March 30, 1954 H. E. B. SCOTT 2,673,494

DOCTOR FOR PAPER AND LIKE MACHINES

Filed Nov. 29, 1951

3 Sheets-Sheet 1

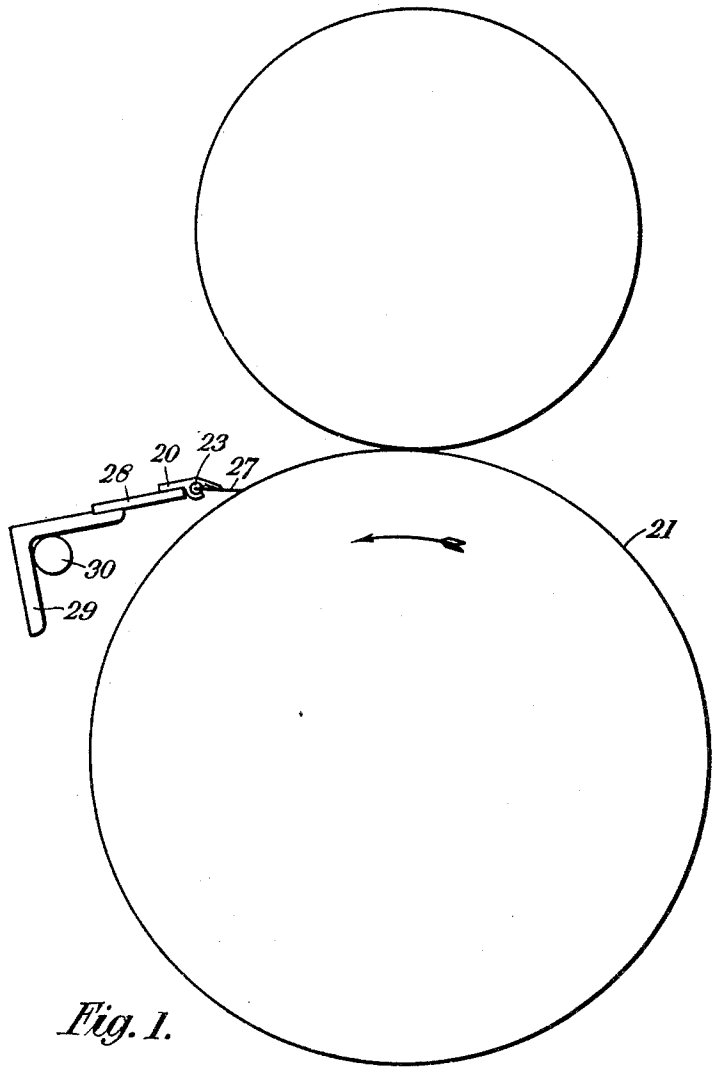



Fig. 1.

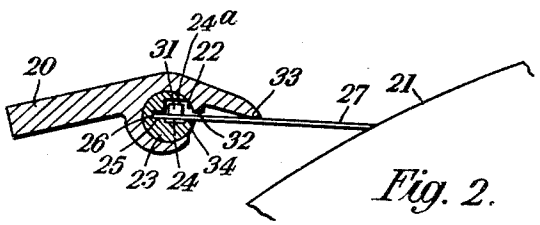



Fig. 2.

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3 Sheets-Sheet 2

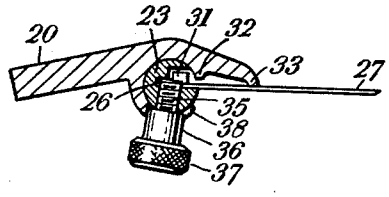



Fig. 3.

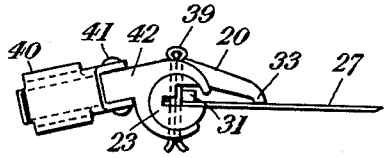



Fig. 7.

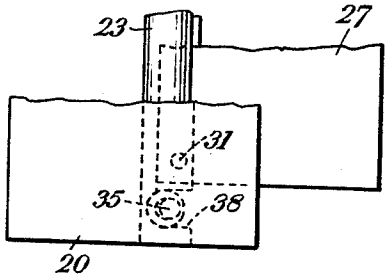



Fig. 4.

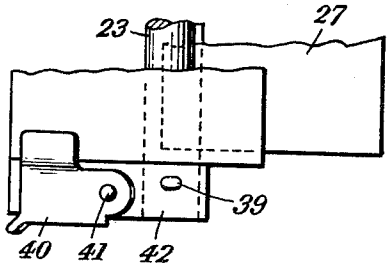



Fig. 8.

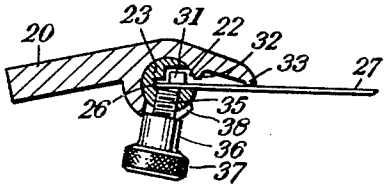



Fig. 5.

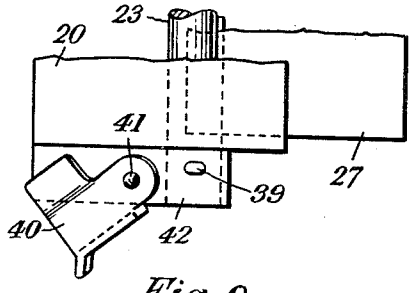



Fig. 9.

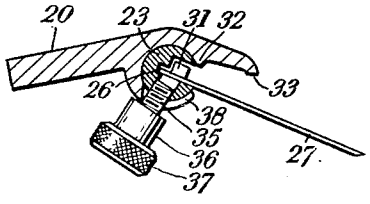



Fig. 6.

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3 Sheets-Sheet 3

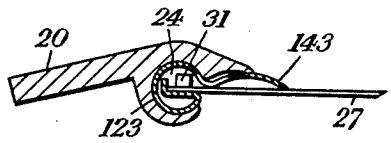



Fig. 12.

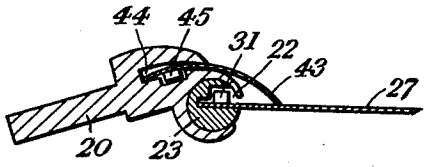



Fig. 10.

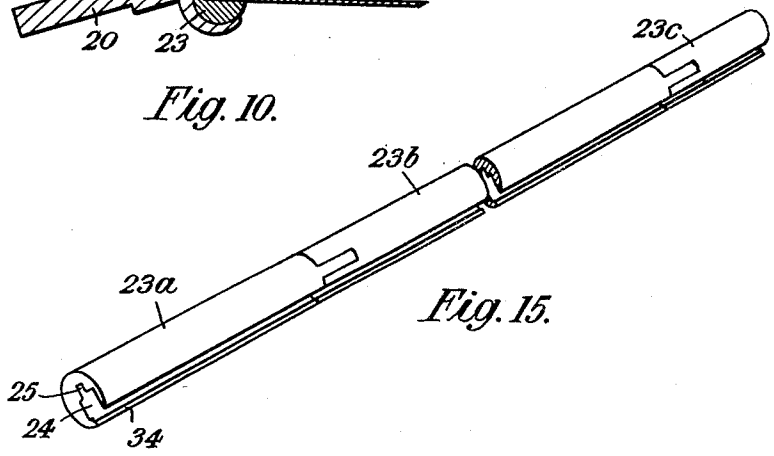



Fig. 15.

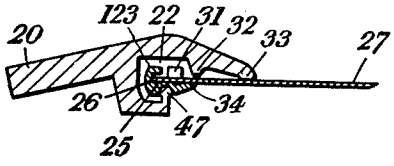



Fig. 13.

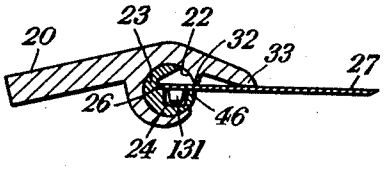



Fig. 11.

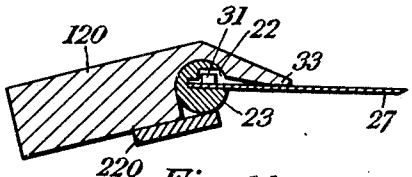



Fig. 14.

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Patented Mar. 30, 1954

2,673,494

# UNITED STATES PATENT OFFICE

2,673,494

## DOCTOR FOR PAPER AND LIKE MACHINES

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Application November 29, 1951, Serial No. 258,850

8 Claims. (Cl. 92—74)

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This invention relates to doctors for paper making and other machines including rolls or cylinders which have to be kept clean, e. g. board making machines, pulp making machines, milk dryers, metal foil rolling mills, and glueing, creping or combining machines.

More specifically, the invention relates to that type of doctor which comprises a holder and a thin blade which is a loose fit in a longitudinal retaining recess in the holder so that it is free to expand longitudinally when applied to a heated roll and is also free to float so that it may conform to any irregularity in the surface of the roll, the holder being biassed, by gravity or springs, so as to maintain the blade in contact with the roll.

Owing to the necessity for a loose fit between the blade and its holder, trouble has been experienced due to the blades falling out of the holder, and it has been proposed in Patent No. 1,912,605 to avoid this difficulty by providing projections on the blade which fit into the recess in the holder. While this overcomes one trouble it introduces another, because the pulp fibres and loading, such as china clay, in the paper work their way into the blade-retaining recess in the holder, particularly on doctors fitted to rolls at the wet end of the paper making machine where the fibres are in the form of slurry, with the result that the blade becomes fast in its holder, and great difficulty is often experienced in removing a worn blade longitudinally from the retaining process. The time occupied in changing a difficult blade means great loss in production.

To obviate this difficulty, it has been proposed in Patent No. 2,077,816 to provide slots in the front wall of the retaining recess, so that the blade may be removed laterally from the front of the holder by merely sliding the blade a short distance longitudinally until the retaining projections on the blade are opposite the slots. In that patent it has also been proposed to provide members which normally lock the blade in its retaining recess, but can be freed, by sliding or rotational movement in relation to the holder, to release the blade so that it can be removed laterally from the retaining groove.

In many cases the doctor has to be located in such a position that it is not possible to fit a new blade laterally from the front of the doctor, although a worn blade can be thus removed. It is, therefore, necessary—if the doctor is to be truly universal—for the blade to be capable of being fitted and also removed both longitudinally from the end and also laterally from the front of the holder.

In all previously proposed doctors having blade retaining means, the blade retaining recess has been located below the bottom surface of the blade, i. e. the side of the blade facing the roll. While, throughout this specification, the surface

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of the blade facing the roll is referred to as its bottom surface and its other surface as its top surface, it will be appreciated that doctor blades are in many instances mounted beneath the roll, so that its "bottom" surface is, in space, located above its "top" surface. There is always a tendency for fibres and other matter in the paper pulp to accumulate on the bottom surface of the doctor blade behind the trailing edge of the portion of the blade which is in contact with the roll and the blade retaining recess is accordingly exposed to this pulp. Also, as the blade pivots or bends from its back edge when pressure is applied to the doctor it lifts away from the front lip of the blade retaining recess with the result that a gap is left between the blade and the front edge of the recess through which pulp can gain access to and choke up the blade retaining mechanism.

The present invention provides a doctor of the above type, comprising a retaining member within the recess in the holder which is free to pivot in the holder about a longitudinal axis and has a groove accommodating the rear end of the blade, the rear edge of the blade being located behind said pivotal axis so that, when the blade is in working position on the roll it will rock the retaining member in a direction such that the bottom surface of the blade seals the front end of the groove, and the blade having projections which coact, either with the retaining member or with the holder, to prevent lateral removal of the blade when in working position but which can be freed, by pivotal movement of the retaining member in relation to the holder after the blade has been lifted off the roll, to permit of lateral removal of the blade.

The blade can thus be removed at will either longitudinally, or laterally without any longitudinal sliding movement in relation to the holder. To allow of lateral withdrawal of the blade it is only necessary to lift the blade off the roll and to turn the retaining member in relation to the holder until the projections on the blade are freed.

In the preferred form of doctor according to the invention the retaining member is constituted by a cylindrical retaining rod mounted in the recess in the holder for rotation about its longitudinal axis and having a blade retaining groove, the blade being disposed in the groove with its rear edge behind the longitudinal axis of the rod. Preferably, the blade has projections on its top surface which coact with a forwardly projecting lip on the holder, so as normally to prevent lateral removal of the blade, but which can be moved clear of the lip, after the blade has been lifted off the roll, by rotation of the rod in relation to the holder. Alternatively, however, the blade may have projections on its undersurface which coact with the front edge of the groove in

the retaining member to prevent lateral removal of the blade when it is in working position. When, however, the blade has been lifted off the roll, its upper surface can be moved, by rotation of the rod, away from the holder to a position in which the projections can be levered out of the groove in the retaining member, so freeing the blade for lateral removal.

Various embodiments of doctor according to the invention will now be described in detail, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a front elevation of one form of doctor, showing it applied to a roll in a paper making machine,

Fig. 2 is an enlarged sectional view through the doctor shown in Fig. 1,

Fig. 3 is a sectional view through a doctor of the kind shown in Fig. 2 and illustrating a device for latching the blade against removal,

Fig. 4 is a corresponding plan view,

Figs. 5 and 6 are views similar to Fig. 3, illustrating how the blade may be removed,

Fig. 7 is an end view of a doctor of the kind shown in Fig. 2 and fitted with an alternative form of latching device,

Figs. 8 and 9 are corresponding plan views, with the latch in alternative positions,

Figs. 10–13 are sectional views through alternative forms of doctors,

Fig. 14 is a sectional view through a doctor generally similar to that of Fig. 2 but with a built-up holder, and

Fig. 15 is a perspective view of a sectional retaining rod.

Like reference characters designate like parts throughout the figures.

Referring first to Figs. 1 and 2, the holder 20 of the doctor is constituted by an extruded section which extends along the entire length of the roll 21 to which the doctor is fitted. The holder 20 has a part cylindrical recess 22 in its front face, i. e. the face nearer the roll. In the recess 22 is accommodated a cylindrical retaining rod 23 having in it a blade retaining groove 24 formed with a flat surface 25 against which rests the rear edge 26 of the blade 27. As is clear from Fig. 2 the rear edge 26 of the blade is located behind the center of the rod 23. The holder 20 is mounted on a bar 28 (Fig. 1) carried by an angle section support 29 which is mounted on a rod 30, and gravity maintains the blade 27 in contact with the roll 21. Projections 31 on the top surface of the blade extend upwardly into the groove 24 in the rod 23 and a lip 32 on the front of the holder 20 coacts with the projections 31 to prevent lateral removal of the blade 27 so long as the latter is pressing on the roll 21. The forward end 33 of the holder is extended beyond the lip 32 to provide a continuous longitudinal support for the top surface of the blade 27 between its front and rear edges.

The blade 27 is free to slide lengthwise in the groove 24 in the rod 23, means described later being provided to hold the blade against endwise removal from the rod during normal operation. The operating pressure on the blade 27 keeps the projections 31 on the blade in a position such that accidental lateral movement of the blade out of the holder is impossible and excessive pressure on the blade cannot force the blade out of the holder as is the case in some previously proposed doctors. The open part 24a of the blade retaining groove in the rod 23 is located above the top surface of the blade 27 and is therefore shielded from the pulp which accumulates behind the trailing edge of the blade. This pulp cannot enter the portion of the groove 24 beneath the blade because the pressure of the blade, due to the location of its rear edge 26 behind the center of the rod 23, tends to rotate the rod in a counterclockwise direction, thereby ensuring that the flat surface 34 at the front of the groove 24 is firmly pressed against the bottom surface of the blade. The forward extension 33 of the holder shields the retaining groove 24 in the rod from pulp which may accumulate on the top surface of the blade 27.



The blade 27 can be inserted or removed either from the end or the front of the doctor, as desired.

The advantages of the doctor shown in Figs. 1 and 2 are as follows:

(1) Should the blade retaining groove 24, notwithstanding that it is well shielded, become choked with pulp, the blade 27 can easily be removed laterally from the doctor and without any longitudinal movement.

(2) There is no possibility of excessive pressure on the blade 27 springing the blade out of its retaining groove 24. As the rear edge 26 of the blade is behind the center of the rod, the pressure on the blade tends to rotate the rod in the direction to keep the retaining groove closed and to ensure that the projection 31 on the blade cannot pass the lip 32 on the holder.

(3) Various thicknesses of blades can be used by replacing only the round blade-retaining rod 23 by another having a suitable size of slot. There is no need to change the holder 20.

(4) After a period of use, the thrust of the rear edge 26 of the blade wears away its support. It is then only necessary to fit a new retaining rod 23, and not to replace the holder 20 as in the case of the known types of doctor.

(5) The blade retaining groove 24 is at all times shielded from contact with pulp and liquid.

In Figs. 3–6 is shown one form of latch for holding the blade 27 against removal from the rod 23 during normal operation. One end of the groove 24 in the rod is closed. Into the other end of the rod is fitted a screw 37, the shank 36 of which extends through a circumferential slot 38 in the holder 20. When the screw 37 is screwed home, as shown in Fig. 3, its threaded end 35 prevents endwise removal of the blade 27 from the groove 24 in the rod 23. The shank 36 of the screw 37 can rotate counter-clockwise in the slot 38 to allow of counter-clockwise rotation of the rod 23 and therefore of maintenance of the surface 34 in contact with the undersurface of the blade 27. The shank 36 however coacts with the left hand end of the slot 38 to prevent clockwise rotation of the rod 23 to an extent sufficient to clear the projections 31 from the lip 32. The blade 27 cannot therefore be removed laterally from the groove 24.

When the screw 37 is partially unscrewed, as shown in Fig. 5, its threaded end 35 is brought below the blade 27, so that the blade can be removed endwise from the doctor, but the shank 36 still coacts with the slot 38 to prevent lateral removal of the blade.

When the screw 37 is further unscrewed to the position shown in Fig. 6, the thin threaded portion 35 thereof is brought into the slot 38 with the result that, after lifting the blade 27 off the roll 21, the rod 23 can rotate clockwise to a position in which the lip 32 no longer prevents lateral withdrawal of the blade.

An alternative form of latch is shown in Figs.

7–9. As before, one end of the groove 24 in the rod 23 is closed and a removable split pin 39 at the other end of the rod normally prevents endwise removal of the blade. A U-shaped clip 40, hinged at 41 to an extension 42 of the rod can be moved to the position shown in Fig. 8, in which it engages the holder 20 to prevent rotation of the rod 23 in the direction required for lateral removal of the blade. There is, however, sufficient clearance between the top limb of the clip 40 and the holder 20 to allow of the small degree of counter-clockwise rotation of the rod 23 necessary to ensure that the surface 34 will bear against the undersurface of the blade 27. When the clip is swung to the position shown in Fig. 9, the rod 23 is freed for clockwise rotation to the position in which the blade may be withdrawn laterally.

If desired, instead of closing one end of the recess 24 in the rod 23, latches such as those shown in Figs. 3–6 or in Figs. 7–9 may be provided at both ends of the rod.

In the doctor shown in Fig. 10, the forward extension of the holder is replaced by a spring plate 43, which may be straight, or curved as shown, and which presses against the top surface of the blade 27 throughout its length and the rear edge of which is accommodated in a retaining groove 44 in the holder and provided with projections 45 which prevent lateral removal of the spring plate 44 from the holder.

In the construction shown in Fig. 11, the projections 131 are on the bottom surface of the blade 27 and coact with the lip 46 at the forward end of the groove 24 to prevent lateral withdrawal of the blade while the latter is in position on the roll.

Instead of employing a solid rod, machined or extruded with a groove to receive the blade, the rod 123 may, as shown in Fig. 12, be hollow and formed of sheet metal, the metal extending forwardly from the groove 24 in the rod, past the lip on the holder, to constitute a spring plate 143 bearing against the top surface of the blade. With this construction a resilient support is provided, in place of a rigid support, for the rear edge of the blade.

In Fig. 13 is shown a doctor in which the retaining member 123 is not a cylindrical rod but is of approximately V-section, and is mounted to rock on a projection 47 at the base of the recess 22 in the holder 20.

The holder of the doctor shown in Fig. 14 is of built-up construction and not extruded. It can consequently be made of steel and other metals which cannot be extruded, and is of special utility having regard to the present shortage both of extruded sections and of non-ferrous metals. The body portion 120 of the holder is machined from bar and the base of the opening 22 in the holder is closed by a bar 220 welded or otherwise secured to the member 120. This construction has the advantage that the angle of presentation of the blade 27 to the roll is determined by the angle to which the inner face of the projection 33 is machined. Consequently, to construct doctors with different blade presentation angles, it is only necessary to provide members 120 with projections 33 machined at different angles and no change is necessary in the machining of the recess in the massive angle iron support (29 in Fig. 1) for the doctor.

If desired the rod, whether solid or of the sheet metal construction just described, can, as shown in Fig. 15, be constituted of several sections, such as 23*a*, 23*b*, 23*c*, having interlocking ends with the result that the blade will be given extra flexibility.



I claim:

1. A doctor blade and blade holder assembly comprising, a blade holder having a longitudinal recess, a blade retaining member fitting said recess and free to pivot about a longitudinal axis, said member having a blade receiving longitudinal groove, a blade having its rear edge in said groove and located behind said longitudinal axis, the bottom surface of the blade contacting the lower edge of the groove to seal the same, said blade having at least one projection, means operative in the active position of the blade to lock the blade against lateral removal of the blade from the blade retaining member, said means being disengaged from said projection by pivotal movement of said retaining member about said axis to permit lateral removal of said blade from said retaining member and said holder.

2. An assembly as set forth in claim 1 in which the blade holder recess is cylindrical and the blade retaining member is coaxial with said recess.

3. An assembly as set forth in claim 1 in which the blade holder has a forwardly projecting lip bearing on the blade and coacting with at least one projection on the blade to prevent lateral removal of the blade.

4. A doctor as set forth in claim 1 in which the blade holder recess is cylindrical, the blade retaining member is coaxial with said recess and is formed of sheet metal, the metal extending forwardly from the retaining groove to form a spring plate bearing against the upper surface of the blade.

5. The assembly as set forth in claim 1 wherein the retaining member is of approximately V-section and mounted in the recess and holder so that it may rock about its base.

6. An assembly as set forth in claim 1 in which the retaining member is constituted of several coaxial sections having interlocking ends.

7. An assembly as set forth in claim 1 in which the blade retaining member comprises a cylindrical rod mounted in the recess in the blade holder, said rod having a blade retaining groove, at least one end of the rod having a projecting member for engaging a slot in the blade holder, said projection being adjustable from a locking position to successive positions in the first of which it frees the blade for endwise withdrawal and in the second of which it also frees the blade for lateral withdrawal.

8. An assembly as set forth in claim 1 having at least one end of the blade retaining member a clip pivoted to an extension of the blade retaining member and engageable with the blade holder to prevent pivoting of the blade retaining member in such direction as to enable lateral withdrawal of the blade.

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