. A carrier and containers as defined in claim 4, wherein the distance between the inner peripheries of adjacent bands across the longitudinal centre of each web is substantially equal to twice the said uniform width.

6. A carrier and containers as defined

in any of claims 1 to 5, wherein there are integral tabs on the ends of the first webs as finger gripping handle means.

7. A carrier and containers as defined in any of claims 1 to 6, wherein the distance between the end connections of each second web to the respective bands is substantially less than the length of a straight line drawn between the points of widest spacing on the inner peripheries of the first and fourth arcuate sections.

8. A carrier and a plurality of containers, substantially as described with reference to Figures 1, 3, 4, 5 and 6 of the accompanying drawings, or modified as described with reference to Figure 2.

9. A carrier substantially as described with reference to Figures 1 and 3 or Figures 2 and 3 of the accompanying drawings.

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