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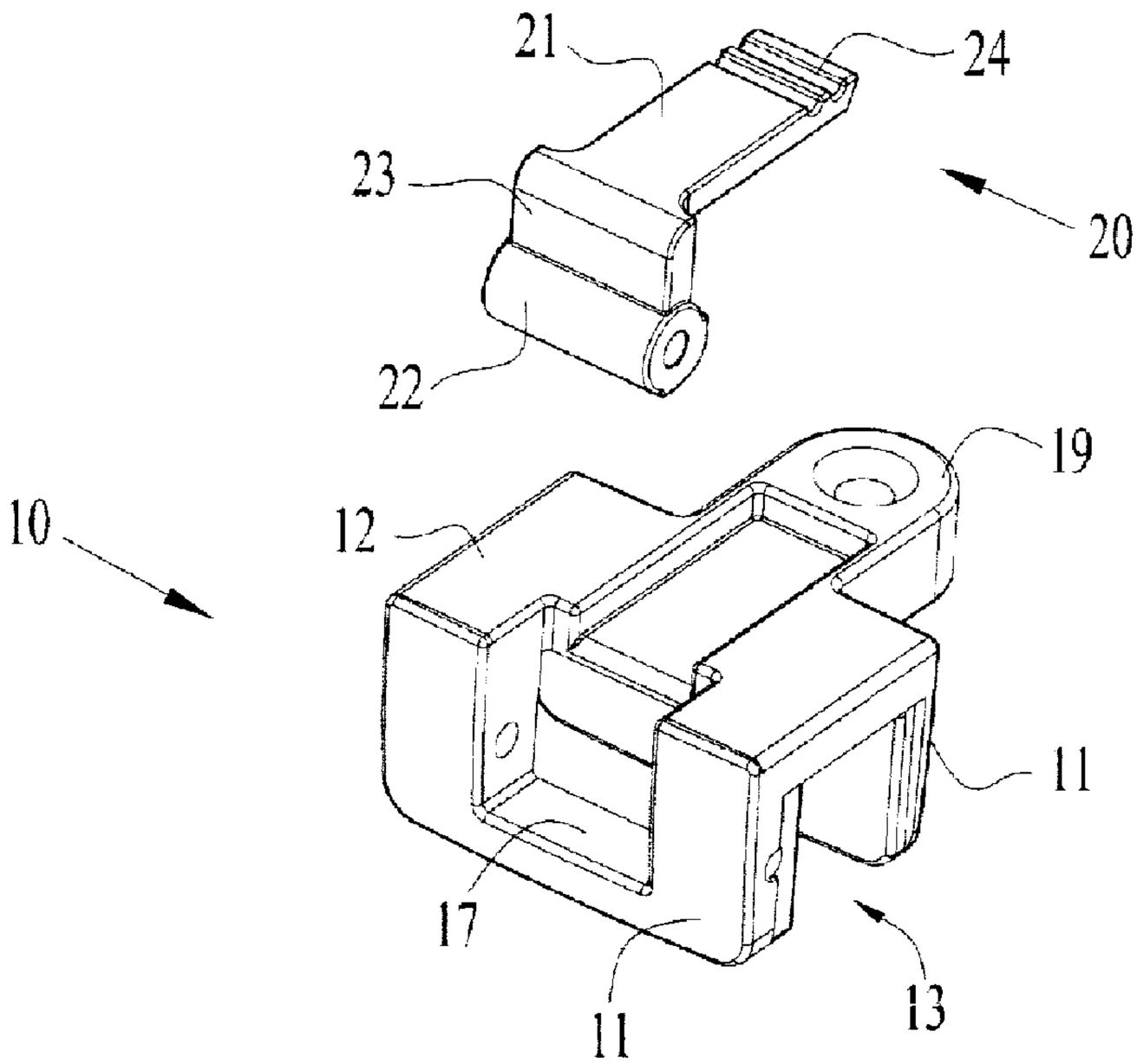



(57) Abrégé/Abstract:
A clamping device comprises a clamping base and a cam mechanism. The clamping base has an opening for receiving at least a part of an object to be clamped and a cavity for receiving the cam mechanism. The cam mechanism is rotatable with respect to the clamping base between a first position, in which the clamping device completely locks the object to be clamped, and a second position, in which the clamping device completely releases from the object. The clamping device can achieve clamping/locking of an object without use of additional tools. In some cases, the clamping device can operated among three different positions, i.e., completely released position, pre-locked position, and completely locked position, facilitating the control and handling of the object.

## Abstract

A clamping device comprises a clamping base and a cam mechanism. The clamping base has an opening for receiving at least a part of an object to be clamped and a cavity for receiving the cam mechanism. The cam mechanism is rotatable with respect to the clamping base between a first position, in which the clamping device completely locks the object to be clamped, and a second position, in which the clamping device completely releases from the object. The clamping device can achieve clamping/locking of an object without use of additional tools. In some cases, the clamping device can operated among three different positions, i.e., completely released position, pre-locked position, and completely locked position, facilitating the control and handling of the object.

# CLAMPING DEVICES

## Cross-reference to Related Document

[0001] This application claims priority benefit from Chinese utility model application No. 201320337395.5 filed on June 13, 2013 in the name of Foshan Ideal Co., Ltd., the disclosure of which is incorporated herein by reference in its integrity.

## Field of the Invention

[0002] The present invention relates to a clamping device, especially to a clamping device suitable for use with fragile products such as glass.

## Background of the Invention

[0003] The mounting and movement of fragile products, such as glass, are normally carried out by means of special tools. For instance, when a glass shower door is mounted, a level and a glass clamper are always needed to fix and move the glass door. However, the coupling of conventional glass clampers with glass requires additional fasteners such as screws or bolts. This causes the mounting operation to be time-consuming and it requires additional tools to complete the mounting operation. In addition, conventional glass clamper can only be operated between completely released position and completely locked position, which is inconvenient for the mounting operation.

## Summary of the Invention

[0004] An object of the invention is to provide a clamping device which does not need any additional tool to achieve clamping.

[0005] Another object of the invention is to provide a clamping device which can be operated among complete released position, pre-locked position and completely locked position, facilitating mounting operation.

[0006] To achieve the one or more objects of the present invention, a clamping device is provided comprising a clamping base and a cam mechanism. The clamping base has an opening for receiving at least a part of an object to be clamped and a cavity for receiving the cam mechanism. The cam mechanism is rotatable in relation to the clamping base between a first position, in which the clamping device completely locks the object to be clamped, and a second position, in which the clamping device completely releases the object.

[0007] In one preferable embodiment, the clamping device further comprises a flexible cushion located within the opening and when in use between the clamping base and the object to be clamped. The flexible cushion is provided to enhance clamping of the object by increase of friction force between the object and the cushion. The cushion preferably

is provided with teeth on one or both sidewalls toward to the object.

[0008] In one preferable embodiment, the clamping device further comprises a rigid cushion located in one sidewall of the flexible cushion and when in use abutted against the cam mechanism. Preferably, the rigid cushion has a lateral wing to increase contact area so as to prevent the rigid cushion from displacement.

[0009] According to one embodiment, the clamping base further comprises a linkage used for linking the clamping device and the object to other elements. The linkage is preferably laterally extended from the clamping base.

[0010] According to one embodiment, the clamping device comprises two sidewalls and one top wall connecting the two sidewalls, defining the opening. The top wall has a first recess and one of the two sidewalls has a second recess, and the first and second recesses jointly define the cavity for receiving the cam mechanism.

[0011] According to one embodiment, the cam mechanism comprises a rod, a cam portion and a linkage portion connecting the rod with the cam portion. The cam portion is substantially in form of a cylinder and has a protruded surface on at least a part of an outer surface of the cylinder.

[0012] In a preferable embodiment, the cam mechanism comprises a rod, a cam portion and a linkage portion connecting the rod with the cam portion. The cam portion is substantially in form of a cylinder and has a first protruded surface and a second protruded surface on at least a part of an outer surface of the cylinder. The first protruded surface has a height with respect to the outer surface smaller than that of the second protruded surface. The protruded surfaces having different heights enable to achieve pre-locking and complete locking of the object. In pre-locking position, the object is not able to freely move but still movable when an external force is applied thereon. In complete locking position, the object is completely not movable.

[0013] Preferably, the first and second protruded surfaces are non-continuous. The first protruded surface preferably has a substantially rectangular section and the second protruded surface preferably has a substantially arched section.

[0014] According to one embodiment, the object to be clamped is glass, wood or other suitable materials, preferably glass.

[0015] The clamping device provided by the present invention can achieve clamping/locking of an object without use of additional tools. In preferable case, the clamping device can operated among three different

positions, i.e., completely released position, pre-locked position, and completely locked position, facilitating the control and handling of the object.

## Brief Description of Drawings

[0016] Fig. 1 shows a clamping device according to one example of the invention.

[0017] Fig. 2 shows an exemplary cam mechanism of the clamping device according to one embodiment of the invention.

[0018] Fig. 3 shows another exemplary cam mechanism of the clamping device according to one embodiment of the invention.

[0019] Fig. 4 shows an exemplary clamping base of the clamping device according to one embodiment of the invention.

[0020] Fig. 5 shows a clamping device according to another embodiment of the invention, in which the cam mechanism is omitted for clarity.

[0021] Figs. 6 to 8 show different operation positions of an exemplary clamping device coupled with glass, in which Fig. 6 shows completely released position, Fig. 7 shows completely locked position, and Fig. 8 shows pre-locked position.

[0022] Elements that are irrelevant to the spirit of the invention are omitted from the drawings for the sake of clarity.

## Detailed Description of the Invention

[0023] The present invention will now be described in more detail in reference to the drawings. It should be noted that the terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of example embodiments of the invention. As used herein, the singular forms "a," "an," and "the," are intended to include the plural forms as well, unless the context clearly indicates otherwise. As used herein, the terms "and/or" include any and all combinations of one or more of the associated listed items. It will be further understood that the terms "comprises" "comprising" "includes" and/or "including" when used herein, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0024] With reference to Fig. 1, a exemplary clamping device according to the present invention is shown. The clamping device comprises a clamping base 10 and a cam mechanism 20, wherein the

clamping base 10 includes two sidewalls 11 and a top wall 12 jointly define an opening 13 in form of a letter "n" for receiving at least a part of the object 40 (see Fig. 6) to be clamped. The clamping base 10 also includes a linkage 19 for connecting the clamping device together with the object 40 to other elements. In the example, the linkage 19 is extended laterally from the clamping base 10.

[0025] As shown in Fig. 4, the clamping base 10 has a first recess 15 on the top wall 12 and a second recess 14 on the sidewall 11. The first recess 15 and the second recess 14 jointly define a cavity for receiving the cam mechanism 20. The first recess 15 does not communicate with the opening 13 while the second recess 14 does.

[0026] The cam mechanism 20 is received in the cavity in suitable manner and rotatable with respect to the clamping base 10 at least in a first position and a second position. For example, the cam mechanism 20 and the clamping base 10 are provided with pin holes 16 through which a pin (not shown) passes to dispose the cam mechanism in the cavity.

[0027] The cam mechanism 20 comprises a rod 21, a cam portion 22 and a linkage portion connecting the rod 21 with the cam portion 22. Preferably, a handle portion 24 is formed at an end of the rod 21 for facilitating handling of the cam mechanism. In the example, a plurality of notch is formed at the handle portion 24 to increase friction force. The cam mechanism 20 is received within the cavity formed by the recesses 14, 15.

[0028] With reference to Fig. 2, an exemplary cam mechanism 20 is shown. The cam mechanism 20 is substantially cylindrical and on a part of the outer surface of the cylinder a protruded surface 221 is formed. As shown in the figure, from the sectional view of the cylinder, R1 represents the distance between the axis of the cylinder and the outer surface, R2 represents the distance between the axis of the cylinder and the protruded surface 221, wherein R2>R1. Therefore, when the clamping base 10 is contact with the outer surface of cylinder with radius R1, the clamping device does not interfere with the object to be clamped and the object is able to move freely. When the clamping base 10 is contact with the protruded surface 221, however, the clamping device applies a force onto the object and enable it to be clamped within the opening and not movable.

[0029] Fig. 3 shows another form of cam mechanism 20. The cam portion 22 of the cam mechanism 20 is substantially cylindrical and on a part of the outer surface of the cylinder a first protruded surface 223 and

a second protruded surface 222 are formed. As shown in the bottom drawing of Fig. 3, from the sectional view of the cylinder, R1 represents the distance between the axis of the cylinder and the outer surface, R2 represents the distance between the axis of the cylinder and the first protruded surface 223, and R3 represents the distance between the axis of the cylinder and the second protruded surface 222, wherein R3>R2>R1. The differences among R1, R2, and R3 enable to achieve different locking/clamping conditions of the clamping device, i.e., completely released position, pre-locked position and completely locked position.

[0030] Specifically, when the clamping base 10 is contact with the outer surface of the cylinder with radius R1, clamping device does not interfere with the object to be clamped and the latter can move freely. When the clamping base 10 is contact with the first protruded surface 223, the clamping device applies a force onto the object to cause the object not to move freely. However, in this position, the object can still be moved when an external force, always generated by a person who carries out the mounting operation, is applied thereon. When the clamping base 10 is contact with the second protruded surface 222, the clamping device will apply a greater force to the object to enable it to be clamped within the opening and not movable. Therefore, the cam mechanism 20 in this example provides a intermediate position between the completely released position and completely locked position, i.e., the pre-locked position, which facilitates the movement and adjustment of the object to be clamped.

[0031] In the example, the first and second protruded surfaces are non-continuous, which is favorable for full achievement of the pre-locking effect. The space between the protruded surfaces can be determined by a skilled person in the art. In the example, the first protruded surface 223 has a substantially rectangular section while the second protruded surface 222 has a substantially arched section. The person skilled in the art can also contemplate sections with other suitable shapes.

[0032] With reference to Fig. 5, another exemplary clamping device is shown. For the sake of clarity, the cam mechanism of the clamping device is omitted, which can be any one of the cam mechanism shown in Fig. 2 or Fig. 3. In the example, the clamping device comprises a flexible cushion in similar shape with the opening so as to be disposed within the opening 13 when in use. The flexible cushion 30 is normally formed by plastic materials such as rubbers, EVA, PE and so on. The flexible

cushion 30 is provided with teeth 31 on one or both sidewalls thereof to increase the friction force with the object to be clamped. The object is then disposed within the opening 33 of the flexible cushion 30. In the example, the flexible cushion 30 may have a concave 32 on the sidewall toward the cam mechanism, for receiving an optional rigid cushion 34, which will be described in more detail herebelow.

[0033] Fig. 5 shows the rigid cushion 34 which is optionally included in the clamping device of the invention. When the rigid cushion 34 exists, it is received within the concave 32 of the flexible cushion 30. In the example, the rigid cushion 34 further comprises a lateral wing 35, for increasing the contact area with the clamping base 10 in a purpose of preventing the rigid cushion 34 from sliding displacement. The rigid cushion 34 is generally in form of metal or non-stainless steel sheet. The provision of rigid cushion 34 is to receive most of the force generated by the protruded surface of the cam mechanism so as to provide buffering for the object to be clamped, such as glass. In the present example, the lateral wing 35 is in contact with the bottom 17 (Fig. 1) of the second recess 14.

[0034] Figs. 6 and 7 show different operation position of the clamping device according to one embodiment of the invention in coupled with the object to be clamped (such as glass 40). Fig. 6 shows completely released position in which no force is applied on the object by the clamping device and the glass 40 is free to move in horizontal and vertical directions. Fig.7 shows the completely locked position in which the protruded surface (221 or 222) of the cam mechanism 20 applies a force to the optional rigid cushion 34, and in turn to the optional flexible cushion 30 and finally to object disposed within the opening 33, such that the object is clamped.

[0035] Fig. 8 shows the pre-locked position of the clamping device, in which the first protruded surface 223 is contact with the rigid cushion 34 and applies force onto the flexible cushion 30 and in turn the glass 40. However, because the first protruded surface 223 has less extent of protrusion, the force applied onto the glass 40 is such that it can only hold the object. When an external force is applied, usually by a person carries out the mounting operation, the glass 40 is still movable. Therefore, it is convenient for the person to move and adjust the glass 40. When the cam mechanism is rotated to enable the second protruded surface 222 to contact with the rigid cushion 34, the glass 40 will be applied with greater force so as to tightly clamp the glass 40 and make it not movable even

under external force.

[0036] It should be understood that various example embodiments have been described with reference to the accompanying drawings in which only some example embodiments are shown. The present invention, however, may be embodied in many alternate forms and should not be construed as limited to only the example embodiments set forth herein.

What is Claimed is:

1. A clamping device, comprising a clamping base and a cam mechanism, wherein

the clamping base has an opening for receiving at least a part of an object to be clamped and a cavity for receiving the cam mechanism, wherein

the cam mechanism is rotatable with respect to the clamping base between a first position, in which the clamping device completely locks the object to be clamped, and a second position, in which the clamping device completely releases from the object.

2. The clamping device of claim 1, wherein the clamping device further comprises a flexible cushion located within the opening and when in use between the clamping base and the object to be clamped.

3. The clamping device of claim 2, wherein the flexible cushion is provided with teeth on one or both sidewalls toward to the object.

4. The clamping device of claim 1, wherein the clamping device further comprises a rigid cushion located in one sidewall of the flexible cushion and when in use abutted against the cam mechanism.

5. The clamping device of claim 4, wherein the rigid cushion has a lateral wing to increase contact area so as to prevent the rigid cushion from displacement.

6. The clamping device of claim 1, wherein the clamping base further comprises a linkage laterally extended from the clamping base.

7. The clamping device of claim 1, wherein the cam mechanism comprises a rod, a cam portion and a linkage portion connecting the rod with the cam portion, the cam portion being substantially in form of a cylinder and having a protruded surface on at least a part of an outer surface of the cylinder.

8. The clamping device of claim 1, wherein the cam mechanism comprises a rod, a cam portion and a linkage portion connecting the rod with the cam portion, the cam portion being substantially in form of a

cylinder and having a first protruded surface and a second protruded surface on at least a part of an outer surface of the cylinder, the first protruded surface having a height with respect to the outer surface smaller than that of the second protruded surface.

9. The clamping device of claim 8, wherein the first protruded surface has a substantially rectangular section and the second protruded surface has a substantially arched section.

10. The clamping device of claim 1, wherein the object to be clamped is glass.

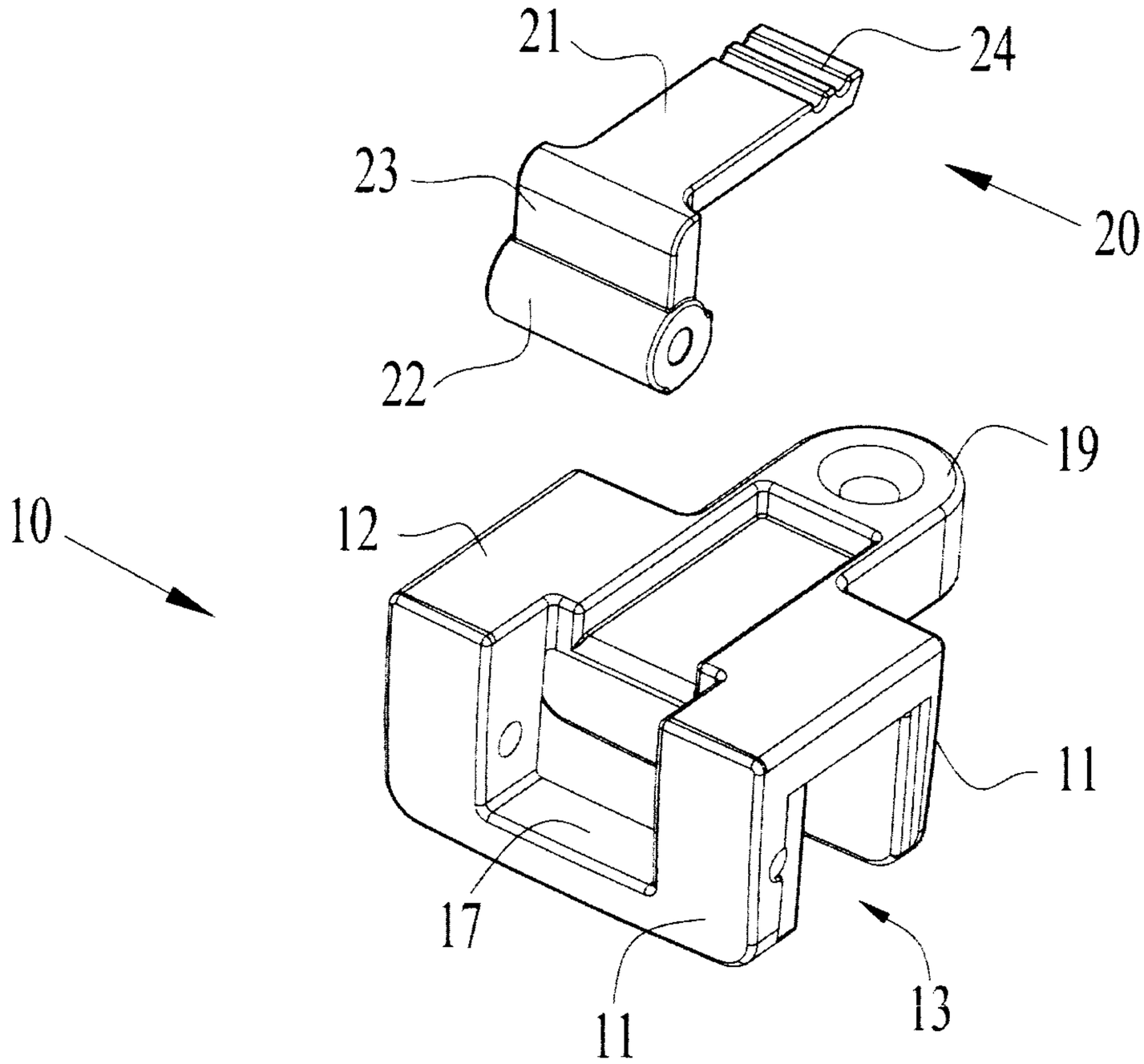



Fig.1

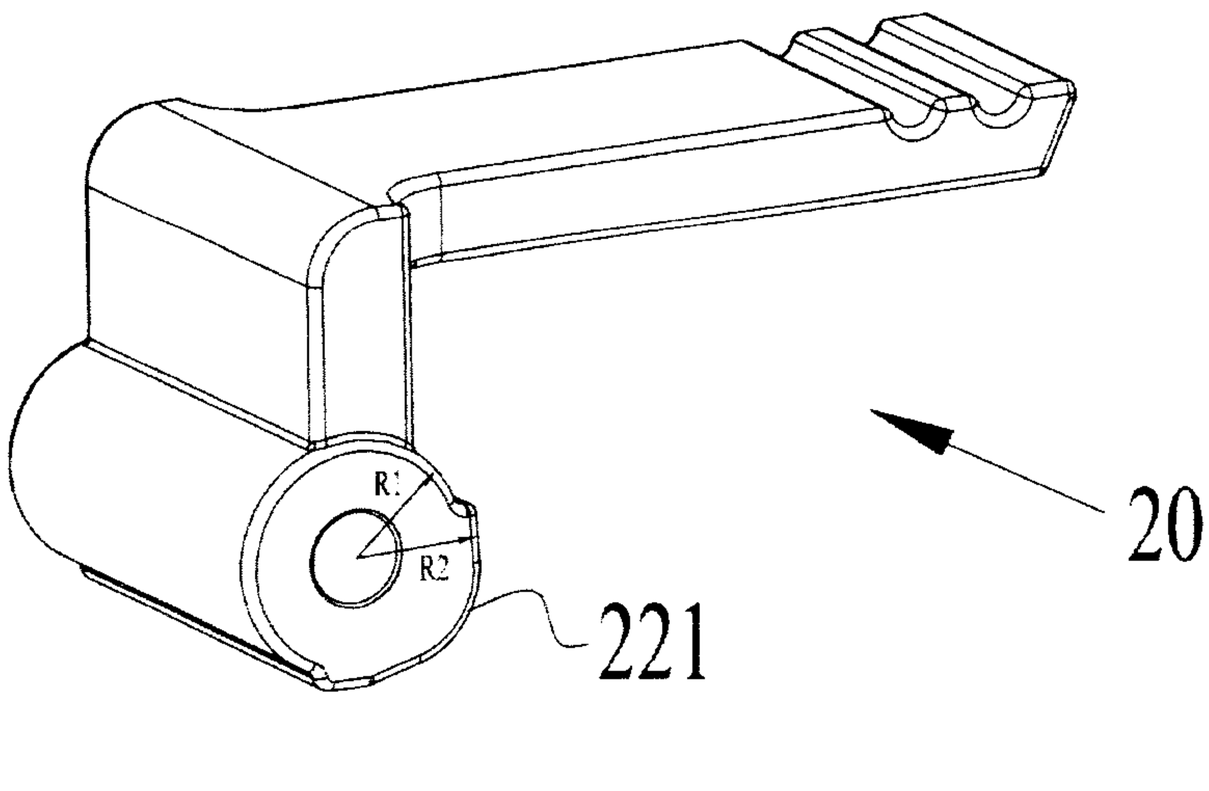



Fig.2

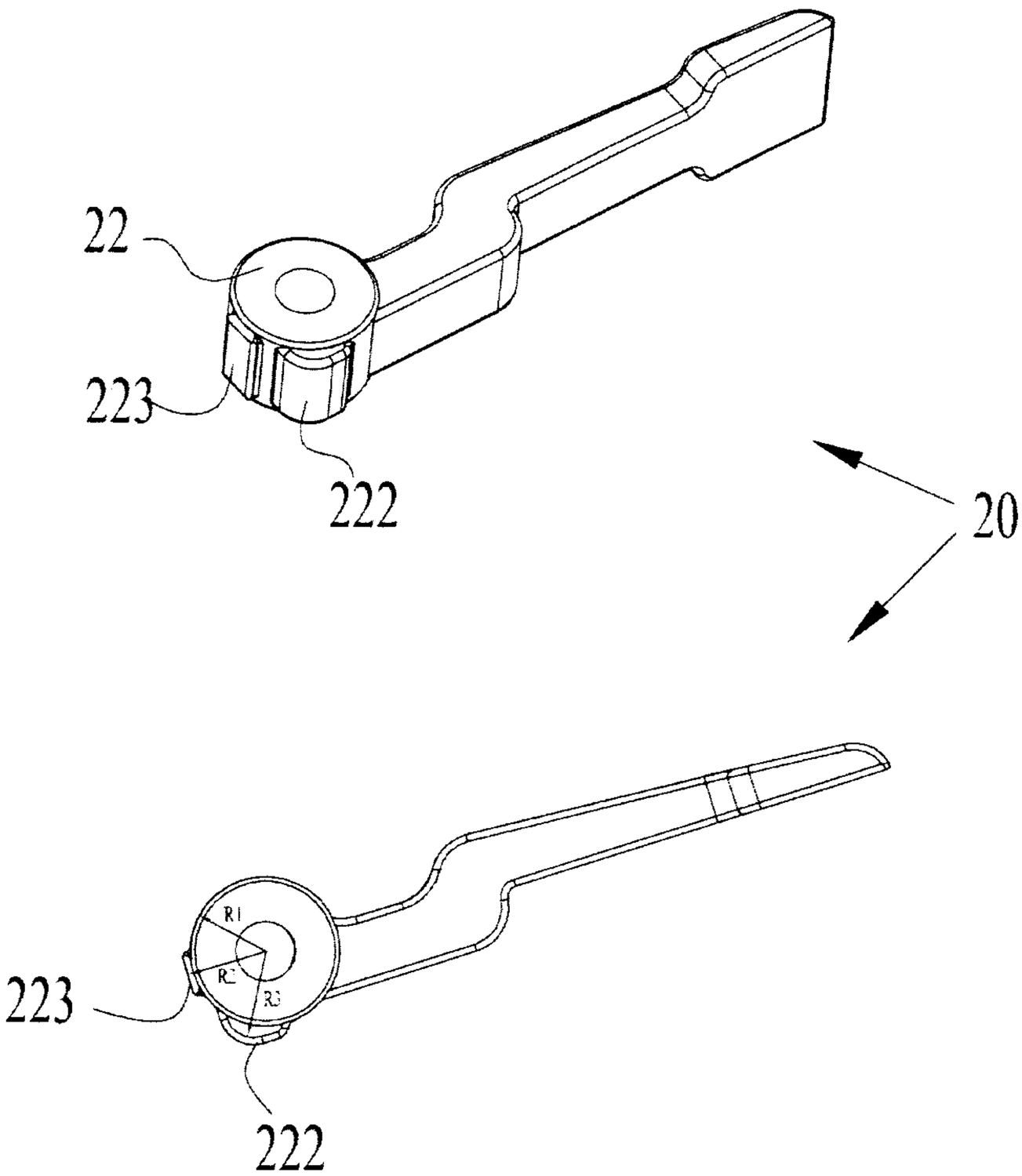



Fig.3

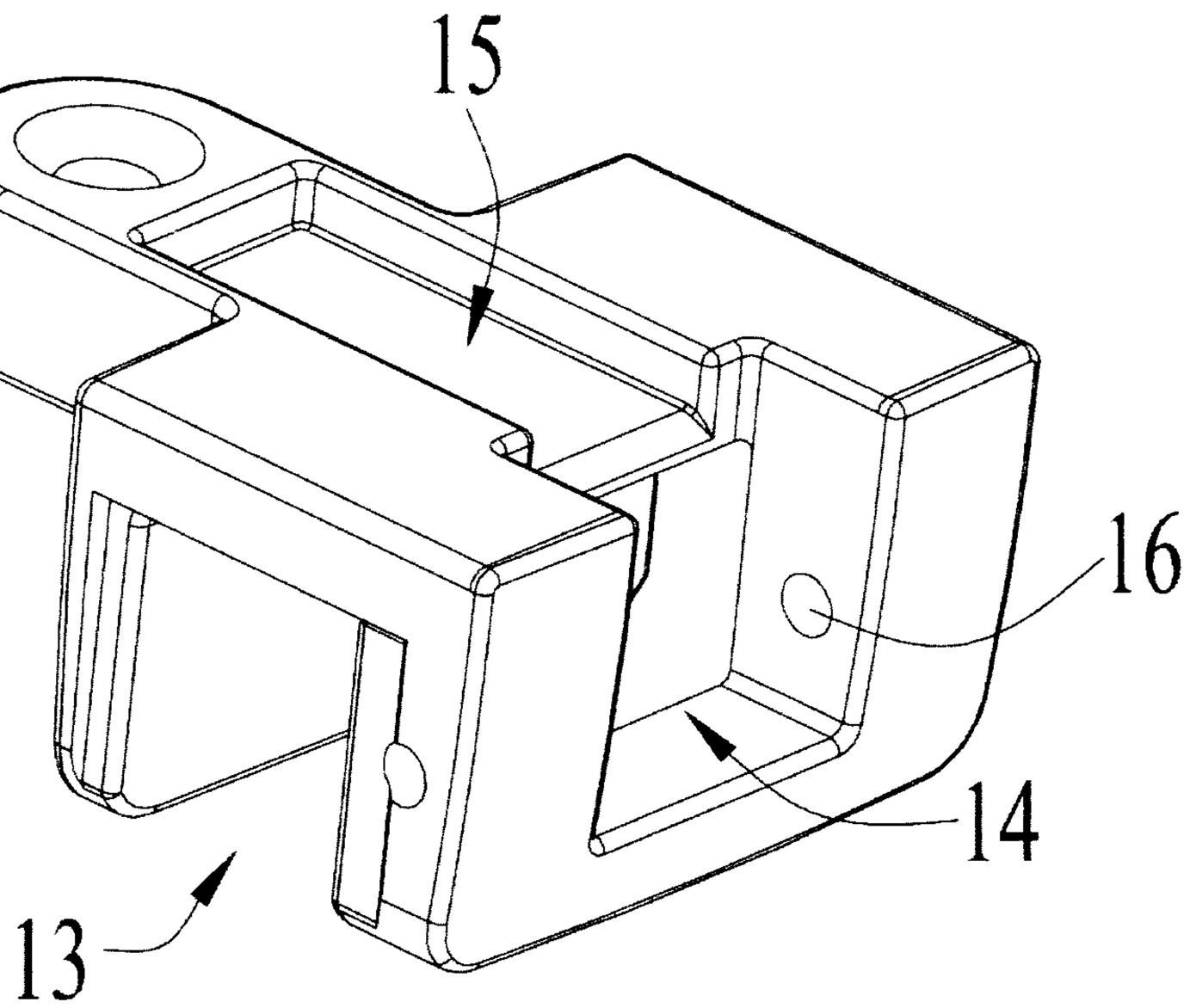



Fig.4

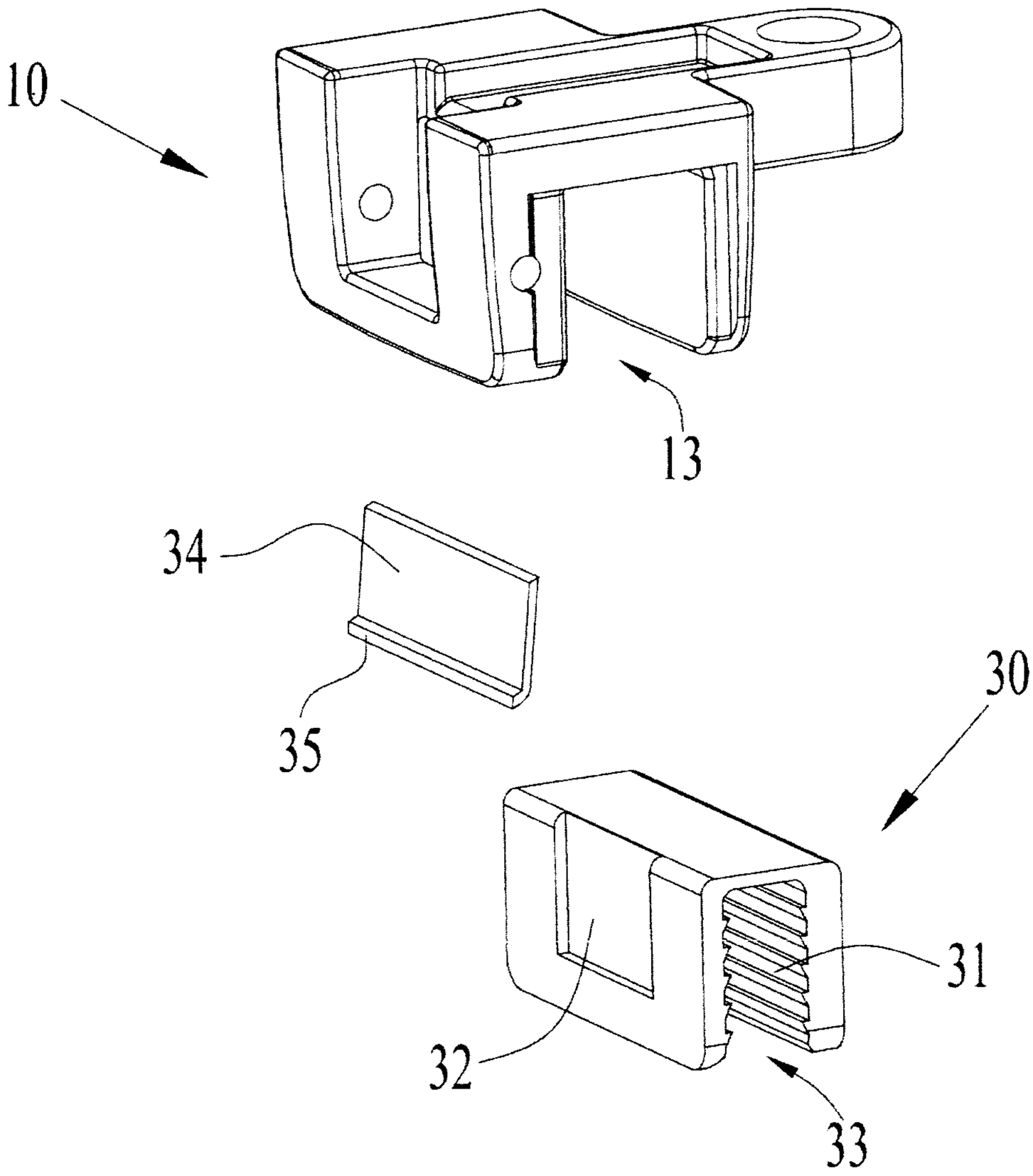



Fig.5

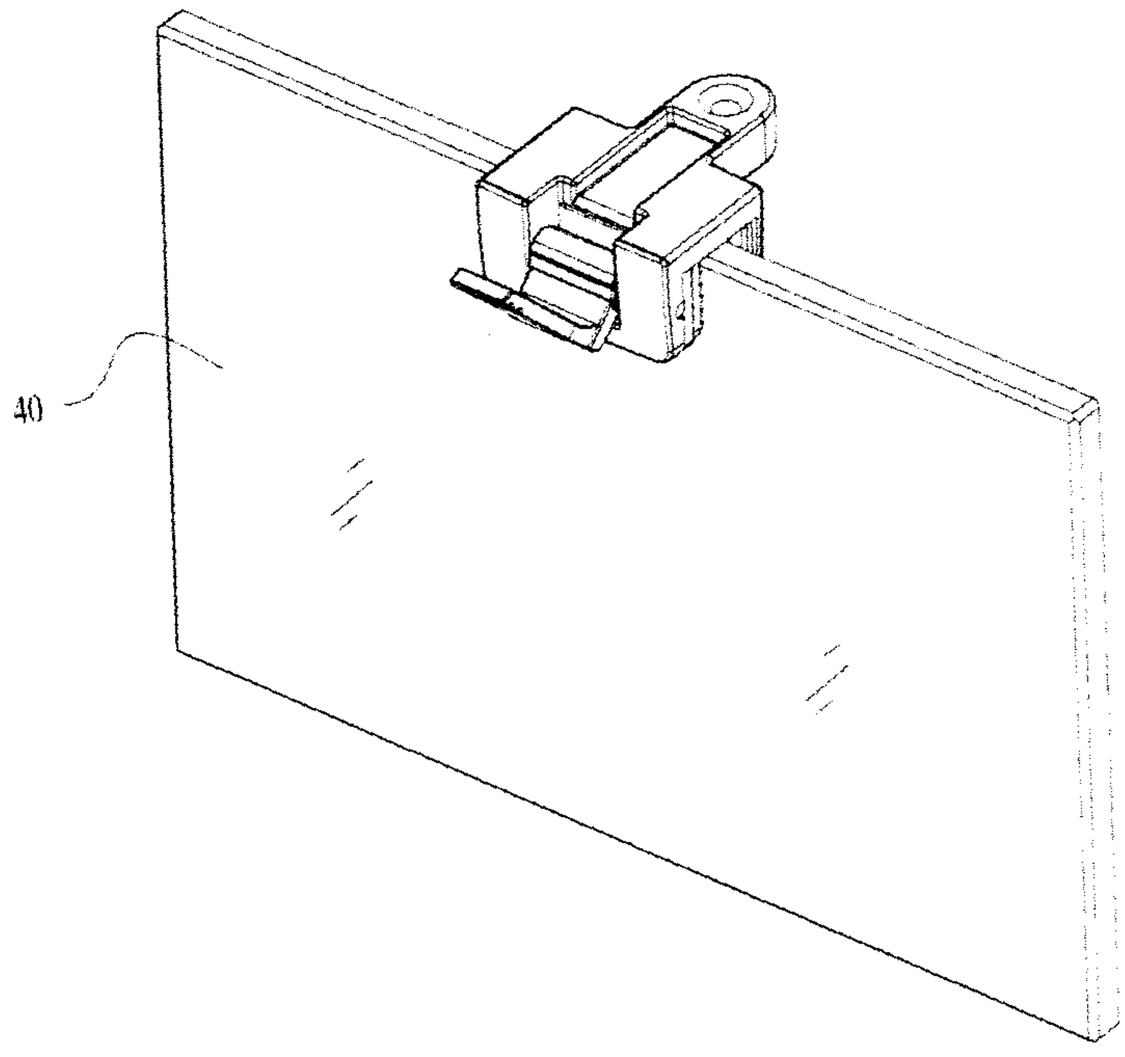



Fig.6

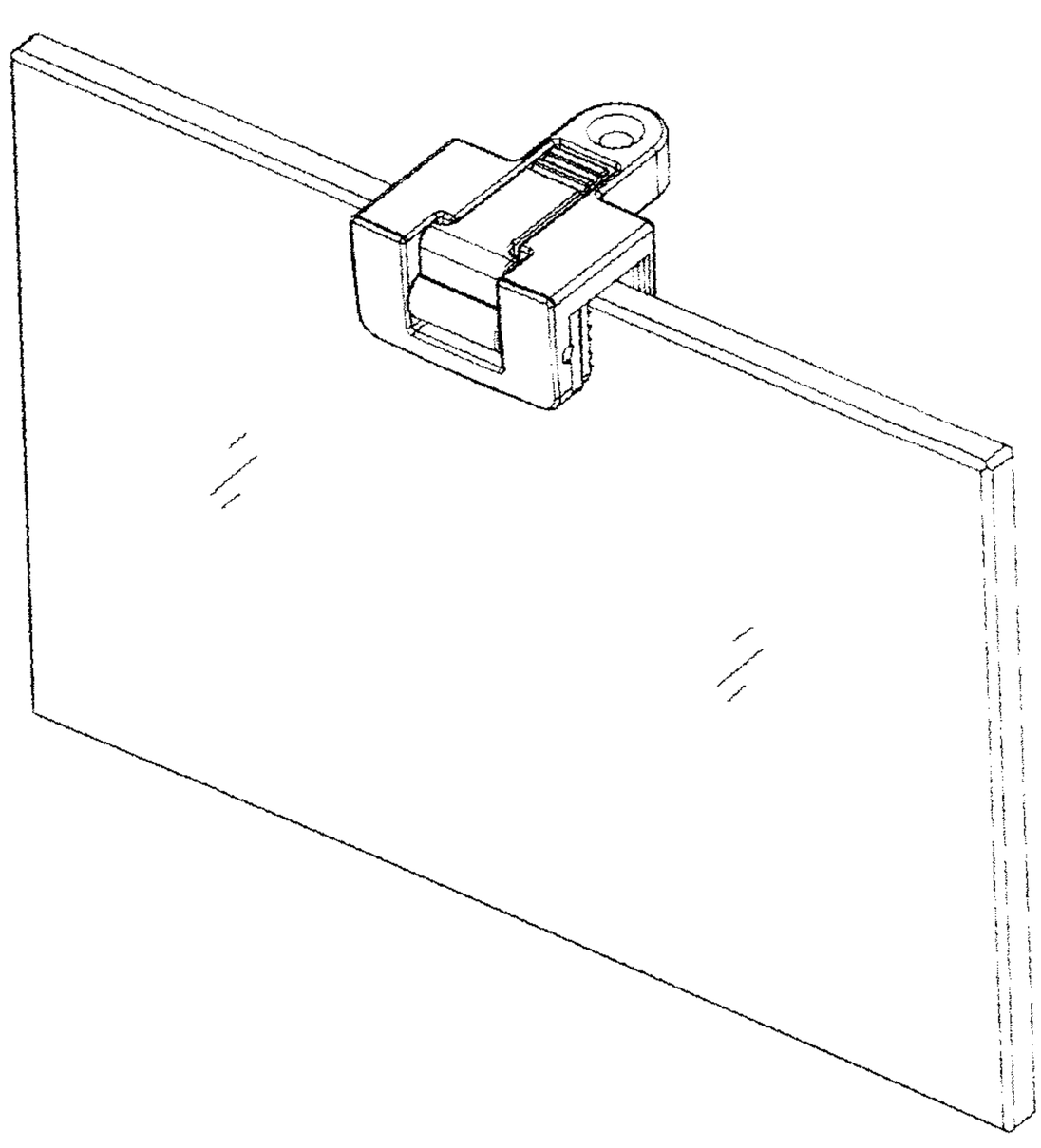


Fig.7

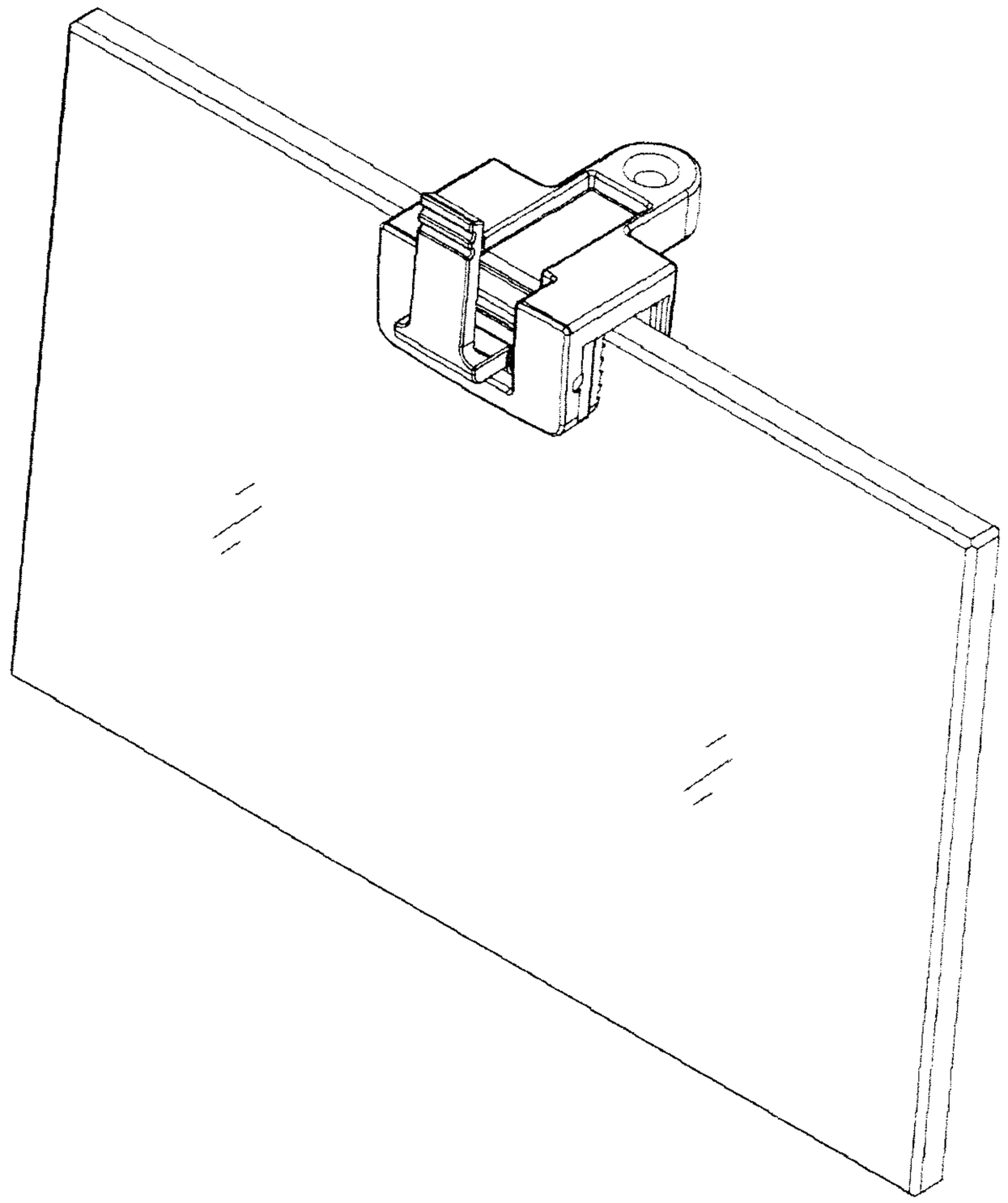
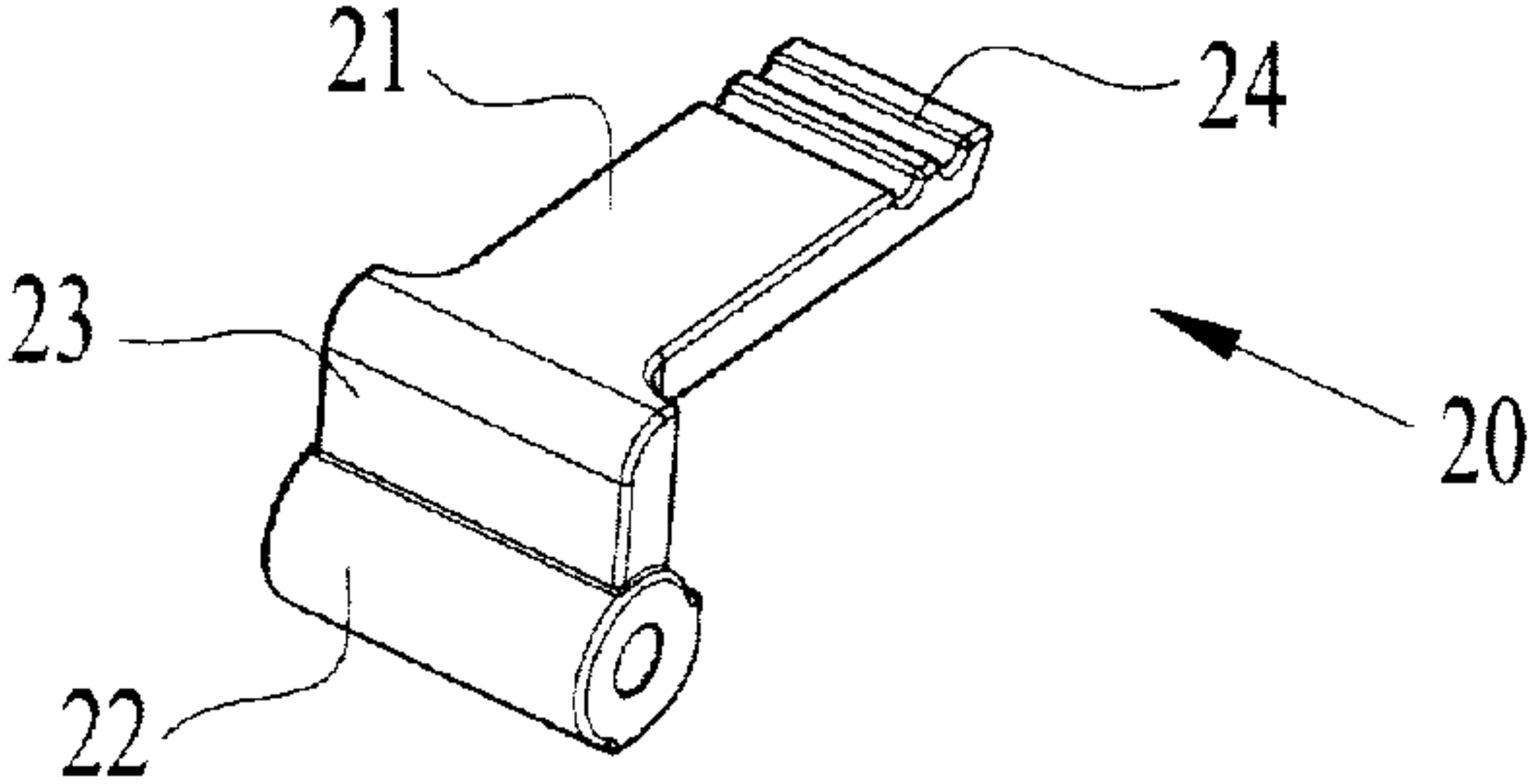


Fig.8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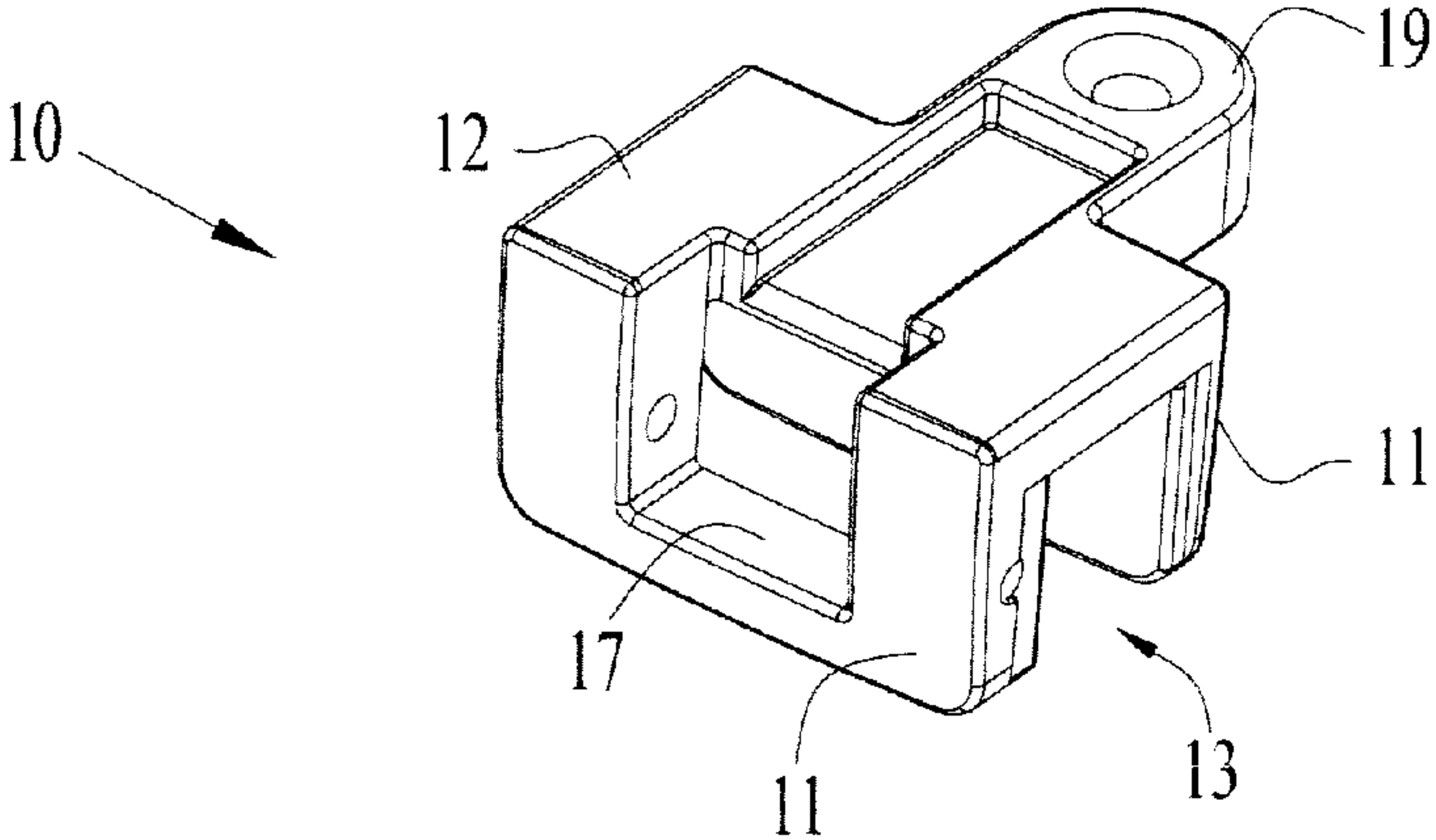
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