(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 391 578 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
25.02.2004 Bulletin 2004/09

(51) Int Cl.[7]: **E05D 15/44**

(21) Application number: **03254938.8**

(22) Date of filing: **08.08.2003**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(30) Priority: **23.08.2002 CN 02247720**

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(54) Heavy duty friction stay for openable member

(57) A friction stay 10 for controlling the opening and closing movement of an openable member relative to a fixed frame on which the member is mounted, in which the friction stay comprises: a track member 11 securable to a frame element of the fixed frame; a vent arm member 12 securable to a frame element of the openable member; a link arm 13 pivotally connected at one end 14 to one end 15 of the track member 11, and pivotally connected at its other end 16 to a pivot connection 17 on the vent arm member 12; a slide 18 mounted on the track member and having an end position, at or near to an opposite end 19 of the track member 11, to correspond with a closed position of the openable member, and being movable along the track member 11 away from the end position and in a direction towards said one end 15 of the track member during opening movement of the friction stay; and, a parallelogram linkage 20 connecting the vent arm member 12 and the link arm 13 to the slide 18 in order to control the movement of the friction stay between the closed position in which the components of the stay overlie the track, and any required open position of the friction stay: in which at least one end 14, 16 of the link arm 13 has a curved bearing surface 26, 29, adjacent to its pivot connection to the respective one of the vent arm member 12 or track member 11, and which is engageable with a corresponding curved bearing surface 27, 30 on the member so as to relieve at least some of the load applied to the pivot connection 17, 32 during opening and / or closing movement of the friction stay.

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Description

[0001] This invention relates to a heavy duty friction stay for controlling the opening and closing movement of an openable member relative to a fixed frame on which the openable member is mounted.

[0002] The present invention has been developed primarily in connection with a friction stay for controlling the opening and closing movement of a rectangular openable member, such as a door or window unit, relative to a fixed rectangular frame in which the member is mounted via the friction stay (and optionally via further hinge and other components).

[0003] It is well known to provide a friction stay, particularly for openable window units, and which comprises:

1. a longitudinal track which is mounted on a frame element of the fixed frame;
2. a so-called vent arm secured to a frame element of the window unit;
3. a link arm pivoted at one end to one end of the track and at its opposite end to a pivot connection with the vent arm at an intermediate position between the opposed ends of the vent arm;
4. a slide movable lengthwise of the track; and,
5. a parallelogram linkage interconnecting the link arm and the vent arm to the slide.

[0004] Parallelogram linkages are well known for use in friction stays, and allow the vent arm to overlie the track when the openable member (window unit) is in the closed position, and to control outward swinging movement of the vent arm, accompanied by movement of the slide along the track, as the window unit is moved to a required extent of opening movement.

[0005] It is usual for the pivot connections of a friction stay to be provided by cylindrical rivets fitting in circular holes, and the geometry of the components of a friction stay and the frictional resistance to relative pivoting of the rivets in the holes provide stable open positions of window units able to resist most wind loadings without movement, and without need for additional stays or latches to hold the window unit in any required defined open position.

[0006] Usually, a pair of friction stays is provided for each openable window unit, and which will be mounted on the top and bottom horizontal frame elements of a fixed frame in the case of a side hung window unit, or on the vertical frame elements of the fixed frame in the case of a top hung or bottom hung window unit.

[0007] Clearly, over a period of time, wear will occur in the fit between each rivet and the hole in which it is mounted, and particularly when large and heavy window units are involved, and this results in increasing clearance developing between the outer surface of the rivet and the circular facing surface of the corresponding hole in which it is mounted. Ovalisation of the rivet and / or the hole may happen with time, and which will eventually result in increasing difficulty in satisfactory opening and closing of the window unit.

[0008] The extent of wear of any particular friction stay in service will depend upon the amount of usage i.e. some windows are opened only infrequently, but there are industry standard tests which friction stay products must meet despite possible infrequent use.

[0009] One standard test requires 30,000 cycles of opening / closing movement, which is considered satisfactory for small / medium size / weight of window units. However, for heavier window units, heavy duty friction stays are required, and industry standards requires satisfactory completion of 50,000 cycles of movement to simulate lifetime use of the stay.

[0010] With current designs of friction stay for heavy duty loadings, conventional rivet / hole pivot connections may wear out too quickly, and can not be guaranteed to meet the exacting new standard.

[0011] The present invention has therefore been developed primarily with a view to reduce the frictional loadings on rivet / hole pivot connections of a friction stay, by arranging for at least part of the loadings (developed during opening / closing movement of the stay) to be borne by components other than the rivet / hole connection.

[0012] According to the invention there is provided a friction stay for controlling the opening and closing movement of an openable member relative to a fixed frame on which the member is mounted, in which the friction stay comprises:

a track member securable to a frame element of the fixed frame;
a vent arm member securable to a frame element of the openable member;
a link arm pivotally connected at one end to one end of the track member, and pivotally connected at its other end to a pivot connection on the vent arm member;
a slide mounted on the track member and having an end position, at or near to an opposite end of the track member, to correspond with a closed position of the openable member, and being movable along the track member away from the end position and in a direction towards said one end of the track member during opening movement of the friction stay; and,
a parallelogram linkage connecting the vent arm member and the link arm to the slide in order to control the movement of the friction stay between the closed position in which the components of the stay overlie the track, and any required open position of the friction stay:

in which at least one end of the link arm has a curved bearing surface, adjacent to its pivot connection to the respective one of the vent

arm member or track member, and which is engageable with a corresponding curved bearing surface on the member so as to relieve at least some of the load applied to the pivot connection during opening and / or closing movement of the friction stay.

[0013] The curved bearing surface may be provided at the end of the link arm which is pivotally connected to the vent arm member, or at the end of the link arm which is pivotally connected to the track member.

[0014] Preferably, a curved bearing surface is provided at each end of the link arm, and which is engageable with a corresponding counter-bearing surface at the respective member to which it is pivotally connected.

[0015] The curved bearing surfaces at the ends of the link arm may be generally semi-circular rounded ends or "noses", whereas the counter-bearing surfaces on the vent arm member and the track member may be quarter-moon and half-moon shaped respectively.

[0016] To strengthen the regions of the vent arm member and the track member which receive part of the operating load (to relieve part of the load on the pivot connections), during opening and closing movement of the friction stay, each counter-bearing surface may be provided on a support plate which is rigidly secured e. g. by rivets to the underlying member.

[0017] A preferred embodiment of friction stay according to the invention will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:

figure 1 is plan view of the friction stay, in a partly open position;
figure 2 is a side view corresponding to figure 1;
figure 3 is an enlarged view of detail A of figure 1;
figures 4(a) and 4(b) are enlarged plan and side view illustrations of detail B of figure 1;
figure 5 is an enlarged side view of detail C of figure 2;
figures 6(a) and 6(b) are respectively plan and side views of a support plate for mounting on a vent arm of the friction stay; and
figures 7(a) and 7(b) are respectively plan and side views of a support plate for mounting on a track member of the friction stay.

[0018] Turning now to the drawings, a friction stay according to the invention is designated generally by reference 10, and is in particular a heavy duty friction stay able to support, and control the opening and closing movement of a heavy weight window or door in a fixed rectangular frame on which the window or door is mounted.

[0019] The friction stay 10 comprises a track member 11 which is securable to a frame element of the fixed frame, and which will be a top or bottom horizontal frame element in the case of a side hung window or door, and will be one of the vertical frame elements of the fixed frame in the case of a top hung or bottom hung window unit. The stay 10 also includes a vent arm member 12, which is securable to a frame element of the openable member (window or door unit). A link arm 13 is pivotally connected at one end 14 to one end 15 of the track member 11, and is pivotally connected at its other end 16 to an intermediate pivot connection 17 on the vent arm member 12. A slide 18 is mounted on the track member 11 and has an end position, at or near to an opposite end 19 of the track member, to correspond with a closed position of the member mounted on the vent arm 12. The slide 18 is moveable along the track member 11 away from the end position and in a direction towards the end 15 of the track member during opening movement of the friction stay.

[0020] A parallelogram linkage, designated generally by reference 20, connects the vent arm member 12 and the link arm 13 to the slide 18 in order to control the movement of the friction stay 10 between the closed position in which the components of the stay overlie the track member 11, and any required open position of the friction stay.

[0021] The parallelogram linkage 20 includes a first link 21 extending between the slide 18 and an intermediate pivot 22 on the link arm 13. A second link of the linkage 20 is formed by a portion of the vent arm member 12 running between its nose end 23 and the intermediate pivot point, such portion extending parallel to the first link 21. The third and fourth links of the parallelogram linkage 20 are formed by short link 24 pivotally interconnecting the nose end 23 of vent arm member 12 to the slide 18, and a portion 25 of the link arm 13 extending between pivot point 22 and pivot 17.

[0022] The components of the friction stay 10 thus far described are generally well known, but the detailed features of the embodiment of the invention which are novel, non-obvious and technically advantageous will now be described.

[0023] In particular, at least one end of the link arm 13 has a curved bearing surface, adjacent to its pivot connection to the respective one of the vent arm member 12 or track member 11, and which is engageable with a corresponding curved counter bearing surface on the member so as to relieve at least some of the load applied to the pivot connection during opening and/or closing movement of the friction stay.

[0024] In the illustrated embodiment, curved bearing surfaces are provided at each end of the link arm. Referring to figure 3, which is an enlarged view on detail A in figure 1, this shows that the vent arm 13 has a rounded end or nose 26, which forms a substantially semi-circular bearing surface, and which bears against a counter-bearing surface 27 provided on a metal support plate 28 which is secured e.g. by rivets, to the underlying vent arm member 12. The counter-bearing surface 27 is an approximately quarter-moon shaped surface, and the inter-engagement between the bearing surfaces 26 and

27 relieve at least some of the load applied to the pivot connection 17 during opening and closing movement of the friction stay 10.

[0025] The opposite end 14 of the link arm 13 is shown to an enlarged scale in figures 4(a) and 4(b), and this end 14 has a rounded end or nose 29 which forms a substantially semi-circular bearing surface, and which engages with a half-moon shaped counter-bearing surface 30 provided on a support plate 31 secured to the end 15 of the track member 11. The engagement between bearing surfaces 29 and 30 relieve at least part of the load applied to pivot 32 (which connects link arm 13 to the end 15 of track member 11) during opening and closing movement of the friction stay.

Claims

1. A friction stay (10) for controlling the opening and closing movement of an openable member relative to a fixed frame on which the member is mounted, in which the friction stay comprises:

   a track member (11) securable to a frame element of the fixed frame;
   a vent arm member (12) securable to a frame element of the openable member;
   a link arm (13) pivotally connected at one end (14) to one end (15) of the track member (11), and pivotally connected at its other end (16) to a pivot connection (17) on the vent arm member (12);
   a slide (18) mounted on the track member and having an end position, at or near to an opposite end (19) of the track member (11), to correspond with a closed position of the openable member, and being movable along the track member (11) away from the end position and in a direction towards said one end (15) of the track member during opening movement of the friction stay; and,
   a parallelogram linkage (20) connecting the vent arm member (12) and the link arm (13) to the slide (18) in order to control the movement of the friction stay between the closed position in which the components of the stay overlie the track, and any required open position of the friction stay:

      in which at least one end (14, 16) of the link arm (13) has a curved bearing surface (26, 29), adjacent to its pivot connection to the respective one of the vent arm member (12) or track member (11), and which is engageable with a corresponding curved bearing surface (27, 30) on the member so as to relieve at least some of the load applied to the pivot connection (17, 32) during opening and / or closing movement of the friction stay.

2. A friction stay according to claim 1, in which two curved bearing surfaces (26, 29) are provided on the link arm (13), one at each end thereof.

3. A friction stay according to claim 2, in which each curved bearing surface is engageable with a corresponding counter-bearing surface (27, 30) at the respective member to which it is pivotally connected.

4. A friction stay according to claim 2 or 3, in which the curved bearing surfaces are generally semi-circular rounded ends or "noses".

5. A friction stay according to claim 4, in which the counter-bearing surfaces (27, 30) on the vent arm member (12) and the track member (11) are quarter-moon and half-moon shaped respectively.

6. A friction stay according to any one of the preceding claims, in which the regions of the vent arm member (12) and the track member (11) which receive part of the operating load during opening and closing movement of the friction stay are strengthened regions provided by a support plate (28, 31) which is rigidly secured to the underlying member, and which is provided with a respective counter-bearing surface.

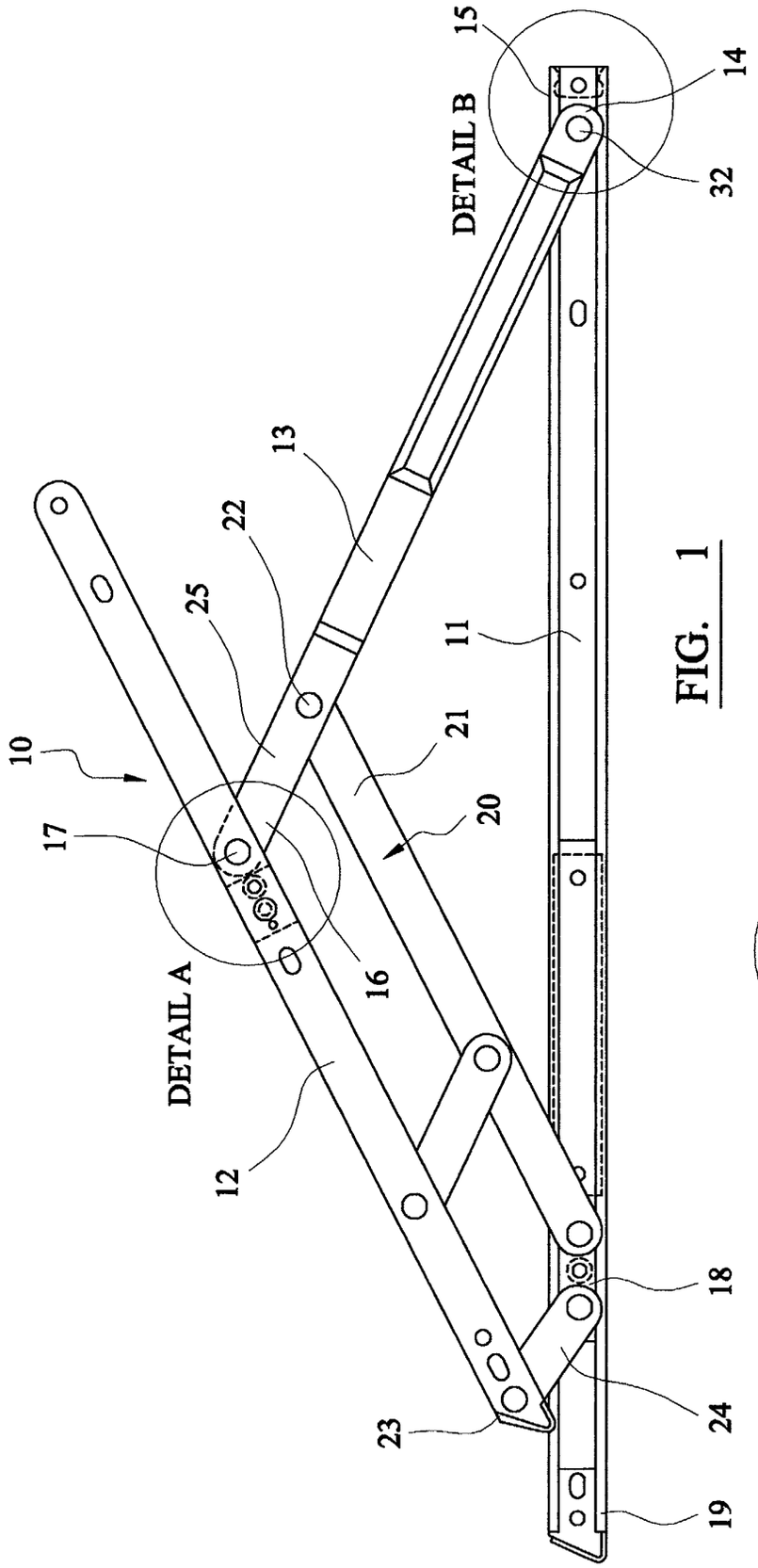
DETAIL A
DETAIL B
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FIG. 1

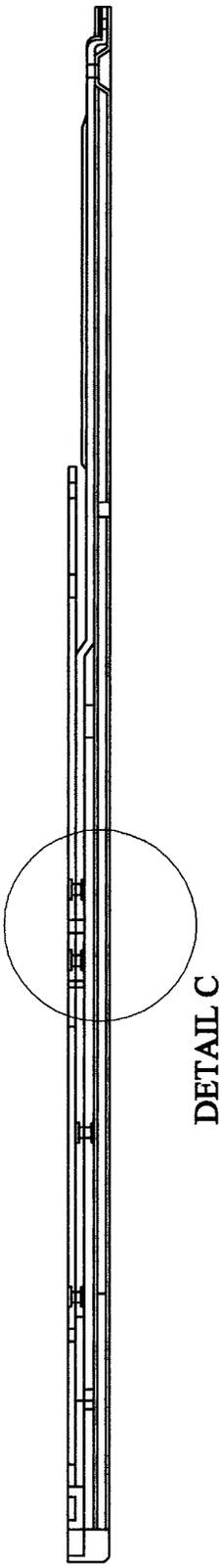
DETAIL C

FIG. 2

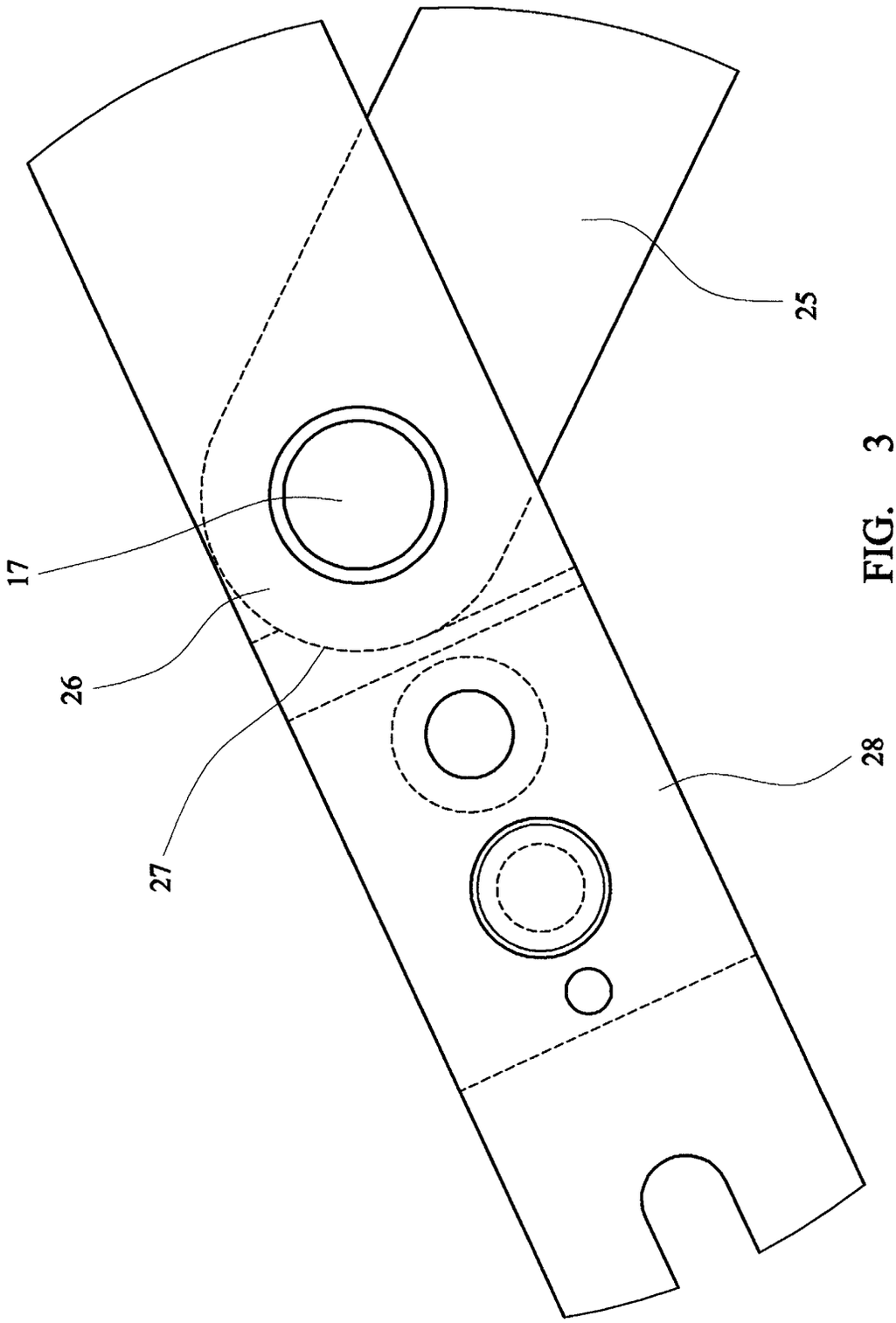

FIG. 3

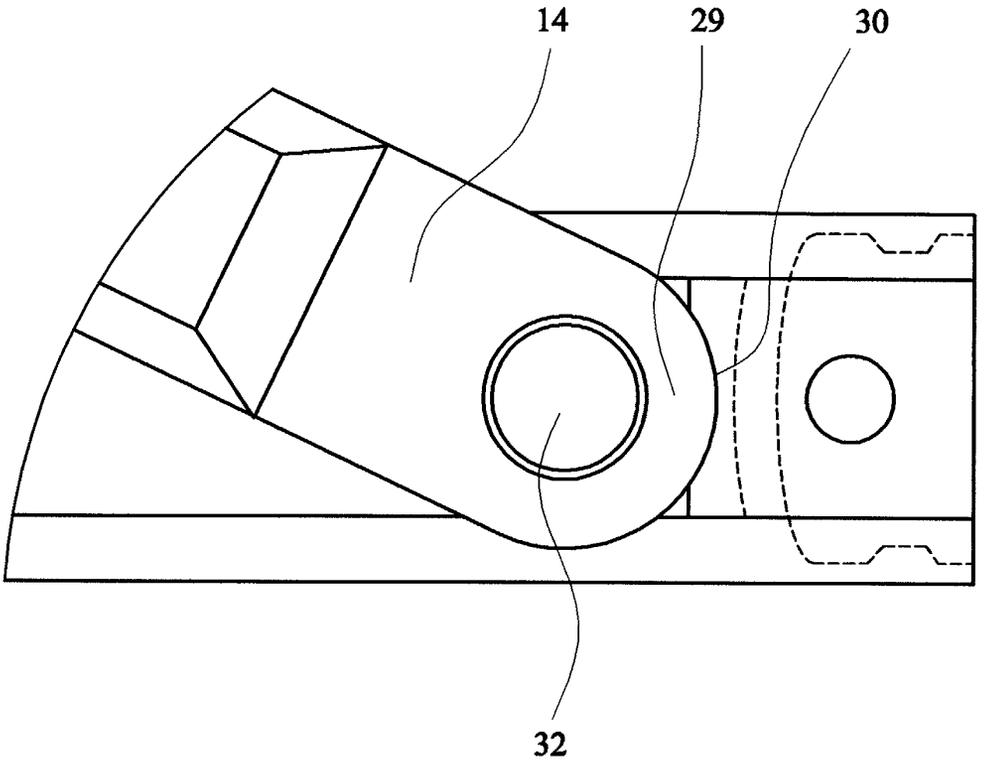

FIG. 4(a)

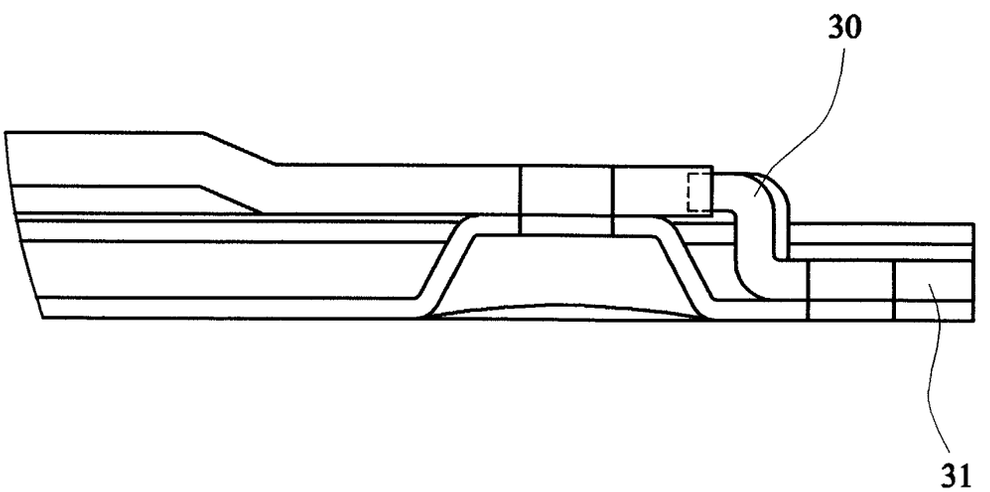

FIG. 4(b)

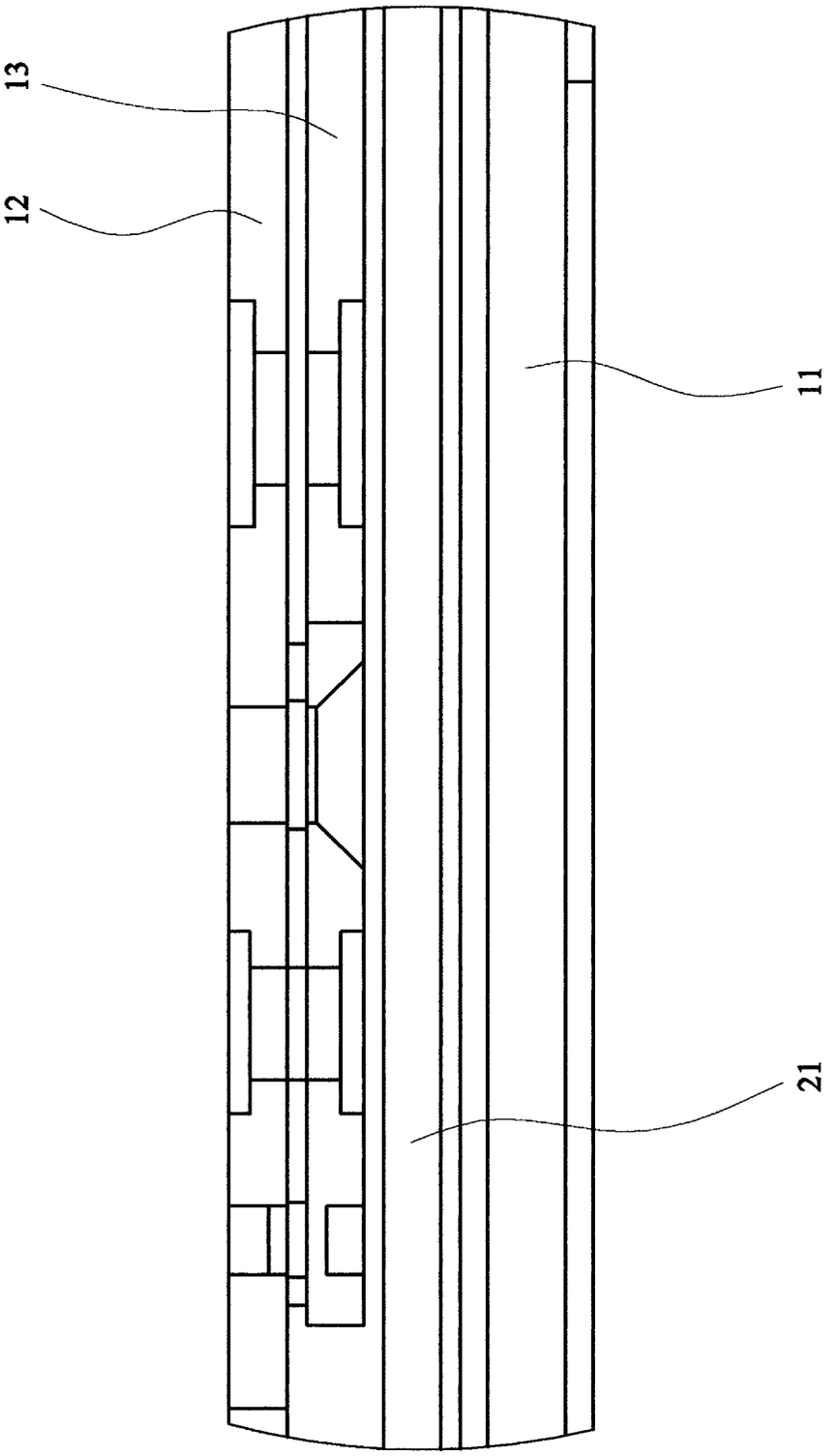

FIG. 5

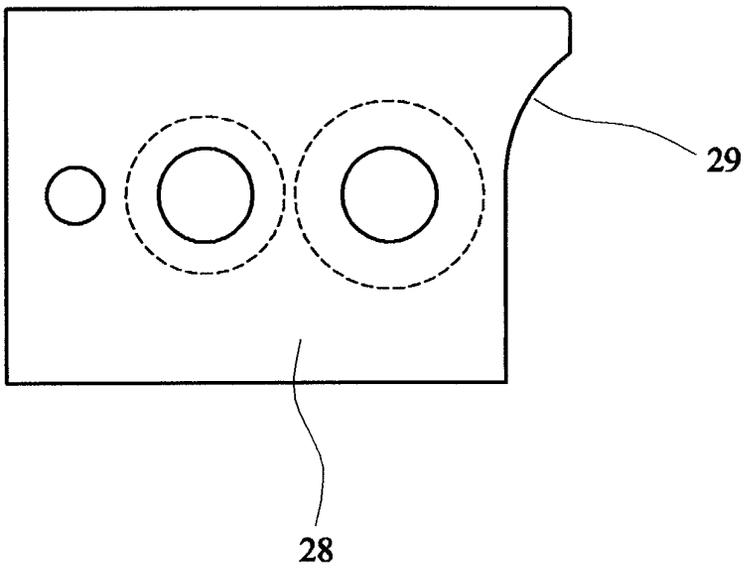

FIG. 6(a)

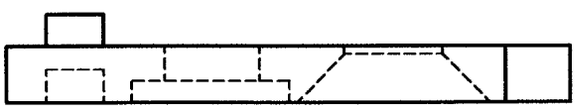

FIG. 6(b)

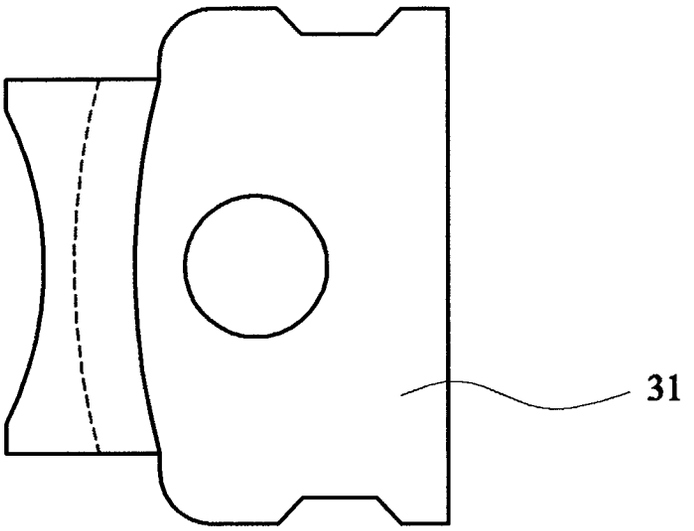

FIG. 7(a)

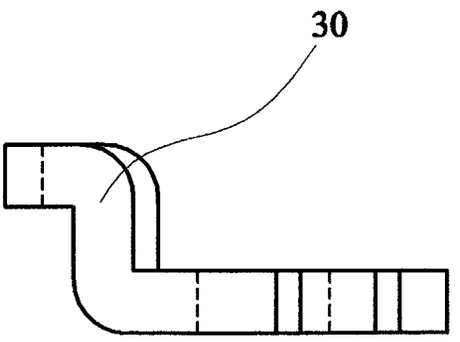

FIG. 7(b)