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3,526,017

DOCTOR SYSTEM SUCTION APPARATUS

Filed Nov. 14, 1966

FIG 1

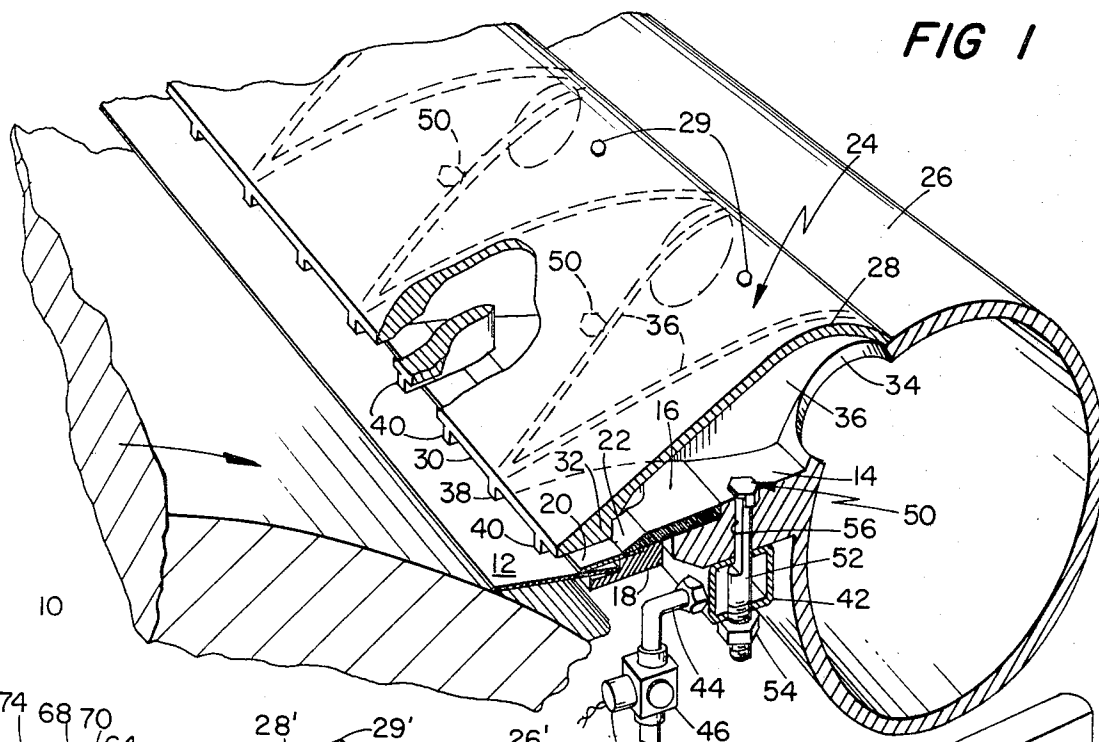
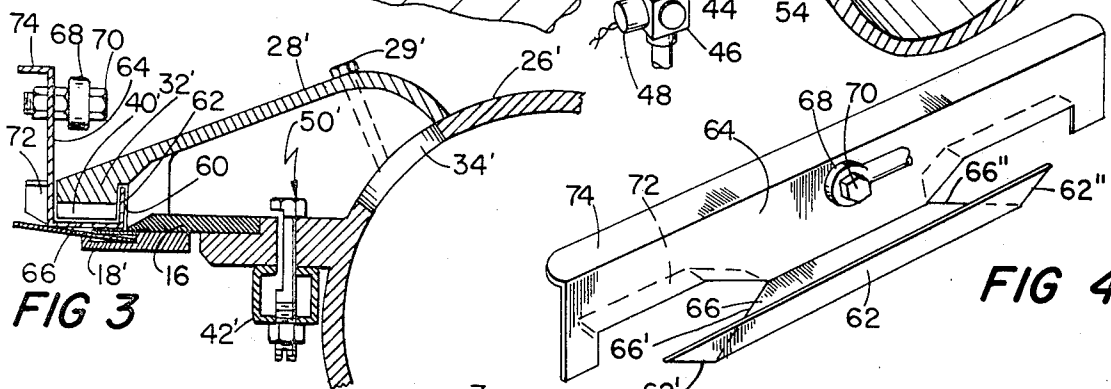


FIG 3

FIG 4

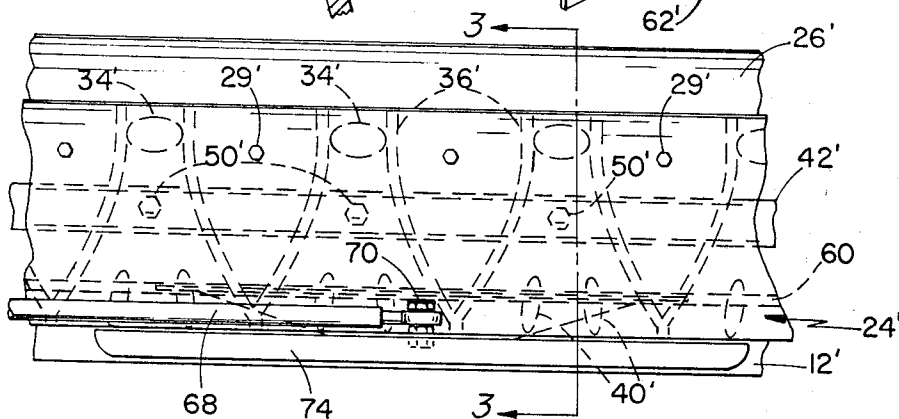


FIG 2

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DOCTOR SYSTEM SUCTION APPARATUS

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5 Claims

ABSTRACT OF THE DISCLOSURE

A suction nozzle is mountable along a doctor blade to provide an inlet for removing debris from the surface of the doctor blade, and a blowback discharge member located interiorly of the suction nozzle for intermittent operation to dislodge accumulations of debris blocking the inlet. A removable clean-out tool is provided for sliding along the nozzle.

This invention relates to doctoring systems for papermaking machines and more particularly to suction apparatus for removing from the doctoring area paper particles and fibers loosened from the machine rolls by doctor blades.

Suction apparatus of the type concerned is equipped with an inlet nozzle closely overlying the associated doctor blade which nozzle tends to become plugged with accumulations of paper fibers or pieces, particularly those of large size or which are wet and sticky. With existing apparatus such plugging accumulations increase in extent rapidly, correspondingly reducing the efficiency of removal until the apparatus becomes essentially inoperative. To remedy this condition it is necessary to stop the machine and manually clear the nozzle obstruction, which is not only a difficult, time consuming task but also idles the whole machine, thereby increasing production cost.

A primary object of this invention is to solve this problem by providing a simple, inexpensive, suction apparatus for doctoring systems in papermaking machines, which periodically removes and eliminates such accumulations of paper particles and similar debris in the suction nozzle, while the machine is running, without the necessity of manual intervention. This object is effected by providing within the suction nozzle, blowback means which periodically and momentarily blasts fluid, normally air under superatmospheric pressure, toward and out the nozzle inlet to break up and dislodge the plugging accumulations so that they can be thereafter removed by the suction system.

In certain applications of the suction apparatus of the invention, particularly to the doctors of rolls adjacent the wet end of the papermaking machine, plugging accumulations or large sized pieces of paper become so wedged within the nozzle inlet that they are not dislodged by the blowback pressure. For such applications the invention provides as an additional feature a special clean-out tool and within the suction nozzle means for guiding the tool so that it may be readily slid along the nozzle and is operable to aid the blowback in ejecting such obstructions from the nozzle inlet.

Although it is not necessary to do so, it is preferred to provide the doctor blade, its holder and support, and the suction nozzle with its manifold as a single assembly, the doctor blade, its holder and support forming the bottom of the suction nozzle.

Other objects, features, and advantages will appear from the following description of preferred embodiments of the invention, taken together with the attached drawings thereof, in which:

FIG. 1 is a partially broken-away perspective view of

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a portion of a roll and of a doctoring system combined with suction apparatus equipped with the blowback feature of the invention;

FIG. 2 is a plan view of apparatus according to FIG. 1 modified to receive and guide a manual clean-out assistance tool shown in use;

FIG. 3 is a transverse vertical cross-section on lines 3—3 of FIG. 2, looking in the direction of the arrows, and FIG. 4 is a perspective view of the tool shown in FIGS. 2 and 3.

Referring to FIG. 1 a papermaking machine roll 10 is shown as doctored by doctor blade 12 mounted on a fixed supporting ledge 14 by a suitable holder assembly, the ledge 14 and holder assembly constituting means for supporting the doctor blade in doctoring position. The holder assembly shown includes a top holder plate 16 removably fastened to ledge 14, a bottom holder plate 18 removably fastened to plate 16 and channeled to receive therein the rear end of the doctor blade, and a keeper spring plate 20 having its rear end held between the front end of plate 16, which is beveled downwardly as shown at 22, and the rear end of plate 18, and has its front end overlying and retaining the rear end of doctor blade 12.

As is preferred, the suction apparatus has the bottom of its intake nozzle, designated generally 24, formed by the doctor blade and holder assembly, which serves to locate the nozzle inlet directly on the doctor blade where it is most efficient. Supporting ledge 14 is conveniently formed, as shown, as an integral part of the suction manifold 26, which is pivotally mounted in bearing supports at its ends (not shown) and connected to a suitable source of suction such as a vacuum pump (not shown). The top of the nozzle is formed of a curved plate or hood 28 removably fastened to manifold 26 by bolts 29 received in threaded apertures (not shown) in the underlying wall (said bolts and manifold thereby constituting means for mounting said hood), with its rear edge engaging the manifold, curving outwardly therefrom to a forwardly and downwardly extending portion terminating in a front end 30. End 30 overlies the rear end of the doctor blade and has a flat undersurfaced rearward extension 32 which overlies the front end of plate 22 and terminates in a rear end spaced from beveled end 22 of plate 16. End 30 and the under surface of extension 32 form with doctor blade 12, plate 20 and beveled end 22, the nozzle inlet slot to an interior of substantial size between plate 16, ledge 14 and hood 28. A plurality of openings 34 extend through the wall portion of manifold 26 exposed to this interior and spaced longitudinally thereof.

Preferably, as shown, the interior of nozzle 24 is divided into a plurality of inlet compartments, one for each opening 34, by pairs of side walls 36 carried by hood 28. The walls of each pair are contiguous to opening 34 at their rearward ends and slant laterally in opposite directions to join at their front ends the oppositely slanted wall of the next pair in a single thin tip 38 which underlies end 30 and extension 32 of hood 28, with only sufficient clearance above doctor blade 12 and plate 20 to permit the requisite upward flexibility of these parts. Tips 38 and additional thin ribs 40 extending down from the under surface of extension 32 function to prevent large pieces of paper from being sucked into the nozzle.

In accordance with the invention the suction nozzle is equipped with blowback means shown as comprising a manifold 42 mounted under ledge 14, the manifold being connected by pipe 44 to a suitable source (not shown) of fluid under pressure, preferably compressed air. Pipe 44 is provided with an open and shut valve 46 which may be operated by a solenoid 48. Manifold 42 is provided with a plurality of jet nozzles designated generally 50

which extend upwardly therefrom through apertures in ledge 14 into the interior of nozzle 24, there being one jet nozzle provided for each inlet compartment formed by walls 36 within nozzle 24.

Jet nozzles 50 may be conveniently and efficiently formed as shown of a conventional bolt 52, the head of which is located in the inlet compartments of nozzle 24, the shank of which extends through bores in ledge 14 and the top and bottom of manifold 42 to which it is fastened by nut 54, and which has a cutaway front portion 56 in its shank and underside of its head facing the nozzle inlet, the cutaway portion extending from within manifold 42, through the bores in the top thereof and in ledge 14 to the cutaway portion of the bolt head which faces the nozzle inlet. Thus there is formed a passage into the jet nozzle between the cutaway portion 56 of each bolt 52 and the bores through which it extends in the top of manifold 42 and ledge 14. Through this passage pressurized fluid may pass to impinge upon the flat underside of the cutaway front portion of the bolt head, the rear end of which is seated on ledge 14. The fluid is directed by the flat surfaces of the bolt head, and of the wall of the cutaway portion of the shank of bolt 52 extending above ledge 14, in a fan-shaped jet toward the suction nozzle inlet and substantially uniformly between the ends 38 of the side walls defining the compartment containing the blowback jet nozzle 50, as is important in obtaining efficient operation of the blowback pressure.

In operating the apparatus of FIG. 1, manifold 26 is normally continuously connected to suction so that paper particles scraped onto doctor blade 12 are continuously sucked therefrom into nozzle 24 and out through opening 34 into manifold 26, from which they are withdrawn by the suction system for disposal. Valve 46 in feed line 44 to pressure manifold 42 is normally kept closed but at selected intervals is momentarily opened to permit compressed fluid to flow from the jet nozzles 50 toward and out said inlet in a reverse flow to the flow of air and debris into said inlet, to break up any blowback particle accumulations in the inlets to suction nozzle 24 so that, upon shutting off of the pressure system, they may be drawn into the suction nozzle and disposed of. Means is provided for intermittently operating said blowback means to dislodge blocking accumulation of debris from said inlet in the form of a valve 46 which may be manually controlled as by a switch (not shown) in the electric connections to solenoid 48. However, it is preferred to operate valve 46 automatically by timing mechanism (not shown) which periodically opens the valve for a brief interval sufficient to blow out obstructions and then closes it. The time intervals between blowback operation and the duration thereof should be such as to prevent any major plugging of the suction nozzle and to insure that under normal conditions all blockages that have occurred are eliminated. In this way the suction apparatus can be kept running continuously at substantially full efficiency without the necessity of stopping the machine for manual cleanout under normal conditions.

The amount of suction maintained and the amount of blowback pressure are variables depending on the particular application of the equipment. In a typical installation, suction is maintained by a subatmospheric pressure in manifold 26 of the order of about an inch of mercury or less, and blowback fluid is supplied at a superatmospheric pressure of about 30 to 50 p.s.i.

As previously stated, plugging material may occasionally become so wedged in the suction nozzle inlet that it is not dislodged by the blowback fluid, particularly at the wet end of the paper machine. For installations where this condition may occur, I prefer to provide the modified suction manifold construction of FIGS. 2 and 3 to enable the use of the clean-out tool shown particularly in FIG. 4.

FIGS. 2 and 3, wherein parts the same as in FIG. 1 are designated by primes of the same reference nu-

merals, show the apparatus of FIG. 1 modified only by the provision of a vertically disposed groove 60 in the underside of hood 28' extending the full length of the hood in the vicinity of the rear edge of extensions 32', and by the addition of the manually operated cleaning tool. Referring to FIGS. 2 and 3 it will be seen that the groove 60 extends through the inner ends of extensions 32' and of ribs 40' and also through walls 36' to provide a continuous track in which an inner positioning flange 62 of the tool may slide. As best shown in FIGS. 3 and 4 the tool, in its preferred form there shown, may comprise a substantially vertically disposed strip 64 of thin gauge metal having a rearwardly extending portion 66 at its under edge which carries at its inner edge positioning flange 62, portion 66 being thin enough to slide under the clearance between the underparts of suction nozzle hood 28' and the doctor blade assembly. The opposite ends 62' and 62'' of flange 62, 66' and 66'' of portion 66 are oppositely inclined from their upper and inner ends respectively, so that as the tool is slid longitudinally of nozzle 24' in either direction the end of flange 62 in the direction of movement of the tool will flow downwardly out of slot 60 any accumulation of paper particles therein and the corresponding end of portion 66 will similarly plow accumulations under the nozzle inlet toward and out of its front end. An elongated handle 68 is pivotally mounted on bolt 70 fixed centrally of the tool strip 64, the handle extending longitudinally of the suction device and being longer than the suction device-doctor assembly so that the tool may be inserted at one end of the assembly and slid via the handle completely from end to end of the assembly.

FIG. 4 shows the tool conveniently made by cutting and bending a strip of light gauge metal to provide portion 66 bent rearwardly and guide flange 62 bent upwardly from the rearward edge of portion 66. Frontal reinforcing projections 72 are formed by bending forwardly the metal adjacent the portions cut away to form the ends of portion 66 and flange 62, and a top reinforcing frontal projection 74 is formed by bending the top of the metal strip forwardly.

If the suction nozzle becomes so plugged that the blowback means will not dislodge the plugging material, the tool of the modification illustrated in FIGS. 2-4 may be utilized to remove the obstructions which are wedged in the suction nozzle inlet. To accomplish this objective, the suction system is normally shut off and the blowback pressure system is turned on as by a manually controlled switch (not shown) in the circuit to solenoid 48. The cleanout tool is then inserted at one end of the apparatus with flange 62 in groove 60 and pushed back and forth through the apparatus by means of elongated handle 68 until the wedged obstructions are cleared out the front of the inlet to the suction apparatus, with the aid of the blowback pressure. This operation may or may not require shutting down the papermaking machine, depending upon whether the angle of removal of the paper from roll 10 over doctor blade 12 is great enough to accommodate the cleanout tool beneath it.

Having described and illustrated preferred embodiments of the invention, I claim:

1. Doctoring apparatus including apparatus for removing from the vicinity of a doctor blade debris such as paper particles scraped from a roll by said blade, which comprises a doctor blade, means for supporting said doctor blade in doctoring position, a suction nozzle overlying said supporting means and having a top hood and a hollow interior, an inlet to said nozzle interior comprising an extension of said hood overlying said doctor blade, means for mounting said hood so that said inlet is exposed to the debris on said doctor blade, opening means for connecting said nozzle to a source of subatmospheric pressure to suck air and said debris into said interior through said inlet, blowback means in the interior of said nozzle for discharging fluid under super-

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atmospheric pressure interiorly of said inlet toward and out said inlet in a reverse flow to the flow of air and debris into said inlet, and means for intermittently operating said blowback means to dislodge blocking accumulations of debris from said inlet.

2. Apparatus according to claim 1 wherein said nozzle is interiorly provided with walls forming a plurality of compartments spaced longitudinally of said blade, separate opening means for connecting each compartment to said subatmospheric pressure, and separate blowback means in the interior of each compartment for discharging fluid under superatmospheric pressure interiorly of said nozzle and inwardly of said inlet toward and out said inlet in a reverse flow to the flow of air and debris into said inlet, and means for intermittently operating said blowback means to dislodge blocking accumulations of debris from said inlet.

3. Apparatus according to claim 2 wherein said blowback means comprises a manifold connected to a source of fluid under pressure and a jet nozzle in each said compartment connected to receive fluid from said manifold and to direct it substantially uniformly to the suction nozzle inlet for each compartment.

4. Apparatus according to claim 1 wherein the ex-

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tension of said hood is provided with a slot extending longitudinally of said nozzle and which includes a slideable cleanout tool having a flange received in said slot, said flange connected to a portion which slides through said nozzle inlet for plowing accumulation of debris from said inlet, said tool being provided with means for sliding it longitudinally of said nozzle inlet.

5. Apparatus according to claim 4 wherein said tool flange and portion have ends, said ends being oppositely inclined to plow debris accumulations outwardly from said slot and inlet when slid in the respective directions of such ends and longitudinally of said nozzle inlet.

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U.S. Cl. X.R.

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