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SPRAY DEVICE

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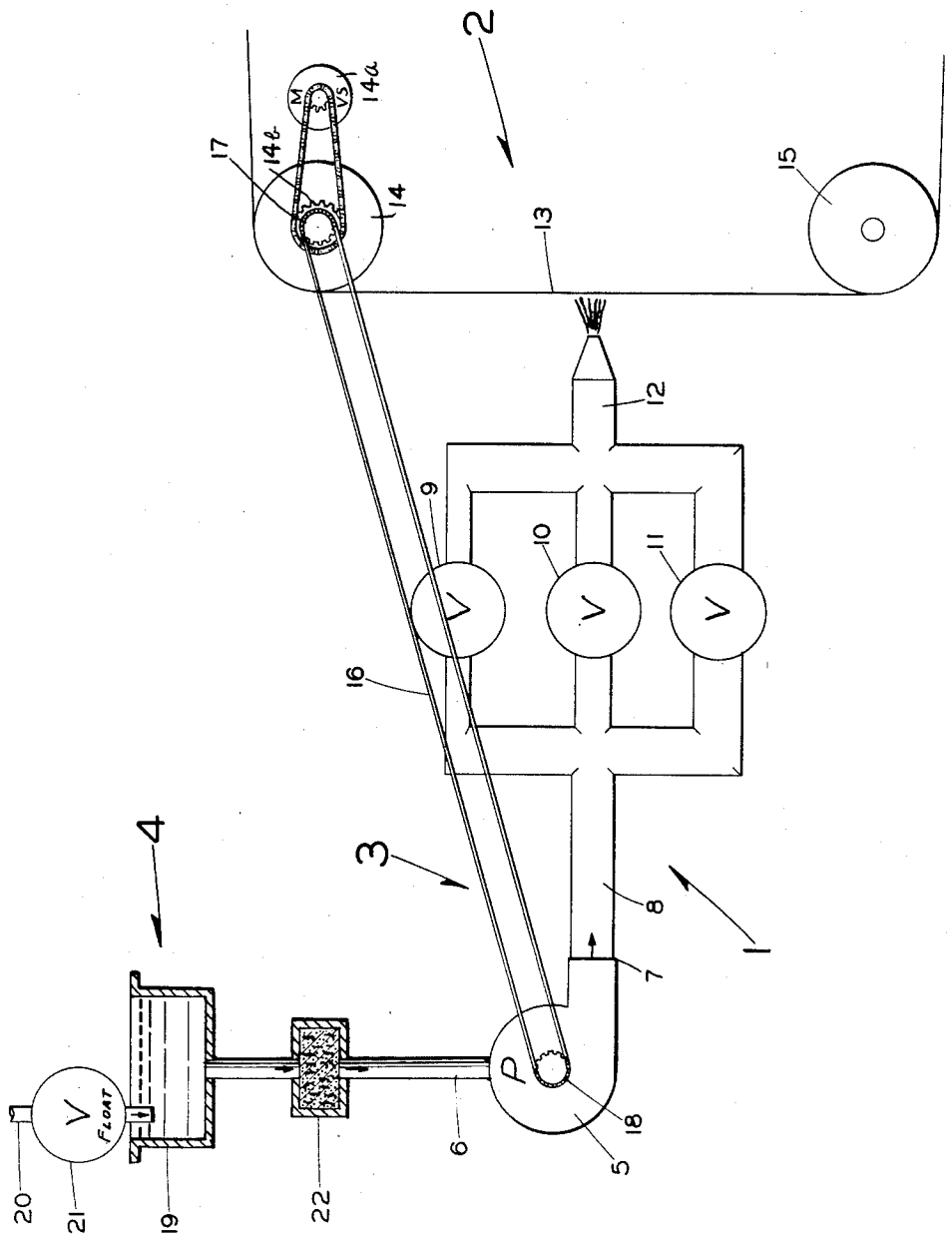

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SPRAY DEVICE

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This invention relates to a spray and more specifically to a device for controlling the volume of fluid delivered by a spray.

In the manufacture of fibrous strips and more particularly in the manufacture of strips of filter paper for cigarette filters, it is desirable to moisten the filter strip during the process of manufacture to facilitate working of the strip. During the particular phase of the process with which we are presently concerned the filter strip passes through a spray. The quantity of water required per unit of time to properly wet the strip varies with the speed of the strip and with the moisture content of the strip immediately before exposure to the spray. In other words, if the initial moisture content of the strip is relatively high or if the strip is moving slowly less water is required, but if the moisture content is relatively low or the speed of the strip is higher more water is required. Since the moisture content of the strip is likely to change from day to day and even during the same day, it is essential to efficient operation that some relatively simple but accurate method be found for controlling the quantity of water delivered by the spray, the proper quantity of water depending on the moisture content of the strip but at the same time constantly changing as the speed of the strip changes.

It is therefore an object of this invention to provide a spray device for a processing machine wherein the volume of water delivered varies automatically with the speed of the machine and wherein the volume of water may be increased or decreased by predetermined increments to compensate for requirements extrinsic the machine itself. Another object of this invention is to provide a fluid metering device which is uniform in the volume of fluid delivered. Another object of this invention is to provide a spray device for a processing machine which will automatically adjust the volume of fluid delivered as the requirements of the machine vary because of changes in the speed of the machine. Still another object of this invention is to provide a spray device in which the volume of fluid delivered may be varied by predetermined increments as the demand varies. Another object of this invention is to provide a metering spray device which is simple and economical to fabricate and maintain. Other objects and advantages will become apparent from the description and the accompanying schematic drawing of the metering spray device.

The aforementioned objects are accomplished by a novel relationship of a constant head reservoir, a pump and a metering flow device installed between the pump and a spray nozzle. In order to insure a constant pressure on the inlet side of the pump a constant head reservoir is provided. A centrifugal pump which when provided with a constant intake head will deliver a constant pressure at any given speed is connected to a volume metering device to control by definite increments the volume of water flowing to the spray nozzle. The speed of the centrifugal pump rotor varies directly as the speed with which a strip to be moistened passes the nozzle.

The coordination between the speed of the pump rotor and the speed of the strip may be provided for by any conventional driving means, for example, by a chain drive in which the speed of a strip feed roller is linked with the pump rotor.

The invention will be better understood from the following detail description and the schematic drawing:

In the drawing the metering spray device is indicated generally by the reference 1, the filter strip and allied feeding mechanism by the reference numeral 2, the drive assembly between the pump rotor and the feed roller by the reference numeral 3 and the reservoir by the reference numeral 4.

The metering spray device 1 comprises a centrifugal pump 5 having an inlet 6 and a discharge end 7. The centrifugal pump delivers a constant pressure at any given speed so long as the intake head remains the same. From the discharge end of the pump the fluid passes through conduit 8 to a group of three valves 9, 10 and 11 arranged in parallel. From these valves the fluid passes to the nozzle 12 from which it is discharged. The valves 9, 10 and 11 and their accompanying conduits are each of different capacity. When subject to the same pressure at the valve inlet, the valve 10 is of such size that in a given time it will pass twice the volume of water as the valve 9; and valve 11 is of such size that it will pass twice the volume of water as the valve 10 or 4 times the volume of water as the valve 9. Any number of such valves may be utilized the only limitation being that each succeeding valve have a capacity twice that of the next largest valve. To facilitate and simplify the description only three valves will be referred to. These valves may be opened and closed independently of each other so that all the valves may be closed, or any selected combination of valves may be open simultaneously. To make the relationship of the capacity of the valves easier to visualize the associated conduits are shown as varying in size, however, this is not necessary since the size of any of the conduits is immaterial so long as they are not too small to handle the maximum volume of fluid to which they may be subjected.

In the filter strip mechanism 2, the filter strip 13 passes over driven rollers 14 and 15 which may, if desired, be coupled together by any conventional means such as a chain drive so that the lineal speed of the surface of each roller is the same. The filter strip mechanism 2 and the driven assembly 3 between the feed roller 14 and the rotor of the centrifugal pump 5 may be driven at varying speeds in any conventional manner as by a variable speed motor 14*a* operatively connected to the driven roller 14 in any suitable manner as by a chain drive engaging a sprocket 14*b* on the roller 14.

The drive assembly 3 between the feed roller 14 and the rotor of the centrifugal pump 5 may be of any conventional type. In the drawing it is shown as a chain 16 engaging sprocket 17 on the feed roller 14 and sprocket 18 on the centrifugal pump rotor shaft. The speed of the strip 13 can only increase or decrease proportionately with the speed of the feed roller 14 and similarly the speed of the pump will change proportionately with the speed of the feed roller. Thus by maintaining a constant intake head on the pump any variation in the speed of the strip will be reflected proportionately in the speed of the pump rotor which is reflected proportionately in the volume of water delivered by the pump. Therefore, as the speed of the strip 13 increases the volume of water delivered by the nozzle 12 increases proportionately.

So long as the intake head on the pump remains constant the pressure delivered by the pump will remain constant at any given speed so that if the moisture content of the strip 13 is very high the valve 9 may be opened,

and the valves 10 and 11 closed to deliver a smaller volume of fluid to the strip. On the other hand, if the moisture content is very low, valves 9, 10 and 11 may all be opened simultaneously so that seven times the amount of water is delivered by the nozzle 12. Thus the volume of water delivered by the nozzle 12 may be manually adjusted in individual increments from one through seven to compensate for the inherent moisture content of the strip. After the valves have been adjusted properly for the moisture content, the volume of water will vary only sufficiently to satisfy the requirements caused by changes in the velocity of the strip itself.

In order to maintain a constant head on the intake side 6 of the pump 5, a constant head reservoir 4 is provided. The constant head reservoir 4 comprises a reservoir 19 and filler pipe 20 provided with a float valve 21 which maintains the level of the reservoir at any predetermined height. From the reservoir the fluid passes into filter 22 to remove any foreign matter and then to the intake 6 of the pump 5. The filter 22 may be of any appropriate conventional type and may be eliminated entirely if desired.

It is to be understood that although this invention is intended primarily for use in conjunction with a cigarette filter manufacturing process as previously described, it is not limited to this application and may be used wherever a metered spray is required, for example in a furnace humidifier or the like. It is also to be understood that this invention is not to be limited to the specific embodiments shown in the drawings. For example, the invention is not to be limited to three valves and if precise volume control is not required the valve group may be replaced by a single adjustable metering valve. Nor is the invention absolutely dependent upon the use of a centrifugal pump but any other type pump may be used so long as the volume of water delivered by the pump varies proportionately as the speed of the pump. In view of the foregoing, it is to be clearly understood that various changes may be made without departing from the spirit and scope of this invention, and that this invention is not to be limited to such specific details except as set forth in the appended claims.

I claim:

1. In a strip processing machine a variable speed strip feeding means, spray means for spraying a controlled volume of fluid on said strip, said spray means comprising; a pump, means to supply a fluid to said pump, nozzle means attached to the discharge end of said pump for spraying said fluid on said strip, fluid conveying adjustable valve means disposed between said pump and said nozzle means to adjust the volume of fluid discharged by said nozzle, and a constant speed ratio drive means between said variable speed strip feeding means and said pump to increase or decrease the speed of said pump, thereby increasing or decreasing the volume of said fluid sprayed against said strip, as the speed of said strip increases or decreases, said pump, said fluid conveying adjustable valve means and said nozzle means forming a totally enclosed fluid conveying system.

2. In a strip processing machine a variable speed strip feeding means, means for discharging a controlled volume jet of fluid onto said strip, said means comprising; a pump, means to supply a fluid to said pump, nozzle means attached to the discharge end of said pump for

discharging said jet of fluid onto said strip, fluid conveying adjustable valve means disposed between said pump and said nozzle means to adjust the volume of fluid discharged by said nozzle and a constant speed ratio drive means between said variable speed strip feeding means and said pump to increase or decrease the speed of said pump, thereby increasing or decreasing the volume of said fluid discharged against said strip, as the speed of said strip increases or decreases; said pump, said fluid conveying adjustable valve means and said nozzle means forming a totally enclosed fluid conveying system.

3. In a strip processing machine a variable speed strip feeding means, means for discharging a controlled volume jet of fluid on said strip, said means comprising; a pump, means to supply a fluid to said pump, nozzle means attached to the discharge end of said pump for discharging said jet of fluid onto said strip, fluid conveying adjustable valve means disposed between said pump and said nozzle means to adjust the volume of fluid discharged by said nozzle and comprising a plurality of independently operable valves arranged in parallel and each fluid conveying means receiving the discharge from said pump, each of said valves discharging into said nozzle means and each valve after the first having twice the volume capacity of the next smaller valve, and a constant speed ratio drive means between said variable speed strip feeding means and said pump to increase or decrease the speed of said pump, thereby increasing or decreasing the volume of said fluid discharged against said strip as the speed of the strip increases or decreases; said pump, said fluid conveying adjustable valve means and said nozzle means forming a totally enclosed fluid conveying system.

4. In a strip processing machine a variable speed strip feeding means, means for discharging a controlled volume jet of fluid on said strip, said means comprising; a pump, means to supply a fluid to said pump, nozzle means attached to the discharge end of said pump for discharging said jet of fluid onto said strip, fluid conveying adjustable valve means disposed between said pump and said nozzle means to adjust the volume of fluid discharged by said nozzle and comprising three independently operable valves arranged in parallel, each having fluid conveying means receiving the discharge from said pump, each of said valves discharging into said nozzle means, the second of said valves having a capacity of twice that of the first valve and the third valve having a capacity four times that of the first valve, each valve being operable independently of each other valve, and a constant speed ratio drive means between said variable speed strip feeding means and said pump to increase or decrease the speed of said pump, thereby increasing or decreasing the volume of said fluid discharged against said strip as the speed of said strip increases or decreases; said pump, said fluid conveying adjustable valve means and said nozzle means forming a totally enclosed fluid conveying system.

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