

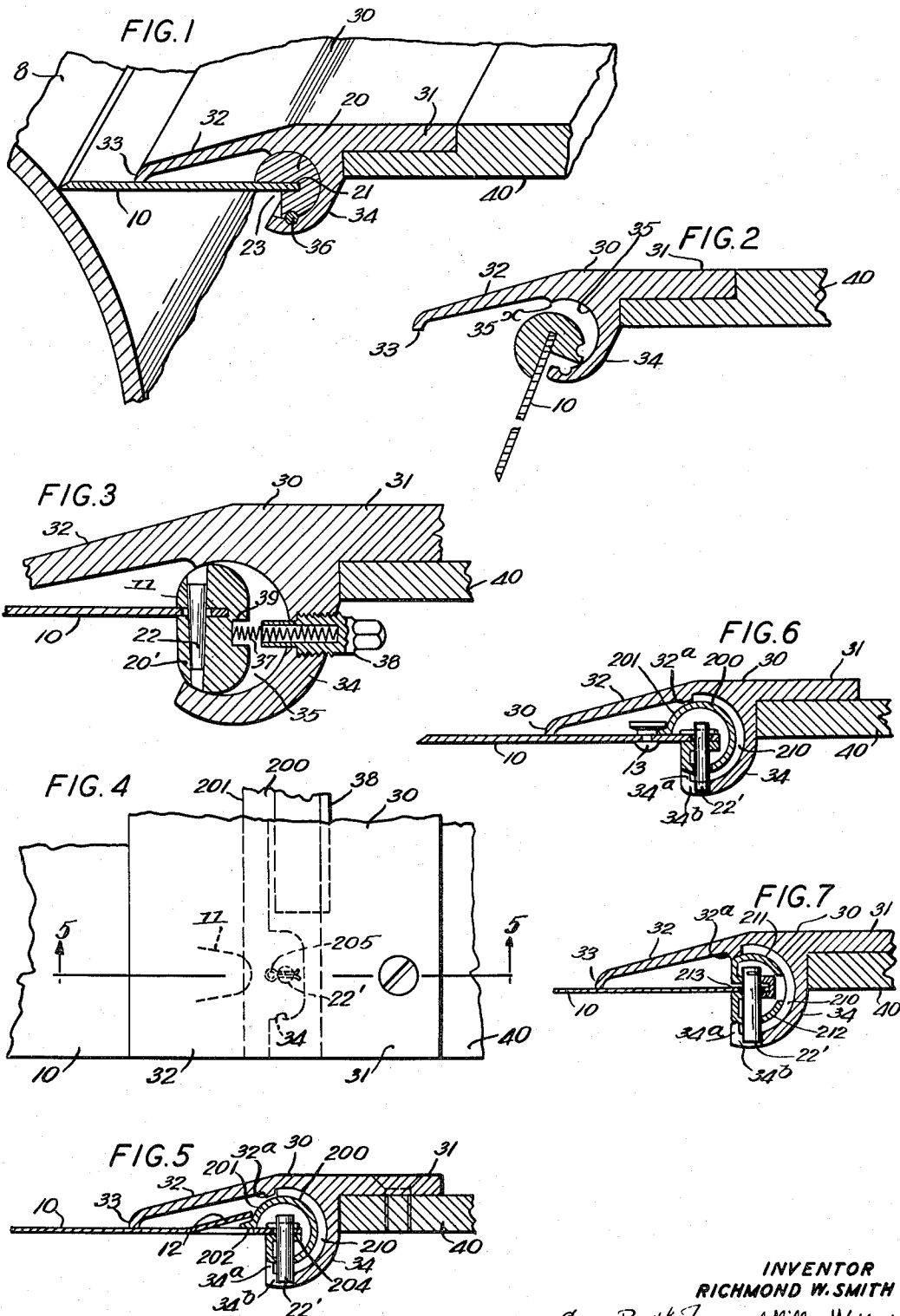
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DOCTOR ASSEMBLY AND FRONT REMOVABLE BLADE AND HOLDER THEREFOR

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DOCTOR ASSEMBLY AND FRONT REMOVABLE BLADE AND HOLDER THEREFOR

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This invention relates generally to paper and other sheet material manufacture and processing wherein matter may accumulate on drums and rolls. More particularly the invention concerns doctors or scrapers for clearing and cleaning the surfaces of calender, dryer, and the like rolls and cylinders comprised in the apparatus used in such manufacture and processing, especially including paper and the like machinery.

Early doctors had blades fastened directly upon a carriage mounted rigidly in the machine frame. Certain more recent constructions have introduced a blade removable endwise of the support means, as from a longitudinal slot or groove therein. But removal of the blade as for inspection, repair or replacement has generally been obstructed by jamming or plugging of the support by the fibrous and other waste material carried from the roll. Also heretofore desired vibration or oscillation of the blade has required that an entire relatively heavy carrier means be reciprocated.

By the present invention there is provided a doctor assembly which permits front or transverse as well as lengthwise removal of the doctor blade from the blade carrier, and by which the blade may be oscillated independently of the support means. My invention further provides a doctor mechanism which is simple in design and of lightweight but rugged construction, and adapted firmly to support the blade over the full length of the roll while preserving such flexibility as may be desired for the same. Additionally the doctor blade of the invention is characterized by a freedom from the mentioned jamming or plugging and is speedily and safely demountable without stopping the machine, thus decreasing costly down time and the quantity of defective paper caused by the changing of blades.

These and other objects of the invention will more fully appear from the following description taken in conjunction with the accompanying drawings, in which like numbers refer to like parts throughout the several views, and wherein:

Fig. 1 is a perspective of one form of the doctor assembly, shown in operating position, with the blade applied to a roll;

Fig. 2 is a side view of the doctor assembly, shown with the blade lowered as for removal;

Fig. 3 is a fragmentary section on a larger scale of another form of the doctor means illustrating particularly the blade lock and associated resilient thrust bearing;

Fig. 4 is a top plan of a further alternative form of doctor assembly;

Fig. 5 is a section along the line 5—5 of Fig. 4;

Fig. 6 is a section of a form like that of Fig. 5, showing an alternative blade thrust bearing; and

Fig. 7 is a vertical section of still another form of the doctor.

Referring now more particularly to the embodiment of Fig. 1, the surface of a roll or cylinder is indicated in fragmentary outline at 8, and a roll clearing and cleaning doctor blade is shown at 10 in operative engagement therewith. The blade 10 is releasably held in an elongated base or butt bar 20 to be referred to herein as the holder, and which is mounted on a carrier 30. Blade 10, holder 20,

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and carrier 30 are together operatively supported in roll facing position by a doctor back or support 40. Such back element 40 may be of any usual or preferred structure and is supported for bodily movement toward and from the roll to present or to throw off the doctor, it generally being rockable on a through-going or other shaft means (not shown) journaled on the machine side frames or other supporting structure. The blade 10 may be of metal, fibre, or a plastic composition as required or preferred for various applications. Such blade is in general a thin sheet member uniformly dimensioned and of adequate strength and rigidity to support thrust stresses in its own plane yet having such predetermined inherent flexibility both lengthwise and radially of the roll as to be self-aligning with the doctored surface under operating pressures.

In accordance with the invention the blade 10 is supported along the rear edge thereof by the butt bar or holder 20 mentioned. The latter is a relatively lightweight elongated member of a general rounded cross-sectional contour, whether of the more or less solid construction of Figs. 1 to 3 or the more open or hollow form of Figs. 4 to 7. This holder 20 may be formed of metal of suitable lightness and resiliency. Being an elongated element of uniform cross-section, it may be drawn or rolled, and is particularly adapted for fabrication of plastic material by the extruding process, in any of the embodiments here illustrated.

In said Figs. 1 and 3 embodiments, the holder 20 has a blade-holding or edge-seating formation shown as a longitudinal slot 21 in which the blade is slidably received. The blade is removably fastened to the holder as by pin means 22 passed through blade apertures 11 which preferably are oversized to preclude a bearing engagement of the blade and pins. Such fastener means may be located near the blade ends and elsewhere along it as appropriate. The surfaces of the blade-receiving slot 21 are desirably machined or otherwise precision made, particularly at the back wall where the blade thrust is taken. It will be understood also that slot 21 may be sized for a snug fit with the blade, as indicated in the drawings, or a considerable clearance may be provided, thereby accommodating blades of varying thickness, and additionally facilitating ready removal of the same.

As noted, an important feature of the invention is the provision for plugging-free mounting and quick and easy removal of the doctor blade as for replacement or repair. This will be seen to be facilitated by the novel design of the herein described carrier, whereby the blade is removable frontally or transversely of the doctor, thereby eliminating the need for modification of the machine side frames or other special provisions as may be required for doctors capable only of lengthwise removal of the blade. More particularly, the blade and holder of the invention are securely held in the carrier 30 in the operating position of Fig. 1, but are readily removable frontwise therefrom when swung or rotated to the downturned or non-operating position of Fig. 2.

To this end the holder 20 is characterized in its several embodiments by the generally cylindrical or rounded cross-sectional contour mentioned, such as to provide it with at least parti-cylindrical or arcuate outer bearing surfaces and with major and minor transverse dimensions or diameters. In the form of Fig. 1 the same is accomplished by extruding or otherwise fashioning the holder 20 as a cylindrical bar having along the full length an open sector 23, shown at the roll-facing quadrant, below the slot 21. It will be seen that holder 20 is thereby provided in cross-section with mutually normal, greater and lesser dimensions, or more particularly with a minor diameter in a plane paralleling the blade, and a major diameter in a plane substantially at right angles thereto.

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Further in accordance with the invention, the blade and holder are firmly supported by a unitary, elongated doctor mount or carrier 30 previously mentioned. This carrier element 30 may be of steel, aluminium, or other material of a strength, weight, and elasticity to supply the correct, uniform pressing action over the full length of the roll without sagging, twisting, chattering or other irregularity. The carrier 30 has along the full length a rearwardly projecting mounting flange 31 to be rigidly fastened in any preferred manner to the supporting back bar 40, as by screws or bolts seen in Figs. 4 to 6, and an integrally and forwardly projecting bearing arm 32 terminating as at 33 in a blade-contacting margin or lip disposed for resistive and pressing or biasing engagement with the blade 10 along a mid-portion thereof. It will be appreciated that the described bearing arm 32 additionally provides in the several embodiments of the doctor a desired means for shielding the blade mounting from the fibre and the like waste removed from the roll, as already mentioned.

The carrier 30 is further provided intermediate the flange 31 and arm 32 with a depending rib 34 similarly extending the full length of the carrier and having at its front face a through-going longitudinal parti-cylindrical bearing recess 35, see Fig. 2, open at both ends and at the front thereof. This recess 35 is sized for bearing support of the holder while affording it a capacity for sliding movement and also for partial relative rotation about a longitudinal axis, as between the operative position of Fig. 1 and a demounting position of Fig. 2. Under the invention the front or roll-facing lateral access or entrant opening 35x to the bearing recess 35 is predeterminedly dimensioned at a value between that of the major and the minor diameters of the holder bar 20, for the purposes of front removability as already referred to, consistent with operative retention of the holder 20.

During use the blade 10 normally is fixed in the operating position of Fig. 1 and the holder 20 and carrier 30 are held against relative rotation by releasable detent or lock means such as a key 36 slidably seated in mating longitudinal keyways in the opposed bearing surfaces. Such key means may be provided at the respective ends of the holder or may extend up to full length of the latter, particularly in the longitudinally sectionalized construction later referred to.

For inspection, repair or replacement of the blade 10 or the holder 20, the doctor as a whole is moved out of roll-engaging position by lifting or retraction of the supporting back 40, as permitted by the usual pivotal support of the latter. The holder locking key means 36 is then removed. It will be readily apparent that the blade and holder will then pivot or rotate by gravity or otherwise to a downfacing position as illustrated in Fig. 2 in which the minor diameter of the holder 20 is brought within the roll-facing entrant opening of the bearing recess 35. The blade and holder as a unit is then free to drop or rock out of the recess 35. If it is now further desired to remove the blade 10 from the holder 20 this may readily be effected, first knocking out any fastener pins such as those of Figs. 3 to 7. It will be appreciated that the entire procedure is speedily accomplished, with a minimum manipulation of parts.

The herein disclosed construction and arrangement of the blade and holder unit and the relation thereof to the carrier gives rise to another important feature of the invention, namely, the provision of a doctor wherein the doctor blade has capacity for reciprocation independently of the doctor back or main supporting element of the doctor such as the part 40 herein shown, independently also of the intermediate support such as the carrier 30 hereof and of any other relatively heavy, massive structure associated in maintaining the blade against the roll under desired firmness and freedom from tendency to sag, twist, or vibrate. It will be seen that the described lengthwise slidability of the blade butt bar or holder 20 in and with

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respect to the carrier 30 permits such independent longitudinal oscillation of the blade 10 and the relatively lightweight holder 20. Such oscillatory movement may be had by any desired or convenient cam or means driven from a moving part of the machine or by pneumatic, hydraulic, electric or other medium coupled to the holder.

In the embodiment of Fig. 3, the blade holder 20' is provided with major and minor diameters by forming it with a substantially ovaloid outside contour, the cylindrical bearing surfaces being retained in the region of the major diameter, as shown. This holder 20' is relatively loosely supported by the carrier 30, so as to permit transverse or lateral as well as longitudinal and also rotational movement thereof in the bearing recess 35. The blade 10 is yieldingly held against the doctored roll and against the forward wall portions of the recess 35 by a thrust-absorbing resilient positioning means herein shown as a compression spring 37 adjustably held as by a threaded cup 38 in the carrier flange 34, the inner end of the spring bearing against a seating formation on the holder 20' as at 39. It will be apparent that the described yieldably seated, spring-biased holder mounting affords the blade enhanced radial flexibility. The positioning means 37 will be seen to function also as a restraining detent against rotation of the holder 30.

In the embodiments of Figs. 4 to 6, the extruded or otherwise fabricated blade holder 200 again has a generally cylindrical or rounded cross-section, in this instance of an open character and approximating the letter G. It includes a forwardly projecting resilient cap portion 201 terminating in a nose 202 adapted to engage the top face of the blade 10, and a horizontally and rearwardly projecting flange 204 defining a longitudinal seat on which the rear margin of the blade is supported. The blade 10 and holder 200 are seen to be held respectively against removal and rotation by the pins 22' which are inserted in aligned apertures in the flange 204 and the opposite circumferential portion of the holder 200 and are held in place as by cotter pins 205. The carrier bearing rib 34 is recessed as at 34b in the region of the pins 22' for access to and removal of the same.

In the embodiment of Figs. 4 to 6 the holder 200 again is front removable by turning it in its mounting piece or carrier 30. It may be oscillated axially or may be stationary as desired. For this purpose there is provided a half-bushing or filler block 210, which is sprung or slipped lengthwise into the bearing recess 35 of the carrier rib 34. In use position it is held at its opposite edges between radial projections 32a, 34a on the carrier arm 32 and the recessed rib 34 respectively. In accordance with the invention the bushing 210 may be substantially shorter in length than the holder 200 and any desired number thereof may be provided along the holder. Such sleeves or bushings are proportioned in thickness and circumferential extent to provide the cylindrical bearing surface and also the holder retaining characteristics as desired in cooperation with the bearing recess 35.

The G section holder 200 will be seen further to permit the employment of blades of different thickness, whereby varying conditions of roll surface requiring different degrees of blade flexibility may be met without demounting or replacing the entire doctor assembly. For certain applications a steel or the like metal blade may be required, for example on the order 0.032 in. in thickness. In such instance the thrust from the blade is conveniently applied to the spring cap 201 through a tab 12 integral with and struck up from the blade, as in Fig. 5. For other uses a fibre blade may be preferred, which may have for example a thickness approximating 0.125 in., and in which case the blade may be provided with a bearing stud 13, Fig. 6, for thrust-transmitting engagement with the cap 201.

It will be appreciated that in the embodiment just described the blade 10 is both front and side removable and may be independently oscillatable, in the manner

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of the forms of Figs. 1 to 3,, while at the same time the resilient open nature of the G section holder affords the blade substantial additional flexibility radially of the roll. It will be observed also that the described construction of the holder permits a considerable saving in weight and material, while retaining the required cylindrical bearing surfaces and major and minor diameters, as well as the longitudinal blade-receiving seat. It is noted further that the modified holder of Figs. 4 to 6 affords the blade enhance freedom of movement at both its front and back edges and also longitudinally thereof, promoting desired adjustment to irregularities in the roll surface, and also well nigh precluding the doctor plugging or jamming encountered with conventional constructions, as already noted.

In Fig. 7 there is shown still another form of the doctor, which is seen to be similar in major respects to the embodiment of Figs. 4 to 6 just described. The holder 210 is likewise of open resilient character and of generally cylindrical or rounded cross-section. It is distinguished by curved, rearwardly projecting upper and lower wings 211, 212 integrally supported at the front edge of a central blade-seating slot or channel 213, which is sized and arranged for sliding reception of blades of different thickness. The blade holder has a lesser or reduced portion facing the roll when in operative position as in Fig. 7. The blade 10 and holder 210 are similarly held against rotation and removal by the locking pins 22' passed through aligned apertures in the lower wing and channel portions 212, 213, and held in place by the usual cotter pins. The carrier bearing rib 34 is again recessed as at 34b for access to the pins 22'.

In the commercially preferred form of Fig. 7 the doctor blade 10 is seen to be of uniform dimensions and interrupted only by the apertures receiving the locking pins 22', thus promoting maximum strength and minimum manufacturing cost for the same. It is to be noted that in this form as well as the others the entire longitudinal bearing recess defined by the rib 34 and adjacent overlying part of the carrier 30, within which the blade holder is received, is closed against entry of foreign matter save for the negligible pin-access apertures. Further, the blade 10 is resiliently supported between upper and lower flat positioning or seating faces of the channel 213, as well as at the back thereof where the radial extent of the channel-forming portion may be extended by reason of the circumferential spacing between the wings 211, 212. Thus the blade is positioned with desired freedom of action in the channel 213 by the holder 210, which is rotatable and also longitudinally stationary or oscillatable in bushing or filler block 210.

In keeping with the invention either and both the holder and the blade elements may be longitudinally sectionalized, in any of the embodiments. The component sections may be of any convenient length, for example 5 in. to 1 ft. or more. Thus any required length of blade and holder may be assembled as appropriate for a given roll, permitting the replacement of any one or more sections, as facilitated by the front removability herein accorded. It will be appreciated that such sectional construction not only facilitates installation and replacement but also affords the doctor the high degree of flexibility, both longitudinally and radially of the roll, which may be required under certain operating conditions, as where the roll has become more or less out of round. In other instances, particularly with shorter rolls, or in any case, the holder and blade may be integrally formed for the full length of the roll or cylinder.

From the foregoing description it will be understood that I have provided a new and improved doctor mechanism which is of simple design and rugged construction, and which is operable with various blades and applicable to the several calender, dryer, press, and other paper and the like sheet material processing machinery rolls. It will be seen further to afford a secure flexure-

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permitting mounting for, and quick and easy front as well as side removal of, the roll-clearing blade. It will be apparent also that my novel doctor permits desired oscillation of the blade independently of the heavy doctor back and associated supporting structure.

My invention is not limited to the particular embodiments thereof illustrated and described herein, and I set forth its scope in my following claims

I claim:

1. In a doctor for use with a calender or the like roll or cylinder, in combination, a blade, a cylindrical holder bar slotted lengthwise to receive the back edge of said blade and having a longitudinal frontal reduced-radius sector, and a carrier rotatably and slidably supporting said bar in a cylindrical recess having a frontal opening whereby said blade and holder are front removable when rotated from the normal roll-facing position.
2. A doctor according to claim 1, and detent means engaging the carrier and holder to restrain relative rotating movement thereof.
3. A doctor assembly for application to rolls or cylinders of paper-making or the like machinery, comprising in combination a roll-engaging blade, a cylindrical holder bar slotted lengthwise to receive and support the rear edge of the blade and having a normally roll-facing longitudinal sector of reduced radius, a carrier having a cylindrical recess for snug sliding pivotal support of said bar, said recess defined by a longitudinal frontal opening through which said bar is removable when pivoted from its normal operative roll-facing position, and a longitudinal bearing arm projecting integrally of said carrier and disposed to bias said blade into the normal operative roll-engaging position.
4. In a doctor, the combination of a roll-engaging blade, a cylindrical holder bar having a longitudinal recess receiving the back edge of said blade and defining a blade-underlying reduced-radius sector, and a carrier element formed with a cylindrical recess rotatably and slidably housing said bar, said recess formed with a longitudinal front opening having a width intermediate the normal and reduced diameter of said bar and through which said bar is removable when said blade is withdrawn and allowed to swing down from its normal roll-engaging position.
5. In a doctor, the combination of a roll-engaging blade, a cylindrical holder bar having a longitudinal recess receiving the back edge of said blade and defining a blade-underlying reduced-radius sector, a carrier element formed with a cylindrical recess rotatably slidably supporting said bar, said recess open at its ends and defined further by a longitudinal front opening having a width intermediate the normal and reduced diameters of said bar and through which said bar is removable when said blade is disengaged and allowed to rotate downwardly from its normal operative position, and a longitudinal bearing arm on said carrier, said arm disposed to engage said blade outwardly of said bar and to bias the blade into the normal roll-engaging position.

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