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Description

The present invention relates to emergency exit devices, in particular to emergency exit devices of the panic device type. The devices according to the invention are particularly suitable for installation on fire resistant doors and are designed to meet the requirements of general safety and of legislation relating to escape from buildings.

An emergency exit device is a device, the main objective of which is to enable a door to be opened at all times by hand or body pressure from the inside, not requiring the use of a key or any other object.

Emergency exit devices fall into two broad categories.

The first category are suitable for installation at locations which are not open to the public, and would only be used by individuals who could be given prior instruction in the operation of the device. Such locations would include, for example, lift machinery housings and transformer installations, where there is a risk of, in particular, fire, and it might be necessary to evacuate the location rapidly in an emergency. The second category of emergency exit device, known as a panic device, is suitable for installation in areas which are open to the public, for example public buildings, places of public entertainment, stores, schools and hospitals, where it is necessary for the panic device to give simple and effective escape through a doorway with minimum effort and without prior knowledge of the device.

A draft common European Standard "Exit Devices/Part 1: Horizontal Panic Devices", has been produced based on existing national standards, setting out stringent performance requirements for panic devices, and it is expected that this common standard will be adopted throughout Europe, in order for buildings to be licensed as being safe for the public to use.

The requirements of this standard, which relate to panic devices actuated by a horizontal bar, include

(a) that the device must complete a minimum of 100,000 opening and closing cycles and still be operable

(b) that, with the test door secured and with no thrust on any part of the door, the bar shall be actuated by a force not to exceed 80N

(c) that, with the test door secured, and with a standard static force applied, the bar shall be actuated by a force not to exceed 220N (this simulates the panic situation where a group of people are rushing to an escape door, and the first one to reach the door will not necessarily operate the horizontal panic device, but may push the surface of the door, while others try to operate the horizontal bar).

Legislation and considerations of general safety already require that public buildings be fitted with doors which satisfy fire resistance standards, both for exits which would be used in emergencies and for providing the control of the spread of fire within the building.

Some fire resistant doors are manufactured by mass production methods, in a variety of sizes, and are produced for economy in standard designs which are to be fitted with mortise locks. In a particular building, the majority of the fire resistant doors, perhaps 80% of such doors, do not need to be fitted with emergency exit or panic devices, but a small percentage, typically 20%, of such doors do have an emergency exit or panic function.

It would be particularly desirable to provide an emergency exit or panic device which could be installed on standard, mass-produced, fire resistant doors, without modification of the fire resistant doors, which exit device would meet the requirements of general safety, and of present and proposed future legislation relating to the performance of such devices.

Exit devices are known which are designed to operate rim-type locks, but these are not suitable for standard mass-produced fire-resistant doors.

Exit devices are also known which are designed to operate mortise locks, but these will have to satisfy the requirement of the proposed European standard referred to above, in particular those aspects of the standard which relate to the opening of the door under pressure, and to the number of operating cycles which the device must complete and still be operable.

DE 32 44 647 discloses an exit device which comprises a housing including a back plate (8) for mounting on a door and providing a guide means for the rack (20) of a rack-and-pinion mechanism (20,21) and a rack-and-pinion mechanism (20,21) in which the rack (20) is retained within the guide means and is free to move, to a limited extent, in a plane parallel to the plane of the back plate (8), and the pinion (21) is adapted to receive the spindle of an anti-panic mortise lock; said device further comprising a lever handle (15) pivotally mounted on the housing (8); co-operating projections 917,18) on the lever handle (15) and attached to the rack (20), such that operation of the lever handle drives the rack within the guide means, and biasing means (24) tending to urge the rack (20) in the direction opposed to that in which it is driven by the lever handle.

It is an object of the present invention to provide an exit device, in particular a panic device, which can be installed on standard fire resistant doors without modification of the doors, and which satisfies stringent requirements as to public safety.

The invention provides an exit device which comprises a housing comprising a back plate for mounting on a door and providing guide means for the rack of a rack-and-pinion mechanism and a rack-and-pinion mechanism, the rack of which is free to move, to a limited extent, in a plane parallel to the plane of the back plate, and the pinion of which is adapted to receive the spindle of an anti-panic mortise lock; which device further comprises a lever handle pivotally mounted on the housing; co-operating projections on the lever handle and attached to the rack, such that operation of the lever handle drives the rack within the guide means, and biasing means tending to urge the rack in the direction opposed to that in which it is driven by the lever handle, characterised in that the rack is a closed rack which is retained within the guide means.

Where the exit device according to the invention is to be used as panic exit device, the lever handle is adapted to be fitted to a horizontal panic bar. In order to be fitted to a horizontal panic bar, the lever handle is preferably fitted with one or more recesses, into which fits a corresponding projection or projections on a metal plate. This metal plate is fastened to a tenon for insertion in known manner in the horizontal panic bar.

The exit device according to the invention is adapted to receive the spindle of an anti-panic mortise lock. By the term "anti-panic mortise lock", is meant a mortise lock in which, on the inside, all unlocking functions are operated by the spindle. The exit device according to the invention is particularly useful in the type of anti-panic mortise lock in which if the dead bolt is projected, the inside lever handle retracts the latch and dead bolt simultaneously. The outside lever handle retracts the latch bolt only. From the outside, the dead bolt operated by the cylinder key only. If the dead bolt is withdrawn, the latch bolt is operated from both sides by the lever handle.

An exit device according to the invention will now be further described with reference to the accompanying drawings in which

Figure 1 is a side view of an embodiment of a panic device according to the invention, with the housing broken away,

Figure 2 is a rear view of the panic device of Figure 1 and

Figure 3 is a front view of the panic device of Figures 1 and 2, with the housing partially broken away.

As shown in Figure 1, a panic device 2 comprises a housing 4 which is mounted on a door 6. The housing 4 comprises a back plate 8 holding a rack 10 of a rack-and-pinion mechanism 12, the pinion 14 of which rack and pinion mechanism 12 is adapted to receive the spindle 16 of an anti-panic mortise lock 18. A lever handle 20 is pivotally mounted on the housing 4 at pivot 22 and has a projection 24 which is arranged to co-operate with a second projection 26 on a plate 11 connected to the rack 10.

A coil spring 28 is mounted on a pin 30 secured in the housing 4. One free end 32 of the spring 28 is urged against the wall 34 of the housing 4 and the other free end 36 of the spring 28 contacts one end of the rack 10. A face 38 of the lever handle 20 engages removable stop means 40 in the rest position of the handle 20.

The rack 10 is slideably mounted within guide means formed by the back plate 8 of the housing 4 and rollers 44, 46 which are mounted in the housing 4 and retain the rack 10 in contact with the back plate 8.

As can be seen from Figure 2, the rack 10 is fitted with two bosses 48, 50 which engage in elongated slots 52, 54 in the back plate 8 of the housing 4. The rack 10 is a closed rack with teeth 56 which engage with teeth 58 in the pinion 14.

As can be seen in Figure 3, the lever handle 20 is provided with two recesses 60, 62 to engage projections 64, 66 on a metal plate 68, which is suitably manufactured from steel. The plate 68 is fastened to a tenon 70 which is inserted into a horizontal panic bar 72. A bolt 74 is screwed into a captive nut 76, to expand the tenon 70 to fit tightly within the horizontal panic bar 72.

An adjustment screw 78 as shown in Figure 1 is located in a threaded aperture 80 provided in the lever handle 20, to allow for adjustment of the panic device 2 at the time of its installation or after installation, when wear during use has caused an increase in the clearance between co-operating parts.

The exit devices according to the invention, when used as a panic device, would normally be installed in pairs, fastened at either end of a horizontal panic bar. The exit device installed at the end of the horizontal panic bar adjacent to the hinges of the door is provided to give support to the panic bar and does not have any unlocking function. This exit device can therefore be installed, for reasons of economy, without the rack and pinion mechanism required to operate the anti-panic mortise lock.

In operation, pressure on the lever handle 20 in the anti-clockwise direction, as shown in Figure 1, causes the handle 20 to pivot about pivot 22 so that the projection 24 on the handle 20 engages with the projection 26 on the plate 11 and drives the rack 10 in an upward direction.

The pinion 14 is thus rotated by the interengagement of the teeth 56 and the teeth 58 by the upwards movement of the rack 10, and the spindle 16 of the anti-panic mortise lock 18 is rotated and

all unlocking functions are operated.

When the exit device 2 is attached to a panic bar 72, pressure on the panic bar 72 exerted downwards and/or in the direction of travel similarly causes rotation of the handle 20.

When pressure on the handle 20 or panic bar 72 is released, the coil spring 28 urges the rack 10 to move downwards within the guide means, the pinion 14 and hence the spindle 16 of the anti-panic lock 18 are driven to rotate in the opposite direction, and the device is returned to its rest position.

The extent of movement of the rack 10 is constrained by the bosses 48, 50 within the corresponding elongated slots 52, 54 in the back plate 8 of the housing 4.

The device can be adjusted by means of the adjustment screw 78 located in the threaded aperture 80 in the lever handle 20. When this screw is screwed in so that its point projects beyond the face 38 of the handle 20, this means that the stop means 40 is engaged with the angle between the handle 20 and the door 6 reduced, as compared to the angle of engagement when the screw 78 is withdraw. This means that the handle 20 and the attached panic bar 72 protrude to a lesser extent, so that when the door 6 is open, the gap for escape or exit from the location is effectively increased.

Where the door to which the exit device is attached is not a fire resistant door, the adjustment screw 78 may be screwed in to a greater extent, so that the exit device is dogged; that is, the bolt head is held in the withdrawn position until manually reset.

Such a dogging mechanism can be of value, for example, in a school or other public building during the day where the door is in constant use. Where the door is a fire resistant door and must be kept closed at all times, the adjustment screw 78 is designed so that only a limited amount of adjustment is available and dogging is not possible.

The stop-means 40 is removable, so that during installation of the exit device 2 the handle 20 can be raised above its usual rest position in order to expose the fastening screws or bolts.

The exit device acccording to the invention is designed to operate an anti-panic mortise lock of the type described above. It has been found to be advantageous to coat certain parts of the lock, for example the latch and counterstrike, with a friction reducing coating such as polytetrafluoroethylene. This coating has the effect of reducing the friction between the lock parts and hence the load required to operate the exit mechanism. It has also been found advantageous to use an anti-panic mortise lock in which a roller is inserted, in known manner, in either the latch or the counterstrike, in order to reduce the friction between the lock parts. The reduction of friction has been found to be particularly important in satisfying the requirements of the draft common European Standard, in particular that test covering the opening force to be applied to a door loaded with a standard static force.

The device according to the invention can be attached to single or double doors of either hand, and to both the active and inactive leaf of double doors. Where the doors are double doors they may be fitted in known manner with door sequencers in order to ensure the correct sequence of door closing, without affecting the operation of the exit device according to the invention.

Claims

1. An exit device (2) which comprises a housing (4) comprising a back plate (8) for mounting on a door (6) and providing guide means for the rack (10) of a rack-and-pinion mechanism (12) and a rack-and-pinion mechanism (12), the rack (10) of which is free to move, to a limited extent, in a plane parallel to the plane of the back plate (8), and the pinion (14) of which is adapted to receive the spindle (16) of an anti-panic mortise lock (18);

which device further comprises a lever handle (20) pivotally mounted on the housing (4); co-operating projections (24,26) on the lever handle (20) and attached to the rack (10), such that the operation of the lever handle (20) drives the rack (10) within the guide means,

and biassing means (28) tending to urge the rack (10) in the direction opposed to that in which it is driven by the lever handle (20), characterised in that the rack (10) is a closed rack which is retained within the guide means.

2. An exit device (2) according to Claim 1, characterised in that the lever handle (20) is adapted to be fitted to a horizontal panic bar (72).

3. An exit device according to Claim 1 or Claim 2 characterised in that rotation of the lever handle (20) in the direction opposed to the direction in which the rack (10) is driven is restrained by a removable stop means (40).

4. An exit device (2) according to Claim 3 characterised in that an adjustment screw (78) is provided between the lever handle (20) and the stop means (40), which screw (78) can be adjusted to increase or reduce the effective depth of the lever handle (20), and hence adjust the rest position of the lever handle (20).

5. An exit device (2) according to any of claims 2 to 4 characterised in that the lever handle (20) is fitted with a recess (60, 62), into which fits a projection (64, 66) on a metal plate (68), which metal plate (68) is fastened to a tenon (70) for insertion into the horizontal panic bar (72).

6. An exit device (2) according to any of claims 1 to 5 characterised in that the rack and pinion mechanism (12) is retained in the guide means, by means of rollers (44, 46) mounted in the housing (4).

7. An anti-panic locking system for a door characterised in that it comprises an exit device (2) according to any of claims 1 to 6 in combination with an anti-panic mortise lock (18).

8. An anti-panic locking system according to claim 7 characterized in that the anti-panic mortise lock (18) comprises a latch and counterstrike which are coated with polytetrafluoroethylene.

9. An anti-panic locking system according to claim 7 characterised in that the anti-panic mortise lock (18) comprises a latch in which a friction-reducing roller is inserted.

10. An anti-panic locking system according to claim 7 characterised in that the anti-panic mortise lock (18) comprises a counterstrike in which a friction-reducing roller is inserted.

Patentansprüche

1. Ausgangsvorrichtung (2), welche aufweist: ein Gehäuse (4), das eine Grundplatte (8) zum Montieren an einer Tür (6) aufweist und eine Führungsvorrichtung für die Zahnstange (10) eines Zahnstange-und-Ritzel-Mechanismusses (12) vorsieht, und einen Zahnstange-und-Ritzel-Mechanismus (12), deren Zahnstange (10) sich in einem begrenzten Umfang in einer Ebene parallel zu der Ebene der Grundplatte (8) frei bewegen kann, und deren Ritzel (14) so angepaßt ist, daß es die Spindel (16) eines Antipanik-Einsteckschlosses (18) aufnimmt;
wobei die Vorrichtung des weiteren aufweist: einen Hebelgriff (20), der schwenkbar an dem Gehäuse (4) montiert ist; zusammenwirkende Vorsprünge (24, 26) an dem Hebelgriff (20), welche an der Zahnstange (10) derart angebracht sind, daß der Betrieb des Hebelgriffes (20) die Zahnstange (10) innerhalb der Führungseinrichtung bewegt, und eine Spanneinrichtung (28), die dazu neigt, die Zahnstange (10) in der Richtung entgegengesetzt zu der zu drücken, in der sie durch den Hebelgriff (20) bewegt wird, dadurch gekennzeichnet, daß die Zahnstange (10) eine geschlossene Zahnstange ist, die innerhalb der Führungseinrichtung gehalten ist.

2. Ausgangsvorrichtung (2) nach Anspruch 1, dadurch gekennzeichnet, daß der Hebelgriff (20) so angepaßt ist, daß er an einen horizontalen Panikbügel (72) paßt.

3. Ausgangsvorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Rotation des Hebelgriffes (20) in der Richtung entgegengesetzt zu der Richtung, in der die Zahnstange (10) bewegt wird, durch eine entfernbare Anschlageinrichtung (40) begrenzt ist.

4. Ausgangsvorrichtung (2) nach Anspruch 3, dadurch gekennzeichnet, daß eine Einstellschraube (78) zwischen dem Hebelgriff (20) und der Anschlageirrichtung (40) vorgesehen ist, wobei die Schraube (78) eingestellt werden kann, um die effektive Tiefe des Hebelgriffes (20) zu erhöhen oder zu reduzieren und somit die Ruheposition des Hebelgriffes (20) einzustellen.

5. Ausgangsvorrichtung (2) nach einem der Ansprüche 2 bis 4, dadurch gekennzeichnet, daß der Hebelgriff (20) mit einer Ausnehmung (60, 62) ausgestaltet ist, in welche ein Vorsprung (64, 66) an einer Metallplatte (68) paßt, wobei die Metallplatte (68) an einem Zapfen (70) zum Einführen in den horizontalen Panikbügel (72) befestigt ist.

6. Ausgangsvorrichtung (2) nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß der Zahnstange-und-Ritzel-Mechanismus (12) in der Führungseinrichtung mittels Rollen (44, 46) gehalten ist, die in dem Gehäuse (4) montiert sind.

7. Antipanik-Verriegelungssystem für eine Tür, dadurch gekennzeichnet, daß es eine Ausgangsvorrichtung (2) gemäß einem der Ansprüche 1 bis 6 in Kombination mit einem Antipanik-Einsteckschloß (18) aufweist.

8. Antipanik-Verriegelungssystem nach Anspruch 7, dadurch gekennzeichnet, daß das Antipanik-Einsteckschloß (18) eine Falle und ein Gegenschließblech aufweist, welche mit Polytetrafluorethylen beschichtet sind.

9. Antipanik-Verriegelungssystem nach Anspruch 7, dadurch gekennzeichnet, daß das Antipanik-Einsteckschloß (18) eine Falle aufweist, in welche eine reibungsreduzierende Rolle eingefügt ist.

10. Antipanik-Verriegelungssystem nach Anspruch 7, dadurch gekennzeichnet, daß das Antipanik-Einsteckschloß (18) ein Gegenschließblech aufweist, in welches eine reibungsreduzierende Rolle eingefügt ist.

Revendications

1. Dispositif de sortie (2) qui comprend un boîtier (4) comprenant lui-même une plaque arrière (8) servant pour le montage sur une porte (6) et formant des moyens de guidage pour la crémaillère (10) d'un mécanisme (12) à crémaillère et pignon, et un mécanisme (12) à crémaillère et pignon dont la crémaillère (10) est libre de se déplacer, sur une distance limitée, dans un plan parallèle au plan de la plaque arrière (8), et dont le pignon (14) est adapté pour recevoir la broche (16) d'une serrure anti-panique à larder (18) ;

lequel dispositif comprend en outre une poignée de levier (20) montée pivotante sur le boîtier (4) ; des saillies coopérantes (24, 26), l'une prévue sur la poignée de levier (20) et l'autre fixée à la crémaillère (10), de telle manière que la manoeuvre de la poignée de levier (20) fasse circuler la crémaillère (10) dans les moyens de guidage,

et des moyens de rappel (28) qui tendent à déplacer la crémaillère (10) dans le sens inverse de celui dans lequel elle est entrainée par la poignée de levier (20), caractérisé en ce que la crémaillère (10) est une crémaillère fermée qui est retenue dans les moyens de guidage.

2. Dispositif de sortie (2) selon la revendication 1, caractérisé en ce que la poignée de levier (20) est adaptée pour être montée sur une barre anti-panique horizontale (72).

3. Dispositif de sortie selon la revendication 1 ou la revendication 2, caractérisé en ce que la rotation de la poignée de levier (20) dans le sens inverse du sens dans lequel la crémaillère (10) est entrainée et limitée par un moyen de butée amovible (40).

4. Dispositif de sortie (2) selon la revendication 3, caractérisé en ce qu'une vis de réglage (78) est prévue entre la poignée de levier (20) et le moyen de butée (40), laquelle vis (78) peut être réglée pour augmenter ou réduire la profondeur effective de la poignée de levier (20) et pour régler ainsi la position de repos de la poignée de levier (20).

5. Dispositif de sortie (2) selon une quelconque des revendications 2 à 4, caractérisé en ce que la poignée de levier (20) est munie d'une encoche (60, 62) dans laquelle s'ajuste une saillie (64, 66) formée sur une plaque métallique (68), laquelle plaque métallique (68) est fixée à un tenon (70) destiné à être inséré dans la barre anti-panique horizontale (72).

6. Dispositif de sortie (2) selon une quelconque des revendications 1 à 5, caractérisé en ce que le mécanisme (12) crémaillère et pignon est retenu dans les moyens de guidage à l'aide de galets (44, 46) montés dans le boîtier (4).

7. Système de verrouillage anti-panique pour une porte, caractérisé en ce qu'il comprend un dispositif (2) selon une quelconque des revendications 1 à 6, en combinaison avec une serrure anti-panique à larder (18).

8. Système de verrouillage anti-panique selon la revendication 7, caractérisé en ce que la serrure anti-panique à larder (18) comprend un pêne demi-tour et une gâche qui sont revêtus de polytétrafluoréthylène.

9. Système de verrouillage anti-panique selon la revendication 7, caractérisé en ce que la serrure anti-panique à larder (18) comprend un pêne demi-tour dans lequel est incorporé un galet de réduction du frottement.

10. Système de verrouillage anti-panique selon la revendication 7, caractérisé en ce que la serrure anti-panique à larder (18) comprend une gâche dans laquelle est incorporé un galet de réduction du frottement.

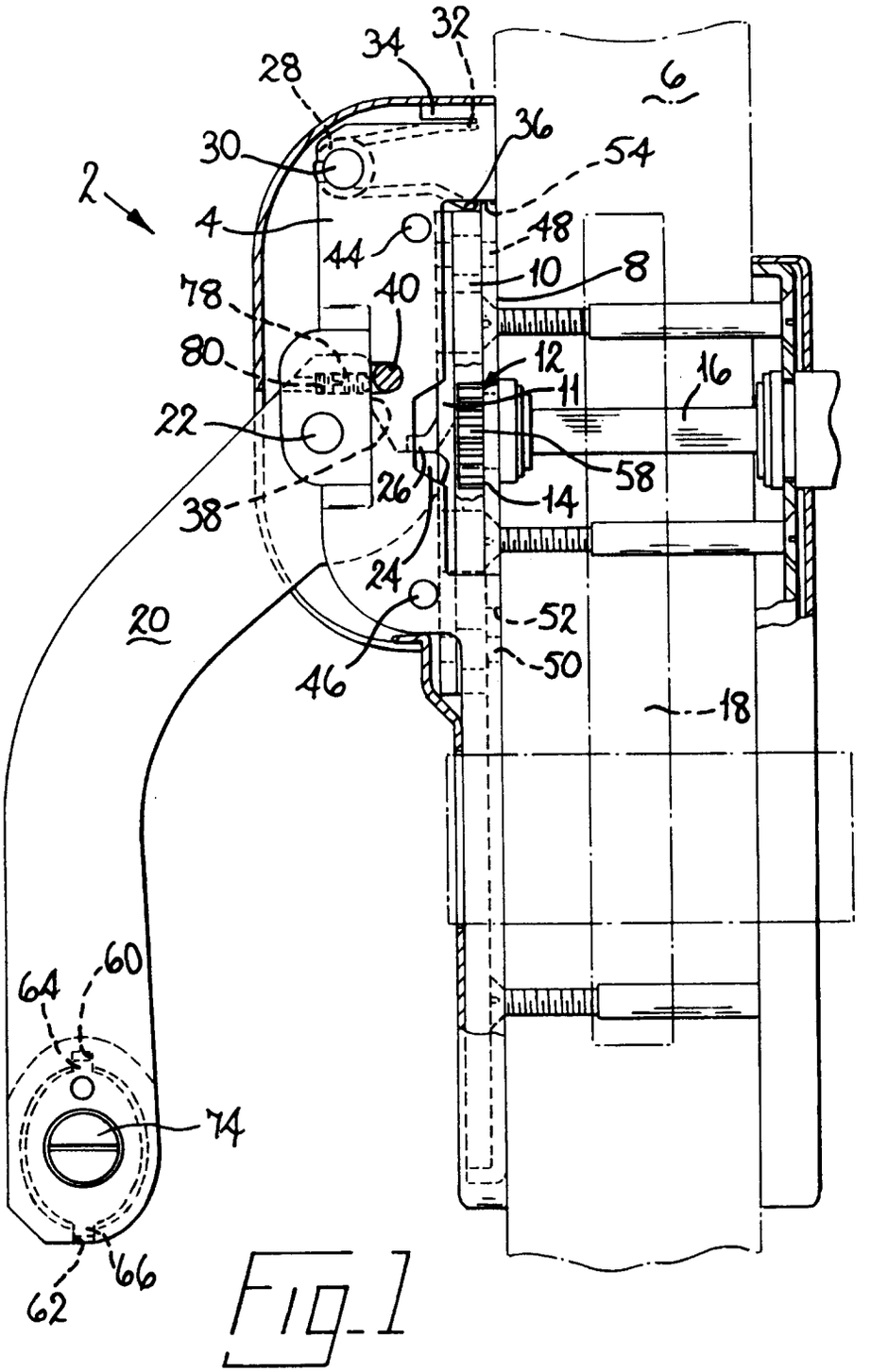

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Fig_1

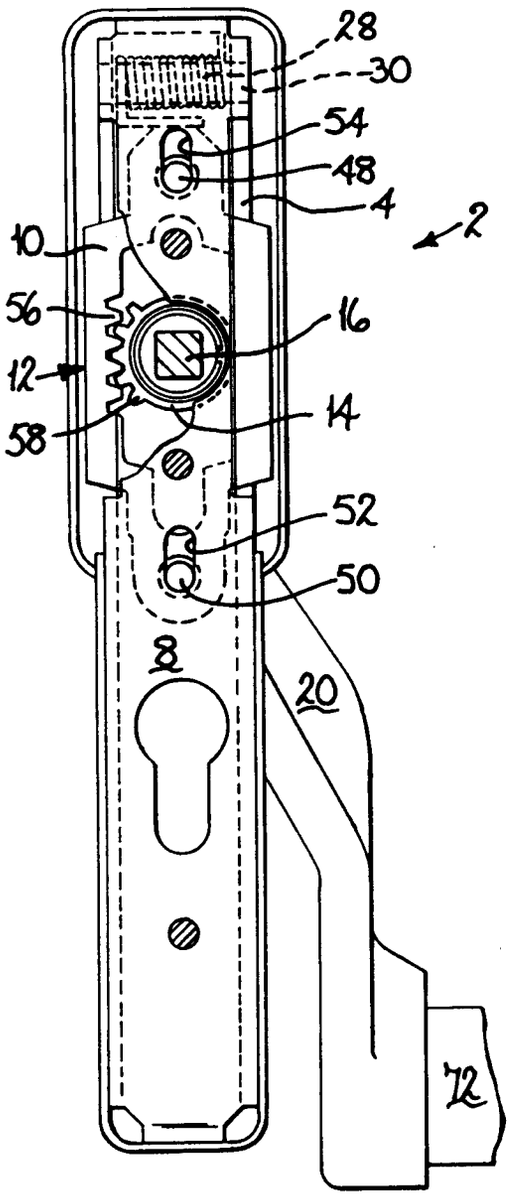

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Fig. 2

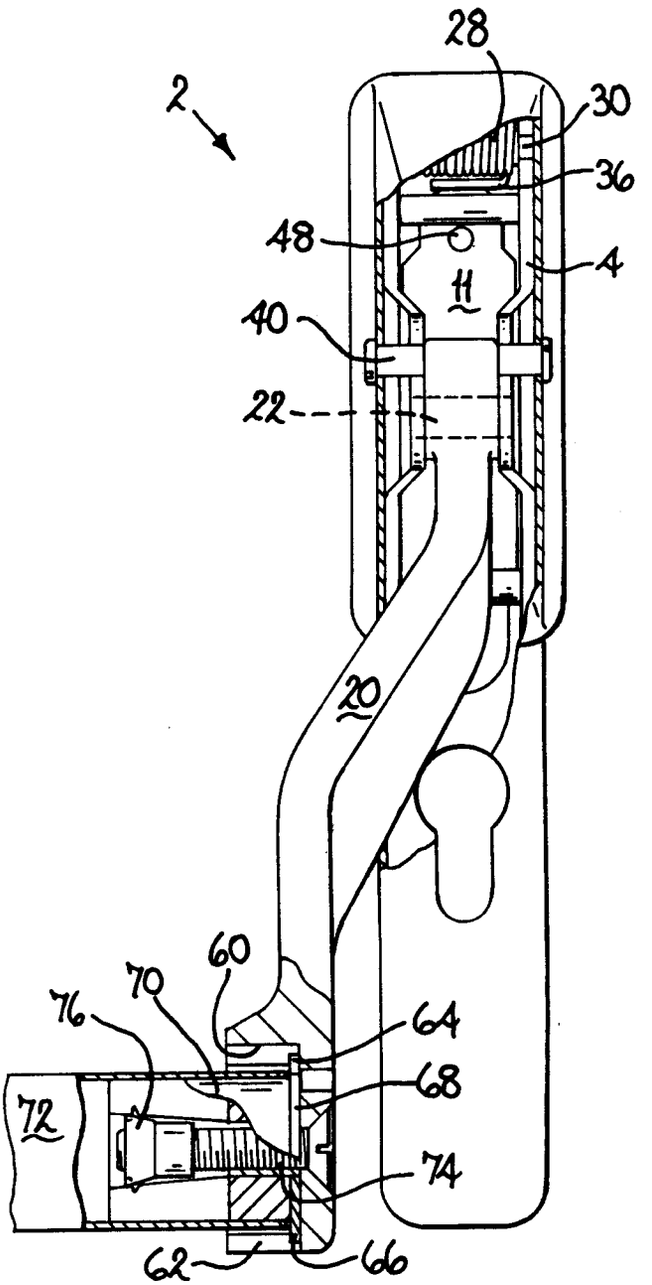

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Fig. 3