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DOOR LOCK

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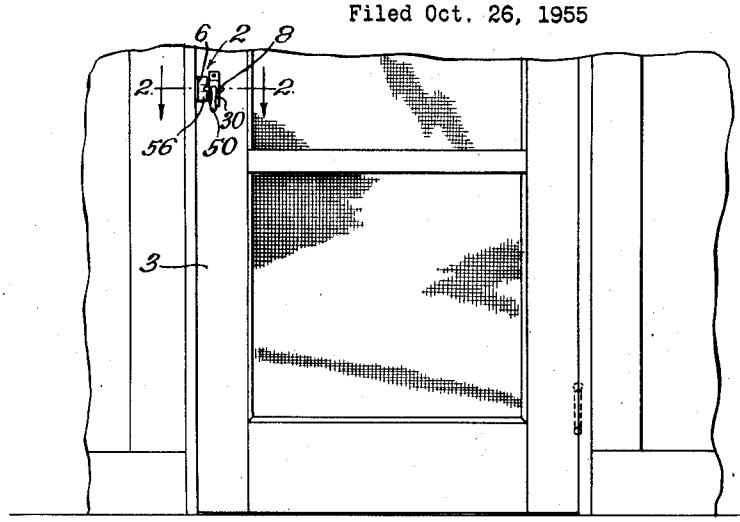


Fig. 1.

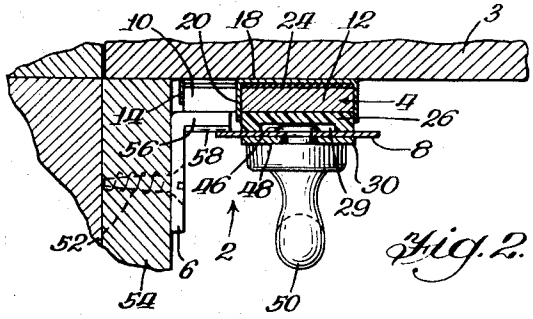


Fig. 2.

Fig. 3.

Fig. 4.

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DOOR LOCK

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This invention relates to door locks and more particularly to a novel lock having magnetic means for pulling the door to closed position and having other means for positively locking the door in said position.

A primary object of the invention is to provide a magnetic door latch with a positive mechanical lock for locking the door after it has been closed by the magnetic latch.

Another object of the invention is to resiliently cushion impacts of the door against the armature to which the door is latched by magnetic means.

A further object of the invention is to devise a lock which can be applied to either right or left hand doors without affecting the locked position of the handle which actuates the locking means.

Still another object of the invention is to devise a lock assembly which is economical to manufacture and is capable of long life in service.

Yet another object of the invention is to simplify installation and repair of the lock assembly.

A further object of the invention is to clamp the armature between the magnet and the locking means of the assembly, and in the preferred embodiment of the invention hereinafter disclosed said clamping is resilient.

A different object of the invention is to adjust the clamping of the armature and also to adjust the lock bar and magnet in unison to simplify installation.

Another object of the invention is to devise a door lock such as above described which can be adjusted to any height on the door inasmuch as there is no connection to a handle or knob on the outside of the door, whereby the novel door lock may be installed out of reach of small children.

Still another object of the invention is to provide a magnetic latch which is effective without the use of moving parts, thereby eliminating wearing of such parts and the necessity for repairing them, and also to provide a lock bar associated with the latch for positively locking the door by a simple mechanical construction capable of long life under any service conditions.

The foregoing and other objects and advantages of the invention will be apparent from a consideration of the following specification and the accompanying drawings, wherein:

Figure 1 is an elevational view of a door having the invention applied thereto;

Figure 2 is an enlarged sectional view on line 2—2 of Figure 1;

Figure 3 is an exploded perspective view of the lock assembly; and

Figure 4 is a perspective view of the armature.

Describing the invention in detail and referring first to Figure 1, it will be seen that the novel door lock 2 is attached to a door 3 hinged in the usual manner for rotation on a vertical axis to open and closed positions. It will be understood that the door 3, however, may be hinged in any desired manner and may be provided with

a closing spring, a pneumatic shock absorber, and a stop for limiting opening of the door by the wind.

The lock 2, as best seen in Figure 2, comprises a permanent magnet assembly 4, an armature plate 6, and a lock bar 8.

The magnet assembly 4 and bar 8 are components of a novel lock assembly shown in the exploded view of Figure 3, wherein it will be seen that the magnet assembly 4 comprises a pair of soft iron magnetic conductors forming pole pieces 10 and an intermediate permanent magnet 12 such as a soft iron core which is preferably secured, as by an adhesive, to the pole pieces 10 defining therewith a somewhat U-shaped magnet assembly. The permanent magnet may be formed of any desired material, such as "Alnico", and after the entire door lock has been assembled, the assembly 4 is electrically charged so that the magnetic flux flows through the pole pieces and all adjacent magnetizeable parts are neutralized to prevent loss of magnetic power.

The pole pieces are confined at their ends by flanges 14 and 16 of a backing plate 18, which is preferably formed of a nonmagnetic, readily deformable material such as aluminum or plastic. The plate 18 also comprises an intermediate flange 20 punched out and bent to define an aperture 22. The flange 20 is preferably approximately parallel to flanges 14 and 16 and engages the magnet 12 between the pole pieces 10, the opposite edge of the magnet engaging the flange 16, so that the magnet assembly 4 is efficiently anchored to prevent horizontal displacement of the pole pieces 10 and the magnet 12.

The pole pieces 10 and magnet 12 are preferably seated at one side thereof against a cushion 24 (Figure 2) which may be formed of any resilient material durable in service. In the preferred embodiment illustrated in the drawings, the cushion 24 is formed of a piece of heavy paper such as building paper, which as best seen in Figure 2 does not extend beyond the permanent magnet so that the assembly 4 may pivot slightly when the pole pieces are engaged by an associated armature plate, as hereinafter described. This feature facilitates installation of the device because alignment within .001 of an inch would be required if the magnet assembly 4 were not able to pivot in this manner.

The opposite side of pole pieces 10 and magnet 12 are seated against the complementary flat surface of a spacer plate 26 having end flanges 28 and a central recess 29 between said flanges. The end flanges 28 bear against a cover plate 30, the ends of which are flanged at 32 to confine the ends of the spacer plate 26 and the remote edges of the pole pieces 10 to restrain vertical movement thereof.

The flanges 32 of the cover plate 30 are reflanged as at 34 and are provided with elongated apertures 36 which register with complementary apertures 38 of backing plate 18 for convenient attachment of said plates to a door as by screws (not shown). As best seen in Figure 2, the lock bar 8 and magnet assembly 4 must be adjusted in unison horizontally by means of the elongation of holes 36 and 38 until properly positioned with respect to the armature plate 6, whereupon the screws may be tightened to clamp plates 18 and 30 to the door.

The lock bar 8 is confined between and guidably engageable with the spacer plate 26 and the cover plate 30 which is provided with an opening 40 for reception of a shaft 42 having a square nose attached to bar 8 by extending through a square hole 44 thereof and by a peened head 46 (Figure 2) or other suitable means for snugly confining the cover plate 30 between lock bar 8 and a shoulder 48 of a handle 50. In this manner a snug connection is afforded between lock bar 8 and cover plate 30 and handle 50 to prevent looseness and rattling

in service. As best seen in Figure 3, the lock bar 8 is resiliently flexible and is preformed in an arcuate or cambered configuration, whereby when the bar 8 is drawn to the substantially linear configuration shown in Figure 2 by the head 46, the bar 8 resiliently clamps the cover plate against the shoulder 48.

As best seen in Figure 2, the armature plate 6 is attached as by screws 52 to the door frame 54 and is flanged as at 56 for contact with the pole pieces 10 to yieldingly hold the door in closed position and to draw the door to closed position from a distance of several inches. The inner side flange 56 is provided with a cam surface 58 formed by slotting plate 6 as at 60 and bending flange 56 as best seen in Figure 4. When the door is in closed position, the handle 59 may be turned to downward position whereat one end of lock bar 8, as shown in Figure 2 projects laterally beyond one side of cover plate 30 and rides on the cam surface 58 to lock the door tightly in closed position against the resistance of cushion 24 which is also effective to soften the impact between pole pieces 10 and flange 56 when the door is magnetically snapped to its closed position.

The armature plate 6, as best seen in Figure 2, constitutes a mounting for the armature flange 56 which projects from the door frame 54 into overlapping relationship with the inner sides of pole pieces 10 for engagement therewith along areas thereof spaced from their free extremities which seat against the flange 14. Thus, it will be understood that the cushion 24 is effective to accommodate full face engagement between both pole pieces 10 and the outer side of the armature flange 56 when the door is magnetically snapped to its closed position. This novel arrangement is an economical and practical structure accommodating such full face engagement between the pole pieces 10 and the armature flange 56 without the necessity of careful adjustment of the parts during installation of the device.

As best seen in Figure 4, the armature plate 6 is provided with horizontally elongated slots 61 for reception of screws 52 (Figure 2) so that the amount of force necessary to clamp the flange 56 between the pole pieces 10 and the lock bar 8 may be conveniently adjusted by moving the plate 6 toward and away from the pole pieces without removing the screws 52.

It may be noted that both ends of lock bar 8 extend laterally beyond cover plate 30 when the handle 50 is in vertical position as shown in Figures 1 and 2. This permits use of the device on either right or left hand doors, with the handle 50 projecting upwardly or downwardly in locked position, as desired. Ordinarily it is preferred that handle 50 extend downwardly in locked position.

The shaft 42 and lock bar 8 may be formed of a magnetically attracted material such as steel, so that the entire assembly shown in Figure 3 is held in assembled position magnetically when attaching the device to or removing it from a door. However, it is preferred to rigidly connect plates 18 and 30, as by welding, to form a casing containing the magnet assembly 4 and lock bar 8.

In this connection it may be noted that the head 46 and recess 29 hold the cover plate 30 against substantial horizontal movement relative to backing plate 18 before they are attached to door, so that the entire assembly of Figure 3 can be efficiently and safely handled as a unit without danger of dropping or losing parts, even if the plates 18 and 30 are not rigidly interconnected as above described.

I claim:

1. A door lock for a door hinged to a frame defining a doorway, said lock comprising an armature having a part anchored to a surface of the frame and having another part extending approximately perpendicularly from the first mentioned part into the doorway, said other armature part comprising oppositely facing inner and outer sides, a casing anchored to the door, a U-shaped permanent magnet in the casing having spaced legs arranged with their free ends facing the surface and spaced therefrom, said legs having corresponding sides thereof engaging one side of said other armature part, resilient means compressed between said casing and opposite corresponding sides of said legs, a lock bar carried by the casing and clamped against the opposite side of said other armature part, and means connected to the lock bar for clamping the latter against said other armature part and for disengaging the lock bar therefrom.

2. In a door lock for a door pivoted to a frame defining a doorway; the combination of an armature support anchored to the frame, an armature element carried by said support at the outer side thereof, a cam surface on the inner side of said armature support, a casing support anchored to the door, a permanent magnetic element carried by said casing support, resilient means between one side of one element and its support, said elements being interengageable to latch the door, and said one element being tiltable against said resilient means upon interengagement of said elements, and lock means carried by the casing for engagement with said cam surface to clamp the armature element between said magnet element and said lock means, thereby compressing said one element against said resilient means, and actuating means for said lock means.

3. A door lock for a door hinged to a frame defining a doorway, said lock comprising an armature having a part anchored to a surface of said frame and having another part with inwardly and outwardly facing surfaces approximately normal to said surface, a casing anchored to the door, a permanent magnet in said casing having a free end facing the frame surface, said magnet having an inner side engaging the outwardly facing surface, resilient means in the casing compressed between the casing and an outer side of said magnet, a lock bar movably mounted on the casing and clamped against the inner surface, and means connected to the lock bar for actuating it to clamped position against the inner surface and to release position out of engagement with said inner surface.

4. In a door lock for a door hinged to a frame defining a doorway; the combination of an armature having a part anchored to a surface of the frame and having another part extending approximately perpendicularly with respect to said surface into the doorway, said other part having an outwardly facing surface and having an inwardly facing cam surface, a casing mounted on the door, a permanent magnet mounted in the casing and having a free end facing the frame surface, said magnet engaging the outwardly facing surface, a flexible lock bar movably mounted on the casing and flexed against said cam surface whereby said other part is resiliently gripped by and between the lock bar and the magnet, and means connected to the lock bar for urging it into and out of engagement with said cam surface,

5. A door lock comprising a casing including a backing plate having spaced slots elongated transversely of the plate, flanges on said plate at opposite sides thereof, a permanent magnet confined between said flanges and seated against said plate, and a cover plate having flanges confining said magnet between the first-mentioned flanges, said second-mentioned flanges having reflanges with elongated slots complementary in shape to and registered with the first-mentioned slots.

6. A door lock comprising a backing plate having a pair of flanges, a magnet confined between said flanges, and a cover plate having flanges confining said magnet between the first-mentioned flanges, said magnet having at least one pole piece projecting beyond said flanges to engage an associated armature.

7. A door lock comprising a backing plate having a pair of substantially parallel flanges, a U-shaped permanent magnet having one end seated against one of the flanges and having spaced portions seated against the other flange, an intermediate flange on said plate seated against the magnet between said portions, and a cover plate having flanges confining the magnet between the first-mentioned flanges, said plates having means for attaching them to each other and to a support.

8. A door lock comprising a backing plate having a pair of abutments at opposite sides thereof, pole pieces seated at opposite ends thereof against respective abutments, a third abutment projecting from said plate between the first-mentioned flanges, a permanent magnet between the pole pieces in contact therewith, said magnet being confined between said third abutment and one of the first-mentioned abutments, and a cover plate having abutments confining remote sides of said pole pieces.

9. A lock according to claim 8, wherein cushion means are interposed between the pole pieces and the backing plate.

10. A door lock comprising a casing having means for attachment to a door, a permanent magnet confined at opposite sides thereof by portions of the casing, readily separable pole pieces engaged along mutually facing sides thereof with opposite ends of the magnet, said pole pieces engaged at their inner ends with one of said portions, means on the casing overlapping the outer ends of the pole pieces, and a cover on said casing spaced from said outer ends of the pole pieces and having means engageable with the sides of said pole pieces remote from said mutually facing sides thereof.

11. A door lock for a door hinged to a frame defining a doorway, said lock comprising an armature having a part anchored to a surface of the frame and having another part extending approximately perpendicularly from the first mentioned part into the doorway, said other armature part comprising oppositely facing inner and outer sides, a casing anchored to the door, a U-shaped permanent magnet in the casing having spaced legs arranged with their free ends facing the frame surface and spaced therefrom, said legs having corresponding sides thereof engaging one side of said other armature part, a lock bar carried by the casing and clamped against the opposite side of said other armature part, and means connected to the lock bar for clamping the latter against said other armature part and for disengaging the lock bar therefrom.

12. A door lock for a door hinged to a frame defining a doorway, said lock comprising an armature having a part anchored to a surface of said frame and having another part with inwardly and outwardly facing surfaces approximately normal to said frame surface, a casing anchored to the door, a permanent magnet in said casing having a free end facing the frame surface, said magnet having an inner side engaging the outwardly facing surface, a lock bar movably mounted on the casing and clamped against the inner surface, and means connected to the lock bar for actuating it to clamped position against the inner surface and to release position out of engagement with said inner surface.

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