Oct. 10, 1939.

C. F. HOFFMAN

REFRIGERATED CASE

Filed June 9, 1938

2,175,396

2 Sheets-Sheet 1

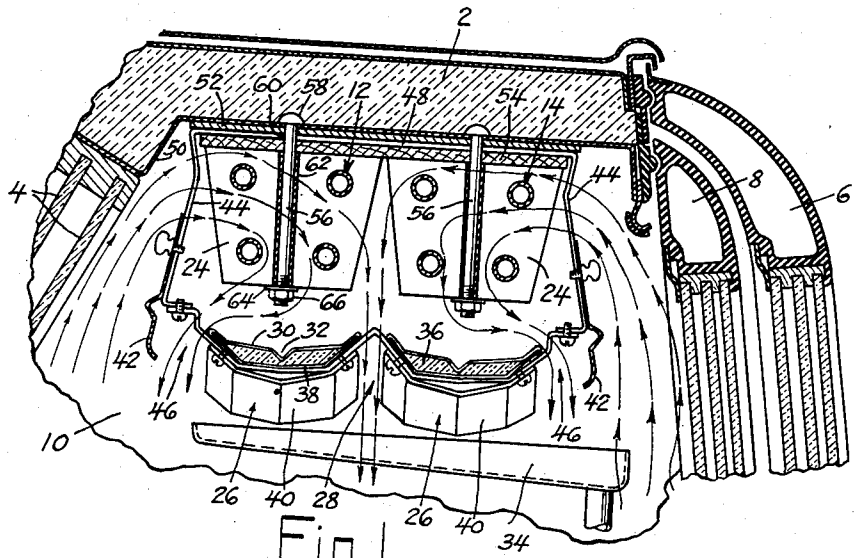


Fig. 1.

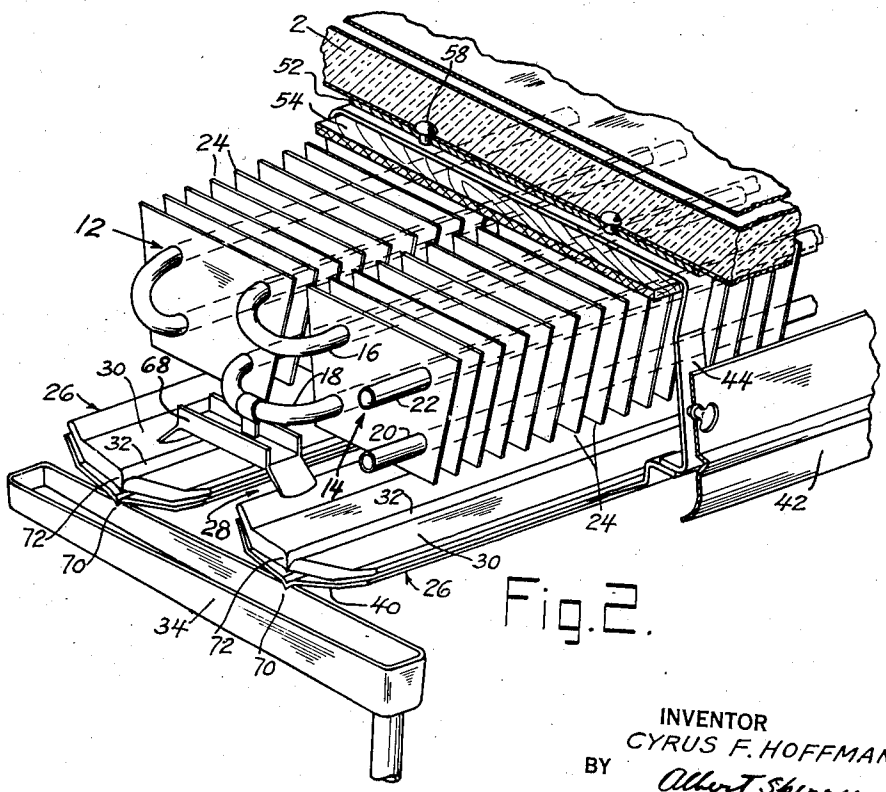


Fig. 2.

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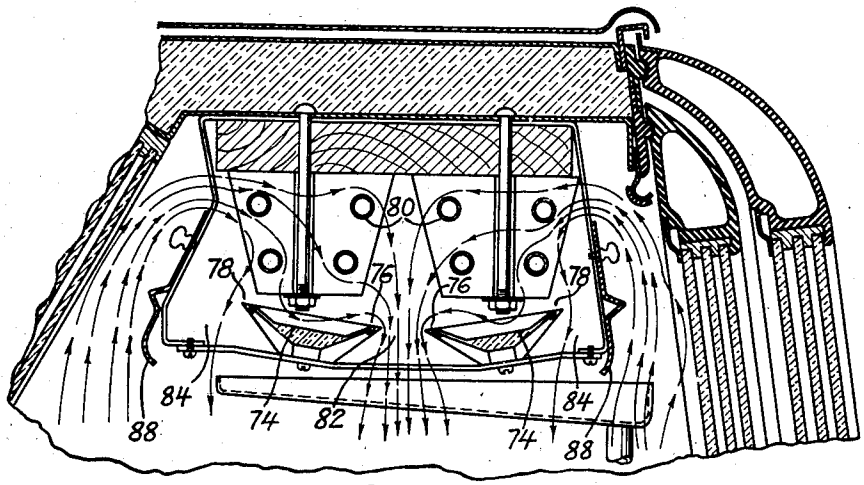


Fig. 3.

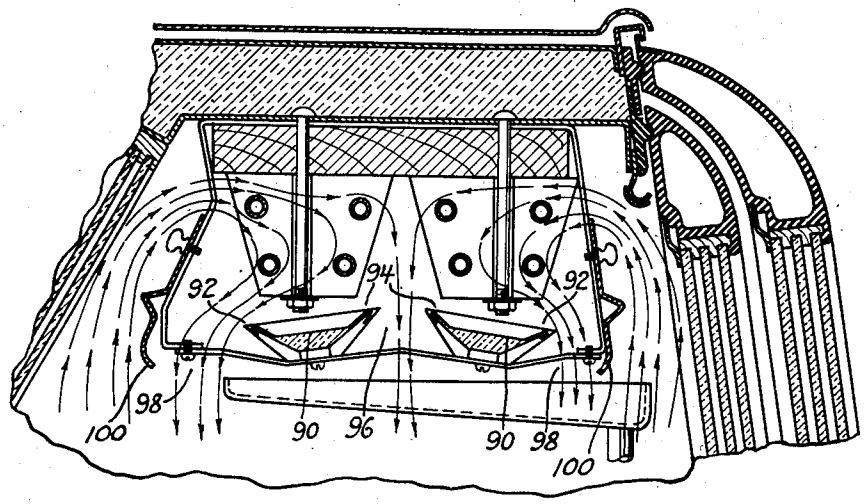


Fig. 4.

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Patented Oct. 10, 1939

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UNITED STATES PATENT OFFICE

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REFRIGERATED CASE

Cyrus F. Hoffman, Trenton, N. J., assignor to C. V. Hill & Company, Incorporated, Trenton, N. J., a corporation of New Jersey

Application June 9, 1938, Serial No. 212,716

8 Claims. (Cl. 62—103)

My invention relates to refrigerated cases such as display cases and the like having cooling coils therein and particularly to constructions serving to provide effective cooling and circulation of air within an enclosure in which the cooling coils are located.

It is customary in refrigerated display cases to employ cooling coils which extend in generally parallel loops or coils lengthwise of the case and to apply fins to the coils for increasing the heat exchanging surfaces thereof. Ordinarily a drip pan is located beneath the coils and fins to collect moisture condensating thereon and dripping downward therefrom when the coils are defrosted or at other times.

Heretofore the coils and fins employed and the drip pan located beneath the same have been so constructed and arranged that they tend to impede the circulation of air over the coils and fins and downward away from the cooling coils. Because of this fact the air coming into contact with the coils tends to collect or to be "pocketed" above the drip pans and to remain near the coils until cooled to such a low temperature that substantially all of the moisture is condensed therefrom onto the fins and adjacent surfaces. Under such circumstances heat exchange is poor and ice builds up on the fins very rapidly while the air within the case becomes so reduced in moisture content that it tends to dry out the articles being preserved in the case.

Even when baffles are employed as described in the patent to C. V. Hill No. 1,698,592 dated January 8, 1929, the air passing downward from the coils does not circulate within the case with the freedom and uniformity desired in some installations or in such a directed manner as is desired in others.

In accordance with my invention these objections to constructions of the prior art are overcome and means are provided to insure rapid circulation of air over the coils and fins and within the case whereby the efficiency of heat exchange is increased and the tendency for frost or ice to build up on the coils and fins and the tendency of the air to become dried out are reduced. Moreover, the means employed may be so arranged as to cause either more or less of the cool air to flow through a desired path whereby over-cooling of portions of the case and insufficient cooling of other portions thereof is avoided.

In those forms of my invention shown, for purposes of illustration, in the accompanying figures of the drawings this result is attained by forming the fins on the cooling coils in parallel groups with a separate drip pan located beneath each group of fins. The drip pans are spaced from each other and preferably are also spaced from adjacent elements of the construction whereby pocketing of the air adjacent the coils and fins is avoided and rapid circulation of the air within the case is assured. In order to permit ready circulation of air about the coils and fins while presenting a large cooling surface to the air passing over the same the fins employed are formed with the lower extremities thereof narrower than the upper portions of the fins so that relatively narrow drip pans may be employed and relatively wide spaces provided for the circulation of air downward from the coils and the fins. In this way condensate collecting on the fins and running down over the surface or along the edges of the fins is conducted toward the drip pans. Moreover, the drip pans may be arranged with one edge thereof above the other to accelerate and direct the flow of air transversely of the drip pans and in a desired direction.

Among the objects of my invention are to increase the efficiency of the refrigerating means employed by providing novel means for insuring effective circulation of air within display cases and the like, to provide a plurality of spaced drip pans so arranged that air may flow downward over each of the edges of each pan and to provide constructions which serve to direct and accelerate the flow of air transversely of the drip pans and toward the edges of the pans.

These and other objects and features of my invention will appear from the following description thereof in which reference is made to the accompanying figures of the drawings.

In the drawings:

Fig. 1 is a vertical sectional view of a portion of a display case having cooling coils and related elements embodying my invention.

Fig. 2 is a perspective of a portion of a coil and fin construction and related elements embodying my invention with parts broken away and shown in section to show details of the construction more clearly; and

Figs. 3 and 4 are each a vertical sectional view similar to Fig. 1 but illustrating alternative forms of my invention.

In that form of my invention illustrated in Figs. 1 and 2 of the drawings a refrigerated display case having an insulated top 2 and transparent panels 4 in the front of the case is provided with sliding doors 6 and 8 at the rear of the case to

provide access to the refrigerated space 10 within the case.

Cooling coils are located in the upper portion of the case adjacent the top 2 thereof and are divided into two groups indicated generally at 12 and 14. The coils extend in parallel loops longitudinally of the case, and as shown are arranged with the coils of the group 12 connected to those of group 14 by means of upper and lower U shaped connections 16 and 18 respectively whereby only a single refrigerant carrying circuit is required. The inlet end 20 and the outlet end 22 of the coils are connected to the compressor or other source of refrigerant as in the usual construction of cooling coils for display cases and the like.

Each of the groups of coils 12 and 14 is provided with a series of fins 24 which are tapered or otherwise formed so that the lower extremities thereof are narrower than the upper portions of the fins. Each of the groups of coils or fins is also provided with a drip pan 26 which extends longitudinally of the case beneath the lower extremities of the fins of each group. The drip pans are wider than the lower extremities of the fins so as to receive condensate or liquid falling from the fins but are narrower than the upper portions of the fins and are spaced apart to provide an air passage 28 therebetween through which cool air flowing downward from the cooling coils and fins may pass.

The drip pans may be of any desired construction but as shown are provided with an upper condensate receiving surface 30 having a narrow central channel 32 in the center thereof into which the condensate is directed so that it will flow readily along the drip pan to the receiver 34 at the end of the case. In this way the formation of a puddle or thin film of water which will not flow readily away from the coils is avoided and the danger of ice formation in the drip pan is eliminated. Moreover, in defrosting the case thin sheets or pieces of ice falling from the fins into the drip pan do not block the narrow channel 32 so that flooding of the drip pan does not occur. Preferably the drip pan is provided with heat insulating means 36 beneath the same to prevent sweating of the lower surface 38 of the drip pan. An outer porcelain shell 40 is also provided for each drip pan to provide a neat attractive appearance to the construction.

The construction illustrated includes baffle members 42 carried by brackets 44 which support the drip pans 26. The baffle members are spaced from the upper portion of the case and from the lateral walls thereof so as to provide channels for the flow of air upward within the refrigerated space adjacent the front transparent panels 4 and the rear doors 6 and 8 and above the baffle members into contact with the coils and fins. The lower portions of the baffle members 42 are spaced from the drip pans to provide channels 46 through which cool air flows downward into the case adjacent the outer edges of the drip pans. In this way at least three paths are provided through which cool air flows downward from the cooling coils and fins and adjacent the opposite edges of each of the drip pans.

The form and arrangement of the cooling coils and fins and the drip pans described has the advantage of providing such free circulation of air over the coils and fins and downward away therefrom that pocketing of cool air above the drip pans is avoided and relatively rapid circulation of the air within the case is assured. For this reason heat exchange between the air and the cooling surfaces of the construction is increased rendering it possible to maintain the desired low temperature within the refrigerated space while operating the coils at a higher temperature than would be possible otherwise. This fact together with the rapid flow of air over the cooling coils and fins serves to effect the desired cooling of the air without permitting the moisture to condense out of the air and collect as frost and ice on the coils and fins. Thus the humidity of the air within the case is maintained relatively high.

The spaced arrangement of the drip pans also insures more uniform distribution of the cool air in its flow downward within the case. Therefore overcooling of certain portions of the case and undercooling of other portions thereof is avoided and the desired low temperature is maintained throughout the refrigerated space.

The cooling coils and fins and the drip pans may be secured in place within the upper portion of the refrigerated space by any suitable means but as shown the brackets 44 extend across the top of the case at 48 and are spaced from the upper and inner porcelain shell 50 of the case by an insulating strip 52. Similarly an insulating strip 54 is located between the portion 48 of the brackets and the fins 24 so that neither the brackets 44 and baffles 42 nor the inner porcelain shell 50 of the cases are cooled by conduction from the fins and coils. Therefore these elements of the construction do not tend to sweat or collect frost. Bolts 56 have the heads 58 thereof located above the inner porcelain shell 50 in the top 2 of the case and pass downward through the insulating strips 52 and 54 and through an opening 60 in the portion 48 of the brackets so as to avoid contact of the bolts 56 of the brackets. Tubular members 62 are secured to adjacent fins of the construction at spaced points longitudinally of the case and are provided at the lower ends with washers 64 engaging the lower edges of the fins and held in place by nuts 66 for securing the fins and the coils as well as the brackets 44 and the drip pans carried thereby in position in the upper portion of the case.

As shown in Fig. 2 the connecting members 16 and 18 by which the coils of series 12 and 14 are joined, extend transversely from one series to the other and above the space 28 between the drip pans. In order to avoid danger of condensate falling from the members 16 and 18 through the space 28 and onto articles within the refrigerated space I prefer to provide a receiver 68 which is supported by the lower member 18 and is located below the members 16 and 18 and adjacent the end fins of the series to conduct condensate dripping from the members 16 and 18 into one or the other of the drip pans 26.

The drip pans 26 are preferably formed at the ends with downwardly turned lips 70 and the narrow channels 32 correspondingly formed at 72 to cause condensate to be discharged readily from the ends of the drip pans.

In that form of my invention illustrated in Figs. 3 and 4 the construction and arrangement of the coils and fins and of drip pans is somewhat similar to that illustrated in Figs. 1 and 2. However, in each case the lateral edges of the drip pans are located at different levels so as to cause the air to flow transversely of the drip pans and to be dumped over an edge thereof.

As illustrated in Fig. 3 the drip pans 74 are arranged with the adjacent edges 76 thereof lower than their outer edges 78 whereby the air in flowing downward from the cooling coils 80 is di-

rected transversely of the drip pans toward the center of the case and flows through the space 82 between the drip pans. However, a portion of the cool air flows downward in the spaces 84 between the outer edges of the drip pans and the baffles 88 so that distributed but controlled flow of the air downward from the cooling coils and fins is maintained with a relatively large volume thereof directed toward the center of the case.

In the construction shown in Fig. 4 the drip pans 90 are arranged with their outer edges 92 lower than their adjacent edges 94 so as to direct downwardly flowing air transversely of the pans and toward the front and rear of the case. Thus while a limited amount of cool air flows downward between the adjacent edges of the drip pans through the channel 96 at the center of the case the greater part of the air is directed transversely of the drip pans so as to flow downward adjacent the outer edges thereof through the channels 98 between the drip pans and the baffles 100.

It will be apparent that the drip pans may be spaced and arranged in various ways other than those herein described in order to accelerate and direct the bow of air transversely of the drip pans and downward away from the cooling coils and fins so as to maintain rapid circulation of the air over the cooling coils and fins or to increase or decrease the amount of cold air directed toward a particularly part of the case. It will also be apparent that the shape of the fins on the cooling coils may be varied considerably to present a large area for heat exchange with the air passing in contact therewith while at the same time serving to direct moisture or condensate running down over the surface or along the edges of the fins toward the drip pans so that it will not fall downward through the channels provided for the flow of air downward in the refrigerated space.

In these and other respects the construction and arrangement of the elements employed may be varied considerably from those forms of the invention illustrated in the drawings and described above. Therefore it should be understood that the forms of my invention herein shown and described are intended to be illustrative of my invention and are not intended to limit the scope thereof.

I claim:

1. In a refrigerated chamber having a plurality of substantially parallel cooling coils, two parallel groups of fins on said coils arranged with the lower extremities of the fins of one group spaced from the lower extremities of the fins of another group, drip pans located beneath the lower extremities of said groups of fins and extending generally parallel to each other and to said coils, the adjacent edges of said drip pans being spaced from each other and located above their outer edges to accelerate and direct the flow of air transversely thereof toward the walls of the chamber whereby paths are provided for the circulation of cool air downward from sail coils and fins and past both edges of each drip pan to provide at least three downwardly flowing streams of cool air with the central stream of air smaller in volume than the outer streams of air.

2. In a refrigerated chamber having a plurality of substantially parallel cooling coils parallel groups of tapered fins on said coils the lower extremities of said fins being narrower than the upper portions thereof and arranged with the lower extremities of the fins of one group spaced from the lower extremities of the fins of another group, baffles located at the sides of said coils and spaced from the coils and from the top of the chamber, drip pans which are narrower than the upper portions of said fins located beneath the lower extremities of said groups of fins and extending generally parallel to each other and to said coils, said drip pans having the lateral edges thereof spaced from each other and from the lower edges of said baffles, one edge of each pan being located at a different level from the other edge thereof to accelerate and direct the flow of air transversely thereof, whereby paths are provided for the circulation of warm air upward outside of the baffles to the cooling coils and downward over the cooling coils and fins past both edges of each drip pan to provide at least three downwardly flowing streams of cool air.

3. In a refrigerated chamber having a plurality of cooling coils, groups of tapered fins on said coils formed with the lower extremities thereof narrower than the upper portions thereof and spaced drip pans which are narrower than the upper portions of said fins located beneath the lower extremities of the fins of each group, one edge of each pan being located at a different level from the other edge thereof to accelerate and direct the flow of air transversely of the pans.

4. In a refrigerated chamber having a plurality of substantially parallel cooling coils, parallel groups of tapered fins on said coils formed with the lower extremities thereof narrower than the upper portions thereof and drip pans which are narrower than the upper portions of said fins located beneath the lower extremities of the fins of each group and spaced from each other to provide paths for the flow of air downward from said coils and fins and past both edges of each drip pan in at least three streams, one edge of each drip pan being located at a different level from the other edge thereof to accelerate and direct the flow of air transversely of the drip pans.

5. In a refrigerated chamber having a plurality of substantially parallel cooling coils, parallel groups of tapered fins on said coils formed with the lower extremities thereof narrower than the upper portions thereof and drip pans which are narrower than the upper portions of said fins located beneath the lower extremities of the fins of each group and spaced from each other to provide paths for the flow of air downward from said coils and fins and past both edges of each drip pan in at least three streams, one edge of each pan being located at a different level from the other edge thereof to accelerate and direct the flow of air transversely of the drip pans, and baffles located at the sides of the coils and spaced from the coils and from the top of the chamber to direct air upward outside the baffles and downward over said coils and fins.

6. In a refrigerated display case having a top, cooling coils extending longitudinally of the case near said top, fins extending transversely of the coils, baffle members spaced from the top of the case and from said fins and means located beneath said coils and fins for collecting condensate falling therefrom, the combination of means for holding said coils, fins, baffle members and condensate collecting means in position, comprising brackets extending transversely of the coils between said fins and the top of the case, elements engaging the fins and the top of the case for holding the brackets in place therebetween and arms on the brackets extending downward on opposite sides of the fins, said arms having means

thereon for securing the baffle members to said arms and for supporting said condensate collecting means.

7. In a refrigerated display case having a top, cooling coils extending longitudinally of the case near said top, fins extending transversely of the coils, baffle members spaced from the top of the case and from said fin and means located beneath said coils and fins for collecting condensate falling therefrom, the combination of means for holding said coils, fins, baffle members and condensate collecting means in position, comprising brackets extending transversely of the coils between said fins and the top of the case, heat insulating means located between said brackets and the fins on said coils and elements engaging said fins and the top of the case for clamping said brackets in place therebetween, said brackets having arms extending downward on opposite sides of the fins and means on said arms for securing the baffle members and said condensate collecting means thereto.

8. In a refrigerated chamber having a plurality of substantially parallel cooling coils, parallel groups of tapered fins on said coils formed with the lower extremities thereof narrower than the upper portions thereof, drip pans which are narrower than the upper portions of said fins located beneath the lower extremities of the fins of each group and spaced from each other, baffle members spaced from said fins and extending parallel to said coils to provide paths for the flow of air downward from said coils and fins and past both edges of each drip pan in at least three streams, and means for holding said coils, fins, drip pans and baffle members in place comprising brackets extending above the coils between the top of the fins and the top of said chamber, said brackets being secured in place adjacent the top of said chamber and having arms extending downwardly on opposite sides of the fins and means connecting said drip pans and baffles to said arms.

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