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(54) Mechanism for transmission of movement of door handle or key to the locking bolt of a lock

(57) The invention relates to a mechanism (2) for transmission of movement of a door handle or a key to the locking bolt (34) of a lock (20), said mechanism being provided with a body (4) and a locking bar member turning on the body about the longitudinal axis. The locking bar member is comprised of two locking bars, axially deflected relative to each other but substantially parallel in direction and operatively connected to each other with cogwheels (6, 8) of different sizes, the first (12) whereof being connectable to the cylinder lock or the door handle and the second (18) to the lock (20) and to the locking bolt (34) thereof. With the aid of the construction, the transmission ratio most advantageous to each embodiment is achieved between the opening movement and the rotary movement of the locking bar (18) displacing the locking bolt (34) of the lock (20). The invention also relates to a method for facilitating the opening of the lock (20).

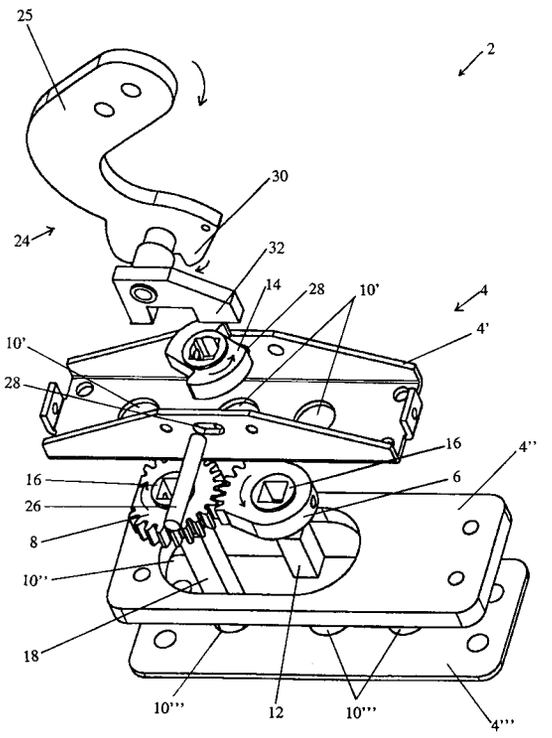

FIG. 1

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Description

[0001] The present invention relates to a mechanism for transmission of movement of a door handle or a key to the locking bolt of a lock according to the preamble of claim 1 presented below.

[0002] Problems have arisen in prior art designs in which the movement of a key or a door handle is directly transmitted from a single-piece locking bar to the locking bolt of the lock. The force needed, when opening with a key, to turn the key in situations in which moving the locking bolt involves considerable friction, becomes easily excessive and may prevent or substantially inhibit the opening of the lock because one should be able to open the locking bolt with a relatively small rotary movement of the key. If the lock is opened by transmission of movement of the door handle, which is frequently the case in exits, a sufficient force is achieved with a moment arm of the door handle, but the path of the door handle is small because of the limited space available (door jambs, risk of the fingers being squeezed) and therefore, that may delimit the appropriate path of the locking bolt.

[0003] The objective of the invention is to provide an enhanced mechanism for the transmission of movement of a key or a door handle in which the above problems have been eliminated or at least minimised. The aim of the invention is to provide a mechanism, that enables, when opening with a key, a transmission ratio between the turning movement of the key and the movement of the locking bolt of the lock, whereby sufficient force is provided for opening the lock without any problems.

[0004] To achieve the above aims, the mechanism of the invention is characterised by what is determined in the characteristic features' part of independent claim 1 below.

[0005] The mechanism of the invention comprises typically a separate body provided with a locking bar member. The locking bar member is comprised of two locking bars, axially deflected aside relative to each other but substantially parallel in direction and operatively connected to each other with cogwheels of different sizes and rotating about their longitudinal axes, the first of said locking bars being connectable to the cylinder body or the door handle and the second to the lock body and the locking bolt of the lock.

[0006] With the aid of the invention, the transmission ratio of the movement opening the lock and of the movement of the locking bolt can be selected for each purpose by changing the cogwheels. Also the positioning of the cylinder body or the door opening handle in the door can be selected according to the purpose.

[0007] When opening with the door handle, by means of appropriate selection of the transmission ratio, the opening of the lock can be enabled even using minor movement of the door handle. The transmission mechanism of the invention also enables the positioning of the door handle as appropriately as possible, for instance in exits, to be at a distance from the door jamb and in upright position on an edge of the door, thus enabling opening without any problems also from floor level (e.g. in a fire or a gas leak).

[0008] The transmission mechanism according to the invention comprises a body separate from the lock body, with two substantially parallel locking bars. The first locking bar can be connected to the cylinder body or the door handle by means of an idler sheave in conjunction therewith. The other locking bar protrudes from the body of the transmission mechanism to the body of the lock, therethrough being connectable with the locking bolt of the lock.

[0009] The mechanism of the invention can be connected to any lock whatsoever as long as it can be carried out so that the movement of one of the locking bars of the mechanism is transmitted to the locking bolt of the lock. Thus old locks, in which the movement of the key and/or the door handle is not, considering their purpose, advantageously transmitted to the locking bolt of the lock, can be provided with a transmission mechanism according to the invention and therethrough the advantages of the invention can be achieved even without having to replace the original lock body.

[0010] The invention is described below, reference being made to the attached drawings in which

Figure 1	presents a perspective exploded view of an embodiment of the invention,
Figure 2	presents a perspective view, in which the body of the mechanism is partly sectioned, of the embodiment of Figure 1 and said figure showing also the lock body whereto it can be connected,
Figures 3 to 5	show the embodiment of Figure 1 in end, lateral and top view with respect to the mechanism body,
Figure 6	shows the central part of a door in which the mechanism of Figure 1 has been mounted between the opening handle and the lock body.

[0011] In the embodiment of Figures 1, 2, 3, 4 and 5, the mechanism of the invention comprises a mainly rectangular body 4, consisting of a cover 4' and an intermediate piece 4" and a bottom 4"'. The body pieces 4', 4", 4"' have been so designed that they can be piled one on top of the other to form a substantially congruent element. The cover 4' and the bottom 4"' are provided with three consecutive apertures 10', 10"', these being placeable in concentric position relative to one another. The intermediate piece includes an aperture 10" greater in size than the apertures 10', 10"' of the bottom 4"' and the cover 4'.

[0012] The cogwheels 6 and 8 of the locking bar mem-

ber of the invention have been placed in aperture 10" of the intermediate piece 4" between the cover 4' and the bottom 4"' so that the arms 16 of the top and bottom surfaces of the cogwheels, round in cross-section, are placed accurately at the respective concentric, round apertures 10' and 10"' of the cover 4' and the bottom 4"', and that the cogwheels are appropriately in conjunction with each other to bring about the transmission movement. The arms 16 of the cogwheel 6, the cogwheel being operatively connected to the door handle 22 or the cylinder body, have each time been adapted to the centremost round apertures 10' and 10"'. The cogwheel 8, connected operatively with the lock body 20, can be adapted to be located on either side of the cogwheel 6 as long as the intermediate piece 4" is so turned that its oval aperture 10" is set in the end of the body 4 on which cogwheel 8 is desired to be disposed. The aperture 10" of the intermediate piece 4" can also be made so ample that the intermediate piece 4" need not be turned when wishing to dispose cogwheel 6 on the other side of cogwheel 8.

[0013] In the square hole in the middle of cogwheel 6, the end of the locking bar 12, square in cross-section, has been disposed. On the other end of the locking bar 12 protruding through the centremost aperture 10' of the cover 4', an idler sheave 14 has been disposed with the aid of the square hole in the middle thereof. Similarly, a locking bar 18, square-shaped in cross-section, has been inserted in the square hole in the middle of cogwheel 8. The other end thereof protruding through the aperture 10"' of the bottom 4"' is operatively adaptable to the mechanism of the lock through the aperture 21 in the lock body 20. Cogwheel 8 is in operating connection with the cogwheel 6.

[0014] The longitudinal edges of the cover 4' of the body have been bent outwards from the body and oval apertures 28 have been made in the middle of the long bent edges, in which apertures a shaft 26 has been disposed. On the shaft 26, a lever 24 turnable about said shaft and a slide shaft have been provided. A door handle 22 has been disposed on one end 25 of the lever 24 and on the other end of the lever 24, on the other side of the shaft 26, a pivoted arm 30 is provided, to be operatively connected to the idler sheave 14. The slide arm 32 is also in operating connection with the idler sheave 14.

[0015] The door handle 22 in the present embodiment is, as can be seen in Figure 1, a rod extending transversely across the door 23, said rod being also at the other end attached pivotably to the door 23. If desired, the door handle can also be disposed to be substantially vertical to the door 23 and extended down to the extent that opening the door, for instance in a fire, is possible on the floor level where the smoke and the heat reach last.

[0016] Cogwheel 6 can be turned with a key, instead of the movement of the door handle 22, if the key has by transmission of the cylinder body and, possibly also, of the locking bar 12 been connected operatively to cogwheel 6.

[0017] In Figures 1 to 5, the movement of the door handle 22 is transmitted by means of a first locking bar 12, a first cogwheel 6, a second cogwheel 8 and a second locking bar 18 to the lock body 20 as follows:

[0018] When the door handle 22 is depressed, the pivoted arm 30 rotates the idler sheave 14 on the first locking bar 6. Since the ends of the shaft 26 are supported by the oval apertures 28, the contact surface between the pivoted arm 30 and the idler sheave 14 and additionally the contact surface of the slide arm 32 and the idler sheave 14, said contact surface being on the opposite side of the pivoted arm 12 on the idler sheave 14, become the supporting points of the movement of the pivoted arm 30 turning the idler sheave 14. Thus, the movement is transmitted to the first locking bar 12 advantageously in this embodiment because the force directed at the door handle 22 is so divided that the pivoted arm 30 and the slide arm 32 rotate the idler sheave 14 from both sides of the locking bar 12 in the same direction and at equal force, whereby the friction between the moving parts is at its minimum.

[0019] From the first locking bar 12, the movement is transmitted to the second locking bar 18 by transmission of the cogwheel 6 of the first locking bar 12 and the cogwheel 8 of the second locking bar 18 operatively connected therewith. By selecting the first cogwheel 6 to be greater in diameter than the second cogwheel 8, the second locking bar 18 can be made to rotate more than the first locking bar 12 and, using a small movement of the door handle, a greater rotary movement for opening the locking bolt 34 of the lock 20 can be provided to the second locking bar 18. By selecting the first cogwheel 6 to be smaller in diameter than the second cogwheel 8, a greater rotary movement of the first locking bar 12 to rotate the second locking bar 18 is needed to open the locking bolt 34 of the lock 20 and respectively, a greater movement of the door handle 22 or the turning movement of the key, if the turning movement of the key rotates the first locking bar 12 by transmission of the cylinder body. The transmission ratio of the cogwheels 6 and 8 may, depending on the purpose, be e.g. in the range 1/4 to 4/1.

[0020] In the figures, the cogwheels 6 and 8 are detachable from the locking bars 12 and 18, square in cross-section, so that by changing the cogwheel sizes, the transmission between the locking bars can be changed. Be it that the locking bars 12 and 18 may be of other cross-sections than rectangular, they are, however, typically angular in shape. The shape of the central apertures in the cogwheels 6 and 8 and in the idler sheave 14 is selected to comply with the shape of the locking bar. The door handle or the cylinder body, intended to be used when opening according to the invention, can be disposed in any desired direction by the distance between the locking bars 12 and 18 from the opening locking bar 18 in order to obtain the most ad-

vantageous location, for instance at a distance away from any obstructions by door jambs possibly inhibiting the movement of the door handle.

[0021] In the embodiment described above, a lock to be opened primarily with a door handle is described. A lock opened with a key is mentioned, and an advantage is in such an instance gained with a transmission with which the rotary movement of the key is enlarged compared with the rotary movement of the locking bar opening the locking bolt, in order to have sufficient force for opening the lock in any situation.

[0022] The mechanism of the invention can be used in exits, such as in exits of dwelling houses, public premises, places of work and ships. The locks of the exit doors are to be relatively easy to open in any circumstances, and therefore, a plurality of authority regulations regulate the properties affecting said aspect. It is of importance that the exit doors can be opened at a given minimum force, also in situations in which forces inhibiting the opening exert an impact on the doors. Several old combinations of doors and locks do not meet all current requirements. An advantage of the present invention lies in that the mechanism of the invention can quite often be mounted on a lock of an existing exit door without having to make significant changes in the door or in the lock body; instead, it is enough that the mechanism of the invention is disposed between the door handle intended for opening and the lock body.

[0023] Above, different ways to implement the mechanism of the invention have been described with the aid of examples. However, the invention comprises all embodiments included in the claims below.

Claims

1. A mechanism (2) for transmission of movement of a door handle or a key to the body and the locking bolt of a lock, characterised in that the mechanism (2) is provided with a body (4) separate from the lock body (20) and with a locking bar member therein, said member being comprised of two locking bars, axially deflected relative to each other but substantially parallel in direction and operatively connected to each other with cogwheels (6,8) of different sizes and rotating about their longitudinal axes, the first (12) whereof being operatively connectable to the cylinder lock or the door handle and the second (18) to the lock body so that the movement of the second locking bar (18) is transmitted to the locking bolt (34) of the lock (20).

2. Mechanism (2) according to claim 1 to be connected to the cylinder lock, characterised in that the cogwheel (6) of the first locking bar (12) to be operatively connectable to the cylinder lock is smaller than the cogwheel (8) of the second locking bar (18) to be operatively connectable to the locking bolt (34) of the lock (20).

3. Mechanism (2) according to claim 1 to be connected to door handle, characterised in that the cogwheel (6) of the first locking bar (12) to be operatively connectable to the door handle (22) is bigger than the cogwheel (8) of the second locking bar (18) to be operatively connectable to the lock body (20) and to the locking bolt (34) of the lock.

4. Mechanism according to any one of the preceding claims, characterised in that the transmission ratio of the cogwheels (6, 8) of the first locking bar (12) and the second locking bar (18) is from 1/4 to 4/1.

5. Mechanism according to any one of the preceding claims, characterised in that the cogwheels (6, 8) are detachably attached to the locking bars (12, 18) angular in cross-section, preferably square.

6. A method for facilitating the opening of a door, characterised in that the mechanism (2) according to claim 1 is disposed between the lock (20) of the door and the cylinder body or the handle (22) thereof.

7. Method according to claim 6, characterised in that the door (36) is an exit door.

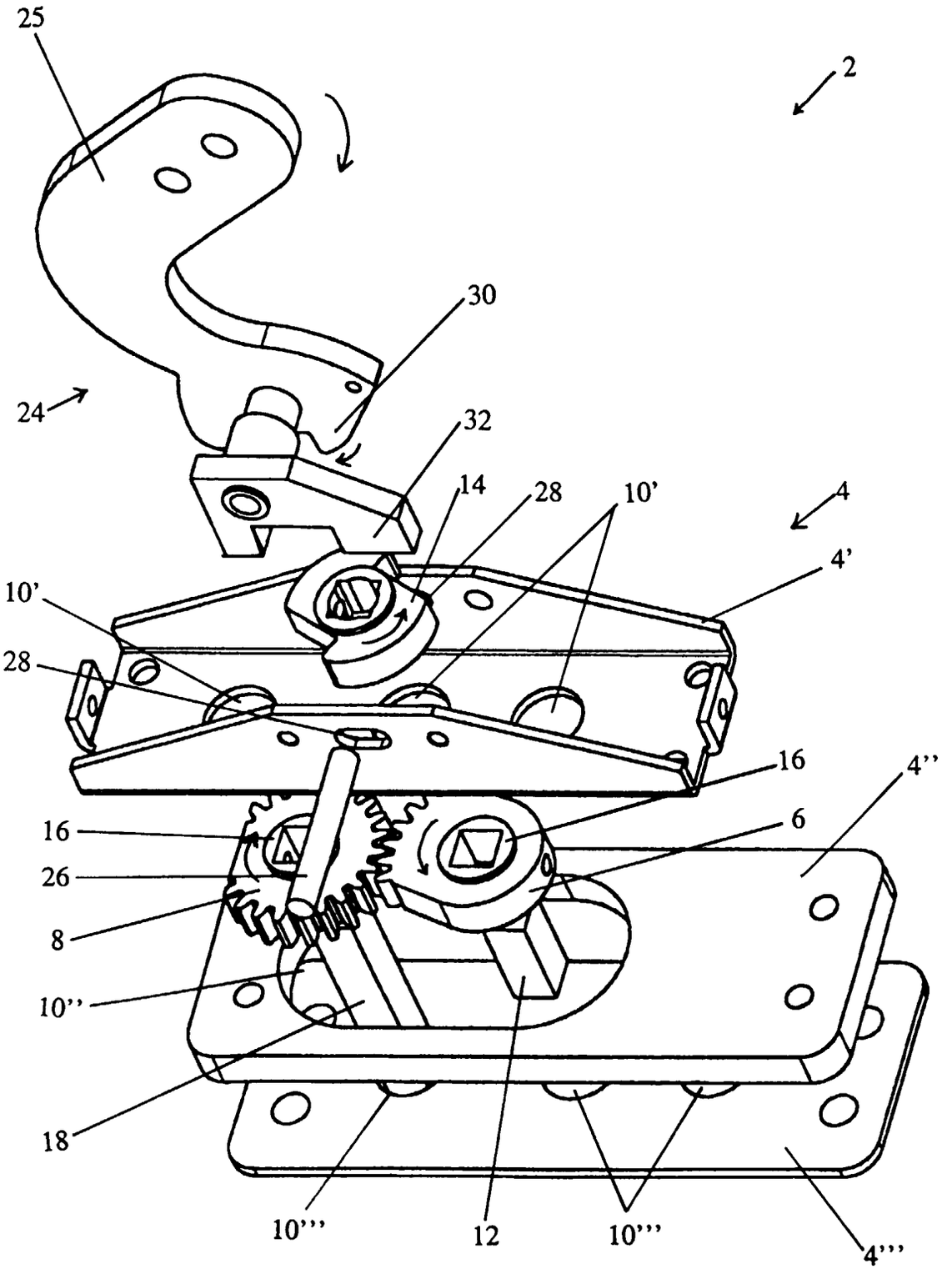

FIG. 1

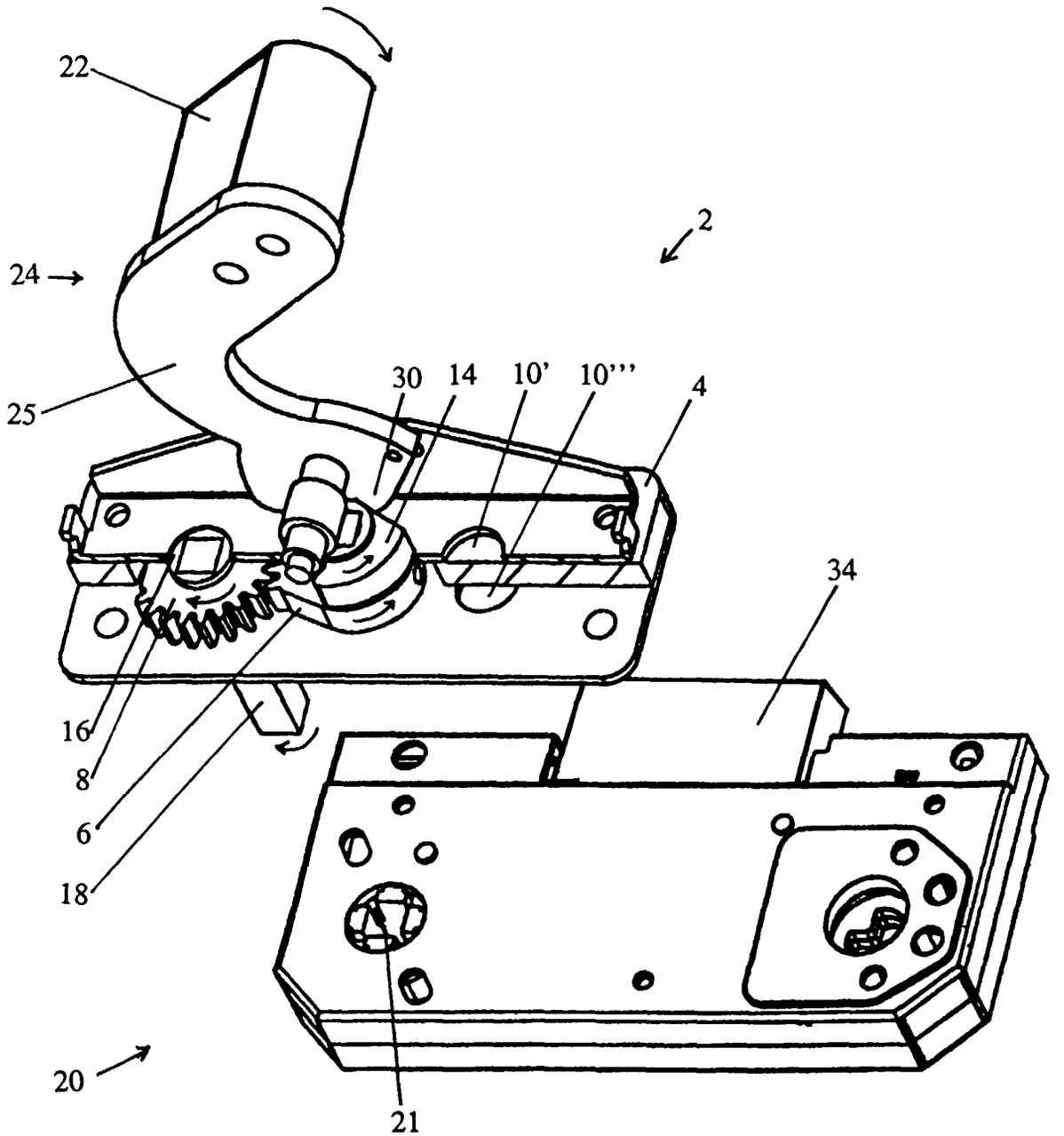

FIG. 2

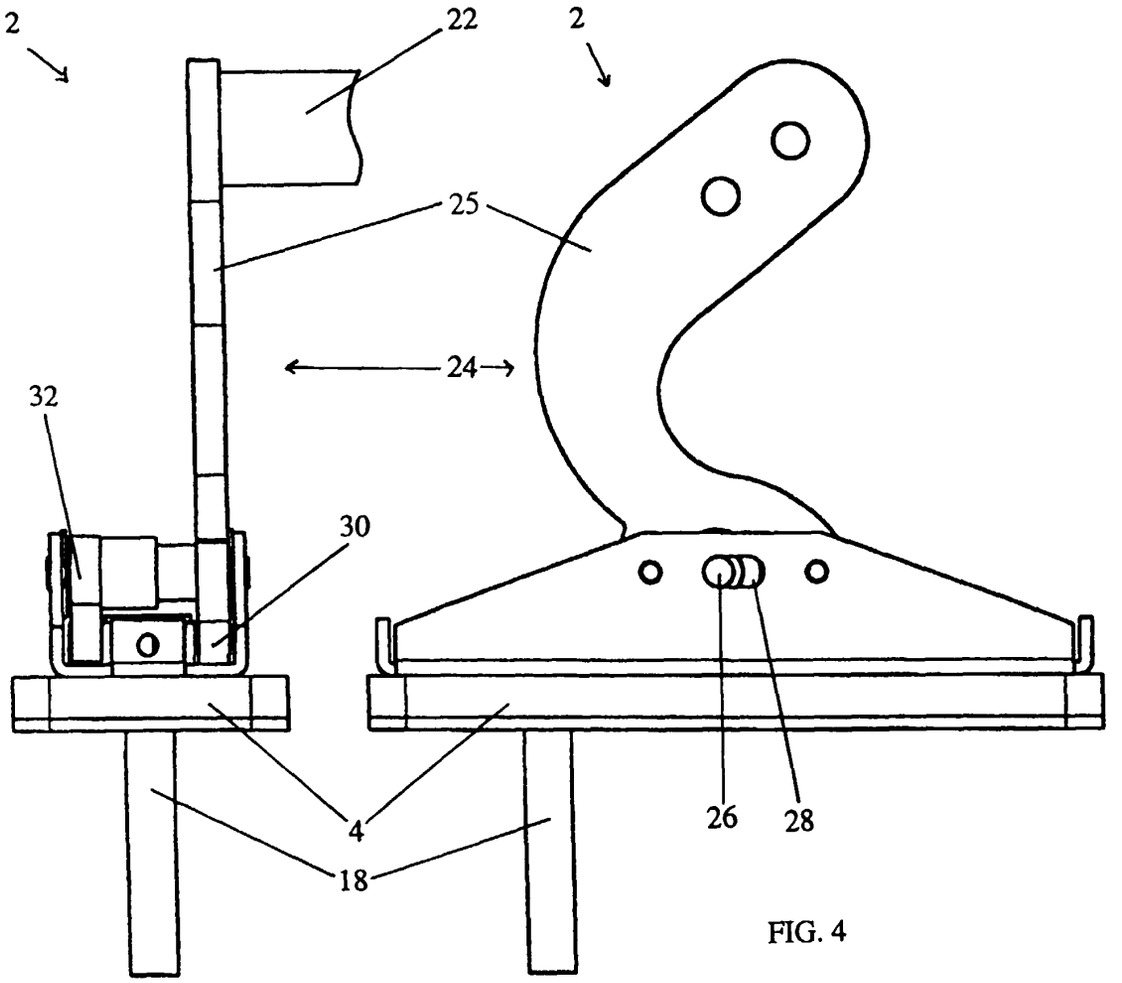

FIG. 3

FIG. 4

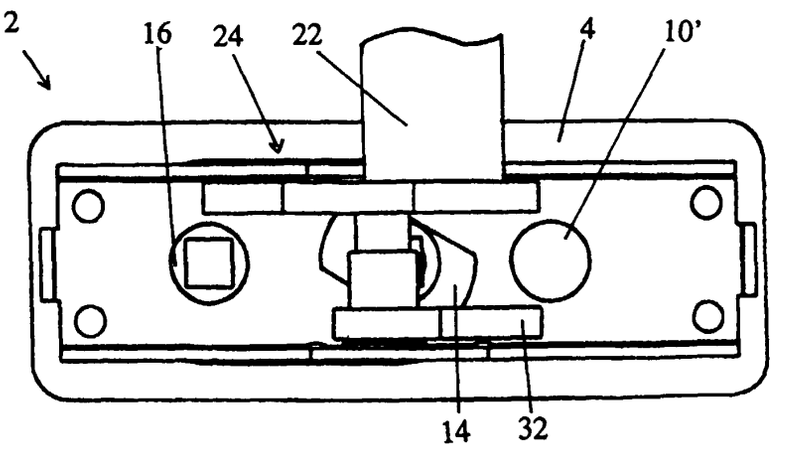

FIG. 5

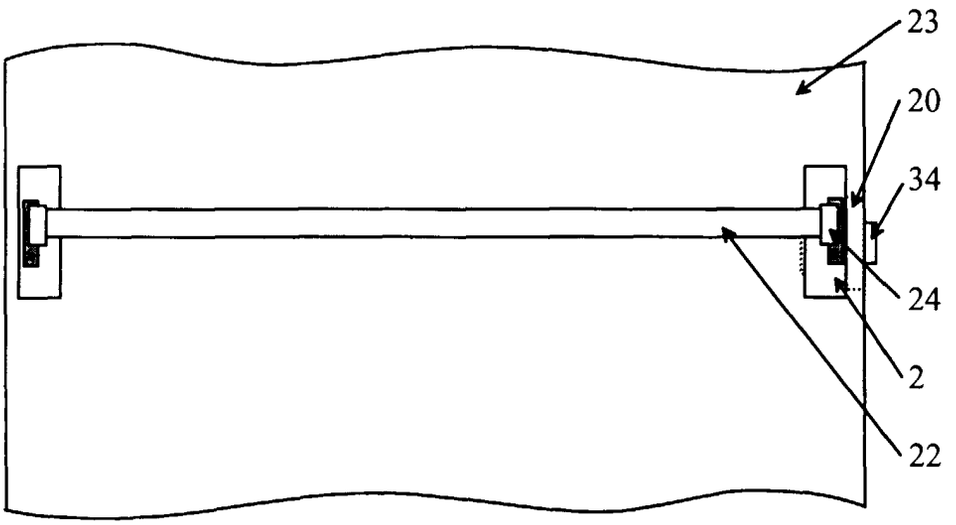

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 99 66 0139

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	CH 685 638 A (EICHHOLZER AG M) 31 August 1995 (1995-08-31) * column 3, line 51 - column 8, line 5; figures 1-3 *	1-7	E05B65/10
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	14 December 1999	Friedrich, A

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