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K. ITO

2,222,201

REFRIGERATOR

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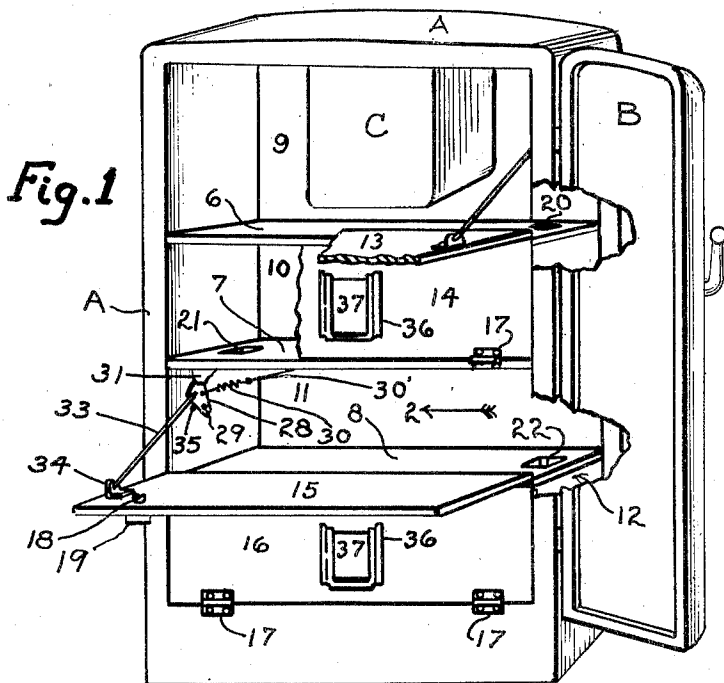


Fig. 1

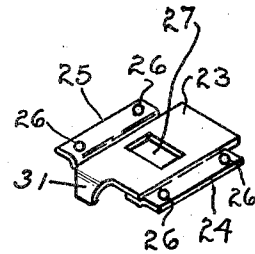


Fig. 5

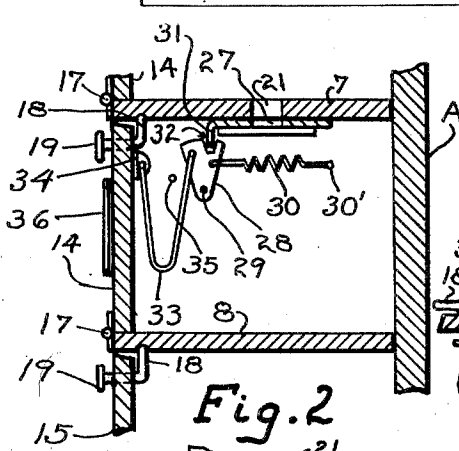


Fig. 2

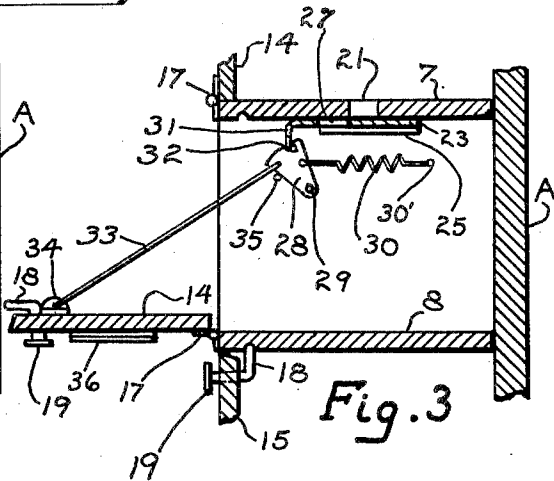


Fig. 3

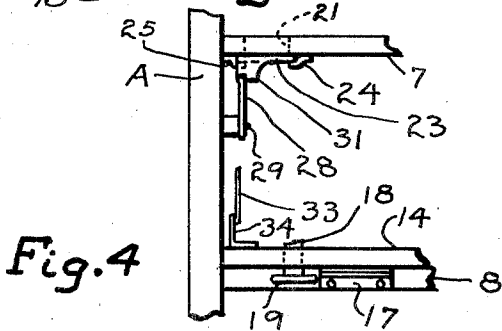


Fig. 4

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# UNITED STATES PATENT OFFICE

2,222,201

REFRIGERATOR

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Application December 11, 1939, Serial No. 308,580

1 Claim. (Cl. 62-39)

This invention relates to refrigerators, and particularly to refrigerators adapted to prevent the escape of cold air therefrom when doors thereof are opened.

5 In the construction of refrigerators it has been the practice to divide the interiors thereof into several compartments, by cross shelves, for storing various sorts of supplies, and to provide means for originating cold air in the upper portion of the interior for circulation downward through the several compartments. In this form, all of the several compartments are exposed to the outside air, when the door of the refrigerator is opened, and the cold air then escapes from each of the compartments.

15 It is therefore an object of this invention, to provide a refrigerator, wherein the circulation of the cold air from above is facilitated, and the escape of such cold air prevented, when the doors are opened, from all of such compartments except the single one to which the user has access for placing or removing supplies.

20 Particular objects, are to provide a plurality of compartments, separated by cross shelves one above the other, said shelves arranged with holes therethrough, for downflow of cold air, in staggered relation in opposite ends of alternate shelves. Further objects are to provide separate doors for closing the fronts of each of said compartments when raised and for forward extension of the shelves, when lowered. Other objects are to provide separate shutter plates slidably mounted adjacent said holes, and normally disposed behind the same to permit free circulation of cold air, with means for drawing such shutter beneath such holes for closing the same to prevent loss of cold air when said doors are opened. A still further object is to provide one outside front door for closing over all of said inner doors for insulation.

40 With these and other objects to be hereinafter stated, I have illustratively exemplified my invention by the accompanying drawing, of which:

45 Figure 1 shows a front elevation of the refrigerator, with an outer front door open to disclose inner doors and compartments, with parts broken away.

50 Figure 2 is an enlarged fragmentary inside elevation view showing an inner door closed and air duct open, taken on line 2-2 of Fig. 1, with parts in section.

Figure 3 is a view similar to that shown in Fig. 2, but with the inner door open and the air duct closed.

Figure 4 is an enlarged fragmentary front ele-

vation view, showing an inner door open and lowered to horizontal position for a shelf extension in line with the fixed shelf.

Figure 5 is a perspective sketch showing an enlarged view of one of the air duct shutters and 5 supporting rails therefor.

Like characters on the different figures represent like parts. A, represents generally a refrigerator housing, and B, represents a front or outer door thereon for insulation of the entire 10 refrigerator. C, represents any suitable case in which cold air may be generated by deposits of ice or by mechanical means. This case is preferably located in the upper portion of the refrigerator. Beneath the case and horizontally 15 mounted across the interior are any desired number of shelves indicated as 6, 7, and 8. Between the shelves are compartments, as 9, 10, 11, and 12, for storing any desired supplies to be cooled.

20 In order to prevent the loss of cold air from all the compartments when access is had to one thereof, individual inner doors as 13, 14, 15, and 16, are provided in front of each of said compartments. These inner doors are pivotally connected along their lower edges as by hinges 17, 25 to the respective shelves; and are normally retained closed in front of the compartments by latches 18, operated by handles 19. As it is necessary that the cold air from the case be 30 allowed to flow down and circulate through all of the compartments when the doors are closed, suitable connecting ducts as 20, 21, and 22, are provided through each of the shelves. As the compartments are ordinarily used for storing 35 and cooling meats and other provisions, it is necessary that the cold air be circulated horizontally within such compartments to surround such articles to be cooled. This cannot be accomplished by providing in the shelves ducts one 40 directly above the others through the several shelves, as the cold air would then flow perpendicularly only, through all the ducts one after the other. The cold air circulation through all portions of the compartments is assured by staggering the locations of the ducts through opposite ends of the alternate shelves. In order to prevent the escape of cold air from a compartment above the one that is open beneath, shutters 23, are slidably mounted on guide rails 24 50 and 25 adjacent said ducts. The rails are affixed to the shelves by any suitable means as rivets through holes 26. The shutters are provided with cross slots 27 therethrough and when a shutter is drawn back its slot matches with the 55

respective duct and permits free passage of the cold air; but when drawn forward the body of the shutter covers or closes the duct and so prevents the loss of cold air from the compartment

5 above.  
 A rocker arm 28, is pivotally connected to the housing by a pin 29 through its base and is normally drawn backward by a spring 30, connected from the housing by a pin 30'. A lip 31, 10 from the shutter is extended freely into a notch 32, in the top of the arm, whereby the shutter is moved to and fro as the arm is moved. A suitable cable 33, is connected at its rear end to the front of the arm and its forward end is connected 15 to the respective inner door as through a lug 34.

When the arm and shutter are drawn forward, the door is opened as seen in Fig. 3. A stop pin or abutment 35, is projected from the housing 20 across the path of the arm in suitable position to bar its forward movement after the duct is closed and the door fully opened. The door is also supported in lowered position suitable for a shelf by the cable from the arm. Thus the cable 25 provides such dual functions, and is important in practice as supporting the lower door for an auxiliary shelf for temporary deposit of articles from the compartments. Any card case 36, is preferably affixed to the front of the inner doors 30 for retaining cards indicated as 37 on which lists may appear of articles placed in the respective compartments for convenience of the user.

Having described my invention, I claim as new for Letters Patent:

A refrigerator with a plurality of shelves forming separate chambers provided with means for conserving cold air, comprising, individual doors for closing perpendicularly in front of each of said compartments and being hingedly connected 5 to the shelf on a horizontal axis beneath each compartment to provide access thereto, ducts through said shelves to provide circulation of cold air downward from above, shutters slidably 10 mounted adjacent said ducts and adapted to be moved both across said ducts for closing and opening the same, means for normally retaining said shutters clear from said ducts when said doors are shut and for closing said ducts by said 15 shutters when said doors are opened, comprising, a rocker arm pivotally supported at the lower end thereof on a pin from the side of the refrigerator, a retractive spring connected to the upper end of the arm and to the refrigerator for normally sustaining said arm in approximate 20 perpendicular position, the said upper end of the arm provided with jaws for moving such shutters and operatively connected to the rear edge thereof for swinging the same backward to move the shutter clear of said aperture when the door 25 is closed, a cable connected by one end to the front edge of said arm and the other end thereof connected to said door and adapted to swing said arm forward when said door is opened to 30 move said shutter across said duct for closing the same, said cable further adapted to sustain said door in horizontal position for an extension shelf, when fully opened.

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