May 23, 1972 P. WEIGELT 3,664,699

MAGNETIC DOOR CLOSURE DEVICE

Filed March 12, 1970 2 Sheets-Sheet 1

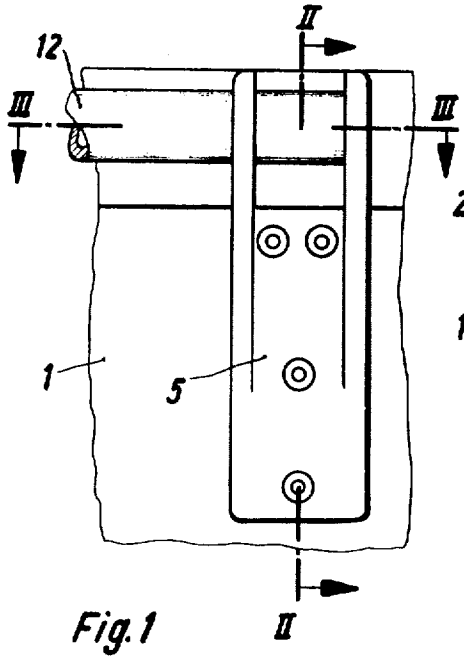


Fig. 1

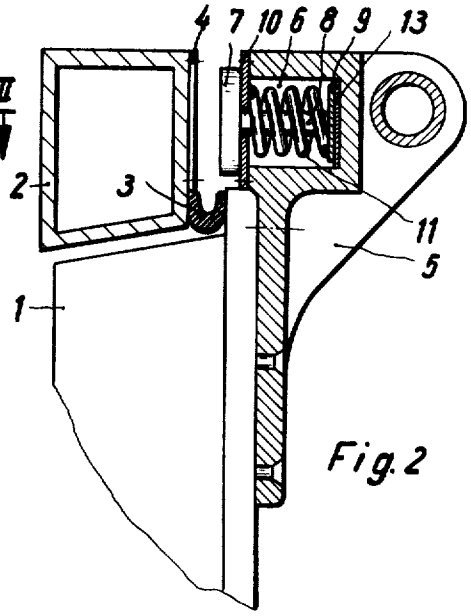


Fig. 2

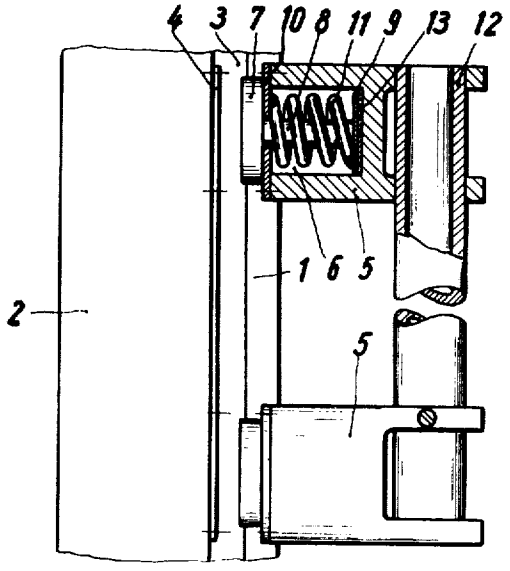


Fig. 3

Inventor:
PETER WEIGELT
BY
ATTORNEY

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MAGNETIC DOOR CLOSURE DEVICE

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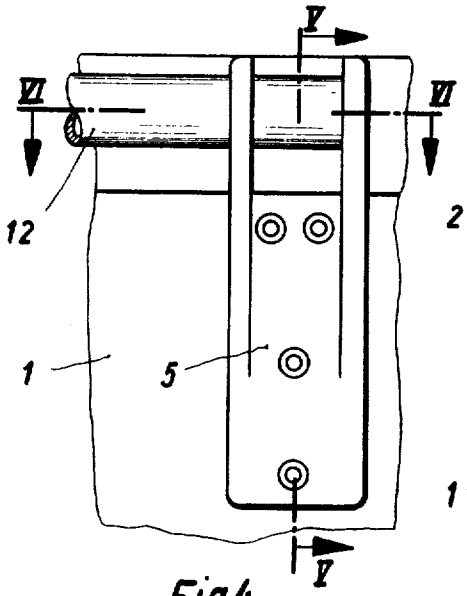


Fig.4

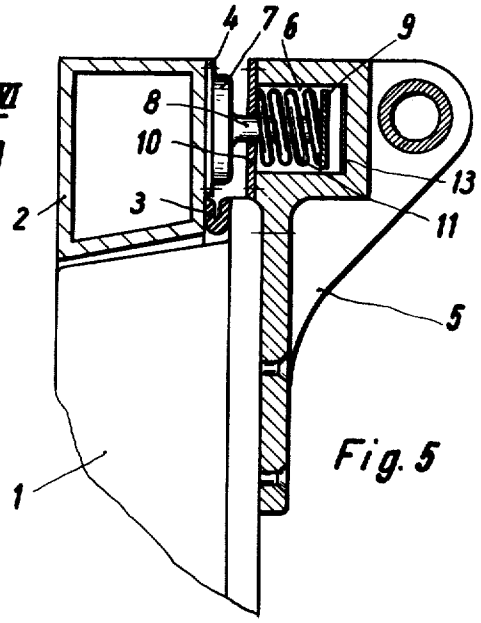


Fig. 5

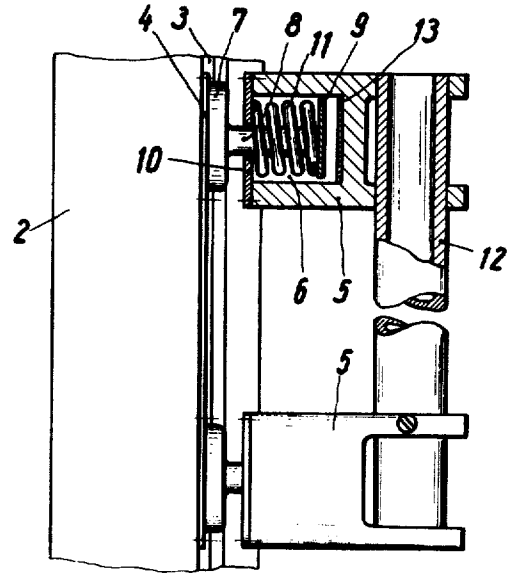


Fig.6

Inventor:

PETER WEIGELT

BY Otto Schulz Attorney

ATTORNEY

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MAGNETIC DOOR CLOSURE DEVICE

Peter Weigelt, 4521 Bakum 156, Germany

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Int. Cl. E05c 19/16
U.S. Cl. 292—251.5 1 Claim

ABSTRACT OF THE DISCLOSURE

The present invention relates to a door closure device in which a permanent magnet is attached to one and a magnetically permeable member is attached to the respective other one of two door members movable relatively to each other. The permanent magnet is movably mounted in its respective member and resiliently urged in a direction opposite to the direction of its movement under the effect of the attractive force between the permanent magnet and the magnetically permeable member.

BACKGROUND OF THE INVENTION

For insulating doors of the kind employed in the construction of refrigerating chambers, there is the general requirement that a high degree of sealing is attained in their closed state. This necessitates great pressure on any seals maintained between the door and the frame; on the other hand only a small expenditure of energy should suffice for opening and closing the door. Moreover, any deterioration of the elasticity of this sealing must be balanced by the pressure maintained between parts of the door. Finally, there is the requirement that the assembly of the door fittings must be very simple and that the fittings do not diminish the insulation qualities of the door.

The previously known and conventional spring cam fittings and pressure lever worm drive fittings, as employed for doors of refrigerating or freezing chambers, do not meet the requirements in respect of ease of operation. Furthermore, they must at least in part be accommodated within the body of the door and thereby detract from the insulation qualities of the door. Finally, the known closure fittings require accurate work in their assembly, since they exert pressure in only a limited range.

SUMMARY OF THE INVENTION

It is an object of the invention to avoid the disadvantages of the prior art by the application of a conventional magnetic door closure, consisting of at least one permanent magnet and one magnetically permeable part which combine to form the closure device. Since, however, an applied pressure of approximately 100 pounds is required for hermetically sealing an insulating door of a refrigerating chamber and permanent magnets capable of such performance already draw the door strongly against the frame even through the opening may still be about one inch wide. It is a particular task of the invention to provide a novel magnetic closure particularly suitable for refrigerating and freezing chamber doors, which meets all the mentioned requirements and is yet easily operable in spite of the strong applied pressure.

For this purpose, the magnetic door closure device provided by the invention is characterised by the permanent magnet being mounted to be movable in the direction of the effective magnetic force and cooperating with a resilient element, which is stressed by the motion of the permanent magnet towards the magnetically permeable member. The permanent magnet is preferably provided with a shank carrying a collar and guided by means of these in a recess of a carrier mounted on the door, the resilient element being housed in the recess between the collar

and a cover plate defining the outward boundary of the recess. The resilient element may simply and expediently consist of a helical spring. It is also expedient for a damping plate of shock absorbent material such as soft rubber or the like to be mounted at the inner end of the recess to act as an abutment surface for the collar.

In a particularly advantageous embodiment of the magnetic door closure according to the invention, two carriers, each provided with a permanent magnet, are mounted on the insulating door, the carriers being constructed to form holders for a door handle extending therebetween and together to provide the closure device.

Various other objects and advantages of this invention will become more apparent from the following description illustrated by the accompanying drawing of an embodiment described by way of example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a partial view of a magnetic closure device embodying the invention;

FIG. 2 shows a section on the line II—II in FIG. 1;

FIG. 3 shows a section on the line III—III in FIG. 1, in the opened position, while

FIGS. 4 to 6 show corresponding views of the magnetic closure device according to FIGS. 1 to 3 respectively; with the closure device in the closed state.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The drawings show that part of an insulating door **1** which is visible in the proximity of the closure device, a frame **2** and a seal **3** by means of which the insulating door **1** in its closed state provides hermetical sealing with the frame **2**. A magnetically permeable member **4** consisting of a steel plate or the like is fastened at the outside of the frame **2** in the range of the door closure device.

At the outside of the insulating door **1**, there is mounted a carrier **5** which projects laterally of the profile of the door and is provided with a recess **6** in a second portion just beyond the edge of the door. The recess **6** and the carrier **5**, which in the closed or near the closed state of the insulating door **1** face the magnetically permeable member **4** on the frame **2**, are provided for the mounting and guiding of the permanent magnet **7**. This permanent magnet **7** is attached to one end of a shank **8**, the other end of which is provided with a collar **9** and extends into the interior of the recess **6**. The outer end of the recess **6** is covered by a cover plate **10**, which is provided with an opening for the shank **8** of the permanent magnet **7** to pass through. The plate **10** acts as a support or counter bearing for a helical spring **11**, which is located in the interior of the recess **6** and supported at its other end on the collar **9**. The permanent magnet **7** is thus movably mounted and guided in the carrier **5**, or rather in its recess **6**, and cooperates with the spring **11** to move in the direction towards the magnetically permeable part **4** on the frame **2**, i.e. in the direction of the magnetic door closure force.

As may be seen from the drawings (in particular FIGS. 3 and 6), the illustrative embodiment may be provided with two carriers **5** each carrying one permanent magnet **7**, the carriers **5** simultaneously forming holders for a door handle **12** extending therebetween and together providing a closure.

When the door and closure device are closed (FIGS. 4 to 6) then the permanent magnet **7** (or both the permanent magnets **7** of the closure device) rests on the magnetically permeable member **4** of the frame **2** and does so with the given magnetic force of attraction. In this, the spring **11** is lightly compressed and stressed by means of the collar **9** at the end of the shank **8** of the permanent

magnet and transmits the attractive force of the permanent magnet **7** via the cover plate **10** to the carrier **5** and thereby to the insulating door **1**, which is thus hermetically closed under compression of the seal **3**. The spring **11** provides a constant applied pressure even when the seal **3** has become weakened. On the opening of the door, when the handle **12** of the closure device is being pulled, the spring **11** is further compressed until a pressure has built up within it of such a magnitude, that the magnet **7** is pulled away from the magnetically permeable plate **4** on the frame **2**. In this process, the spring loading is discharged and the collar **9** provided at the end of the shank **8** on the permanent magnet **7** bounces against a damping plate **13** of soft rubber or the like at the inner end of the recess **6** in the carrier **5**, so that no disturbing noise is created. Instead of the soft rubber plate **13** acting as a damping abutment or in addition thereto, a buffer of soft rubber or the like may also be provided on the outer face of the cover plate **10**. In the opened position, the permanent magnet **7** and the spring **11** assume the position shown in FIGS. 1 to 3.

The opening of the door can easily be effected with little exertion, since the permanent magnet **7** is not detached with a jerk but by a pull exerted over a path of about one inch, i.e. the extent of the compression of the spring **11**, and then automatically jumps back by means of the spring force.

It is to be emphasized, that the magnetic closure device according to the invention is not limited in its application to doors of cooling or refrigerating chambers, but may with advantage be applied in all cases in which similar conditions exist and similar requirements are to be met.

It is also to be understood that the invention is not limited to the exemplary embodiment hereinbefore described and shown in the drawings, but that modifications in different aspects are feasible and possible.

I claim:

1. A door closure device, comprising in combination

(a) cooperating closure members on mutually facing surface portions of a movable door and a door frame, respectively;

(b) a magnetically permeable member attached to one of said cooperating members;

(c) guide means mounted in fixed relationship to the respective other one of said cooperating members.

(d) a permanent magnet movably retained by said guide means; and

(e) resilient means urging said permanent magnet

(i) in a direction opposite to the direction of the attractive force between said magnetically permeable member and said permanent magnet; and

(ii) to a degree insufficient to overcome the attractive force present when the door is closed;

(f) two carrier means mounted on said door and connecting said guide means to said respective other one of said cooperating members;

(g) holders extending one from each of said carrier means;

(h) a door handle located intermediate said holders;

(i) wall portions of said carrier means forming a recess of said guide means;

(j) a plate covering said recess at the outer end thereof;

(k) a shank attached at one end thereof to said permanent magnet and extending through an aperture in said plate into said recess; and

(l) a collar provided at the respective other end of said shank and located within said recess, said resilient means being located between said collar and said plate.

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GEORGE F. MAUTZ, Primary Examiner

E. J. McCARTHY, Assistant Examiner