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APPARATUS FOR REFRIGERATING LIQUIDS

Filed Aug. 19, 1939

2 Sheets-Sheet 1

*Fig. 1*

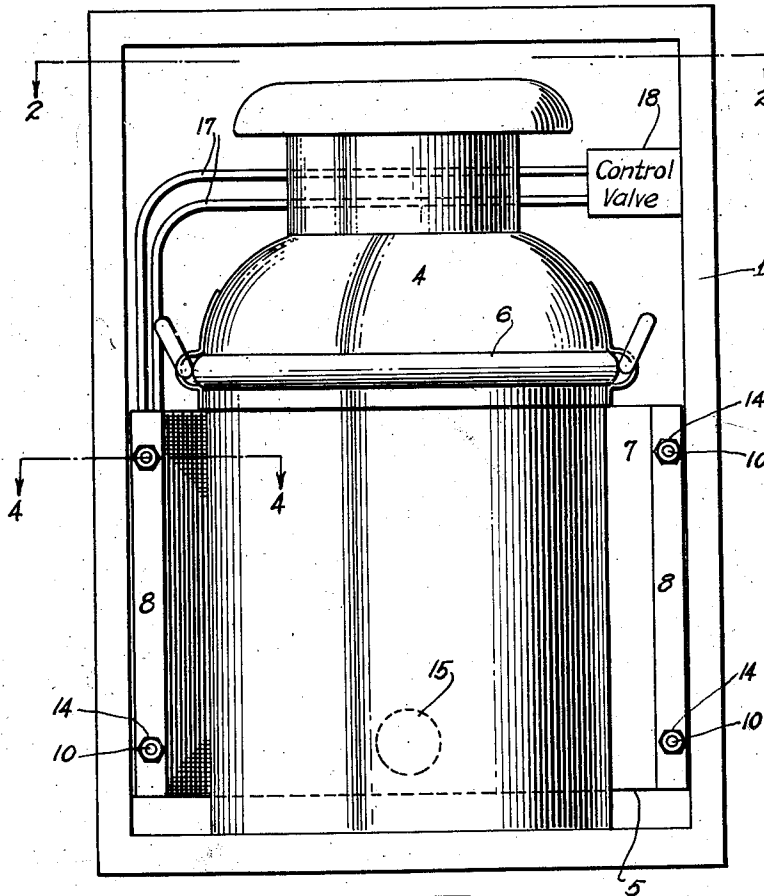
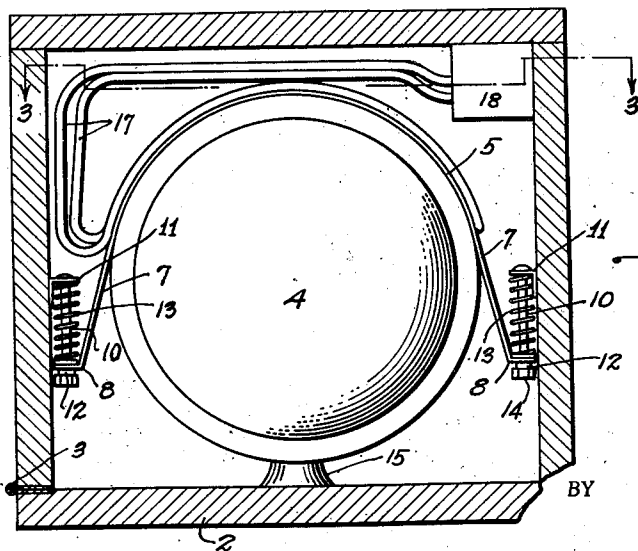


*Fig. 2*

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2 Sheets-Sheet 2

*Fig. 3*

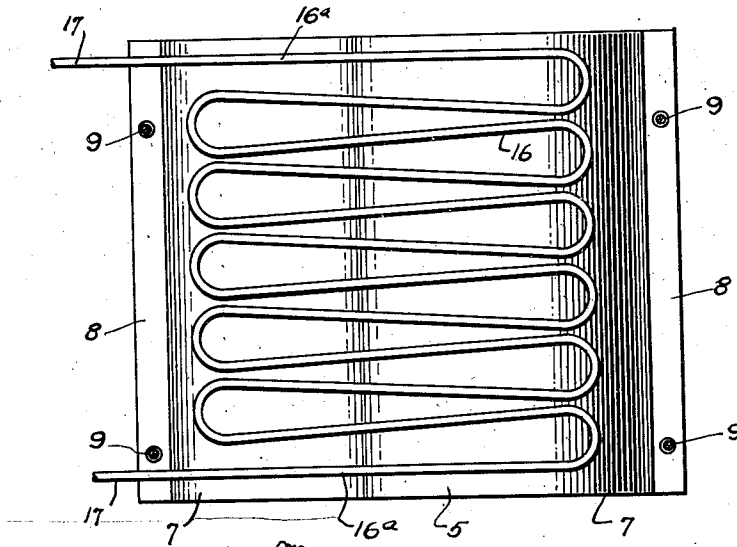
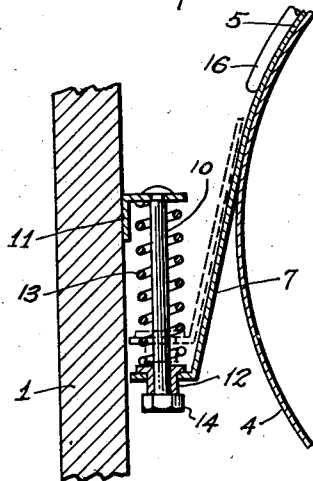


*Fig. 4*

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## UNITED STATES PATENT OFFICE

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## APPARATUS FOR REFRIGERATING LIQUIDS

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a corporation of New Jersey

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10 Claims. (Cl. 62—141)

This invention is an apparatus for refrigerating liquids and, while adapted to be used in connection with liquids generally, is primarily intended for refrigeration of milk in delivery cans, of which the usual 20 quart and 40 quart variety are typical. Cans of the type referred to are commonly shipped from the creamery to retail distributors who place the can in suitable containers or receptacles and draw off quantities thereof from time to time in any appropriate manner for the retail sale of milk by the glass.

It has become the common practice for the retailer to house such cans within an appropriate casing or cabinet which is substantially air-tight and to refrigerate the interior of such cabinets by means of cooling coils through which a refrigerant is circulated. These coils are in some instances supported directly upon the wall of the cabinet, although the better prior practice is to mount the coils upon a metal plate which is in turn secured to the wall of the cabinet in a rigid position therein and so located that the coils, as well as the plate, are spaced from the can contained within the cabinet. This arrangement has been used so as to allow for variations which are commonly found in can sizes and to permit of cans embodying such variation to be housed within the cabinet without damage to the coils.

With all prior constructions of which I am aware the coil, as well as the plate, have been spaced from the can, the contents of which were to be cooled and the theory of operation has been that the refrigerant circulated through the coil would cool the coil, while the coil would cool the air within the cabinet, while the air within the cabinet cooled the can which in turn cooled the milk. The cabinets employed cannot in practice be absolutely air-tight or hermetically sealed. There is always some leakage of atmospheric air into the cabinet and this must be so, for as liquid is drawn from the can, it must be replaced by air flowing thereinto. Thus inasmuch as air is permitted to enter the cabinet even in small quantities, the theory of cooling the milk by cooling the air does not seem to be basically sound.

The purpose of the present invention therefore is to provide for a more efficient heat exchange between the milk in the can and the cooling medium in the coil. I have accomplished this result in a simple and thoroughly efficient manner by forming a plate of good conductive material in such manner that it will substantially conform to the exterior of an appreciable por-

tion of the circumference of the can and by floatably mounting said plate within the confines of the cabinet in such position that, when the can is placed in the cabinet and forced against the plate, it will firmly and resiliently contact therewith, so that there is such direct engagement between the wall of the can and the concave face of the plate as to insure direct heat exchange through the conductivity of these parts. On the convex face of the plate I mount a coil, preferably by soldering, sweating or brazing the coil to the plate and make the connections between the coil and the remainder of the circulatory system of an appropriate refrigerating apparatus in such a way as to permit of appreciable movement of the coil without damage to the coil. In practice the plate is preferably spring pressed in the direction of the can, so that there results metallic conductivity between the coil and the plate and between the plate and the can and even at such portions of the plate where direct contact may not be accomplished due to irregularities in can sizes, the film of air between these parts is so small that the heat from the milk in the can may be readily absorbed therethrough to the refrigerating fluid in the coil in an efficient manner.

In addition to the foregoing I provide appropriate means, such as mechanical or air agitation for the milk within the can, so that all parts of such milk may be brought into contact with the thus cooled portions of the can wall and the milk thereby cooled in a uniform manner.

Important features of the present invention consist in the simplicity, economy and efficiency of the apparatus and its ability to operate through protracted periods without maintenance of any kind insofar as the structure of this invention is concerned.

Features of the invention, other than those adverted to, will be apparent from the herein-after detailed description and claims, when read in conjunction with the accompanying drawings.

The accompanying drawings illustrate one practical embodiment of the invention, but the construction therein shown is to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is a front elevation of a cabinet having associated therewith the present invention, the door of the cabinet being removed so that the interior thereof may be readily seen.

Figure 2 is a plan view taken in the plane of the line 2—2 of Figure 1.

Figure 3 is a section on the line 3—3 of Fig-

ure 2 with the cabinet omitted, so as to show merely the back face of the coil and the plate on which it is mounted.

Figure 4 is a section on the line 4-4 of Figure 1.

Referring to the drawings, 1 designates a cabinet of any appropriate kind. It is shown in the drawings merely as a rectangular box having a front door 2 which may be hinged as at 3. In practice, it is common to make these cabinets double walled with insulation of any appropriate kind in the jackets thus provided. The present invention is not limited to any particular kind of a cabinet, nor does it concern a can 4 adapted to be housed therein, other than that such can be of an appropriate size, within reasonable limits, to properly coact with the refrigerating unit of this invention.

The refrigerating unit of this invention is best shown in Figures 2, 3 and 4. It embodies a metal plate 5 of substantially semi-cylindrical shape adapted to snugly fit about and substantially conform to the rear half of the can 4 when the latter is placed in the cabinet 1. The plate 5 is of a height to extend for the greater portion of the height of the body of the can, i. e., from substantially the bottom of the can to a point adjacent the usual bead 6 thereof. The lateral portions of the plate 5 are flared or diverge, as indicated at 7, and are provided with upright flanges 8 perforated at 9 for the passage there-through of support and guide studs 10. Any appropriate number of these studs may be employed, but four are used in practice as sufficient.

The guide studs are rigidly or fixedly secured to brackets 11 mounted on the inside of the cabinet, as shown best in Figure 4, and in a manner to extend forwardly in parallel relation toward the open front of the cabinet. The perforations 9 are placed to receive such studs and are each provided therein with a bushing 12 adapted to be impelled in a forward direction by a spring 13 embracing one of the studs and interposed between the bracket 11 and the corresponding bushing. The forward movement of the bushings and corresponding forward movement of the plate is limited by heads 14 mounted on the several studs. This means of mounting the plate provides for a substantially floating attachment of the plate within the cabinet, so that when a can of milk is placed in the cabinet and forced into position therein, the several springs 13 will be placed under compression and will thus serve to hold the plate in firm contact with the rear portion of the can body. The dotted line position indicated in Figure 4 shows the manner in which the plate is moved by the can and in practice I find it convenient to force these parts into firm contact by providing upon the inner surface of the door 2 of the cabinet a bumper 15, which is preferably of elastic material, such as rubber, or may, if desired, comprise a spring or even be rigid. When the door of the cabinet is closed, the bumper will engage with the can and force the can rearwardly within the cabinet to bring about the firm contact between the can and the plate 5 to which I have referred.

Mounted on the back of convex face of the plate 5 is a coil 16 of any appropriate number of convolutions as may be required to effect the desired cooling. The coil is looped back and forth in contact with the plate 5 as shown best in Figure 3 and those portions of the coil which engage with the plate are preferably soldered,

sweated or brazed thereto. This coil, as well as the plate, may conveniently be made of copper, brass or other suitable material of high conductivity, so that, when the coil is intimately connected to the plate as stated, an efficient heat exchanging relation results. The opposite ends of the coil are connected by relatively long leads 17 to the control valve 18 of the refrigerating system which valve may be located in any appropriate position, either inside or outside of the cabinet, but the lead 17 should be sufficiently long as to permit of a floating mounting of the coil through springing of the connections without harming these connections in any way. If desired, the uppermost and lowermost loops 16a of the coil may be left unattached to the plate to provide for greater movement of the coil without harm to its connections.

With the arrangement which I have described the can is placed in the cabinet and when the door is closed the bumper 15 will automatically insure firm contact between the can and the plate 5 and this is true even though the can is tilted somewhat in accordance with the practice of dispensing from a tilted can in some cabinets, for the lowermost springs may in such instance be compressed to a greater extent than the uppermost springs. In any event intimate contact between the can and the plate 5 will result. In practice a suitable latch is provided to lock the door 2 of the cabinet in closed position.

When the can is in place in the cabinet as described, the heat of the milk in the can will be transferred to the wall of the can and then by direct contact with the plate will be transferred to the plate to be conducted through the plate and coil to the refrigerating medium circulating in the latter. Thus the invention provides for refrigeration through metallic conduction of the parts and even though certain parts of the plate may be slightly spaced from the can, there will be such a thin layer of air between these parts as not to appreciably insulate one from the other. Thus the milk in contact with those portions of the wall of the can which are in direct engagement with the plate will have heat exchange through metal conductivity to an appreciable extent and in practice the milk in the can is agitated by any known form of air or mechanical agitation common to the art, so that all parts of the contents of the can will be brought into contact with the coolest portions of the wall of the latter and will thus be divested of residual heat through heat transfer of the character described.

I have shown in the accompanying drawings the plate 5 and the coil as made independently of one another and thereafter the coil mounted on the plate. It is possible, however, that the coil may be fabricated integral with the plate if so desired. Consequently in the appended claims, where I refer to a plate and an associated coil, these may be integral with one another without departing from this invention.

Also I have described, for the purpose of concrete illustration, the preferred form of the invention, wherein the invention is incorporated in a cabinet of a type in which the can is introduced through a front door. In some commercial constructions the cabinet is such that the can is introduced from the top. The present invention may also be used in this type of construction by introducing the can through the top in such a way as to force the plate backwardly against the tension of the springs to permit of introduction of the can after which the springs will

press the plate against the can as hereinbefore described. In the preferred form of the invention described moreover, the invention has been described particularly with reference to milk cans which have a cylindrical body and consequently the plate is correspondingly or complementarily shaped. If the can or receptacle holding the liquid to be cooled is other than of the cylindrical form described, the plate will of course be correspondingly shaped to properly cooperate with the particular shape of the container.

In the foregoing detailed description, I have set forth the preferred practical embodiment of the invention, but the invention is to be understood as fully commensurate with the appended claims.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. An apparatus for refrigerating liquids comprising a cabinet adapted to house a can, a plate shaped to substantially conform to the contour of the can and mounted within the cabinet to embrace a portion and not more than one half of the circumference of the can and contact therewith, and a refrigerating coil mounted on and in contact with said plate and free from contact with the can.

2. An apparatus for refrigerating liquids comprising a cabinet adapted to house a can, a plate adapted to substantially conform to the contour of the can and mounted within the cabinet to embrace a portion and not more than one half of the circumference of the can with one face of the plate in contact with the can, and a refrigerating coil mounted on and in contact with the other face of said plate and free from contact with the can.

3. An apparatus for refrigerating liquids comprising a cabinet adapted to house a can, a metal plate adapted to substantially conform to the contour of the can and mounted within the cabinet to embrace a portion of the circumference of the can with one face of the plate in contact with the can, a refrigerating coil mounted on and in contact with the other face of said plate, and means for cushionably holding said plate in such contact with the can.

4. An apparatus for refrigerating liquids comprising a cabinet adapted to house a can, a metal plate shaped to substantially conform to the contour of the can, a plurality of springs forcing one face of the plate into intimate contact with a portion of the circumference of the can, and

a refrigerating coil mounted on and in contact with the opposite face of said plate.

5. An apparatus for refrigerating liquids comprising a cabinet adapted to house a can, a plate shaped to substantially conform to the contour of the can and to embrace a portion of the circumference thereof, means for resiliently and floatably mounting said plate to cause the same to engage with the can, and a refrigerating coil mounted on and in contact with said plate.

6. An apparatus for refrigerating liquids comprising a cabinet adapted to house a can, a plurality of guides supported interiorly of the cabinet, a plate supported on said guides and shaped to substantially conform to the contour of the can and to embrace a portion of the circumference thereof, springs bearing against said plate to hold the same in contact with the can, and a refrigerating coil mounted on and in contact with said plate.

7. An apparatus for refrigerating liquids comprising a cabinet adapted to house a can, a door for said cabinet, a plate floatably and resiliently mounted within the cabinet and shaped to substantially conform to the contour of the can and to embrace a portion of the circumference of the can, means for forcing and holding said can in contact with said plate, and a refrigerating coil mounted on and in contact with said plate.

8. An apparatus for refrigerating liquids comprising a cabinet adapted to house a can, a door for said cabinet, a plate floatably and resiliently mounted within the cabinet and shaped to substantially conform to the contour of the can and to embrace a portion of the circumference of the can, means mounted on the door of the cabinet for forcing and holding said can in contact with said plate, and a refrigerating coil mounted on and in contact with said plate.

9. An apparatus for refrigerating liquids comprising a cabinet adapted to house a can, and a refrigerating unit resiliently and floatably mounted within the cabinet in contact with the can and shaped to substantially conform to the contour of the can and embrace a portion of the circumference thereof.

10. An apparatus for refrigerating liquids comprising a cabinet adapted to house a can, a refrigerating unit mounted within the cabinet and shaped to substantially conform to and embrace a portion of the circumference of the can, and means for resiliently holding said refrigerating unit in contact with the can.

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