

March 26, 1957

M. O. TEETOR

2,786,703

MAGNETIC DOOR CATCH

Filed May 5, 1954

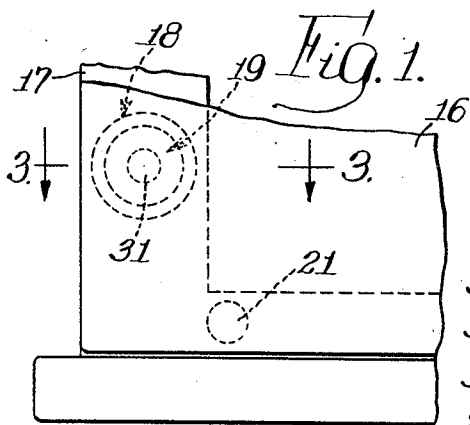


Fig. 2.

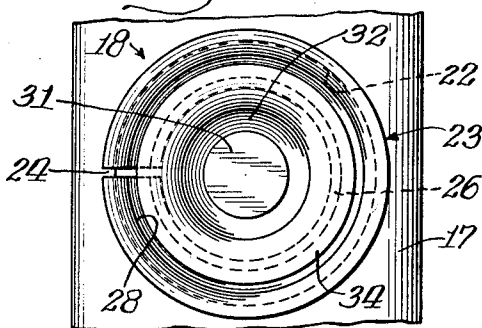


Fig. 4.

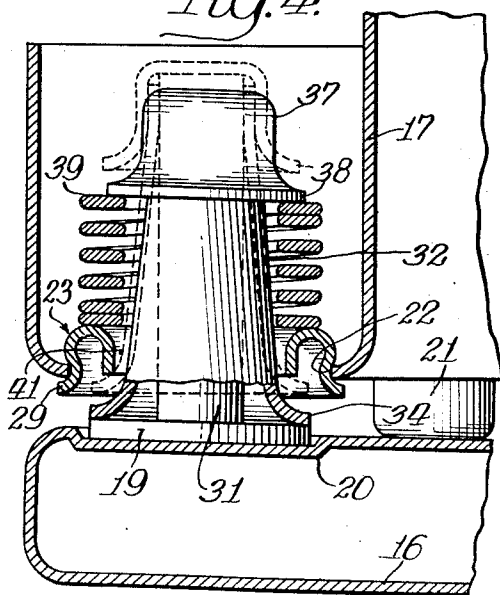


Fig. 3.

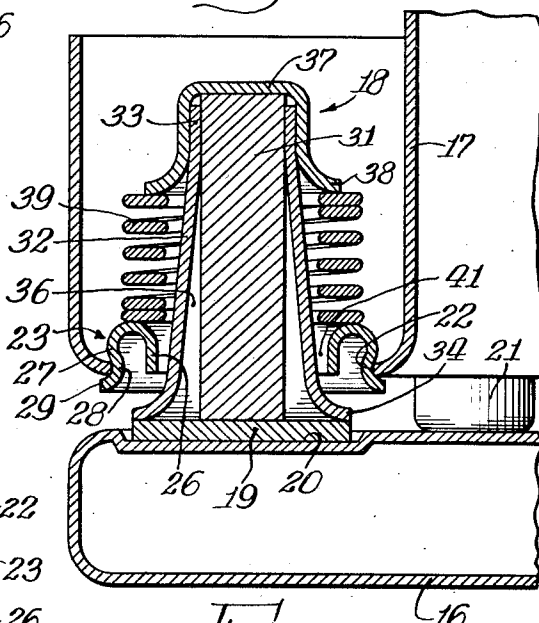
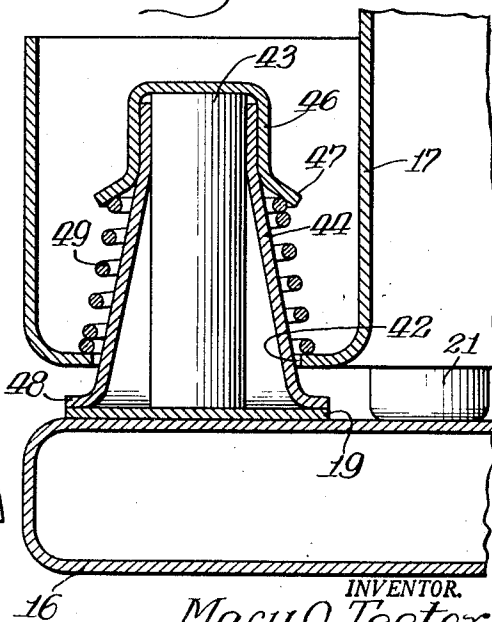


Fig. 5.



INVENTOR.
Macy O. Teetor,

BY
Davis, Lindsay, Hibben & Noyes
Attys.

1

2,786,703

MAGNETIC DOOR CATCH

Macy O. Teetor, New Orleans, La.

Application May 5, 1954, Serial No. 427,820

19 Claims. (Cl. 292—251.5)

This invention relates to a device for retaining a door or other closure member in closed position by magnetic attraction and more particularly to a magnetic catch particularly adapted for use on steel cabinets.

It is common experience in the case of wood cabinets that considerable difficulty is often encountered with the operation of the cabinet latch or catch because of warpage or sagging of portions of the cabinet after the initial installation. In the usual type of cabinet catch, one of the catch elements is fastened to the door and the companion catch element is mounted in coacting position on the cabinet frame or shelf. Consequently, even a slight degree of change in the relative positions of the cabinet frame and door will result in improper contact between the catch elements which can usually be corrected only by removing one or both catch elements and remounting them in properly aligned positions.

Although in steel cabinets there are no problems due to warpage, nevertheless, it is often difficult to obtain uniform and satisfactory operation of the usual friction type catch or other mechanical catch used on steel cabinets. This difficulty stems first of all from the fact that the wall surface of the average room is far from level or even. As a result, the cabinet installer must resort to the use of shims or other expedients to insure substantially straight and level mounting of the steel cabinet. Otherwise, it has been found that the catch elements will be misaligned and will not function as intended.

In addition, even if the steel cabinet is perfectly mounted on the wall, it is still difficult to obtain the necessary horizontal and vertical alignment of the catch elements per se. The conventional steel cabinet catch comprises a projection on the door which is inserted into and is gripped by a resilient clip or friction element on the cabinet frame when the door is closed. For proper operation, it is necessary that the projection enter the friction element at the exact center thereof. Even a slight off-center condition will make the door difficult to open and close. Consequently, it will be seen that the conventional steel cabinet catch requires great care and accuracy both in the installation of the catch elements on the cabinet and in the mounting of the cabinet on the wall.

In my copending application Ser. No. 217,609, filed March 26, 1951, now U. S. Patent No. 2,690,349 issued September 28, 1954, I have described and claimed a novel magnetic catch having particular utility in connection with steel cabinets. The present invention is likewise directed to a novel door catch of the magnetic type which is particularly adapted for use on steel cabinets but which is also an improvement over my prior construction. As will hereinafter appear, the invention permits both the cabinet and the catch to be installed without the high degree of exactitude and care previously found to be necessary in order to insure proper operation of the ordinary friction type or other mechanical cabinet catch. In addition, the magnetic door catch of the present in-

2

vention has the important advantage of being simple and relatively economical to manufacture and install.

Accordingly, a primary object of the present invention is to provide a novel door catch which is especially adapted for use on steel cabinets and the like and which substantially eliminates the need for extreme care and exactitude in the installation of the cabinet and the catch which has heretofore been necessary in order to insure proper operation of the cabinet catch.

A further object of the invention is to provide a novel and improved magnetic catch which is particularly suitable for use on steel cabinets and the like.

Another object of the invention is to provide a novel and relatively inexpensive magnetic catch for steel cabinets which is capable of being installed entirely from the outside of the cabinet frame.

Other objects and advantages of the invention will become apparent from the subsequent detailed description of the invention taken in connection with the accompanying drawings wherein:

Fig. 1 is a fragmentary front elevational view of a corner portion of a steel cabinet provided with a magnetic door catch comprising one embodiment of the invention, the cabinet door being in closed position;

Fig. 2 is a fragmentary front elevational view, on an enlarged scale, of an upright portion of the cabinet frame illustrated in Fig. 1 and showing one of the catch elements mounted thereon;

Fig. 3 is a horizontal sectional view, on an enlarged scale, as taken along the line 3—3 of Fig. 1;

Fig. 4 is a horizontal sectional view similar to Fig. 3 but showing the manner in which the catch elements compensate for misalignment of the cabinet door and frame members; and

Fig. 5 is a horizontal sectional view similar to Fig. 3 but showing a modified form of the invention.

Referring first to Figs. 1 to 4 of the drawing, a steel cabinet of a conventional type is shown comprising a door 16 hingedly secured at one edge thereof to a cabinet frame 17, both the door and the frame having the usual hollow construction. The cabinet is provided with a magnetic door catch embodying the features of my invention and consisting of a magnet unit 18 mounted adjacent the lower left-hand corner of the cabinet frame 17 and a cooperating armature unit 19 secured at a corresponding location on the door 16. The armature unit 19 in this case consists of a steel or iron disk rigidly fastened, as by spot welding or by a suitable adhesive, in a depression 20 in the door 16. It will be understood that the magnet unit 18 and the armature unit 19 are thus mounted in coacting positions on the cabinet frame and door, respectively, so that the armature unit 19 engages the magnet unit 18 when the door 16 is in closed position against the cabinet frame 17. For the purposes described hereinafter, the outer edge of the frame 17 is also provided with one or more bumpers in the form of circular rubber pads 21 secured to the cabinet frame in spaced relation thereon. It will be understood that the number of bumpers may be altered to fit the circumstances of each installation and, in addition, the bumpers may be secured to the door rather than the cabinet frame.

Although, as shown in the drawing, the magnet unit 18 is secured to the cabinet frame and the armature unit 19 is secured to the cabinet door, it will be understood that the two units may be mounted in reverse locations. Also, the magnet and armature units need not necessarily be mounted in the exact positions on the cabinet structure illustrated in Fig. 1. For example, the catch elements may be positioned adjacent the top or central portions of the cabinet structure if desired.

As best seen in Fig. 3, the magnet unit 18 of the device

3

comprises an elongated movable magnet means which extends inwardly through an enlarged opening 22 in the front of the frame 17 into the hollow or open interior of the frame. A split resilient annular retainer or snap ring 23 is detachably fitted in the opening 22 and when in position is substantially rigid with the frame so as to restrict the size of the opening 22. The ring 23 is formed with a gap or split 24 (Fig. 2) and has a generally U-shaped cross-section with inner and outer wall portions 26 and 27, respectively. The outer wall of the U is bulged inwardly to a slight extent, as at 28, to provide a snug resilient engagement with the periphery of the aperture 22. The outer wall 27 is also extended axially and curled outwardly to provide a retaining flange portion 29 which limits the inward position of the ring 23 and permits rapid and easy installation thereof in the frame 17.

The movable magnet means of the catch includes a magnet element 31 in the form of an elongated cylindrical bar magnet having a positive pole at one end and a negative pole at the other end and movably disposed within the ring 23. Any suitable magnetic metal or alloy may be used for the magnet element 31, but the alloy of aluminum, nickel and cobalt commercially known as "Alnico" is particularly desirable. For maximum convenience and economy, the magnet element 31 may be cut from elongated bar stock and no special machining or finishing operations are necessary for the rough cast surfaces of the individual magnet elements. In order to enhance the holding power of the magnet element 31 relative to the armature 19, I utilize as part of the movable magnet means an external magnet shell of steel or other magnetic metal (i. e. a metal with high magnetic permeability), the shell being an elongated sleeve 32 having a cylindrical inner end portion 33 of reduced diameter and preferably tapering outwardly to an enlarged diameter end flange portion 34 which extends concentrically with the magnet element 31 and terminates in alignment with the outer end of the latter. The reduced end portion 33 of the magnet shell has a tight frictional press fit with the inner end portion of the magnet element 31, and the tapered body portion of the shell 32 provides an annular clearance space or leakage gap 36 between the outer shell and the magnet element. Although not necessary, the air gap 36 may be filled with a suitable non-magnetic material if desired. A cup 37 of steel or other magnetic metal is telescoped over the inner end 33 of the magnet shell and has a tight frictional fit thereon so that the cup 37, the tube 32, and the magnet 31 constitute in effect a movable unit with the cup 37 insuring good magnetic contact between the magnet and the tube. In this connection, the cup 37 preferably seats tightly against the inner axial end of the magnet 31. Also, the mouth of the cup 37 is turned outwardly to provide a flange or stop 38 for the purpose hereinafter described.

By the above described arrangement, the outer or contact end of the magnet means is thereby provided with annularly spaced magnetic poles at the outer or operating end of the magnet unit so that the magnetic flux path is highly concentrated whereby to obtain a greatly enhanced holding power of the magnet means for the armature 19. In other words, the external magnet shell 32 is in effect an extension or pole piece for extending the inner pole of the magnet in close proximity to the outer magnet pole whereby to obtain a more effective flux path at the operating end of the magnet element. This is particularly important in a steel cabinet installation because of the tendency of the steel frame structure surrounding the magnet unit to interfere with the desired attraction between the magnet and armature units. However, with the present construction, the magnetic field is concentrated at the forward end of the magnet unit and outside of the cabinet frame with little if any of the field extending behind the steel panel in which the magnet unit is mounted. As a result, the door and its armature 19 is

4

the predominant attraction for the magnet unit. For further minimizing any adverse magnetic effect of the surrounding steel cabinet frame on the operation of the movable magnet unit, the snap ring 23 may be made of a nonmagnetic metal such as brass.

For normally retracting the axially movable magnet means 31—32—37, a helical spring 39 is interposed between the flange portion 38 and the snap ring 23, the coils of the spring being relatively thin and flat and having a substantially rectangular cross-section. As seen in Fig. 3, when the door 16 is closed, the magnet 31 and its attached shell 32 move outwardly against the force of the spring 39 so that the double-pole outer end of the unit projects beyond the ring 23 and makes contact with the armature 19. With magnetic holding contact thus established, the compressed spring 39 tends to urge the magnet unit inwardly of the frame 17 whereby to hold the door 16 in closed position. Of course, the magnetic attractive force between the magnet unit and the armature 19 is greater than the rearward or retractive force exerted by the spring 39 in order to permit the outward movement of the magnet unit into engagement with the armature. It will be understood that as the cabinet door 16 approaches a closed position when being moved at a normal rate of closure, the magnet unit moves outwardly from the ring 23 into engagement with the disk 19 and this engagement normally occurs an instant before the door 16 reaches its finally closed position. Thereafter, the final closure and retention of the door in closed position is accomplished solely by the action of the spring 39. When the door 16 is opened, the spring 39 is fully collapsed and serves as a breaker for disrupting the magnetic bond between the magnet and armature units. With the door 16 in fully open position, the spring 39 retracts the magnet unit completely so that the flanged outer end 29 seats against the edge of the inner wall 26 of the ring 23 in recessed position relative to the outwardly turned outer wall 27 of the ring (see dotted line position in Fig. 4).

During the movement of the door 16 to closed position, the rubber bumpers 21 serve to prevent noisy slamming closure of the steel door. However, the bumpers 21 also serve to space the magnet and armature units to insure proper operation of the catch. The thickness of the bumper 21, as shown in Fig. 3, is sufficient to insure that the armature disk 19 will be spaced a proper distance outwardly from the magnet unit so that the magnet 31—32 must move to its outwardly extended position with the spring 39 under compression in order to engage the armature. By means of this arrangement, it will be seen that the magnet 31—32 merely adheres to or establishes a firm contact with the door but the actual retention of the door in closed position is accomplished by the resilient action of the spring 39. In this manner, proper functioning of the magnetic catch is realized and undesirable looseness or rattling of the closed door is completely avoided.

The provision of the bumper 21 in the manner just described also accomplishes another objective, namely, the protection of the magnet 31 against severe slamming impact with the armature 19. The magnetic alloys are in most cases quite brittle and low in impact resistance, and as a result of these properties it is desirable to avoid direct impact between the magnet and armature elements. Although the double pole outer end of the magnet 31—32 in its normally retracted position (Fig. 4) is substantially flush with or slightly recessed within the ring 23, it will be seen that even when the door 16 is slammed with severe force, the disk 19 cannot possibly engage the magnet 31 with a slamming impact because of the presence of the bumper 21. In other words, the spacing effect of the bumper 21 is such that the magnet must always move outwardly against the action of the spring 39 in order to effect magnetic engagement with the armature element.

In addition to the operating features described above,

5

a further important feature of the invention resides in the automatic self-aligning characteristics of the catch in order to compensate for relative misalignment between the door and frame due to inaccurate installation of either the cabinet or the catch elements. As will be evident, the spring 39 not only provides the retractive force for returning the magnet to its inner position but it also serves to hold the magnet unit assembly 31—32—37 in place in the ring 23 in substantially perpendicular and rearwardly projecting relation from the front face of the frame 17. Thus, the magnet unit is held in position securely and firmly but is nevertheless yieldable or laterally movable in all directions by the inherent nature of the spring mounting. Moreover, the tapered configuration of the outer shell 32 is such that when the magnet unit 31—32 moves outwardly (i. e. from its Fig. 4 dotted line position to its Fig. 3 position) the clearance space, designated at 41, between the shell 32 and the inner opening of the ring 23 increases because of the rearwardly decreasing diameter of the shell 32. Consequently, the magnet unit has ample clearance to assume an angularly twisted or cocked position, as illustrated in full lines in Fig. 4, whereby to permit full face contact between the outer pole faces of the magnet and the armature 19.

In Fig. 4 the misalignment between the door and frame structure is shown in a horizontal plane, but it will be quite apparent that the clearance 41 extends entirely around the magnet shell 32 so that even if the misalignment is in a vertical plane, a corresponding angular or cocked movement of the magnet can occur in a vertical plane to compensate for the misalignment. Hence, the magnetic forces in my device are utilized to their fullest extent at all times, the self-adjusting feature of the movably mounted catch element compensating for all types of misalignment between the door and frame. Thus, it is unnecessary to exercise any excessive degree of care in mounting a steel cabinet when the cabinet is equipped with catches of the present type.

Another characteristic of the catch described herein which renders it particularly suitable for use on steel cabinetware is the fact that the catch does not depend for its retention effect on the frictional engagement of a projecting element with a resilient clip or the like as is the case with conventional steel cabinet catches heretofore used. As pointed out above, in such a friction type catch it is essential that the catch elements be perfectly aligned with each other in order to obtain satisfactory operation of the catch. My invention avoids such difficulties because, as will be readily apparent, it is unnecessary that the disk 19 be in exact center-to-center alignment with the magnet unit in order to obtain effective magnetic contact between the magnet and armature elements. In other words, the armature disk 19 can be off-center to some extent either vertically or horizontally relative to the magnet without affecting the operation of the catch. To this end, it may be desirable to provide a disk 19 of slightly greater diameter than the outer end 34 of the magnet shell.

Although not shown in the drawing, it will be quite evident that in the case of steel cabinets the use of a separate armature element such as the disk 19 may be eliminated if desired, the steel door 16 acting per se as an armature for the magnet unit.

The above described embodiment of the invention as illustrated in Figs. 1 to 4 is particularly adapted for use with steel cabinets of the type having blind channels for frames so that installation of the catch mechanism must be accomplished entirely from the front face of the cabinet frame. Accordingly, the magnet means 31—32—37 is first inserted through the retainer ring 23 and the spring member 39 is mounted in operative relation between the ring 23 and the flange 38 to provide a unitary assembly. Of course, the spring 39 must be capable of being expanded circumferentially to a sufficient extent to clear the cup flange 38 so that the spring can be assembled

6

over the rear end of the unit. In addition, the radial wall dimension of the rectangular cross section spring must be sufficient so that the spring makes direct contact with both the ring 23 and flange 38. The entire assembly of the ring 23 with the magnet means and the spring 39 is then inserted through the aperture 22 from the front of the cabinet frame, the split ring 23 being compressed slightly and then permitted to snap snugly into position in the cabinet aperture for holding the assembly in place.

It will be noted that the spring 39 has a uniform diameter throughout its length. This arrangement together with the rectangular cross section of the spring provides a positive stop or limit to the extent of outward movement of the magnet means when the door is opened from its Fig. 3 position. In other words, the spring 39 readily collapses to provide a rigid abutment against continued outward movement of the magnet unit. This function of the spring 39 is important in order to minimize noisy operation of the device. Once magnetic contact between the armature and magnet units is disrupted, it will be seen that the compressed spring 39 will cause the magnet unit to snap back or be retracted with considerable force. In a steel cabinet especially, the noise of this impact is objectionable, and the spring arrangement shown in Figs. 1 to 4 is particularly desirable in order to minimize this source of noise. In addition, it will be seen that upon retraction of the magnet unit the impact is between the flange 34 of the magnet unit and the wall 26 of the retaining ring 23. Thus, the ring 23 serves to some extent to damp the noise and cushion the impact of the rearwardly retracted magnet unit. In any event, direct striking impact between the magnet unit and the cabinet frame is avoided.

In Fig. 5 I have shown a modified form of the invention which eliminates the use of the retaining ring for the magnet unit and is particularly useful for steel cabinets of the type having an open rim or peripheral channel so that installation of the magnet unit can be effected to some extent from the rear side of the cabinet frame. In this case, the door 16, the frame 17, the armature disk 19, and the rubber bumper 21 are substantially the same as illustrated in the first described embodiment of the invention. The front face of the frame has an aperture 42 for receiving the magnet unit.

The movable magnet means is generally similar to the construction previously described and consists of an elongated cylindrical bar magnet element 43, a tapered or cone-shaped outer shell 44 having a tight press fit on the magnet 43, and a rear cup 46 with a flange portion 47. The unit extends rearwardly into the frame through the opening 42, and an outwardly extending radial flange portion 48 on the magnet shell 44 engages the cabinet frame 17 adjacent the periphery of the opening 42 for limiting the extent of inward movement of the magnet unit. A helical spring 49 is interposed between the flange 47 and the inside of the cabinet frame 17 for normally retracting the magnet unit. However, in this instance the spring 49 has a circular cross-section and the spring is tapered in a longitudinal or axial direction so as to conform generally to the tapered configuration of the magnet shell 44.

In installing the device, the magnet means 43—44—46 is first inserted through the frame opening 42 from the front side of the frame and thereafter the conical or volute spring 49 is assembled over the cup 46 from the rear side of the frame. Of course, the diameter of the opening 42 must be large enough to accommodate the cup flange 47. The operation of the device is generally similar to the operation hereinbefore described with the exception that the extent of outward movement of the magnet unit is somewhat greater because of the different construction of the spring 49 and the lesser degree of rigid breaker action of the spring. Also, the noise cushioning effect of the interposed retainer ring 23 in the

first described form of the invention is not present in the Fig. 5 embodiment.

Although the invention has been described with particular reference to certain specific structural embodiments, it is to be understood that various modifications and equivalent structure may be resorted to without departing from the scope of the invention as defined in the appended claims.

I claim:

1. In a magnetic catch, a magnet unit adapted to be mounted on one of a pair of door and frame members for coaction with an armature means associated with the other of said members, said magnet unit comprising a magnet element adapted to extend into a recess in said one member for limited inward and outward movement, a sleeve of magnetic metal rigidly mounted on said magnet element for movement as a unit therewith, said sleeve being in contact with said magnet element at one end thereof and being spaced annularly from said magnet element at the other end thereof whereby to provide a pair of annularly spaced magnetic poles at said other end adapted to coact magnetically with the armature means upon outward movement of the magnet element and its attached sleeve relative to said one member, means for normally urging the magnet element and attached sleeve inwardly into retracted position relative to said one member, and an outwardly extending radial flange portion at said other end of said sleeve adapted to seat against said one member around said recess for limiting the inward retraction of the magnet unit.

2. In a magnetic catch, including a magnet unit adapted to be mounted on one of a pair of door and frame members for coaction with an armature means associated with the other of said members, movable magnet means receivable in a recess in said one member and adapted to move outwardly therefrom for projection into magnetic contact with the armature means, said magnet means comprising an elongated axially movable magnet element and a sleeve of magnetic metal rigidly carried on said magnet element, said sleeve having a reduced diameter portion rigidly secured around said magnet element adjacent the inner end of the latter and said sleeve also having an enlarged diameter portion annularly spaced from the magnet element at the outer end thereof whereby to provide at the outer contact end of the magnet means a pair of annularly spaced magnetic poles for coaction with the armature means, and resilient means providing a retractive force between said movable magnet means and said one member for normally urging the magnet means into retracted position within the recess, said enlarged diameter portion of said sleeve including means adapted to coact with said one member adjacent said recess for limiting the inward retraction of the magnet means.

3. The device of claim 2 further characterized in that said resilient means comprises a spring means operatively engaging said magnet means and adapted for operative coaction with said one member.

4. In a magnetic catch, a magnet unit adapted to be mounted on one of a pair of steel door and frame members for coaction with an armature means associated with the other of said members, said magnet unit comprising an elongated cylindrical bar magnet element adapted to extend into a recess in said one member for axial movement relative thereto and having magnetic poles at its ends, sleeve means of magnetic metal surrounding said magnet element and rigid therewith for movement as a unit with the magnet element, said sleeve means being in magnetic contact with said magnet element at the inner end of the latter and being annularly spaced from the magnet element at the outer end of the latter whereby to provide a pair of annularly spaced magnetic poles at said outer end adapted to contact said armature means upon outward movement of the magnet element and attached sleeve means and whereby the field between the

magnetic poles is concentrated forwardly of said one member for minimizing interference of the steel supporting member with effective magnetic attraction between the magnet unit and the armature means, a spirally extending spring surrounding said sleeve means in coacting engagement with the inner end thereof and adapted for operative engagement with said one member adjacent the recess therein for normally urging the magnet element and attached sleeve means into retracted position, and retainer means adjacent the outer end of said sleeve means adapted to coact with said one member for limiting the extent of inward retraction of said magnet unit.

5. In a magnetic catch, a magnet unit adapted to be mounted on one of a pair of door and frame members for coaction with an armature means associated with the other of said members, said magnet unit comprising an elongated magnet element adapted to be mounted for axial movement in a recess in said one member and having magnetic poles at its opposite ends, an axially tapered sleeve of magnetic metal surrounding said magnet element and rigid therewith for movement as a unit with the magnet element, said tapered sleeve having a restricted diameter at its inner end and being in magnetic contact with said magnet element at the inner end of the latter and said tapered sleeve having an enlarged diameter at its outer end and being annularly spaced from the magnet element at the outer end of the latter whereby to provide a pair of annularly spaced magnetic poles at said outer end adapted to contact the armature means upon outward movement of the magnet element and attached sleeve from said recess, and a spirally extending spring surrounding said tapered sleeve for coaction between said one member and said sleeve for normally urging the magnet element and its attached sleeve inwardly into retracted position, the tapered configuration of said sleeve providing an increasing annular clearance between the exterior of the sleeve and said recess as the magnet element and sleeve move outwardly from the recess whereby to facilitate angular cocking movement of the magnet element and sleeve to compensate for misalignment between the magnet unit and armature means.

6. In a magnetic catch, a magnet unit adapted to be mounted on one of a pair of door and frame members for coaction with an armature means associated with the other of said members, said magnet unit including an elongated magnet element and a tapered sleeve having a restricted end rigidly fitted on one end of the magnet element and tapering outwardly to an enlarged end annularly spaced from the other end of the magnet element whereby to provide a pair of annularly spaced magnetic poles, said magnet element and attached sleeve being movable axially as a unit and being adapted to extend inwardly at the restricted end of the sleeve into a recess in said one member having a circular opening, and spring means mounted on said sleeve and adapted to coact operatively with said one member for normally urging the magnet element and attached sleeve into retracted position, said magnet element and attached sleeve being movable outwardly from the recess for engagement of said annularly spaced poles with the armature means and the tapered configuration of said sleeve providing an increasing annular clearance between the exterior of the sleeve and the opening of said recess as the magnet and sleeve move outwardly therefrom whereby to permit angular cocking movement of the magnet and sleeve to compensate for misalignment between the magnet unit and armature means.

7. In a magnetic catch including a magnet unit adapted to be mounted on one of a pair of door and frame members for coaction with an armature means associated with the other of said members, movable magnet means receivable in a recess in said one member and adapted to move outwardly therefrom for projection into magnetic contact with the armature means, said magnet means comprising an elongated axially movable magnet element and a sleeve of magnetic metal rigidly carried on said

magnet element, said sleeve being in magnetic contact with said magnet element adjacent the inner end of the latter and said sleeve being annularly spaced from the magnet element at the outer end thereof whereby to provide at the outer contact end of the magnet means a pair of annularly spaced magnetic poles for contact with the armature means, a cup-shaped member rigidly fitted over the inner ends of said magnet element and said sleeve and having a radially extending mouth portion, and a spring member mounted around said sleeve in endwise engagement at one end thereof with said radially extending mouth portion and adapted for operative coaction at its other end with said one member for normally urging the magnet means into retracted position.

8. The device of claim 5 further characterized in that said sleeve has an outwardly extending radial flange portion at its outer end adapted to seat against the supporting structure around said recess for limiting the inward retraction of the magnet unit.

9. The device of claim 2 further characterized in that said resilient means comprises a helical spring of generally rectangular cross-section surrounding said sleeve for operative coaction between the sleeve and said one member, said spring being completely collapsible upon outward movement of the magnet means for limiting the extent of outward movement and for providing a rigid breaker action to effect disruption of the magnetic attraction between the magnet means and the armature means upon opening of the door member.

10. In a magnetic catch, a magnet unit adapted to be mounted on one of a pair of door and frame members for coaction with an armature means associated with the other of said members, said magnet unit comprising an expansible and compressible annular retainer element adapted to be mounted substantially rigidly in the opening of a recess in said one member, a magnet element disposed for movement in said retainer element and having magnetic poles at its opposite ends, a sleeve of magnetic metal surrounding said magnet element and rigid therewith for movement as a unit with the magnet element, said sleeve being in magnetic contact with said magnet element at the inner end of the latter and being annularly spaced from the magnet element at the outer end of the latter whereby to provide a pair of annularly spaced magnetic poles at said outer end adapted to coact with the armature means upon outward movement of the magnet element and attached sleeve from said recess, an outwardly extending radial flange portion at the outer end of said sleeve for limiting the inward movement of the magnet and sleeve, and spring means operatively coacting with said sleeve for normally urging the magnet element and its attached sleeve inwardly into retracted position.

11. The device of claim 10 further characterized in that said spring means comprises a helical spring encircling said sleeve and operatively coacting at its opposite axial ends with said retainer element and said sleeve.

12. The device of claim 10 further characterized in that said retainer element comprises a split ring.

13. The device of claim 10 further characterized in that said retainer element comprises a ring having a generally U-shaped cross-section with the outer wall of the U resiliently engaging the peripheral edge of said opening.

14. In a magnetic catch, a magnet unit adapted to be mounted on one of a pair of door and frame members for coaction with an armature means associated with the other of said members, said magnet unit comprising a retainer ring adapted to be mounted in an opening in said one member, an elongated magnet element disposed for axial movement in said ring and adapted to extend into said opening, an elongated sleeve of magnetic metal surrounding said magnet element and having a reduced diameter portion rigidly fitted on the inner end of said magnet element for movement as a unit with the latter and in magnetic contact with the inner end of the magnet ele-

ment, the opposite end of said sleeve being annularly spaced from the outer end of the magnet element whereby to provide a pair of annularly spaced magnetic poles adapted to contact the armature means upon outward movement of the magnet element and attached sleeve, an outwardly directed radial flange at the outer extremity of said sleeve, and a spring surrounding said sleeve and operatively coacting at its ends with said sleeve and said ring for normally urging the magnet element and its attached sleeve into retracted position, said ring having a generally U-shaped cross-section with the outer wall of the U engaging the peripheral edge of said opening and the inner wall of the U being axially recessed whereby said flange is received in recessed relation within said ring when said magnet element and attached sleeve are in retracted position.

15. In combination, supporting panel means having an opening therethrough, movable magnet means extending through said opening from the front side of said panel means and adapted to move outwardly for magnetic contact with an armature means, said magnet means having an outwardly directed radial flange means at its outer end adapted to seat against said panel means around said opening for limiting the extent of inward movement of said magnet means, and spring means at the rear of said panel means and interposed between the panel means and said magnet means for normally urging the magnet means into retracted position and also for holding the magnet means in laterally extending assembled position relative to the panel means.

16. In combination, supporting panel means having an opening therethrough, elongated axially movable magnet means extending through said opening from the front side of said panel means and adapted to move outwardly for magnetic contact with an armature means, said magnet means including an elongated magnet element and a sleeve of magnetic metal surrounding said magnet element and rigidly fitted thereon at the inner end of the magnet element, said sleeve being spaced annularly from the magnet element at the outer ends thereof to provide annularly spaced magnetic poles and said sleeve having an outwardly directed radial flange at its outer end adapted to seat against said panel means around said opening for limiting the extent of inward movement of said magnet means, and a spring member encircling said sleeve at the rear of said panel means and operatively coacting between the inner end of said sleeve and the rear face of said panel means for normally urging the magnet element and attached sleeve into retracted position and also for holding the magnet element and attached sleeve in rearwardly projecting assembled position relative to said panel means.

17. In combination, supporting panel means having an opening therethrough, a retainer ring fitted in said opening, elongated axially movable magnet means extending through said ring from the front side of said panel means and adapted to move outwardly for magnetic contact with an armature means, said magnet means having an outwardly directed radial flange means at its outer end adapted to seat against said ring for limiting the extent of inward movement of said magnet means, and spring means at the rear of said panel means and interposed between the panel means and said magnet means for normally urging the magnet means into retracted position and also for holding the magnet means in laterally extending assembled position relative to the panel means.

18. The combination of claim 17 further characterized in that said retainer ring comprises a split resilient ring adapted to be compressed for insertion in said opening.

19. The combination of claim 15 further characterized in that said magnet means comprises a magnet element extending axially of said opening and a tapered sleeve of magnetic metal surrounding said magnet element and rigid therewith for movement with the magnet element, the tapered configuration of said sleeve providing an in-

creasing annular clearance between the exterior of the sleeve and said opening as the magnet element and sleeve move outwardly from the panel means whereby to facilitate angular cocking movement of the magnet element and sleeve to compensate for misalignment between the magnet means and the armature means.

5

References Cited in the file of this patent

UNITED STATES PATENTS

2,475,226
2,673,377Ellis ----- July 5, 1949
Gaugler ----- Mar. 30, 1954