

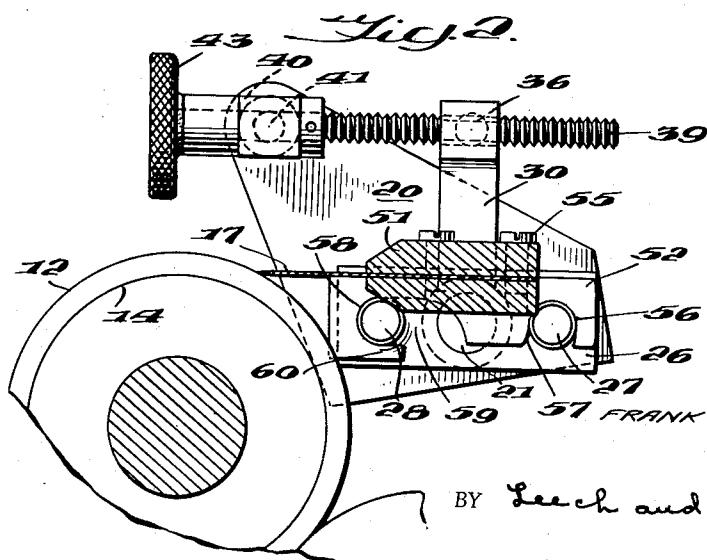
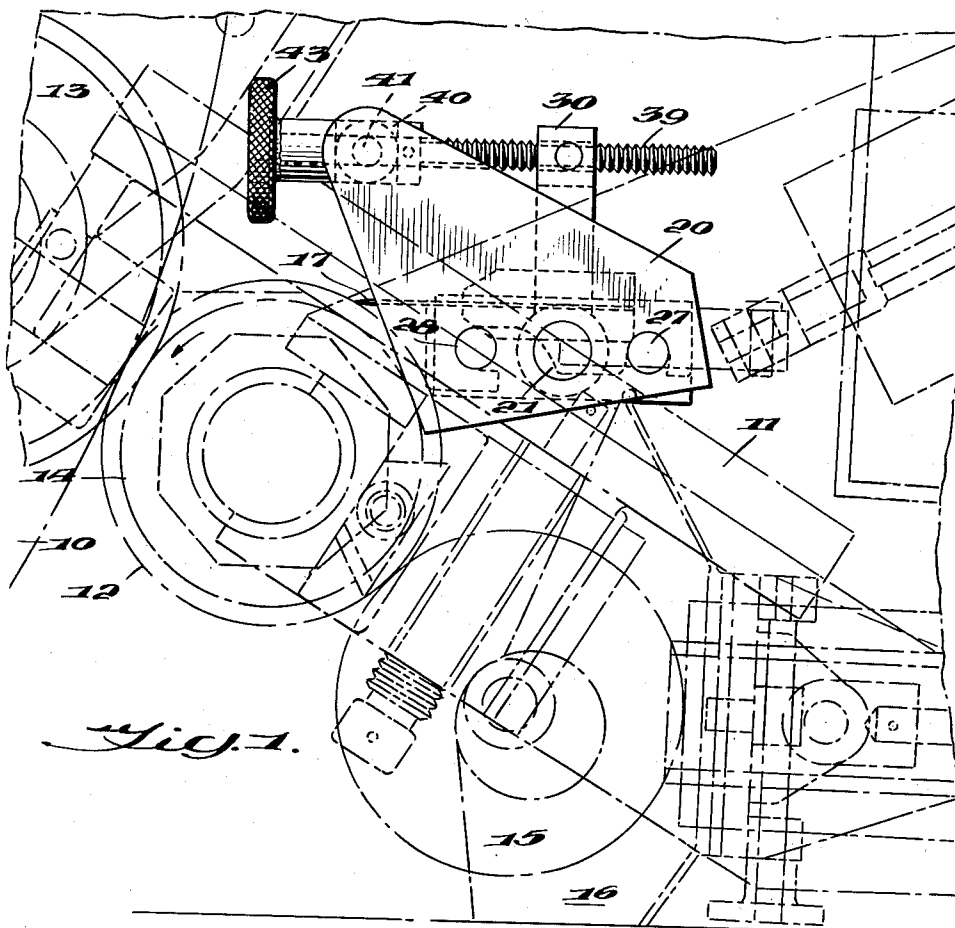
Sept. 14, 1954

F. F. KAISER
DOCTOR BLADE HOLDER

2,688,919

Filed Dec. 17, 1952

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 3.

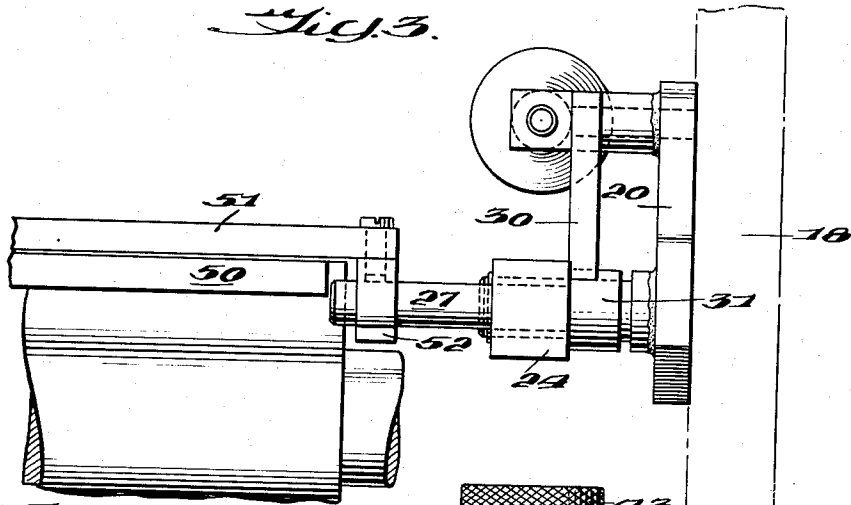


Fig. 4.

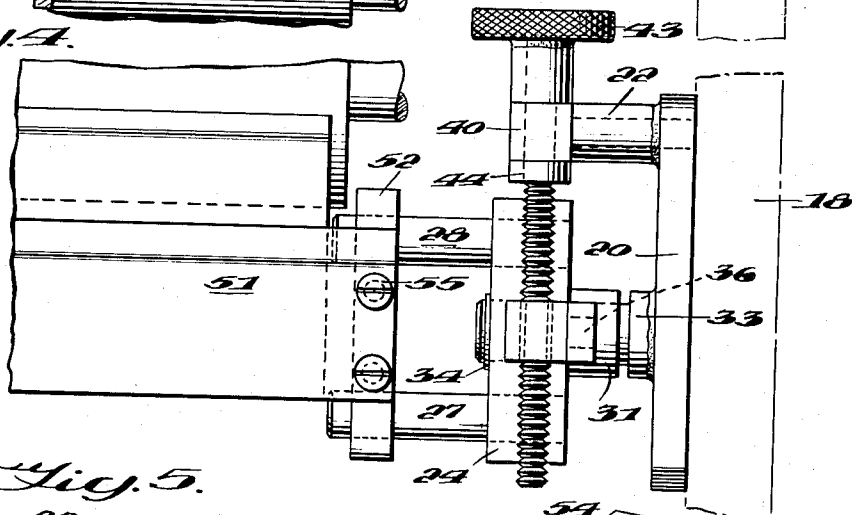
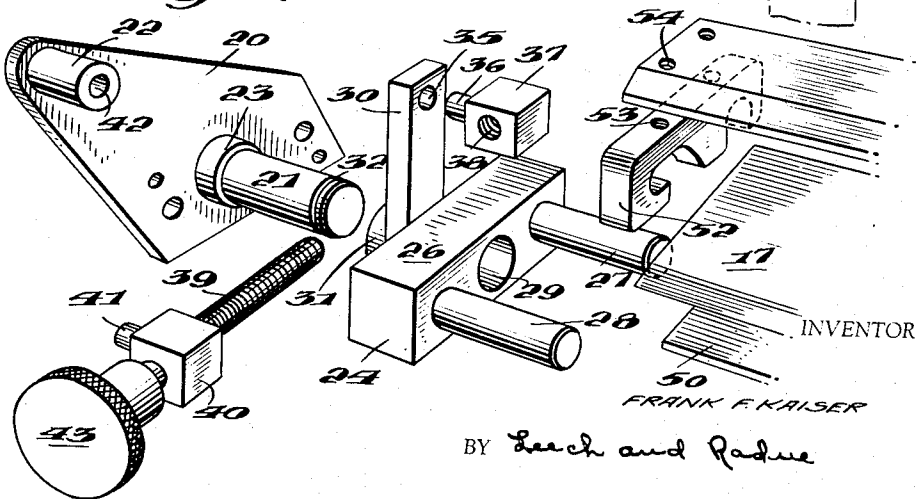


Fig. 5.



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UNITED STATES PATENT OFFICE

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DOCTOR BLADE HOLDER

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Application December 17, 1952, Serial No. 326,545

9 Claims. (Cl. 101—157)

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This invention relates to doctor blade holder assemblies for machines of the intaglio printing type or others requiring a quickly removable and separable doctor blade.

It is a general object of the present invention to provide a novel and improved doctor blade holder assembly and more particularly such an assembly permitting ready and quick removal and replacement of the doctor blade without the use of tools and facilitating the mounting and adjustment of the blade.

More particularly it is an object of the invention to provide a doctor blade assembly in which the blade and its shears are removable as a unit from the supporting fulcrums and flexing adjusters by a mere lifting action.

An important object of the invention comprises the arrangement on the ends of the blade shears of saddle plates involving hooks and notches capable of assuming and holding fixed positions on rotatably adjustable pin bars cooperating with blade flexing means.

Another important object of the invention resides in the interlocking of the saddle plates and pin bars to permit ready assembly and disassembly while providing for longitudinal vibration of the blade to prevent streaking, etc.

Features of novelty include:

Mounting of saddle plates on overhanging ends of upper shear bar;

Suspending whole doctor assembly between end plates;

Attachment of flexing adjusters to rocking pin bar from which blade shear unit is quickly detachable; and

Particular arrangement of hooks and notches on saddle plates.

Other and further objects and features of the invention will be clear to those skilled in the art from a consideration of the following specification and accompanying drawings wherein is disclosed a single exemplary embodiment of the invention, with the understanding that such changes may be made therein as fall within the scope of the appended claims without departing from the spirit of the invention.

In said drawings:

Fig. 1 is a fragmentary end elevation of a multi-color printing machine equipped with a doctor holder assembly constructed in accordance with the present invention, parts not directly relevant to the invention being shown in dot and dash lines;

Fig. 2 is a transverse section through the doctor blade and blade shears and the intaglio

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printing roll showing the doctor holder and blade flexing adjusting screw;

Fig. 3 is an elevation of the doctor holder assembly and associated parts at one end thereof;

Fig. 4 is a top plan view thereof; and

Fig. 5 is an exploded perspective view of the parts forming one end of the doctor holder assembly.

In various forms of paper converting machines, and notably intaglio printing machines, use is made of a thin, flexible steel blade known as a "doctor" either for controlling the thickness of a coating substance such as coloring material or the like on the surface of an applying roller, or for removing ink from the polished cylindrical surface of an intaglio roll and leaving only that required for printing in the engraved depressions in the roll. Whatever the purpose and however used, there is a considerable need and demand for a readily removable doctor blade since often during its use it must be removed for cleaning or the like. The blade must be rigidly mounted and conveniently adjustable to change its flexing and hence the pressure with which it bears on the surface of the roll. It is therefore highly desirable that the doctor blade and its supporting shears be readily removable without the use of tools or actually without the disconnecting of any parts, so that it can be lifted quickly from the machine, cleaned and restored to its original position without adjustments. The manner of mounting also is preferably such that longitudinal reciprocation or vibration within limited range may be given to the doctor so as to prevent streaking or the like on the surface of the roll being cleaned by it. Such vibration also prevents undue wear on those portions of the edge of the doctor blade which pass over the engraving on the roll.

For convenience the invention has been disclosed in connection with a multi-color printing machine of the rotary impression cylinder type such as might be used for web printing of fabrics, plastics, wall paper and the like, but it will be understood that this use of the invention is wholly illustrative and in no sense limiting.

For a better understanding of the drawing reference should now be had to Fig. 1, which is a fragmentary side elevation of a rotary type printing machine for multi-color work. At 10 there is seen a portion of the periphery of the rotary impression cylinder around which the web to be printed is passed. It is supported from and journaled on suitable side frames, not shown, which mount a plurality of substantially

radially extending supporting arms 11 on which are adjustably mounted the various inking and printing assemblies, one of which is illustrated in the drawing. At 12 is seen the engraved intaglio or printing roll whose periphery contacts the web running on the surface of the impression cylinder 10. A gear driven in unison with the impression cylinder engages with the idler gear 13 which in turn meshes with gear 14 secured to the intaglio roll for driving it at the same peripheral speed as the impression cylinder.

Ink is delivered to the whole surface of the intaglio roll in excess quantity by means of the furnish roll 15, shown in driving contact with the periphery of the intaglio roll. This furnish roll has its lower portion immersed in ink in the fountain 16 removably and adjustably arranged on the mounting ways 11. A quantity of ink is picked up by the furnish roll and delivered to the surface of the intaglio roll which rotates in a counterclockwise direction as viewed in Fig. 1. The ink not only fills in the depressions or engravings in the roll surface but also covers the high polished, smooth periphery thereof, from which it must be wiped so that no smudging of the white areas of the web being printed will take place, and this is achieved by the use of a sharp edged, thin, flexible steel doctor blade 17 bearing on the periphery of the intaglio roll between the positions where it contacts the furnish roll and the impression cylinder.

With a number of inking and printing systems arranged about the periphery of the impression cylinder, a varied assortment of arrangements of the furnish roll and the intaglio roll are needed in order that the furnish roll may always dip in an open ink fountain for the proper supply of this liquid. This requires somewhat different dispositions of the furnish roll and the doctor blade in order to compensate for the different orientation of the various parts, but in effect the final results are always the same. The various rolls are suitably journaled as shown in bearings carried by the radial arms 11 in the manner which forms no part of the present invention.

The two ends of the machine are identical and for convenience but a single one has been shown. As seen in Figs. 3 and 4 side members 18 are slidably arranged on the radial arms 11 and adjustable to be moved in accordance with the requirements fixed by the diameter of the intaglio roll, which is made interchangeable for the purpose of varying the style and length of repeats of the pattern of the material printed. Each side member 18 has rigidly secured thereto, as by screws and dowel pins received in the openings shown in Fig. 5, an end plate 20 of the general configuration seen in Figs. 2 and 5. The exact shape of this plate will depend on the disposition of the particular inking mechanism about the impression cylinder. This end plate has secured thereto and extending normal from its face a fulcrum or journal cylinder 21 and at a suitable spaced distance therefrom the sleeve 22. A collar 23 on cylinder 21 reinforces its connection to the plate and forms an abutment.

A pin bar 24, best seen in Fig. 5, comprises a rectangular block 26 having extending from one face thereof a pair of large diameter parallel pins 27 and 28. Between these pins and on an axis parallel to theirs is provided a bearing opening 29 of a diameter to have a close working fit over the journal cylinder 21 on end plate 20. Secured transversely to the pin bar block 26 on the opposite face from the pins and extending

upwardly therefrom, is the adjusting lever 30. This has on its outer face the spacer bushing 31 which is drilled to the same diameter as the opening 29 to provide an elongated bearing for the block on the cylinder 21, which is sufficiently longer than the overall length of opening 29 to be provided with a peripheral groove 32 near its outer end to receive a washer or snap ring 34 for the purpose of holding the parts in their assembled relation. The block is well spaced from plate 20 by collar 23 and bushing 31.

Near its outer end each adjustment lever 30 is provided with a bore 35 parallel to the bearing opening 29 and which receives with a working fit the integral trunnion 36 extending from a block 37 having a threaded transverse bore 38 adapted to receive the screw 39 whose unthreaded shank portion is journaled in a stud block 40 having a transverse bearing pin 41 adapted to be received in a bore 42 of sleeve 22 on end plate 20. A large knurled head 43 facilitates manipulation of the screw and a collar 44 thereon prevents longitudinal movement of the screw shank in stud 40, the other end of the stud being engaged by the base of the screw head.

It will be appreciated that the arrangement just described permits of rocking the pin bars about their coaxial journal pins 21 with a fine adjustment by manipulation of the large knurled knobs 43 on the adjusting screws. In this manner the doctor blade may be adjusted toward or into contact with the surface of the printing roll and given any desired degree of flexing to increase its pressure thereon. Because of the flexibility of the doctor blade assembly itself, slight variations in the pressure exerted by its opposite ends may be achieved because of the separate adjusting screws.

As previously mentioned, the doctor blade itself, numbered 17 in the drawings, is a relatively thin sheet of hard, spring-tempered steel of considerable width and of such thickness that it has the desired flexibility and capability of following the surface of the printing roll closely enough to clean it completely of any residual ink. Its contacting edge is for this purpose carefully ground to considerable thinness. To impart the desired longitudinal rigidity and stiffness to the blades its rear portion only is mounted between a pair of shear bars, the lower one 50 being of approximately the same length as the blade itself, whereas the upper shear bar 51 extends beyond the blade ends as clearly seen in Figs. 3 and 4. The three parts are secured together in an appropriate manner, not shown, as for instance by screws whose shanks pass freely through appropriate openings in the blade and one shear bar and whose threaded ends are received in aligned openings in the other shear bar. Beneath each overhanging end of the upper shear bar is secured a saddle plate 52, as best seen in Figs. 3, 4 and 5. These saddle plates are irregular shaped steel plates of substantial thickness having a width and length substantially corresponding to that of the pin face of block 26 forming the major portion of the pin bar. Their upper edges are drilled and threaded as shown at 53 and correspondingly spaced unthreaded apertures 54 are placed in the ends of the upper shear bar to receive screws 55 which assemble the saddle plates in position.

The relatively rigid assembly of attached doctor blade, blade shears and saddle blocks is a unit which is readily manually manipulated and removed from or replaced in the machine with considerable ease by virtue of the arrangement

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for cooperation between the saddle blocks and the pin bar, now about to be described.

During its construction each saddle plate is provided with through apertures corresponding in size, positioning and arrangement to the corresponding pins 27 and 28 in the pin bar. The one of these 56 near the rear of the blade assembly may be called the "pressure notch" and is open to the lower edge of its plate by means of a cutout 57 of a width equal to the hole diameter and somewhat tapered on its lower edges so that the bar may be dropped over the pin 27 with facility and yet will have close engagement therewith for one-half of the periphery of the opening drilled for the pin 27. Note that this notch 57 as viewed in Fig. 2 faces downwardly or in a direction normal to the plane of the doctor blade.

The hole 58 at what may be termed the front or "tensioned" end of the saddle plate is connected to the lower edge thereof by means of a curved slot 59 directed first rearwardly from the opening 58 as clearly seen in Figs. 2 and 5, and then curving downwardly to exit through the bottom of the saddle plate. The forward portion of the saddle plate is of greater width than the rear to provide the hook end 60 beneath the pin 28 whereby a flexing pull can be imparted to the forward edge of the blade.

With the parts assembled as seen in Fig. 2, it is only necessary to loosen the tension screws 43 until the forward edge of the doctor blade is well clear of the periphery of printing roll 12. The blade assembly is then rotated about pins 27 until notches 57 are lifted off rear pins 27. The whole assembly is then moved toward the roll 12 and lifted to release the forward pins 28 from their openings in the saddle plates. The doctor blade assembly is now wholly free from the machine and ready to be cleaned or otherwise conditioned for re-use. For re-assembly the operation just described is repeated in reverse order, the hooks 60 first being moved beneath the pins 28 and the doctor blade assembly drawn rearwardly to seat the pins in the forward ends of the notches 59. The whole assembly is then rotated in a clockwise direction as viewed in Fig. 2 until the notches 57 fit over the pins 27. The desired degree of flexing is then imparted to the doctor blade by appropriate adjustment of the tension screws 39 which rotate the arms 30 in a counterclockwise direction, carrying the blade with them until it contacts the roll to the required degree of pressure.

The connection between each pin bar and its saddle plate is through a pair of parallel pins and saddles so that the assembly of doctor blade and shears is mounted for lateral vibration or oscillation such as may be required in some cases to improve the operation of ink wiping. Mechanism for carrying out such oscillation is clearly shown in the prior patent to Frank F. Kaiser, 2,042,060, granted May 26, 1936. Because of the lengths of the pins 27 and 28 and the positioning of the saddle bars in respect to the pin bars 24 room is provided for a substantial amount of transverse movement of the doctor blade assembly as will be appreciated from an inspection of Figs. 3 and 4. The pins and their saddle bar notches provide excellent guides which insure a true longitudinal movement of the doctor blade under all circumstances and one which facilitates the application of the needed lubricant where such operation is desired.

The usefulness of the present invention will be readily appreciated when it is seen that the doc-

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tor blade assembly can be lifted out without the use of any tools or the disconnecting of any assembled parts.

I claim:

1. The combination with a rotatable roll of a doctor blade having an edge for cooperation therewith, a pair of pin blocks, one adjacent each end of the roll, means supporting said blocks for rotary adjustment about an axis parallel to that of the roll, individual adjusting means for the blocks, two spaced pins on each block parallel to the axis thereof, a saddle plate rigidly secured to each end of said blade and spaced for cooperation with said pins on said blocks, each saddle plate having a "tension" hook to engage the pin nearer the roll and a "pressure" notch to rest on the remote pin, all engageable and disengageable while the blocks are in position.

2. The combination of claim 1 in which the pins are of such length that the saddle plates may be oscillated longitudinally thereon to vibrate the blade.

3. The combination with a rotatable roll of a doctor blade having an edge for cooperation therewith, a pair of blocks, one adjacent each end of the roll, means supporting said blocks for rotary adjustment about an axis parallel to that of the roll, individual adjusting means for the blocks, each block having abutment means thereon extending toward the other block, a saddle plate rigidly secured to each end of said blade and spaced for cooperation with said abutment means on said blocks, each saddle plate having a "tension" hook to engage the abutment means nearer the roll and a "pressure" area to rest on the abutment means remote from the roll, all engageable and disengageable while the blocks are in position.

4. The combination of claim 3 in which the abutment means have areas engageable by said saddle plate portions which are defined by elements parallel to the roll axis and of such length that the blade may be oscillated longitudinally for the purpose defined.

5. In a doctor holder assembly, in combination, rigid spaced side frames, parallel confronting end plates supported by said frames, a pin bar fulcrumed on each plate for adjustment about an axis connecting said plates, manual means for adjusting each bar about said axis, each bar having a pair of spaced pins projecting therefrom towards the opposite bar and parallel to said axis, a thin flexible doctor blade, shear bars secured to the upper and lower faces of said blade and leaving a portion of the width thereof exposed for flexing, one of said shear bars overhanging the ends of the blade and of the other bar, a saddle plate for and secured to each of said overhanging bar portions and spaced to respectively engage the pins on said pin bars, each of said saddle plates having a "tension" slot parallel to the blade surface and a "pressure" slot substantially normal to that surface and each opening through the bottom of the saddle plate for successive engagement with the pins on a pin bar, the "pressure" slot being most remote from the exposed edge of the blade.

6. In a doctor holder assembly in combination, spaced side frames, plates supported by said frames, a bar fulcrumed on each plate for rotary adjustment about an axis normal to said plates, manual means for adjusting each bar about said axis, each bar having a pair of spaced pins projecting therefrom towards the opposite bar and parallel to said axis, a doctor blade, shear bars

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secured to the upper and lower faces of said blade and leaving a portion of the width thereof exposed, a saddle plate for and secured to each end of the blade-shear assembly and spaced to respectively engage the pins on said pin bars, each saddle plate having a "tension" slot extending generally widthwise of the blade and a "pressure" slot substantially normal to the blade surface and each opening through an edge of the saddle plate for successive engagement with the pins on a pin bar, the "pressure" slot being most remote from the exposed edge of the blade.

7. The doctor holder assembly of claim 6 in which the fulcrumed bars each have a lever arm secured thereto, and in which the manual adjusting means comprises a screw acting between the corresponding frame supported plate and the end of said lever to rock the bar for blade adjustment.

8. In a doctor holder assembly, in combination, confronting rigid spaced end plates, a bar journaled on each plate for adjustment about an axis connecting said plates, screw means for adjusting each bar about said axis, each bar having one-half of a pair of interlocking means projecting therefrom towards the opposite bar and parallel to said axis, a doctor blade and shear assembly, the other half of said interlocking means comprising a saddle plate for and secured to each end of said assembly and spaced to respectively engage the interlocking means on said bars, each of said saddle plates having a "tension" engagement area and a "pressure" engagement area forming part of the interlock and surfaces on each saddle plate to hold the parts as-

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sembled for "lift out" separation whereby the blade assembly may be quickly removed and replaced.

9. In a doctor holder for use with a roll mounted for rotation, in combination, confronting plates supported adjacent the roll ends, a bar fulcrumed on each plate for adjustment about an axis parallel to that of the roll, manual means for adjusting each bar about said axis, each bar having abutment means projecting therefrom towards the opposite bar and having surfaces parallel to said axis, a flexible doctor blade, shears secured to said blade and leaving a portion of the width thereof exposed for flexing, a saddle plate for and secured to each end of said blade-shear assembly and spaced to respectively engage the said surfaces on said bars, each of said saddle plates having a tension slot substantially parallel to the blade surface and a pressure slot substantially normal to that surface and each opening through an edge of the saddle plate for engagement with the said surfaces on said bar, the pressure slot being most remote from the exposed edge of the blade.

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