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3,065,486

DOCTORS FOR PAPER-MAKING AND LIKE MACHINES

Filed Aug. 31, 1961

5 Sheets-Sheet 1

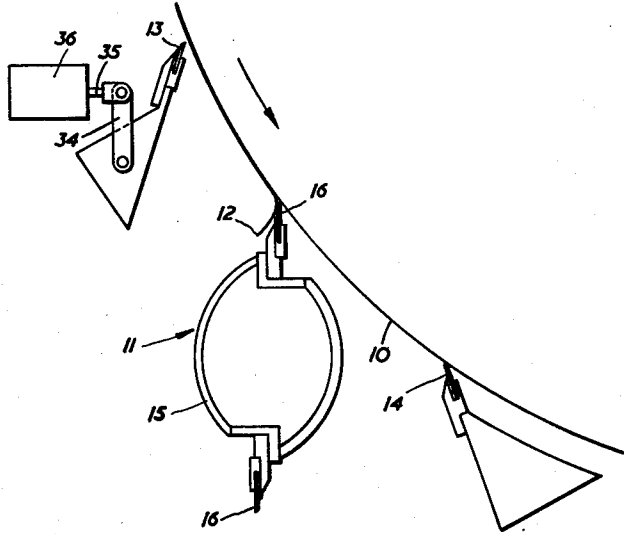


FIG. 1.

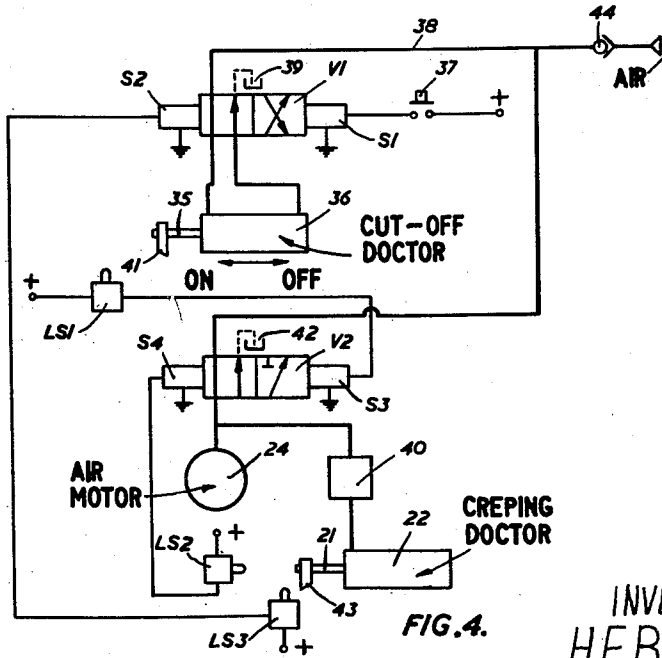


FIG. 4.

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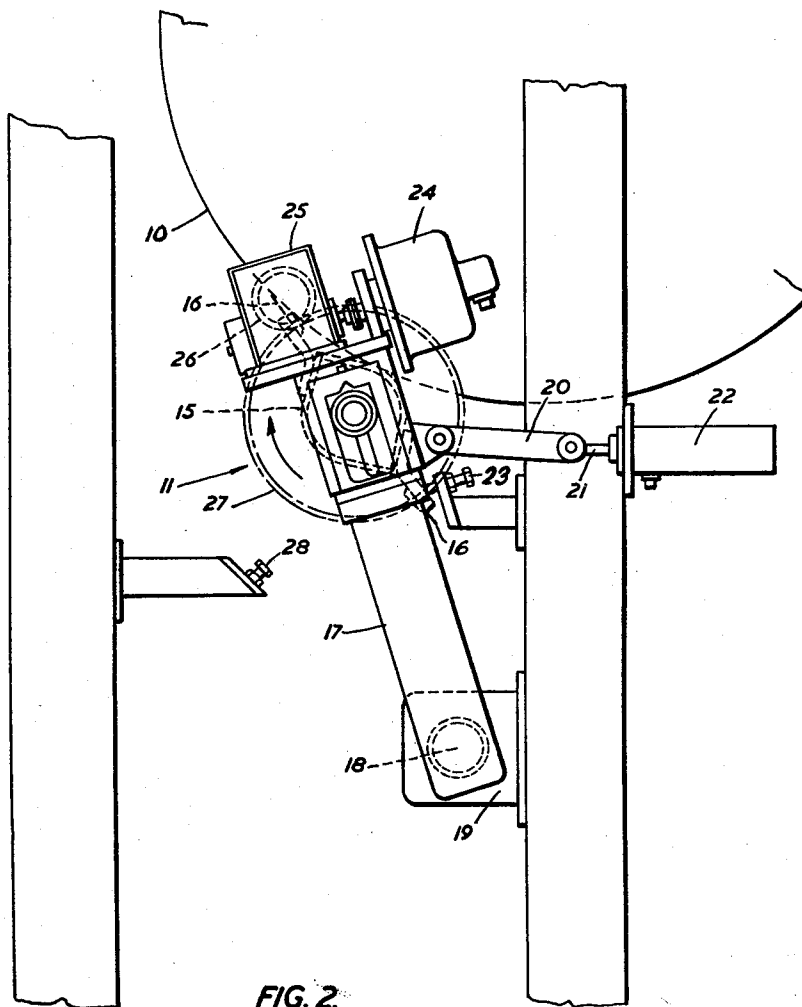
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5 Sheets-Sheet 2



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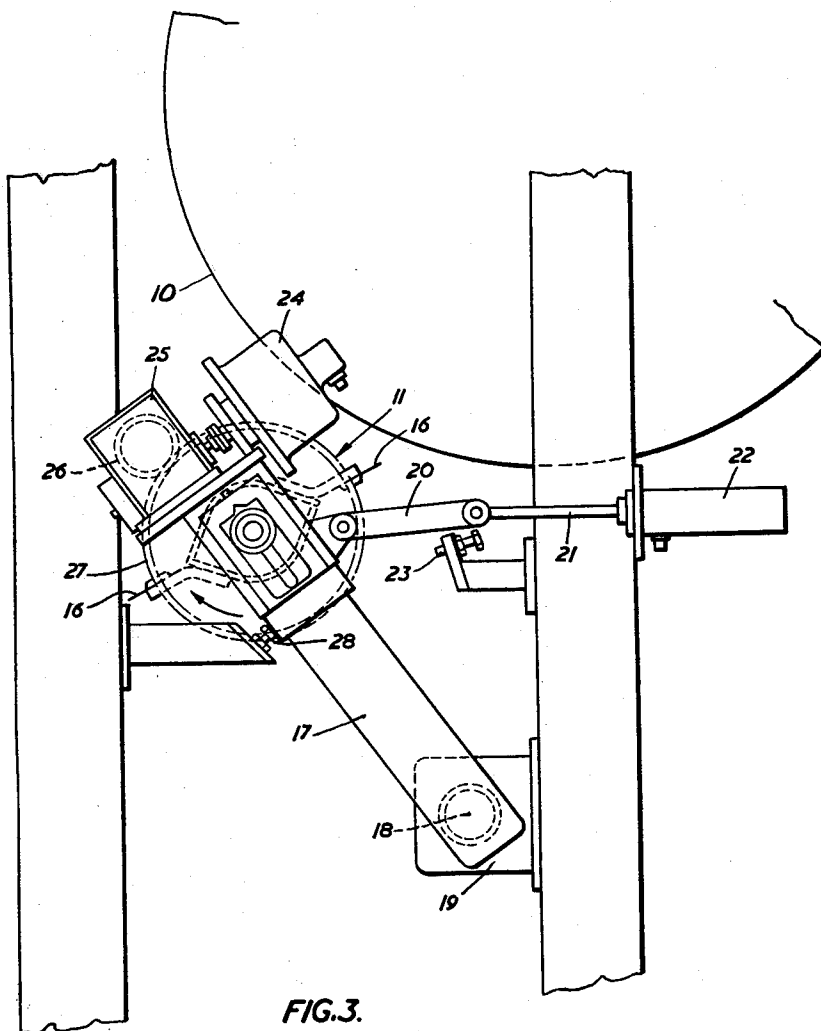


FIG. 3.

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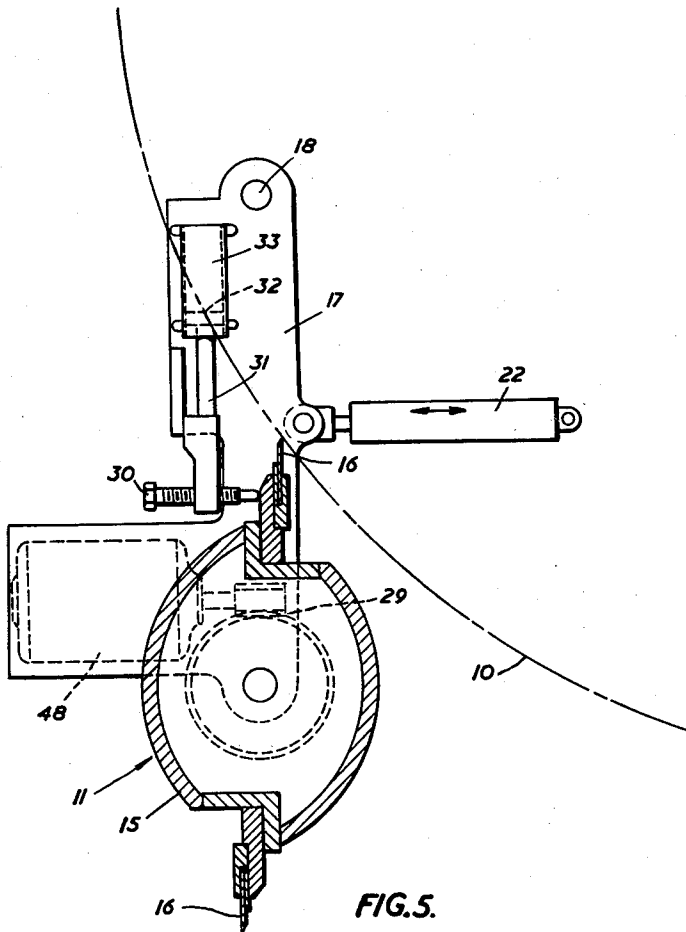


FIG. 5.

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5 Sheets-Sheet 5

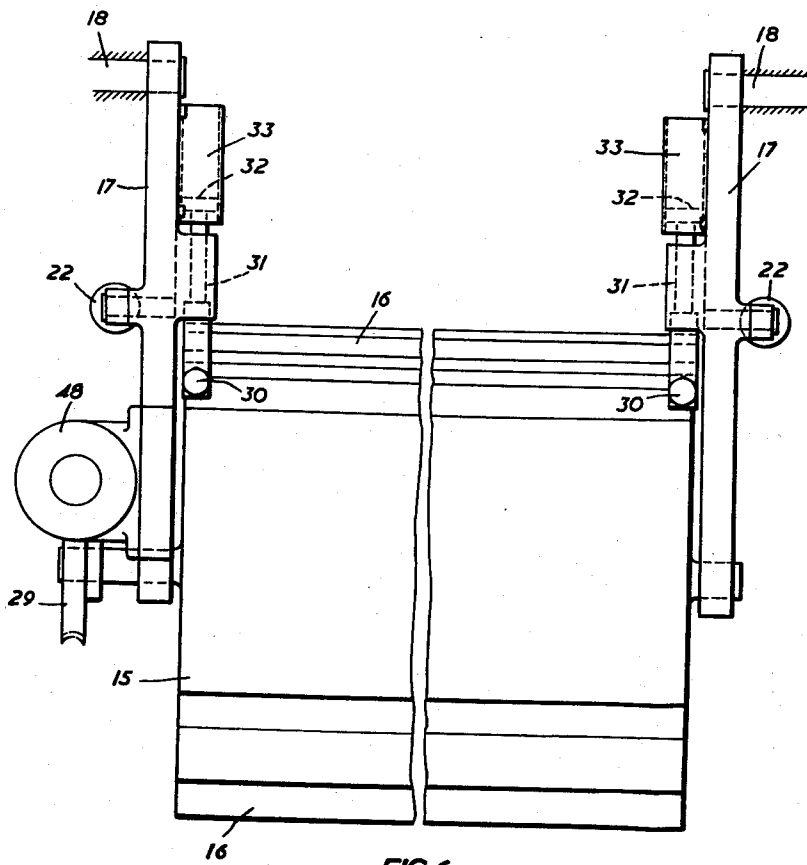


FIG. 6.

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1

3,065,486

DOCTORS FOR PAPER-MAKING AND
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11 Claims. (Cl. 15—256.51)

The invention has reference to doctors for paper-making and like machines which incorporate rolls or cylinders which require to be maintained in a clean condition. The invention is more specifically concerned with those of said machines in which provision must be made for the replacement of a worn doctor blade without stopping the machine. For example, in a machine for making crepe paper it is necessary to renew the doctor blade at very frequent intervals, due to the fact that the pressure of the blade against the fast-running surface of the cylinder causes the edge of the blade to be worn thin at a very considerable rate, and since the degree of crepe imparted to the paper depends largely upon the width of the edge portion of the creping doctor blade by which the paper is taken from the creping cylinder.

In customary practice, when a creping doctor is to be changed, the paper web is first interrupted with a cut-off doctor, the creping doctor is then removed from contact with the cylinder, the worn blade is drawn out and a fresh blade inserted in its place after which the creping doctor is restored to its creping position, and the cut-off doctor is moved away to permit of resumption of the feed of the paper web round the cylinder to the creping station. These operations are not only time-wasting but potentially dangerous to the machine operator since the doctor blade must be changed while the blade holder is close to the rotating cylinder; furthermore, since they must be carried out whilst the machine remains running at high speed, a large quantity of paper is necessarily run to waste during the blade-changing operation.

With a view to overcoming these difficulties, the invention provides in or for a paper-making or like machine, a dual doctor assembly comprising two oppositely directed doctor blades mounted on a support which is rotatable in a carrier to present the doctor blades alternatively to a cylinder of the machine, and an automatic control system which can be set in motion under control of the machine operator, when a doctor blade requires renewal, to cause movement of the carrier away from the cylinder and afterwards back again to its original position and to cause rotation of the support in relation to the carrier, after the latter has commenced to move away from the cylinder, to present the other doctor blade to the cylinder.

The worn doctor blade is thus moved into a position remote from the cylinder in which it can be removed at the operator's leisure and without risk of injury, and the other doctor blade is brought rapidly into operative relation to the cylinder so that the wastage of paper is reduced to a minimum.

Preferably the automatic control system is effective to move a cut-off doctor into operative position before the carrier moves away from the cylinder and to retract the cut-off doctor after the other doctor blade has been presented to the cylinder.

Two embodiments of dual doctor assembly in accordance with the invention will now be described in more detail, by way of example, with reference to the accompanying drawings in which:

FIG. 1 shows in simplified form a creping cylinder of a paper-making machine and the associated doctors,

FIG. 2 is an end elevation of a first form of dual doctor assembly according to the invention, showing one of the doctor blades in operation,

2

FIG. 3 is a similar view showing the assembly in the position it occupies during presentation of the other doctor blade to the creping cylinder,

FIG. 4 is a diagram showing the automatic control system utilised with the assembly shown in FIGS. 2 and 3,

FIG. 5 is a side elevation of an alternative form of dual doctor assembly and

FIG. 6 is a corresponding side elevation.

Like reference numerals indicate like parts throughout the figures.

FIG. 1 shows a creping cylinder 10 with an associated creping doctor 11, which strips the web 12 of paper from the cylinder and, in so doing, imparts crepe to it. In advance of the creping doctor 11 is a cut-off doctor 13 coupled at each side of the machine by an arm 34 to the piston rod 35 of a piston mounted in an air cylinder 36. Air pressure in the air cylinders 36 normally holds the cut-off doctor away from the cylinder 10 as shown. Beyond the creping doctor 11 is a cleaning doctor 14.

The creping doctor 11 has dual doctor blades 16 as later described, and when it is desired to change the creping doctor blade the operator presses a button to initiate operation of the automatic control system. This causes the cut-off doctor 13 to be presented to the cylinder 10 to interrupt the feed of the web 12 to the creping station, the creping doctor assembly is then actuated to withdraw the worn creping doctor blade from the cylinder and present the other doctor blade to the cylinder in its place and finally the cut-off doctor is withdrawn to its original position clear of the cylinder to permit creping to be resumed.

The dual doctor assembly 11 shown in FIGS. 2 and 3 comprises a supporting beam 15 carrying a pair of diametrically opposite doctor blades 16, one of which is shown in FIG. 2 presented to the cylinder 10. The beam 15 is supported at opposite ends of the cylinder 10 by a carrier constituted by a pair of arms 17, one only of which is shown in FIGS. 2 and 3, pivoted at their lower ends 18 to the machine frame 19. Each arm 17 is connected by a link 20 to the piston rod 21 of a piston mounted in an air cylinder 22. When air under pressure is admitted to the left hand ends of the air cylinders 22 each of the arms is held, as shown in FIG. 2, against an adjustable stop 23. Adjustment of the stops 23 serves to determine the angle at which the doctor blade 16 is presented to the cylinder 10 and such adjustment can be made while the machine is running.

Pressure is applied to the doctor blade 16 by motors 24, one at each side of the cylinder 10, each of which is connected through reduction gearing 25 to a pinion 26 meshing with a gear wheel 27 on the end of the beam 15. The motors 24 tend to rotate the beam in a clockwise direction and air is admitted to them while the creping doctor is in operation. Under these conditions the motors 24 are stalled but apply operating pressure to the doctor blade 16.

When the operator desires to change a worn blade he presses a button to set in operation an automatic control system which automatically performs the following operations in sequence:

(1) The cut-off doctor 13 (FIG. 1) is applied to the cylinder 10.

(2) Air pressure is cut off from the motors 24, so releasing the pressure on the doctor blade 16.

(3) Air pressure is released from the air cylinders 22, so allowing the arms 17 to fall away from the cylinder 10 to the position shown in FIG. 3 in which they are arrested by stops 23.

(4) While the arms 17 are so moving, air pressure is re-applied to the air motors 24 causing the beam 15 to rotate in a clockwise direction.

(5) When the worn doctor blade 16 has cleared the

3

cylinder 10, air pressure is re-applied to the air cylinders 22, so causing the arms 17 to move back towards the position shown in FIG. 2. During this movement the beam 15 continues to rotate until the other doctor blade 16 comes into contact with the cylinder 10, whereupon the air motors 24 stall and maintain pressure on the doctor blade.

(6) The cut-off doctor 13 is lifted from the cylinder 10 allowing resumption of creping of the paper web.

The operation of the automatic control system will now be explained with reference to FIG. 4. This shows the air cylinders 22 and 26 and the air motor 24 at one side of the machine. Similar air cylinders and a similar air motor are, of course, provided at the other side of the machine and operated in unison with those shown in FIG. 4 under control of the valves and the limit switches shown in the figure.

The control system includes two solenoid actuated control valves V_1 , V_2 with which are associated pairs of solenoids S_1 , S_2 and S_3 , S_4 respectively. When the dual doctor assembly is in its operative position the valve V_1 occupies a position such that air under pressure is admitted from an air supply line 38 to the left hand end of the cylinder 36, the right hand end of the cylinder 36 being connected to exhaust as indicated at 39. The valve V_2 occupies a position such that air under pressure is supplied from the line 38 to the air motor 24 and also, through a needle valve 40, to the left hand end of the cylinder 22 which holds the doctor assembly against the creping cylinder.

To bring the other blade of the dual doctor assembly into operation, the operator depresses the start button 37, so initiating the following sequence of operations:

Depression of the button 37 momentarily energizes the solenoid S_1 , so causing the valve V_1 to move to its alternative position, thus reversing the pressure and exhaust connections to the cylinder 36 which lowers the cut-off doctor 13 (FIG. 1) on to the machine cylinder 10. When the piston in the cylinder 36 has nearly completed its stroke a cam 41 on its piston rod 35 actuates a limit switch LS1 to energise the solenoid S_3 . This causes the valve V_2 to move to its alternative position, cutting off the air supply to the air motor 24 and allowing air to leak from the cylinder 22 to an exhaust connection 42 through the needle valve 40. The arms 17 (FIG. 2) supporting the doctor assembly accordingly fall away from the machine cylinder 10.

As the piston in the cylinder 22 nears the end of its stroke, a cam 43 on its piston rod 21 actuates a limit switch LS2, so energising the solenoid S_4 and causing the valve V_2 to return to its original position. Air under pressure is accordingly re-admitted to the air motor 24 which commences to rotate the beam 15 (FIG. 2). Air under pressure is also re-admitted to the cylinder 22 so causing the dual doctor assembly to return towards the machine cylinder. Just before the piston rod 21 is fully retracted into the cylinder 22 the cam 43 operates a limit switch LS3, so energising the solenoid S_2 and causing the valve V_1 to return to its original position. As the result the air connections to the cylinder 36 are reversed and the cut-off doctor is lifted from the machine cylinder. The parts are now back in their original position.

It should be noted that the cam 41 operates the limit switch LS1 only when it moves to the left and not when it returns to the right. Similarly the limit switch LS3 is operated by right hand movement only of the cam 43. A non-return valve 44 is provided in the air supply line 38 so that if the air pressure should fail the dual doctor assembly cannot fall away from the machine cylinder.

The dual doctor assembly 11 shown in FIGS. 5 and 6 operates on the same general principle. Again two opposed doctor blades 16 are provided on a beam 15 which is rotatable in a carrier constituted by a pair of arms 17, which in this case are pivoted at their upper ends 18 to the machine frame. Each arm 17, as before, is associated with an air cylinder 22 for moving it towards and away

4

from the cylinder 10. Rotary movement is imparted to the beam 15 by an electric motor 48 at one side of the machine which is connected to the beam 15 through worm and worm wheel gearing 29. Operating pressure is applied to the blade 16 by the air cylinders 22 and its angle of presentation to the cylinder 10 is controlled by adjustable screws 30 carried by the piston rods 31 of pistons 32 mounted in air cylinders 33 situated at opposite sides of the machine. The screws 30 can be adjusted to vary the inclination of the blade 16 while the machine is running.

The assembly has a similar automatic control system to that already described. The sequence of operations following pressure on the control button is as follows:

(1) The cut-off doctor 13 (FIG. 1) is presented in the cylinder 10.

(2) The pressure and exhaust connections to the cylinders 22 are reversed, causing the arms 17 to move away from the cylinder 10.

(3) The pressure and exhaust connections to the cylinders 33 are reversed, so lifting the screws 30 clear of the path of the doctor blade 16.

(4) Current is supplied to the motor 48, causing the beam 15 to rotate in an anticlockwise direction.

(5) When the worm blade has passed clear of the screws 30 the connections to the cylinders 33 are again reversed to return the screws to the position shown in FIG. 5.

(6) When the other doctor contacts the screws 32 a limit switch is actuated to stop the motor 48.

(7) The connections to the cylinders 22 are reversed to restore the arms 17 to the position shown in FIG. 5.

(8) The cut-off doctor 13 is lifted from the cylinder 10.

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

1. A doctor assembly for doctoring the cylinder of a paper-making or like machine comprising a carrier, a support carrying two oppositely directed doctor blades and mounted for rotation in said carrier to present the doctor blades alternatively to said cylinder, a cut-off doctor movable from a normal inoperative position to an operative position in which it contacts said cylinder, and an automatic control system adapted to be set in motion when a doctor blade requires renewal and operative first to move the cutoff doctor to its operative position, then to move the carrier away from the cylinder and back again, to rotate the support in relation to the carrier, after said carrier has commenced to move away from the cylinder to present the other doctor blade to the cylinder, and finally to return the cut-off doctor to its inoperative position after said other doctor blade has been presented to the cylinder.

2. A doctor assembly as claimed in claim 1, which includes a stop mechanism which is adjustable while the machine is running to vary the angle of presentation of the doctor blade to the cylinder.

3. A doctor assembly as claimed in claim 2, wherein said carrier is pivoted to the machine, said control system includes an air cylinder for moving the carrier towards and away from the cylinder of the machine and the adjustable stop mechanism is effective to limit the movement of the carrier towards the cylinder of the machine.

4. A doctor assembly, as claimed in claim 1, which includes an air motor for rotating the support in relation to the carrier which runs stalled to maintain pressure on the doctor blade presented to the cylinder and in which the control system is effective to stop the air motor prior to movement of the carrier away from the cylinder.

5. A doctor assembly, as claimed in claim 1, which includes an adjustable stop mechanism bearing against the doctor to control the angle of presentation of the doctor blade to said cylinder and wherein the control system is effective to withdraw the stop mechanism from the doctor prior to rotation of the support in relation to the car-

rier, and afterwards to return it into operative relation with the other doctor blade.

6. A doctor assembly as claimed in claim 5, wherein the control system includes air cylinders for respectively moving the carrier away from and towards the cylinder and for moving the stop mechanism into and out of its operative position, and a motor for rotating the support in relation to the carrier.

7. A dual doctor assembly for doctoring a cylinder of a paper-making or like machine, comprising a carrier mounted for movement in said machine, a support carrying two oppositely directed doctor blades and mounted for rotation in the carrier to present said doctor blades alternatively to the cylinder means for applying yielding operating pressure to the doctor blade presented to said cylinder, and a control system operable, when it is desired to renew a doctor blade, to move said carrier away from the cylinder and then back again and to rotate the support in relation to the carrier, after the carrier has begun to move away from the cylinder, to present the other blade to the cylinder.

8. A dual doctor assembly for doctoring a cylinder of a paper-making or like machine, comprising a carrier mounted for movement in said machine, a support carrying two oppositely directed doctor blades and mounted for rotation in the carrier to present said doctor blades alternatively to the cylinder, a normally stalled air motor coupled to drive said support and applying yielding operating pressure to the doctor blade presented to the cylinder, a control system operable, when it is desired to renew a doctor blade, to move said carrier away from the cylinder and then back again and to permit said air motor to rotate the support in relation to the carrier, after the carrier has begun to move away from the cylinder, to present the other blade to the cylinder.

9. A doctor assembly as claimed in claim 8, which in-

cludes an air cylinder coupled to the carrier and normally effective to urge it towards the cylinder about a pivot and an adjustable stop coacting with said carrier to limit its movement towards the cylinder, said control system including a valve controlling the exhaust of air from and its admission to said air cylinder to effect movement of the carrier away from and back to the cylinder.

10. A dual doctor assembly for doctoring a cylinder of a paper-making or like machine, comprising a carrier pivoted to said machine, a support carrying two oppositely directed doctor blades and mounted for rotation in the carrier to present said doctor blades alternatively to the cylinder, an air cylinder which is normally effective to maintain said carrier in position to apply yielding operating pressure to the doctor blade presented to the machine cylinder, a normally inoperative motor for imparting rotation to the support and a control system operable, when it is desired to renew a doctor blade, to condition said air cylinder to cause the carrier to move away from the cylinder and back again and to render said motor effective to rotate the support after said carrier has commenced to move away from the cylinder.

11. A doctor assembly as claimed in claim 10, which includes an adjustable abutment coacting with the doctor to control the angle of presentation of the doctor blade to the cylinder and wherein the control system includes means for withdrawing said abutment from the doctor blade prior to rotation of the support and afterwards returning it to position to coact with the other blade.

References Cited in the file of this patent

UNITED STATES PATENTS

2,474,052	Johnson	June 21, 1949
2,698,453	Garrow	Jan. 4, 1955

FOREIGN PATENTS

141,982	Australia	July 4, 1951
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