



(51) International Patent Classification:
B65D 43/02 (2006.01) **B30B 1/00** (2006.01)
B65D 49/12 (2006.01)

(21) International Application Number:
PCT/CN2010/078551

(22) International Filing Date:
9 November 2010 (09.11.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
200920269209.2 10 November 2009 (10.11.2009) CN

(71) Applicants (for all designated States except US): **AKZO NOBEL SWIRE PAINTS (SHANGHAI) LTD.** [CN/CN]; No.536 Rong Le Road (E.), Song Jiang Industrial Zone, Shanghai 201600 (CN). **Wujiang Huayuan Tinplate-printing & Tin-making Co., Ltd.** [CN/CN]; Economic Development Zone, Taoyuan Town, Wujiang, Jiangsu 215236 (CN).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **LAI, Guangde** [CN/CN]; c/o Akzo Nobel Swire Paints (Shanghai) Ltd.,

No. 536 Rong Le Road (E.), Song Jiang Industrial Zone, Shanghai 201600 (CN).

(74) Agent: **ZHONGZI LAW OFFICE**; 7F, New Era Building, 26 Pinganli Xidajie, Xicheng District, Beijing 100034 (CN).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,

[Continued on next page]

(54) Title: BULGE FORMING APPARATUS FOR PRODUCING CANNED PRODUCT, AND CANNED PRODUCT

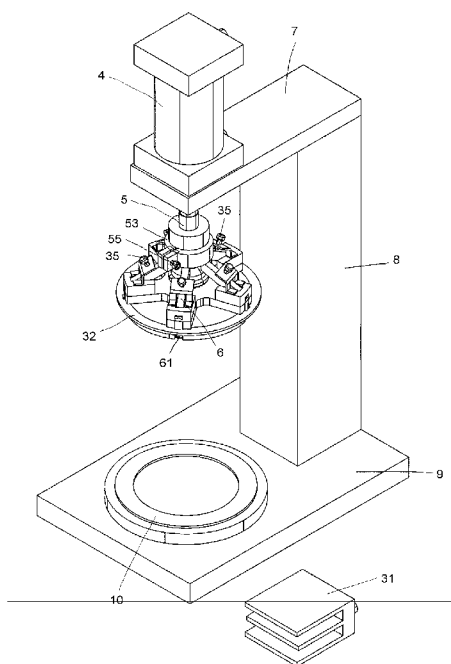


Fig. 4

(57) Abstract: A bulge forming apparatus for producing a canned product and a canned product produced by the bulge forming apparatus are disclosed. The canned product comprises a can (1) having an mouth (13), a lid (2) having an extension (21), and contents filled in the can (1), wherein the lid (2) is fitted in the mouth (13) such that the extension (21) forms a fit with a sidewall (11) of the mouth to seal the can (1). The bulge forming apparatus (3) is configured to form at least one bulge (22) on one of the extension (21) of the lid (2) and the sidewall (11) of the mouth (13) after the lid (2) has been fitted in the mouth (13) of the can (1), and while the lid (2) is removed from the can (1), the convex surface of the at least one bulge (22) is engaged with the other of the extension (21) of the lid (2) and the sidewall (11) of the mouth (13) in such a way that the extension (21) and/or the sidewall (11) is destroyed. The apparatus can produce a canned product in a simple way and at a low cost, and the canned product has an anti-counterfeit function.

WO 2011/057555 A1



SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, **Published:**
GW, ML, MR, NE, SN, TD, TG).

— *with international search report (Art. 21(3))*

BULGE FORMING APPARATUS FOR PRODUCING A CANNED PRODUCT,
AND CANNED PRODUCT

FIELD OF THE INVENTION

The invention relates to a bulge forming apparatus for producing a canned (tinned) product or generally a product packed in a container and especially a canned paint product. The invention also relates to a canned product, especially a canned paint product, produced by such a bulge forming apparatus.

BACKGROUND OF THE INVENTION

As a conventional process for producing a canned paint product, a can is filled with paint, thereafter a lid is fitted into a mouth of the can via press. The canned paint product thus produced has a disadvantage that, since the fit force between the lid and the can is produced merely by the press fit between a surface of the lid and an opposed surface of the can, which surfaces are substantially parallel and abut against each other, the lid is liable to escape from the can when the canned paint product is subject to shake or vibration during, for example, handling process or transportation, or is tipped over by accident, etc., causing paint leaking or contaminated. Another disadvantage of the conventional canned paint product lies in that, the used cans and lids may often be reused by others to make counterfeit paint products in the market, thereby damaging the business image and interests of the paint manufacturer. Existing anti-counterfeit technologies include laser printing or anti-counterfeit label and so on, however, these technologies are complicated and expensive.

SUMMARY OF THE INVENTION

The technical problem to be solved or the object to be achieved by the invention is to overcome the disadvantages in prior art as set forth above, that is, to produce a canned product in a simple way and at a low cost, the lid of which canned product is not liable to escape from the can, and the lid and the can per se have an anti-counterfeit function. The canned product according to the invention may include various products, and is especially a canned paint product.

According to the invention, the object described above is achieved by such a bulge

forming apparatus for producing a canned product, the canned product comprising a can having an mouth, a lid having an extension, and contents filled in the can, the lid being fitted in the mouth such that the extension forms a fit with a sidewall of the mouth to seal the can, wherein the bulge forming apparatus is configured to form at least one bulge on one of the extension of the lid and the sidewall of the mouth after the lid has been fitted in the mouth of the can, and while the lid is removed from the can, the convex surface of the at least one bulge is engaged with the other of the extension of the lid and the sidewall of the mouth in such a way that the extension and/or the sidewall is destroyed.

According to the invention, by making at least one bulge on the extension of the lid or the sidewall of the can using said bulge forming apparatus in a simple way and at a low cost, wherein the bulge being protruded to such an extent that it can be engaged with or even embedded into the mouth or extension during removal of the lid, a more reliable engagement between the lid and the mouth may be achieved, thereby increasing the fit force between the lid and the mouth and reducing the risk that the lid will escape from the can. Further, the sidewall of the mouth and/or the extension is destroyed after the lid is removed. As used herein, “destroyed” means a visible evidence (especially, scratch mark) is produced on the extension or the sidewall, and/or the bulges themselves are squashed, etc., due to the relatively high pressure caused by the fact that the convex surface of the bulge tightly abuts against and slides on the extension or the sidewall while the lid is removed from the can. The evidence of being “destroyed” may also include the damage to the edge of the lid due to an increased force applied by a tool for removing the lid, for example, caused by an increase of the fit force between the lid and the mouth. Thus, on the one hand, the unique bulges on the lid can serve as an anti-counterfeit appearance characteristic of the canned product of the invention. On the other hand, the destroyed can and lid cannot be reused by others any more, and even if they are reused for counterfeit product, it can be easily determined whether the lid has ever been removed from the can by checking and analyzing the “destroyed” evidence or scratch mark on the lid and the mouth after the lid is removed, thus serving for an anti-counterfeit purpose.

In a specific configuration, the bulge forming apparatus comprises: a driving means; a connecting mechanism operably coupled with the driving means in such a way that the driving means is able to drive the connecting mechanism; and an implementing mechanism having at least one bulge forming part, the implementing mechanism being operably engaged with the connecting mechanism in such a way that the movement of the connecting mechanism causes the movement of the implementing

mechanism, the movement of the implementing mechanism enabling the at least one bulge forming part to apply a force on parts of the surface of one of the extension of the lid and the sidewall of the mouth, such that the parts of the surface are protruded to form the at least one bulge. In such a manner, the bulge(s) may be formed in a simple, fast and low-cost way.

More specifically, the connecting mechanism may comprise a connecting rod having a vertical axis, an upper end of the connecting rod is operably coupled with the driving means so as to enable the connecting rod to move along a vertical direction, and a lower end of the connecting rod is operably engaged with the implementing mechanism.

Advantageously, the implementing mechanism may comprise at least one lever, an upper end of the at least one lever is engaged with the lower end of the connecting rod in such a way that the connecting rod is able to cause the movement of the at least one lever while the at least one bulge is formed, and the at least one bulge forming part is formed as a protrusion located on a lower end of the lever. In a preferred solution, the lower end of the connecting rod has a circumferential groove, which is engaged with the upper end of the at least one lever while the at least one bulge is formed.

According to another advantageous configuration, the bulge forming apparatus also comprises a seating which is placed on the top surface of the lid when the at least one bulge is formed, the seating is connected to the connecting rod via a connecting member, and the at least one lever is hinged to the seating so as to be able to pivot around the hinged point to form the at least one bulge.

Advantageously, the implementing mechanism may include a plurality of the levers, and on the lower end of each lever is formed one said protrusion. Preferably, the implementing mechanism may include at least five levers. In this configuration, a plurality of the bulges can be formed correspondingly, thereby the engagement force between the lid and the mouth during removal of the lid can be increased.

Advantageously, the plurality of the levers are evenly distributed along the circumference of the connecting rod. In doing so, the plurality of bulges formed are also evenly distributed along the circumference of the lid or the mouth, which therefore helps to evenly distribute the engagement force between the lid and the mouth along the circumference of the can.

Advantageously, the connecting rod is provided with a regulating means, which is able to adjust the engagement position of the upper end of the at least one lever and the lower end of the connecting rod. In a specific configuration, the connecting rod is provided with an external thread, and the regulating means is a screwing member which is engaged with the external thread in such a way as to be able to vertically move along the connecting rod by being screwed. The depth of the bulge can be adjusted by the regulating means.

Advantageously, the implementing mechanism may also comprise a limiting means for limiting the pivoting angle of the lever, which can prevent the lever from interfering with the extension of the lid due to over-pivoting of the lever when it returns to its original position after the bulge has been formed.

Advantageously, an elastic means is provided between the lower end of the connecting rod and the seating. This helps to slow down the downward movement of the connecting rod, so as to avoid excessive impact caused by over-fast pivoting of the lever while the bulge is formed.

Preferably, the driving means comprises a cylinder-piston assembly.

Advantageously, the force applying surface of the at least one bulge forming part is formed as a smooth surface without any sharp protrusion. This can prevent the protection film possibly existing on the convex surface from being damaged while the bulge is formed.

Correspondingly, the invention also provides a canned product produced by the bulge forming apparatus as described above, the canned product comprising a can having a mouth, a lid having an extension, and contents filled in the can, the lid being fitted in the mouth such that the extension forms a fit with a sidewall of the mouth to seal the can; it is characterized in that, one of the extension of the lid and the sidewall of the mouth has at least one bulge, and while the lid is removed from the can, the convex surface of the at least one bulge is engaged with the other of the extension of the lid and the sidewall of the mouth in such a way that the extension and/or the sidewall is destroyed.

The advantageous effects of the invention consist in producing a canned product by the bulge forming apparatus according to the invention in a simple way and at a low cost, the lid of which canned product is not liable to escape from the can and the lid

and the can per se have an anti-counterfeit function.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other features and advantages of the invention will be apparent from the following description of the embodiments thereof with reference to the drawings, wherein:

Fig. 1 shows an exploded sectional view of a can and a lid according to an embodiment of the invention, in a state before being fitted together;

Fig. 2 shows a sectional view of the can and the lid according to the embodiment of the invention in a fitted state, in which only the right half portion of the two half portions that are symmetric with respect to the central axis is shown;

Fig. 3 shows a bottom view of the lid in Fig. 2;

Fig. 4 shows a perspective view of the bulge forming apparatus according to an embodiment of the invention;

Figs. 5a-5c show a front view, a top view and a side view of the bulge forming apparatus according to the embodiment of the invention, respectively; and

Fig. 6 shows an enlarged half sectional view of the circled part A in Fig. 5c.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 shows an exploded view of a lid and a can of a canned product (for example, a canned paint product) according to an embodiment of the invention. In the embodiment, the lid is in a circular shape and the can is in a cylindrical shape. Fig. 1 is a sectional view taken along a plane that passes through the central axis of the lid and the can. It will be appreciated by a person skilled in the art that the lid and the cross section of the can are not limited to a circular shape, and may be any other proper shapes, such as square or rectangular shape, etc.. As shown in Fig. 1, a can body 14 of the can 1 (partially shown) has a mouth 13 that receives the paint and matches the lid. The mouth 13 may be a part formed integrally with the can body 14 of the can 1 by the same material (same metal, for example); however, it may also be a part that is separate from the can body 14 and fixedly disposed on the can body 14

by any proper means known in the art and formed of a same or different material from that of the can body 14. As an example, in the embodiment, as shown in Fig. 1, the mouth is formed by a separate collar 13, which is fixedly joined to the can body 14 at a top edge 15 thereof and made from a same or different metal material from that of the can body 14. It will be understood that, the can body 14 and the mouth 13 of the can 1, and the lid 2 may be respectively formed from any proper material depending on specific requirements regarding property and strength of the contents in the can, environmental protection, and costs, etc., without limitation to metal material. The mouth 13 has a sidewall 11, which takes a cylindrical shape with a generally vertical orientation in the embodiment. As shown in Figs. 1 and 3, in the embodiment, the lid 2 comprises a circular plate-like lid body 23 and an extension 21 extending generally vertically around the lid body 23. An annular groove 24 is defined between the extension 21 and the lid body 23. When the lid 2 and can 1 are fitted together, the extension 21 abuts against the sidewall 11 of the mouth 13 in such a way that the lid 2 properly seals the can 1.

According to the invention, when a canned paint product is to be produced, the can 1, lid 2 and paint are provided, and then the paint is filled in the can 1. Next, the lid 2 is fitted in the mouth 13 of the can 1, generally by being pressed into the mouth 13, such that the extension 21 of the lid 2 forms a relatively tight press-fit with the sidewall 11 of the mouth 13. However, a force produced by such a press-fit is generally not great enough, thus the lid tends to escape from the can when the canned product is subject to shake or tipped over. For this reason, after the lid 2 is fitted in the mouth 13 of the can 1, as shown in Figs. 2 and 3, at least one bulge 22 is made on the extension 21 of the lid 2 by the bulge forming apparatus according to the invention, a convex surface of which bulge is engaged with the sidewall 11 of the mouth 13, such that the extension 21 and/or the sidewall 11 will be destroyed while the lid 2 is removed from the can, that is, since the convex surface of the bulge 22 is engaged with the sidewall 11, it will tightly abut against and slide on the sidewall 11 while the lid 2 is removed from the can, thus a relatively high pressing force between the bulge and the sidewall will produce a visible evidence (scratch mark) on the sidewall 11, and at the same time the convex surface of the bulge 22 will also be destroyed (squashed and/or scratched, for example) due to the pressing force.

Thus, on the one hand, a more reliable engagement between the bulge 22 of the extension 21 and the sidewall 11 increases the fit force between the lid 2 and the mouth 13 of the can 1, thereby reducing the probability that the lid will escape from the can. On the other hand, it can be recognized whether or not the canned product is

counterfeit by checking whether any bulge 22 exists on the lid 2; in addition, since the sidewall 11 of the mouth 13 and the bulge 22 on the extension 21 have been destroyed after the lid is removed from the can, the can and the lid cannot be reused; or alternatively, it can be easily determined whether the lid has ever been removed from the can by checking if a visible evidence exists or not.

According to an advantageous configuration, as shown in Fig. 2, after the lid 2 has been fitted in the mouth of the can 1, bulges 22 are protruded by extending parts of the surface of the extension 21 of the lid 2 in the direction towards the sidewall 11 (the direction as indicated by the arrow E in Fig. 2). Here, the protrusion of the bulges 22 is accomplished by deforming the material in specific areas of the extension 21. Such a deformation by extending may be easily carried out by any proper tool or means, for example, by the bulge forming apparatus according to the invention, according to the specific configurations of the lid and the mouth of the can. One of members 6 for forming the bulges 22 of the bulge forming apparatus according to the invention is schematically shown in Fig. 2 (which will be explained thereafter in more detail).

In order to increase and evenly distribute the fit force between the lid 2 and the mouth 13, as shown in Fig. 3, five bulges 22 may be equidistantly formed along the circumference of the lid. However, the number and arrangement of the bulges 22 are not specifically limited, and may be arbitrarily varied as desired, such that it is possible to adjust the magnitude and distribution of the fit force between the lid and the can. Preferably, the five bulges 22 are substantially in the same plane. As shown in Fig. 2, in a preferable mode, the convex surface of the bulge 22 is formed as a smooth surface without any sharp protrusion, so as to prevent the protection film, possibly existing on the back side of the lid 2 and protecting the lid from corrosion by the paint, from being damaged when the bulges are formed.

Figs. 4-6 show a bulge forming apparatus 3 according to one embodiment of the invention. The bulge forming apparatus may be used to form the at least one bulge 22, for example, on the canned product shown in Figs. 1-3. The structure and the operation of the bulge forming apparatus 3 are described thereafter in detail.

The bulge forming apparatus 3 comprises a driving means, a connecting mechanism, and an implementing mechanism having at least one bulge forming part. In this embodiment, as shown in Figs. 4-5, the bulge forming apparatus 3 also comprises a frame, which includes a beam 7, a post 8 and a base 9, for supporting the driving

means, the connecting mechanism and the implementing mechanism. A support disc 10 is mounted on the base 9, and a can may be placed erectly on the support disc 10 and be accurately positioned by this support disc 10.

In this embodiment, the driving means comprises a cylinder-piston assembly 4, which is connected with a gas source (not shown) via pipelines also not shown. A pedal switch 31 is also connected with the gas source via pipelines not shown, and controls the operation of the cylinder-piston assembly.

In this embodiment, the connecting mechanism comprises a connecting rod 5 having a vertical axis, the upper end of the connecting rod is operably coupled with the piston rod of the cylinder-piston assembly 4, such that the cylinder-piston assembly 4 can drive the connecting rod 5 to move along a vertical direction. The lower end of the connecting rod 5 is operably engaged with the implementing mechanism, such that the movement of the connecting rod 5 can cause the movement of the implementing mechanism.

In this embodiment, the implementing mechanism comprises at least one lever 6. Especially as shown in detail in Fig. 6, the lower end of the lever 6 is formed with a protrusion 61, which functions as the bulge forming part of the implementing mechanism to form the bulge 22. In this embodiment, the bulge forming apparatus 3 also comprises a seating 32, which is placed on the top surface of the lid 2 when the bulge 22 is formed and the contour of which is matched with the shape of the lid 2 (also circular in this embodiment). As shown in Fig. 6, the seating 32 is connected to the lower end of the connecting rod 5 by a connecting member 33 (for example, a bolt), while a gap is kept between the seating 32 and the lower end of the connecting rod 5. In this embodiment, the lever 6 is hinged to the seating 32 at a hinged point 63, so as to be able to pivot around the hinged point 63. The lever 6 takes such a shape that flexes at the hinged point 63: when not operated, the upper end 62 of the lever 6 is leaned against the lower end of the connecting rod 5, and a portion of the lever 6, which is located below the hinged point 63 and formed with the protrusion 61, is generally vertically oriented. Here, the lower end of the connecting rod 5 has a circumferential groove 51, and while the bulge 22 is formed, the upper end 62 of the lever 6 is engaged in the circumferential groove 51, and thus the circumferential groove 51 can move along with the upper end 62.

In order to form a plurality of bulges 22 along the circumference of the lid 2, a plurality of (corresponding to the number of the bulges) levers 6 are provided along

the circumference of the seating 32. In this embodiment, five identical levers 6 are equidistantly provided along the circumference of the seating 32, in this way the protrusions 61 of the levers 6 can form five identical bulges 22 equidistantly spaced from each other.

The operation of the bulge forming apparatus 3 is described as follows:

First, the can 1 filled with contents (for example, paint) along with the lid 2 as shown in Figs. 1-3 is placed on the support disc 10 of the base 9 and positioned accurately, wherein the lid 2 has been fitted in the mouth 13 of the can 1 via press, such that a press fit is formed between the extension 21 of the lid 2 and the sidewall 11 of the mouth 13.

Then, the pedal switch 31 is actuated such that the cylinder-piston assembly 4 begins its working stroke. Specifically, the piston rod of the cylinder-piston assembly 4 moves downwards, and drives the connecting rod 5 operably coupled therewith to move downwards as well. The connecting rod 5 in turn drives the seating 32 and the levers 6 coupled therewith to move downwards, until the seating 32 contacts with and is supported on the top surface of the lid 2 which has been positioned beneath the seating 32. The sizes of the seating 32 and the levers 6 are designed in such a way that during this process, as shown in Fig. 2, each lever 6 of the bulge forming apparatus 3 can just be freely inserted into the annular groove 24 of the lid 2. It is also noted that, the height of the post 8 of the bulge forming apparatus 3, the length of the working stroke of the cylinder-piston assembly 4 and the length of the levers 6, etc. are designed depending on the height of the can, such that when the levers 6 extend into the annular groove 24 and the seating 32 contacts with the top surface of the lid, the protrusions 61 are located at a suitable vertical position for forming bulges 22, for example, located at approximately halfway of the height of the extension 21.

After the seating 32 is supported on the top surface of the lid 2, the working stroke of the cylinder-piston assembly 4 has not yet finished, and the piston rod drives the connecting rod 5 to keep on moving downwards, while at this time, the seating 32 and levers 6 do not move downwards any more. Thus, the gap between the lower end of the connecting rod 5 and the seating 32 will decrease. During this process, the upper ends 62 of the levers 6 will be engaged in the circumferential groove 51 of the lower end of the connecting rod 5, and the upper side face 52 of the circumferential groove 51 contacts with the upper ends 62 and pushes the upper ends 62 to move downwards. Thereby, a lever 6 pivot around the hinged point 63 in a clockwise direction shown in

Fig. 6 (see the arrow C in Fig. 6), such that the protrusion 61 on lower end of the lever 6 moves generally towards the left side in Fig. 6 (for all the levers disposed in the circumferential direction, they “extend” radially outwards), until it contacts with the extension 21 on the left side of the protrusion 61 and applies a force on this extension 21, thereby deforming the material in a specific area of the extension 21 to form a bulge 22 (see Fig. 2). Advantageously, the force applying surface of the protrusion 61 is formed as a smooth surface without any sharp protrusion, so as to enable the convex surface of the bulge 22 to be formed as a smooth surface without any sharp protrusion as well.

As the lower end of the connecting rod 5 keeps on moving downwards, the pivoting angle of the lever 6 increases, and the protrusion 61 keeps on moving leftwards, so that the depth of the bulge 22 formed on the extension 21 increases correspondingly. When the lower end of the connecting rod 5 contacts with the top surface of the seating 32, the working stroke of the cylinder-piston assembly 4 is completed, thus the connecting rod 5 does not move downwards any more, and the lever 6 also does not pivot any more. At this moment, the bulge 22 reaches its largest depth and takes the final shape thereof. Here, as shown in Fig. 6, an elastic means, such as a spring 34, may be provided between the lower end of the connecting rod 5 and the top surface of the seating 32, so as to achieve a buffering effect while the connecting rod 5 moves downwards and drives the levers 6 to pivot, and therefore avoid excessive impact on the extension 21 caused by over-fast pivoting of the levers 6, which would otherwise damage the quality of the formed bulges 22.

Here, the final depth of the formed bulges 22 may be adjusted by a regulating means provided on the connecting rod 5. The regulating means can adjust the engagement position of the upper ends 62 of the levers 6 and the lower end of the connecting rod 5. In this embodiment, as shown in Fig. 6, a screwing member 53 is provided on the lower end of the connecting rod 5. The screwing member 53 has an internal thread and is thread-engaged with the connecting rod 5 via an external thread provided on the lower end of the connecting rod 5. The screwing member 53 can move on the connecting rod 5 along the vertical direction by being screwed, thereby adjusting the vertical position of the lower side face 54 thereof. In the case where this regulating means is provided, the lower side face 54 of the screwing member 53 can serve as the upper side face 52 of the circumferential groove 51 of the connecting rod 5, so as to contact with the upper ends 62 of the levers 6 and push the upper ends 62 to move downwards while the bulges 22 are formed. The lower the vertical position of the lower side face 54 is adjusted, the earlier the connecting rod 5 will contact with the

upper ends 62 of the levers 6 and push the upper ends 62 when it moves downwards, and thus the earlier the levers 6 will pivot. Eventually, the pivoting angle of the levers 6 will be larger, and the bulges 22 may be formed deeper. On the contrary, the higher the vertical position of the lower side face 54 is adjusted, the smaller the depth of the bulges 22 will eventually be formed. After the vertical position of the screwing member 53 has been set, it can be fastened by a screw 55 (see Figs. 4 and 5a).

After each of the bulges 22 has been formed, the pedal switch 31 may be released, such that the cylinder-piston assembly 4 begins its return stroke. The piston rod drives the connecting rod 5 to move upwards, and the lower end of the connecting rod 5 in turn drives the upper end 62 of each lever 6 to move upwards, such that the levers 6 pivot back in an anti-clockwise direction in Fig. 6, thereby the protrusions 61 are disengaged from the bulges 22 having been formed on the extension 21. Here, in order to prevent the levers 6 from pivoting back by an excessive angle in the anti-clockwise direction and thus contacting with the sidewall of the annular groove 24, a limiting means can be provided on the seating 32 and above the levers 6, for example, a limiting screw 35 as shown in Figs. 4-6. As the protrusions 61 are disengaged from the bulges 22, the connecting rod 5 keeps on moving upwards, and simultaneously drives the seating 32 and the levers 6 to move together upwards via the connecting member 33, gradually bringing them away from the lid 2 and eventually back to the original position. Now, a canned product having bulge(s) formed between the can and the lid, which bulge(s) has an anti-counterfeit function and can prevent the lid from escaping from the can, has been completed.

When the extension 21 of the lid 2 is extended by the levers 6, advantageously, the depth of the bulges 22 may be adjusted by screwing the screwing member 53 to such an extent that the bulges 22, while being shaped per se, press the sidewall 11 which fits with the extension 21, so as to correspondingly form five concaves 12 on the sidewall 11. As shown in Fig. 2, respective bulges 22 and respective concaves 12 are engaged with each other by matching shapes, thereby the fit force between the lid and the mouth is further increased. However, the concaves 12 are not necessarily formed on the sidewall 11, and the technical effects of the invention may be achieved as long as the formed bulges can be engaged with the sidewall while the lid is removed from the can to such an extent that is enough to destroy the extension 21 and/or the sidewall 11.

In the above embodiment, the bulge forming apparatus 3 is configured to form the bulges 22 on the extension 21 of the lid 2. However, the invention is not limited to

this, and the bulges may also be formed on the sidewall of the mouth 13 to be engaged with the extension of the lid while the lid is removed, for example, this depending on the specific configurations of the lid and the mouth as well as the workability for forming the bulges. In this case, a person skilled in the art can correspondingly adjust the configurations of the connecting rod 5 and the levers 6 of the bulge forming apparatus 3.

In the above embodiment, after the lid has been fitted, the mouth 13 of the can 1 surrounds the extension 21 of the lid 2, such that the bulges 22 may be protruded by extending parts of the surface of the extension 21 of the lid 2 in the direction towards the sidewall 11 using the bulge forming apparatus 3. However, the invention is not limited to this, for example, in the case where the extension 21 of the lid surrounds the mouth 13, the bulges 22 may be protruded by drawing together parts of the surface of the extension 21 in the direction towards the sidewall 11, and herein the bulges 22 protrude towards the center of the lid. In this case, the bulge forming apparatus 3 can be designed such that the protrusion 61 of each lever 6 faces radially inward of the lid, and the working stroke of the cylinder-piston assembly 4 can drive the levers 6 and the protrusions 61 thereof to apply forces radially inwards to specific areas of the extension 21 of the lid.

In the above embodiment, a cylinder-piston assembly is employed as the driving means of the bulge forming apparatus 3. However, the invention is not limited to this, and any other appropriate driving means, for example, linear motor, etc., may be employed.

It will be understood that, the invention is not limited to the exemplary embodiment as described hereinabove and various modifications can be made by a person skilled in the art without departing from the scope and spirits of the invention.

CLAIMS

1. A bulge forming apparatus (3) for producing a canned product, the canned product comprising a can (1) having an mouth (13), a lid (2) having an extension (21), and contents filled in the can (1), the lid (2) being fitted in the mouth (13) such that the extension (21) forms a fit with a sidewall (11) of the mouth to seal the can (1),

wherein the bulge forming apparatus (3) is configured to form at least one bulge (22) on one of the extension (21) of the lid and the sidewall (11) of the mouth after the lid (2) has been fitted in the mouth (13) of the can, and while the lid (2) is removed from the can, the convex surface of the at least one bulge (22) is engaged with the other of the extension (21) of the lid and the sidewall (11) of the mouth in such a way that the extension (21) and/or the sidewall (11) is destroyed.

2. The bulge forming apparatus according to claim 1, comprising:

a driving means;

a connecting mechanism operably coupled with the driving means in such a way that the driving means is able to drive the connecting mechanism; and

an implementing mechanism having at least one bulge forming part, the implementing mechanism being operably engaged with the connecting mechanism in such a way that the movement of the connecting mechanism causes the movement of the implementing mechanism, the movement of the implementing mechanism enabling the at least one bulge forming part to apply a force on parts of the surface of one of the extension (21) of the lid and the sidewall (11) of the mouth, such that the parts of the surface are protruded to form the at least one bulge (22).

3. The bulge forming apparatus according to claim 2, wherein the connecting mechanism comprises a connecting rod (5) having a vertical axis, an upper end of the connecting rod being operably coupled with the driving means so as to enable the connecting rod to move along a vertical direction, and a lower end of the connecting rod being operably engaged with the implementing mechanism.

4. The bulge forming apparatus according to claim 3, wherein the implementing mechanism comprises at least one lever (6), an upper end (62) of the at least one lever being engaged with the lower end of the connecting rod (5) in such a way that the connecting rod is able to cause the movement of the at least one lever while the at least one bulge (22) is formed, and the at least one bulge forming part being formed as a protrusion (61) located on a lower end of the lever.

5. The bulge forming apparatus according to claim 4, wherein the lower end of the connecting rod (5) has a circumferential groove (51), which is engaged with the upper end of the at least one lever while the at least one bulge is formed.
6. The bulge forming apparatus according to claim 4, further comprising a seating (32) which is placed on the top surface of the lid (2) when the at least one bulge is formed, the seating being connected to the connecting rod via a connecting member (33), and the at least one lever being hinged to the seating so as to be able to pivot around the hinged point (63) to form the at least one bulge.
7. The bulge forming apparatus according to any one of claims 4 to 6, wherein the implementing mechanism comprises a plurality of the levers (6), and on the lower end of each lever is formed one said protrusion (61).
8. The bulge forming apparatus according to claim 7, wherein the implementing mechanism comprises at least five levers (6).
9. The bulge forming apparatus according to claim 7, wherein the plurality of the levers (6) are evenly distributed along the circumference of the connecting rod (5).
10. The bulge forming apparatus according to any one of claims 4 to 6, wherein the connecting rod (5) is provided with a regulating means, which is able to adjust the engagement position of the upper end of the at least one lever and the lower end of the connecting rod.
11. The bulge forming apparatus according to claim 10, wherein the connecting rod (5) is provided with an external thread, and the regulating means is a screwing member (53) which is engaged with the external thread in such a way as to be able to vertically move along the connecting rod by being screwed.
12. The bulge forming apparatus according to claim 6, wherein the implementing mechanism further comprises a limiting means (35) for limiting the pivoting angle of the lever.
13. The bulge forming apparatus according to claim 6, wherein an elastic means (34) is provided between the lower end of the connecting rod and the seating (32).
14. The bulge forming apparatus according to any one of claims 2 to 6, wherein the

driving means comprises a cylinder-piston assembly (4).

15. The bulge forming apparatus according to any one of claims 2 to 6, wherein the force applying surface of the at least one bulge forming part is formed as a smooth surface without any sharp protrusion.

16. The bulge forming apparatus according to any one of claims 1 to 6, wherein the mouth (13) comprises a collar that is fixedly disposed on the can body of the can (1).

17. The bulge forming apparatus according to any one of claims 1 to 6, wherein the contents are paint.

18. A canned product produced by the bulge forming apparatus according to any one of claims 1 to 17, the canned product comprising a can (1) having a mouth (13), a lid (2) having an extension (21), and contents filled in the can (1), the lid (2) being fitted in the mouth (13) such that the extension (21) forms a fit with a sidewall (11) of the mouth to seal the can (1), characterized in that,

one of the extension (21) of the lid and the sidewall (11) of the mouth has at least one bulge (22), and while the lid (2) is removed from the can, the convex surface of the at least one bulge (22) is engaged with the other of the extension (21) of the lid and the sidewall (11) of the mouth in such a way that the extension (21) and/or the sidewall (11) is destroyed.

1/8

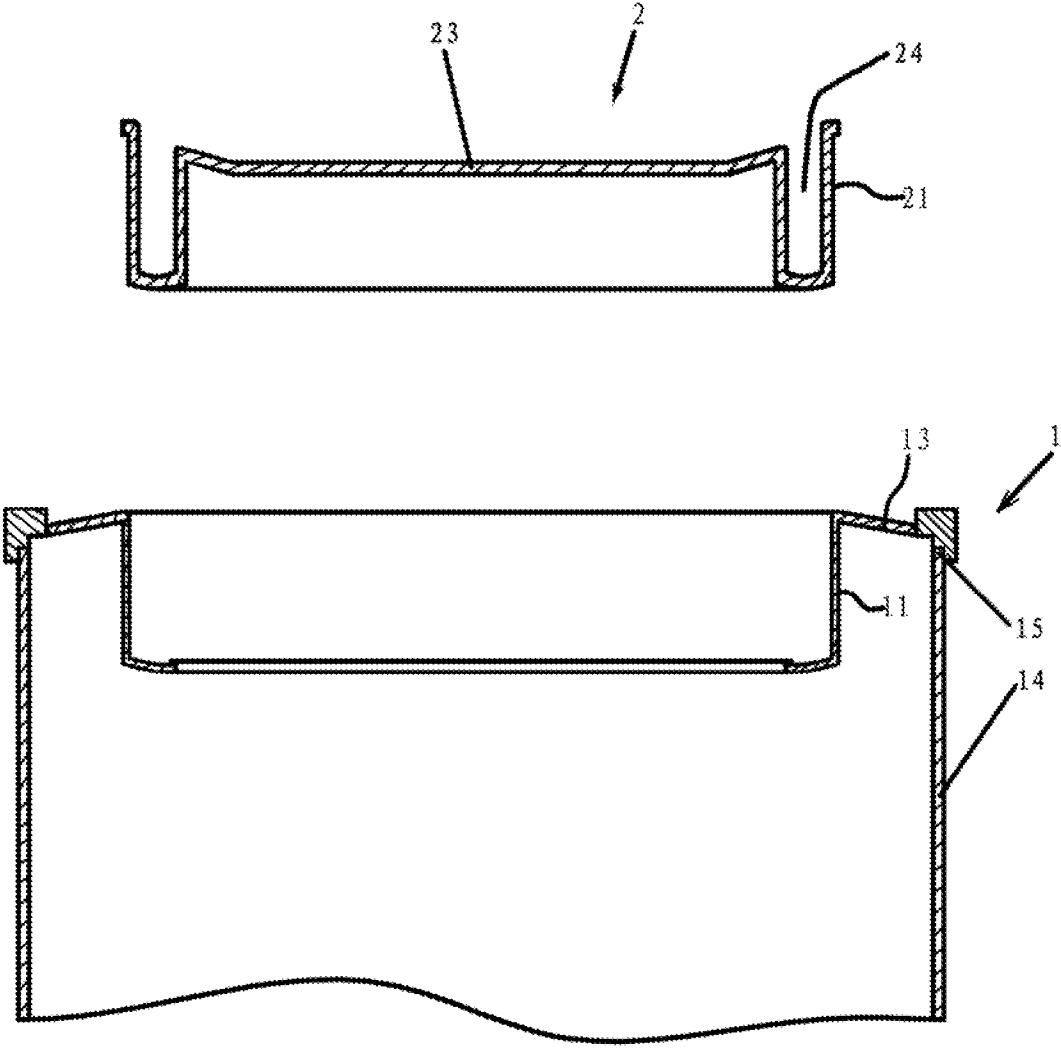


Fig. 1

2/8

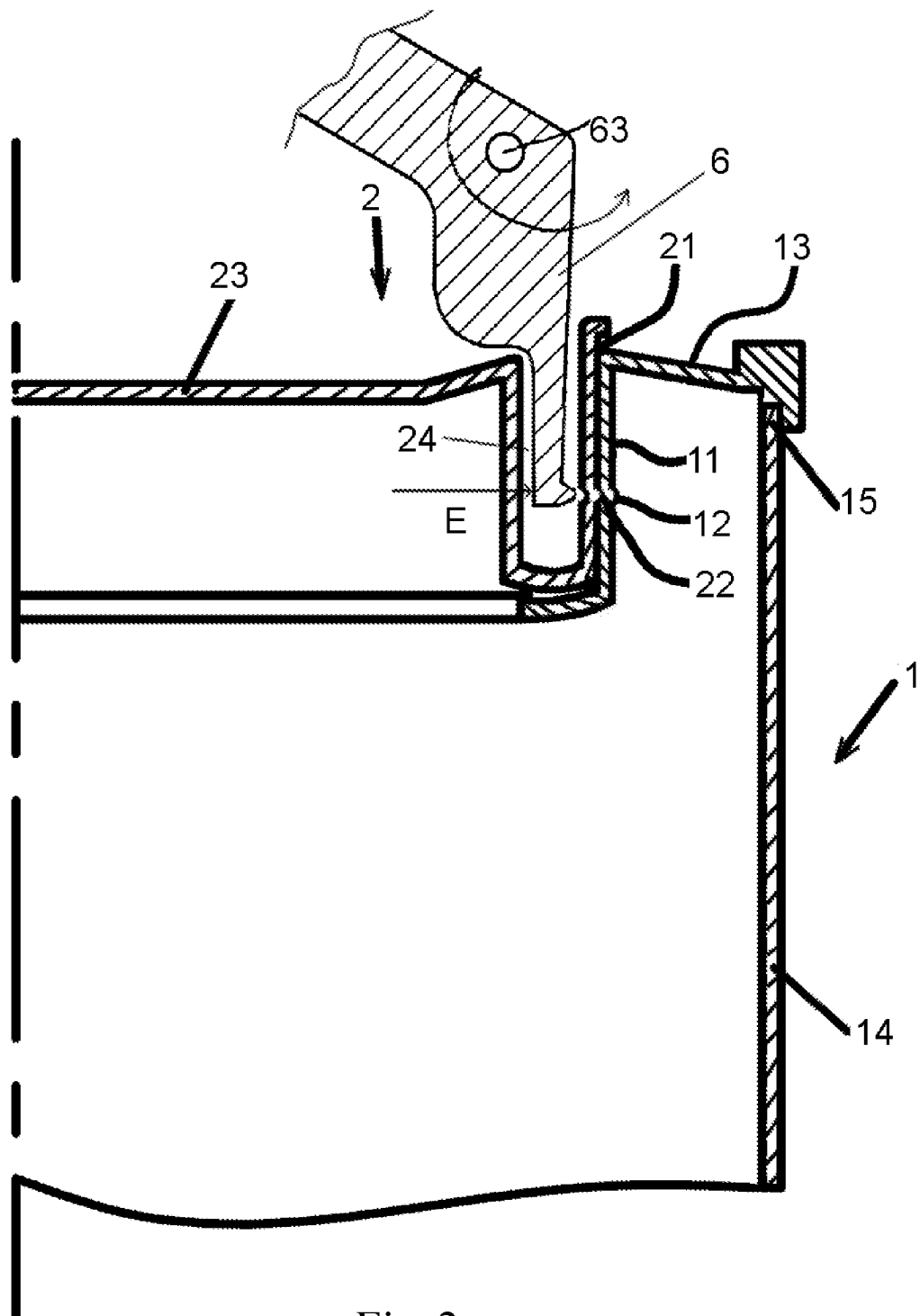


Fig. 2

3/8

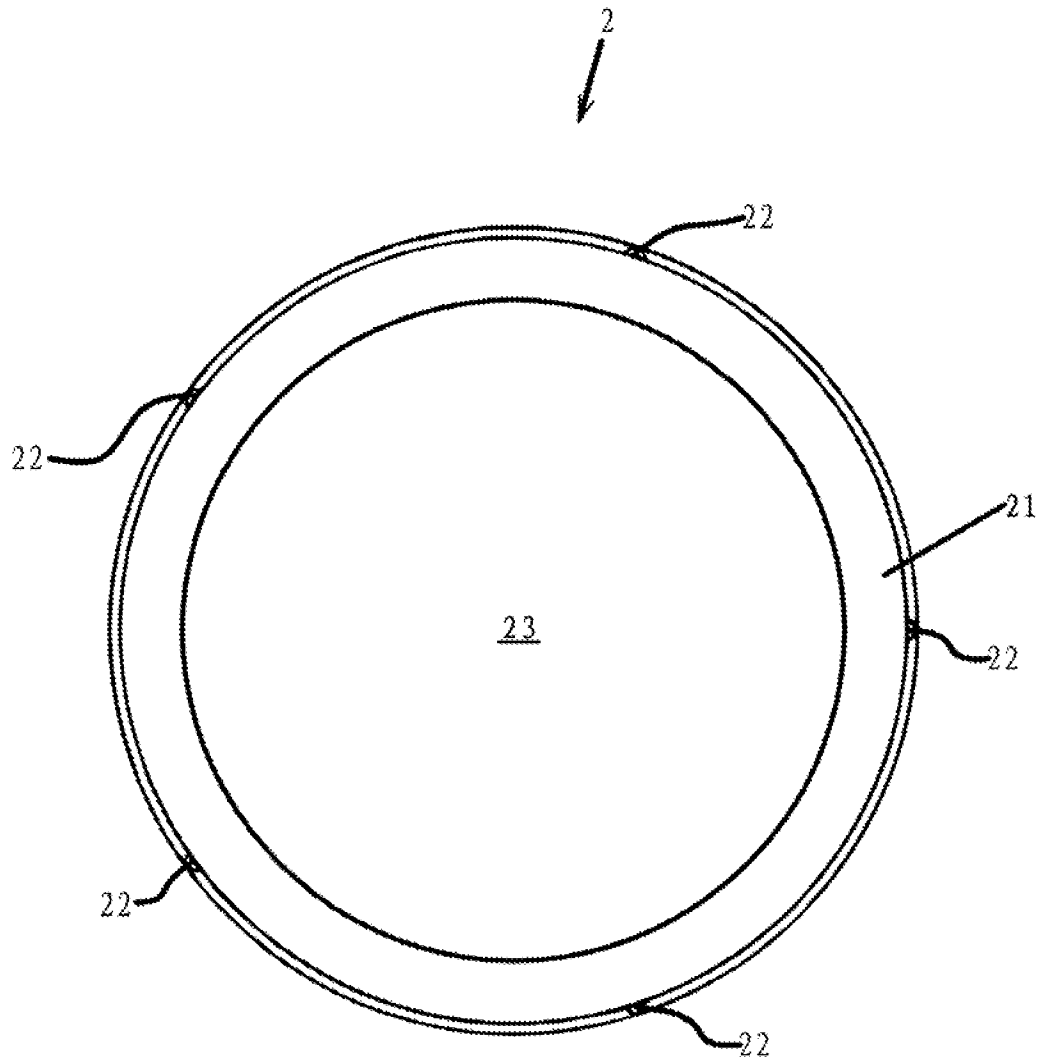


Fig. 3

4/8

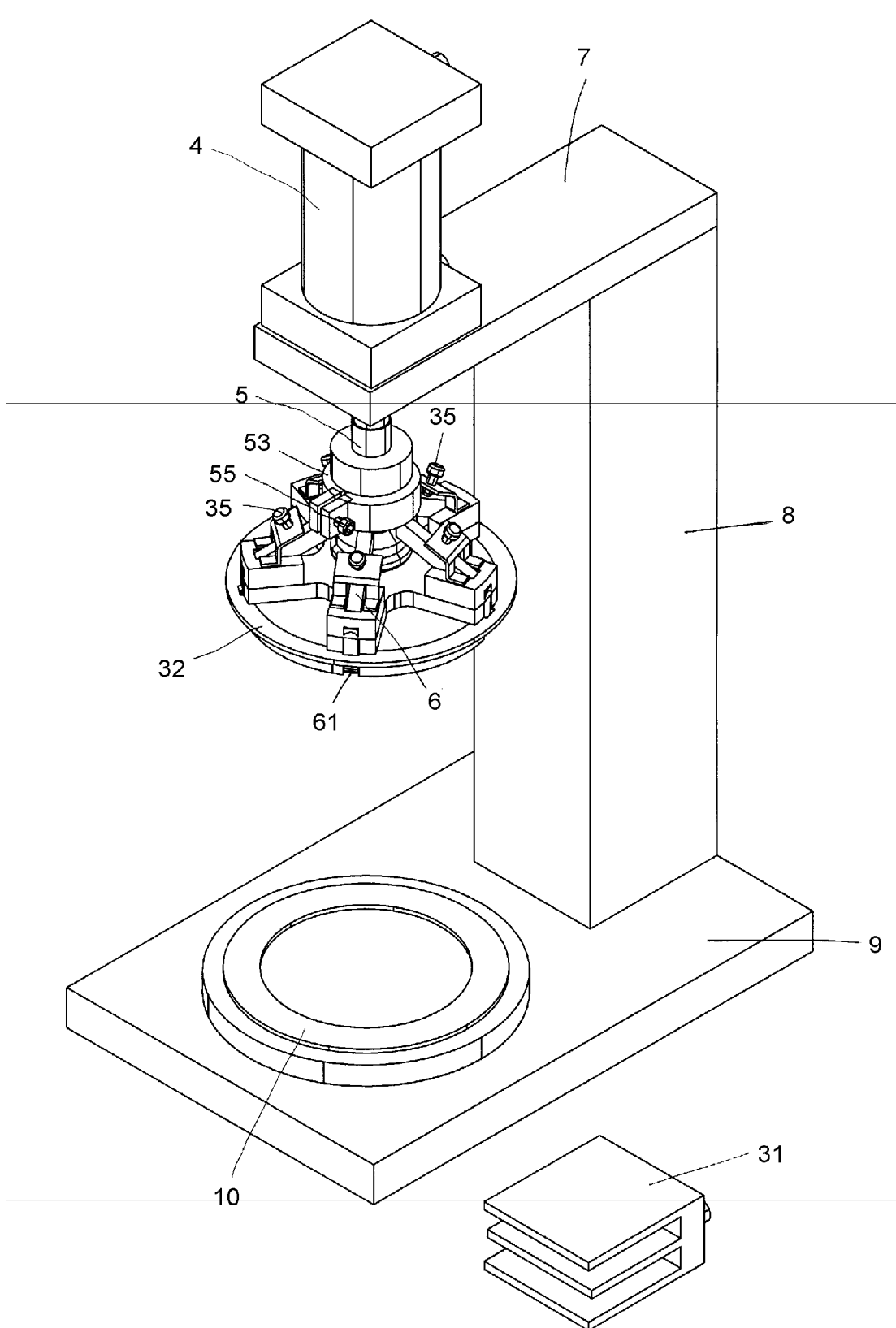
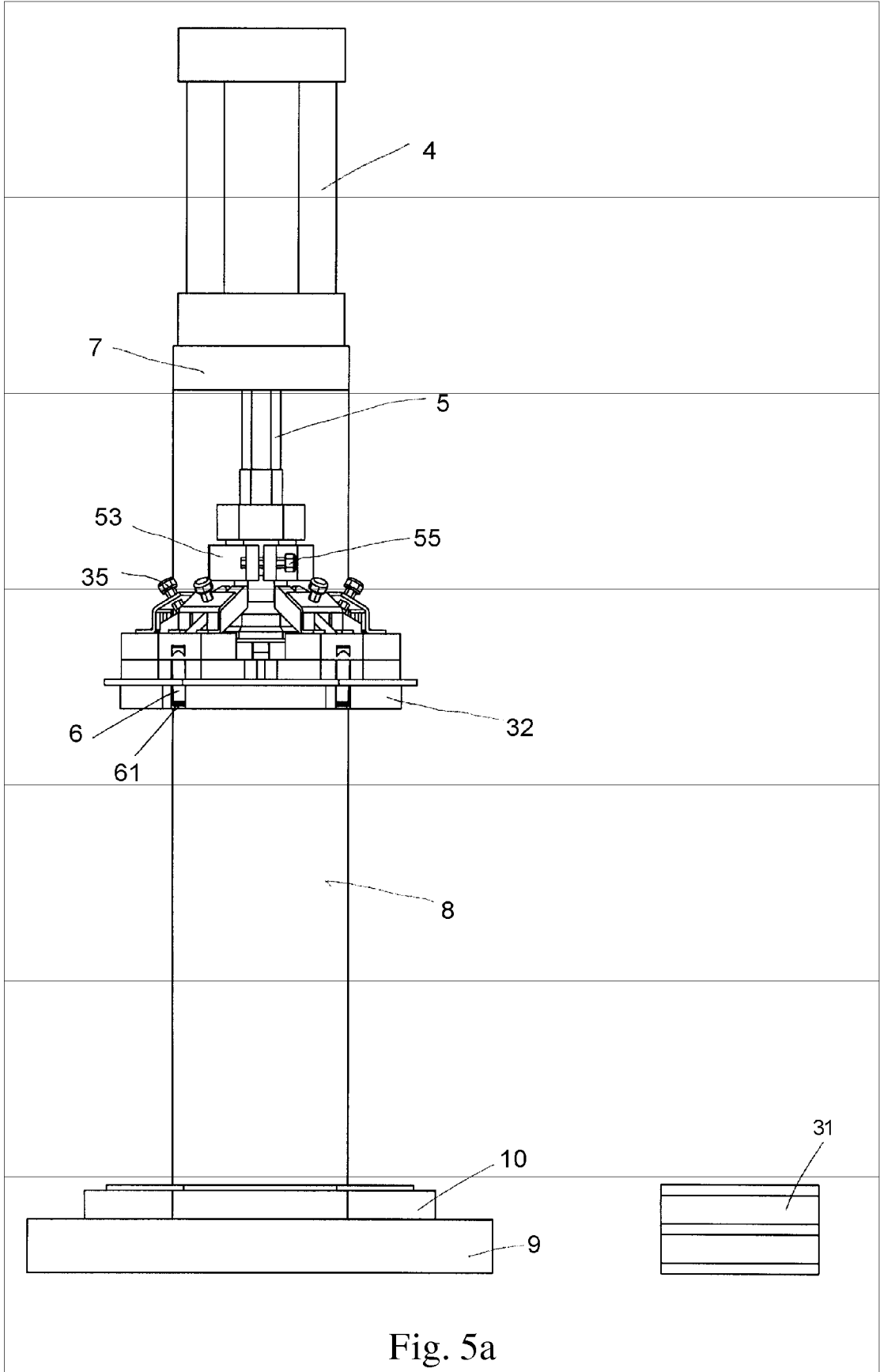


Fig. 4

5/8



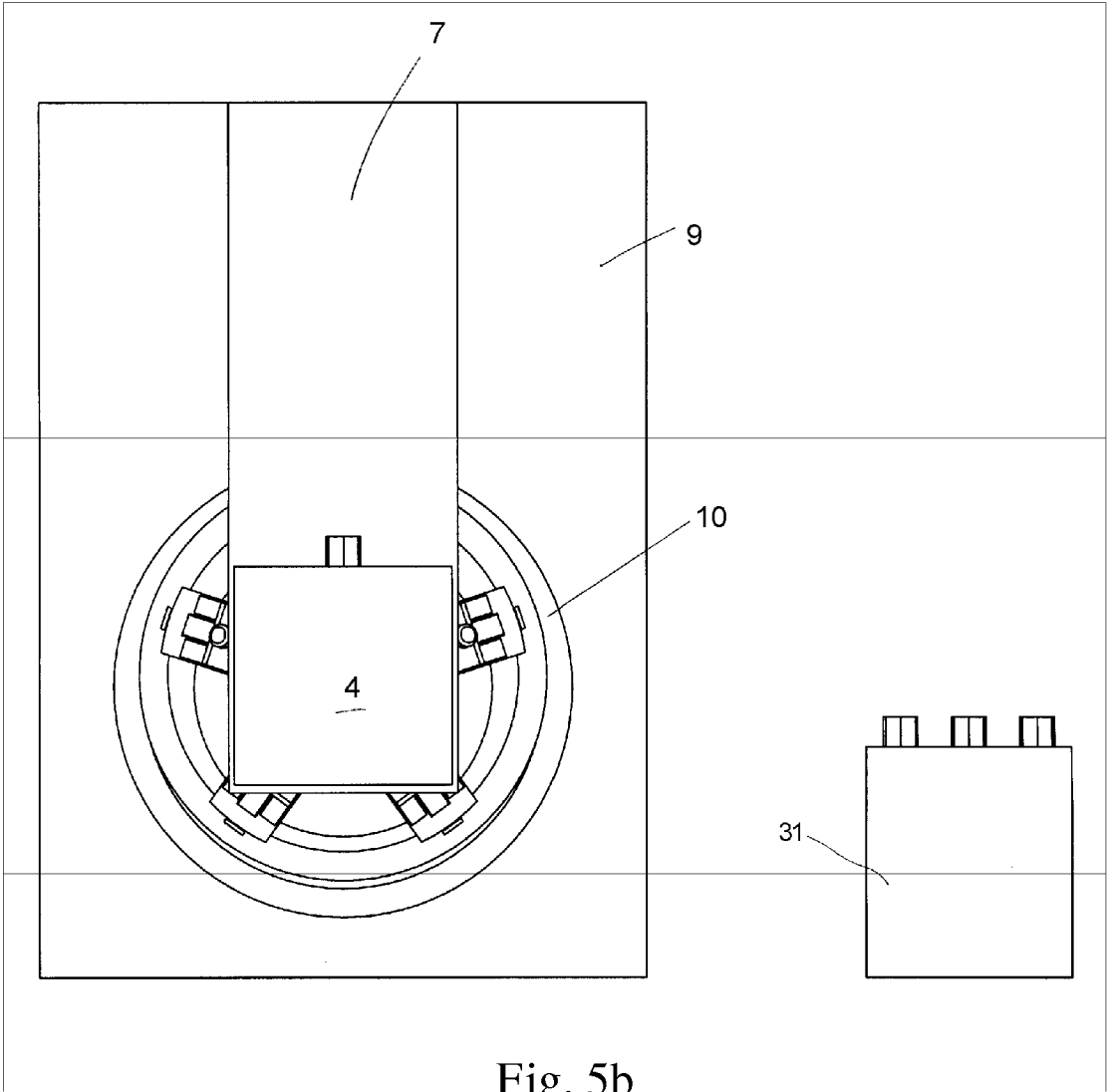


Fig. 5b

7/8

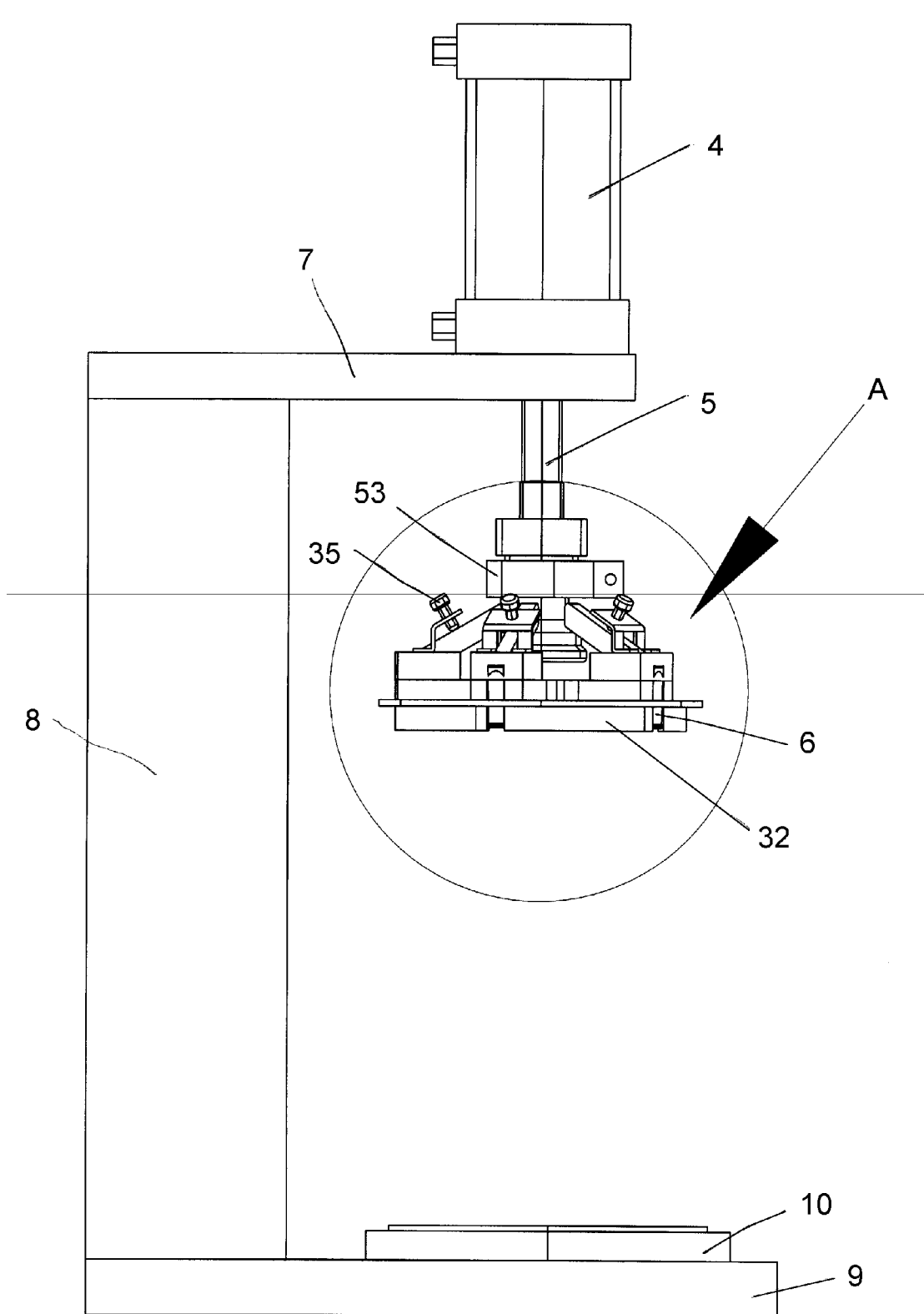


Fig. 5c

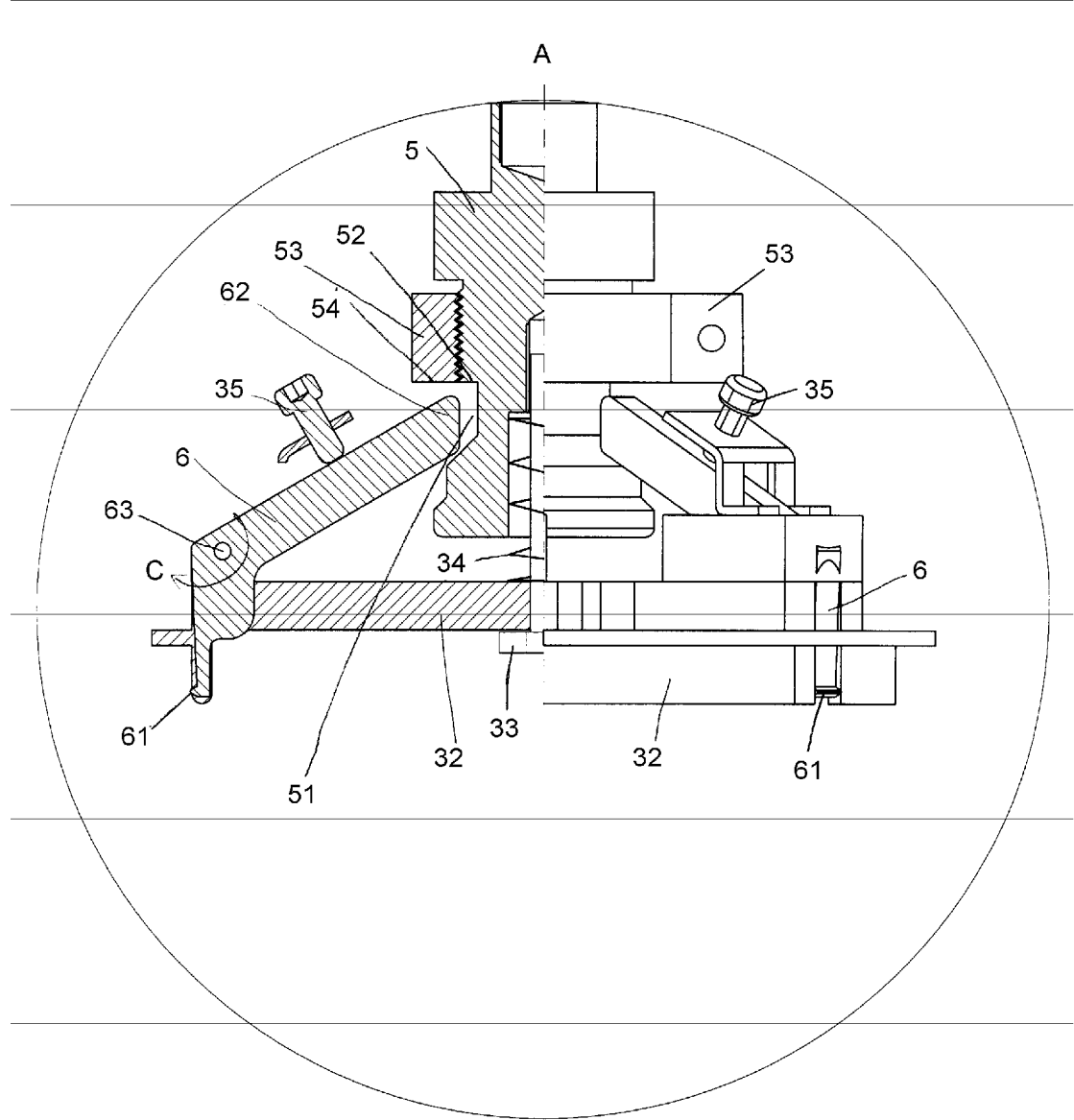


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2010/078551

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B65G, B21D, F16H, B30B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI,EPODOC,CNPAT,CNKI: can, tin, jar, pot, kettle, barrel, canister, mouth, opening, lid, cap, cover, casing, extension, sidewall, bulge, projection, abutment, convex, heave, protuberance, punch, die, rod, lever

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	CN201603790U(AKZONOBEL CHEM CO LT) 13 Oct.2010(13.10.2010) See claims 1-18	1-18
X	GB363401A(MANDER BROTHERS LTD et al.) 18 Dec.1931(18.12.1931) See description lines 63-101, figures 1-3	1,14-18
Y		2-4
Y	CN101130284A(MURATA MACHINERY LTD) 27 Feb.2008(27.02.2008) See description page 7, lines 2-8, figures 1-3	2-4
A	WO2006050592A2(BRASILATA EMBALAGENS METALICAS et al.) 18 May 2006 (18.05.2006) See the whole document	1-18
A	EP0186979A2(MARDON ILLINGWORTH)09 Jul.1986(09.07.1986) See the whole document	1-18
A	GB461522A(NAAMLLOOZE VENNOOTSCHAP VAN LEE) 18 Feb.1937(18.02.1937) See the whole document	1-18

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
“A” document defining the general state of the art which is not considered to be of particular relevance	“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
“E” earlier application or patent but published on or after the international filing date	“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
“L” document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)	“&” document member of the same patent family
“O” document referring to an oral disclosure, use, exhibition or other means	
“P” document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 14 Jan.2011(14.01.2011)	Date of mailing of the international search report 10 Feb. 2011 (10.02.2011)
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer LI, Xiaoli Telephone No. (86-10)62085373

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2010/078551

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN201603790U	13.10.2010	None	
GB363401A	18.12.1931	None	
CN101130284A	27.02.2008	US2008041244A	21.02.2008
		KR20090017233A	26.02.2008
		EP1892084A	27.02.2008
		JP2008043933A	28.02.2008
WO2006050592A2	18.05.2006	UY29205A	30.12.2005
		CA2585867A	18.05.2006
		WO2006050592A	18.05.2006
		AU2005304301A	18.05.2006
		BRPI0504528 AC	19.12.2006
		AR052230A	07.03.2007
		MX2007005721A	09.07.2007
		EP1809547A	25.07.2007
		KR20070083999A	24.08.2007
		CN101107177A	16.01.2008
		JP2008519737T	12.06.2008
		US2009134160A	28.05.2009
		RU2391274C	10.06.2010
EP0186979A2	09.07.1986	DK563885A	20.06.1986
		AU5120485A	26.06.1986
		GB2168960A	02.07.1986
		EP0186979A	09.07.1986
		JP61152562A	11.07.1986
		US4606474A	19.08.1986
GB461522A	18.02.1937	None	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2010/078551

Continuation of the second sheet A:

CLASSIFICATION OF SUBJECT MATTER:

B65D43/02 (2006.01) i

B65D49/12 (2006.01) i

B30B 1/00 (2006.01) i