DESCRIPTION

Title of the Invention: SEALING DEVICE

Technical Field

[0001] The present invention relates to a sealing device for sealing a lid on a container.

Background Art

[0002] Conventionally, it has been widely practiced in various stores such as convenience stores, supermarkets, and fast food restaurants to provide food and beverages, including various beverages such as coffee and carbonated drinks, and prepared foods, contained in containers (hereinafter, these various food and beverages may be referred to as "contents"). Traditionally, items with contents already stored in containers were displayed and provided in stores, or store clerks would store contents in containers on the spot when receiving customer orders. In recent years, in addition to these conventional sales, cases where purchasers store contents in containers on their own to go have also been done.

[0003] Generally, when providing contents to store in a container, it is common to put a lid on the container. There are various ways to lid a container, and among them, a heat sealing that joins a lid to a container by heating, and ultrasonically welding that joins a container and a lid by applying ultrasonic waves, are known. With such lid joined to a rim formed around an opening of the container, the container becomes sealed internally. For high salability inside the container, it is common to use a sealing device that seals the container with the lid by joining the lid to the rim of the container. An example of a conventionally known sealing device is disclosed in Patent Literature 1 below. The sealing device (sealing apparatus) described in Patent Literature 1 seals a lid made of a film member to a rim of the container by heating. This sealing apparatus comprises a main body, a support part for supporting the container, and a hot press plate for heat-sealing the film member to the container supported by the support part. The support part is configured to be slidable between an extending part in the front surface of the main body (an exterior portion of the main body of the sealing apparatus) and a portion underneath the hot press plate in the main body of the sealing apparatus. The support part in supporting the container is in a position outside of the main body of the sealing apparatus and slides to a downward direction of the hot press plate, thereby the lid is sealed to the container as supported. After the lid is sealed to the container by the hot press plate at this position, the support part slides from the position underneath the hot press plate to a position outside the main body of the sealing apparatus. Purchasers who have purchased beverages or the like can take the container from the support part located on the exterior of the main body of the sealing apparatus to go.

Citation List

Patent Literature

[0004] Patent Literature 1: Japanese Utility Model Registration No. JP3152023U

Summary of the Invention
Technical Problem
[0005] The sealing apparatus described in Patent Literature 1 recited above has an elongated film body wound in a roll provided on one side roller (active roller), and the leading end of this rolled film is attached to the other side roller (passive roller), so that as the passive roller rotates, the film provided on the active roller is sequentially fed out and wound onto the passive roller. The part where the film is sealed to the container is located between the active roller and the passive roller, and this part is configured to cut the elongated film body into a form in accordance with the size and shape of the container, and to heat-seal it to the container.
[0006] However, in such sealing apparatus that seals the inside of a container in which the elongated film body is cut in predetermined size and shape, and is heat-sealed to the container, the elongated film body wound onto the passive roller includes scraps of film punched out in predetermined shapes. This elongated film body wound onto the passive roller is discarded in the end, and there has been a problem of very large volume of film loss caused after the lids are punched out. Furthermore, in the sealing apparatus disclosed in Patent Literature 1 where the film is cut from the elongated film body and heat-sealed to the container, there was a risk that dust generated in a process of cutting the film into pieces might enter the container and be mixed with the contents.
[0007] Furthermore, the sealing apparatus described in Patent Literature 1 requires separate steps for film cutting and for heat-sealing of the film to the container. It means that the configuration of the sealing apparatus is complicated and that a risk is concerned if store clerks might accidentally touch the film cutting parts at the site and get injured when they check or clean the inside of the sealing apparatus.
[0008] The present invention has been made in view of such problems, and an object of the present invention is to provide a sealing device that can greatly reduce the loss of material to form the lid, prevent the contamination of contents in the container with dust, and further simplify the overall configuration of the device.
Solution to Problem
[0009] The present invention is summarized by the inventions according to (1) to (15) shown below.
(1) A sealing device for sealing an opening of a container, the container having an opening and a rim forming the outer periphery of the opening, comprising: a holding part having a holding body that holds the container with the rim of the container exposed; and a joining force applying part having a joining body for joining a lid to the rim formed along a peripheral edge of the opening, the sealing device is characterized in that the holding part joins a lid material formed to be sheet and placed so as to face the opening of the holding body to the container.
(2) The sealing device according to (1), further comprising a moving part that displaces at least one of the joining part and the holding part such that the joining body and the holding body are in closer contact with each other via the container

held by the holding part and the lid located on the container, and that the joining body and the holding body are in a mode far from each other than their closer contact mode,

wherein the joining part is configured to join the lid to the container when the moving part switches into the closer contact mode.

(3) The sealing device according to (1), further comprising a positioning part that has a guide body for guiding the position of the lid into a predetermined space.

(4) The sealing device according to (3), wherein a plurality of the guide bodies is hanged from a predetermined position of the joining part towards the holding body, and the arrangement of the plurality of guide bodies is determined such that the plurality of guide bodies hold the lid and position the lid within the space.

(5) The sealing device according to (1), wherein the joining body is provided with an energy applying part that applies energy to a contact part between the lid and the container.

(6) The sealing device according to (5), wherein the energy applying part applies at least one type of energy selected from the group consisting of electrical energy, vibratory energy, and thermal energy.

(7) The sealing device according to (1), further comprising an insertion part formed to allow insertion of the lid, and a conveying part that conveys the lid inserted from the insertion part towards the space.

(8) The sealing device according to (2), wherein the holding part has a through-hole passing between a front surface and a back surface thereof, and an insertion part formed to allow insertion of the container into the through-hole, and a support part located underneath the insertion part, contacting the bottom of the container, and supporting the bottom, wherein the position in the height direction of the contact point between the support part and the bottom varies with the transition between the closer contact mode and a separated mode.

(9) The sealing device according to (3), wherein the holding part has an insertion part for inserting the container formed to penetrate between the front surface and the back surface of the holding part, and the positioning part is formed along a periphery of the insertion part.

(10) The sealing device according to (3), wherein the positioning part is formed of a flexible material.

(11) The sealing device according to (3), wherein the positioning part is formed of a heat-resistant material.

(12) The sealing device according to (1), further comprising a storage part for storing a plurality of stacked lids, a dispenser for individually dispensing lids from the storage part, , and a transfer part for transferring the lids dispensed by the dispenser towards the holding part, wherein the lid is arranged on the container via the transfer part when the container is placed on the holding part.

(13) The sealing device according to (12), wherein a plurality of storage parts are provided, and the dimensions of the lids stored in at least one of the storage parts

are different from the dimensions of the lids stored in the storage part placed on the holding part, and in accordance with the size of the container placed on the holding part, the storage part containing the lids to be placed on the container from the transfer part is selected, and the lid is placed on the container via the transfer part from the selected storage part.
(14) The sealing device according to (12), wherein the transfer part has a standby part that temporarily holds the lids sent from the storage part, and the lids placed in the standby part are placed on the container when the container is placed on the holding part, and the lids are sent from the storage part to the standby part of the transfer part.
(15) The sealing device according to (12), wherein the storage part has an opening at its lower end, and the dispenser is configured to take out the lids from the opening at the lower end of the storage part.

Effects of the Invention

[0010] According to the present invention, a lid can be reliably joined to a container and the container can be sealed without complicating the structure. Furthermore, according to the present invention, when joining the lid to the container, the risk of foreign matter contaminating the inside of the container can be greatly reduced, and the loss of material forming the lid can also be greatly reduced.

Brief Description of the Drawings

[0011]

[Fig. 1] Fig. 1 is a perspective view schematically showing an embodiment of a holding jig, which is a first embodiment of the sealing device according to the present invention.
[Fig. 2] Fig. 2 is a plan view schematically showing an embodiment of the holding jig of the sealing device according to the first embodiment.
[Fig. 3] Fig. 3 is a cross-sectional view schematically showing the state of the longitudinal cross-section taken along line A-A in Fig. 2.
[Fig. 4] Fig. 4A is a plan view schematically showing an embodiment of a holding jig according to Modification 1. Fig. 4B is a cross-sectional view schematically showing the state of the longitudinal cross-section taken along line B-B in Fig. 4A.
[Fig. 5] Fig. 5A is a plan view schematically showing an embodiment of a holding jig according to Modification 3. Fig. 5B is a cross-sectional view schematically showing the state of the longitudinal cross-section taken along line C-C in Fig. 5A.
[Fig. 6] Fig. 6 is a cross-sectional view schematically showing an embodiment of a holding jig according to Modification 4.
[Fig. 7] Fig. 7 is a cross-sectional view schematically showing an embodiment of a holding jig according to Modification 5.
[Fig. 8] Figs. 8A and 8B are cross-sectional views schematically showing an embodiment of a holding jig according to Modification 6.

[Fig. 9] Fig. 9A is a plan view schematically showing an embodiment of a holding jig according to Modification 7. Fig. 9B is a side view schematically showing an embodiment of a holding jig according to Modification 7.
[Fig. 10] Fig. 10 is an external perspective view showing a first embodiment of the sealing device according to the present invention.
[Fig. 11] Fig. 11 is an external perspective view of the sealing device according to the first embodiment, with the lid storage part removed.
[Fig. 12] Fig. 12 is an exploded perspective view of the sealing device shown in Fig. 11.
[Fig. 13] Fig. 13(a) is an external perspective view showing the configuration of the joining force applying part, and Fig. 13(b) is a plan view showing the configuration of the joining force applying part.
[Fig. 14] Fig. 14 is a perspective view schematically showing an embodiment of a holding jig according to Modification 8.
[Fig. 15] Fig. 15A is a plan view schematically showing an embodiment of a holding jig according to Modification 8. Fig. 15B is a side view schematically showing an embodiment of a holding jig according to Modification 8.
[Fig. 16] Fig. 16 is a longitudinal cross-sectional view of the sealing device according to the first embodiment.
[Fig. 17] Fig. 17 is a longitudinal cross-sectional view of the sealing device according to the first embodiment.
[Fig. 18] Fig. 18 is an explanatory diagram for explaining the operation of the joining force applying part in the first embodiment.
[Fig. 19] Fig. 19 is an external perspective view representing a second embodiment of the sealing device according to the present invention.
[Fig. 20] Fig. 20A is a plan view showing an embodiment of a holding jig according to Modification 8. Fig. 20B is a longitudinal cross-sectional view schematically showing the state of the longitudinal cross-section taken along line E-E in Fig. 20A.
[Fig. 21] Fig. 21 is a plan view showing an embodiment of a holding jig according to Modification 8.
[Fig. 22] Fig. 22A is a plan view showing an embodiment of a holding jig according to Modification 7, and Fig. 22B is a side view showing an embodiment of a holding jig according to Modification 7.
[Fig. 23] Fig. 23 is an explanatory diagram for explaining the operation of the sealing device according to the second embodiment.
[Fig. 24] Fig. 24 is an explanatory diagram for explaining the internal configuration of the sealing device according to the second embodiment.
[Fig. 25] Fig. 25 is an exploded perspective view of the sealing device according to the second embodiment.
[Fig. 26] Fig. 26(a) is an external perspective view of the sealing device according to the third embodiment. Fig. 26(b) is a plan view of the sealing device according to the third embodiment.

[Fig. 27] Fig. 27 is a perspective view showing the internal configuration of the sealing device according to the third embodiment.
[Fig. 28] Fig. 28 is an exploded perspective view of the sealing device according to the third embodiment.
[Fig. 29] Fig. 29 is a perspective view showing the configuration of the insertion part and the joining force applying part of the sealing device according to the third embodiment.
[Fig. 30] Fig. 30A is a plan view showing an embodiment of a holding jig according to Modification 8. Fig. 30B is a longitudinal cross-sectional view schematically showing the state of the longitudinal cross-section taken along line E-E in Fig. 30A.
[Fig. 31] Fig. 31A is a plan view showing an embodiment of a holding jig according to Modification 8. Fig. 31B is a longitudinal cross-sectional view schematically showing a cross-section of biasing structure in a holding jig.
[Fig. 32] Fig. 32A is a plan view showing an embodiment of a holding jig according to Modification 8. Fig. 32B is a longitudinal cross-sectional view showing the longitudinal cross-section taken along line G-G in Fig. 32A.
[Fig. 33] Fig. 33 is a side view of the insertion part and the joining force applying part of the sealing device according to the third embodiment.
[Fig. 34] Fig. 34A is a perspective view of the sealing device's insertion part when viewed from the front side. Fig. 34B is a perspective view of the sealing device's insertion part when viewed from the rear side. Fig. 34C is a side view of the insertion part.
[Fig. 35] Fig. 35 is a plan view schematically showing an embodiment of a holding jig according to Modification 10.
[Fig. 36] Fig. 36 is a plan view schematically showing an embodiment of a holding jig.
[Fig. 37] Fig. 37 is a plan view schematically showing an embodiment of a holding jig.
[Fig. 38] Fig. 38 is a plan view schematically showing an embodiment of a holding jig.
[Fig. 39] Fig. 39 s a plan view schematically showing an embodiment of a holding jig.
[Fig. 40] Fig. 40A is a plan view schematically showing an embodiment of a holding jig according to Modification 8. Fig. 40B is a plan view schematically showing the state of the longitudinal cross-section taken along line H-H in Fig. 40A. Fig. 40C is a cross-sectional view schematically showing an example of the state during use in an embodiment of a holding jig according to Modification 8.
[Fig. 41] Fig. 41A is a plan view schematically showing an embodiment of a holding jig according to Modification 8. Fig. 41B is a cross-sectional view schematically showing the state of the longitudinal cross-section taken along line I-I in Fig. 41A. Fig. 41C is a cross-sectional view schematically showing the state of the longitudinal cross-section taken along line J-J in Fig. 41A.
[Fig. 42] Figs. 42A and 42B are cross-sectional views schematically showing an embodiment of a holding jig according to Modification 8.

[Fig. 43] Fig. 43A is a plan view schematically showing an embodiment of a holding jig according to Modification 9. Fig. 43B is a diagram schematically showing an embodiment of a holding jig according to Modification 9.
[Fig. 44] Fig. 44 is a plan view schematically showing an embodiment of a holding jig according to Modification 10.
[Fig. 45] Fig. 45A is a plan view schematically showing an embodiment of a holding jig according to Modification 11. Fig. 45B is a cross-sectional view schematically showing the state of the longitudinal cross-section taken along line K-K in Fig. 45A.
[Fig. 46] Fig. 46A is a plan view schematically showing an embodiment of a holding jig according to Modification 12. Fig. 46B is a cross-sectional view schematically showing the state of the longitudinal cross-section taken along line L-L in Fig. 46A. Fig. 46C is a cross-sectional view schematically showing the state of the longitudinal cross-section taken along line M-M in Fig. 46A.
[Fig. 47] Fig. 47A is a plan view schematically showing an embodiment of a holding jig according to Modification 13. Fig. 47B is a side view schematically showing an embodiment of a holding jig according to Modification 13.
[Fig. 48] Fig. 48A is a plan view schematically showing an embodiment of a holding jig according to Modification 14. Fig. 48B is a diagram schematically showing an embodiment of a holding jig according to Modification 14.
[Fig. 49] Fig. 49A is a plan view schematically showing an embodiment of a holding jig according to Modification 15. Fig. 49B is a cross-sectional view schematically showing the state of the longitudinal cross-section taken along line N-N in Fig. 49A.
[Fig. 50] Fig. 50A is an external perspective view showing the configuration of the joining force applying part of the sealing device according to the third embodiment. Fig. 50B is a front view showing the configuration of the joining force applying part.
[Fig. 51] Fig. 51 is a perspective view schematically showing an embodiment of a holding jig according to Modification 16.
[Fig. 52] Fig. 52A is a plan view schematically showing an embodiment of a holding jig. Fig. 52B is a side view of the holding jig shown in Fig. 52A. Fig. 52C is a diagram schematically showing the holding jig positioning the lid.
[Fig. 53] Fig. 53 is an external perspective view showing a fourth embodiment of the sealing device according to the present invention.
[Fig. 54] Fig. 54 is an external perspective view showing a fourth embodiment of the sealing device according to the present invention.
[Fig. 55] Fig. 55 is a perspective view schematically showing the internal configuration of the sealing device according to the fourth embodiment.
[Fig. 56] Fig. 56 is a perspective view showing a modification of the sealing device according to the third embodiment.
[Fig. 57] Fig. 57 is a perspective view showing a modification of the sealing device according to the second embodiment.
[Fig. 58] Fig. 58 is a perspective view schematically showing the configuration of the lid storage part.

[Fig. 59] Fig. 59 is a perspective view schematically showing the configuration of the lid storage part.
[Fig. 60] Fig. 60 is an explanatory diagram for explaining the operational effects of the lid storage part.
[Fig. 61] Fig. 61 is a cross-sectional view showing the cross-sectional configuration of the lid storage part.
Description of Embodiments
[0012] Hereinafter, embodiments of the sealing device according to the present invention will be described in detail with reference to the drawings. In this specification and the drawings, parts having substantially the same function and configuration are denoted by the same reference numerals, and redundant explanations are omitted.
[0013] The following description is a preferred specific example of the sealing device according to the present invention. Therefore, the content of the present invention is not limited to the embodiments described below. In the following description, directions such as front, rear, left, right, up, and down are indicated for convenience of explanation, but the content of the present invention is not limited to these directions. In the following description, when X-axis, Y-axis, and Z-axis are shown in the drawings, the Z-axis direction is defined as the vertical direction (upper side is +Z direction, lower side is -Z direction), the X-axis direction is defined as the front-rear direction (front side is +X direction, rear side is -X direction), and the Y-axis direction is defined as the left-right direction (right side is +Y direction, left side is -Y direction), and the description will be made based on these definitions. Furthermore, the size ratios of the sealing device and each component of the sealing device shown in each figure are for convenience of description and do not limit the actual size ratios. Moreover, the configuration of each part described in detail below is not limited to application in each embodiment and modification, but may be appropriately applied to other embodiments and modifications.
[0014] [First Embodiment]
First, a first embodiment of the sealing device 1001 according to the present invention will be described. The sealing device 1001 according to the present invention is for sealing the opening of a container, which has an opening and a rim forming the outer periphery of the opening, with a lid. It comprises a holding part 1003 having a holding jig as a holding body for holding the container with the rim of the container exposed, and a joining force applying part 1004 having a joining body for joining the lid to the rim formed around the opening of the container. The holding part 1003 is configured to join a pre-formed sheet lid to the container, with the lid arranged to face the opening of the holding body.
[0015] The configuration of the sealing device 1001 according to this embodiment is shown in Figures 10 to 13, and Figures 16 to 18. As shown in Figure 10 and so on, the sealing device 1001 according to this embodiment is configured so that a person who seals the lid to the container (hereinafter referred to as "user") manually seals

the container. This sealing device 1001 includes a casing 1002, a holding part 1003, a joining force applying part 1004, a moving part 1005, and a lid storage part 1006. The casing 1002 is a base member of the sealing device 1001. The casing 1002 is formed by molding a metal plate of a conventionally known material such as iron or stainless steel. In the sealing device 1001 according to this embodiment, the bottom plate 1007, the right side plate 1008, the left side plate 1009, the rear plate 1010, etc., of the casing 1002 are formed by conventionally known methods such as welding or bending, but the method of forming the casing 1002 is not limited to the above, and the casing 1002 may be formed by other methods. The bottom plate 1007 is a plate-shaped member located at the lower part 1015 of the sealing device 1001, and has through-holes formed at four locations, front, rear, left, and right. These four through-holes are for attaching, for example, rubber feet. The right side plate 1008, the left side plate 1009, and the rear plate 1010 are formed so as to stand upright from the bottom plate 1007. The right side plate 1008 and the rear plate 1010, and the left side plate 1009 and the rear plate 1010 are integrated with each other by joining or the like. The casing 1002 has a storage space 1011 surrounded by these bottom plate 1007, right side plate 1008, left side plate 1009, and rear plate 1010. This storage space is for arranging and attaching various parts and members constituting the sealing device 1001. The upper ends of the right side plate 1008 and the left side plate 1009 are bent inward. Guide rails are attached to these bent parts. A plug socket (not shown) for supplying power to the sealing device 1001 can be attached to the rear plate 1010.

[0016] Furthermore, the casing 1002 is provided with a lock member 1012. The lock member 1012 is a member for regulating or releasing the rotation of a lever constituting the joining force applying part 1004, which will be described later, in the direction A in Fig. 7A. This lock member 1012 has a movement space 1013 that allows a locking projection formed on the joining force applying part 1004 to move in the front-rear direction, and is provided with an upper part 1014, a lower part 1015, a side part 1016, and a rear part 1017 so as to surround the movement space 1013. Furthermore, a lock release part 1018 for releasing engagement with the locking projection is formed at the front of this lock member 1012.

[0017] The holding part 1003 is for holding the container with the rim of the container exposed, and at least a part of it is arranged to be located within the storage space 1011. This holding part 1003 is composed of a holding jig 10 and a holding base plate 1019 for supporting this holding jig 10. The holding base plate 1019 is a plate-shaped member formed by bending both ends in the left-right direction. This holding base plate 1019 is attached to the casing 1002 by fixing its bent left end part to the left side plate 1009 of the casing 1002 by screwing or the like, and fixing its right end part to the right side plate 1008 of the casing 1002 by screwing or the like. The holding base plate 1019 is capable of mounting and fixing the holding jig 10 thereon. Note that the holding base plate 1019 may be formed by bending both ends in the left-right direction, or it may be formed by other methods.

[0018] Next, the configuration of the holding jig 10 will be described. The configuration of the holding jig 10 will be described including modifications. The holding jig 10 of the sealing device 1001 according to the first embodiment (hereinafter sometimes referred to as "holding jig 10 according to the first embodiment") has a holding body 11, as shown in Figures 1, 2, and 3, and so on. The holding jig 10 is formed in a rectangular shape in its plan view, but this is just an example and does not prohibit other shapes. The outer peripheral shape of the holding jig 10 in its plan view may be circular, tongue-shaped, elliptical, polygonal, or any other shape, in addition to rectangular. For example, in the example shown in Figure 39, the outer peripheral shape of the holding jig 10 is formed in a tongue shape in its plan view. In Figures 1 and 2, for convenience of explanation, it is described that a gap exists between the receiving member 13 and the displacement element 14, which will be described later. However, a state where a gap occurs due to the displacement of the displacement element 14 and a state where the receiving member 13 and the displacement element 14 are in contact (no gap) can both occur. This also applies to Figures 4 to 5 and so on.

[0019] (Objects to be held)

The holding jig 10 can be used for holding objects. Therefore, the holding jig 10 is a concept that includes structures usable as so-called container holding parts or container supports. Objects to be held are objects held by the holding jig 10, and examples include containers, laminates of containers and lids, and integrated container-lid units. Objects to be held include those held by the upper edge of the through-hole of the holding jig, and those held by the peripheral surface of the through-hole of the holding jig.

[0020] (Base Plate)

In the example of FIG. 1, the holding jig 10 includes a holding body 11 on a base plate 12. In this example, the holding body 11 arranges a plurality of displacement elements 14 and a receiving member 13, which will be described later, on the upper surface (plate upper surface) of the base plate 12. However, this is not limited to the case where the holding jig 10 includes the base plate 12. The base plate 12 may be omitted if the holding body 11 is not disassembled, that is, if the combination of the plurality of displacement elements 14 described later are not individually disassembled and the displacement elements 14 can be prevented from detaching from the holding body 11. The material of the base plate 12 is not particularly limited, but it is not particularly limited to metal, plastic, wood, glass, ceramics, or the like, but from the viewpoint of excellent strength, the base plate 12 is preferably made of metal. The base plate 12 is formed with auxiliary holes 17 at positions corresponding to the through-holes 16 described later. In the example of FIG. 1, the auxiliary holes 17 are formed in a shape that is approximately inscribed in the shape of the peripheral surface portion 16A of the through-hole 16 in a plan view of the holding jig 10, with the size of the through-hole 16 in an enlarged state. As the size of the through-hole 16 changes to become smaller, the edge portion 17A of the

auxiliary hole 17 comes to be located outside the through-hole 16 in a plan view of the holding jig 10.

[0021] (Holding body)

The holding body 11 has a through-hole 16 and includes a plurality of displacement elements 14 forming at least a part of the through-hole 16. In the example of FIG. 1, the through-hole 16 is formed by a plurality of displacement elements 14. In the example of FIG. 1, the holding body 11 also includes a receiving member 13 outside the displacement elements 14, when the direction towards the through-hole 16 is defined as the inner side. More specifically, in the example of FIG. 1, the holding body 11 includes an annular structure 15 composed of a plurality of displacement elements 14, and further includes a receiving member 13 outside the annular structure 15. Note that in FIG. 1, the holding jig 10 may have the displacement elements 14 arranged non-annularly. Also, for example, the holding jig 10 is an example, and the through-hole 16 may be configured by a combination of the displacement element 14 and a non-displacement member that does not displace. In this example, the displacement elements 14 will be arranged non-annularly.

[0022] (Through-hole)

The through-hole 16 of the holding body 11 is formed so that its size can be changed according to the displacement of the displacement element 14, as will be described later. The through-hole 16 has a diameter such that it functions to allow the held object M to pass through. The through-hole 16 has a peripheral surface portion 16A and an upper edge portion 16B. When the held object M is a container 200 having a main body part 210 with an open upper side, a bottom part 220, a space 230 enclosed by the main body part 210 and the bottom part 220, and a flange part 240 extending outward from the upper end (upper edge part 250) side of the main body part 210, as will be described later with reference to Fig. 11 in the description of the sealing device, the peripheral surface part 16A faces the outer peripheral surface 210A of the main body part 210 (outer peripheral surface of the container 200), and the upper edge part 16B faces the flange part 240. The flange part 240 may be flat or curled. In the following description, when explaining using a container, the held object is the container 200 as described above, the shape of the main body part 210 tapers from the upper end to the lower end, and the main body of the container 200 has an open upper side. The description will continue using this case. Note that the upper edge part 16B indicates the part that forms the upper edge of the through-hole 16 when it is assumed that the container 200 is generally passed through the holding jig 10 in the vertical direction. When inserting the container 200 into the holding jig 10, it is preferable that the container 200 is inserted so as to pass through the through-hole 16 from the upper edge part 18B side.

[0023] The size of the through-hole 16 is changed within a predetermined range according to the displacement of the displacement element 14. The enlarged state of the through-hole 16 is predetermined. The enlarged state is a state where the

size of the through-hole 16 is made larger as determined by conditions such as the size of the object to be held M and the arrangement of the displacement elements 14. For example, in the case of Fig. 1, it is the size of the through-hole 16 when the displacement element 14 is displaced to a position where it contacts the regulating wall part 21. The reduced state of the through-hole 16 is also predetermined. The reduced state is a state where the size of the through-hole 16 is made smaller as determined by conditions such as the size of the object to be held M and the arrangement of the displacement elements 14. For example, in the case of Fig. 4, which will be referred to in modified example 1 described later, it is the size of the through-hole 16 when the displacement element 14 is displaced until the elastic member 22 (described later) reaches its natural length. Furthermore, for example, if the object to be held M is a container 200 having a shape that tapers downward, the size of the through-hole 16 corresponding to the reduced state of the through-hole 16 may be set to be slightly larger than the size of the lower end of the container 200, in relation to the reduced state of the object to be held M. In relation to the enlarged state of the object to be held M, the size of the through-hole 16 corresponding to the enlarged state of the through-hole 16 may be set to be slightly larger than the size of the upper end of the container 200 (excluding the flange part 240). Note that when the size of the through-hole 16 is changed, the size of the through-hole 16 may be changed such that the shapes before and after the change are similar to each other, or the size of the through-hole 16 may be changed such that they are dissimilar. When the size of the through-hole 16 is in the reduced state, it includes cases where the size of the through-hole 16 becomes approximately zero.

[0024] (Specifying the size of the through-hole)

The size of the through-hole 16 is determined by aligning the center CT of the through-hole 16 (indicated by a dashed-dotted line in Figs. 1 and 3, and by a dot in Fig. 2) with the position of the displacement element 14. If, when one through-hole 16 is assumed to be placed forward and other through-holes 16 are placed backward, the other through-holes 16 are exposed, then the other through-holes 16 are smaller than the one through-hole 16. If the one through-hole and the other through-holes 16 match, then the one through-hole 16 and the other through-holes 16 are the same size. If the other through-holes 16 are not exposed and are not the same as the one through-hole 16, then the other through-holes 16 are larger than the one through-hole 16. The relative sizes of the through-hole 16 and the auxiliary holes 17, 18 are determined by the diameters of the maximum inscribed circle of the through-hole 16 and the diameters of the auxiliary holes 17, 18.

[0025] (Displacement Element)

In the holding jig 10, in the examples of Figs. 1, 2, etc., the plurality of displacement elements 14 are arranged annularly. Here, "arranged annularly" means that when a predetermined position is set as a reference position (in the example of Fig. 2, the center CT of the through-hole 16), they are arranged so as to surround the

reference position. When arranged annularly, it is assumed that cases where adjacent plurality of displacement elements 14 overlap are included, when the direction away from the reference position (the direction extending outward from the reference position along a plane normal to the thickness direction of the holding jig 10) is taken as the line of sight. The displacement element 14 refers to an object (a displaceable element) that moves, such as by position change or rotation, under the action of external pressure, electricity, magnetism, or the like. Examples of the displacement element 14 include movers and rotors. A mover is a tangible object that changes its position. A rotor is a tangible object that rotates. It is sufficient if at least a part of the displacement element 14 is arranged so as to be recognizable from the through-hole 16, and it is not prohibited that some of the plurality of displacement elements 14 do not expose to the through-hole 16 when the through-hole 16 has a predetermined size.

[0026] (Layout of Displacement Elements)

Regarding the layout of the displacement elements 14, in the examples of Figs. 1, 2, etc., when the direction away from the reference position is taken as the line of sight, a plurality of adjacent displacement elements 14 overlap, and adjacent displacement elements 14 are in contact with each other. The annularly arranged displacement elements 14 form an annular structure 15 as a whole. The annular structure 15 has a penetration part (a part that penetrates in the direction along the Z-axis) formed on the inner side, and this penetration part forms the through-hole 16. Therefore, a plurality of displacement elements 14 form the through-hole 16. However, this is not limited to the case where the through-hole 16 is formed by the penetration part formed by the annular arrangement of the displacement elements 14. For example, as shown in Fig. 37, cases where the through-hole 16 is formed by the displacement element 14 and a wall part 53 are not excluded. Fig. 37 is a plan view showing an embodiment of the holding jig 10 according to the first embodiment. In Fig. 37, as indicated by dashed lines, the size of the exposed area ER changes as the displacement element 14 slides in the direction of arrow SL, and the size of the through-hole 16 changes according to the change in the size of the exposed area ER.

[0027] Furthermore, in the examples of Figs. 1 and 2, in a plan view of the holding body 11 (in a plan view of the holding jig 10), the plurality of displacement elements 14 are arranged annularly such that the shape of the through-hole 16 is generally a regular polygonal shape (a regular dodecagon in Fig. 2), but the arrangement (layout) of the plurality of displacement elements 14 is not limited to this example. For example, as shown in Fig. 36, a plurality of displacement elements 14 may be arranged such that the shape of the through-hole 16 is close to a rectangle, or a plurality of displacement elements 14 may be arranged such that the shape of the through-hole 16 is a polygon other than a regular polygon. In the example of Fig. 36, four displacement elements 14 are arranged to form the through-hole 16 in a rectangular shape. In this example, the displacement elements 14 are formed in a

generally right-angled triangular shape in a plan view of the holding jig 10, and the length LB of one side facing the through-hole 16 is longer than the length LA of a side extending generally perpendicular to this side. As the displacement element 14 slides in the direction of arrow SL, the size of the exposed area ER changes as indicated by the dashed line, and the size of the through-hole 16 changes according to the change in the size of the exposed area ER. Furthermore, as will be described later, when the side surfaces of the displacement elements 14 are curved, a plurality of displacement elements 14 may be arranged such that the through-hole 16 becomes circular.

[0028] (Exposed Area of Displacement Element)

Among the surfaces of the displacement element 14 (in the example of Fig. 1, the first side surface 14A1 of the side surface 14A), the region that forms the peripheral surface portion 16A of the through-hole 16 is an exposed area ER that is exposed toward the through-hole 16. The size of the exposed area ER is determined according to the size of the through-hole 16. In at least some of the displacement elements 14, the exposed area ER of the displacement element 14 exposed in the peripheral surface portion 16A of the through-hole 16 changes as the displacement element 14 displaces in the displacement direction T. In the example of Fig. 1, as the size of the through-hole 16 decreases, the exposed area ER of the displacement element 14 forming the through-hole 16 decreases. As the exposed area ER of the displacement element 14 decreases, the area among the surfaces of the displacement element 14 that is in contact with an adjacent displacement element 14 and is covered by the adjacent displacement element 14 (covered area CR) increases. As the size of the through-hole 16 increases, the exposed area ER of the displacement element 14 increases. As the exposed area ER of the displacement element 14 increases, the area among the surfaces of the displacement element 14 that is covered by an adjacent displacement element 14 (covered area CR) decreases. In this way, in the holding jig 10, as each displacement element 14 displaces in the displacement direction T, the exposed area ER of each displacement element 14 exposed in the peripheral surface portion 16A of the through-hole 16 changes. Note that Fig. 1 is just an example, and it does not prohibit the size of the exposed area ER from not changing for some of the displacement elements 14, as long as the size of the through-hole 16 can be changed.

[0029] (Shape of Displacement Element)

In the examples of Figs. 1, 2, etc., the shape of each individual displacement element 14 is triangular in plan view, and they are formed as triangular plates having a predetermined thickness. Furthermore, the plurality of displacement elements 14 are formed to be substantially uniform. However, this does not limit the shape of the displacement element 14 to the examples of Figs. 1, 2, etc. The examples of Figs. 1, 2, etc., do not prohibit at least some of the plurality of displacement elements 14 from having different shapes compared to other displacement elements 14. For example, as shown in Fig. 38, the shapes of the plurality of displacement elements

14 forming the through-hole 16 may include triangular, trapezoidal, or shapes with curved portions. In Fig. 38, the displacement element 14TRP is trapezoidal in a plan view of the holding body 11, while the other displacement elements 14, excluding the displacement element 14TRP, are triangular in a plan view of the holding body 11.
[0030] (Size of Displacement Element) In the examples of Figs. 1, 2, etc., the sizes of the plurality of displacement elements 14 are formed to be substantially uniform. However, this does not prohibit the case where the sizes of at least some of the plurality of displacement elements 14 are different.
[0031] (Material of Displacement Element)

The material of the displacement element 14 is not particularly limited, but from the viewpoint of ease of manufacture, it is preferable that it is the same material as the receiving member 13. While not particularly limited to metal, plastic, wood, glass, ceramics, etc., from the viewpoint of excellent sliding motion and ease of molding, it is preferable that the material of the displacement element 14 is plastic. When the displacement element 14 is made of plastic, it is preferable that the displacement element 14 has cushioning properties, and from this viewpoint, it is preferable that the displacement element 14 is made of a porous polymer material. Examples of porous polymer materials include foamed polymer materials. Note that the plastic may be elastic or have low elasticity. If the displacement element 14 is easily elastically deformable, even if the side surface of the displacement element 14 is curved, the size of the through-hole 16 can be smoothly changed even if a plurality of displacement elements 14 are arranged so that the through-hole 16 becomes circular. Furthermore, from the viewpoint of excellent strength of the displacement element 14 and low wear due to friction during sliding, it is preferable that the material of the displacement element 14 is metal (including alloys). When the material of the displacement element 14 is metal, specific examples of the material of the displacement element 14 include iron, copper, aluminum, stainless steel, and the like. From the viewpoint of preventing rust, it is preferable that the material of the displacement element 14 is aluminum alloy or stainless steel.
[0032] (Displacement Direction of Displacement Element)

Each displacement element 14 shown in the example of Fig. 1 slides on the upper surface (plate upper surface) of the base plate 12. Therefore, the displacement element 14 displaces in the plane direction (XY plane direction) of the base plate 12. At this time, in a plan view of the holding body 11, the displacement direction T of the displacement element 14 is predetermined for each displacement element 14. The displacement direction T of the displacement element 14 is determined according to the shape and arrangement of the displacement element 14. In the examples of Figs. 1 and 2, the displacement direction T of each displacement element 14 is determined according to the orientation of the base 140 of the displacement element 14. In this example, the displacement element 14 displaces linearly along the displacement direction T, where the direction along which the base 140 of the triangle forming the displacement element 14 extends is defined as the

displacement direction T. At this time, by setting such a direction as the displacement direction T, adjacent displacement elements 14 can be interlocked as will be described later. In the example of Fig. 1, the displacement element 14 displaces linearly along the displacement direction T, but the displacement direction T is not limited to being linear. For example, the displacement element 14 may be configured to displace in an arc shape or the like. Note that when the displacement element 14 has a triangular shape in plan view, the base 140 is defined as the shortest side among the three sides in the examples of Figs. 1, 2, etc., but this is for convenience of explanation and is not limited thereto. When displacing in an arc shape, it is preferable that the displacement element 14 is made of an elastically deformable material such as rubber.

[0033] (Interlocking of Adjacent Displacement Elements)

Adjacent displacement elements 14 interlock as described above. Interlocking means that the displacement of one displacement element 14 causes the adjacent displacement element 14 to also displace. The interlocking structure is not particularly limited, but in the example of Fig. 1, it is realized by the arrangement structure of adjacent displacement elements 14. In the example of Fig. 1, adjacent displacement elements 14 are in contact with each other at their side surfaces 14A (first side surface 14A1). Then, one of the adjacent displacement elements 14 applies a pressing force to the other displacement element 14. The other displacement element 14 displaces under the action of this pressing force.

[0034] In the example shown in Fig. 1, when one of the adjacent displacement elements 14 moves along a guide part 20 (described later) corresponding to that one displacement element 14, it applies a pressing force to the other displacement element 14 in an oblique direction relative to the direction in which the guide part 20 of the other displacement element 14 extends. Therefore, the other displacement element 14 displaces along the guide part 20 due to the pressing force received from the one displacement element 14. Note that displacement along the guide part 20 is not limited to cases where the guide part 20 and the displacement element 14 move while continuously touching, but may include cases where the guide part 20 and the displacement element 14 partially touch and move, or where there are momentary separations between the guide part 20 and the displacement element 14, as long as the function of the guide part 20 is not lost.

[0035] (Sliding of Adjacent Displacement Elements)

Adjacent displacement elements 14 slide against each other. At this time, they slide against each other along the predetermined displacement direction T for each displacement element 14. Adjacent displacement elements 14 are in contact with each other at their side surfaces 14A (first side surface 14A1 in Fig. 1), and the adjacent displacement elements 14 displace along their respective predetermined displacement directions T such that their side surfaces 14A rub against each other. Note that the concept of two objects sliding includes cases where the two objects slide smoothly and cases where the two objects move with friction. When adjacent

displacement elements 14 slide, it is preferable that a frictional force acts between the adjacent displacement elements 14. In this case, it is preferable that the frictional force in a direction different from the sliding direction of the adjacent displacement elements 14 is greater than the frictional force in the sliding direction of the adjacent displacement elements 14. Furthermore, when adjacent displacement elements 14 slide, it includes not only cases where the adjacent displacement elements 14 always slide in contact, but also cases where there is a moment when the adjacent displacement elements 14 separate.

[0036] Furthermore, as shown in Fig. 3, adjacent displacement elements 14 are all arranged on the base plate 12, and overlapping of adjacent displacement elements 14 in the vertical direction is avoided. This ensures that by equalizing the thickness of adjacent displacement elements 14, as shown in Fig. 1, unevenness along the circumferential direction of the through-hole 16 is prevented from being formed at the upper edge portion 16B of the through-hole 16. In the example of Fig. 1, at the upper edge portion 16B of the through-hole 16, the positions of the upper surfaces 14B of adjacent displacement elements 14 are aligned. With this configuration, when the holding jig 10 is used in a sealing device, which will be described later, the vertical contact position between the upper edge portion 16B of the through-hole 16 in the holding jig 10 and the flange portion 240 of the container 200 is substantially uniform, and the container 200 can be pressed against the pressing body 310, which will be described later, at substantially the same timing.

[0037] (Receiving Material)

In the example of FIG. 1, the holding body 11 is provided with a receiving member 13 outside the annular structure 15. The receiving member 13 can function as a structure having a regulating structure 19, which will be described later. The receiving member 13 is formed in an annular shape, and the outer peripheral surface 13A of the receiving member 13 is formed in a shape corresponding to the outer peripheral surface 11A of the holding body 11. The inner peripheral surface 13B of the receiving member 13 is formed in a shape corresponding to the outer peripheral surface 15A of the annular structure 15. The receiving member 13 is fixed on the base plate 12, and since the annular structure 15 is formed so as to face the inner peripheral surface 13B of the receiving member 13, displacement of the annular structure 15 relative to the base plate 12 can be suppressed, and thus, displacement of the displacement element 14 relative to the base plate 12 can be suppressed.

[0038] (Material of Receiving Material)

The material of the receiving member 13 is not particularly limited, but from the viewpoint of ease of manufacturing, it is preferably the same material as the displacement element 14.

[0039] In the examples of Figs. 1, 2, etc., the receiving member 13 is formed by a single member, but the receiving member 13 may be formed by a combined structure of divided bodies separated into a plurality of parts (not shown).

[0040] (Regulation Structure)

The holding body 11 preferably includes a regulating structure 19, as shown in the examples of Figs. 1 and 2. The regulating structure 19 is a structure that regulates the displacement direction T (displacement direction regulating structure). The regulating structure 19 regulates the displacement direction T of at least some of the displacement elements 14. The regulating structure 19 has a guide part 20 in the examples shown in Figs. 1 and 2. In the examples of Figs. 1 and 2, the guide part 20 is formed on the receiving member 13. The guide part 20 shown in this example regulates the displacement direction T so that the displacement element 14 undergoes linear displacement from a first position to a second position.

[0041] (First Position and Second Position) The first position, as shown in Fig. 2, is the position of the displacement element 14 determined when the size of the through-hole 16 is in a predetermined enlarged state (e.g., the position of the displacement element 14 indicated by a solid line in Fig. 2). The second position is the position of the displacement element 14 determined when the size of the through-hole 16 is in a predetermined reduced state (e.g., the position of the displacement element 14 indicated by a dashed line in Fig. 2). Note that the case where the regulating structure 19 has a guide part 20 is one example of the regulating structure 19, and the regulating structure 19 is not limited to this. In the description of the first embodiment, for convenience of explanation, the description will continue with the case where the regulating structure 19 has a guide part 20 as an example.

[0042] (Guide Part)

The guide part 20 only needs to be provided for at least some of the displacement elements 14, and in the example of Fig. 1, it is provided for each displacement element 14. The guide part 20 regulates the movement of the displacement element 14 so as to limit the displacement direction of the displacement element 14. In the examples of Figs. 1 and 2, the guide part 20 is provided corresponding to each displacement element 14 and guides the displacement element 14 in a predetermined direction. The guide part 20 is formed by a guide wall part 23 of the receiving member 13 that faces one side surface of the displacement element 14 (the second side surface 14A2 formed at the position of the base 140). The guide part 20 guides the movement of the displacement element 14 such that the displacement direction T of the displacement element 14 is along the wall surface of the guide wall part 23 of the guide part 20 corresponding to that displacement element 14. In the examples of Figs. 1 and 2, the wall surface direction of the guide wall part 23 forming the guide part 20 and the extending direction of the triangular base forming the shape of the displacement element 14 (the surface direction of the second side surface 14A2) are aligned. In this example, since the orientation of the base of adjacent displacement elements 14 (surface direction of the second side surface 14A2) is different, the wall surface directions of the guide wall parts 23 corresponding to each displacement element 14 are also different from each other. The length of the guide part 20 is preferably generally aligned with or greater than

the displacement range of the displacement element 14 (the movement range of the displacement element 14 when its position moves from the first position to the second position). Note that the example of Fig. 1 is just an example of the guide part 20, and the configuration of the guide part 20 is not limited as long as it can regulate the displacement direction T of the displacement element 14.

[0043] (Regulating Wall Part)

As shown in the examples of Figs. 1 and 2, the holding body 11 preferably has a regulating wall part 21 that regulates the displacement distance of at least one displacement element 14. The regulating wall part 21 has a wall surface 21A that contacts the displacement element 14 when the displacement element 14 is displaced to a predetermined position. For example, the regulating wall part 21, when the displacement element 14 displaces to the first position in the displacement direction T, the first side surface 14A1 of the displacement element 14 contacts the wall surface 21A of the regulating wall part 21, and further displacement of the first position in the displacement direction T in the direction opposite to the direction towards the second position is regulated. Therefore, the regulating wall part 21 regulates the displacement distance of the displacement element 14.

[0044] In the examples of Figs. 1 and 2, the regulating wall part 21 is formed on the receiving member 13, and the edge of the regulating wall part 21 is shared with the edge of the guide part 20. The angle formed by the wall surface 21A of the regulating wall part 21 and the wall surface of the guide wall part 23 of the guide part 20 is acute. In this example, the receiving member 13 forms a generally V-shaped wall part 24, which forms the regulating wall part 21 and the guide wall part 23 for each displacement element 14 in a plan view of the holding member. The V-shaped wall parts 24 are formed to be arranged annularly so as to correspond to the arrangement of the displacement elements 14. In the examples of Figs. 1 and 2, a curved wall surface part 25, which is curved in a C-shape in a plan view of the receiving member 13, is formed at the edge of the regulating wall part 21 and the edge of the guide part 20. The curved wall surface part 25 can prevent the corner (vertex 141) of the displacement element 14 from contacting the edge of the regulating wall part 21 and the edge of the guide part 20.

[0045] [1-2 Operation and Effects]

According to the first embodiment, the exposed area ER of the displacement element 14 forming the peripheral surface portion 16A of the through-hole 16 changes with the displacement of the displacement element 14, and the size of the through-hole 16 can be changed. For multiple types of containers 200 with different sizes as the object to be held M, the container 200 and the upper edge portion 16B of the through-hole 16 can be contacted with the same holding jig 10, and the container 200 can be supported by the upper edge portion 16B of the through-hole 16.

[0046] Furthermore, according to the holding jig 10 of the first embodiment, since the size of the through-hole 16 can be varied according to the displacement of the

displacement element 14, it can handle cases where there is a variation in the size of the main body part 210 of the container 200 itself.
[0047] For example, when the object to be held M is a container 200, and the container 200 has a main body part 210 with an open top and a bottom part 220, forming a space 230 inside, and has a flange part 240 extending outward from the upper end side of the main body part 210, when the holding jig 10 holds the object to be held M with the through-hole 16, the peripheral surface part 16A faces the outer peripheral surface 210A (outer peripheral surface of the container 200) of the main body part 210, and the upper edge part 16B faces the flange part 240. If the shape of the outer peripheral surface 210A of the main body part 210 is tapered downwards, the size of the cross-section of the main body part 210 is smaller at the lower part of the main body part 210 (the part closer to the bottom part 220) than at the vicinity of the flange part 240. When the container 200 is placed inside the through-hole 16 of the holding jig 10 and the holding jig 10 is moved upward, as long as the size of the outer peripheral surface 210A of the main body part 210 is smaller than the size of the through-hole 16 when the through-hole 16 of the holding jig 10 is in a reduced state, only the holding jig 10 is pulled upward. Eventually, when the size of the outer peripheral surface 210A of the main body part 210 matches the size of the through-hole 16 when the through-hole 16 of the holding jig 10 is in a reduced state, the through-hole 16 of the holding jig 10 contacts the outer peripheral surface 210A of the main body part 210. If the weight of the container 200 is equal to or greater than a predetermined weight, the holding jig 10 slides upward relative to the main body part 210 of the container 200 while still contacting the main body part 210 of the container 200. At this time, the container 200 may or may not move upward with the holding jig 10. The holding jig, while contacting the main body part 210 of the container 200 and sliding upward, changes (enlarges) the size of the through-hole 16 according to the displacement of the displacement element 14 corresponding to the size of the main body part 210 of the container 200. Then, while the holding jig 10 is moving upward, when the upper edge part 16B of the through-hole 16 of the holding jig 10 contacts the flange part 240 of the container 200, the holding jig 10 holds the container 200 and moves upward with the container 200. In this way, according to the holding jig 10, since the size of the through-hole 16 can be varied, the upper edge part 16B of the holding jig 10 can be kept in contact with the flange part 240 even when there is a variation in the size of the main body part 210 of the container 200 itself.
[0048] Next, modifications of the first embodiment will be described. Note that the modifications described below may be combined with each other as long as there is no contradiction. For example, modified example 1 and modified example 3 may be combined.
[0049] [1-3 Modified Examples]
(Modified Example 1)

In the holding jig 10 according to the first embodiment, as shown in Figs. 4A and 4B, the holding body 11 may include an elastic member 22 that biases at least one displacement element 14. This embodiment will be referred to as Modified Example 1 of the first embodiment. Fig. 4A is a plan view showing an example of the holding jig 10 according to Modified Example 1 of the first embodiment. Fig. 4B is a cross-sectional view showing the state along line B–B in Fig. 4A.

[0050] (Elastic Member)

In the holding member shown in Fig. 4A, for each of the plurality of displacement elements 14 selected from the annularly arranged displacement elements 14 (three displacement elements 14 in Fig. 4A), a hole part 26 is formed extending inward from a predetermined position in the inner region of the wall surface 21A of the regulating wall part 21 corresponding to the displacement element 14. An elastic member 22 is placed in this hole part 26.

[0051] In the example of Fig. 4A, the number of elastic members 22 arranged in the holding member is three, but this is just an example, and at least one elastic member 22 may be arranged. Also, the arrangement position of the elastic member 22 is not particularly limited.

[0052] (Material of Elastic Member)

As the elastic member 22, a coiled spring is adopted, as shown in Fig. 4B. However, this is just an example of the elastic member 22, and besides springs, rubber, urethane, or the like may be adopted as the elastic member 22. Furthermore, the elastic member 22 may be a combination of these. It is also not prohibited to use a combination of magnets instead of the elastic member 22.

[0053] (Operation and Effects)

In Modified Example 1 of the first embodiment, when the displacement element 14 is placed at the first position, the elastic member 22 biases the displacement element 14 in the direction of arrow P so as to displace the displacement element 14 towards the second position (pushes the displacement element 14 away from the regulating wall part 21). Therefore, when the exposed area ER is in an increased state (the size of the through-hole 16 is in an enlarged state), the elastic member 22 biases the displacement element 14 so that the exposed area ER is in a reduced state (the size of the through-hole 16 is in a reduced state). When the displacement element 14 is placed at the second position, the length of the elastic member 22 is its natural length, and the displacement element 14 is in a state where the pressing force from the elastic member 22 is released. Therefore, when the exposed area ER is in a reduced state, the displacement element 14 is released from the biasing force it received from the elastic member 22. That is, the displacement element 14 is released from the state of receiving a force that pushes it away from the regulating wall part 21. In this way, the elastic member 22 biases the displacement element 14 such that the exposed area ER of each displacement element 14 exposed in the peripheral surface portion 16A of the through-hole 16 decreases when the exposed

area ER increases. And by the biasing of the elastic member 22, the size of the through-hole 16 can follow the size of the container 200.
[0054] According to the holding jig 10 of Modified Example 1 of the first embodiment, when the container 200 is placed in the through-hole 16, even if the outer peripheral surface 210A of the main body part 210 of the container 200 displaces the displacement element 14 from the second position and the container 200 expands the through-hole 16, by removing the container 200 from the through-hole 16, the position of the displacement element 14 can be returned to the second position due to the restoring force of the elastic member 22.
[0055] (Modified Example 2)
In the holding jig 10 according to the first embodiment, the holding body 11 may include a control mechanism that controls the movement of at least one displacement element 14. The control mechanism may be a mechanical structure or an electrical structure. As a mechanical structure, a control structure for the movement of the displacement element 14 by gears can be exemplified (not shown). As an electrical structure, a control structure for the movement of the displacement element 14 by electrical control of magnetic force can be exemplified (not shown).
[0056] (Modified Example 3)
In the holding jig 10 according to the first embodiment, as shown in Figs. 5A and 5B, the holding body 11 may have a first groove part 27 in the regulating wall part 21, and a second groove part 28 may be formed in the displacement element 14 that contacts the regulating wall part 21, at a position corresponding to the first groove part 27. In this case, as shown in Figs. 5A and 5B, a regulating rod 29, which is common to the first groove part 27 and the second groove part 28 and embedded in the first groove part 27 and the second groove part 28, is provided. This embodiment will be referred to as Modified Example 3 of the first embodiment. Fig. 5A is a plan view showing an example of the holding jig 10 according to Modified Example 3 of the first embodiment. Fig. 5B is a cross-sectional view showing the state along line C-C in Fig. 5A.
[0057] (First Groove Part and Second Groove Part)
In the holding member shown in Fig. 5A, for each of the plurality of displacement elements 14 selected from the annularly arranged displacement elements 14 (in Fig. 5A, six displacement elements 14, every other one along the arrangement direction of the displacement elements 14), the first groove part 27 extends from a predetermined position at the upper end of the wall surface 21A of the regulating wall part 21 corresponding to each displacement element 14, along the upper surface 13C of the receiving member 13, in a direction away from the wall surface 21A, towards the inner region of the upper surface 13C.
[0058] The second groove part 28 extends from a predetermined position at the upper end of the side surface 14A (first side surface 14A1) of each displacement element 14 toward the inner region of the upper surface 14B of the displacement element 14. The position of the first groove part 27 on the wall surface 21A and the

position of the second groove part 28 on the side surface 14A face each other, and the positions of the groove bottom 28A of the second groove part 28 and the groove bottom 27A of the first groove part 27 substantially coincide.

[0059] In the example of Fig. 5A, the extending direction of the first groove part 27 matches the extending direction of the second groove part 28. Also, the extending directions of both the first groove part 27 and the second groove part 28 match the displacement direction T of the displacement element 14 forming the second groove part 28 (in the example of Fig. 4, the extending direction of the second groove part 28 and the extending direction of the base 140 of the displacement element 14 are aligned).

[0060] (Regulating Rod)

A regulating rod 29 is embedded in the first groove part 27 and the second groove part 28. The regulating rod 29 is common to the first groove part 27 and the second groove part 28. The material of the regulating rod 29 is not particularly limited, but to stabilize the position of the displacement element 14, it is preferable that the regulating rod 29 has rigidity. From this viewpoint, it is preferable that the regulating rod 29 is made of metal. The regulating rod 29 may be a member different from a rod shape, as long as it is a common member to the first groove part 27 and the second groove part 28. For example, a curved member or a plate-shaped member may be used as the member usable as the regulating rod 29.

[0061] (Operation and Effects)

In Modified Example 1 of the first embodiment, by having the first groove part 27, the second groove part 28, and the regulating rod 29, the facing positions of the side surface 14A of the displacement element 14 and the wall surface 21A of the regulating wall part 21 become less likely to shift in the surface direction of the wall surface 21A of the regulating wall part 21.

[0062] (Modified Example 4)

In the holding jig 10 according to the first embodiment, as shown in Fig. 6, the holding body 11 may have the peripheral surface portion 16A of the through-hole 16 forming an inclined surface 30. This embodiment will be referred to as Modified Example 4 of the first embodiment. Fig. 6 is a cross-sectional view for explaining an example of the holding jig 10 according to Modified Example 4 of the first embodiment. Fig. 6 is a cross-sectional view passing through the center CT of the through-hole 16. Note that in Fig. 6, for convenience of explanation, only the parts appearing at the cross-sectional position are shown in the cross-sectional view, and descriptions of other parts outside the cross-sectional position are omitted. This also applies to Figs. 7, 8A, and 8B. Since the part of the displacement element 14 corresponding to the exposed area ER forms the peripheral surface portion 16A of the through-hole 16, Modified Example 4 of the first embodiment can be realized by at least the part of the displacement element 14 corresponding to the exposed area ER forming an inclined surface (the inclined surface of the exposed area ER

becomes the inclined surface of the peripheral surface portion of the through-hole 16).

[0063] (Inclined Surface of Peripheral Surface Portion)

The inclined surface 30 slopes downward towards the inside of the through-hole 16 (towards the center CT in the example of Fig. 6) as it goes downward from the upper edge portion 16B of the through-hole 16. The inclination angle α of the inclined surface 30 of the peripheral surface portion 16A is not particularly limited, but as described above, when the object to be held M is a container 200 and the main body of the container 200 has a shape that tapers downwards, it is preferable that the inclination angle α of the inclined surface 30 is determined so as to correspond to the tapered shape of the main body.

[0064] According to Modified Example 4 of the first embodiment, since the inclined surface 30 having a predetermined inclination angle α is formed on the peripheral surface portion 16A, the outer peripheral surface 210A of the main body part 210 of the container 200 can be more easily fitted to the peripheral surface portion 16A of the through-hole 16 while avoiding inclination of the container 200, and a state where the container 200 is held by the holding jig 10 with the container 200 inclined relative to the holding jig 10 is less likely to be formed. The inclination of the container 200 indicates that the center BCT of the container 200 (indicated by a dashed-dotted line in Fig. 11) is inclined with respect to the vertical direction (Z-axis direction).

[0065] (Modified Example 5)

In the holding jig 10 according to the first embodiment, as shown in Fig. 7, the holding body 11 may be provided with a protrusion 31 at the upper edge portion 16B of the through-hole 16. This embodiment will be referred to as Modified Example 5 of the first embodiment. Fig. 7 is a cross-sectional view for explaining an example of the holding jig 10 according to Modified Example 5 of the first embodiment. Fig. 7 is a cross-sectional view passing through the center of the through-hole 16. Since the displacement element 14 forms the through-hole 16, Modified Example 5 of the first embodiment can be realized by forming a protrusion on the upper surface 14B of the displacement element 14.

[0066] In the example of Fig. 1 and others, since the portion corresponding to the exposed area ER of the displacement element 14 forms the peripheral surface portion 16A of the through-hole 16, Modified Example 5 of the first embodiment can form the protrusion 31 at a position corresponding to the upper edge portion 16B of the through-hole 16 on the upper surface 14B of the displacement element 14 by forming a protrusion on the upper surface 14B at the position of the upper end of the portion corresponding to the exposed area ER of the displacement element 14 (i.e., the protrusion formed at a predetermined position on the upper surface 14B of the displacement element 14 corresponds to the protrusion 31 of the upper edge portion 16B of the through-hole 16).

[0067] According to Modified Example 5 of the first embodiment, by forming a protrusion at a predetermined position on the upper surface of the displacement element 14, a state where the protrusion 31 is provided at the upper edge portion 16B of the through-hole 16 can be formed. And by having the protrusion 31 at the upper edge portion 16B of the through-hole 16, when a pressing force is applied to the container 200 and the lid 290 between the holding jig 10 and the pressing body 310 in the sealing device 300 (described later), the action of the pressing force can be concentrated at the position between the protrusion 31 of the holding jig 10 and the pressing body 310, and a locally strong force can be exerted on the container 200 and the lid 290.

[0068] (Modified Example 6)

In the holding jig 10 according to the first embodiment, as shown in Figs. 8A and 8B, the holding body 11 may have an extended part 32 extending along the peripheral surface part 16A of the through-hole 16 on the lower surface 14C of the displacement element 14. This embodiment will be referred to as Modified Example 6 of the first embodiment. Figs. 8A and 8B are cross-sectional views for explaining an example of the holding jig 10 according to Modified Example 6 of the first embodiment. Figs. 8A and 8B are cross-sectional views passing through the center CT of the through-hole 16.

[0069] (Extended Part)

The extended part 32 is composed of a part extending downward along the side surface 14A from a predetermined part of the lower surface 14C including the lower end edge of the side surface 14A of the displacement element 14. The position where the extended part 32 is formed among the lower end edges of the side surface 14A of the displacement element 14 is at least the position that forms the peripheral surface part 16A of the through-hole 16 among the side surface 14A of the displacement element 14, i.e., the position that forms the exposed area ER, and the extended part 32 is formed as a part extending downward from that position.

[0070] Note that the auxiliary hole 17 of the base plate 12 is formed so as to avoid the part where the extended part 32 is formed, as shown in Figs. 8A and 8B, and the size of the auxiliary hole 17 is larger than that of the through-hole 16.

[0071] According to Modified Example 6 of the first embodiment, by forming the extended part 32 in the through-hole 16, the contact area between the container 200 and the peripheral surface part 16A of the through-hole 16 can be expanded, making it easy to stably hold the container 200 with the holding jig 10.

[0072] However, in the case where the object to be held M is a container 200 and the main body part 210 of the container 200 has a shape that tapers downward, it is conceivable that the contact area may tend to expand more when the container 200 is held by the holding jig 10 in an inclined state relative to the holding jig 10 due to the extended part 32 being formed in the through-hole 16. Therefore, it is preferable that Modified Example 6 of the first embodiment is combined with Modified Example 4 of the first embodiment described above. In this case, as shown in Fig. 8B, the

peripheral surface portion 16A of the through-hole 16 becomes an inclined surface 30, and the holding body 11 will have the extended part 32 formed on the lower surface 14C of the displacement element 14 along the inclined surface 30 of the peripheral surface portion 16A. In this case, it becomes easier to further fit the main body part 210 of the container 200 to the peripheral surface portion 16A of the through-hole 16 while avoiding inclination of the container 200.

[0073] (Modified Example 7)

In the holding jig 10 according to the first embodiment, as shown in Figs. 9A and 9B, a protective plate 33 may be provided so as to cover at least a part of the upper surface 11B of the holding body 11. In this case, it is preferable that the protective plate 33 covers at least a part of the upper surface 14B of the displacement element 14. This embodiment will be referred to as Modified Example 7 of the first embodiment. Fig. 9A is a plan view for explaining an example of the holding jig 10 according to Modified Example 7 of the first embodiment. Fig. 9B is a side view for explaining an example of the holding jig 10 according to Modified Example 7 of the first embodiment.

[0074] (Protective Plate)

The protective plate protects the upper surface 11B side of the holding body 11. The protective plate 33, similar to the base plate 12, is provided with an auxiliary hole 18, and in the example of Fig. 9A, as shown in Fig. 9B, the through-hole 16 is formed at a position between the auxiliary hole 18 of the protective plate 33 and the auxiliary hole 17 of the base plate 12. It is preferable that the size of the auxiliary hole 18 of the protective plate 33 is larger than the size of the through-hole 16 when the through-hole 16 is in the enlarged state. This allows at least a part of the upper surface 14B of the displacement element 14 to be exposed inside the auxiliary hole 18 of the protective plate 33, thereby forming a state where the upper edge portion 16B of the through-hole 16 is exposed, and when the object to be held M is a container 200 having a flange part 240, the flange part 240 of the container 200 can be reliably brought into contact with the upper edge portion 16B of the through-hole 16.

[0075] The material of the protective plate 33 is not particularly limited, but from the viewpoint of increasing rigidity, metal is preferable.

[0076] (Fixing Member)

It is preferable that a fixing member 38 for fixing the position of the protective plate 33 is detachably attached to the protective plate 33, as shown in Fig. 22. In the example of Fig. 22, a first fixing member 38A is provided as a detachable fixing member 38. Fig. 22 is a plan view for explaining an example of the holding jig 10 according to Modified Example 7 of the first embodiment. The first fixing member 38A is provided at three out of four corners. A second fixing member 38B is provided at the remaining one location. It is preferable that this second fixing member 38B is not provided so that it can be easily detached like the first fixing

member 38A. Examples of the first fixing member 38A include detachable screws. Examples of the second fixing member 38B include rivets for caulking.
[0077] In this case, it is preferable that the protective plate 33 is not adhered to the holding body 11 on the upper surface side of the holding body 11. In such a case, when the fixing member 38 is removed, the protective plate 33 is configured to be displaceable in a plane direction whose normal is the thickness direction of the protective plate 33. In the example of Fig. 22, when the first fixing member 38A is removed, the protective plate 33 is configured to be rotatable (indicated by arrow SL in Fig. 22 for the rotation direction of the protective plate 33) about the second fixing member 38B in a plane direction whose normal is the thickness direction of the protective plate 33.
[0078] (Modified Example 8)
In the holding jig 10 according to the first embodiment, as shown in Fig. 14, a positioning structure 35 may be provided. This embodiment will be referred to as Modified Example 8 of the first embodiment. Fig. 14 is a perspective view for explaining an example of the holding jig 10 according to Modified Example 8 of the first embodiment.
[0079] (Positioning Structure)
The positioning structure 35 is a structure that has a function of defining the position (position in the planar direction) of a second object to be held, which is mounted on the upper side (in the +Z direction in Fig. 14) of a first object to be held (including cases where it overlaps the first object to be held), when the object to be held that contacts the through-hole 16 of the holding jig 10 is defined as the first object to be held. In this case, the object to be held M will have a first object to be held and a second object to be held. Note that the position of the second object to be held in the planar direction indicates the surface direction of a plane (XY plane in Fig. 14) whose normal is the thickness direction of the holding jig 10 (Z-axis direction in Fig. 14).
[0080] The position of the positioning structure 35 is not particularly limited, but in the example of Fig. 14, the holding body 11 is provided with the positioning structure 35. In the example of Fig. 14, the positioning structure 35 is composed of a combination of a plurality of convex pieces 34. The convex pieces 34 are provided so as to rise upward from the upper surface 14B of the displacement element 14. The rising direction of the convex pieces 34 may be directly upward or obliquely upward. In the example of Fig. 14, the rising direction of the convex pieces 34 is slightly obliquely upward in a direction away from the center of the through-hole 16 (outward direction).
[0081] It is preferable that the convex pieces 34 can spread in the direction of arrow K1 according to the size of the second object to be held when the second object to be held is stacked on the first object to be held. In this case, it becomes easy to define the position of the second object to be held relative to the first object to be held for second objects to be held of various dimensions. This can be realized, for

example, by forming the convex pieces 34 from a flexible material such as metal or plastic. From the viewpoint of heat resistance, it is preferable that the convex pieces 34 are made of metal. This also applies to the slide member 36 described later with reference to Fig. 15 and so on. In Fig. 14, the convex pieces 34 are formed from a wire-like metal member. However, these are just examples and do not limit the material and shape of the convex pieces 34.

[0082] Furthermore, it is preferable that the convex pieces 34 are configured to be movable back and forth along the rising direction (along the direction of arrow K2 in Fig. 14). Movable back and forth means that it is possible to form an advanced state and a retracted state. The advanced state indicates a state where the convex piece 34 extends further upward from the upper surface 14B of the displacement element 14. The retracted state indicates a state where the convex piece 34 sinks further downward from the upper surface 14B of the displacement element 14. This can be specifically realized, for example, by drilling a hole in the displacement element 14 at the base end side of the convex piece 34, placing an elastic material inside the hole, connecting the elastic material and the convex piece 34, and configuring the advanced state and retracted state to be formed according to the expansion and contraction of the convex piece 34.

[0083] (Other Examples of Positioning Structure)

(Other Example 1)

In Fig. 14, the positioning structure 35 was provided on the displacement element 14, but the position and structure where the positioning structure 35 is provided are not limited to this. For example, as shown in Modified Example 7 of the first embodiment described above, if the holding jig 10 has a protective plate 33, the positioning structure 35 may be provided on the upper surface side of the protective plate 33, as shown in Figs. 15A and 15B. Such a positioning structure 35 may be referred to as Other Example 1. Fig. 15A is a plan view for explaining an example of the holding jig 10 according to Modified Example 8 of the first embodiment. Fig. 15B is a side view (side view of the holding jig 10 shown in Fig. 15A) for explaining an example of the holding jig 10 according to Modified Example 8 of the first embodiment. The positioning structure 35 exemplified in Figs. 15A and 15B is an example of Other Example 1, and the content of Other Example 1 is not limited to Figs. 15A and 15B.

[0084] In the holding jig 10 shown in Figs. 15A and 15B, on the upper surface side (+Z direction side) of the protective plate 33, multiple sets of combinations of a slide member 36 and a rail 37 are provided at predetermined positions around the through-hole 16. The slide member 36 is formed in a convex shape rising upward from the rail 37, and is attached to the rail 37 on the lower side of the slide member 36. The slide member 36 is configured to be slidable along the rail surface of the rail 37. The rail 37 is fixed on the protective plate 33. It is preferable that both ends of the rail 37 in the sliding direction (direction along arrow K3 in Figs. 15A and 15B) are configured to prevent the slide member 36 from coming off. Specifically, for example,

it is preferable that both ends of the rail 37 are closed. In this case, it becomes easy to regulate the movement range of the slide member 36. Even with this configuration, it is easy to define the position of the second object to be held relative to the first object to be held for second objects to be held of various dimensions. It is preferable that the slide member 36 is biased towards the center of the through-hole 16 by an elastic member such as a spring or a buffer material. In this case, a plurality of slide members 36 may be connected by an elastic member, or an elastic member may be connected to each individual slide member 36.
[0085] (Other Example 2) In Figs. 15A and 15B, the entire positioning structure 35 was provided in the area above the protective plate 33, but the position and structure where the positioning structure 35 is provided are not limited to this. As shown in Figs. 20A, 20B, etc., the slide member 36 may be configured to extend from the protective plate 33 to the position of the upper edge portion 18B of the through-hole 16. This example of the positioning structure 35 may be referred to as Other Example 2. Fig. 20A is a plan view showing an example of the holding jig 10 according to Modified Example 8 of the first embodiment. Fig. 20B is a longitudinal cross-sectional view schematically showing the state along line E-E in Fig. 20A. The positioning structure 35 exemplified in Figs. 20A and 20B is an example of Other Example 2, and the content of Other Example 2 is not limited to Figs. 20A and 20B.
[0086] In the holding jig 10 shown in the example of Figs. 20A and 20B, similar to the example shown in Fig. 15, the positioning structure 35 includes a rail 37 and a slide member 36. The slide member 36 has an inclined surface at the end face portion closer to the through-hole 16 (inner end face portion 36B), and slopes downward from the upper end portion 36C to the lower end portion 36A of the inner end face portion 36B. A hanging portion 41, which hangs down towards the displacement element 14, is formed on the lower end portion 36A side of the inner end face portion 36B. The lower end of the hanging portion 41 is the lower end portion 36A. If there is a gap between the lower end portion 36A and the upper surface 14B of the displacement element 14, it is preferable that the size of the gap is smaller than the thickness of the object to be held M. It is preferable that the separation distance between the lower end portion 36A and the upper surface 14B of the displacement element 14 (upper edge portion 16B of the through-hole 16) is as close to zero as possible. However, this does not restrict the occurrence of a gap between the lower end portion 36A and the upper surface 14B of the displacement element 14. It is preferable that the upper end portion 36C is formed to be positioned further outward than both the first object to be held and the second object to be held in a plan view of the holding jig 10.
[0087] It is preferable that the slide member 36 is provided with a biasing structure 40 that biases the slide member 36 inward toward the through-hole 16 (in the direction towards the center CT in the example of Fig. 20A). As the biasing structure 40, an elastic member 39 can be exemplified as shown in Fig. 20B. Note that for

convenience of explanation, the description of the elastic member 39 is omitted in Fig. 20A. The elastic member 39 can be exemplified by a spring, rubber, or the like.
[0088] The biasing structure 40 is not limited to the examples of Figs. 20A and 20B. For example, it may be configured as shown in Fig. 21. Fig. 21 is a plan view showing an example of the holding jig 10 according to Modified Example 8 of the first embodiment. In this example, two adjacent slide members 36 in the circumferential direction of the through-hole 16 are connected by an elastic member 39. Even in this case, the slide member 36 can be biased inward toward the through-hole 16 by the action of the elastic force of the elastic member 39.
[0089] (Other Example 3)
The positioning structure 35 may have a structure as shown in Figs. 30A, 30B, 31, 32A, and 32B. Such an example of the positioning structure 35 may be referred to as Other Example 3. Fig. 30A is a plan view showing an example of the holding jig 10 according to Modified Example 8 of the first embodiment. Fig. 30B is a longitudinal cross-sectional view schematically showing the state along line E-E in Fig. 30A. Figs. 31 and 32A are plan views showing another example of the holding jig 10 according to Modified Example 8 of the first embodiment. Fig. 30B is a longitudinal cross-sectional view schematically showing the state along line G-G in Fig. 32A. The positioning structure 35 exemplified in Figs. 30A, 30B, 31, 32A, and 32B are all examples of Other Example 3, and the configuration of Other Example 3 is not limited to Figs. 30A, 30B, 31, 32A, and 32B.
[0090] In the holding jig 10 shown in the example of Figs. 30A and 30B, the positioning structure 35 is provided on the upper surface side (+Z direction side) of the protective plate 33. The positioning structure 35 includes a plurality of rotating members 43. In the holding jig 10 shown in this example, a support shaft 42 is provided corresponding to each rotating member 43. Also, in the holding jig 10 shown in this example, the support shaft 42 is placed in the area above the protective plate 33. The support shaft 42 supports the rotating member 43. In this example, the support shaft 42 has a structure that penetrates through the hole part 48A of the bearing 48 of the rotating member 43 from the head part 47, which is composed of the upper end side of the support shaft 42, and reaches the protective plate 33. In the example of Figs. 30A and 30B, the support shaft 42 is fixed to the protective plate 33. A predetermined portion of the support shaft 42 on the tip end 42A side (-Z direction side) extends into the protective plate 33, and the portion of the support shaft 42 that extends into the protective plate 33 is fixed to the protective plate 33. At this time, the method of fixing the portion of the support shaft 42 that extends into the protective plate 33 to the protective plate 33 is not particularly limited. For example, a screw structure (so-called half-thread) may be formed on the outer peripheral surface from the tip end (lower end) of the support shaft 42 to a predetermined position (a predetermined position upward), and the portion of the support shaft 42 that extends into the protective plate 33 may be fixed to the

protective plate 33 by screwing at least a part of the portion where the screw structure is formed into the protective plate 33.

[0091] (Rotating Member)

In the example of Figs. 30A and 30B, the rotating member 43 is rotatable about the support shaft 42. The rotating member 43 includes a bearing 48 having a hole part 48A penetrating vertically, an arm 44 connected to a predetermined position on the upper end side of the outer peripheral surface of the bearing 48 and extending in a direction away from the bearing 48, and a pin 45 hanging down from the tip end part 44A of the arm 44. The arrangement of the rotating member 43 is not particularly limited as long as it can perform the function of defining the position of the second object to be held as described above. In the example of Fig. 30A, two sets of combinations of two adjacent rotating members (combination of rotating members 43A and 43B, and combination of rotating members 43C and 43D) (i.e., four rotating members 43) are arranged outside the through-hole 16 so as to be adjacent to each other. The combination of one set of rotating members 43 (combination of rotating members 43A and 43B) and the combination of the other set of rotating members 43 (combination of rotating members 43C and 43D) are arranged at positions along the outer periphery of the through-hole 16 such that they are opposite to each other with the center CT of the through-hole 16 in between (in the example of Fig. 30A, the −X direction side and the +X direction side). Each combination of rotating members 43, 43 is configured such that the rotation direction K4 of one rotating member 43 and the rotation direction K4 of the other rotating member 43 are opposite to each other. For example, taking the combination of rotating member 43A and rotating member 43B as an example, when rotating member 43A rotates in the +K4 direction, rotating member 43B rotates in the −K4 direction. When rotating member 43A rotates in the −K4 direction, rotating member 43B rotates in the +K4 direction. This allows the rotating member 43A and rotating member 43B to rotate such that their respective pins 45 approach each other, and also to rotate such that their respective pins 45 move away from each other. The point that rotation can be performed such that the rotation directions K4 are opposite to each other also applies to the combination of rotating member 43C and rotating member 43D.

[0092] (Gears) The structure for performing rotational movements in mutually opposite directions K4 is not particularly limited. In the example of Fig. 30A, it is realized by the meshing structure of gears 46, 46. For example, taking the combination of rotating members 43A and 43B as an example, a gear 46 is fixed to the lower end side of the bearing 48 of the rotating member 43A, and a gear 46 is also fixed to the lower end side of the bearing 48 of the rotating member 43B. The gears 46, 46 arranged on the rotating members 43A, 43B are configured to rotate in mutually opposite directions by meshing with each other. The configuration of the gears 46 is the same for the combination of rotating members 43C and 43D.

[0093] In the rotating member 43, a pin 45 is provided, and it is preferable that the lower end (tip 45A) of the pin 45 is located underneath the upper surface of the

protective plate 33 and slightly above the upper surface 14B of the displacement element 14.
[0094] Furthermore, the pin 45 extends obliquely downward towards the center CT from the connection part with the arm 44 towards the tip 45A, but this is just an example. For example, the pin 45 may extend vertically downward. Also, the pin 45 may be partially or entirely bent or curved.
[0095] (Rotation Range of Arm)
The rotation range of the arm 44 in the rotating member 43 (the maximum value of the rotation angle along the direction of arrow K3) is not particularly limited. For example, in a plan view of the holding jig 10, the rotation range of the arm 44 may be determined within a range where the tip 45A of the pin 45 falls within the formation area of the auxiliary hole 18 of the protective plate 33. Alternatively, the rotation range of the arm 44 may be determined within a range where the tip 45A of the pin 45 extends outside the formation area of the auxiliary hole 18 of the protective plate 33. The position of the arm 44 when the tip end part 44A of the arm 44 is at the position closest to the center CT is not particularly limited. In the examples of Figs. 30A, 31, 32A, etc., positioning is performed for each combination of rotating members 43, 43. For example, regarding the positioning of the arm 44 of the rotating member 43A and the arm 44 of the rotating member 43B, when arranging the second object to be held on the upper side of the first object to be held as described above, the positioning of the arm 44 of the rotating member 43A and the arm 44 of the rotating member 43B is performed so that they can rotate in the +K4 direction and −K4 direction, respectively, according to the size of the second object to be held. In the examples of Figs. 30A, 31, 32A, etc., even when holding the first object to be held at the upper edge portion 16B of the through-hole 16, the arm 44 of the rotating member 43A and the arm 44 of the rotating member 43B can rotate in the +K4 direction and −K4 direction, respectively, according to the size of the first object to be held. The positioning of the arm 44 is also the same for the arm 44 of the rotating member 43C and the arm 44 of the rotating member 43D.
[0096] It is preferable that the rotating member 43 is biased to rotate in a direction where the tip end part 44A of the arm 44 approaches the center CT of the through-hole 16. In this case, even if the rotating member 43 rotates such that the tip end part 44A of the arm 44 moves away from the center CT of the through-hole 16 when the first object to be held and the second object to be held are held by the holding jig 10, by removing the first object to be held and the second object to be held from the holding jig 10, the rotating member 43 rotates in a direction where the tip end part 44A of the arm 44 approaches the center CT of the through-hole 16, and can return to approximately its original position.
[0097] (Relief Part)
If the rotation range of the arm 44 is determined such that the tip 45A of the pin 45 extends outside the formation area of the auxiliary hole 18 of the protective plate 33, it is preferable that a relief part 49 as shown in Figs. 31, 32A, etc., is formed. In

this case, even if the tip 45A of the pin 45 is located underneath the upper surface of the protective plate 33, the risk of the tip 45A of the pin 45 colliding with the protective plate 33 due to the rotation of the rotating member 43 can be avoided. In the examples of Figs. 31 and 32A, the relief part 49 is formed by an arc-shaped cutout in a plan view of the holding jig 10, but this is just an example, and the structure of the relief part 49 is not limited to such an example. Also, the size of the relief part 49 may be appropriately determined according to conditions such as the size of the first object to be held and the second object to be held.

[0098] (Extended Part)

In the positioning structure 35, as shown in the examples of Figs. 32A and 32B, it is preferable that the rotating member 43 is provided with a first extended part 50 and a second extended part 51 as extended parts extending in a direction away from the support shaft 42. In the examples of Fig. 32A and so on, the first extended part 50 and the second extended part 51 are formed at the outer peripheral end of the gear 46, and are parts protruding outward from the teeth of the gear 46. The first extended part 50 is formed at a position such that when it contacts a protrusion member 410 (described later), the tip end part 44A of the arm 44 rotates in a direction away from the center CT of the through-hole 16. The second extended part 51 is formed at a position such that it contacts a rotation regulating member 52 when the tip end part 44A of the arm 44 rotates in a direction approaching the center CT of the through-hole 16. Therefore, the rotation regulating member 52 is arranged at a position where it can contact the second extended part 51. When the tip end part 44A of the arm 44 of the rotating member 43 rotates in a direction approaching the center CT of the through-hole 16, the rotation of the rotating member 43 can stop at the position where the second extended part 51 and the rotation regulating member 52 contact. In the example of Fig. 32A, the first extended part 50 and the second extended part 51 are provided on the rotating members 43B, 43D, and since the rotating members 43A, 43C interlock with the rotational movement of the rotating members 43B, 43D via the movement of the gears 46, the rotation range of the rotating members 43A, 43C is regulated according to the regulation of the rotation of the rotating members 43B, 43D.

[0099] (Operating Mechanism of Positioning Structure in Other Example 3)

According to the holding jig 10 having the positioning structure 35 described in Other Example 3 above, when the first object to be held is placed on the holding jig 10, each rotating member 43 constituting the combination of rotating members 43, 43 rotates in mutually opposite directions such that the positions of their respective pins 45 move apart. For example, the pin 45 of the rotating member 43A rotates in the +K4 direction, and the pin 45 of the rotating member 43B rotates in the −K4 direction. Also, the pin 45 of the rotating member 43C rotates in the +K4 direction, and the pin 45 of the rotating member 43D rotates in the −K4 direction. In the examples of Figs. 30A, 31, and 32A, etc., since the rotating members 43 in the combination of rotating members 43, 43 interlock via the gears 46, each rotating

member stops simultaneously at a position corresponding to the outer diameter of the first object to be held.

[0100] Then, when the second object to be held is placed on the upper side of the first object to be held, it is guided to a position approximately directly above the first object to be held by the plurality of pins 45 provided on the plurality of rotating members (rotating members 43A, 43B, 43C, 43D in the examples of Figs. 30A, 31, and 32A, etc.). In this way, according to the holding jig 10 having the positioning structure 35 described in Other Example 3, the positioning of the second object to be held can be achieved by the positioning structure 35 having rotating members.

[0101] Note that the positioning structure 35 described in Modified Example 8 may be applied to a holding jig different from the holding jig 10. For example, a holding jig that differs from the holding jig 10 in that the diameter of the through-hole is set to a specific diameter (referred to as a fixed-diameter type) may be prepared as a holding jig, and the positioning structure 35 may be provided for the fixed-diameter type holding jig.

[0102] (Other Example 4)

The positioning structure 35 may have a structure as shown in Figs. 40A and 40B. Such an example of the positioning structure 35 may be referred to as Other Example 4. Fig. 40A is a plan view showing an example of the holding jig 10 according to Modified Example 8 of the first embodiment. Fig. 40B is a longitudinal cross-sectional view schematically showing the state along line H-H in Fig. 40A. The positioning structure 35 exemplified in Figs. 40A and 40B is an example of Other Example 4, and the configuration of Other Example 4 is not limited to the examples shown in Figs. 40A and 40B. Note that in the example of the holding jig 10 according to Modified Example 10 shown in Fig. 40, the receiving member 13 is omitted, but this is just an example. In Figs. 40B and 40C, reference numeral 71 denotes a gap space generated due to the omission of the receiving member 13.

[0103] (Pin)

In the holding jig 10 shown in the examples of Figs. 40A and 40B, in the example shown here, the holding body 11 is provided with a positioning structure 35. In the example of Fig. 40A, the positioning structure 35 has a combination of a plurality of pins 55. The pins 55 are formed in a columnar shape, and it is preferable that the longitudinal direction of the pins 55 is arranged to be generally along the vertical direction of the holding body 11. However, this is just an example, and the longitudinal direction of the pins 55 may be along the vertical direction or an oblique direction relative to the vertical direction. Also, in a plan view of the holding body 11, the pins 55 are arranged at predetermined positions within the upper surface 14B of the displacement element 14, and displace together with the displacement element 14. Furthermore, the pins 55 are arranged such that their upper ends 55A can be located above the upper surface 14B of the displacement element 14. Note that the pins 55 may be formed to have the same length or different lengths.

[0104] (Inlet/Outlet)

In the positioning structure 35, the displacement element 14 is formed with an opening that serves as an inlet/outlet 57 for vertically inserting a predetermined portion on the upper end 55A side of the pin 55. The size of the inlet/outlet 57 is formed to be slightly larger than the size of the outer peripheral surface of the pin 55. The pin 55 is displaced vertically from the inlet/outlet 57.

[0105] (Mounting Hole)

In the positioning structure 35, the displacement element 14 is provided with a mounting hole 58 at a predetermined position on the lower surface 14C of the displacement element 14 for attaching a receiving member 60 (described later).

[0106] (Receiving Member)

In the positioning structure 35, a receiving member 60 is provided. The receiving member 60 is fitted into the mounting hole 58. In the example of Fig. 40, the receiving member 60 is fixed to the displacement element 14 by a fixing member 59. Examples of the fixing member 59 include screws. The receiving member 60 is formed in a shape that has an open upper surface and a space 61 formed inside (towards the back) from that opening. In a plan view of the holding body 11, the opening 62 of the receiving member 60 is located at the inlet/outlet 57.

[0107] (Vertical Movement Mechanism)

In Other Example 4, a vertical movement mechanism for vertically moving the pin 55 is provided. The vertical movement mechanism is not particularly limited, but from the viewpoint of structural simplicity, it is preferable that a biasing structure that applies an upward biasing force to the pin 55 (sometimes referred to as a pin biasing structure 63) is adopted. The pin biasing structure 63 is not particularly limited as long as it can apply a biasing force to the pin 55, but a structure as shown in Fig. 40 can be exemplified. The pin biasing structure 63 can be exemplified by a structure configured such that the pin 55 moves upward when the downward pressing force is released after the pin 55 is pressed downward by the downward pressing force. In the example shown in Fig. 40B, the pin biasing structure 63 has an elastic member 56. The elastic member 56 is arranged between the lower end 55B of the pin 55 and the bottom surface 64 of the space 61 of the receiving member 60, with the lower end of the elastic member 56 arranged on the bottom surface 64 and the upper end of the elastic member 56 arranged at the lower end of the pin 55. As the elastic member 56, a spring material such as a coiled spring is used in the example of Fig. 40B, but this is just an example. The elastic member 56 biases the pin 55 upward when the pin 55 is pressed downward.

[0108] According to Other Example 4, when the second object to be held is placed, one of the second objects to be held is determined by the plurality of pins 55. For example, if the second object to be held is a lid, the outer peripheral edge of the lid contacts the pins 55, and the position of the lid is determined according to the positions of the pins 55. Furthermore, according to Other Example 4, when a downward pressing force is applied to the pin 55, it can be pressed downward (in the direction of arrow FD in Fig. 40B) as shown in Fig. 40C. Fig. 40C is a cross-sectional

view showing an example of the pin 55 being pressed downward. When the pin 55 is pressed downward, stress is applied upward to the pin 55 from the elastic member 56, and when the downward pressing force applied to the pin 55 is removed, the pin 55 is pushed upward by the upward biasing force applied from the elastic member 56. Therefore, according to Other Example 4, in a sealing device (described later) provided with a holding jig, when the pressing body tries to bring the separation distance between the pressing body and the holding jig closer so as to press the second object to be held against the first object to be held, the pin 55 can be pressed downward, thereby suppressing the risk of the pin 55 obstructing the approach of the pressing body and the holding jig 10.

[0109] (Upper Movement Regulating Structure)

In Other Example 4, when the pin 55 is pushed upward, as shown in Fig. 42A, an upper movement regulating structure 67 that defines the upper limit position to which the pin 55 is pushed up may be provided. In Fig. 42A, the upper movement regulating structure 67 is configured by forming a flange part 65 on the lower end side of the pin 55 that expands outward with the longitudinal direction of the pin 55 as the line of sight, and by making the outer diameter of the flange part 65 and the diameter of the opening 62 of the receiving member 60 larger than the diameter of the inlet/outlet 57, thereby forming an eaves part 66. According to such an upper movement regulating structure 67, even if the pin 55 is pushed upward, when the flange part 65 of the pin 55 contacts the eaves part 66 on the lower surface 14C of the displacement element 14 in the lower side of the inlet/outlet 57, the upward displacement of the pin 55 stops.

[0110] (Other Example 5)

The positioning structure 35 may have a structure as shown in Figs. 41A, 41B, and 41C. Such an example of the positioning structure 35 may be referred to as Other Example 5. Fig. 41A is a plan view showing an example of the holding jig 10 according to Modified Example 8 of the first embodiment. Fig. 41B is a longitudinal cross-sectional view schematically showing the state along line I–I in Fig. 41A. Fig. 41C is a longitudinal cross-sectional view schematically showing the state along line J–J in Fig. 41C. The positioning structure 35 exemplified in Figs. 41A, 41B, and 41C is an example of Other Example 5, and the configuration of Other Example 5 is not limited to the examples shown in Figs. 41A, 41B, and 41C. Note that in the example of the holding jig 10 according to Modified Example 10 shown in Fig. 41, the receiving member 13 is omitted, but this is just an example. In Fig. 41B, reference numeral 71 denotes a gap space generated due to the omission of the receiving member 13.

[0111] In the holding jig 10 shown in the examples of Figs. 41A, 41B, and 41C, the holding body 11 is provided with a positioning structure 35. In the example of Fig. 41, the positioning structure 35, similar to Other Example 4, has a combination of a plurality of pins 55, a receiving member 60, and an elastic member 56. The shape of the pins 55 may be the same as in Other Example 4, so the description is omitted. In Other Example 5, similar to Other Example 4, in a plan view of the holding body 11,

the pins 55 are arranged at predetermined positions within the upper surface 14B of the displacement element 14 so as to be vertically displaceable.

[0112] (Through-hole for Access)

In the positioning structure 35, the displacement element 14 is formed with a through-hole for access (first through-hole for access 68) that forms an access opening 57 for vertically inserting a predetermined portion on the upper end 55A side of the pin 55. The first through-hole for access 68 is formed in a long shape, a so-called elongated hole, in a plan view of the holding body 11, and in the example of Fig. 41, it is formed in a chamfered rectangular shape. It is preferable that the longitudinal direction of the first through-hole for access 68 is aligned with the displacement direction of the displacement element. In this case, even if displacement of the displacement element 14 occurs, the movement of the pin 55 interlocked with the displacement element 14 can be suppressed.

[0113] Furthermore, in the positioning structure 35, the base plate 12 is also formed with a through-hole for access (second through-hole for access 69) that forms an access opening 57 for vertically inserting the pin 55. In a plan view of the holding body 11, the second through-hole for access 69 is aligned so as to largely overlap the position of the first through-hole for access 68. The pin 55 is attached so as to be vertically displaceable while passing through both the first through-hole for access 68 and the second through-hole for access 69.

[0114] (Receiving Member)

In the positioning structure 35, a receiving member 60 is provided. As shown in the fourth example, the receiving member 60 is formed in a shape with an open upper surface and a space 61 formed inside (towards the back) from that opening 62. In a plan view of the holding body 11, the receiving member 60 is positioned so that the opening 62 of the receiving member 60 largely overlaps the position of the second through-hole for access 69. The receiving member 60 is attached to the bottom surface of the base plate 12. In the example of Fig. 40, the receiving member 60 is fixed to the base plate 12 by a fixing member 59. Examples of the fixing member 59 include screws.

[0115] (Vertical Movement Mechanism)

In Other Example 5, a vertical movement mechanism for vertically moving the pin 55 is provided. The vertical movement mechanism in Other Example 5 may be configured similarly to Other Example 4. That is, in the vertical movement mechanism in Other Example 5, it is preferable that a pin biasing structure 63 that applies an upward biasing force to the pin 55 is adopted. In the examples shown in Figs. 41B and 41C, the pin biasing structure 63 has an elastic member 56. The elastic member 56 is arranged between the lower end 55B of the pin 55 and the bottom surface 64 of the space 61 of the receiving member 60, with the lower end of the elastic member 56 arranged on the bottom surface 64 and the upper end of the elastic member 56 arranged at the lower end 55B of the pin 55. As the elastic member 56, a spring material such as a coiled spring is used in the example of Fig.

40B, but this is just an example. The elastic member 56 biases the pin 55 upward (applies stress upward) when the pin 55 is pressed downward. Therefore, as shown in Fig. 41, the pin biasing structure 63 is configured such that the pin 55 moves upward when the downward pressing force is released after the pin 55 is pressed downward by the downward pressing force.

[0116] According to Other Example 5, when the second object to be held is placed, one of the second objects to be held is determined by the plurality of pins 55. For example, if the second object to be held is a lid, the outer peripheral edge of the lid contacts the pins 55, and the position of the lid is determined according to the positions of the pins 55.

[0117] (Upper Movement Regulating Structure)

In Other Example 5, when the pin 55 is pushed upward, as shown in Fig. 42B, an upper movement regulating structure 67 that defines the upper limit position to which the pin 55 is pushed up may be provided. In Fig. 42B, the upper movement regulating structure 67 is configured by forming a flange part 65 on the lower end 55B side of the pin 55 that expands outward with the longitudinal direction of the pin 55 as the line of sight, and further by forming an eaves part 70. The eaves part 70 in Other Example 5 is formed on the bottom surface of the base plate 12 by making the outer diameter of the flange part 65 and the diameter of the opening 62 of the receiving member 60 larger than the diameter of the second through-hole for access 69 among the access opening 57. According to such an upper movement regulating structure 67, even if the pin 55 is pushed upward, when the flange part 65 of the pin 55 contacts the part corresponding to the eaves part 70 on the bottom surface of the base plate 12 in the lower side of the second through-hole for access 69, the upward displacement of the pin 55 stops.

[0118] (Modified Example 9)

In the holding jig 10 according to the first embodiment, as shown in Figs. 43A and 43B, a configuration in which an elastic member 72 is attached to the displacement element 14 may be provided. Such a form will be referred to as Modified Example 9 of the first embodiment. Fig. 43A is a plan view showing an example of the holding jig 10 according to Modified Example 9 of the first embodiment. Fig. 43B is a diagram showing essential parts for schematically explaining an example of a structure for attaching an elastic member 72 to the displacement element 14 arranged on the upper surface 12A of the base plate 12.

[0119] In the example of the holding jig 10 according to Modified Example 9 shown in Figs. 43A and 43B, the receiving member 13 is omitted, but this is just an example. Also, in the example shown here, a hooking member 73 is provided at a predetermined position on the surface (second side surface 14A2) of the adjacent displacement element 14 that is not facing (or potentially contacting) the other (first side surface 14A1). In the example of Fig. 43, the hooking member 73 is provided on the surface (second side surface 14A2) of the displacement element 14 corresponding to the base 140. The shape of the hooking member 73 in the example

of Fig. 43 is formed in a screw-like shape having a head 73A and a body 73B. Furthermore, the elastic member 72 is provided with, for example, annular parts 74A, 74B at both ends as attachment parts in Figs. 43A and 43B, and the annular part 74A on one end side of the elastic member 72 is hooked onto the hooking member 73. The annular parts 74A, 74B are examples, and the structure is not particularly limited as long as it can attach the elastic member 72 to the displacement element. Also, in Figs. 43A and 43B, a spring material such as a coiled spring is exemplified as the elastic member 72. A hooking member 75 is also provided at a predetermined position on the base plate 12, and the annular part 74B on the other end side of the elastic member 72 is hooked onto the hooking member 75. In the example of Fig. 43, the position of the hooking member 75 on the base plate 12 is determined such that the elastic member 72 is stretched when the displacement element 14 is displaced so that the through-hole 16 expands, as indicated by the dashed line in Fig. 43A. In this case, as the displacement element 14 displaces so that the through-hole 16 expands (in the example of Fig. 43A, the displacement element 14 moves away from the center CT), the elastic member 72 is stretched, and a restoring force (a force to return to its original length) is generated in the elastic member 72, and stress is applied from the elastic member 72 to the displacement element 14 so that the through-hole 16 narrows (so that the displacement element 14 returns to a position corresponding to the state before the through-hole 16 expanded).

[0120] (Modified Example 10) In the holding jig 10 according to Modified Example 9 of the first embodiment, as shown in Fig. 44, the position where the elastic member 72 is attached to the displacement element 14 and the position of the hooking member 75 on the base plate 12 may be determined such that the elastic member 72 is contracted when the displacement element 14 is displaced so that the through-hole 16 expands. Such a form will be referred to as Modified Example 10 of the first embodiment. Fig. 44 is a plan view showing an example of the holding jig 10 according to Modified Example 10 of the first embodiment. In this case, as indicated by the dashed line in Fig. 44, as the displacement element 14 displaces so that the through-hole 16 expands, the elastic member 72 contracts, and accordingly, a restoring force of the elastic member is generated, and stress is applied from the elastic member 72 to the displacement element 14 so that the through-hole 16 narrows. Note that in the example of the holding jig 10 according to Modified Example 10 shown in Fig. 44, the receiving member 13 is omitted, but this is just an example.

[0121] (Modified Example 11)

In the holding jig 10 according to Modified Example 7 of the first embodiment, as shown in Figs. 45A and 45B, a step 77 may be formed in the exposed area of the upper surface 14B of the displacement element 14 exposed inside the auxiliary hole 18 of the protective plate 33. Such a form will be referred to as Modified Example 11 of the first embodiment. Fig. 45A is a plan view schematically showing an example of

the holding jig 10 according to Modified Example 11 of the first embodiment. Fig. 45B is a cross-sectional view schematically showing the state along line K-K in Fig. 45A.
[0122] In the holding jig 10 according to Modified Example 7, a step 77 is formed on the upper surface 14B of the displacement element 14, and the upper surface 14B of the displacement element 14 is divided into a lower part 78 region AR1 and an upper part 79 region AR2, with the step 77 as the boundary. The position of the portion of the upper surface 14B corresponding to the lower part 78 of the displacement element 14 (region AR1) is lower than the position of the lower surface 33B (bottom surface) of the protective plate 33. Furthermore, in the holding jig 10 according to Modified Example 7, as shown in Figs. 45A and 45B, the position of the portion of the upper surface 14B corresponding to the upper part 79 of the displacement element 14 (region AR2) is higher than the position of the lower surface 33B (bottom surface) of the protective plate 33. By providing such a step 77, when the displacement element 14 displaces so as to expand the through-hole 16 (in Fig. 45A, for example, when displacing in the direction of arrow FH from the position of the displacement element 14 indicated by the dashed line to the position indicated by the solid line), the displacement of the displacement element 14 can be stopped at the position where the step 77 of the displacement element 14 contacts the inner surface 33C of the protective plate 33, thereby making it possible to define the upper limit of the size of the through-hole 16. It is also preferable that the position of the upper surface 14B of the upper part 79 of the displacement element 14 is generally aligned with the position of the upper surface 33A of the protective plate 33.
[0123] In a plan view of the holding jig 10, it is preferable that the step 77 is formed in a shape that matches the edge shape of the auxiliary hole 18.
[0124] Further, on the base plate 12, a boss portion 80 having a boss hole 81 for fixing the protective plate 33 is erected at a predetermined position outside the displacement element 14 on the upper surface 12A side. The protective plate 33 is arranged so as to be supported by the upper surface 80A of the boss portion 80. The boss portion 80 can function as a spacer to secure the distance between the protective plate 33 and the base plate 12. The protective plate 33 is provided with a hole portion 83 for inserting a fixing member 82 at a position corresponding to the boss portion 80. The fixing member 82, such as a screw, is inserted through the hole portion 83 and fitted into the boss hole 81. At least a part of the portion of the displacement element 14 corresponding to the lower part 78 is, as shown in Fig. 45B, sandwiched between the protective plate 33 and the base plate 12, thereby restricting the vertical movement (wobbling in the vertical direction) of the displacement element 14.
[0125] Note that in the example of the holding jig 10 according to Modified Example 11 shown in Figs. 45A and 45B, the receiving member 13 is omitted, but this is just an example.
[0126] (Modified Example 12)

In the holding jig 10 according to Modified Example 7 of the first embodiment, as shown in Figs. 46A, 46B, and 46C, a displacement guide structure 85 that regulates the displacement direction of the displacement element 14 may be provided on the lower surface 14C side of the displacement element 14. Such a form will be referred to as Modified Example 12 of the first embodiment. Fig. 46A is a plan view schematically showing an example of the holding jig 10 according to Modified Example 12 of the first embodiment. Fig. 46B is a cross-sectional view schematically showing the state along line L-L in Fig. 46A. Fig. 46C is a cross-sectional view schematically showing the state along line M-M in Fig. 46A. In Fig. 46A, an example of the displacement element 14 when it is displaced outward (in the direction away from the center CT in Fig. 46A) along the direction of arrow FH is shown by a dashed line. Also, in Fig. 46C, an example of the displacement element 14 when it is displaced outward (in the direction away from the center CT in Fig. 46A) along the direction of arrow FH is shown by a dashed line.

[0127] (Displacement Guide Structure)

The displacement guide structure 85 includes an elongated hole portion 86 provided in the base plate 12 and a leg portion 87 provided on the lower surface 14C side of the displacement element 14. It is preferable that the elongated hole portion 86 is formed such that its longitudinal direction is generally aligned with the displacement direction of the displacement element 14 (in the examples of Figs. 46A and 46C, the direction of arrow FH (this direction is specific to each displacement element 14)). The leg portion 87 has a plurality of leg members 88 at positions corresponding to the elongated hole portion 86, and the plurality of leg members 88 are generally arranged along the longitudinal direction of the elongated hole portion 86. In the example of Fig. 46B, two leg members 88 are arranged along the longitudinal direction of the elongated hole portion 86. The shape of the leg members 88 is not particularly limited as long as they can be displaced along the longitudinal direction of the elongated hole portion 86, but in the examples of Figs. 46A to 46C, the leg members 88 have a body portion 88B formed as a columnar body, and a flange portion 88A is formed at the lower end of the body portion 88B. The upper end side of the leg members 88 is fixed to the displacement element 14. In the examples of Figs. 46A to 46C, the body portion 88B of the leg members 88 has screw grooves formed in a predetermined portion extending downward from its upper end. Also, at least a part of the screw-grooved portion of the body portion 88B is fitted (screwed) into the lower surface 14C (bottom surface) of the displacement element 14. When the displacement guide structure 85 is provided, the leg portion 87 can displace in the direction of arrow FH within the space of the elongated hole portion 86 as shown in Fig. 46C, thereby enabling regulation of the displacement of the displacement element 14 in this direction.

[0128] (Ring Material)

It is preferable that the leg portion 87 is provided with a ring material 89 arranged so as to circulate around the body portion 88B. The ring material 89 is arranged

between the flange portion 88A of the leg member 88 and the lower surface 14C of the displacement element 14. Furthermore, the ring material 89 is provided so as to be rotatable around the body portion 88B. When such a ring material 89 is provided, the leg portion 87 can displace more smoothly within the space of the elongated hole portion 86 in the direction of arrow FH as shown in Fig. 46C.

[0129] (Modified Example 13)

In the holding jig 10 according to Modified Example 7 of the first embodiment, as shown in Figs. 47A and 47B, a buffering covering material 90 (outer peripheral covering material) that surrounds and covers the outer peripheral portion 10A of the holding jig 10 may be provided. Such a form will be referred to as Modified Example 13 of the first embodiment. Figs. 47A and 47B are a plan view and a side view, respectively, schematically showing an example of the holding jig 10 according to Modified Example 13 of the first embodiment.

[0130] In the holding jig 10 according to Modified Example 13 of the first embodiment, the material of the covering material 90 is not particularly limited as long as it has buffering properties, but examples include rubber material, silicone material, urethane material, and the like. As also shown in Fig. 47A and elsewhere, it is preferable that the covering material 90 covers the outer peripheral portion 10A of the holding jig 10 and extends from the edge of the upper surface side of the holding jig 10 (the upper surface 33A of the protective plate 33 in the example of Fig. 47A) slightly inward (inward in a plan view of the holding jig 10) to a predetermined position. Furthermore, it is preferable that the covering material 90 also covers from the edge of the lower surface side of the holding jig 10 (the lower surface 12B of the base plate 12 in the example of Fig. 47A) slightly inward (inward in a plan view of the holding jig 10) to a predetermined position. Note that in the holding jig 10, the covering material 90 is provided so as to contact the protective plate 33 and the base plate 12, and not to contact the displacement element 14. Therefore, the risk of the covering material 90 hindering the displacement of the displacement element 14 is reduced.

[0131] According to the holding jig 10 of Modified Example 13, by providing the covering material 90, the risk of damaging other objects when the holding jig 10 falls and contacts them can be further reduced, and the risk of damage to the holding jig 10 itself can be reduced. According to the holding jig 10 of Modified Example 13, the risk of damage to the holding jig 10 can also be reduced when transporting the holding jig 10, for example.

[0132] (Modified Example 14)

In the holding jig 10 according to the first embodiment, as shown in Figs. 48A and 48B, a groove 92 may be provided in at least a part of the displacement element 14. Such a form will be referred to as Modified Example 14 of the first embodiment. Fig. 48A is a plan view schematically showing an example of the holding jig 10 according to Modified Example 14 of the first embodiment. Fig. 48B is a diagram schematically

showing an example of the displacement element 14 arranged on the upper surface 12A of the base plate 12.

[0133] (Groove)

In the holding jig 10 according to Modified Example 14 of the first embodiment, a groove 92 is formed in at least a part of at least one of the side surface 14A, the upper surface 14B, and the lower surface 14C of the displacement element 14.

[0134] In the examples of Figs. 48A and 48B, a first groove 93 is formed as a groove 92 on the upper surface 14B of the displacement element 14. It is preferable that the first groove 93 is formed in a portion of the upper surface 14B that is offset from the portion corresponding to the upper end edge 16B of the through-hole 16. From the viewpoint of making dirt substances flow outward easily even if they adhere to the upper end edge 16B, it is preferable that the longitudinal direction of the first groove 93 extends along the displacement direction of the displacement element 14.

[0135] Furthermore, in the examples of Figs. 48A and 48B, a second groove 94 is formed as a groove 92 on the side surface 14A of the displacement element 14. It is preferable that a plurality of gently convexly curved convex chevron portions 95 are formed on the side surface 14A of the displacement element 14 so as to be arranged in the vertical direction, and a second groove portion is formed between adjacent convex chevron portions 95. In this case, the second groove 94 is formed as a horizontal groove extending horizontally on the side surface 14A. Furthermore, it is preferable that the formation of the second groove 94 is avoided on the surface of the side surface 14A that forms the through-hole 16.

[0136] (Modified Example 15)

In the holding jig 10 according to Modified Example 7 of the first embodiment, the protective plate 33 was provided so as to cover at least a part of the upper surface 11B of the holding body 11. In such a holding jig 10 according to Modified Example 7 of the first embodiment, as shown in Figs. 49A and 49B, a small through-part 96 that penetrates the protective plate 33 in the thickness direction (vertical direction in Figs. 49A and 49B) of the protective plate 33 may be provided at a predetermined position of the protective plate 33. Such a form will be referred to as Modified Example 15 of the first embodiment. Fig. 49A is a plan view showing an example of the holding jig 10 according to Modified Example 14 of the first embodiment. Fig. 49B is a plan view showing an example of the holding jig 10 according to Modified Example 14 of the first embodiment. Note that in the examples of Figs. 49A and 49B, the receiving member 13 is omitted, but this is just an example. In Fig. 49B, reference numeral 71 denotes a gap space generated due to the omission of the receiving member 13.

[0137] (Small Through-part)

The small through-part 96 is a part that penetrates the protective plate 33 and has an opening size smaller than that of a single displacement element. The meaning of the small through-part 96 having an opening size smaller than that of a single

displacement element is that, in a plan view of the holding jig 10, the size of the small through-part 96 is small enough that the upper surface 14B of the displacement element 14 is not completely exposed from the small through-part 96. At least some of the small through-parts 96 are arranged at positions such that, in a plan view of the holding jig 10, they can overlap at least a part of the upper surface 14B of the displacement element 14. Furthermore, it is preferable that the layout of the small through-parts 96 is such that, in a plan view of the holding jig 10, all arranged displacement elements 14 can expose at least a part of their upper surface 14B upward through at least one small through-part 96. The small through-part 96 is formed as a circular hole in the example of Fig. 49A, but this is just an example. The small through-part 96 may be a non-circular hole or may be formed as a slit. By providing the holding jig 10 with the small through-parts 96, even if dirt adheres to the displacement element 14 inside the holding jig 10, cleaning liquid such as water can be poured from the upper surface side of the holding jig 10, allowing the cleaning liquid to flow into the upper surface 14B of the displacement element 14 through the small through-parts 96, thereby effectively cleaning the displacement element 14.

[0138] (Blind Plate)

In the holding jig 10 according to Modified Example 15 of the first embodiment, it is preferable that a blind plate 97 is provided to cover the small through-part 96 from the upper surface side. It is preferable that the blind plate 97 is detachably provided with respect to the protective plate 33. By providing such a blind plate 97, the risk of dust and other debris falling into the small through-part 96 from the upper surface of the holding jig 10 can be suppressed. The material of the blind plate 97 is not particularly limited, but plastic is preferable from the viewpoint of lightweightness, and metal material is preferable from the viewpoint of strength. Furthermore, the shape of the blind plate 97 is not particularly limited as long as it can cover the small through-part 96, but from the viewpoint of preventing displacement or other movement in the surface direction of the protective plate 33 relative to the protective plate 33, it is preferable that the shape is generally similar to the shape of the protective plate 33, as shown in Figs. 49A and 49B. In the holding jig 10, as shown in Fig. 51, if the outer peripheral edge part is entirely surrounded by an elastic member, it becomes possible to prevent the holding jig 10 from being damaged if it is accidentally dropped, or to prevent injury if it falls onto the foot of a user or others.

[0139] (Joining Force Application Part 1004)

The joining force application part 1004 is for sealing the lid to the peripheral edge of the container to seal the container. As shown in Fig. 1 and elsewhere, this joining force application part 1004 includes a heater 1020 as a joining body for joining the lid to the peripheral edge of the container, a cover body 1021, and an operating part 1022. The heater 1020 has a heater body 1023, a plate-like member 1024, and a spring member (not shown) as a pressing force application member provided between the heater body 1023 and the plate-like member 1024. The heater body

1023 is formed in a circular shape in this embodiment, but the shape and size of the heater body 1023 may be arbitrarily changed according to the shape and size of the container and lid to be sealed. A lead wire for supplying power to the heater body 1023 is connected to the heater body 1023, and power can be supplied via the lead wire to heat it to a predetermined temperature. The plate-like member 1024 is a disk-shaped member provided so as to be located above the heater body 1023. The spring member is provided between the heater body 1023 and the plate-like member 1024. This spring member is for increasing the pressing force by the heater body 1023. That is, when the heater body 1023 presses the lid and the container, the spring member undergoes compressive deformation via the plate-like member 1024 due to the pressing force from the drive motor, and the compressive force generated during this compressive deformation increases the pressing force that presses the edges of the lid and the container. The magnitude of the pressing force of the heater body 1023 on the lid and the container can be adjusted by adjusting the length of this spring member during normal operation, other than during pressing.
[0140] The cover body 1021 is a cover-shaped member formed so as to cover the periphery of the heater 1020 (at least the front of the heater 1020). This cover body 1021 prevents the user from accidentally touching the heated heater body 1023, and by blocking the heat radiated from the heater body 1023 during heating, it can reduce the psychological burden on the user caused by heat when using the sealing device 1001. Note that this cover member can be arbitrarily selected from conventionally known materials, but since it is provided near the heater 1020, it is preferable to use a material that is not easily affected by the heat radiated from the heater 1020.
[0141] The operating part 1022 includes a rack 1025, a pinion 1026, and a lever 1027. One end of the rack 1025 is connected to the plate-like member 1024 of the heater 1020, and it is configured to be able to slide vertically (in the Z-axis direction). The pinion 1026 is connected to the lever 1027 at its central rotation part, and its teeth formed on the outer periphery are arranged to mesh with the teeth of the rack 1025. One end of the lever 1027 is connected to the pinion 1026 via a shaft member, and the other end is configured to be holded by a user. These rack 1025, pinion 1026, and lever 1027 can be arbitrarily selected and used from conventionally known ones, and their materials can also be arbitrarily selected from conventionally known ones.
[0142] A locking protrusion 1028 is formed on the joining force application unit 1004. This locking protrusion 1028 is a member formed to project laterally from the joining force application unit 1004 and is configured to be able to rotate in conjunction with the rotation operation of the lever 1027. That is, this locking protrusion 1028 is provided at a position offset radially outward from the rotation center of the pinion 1026, which rotates due to the rotation of the lever 1027, and when the lever 1027 is rotated, it rotates in conjunction with the rotational movement of the pinion 1026. Furthermore, this locking protrusion 1028 is located within the movement space

1013 of the lock member 1012, at a position where it is likely to come into contact with the upper back surface (ceiling surface). That is, within the movement space 1013, when the locking protrusion 1028 attempts to rotate in conjunction with the rotation of the lever 1027, it comes into contact with the upper ceiling surface. Therefore, in the sealing device 1001, the locking protrusion 1028 is configured to restrict further rotation, in other words, to restrict further rotation operation of the lever 1027. This locking protrusion 1028 is also configured to be able to rotate without contacting the upper ceiling surface in the disengagement part. Therefore, the lever 1027 can be operated without its rotation being restricted.
[0143] Furthermore, the joining force application unit 1004 may be provided with an opening/closing member for performing the opening/closing operation of the positioning structure when the holding jig 10 has the above-mentioned positioning structure. This opening/closing member is a rod-shaped member extending in the front-rear direction, and is provided as a pair, one on each of the left and right sides of the heater 1020. This opening/closing member has a predetermined interval from its rear end for a predetermined distance, and is formed such that its interval gradually narrows towards the front end from a predetermined position forward.
[0144] (Moving Art 1005)
The moving part 1005 is for moving the joining force application part 1004 between a standby position and an operable position which is forward of the standby position. This moving part 1005 is composed of guide rails attached and fixed to the right and left side plates of the casing 1002, and a moving body attached to the guide rails so as to be slidable, and provided on the joining force application part 1004. The joining force application part 1004 can smoothly slide between the standby position and the operable position by the moving body sliding in the front-rear direction along the guide rails of the moving part 1005.
[0145] (Lid Storage Part 1006)
The lid storage part 1006 is for storing beforehand individual lids, formed as sheets, before they are joined to the container in the sealing device 1001. This lid storage part 1006 is provided such that a storage space for storing lids is located above the pressing force application unit, while being attached and fixed to the right and left side plates of the casing 1002. In the sealing device 1001 according to this embodiment, the lid storage part 1006 is formed with a plurality of storage spaces. These plurality of storage spaces may be classified, for example, by the size of the lid or whether the contents to be put into the container are cold beverages or hot beverages, or the same type of lid may be stored in a plurality of storage spaces. Furthermore, the configuration of the lid storage part 1006 is not limited to the configuration shown in Fig. 1 and so on, and the number and size of the storage spaces may be arbitrarily determined.
[0146] Next, the operation and effects of the sealing device 1001 according to this embodiment will be described. In this sealing device 1001, the joining force application part 1004 is usually located at the standby position, and the holding part

1003 is in a state where no container or the like is placed. When the user seals a lid to a container, the user inserts the container into the through-hole of the holding jig 10 to hold the container. At that time, the user inserts the lower end part of the container from above the holding jig 10 until the lower end of the peripheral edge formed at the upper end part of the container abuts against the inner end part of the displacement element constituting the holding jig 10. In other words, the container is inserted until the lower end of the peripheral edge of the container abuts against the displacement element of the holding jig 10. At this time, when the container is inserted to some extent, the displacement element contacts the outer peripheral surface, and thereafter allows the insertion of the container while contacting the outer peripheral surface of the container and expanding the diameter of the through-hole. Then, when the holding jig 10 reaches the position where the lower end of the peripheral edge of the container abuts against the inner end part of the displacement element, it holds the container at that position.

[0147] After the container is held by the holding jig 10, the user places the lid on the held container. At this time, for example, if the holding jig 10 has a positioning structure as shown in the modified examples recited above, the position for placing the lid can be accurately determined when placing the lid on the container. Furthermore, if a positioning structure is provided, it also becomes possible for the lid to maintain its position relative to the container due to that positioning structure.

[0148] Next, the user moves the joining force applying part 1004 from the standby position to the operable position. At this time, the user holds the lever 1027, which constitutes the joining force applying part 1004, and moves it from the standby position to the operable position (from rear to front). Thereby, the joining force applying part 1004 can smoothly slide from the standby position to the operable position by the moving part 1005. Note that when the joining force applying part 1004 is in the standby position, and when the joining force applying part 1004 is located midway between the standby position and the operable position, if the user attempts to rotate the lever 1027 in direction A, the locking protrusion 1028 of the joining force applying part 1004 will abut against the upper ceiling surface of the lock member 1012 due to that rotation operation. Therefore, the rotational movement of the locking protrusion 1028 accompanying the rotation operation of the lever 1027 is restricted, and the rotation of the lever 1027 is restricted. This restricts the lowering operation of the heater 1020 by the rotation operation of the lever 1027, and thus restricts the operation of the heater 1020 lowering at positions other than the part where the lid and container are heat-sealed, thereby preventing damage to the sealing device 1001 due to erroneous operation of the sealing device 1001 and injuries to the user.

[0149] When the joining force applying part 1004 reaches the operable position from the standby position, the locking protrusion 1028 will be located in the disengagement part of the lock member 1012. In this position, the locking protrusion 1028 is not locked by the lock member 1012 and its rotational movement is not

restricted, allowing rotational movement. Therefore, the lever 1027, which is connected to the locking protrusion 1028 via the pinion 1026, also becomes capable of rotational movement. When the user rotates the lever 1027 after moving the joining force applying part 1004 from the standby position to the operable position, the pinion 1026 connected to the lever 1027 starts to rotate in conjunction with the rotation of the lever 1027. When the pinion 1026 starts to rotate, the rack 1025, which meshes with the pinion 1026, starts to move vertically in conjunction with the rotational movement of the pinion 1026. In this case, since the user rotates the lever 1027 in direction A in the figure, the pinion 1026 rotates in direction B. Therefore, the rack 1025, which meshes with the pinion 1026, moves in direction C in the figure, i.e., downward. Since the heater 1020 is attached to the rack 1025 via the plate-like member 1024, when the rack 1025 moves downward, the heater 1020 also moves downward in conjunction with that movement. At the operable position, the container with the lid is located underneath the heater 1020. Therefore, the heater 1020 presses the lid and the container as located below.

[0150] Since the heater 1020 is preheated to a predetermined temperature (e.g., 170° C to 200° C, but not limited to this temperature), when pressing the lid, it does not only applies pressing force but also heats and seals the peripheral edge of the lid and the container. At this time, since the heater 1020 is provided with a spring member, the pressing force can be further increased.

[0151] The time for heat-sealing the lid to the container by the heater 1020 can be arbitrarily determined. For example, in the sealing device 1001, when a predetermined time has passed since the heater 1020 started pressing the lid and the container, it informs the user that the container sealing is complete, for example, by changing the color of a lamp or playing a voice message. The user observes this indication (notification) and operates the lever 1027 in the direction opposite to the aforementioned A direction. When the user rotates the lever 1027 in this direction, the pinion 1026 connected to the lever 1027 rotates, and the rack 1025 meshing with the pinion 1026 moves upward. This movement of the rack 1025 causes the heater 1020 connected to the rack 1025 to rise, and the container sealing is completed. Thereafter, the user rotates the lever 1027 back to its initial position, then moves the joining force applying part 1004 from the operable position to the standby position, and then takes out the container sealed by the lid (container with lid) held by the holding jig 10 for consumption.

[0152] According to the sealing device 1001 of this embodiment, the positioning of the lid relative to the container can be performed with high accuracy, and significant reduction in lid misalignment after sealing can be achieved. Furthermore, since the sealing device 1001 according to this embodiment seals containers using individual sheet lids, it is possible to greatly reduce the loss of material when forming the lids compared to cases where containers are sealed by continuously punching out a long body of lid material wound in a roll. Moreover, according to the sealing device 1001 of this embodiment, the sealing device 1001 can be miniaturized because it is not

necessary to provide a configuration for setting the aforementioned long body in the sealing device 1001 or a configuration for cutting the long body into a predetermined shape and size. Therefore, it is very advantageous even when installing the sealing device 1001 in a limited space, such as in stores. Furthermore, in the sealing device 1001 according to this embodiment, the holding jig 10 that holds the container with contents does not move, and the joining force applying part 1004 slides between the standby position and the operable position, which can prevent the contents in the container from spilling out of the container due to shaking. Therefore, it is possible to greatly reduce the adhesion of contents around the holding jig 10 of the sealing device 1001 and the resulting dirt, and to perform heat sealing of the lid more reliably.

[0153] Next, a second embodiment according to the present invention will be described based on Figs. 19, 23 to 25. The sealing device 1001 according to this embodiment includes a base part 1051, a holding part, a joining force applying part 1004, a moving part 1005, and a lid storage part. Note that in the sealing device 1001 according to this embodiment, the holding jig 10 constituting the holding part and the lid storage part have the same configurations as described earlier, so their description will be omitted here.

[0154] (Base Part 1051)

The base part 1051 is the foundation of the sealing device 1001. This base part 1051 is configured by integrating a bottom plate part 1052, a right side plate 1053, a left side plate 1054, and an upper plate part 1055 by welding or the like. Furthermore, the upper plate part 1055 is formed so that the holding part is attached and fixed, and at the location corresponding to the opening of the attached and fixed holding jig 10, a through-part penetrating in the plate thickness direction of the upper plate part 1055 is formed. In addition, the right side plate 1053 and the left side plate 1054 are joined and integrated inward from the left and right ends of the upper plate part 1055, and guide rails constituting the moving part 1005 are provided at the end part of the upper plate part 1055 located to the right of the right side plate 1053 and at the end part located to the left of the left side plate 1054. Along these guide rails, the joining force applying part 1004 can slide in the front-rear direction. Note that in the sealing device 1001 according to this embodiment, the length of the bottom plate part 1052 in the longitudinal direction (front-rear direction) of the base part 1051 is fixed and does not change, but the end part on one side (e.g., front side) and/or the end part on the other side (e.g., rear side) of the bottom plate part 1052 may be configured to extend by a predetermined length. By configuring the bottom plate part 1052 in this way, the stability when installing the sealing device 1001 can be further improved, and the user can use the sealing device 1001 with greater stability and peace of mind.

[0155] The joining force applying part 1004 includes a heater 1020, a drive motor 1056, a connecting member 1057, and a cover body. The configuration of the heater 1020 is the same as described in the previous embodiment, so its description will be

omitted here. The drive motor 1056 is for applying a driving force to move the heater 1020, as a joining body, between a closer position where it contacts the holding jig 10 via a lid positioned on the container, and a separating position where the heater 1020 and the holding jig 10 are far from each other than at the closer position. This drive motor 1056 can be arbitrarily selected from conventionally known ones, as long as it has the output to move the heater 1020 between the separated position and the closer position.

[0156] The connecting member 1057 is provided between the drive motor 1056 and the heater 1020, and is for transmitting the driving force from the drive motor 1056 to the heater 1020 to move the heater 1020 between the separating position and the approaching position. In the sealing device 1001 according to this embodiment, the connecting member 1057 is composed of a first connecting member 1058, one end of which is connected to the drive shaft of the drive motor 1056 and the other end of which is provided at a predetermined distance from the drive shaft, a second connecting member 1059, one end of which is connected to the first connecting member 1058, and a third connecting member 1060, one end of which is connected to the other end of the second connecting member 1059 and the other end of which is connected to the plate-like member of the heater 1020. By including these first connecting member 1058, second connecting member 1059, and third connecting member 1060, the sealing device 1001 according to this embodiment is configured to convert the rotational movement of the drive shaft of the drive motor 1056 into linear movement where the heater 1020 slides vertically, and further apply pressing force.

[0157] The cover body includes an upper cover body 1061 and a lower cover body 1062, and is configured to accommodate the heater 1020, the drive motor 1056, and the connecting member 1057. The upper cover body 1061 has a handle 1063 attached to its entire surface, and is configured to be held by the user when using the sealing device 1001. The lower cover body 1062 is located below the upper cover body 1061 and has an operation panel 1064, which constitutes the operating part, on its front surface. This operation panel 1064 can perform various settings, including turning the power of the sealing device 1001 on and off, and setting the temperature and sealing time of the heater 1020 itself. Note that this operation panel 1064 can be arbitrarily selected from conventionally known ones, and may be, for example, a button-type operation panel 1064 or a touch panel-type operation panel 1064. Furthermore, the operation panel 1064 may appropriately use other forms than those described above.

[0158] (Moving Part 1005)

The moving part 1005, as described in the previous embodiment, consists of guide rails and a movable body. The guide rails are provided at both the left and right ends of the upper plate part 1055, and the movable body is attached to the guide rails so as to be slidable. This

[0159] As described above, the heater 1020 and the like are housed and arranged inside the upper cover body 1061 and the lower cover body 1062. In this joining force applying part 1004, the trigger for the drive motor 1056 to start driving, i.e., the heater 1020 to start moving from the separated position to the closer position, can be, for example, when the user moves the joining force applying part 1004 from the standby position to the operable position and keeps it in the operable position for a predetermined time (e.g., 0.5 to 1.5 seconds). Note that the above-mentioned timing to switch is just an example, and it may be set by other conditions for the heater 1020 to move from the separated position to the closer position.
[0160] According to the sealing device 1001 of this embodiment, the user sets the container in the holding part, specifically the holding jig 10, and has the holding jig 10 hold the container. Next, the lid is placed on the container. At this time, since the container is held by the holding jig 10, the sealing device 1001 accurately positions the lid relative to the container. In particular, if the holding jig 1010 has a positioning structure, the positioning accuracy can be further improved. Next, when the user pulls the handle 1063 of the upper cover body 1061 towards the front in the front-rear direction, the joining force applying part 1004, which was located at the standby position, moves to the operable position. At this time, since the movable body slides along the guide rails in the moving part 1005, the joining force applying part 1004 can be moved smoothly.
[0161] The sealing device 1001 detects, using detection means (not shown) such as a sensor or a limit switch, that the joining force applying part 1004 has moved to the operable position. If it is further determined that the detected state has elapsed for a predetermined time, the drive motor 1056 of the joining force applying part 1004 starts driving. At this time, the drive motor 1056 rotates its drive shaft by a predetermined amount. When the drive motor 1056 rotates its drive shaft, the first connecting member 1058, which is connected to this drive shaft, starts to rotate around the end connected to the drive shaft. When the first connecting member 1058 starts to rotate in this way, the second connecting member 1059, which is connected to the first connecting member 1058, converts the rotational movement of the first connecting member 1058 into linear movement. Then, the third connecting member 1060, which is connected to the second connecting member 1059, performs linear movement by sliding in the vertical direction. In this way, when the third connecting member 1060 performs linear movement in the vertical direction, the heater 1020 becomes capable of moving in the vertical direction. Furthermore, the force with which the heater 1020 presses when joining the lid to the container can also be transmitted by the aforementioned connecting member 1057 from the drive motor 1056.
[0162] Then, with the start of driving of the drive motor 1056, the heater 1020 starts its downward movement. Next, the heater body of the heater 1020 starts pressing and heating the lid and the container. Whether the heater body 1020 has descended to a position where it can press the lid and the container can be determined, for

example, by controlling the rotation amount of the drive motor 1056, or by detecting the position of the heater body 1020 using a sensor or the like (not shown). Then, after a predetermined time (e.g., 1 to 5 seconds, but not limited to this time) has passed since the start of pressing and heating, the drive motor 1056 rotates in the opposite direction to before, and raises the heater body 1020. The container with the lid joined can then be taken out by the user holding the handle 1063 and pushing it backward in the front-rear direction, causing the joining force applying part 1004 to retract. At this time, a mechanism can also be provided that raises the container with the lid joined (container with lid) as the joining force applying part 1004 retracts. By providing such a mechanism, the user can more easily remove the container with the lid. Finally, the user removes the container with the lid from the holding jig 10 and consumes its contents.

[0163] Thus, according to the sealing device 1001 of this embodiment, the user only needs to hold the handle 1063 and pull it from the standby position to the operable position, or push it from the operable position to the standby position, and the sealing device 1001 joins and seals the lid to the container when these operations are performed by the user. Therefore, it becomes possible to join the lid to the container and seal the container with very simple operations. Furthermore, the sealing device 1001 of this embodiment can also achieve the same effects as described for the sealing device 1001 of the previous embodiment. Moreover, since the sealing device 1001 of this embodiment is configured such that the joining force applying part 1004 moves in the front-rear direction above the holding part, the holding part that holds the container with contents is configured not to move. Therefore, according to the sealing device 1001 of this embodiment, it is possible to prevent the container and content particles from shaking when the holding part (and thus the container held by the holding part) is positioned close to the sealing part, and it is also possible to greatly reduce the contents of the container from spilling out of the container and soiling the surroundings of the holding part due to this movement, thereby maintaining a good hygienic state.

[0164] In the sealing device 1001 according to this embodiment, the lid storage part 1006 shown in Figs. 57 to 60 may be used. What is shown in Fig. 57 and so on is a modified example of the second embodiment of the sealing device 1001 according to the present invention. As shown in Figs. 25 to 28 and so on, this lid storage part 1006 of the sealing device 1001 includes a first roller 2001, a second roller 2002, and an interlocking member 2003 for interlocking these first roller 2001 and second roller 2002. This lid storage part 1006 has a storage space for storing a plurality of lids in a stacked state, and the aforementioned first roller 2001, second roller 2002, interlocking member 2003, and the like are arranged underneath the storage space. That is, these first roller 2001 and the like are located underneath the group of stacked lids. Furthermore, when the lid group is stored in the storage space, the lid located at the lowest end of the lid group is stored in contact with the first roller 2001 and the second roller 2002. As shown in Fig. 28 and so on, the first roller 2001

and the second roller 2002 are provided such that the height position of the first roller 2001 is higher than that of the second roller 2002. Furthermore, the first roller 2001 is formed to have a larger diameter than the second roller 2002. By forming and arranging these first roller 2001 and second roller 2002 in this manner, the contact resistance with the lid can be increased. This lid storage part 2006 can take out the lids constituting the lid group stored in the storage space one by one. That is, when attempting to pull out and remove the lid L located at the very bottom among the lid group stored in the storage space, since the back surface of this lid L is in close contact with at least the first roller 2001, the first roller 2001 also rotates in accordance with the movement of the lid L being pulled out. When the first roller 2001 rotates, the interlocking member 2003, which is provided to interlock between the first roller 2001 and the second roller 2002, also starts to operate, and the second roller 2002 also starts to rotate due to the movement of the interlocking member 2003. In other words, when the operation of pulling out the lid L is performed, the first roller 2001 and the second roller 2002 start to rotate via the interlocking member 2003 in conjunction with that operation. Furthermore, the second roller 2002 contacts the back surface of the lid L that will be positioned at the very bottom after the lid L being pulled out has been removed (the lid located at the very top of the lid L being pulled out), so when the second roller 2002 starts to rotate, it moves as if being pushed forward due to the friction resistance generated between the second roller 2002 and the lid L. Then, when the previously pulled out lid L is removed from the storage space, the rotational movement of the first roller 2001 and the second roller 2002, which was performed by the movement of this lid L, also stops. Therefore, the next lid to be pulled out will stop its forward movement with a slight projection from the storage space. In this way, according to this lid storage part 1006, the lid L located at the very bottom of the lid group stored in the storage space will wait in a state where it slightly projects forward from the storage space, so when attempting to take out the lid L next time, the operation of picking up and removing only one lid becomes easy, and handling is greatly improved.

[0165] Next, a third embodiment of the sealing device according to the present invention will be described based on FIGS. 26 to 29, 33, 34, 50, and 51. The sealing device 1001 according to this embodiment includes a casing 1002, a holding part 1003, a joining force imparting part 1004, and an operating unit 1005. While a lid storage part for storing a large number of lids can also be provided on the upper surface of the casing 1002 for this sealing device 1001, it is omitted here. Note that in the sealing device 1001 according to this embodiment, the configuration of the holding member 1 that constitutes the holding part 1003 and the configuration of the operation panel 1030 that constitutes the operating unit 1005 are the same as those described earlier, so their description will be omitted here. The casing 1002 has a storage space 1011 for accommodating various control components 1033 that constitute the holding part 1003, the joining force imparting part 1004, and the operating unit 1005 in the sealing device 1001. Furthermore, in the casing 1002

according to this embodiment, one end of the upper cover body 1027 is joined to the back plate at the rear by a hinge or other component, and is configured to be able to open backward by the hinge. Moreover, the sealing device 1001 according to this embodiment is configured such that the joining force imparting part 1004 is a single unitized module, and only this joining force imparting part 1004 can be replaced. This configuration allows for significant improvements in work efficiency, as only the unitized module of the joining force imparting part 1004 needs to be replaced for maintenance or troubleshooting of the sealing device.

[0166] Furthermore, the sealing device 1001 according to this embodiment has an insertion part 1071 into which the lid is inserted. This insertion part 1071 has an insertion opening 1035, and behind this insertion opening 1035, a driving roller and a driven roller are provided. The driving roller is connected to the rotating shaft of a motor and is configured to be able to perform rotational movement by the rotation of the motor. The driven roller is provided such that its peripheral surface contacts the peripheral surface of the driving roller, and when the driving roller is rotating, it is configured to perform rotational movement by receiving the rotational force of the driving roller. When the user inserts the lid into the insertion part 1071, this insertion part 1071 detects that the lid has been inserted, for example, by a sensor member. Based on the detection result by this sensor member, the motor starts to rotate its rotating shaft, and concomitantly, the driving roller and the driven roller also start to rotate. At this time, the lid inserted by the user into the insertion opening is configured to be taken into the interior of the casing by these driving roller and driven roller when its front end approaches the part where the driving roller and the driven roller are in contact with each other.

[0167] The configuration of the joining force imparting part 1004, including the drive motor 1056 described earlier and the connecting member 1057 that transmits the driving force of the drive motor 1056 to the heater body 1015, is the same as described earlier, so its description will be omitted here. Furthermore, this joining force imparting part 1004 differs from what was described earlier in that it is provided with positioning members as guiding bodies. A plurality of these positioning members 1072 (four in this embodiment) are formed hanging down from a predetermined position in the joining force imparting part towards the holding body. The arrangement of the plurality of guiding bodies is determined such that the plurality of guiding bodies hold the lid and position the lid within the space. For example, they are provided at positions close to the heater body 1023, specifically at four locations: front, rear, left, and right of the heater body 1023. Furthermore, these four positioning members 1072 are arranged such that, for example, positioning members 1072 located in the left–right direction are positioned at predetermined positions where their mutual distance is short, by means of a spring member or the like. It is preferable that this mutual distance is smaller than the diameter of the lid. Moreover, with this configuration, when the lid inserted from the insertion part 1071 is transported, the interval between the positioning members is preferably configured

to expand and contract in accordance with the outer shape of the lid. This positioning member 1072 can be formed using, for example, a metal material, but in addition to metal materials, for example, heat-resistant resin materials or even flexible resin materials can be used. When a metal material is used as the material for the positioning member 1072, it is preferable to wrap a member made of, for example, a resin material around the positioning member 1072 located on the inner side. This configuration can reduce the risk of the lid bouncing back due to the impact when the lid inserted from the insertion part 1071 hits the inner positioning member 1072, thereby preventing a decrease in positioning accuracy.
[0168] Although not shown in the drawings, a heat-resistant sheet material may be placed between the heater body 1023 and the lid, so that the heater body 1023 is always pressed against the lid via this sheet material. This can prevent debris that may be generated from the surface of the lid from adhering to the surface of the heater body 1023 facing the lid when the lid is heated and joined. Furthermore, depending on the lid, there is a risk of it sticking to the surface of the heater body 1023 due to the heat applied from the heater body 1023, but by interposing such a sheet material, the risk of sticking can also be eliminated.
[0169] The holding part 1003 is provided with a support unit 1073 that supports the bottom of the container. The support unit 1073 is configured to move vertically in conjunction with the holding member 1 being housed inside the casing 1002. That is, a slope part 1074 is provided on the inner surface of the right side plate of the casing 1002, and a protrusion 1076 of the support unit 1073 passes through a groove 1075 formed in this slope part 1074, allowing the support unit to move vertically in conjunction with the front-rear movement of the holding part 1003. This support unit 1036 is located at a high position close to the holding member 1 when the holding member 1 is outside the casing 1002, and its height position gradually lowers as the holding member 1 moves inside the casing 1002, operating to be at the lowest end when the holding member is located inside the casing 1002.
[0170] In the sealing device according to this embodiment, when a container is inserted into the through-hole of the holding jig 10, a sensor member (not shown) provided in the support unit detects it and starts operation. This operation is primarily to pull the holding part into the casing. At that time, the support unit moves from a relatively upper position to a lower position along the slope part, while the holding part is pulled into the casing 1002. After that, when the user inserts the lid into the insertion opening, the motor of the insertion opening starts to drive, and the lid is pulled into the casing by the rotation of the driving roller and the driven roller. This lid is placed in a predetermined position on the container, positioned by the positioning members. Then, the heater body 1023 descends and joins the lid to the container by heat sealing. Thereafter, the heater body 1023 rises, and the holding part is pushed out of the casing. At that time, the support unit moves upward along the slope part, from a relatively lower position to an upper position, contrary to

before. Concomitantly, the container whose bottom is supported by the support unit also rises, making it easy for the user to pick it up.

[0165] Next, a third embodiment of the sealing device according to the present invention will be described based on FIGS. 26 to 29, 33, 34, 50, and 51. The sealing device 1001 according to this embodiment includes a casing 1002, a holding part 1003, a joining force imparting part 1004, and an operating unit 1005. While a lid storage part for storing a large number of lids can also be provided on the upper surface of the casing 1002 for this sealing device 1001, it is omitted here. Note that in the sealing device 1001 according to this embodiment, the configuration of the holding member 1 that constitutes the holding part 1003 and the configuration of the operation panel 1030 that constitutes the operating unit 1005 are the same as those described earlier, so their description will be omitted here. The casing 1002 has a storage space 1011 for accommodating various control components 1033 that constitute the holding part 1003, the joining force imparting part 1004, and the operating unit 1005 in the sealing device 1001. Furthermore, in the casing 1002 according to this embodiment, one end of the upper cover body 1027 is joined to the back plate at the rear by a hinge or other component, and is configured to be able to open backward by the hinge. Moreover, the sealing device 1001 according to this embodiment is configured such that the joining force imparting part 1004 is a single unitized module, and only this joining force imparting part 1004 can be replaced. This configuration allows for significant improvements in work efficiency, as only the unitized module of the joining force imparting part 1004 needs to be replaced for maintenance or troubleshooting of the sealing device.

[0166] Furthermore, the sealing device 1001 according to this embodiment has an insertion part 1071 into which the lid is inserted. This insertion part 1071 has an insertion opening 1035, and behind this insertion opening 1035, a driving roller and a driven roller are provided. The driving roller is connected to the rotating shaft of a motor and is configured to be able to perform rotational movement by the rotation of the motor. The driven roller is provided such that its peripheral surface contacts the peripheral surface of the driving roller, and when the driving roller is rotating, it is configured to perform rotational movement by receiving the rotational force of the driving roller. When the user inserts the lid into the insertion part 1071, this insertion part 1071 detects that the lid has been inserted, for example, by a sensor member. Based on the detection result by this sensor member, the motor starts to rotate its rotating shaft, and concomitantly, the driving roller and the driven roller also start to rotate. At this time, the lid inserted by the user into the insertion opening is configured to be taken into the interior of the casing by these driving roller and driven roller when its front end approaches the part where the driving roller and the driven roller are in contact with each other.

[0167] The configuration of the joining force imparting part 1004, including the drive motor 1056 described earlier and the connecting member 1057 that transmits the driving force of the drive motor 1056 to the heater body 1015, is the same as

described earlier, so its description will be omitted here. Furthermore, this joining force imparting part 1004 differs from what was described earlier in that it is provided with positioning members as guiding bodies. A plurality of these positioning members 1072 (four in this embodiment) are formed hanging down from a predetermined position in the joining force imparting part towards the holding body. The arrangement of the plurality of guiding bodies is determined such that the plurality of guiding bodies hold the lid and position the lid within the space. For example, they are provided at positions close to the heater body 1023, specifically at four locations: front, rear, left, and right of the heater body 1023. Furthermore, these four positioning members 1072 are arranged such that, for example, positioning members 1072 located in the left-right direction are positioned at predetermined positions where their mutual distance is short, by means of a spring member or the like. It is preferable that this mutual distance is smaller than the diameter of the lid. Moreover, with this configuration, when the lid inserted from the insertion part 1071 is transported, the interval between the positioning members is preferably configured to expand and contract in accordance with the outer shape of the lid. This positioning member 1072 can be formed using, for example, a metal material, but in addition to metal materials, for example, heat-resistant resin materials or even flexible resin materials can be used. When a metal material is used as the material for the positioning member 1072, it is preferable to wrap a member made of, for example, a resin material around the positioning member 1072 located on the inner side. This configuration can reduce the risk of the lid bouncing back due to the impact when the lid inserted from the insertion part 1071 hits the inner positioning member 1072, thereby preventing a decrease in positioning accuracy.

[0168] Although not shown in the drawings, a heat-resistant sheet material may be placed between the heater body 1023 and the lid, so that the heater body 1023 is always pressed against the lid via this sheet material. This can prevent debris that may be generated from the surface of the lid from adhering to the surface of the heater body 1023 facing the lid when the lid is heated and joined. Furthermore, depending on the lid, there is a risk of it sticking to the surface of the heater body 1023 due to the heat applied from the heater body 1023, but by interposing such a sheet material, the risk of sticking can also be eliminated.

[0169] The holding part 1003 is provided with a support unit 1073 that supports the bottom of the container. The support unit 1073 is configured to move vertically in conjunction with the holding member 1 being housed inside the casing 1002. That is, a slope part 1074 is provided on the inner surface of the right side plate of the casing 1002, and a protrusion 1076 of the support unit 1073 passes through a groove 1075 formed in this slope part 1074, allowing the support unit to move vertically in conjunction with the front-rear movement of the holding part 1003. This support unit 1036 is located at a high position close to the holding member 1 when the holding member 1 is outside the casing 1002, and its height position gradually

lowers as the holding member 1 moves inside the casing 1002, operating to be at the lowest end when the holding member is located inside the casing 1002.
[0170] In the sealing device according to this embodiment, when a container is inserted into the through-hole of the holding jig 10, a sensor member (not shown) provided in the support unit detects it and starts operation. This operation is primarily to pull the holding part into the casing. At that time, the support unit moves from a relatively upper position to a lower position along the slope part, while the holding part is pulled into the casing 1002. After that, when the user inserts the lid into the insertion opening, the motor of the insertion opening starts to drive, and the lid is pulled into the casing by the rotation of the driving roller and the driven roller. This lid is placed in a predetermined position on the container, positioned by the positioning members. Then, the heater body 1023 descends and joins the lid to the container by heat sealing. Thereafter, the heater body 1023 rises, and the holding part is pushed out of the casing. At that time, the support unit moves upward along the slope part, from a relatively lower position to an upper position, contrary to before. Concomitantly, the container whose bottom is supported by the support unit also rises, making it easy for the user to pick it up.
[0171] FIG. 52 shows a modified example of the holding part 1003. This holding part 1003 is applicable to each of the sealing devices of the embodiments described above. This holding part 1002 is used when the diameter (size) of the container is constant. In this case, the user places the lid on the container and performs positioning. At that time, according to the holding part 1003 of this modified example, positioning parts are provided at four locations around the opening into which the container is inserted, so that the lid can be easily positioned, and its positioning accuracy can also be improved. Note that the number, shape, and size of the positioning parts are arbitrary and not limited to these.
[0172] Next, a fourth embodiment of the sealing device according to the present invention will be described based on FIGS. 53 to 55. The sealing device according to this embodiment differs from the sealing device described earlier in that it has a plurality of storage parts and a transport mechanism (transfer unit 1082) for transporting lids stored in these storage parts. This sealing device is exemplified by a mode having one storage part and a mode having three storage parts, but the number of storage parts is not limited to one or three, and may be less than three or more than three. Furthermore, this sealing device is provided with a dispenser 1081 for dispensing lids. This dispenser 1081 uses a suction cup in this embodiment, and this suction cup is configured to move up and down. The dispenser 1081 is configured to be able to move between a dispensing position for dispensing lids and a standby position for waiting. Normally, this dispenser is located at the standby position, and when dispensing a lid, it moves from the standby position to the dispensing position and presses the suction cup against the lid located above. Then, after pressing the suction cup against the lid, it descends from the dispensing position to the standby position. At that time, since the suction cup, which becomes

the dispenser 1081, is sucking the lid, it moves together with the sucked lid during processing. The sucked lid is placed on a moving part located underneath the storage part and above the standby position of the dispenser 1081. When the lid is placed on the moving part, the dispenser 1081 releases the sucked state and moves to the standby position. Note that examples of members for moving the dispenser 1081 include plungers, but any conventionally known device other than a plunger may be arbitrarily selected and used.

[0173] The transfer unit 1082 includes a transfer belt 1083 and a motor that rotates the transfer belt 1083. When a lid is placed on the transfer belt 1083, the motor starts driving to operate the transfer belt 1083. The transfer belt 1083 can transfer the lid from a position under each storage part to a position near the joining force imparting part 1004. When a lid is placed by the dispenser 1081, the placed lid is transferred to the vicinity of the joining force imparting part 1004. The lid transferred by the transfer unit 1082 may temporarily wait at a predetermined position near the joining force imparting part 1004 and then be placed on the container that has moved to the lower side of the joining force imparting part 1004, or it may be configured to be directly placed on the container that has moved to the lower side of the joining force imparting part 1004 without waiting at a predetermined position. However, from the viewpoint of shortening the time from holding the container with contents in the holding jig to the user taking out the container with the lid joined, it is preferable that the lid transferred by the transfer unit 1082 is pre-transferred to a predetermined position near the joining force imparting part 1004 and kept in a standby state.

[0174] This transfer unit 1082 may be provided as only one for all lid storage parts, or it may be provided individually for each storage part. If there are multiple storage parts, lids of different sizes or shapes may sometimes be stored. In such cases, since the user may not be able to predict which size or shape of lid is needed, it is preferable to provide one transfer unit 1082 individually for each storage part. On the other hand, if one type of lid is stored in multiple storage parts, a single transfer unit 1082 may be provided for the multiple storage parts. In this way, the number of lid storage parts and the number of transfer units 1082 are not necessarily required to be in a one-to-one relationship and may be changed as needed.

[0175] The sealing device according to the present invention has been described in detail above, but the above is merely a description of specific aspects of the sealing device according to the present invention, and appropriate variations may be made within the scope of the present invention. Furthermore, the sealing devices and modified sealing devices and holding jigs etc. according to each of the above embodiments are not limited to being applied only to their respective embodiments, and configurations according to each embodiment may be appropriately combined and used.

[0176] The sealing device according to the present invention encompasses the following technical ideas.

(1) A sealing device for sealing an opening of a container, the container having an opening and a rim forming the outer periphery of the opening, comprising:
a holding part having a holding body that holds the container with the rim of the container exposed; and
a joining force applying part having a joining body for joining a lid to the rim formed along a peripheral edge of the opening,
the sealing device is characterized in that the holding part joins a lid material formed to be sheet and placed so as to face the opening of the holding body to the container.
(2) The sealing device according to (1), wherein a moving part that displaces at least one of the joining part and the holding part such that the joining body and the holding body are in closer contact with each other via the container held by the holding part and the lid located on the container, and that the joining body and the holding body are in a mode far from each other than their closer contact mode,
wherein the joining part is configured to join the lid to the container when the moving part switches into the closer contact mode.
(3) The sealing device according to (1) or (2), further comprising a positioning part that has a guide body for guiding the position of the lid to a predetermined space.
(4) The sealing device according to any one of (1) to (3), wherein the guide bodies are plural and hang down from predetermined positions in the joining part towards the holding body, and
the arrangement of the plurality of guide bodies is determined such that the plurality of guide bodies hold the lid and have the lid positioned within the space.
(5) The sealing device according to any one of (1) to (4), wherein the joining body is provided with an energy imparting part that imparts energy to a contact part between the lid and the container.
(6) The sealing device according to (5), wherein the energy imparting part imparts at least one type of energy selected from the group consisting of electrical energy, vibration energy, and thermal energy.
(7) The sealing device according to any one of (1) to (6), further comprising: an insertion unit formed to allow insertion of the lid; and a transport unit that transports the lid inserted from the insertion unit towards the space.
(8) The sealing device according to any one of (1) to (7), wherein the holding part has a through-hole passing between a front surface and a back surface thereof, and an insertion part formed to allow insertion of the container into the through-hole, and a support part located underneath the insertion part, contacting the bottom of the container, and supporting the bottom, wherein the position in the height direction of the contact point between the support part and the bottom varies with the transition between the closer contact mode and a separated mode.
(9) The sealing device according to any one of (1) to (8), wherein the holding part has an insertion part for inserting the container formed to penetrate between the

front surface and the back surface of the holding part, and the positioning part is formed along a periphery of the insertion part.
(10) The sealing device according to any one of (1) to (9), wherein the positioning part is formed from a flexible material. (11) The sealing device according to any one of (1) to (10), wherein the positioning part is formed from a heat-resistant material.
(12) The sealing device according to any one of (1) to (11), further comprising a storage part for storing a plurality of stacked lids, a dispenser for individually dispensing lids from the storage part, a transfer part for transferring the lids dispensed by the dispenser towards the holding part, and a transfer part for transferring the lids dispensed by the dispenser towards the holding part, wherein the lid is arranged on the container via the transfer part when the container is placed on the holding part.
(13) The sealing device according to any one of (1) to (12), wherein a plurality of storage parts are provided, and the dimensions of the lids stored in at least one of the storage parts are different from the dimensions of the lids stored in the storage part placed on the holding part, and in accordance with the size of the container placed on the holding part, the storage part containing the lids to be placed on the container from the transfer part is selected, and the lid is placed on the container via the transfer part from the selected storage part.
(14) The sealing device according to any one of (1) to (13), wherein the transfer part has a standby part that temporarily holds the lids sent from the storage part, and the lids placed in the standby part are placed on the container when the container is placed on the holding part, and the lids are sent from the storage part to the standby part of the transfer part.
(15) The sealing device according to any one of (1) to (14), wherein the storage part has an opening at its lower end, and the dispenser is configured to take out the lids from the opening at the lower end of the storage part.
[Explanation of Reference Numerals]
[0177]
1001 Sealing device
1002 Casing
1003 Holding part
1004 Joining force imparting part
1005 Moving part
1006 Lid storage part
1007 Bottom plate
1008 Right side plate
1009 Left side plate
1010 Rear plate
1011 Storage space
1012 Lock member
1013 Moving space

1014 Upper part
1015 Lower part
1016 Side part
1017 Rear part
1018 Lock release part
1019 Holding base plate
1020 Heater
1021 Cover body
1022 Operating unit
1023 Heater body
1024 Plate-like member
1025 Rack
1026 Pinion
1027 Lever
1028 Locking protrusion
1051 Base part
1052 Bottom plate part
1053 Right side plate
1054 Left side plate
1055 Upper plate part
1056 Drive motor
1057 Connecting member
1058 First connecting member
1059 Second connecting member
1060 Third connecting member
1061 Upper cover body
1062 Lower cover body
1063 Handle
1064 Operation panel
1071 Insertion unit
1072 Positioning member
1073 Support unit
1074 Slope part
1075 Groove
1076 Protrusion
1081 Dispenser
1082 Transfer unit

CLAIMS

[CLAIM 1] A sealing device for sealing an opening of a container, the container having an opening and a rim forming the outer periphery of the opening, comprising:

a holding part having a holding body that holds the container with the rim of the container exposed; and

a joining force applying part having a joining body for joining a lid to the rim formed along a peripheral edge of the opening,

the sealing device is characterized in that the holding part joins a lid material formed to be sheet and placed so as to face the opening of the holding body to the container.

[CLAIM 2] The sealing device according to Claim 1, wherein a moving part that displaces at least one of the joining part and the holding part such that the joining body and the holding body are in closer contact with each other via the container held by the holding part and the lid located on the container, and that the joining body and the holding body are in a mode far from each other than their closer contact mode,

wherein the joining part is configured to join the lid to the container when the moving part switches into the closer contact mode.

[CLAIM 3] The sealing device according to Claim 1, wherein a positioning part that has a guide body for guiding the position of the lid to a predetermined space.

[CLAIM 4] The sealing device according to Claim 3, wherein the guide bodies are plural and hang down from predetermined positions in the joining part towards the holding body, and

the arrangement of the plurality of guide bodies is determined such that the plurality of guide bodies hold the lid and have the lid positioned within the space.

[CLAIM 5] The sealing device according to Claim 1, wherein the joining body is provided with an energy imparting part that imparts energy to a contact part between the lid and the container.

[CLAIM 6] The sealing device according to Claim 5, wherein the energy imparting part imparts at least one type of energy selected from the group consisting of electrical energy, vibration energy, and thermal energy.

[CLAIM 7] The sealing device according to Claim 1, further comprising: an insertion unit formed to allow insertion of the lid; and a transport unit that transports the lid inserted from the insertion unit towards the space.

[CLAIM 8] The sealing device according to Claim 2, wherein the holding part has a through-hole passing between a front surface and a back surface thereof, and an insertion part formed to allow insertion of the container into the through-hole, and a support part located underneath the insertion part, contacting the bottom of the container, and supporting the bottom, wherein the position in the height direction of the contact point between the support part and the bottom varies with the transition between the closer contact mode and a separated mode.

[CLAIM 9] The sealing device according to Claim 3, wherein the holding part has an insertion part for inserting the container formed to penetrate between the front surface and the back surface of the holding part, and the positioning part is formed along a periphery of the insertion part.
[CLAIM 10] The sealing device according to Claim 3, wherein the positioning part is formed from a flexible material.
[CLAIM 11] The sealing device according to Claim 3, wherein the positioning part is formed from a heat-resistant material.
[CLAIM 12] The sealing device according to Claim 1, further comprising a storage part for storing a plurality of stacked lids, a dispenser for individually dispensing lids from the storage part, and a transfer part for transferring the lids dispensed by the dispenser towards the holding part, wherein the lid is arranged on the container via the transfer part when the container is placed on the holding part.
[CLAIM 13] The sealing device according to Claim 12, wherein a plurality of storage parts are provided, and the dimensions of the lids stored in at least one of the storage parts are different from the dimensions of the lids stored in the storage part placed on the holding part, and in accordance with the size of the container placed on the holding part, the storage part containing the lids to be placed on the container from the transfer part is selected, and the lid is placed on the container via the transfer part from the selected storage part.
[CLAIM 14] The sealing device according to Claim 12, wherein the transfer part has a standby part that temporarily holds the lids sent from the storage part, and the lids placed in the standby part are placed on the container when the container is placed on the holding part, and the lids are sent from the storage part to the standby part of the transfer part.
[CLAIM 15] The sealing device according to Claim 12, wherein the storage part has an opening at its lower end, and the dispenser is configured to take out the lids from the opening at the lower end of the storage part.