

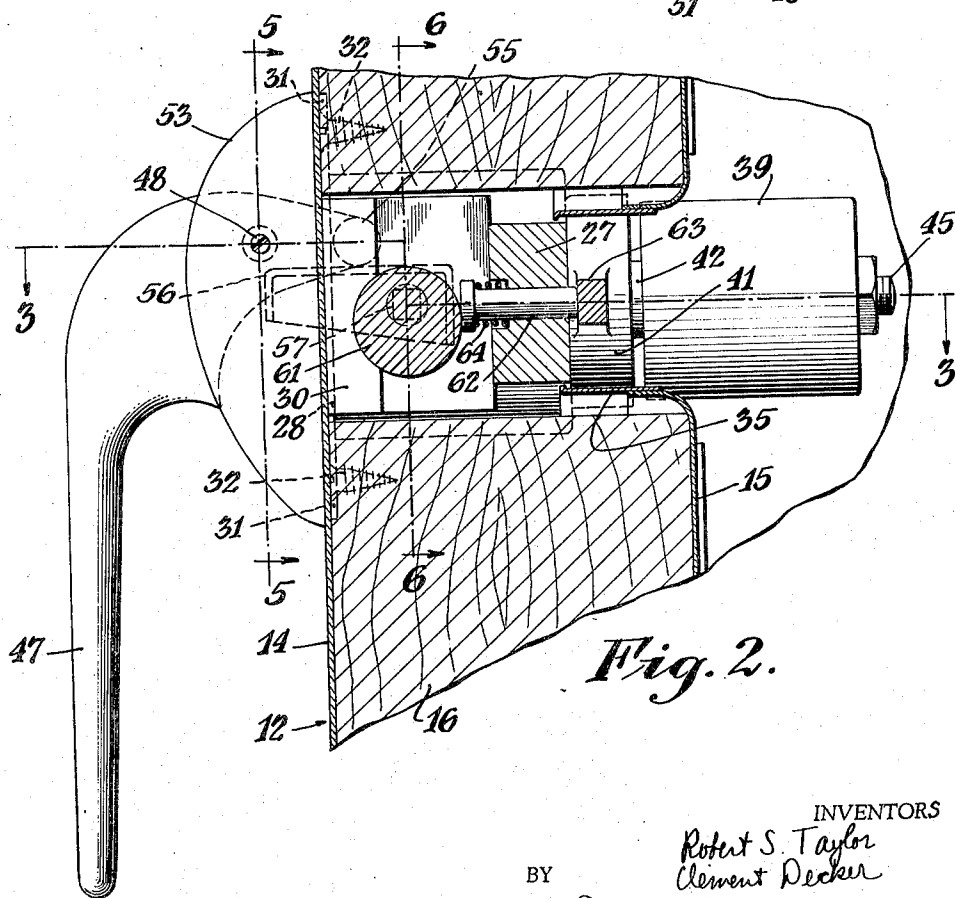
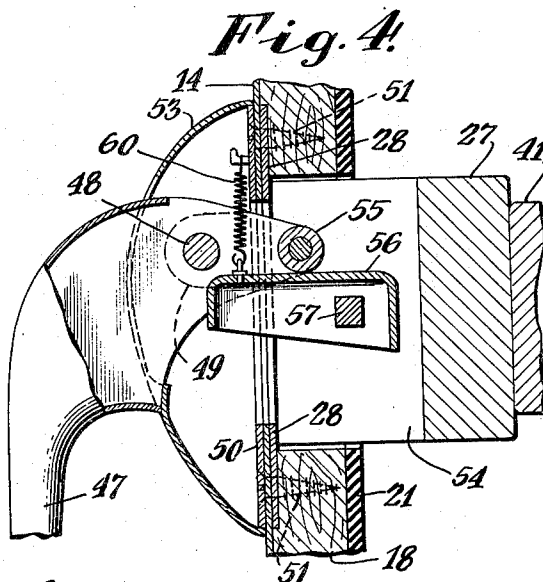
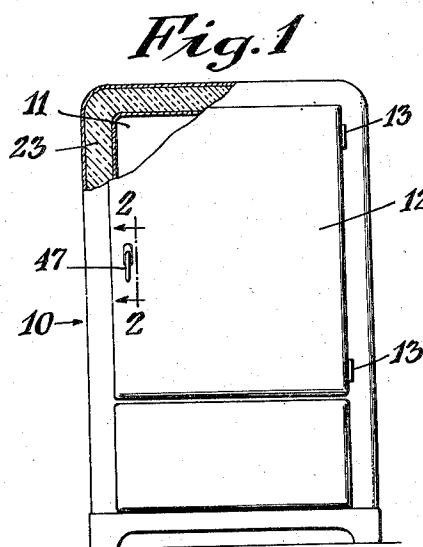
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REFRIGERATOR DOOR LATCH

2,252,144

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

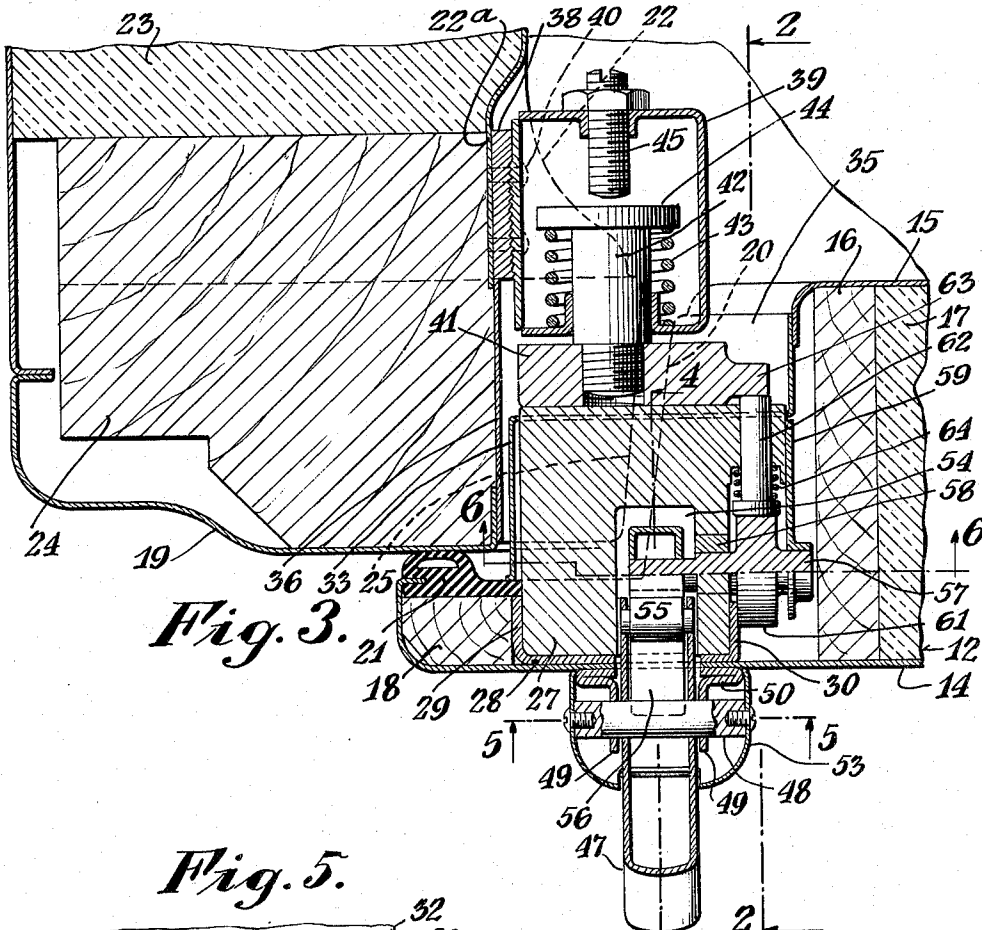


Fig. 3.

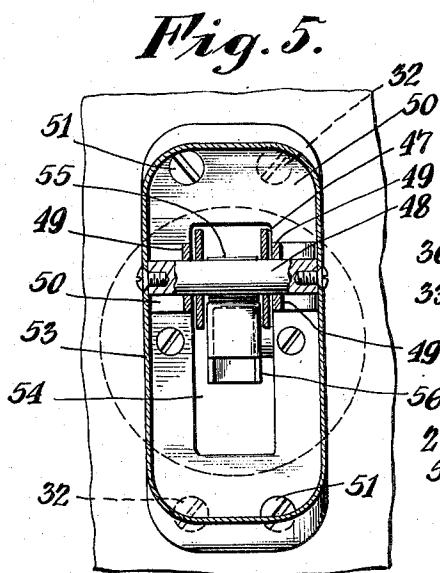


Fig. 5.

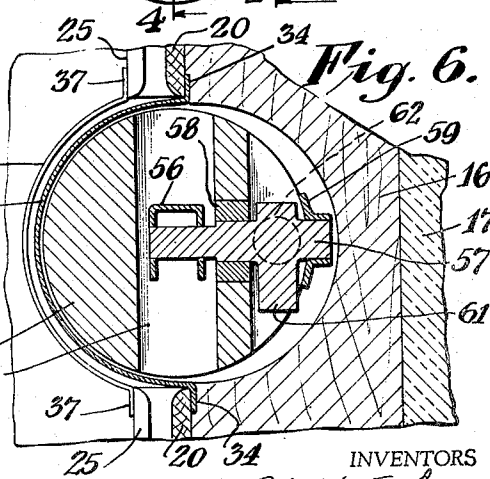


Fig. 6.

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REFRIGERATOR DOOR LATCH

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7 Claims. (Cl. 292—1)

This invention relates to a refrigerator door latch, and it is an object of the invention to provide an improved magnetic latch whereby a door is automatically latched when it is moved to its closed position. More particularly, it is an object of the invention to provide such a magnetic latch having mechanism to overcome the magnetic force of attraction to facilitate the opening of a door.

The above and other objects and advantages of the invention will be better understood from the following description and accompanying drawings forming a part of this specification, and of which:

Fig. 1 is a front elevation of a refrigerator, partly broken away and in section, provided with a magnetic latch embodying the invention;

Fig. 2 is an enlarged vertical sectional view taken on line 2—2 of Figs. 1 and 3 to illustrate the magnetic latch more clearly;

Fig. 3 is a horizontal sectional view taken on line 3—3 of Fig. 2 to illustrate parts of the latch more clearly;

Fig. 4 is a fragmentary vertical sectional view taken on line 4—4 of Fig. 3; and

Figs. 5 and 6 are vertical sectional views taken on lines 5—5 and 6—6, respectively, of Fig. 3.

Referring to Fig. 1, the invention has been shown in connection with a refrigerator 10 having a storage compartment 11 into which access may be had by a door 12 hinged at 13 to the front of the refrigerator. As shown in Figs. 2 and 3, the door 12 comprises outer and inner wall members 14 and 15 which are maintained in spaced relation by a wooden frame structure 16 with the space therebetween filled with a suitable heat insulating material 17.

The door frame 16 is provided with an outer ledge 18 which overlies an outer wall member 19 of the refrigerator 10 when the door is closed. The edges of the outer and inner wall members 14 and 15 are secured to the door frame 16 in any suitable manner. A trim or breaker strip 20, which is indicated by a dotted line in Fig. 3, is arranged about the door frame 16 and extends from the edge of the inner door member 15 to the inside of ledge 18. A portion of the breaker strip 20 is shown in section in Fig. 6. A suitable gasket 21 formed of rubber or the like is fixed to the inner surface of ledge 18 and may extend toward the outer edge of breaker strip 20. The gasket 21 bears against the outer wall member 19 of the refrigerator 10 and forms a seal with the latter to prevent the escape of cold air from storage compartment 11.

Between the spaced outer and inner wall members 19 and 22 of refrigerator 10 is provided a suitable insulating material 23. The outer wall member 19 extends about a wooden frame 24 at the door opening and terminates at an inner surface of the frame. The inner wall member 22 is curved inwardly about a major portion of the door opening, as indicated by the dotted line 22 in Fig. 3, and between the spaced edges of the wall members 19 and 22 is provided a breaker strip 25 which is also indicated by a dotted line in Fig. 3. The breaker strip 25 is shown in section in Fig. 6.

In accordance with this invention, we provide a magnetic latch for retaining door 12 in its closed position. The magnetic latch includes a permanent magnet 27 which is formed of a suitable magnetic material, such as the material commercially known as Alnico or the like, for example, and which is generally of cylindrical shape. As shown most clearly in Fig. 3, magnet 27 is fixed to a supporting plate 28 having a curved flange 29 which bears against a curved side of the magnet, and a flange 30 which bears against a flat side of the magnet. The supporting plate 28 is fixed to the magnet in any suitable manner, as by screws, and is provided with tabs 31 which extend above and below the magnet 27, as shown in Fig. 2. The tabs 31 of supporting plate 28 may be secured to the inside of outer wall member 14, as by screws 32, for example.

The magnet 27 is disposed in a recessed portion of door 12, and, when the door is closed, the magnet moves into a recessed portion of the door opening in refrigerator 10. The magnet 27 is arranged in a housing which includes a semi-circular plate 33 which extends about a curved portion of magnet. The inner edge of plate 33 bears against gasket 21 and the outer edge terminates below the face of magnet 27. The breaker strip 20 in door 12 is broken at the region at which the magnet is mounted thereon, and the plate 33 serves as a continuation of the breaker strip around the magnet. The plate 33 may be formed of the same material as the breaker strip, such as the material commercially known as Bakelite, and provided with flanges 34, as shown in Fig. 6, which underlie the ends of breaker strip 20.

Similarly, a second curved plate 35 is disposed about an opposite curved portion of the magnet between the outer face thereof and inner wall member 15. The curved plate 35 also serves as a continuation of breaker strip 20 at the region

of magnet 27 and may be provided with flanges (not shown) which connect the ends of the breaker strip 20 in a manner similar to that shown in Fig. 6. Suitable insulating material, such as sponge rubber, for example, may be employed about the magnet 27 and housing formed by the curved plates 33 and 35 to effectively insulate the door at the region of the magnetic latch.

As shown in Fig. 6, the door opening is also recessed in the region of the magnetic latch to receive the magnet when the door 12 is closed. The frame 24 is recessed to receive a curved plate 36 which conforms to the contour of plate 33 and serves as a continuation of breaker strip 25. The plate 36 is provided with flanges 37 which underlie the ends of breaker strip 25. As shown most clearly in Fig. 3, the plate 36 extends from the edge of outer wall member 19 to the edge of inner wall member 22 of the refrigerator 10. As pointed out above, the edge portion of inner wall member 22 is curved inwardly about a major portion of the door opening. At the region of the magnetic latch the edge portion of the inner wall member 22 slopes into the recessed part of the frame 24, as indicated at 22a, and at the extreme edge conforms more or less to the curved contour of plate 36. To the portion 22a of inner wall member 22 is fixed a curved supporting plate 38 which is serrated or notched on its outer surface.

To supporting plate 38 is adjustably secured a housing 39. The housing 39 may be cylindrical in shape and provided with serrations or notches which cooperate with the serrations on supporting plate 38. Flanges (not shown) having elongated openings may be fixed to the exterior of housing 39 for securing the latter to the supporting plate 38, as by screws 40. With this arrangement the housing is adjustable on plate 38 and may be moved forward or rearward on the latter.

A metal block 41 is carried by housing 39 in front of the latter. The block 41 serves as an armature element for magnet 27 and is formed of suitable material whereby the block is firmly held to the magnet, due to the magnetic field produced by the latter, when the door is moved to its closed position.

The block 41 is provided with a threaded opening to receive the outer threaded end of a stud 42 which extends through an opening in housing 39. A coil spring 43 is disposed between the front end wall of housing 39 and the flanged head 44 of stud 42 to permit rearward movement of block 41 when door 12 is closed and magnet 27 bears against the block 41. An adjustable stop 45 is secured to the rear end wall of housing 39 to limit rearward movement of stud 42 and block 41 carried thereby.

The operation of the magnetic latch thus far described is substantially as follows: When door 12 is closed the gasket 21 first bears against the outer wall member 19 of the refrigerator 10. After an effective seal is provided about the door opening by gasket 21, the outer face of magnet 27 bears against the block or armature element 41. Due to the strong magnetic field produced by magnet 27, the magnet and block are firmly held together to keep the door 12 in its closed position. The housing 39 is adjusted on its supporting plate 38 so that gasket 21 is firmly pressed against the outer wall member 29 when the magnet 27 and block or armature element 41 are held together.

In order to effect easy opening of the door 12, mechanism is provided to break the magnetic field between magnet 27 and block 41. This mechanism is incorporated in the magnetic latch and includes a handle 47. The handle 47 is preferably hollow and provided with openings in the upper part thereof to receive a pin 48. The pin 48 is journaled in the spaced arms 49 formed on a plate 50 which is secured by screws 51 to the door frame 16. As shown in Fig. 5, the plate 50 covers the screws 32 which secure supporting plate 28 in position on the inside of outer wall member 14. The plate 50 is secured in position subsequent to the supporting plate 28 and the screws 51 provide additional strength for holding supporting plate 28 on the inside of wall member 14. About the pin 48 and plate 50 is provided an enclosing shell 53 having an opening through which the handle 47 extends.

The handle 47 extends through openings formed in plate 50, outer wall member 14, and supporting plate 28, and into a recessed portion 54 of magnet 27. To the inner end of handle 47 is journaled a roller 55 which is adapted to bear against a flat side of a lever 56 which is U-shaped in cross-section. The sides of hollow handle 47 straddle the lever 56, as shown in Figs. 3 and 5. The lever 56 is rigidly secured to the squared end of a shaft 57 which is journaled in a bushing 58 in magnet 27 and a plate 59 which is secured to the forward part of the magnet adjacent the face thereof. A coil spring 60 is secured to the end of lever 56 and plate 50 to urge the lever upward, as shown in Fig. 4.

The shaft 57 is provided with a cam 61 which is disposed in a cutaway portion of the magnet at one side thereof. The cam 61 cooperates with a pin 62 which extends through an opening in magnet 27 and terminates at the outer face of the latter at the region of an abutment or stop 63 formed on block 41. A coil spring 64 is disposed between the head of pin 62 and a recessed portion of magnet 27 to urge pin 62 away from abutment 63.

The operation of the magnetic latch release mechanism just described is as follows: Assuming that door 12 is closed and that magnet 27 and block 41 are firmly held together, the outer end of handle 47 is raised about the pin 48. The movement of handle 47 depresses the inner end thereof whereby the roller 55 moves lever 56 and causes rotation of shaft 57. With turning movement of shaft 57, cam 61 is turned and pin 62 is moved against stop 63 of block 41, whereby a separating force is produced which overcomes the magnetic field between magnet 27 and block 41. The force applied in raising handle 47 is multiplied by the latch release mechanism so that considerable force is produced to effect separation of the magnet 27 and block 41 and thereby effect easy opening of the door 12. When handle 47 is released the outer end thereof falls by gravity, whereby roller 55 at the inner end thereof is raised. With upward movement of roller 55, lever 56 is raised by the action of spring 60 whereby cam 61 is turned, thereby permitting spring 64 on pin 62 to urge the latter away from stop 63. This permits subsequent closing of door 12 so that magnet 27 and block 41 will again be held together to retain the door in its closed position.

The bushing 58, plate 59, and pin 62 are preferably formed of a suitable non-magnetic material, such as brass, for example. Instead of providing the spring 60 under cover plate 53 to turn shaft

57 when handle 47 is released after opening the door, a coil spring may be arranged about shaft 57 to effect turning of the latter. The stop 45 limits rearward movement of armature element 41 and also serves as an adjusting screw to spring 43. By moving stop 45 the latch may be adjusted without any necessity of moving the housing 39. Spring 43 effectively holds armature element 41 in position and compensates for any manufacturing variations.

Although a particular embodiment of the invention has been shown and described, it will be apparent that various changes and modifications may be made without departing from the spirit and scope of the invention, as pointed out in the following claims.

What is claimed is:

1. For use with a cabinet having a door, a latch including a magnet element and a cooperating armature element to hold the door in its closed position, said elements being mounted on the cabinet and door in such a manner that the element mounted on the cabinet is in the path of movement of the element mounted on the door when the door is moved to its closed position, and resilient means associated with one of said elements and permitting movement thereof when it is contacted by said other element.

2. Apparatus as set forth in claim 1 and including a stop to limit movement of said one element having resilient means associated therewith.

3. In combination with a cabinet having a door, of a latch including a magnet element and a cooperating armature element to hold the door in its closed position under the influence of the magnetic field in said magnet element, said elements being mounted on the cabinet and the door in such a manner that the element mounted on the cabinet is always in the path of movement of the element mounted on the door, and means cushioning the shock of impact between the magnet element and armature element when said elements are moved into abutting relation by a sudden or forceful closing of the door.

4. In combination with a cabinet having a door, of a latch including a magnet element and a cooperating armature element to hold the door in its closed position under the influence of the magnetic field in said magnet element, one of said elements being mounted on the door and having a face exposed on the rear side of the door, the other of said elements being mounted on the cabinet and having an exposed face, said elements being mounted on the cabinet and door in such a manner that the exposed face of the element mounted on the cabinet is always in the

path of movement of said element mounted on the door when the latter is moved to its closed position, and means yieldably mounting at least one of said elements to reduce shock transmitted to the door and the cabinet when the faces of said elements abut each other and are moved into such abutting relation by sudden or forceful movement of the door to its closed position.

5. In combination with a cabinet having a door provided with a movably mounted handle to facilitate opening of the door, latch mechanism including a magnet element and a cooperating armature element to hold the door in closed position under the influence of the magnetic field in the magnet element, said elements being mounted on the cabinet and door in a manner such that the element on the cabinet is in the path of movement of the element on the door, and movable means associated with one of said elements and adapted to be actuated by said handle for separating said elements against magnetic attraction upon movement of said handle.

6. In combination with a cabinet having a door provided with a movably mounted handle to facilitate opening of the door, latch mechanism including a magnet element and a cooperating armature element to hold the door in closed position under the influence of the magnetic field in the magnet element, said elements being mounted on the cabinet and door in a manner such that the element on the cabinet is in the path of movement of the element on the door, and movable means associated with one of said elements and adapted to be actuated by said handle for forcibly separating said elements to open the door, said movable means including means providing an additional mechanical advantage for said handle.

7. In combination with a cabinet having a door provided with a movably mounted handle to facilitate opening of the door, latch mechanism including a magnet element and a cooperating armature element to hold the door in closed position under the influence of the magnetic field in the magnet element, one of said elements being mounted on the door and the other of said elements being mounted on the cabinet in a manner such that coacting surfaces of said elements are brought into abutting relation when the door is moved to closed position, means movably supporting one of said elements, and movable means associated with said handle and with said movable element and adapted to be actuated by the handle for separating said elements upon movement of said handle.

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