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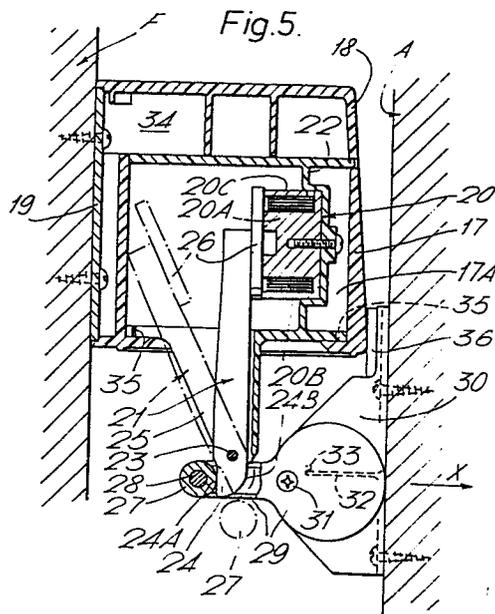
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Electromechanical release mechanism.

A mechanism eg for holding open a fire door (A) against the action of a closing force (X) includes a pivoted latch bar (21) in a wall-mounted unit engaging a roller (27) attached via spring-biased arms (29) to the door. The bar (21) carries an armature (26) which is normally held in the latching position by an electromagnet (20). In the event of a fire the magnet (20) is de-energised to allow the latch bar (21) to pivot to an unlatching position (broken line) in which the roller (27) rolls down under the nose (24) of the bar under the action of the closing force (X), and allows the door to close.



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Electromechanical Release Mechanism

The present invention relates to an automatic release mechanism including electromagnetic means and adapted to hold
5 a door or like member in a first position against the action of a force tending to move that member to a second position, when the electromagnetic means are energised, and to release that member for movement to its second position under the action of said force when the electromagnetic means are de-
10 energised (hereinafter called "a mechanism of the kind stated").

Mechanisms of the kind stated are often provided in conjunction with fire doors eg in hospitals and other
15 buildings so that a door can normally be held open by energisation of the electromagnetic means (against the force of a conventional self-closer), to provide unobstructed access through the respective doorway, but is released to close automatically by de-energisation of the electromagnetic
20 means in response to the detection of a fire. Such mechanisms are "fail-safe" in that they require a constant

supply of electrical power to keep the door in its open condition and if that power supply should fail for any reason the door will be released to move into its safety condition, ie closed. The devices hitherto available to provide this
5 function do, however, have certain drawbacks. The conventional release mechanism comprises an electromagnet fixed in position adjacent to the door and arranged to cooperate with an armature plate mounted on the door, ie so that the electromagnet holds open the door by direct magnetic
10 attraction. The electromagnet must develop a constant attractive force on the door such as to exceed the force applied by the self-closer and hence these known devices tend to consume undesirably large amounts of power and are generally required to be mains-powered. Another consequence
15 of the high-power operation of known devices is that the magnet tends to become very hot after a continuous period of use and therefore often has to be located adjacent to the top edge of the door to avoid being inadvertently touched. Generally speaking, however, this is not a desirable location
20 from the point of view of wiring-in the device and for maintenance and testing purposes. The excessive heat generated by the device may also itself create a fire hazard.

25 It is therefore an aim of the invention to provide a simple, compact, automatic release mechanism suitable for the service described above but which is capable of operating at lower power levels than the known electromagnetic types. Although primarily intended for use in connection with hinged or
30 sliding fire doors, release mechanisms according to the invention may also find application in the control of ordinary (non fire-protection) doors or other like members for different purposes. Also, while described herein in

relation to a door which is normally held open by the mechanism and released to close when the electromagnetic means are de-energised, mechanisms according to the invention may equally find application in relation to movable members -
5 such as smoke ventilators - which are normally held closed against the action of a self-opening device and are released to open upon de-energisation of the electromagnetic means.

The invention accordingly resides in a mechanism of the kind
10 stated comprising a latching member associated with the electromagnetic means and arranged normally to be held in a latching position by said electromagnetic means when the latter are energised and to be released into an unlatching position when the electromagnetic means are de-energised; and
15 an engaging member biased to adopt a predetermined position in which it is engageable with a portion of the latching member to hold the door or like member in its said first position against the action of said force when the latching member is in its said latching position; the engaging member
20 being arranged to move away from its said predetermined position against said bias under the action of said force when the latching member moves to its unlatching position, thereby to disengage from the latching member and release the door or like member for movement to its second said
25 position.

Preferably, the latching member comprises a pivotally-mounted bar providing a surface against which the engaging member abuts to hold the door or like member in its first position
30 and which is tilted relative to the engaging member when the

bar pivots to its unlatching position so that, in use, the engaging member moves against said surface away from its predetermined position under the action of said force. The engaging member may itself comprise a roller carried between
5 a pair of arms or by other cantilever means pivoted to a mounting member for attachment to the door or like member, with spring means biasing the cantilever means to place the roller in said predetermined position:

10 In a mechanism according to the invention the closing or equivalent force on the door or like member is resisted through the latching member which in turn is held in its latching position by the electromagnetic means; the mechanical advantage of the latching member can readily be
15 chosen such as to require only a modest magnetic holding force to keep that member in its latching position, and hence the electromagnetic means can be operated at significantly reduced power levels as compared with the conventional form of device described above.

20

In use, mechanisms according to the invention may be set up with either the engaging member or the latching member mounted to the door or the like, while the other of those members is fixed eg to an adjacent wall or other structure so
25 as to achieve the specified engagement between the members when the door or the like is in its said first position.

These and other features of the present invention will now be more particularly described, by way of example, with
30 reference to the accompanying drawings, in which:

Figure 1 is a schematic plan view of a typical installation of a mechanism according to the invention to hold open a fire door;

5 Figure 2 is a side view, partly in section, of a first embodiment of a mechanism according to the invention, in its latched condition;

Figure 3 is a view similar to Figure 2 of the same mechanism
10 in its releasing condition;

Figure 4 is an underneath plan view of the mechanism as shown in Figure 3; and

15 Figure 5 is a side view, partly in section, of a second embodiment of a mechanism according to the invention, indicating both latched and releasing conditions.

Referring to Figure 1 there is shown a hinged fire door A in
20 a corridor B. This door is normally latched in an open position, as shown in full line, by a mechanism C, so as to provide unrestricted passage through the corridor. In the event of a fire, however, the door must close automatically to its broken line position shown in Figure 1. To this end
25 the door is equipped with a conventional self-closer D which applies a continuous closing force to the door in opposition to the mechanism C. As more fully described hereafter, the mechanism C includes an electromagnet which, while energised, holds the mechanism in a latching condition to keep the door
30 open against the force of the self-closer. If fire is detected, however, the energising current to the electromagnet is cut off so that the mechanism releases the door to move to its closed position. The provision of a suitable self-closer

D and of a suitable fire detection system for controlling the supply of electrical power to the electromagnet in the mechanism C are matters which will be apparent to those skilled in the art and need not be further described herein.

5

In Figures 2-4 there is shown one example of a mechanism according to the invention for use as the mechanism C. A mounting plate 1 is fixed over a recess E provided in the wall F adjacent to the edge of the door A (when open) at any
10 suitable height, eg at skirting level. An electromagnet 2 is mounted within the recess by means of a bracket 3 attached to the plate 1. Externally, the plate 1 supports a bracket 4 to which an L-shaped latch bar 5 is pivoted by a horizontal pin 6. The bar 5 extends through a slot 7 in the mounting plate
15 1 and at its inner end carries an armature plate 8 for cooperation with the core 2A of the electromagnet 2 and with the inner limb 3A of the bracket 3 (which provides a return path for magnetic flux when the electromagnet is energised). With energising current supplied to the coil 2B of the
20 electromagnet the plate 8 is normally held by the magnet to maintain the latch bar 5 in the generally horizontal orientation illustrated in Figure 2.

Mounted to the door A is a channel-shaped bracket 9 to which
25 a pair of parallel arms 10 are pivoted by a horizontal pin 11. A roller 12 on a pin 13 is carried between the distal ends of the arms 10, and a torsion spring 14 biases the arms to adopt the generally horizontal orientation illustrated in Figure 2.

30

With the parts disposed as shown in Figure 2 the roller 12 engages behind the nose 15 of the latch bar 5 to hold the door A in its open position, against the force of the self-

closer acting in the sense of arrow X. More particularly, the roller 12 engages the flat face 15A of the latch bar, which extends substantially perpendicularly to the direction of "pull" on the door, at a point spaced slightly below the pivot 5 pin 6. There is thus applied to the bar 5 a moment tending to pivot the latter in the anticlockwise sense about pin 6 (as viewed in the Figure). However, this moment is counteracted by the clockwise moment on the bar due to the attractive force of the electromagnet 2 acting on the armature plate 8.

10 Furthermore, the moment arm of this magnetic force is many times the moment arm of the closing force acting through the roller 12 so that the force of attraction which the magnet 2 has to develop to hold the door open is only a fraction of the applied closing force. The corresponding power

15 consumption of the electromagnet is therefore much lower than that which would be required to hold open the door by direct attraction of an armature plate fixed to the door. The magnet may thus be powered eg from a 24V d.c. supply such as is typically used to operate the detection and control equipment

20 of an associated fire alarm system.

In the event of a fire, the energising current to the magnet coil 2B is cut off, allowing the latch bar 5 to pivot anticlockwise to the position shown in Figure 3. This tilts 25 the nose 15 of the bar so that the face 15A is now inclined to the direction of "pull" X applied to the roller 12. The closing force accordingly now acts to roll the roller 12 down along the face 15A, pivoting the arms 10 against the bias of spring 14 to the position shown in Figure 3, whereupon the

30 roller disengages from the latch bar and allows the door to close.



If it is required to close the door at any time without de-energising the magnet 2 this can be achieved in either of two ways. Firstly, the arms 10 can be depressed manually to clear the bottom of the nose 15 and disengage from the latch 5 bar without disturbing the latter. Alternatively, if the door is pulled hard enough in the closing direction the attraction of the magnet 2 for the plate 8 can be overcome, allowing the latch bar to be moved to its releasing position of Figure 3; reference numeral 16 indicates a "trimming" 10 potentiometer in series with the magnet coil 2B by which the current through the coil and hence the intensity of the attractive force can be adjusted to determine the amount of "pull" required to override the mechanism in this way. Similarly, the mechanism can be set or reset into its latched 15 condition from the door-closed condition either by placing the components by hand into their Figure 2 positions or simply by opening the door and pressing the roller 12 against the latch bar nose 15 - this causes the roller to roll down the arcuate surface 15B of the latch bar and then spring up 20 behind the surface 15A, the same action serving to pivot the latch bar into its latching position if not already in that position.

Turning now to Figure 5, this shows another automatic release 25 mechanism functionally equivalent to the mechanism of Figures 2-4. In this case there is a two-part plastics casing 17/18 surface-mounted to the wall F via a backplate 19. Mounted within this casing is an electromagnet 20 and a straight latch bar 21 assembled in a plastics housing 22. The latch bar 21 30 is pivoted on a pin 23 and has a nose portion 24 extending out through a slot 25 at the lower end of the housing 22. At its upper end the bar 21 carries an armature disc 26 for cooperation with the magnet 20, of which the core is

indicated at 20A and the energising coil at 20B. The outer skirt portion 20C of the core 20A provides a return path for magnetic flux when energised. With energising current supplied to the coil 20B the armature disc 26 is normally held by the magnet to maintain the latch bar in the generally vertical orientation illustration in full line in Figure 5.

For engaging with the latch bar 21 there is again a spring-biased roller 27 mounted to the door A. The roller is carried on stubs 28 at the ends of a pair of moulded plastics arms 29 which straddle a mounting body 30 and are pivoted thereto at 31. The arms 29 are biased to adopt the generally horizontal orientation illustrated in Figure 5 by means of leaf springs 32 moulded on to the arms engaging stops 33 on the body 30.

With the parts disposed as shown in full line in Figure 5 the roller 27 engages the face 24A of the latch bar nose to hold the door open, against the force of the self-closer acting in the sense of arrow X, as in the case of the Figures 2-4 embodiment. When the energising current to the magnet coil 20B is cut off, the latch bar is allowed to pivot to the broken line position of Figure 5 to tilt the face 24A relative to the roller 27. The roller accordingly rolls down the face 24A to the position indicated in broken line and disengages from the latch bar to permit closure of the door, again as in the case of the Figures 2-4 embodiment. Likewise, the mechanism can be manually disengaged, and re-set, as described above for the previous embodiment. A "trimming" potentiometer and the terminal connections for the power supply to the magnet 20 (not shown) are located in a compartment 34 in the casing part 18.

The latch bar and magnet housing 22 is mounted in the cylindrical "well" 17A of the casing part 17 in this embodiment through a circumferential series of intermeshing splines or teeth 35, which enable the housing 22 to be
5 mounted in any one of a number of selected azimuthal orientations relative to the casing 17 and wall F. This is of advantage in aligning the latch bar 21 with the roller 27 in installations where the open door is inclined to the mounting surface for the latch unit (ie, in the case of
10 Figure 1, if the door A opened at an angle to the wall surface F). Reference numeral 36 indicates a buffer pad carried by the body 30 to cushion any impact of the door against the latch unit.

CLAIMS

1. An automatic release mechanism including electromagnetic means (2,20) and adapted to hold a door (A)
5 or like member in a first position against the action of a force (X) tending to move that member (A) to a second position, when the electromagnetic means (2,20) are energised, and to release that member (A) for movement to its second position under the action of said force (X) when the
10 electromagnetic means (2,20) are de-energised, characterised by: a latching member (5,21) associated with the electromagnetic means (2,20) and arranged normally to be held in a latching position by said electromagnetic means (2,20) when the latter are energised and to be released into an
15 unlatching position when the electromagnetic means (2,20) are de-energised; and an engaging member (12,27) biased (14,32) to adopt a predetermined position in which it is engageable with a portion (15,24) of the latching member (5,21) to hold the door (A) or like member in its said first position
20 against the action of said force (X) when the latching member (5,21) is in its latching position; the engaging member (12,27) being arranged to move away from its said predetermined position against said bias (14,32) under the action of said force (X) when the latching member (5,21)
25 moves to its unlatching position, thereby to disengage from the latching member (5,21) and release the door (A) or like member for movement to its second said position.

2. A mechanism according to claim 1 wherein the latching
30 member comprises a pivotally-mounted bar (5,21) providing a surface (15A,24A) against which the engaging member (12,27) abuts to hold the door (A) or like member in its first position and which (15A,24A) is tilted relative to the

engaging member (12,27) when the bar (5,21) pivots to its unlatching position so that, in use, the engaging member (12,27) moves against said surface (15A,24A) away from its predetermined position under the action of said force (X).

5

3. A mechanism according to claim 2 wherein said surface (15A,24A) is provided at one end of the bar (5,21); the bar (5,21) carries at its other end an armature (8,26) for cooperation with the electromagnetic means (2,20); and the
10 pivot point (6,23) of the bar (5,21) is closer to said surface (15A,24A) than to said armature (8,26).

4. A mechanism according to claim 3 wherein the bar (4) is generally L-shaped with the longer limb thereof carrying the
15 armature (8) and the shorter limb thereof providing said surface (15A); in use, the longer limb being disposed generally horizontally when in the latching position, with the shorter limb depending therefrom.

5. A mechanism according to claim 3 wherein the bar (21)
20 is generally straight and pivoted intermediate its ends with the longer portion thereof carrying the armature (26) and the shorter portion thereof providing said surface (24A); in use, the bar (21) being disposed generally vertically when in the latching position, with the shorter portion lowermost.

25

6. A mechanism according to any preceding claim wherein the engaging member comprises a roller (12,27) carried by cantilever means (10,29) pivoted to a mounting member (9,30) for attachment to the door (A) or like member, with spring
30 means (14,32) biasing the cantilever means (10,29) to place the roller (12,27) in said predetermined position.

7. A mechanism according to any preceding claim wherein the latching member (5,21) is configured such that, in use, with the engaging member (12,27) in its said predetermined position and the door (A) or like member in its second
5 position, movement of the door (A) or like member into its first position causes the engaging member (12,27) to strike a surface (15B,24B) of the latching member (5,21) so as to be deflected thereby around the latching member (5,21) and then re-engage with the latching member (5,21) under the action of
10 said bias (14,32) in the position to hold the door (A) or like member in its first position.

8. A mechanism according to claim 7 wherein, in use, if the latching member (5,21) is in its unlatching position the
15 aforesaid striking of the latching member (5,21) by the engaging member (12,27) causes the latching member (5,21) to move to its latching position.

9. A mechanism according to any preceding claim wherein
20 the electromagnetic means (20) and latching member (21) are embodied in a unit (22) for location in a casing (17,18) adapted to be mounted in juxtaposition to a door (A) or like member, and said unit (22) and casing (17,18) are configured
(35) to permit their interengagement in a plurality of
25 discrete relative azimuthal orientations.

Fig. 1.

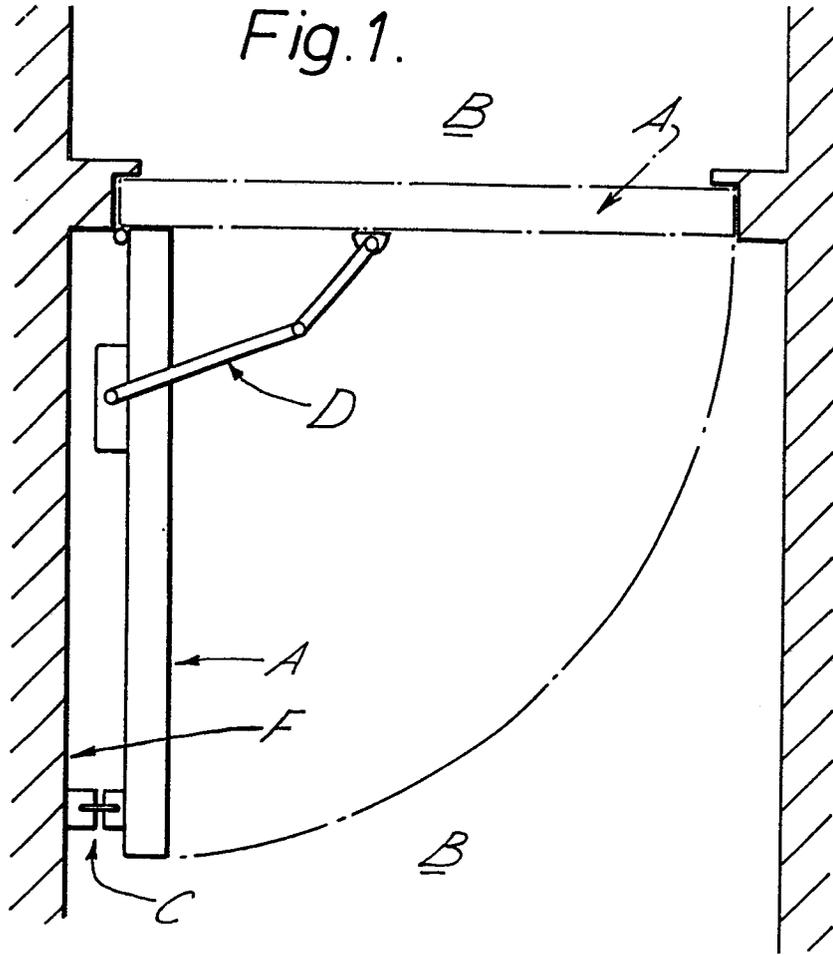
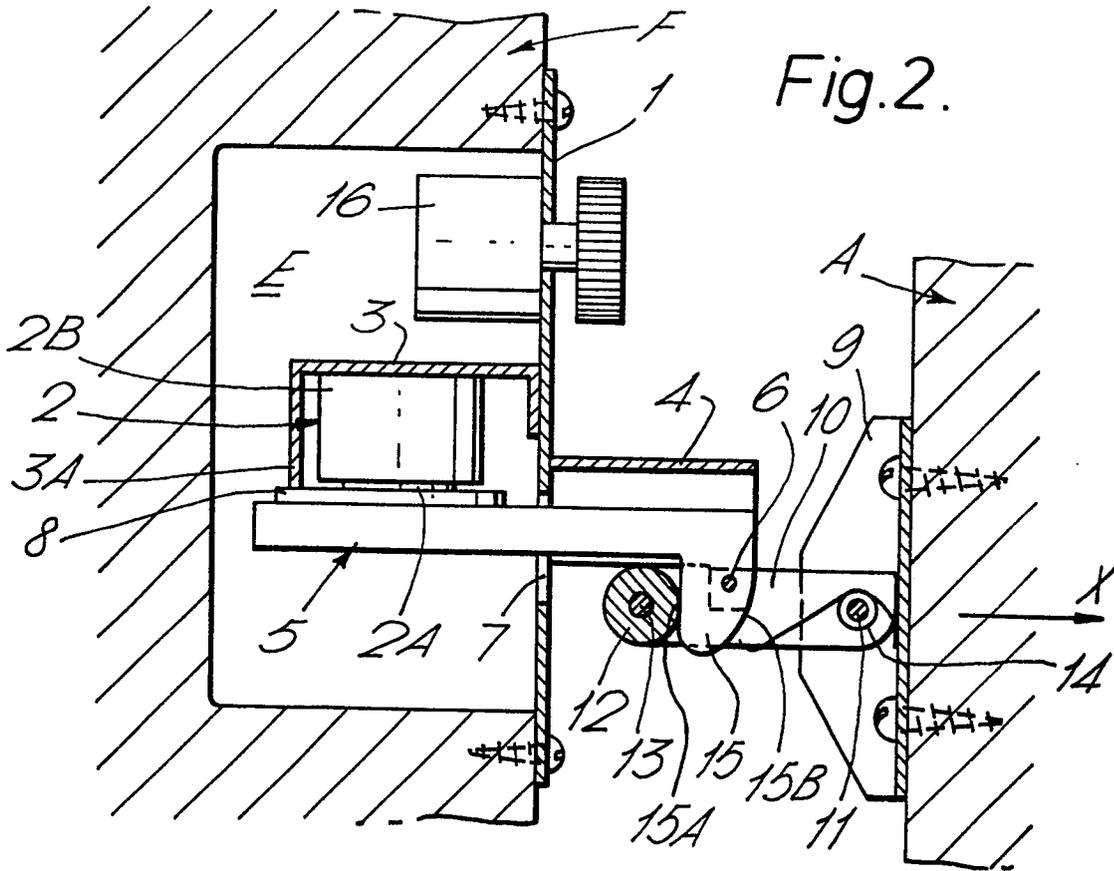


Fig. 2.



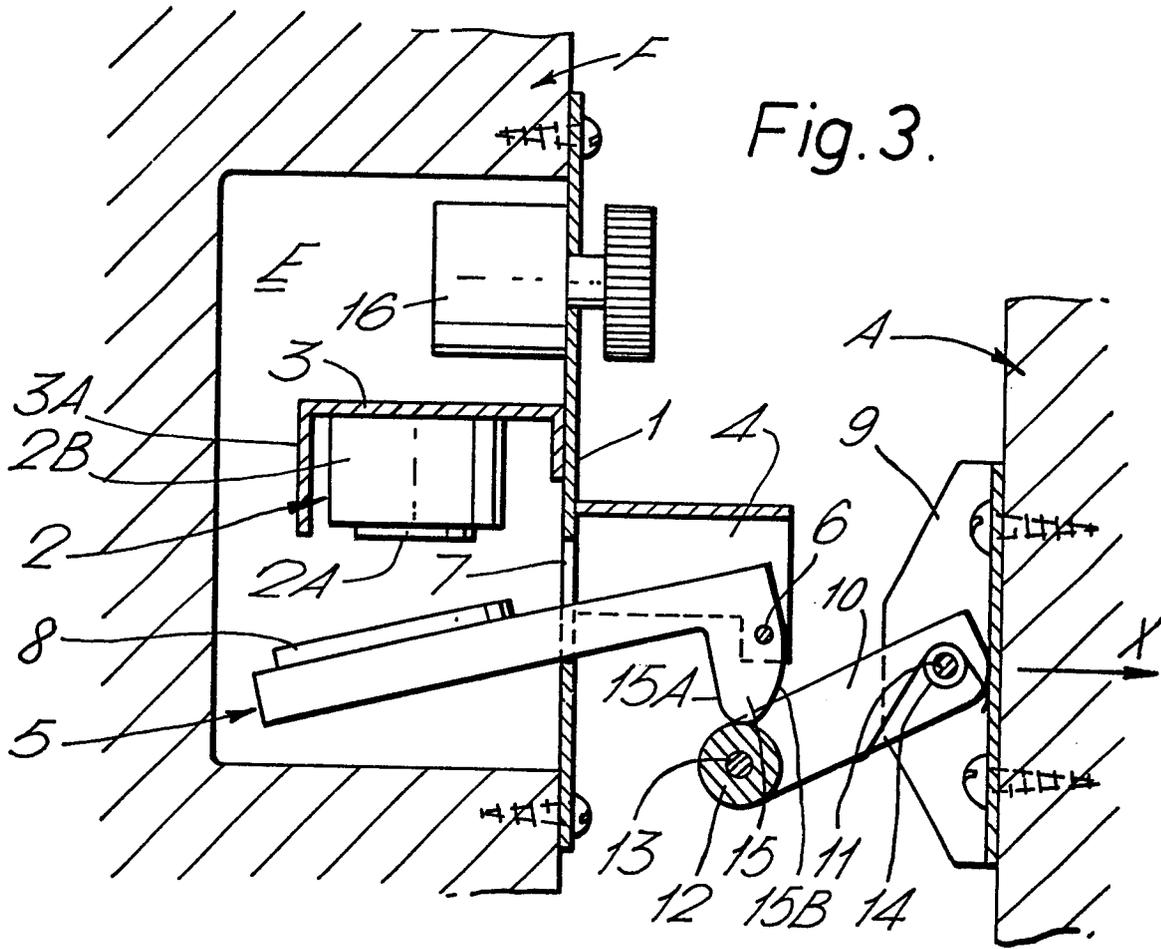


Fig. 3.

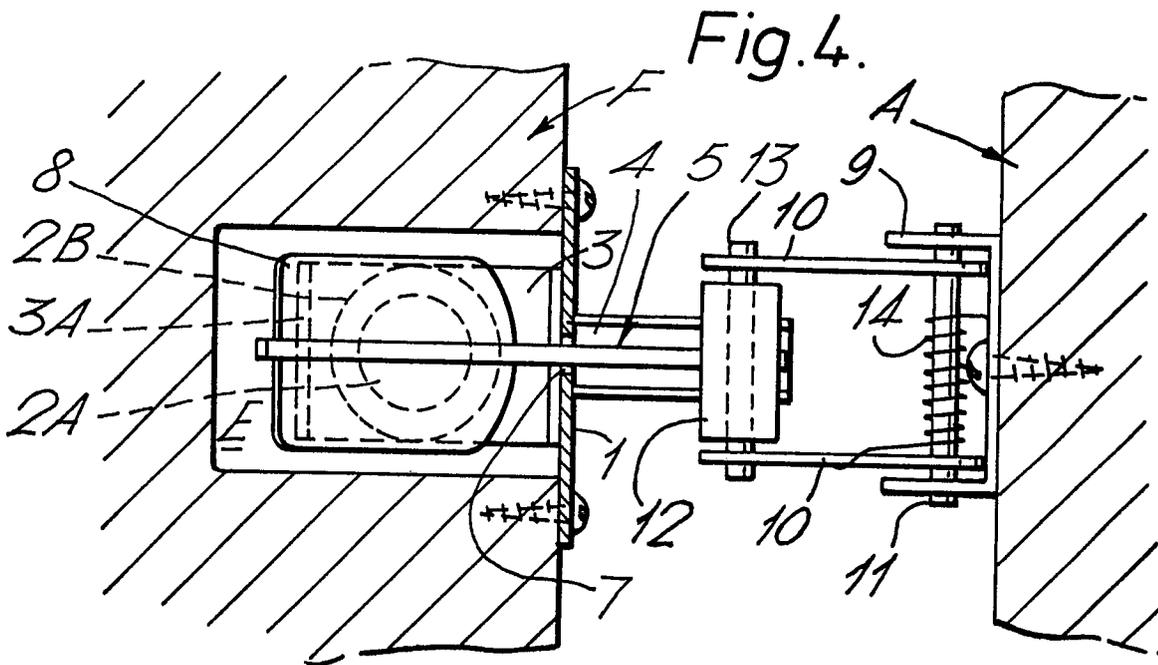


Fig. 4.

Fig.5.

