

[54] **DOOR CLOSING AND CHECK DEVICE  
FOR REFRIGERATORS, FREEZERS  
AND THE LIKE**

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[52] U.S. Cl.....16/153

[51] **Int. Cl.**.....E05f 1/06

[58] **Field of Search**.....16/153, 152, 154, 155, 156

[56] **References Cited**

## UNITED STATES PATENTS

3,628,845 12/1971 Grimm .....16/153

*Primary Examiner*—James T. McCall

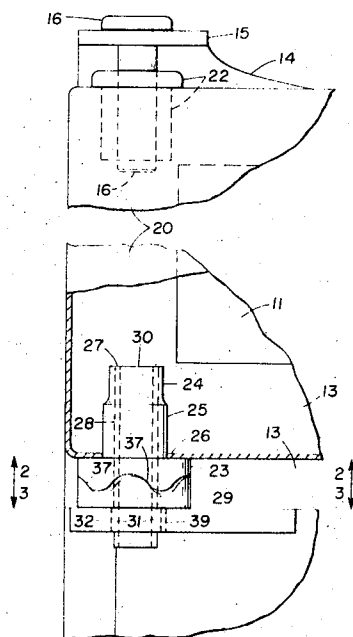
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[57] **ABSTRACT**

A door closing and check device for refrigerators, freezers and the like is disclosed which employs a stationary bushing, including a hinge pin formed integrally therewith, mounted to the cabinet having four upperly directed cam lobes which engage four complementary, downwardly directed cam lobes of a rotatable bushing mounted to the door and rotating in its hinge axis. The lobes of the two bushings are located relative to each other to cause the weight of the door to swing the same to its closed position from a partially open position as well as to check and maintain the door in two successively wider open positions of approximately 85° and a 175°. The two bushings are also formed in a manner to prevent their improper installation and consequent malfunction in the door and cabinet.

## 2 Claims, 7 Drawing Figures



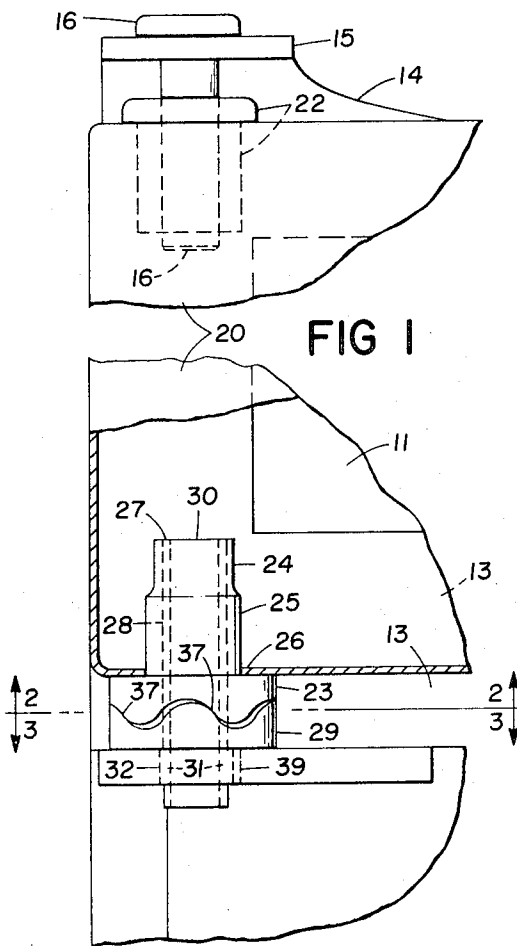


FIG 1

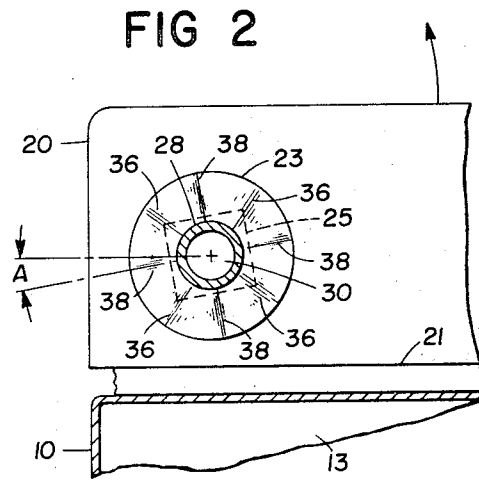


FIG 2

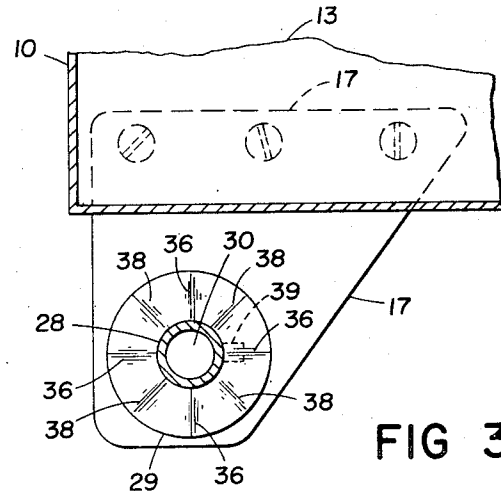


FIG 3

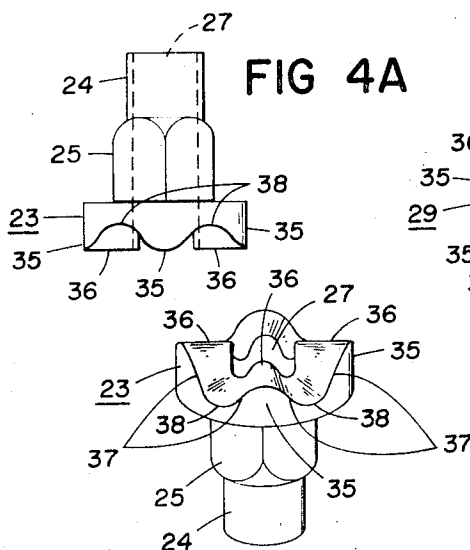


FIG 4A

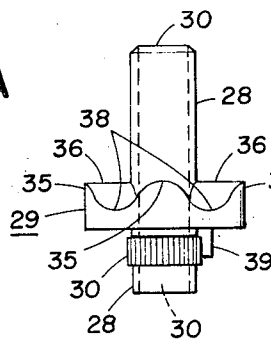


FIG 5A

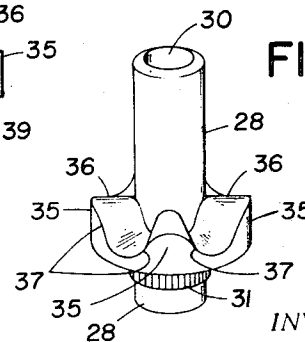


FIG 5B

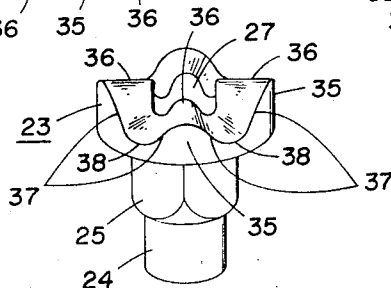


FIG 4B

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## DOOR CLOSING AND CHECK DEVICE FOR REFRIGERATORS, FREEZERS AND THE LIKE

### BACKGROUND OF THE INVENTION

Especially in the case of refrigerators and freezers employing magnetic door gaskets, it is desirable for obvious reasons to include some device by which the door is positively closed in order to prevent the door from inadvertently being left slightly ajar. It is also desirable that the door be positively checked and maintained in several open positions so that it will not swing shut unless urged to do so and at the same time will not swing open wider and bump its handle against a wall or other object adjacent the cabinet. Typically desirable such positions are those somewhat less than 90° and 180° if there are walls or objects which the door would strike if fully opened those extents. Likewise, whatever the device used, it should be inexpensive, quiet, long lasting and efficient. However, current devices of this nature suffer in almost all of these respects.

For instance, the closing devices shown in U.S. Pat. Nos. 3,452,387 and 3,518,716, which are typical of those presently used, each incorporates a spring to provide the driving force for the door in conjunction with various cam arrangements. These devices are necessarily relatively large, expensive and complicated. They require substantial space for installation and incur assembly problems, especially when they are to be used on both right and left hand hinged doors. They are also often noisy. The use of springs inherently detracts from their attractiveness since springs can weaken or even break over long periods rendering the devices useless. Hence the primary object of the present invention is to provide a door closing and check device which is simple, inexpensive, effective and long lasting, requiring little mounting space and no springs, as well as being proof against improper installation.

### SUMMARY OF THE INVENTION

The foregoing object is achieved by employing a pair of cam members incorporated directly into one of the hinges of the door. Both cam members are integral pieces. One member, the stationary one, which also acts as the hinge pin, is secured to a hinge plate fastened to the cabinet and is formed to provide four symmetrical, upwardly directed cam lobes extending radially from the hinge axis and equally spaced circumferentially thereabout. The other member, the moving one, which fits over the stationary member, is fixed to the door and formed to provide four complementary, downwardly directed cam lobes about the hinge axis which rotate on the stationary lobes as the door is swung, the toes and heels of the lobes respectively engaging the heels and toes of the stationary lobes. The two members are positioned relative to each other so that when the door is slightly ajar, interaction between the ramps of the respective lobes causes the weight of the door to positively swing it shut and to maintain it pressed against the cabinet. Thereafter, as the door is swung open wider, it is checked and held in two successive positions owing to the number and relative positions of the two sets of lobes, the first position being somewhat less than 90° and the second somewhat less than 180° of door opening. A square shank on the rotatable member fixes the position of its lobes relative to the door and a key on the stationary member en-

gages its hinge plate to fix the position of its lobes relative to the cabinet in order to locate the two sets of lobes relative to each other to achieve proper closing and checking action.

Many advantages stem from the foregoing. In the first place, only two simple, integral members are required which in effect largely merely replace the hinge pin and bushings that are normally used anyway in the hinges of doors of the types concerned. Thus little or no additional installation space, material or assembly time is required. In the second place, the two members are relatively inexpensive being preferably steel castings with the lobes chromium plated. Third, there are no springs or other moving parts to weaken or break; simply the weight of the door alone provides the desired closing and checking action. Indeed, the greater the load on the door, owing for instance to filling its shelves, the greater the closing and checking action, whereas when springs are used the very opposite is the case. The fact that several cam lobes are used on each member decreases the load on each lobe and so prolongs the life of the device and insures trouble-free operation. And finally, the device can be readily used for either left or right hand hinged doors interchangeably, and the square shank and locating key of the two members make their installation foolproof, that is to say, they cannot be installed on the assembly line so that they are improperly aligned with each other.

Other and further features and advantages of the present invention will become apparent from the more detailed description which follows.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial, front elevation view of a typical refrigerator or freezer or the like showing the invention incorporated therein, the outer panel of the door being broken away and all insulation omitted for clarity.

FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1 illustrating the position of the rotatable cam member.

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 1 illustrating the position of the stationary cam member.

FIGS. 4A and 4B are enlarged views of the rotatable cam member itself illustrating its details.

FIGS. 5A and 5B are enlarged views of the stationary cam member illustrating its details.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, a typical refrigerator or freezer cabinet is designated by the reference numeral 10 while 11 designates an interior compartment thereof for either food storage or freezing. The machinery compartment is designated generally at 12 which is normally closed by a suitable grille (not shown) and is separated from the compartment 11 by an insulated partition 13. To the top of the cabinet 10 is secured an upper hinge plate 14 having an upset portion 15 projecting forwardly of the cabinet 10 and provided with an upper vertical hinge pin 16. Below the hinge plate 14 and secured to the partition 13 is a lower hinge plate 17 extending forwardly of the cabinet 10. A door 20 overlies and closes the compartment 11 against a suitable

gasket 21, the upper edge of the door 20 adjacent one corner being fitted with a suitable flanged bushing 22 in which the upper hinge pin 16 is journaled, while the lower edge of the door 20 therebelow is fitted with a cam bushing 23 having a round, upper shank 24, the lower portion 25 of which is squared and fits through a suitable squared hole 26 in the lower edge of the door 20, thus fixing the bushing 23 relative to the door 20. The interior of the shank 24 is provided with a cylindrical bore 27, extending through the bushing 23 in axial alignment with the hinge pin 16, in which is journaled the upper portion of a cylindrical shank 28 extending above and below a second cam bushing 29 beneath the bushing 23. The shank 28, which thus acts as a lower hinge pin, and the bushing 29 are also bored at 30 in order to provide a passage into the door 20 for electrical cables, while the portion of shank 28 below the bushing 29 is provided with serrations 31 or similar means to fix the bushing 29 against rotation in a hole 32 through the lower hinge plate 17.

As will be observed from the drawings, the lower face of the bushing 23 and the upper face of the bushing 29 are each integrally formed to provide two complementary sets of four cam lobes 35 equally spaced circumferentially around the shanks 24 and 28, the toes 36 of the lobes 35 extending radially therefrom. Ramps 37 incline smoothly away from the toes 36 and form radially extending heels 38 between adjacent lobes 35. While as noted preferably cast steel is employed for the bushings 23 and 29, and the lobes 35 are chromium plated, obviously other materials could be used, even suitable plastics. Next, it will be observed from FIG. 2, opposite pairs of the heels 38 of the rotatable bushing 23 are disposed slightly askew of the plane of the door 20 as indicated by angle A in FIG. 2 which is preferably about 5°, the hole 26 being punched in the door 20 to dispose the square shank 25 accordingly, while the toes 36 of the stationary bushing 29 are disposed parallel and at right angles to the plane of the door 20 when closed, as illustrated in FIG. 3. Consequently, as illustrated in FIG. 1 with the door 20 in its closed position, the respective toes 36 of the bushing 23 do not quite seat on the respective heels 38 of the bushing 29, but instead the respective ramps 37 only of the two are engaged whereby the resulting interaction therebetween and the weight of the door 20 tend to press the latter against the cabinet 10. The same action closes the door 20 if inadvertently left slightly ajar. When on the other hand the door is opened towards its 90° position, the respective lobes 35 of the bushing 23 will rotate on those of the stationary bushing 29, raising the door on the hinge pin 16 and the shank 28 and then lowering it until the respective toes 36 and heels 38 of the two bushings 23 and 29 seat upon each other in their next relative location, whereupon the door 20 will be checked and maintained at an angle of approximately 85° with respect to its closed position owing to the skewed position of the bushing 23. Further opening of the door will in like manner check and maintain it at approximately 175°, it being noted that the upset portion 15 of the upper hinge plate 14 is formed to provide sufficient space above the bushing 22 to permit the door 20 to rise and fall on the hinge pin 16 and shank 28 as it is opened and closed. Using more than four lobes on each bushing 23 and 29 would obviously pro-

vide additional check positions for the door 20 as well as decreasing the load and thus the wear on the lobes.

As previously mentioned, the square shank 25 accurately locates the rotatable bushing 23 in its skewed position relative to the door 20. In those installations in which the door 20 is adapted to be hinged along either edge, the opposite lower corner of the door is also punched to provide a square hole, skewed similar to the hole 26, to receive the shank 25 when the door 20 is hung as a right hand door, instead of a left hand one as shown. In order to locate the stationary bushing 29 relative to the cabinet 10, the lower portion of its shank 28 adjacent the serrations 31 is provided with a key 39 which engages an appropriate recess in the wall of the bore 32 through the hinge plate 17. When the latter is also used for a right-hand instead of a left-hand hinged door, it too will still accurately locate the bushing 29. Thus in all cases improper alignment of the two bushings 23 and 29 is impossible during assembly.

Though the invention has been described in terms of a particular embodiment, being the best mode known of carrying out the invention, it is not limited to that embodiment alone. Instead, the following claims are to be read as encompassing all adaptations and modifications of the invention falling within its spirit and scope.

I claim:

1. In a refrigerator or freezer or the like having a closed cabinet and a door hinged about a vertical axis for access to said cabinet by hinge means permitting raisable movement of said door along said axis, said hinge means including door closing and check means in combination therewith, said closing and check means comprising: a stationary member and a cooperating rotatable member, said stationary member being fixed relative to said cabinet and said rotatable member being secured to said door to rotate in said hinge axis upon hinged movement of said door, one of said members including an integral hinge pin and the other of said members an integral sleeve receiving said hinge pin for rotation therein in said axis, said rotatable member also including at least one pair of diametrically opposite downwardly directed cam lobes spaced about said axis and said stationary member at least one pair of diametrically opposite upwardly directed complementary cam lobes equally spaced around said axis, said cam lobes having diametrically extending toes and diametrically extending ramps inclining away from the sides of said toes, the respective ramps of adjacent pairs of cam lobes having diametrically extending heels therebetween, said rotatable cam lobes overlying said stationary lobes with the respective toes and heels of said rotatable member successively engaging respective heels and toes of said stationary member during hinged movement of said door, one of said members including a portion positively locating the diametrical axis of one pair of said lobes thereof at a right angle with respect to the plane of said door, and other of said members including a portion positively locating the diametrical axis of one pair of said lobes thereof at an acute angle relative to the plane of said door, whereby interaction between respective ramps of said members and the weight of said door tends to positively press said door against said cabinet when said door is closed and when said door is swung open to check its movement and maintain the same in an open position, said portions

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respectively engaging means carried by said cabinet and said door to provide said positive lobe location, said portions and means being adapted to provide said ramp interaction in case of either a left hand or a right hand hang of said door.

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2. The combination of claim 1, wherein said hinge pin is hollow and opens at its axial ends to provide a conduit through both of said members for the passage of cables from said cabinet into said door.

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