Sept. 3, 1929. R. L. SHIPMAN 1,726,631

REFRIGERATOR CLOSURE

Filed May 7, 1927

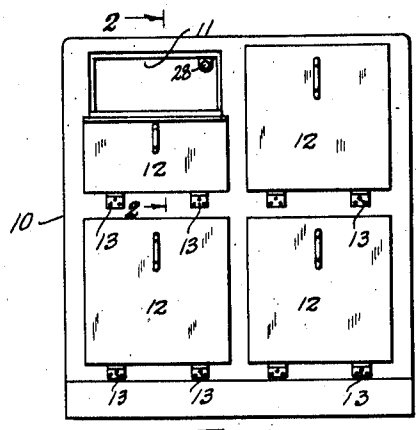

Fig. 1.

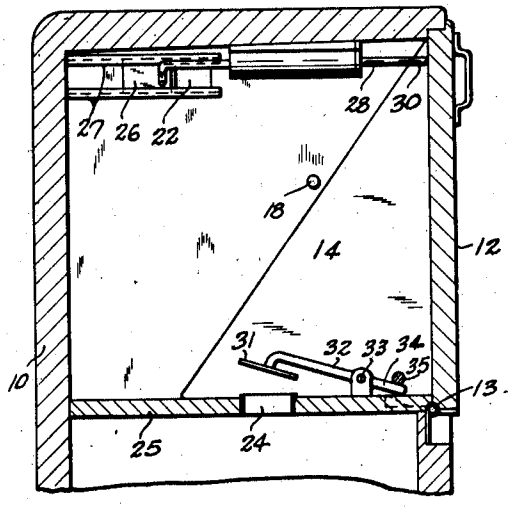

Fig. 2.

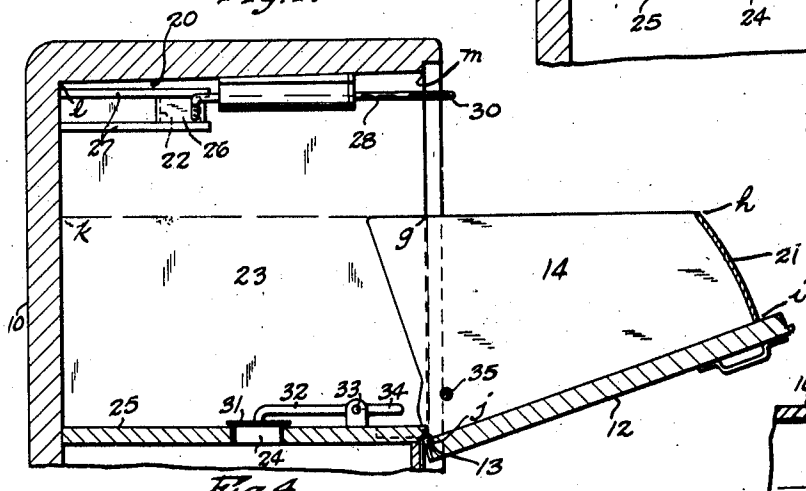

Fig. 4.

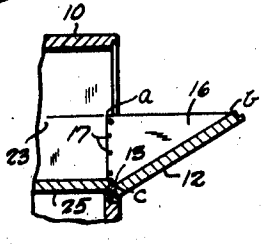

Fig. 5.

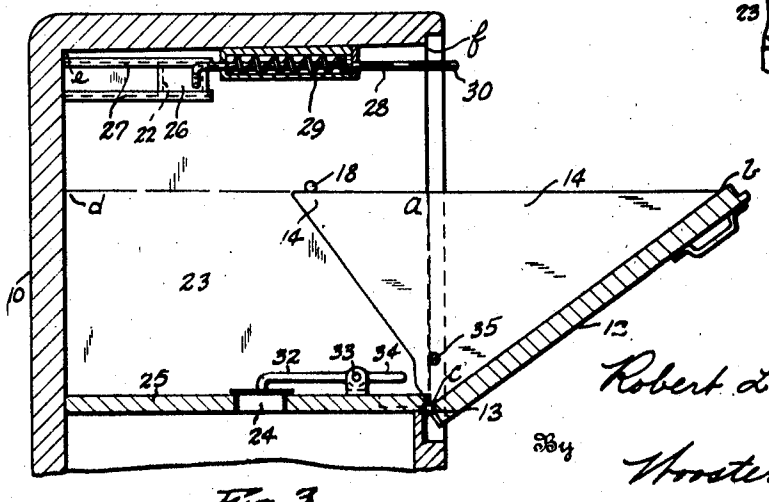

Fig. 3.

Inventor

Robert L. Shipman

By Wooster & Davis

Attorneys

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UNITED STATES PATENT OFFICE.

ROBERT L. SHIPMAN, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR OF ONE-HALF TO EARL D. SPRAGUE, OF BRIDGEPORT, CONNECTICUT.

REFRIGERATOR CLOSURE.

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This invention relates to refrigerators particularly of the household type, and has for an object to provide a refrigerator of this type in which the escape of cold air from the refrigerator is prevented when a door or doors are opened to gain access to the refrigerator and thus increase the efficiency and the effectiveness of the refrigerator.

In the ordinary household refrigerator, with the doors mounted to swing about an upright axis at one side thereof for example, when a door is opened not only does all the chilled air in that compartment flow out owing to its greater specific gravity, but warm air from the outside sweeps in over the cold walls and articles in storage giving up heat to the surfaces of these walls and these articles, thereby itself becoming chilled and flowing out as cooled air. This action continues as long as the door is open thereby materially warming the surfaces in the refrigerator. This warming of the surfaces, however, may not be the worst effect. This warm germ laden air coming in contact with the cold surfaces in the refrigerator deposits moisture and germ life on these surfaces, which is liable to produce more or less serious results.

Furthermore, in the common type of refrigerator, not only does a refrigerated compartment empty itself of chilled air when the door is opened but in many cases the open door of one compartment will drain the chilled air from the entire refrigerator, especially when the opening extends to the bottom of the refrigerator. This loss of cold air not only requires a proportionately larger amount of refrigerating effect, but it maintains a higher average temperature in the refrigerator, thus promoting the growth of germ life in the refrigerator, and the articles to be preserved do not keep for as great a length of time.

This chilled air in the refrigerator being considerably heavier than the warm air outside can be retained in the refrigerator if the operation of opening the door provides a basin or container into which this heavier air may settle and be held while the door stands open. It is, therefore, an object of the present invention to provide a structure, especially a door structure for a refrigerator in which such a basin or container for retaining the cold air is provided while the door is open and from which the cold air is forced back into the refrigerator when the door is closed.

With the foregoing and other objects in view, I have devised a construction several forms of which are shown in the accompanying drawing as illustrating my invention. In this drawing,

Fig. 1 is a more or less diagrammatical front elevation of a refrigerator showing four doors involving my improvements leading to as many separate compartments within the refrigerator.

Fig. 2 is a vertical section on an enlarged scale substantially on line 2—2 of Fig. 1 showing one form of closure.

Fig. 3 is a similar section showing the door in open position.

Fig. 4 is a view similar to Fig. 3 showing a slightly different construction, and

Fig. 5 is a similar view on a smaller scale showing a still further change in construction.

The refrigerator 10 may have any of the usual body constructions, such as double walls separated by insulating material, but I have not shown in detail such a construction as it of itself forms no part of my invention. I have indicated in Fig. 1 a refrigerator having four compartments. Usually three of these compartments are used for the food or other articles to be kept cool and the other compartment, usually one of the upper compartments, is used for the ice or the cooling coils or cooling element where an automatic system is used. My improved construction, however, may be used with any of these compartments and is intended to be used with all of them.

In Figs. 2 and 3 I have shown one form of my improved closure construction in both the closed and open positions. The front wall of the refrigerator body is provided with the usual openings 11 leading to the respective compartments, and each opening is closed by a door 12. In the present construction, however, the door is hinged at its lower edge at the bottom of the door opening so that it may swing outwardly about a

horizontal axis to the open position as indicated in Fig. 3, the hinges being shown at 13. For best effect the hinges should be so located that their axes are on the lower inner edge of the door so that as the door swings open this lower edge will not move away from the wall of the body but will remain close to this body and thus prevent the formation of a crack or opening to permit escape of cold air.

At the opposite upright side edges of the door are upright end walls 14. These walls are preferably secured to the door so as to move therewith and extend from the door to the sides of the opening to the compartment, and therefore, close the ends of the space between the open door and the refrigerator, and thus prevent the escape of cold air through the ends of this space. These walls may be rigid plates so that when the door is closed they will swing into the compartment within the refrigerator or into recesses in the walls of the compartments, and thus will automatically assume the position to close the ends of the space between the door and refrigerator when the door is moved to its open position. These walls are not necessarily rigid, however, as they may be of some flexible material such as leather or cloth as shown at 16, Fig. 5, and secured at their opposite edges, as by means of tacks 17, to the refrigerator and the door. Of course, in this construction, as the door is closed these side walls will fold up into the compartment. The opening movement of the door may be limited by suitably placed stops such as stops 18 carried by the refrigerator and cooperating with the movable walls 14.

It will be apparent from an inspection of Fig. 3 that as the door is swung outwardly to the open position the door and the end walls 14 will provide a basin or compartment into which a portion of the cold air from the refrigerator compartment may flow or settle and be retained. In other words if the volume of the space represented by the triangle *a*, *b*, *c*, is equal to or greater than the volume represented by the rectangle *a*, *d*, *e*, *f*, no cold air will be lost from the refrigerator, as the cold air which flows out of the refrigerator compartment when the door is opened will be retained in the space *a*, *b*, *c*. Warm air will, of course, flow in and take the place of the cold air in the upper part of this compartment, but as soon as the door is closed again, as the cold air is heavier than the warm air, the cold in the space *a*, *b*, *c*, will be forced back into the refrigerator compartment and will force the lighter warm air out. The outflow of the warm air may be facilitated by making the top wall 20 of the compartment incline upwardly toward the door opening. It will thus be apparent that while the door is open there is not only no loss of cold air from the refrigerator but there is no circulation of warm air through the compartment to warm up the articles therein or the walls of the compartment. There will, of course, be some warming of the walls by warm air which flows into the upper part of the compartment, but this is relatively small as compared with the loss of cold air and the circulation of warm air in the ordinary construction of refrigerators.

If it is desired that the door be dropped to a lower position than that shown in Fig. 3, this may be done by placing an upright wall 21 at the upper or outer edge of the door as indicated in Fig. 4. In this construction, if the volume represented by the figure *g*, *h*, *i*, *j*, is equal to or greater than the volume represented by rectangle *g*, *k*, *l*, *m*, there will be no loss of cold air when the door is open, the operation being the same as that of Fig. 3.

These constructions of door will give plenty of space for easy access to the refrigerator compartment for insertion and removal of articles in and from the compartment.

Usually the refrigerator comprises more than one compartment, there ordinarily being at least two compartments and it is, therefore, desirable when the door of any compartment is opened to cut off communication between this compartment and any of the other compartments to prevent air flowing from the other compartment and escaping through the open compartment. For instance, the compartment may communicate through a side wall thereof with an adjacent side compartment by an opening or passage 22 in the side wall 23 separating the compartments, and superimposed compartments may also be in communication by a passage 24 through the horizontal wall 25 separating the compartments. The passage 22 may be controlled by a sliding valve or damper 26 mounted in suitable guides 27 and operated by a rod 28. A spring 29 tends to shift this rod to move the valve over the passage to close the same, as indicated in Figs. 3 and 4. The rod extends to a position where its free end 30 may be engaged by the door as shown in Fig. 2, when the door is in the closed position to shift the valve 26 away from the passage and permit circulation of air between the two compartments. Similarly a valve or damper 31 may be mounted to close the passage 24 and mounted on a rod 32 pivoted at 33. This rod has an extension 34 projecting into a position in the path of movement of a stop 35 carried by an end wall 14 arranged so that when the door is in closed position this stop will engage the extension 34 and remove the valve 31 from the passage as shown in Fig. 2. It will be obvious that as soon as the door is moved outwardly toward open position the spring

29 will close the valve 26, and the valve 31 will drop by gravity over the passage 24, thus automatically closing communication between the open compartment and the other compartments as soon as the door starts to open, and also automatically opening communication between this compartment and the other compartments when the door is closed. Therefore, when the door of any compartment is open this compartment is out of communication with the other compartments and the cold air from the closed compartments cannot escape through the open compartment.

It will be apparent from the foregoing description that although this door construction and arrangement will prevent escape of cold air from the refrigerator when the door is open, no more operations are required by the user than in opening the ordinary doors, as the operation of the device is entirely automatic. In other words the operator merely swings the door open and closes it and the construction and arrangement automatically prevents the escape of cold air. This construction will prevent much new germ deposit in the refrigerator, will maintain a lower average temperature within the refrigerator and will also reduce to a large extent the usual losses incident to the opening of the doors, and will, therefore, considerably reduce the cost of refrigeration, making the installation more efficient. At the same time it admits of the very desirable opening of the front of the refrigerator.

Having thus set forth the nature of my invention, what I claim is:

1. In a refrigerator comprising a body having a door opening in a side wall thereof to give access to a compartment within the refrigerator, a door for said opening hinged adjacent its lower edge to swing about a horizontal axis, and upright side walls secured to the door and having sliding engagement with the walls of the body for closing the space at the upright side edges of the door between the door and the body to prevent escape of cold air from the compartment through these spaces when the door is opened.

2. In a refrigerator comprising a body having a door opening in a side wall thereof to give access to a compartment within the refrigerator, a door for said opening hinged adjacent its lower edge to swing about a horizontal axis, and upright side walls secured to the door to move therewith and extending from the upright sides of the door to the upright edges of the opening to close the ends of the space between the door and the opening to prevent escape of cold air from the refrigerator when the door is open.

3. In a refrigerator having an opening in a side wall thereof leading to a compartment within the refrigerator, a door hinged adjacent the lower edge of said opening to swing outwardly about a horizontal axis, and walls cooperating with the door and the upright edges of the opening to prevent escape of cold air from the compartment through the spaces between the door and the walls of the refrigerator when the door is open.

4. In a refrigerator having a plurality of compartments and an opening in a wall separating said compartments, a valve for controlling passage of air through said opening, said refrigerator having an opening in a side wall thereof leading to one of said compartments, a door for said opening hinged at its lower edge at the bottom of said opening to swing outwardly about a horizontal axis, walls extending from the door and having sliding contact with the walls of the refrigerator to close the ends of the space between the door and the refrigerator when the door is open to prevent escape of cold air from the refrigerator through this space, and means controlled by the door to open said damper when the door is closed and to close the damper when the door is opened.

5. In a refrigerator having an opening in a side wall thereof leading to a compartment within the refrigerator, a door hinged at its lower edge at the bottom of said opening to swing outwardly about a horizontal axis, a wall secured adjacent the upper edge of the door to extend upwardly therefrom when the door is in its open position, and upright walls extending from the door to the walls of the refrigerator to close the ends of the space between the door, said upwardly extending wall and the refrigerator to prevent escape of cold air from the refrigerator when the door is open.

6. In a refrigerator having an opening in a side wall thereof leading to a compartment within the refrigerator, a door hinged at its lower edge at the bottom of said opening to swing outwardly about a horizontal axis, a wall secured adjacent the upper edge of the door to extend upwardly therefrom when the door is in its open position, and upright walls secured adjacent the opposite side edges of the door to move therewith and extending from the door to the refrigerator to close the ends of the space between the door and the refrigerator when the door is open and prevent escape of cold air from the refrigerator through these ends.

7. A refrigerator having two compartments connected by a passage in the wall between said compartments and having an opening through a side wall leading to one of said compartments, a door hinged at its lower edge at the bottom of said opening to swing outwardly about a horizontal axis, walls secured adjacent the upright side edges of the door to move therewith and

extending between the door and the upright edges of the opening and having sliding contact therewith to close the ends of the space between the door and the refrigerator when the door is open and prevent escape of cold air from the refrigerator through these ends, a valve to control said passage, and means operated by movements of the door to open said valve when the door is closed and to permit closure of the valve when the door is opened.

In testimony whereof I affix my signature.

ROBERT L. SHIPMAN.