

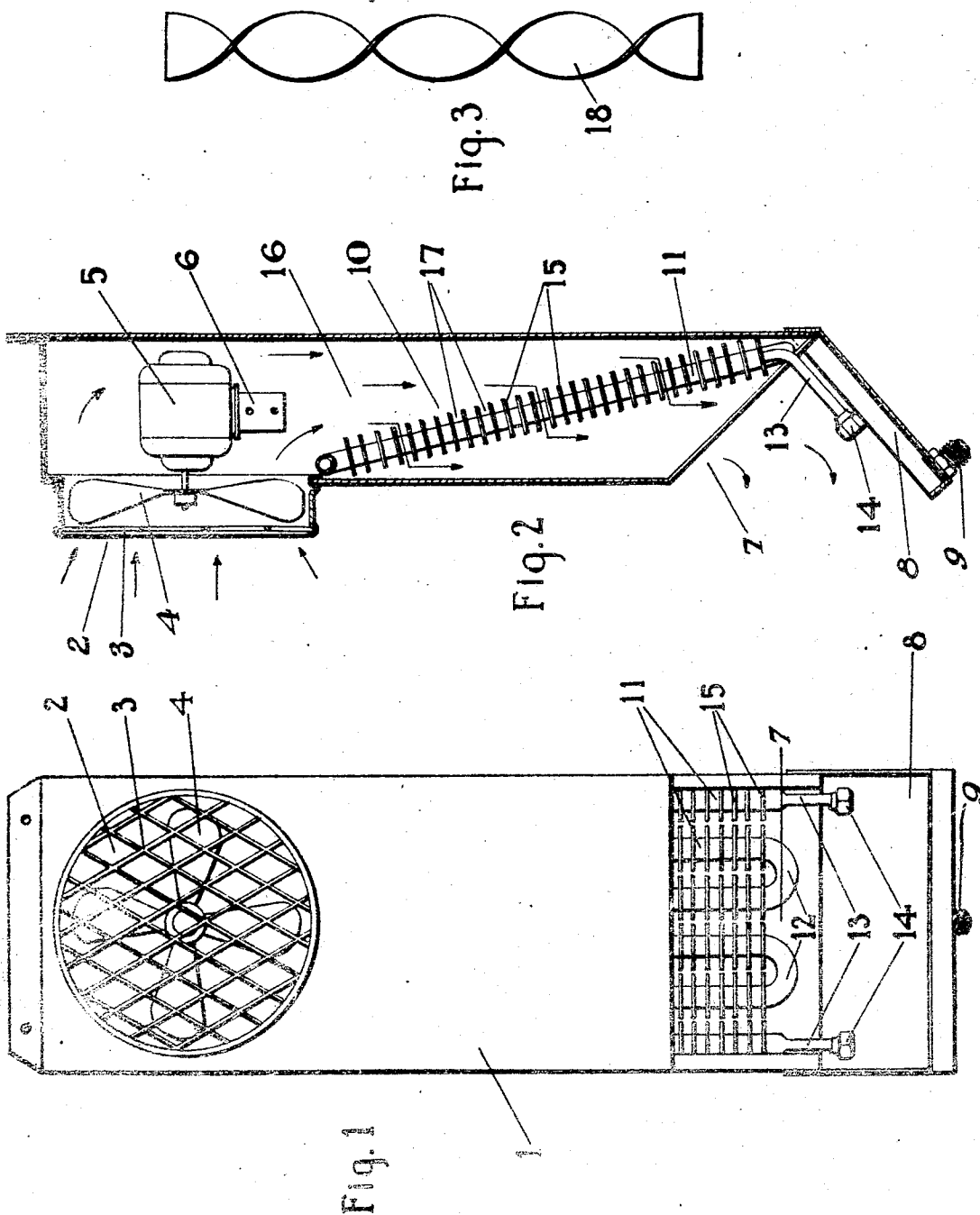
Aug. 12, 1941.

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2,251,907

FORCED AIR CIRCULATION COOLING UNIT

Filed May 27, 1939



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UNITED STATES PATENT OFFICE

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FORCED AIR CIRCULATION COOLING UNIT

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Application May 27, 1939, Serial No. 276,104

7 Claims. (Cl. 62—102)

The present invention relates to a forced air circulation cooling unit having numerous advantages over those of older types.

An object of the present invention is to provide a forced air circulation cooling unit which is comparatively low in depth and narrow in width, as compared with older types, in order that same may be employed within rather restricted environment.

Another object of the invention is to provide an angular placement of the cooling coil situated within the casing of a cooling unit as mentioned above.

A further object is to provide refrigerant baffle means within such cooling coil, in order to increase the heat transfer capacity thereof.

In the drawing:

Figure 1 is a front elevational view of a cooling unit employing the invention.

Figure 2 is a cross-sectional view through the center of Figure 1.

Figure 3 is a view of a refrigerant baffle used in the invention.

Referring to the drawing:

In Figures 1 and 2, a casing 1 has a warm air inlet 2, at its upper end, which is covered by a perforated safety guard 3, through which air is sucked by the fan 4 driven by the motor 5 having a support 6 fastened to the casing 1 in any suitable manner.

At its lower end, the casing 1 has a cooled air outlet 7, directly beneath which is disposed a drip pan 8, having a drain fitting 9, generally connected to a sewer for the purpose of passing the water drip collected by the drip pan 8 during defrosting of the unit.

Inside of the casing 1, and between two opposite walls thereof, there is placed, at an angular relation to the vertical, a cooling unit 10 comprised of conduits 11, joined in series relation by means of return bends 12. The conduit extensions 13 serve as the refrigerant inlet and outlet whenever connected to a suitable source of refrigerant by means of couplings 14.

The conduits 11 have fins 15 mounted thereon and in thermal conductive contact therewith, in order to increase the effective circulated air heat transfer area.

The angular displacement, of the cooling unit 10, provides a plenum chamber 16, within the casing 1, in which the fan 4 generates an air pressure, and from which the air escapes by passing through the spaces 17 between the fins 15, in its passage to the cooled air outlet 7.

In Figure 3, with the employment of volatile

refrigerants, which are simultaneously in both liquid and vapor phase, I have found it necessary to employ, for greatest efficiency of heat transfer, a refrigerant baffle 18, comprising a twisted metal ribbon, which when placed inside the conduits 11 prevents the refrigerant, in liquid phase, from too freely dropping down those particular conduits 11, in which the refrigerant flow is in a downward direction.

I have experimentally determined that whenever cooling units have their refrigerant conduits disposed in a vertical flow direction, or substantially so as in the present instance, that the refrigerant, in liquid phase, tends to drop through the center of the conduit bore and consequently does not completely wet the internal walls of the conduit. Since effective refrigeration is produced only by the evaporation, of the liquid refrigerant, in absorbing heat from the conduit walls, it can be readily realized that some means, from the standpoint of efficiency, must be provided in order to prevent the liquid refrigerant from too freely dropping down the center of the conduit bores and without adequately wetting the internal surfaces thereof.

It is very essential that the baffle means be of such form that the refrigerant liquid be brought into intimate contact with the refrigerant conduit walls and in the present preferred embodiment, of the baffle means, I entirely eliminate the possibility of the refrigerant liquid dropping freely through the conduit bores. The helical paths, generated by twisting the refrigerant baffle 18, in conjunction with the flow velocity of the refrigerant mixture, liquid and vapor, generates a centrifugal component, which tends to centrifuge the refrigerant liquid toward and into intimate contact with the internal walls of the conduit.

Since the potential heat transfer capacity of a cooling coil is dependent, in part, upon the amount of exterior surface thereof and the amount of air which can be passed therethrough, which is generally related to the air face area of the coil, it will be noted that the particular disposition of the cooling coil in its associated casing, in the present invention, allows of a large air face area within a comparatively small cross-sectional casing area; therefore, minimizing resistance to air flow and allowing the use of ordinary fans for forcing the circulation of air therethrough.

In the conventional type of forced air cooling unit, the cooling coil conduits are in a horizontal position and the parasitic spaces, occu-

pled by the return bends, materially decrease the available air face area of the finned portion of the cooling unit since the space area occupied by the return bends, on these conventional units, must be blocked against air circulation; otherwise, due to the decreased air resistance, much air would pass therethrough without being cooled down to its proper temperature. Furthermore, this would detract from the available air which might be forced through the cooling coil whenever the return bend spaces would be blocked against air passage.

With the present invention, I have been enabled to make cooling units, of comparable heat transfer capacity, with a smaller volumetric displacement than the conventional type of forced air circulation unit, which is an extremely desirable feature because this type of cooling unit is coming into more and more common use on the smaller size refrigerators.

While the foregoing is a specific concept of my invention, it is realized that certain modifications can be made without departing from the spirit and scope of the invention, which is limited only to the following claims.

I claim:

1. In a forced air circulation cooling unit, the combination of a casing, a fan to force air through said casing, a cooling coil within said casing and comprising extended surface refrigerant circulation conduits disposed angularly within the casing, and refrigerant baffle means within the said extended surface refrigerant circulation conduits the said baffle means comprising a twisted metal ribbon providing a multiple helical flow path adjacent the internal walls of the said conduits.

2. In a forced air circulation cooling unit, the combination of a casing, a fan to force air through said casing, a cooling coil within said casing and comprising extended surface refrigerant circulation conduits disposed angularly within the casing and in series refrigerant flow relation and a twisted metal ribbon inside of said conduits and providing a multiple helical flow path adjacent the internal walls of the said conduits.

3. In a forced air circulation cooling unit, the combination of a casing, a fan to force air through said casing, a multiple refrigerant conduit extended surface cooling unit angularly disposed within said casing and providing a plenum chamber between said fan and said cooling unit and a twisted metal ribbon inside of said conduits and providing a multiple helical flow path adjacent the internal walls of the said conduits.

4. In a forced air circulation cooling unit, the combination of a casing, a fan to force air

through said casing, a multiple refrigerant conduit extended surface cooling unit angularly disposed within said casing and providing a plenum chamber between said fan and said cooling unit, and refrigerant baffle means within the refrigerant conduits of said cooling unit the said baffle means comprising a twisted metal ribbon providing a multiple helical flow path adjacent the internal walls of the said conduits.

5. In a forced air circulation cooling unit, the combination of a casing having an air inlet and an air outlet, a fan to force air through said casing, an extended surface cooling coil within said casing and having a width substantially equal to the width of said casing which has a depth exceeding the depth of said cooling coil which is angularly disposed therein and providing acute angled plenum chambers for the air inlet and air discharge respectively to and from the cooling coil through which said air circulation is forced, the open ends, of said acute angled plenum chambers, being at the air inlet and the air discharge ends of the angularly disposed cooling unit.

6. In a forced air circulation cooling unit, the combination of a casing having an air inlet and an air outlet, a fan to force air through said casing, an extended surface cooling coil within said casing and having a width substantially equal to the width of said casing which has a depth exceeding the depth of said cooling coil which is angularly disposed therein and providing acute angled plenum chambers for the air inlet and air discharge respectively to and from the cooling coil through which said air circulation is forced, the open ends, of said acute angled plenum chambers, being at the air inlet and the air discharge ends of the angularly disposed cooling unit and a drip pan situated below the air outlet end of said casing.

7. In a forced air circulation cooling unit, the combination of a casing having a perpendicular length in excess of the casing width and having a depth less than said width, a fan adjacent the top of said casing and to force an air circulation therethrough in a downward direction, an extended surface cooling unit comprising refrigerant conduits from which extended surfaces project, the said extended surfaces giving a certain depth to said cooling unit, said cooling unit depth being less than the depth of said casing, said cooling unit being disposed angularly within said casing, relative to the casing and cooling unit depths, thereby providing acute angled plenum chambers at both the air inlet and air outlet sides of said cooling unit, and a drip pan situated below the air outlet end of said casing.

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