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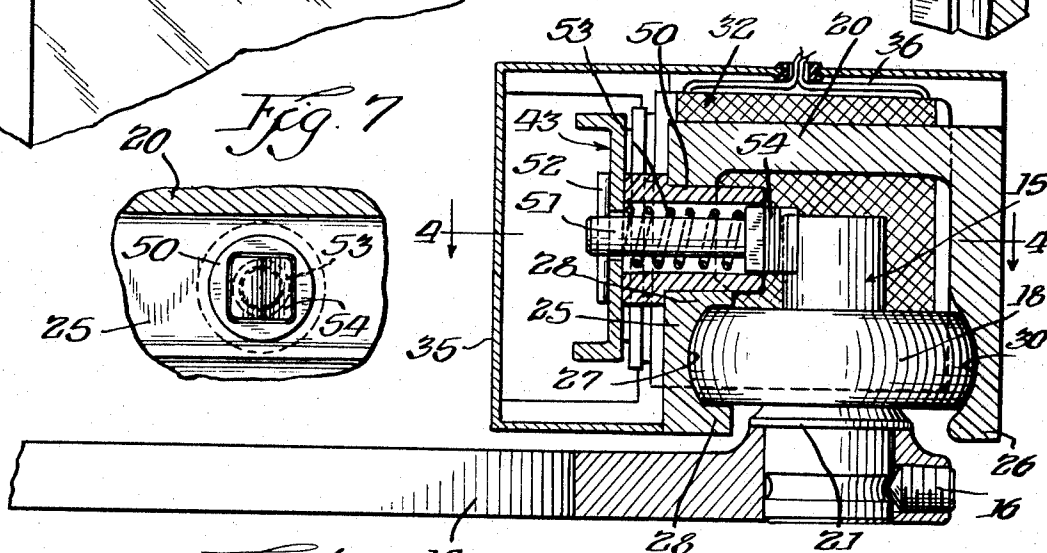
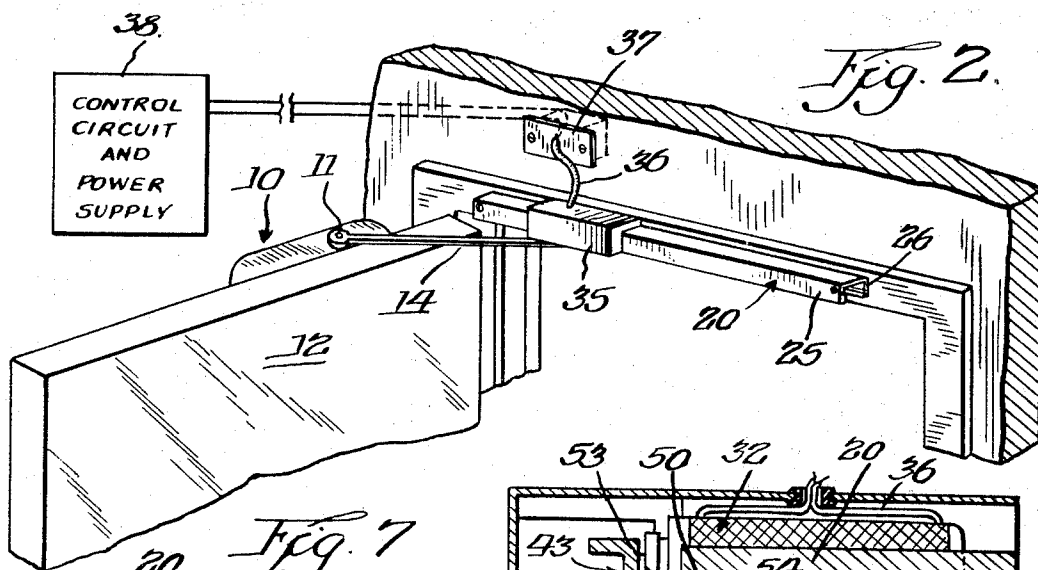
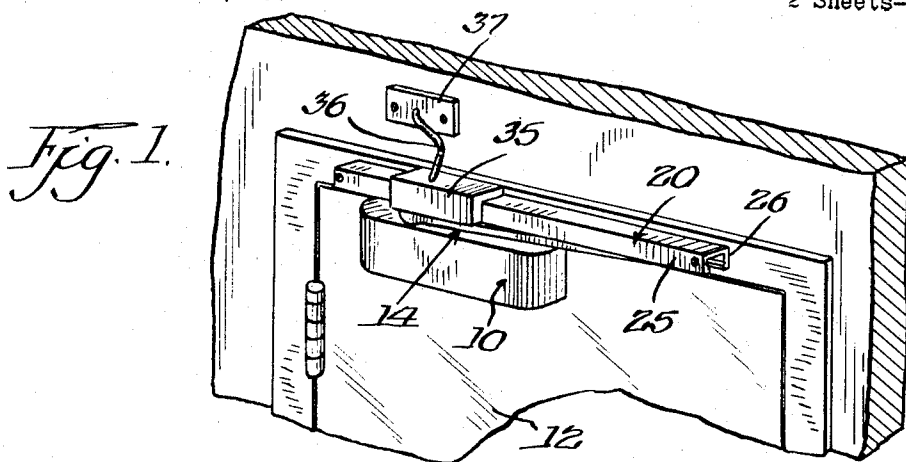
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3,415,562

MAGNETIC HOLD-OPEN DEVICE

Filed March 15, 1967

2 Sheets-Sheet 1



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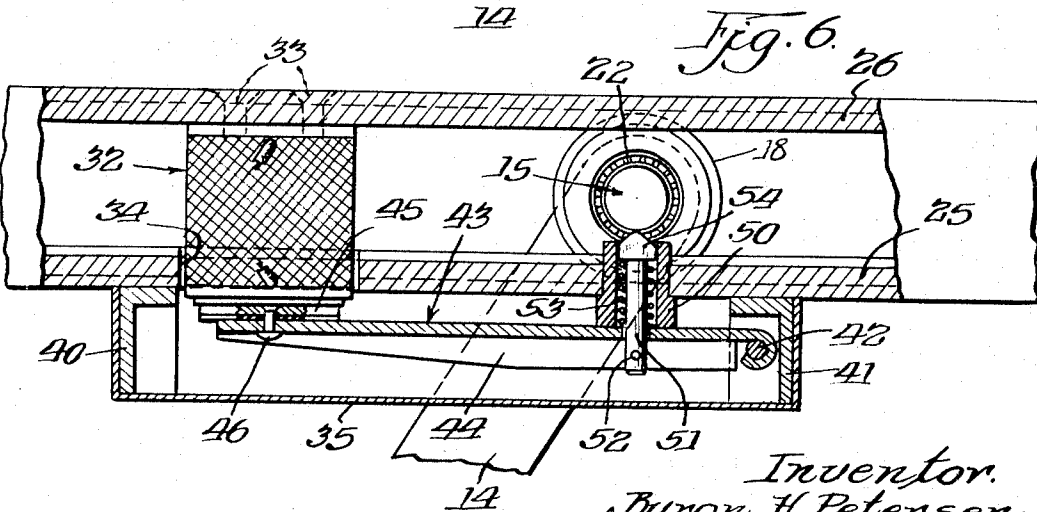
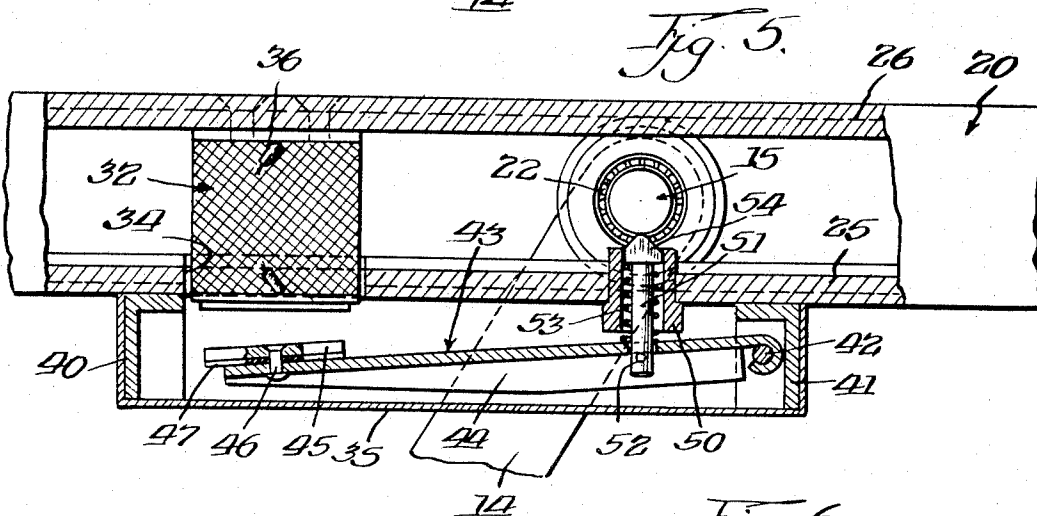
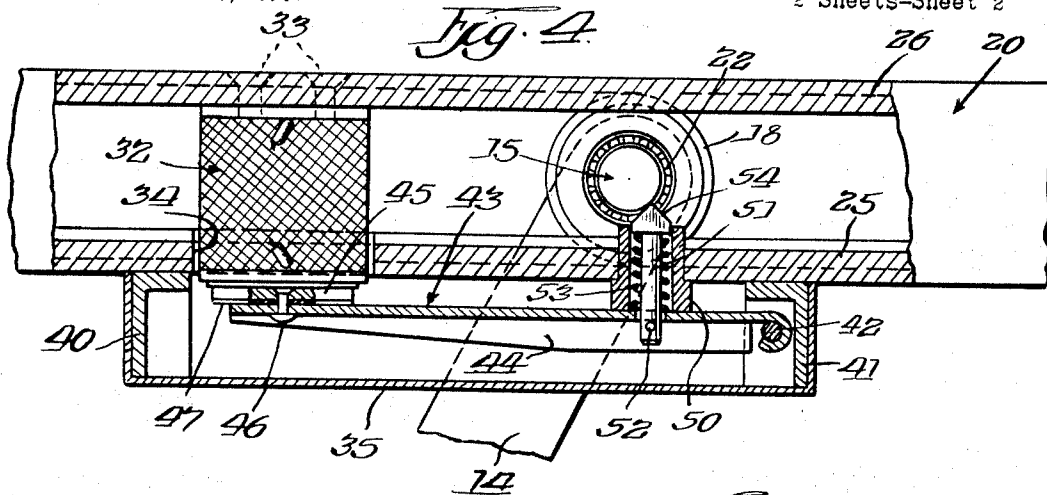
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2 Sheets-Sheet 2



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MAGNETIC HOLD-OPEN DEVICE

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ABSTRACT OF THE DISCLOSURE

The invention relates to door closing and checking mechanism having a lever arm providing a spindle and roller combination which travels within a trackway. An electromagnet together with an armature unit and a holding plunger are mounted with respect to the trackway so as to coact with the spindle whereby to hold the door open when in a hold magnet-energized position and to release the door when the magnet is de-energized. The holding plunger is spring biased so that an over-ride is provided whereby the operator with slightly more than normal effort can close the door from its hold magnet-energized position.

The combination required for the invention includes a door closer having a connecting arm for a guide and spindle unit which is caused to travel within a trackway so as to coact with an electromagnet. The guide and spindle unit has a hold, an unlatched and an over-riding relation with a plunger forming part of the electromagnet means.

An object of the invention resides in the provision of electromagnetic means in combination with door closing and checking mechanism whereby the electromagnetic means in an energized position will hold the door open and whereby the door is automatically released from its held position when the electromagnetic means is de-energized.

Another and more specific object of the invention is to provide an electromagnet with armature and holding plunger and which will be so located on the trackway of a door closer that the holding plunger, when the electromagnet is energized, will hold the guide and spindle unit, which is caused to travel back and forth within the trackway by the lever arm of the door closing mechanism, and thereby hold the door open. When the electromagnet is de-energized, the holding plunger automatically releases its engagement with the arm-actuated guide and spindle unit and the door is thus closed by the door closing mechanism.

Another object of the invention is to provide electromagnetic means for holding a door open by coaction with a guide and spindle unit which is caused to reciprocate within a trackway by door closing mechanism upon open and closing movements of the door, wherein the holding plunger, when the electromagnetic means is energized, will hold the guide and spindle unit and when the electromagnet is de-energized the said guide and spindle unit will have free travel and wherein the holding plunger is spring biased so that an over-ride is provided permitting the operator with slightly more than normal effort to close the door from its hold magnet-energized position.

With these and various other objects in view the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended thereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts:

FIGURE 1 is a perspective view of a door closing and checking mechanism with connecting arm and trackway

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and which structure embodies the improvements of the invention;

FIGURE 2 is a perspective view of the structure shown in FIGURE 1 with the door in an open position;

FIGURE 3 is a transverse sectional view taken through the trackway at the location of the holding plunger to show the coaction between the plunger and the lever-actuated spindle of the door closing mechanism;

FIGURE 4 is a longitudinal sectional view showing the trackway, electromagnet, armature unit and holding plunger, with the plunger in engagement with the spindle unit for holding the door in an open position when the magnet is energized;

FIGURE 5 is a longitudinal sectional view similar to FIGURE 4, but which shows the plunger in the non-holding position, the magnet being de-energized;

FIGURE 6 is a longitudinal sectional view similar to FIGURE 4 but which illustrates the over-ride feature of the holding plunger when the magnet is energized; and

FIGURE 7 is a detail view in plan looking at the arrow-shaped head end of the holding plunger.

Referring now to the drawings it will be noted that the present invention is adapted to be operatively associated with a door closing and checking mechanism 10 of the conventional type. The mechanism has an operating shaft 11 as shown. The said mechanism is of the type employing spring means for imparting closing movements to the door 12 and the mechanism also embodies a dash-pot for checking the closing movements of the door in the preferred manner. For operating the mechanism, the opening and closing movements of the door must be transmitted to shaft 11 in the form of rotary movement.

The connecting arm 14 is fixedly secured at its pivot end to the outwardly extending portion of the operating shaft 11 of the door closing and checking mechanism. The securing means may comprise a plurality of screws for fixedly securing the arm to the shaft and which may be easily detached therefrom when desired. The other end of the arm 14 is operatively connected to the door in a manner which will now be described and wherein an electromagnetic door holder is located in the track of the door closer.

In accordance with the invention the arm 14 as best shown in FIGURE 3 is releasably secured to the upstanding spindle 15. The securing means may comprise a set screw 16 or similar means which will fixedly but releasably unite the parts. The spindle 15 supports a roller 18 adapted to move in the trackway 20, FIGURE 2, the said trackway being fixed to the doorjamb immediately above the door. The spindle 15 is inserted in an aperture in the arm and a boss 21 is formed on the spindle to bear against the top side of the arm. The spindle 15 carries a ball bearing race 22 as shown in FIGURES 4, 5 and 6, which journals the roller 18 for free rotation. Rotation of the roller takes place as the arm 14 is moved by the opening and closing movements of the door 12. The outer periphery of the roller has an arcuate configuration to permit inclination of the axis of rotation of the roller with respect to the trackway 20.

The said trackway has two spaced parallel sides 25 and 26. Side 25 which is nearest the door closing and checking mechanism has an accurate concave track 27 bounded by a pair of shoulders 28 which are inclined away from the roller 18 to prevent sliding friction. The side 26 of the trackway has a dished portion 30 which has a somewhat larger radius of curvature on the concave face thereof than the outer periphery of the roller 18. It will be clear from the foregoing that as the door 12 is opened the arm 14 is given pivotal movement and the spindle 15 and thus the roller 18 are caused to travel within the trackway 20. During opening movement, the roller will generally engage the track 27 whereas during closing

movement the roller will generally engage the track 30, as the checking mechanism damps the closing momentum of the door. Also during opening of the door, the spindle and roller combination will travel from right to left FIGURE 1, whereas during the closing of the door the spindle and roller combination will travel from the left to the right.

The electromagnetic means for holding the door open when electric power is supplied to the magnet is best shown in FIGURES 4, 5 and 6. The electromagnet generally indicated by the numeral 32 is located in the trackway 20 being secured by the screws 33 to side wall 26 and extending through opening 34 to project somewhat beyond side wall 25. At this location the trackway supports a housing 35. The electric conductors 36 for supplying power to the magnet extend through an opening in the housing and said conductors have electrical connection within the outlet box 37 with the control circuit and power supply unit 38. The said unit normally maintains the magnet energized but in the event of fire or for other reasons the power to the magnet may be terminated whereby the magnet is de-energized.

The housing 35 includes end brackets 40 and 41 and wherein bracket 41 provides the pivot pin 42 for pivotally mounting the lever arm 43. The said lever arm is strengthened by the side flanges 44 and said lever carries at its free end the armature plate 45. The armature plate is conveniently secured to the lever arm by the rivet 46 with a disc 47 of rubber or other resilient material being interposed between. The rivet 46 forms a rather loose connection of the armature plate 45 with the lever arm 43 and further with the interposed resilient material the armature plate can always align itself with the face of the magnet 32 even though there is a slight misalignment in the assembly.

The guide bushing 50 is located in the side wall 25 being fixedly mounted in the side wall of the trackway at a point between the magnet and the pivot pin. More particularly the guide bushing is preferably located closer to the pin 42 in order to obtain the desired leverage for the holding plunger 51. The plunger is adapted to move axially within the guide bushing 50 for which purpose the plunger is operatively connected to the lever arm. Thus it will be observed that one end of the plunger projects through an opening in the lever arm and said projecting end carries the cotter pin 52. The coil spring 53 which encircles the plunger is confined between the arrow-shaped head 54 of the plunger and the lever arm 43. The action of the coil spring, since it seats on the lever arm, is to yieldingly bias the plunger 51 away from the lever arm and toward and into the passage provided by the trackway. Thus the spindle 15, which travels back and forth within the trackway passage together with the roller 18, is caused to engage the holding plunger 51 to accomplish the objectives of the invention.

In FIGURES 4, 5 and 6 the plunger 51 is shown in a latched, an unlatched and in the over-ride position. When the magnet 32 is energized the armature plate 45 is attracted and the lever arm is located substantially parallel with the trackway so that the plunger is caused to project within the passage of the trackway. Accordingly the plunger is in a position to intercept the spindle unit as it moves back and forth within the trackway. Such interception occurs when the door starts to close to thus cause movement of the spindle unit from its extreme left hand position to its right hand position. As shown in FIGURE 4 the spindle unit contacts the projecting plunger and the door is thus held in an open position.

However, in case of fire or for other reasons it may be desirable for the door to close automatically. For such action it is only necessary to de-energize the magnet which releases the armature and likewise releases the plunger, FIGURE 5. Since the spindle unit is thereupon released, the door can close under the spring action of the door closer.

When the magnet is de-energized the lever arm is free to move away from the magnet due to the plunger being pushed into the bushing as the spindle passes the plunger. The coil spring has an additional function, namely that of providing an override as shown in FIGURE 6. Even though the magnet remains energized, the door can be closed by the operator with an effort only slightly more than normal since the plunger can be depressed by the spindle unit against the expanding force of the coil spring.

The plunger 51 is provided with a V-shaped head 54 for the express purpose of facilitating the over-riding feature. The expanding force of the coil spring 53 is also critical to this feature of the invention. In the latched position when the electromagnet is energized, the coil spring 53 should exert sufficient force so that the plunger 51 functions as stop for the spindle unit. However, the coil spring should be weak enough so that the plunger can be depressed by the spindle for the over-riding action on the spindle as shown in FIGURE 6 when the door is closed by the operator and which will thus require only slightly more than normal effort.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings, as various other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. In apparatus of the character described, the combination with a door adapted to have opening and closing movements, of door closing mechanism having an arm connecting with a guide and spindle unit which is caused to reciprocate within a trackway, an electromagnet located within the trackway at one end thereof, an armature for the electromagnet, and a holding plunger operatively associated with the armature and adapted to enter the passage provided by the trackway so as to intercept the spindle when the electromagnet is energized, whereby when the guide and spindle unit is thus engaged and held by the plunger the door is held in an open position.

2. In apparatus of the character as described in claim 1, wherein the armature includes a lever arm which is pivotally mounted at one end thereof on a wall of the trackway, and wherein an armature plate is secured to the lever arm at its end opposite the pivot mounting.

3. In apparatus of the character as described in claim 1, wherein the armature includes a lever arm which is pivotally mounted at one end thereof on a wall of the trackway, wherein an armature plate is secured to the lever arm at its end opposite the pivot mounting, and additionally including securing means for loosely securing the armature to the lever arm, whereby the plate can align with the face of the electromagnet even though a slight misalignment exists in the assembly.

4. In apparatus of the character described in claim 1, wherein the plunger is withdrawn from the passage to release any holding engagement with the spindle when the electromagnet is deenergized, and wherein the holding plunger is spring biased in a direction to cause the plunger to enter the passage and intercept the spindle, thereby providing an over-ride permitting the operator to close the door even though the electromagnet is energized with the plunger in holding contact with the spindle.

5. In apparatus of the character described, the combination with a door adapted to have opening and closing movements, of door closing mechanism having an arm connecting with a guide and spindle unit which is caused to reciprocate within a trackway, an electromagnet located within the trackway at one end thereof, a lever arm pivotally mounted at one end on a wall of the trackway, an armature plate carried by the lever arm at its opposite end and which plate is caused to engage the face of the electromagnet when the same is energized, a guide bushing in said wall of the trackway be-

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tween the pivot mounting and the said electromagnet, a holding plunger adapted to reciprocate within the guide bushing, one end of the holding plunger having an operative connection with the lever arm, and a coil spring encircling the holding plunger and being confined between the enlarged head of the plunger and the lever arm, whereby the holding plunger is resiliently biased in a direction to project into the passage provided by the trackway so as to intercept the spindle when the electromagnet is energized.

6. In apparatus of the character described in claim 5, wherein the plunger is withdrawn from the passage to release any holding engagement which the plunger may have with the spindle when the electromagnet is de-energized, and wherein the coil spring provides an over-ride permitting the operator to close the door even though

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the electromagnet is energized with the plunger in holding contact with the spindle.

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