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(54) **Hinging device for windows and doors**

(57) A hinging device for windows and doors including a fixed frame (12) and a movable frame (14), comprising:

- a first support element (24) to be fastened to the fixed frame (12) and bearing a main axis of articulation (38),
- a second support element (26) to be fastened to the movable frame (14),
- a main lever (42) articulated to the first support element (24) around the main axis (38),

- a secondary lever (60) slidably articulated to the first support element (24) and articulated to an intermediate region (45) of the main lever (42), and
- a connecting rod (76) having an end (78) articulated to the second support element (26).

The first support element (24) bears an elongated articulation pivot pin (36) and the main lever (42) has an articulation portion (50) which extends parallel to the main axis of articulation (38) and engages the pivot pin (36) at least at its end regions.

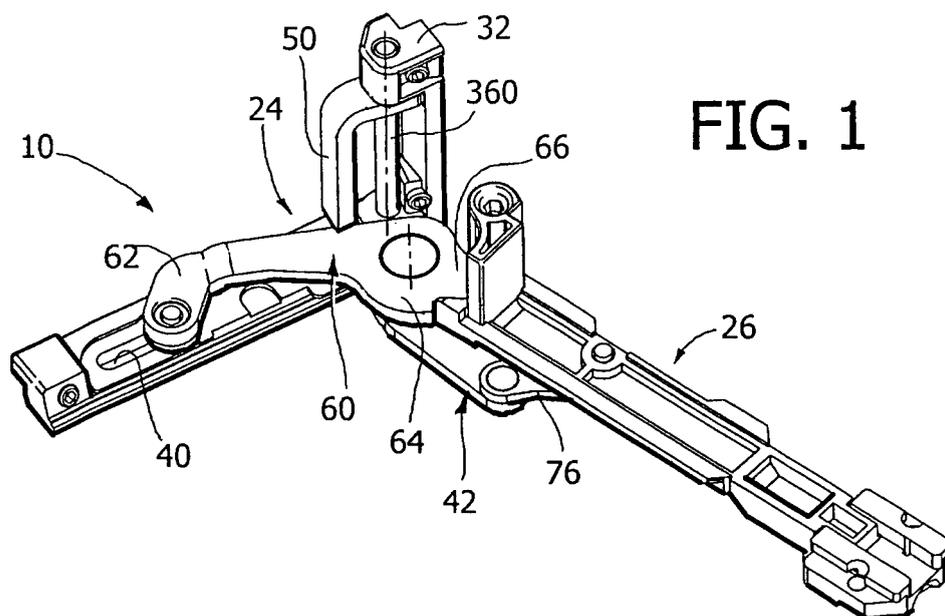


FIG. 1

Description

[0001] The present invention relates to a hinging device for windows and doors comprising a fixed frame and a movable frame. The invention was developed for application to light alloy windows and doors, but it is not limited to this kind of windows and doors.

[0002] The present invention can be applied to windows, French windows and the like provided solely with a wing opening motion (in which the movable frame rotates relative to the fixed frame around a vertical axis) or with swivel wing motion (in which the movable frame can be selectively opened by rotation around a vertical axis or by rotation around a lower horizontal axis).

[0003] The invention relates in particular to "disappearing" hinging devices, which are invisible when the window or door is in the closed position. Examples of hinging devices of this kind are disclosed in Italian utility model no. T096U000013 by the same Applicant, and in the documents EP-A-1 426 534 and EP-A-0 360 024.

[0004] The Italian utility model no. T096U000013 discloses a hinging device for windows and doors having the characteristics set out in the preamble to the main claim. The hinging device disclosed by this document comprises a first support element to be fastened to the fixed frame, a second support element to be fastened to the movable frame, a main lever articulated to the first support element, a secondary lever articulated in an intermediate region of the main lever and a connecting rod articulated to one end of the main lever. The second support element is articulated to the secondary lever and to the connecting rod around two mutually parallel axes. When the movable frame is in the closed position, the device is housed between the fixed frame and the movable frame and it is invisible from the exterior.

[0005] The main drawback of the known solution is that the hinging device is not sufficiently strong to support the weight of the window by itself and it needs an auxiliary support device which contributes to bear the weight of the movable frame when the latter is in the open position.

[0006] The solution described in the document EP 0 360 024 also requires the presence of an auxiliary support device to support the weight of the movable frame in the open position.

[0007] The object of the present invention is to provide an enhanced hinging device which has a strong structure, able autonomously to bear the weight of the movable frame in the open position without having to provide an auxiliary support device.

[0008] According to the present invention, said object is achieved by a hinging device having the characteristics set out in the main claim.

[0009] The characteristics and the advantages of the present invention shall become readily apparent in the detailed description that follows, provided purely by way of non limiting example with reference to the accompanying drawings, in which:

- Figure 1 is a perspective view of a hinging device according to the present invention,
- Figure 2 is a perspective view of the device of Figure 2 mounted on a window,
- Figure 3 is a partially exploded perspective view of the hinging device of Figure 1,
- Figure 4 is an exploded perspective view of the part indicated by the arrow IV in Figure 3,
- Figure 5 is a partial plan view of the hinging device of Figure 1 in the closed position, and
- Figure 6 is a section according to the line VI-VI of Figure 5.

[0010] With reference to Figure 1, the reference number 10 designates a hinging device usable as a lower hinge of a window, French window or the like. In Figure 2, the hinging device 10 is mounted on window or the like including a fixed frame 12 and movable frame 14, only partially shown in Figure 2. The fixed frame 12 and the movable frame 14 comprise respective lower cross members 16, 18 and respective mutually parallel uprights 20, 22. In the illustrated example, the fixed frame 12 and the movable frame 14 are formed by metallic section bars made of light alloy (only partially shown in Figure 2) provided with longitudinal slots for fastening accessories.

[0011] With reference in particular to Figure 4, the hinging device 10 comprises a first support element 24 to be fastened to the fixed frame 12 and a second support element 26 to be fastened to the movable frame 18. The first support element 24 is shaped substantially as a square, with a horizontal part 28 and a vertical part 30 which are inserted and fastened within respective slots of the cross member 16 and of the upright 20 of the fixed frame 12. The first support element 24 is preferably constituted by a monolithic piece of die-cast material and it has a widened portion 32 at the upper end of the vertical part 30. The widened portion 32 has a through hole 34 coaxial to a hole 36 formed on the horizontal portion 28. The holes 34, 36 support respective end portions of an elongated pivot pin 360 which defines a main axis of articulation 38. The horizontal portion 28 of the first support element 24 has a sliding guide 40 formed by a groove elongated in an orthogonal direction relative to the main axis of articulation 38.

[0012] With reference again to Figure 4, the device 10 further comprises a main lever 42 which comprises a first end region 44, an intermediate region 45, and a second end 48. The main lever 42 has, at the first end region 44, a "C" shaped articulation portion 50 provided with two mutually distanced coaxial holes 52. The articulation portion 50 is preferably formed in integral fashion with a horizontal planar portion 51 bearing a hole 54 in the intermediate region 44 and a hole 56 in the second end 48. As shown in particular in Figures 4 and 6, the articulation pivot pin 360 has a length that is substantially greater than its own diameter and it is fastened at both its ends to the first support element 24. Preferably, an end region of the pivot pin 360 is provided with knurling 58 that is

planted in the hole 34 of the first support element 24. The pivot pin 360 engages the holes 34, 36 and 52 mutually aligned along the axis of circulation 38. The two holes 52 of the main lever 42 rotatably engage portions of the pivot pin 360 that are axially distanced from each other and situated at the two end regions of the pivot pin 36.

[0013] The device 10 comprises a secondary lever 60 having a first end 62, an intermediate region 64 and a second end 66. The intermediate region 64 of the secondary lever 60 is articulated to the intermediate region 45 of the main lever 42 by means of a pivot pin 68 with its axis parallel to the main axis of articulation 38. The first end 62 of the secondary lever 60 is articulated in slidable fashion to the first support element 24 by means of a pivot pin 70 which slidably engages the sliding guide 60 of the first support element 24.

[0014] The second end 66 of the secondary lever 60 is articulated to the second support element 26 around a third axis 72 parallel to the main axis of articulation 38. In the illustrated example, said articulation is obtained by means of a pivot pin 74 which engages in rotatable fashion a hole formed in a seat 74 of the second support element 26.

[0015] The second end 48 of the main lever 42 is articulated to a first end of a connecting rod 76. The second support element 26 is articulated to a second end 78 of the connecting rod 76 around a fourth axis 80 parallel to the third axis 72. In the illustrated example, said articulation is obtained by means of a pivot pin 82 fastened to the second support element 26 and which engages with play a hole 84 provided at the second end 78 of the connecting rod 76.

[0016] The geometry of the hinging device 10 allows a movement of the movable frame 14 relative to the fixed frame 12 between a closed position and an open position with an angle of opening exceeding 90°, e.g. in the order of 110°. In the closed position of the window or the like, the hinging device 10 is entirely contained in the space between the cross members 16, 18 and the uprights 20, 22 of the window or the like and it is invisible from the exterior. During the opening motion, the movable frame 14 moves laterally outwards relative to the fixed frame 12 in such a way as to free the transverse port of the fixed frame 12.

[0017] The articulation between the first support element 24 and the main lever 42 obtained by means of the elongated pivot pin 360 and the "C" shaped articulation portion 50 allows to obtain a particularly rigid support of the main lever 42, which bears the weight of the entire movable frame 14 without substantial flexion deformations. Therefore, the device according to the invention does not need an independent load support system.

[0018] Naturally, the device according to the present invention may be subject to numerous variants without thereby departing from the scope of the invention. For example, the articulation region between the main lever 42 and the first pivot pin 36 could comprise an elongated hole which extends for a substantial part or for the entire

length of the part of the pivot pin 360 included between the regions of fastening to the first support element 24. Alternatively, the articulation of the main lever to the pivot pin 360 could be achieved outside with respect to the regions of fastening of the pivot pin 36 to the first support element 24.

Claims

1. A hinging device for windows and doors including a fixed frame (12) and a movable frame (14), comprising:

- a first support element (24) to be fastened to the fixed frame (12) and bearing a main axis of articulation (38) and a sliding guide (40) orthogonal to the main axis of articulation (38),
- a second support element (26) to be fastened to the movable frame (14),
- a main lever (42) having a first end region (44), an intermediate area (45) and a second end (48), in which said first end region (44) of the main lever is articulated to the first support element (24) around said main axis (38),
- a secondary lever (60) having a first end (62), a second end (66) and an intermediate region (64), in which the first end (62) of the secondary lever (60) is slidably articulated to the first support element (24) in said sliding guide (40), the intermediate region (64) of the secondary lever (60) is articulated to the intermediate region (45) of the main lever (42) around a second axis parallel to the main axis of articulation (38), and in which the second end (66) of the secondary lever (60) is articulated to the second support element (26) around a third axis (72), and
- a connecting rod (76) having a first end articulated to the second end (48) of the main lever (42) and a second end (78) articulated to the second support element (26) around a fourth axis (80) parallel to said third axis (72),

characterised in that the main axis of articulation (38) is defined by an elongated articulation pivot pin (360), whose length is substantially greater than its own diameter, supported at both its ends by the first support element (24), and **in that** the main lever (42) has an articulation portion (50) which extends parallel to the main axis of articulation (38) and engages said pivot pin (360) on at least two portions, axially distanced from each other.

2. Device as claimed in claim 1, **characterised in that** the main lever (42) has a planar portion (51) integral with the articulation portion (50) which is provided with two holes (52) distanced from each other in the axial direction which engage end regions of said piv-

ot pin (36).

- 3. Device as claimed in claim 2, **characterised in that** the first support element (24) has a horizontal portion (28) and a vertical portion (30) positioned according to a general square configuration, the vertical portion (30) having a widened end (32) provided with a hole (34) coaxial to a hole (36) positioned at one end of the horizontal portion (28), the pivot pin (36) engaging at its own ends said holes (34, 36).

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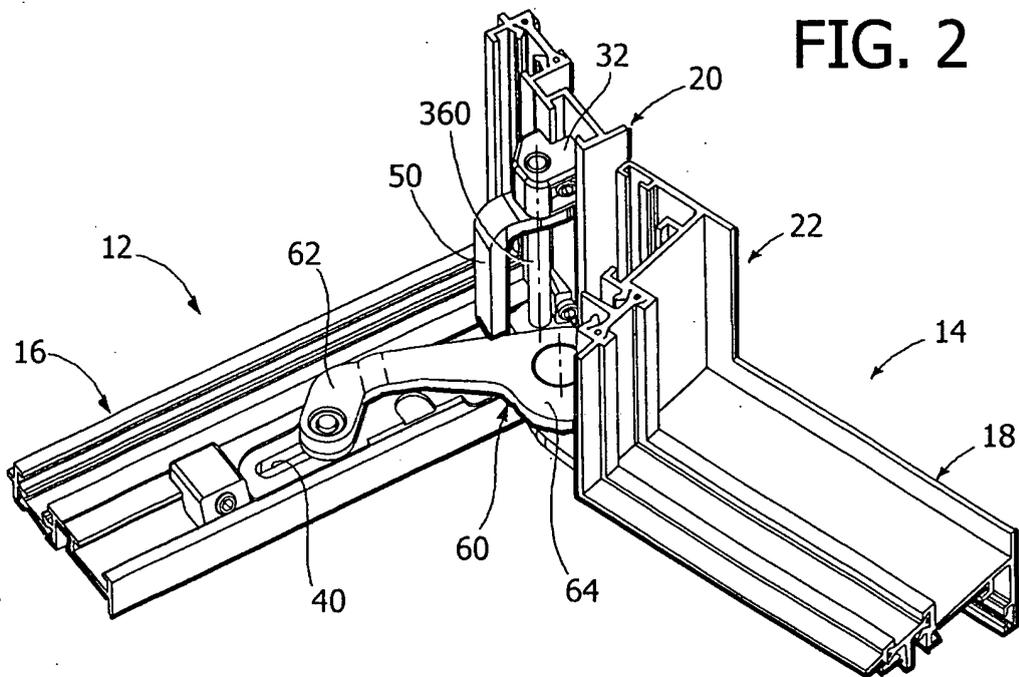
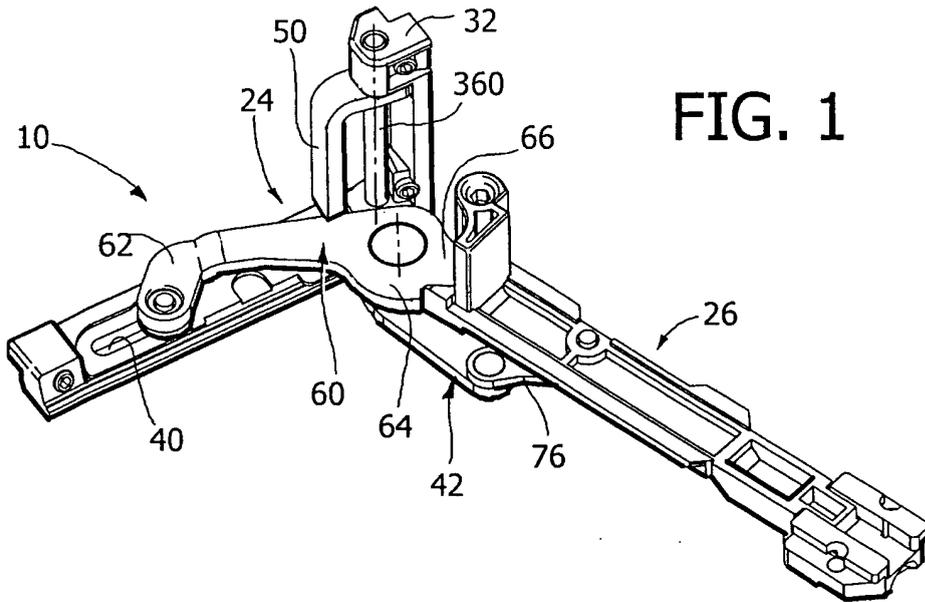
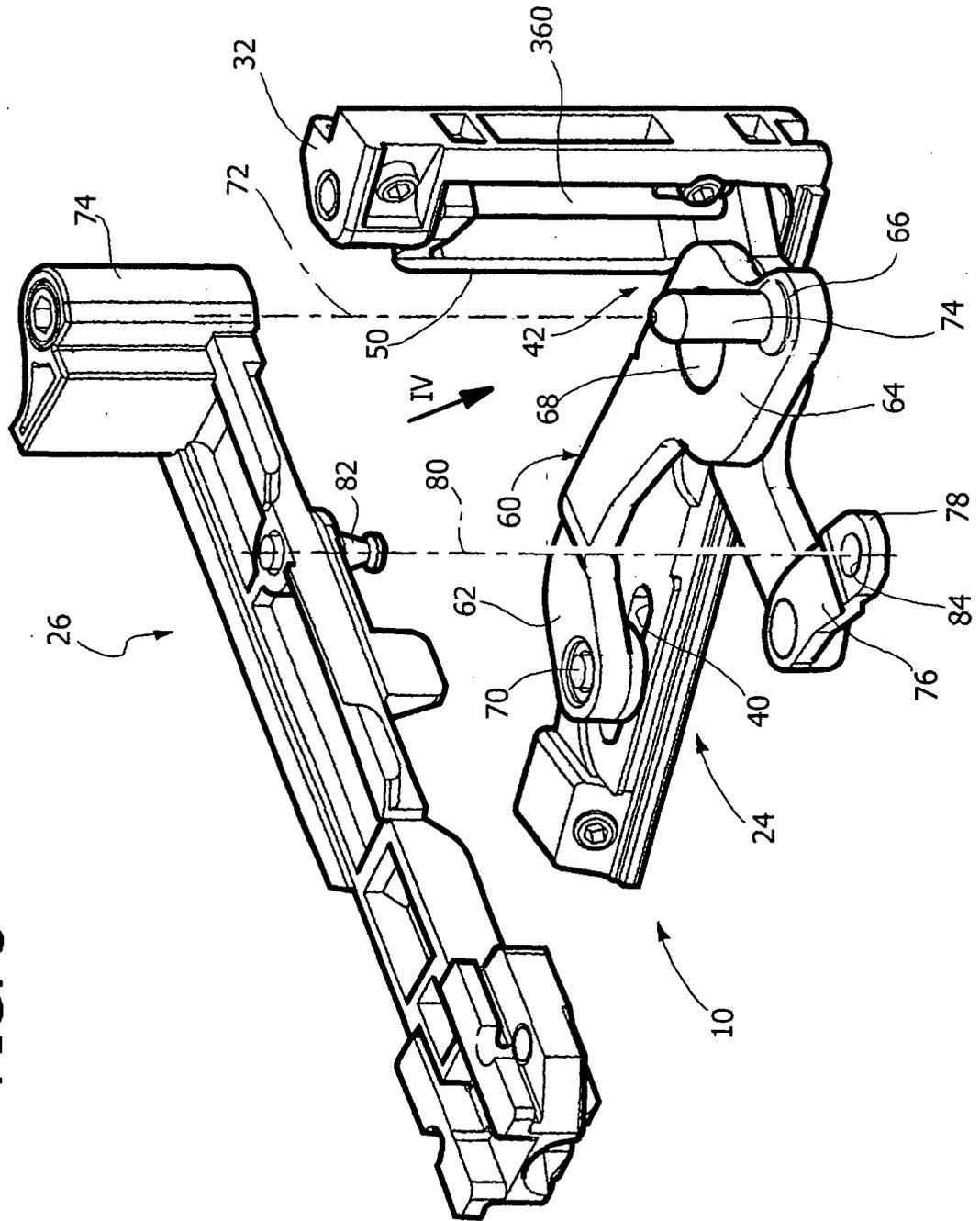


FIG. 3



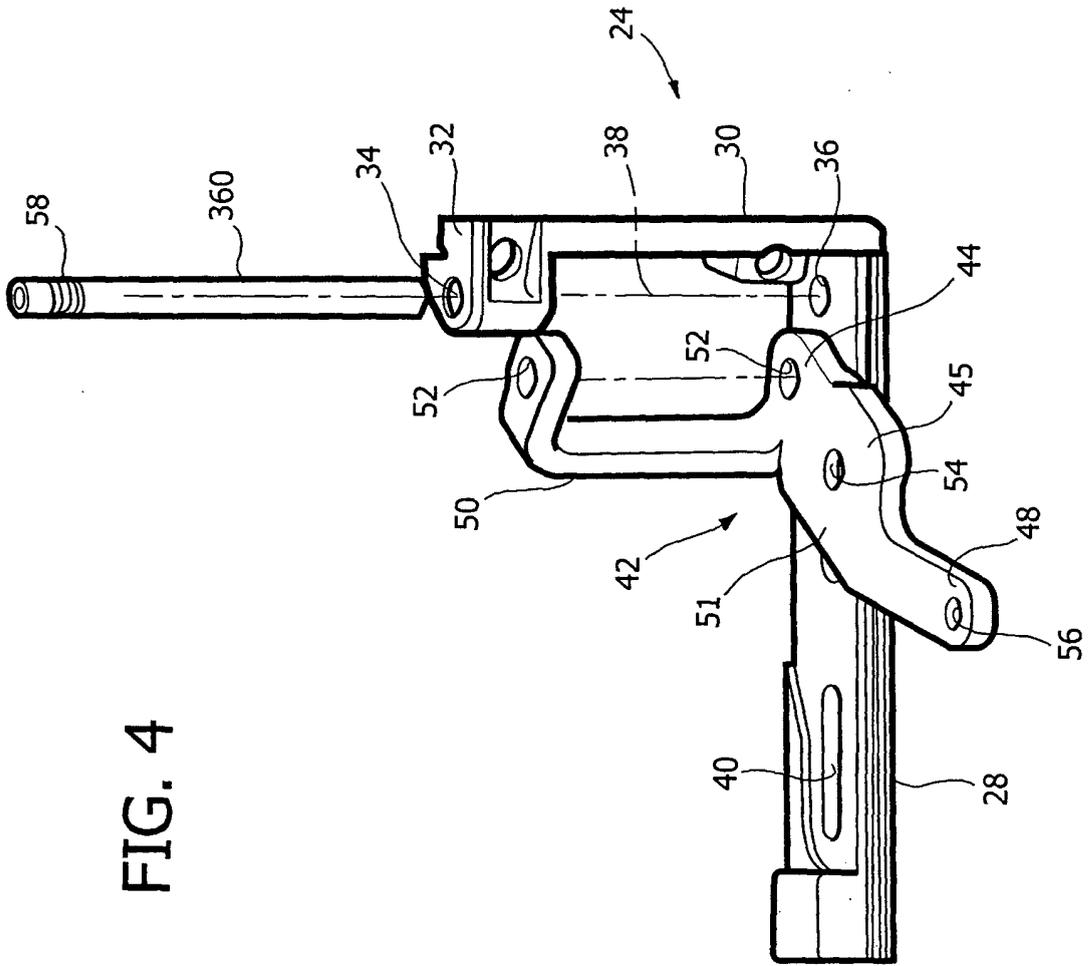


FIG. 4

FIG. 5

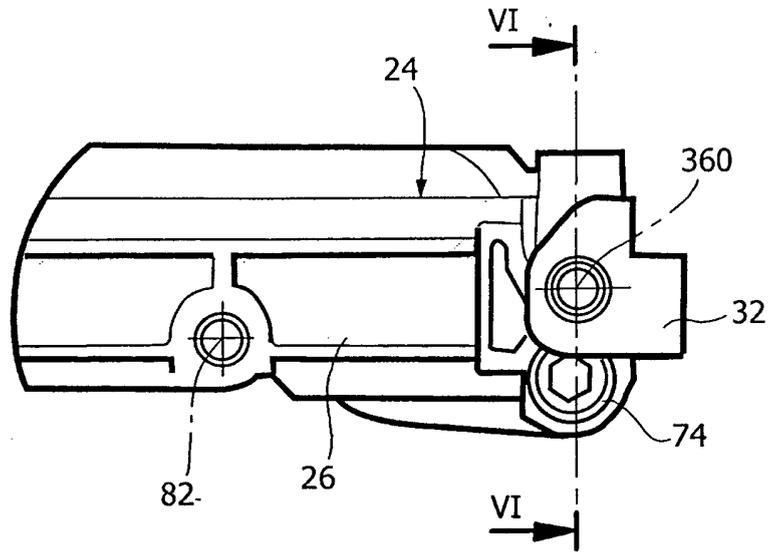


FIG. 6

