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SPRAYING APPARATUS

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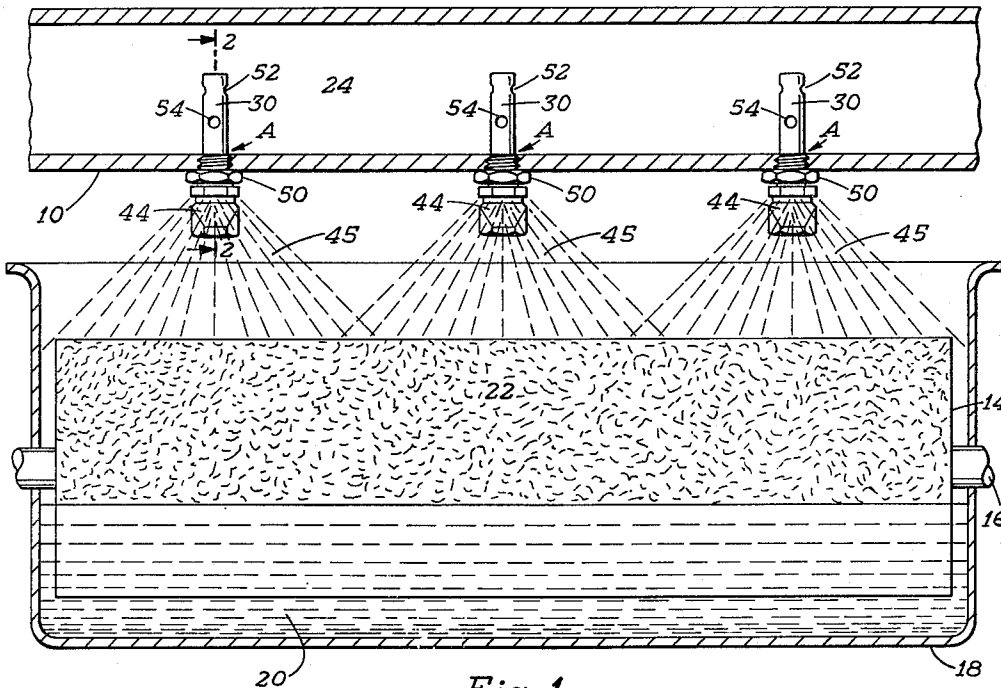


Fig 1

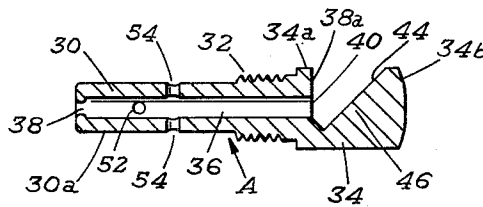


Fig 2

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## SPRAYING APPARATUS

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1 Claim. (Cl. 239-521)

This invention relates to a non-clogging, low pressure spraying apparatus particularly adapted for use in paper making machines.

During the manufacture of certain kinds of paper it is necessary to spray a pulp-containing liquid under low pressure onto the material being formed into paper. A serious and difficult problem arises during this spraying operation in that the intake openings in the spray nozzles frequently become clogged by the pulp material in the spraying liquid.

It is an object of this invention to provide a low pressure spraying apparatus for spraying a pulp containing liquid which will not be clogged by the pulp contained in the spraying liquid.

It is also an object to provide a spray nozzle having a cylindrically shaped intake element having a longitudinal passage therethrough extending a substantial distance into the feeder pipe and having a substantially smooth outside surface to prevent pulp particles from clinging thereto and clogging the intake openings.

It is a more specific object of this invention to provide a spraying apparatus having a plurality of spaced apart spray nozzles in which pressure within the intake element is maintained at substantially the same level as the pressure within the pipe feeding the intake element by providing a plurality of openings in the intake element spaced apart from the major intake opening, to permit the spraying liquid and the pulp particles therein to flow into the intake element at a relatively low rate of speed, and thereby prevent the pulp particles in the spraying liquid from clinging to the portion of the intake element surrounding the intake opening.

It is another object to provide a spray nozzle for use in such a paper spraying apparatus in which a plurality of intake openings are provided through the intake element of the spray nozzle so that the nozzle will continue to operate even though a portion of the intake openings become clogged.

These and other objects and advantages of this invention will more fully appear from the following description made in connection with the accompanying drawing wherein like reference characters refer to the same or similar parts throughout the several views, and in which:

FIG. 1 is a view, partly in sections, of a spraying apparatus embodying the present invention shown in operation spraying a revolving drum containing thereon material being formed into paper; and

FIG. 2 is a central vertical sectional view of one of the spray nozzles shown in FIG. 1 taken along the line 2-2.

It is desirable to use the pulp-containing whitewater for spraying purposes in paper making operations for many reasons. In the bleaching of the pulp, for example, it is desirable to reuse the pulp-containing liquid for spray purposes since the proper bleaching materials have been added thereto and unless this liquid were reused for spraying purposes unnecessary waste would be incurred. It is therefore very important in the paper making industry to provide nozzles and other spraying equipment which will not clog when used for spraying pulp-containing whitewater.

In the form of the invention illustrated, FIG. 1 shows a supply or feeder pipe 10 having a plurality of spray nozzles A threadably received therein. Below the pipe 10 a revolving drum 14 is disposed, rotated by a rotary shaft 16 within a vat 18 containing pulp 20 to be treated. The drum 14 is coated with a paper making pulp 22 being

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treated as in the bleaching process necessary to produce most qualities of paper. Spraying liquid 24 carried by the feeder pipe 10 under relatively low pressure, enters the spray nozzles through openings in a nozzle intake element 30 and is sprayed onto the revolving drum 14 through discharge openings in the spray nozzles A.

Each spray nozzle A in the form shown has an intake element or tube 30 which has an externally threaded portion 32 at an intermediate portion thereof and discharge portion 34 at the one end thereof disposed externally of the feeder pipe 10. A longitudinal passage 36 is provided through the spray nozzle A forming a main intake opening 38 at the intake end thereof and a discharge opening 40 at the discharge end thereof. As illustrated the intake opening 38 is of smaller diameter than passage 36.

The discharge portion 34 of the intake element 30 disposed outside of the pipe 10 includes a discharge element 34a as best shown in FIG. 2, which forms a generally smooth surface 38a surrounding the discharge opening 40. A liquid dispersing element 34b is formed at discharge end of nozzle and is spaced outwardly from the discharge opening 40. A generally flat dispersing surface 44 is formed on the dispersing element 34b and is inclined at an obtuse angle from the axis of the longitudinal passage.

All portions of the dispersing surface 44 are disposed a greater distance from the discharge end 38a of the intake element 30 than the diameter of the longitudinal passage 36 in order to positively prevent any clogging of solid materials between the end 38a of the element 30 and the deflecting or dispersing surface 44. The dispersing element 34b includes an intermediate portion 46 against which the liquid passing through the passage 36 and opening 40 first impinges. The dispersing surface 44 is designed to produce a fan type spray 45 as indicated in FIG. 1. The intake end 38 of longitudinal passage 36 is diminished to a size smaller than the diameter of the passage 36 in order to restrict and limit the size of particles permitted to enter said passage. This, of course, prevents clogging of the pulp within the longitudinal passage 36.

The plurality of nozzles A are spaced apart so that the spray from adjacent nozzles falls upon overlapping portions of the drum 14 when the spraying liquid 24 is forced into the feeder pipe 10 under the desired pressure to insure spraying the entire surface of the drum 14.

A plurality of spaced apart threaded openings are provided through the bottom of the feeder pipe 10 in the form shown for receiving the spray nozzles A. A lock washer 50 is threadably screwed downwardly onto the threaded portion 32 of each spray nozzle A. One of the nozzles A is threadably screwed upwardly into each of the openings in the feeder pipe until the nozzles are disposed in the desired position as shown in FIG. 1, with the upper end of the intake element extending upwardly into the interior of the pipe 10. The lock washer 50 is threadably screwed upwardly upon the threaded portion 32 of the nozzle into locking engagement with the outside under surface of the pipe 10 to hold the nozzle in operative position as shown in FIG. 1. Liquid 24 and pulp particles in the pipe enter the intake element 30 through the intake openings which are upwardly spaced from the bottom of the feeder pipe. The upper end 38 of the longitudinal passage opens into the intermediate portion of the pipe and is disposed normal to the normal flow of the spraying liquid 24 therethrough. A pair of lateral intake openings 52 of diameter smaller than the diameter of the longitudinal passage 36 are formed through opposed portions of the intake element in axial alignment and spaced apart from the upper discharge opening 38 in the element 30 disposed parallel to the normal horizontal flow of liquid through the pipe 10. Another pair of opposed openings 54 are formed through

the element 30 intermediate between the upper end 38 of the passage 36 and the lateral openings 52 and disposed normal to the flow of spraying liquid 24. I have found that such disposition of intake openings provides a nozzle which does not become clogged by pulp particles as do the nozzles of conventional construction.

Fluid entering said intake openings renders the pressure within the intake element generally equal to the pressure within the feeder pipe 10 so that pressure on the liquid 24 is not increased in magnitude in entering the element 30. The pulp particles in the liquid 24 therefore do not tend to cling to the edges of the intake openings and so the openings do not become clogged by the pulp particles.

The portion of intake element 30 disposed within the pipe 10 has a smooth outside surface 30a and the openings 52 and 54 are smoothly countersunk to further prevent pulp particles from clinging thereto. When pulp particles have entered the intake element 30 they are discharged downwardly through the longitudinal passage 36 and out of the discharge opening 40 in the spray nozzle without an increase in pressure due to any constriction in the longitudinal passage 36, and so are discharged from the discharge opening 40 under generally the same pressure as that prevailing in the feeder pipe 10.

I have found that the arrangement of the holes 38, 52 and 54 which supply the longitudinal passage 36 are such that said openings do not become plugged even after long periods of use with the soft clinging pulp particles present in whitewater used for such sprays. This is not true of screens or closely perforated sleeves commonly in use for such purposes. It should be noted that the total area of the inlet openings 38, 52 and 54 is greater than the area of the longitudinal passage 36 and that there is a relatively large smooth surface area surrounding each of the openings 38, 52 and 54 to prevent the pulp from clinging thereto and building up around these openings.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportion of parts without departing from the scope of my invention, which generally stated consists in the matters set forth in the appended claim.

What I claim is:

A spray nozzle comprising a feeder pipe having side walls with inner and outer wall surfaces, an elongated intake element mounted through the side wall of said pipe having a longitudinal passage therethrough, said passage having an intake end and a discharge end and being of uniform diameter throughout its length except that its intake end is smaller than said diameter, means on said element for positioning the same within a feeder pipe with the intake end disposed a substantial distance inwardly of the feeder pipe wall and the discharge end disposed outwardly thereof, said intake element having a plurality of cross passages extending therethrough and communicating with and being of a smaller diameter than the longitudinal passage, the outer ends of said cross passages being smoothly counter-sunk and a liquid dispersing element disposed in opposed relation to the discharge end of said longitudinal passage to receive and disperse liquid discharged therefrom.

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