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H. TORRANCE

REFRIGERATING APPARATUS

Filed Nov. 2, 1926

Fig. 1.

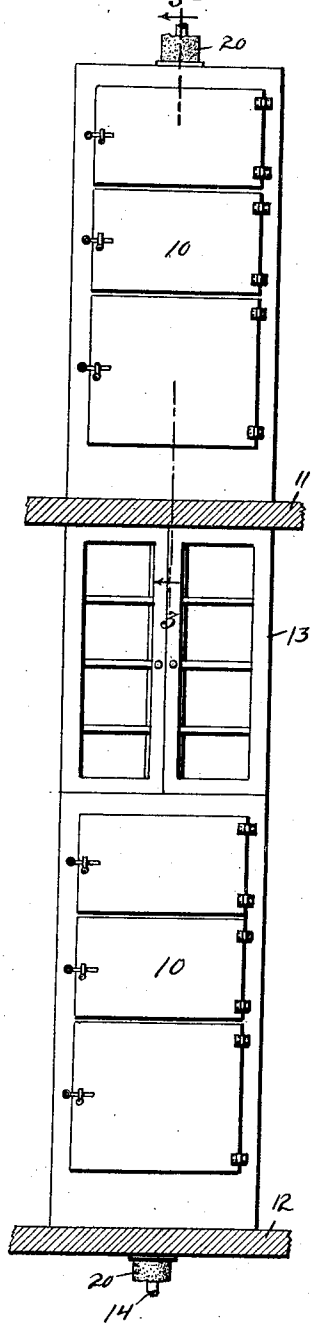


Fig. 2.

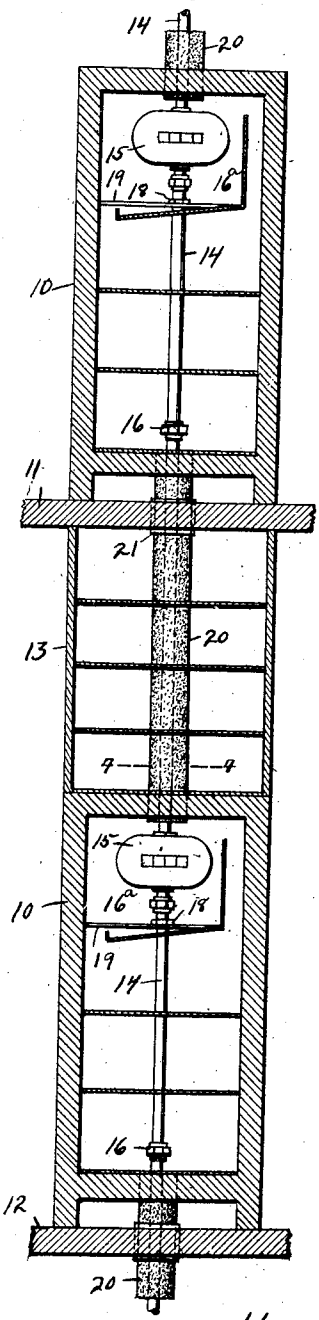


Fig. 3.

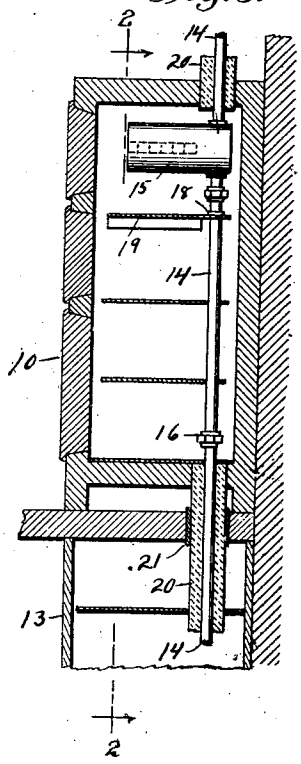
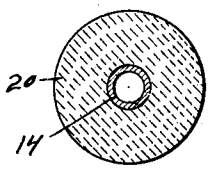


Fig. 4.



INVENTOR

Henry Torrance

BY

Dean Fairbank Obright & Hirst

ATTORNEYS

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UNITED STATES PATENT OFFICE.

HENRY TORRANCE, OF NEW YORK, N. Y., ASSIGNOR TO THE CARBONDALE MACHINE CO., OF CARBONDALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

REFRIGERATING APPARATUS.

Application filed November 2, 1926. Serial No. 145,746.

This invention relates to refrigerating or cooling apparatus in which there are employed a plurality of units through which a cooling fluid is circulated.

My invention is particularly applicable to refrigerator installations for buildings, such, for instance, as apartment houses, in which refrigerator boxes are installed on various floors of the building and the cooling units in the refrigerators are supplied with a cooling fluid from a common source of supply. In practice the cooling units are usually cells or coils of pipe through which the cold brine is circulated. Heretofore it has been a common practice in such installations to provide two vertical headers adjacent the series of refrigerator boxes, one to supply the brine to the cooling units, and the other to return it to the refrigerating apparatus, the respective cells being connected in parallel to the headers by inlet and outlet laterals respectively. In other systems, a single riser or manifold is located adjacent the refrigerator boxes with two laterals from the manifold to each unit, a valve or other obstruction being provided in the manifold between the two laterals for diverting fluid through the cooling unit. Thus an approximation to a series connection of the units is provided.

In all these systems difficulties are encountered due to thermal expansion or contraction of the headers. In service, moisture accumulates on the cooling units in the form of frost. The frost acts as an insulator retarding the flow of heat out of the refrigerator box into the cooling units, and it is necessary to interrupt the flow of brine from time to time to permit the frost to melt off. The frost is sometimes removed by pouring hot water on the cooling unit. Thus the system is periodically subjected to temperature variations and consequent thermal expansion and contraction, with the result that the laterals leading into the cooling units in time work loose causing leakage.

One object of the present invention is to avoid these difficulties and also to economize on the cost of piping, pipe fittings, insulation and labor by providing a very simple construction in which the cooling units are connected in series without any laterals. In other words, by my present invention I provide a system in which a single header or riser passes through a series of superposed refrigerator boxes with the cooling units interposed directly in the riser and forming a part thereof.

Another object of my invention is to provide a system which can be installed in an existing building. Heretofore it has been the practice to form a groove in the walls of the building during erection, and, place the headers therein at that time. After the building has been completed, the refrigerator boxes are installed and the connections are then made to the cooling units. With my improved system no groove for the riser is necessary, and the difficulty of accurately locating the outlets for the various cooling units during the erection of the building is avoided. The riser pipe passes directly through the refrigerator boxes and is concealed therein while in the space above each refrigerator box, which is usually wasted, I provide a cupboard reaching from the refrigerator box to the ceiling, thus not only providing storage space but also a housing for the riser pipe.

Another object of my invention is to provide improvements in insulation of the riser. Heretofore it has been necessary to use mating pairs of insulation members fitted about the riser, each member being of semi-annular cross-section, the reason for this being that the insulation is applied after the risers, and laterals have been connected up. A disadvantage of this construction lies in the fact that moisture is liable to work into the joints between the mating sections and this moisture on repeated freezing and melting will expand and force the insulation away from the riser, thus destroying its heat insulating quality. In my present construction the riser consists of a straight vertical pipe, with no laterals, thus making it possible to use insulation of tubular form slipped over the pipe as it is installed. With the tubular form of insulation there are no joints in which the moisture can enter and the ends of the insulator tubes may be sealed with a material which will prevent the entrance of moisture therein. The parts of the riser which pass through the refrigerator boxes may be left bare to increase the cooling capacity in the refrigerator and only that portion which passes through the cupboard and up to the next refrigerator above needs to be insulated. Thus there is a saving of insulation and a gain in cooling effect.

In many of the constructions heretofore

supplied, it has been customary, and in some cases necessary, to use a valve at each refrigerator unit to control the flow of cooling fluid into the unit, but these valves are liable to be tampered with, with the result that some cooling units are cooled less effectively than others.

By my invention, not only do I provide a very simple and economical construction, but I avoid the use of valves at the several cooling units of a single riser, and control all from a single central point.

Another object of my invention is to provide a refrigerator unit in which cooling fluid is fed in through the bottom of the unit and out at the top, so that less skill and accuracy is required for installation.

Another object of the invention is to provide a system in which the weight of the riser pipe is supported on the refrigerator boxes so that each refrigerator box carries its proportionate share of the load, and sagging and undue strain on joints in the pipe is avoided and separate hangers or brackets are not necessary.

With these and other objects in view my invention consists in certain novel features of construction and combinations and arrangements of parts, which will be more fully hereinafter described and pointed out in the claims.

In the accompanying drawings:

Figure 1 is a front elevation illustrating my improved system as applied to a pair of refrigerator units mounted in superposed relation on successive floors of a building;

Fig. 2 is a vertical section of the units shown in Fig. 1, the section being taken on line 2—2 of Fig. 3.

Fig. 3 is a vertical section, taken on the line 3—3 of Fig. 1.

Fig. 4 is a section on the line 4—4 of Fig. 2.

I have shown a pair of refrigerator boxes 10, mounted respectively on two floors 11 and 12 of a building. Above each refrigerator box I provide a cupboard 13 extending from the top of the box to the ceiling. The refrigerator boxes and cupboards are arranged in vertical alinement and through them, preferably adjacent the rear wall of the boxes, alined openings are formed in the refrigerator boxes, cupboard and floors to admit a riser pipe 14. Interposed in the riser pipe near the top of each refrigerator box, is a cooling unit 15. The riser thus connects the top of one cooling unit to the bottom of the next unit above. For convenience of installation the riser may be made in sections connected by coupling members 16. The cooling unit in each box is housed in a chamber 16^a and a nut 18 threaded on the riser rests upon the bottom wall 19 of the chamber. The nut may be adjusted so that each refrigerator box will support its own cooling unit and its proportionate share of the weight of the riser. Those portions of the riser which pass through the refrigerator boxes may be left bare but the remaining portions are thermally insulated by seamless tubular jackets 20 of insulation material. The jackets extend from the inner face of the top wall of each refrigerator box, through the cupboard and to the inner face of the bottom wall of the next box above. A pipe sleeve 21 may be inserted in the opening in each floor through which the riser passes to protect the insulation. The ends of the insulator sections are coated with a waterproof material to prevent entrance of moisture from the refrigerator boxes.

My improved apparatus is installed as follows:

After the building has been completed, or at least after the floors have been laid, apertures are formed in the floors to receive the riser with its insulation if such apertures have not been left during erection. At each floor a riser pipe section is introduced through the floor opening, a jacket 20 is slipped over the pipe section, and then a refrigerator box is located over the opening, with the pipe section entering the bottom wall thereof. The riser is then continued by another pipe section within the refrigerator box and into the cooling chamber where the nut 18 is applied and adjusted to bear upon the wall 19. The cooling unit is now coupled to the latter pipe section and the riser is continued by another pipe section extending from the top of the cooling unit through the cupboard and the floor above. Another tubular jacket 20 is now slipped over the riser and thus the construction is carried on from floor to floor to the top of the building.

The cupboard 13 may be built in place after the other parts are installed, or may be made integral with the refrigerators or may be installed as units during the installation of the other parts.

The cooling units may consist of brine cells, as shown, or coils of pipe, or of any other desired form, but preferably they should possess a certain degree of flexibility so that as the riser expands or contracts under changes of temperature they will give sufficiently to compensate for the linear variations of the riser. Thus the cooling elements serve as expansion joints in the riser. Even were there not sufficient flexibility in the walls of the cooling units to compensate for such variations, expansion of the riser would result merely in lifting the nuts 18 off their supports 19. Obviously there would be no strain on the joints in the system tending to work them loose and cause leakage.

It will be understood that there may be

any number of refrigerator boxes in a series depending on the height of the building and any desired number of the series in the building each superposed series being served by a single riser pipe. At the top all of the risers may be connected to a single return pipe or each may have its separate return pipe whereby the circulation is completed to the refrigerating plant from which the brine is supplied and which is usually placed in the basement.

Having thus described my invention, what I claim is:

1. In a refrigerating apparatus, a riser comprising a plurality of pipe sections, and chambers having flexible walls coupling said sections together in series and permitting independent endwise expansion of said sections, each of said chambers consisting of a brine cell.

2. In a refrigerating apparatus, a plurality of superposed refrigerator boxes each having an opening in the top and an opening in the bottom, a supply pipe including independent sections extending vertically through said openings, a cooling unit in each box and interposed in said pipe, and adjustable means in each box for supporting the weight of the pipe.

3. In a refrigerating apparatus, a plurality of superposed refrigerator boxes, a supply pipe extending vertically through said boxes and including a series of independent sections spaced apart endwise, a cooling unit in each box, and interposed between successive sections, a support in each box, and means in each box on said pipe and adapted to bear upon said supports.

4. In a cooling system, a plurality of superposed cooling units, a riser comprising separate pipe sections independent of each other and directly connecting said units in series, a seamless tubular jacket of insulating material on each section and adapted to be slipped endwise onto the section during installation of the apparatus, and a waterproof coating on each end of the jacket.

5. A refrigerating apparatus for buildings, including a series of refrigerators in vertical alinement on successive floors, a cooling unit in each refrigerator and having flexible walls, a series of separate pipe sections spaced apart endwise and connecting said units in series, the flexibility of the walls of the units permitting independent endwise expansion of said pipe sections, said pipe sections extending through the tops and bottoms of the refrigerators, and a seamless insulation tube encircling the portion of each pipe section between the top of one refrigerator and the bottom of the next higher refrigerator.

6. In a refrigerating apparatus, a plurality of superposed refrigerator boxes, each having an opening in the top and an opening in the bottom, a series of cooling units, one in each refrigerator box, a supply pipe including independent sections extending vertically through said openings and connected to said cooling units in series, and separate means for supporting each of said pipe sections.

7. In a refrigerating apparatus, a plurality of superposed refrigerator boxes, each having an opening in the top and an opening in the bottom, a series of cooling units, one in the upper portion of each of said refrigerator boxes, a supply pipe, including independent sections extending vertically through said openings and connecting said cooling units in series, and means for insulating the portions of said pipe sections extending from one refrigerator box to the next, but leaving exposed the portions of said sections within said refrigerator boxes.

8. In a refrigerating apparatus, a plurality of refrigerator boxes in vertical alignment on successive floors of a building, a plurality of cooling units, one in the upper portion of each refrigerator box, and a riser comprising separate pipe sections independent of each other and directly connecting said units in series, each of said pipe sections having a portion exposed within the lower portion of the refrigerator box, and said exposed portion having a coupling therein.

Signed at New York in the county of New York and State of New York this 28th day of October A. D. 1926.

HENRY TORRANCE.