

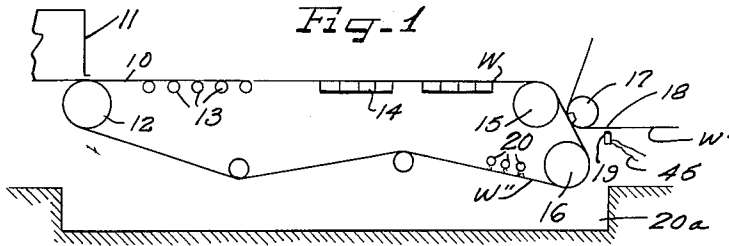
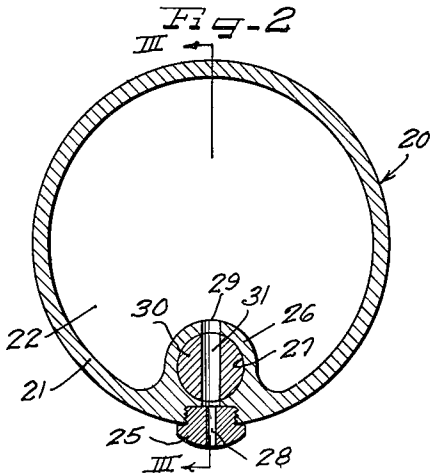
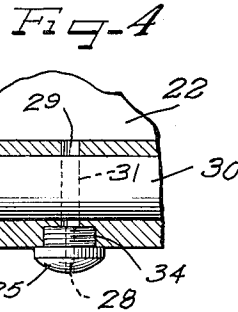
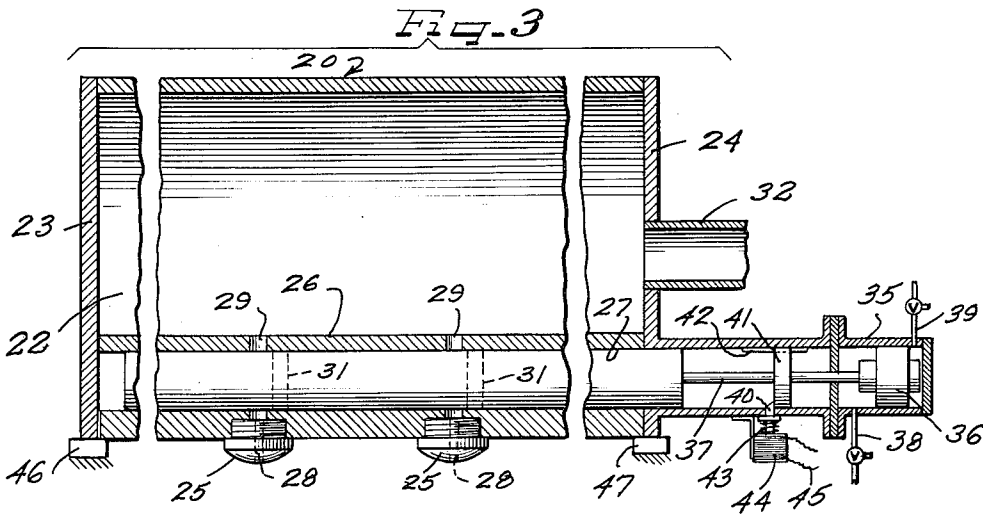
Nov. 16, 1965

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3,218,227

KNOCKOFF SHOWER FOR A FOURDRINIER MACHINE

Filed April 22, 1963



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1

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KNOCKOFF SHOWER FOR A FOURDRINIER MACHINE

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Filed Apr. 22, 1963, Ser. No. 274,536

4 Claims. (Cl. 162-255)

The present invention relates to improvements in paper making machines and more particularly to an improved knock-off shower arrangement for rapidly removing a paper web from a Fourdrinier wire when the web improperly follows the return run of the wire.

As a paper web is formed and de-watered on a Fourdrinier wire, it is transferred following the couch roll to web transfer mechanism for delivery to a press section of the machine. It is possible for the web to accidentally break or at machine start-up to improperly follow the wire down from the couch roll without traversing to the transfer members and instead of follow down around the return roll to follow the return run of the Fourdrinier wire. Since the web will stick to the wire it will be carried through the return rolls and guide rolls and may wrap itself around these rolls or possibly be carried back to the breast roll. The web in improperly traveling back on the return run of the Fourdrinier wire can cause considerable damage in stretching the Fourdrinier wire by wrapping the rolls and in generally clogging and jamming the mechanism so that parts may have to be replaced and expensive shut-down time will be necessary to stop the machine and clean it. This is avoided by knocking the web off of the return run of the wire when it accidentally follows it preferably by the use of a knock-off shower having a plurality of jets directed downwardly at the inner surface of the wire. Difficulties have been encountered with the shower having a fast enough response. For example, with the wire traveling at a high rate of speed such as on the order of 3,000 feet per minute it will take only a fraction of a second for the web to follow down around the return roll. Operation of the knock-off shower must be immediate so that it catches the lead end of the web and throws it down into the wire pit so that the remainder of the web will follow by gravity into the pit.

It is accordingly an object of the present invention to provide a knock-off shower for a paper making machine which has a substantially instantaneous response and can upon receipt of a signal immediately provide jets of high velocity water to knock the leading end of the web off the wire.

A further object of the invention is to provide an improved knock-off shower structure which embodies a rod extending across the machine and which has sufficient strength to be self supporting.

A further object of the invention is to provide a knock-off shower which is of satisfactory construction for use in various industries wherein a shower is maintained in a ready condition and is capable of immediate response for the delivery of a water shower.

A further object of the invention is to provide an improved shower and control valve arrangement wherein the shower has a chamber maintained under constant pressure with a simplified valve arrangement which can instantaneously release the water simultaneously through a number of jets.

Other objects, advantages and features will become more apparent with the teaching of the principles of the invention in connection with the disclosure of the preferred embodiment thereof in the specification, claims and drawings, in which:

2

FIGURE 1 is a side elevational view of a Fourdrinier section of a paper machine utilizing a knock-off shower embodying the principles of the present invention;

FIGURE 2 is an enlarged vertical sectional view taken through the tube of the knock-off shower;

FIGURE 3 is a sectional view taken substantially along line III-III of FIGURE 2; and

FIGURE 4 is a fragmentary sectional view of a portion of FIGURE 3 showing the valve in open position.

On the drawing:

As illustrated in FIGURE 1, a looped Fourdrinier forming wire 10 receives paper stock from a headbox and dewaters the stock on its upper run forming a web W thereon. The Fourdrinier wire is supported on a breast roll 12 and travels over table rolls 13, suction boxes 14 and a couch roll 15. The web W is taken off of the forming wire 10 by a suction pick-up roll 17 where it is carried on a felt 18 to a press section as indicated by the position of the web W'.

The wire travels downwardly over a return roll 16 to complete its loop back to the breast roll and in the event the web should fail to follow the felt 18 it will travel downwardly as indicated by the position of the web W''.

If this occurs the improper travel of the web will operate a web detector 19 to operate a knock-off shower 20 which may include one or more tubes positioned immediately following the return roll 16. The end of the web then is directed down into the wire pit 20a where it is removed and discarded or reprocessed. The web detector 19 may be of any suitable type which emits a signal manifesting the absence of the web and may operate for example utilizing a photoelectric cell. The detector 19 may be located opposite the felt 18, or it may be positioned opposite the forming wire immediately following the pick-up roll 17.

Details of the knock-off shower 20 are illustrated in FIGURES 2-4. The shower includes an elongate extruded tube 21 forming a water pressure chamber 22 therein. The ends of the chamber are closed by end walls 23 and 24 in the tube.

Within the extruded tube is an arcuate wall 26 forming a continuous cylinder 27 therein co-extensive with the tube. Within the cylinder is positioned a sliding valve rod 30.

Along one side of the tube and facing radially downwardly are a plurality of shower jet nozzles 25. These nozzles are suitably mounted in openings 34 in the tube such as by being welded or threaded into the tube 21. The nozzles have an opening which registers with an opening in the tube to form a shower jet opening 28 communicating with the cylinder 27.

Valve openings 29 are positioned along the cylinder wall opposite jet openings 28.

The valve rod has a plurality of axially spaced transverse passages 31 which are positioned so that in a release position of the valve rod 30 each of the passages 31 will be in alignment with a jet opening 28 so as to release water from the pressure chamber 22 within the tube 21.

The rod 30 is thus slidable within the cylinder 27 from a first position, shown in FIGURE 3 wherein the passages are not aligned with the valve openings 29 and jet discharge openings 28, to a second position as illustrated in FIGURE 4 wherein the passages are aligned with said openings.

The valve rod 30 is operated so as to be very rapidly movable from its first to its second position to release water from the pressure chamber 22. For supplying water to the chamber a supply inlet line 32 is connected to the end wall 24 and supplied with water under pressure such as by being connected to the pressure supply in the

paper mill. The pressure chamber 22 is thus maintained under pressure at all times during operation of the paper making machine. Suitable valve means will of course be provided to shut off the supply to the line 32 during shut-down periods and during servicing.

For operating the valve rod 30, an operating cylinder 35 is provided with a slidable piston 36 therein having a piston rod 37 connected to the valve rod 30. The piston is operated by air pressure and a valve to supply line 39 maintains the head end of the cylinder 35 under constant pressure so that a constant biasing force is available for the valve rod 30. The valve rod is maintained in its first non-release position by a latch 40 which engages a collar 41 on the piston rod 37 and is held in latched position by a spring 43.

The latch 40 is suddenly released when the shower 20 is to be operated by a solenoid 44 connected to the latch and operated by electrical leads 45 which are also connected to the web detector 19 of FIGURE 1.

The valve rod 30 is provided with suitable means for keeping it in rotational alignment so that the passages 31 will extend between the openings 29 and 28, such as by a guide 42 which keeps the valve rod and piston rod 37 from rotating. Instead of transverse passages 31 annular grooves may be employed which will avoid the necessity of maintaining the valve rod 30 in rotational alignment. It is also possible within the scope of the invention to arrange to rotate the rod 30 from an "off" position where the passages 37 extend horizontally to an "on" position where they are vertically extended, although the preferred arrangement is shown.

The cylinder 35 and its piston 36 are positioned so that, when the piston 36 reaches the end of its travel after being released by the latch 40, the transverse passages 31 in the valve rod 30 will be in exact alignment with the openings 29 and 28. For returning the rod 30 to its first position where release of the water is cut off, air pressure is admitted to the ether end of the cylinder through a valve to supply line 38, and the line 39 is vented whereupon the latch 40 will be relocked and the other end of the cylinder 35 again pressurized.

The valve rod 30 can be made relatively small and of light-weight material such as aluminum for instantaneous movement. The valve opening 29 can be made larger than the passage 31, and the passage 31 can be made larger than the opening 28 so that the water will flow extremely rapidly to increase the speed of response of the shower. The release opening 28 is made sufficiently large to deliver a high velocity water jet at sufficient volume to reliably knock the web off of the surface of the wire 10.

As an example of a structure formed and operating in accordance with the principles of the present invention, for a machine wire width of 200 inches a 6 inch diameter pipe 20 is employed. This provides water in the pressure chamber 22 more than adequate for supplying the jets without loss of pressure when the valves are opened by movement of the valve rod 30, and the tube is primarily made of the large size for adequate stiffness to be self-supporting across the machine. A tube of this size can be supported with support 46 and 47 at each end or a cantilever arrangement may be provided for supporting the tube 21 at the end at which the water supply line 32 is connected. The supports 46 and 47 are located at each side of the Fourdrinier machine of FIGURE 1. The nozzles 25 are suitably attached to the tube 21 such as by being threaded into an opening 34 or by being welded in place, or the openings may merely be drilled.

In operation the web W is formed on the moving Fourdrinier wire 10 and will normally be transferred to the felt 18; in the event the web should cling to the wire and follow down around the return roll 16 the leading end is immediately knocked off of the wire down into the wire pit 20a by the shower 20. The shower is maintained

under constant water pressure within the chamber 22 of the tube 21 and for instantaneous operation of the shower the valve rod 30 is moved axially from the first position of FIGURE 3 to the second position of FIGURE 4 wherein passages 31 provide communication between the valve openings 29 and the discharge openings 28. Movement of the rod is effected by operation of the biasing cylinder 35 controlled by a latch 40 operated by a web detection mechanism 19.

As will be recognized various other forms of quick operating devices may be employed for the valve rod 30 and various suitable types of detectors and operators may be employed.

Thus it will be seen that we have provided an improved knock-off shower arrangement which is particularly well suited for use in a paper making machine but is adapted to use in other industries where an immediate shower of liquid must be provided and must be available for operation at any time. The structure is compact and the valve arrangement with the enclosing wall 26 is constructed for immediate operation and also to afford beam strength to the unit. Operation of all the valve discharge passages at the same time is insured and binding of the valve operator is substantially impossible.

The drawings and specification present a detailed disclosure of the preferred embodiments of the invention, and it is to be understood that the invention is not limited to the specific forms disclosed, but covers all modifications, changes and alternative constructions and methods falling within the scope of the principles taught by the invention.

We claim as our invention:

1. In a Fourdrinier paper making machine having a Fourdrinier wire loop with means for supplying stock to the wire and de-watering a web formed on the wire and delivered to a press section, a knock-off shower assembly positioned within the wire loop for removing the web from the return run of the wire loop and directing the web down into a wire pit when the web inadvertently follows the return wire run comprising,

an elongate rigid tube having closed ends forming a pressure chamber therein and having a plurality of high velocity water discharge openings along its length directed radially downwardly, end supports for each end of the tube,

said tube having sufficient rigidity to support its length between said supports with the tube filled with water,

wall means within said tube defining an inner substantially closed slide chamber of substantially uniform cross-sectional area, said slide chamber adjacent the outer wall of the tube and coextensive therewith,

said wall means having a plurality of valve openings positioned opposite said discharge openings,

an elongate valve plunger slidably positioned in said slide chamber having a plurality of transverse passages spaced axially in accordance with the spacing of said discharge openings with said plunger movable from a first position wherein said passages are out of alignment with said openings and a second position wherein said passages are in line with said openings for directing water from the pressure chamber through the discharge openings,

a water supply inlet line connected to the tube for pressurizing the pressure chamber therein,

and a valve plunger operator connected to the plunger for moving its rapidly from said first to said second position.

2. In a Fourdrinier paper making machine having a Fourdrinier wire loop with means for supplying stock to the wire and de-watering a web formed on the wire and delivered to a press section, a knock-off shower assembly positioned within the wire loop for removing the web from the return run of the wire loop and directing the web

5

down into a wire pit when the web inadvertently follows the return wire run comprising,

an elongate tube for extending across the width of and within the Fourdrinier wire loop and having a pressure chamber wherein,

said tube having a plurality of high velocity discharge openings directed radially downwardly,

a water pressure supply line connected to the tube chamber for supplying water under a constant high pressure,

a wall within said tube defining a cylinder adjacent the outer wall of the tube and coextensive therewith, valve openings in said wall opposite said discharge openings,

a cylindrical valve rod slidably mounted in said tube having lateral passages permitting the flow of water from the tube out of said discharge openings in a release position of the rod,

and means for rapidly axially moving said rod into said release position.

3. In a Fourdrinier paper making machine having a Fourdrinier wire loop with means for supplying stock to the wire and de-watering a web formed on the wire and delivered to a press section, a knock-off shower assembly positioned within the wire loop for removing the web from the return run of the wire loop and directing the web down into a wire pit when the web inadvertently follows the return wire run comprising,

an elongate tube for extending across the width of and within the Fourdrinier wire loop and having a pressure chamber therein,

said tube having a plurality of high velocity discharge openings directed radially downwardly,

a water pressure supply line connected to the tube chamber for supplying water under a constant high pressure,

a wall within said tube defining a cylinder adjacent the outer wall of the tube and coextensive therewith, valve openings in said wall opposite said discharge openings,

a cylindrical valve rod slidably mounted in said tube having lateral passages permitting the flow of water from the tube out of said discharge openings in a release position of the rod,

means for applying a biasing force urging said rod toward said release position,

and a releasable latch holding said rod out of said release position and permitting rapid movement of the rod into the release position when released.

4. A Fourdrinier paper making machine comprising a looped Fourdrinier wire,

6

rolls for supporting said wire loop including a counter roll and a return roll,

means for taking off a web from the Fourdrinier wire loop,

a one-piece extruded rigid knock-off shower tube within the wire loop following said return roll having close ends with a pressure chamber therein,

means for supporting the ends of the tube parallel to said wire,

a water pressure supply line connected to the tube chamber maintaining the tube filled with water under constant pressure during operation of the wire,

an integral extruded wall within said tube defining a cylinder adjacent the outer wall of the tube and coextensive therewith,

valve openings leading into said cylinder from said tube,

nozzle members extending along the tube facing radially downwardly and having openings leading from said cylinder,

a valve rod slidably mounted in said cylinder having transverse openings spaced to be aligned with the valve openings and nozzle openings in a second release position of the valve rod,

said rod movable from a first position wherein the transverse passages are out of alignment with said openings to said second position,

a fluid pressure cylinder with a piston therein connected to said valve rod,

means pressurizing said pressure cylinder for applying a constant biasing force to said valve rod urging it from said first to said second position,

a latch holding said rod in said first position,

an electrically operated latch release member,

and a paper web detector producing a signal manifesting an absence of a paper web and connected to the latch operator producing a signal releasing said latch in the absence of a paper web on said web take-off means.

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