United States Patent [19]

Burney

[11] **3,763,660**

[45] **Oct. 9, 1973**

[54] **AIR CONDITIONING CONDENSER FAN ARRANGEMENT WITH CONDENSATE REMOVAL**

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[73] Assignee: **Westinghouse Electric Corporation,** Pittsburgh, Pa.

[22] Filed: **June 5, 1972**

[21] Appl. No.: **259,430**

[52] **U.S. Cl.** **62/280,** 62/279, 261/84

[51] **Int. Cl.** **F25b 4/00**

[58] **Field of Search** 62/279, 280; 261/84

[56] **References Cited**

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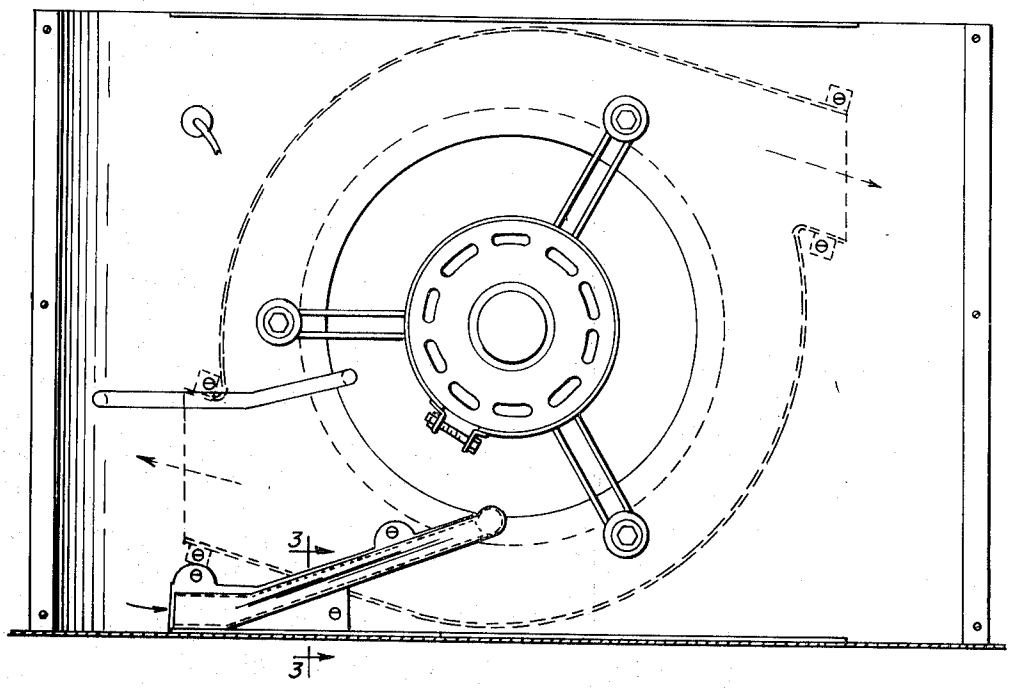
Primary Examiner—William J. Wye

Attorney—F. H. Henson et al.

[57] **ABSTRACT**

This invention relates to an air conditioner condenser section which includes a condenser and a low speed, double-exit centrifugal blower having a large diameter fan wheel. The fan wheel speed and velocity of the air passing through the condenser may be kept relatively low to provide a more quiet and efficient operation. Slanted water channel means are also provided to pump, by an aspiration effect, the water that has collected in the bottom pan of the air conditioner and housing to the blower fan wheel for atomization and dispersal.

6 Claims, 4 Drawing Figures



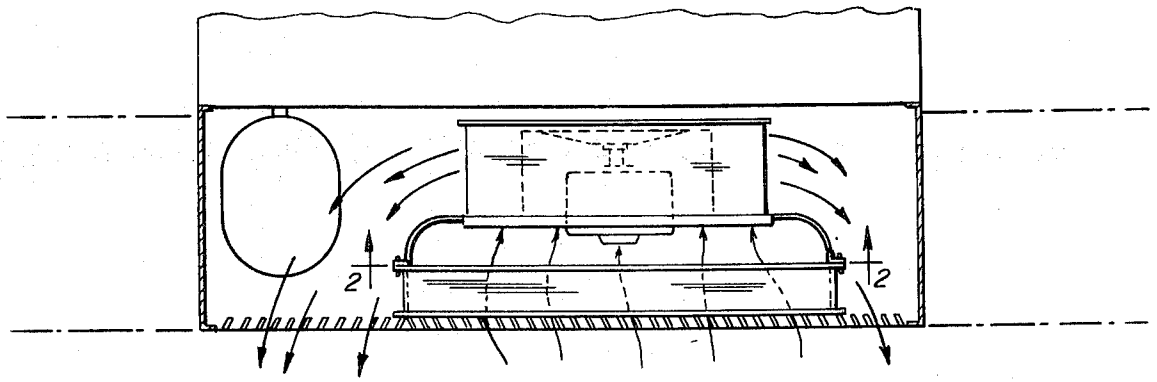


FIG. 1

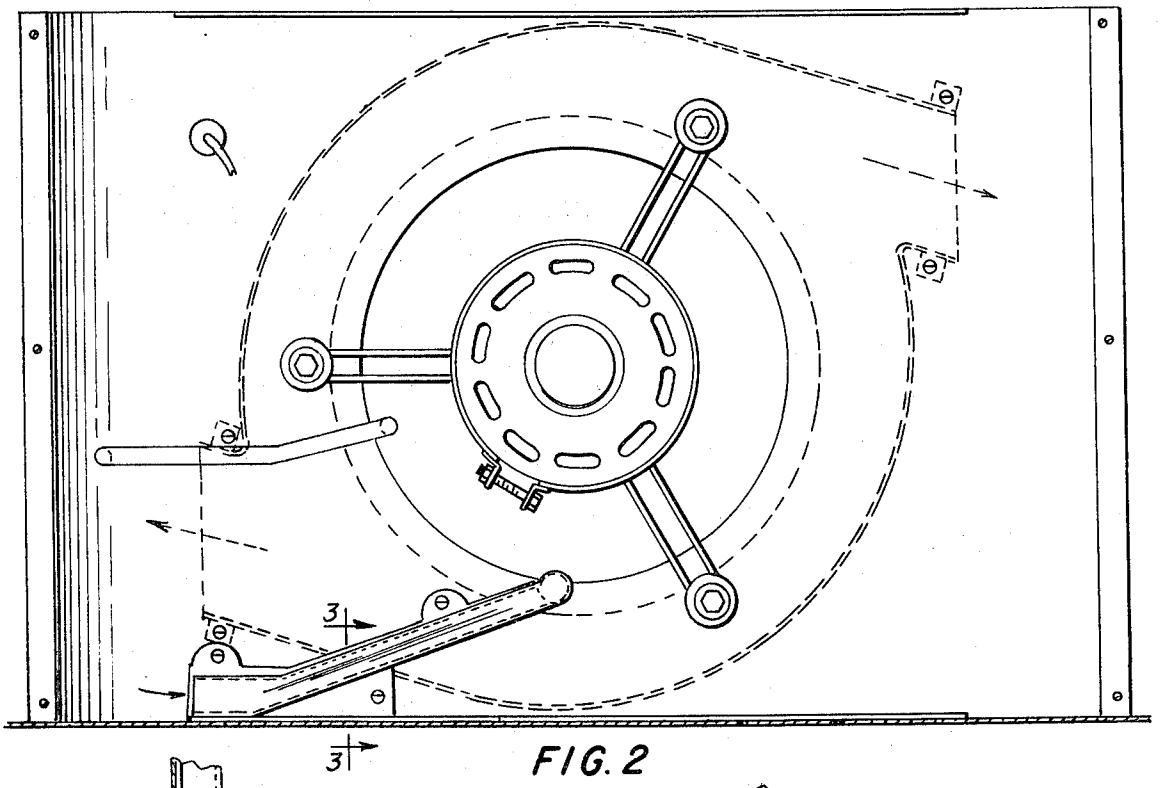


FIG. 2

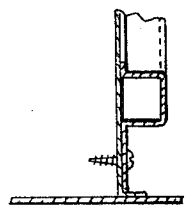


FIG. 3

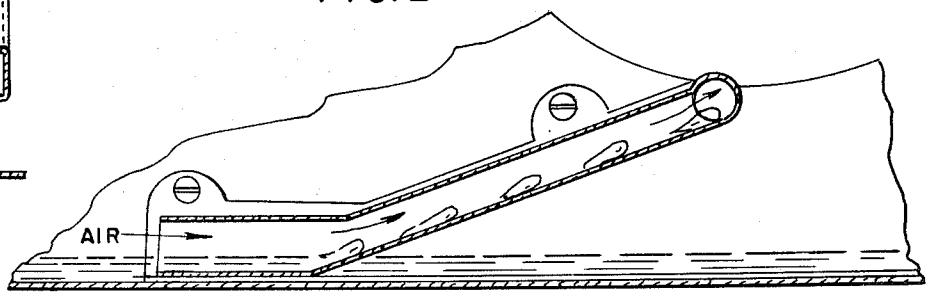


FIG. 4

AIR CONDITIONING CONDENSER FAN ARRANGEMENT WITH CONDENSATE REMOVAL

CROSS REFERENCES TO RELATED APPLICATION

So far as known, this invention is not related to any pending patent application.

BACKGROUND OF THE INVENTION

Air conditioning systems of conventional design utilize a blower arrangement that is necessary to move a required cooling air flow through the condenser. A draw-through air path is desirable for uniform air flow through the condenser. However, present centrifugal blowers are low in efficiency for this application while a propeller fan is very noisy.

It would be more desirable to design an efficient air conditioner condenser blower which would move the necessary cooling air flow with a minimum power input requirement and minimum noise. It would also be desirable to enhance the air conditioner condensate water disposal means without a drain, runover, or blowing large drops of water outside by providing a disposal system with no moving parts but which uses an aspiration effect to pump the collected condensate to the blower fan wheel for atomization and dispersal. It has been found that by employing a blower with a large diameter, double-exit centrifugal fan wheel, the aforementioned advantages may be obtained.

PRIOR ART

The following U.S. patents disclose either a double-exit centrifugal blower or a condensate entrainment means having no moving parts respectively:

U.S. Pat. No. 513,057 to Poole

U.S. Pat. No. 3,079,767 to Speaker.

Although double-exit fan housings are also known in design literature, no previous field applications or patents are known which disclose a double-exit centrifugal blower used in an air conditioning unit in an arrangement in combination with a condensate pump.

SUMMARY OF THE INVENTION

An air conditioner condenser section housing is disclosed having end walls and a rear grill wall with an integral central air intake grill portion and side discharge portions, a housing bottom pan which is disposed at a first elevation for collecting condensed water, a compressor, a condenser coil, a rotating centrifugal fan wheel having an inlet which is disposed at a second elevation within the housing, a fan scroll member having at least two outlets, and a condensate water disposal means. The fan scroll discharges air through the scroll outlets and in a direction towards the end walls of the housing where the air is turned to pass through the side discharge grill portions of the housing, while at the same time, air being discharged from one of the scroll outlets also cools the compressor.

The condensate disposal means, which consists primarily of a sloping channel extending between the first and second elevations is adapted to pump water from the housing bottom pan to the inlet of the rotating fan wheel by an aspiration effect for atomization and discharge with the air being pumped by the fan and turned to pass through the discharge grills. Air that is discharged at the scroll outlets is turned approximately 90° which will centrifuge any large water droplets against the side walls of the housing for eventual recollection and discharge, thereby preventing large droplets from being blown outside the housing. The aspiration effect is created within a portion of the sloping channel by a flow of air due to the air pressure differential that exists between ends of the channel, thereby providing an efficient condensate disposal system with no moving parts in combination with an air conditioning unit.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a top view of an air conditioner condenser section employing the present invention;

FIG. 2 is a section taken along lines 2—2 of FIG. 1;

FIG. 3 is a section taken along lines 3—3 of FIG. 2; and

FIG. 4 is an enlarged detail of the condensate water disposal arrangement of the present invention.

DESCRIPTION OF PREFERRED EMBODIMENT

Relating to FIG. 1 of the drawings, an air conditioner evaporator section housing is shown generally at 2 and a condenser section housing at 3. Condenser section housing 3 includes end walls 4 and 5, a draw-through air intake grill portion 6, side discharge grill portions 7 and 8, and a housing bottom pan 10 (shown best in FIG. 2). The housing bottom pan 10 is disposed at a first elevation to collect both condensed water from the air conditioner evaporator coil (not shown) and accumulated rain water from the outside of the housing. Enclosed within condenser section housing 3 are also a compressor 12, a condenser coil 14, and a low speed centrifugal blower 16. Centrifugal blower 16 includes both a large diameter rotating centrifugal fan wheel 17 disposed at a second elevation with respect to the first elevation of pan 10 and fan scroll member 18 having at least two outlet conduits for discharging air, as illustrated, in a direction towards the end walls 4 and 5 of housing 3 to be thereby turned to pass through side discharge grills 7 and 8 of housing 3 (which will be explained in more detail hereinafter). By employing a large diameter fan wheel 17, the wheel speed and air velocity may be kept relatively low, thus maintaining quiet blower operation. A suitable motor 25, supported by conventional motor mounts 26 and having motor leads 27, drives fan wheel 17.

To dispose of the condensed and the collected outside rain water, an improved condensate disposal means 30 (best shown in FIG. 2), which is capable of pumping collected water from the housing bottom pan 10 back into the fan wheel 17, has been developed to most effectively dispose of collected water when used in conjunction with the double exit centrifugal blower 16 of the instant invention. Condensate disposal arrangement 30 includes a hollow sloping channel portion 32 (a section of which is shown in FIG. 3) that extends from housing bottom pan 10 to the rotating fan wheel 17 and from the first to the second elevation. Sloping channel portion 32 may be attached in any well known manner to the blower inlet shroud 28, as illustrated. An inlet portion 34 of channel 32 is adapted to receive the water which has accumulated in bottom pan 10. Inlet portion 34 is disposed adjacent the first elevation and is aligned substantially parallel to the bottom pan 10 of housing 3. Channel 32 has a discharge end 35 terminating at the blower wheel inlet orifice 36 from which the collected water may be emptied into

rotating fan wheel **17** to be subsequently atomized and discharged with the air being pumped by blower **16** and turned through the side discharge grills. A condensate drain tube **38** is also provided which carries water from the evaporator section to be thereby transported and emptied from drain discharge orifice **40** into the blower inlet opening **45** for eventual atomization and discharge.

The operation of the combination of the improved condensate disposal and air conditioner blower arrangement can best be described with reference to FIG. **4.** In order to pump the collected water from bottom pan **10,** which is disposed at the first elevation, to the rotating centrifugal fan wheel, which is disposed at the second elevation, for subsequent atomization and discharge, it has been found necessary to lift the water a vertical distance which may be over 2 inches to reach the blower fan wheel inlet orifice **36.** The actual position of the discharge end **35** is at a point where there is at least a ½ inch water pressure differential between ends of sloping channel **32** to thereby establish a movement of high velocity air flow through the channel **32** towards the end **35** above the collected water being moved through the channel. Most efficient pumping has been obtained when the angle X that sloping channel portion **32** forms with bottom pan **10** is relatively shallow; by way of example, **20** to **25** degrees providing optimum results.

With condensate disposal means **30** in the assembled relationship within housing **3,** it is essential that the height of the water receiving channel inlet portion **34** be greater than the static level of condensed water to be received therein, so as to always provide a free air flow path within channel **32** towards the discharge end **35.** Thus, the high velocity air, which has been generated above the collected water by the pressure differential in sloping channel **32,** is capable of causing an aspiration effect, thereby providing means whereby collected water may be pumped along the inner surface of the sloping channel from the first to the second elevation (as diagrammatically illustrated). Without the provision for a free air path, an aspiration effect would not be possible, and the disposal means would not be effective for pumping water to the rotating fan wheel. Although the maximum pressure differential between ends of channel **32** is less than 1 inch of water, the collected water can be lifted a vertical distance D of at least three inches because it is carried and aspirated up the slope of the channel by the high velocity air in discreet slugs or droplets **42** which are propogated in inlet portion **34.**

The pumping of the collected water into the rotating fan wheel for discharge can help to break up the water into fine droplets as it passes through the blower wheel. As previously disclosed and again referring to FIG. **1,** air is discharged from the blower outlet conduits towards the end walls **4** and **5** of housing **3** to be passed through side discharge grills **7** and **8.** With the air being turned approximately 90° at the blower outlet conduit, as illustrated, only small droplets in the air will be able to pass through the side discharge grills **7** and **8,** because any large droplets still remaining will be both centrifuged and separated out against side walls **4** and **5** to eventually drop back into pan **10** for re-collection and discharge. This feature insures that only small droplets will be discharged and that no large droplets will be blown outside. The compressor **12** is disposed at a position within housing **3** such that air being discharged from one of the blower outlet conduits not only centrifuges out large water droplets against the compressor and the housing side wall, but simultaneously passes over and cools the compressor.

The water disposal means of the present invention may continuously pump water from the bottom pan to the blower fan wheel inlet to thereby greatly increase the maximum water disposal capacity of the system. By providing a low speed, double-exit centrifugal blower in combination with the disclosed water disposal means which can be of low cost and have no moving parts, both the condensed and the collected rain water may be discharged efficiently and with little noise and minimum power input requirements. Other modifications will occur to those skilled in the art.

I claim:

1. An air conditioner condenser section housing having end walls and a rear grill wall with a central air intake grill portion and side discharge grill portions, a housing bottom pan, said bottom pan being disposed at a first elevation for collecting condensed water, a compressor within said housing, a condenser coil within said housing, a rotating centrifugal fan wheel having an inlet disposed at a second elevation, a fan scroll having at least two outlets for discharging air in a direction towards the end walls of the housing to be thereby turned to pass through the side discharge grill portions of said housing, and condensate water disposal means whereby water which has collected in said housing bottom pan may be delivered to said rotating fan wheel for atomization and discharge with the air pumped by said fan and turned through said discharge grills.

2. The invention of claim **1,** wherein said condensate disposal arrangement includes a sloping channel, said channel extending from said housing pan to the inlet of said rotating fan wheel and from said first to said second elevation.

3. The invention of claim **2,** wherein an inlet portion of said condensate disposal channel is adapted to receive the collected condensed water, said water receiving inlet portion being disposed adjacent said first elevation and aligned substantially parallel to the bottom pan of said air conditioner housing.

4. The invention of claim **3,** wherein the position of the discharge end of said channel with respect to the inlet of said fan wheel is effective to cause at least a ½ inch water pressure differential of air pressure between ends of said sloping channel, thereby causing a movement of air towards the fan inlet above said collected condensate water within the channel.

5. The invention of claim **4,** wherein the height of said parallel water receiving channel portion is greater than the level of condensed water to be received therein, said moving air above said collected condensate water producing an aspiration effect therein, and said aspiration effect adapted to pump said condensed water from said first to said second elevation.

6. The invention of claim **1** wherein the compressor is positioned within said housing at a position whereby the air that is to be discharged from one of said fan scroll outlets passes over and cools said compressor.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,763,660 Dated October 9, 1973

Inventor(s) Ivan T. Burney

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet the illustrated Figure and Figures 1, 2, 3 and 4, should appear as shown on the attached sheets.

Signed and sealed this 7th day of January 1975.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

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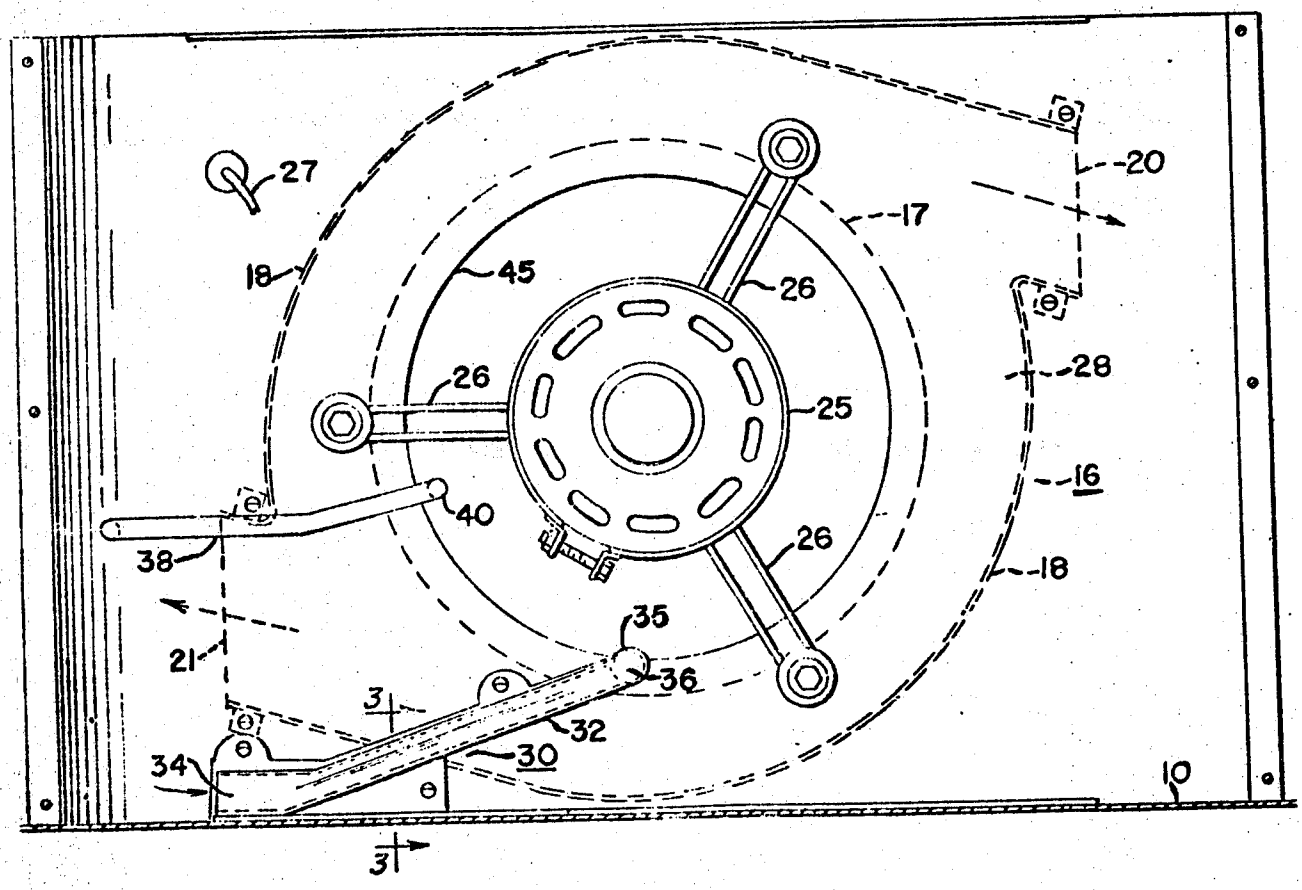
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UNITED STATES PATENT OFFICE

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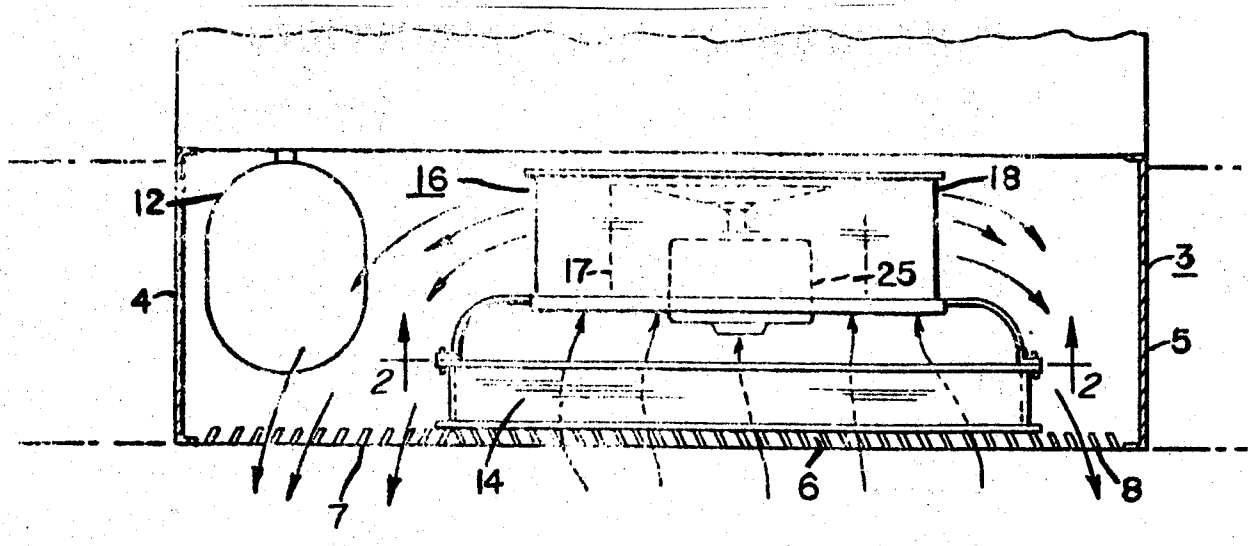

FIG. 1

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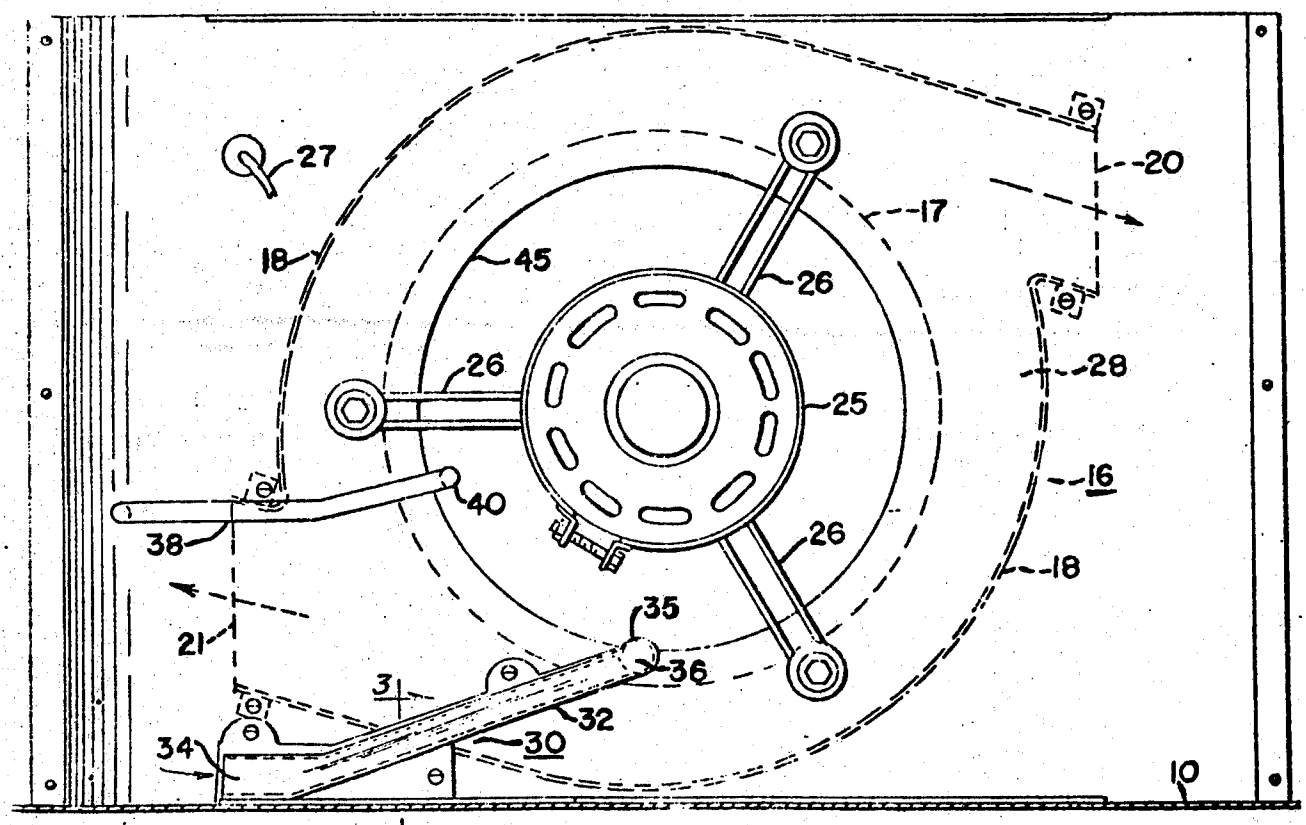

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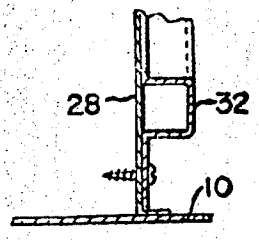

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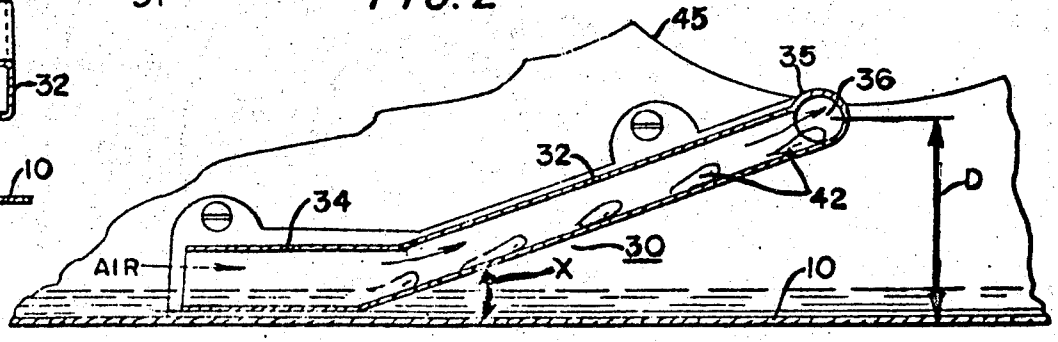

FIG. 4