

[54] **DISCHARGING NOZZLE ASSEMBLY FOR PRODUCING EQUALIZED DISTRIBUTION OF PRESSURIZED FLUID IN AN ELONGATED DRYING CHAMBER**

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[51] Int. Cl.....**D21f 5/18**

[58] Field of Search162/290, 308, 375, 376; 165/174, 161; 34/155, 229; 137/590, 592

[57] **ABSTRACT**

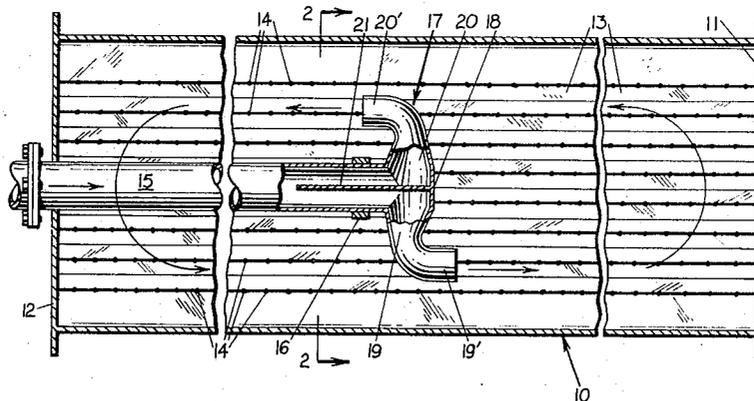
A pipe for delivering steam under pressure to the longitudinal center of the elongated steam chamber terminates in a discharging nozzle assembly comprising two identical but oppositely positioned nozzles located in a plane parallel to the longitudinal center line of the chamber and discharging in opposite directions respectively. A baffle or divider plate, extending along the axial line in the end of the pipe and at the entrance to the nozzles and extending perpendicular to the plane of the nozzles, equalizes the flow through the nozzles, causing an even circulation throughout the length of the chamber.

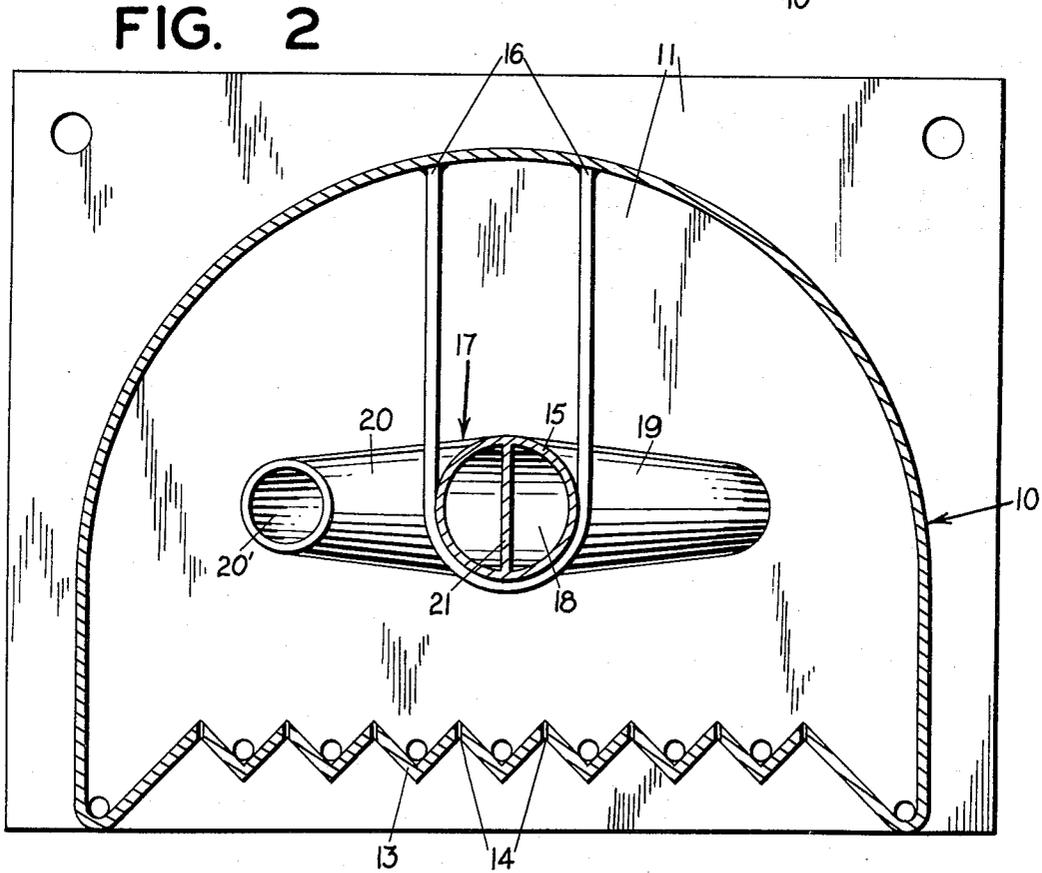
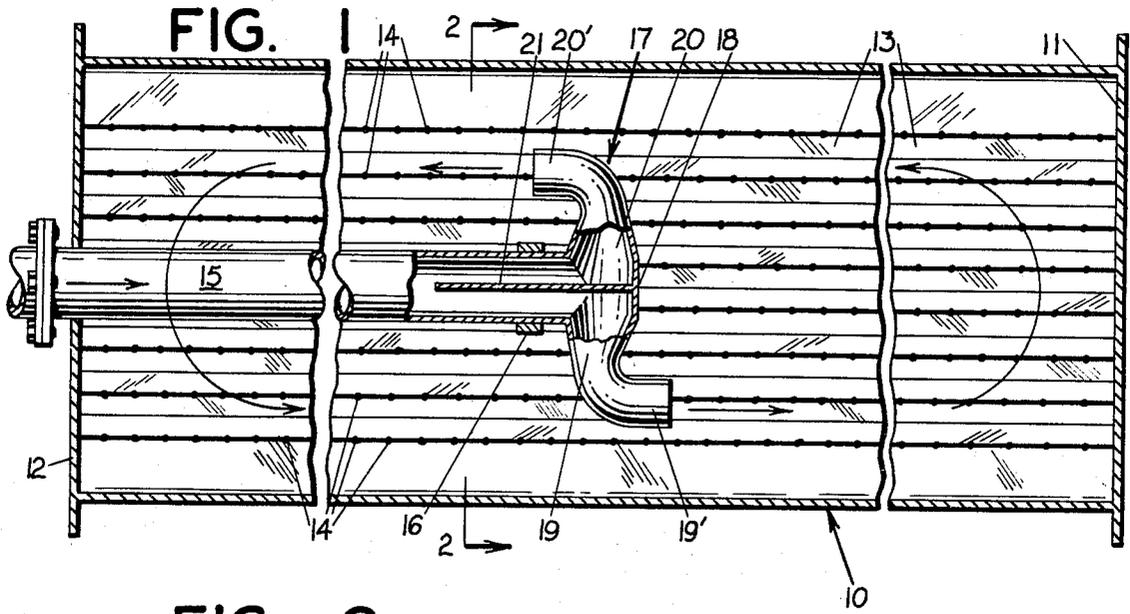
[56] **References Cited**

2 Claims, 2 Drawing Figures

UNITED STATES PATENTS

2,838,982 6/1958 Dupasquier.....162/290





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DISCHARGING NOZZLE ASSEMBLY FOR PRODUCING EQUALIZED DISTRIBUTION OF PRESSURIZED FLUID IN AN ELONGATED DRYING CHAMBER

BACKGROUND OF THE INVENTION

Several types of nozzles for disbursing fluids and spraying liquids over a circular area are well known. The present invention, however, is concerned with the equalized disbursing or circulation of a fluid, particularly steam, under pressure in an elongated chamber, more specifically in a steam chamber extending transversely over a pulp mat in a paper-making machine for the purpose of discharging drying steam down on the pulp through orifices in the bottom of the steam chamber. In such case it is important to have the steam circulated and distributed equally throughout the interior of the chamber. Since the chambers for applying steam on a pulp mat in paper-making machines may have a length as great as 30 feet or more, it has not been possible to employ any of the various known types of nozzles on the end of a single pipe to produce equalized circulation and distribution of steam through the chamber. A plurality of steam inlets along the chamber and steam inlets at opposite ends of the chamber have also been used, but, in addition to involving more expense, have not been entirely satisfactory either, due to the fact that the paths of the steam as delivered through the plurality of inlets or the nozzles will necessarily have some convergence or interference, with the result that the circulation of the steam throughout the elongated chamber will not be even and equal.

The object of the present invention is to provide a simple and novel nozzle assembly which, when mounted at the longitudinal center of the elongated chamber, at the end of a single pipe, will produce the desired even distribution of the steam.

SUMMARY OF THE INVENTION

A pipe supplying steam under pressure from a suitable source extends into the chamber and terminates in a novel nozzle assembly at the approximate longitudinal center of the chamber. The bottom of the chamber, which extends transversely over the pulp mat at a short distance above the pulp mat, is provided with orifices through which the steam from the chamber is discharged down on the pulp mat for the purpose of heating the pulp and hastening the withdrawal of water and moisture from the pulp mat in the well-known manner.

The nozzle assembly comprises a pair of identical nozzles mounted on the end of the delivery pipe, extending first outwardly in opposite lateral directions and then each nozzle making a right angle bend so that the axes of the discharging mouths of the nozzles will be substantially parallel to each other, but with such mouths extending in opposite directions. The two nozzles are located in the same, preferably horizontal, plane and so arranged that they discharge in opposite directions substantially parallel to the longitudinal axis of the chamber.

In order to equalize the discharge through the two nozzles, and particularly to prevent vacuum suction being set up in through one nozzle with the discharge from the delivery pipe occurring mainly through the other nozzle, a divider plate or baffle is placed in the end of the pipe and in the intake portion of the nozzle, this divider plate extending along the axial line of the pipe end and of the nozzle intake and extending in a plane perpendicular to the plane of the two nozzles.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a foreshortened horizontal section of a well-known type of elongated steam chamber employed for discharging steam down on a pulp mat, with the improved nozzle assembly shown located midway between the end walls of the chamber; and

FIG. 2 is a transverse sectional elevation taken through the steam chamber on the line indicated at 2—2 in FIG. 1, drawn to a larger scale.

The steam chamber, indicated as a whole by the reference 10, comprises a more or less semi-cylindrical shell having a pair of end walls 11 and 12 and a bottom wall 13. The bottom wall is formed with a series of ridges and valleys extending longitudinally of the chamber, and thus transversely with respect to the pulp mat (not shown) which passes beneath the chamber. Steam from the chamber is discharged down on the pulp mat from a series of orifices 14 positioned along the ridges in the bottom wall. This general type of steam chamber employed for discharging steam on a traveling pulp mat in order to heat the pulp and facilitate the withdrawal of water and moisture from the pulp mat is well known in the paper industry. Such a steam chamber is described in U.S. Pat. No. 2,838,982, issued under date of June 17, 1958 entitled "Apparatus for Applying Dried Steam to a Pulp Mat to Evaporate Water Therefrom," and need not be described further here. An important feature of this particular type of steam chamber is the fact that any water particles in the steam delivered into the chamber will collect in the valleys in the bottom of the chamber and be drawn off so that the steam discharged down on the pulp mat will be relatively dry, the desirability of this being readily understood.

It is important, however, that the steam delivered into the elongated chamber 10 be circulated freely and distributed evenly throughout the entire chamber so that there will be a desired even distribution of steam down on the pulp mat at all times. As previously indicated, due to the fact that these steam chambers, when used for wide pulp mats, have considerable length, there is a problem involved in having the delivered steam circulated and distributed evenly.

A pipe 15, delivering steam under pressure from a suitable source (not shown), extends into the chamber 10, preferably through one of the end walls of the chamber such as the end wall 12 as shown in FIG. 1. The pipe 15 is supported within the chamber by suitable means, for example by a plurality of hangers, one of which is shown at 16 in FIG. 2. The nozzle assembly 17 is secured on the end of the pipe 15 by welding, or by threaded connection therewith, and is positioned at the longitudinal center of the chamber and thus approximately equi-distance from the two end walls 11 and 12.

The nozzle assembly 17 consists of a central head portion 18, corresponding in interior cross section to the end of the pipe 15, and a pair of nozzles 19 and 20 extending from opposite sides respectively of the central head portion. The two nozzles lie preferably in the same horizontal plane, are the same size, and are similar in that each nozzle makes a substantially right angle bend and terminates in a discharging mouth 19' or 20', the axis of which mouth is substantially parallel to the longitudinal axis of the chamber. The discharging mouths 19' and 20' are the same size but discharge in opposite directions. Thus the direction of discharge from the mouth 19' of the nozzle 19 (as shown in FIG. 1) is towards the end wall 11, and the direction of the discharge from the other nozzle mouth 20' is towards the end wall 12.

In the arrangement illustrated in the drawings, in which the delivery pipe 15 extends along horizontally parallel to the longitudinal center line of the chamber, the steam discharging through the nozzle 19 first momentarily follows an off-set path and then continues on in the same direction as previously and out through the nozzle mouth 19'. In the case of the other nozzle 20, however, the direction of flow of the stem is completely reversed and the flow thus encounters more resistance in its course to the nozzle mouth 20'. As a result there would be a tendency not only for the discharge through the nozzle 19 to increase at the expense of the discharge through the nozzle 20, but even for a vacuum suction to develop in the nozzle 20, a condition which has actually been found to happen, preventing equalized distribution and even circulation throughout the full length of the chamber. To prevent this condition, a divider plate or baffle 21 is secured in the end of the pipe and in the head portion of the nozzle assembly extending along the axis of the same and also extending in a plane perpendicular to the plane of the two nozzles. This divider plate, by diametrically

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dividing the flow through the end of the pipe and into the head of the nozzle assembly, forces the pressurized flow through the two nozzles to be substantially equalized and effectively prevents any vacuum suction developing in the reverse flow nozzle.

Thus, as indicated by the arrows in FIG. 1, the pressurized flow from the single supply pipe delivered at the center of an elongated chamber, is distributed evenly throughout the length of the chamber.

I claim:

1. A nozzle assembly for producing an equalized circulation of fluid throughout the interior of an elongated chamber from a delivery pipe leading into the longitudinal center of the chamber and delivering fluid under pressure, said assembly comprising a nozzle head, a connection between the end of the delivery pipe and said nozzle head, a pair of nozzles extending laterally from opposite sides of said head and extending in the same plane, each of said nozzles making a substantially right angle bend and terminating in a discharging mouth having an axis substantially parallel to the longitudinal axis of the chamber, said nozzles being similar but with said mouths discharging in opposite directions respectively, and a divider plate extending along in said delivery pipe end and in said nozzle head dividing said nozzle head equally in half and extend-

ing in a plane perpendicular to the plane of said nozzles, whereby to equalize the discharge through said nozzles and the resulting fluid circulation in the respective areas of the chamber.

2. The combination of an elongated steam chamber extending transversely over a traveling pulp mat in a paper-making machine and having a horizontal bottom wall with orifices arranged to discharge steam down on the pulp mat, a steam delivery pipe delivering steam under pressure into said chamber, said pipe terminating at the approximate longitudinal center of said chamber, a nozzle assembly connected to the end of said pipe, said assembly consisting of a nozzle head portion and a pair of similar nozzles leading from the sides of said head portion respectively and extending in the same horizontal plane, each of said nozzles terminating in a discharging mouth having its axis substantially parallel to the longitudinal center line of said chamber, said discharging mouths being of equal size but discharging in opposite directions respectively, and a divider plate in said end of said pipe end in said nozzle head, said divider plate extending in a vertical plane and dividing the delivery of steam from said pipe equally between said nozzles.

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