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LIQUID DISTRIBUTOR FOR GAS AND LIQUID CONTACT APPARATUS

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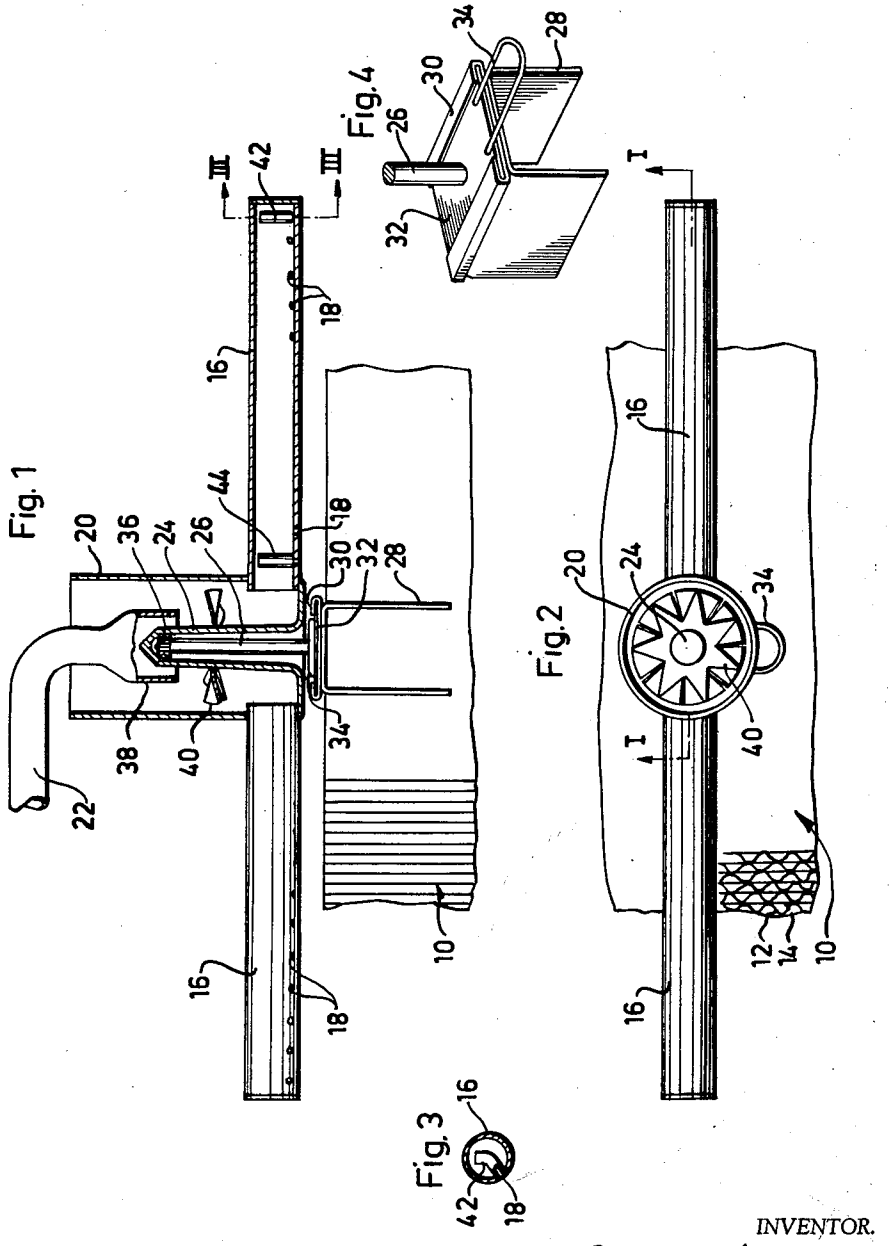

INVENTOR.
George W. Meek
BY
Eric G. Swenson
Attorney

United States Patent Office

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LIQUID DISTRIBUTOR FOR GAS AND LIQUID CONTACT APPARATUS

George W. Meek, Pelham, N.Y., assignor to Lizenzia A.G., Zug, Switzerland, a Swiss corporation

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The present invention relates to liquid-distributing means for gas and liquid contact apparatus and particularly to the type in which a liquid spreader in the form of a sprayer or distributor is rotative on a stationary axle, and which is rotated by the jet pressure of the liquid leaving the jet openings in the spreader.

In the apparatus of the present invention, this jet pressure is determined by the liquid level in a container which is part of the spreader. The present apparatus is primarily useful in connection with a cooling tower in which the water is cooled by means of an air stream, but it is not limited to use in connection therewith.

Below the spreader or distributor, a contact body is arranged, said body being provided with a plurality of channels or flutes in which the water and air are brought into direct contact with one another, preferably in countercurrent relationship. The contact body or packing is preferably of the type shown in U.S. Patent No. 2,809,818, dated October 15, 1957, according to which it is composed of a series of thin layers of water-absorbent material, preferably paper or the like, having substantial wet strength.

One of the objects of the present invention is to provide a uniform distribution of the liquid over the entire frontal area of the contact body or packing even when the supply of liquid fluctuates considerably. This object is principally obtained by the fact that a bladed wheel of paddle-shape is mounted in the liquid container, which wheel is so arranged that when the supply of liquid to the container is reduced, the wheel will be actuated by liquid flowing into the container and will thereby transfer the energy and motion of the liquid into a rotative movement affecting the rotation of the spreader or distributor. In the event that the supplied liquid should be reduced for one reason or another, the level in the container will drop whereby the reaction force of the liquid jet will be weaker. According to the invention, the speed of the gravitational descent of the liquid into the container will then be utilized so that added momentum will be obtained to rotate the spreader.

Another object of the invention is to provide venting means for the spreader, and which comprises an arm extending from a hub and provided with a series of spray openings, arranged so that the spreader will have an improved motion while at the same time the driving force is being utilized in the most advantageous manner.

With these and other objects to be hereinafter set forth in view, I have devised the arrangement of parts to be described and more particularly pointed out in the claims appended hereto.

In the accompanying drawing, in which an illustrative embodiment of the invention is disclosed,

FIG. 1 shows a spreader or distributor for a cooling tower and made according to the invention, as seen from the side and partially in vertical section along the line I—I of FIG. 2, looking in the direction of the arrows;

FIG. 2 is a top plan view of the improved spreader;

FIG. 3 is a sectional view, taken substantially on the line III—III of FIG. 1, looking in the direction of the arrows, and

FIG. 4 is a perspective view of a detail.

Referring to the drawing, the reference numeral 10 indicates a contact body or packing which may be composed of alternating plane and corrugated layers or sheets 12 and 14 in accordance with the aforementioned Patent No. 2,809,818. The layers or sheets form a large number of channels or flutes through which the water is distributed by means of a water spreader in the form of a rotative sprayer or distributor arranged above the flutes. This spreader is provided with a plurality of cylindrical, hollow arms 16, each of which is provided with a row of spirally-arranged spray openings 18. The spray openings are directed downwardly at an angle to a horizontal plane and are reduced in size with the increasing radius. The arms 16 are supported by and connected to a receptacle or container 20 which is open at the top and closed at the bottom and a water-supply conduit 22 terminates in the container 20.

Centrally positioned in the cylindrical container 20 is a vertically disposed sleeve 24 which is closed at the top and has its lower end fixed at the bottom of the container. The sleeve 24 extends centrally upwardly within the container, with gradually reducing diameter toward its top.

In the embodiment shown, a post 26 is carried by the body or contact member 10, for which purpose a U-shaped member or plate 28 has its legs inserted into the upper end of the packing or contact member 10. At its top, the member 28 is provided with inturned flanges 30 which engage with the edges of a plate 32 to which the post 26 is rigidly connected. The plate 32 may be provided with a loop 34 by means of which it may be slidably removed from between the flanges 30.

In the upper portion of the sleeve 24 is provided a ball bearing 36 on which the post 26 is mounted. This bearing supports the spreader radially and carries the weight of the same.

The water which is to be cooled is supplied through the conduit 22 which, if it is positioned over the closed upper end of the sleeve 24, can have a widened or flared lower end 38. On the sleeve 24 is mounted a paddle-shaped or bladed wheel 40, which in its simplest form may consist of an annular plate inserted upon or fixedly mounted on the sleeve 24, and which is slit and then bent to form angular wings or blades which are affected by the liquid flowing from the end of the conduit 22 by the utilization of the energy of motion of the liquid so supplied.

In the container 20 there is a water column of such height that when the liquid streams out through the spreader openings 18 a reaction force is created which is sufficient to rotate the spreader. In the event the liquid level should drop, the reaction force would drop accordingly and thereby the rotative speed of the arms 16 might lower to an extent that an even distribution of the liquid in the flutes of the packing 10 would no longer take place. In such case, the wheel 40 would become exposed above the level of the water in the container, and the gravitational flow of the stream entering the container from conduit 22 would contact the wheel 40 and cause a turning movement thereof, and which turning movement would be added to that produced by the reaction force so that the spreader, even in such an event as above described, would have a uniform rotation.

Another feature of the invention resides in the venting nozzle 42 arranged in the outer portions of the arms 16. This nozzle terminates above the sprayer openings 18 so that any air pocket created in the outer end portions of the arms will be evacuated. The nozzle or conduit 42 terminates in a sprayer opening 18 whereby the continuous liquid flow through the nozzle is utilized in a most advantageous manner for the rotation of

the spreader. A nozzle 44 having a similar function may be arranged in the arms 16 near the hub thereof where an air cushion is created by some sort of contraction.

Having thus described a single embodiment of the invention, it is obvious that the same is not to be restricted thereto, but is broad enough to cover all structures coming within the scope of the annexed claims.

What I claim is:

1. In a distributor or liquid spreader, a hub from which at least one hollow radial arm extends, said arm being provided with a plurality of jet outlets, a tube connected to one of the outlets and located within said arm, one end of the tube being in communication with atmosphere for the purpose of removing trapped air from the arm.

2. The structure of claim 1 wherein said hub includes a second hollow arm similar to and extending substantially diametrically from the first mentioned radial arm.

3. In a distributor as provided in claim 1, wherein the tube is located in the outer end portion of the arm.

4. In a distributor as provided for in claim 1, wherein the tube is located adjacent to the point of connection of the arm to the hub.

5. A contact apparatus for gas and liquid for a cooling tower or the like comprising, a rotative liquid distributor driven by the reaction force of liquid projected through it, a rotative container associated with the distributor and into which a liquid flow is had for spraying out of the distributor, a bladed wheel located within and surrounded by the rotatable container at a distance above the bottom of the container and secured to the distributor at a point above the same, said bladed wheel being located in the path of liquid entering from the top of the container and so arranged that when the water level in the container reaches a point below the bladed wheel, the wheel will be exposed to the flow of liquid entering the container so that the energy and motion of such flow is transferred into turning energy affecting the distributor.

6. An apparatus according to claim 5, wherein the bladed wheel is mounted at such a height in the rotative container that it will become effective only when the liquid level in the container falls below normal by a reduction of the liquid supply.

7. A contact apparatus for gas and liquid for a cooling tower and the like comprising, a vertical support in the form of a post, a liquid distributor including a vertical sleeve rotatively supported on the post, a bladed member encircling the sleeve and secured thereto, a rotative container extending around the sleeve and around the bladed member, radial spraying arms extending from the container, the container having a closed bottom and an open top, the bladed member being positioned above the closed bottom, a liquid conduit leading into the container through the open top thereof and above the bladed member and having an end surrounding and extending over the top of the sleeve, the bladed member being so positioned that when the liquid contents of the container fall below the bladed member, a downward liquid flow from the end of the conduit will contact the bladed member and rotate the same and cause it to apply rotative force to the distributor.

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