Oct. 17, 1961 F. L. LAPORTE 3,004,403

REFRIGERATED SPACE HUMIDIFICATION

Filed July 21, 1960

Fig. 1.

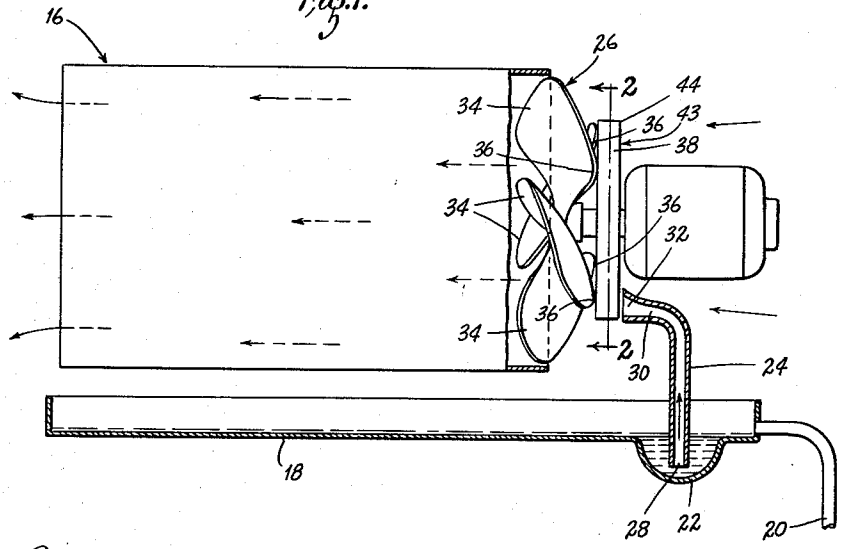


Fig. 2.

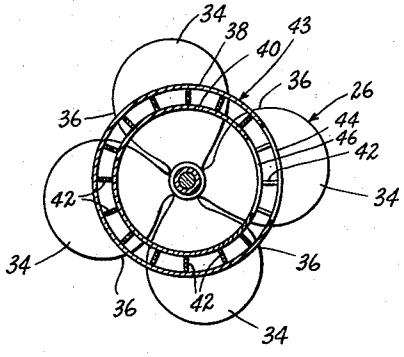


Fig. 3.

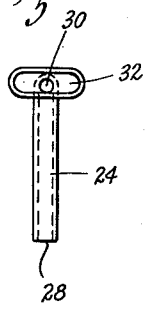
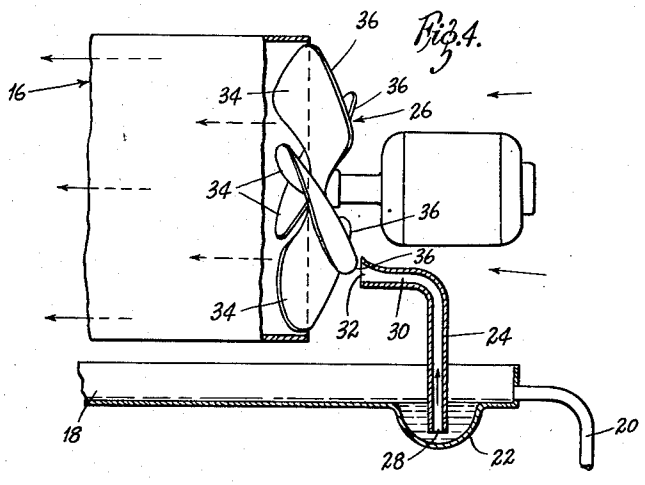


Fig. 4.



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REFRIGERATED SPACE HUMIDIFICATION

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The present invention relates generally to mechanical refrigeration, and more particularly to refrigeration of storage compartments, display cases and fixtures of the type wherein it is desirable to maintain perishable commodities such as fruits, vegetables, flowers and the like, in fresh condition.

From experience it has been found, and this is generally accepted, that the ideal temperature to attain this end is in a range between forty and fifty-five degrees Fahrenheit. At such temperatures, the fresh fruit, vegetables, flowers and the like will retain their pristine appearance and crispness provided that dehydration of them does not result in consequence of the refrigeration system operation.

In other words, during normal refrigeration cycles, the evaporator of the refrigeration system inherently attracts to itself the moisture in the atmosphere ambient thereto, and in the process gradually extracts therefrom the natural moisture existent in the friuts, vegetables, and flowers that are kept in the refrigerated space.

Consequently therefore, these commodities will wilt notwithstanding their subjection to the cooling effects of the refrigeration system. This has heretofore posed a considerable problem, and various remedies have been resorted to in attempts to solve the problem.

From numerous tests and the experience derived therefrom, it has been found that commodities of the type under consideration can be preserved for long periods of time at the above-designated temperatures provided the humidity of the ambient atmosphere be maintained at approximately ninety percent.

Among the numerous remedies heretofore employed in attempts to solve this problem, spraying of the refrigerated space with water has been resorted to at times. Again, it has been customary to place pans of water in the refrigerated space in an endeavor to replenish the moisture extracted therefrom. Sprinkling of the commodities with the attendant mess has frequently been resorted to, and so on.

Inasmuch as the preferable temperature in this type of refrigeration is within the range set forth hereinbefore, frost does not accumulate on the evaporator, and defrosting thereof is rarely requisite. In other words, in the parlance of the industry, the evaporator "sweats," so that its drippings drop into the drain pan whence they are discharged to sewage via a drain pipe.

In consequence of this customary arrangement as should now be apparent, moisture concurrently extracted from the commodities aforesaid and from the atmosphere in the refrigerated space has heretofore not only been dissipated, but it has been found necessary to substitute moisture therefor by manually supplied means, or other auxiliary means.

In accordance with the concepts of the present invention however, the condensate or moisture drippings of the evaporator that descend into the drain pan will be trapped and prevented from being discharged via the usual drain

pipe. To this end, the present invention first of all provides a sump in the drain pan wherein such drippings are adapted to collect rather than to proceed into the drain pipe. Further, the present invention teaches the provision of a tubular member having its intake or lower end submerged in the condensate collected in said sump, and having its outlet or upper end terminate contiguously to the leading edges of the blades of an electric fan positioned in horizontally spaced relationship relatively to one end of the evaporator.

Preferably but not necessarily, the upper or outlet end of the tubular member is flared both upwardly and laterally whereby to present an enlarged area for the suction action of the fan blades aforesaid as they rapidly revolve across the opening expanse thereof.

Furthermore, preferably but not necessarily, the present invention contemplates the incorporation of a pair of spaced concentric ring members each rigidly secured to the leading edges of the fan blades, and having a series of circumferentially spaced vanes integrated therewith. These vanes augment the vacuum or suction action of the fan blades as the latter travel in rapid succession past the upper end of the tubular member.

As should be apparent from the foregoing, the primary object of the present invention is to provide a method and means adapted to automatically maintain a high humidity condition in refrigerated spaces of the type under consideration. In attaining this primary objective, novel means are provided to first capture the moisture extracted from the refrigerated space and thereupon to re-distribute this moisture throughout the space in atomized form.

Accordingly, it is another object of this invention to add a sump portion onto the conventional drain pan, whereinto the drippings from the evaporator will collect rather than discharge via the drain pipe.

It is a further object of the invention to provide a suction tube that has its lower or inlet end disposed in said sump portion, and its upper or outlet end disposed in proximity to the leading edges of the blades of a conventional fan, whereby the rapid rotation of said blades past said upper end of the tube will create a vacuum condition adapted to withdraw the condensate from the sump and deliver it into the air stream simultaneously created by the rotating blades aforesaid.

It is another object of the present invention to mount said fan in such position that the air stream thereby created is directed through the evaporator. Thus the mixed air and atomized condensate has a tendency to become further moist-laden before it circulates throughout the refrigerated space.

Another object of the invention is to preferably provide an enlarged outlet portion on the upper end of the suction tube, so that the vacuum condition created by the fan blades in passing will be enhanced.

It is a further object of the invention to integrate with the leading edges of the fan blades a pair of spaced concentric ring members connected by a circular series of vanes adapted to augment the vacuum-creating action of said blades.

The invention is illustrated on a sheet of drawings that accompanies this specification. It will of course be understood that these drawings are given by way of example only, in order to illustrate the basic concepts of the invention.

In said drawings:

FIGURE 1 is a generally diagrammatic illustration of an evaporator and drain pan assembly in association with exemplary refrigerated space humidifying means in accordance with the teachings of the present invention;

FIGURE 2 is a vertical sectional view taken along the line 2—2 of FIGURE 1;

FIGURE 3 is an elevational view of the suction tube appearing in FIGURE 1; and

FIGURE 4 is a fragmentary view similar to FIGURE 1, illustrating an embodiment wherein the ring-vane assembly is omitted.

In FIGURE 1, numeral 16 indicates a conventional evaporator that is diagrammatically illustrated, and is representative of various types of evaporator units currently in use.

Disposed below the evaporator 16 is the usual drain pan 18, said pan as customary being provided with a drain pipe 20. In accordance with the concepts of the present invention, the drain pipe 20 could well be dispensed with. However, it has been illustrated inasmuch as the provision of a drain pipe is a legal requirement in some localities. The balance of the refrigeration system is not illustrated, nor is it deemed necessary for a complete understanding of this invention.

The means wherewith the present invention attains its objectives include a sump portion 22 formed in the drain pan 18, a suction conduit or tube 24, and a motor driven fan generally designated 26. As shown in the drawing, the sump portion 22 is formed in advance of the drain pipe 20 with respect to the evaporator, whereby the drippings therefrom will collect in said sump, and only the overflow should there be any, will flow into the drain pipe. The contour of the sump portion is not critical as should be obvious.

The suction tube 24 is shown per se in FIGURE 3, and includes a lower or intake end 28, and an upper or outlet end 30. The end 30 of the tube 24 projects laterally from the main body of the tube as shown in FIGURE 1, and terminates in an enlarged mouth or outlet segment 32 that flares upwardly and laterally, as best seen in FIGURE 3.

The fan includes a plurality of fan blades 34, the illustrated fan 26 being shown equipped with four such blades. Rigidly attached to portions of the leading edges 36 of said blades in any suitable manner such as by welding or the like, is a pair of concentric ring members 38 and 40 that are maintained in spaced relationship by means of a circular series of spaced blades or vanes 42. In the ring and vane assembly appearing in FIGURE 2 and generally designated 43, it will be seen that the vanes 42 extend axially of the rings. It will be understood however, that such vanes may be disposed in diagonal fashion if desired.

It is not deemed necessary to illustrate the supporting structure for the evaporator and drain pan, the suction tube, and the motor driven fan, inasmuch as any suitable means may be employed for this purpose, as is understood. Furthermore, the supporting structure will vary in different installations dependent on the location of the evaporator, and the particular construction of the fixture that encloses the refrigerated space.

In practice, the lower end 28 of the suction tube 22 would be disposed adjacent the lowermost region of the sump 22. The flared mouth portion 32 of the upper end 30 of said tube would be disposed in proximity to the rear edges 44 and 46 respectively of the pair of concentric rings 38 and 40.

As the fan blades and the thereto secured ring and vane assembly 43 rapidly revolve past the flared mouth portion 32 of the suction tube 24, the resulting vacuum thus created continuously withdraws condensate from the sump 22, breaks it into particles, and mixes these particles into the refrigerated air being circulated and diffused by the fan action.

In consequence of this arrangement, the humidity of the refrigerated space is constantly maintained at a high level, thus automatically achieving the primary objective of the invention.

With attention directed now to FIGURE 4, it will be seen that the arrangement there illustrated is similar to that appearing in FIGURE 1, except that the ring and vane assembly 43 is not included, and the flared portion 32 of the suction tube 24 is disposed contiguously to the leading edges of the fan blades 34. With this arrangement, the operation corresponds to that recited with respect to the FIGURE 1 arrangement, the only difference being that the condensate-air mixture would be diffused in spray form instead of in atomized form.

In view of the foregoing description and the drawings, it should be apparent that the present invention teaches a novel concept adapted to maintain a refrigerated space in desired humidified condition. It should further be apparent that the invention admits of modifications without departing from the basic principles thereof as set forth in the description and exemplified in the drawings.

Wherefore it is to be understood that the invention contemplates any and all modifications that may fall within the scope of the claims hereunto appended.

What I claim is:

1. In a refrigeration system of the character described, said system including an evaporator and a therebelow disposed drain pan: means for trapping and collecting the condensate dripping from the evaporator into said drain pan, in combination with means for continuously withdrawing some of said condensate from the collected body thereof and diffusing it in atomized form about said evaporator and circulating it throughout the space refrigerated thereby, said last recited means including a suction tube, a motor driven fan having a plurality of fan blades, a pair of spaced concentric ring members each rigidly secured to portions of the leading edges of said fan blades, and a circular series of spaced vanes disposed between and secured to said ring members.

2. Means for maintaining a desired humidity in the space refrigerated by the evaporator of mechanical refrigeration system located above a drain pan in said space, said means comprising: a sump formed in the bottom wall of said pan for trapping therein the condensate dripping from said evaporator; a motor driven fan disposed above said drain pan near one end of the evaporator, said fan having a plurality of blades for circulating air throughout said space; and a suction tube having its lower end disposed in fluid communication with the condensate trapped in said sump and its upper end disposed contiguously to the leading edges of said fan blades.

3. Means for maintaining a desired humidity in the space refrigerated by the evaporator of a mechanical refrigeration system located above a drain pan in said space, said means comprising in combination: a sump formed in the bottom wall of said pan for trapping therein the condensate dripping from said evaporator; a motor driven fan disposed above said drain pan near one end of the evaporator, said fan having a plurality of blades for circulating air throughout said space; a pair of concentric ring members maintained in spaced relationship by a circular series of spaced vanes rigidly secured to the leading edges of said blades; and a suction tube having its lower end disposed in fluid communication with the condensate trapped in said sump and its upper end disposed contiguously to the leading edges of said fan blades and thereto secured ring members aforesaid, whereby the vacuum created by said edges as they revolve past the upper end aforesaid of the tube will continuously siphon the condensate in spray form into the air stream circulated by said fan.

4. Means for maintaining a desired humidity in the space refrigerated by the evaporator of a mechanical refrigeration system located above a drain pan in said space, said means comprising: the means set forth in claim 8

wherein the upper end of the suction tube terminates in an upwardly and laterally flared mouth portion adapted to enhance the vacuum creating action of the blades.

5. In a refrigeration system of the character described, said system including an evaporator and a therebelow disposed drain pan, the combination of: means for trapping and collecting condensate dripping from the evaporator into said drain pan comprising a sump portion provided in the bottom wall of said drain pan; and means for continuously withdrawing condensate from the body thereof collected in said sump portion, for diffusing the withdrawn condensate in spray and atomized form through and about said evaporator, and for circulating said condensate throughout the space refrigerated by the evaporator, said

means comprising a motor driven fan having a plurality of air circulating blades disposed above said drain pan near one end of the evaporator, and a suction tube having its lower end disposed in the sump portion and thus in fluid communication with the collected body of condensate, and having its upper end disposed contiguously to the leading edges of said fan blades.

References Cited in the file of this patent

UNITED STATES PATENTS

1,736,799	Planert	Nov. 16, 1929
1,990,431	Frederick	Feb. 5, 1935