

[54]	DIFFUSION PUMP ASSEMBLY	3,137,551	6/1964	Mark	62/55.5
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55/DIG. 15, 269; 417/152, 153

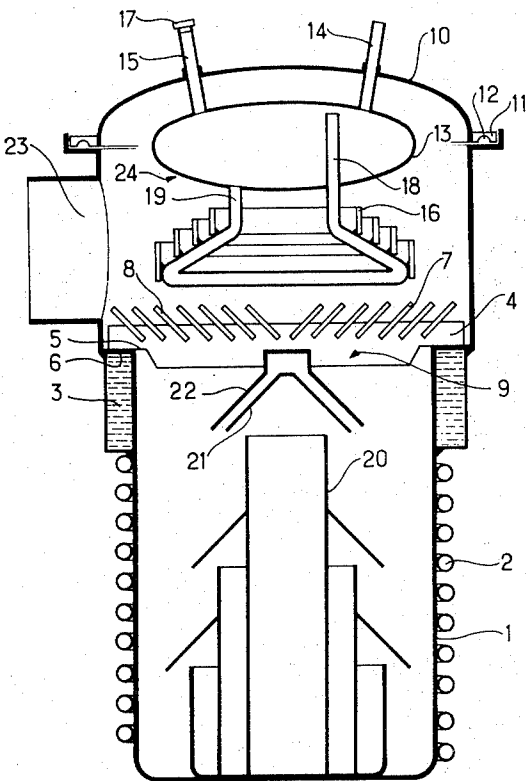
[56] References Cited
UNITED STATES PATENTS

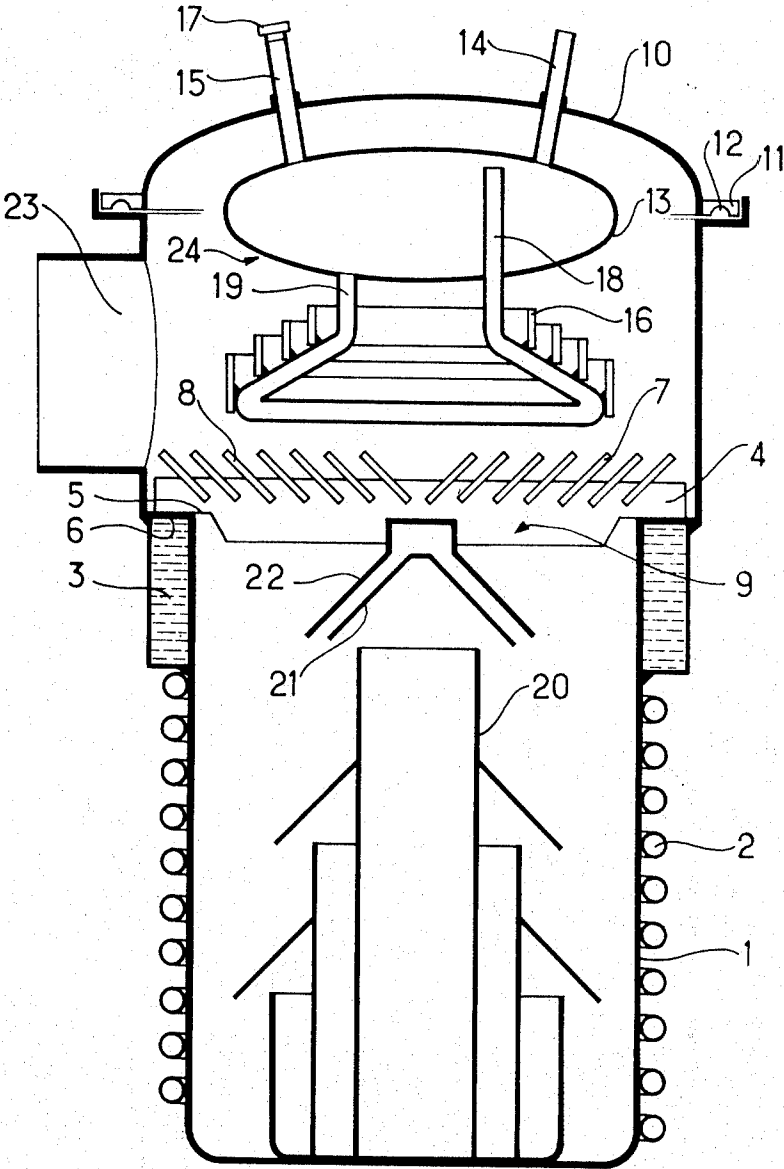
3,081,068 3/1963 Millerson 62/55.5

[57] **ABSTRACT**

Pumping assembly in which the condensation elements for preventing oil from entering the enclosure to be emptied consists of a baffle cooled by conduction coming from a cold source and by a liquid nitrogen trap in communication with a liquid nitrogen receptacle. The cold source of the baffle is incorporated in the wall of the pump body; the liquid nitrogen receptacle is fixed under the pump cover, so that the assembly is easy to dismantle and to clean.

8 Claims, 1 Drawing Figure





DIFFUSION PUMP ASSEMBLY

The object of the invention is a diffusion pump which may easily be dismantled with a view to cleaning the elements constituting the pump.

It is known that diffusion pumps comprise, essentially, above a heater, an oil receptacle above which is installed a diffuser which tends to discharge oil vapor at high speed against the cooled wall forming the pump body and surrounding the oil receptacle. These vapors are condensed on that wall before being made to enter the receptacle again.

To avoid the ingress of particles of oil vapor in the space to be emptied, it is current practice to arrange directly above the pump a condensation assembly formed by a baffle, cooled by water, above which is installed a liquid nitrogen trap.

The man in the art also knows that the cooled wall surrounding the oil receptacle, subjected to ceaseless bombardment with molecules drawn along by the vapor flux, must be very carefully cleaned fairly regularly, as must also the baffle and the liquid nitrogen trap. The result is that it is necessary to proceed with fairly frequent and fairly long dismantling which seriously affects the operation budget of the equipment provided with the diffusion pump.

The present invention is directed to a pumping assembly in which the various superimposed components are very easy to dismantle so that the inner wall of the pump body is then easily accessible and the cleaning thereof becomes very easy. Moreover, the various components of the pump, having been removed from inside the pump body, may, in their turn, be cleaned very minutely.

The object of the invention is therefore a diffusion pump assembly which is easy to dismantle, comprising, in a cylindrical pump body 1, closed by its cover 10 locked in the closed position by a rim 11 by suitable locking devices, such as clamps, an oil receptacle 20 arranged in the bottom of the pump body and above which is installed its diffuser 21, as well as two superimposed condensation elements placed at the level of the discharge pipe 23, constituted by a baffle 9 provided with fins 7, by a protection cap 22 and by a liquid nitrogen trap 24 provided with fins 16, characterized in that the connection established between the pump body 1 and the components of the pump enable the extraction of the said components by a simple linear upward movement, after the unlocking of the rim 11.

The result is that it is sufficient to raise such a condensation element to separate it from the cold source without its being necessary to dismantle any freezing liquid tubing. It will be seen that in these conditions, it is sufficient to subject the components contained in the pump body to a simple linear upward movement to dismantle the pump completely. A cylindrical internally smooth component forming the inner portion of the pump body then remains. Such a component is very easy to clean.

It may easily be conceived that the producing of a thermal contact having very slight thermal impedance between the cold source and the base of the rib requires certain precautions. The surfaces in contact are perfectly dressed. Moreover, the contact may be improved by the pressure of a spring if the forces of gravity prove to be insufficient.

In conventional types of pumps, in which the baffle is cooled by a flow of water, it is known that a troublesome incident may occur when the flow of water is stopped for an unforeseen reason. In the upper part of the pump body, the action of the liquid nitrogen trap becomes preponderant, and the water of the baffle may freeze. The result thereof is tearing in the water tubing which may lead to irreparable damage, more particularly in the diffusion pump, by mixing oil with water. Such incidents are avoided when the cooling of the baffle is effected by thermal conduction. The cold source of the baffle is, to great advantage, incorporated in the wall of the pump body so that it does not project after the dismantling of the pump.

An analogous device may be implemented for producing the liquid nitrogen trap, the surface of the bases of the ribs in contact with the surface of the cold source is then much greater and the cross section of the conductive ribs is appreciably greater.

In certain embodiments it is preferred to connect the liquid nitrogen trap circuit with the pump cover, this enabling, as previously, the connection of the nitrogen tubing to be kept outside the pump. The action of the trap is then made more energetic without giving rise to any difficulty in dismantling. Indeed, when the cover is removed, the trap and the liquid nitrogen tank which are connected to it are removed simultaneously.

The invention will be better understood on referring to the single FIGURE, showing diagrammatically a sectional view of an example of an embodiment of a diffusion pump according to the invention, in which the baffle is cooled by conduction, whereas the liquid nitrogen trap is connected to the cover.

The single FIGURE shows the pump body 1 surrounded by a water cooling coil 2, above which is installed a tank 3 forming the cold source of the baffle 9. The latter itself is constituted by a set of ribs such as 4 to which are thermally and mechanically connected the fins such as 7 and 8 forming an opaque screen. These ribs 4 are provided, at both ends, with a dressed base 5 which rests against a component having a surface 6 which is also perfectly plane, on the upper part of the tank 3.

The oil receptacle 20 above which its diffuser 21 is installed is separated from the baffle by a cap 22 mechanically and thermally connected to the baffle 9. The baffle is arranged substantially at the level of the tubing 23 making the pump communicate with the space to be emptied through a valve (not shown).

The cover 10 closing the pumping column is placed above the baffle. That cover is connected to the pump body 1 by a rim 11 which has an O ring (not shown) arranged in an annular groove 12.

In the embodiment described, the liquid nitrogen trap 24 is supported by the cover 10. The liquid nitrogen tank 13 forming the cold source of the liquid nitrogen is extended downwards by tubing such as 18 and 19 supporting the circular fins such as 16 in close thermal connection with the said tubing.

As its upper part, the tank is extended by two tubes: a supply tube 15 closed by a stopper 17 and a discharge tube 14.

It will be seen that the connection means between the various components make the dismantling of the pump very easy; when the cover 10 is removed after having released the rim 11, the condensation device constituted by the liquid nitrogen trap which is mechanically

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connected to the cover is removed simultaneously. It is then sufficient to remove the second condensation device formed by the baffle. That dismantling is also very easy, since the baffle rests simply on its cooling tank 3, the thermal connection having been made very good by the contact between the dressed base 5 and the perfectly plane surface 6 of the tank 3. No connection by screw or rivet is established between the baffle and the pump body.

By lifting the baffle, the cap 22 which protects the baffle 9 from the direct discharge of the diffuser 21, but which is connected to the ribs 4 of the baffle 9 is removed simultaneously. The diffuser 21 is then accessible. It is also possible to remove the diffuser 21 and the oil receptacle 20. The pump body 1 is then completely released.

It will be seen that in the device according to the invention, no element of the condensation components is screwed or riveted to the pump body.

Although the device which has just been described appears to be one affording the most advantages for implementing the invention, it will be understood that various modifications may be made thereto without going beyond the scope of the latter, more particularly by incorporating the nitrogen tank in the upper part of the wall of the pump body and by then cooling the fins of the liquid nitrogen trap by thermal conduction of the cross members thermally connected to the latter and to the tank.

What is claimed is:

1. A diffusion pump assembly comprising a generally cylindrical body having one open end closed by a cover, a discharge pipe communicating with the interior of said pump body through the side thereof, an oil receptacle within said pump body supported on the bottom thereof, a diffuser supported above said oil receptacle, first and second superimposed condensation elements disposed within said pump body substantially at the level of said discharge pipe, said first condensation element being supported on an annular inset portion of said pump body and including a baffle provided with fins and a protection cap disposed above said diffuser, said second condensation element being supported by said cover above said first condensation element and including a liquid nitrogen trap provided with fins, whereby the disposition and support of the components of the pump assembly enable the extraction of said components by a simple linear upward movement.

2. A diffusion pump assembly as defined in claim 1 further including a condensation tank associated with said first condensation element and disposed around

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said pump body against the outer surface of said annular inset portion thereof.

3. A diffusion pump assembly as defined in claim 2 wherein said condensation tank is fast with the pump body, and in that the thermal connection between the baffle of said first condensation element and said tank is ensured by simple gravity between accurately dressed contacting surfaces of the baffle and the annular inset portion of the pump body contacting said condensation tank, so that the said first condensation element may be dismantled by a simple linear upward movement.

4. A diffusion pump assembly as defined in claim 3, wherein said fins of said second condensation element are mechanically and thermally connected to a liquid nitrogen tank which is itself mechanically connected to said cover, so that on lifting the cover, the said condensation element is drawn out of said pump body with a linear upward movement.

5. A diffusion pump assembly as defined in claim 4 wherein said pump body is constituted by two cylindrical components having a common axis, placed one above the other and being connected at the level of the discharge duct by a horizontal circular shoulder forming said annular inset portion which also constitutes the upper part of said condensation tank.

6. A diffusion pump assembly as defined in claim 5 wherein the fins of said first and second condensation elements are mechanically and thermally connected to respective sets of ribs made of a metal which is a very good heat conductor, and in that the fins are kept in close thermal contact with the corresponding surface of the condensation tank and the nitrogen tank, respectively.

7. A diffusion pump assembly as defined in claim 2 wherein said pump body is constituted by two cylindrical components having a common axis, placed one above the other and being connected at the level of the discharge duct by a horizontal circular shoulder forming said annular inset portion which also constitutes the upper part of said condensation tank.

8. A diffusion pump assembly as defined in claim 4 wherein the fins of said first and second condensation elements are mechanically and thermally connected to respective sets of ribs made of a metal which is a very good heat conductor, and in that the fins are kept in close thermal contact with the corresponding surface of the condensation tank and the nitrogen tank, respectively.

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