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(54) **Tool box**

(57) A toolbox includes a metal upper casing, a metal lower casing including a first lateral side pivotally connected to a first lateral side of the metal upper casing and a second lateral side releasably engaged with a second lateral side of the metal upper casing, and four end closures made of plastic material and attached to the ends of the metal upper casing and the ends of the metal lower casing, respectively. Each of the ends of the metal upper casing and the metal upper casing and the metal lower casing has a plurality of engaging holes.

Each end closure includes a mediate portion, two lateral walls, and an end wall. A plurality of stops are extended from the end wall to form a gap between each stop and the mediate portion and the lateral walls of the end closure, the gap being sized to fittingly receive an associated end of one of the metal upper casing and the metal lower casing. Each of the mediate portion and the lateral walls of the end closure includes an inner side with a plurality of retainers formed thereon. Each retainer is securely engaged with an associated engaging hole.

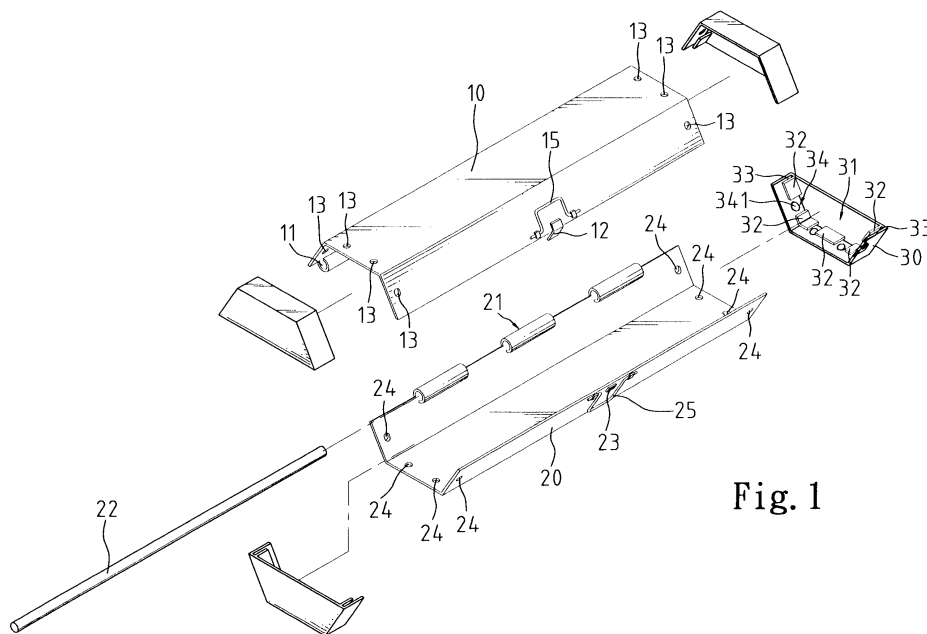


Fig. 1

Description

Background of the Invention

1. Field of the Invention

[0001] The present invention relates to a toolbox that includes metal casings and plastic end closures.

2. Description of the Related Art

[0002] A typical toolbox is made of either plastic material or metal. Plastic toolbox is inexpensive since it is formed by injection molding, yet the resultant product looks cheap. In addition, the plastic toolbox tends to deform and thus cannot be opened if there are too many tools in the toolbox. In some cases, upper casing and lower casing of the plastic box disengage from each other and thus causes a mass as a result of falling of the tools out of the toolbox. Therefore, professional users do not use plastic toolbox. Although not having the above-mentioned drawbacks of the plastic toolbox, a metal toolbox is expensive and not easy to produce, as bending a sheet of metal into the form of a casing is required. In addition, noise occurs during closing of the metal toolbox.

[0003] The present invention is intended to provide a buckle device that mitigates and/or obviate the above problems.

Summary of the Invention

[0004] It is a primary object of the present invention to provide an improved toolbox that includes a metal upper casing, a metal lower casing, and four plastic end closures for two ends of each of the upper casing and the lower casing. Thus, troublesome formation of end portions of each casing is not necessary. In addition, the upper casing and the lower casing may have any desired length. The plastic end closures can be assembled easily and rapidly to both ends of each casing.

[0005] A toolbox in accordance with the present invention comprises:

- a metal upper casing including a first lateral side, a second lateral side, and two ends;
- a metal lower casing including a first lateral side pivotally connected to the first lateral side of the metal upper casing and a second lateral side releasably engaged with the second lateral side of the metal upper casing, the metal lower casing further including two ends; and
- four end closures made of plastic material, said end closures being attached to the ends of the metal upper casing and the ends of the metal lower casing, respectively.

[0006] Each of the ends of the metal upper casing and

the metal upper casing and the metal lower casing has a plurality of engaging holes. Each end closure includes a mediate portion, two lateral walls, and an end wall. A plurality of stops are extended from the end wall to form a gap between each stop and the mediate portion and the lateral walls of the end closure, the gap being sized to fittingly receive an associated end of one of the metal upper casing and the metal lower casing. Each of the mediate portion and the lateral walls of the end closure includes an inner side with a plurality of retainers formed thereon. Each retainer is securely engaged with an associated engaging hole.

[0007] In an embodiment of the invention, the retainer is in the form of a knurl with an inclined surface, the knurl being fittingly received in the associated engaging hole.

[0008] In a first modified embodiment of the invention, the retainer is in the form of a stub that extends beyond the associated engaging hole, and a screw is engaged in a hole defined in the stub.

[0009] In a second modified embodiment of the invention, the retainer is in the form of a stub that extends beyond the associated engaging hole, the stub including an annular groove in an outer periphery thereof for receiving a C-clip to thereby retain the stub in place.

[0010] In a third modified embodiment of the invention, the retainer is in the form of a stub that is received in the engaging hole, the stub including a stepped hole with a relatively larger portion. A plastic rivet includes a stem extended through the stepped hole of the stub with an enlarged head of the stem retained in the relatively larger portion of the stepped hole.

[0011] In a fourth modified embodiment of the invention, each of the ends of the metal upper casing and the metal upper casing and the metal lower casing has a plurality of engaging holes. Each stop is treated with high-frequency heating in an area that covers the associated engaging hole such that the area covering the engaging hole is melt and thus flows into the engaging hole, thereby forming a solid engagement after hardening.

[0012] In a fifth modified embodiment of the invention, the retainer is in the form of a stub that extends beyond the associated engaging hole, the stub being treated with high-frequency heating such that an end portion of the stub melts and thus forms an enlarged head above the engaging hole after hardening, thereby forming a solid engagement.

[0013] Other objects, advantages, and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

[0014] Fig. 1 is an exploded perspective view of a toolbox in accordance with the present invention.

[0015] Fig. 2 is a perspective view of the toolbox in accordance with the present invention.

[0016] Fig. 3 is an enlarged partial perspective view illustrating engagement between an end closure and a lower casing of the toolbox in accordance with the present invention.

[0017] Fig. 3A is a schematic partial sectional view illustrating engagement between the end closure and the lower casing of the toolbox.

[0018] Fig. 4 is a sectional view similar to Fig. 3A, illustrating a first modified embodiment of a retainer of the end closure.

[0019] Fig. 5 is a sectional view similar to Fig. 3A, illustrating a second modified embodiment of the retainer of the end closure.

[0020] Fig. 6 is a sectional view similar to Fig. 3A, illustrating a third modified embodiment of the retainer of the end closure.

[0021] Figs. 7A and 7B illustrate formation of a fourth modified embodiment of the retainer of the end closure.

[0022] Figs. 8A and 8B illustrate formation of a fifth modified embodiment of the retainer of the end closure.

Detailed Description of the Preferred Embodiments

[0023] Referring to Fig. 1 and 2, a toolbox in accordance with the present invention generally includes an upper casing 10 that is substantially U-shape and made of metal. One of two lateral sides of the upper casing 10 includes a number of pivotal sections 11 and the other lateral side of the upper casing 10 includes an engaging member 12 and a handle 15. In addition, each end of the upper casing 10 includes a number of engaging holes 13, which will be described later. It is appreciated that the upper casing 10 includes two open ends and thus can be easily formed.

[0024] The toolbox further includes a lower casing 20 that is substantially U-shape and made of metal. One of two lateral sides of the lower casing 20 includes a number of pivotal sections 21 for pivotal connection with the pivotal sections 11 of the upper casing 10. The other lateral side of the lower casing 20 includes an engaging member 23 (e.g., in the form of a hole) for releasable engagement with the engaging member 12 of the upper casing 10. The lower casing 20 further includes a handle 25 to allow convenient carriage. In addition, each end of the lower casing 20 includes a number of engaging holes 24, which will be described later. It is appreciated that each casing 10, 20 includes two open ends and thus can be easily formed.

[0025] Referring to Figs. 1 and 3, each end of each casing 10, 20 is enclosed by an end closure 30 attached thereto. The end closure 30 is substantially U-shape and made of plastic material and includes a mediate portion 36 (Fig. 3), two lateral walls 35, and an end wall 31, thereby defining an opening (not labeled) facing the associated end of the associated casing 10, 20. A number of stops 32 extends from the end wall 31 and thus form a gap 33 between the each stop 32 and associated mediate portion 35 and lateral walls 36. The gap 33 is sized

to fittingly receive an associated end of the associated casing 10, 20 when the end closure 30 is attached to the associated end of the associated casing 10, 20. One of the stops 32 may be provided in a corner area of the end wall 31. In addition, the inner side of each of the mediate portion 36 and the lateral walls 35 of the end closure 30 includes at least one retainer 34 for engaging with an associated engaging hole 13 or 24. Thus, a toolbox in accordance with the present invention is reduced in the manufacture cost, and the noise generated during closing of the upper casing 10 is also reduced.

[0026] Referring to Figs. 3 and 3A, in this embodiment, the retainer 34 is in the form of a knurl with an inclined surface. The knurl 341 is fittingly received in the associated engaging hole 24 to thereby securely engage the end closure 30 with the lower casing 20 (or the upper casing 10).

[0027] Referring to Fig. 4, in a first modified embodiment of the retainer, the retainer is in the form of a stub 35 that extends beyond the engaging hole 24. A washer 353 is mounted around the stub 35 and a screw 351 is engaged in a hole 352 defined in the stub 35.

[0028] Referring to Fig. 5, in a second modified embodiment of the retainer, the retainer is in the form of a stub 36 that extends beyond the engaging hole 24. The stub 36 may have a dome in a distal end thereof. The stub 36 includes an annular groove 362 in an outer periphery thereof for receiving a C-clip 361.

[0029] Referring to Fig. 6, in a third modified embodiment of the retainer, the retainer is in the form of a stub 37 that is received in the engaging hole 24. A plastic rivet 371 includes a stem 373 extended through a stepped hole 372 defined in the stub 37 with an enlarged head 374 retained in the relatively larger portion (not labeled) of the stepped hole 372.

[0030] Figs. 7A and 7B illustrate formation of a fourth modified embodiment of the retainer. In this embodiment, the stop (now designated by 38) covers the engaging hole 24 of the casing 20. High-frequency heating is applied to the stop 38 in an area that covers the engaging hole 24 (Fig. 7A) such that the area covering the engaging hole 24 is melt and thus flows into the engaging hole 24 (Fig. 7B), thereby forming a solid engagement after hardening.

[0031] Figs. 8A and 8B illustrate formation of a fifth modified embodiment of the retainer. In this embodiment, the retainer is in the form of a stub 38 that extends beyond the engaging hole 24 of the casing 20. High-frequency heating is applied to the stub 39 (Fig. 8A) such that an end portion of the stub 39 melts and thus forms an enlarged head above the engaging hole 24 after hardening (Fig. 8B), thereby forming a solid engagement.

[0032] According to the above description, it is appreciated that the toolbox in accordance with the present is solid (metal casings 10 and 20) and less expensive (end closures 30 are made of plastic material), and the noise generated during closing of the upper casing 10 is also

reduced. Manufacture of the metal casings 10 and 20 are simple and easy, and assembly of the enclosures 30 to the casings 10 and 20 are also simple and easy. The resultant product provides an aesthetically pleasing effect to attract the customers. In addition, the metal casings 10 and 20 may have any desired length, while the end closures 30 may be attached to metal casings 10 and 20 of any length.

[0033] Although the invention has been explained in relation to its preferred embodiment, it is to be understood that many other possible modifications and variations can be made without departing from the spirit and scope of the invention as hereinafter claimed.

Claims

1. A toolbox comprising:
 - a metal upper casing including a first lateral side, a second lateral side, and two ends;
 - a metal lower casing including a first lateral side pivotally connected to the first lateral side of the metal upper casing and a second lateral side releasably engaged with the second lateral side of the metal upper casing, the metal lower casing further including two ends; and
 - four end closures made of plastic material, said end closures being attached to the ends of the metal upper casing and the ends of the metal lower casing, respectively.
2. The toolbox as claimed in claim 1, wherein each of the ends of the metal upper casing and the metal upper casing and the metal lower casing has a plurality of engaging holes, each said end closure including a mediate portion, two lateral walls, and an end wall, a plurality of stops being extended from the end wall to form a gap between each said stop and said mediate portion and said lateral walls of the end closure, the gap being sized to fittingly receive an associated said end of one of the metal upper casing and the metal lower casing, each of the mediate portion and the lateral walls of the end closure including an inner side with a plurality of retainers formed thereon, each said retainer being securely engaged with an associated said engaging hole.
3. The toolbox as claimed in claim 2, wherein the retainer is in the form of a knurl with an inclined surface, the knurl being fittingly received in the associated engaging hole.
4. The toolbox as claimed in claim 2, wherein the retainer is in the form of a stub that extends beyond the associated engaging hole, the stub including a hole defined therein, further comprising a screw engaged in the hole defined in the stub.
5. The toolbox as claimed in claim 2, wherein the retainer is in the form of a stub that extends beyond the associated engaging hole, the stub including an annular groove in an outer periphery thereof for receiving a C-clip to thereby retain the stub in place.
6. The toolbox as claimed in claim 2, wherein the retainer is in the form of a stub that is received in the engaging hole, the stub including a stepped hole with a relatively larger portion, further comprising a plastic rivet including a stem extended through the stepped hole of the stub with an enlarged head of the stem retained in the relatively larger portion of the stepped hole.
7. The toolbox as claimed in claim 1, wherein each of the ends of the metal upper casing and the metal upper casing and the metal lower casing has a plurality of engaging holes, and wherein each said stop covers the associated engaging hole, the stop being treated with high-frequency heating in an area that covers the associated engaging hole such that the area covering the engaging hole is melt and thus flows into the engaging hole, thereby forming a solid engagement after hardening.
8. The toolbox as claimed in claim 2, wherein the retainer is in the form of a stub that extends beyond the associated engaging hole, the stub being treated with high-frequency heating such that an end portion of the stub melts and thus forms an enlarged head above the engaging hole after hardening, thereby forming a solid engagement.

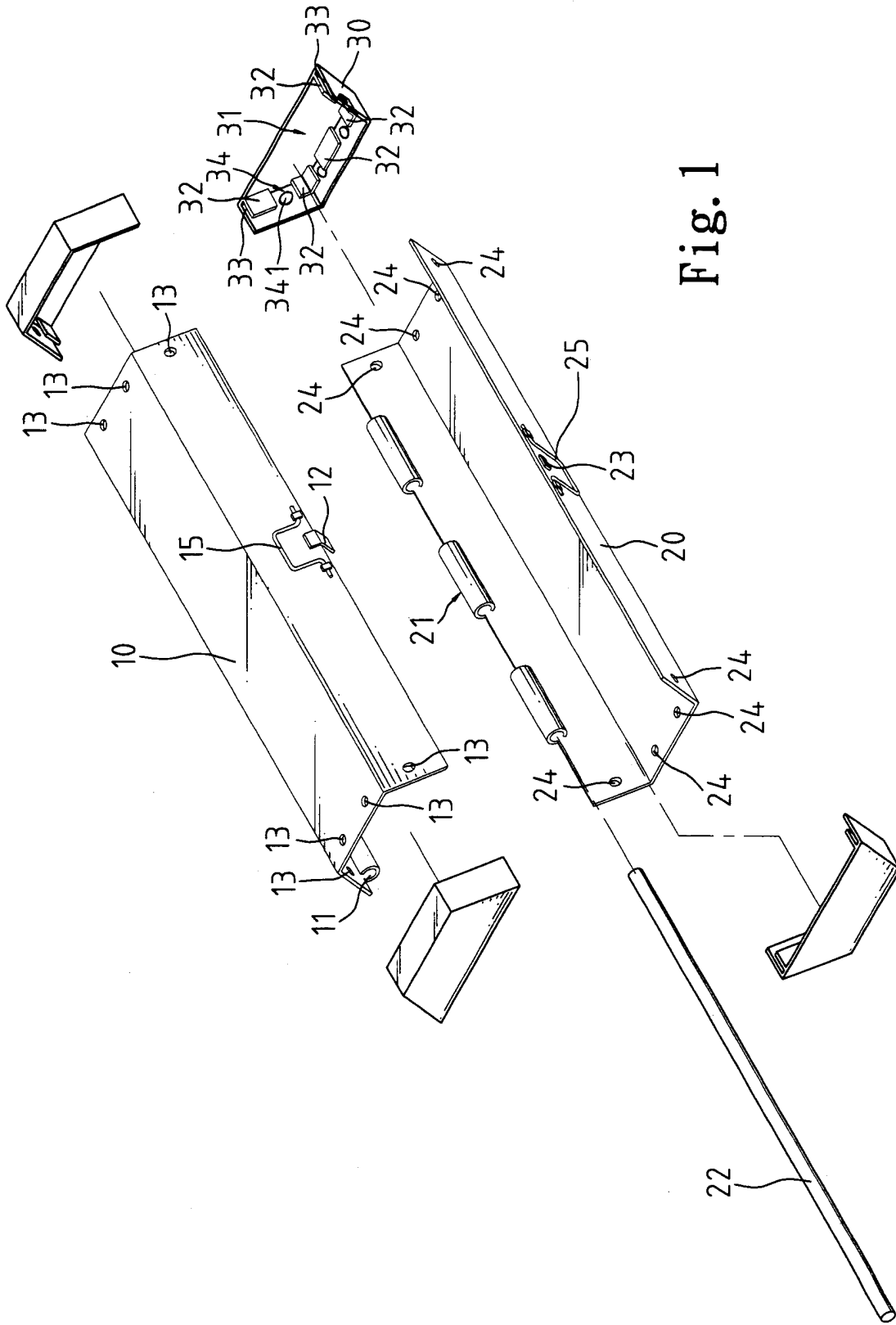


Fig. 1

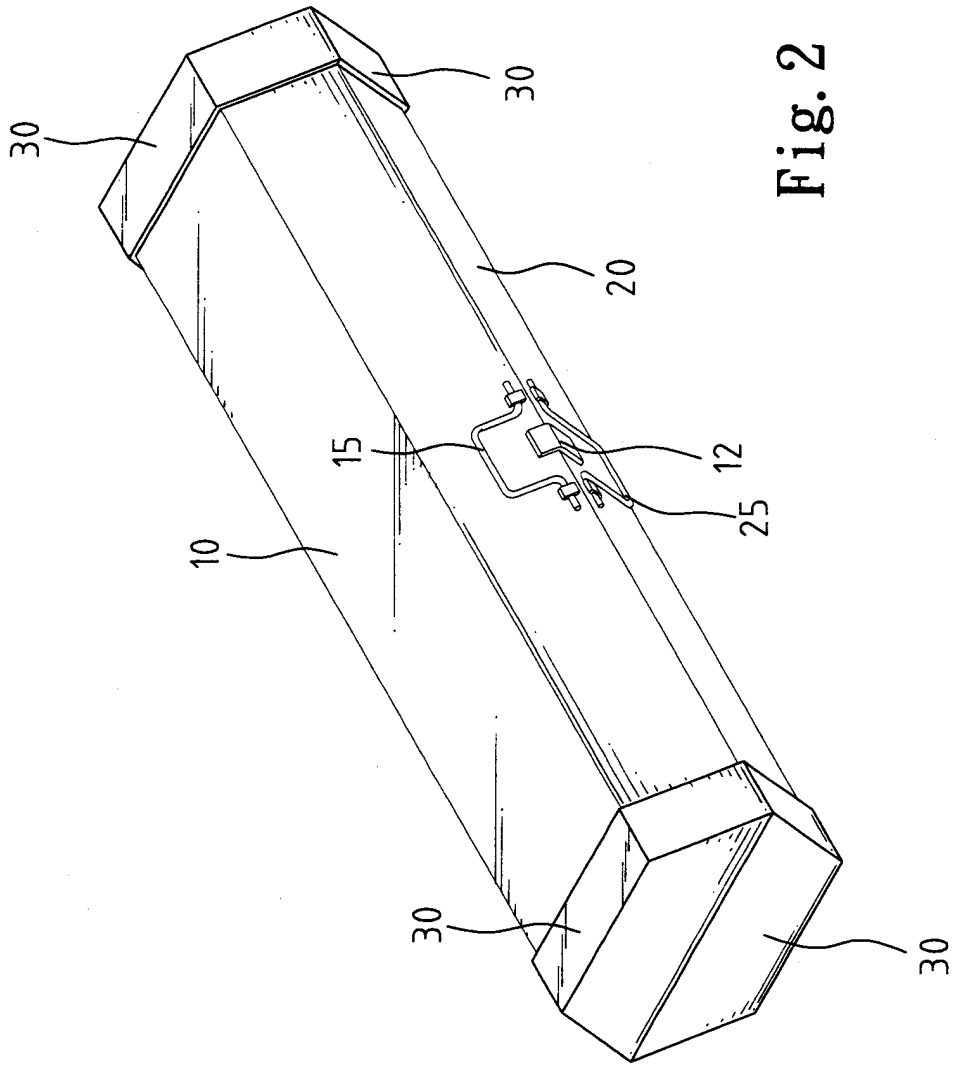


Fig. 2

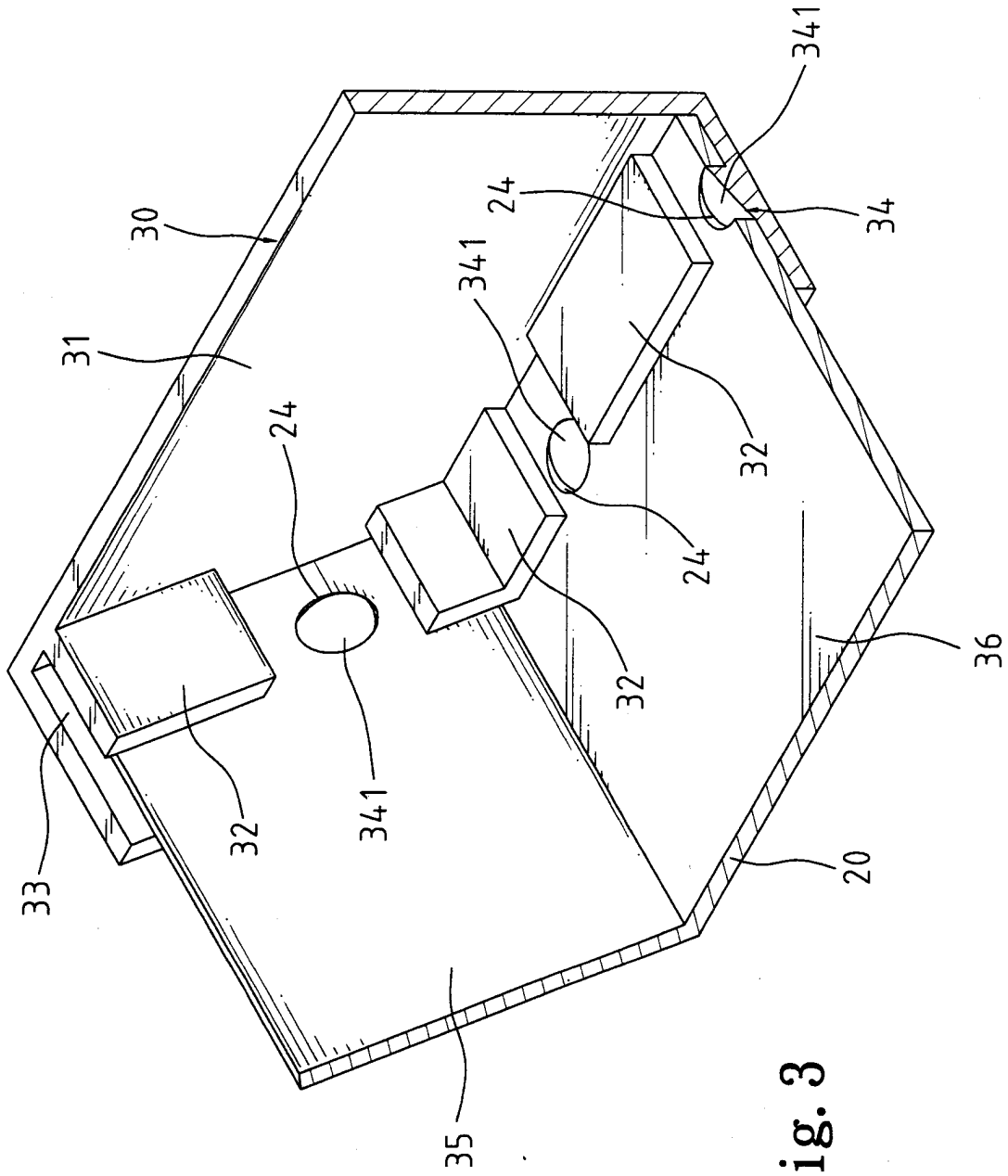


Fig. 3

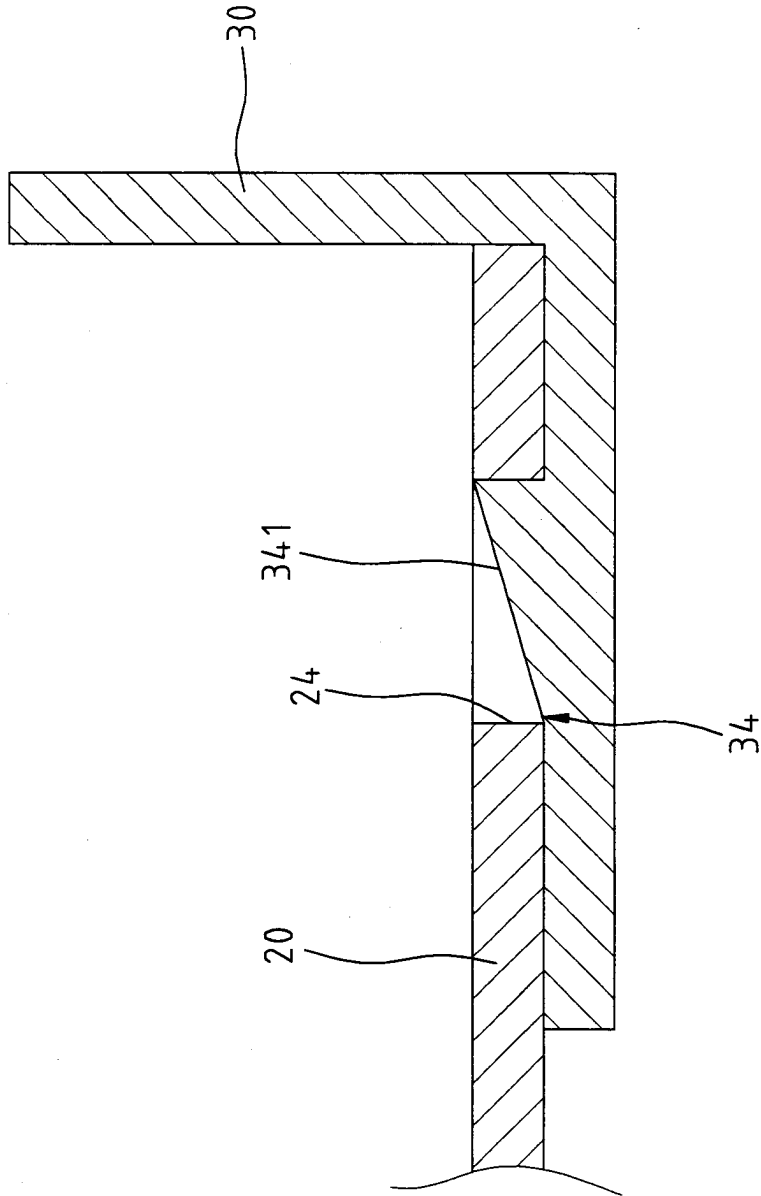


Fig. 3A

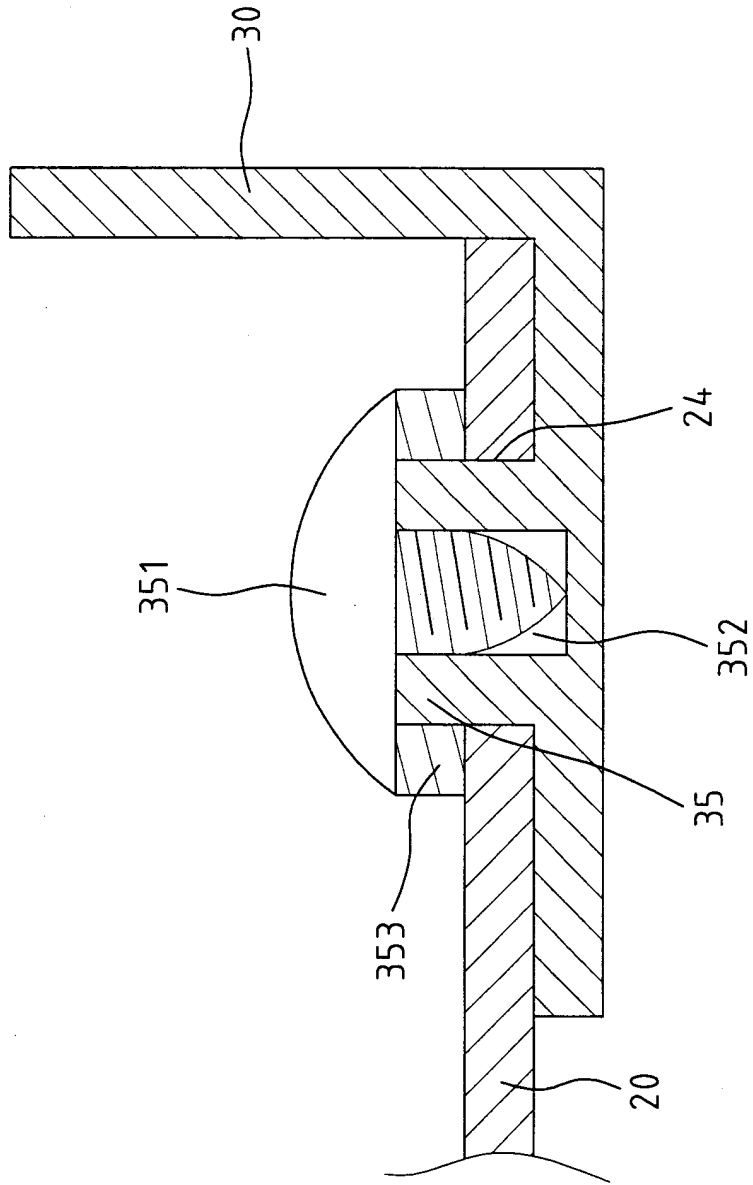


Fig. 4

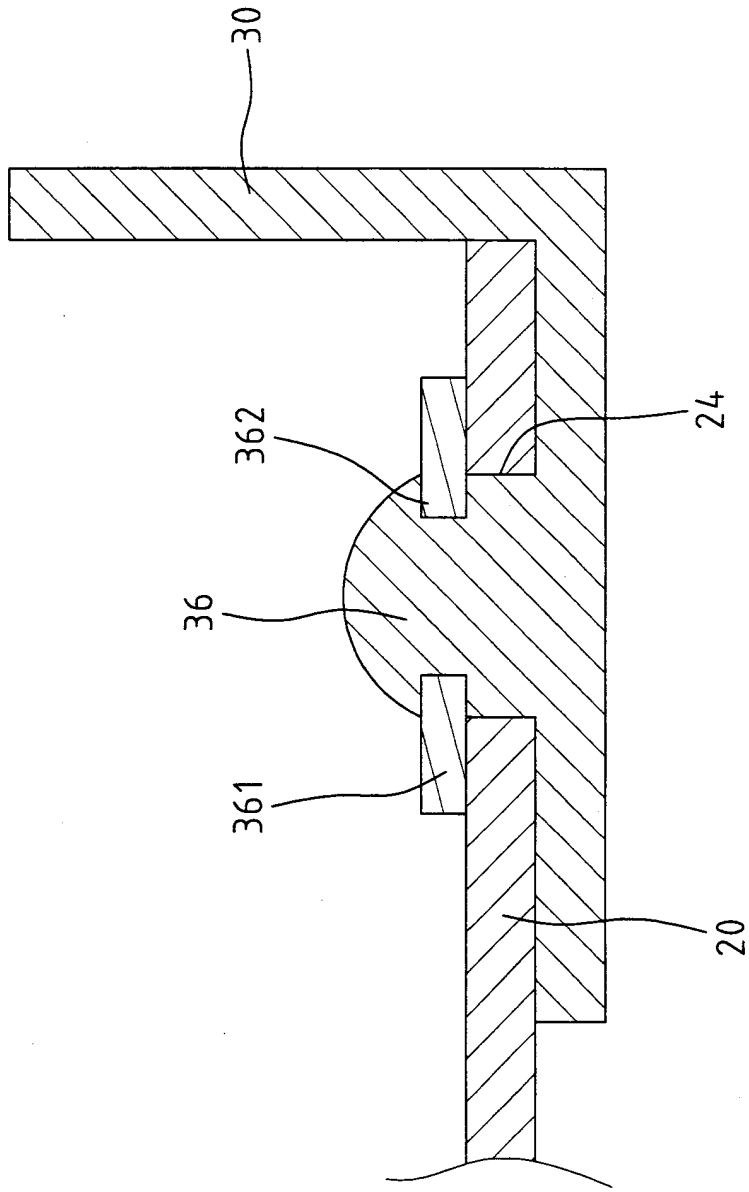


Fig. 5

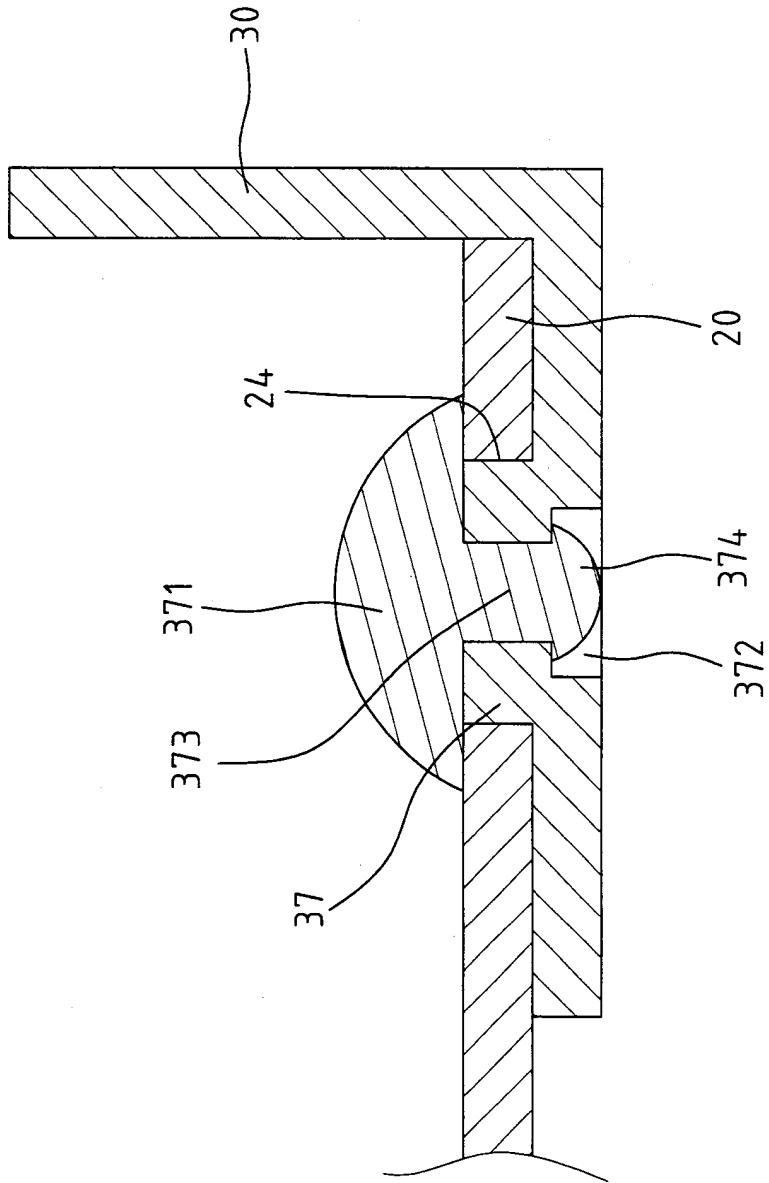


Fig. 6

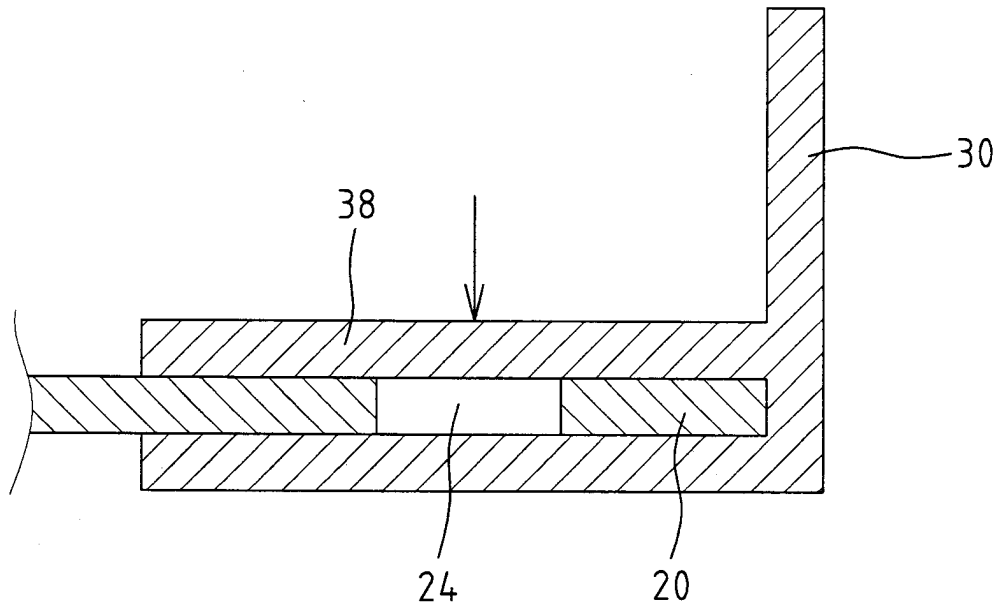


Fig. 7A

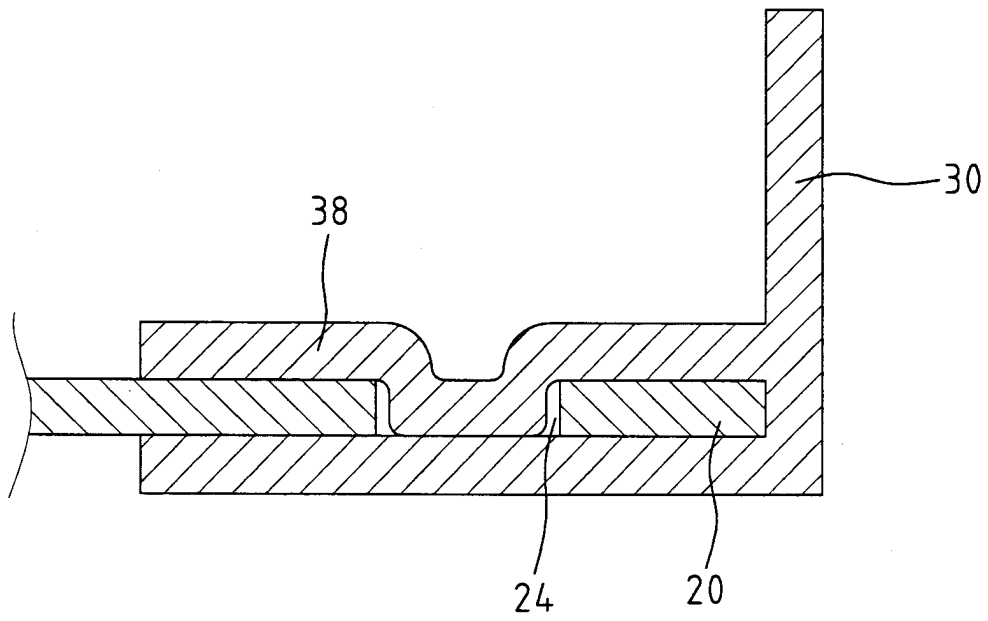


Fig. 7B

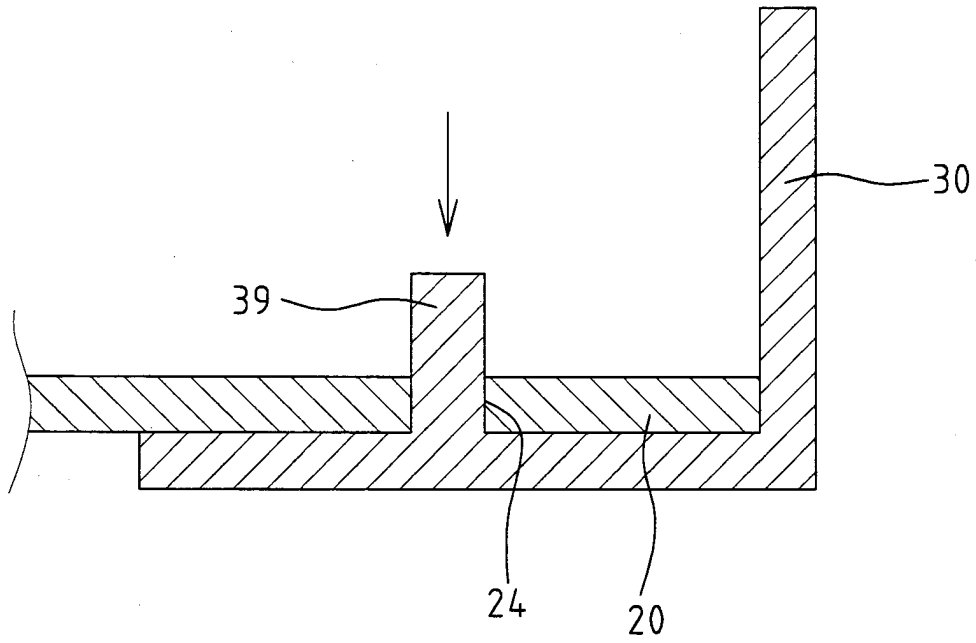


Fig. 8A

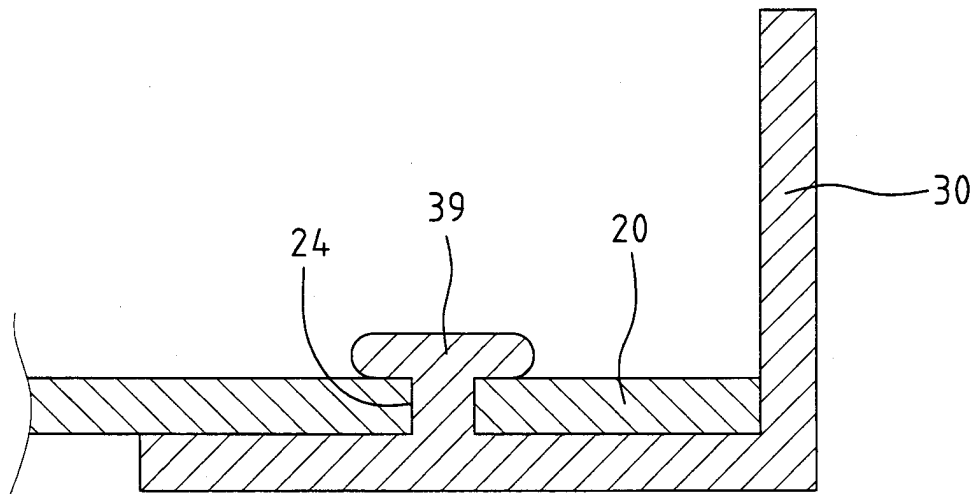


Fig. 8B