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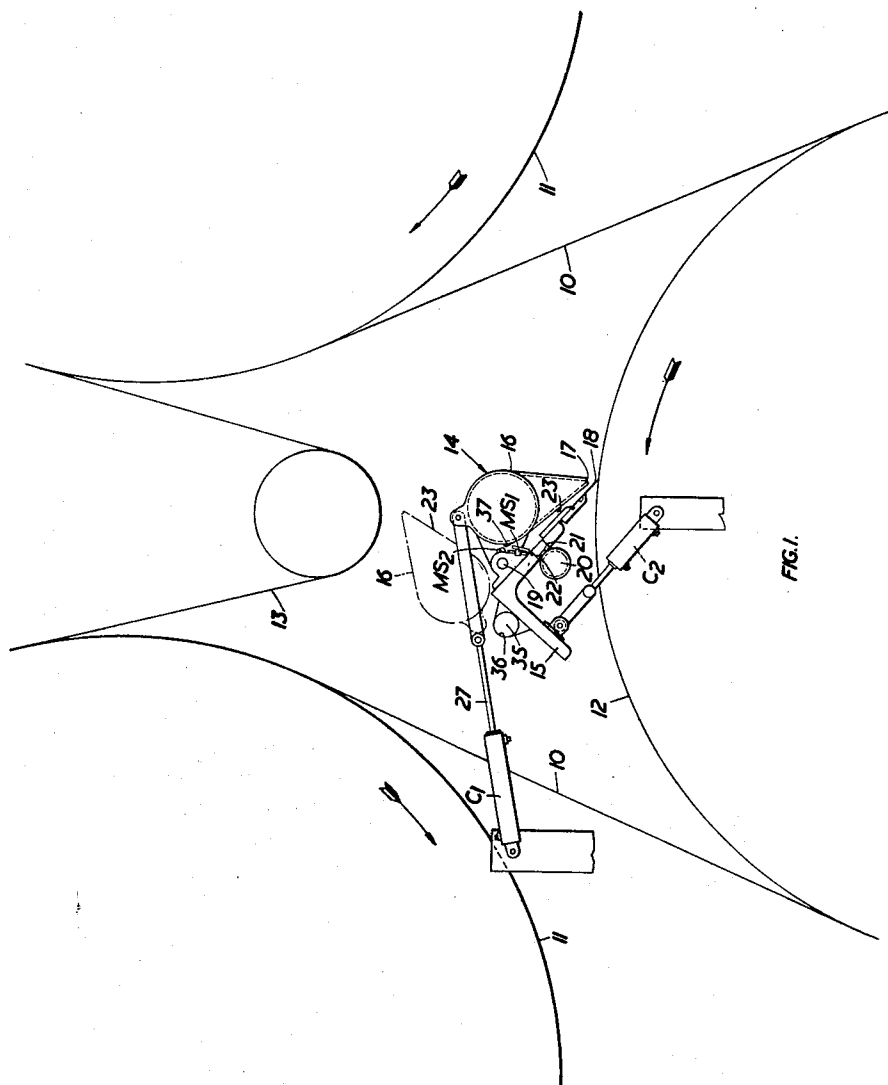
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DOCTORS FOR PAPER MAKING MACHINES

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1

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DOCTORS FOR PAPER MAKING MACHINES

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With the increasing speed of papermaking machines and the modern practice of coating the paper web with china clay, titanium dioxide and other fillers to increase the opacity while the paper is being made on the machine, fuzz and dust particles removed from the rolls and especially from the drying rolls by the doctors create a problem.

The invention provides a doctor for a papermaking machine having on its support a suction chamber for applying suction to the doctor blade along its length and at a location near to its tip in order to remove dust and fluff scraped from the roll and including means for moving a suction chamber in relation to the support from its working position to a break position in which in the event of breakage of the web of material being doctored, it is effective to guide the tail of the broken web into the following nip.

Preferably the suction chamber is hinged to the support and includes means operative automatically in response to accumulation of broken web between the suction chamber and its support to cause movement of the suction chamber into the break position.

The doctor according to the invention is primarily intended for use on a bottom drying roll of the machine. It may include an air pressure blast pipe, integral with or fixed to the doctor support, having nozzles spaced along its length and so positioned that on breakage of the web air jets are directed to assist in transferring the tail of the broken web into the following nip, thus preventing an accumulation of the web in the space between the rolls. On modern fast paper making machines such accumulation builds up very rapidly and has to be removed by a long-handled spear or hook. As it is not practical to stop the machine the web is accumulating all the time the broke is being removed, and it is extremely difficult and takes an appreciable time to get the web into the next nip. The present invention enables the broken web to be transferred almost instantaneously.

A micro-switch or other detecting device can be located between the suction chamber and the doctor support so that when the leading edge of the broken web, which will automatically pass between the suction chamber and the support when removed from the roll by the doctor blade, operates the detecting device mechanism is set into motion for admitting compressed air into the blast pipe and also to pneumatic cylinders for lifting the suction chamber into the up or "break" position. The mechanism can also shut off the suction to the suction chamber to prevent the tail of the broken web being drawn into the tube. It can also shut off the suction on any suction chambers fitted to the doctors on the adjoining top rolls, which must of necessity, be of different construction to those on the bottom rolls. The control mechanism can, if desired, also give an audible or other signal that a break has occurred.

The invention will now be described in more detail, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a side elevation showing drying rolls of a papermaking machine in association with a doctor according to the invention.

FIG. 2 is a circuit diagram illustrating the control system of the doctor shown in FIG. 1, and

2

FIG. 3 is a side elevation of an alternative construction of doctor.

Like reference numerals indicate like parts throughout the figures.

FIG. 1 shows a web 10 of paper passing around top drying rolls 11 and a bottom drying roll 12. The felt is shown at 13. A doctor 14 is fitted to the bottom roll 12.

The doctor support 15, which is pivoted at 35 to a fixed member 36, carries a pear shaped suction chamber 16 having at its lower end a suction orifice 17 situated close to the tip of the doctor blade 18. The suction orifice 17 may be a continuous slot extending for the length of the doctor blade or it may be constituted by a number of adjacent suction ports. The suction chamber 16 is pivoted at 19 to the support 15 and normally occupies the position shown in full lines. Beneath the support 15 is an air blast pipe 20 which is normally out of action. It extends for the full length of the doctor and has a number of orifices 21, opposite corresponding holes 22 in the support 15, through which air may be blown in an upward direction when necessary.

When the web 10 consists of board or thick paper, the web, if it breaks, will be forced upwardly between the suction chamber 16 and the support 15 and close a micro-switch MS₁. If the web 10 is of light weight paper, breakage of the web will cause the paper to bunch up beneath the suction chamber 16 and cause it to lift about its pivot 19, with the result that a cam 37 on the suction chamber will close a micro-switch MS₂. Closure of either micro-switch will as described below with reference to FIG. 2, cause a pneumatic cylinder C₁ to operate to swing the suction chamber 16 about its pivot into the dash position of FIG. 1, in which its face 23 will assist in guiding the tail of the broken web into the following nip, a pneumatic cylinder C₂ to operate to rock the support 15 clockwise about its pivot 35 and so cause application of additional pressure to the doctor blade 18 so as to maintain or, if desired, increase its bearing pressure on the roll 12, so compensating for the change in pressure resulting from movement of the suction chamber 16 from its "working" to its "break" position, and air under pressure to be blown into the pipe 20. The blast emerging from the orifices 21 assists in guidance of the broken web into the following nip. While the cylinders C₁, C₂ are shown in the drawings as single cylinders only, it will be understood that two cylinders C₁ and two cylinders C₂ will be provided at opposite ends of the doctor, the cylinders of each pair operating in unison. It will be understood that the blast pipe 20 is not essential and that in suitable cases the broken web can be guided into the next nip solely by the mechanical action of the surface 23 of the lifted suction chamber 16.

When normal running is resumed the mechanism can be reset to its "working" position by means of a hand switch. A master hand control can be provided to put the mechanism into the "break" position when starting up the paper machine or should continuous trouble be experienced with feeding up the web.

The control system described in FIG. 2 will now be described. The cylinder C₁ for moving the suction chamber 16 to its alternative position is controlled by a valve V₁ which according as to whether one or other of an associated pair of solenoids S₁, S₁A is energized, effects alternative connections between the ends of the cylinder C₁ to a compressed air supply line 24, containing a non-return valve 25, and an exhaust outlet 26. Closure of either of the micro-switches MS₁, MS₂ energizes the solenoid S₁ and causes the valve V₁ to shift and admit compressed air to the left hand end of the cylinder C₁ so

causing the suction chamber 16 to move from the running to the break position. Compressed air is also admitted to the right hand end of the cylinder C₂, through an open valve V₆, causing application of increased pressure to the doctor blade 18.

The degree of increased pressure applied to the doctor blade is determined by a pressure relief valve PRV₂.

After the piston in the cylinder C₁ has moved for a predetermined distance, e.g. ¼ of its stroke, a cam K₁ on its rod 27 operates a limit switch LS₁, so energizing solenoids S₃, S₄ associated with valves V₃, V₄. As the result the valve V₃ closes to cut off a pipe 128 connecting the suction chamber 16 to a source of vacuum and the valve V₄ opens to relieve the suction in the chamber 16. On further movement of the piston in the cylinder, e.g. to ½ of its stroke, a cam K₂ on its rod 27 operates a limit switch LS₂, so energizing a solenoid S₅ and causing a valve V₅ to open to admit compressed air to the blast pipe 20.

To restore the system to the running position a reset button 28 is depressed, so energizing the solenoid S₁A and causing the valve V₁ to reverse its position. The air connections to the cylinder C₁ are therefore reversed causing the suction chamber 16 to descend in controlled fashion towards the doctor blade as air is exhausted from the cylinder through a pressure relief valve PRV₁. The limit switches LS₁ and LS₂ are operated by the cams K₁, K₂ to restore the vacuum supply to the suction chamber 16 and cut off the air supply to the blast pipe 20. As reversal of the valve V₁ also cuts off the air supply to the cylinder C₂, air exhaust from this cylinder through the valve PRV₂ to restore the normal working pressure on the doctor blade.

On depression of a hand operation button 29, the system will perform the same operations as those ensuing upon closure of the micro-switch MS₁ or MS₂.

The doctor can be raised from the roll 12 by closing switches A and B. Closure of switch A energizes a solenoid S₆ to close the normally open valve V₆ and closure of switch B energizes a solenoid S₇ to open a normally closed valve V₇, so causing the cylinder C₂ to operate under control of a pressure relief valve PRV₃ to rotate the support 15 about the pivot 35 to lift the doctor from the roll.

FIG. 3 shows an arrangement generally similar to that of FIG. 1 but in which the cylinder C₂ is omitted. The piston rod transmits movement to the suction chamber 16 to rotate it upwardly about its pivot 19 through meshing gear wheels 30, 31. As will be seen the force urging the piston rod 27 to the right in the event of breakage of the web tends to rock the support 15 about its pivot 35 in the direction to increase the pressure on the doctor blade.

What I claim as my invention and desire to secure by Letters Patent is:

1. A doctor for doctoring a roll of a papermaking machine comprising a doctor blade, a doctor support, a suction chamber movably mounted on said support for applying suction to the doctor blade along its length and at

a location near to its tip in order to remove dust and fluff scraped from the roll and means for moving the suction chamber in relation to the support from its working position to a break position in which, in the event of breakage of the web of material being doctored, it is effective to guide the tail of the broken web into the following nip.

2. A doctor according to claim 1, which includes means for directing compressed air through nozzles on to the broken web when the suction chamber is in its break position, to assist in transfer of the tail of the broken web into the following nip.

3. A doctor according to claim 1, which includes means for applying increased pressure to the doctor blade when the suction chamber is moved to the break position.

4. A doctor according to claim 1, in which the suction chamber is hinged to the support and includes means operative automatically in response to accumulation of broken web between the suction chamber and its support to cause movement of the suction chamber into the break position.

5. A doctor according to claim 4, comprising a pneumatic cylinder for effecting movement of the suction chamber, a micro-switch arranged to be operated by accumulation of broken web and a control system responsive to operation of said switch for admitting air to the pneumatic cylinder to move the suction chamber to the break position.

6. A doctor according to claim 5, which includes nozzles for directing compressed air on to the broken web when the suction chamber is in its break position and in which the control system is also effective to supply compressed air to the nozzle in response to operation of the switch.

7. A doctor according to claim 5, in which the control system is effective to cut off the suction from the suction chamber in response to operation of the switch.

8. A doctor according to claim 5, which includes a second pneumatic cylinder arranged to be operated in response to operation of the switch to apply increased pressure to the doctor blade.

9. A doctor according to claim 5, in which the cylinder is effective also to apply increased pressure to the doctor blade when it operates to move the suction chamber to the break position.

10. A doctor according to claim 8, in which the suction chamber is arranged to receive pivotal movement from the cylinder through meshing gears.

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