Sept. 5, 1967 E. R. TAGGART 3,339,376

CONDENSER APPARATUS AND METHOD OF DEFROSTING

Filed Nov. 5, 1965 2 Sheets-Sheet 1

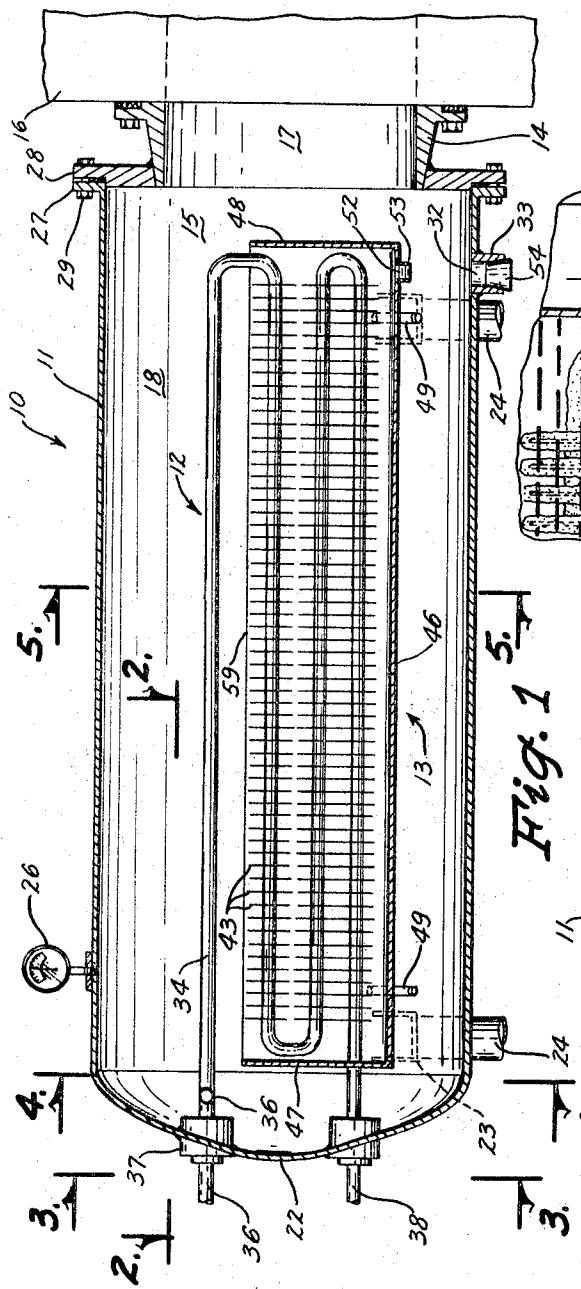


Fig. 1

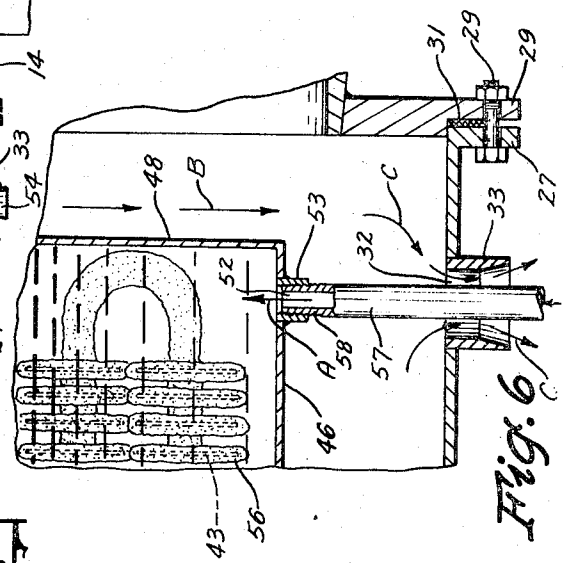


Fig. 6

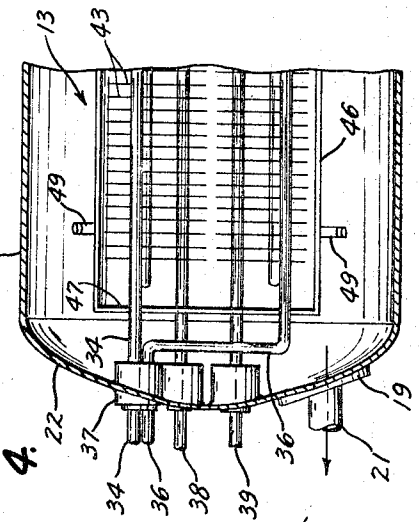


Fig. 2

INVENTOR
E. RAY TAGGART
BY Robert E. Hudson
ATTORNEY

Sept. 5, 1967 E. R. TAGGART 3,339,376

CONDENSER APPARATUS AND METHOD OF DEFROSTING

Filed Nov. 5, 1965 2 Sheets-Sheet 2

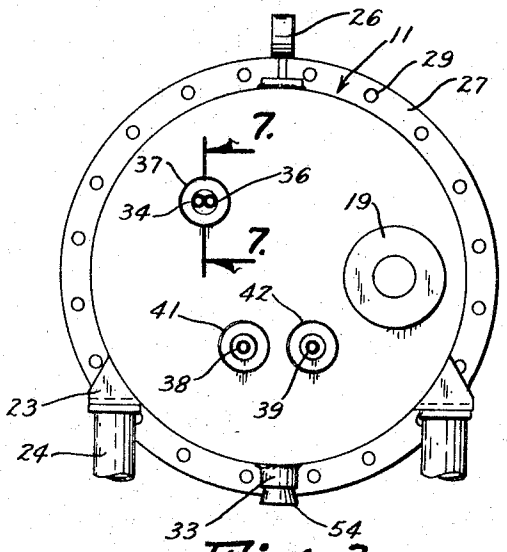


Fig. 3

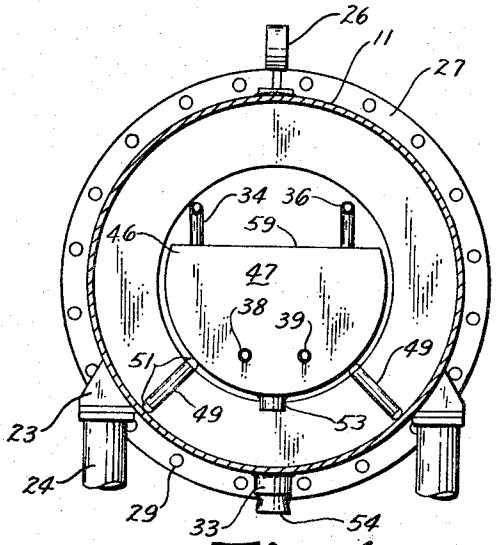


Fig. 4

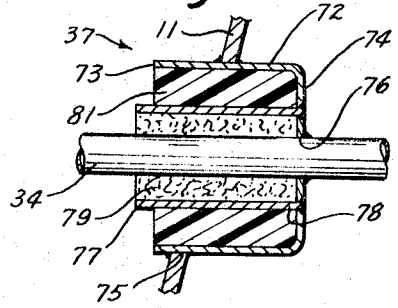


Fig. 7

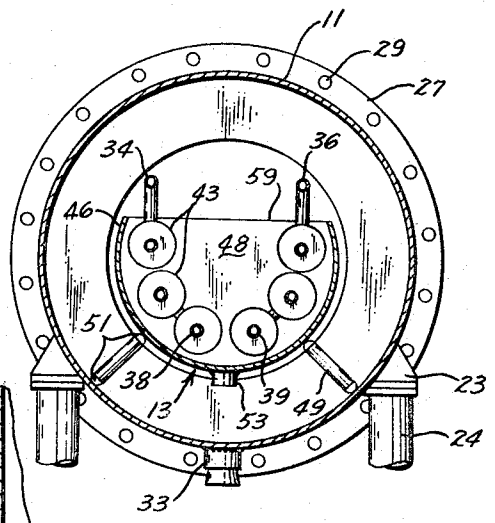


Fig. 5

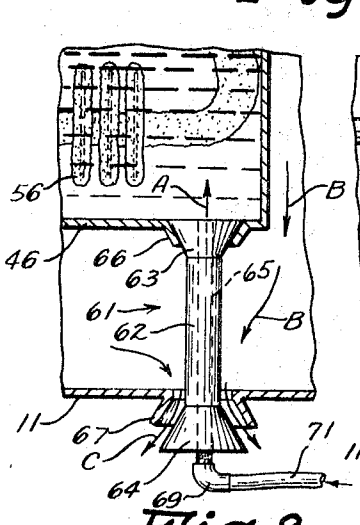


Fig. 8

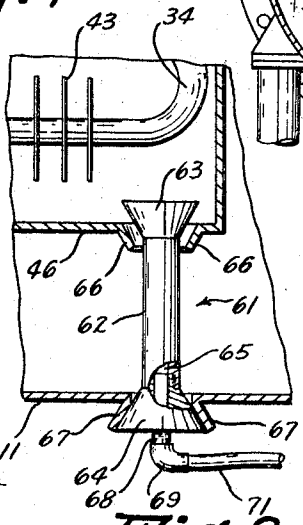


Fig. 9

INVENTOR
E. RAY TAGGART
BY
Robert E. Knudson
ATTORNEY

United States Patent Office

3,339,376

Patented Sept. 5, 1967

3,339,376
CONDENSER APPARATUS AND METHOD OF DEFROSTING

Everett R. Taggart, 5176 SE. 40th St., Des Moines, Iowa 50320

Filed Nov. 5, 1965, Ser. No. 506,522
6 Claims. (Cl. 62—282)

This invention relates to the art of condensing vapors and gases, generally to removing water vapor or moisture from air under vacuum or negative pressure conditions, and more particularly to an apparatus for and method of providing the most efficient and positive defrosting of the condenser evaporator unit.

One well known method of defrosting evaporator coils is the system of supplementary heat defrosting. The supplementary heat is most conventionally water or brine, or the like, although electricity and other such forms of supplementary heat is used. The procedure normally employed includes stopping the flow of refrigerant through the evaporator coils, and stopping the compressor. Water is then sprayed upon the evaporator coils until the frost and ice thereon is melted off to fall downwardly into a drain pan or the like. Subsequently the refrigerating equipment is put back into operation. Within a vacuum system, this type of defrosting is most disadvantageous and inefficient.

It is, therefore, an object of this invention to provide a new and useful condenser apparatus, particularly for application within a vacuum system.

It is another object of this invention to provide a new and useful method of defrosting evaporator coils.

Another object of this invention is the provision of an improved condenser apparatus wherein the evaporator coils are substantially completely insulated from the exterior surface of the apparatus.

Still another object of this invention is the provision of an improved condenser apparatus wherein the evaporator coils are mounted substantially concentrically within a condenser relative to the walls of the latter whereby to provide a most effective volumetric efficiency of the coils.

Yet another object of this invention is the provision of an improved condenser apparatus where the evaporator coils are completely covered by water, such that ice and frost matter dislodged from the evaporator coils is moved upwardly and away from the coils, against the pull of gravity, to ensure a positive removal thereof from the coils, and also providing means for preventing the blocking of the ice and frost removal therefrom.

It is another object of this invention to provide an arrangement for effectively insulating the refrigerant-carrying conduits from the externally exposed condenser walls.

It is still another object of this invention to provide an improved method of defrosting the coils of a condenser wherein the coils, without moving, are submerged such that the ice and frost formed thereon is floated upwardly and away therefrom, and further wherein the fluid within which the coils are submerged flows constantly for a predetermined period of time, the fluid flowing into and out of the condenser proper in such a manner to ensure no moisture or water flowing into the vacuum system.

Yet another object of this invention is the provision of an improved condenser apparatus, capable of attaining the above designated objectives, and which is simple and rugged of construction, economical to manufacture, and effective in operation.

Still another object of this invention is the provision of a novel method for defrosting a condenser which is economical, easily accomplished, and effective.

These objects, and other features and advantages of this

invention will become readily apparent upon reference to the following description when taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a vertical sectional view along the longitudinal axis of the condenser of this invention;

FIG. 2 is a fragmentary, horizontal sectional view taken along the line 2—2 in FIG. 1;

FIG. 3 is an end elevational view taken along the line 3—3 in FIG. 1;

FIG. 4 is a vertical sectional view taken along the line 4—4 in FIG. 1;

FIG. 5 is a vertical sectional view taken along the line 5—5 in FIG. 1;

FIG. 6 is an enlarged, fragmentary view of a detail of FIG. 1, wherein frost has formed on the condenser coils;

FIG. 7 is an enlarged, fragmentary view of a detail of FIG. 1;

FIG. 8 is an enlarged, fragmentary view of a modified structure relative to FIG. 6; and

FIG. 9 is a view similar to FIG. 8, with an alternate position illustrated.

Referring now to the drawings, the condenser of this invention is indicated generally at **10** in FIG. 1 and comprises basically a cylindrical housing **11** enclosing an evaporator unit **12**, the latter substantially enclosed by a trough unit **13**.

The condenser **10** is mounted at an open and **15** thereof by a mounting bracket **14** to a wall **16**, the latter having an enclosure (not shown). The function of the condenser **10** is to withdraw water vapor from the air within the enclosure and the housing **11**. The air is withdrawn from said enclosure and housing, by means of suction, through the bracket opening **17** and into the chamber **18** (FIG. 1) of the housing **11**, then drawn through an outlet **19** (FIG. 2) and conduit **21** to a vacuum pump arrangement (not shown).

The housing **11** includes the cylindrical wall having an outer closed end **22** (FIG. 1) within which are formed several openings described more in detail hereinafter. The housing **11** is mounted on a quartet of support brackets **23** (FIG. 3) which are in turn supported by upstanding legs **24** supported on a generally horizontal surface (not shown).

On top of the housing wall **11**, a vacuum gauge **26** (FIG. 1) is provided in fluid communication with the interior of the chamber **18** for indicating the vacuum therein at any instant. At the inner open end **15** of the housing **11**, a flange **27** is secured to a flange **28** formed as a part of the mounting bracket **14**, by a plurality of fastening devices **29**. An annular gasket **31** (FIG. 6) is secured between the flanges **27** and **28** for providing a fluid tight seal therebetween. Referring particularly to FIG. 6, a fluid transmitting passage **32** is formed in a lowermost portion of the housing **11** directly below the trough unit **13**. The passage **32** is formed by a circular, short length of pipe **33** secured, as by welding, to the housing **11**.

The evaporator unit **12** comprises a pair of conduits **34** and **36** (FIGS. 1 and 3), which carry a liquid refrigerant therein. These conduits enter the housing chamber **18** together from without through an insulator device **37** (FIG. 3). Inside the chamber **18**, the conduits **34** and **36** diverge and extend generally horizontally in a parallel manner (see FIG. 4) to the rear of the trough unit **13**, at which point both conduits depend into the interior of the trough unit. From that point, both conduits **34** and **36** have a serpentine-coil configuration best illustrated in FIGS. 1 and 5.

The discharge ends **38** and **39** (FIGS. 1 and 5) of the refrigerant carrying conduits **34** and **36** leave the trough unit **13** through a wall thereof, described hereinafter, and

leave the closed end 22 of the housing 11 through another pair of insulator devices 41 and 42. Within the trough unit 13, both conduits 34 and 36 have a plurality of conventional, circular fins 43 secured thereto in spaced relation for providing a maximum amount of surface for condensing purposes.

The trough unit 13 of the condenser 10 comprises an actual trough 46 having a semi-circular form in cross-section (FIG. 5), with the top thereof open. Both ends 47 and 48 (FIG. 1) of the trough 46 are closed, except that the outer end 48 has a pair of openings (not shown) formed therein through which the discharge ends 38 and 39 extend in a fluid tight manner.

The trough 46 is mounted upon a quartet of legs 49 which support the trough 46 upon the inner wall surfaces of the housing 11 in a position where the trough is concentrically located within the interior of the cylindrical housing 11. This is best illustrated in FIGS. 4 and 5. All legs 49 are insulated with both ends 51 thereof in engagement with the trough 46 and the housing 11 formed of plastic or the like. A fluid discharge port 52 (FIGS. 1 and 6) is formed in the lowermost portion of the trough 46 at an inner end thereof, with the passage formed by a short length of internally threaded pipe 53. The port 52 is directly over the passage 32 of the cylinder 11, and is vertically axially aligned therewith for a purpose hereinafter described.

In normal operation of the condenser 10, with a plug 54 (FIG. 1) closing the lower passage 32, the transmission of a refrigerant, such as liquid Refrigerant R–12, through the conduits 34 and 36 eventually causes ice and frost (FIG. 6) to form on the coils 34 and 36 and the fins 43.

To effect a defrosting of this condensate 56 in its crystallized form, the following process is performed. A length of pipe 57, designated hereinafter as a nozzle, having a diameter less than the internal diameter of the pipe 33 (FIG. 6), with its upper end 58 externally threaded, is threadably inserted into the port pipe 53 of the trough 46 as best illustrated in FIG. 6. At this time there is no vacuum within the condenser 10 and the refrigerant lines 34 and 36 have been vacated of their refrigerant, with the usual compressor (not shown) connected with such equipment stopped from operation.

A fluid, such as normal tap water, brine, or the like is forced through the nozzle 57 upwardly into the trough 46 as indicated by the arrow A in FIG. 6. As the trough 46 fills with the water, the evaporator unit 12 therewithin is completely submerged, the finned coils thus being completely covered with water substantially simultaneously. The ice and frost 56 is thereby melted with the latter adding merely to the quantity of water.

As the water continues to flow into and upwardly within the trough 46, it eventually spills over the upper edge 59 of the trough, which edge extends completely about and above the serpentine, finned portions of the conduits 34 and 36. The overflowing water then runs down the sides of the trough 46, running into the bottom portion of the housing 11 and collecting there. Referring to FIG. 6, the arrows B indicate the overflowing water, with the arrows C showing the path of discharge of the overflowed water, said discharge being through the passage 32 and about the nozzle 57. From the passage 32, the discharged fluid is transmitted to a drain or the like.

The continual flow of the fluid upwardly through the nozzle 57 and upwardly within the trough 46 continues for a predetermined period of time so as to melt and dislodge all frost and ice 56 formed on the evaporator unit 12. This can readily be ascertained through a glass window or the like supported in the housing end 22.

The fluid being discharged through the nozzle 57 is then stopped, when the ice 56 has melted, and the nozzle 57 is then removed from the pipe 53. All of the water within the housing 11 which had overflowed the trough 46 will have drained through the lower passage 32. By removing the nozzle 57 from the trough 46, the port 52 is automatically opened for draining the water from within the trough 46 downwardly through the passage 32 and toward the drain provided therefor.

It can therefore be readily envisaged that a complete and positive defrosting of the evaporator unit 12 occurs due to a complete submerging of the evaporator coils and fins of the unit 12 by virtue of filling the trough 46 with a body of the supplementary-heat fluid, and maintaining a flow of the fluid within the trough 46 such as to overflow said trough for a predetermined period of time. The location of the passage 32 and the port 52 are such as to provide an extremely practical and economical method of introducing the defrosting fluid into the trough while permitting the overflow caught by the housing 11 to pass through the lower passage. The same path of introducing the water is therefore used as a drain path.

Referring particularly to FIGS. 8 and 9, a modified nozzle arrangement is illustrated with all other elements identical to the structure of FIGS. 1–7 indicated by like reference numerals. The modified nozzle 61 comprises a closure member 62 with a pair of oppositely flared ends 63 and 64 having a complementary fit with the trough port 66 and the housing passage 67. It will be noted that the latter openings are again vertically aligned, but are themselves oppositely flared to snugly accept the nozzle ends.

The length of the member 62 is such that with the upper end 63 closing the port 66 from the passage of fluid therethrough, the lower end 64 is spaced from the passage 67 (FIG. 8). In FIG. 9 the opposite condition is illustrated; and the member 62 has an intermediate position where neither opening is closed. To supply water or the like to the trough 46, a pipe 68 (FIG. 8) is provided, having an elbow 69 connecting its outer end to the flexible conduit 71 leading to a source of water. The pipe 68 (FIG. 9) is inserted through the end 64 for threaded insertion into the member 62, the latter having a passage 65 formed therethrough for transmitting the water.

The defrosting operation utilizing the nozzle 61 is substantially the same as the FIGS. 1–7 nozzle 57. With the nozzle 61 in the position of FIG. 8, water is forced through the pipe 68 into the trough 46, as indicated by the arrow A. When the trough 46, with the port 66 closed, overflows, with the frost and ice 56 melting, the water flows over the sides of the trough (see arrows B) (FIG. 8) and then flows out the passage 67 as indicated by the arrows C for further transmission to a drain or the like.

When it is desired to drain the trough 46, the nozzle 61 is raised, by any conventional means, to a position intermediate that of FIGS. 8 and 9, such that both the port 66 and the passage 67 are open. Then, when the trough 46 is completely emptied of the fluid, the nozzle 61 is raised to the FIG. 9 position, closing the passage 67 and thus permitting a vacuum to be obtained within the chamber 18.

Referring now to FIG. 7, the insulator device 37 is illustrated in detail. This device 37 is identical to insulator devices 41 and 42. It comprises a circular member 72 having an open end 73 exposed beyond the housing 11, and an inner end which is closed by a plate 74. The member 72 is secured as by welding to the opening 75 provided therefore within the housing 11. The securement provides a fluid-tight arrangement. Within the plate 74, an opening 76 is formed centrally thereof through which the conduit 34 passes. This passage also is of a fluid-tight nature.

Another cylindrical element 77 is provided which surrounds the conduit 34, and the inner end 78 of which abuts the outer side of the plate 74 and is secured thereto in a concentric manner relative to the conduit 34 and to the member 72. By this arrangement, a pair of annular cavities are formed, one between the element 77 and the conduit 34, and the other between the element 77 and the member 72.

To completely insulate the conduit 34 from the housing

11, packing 79 is placed within the inner cavity, and Styrofoam 81 or the like is placed within the outer cavity, as illustrated in FIG. 7. By this arrangement, during operation of the conduit 10 and the unit associated therewith, absolutely no frost or the like is formed about the conduit 34 and the housing 11 associated therewith. This is also true with respect to the discharge conduits 38 and 39 (FIG. 3) due to their insertion through the insulator devices 41 and 42.

Although a preferred embodiment of the invention, with a modification thereof has been described and disclosed hereinbefore, modifications and alterations can be made thereto without departing from the true spirit and scope of the invention as defined in the appended claims.

I claim:

1. A defrosting device in a condenser apparatus comprising in combination:

a housing having a chamber enclosed by a wall, and having an opening formed in said wall for communicating said chamber with the interior of that within which the vapor is to be condensed;

means attached to said housing for discharging fluid therefrom;

refrigerant carrying means disposed within said chamber;

container means also disposed within said wall and open at the top thereof, said container means enclosing said refrigerant carrying means on both sides and the bottom thereof and for receiving fluid therein for contacting said refrigerant carrying means for defrosting same, wherein any and all material defrosted from said refrigerant carrying means is carried by the fluid outwardly through the said open top for gravitational discharge downwardly into said chamber.

2. A condenser apparatus as defined in claim 1, and

further wherein said enclosing means comprises a trough member, open at the top thereof, with the sides, ends, and bottom thereof enclosing said refrigerant carrying means, and with a port formed in said bottom thereof at a lowermost portion.

3. A condenser apparatus as defined in claim 1, and further wherein said wall has a passage formed therein and spaced directly vertically below and axially aligned with said port.

4. A condenser apparatus as defined in claim 2, and further wherein said trough member sides and bottom are substantially semi-circularly formed in transverse cross section, and with said trough member mounted concentric relative to said housing wall.

5. A condenser apparatus as defined in claim 3, and further wherein said passage has a diameter larger than the diameter of said port.

6. A condenser apparatus as defined in claim 1, and including further a valve device reciprocally mounted between said port and said passage, said valve device operable in one position to emit fluid into said enclosing means while simultaneously closing said port and opening said passage, operable in a second position to open both said passage and said port, and operable in a third position to close said passage.

References Cited

UNITED STATES PATENTS

2,436,693	2/1948	Hickman	62—282 X
2,524,568	10/1950	Kritzer	62—282 X
2,571,192	10/1951	Brill et al.	62—282

ROBERT A. O'LEARY, *Primary Examiner.*

W. E. WAYNER, *Examiner.*