Aug. 4, 1964 L. H. HASKIN, JR 3,143,067

DOCTOR BAR MECHANISM

Filed Jan. 8, 1962

4 Sheets-Sheet 1

FIG. 1

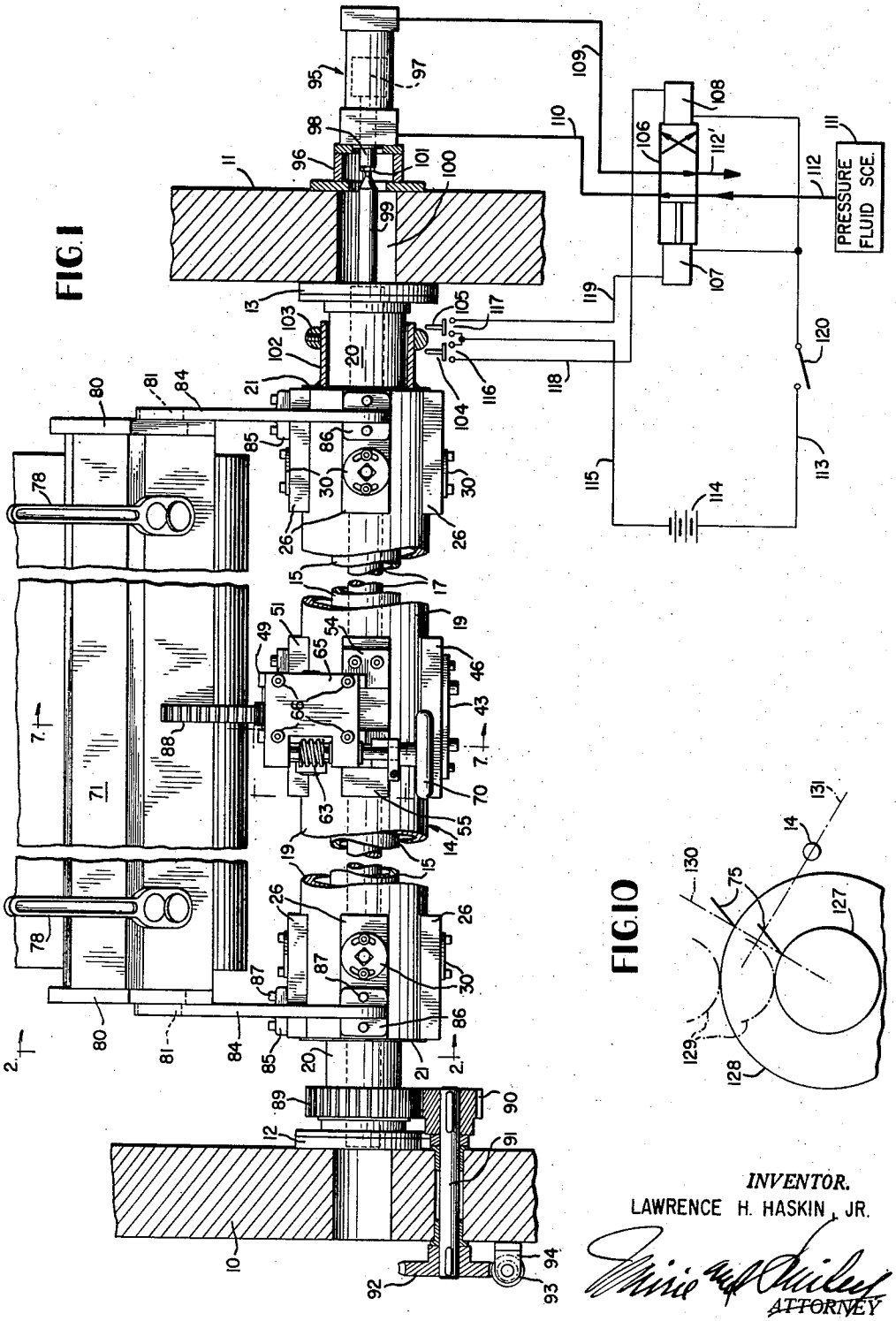


FIG. 10

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FIG.2

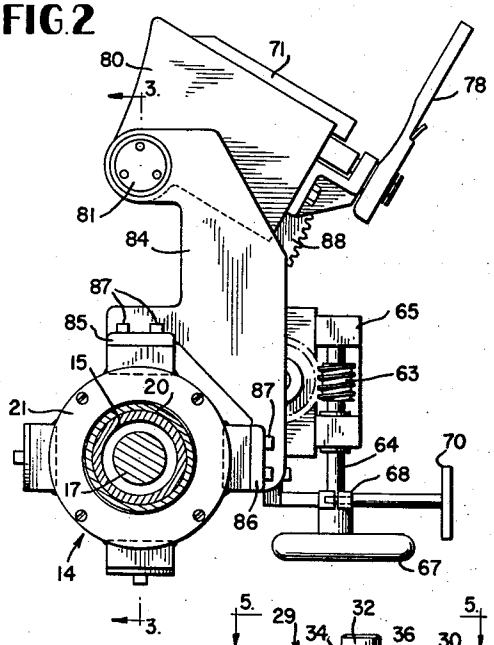
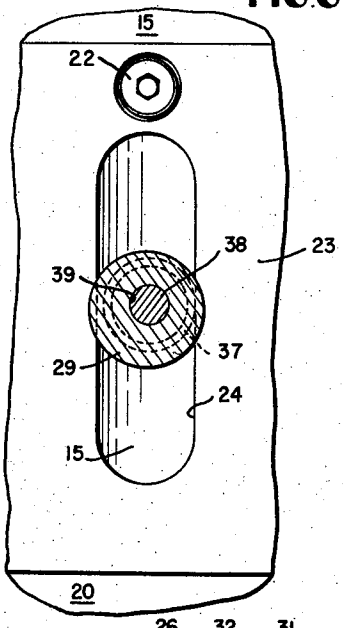


FIG.6



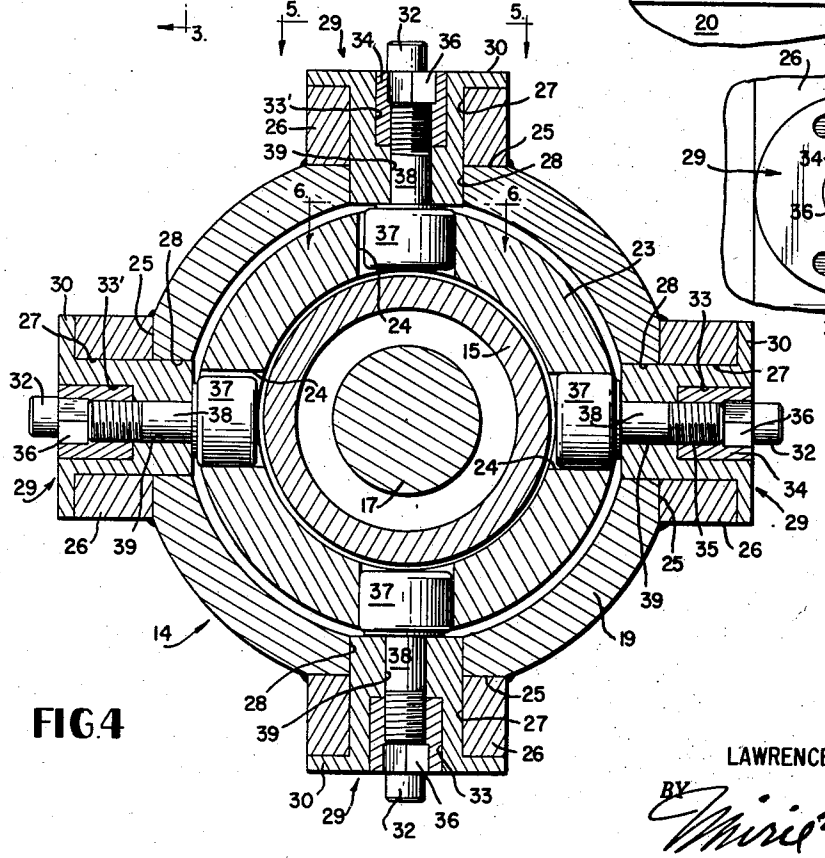


FIG.4

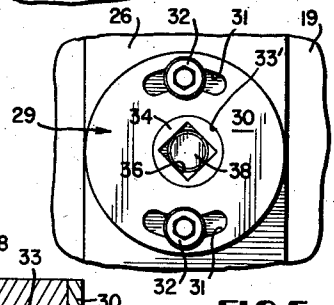


FIG.5

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DOCTOR BAR MECHANISM

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FIG. 3

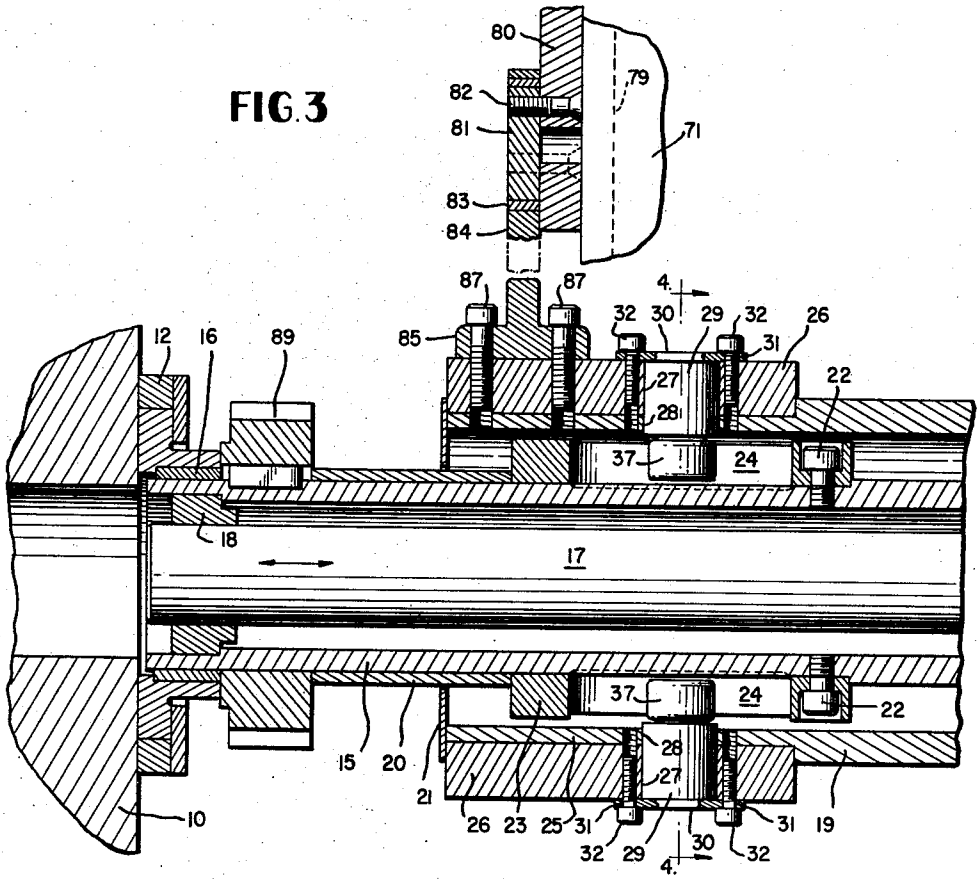
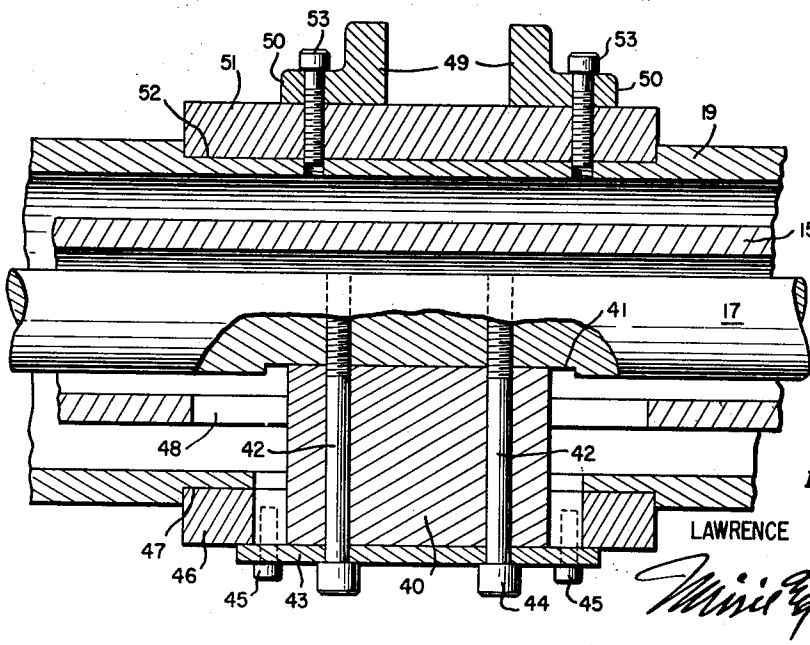


FIG. 8



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DOCTOR BAR MECHANISM

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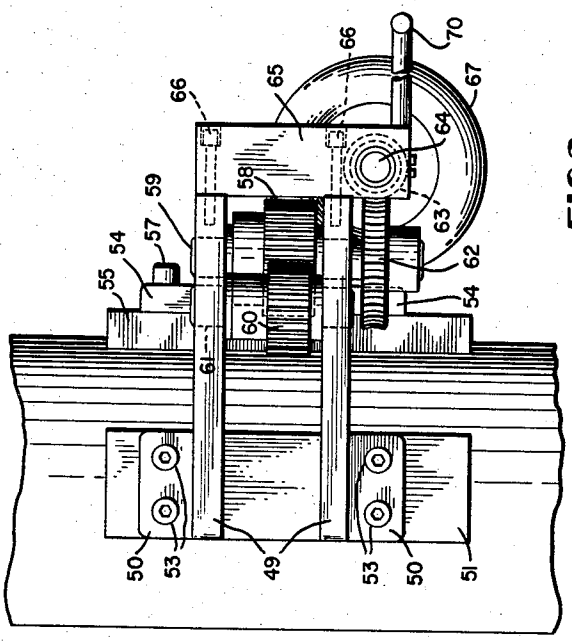


FIG 9

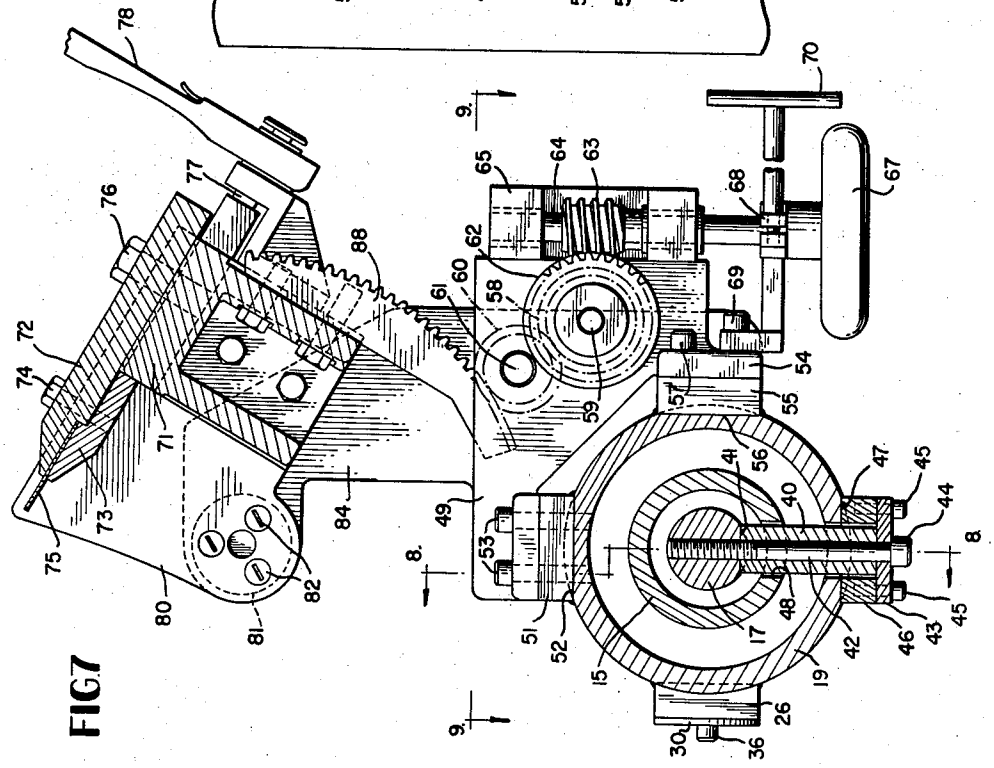


FIG 7

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United States Patent Office 3,143,067 Patented Aug. 4, 1964

3,143,067

DOCTOR BAR MECHANISM

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Filed Jan. 8, 1962, Ser. No. 164,765
16 Claims. (Cl. 101—157)

This invention relates to doctor blade and bar mechanism for web treating apparatus such as printing machines and the like.

An important object of the invention is to provide an improved mounting for the reciprocating doctor bar whereby the latter is substantially fully enclosed and therefore protected from the liquids being handled such as glue, corrosive and abrasive printing ink and the like.

Another important object is to provide a substantially frictionless mounting for the enclosed reciprocating doctor bar including adjustment means to eliminate all play and chatter from the assembly and thereby implementing extremely smooth operation.

A further object of the invention is to provide a doctor blade mechanism having a fixed center of oscillation which affords the optimum wiper angle on the doctor blade regardless of changes in the printing cylinder diameter between minimum and maximum limits thereof.

Another object is to provide doctor blade mechanism and adjusting means therefor, so constructed and arranged that the doctor blade may always be arranged as closely as possible to the nip of the printing cylinder and impression roller in all adjusted positions of the mechanism with respect to printing cylinders of different diameters between known minimum and maximum diameters.

Another object is to provide doctor blade mechanism of the above-mentioned character in which the angle of the doctor blade relative to the nip and relative to the periphery of the printing cylinder is maintained within desirable limits in all adjusted positions of the mechanism about the fixed center of oscillation thereof.

Still another important object of the invention is to provide novel and simplified means for reciprocating the doctor bar, said means being controlled directly by the movement of the doctor bar itself, thereby eliminating the use of cams or like elements involving a timing adjustment.

Additional objects of the invention are to provide doctor blade mechanism of the mentioned character having simplicity and compactness of construction and design, efficiency of operation and economy of manufacture.

The novel features that are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawings, wherein like reference characters indicate like parts throughout the several figures and in which:

FIG. 1 is a fragmentary side elevational view, partly in section, of doctor blade mechanism embodying the invention and including a schematic illustration of means for reciprocating the doctor bar;

FIG. 2 is a sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken on line 3—3 of FIG. 2;

FIG. 4 is a sectional view taken on line 4—4 of FIG. 3;

FIG. 5 is a fragmentary plan view taken on line 5—5 of FIG. 4;

FIG. 6 is a fragmentary sectional view taken on line 6—6 of FIG. 4;

FIG. 7 is an enlarged sectional view taken on line 7—7 of FIG. 1;

FIG. 8 is an enlarged fragmentary sectional view taken on line 8—8 of FIG. 7;

FIG. 9 is a fragmentary plan view taken on line 9—9 of FIG. 7, and

FIG. 10 is a diagrammatic view illustrating the relationship of the doctor blade mechanism to the peripheries of printing cylinders of different diameters.

Referring to the drawings in detail, specifically to FIG. 1, a web treating apparatus, such as a rotary intaglio printing press, may comprise rigid frame sides 10 and 11 to the inner faces of which are fixed bearings 12 and 13 for the support of opposite ends of a doctor bar assembly 14 which, as also shown in FIG. 2, adjustably and reciprocally carries a doctor blade holder 71. The doctor bar assembly 14, briefly, comprises an intermediate tubular shaft 15 adapted to rotate only, an inner shaft 17 adapted to reciprocate continuously, and an outer tubular shaft 19 which carries the doctor blade holder mechanism and is reciprocally mounted on the intermediate shaft 15 to rotate therewith and connected with the inner shaft 17 to be reciprocated thereby.

As best shown in FIG. 3, the intermediate shaft 15 has its opposite ends journaled for rotation within liners 16 of the bearings 12 and 13. The inner shaft 17 may be solid, extends axially within the tubular shaft 15, is substantially coextensive therewith, and has its end portions slidably mounted within plain sleeve bearings 18 fixed within end recesses of the tubular shaft 15. The outer tubular shaft or sleeve 19 surrounds the shaft 15 in spaced concentric relation with its ends spaced inwardly of the bearings 12 and 13 equidistantly and enclosing the major portion of the length of the shaft 15.

Adjacent the ends of the outer shaft 19, spacer sleeves 20 are mounted upon the exposed end portions of the intermediate shaft 15 to protect the latter from contact with printing ink or the like. Coacting annular shield plates 21 are secured to opposite ends of the tubular shaft 19 and closely surround the sleeves 20, and are movable with the shaft 19 relative thereto. Adjacent the sleeves 20 and secured on the intermediate shaft 15 by screws 22 are relatively heavy rings 23 each having, as best shown in FIG. 4, four circumferentially equidistantly spaced axially extending slots 24.

The end portions of outer tubular shaft 19 have four circumferentially equidistantly spaced flat faces 25 machined thereon and blocks 26 are rigidly secured to these flat faces 25. The blocks 26 have radial bores 27 in registration with similar radial bores 28 through the sleeve 19, and adapted for substantially radial alignment with the slots 24. Cylindrical adjusting cartridges 29 engage rotatably within the bores 28 and 27, and the cylinders 29 have outer annular flanges 30 which bear against the outer faces of the blocks 26. The flanges 30 are adapted to be secured, preferably releasably, to the blocks 26. Conveniently, each have at least one and preferably a pair of slots 31 arcuately concentric with the axis of the cartridges 29, at diametrically opposite sides thereof, FIG. 5, for the respective reception of a clamp screw 32, having screw-threaded engagement within the block 26.

Each cartridge 29 has a cylindrical recess in its outer end and the recesses 33 of two cylinders 29, FIG. 4, are concentric with the cylinders and the bores 27 and 28, whereas the recesses 33' of the other pair of cylinders are eccentrically arranged relative thereto and relative to the bores 27 and 28. In addition, each cylinder 29 has a bore 39 extending from the inner end of the cylinder through the base of the recess 33 or 33' and concentric

with the latter. Tightly frictionally engaged within each recess 33 and 33' is a cylindrical nut 34 having a concentric screw-threaded bore 35 that is coaxial with the cylinder bore 39, and an exterior wrench socket 36 or the like at its outer end.

Frictionless rollers 37 are disposed rollingly within the slots 24 of rings 23 and are freely journaled for rotation upon radial pins 38 threaded at their outer ends and extending through the concentric radial openings 39 of the cylinders 29, and having screw-threaded engagement within the concentric screw-threaded bores 35 of the nuts 34. Thus, the rollers 37 constitute antifriction bearings supporting the outer shaft 19 concentrically on the intermediate shaft 15 for axial movement, and the eccentrically mounted rollers may be adjusted to take up slack and any wear between the rollers and the sides of the slots 24 that they engage.

Although diametrically disposed rollers 37 may be mounted concentrically, it is advantageous during assembly to have the concentrically mounted rollers in adjacent cartridges 29 as these rollers then serve to position the shafts 15 and 19 concentrically prior to adjustment of the eccentric rollers 37 which then may be adjusted within the adjacent slots 24 to eliminate all play or clearance between the slots 24 and the several rollers. To effect this adjustment, the clamp screws 32 are merely loosened and wrenches are placed within the sockets 36 of the eccentrically mounted nuts 34 and these nuts are turned with their cylinders 29 to thereby shift the particular pair of rollers 37 into positive engagement with opposite sides of the adjacent slots 24, FIG. 4. This assures that there will be no backlash or clearance between the rings 23 and outer tubular shaft 19 at either end of the latter.

To effect axial movement of the outer shaft 19, it is rigidly secured, as shown in FIGS. 7 and 8, to the reciprocal inner shaft 17 by a heavy key 40 preferably disposed near the longitudinal center of the assembly. The inner end of the key 40 abuts a flat surface 41 on the shaft 17 and is rigidly secured thereto by screws 42 engaged within screw-threaded openings in the shaft 17. A plate 43 bears against the outer end of the radially extending key 40 and is engaged by the heads 44 of the screws 42. Additional screws 45 serve to rigidly connect the plate 43 with a block 46 engaging a flat face 47 of the outer tubular shaft 19. The intermediate tubular shaft 15 has a longitudinal slot 48 through which the key 40 passes, and providing clearance for the relative movement therebetween.

Spaced parallel brackets 49 extend traversely of the doctor bar assembly 14 near the longitudinal center thereof and above the top and adjacent one side of the outer tubular shaft 19, FIGS. 7–9. The brackets 49 include integral feet 50 at one end which rest upon a block 51, in turn engaging a flat face 52 on the tubular shaft 19. Screws 53 rigidly secure the brackets 49 and block 51 to the tubular shaft 19. The other ends of the brackets 49 have integral feet 54 bearing upon a block 55 engaging a flat face 56 on the tubular shaft 19 and spaced 90 degrees circumferentially from the flat face 52. Screws 57 rigidly secure the bracket feet 54 and the block 55 to the tubular shaft 19.

First and second spur gears 58 and 60, respectively carried by short shafts 59 and 61, are journaled between the brackets 49. The gear 60 is smaller in diameter than the gear 58 and in constant mesh therewith. Rigidly mounted upon the shaft 59 of gear 58 outwardly of one bracket 49 is a worm gear 62 driven by a worm 63, secured to a vertically extending shaft 64, journaled in a bearing structure 65 rigidly secured to corresponding ends of the brackets 49 as by screws 66. The shaft 64 of the worm 63 is adapted to be turned by a handwheel 67 rigidly secured thereto. A clamping or brake device 68 for the shaft 64 is secured by screws 69 to the adjacent bracket foot 54, and has a handle 70 for manipulating the clamping device 68 to secure the shaft 64 against rotation after the desired adjustment thereof by the handwheel 67.

The doctor blade holder 71, FIGS. 1, 2 and 7, is generally parallel and substantially coextensive with the outer tubular shaft 19, and embodies the usual coacting clamp members 72 and 73 releasably secured together by screws 74 with the doctor blade 75 therebetween. The clamp bar assembly is further secured to the holder 71 by screws 76, and screw adjusting means 77 operated by wrenches 78 may be provided to shift the clamp bars 72, 73 and blade 75 forwardly or rearwardly of the holder.

The holder 71 has end plates or arms 80 having pivot discs 81 rigidly secured thereto by screws 82 and which are journaled within bushings 83 of outer support arms 84 having feet 85 and 86 rigidly secured by screws 87 to the blocks 26, FIGS. 1–3. An arcuate gear sector 88 is rigidly secured to the back of the holder 71 at the longitudinal center thereof as shown in FIGS. 1 and 7, and this gear sector meshes with the spur gear 60. Thus, a first rockable adjustment for the doctor blade 75 is provided about the axes of the pivot discs 81, and this adjustment is effected by turning the handwheel 67 to operate the worm gearing 63, 62, spur gears 58, 60 and sector 88.

A second and primary rockable adjustment of the doctor blade upon the axis of the doctor bar assembly 14 is effected by rotation of the doctor bar assembly 14. A gear 89 is keyed to the tubular shaft 15 near and inwardly of the bearing 12, FIGS. 1 and 3, and this gear meshes with a pinion 90 keyed to a shaft 91 journaled in and extending through the adjacent frame side 10. A worm gear 92 is keyed to the outer end of the shaft 91, and this gear meshes with a worm 93, journaled upon bearing means 94 secured to the outer side of frame 10. The worm 93 may be rotated by a suitable handwheel, not shown, to effect rotation of the gear 89 and the rotatable tubular shaft 15 to swing the doctor blade 75 toward or from the periphery of the printing cylinder.

To continuously reciprocate the doctor blade 75 longitudinally of the printing cylinder during the operation of the press, a fluid pressure operated servomotor 95 is secured to a cuplike housing 96 in turn secured to the outer face of the side frame 11, FIG. 1. The servomotor 95 has a reciprocating piston 97 therein including a rod 98 in axial alignment with the reciprocatory shaft 17 which has on its adjacent end an axial extension 99 extending through a clearance opening 100 in the side frame 11 and connected with the rod 98 by coupling means 101.

The shaft 17 is reciprocated axially by the servomotor 95 and the operation of the servomotor is controlled directly by the reciprocatory movement of the shaft 17 by a sleeve extension 102 freely surrounding the end portion of the intermediate shaft 15 and secured to the shield plate 21 on the adjacent end of the outer tubular shaft 19. Rigidly secured on the sleeve 102 is a cam 103 which is alternately engageable with axially spaced switch elements 104 and 105 as the sleeve 102 reciprocates. Conveniently, the cam 103 comprises an annular ring of rounded cross section so as to engage the switch elements 104, 105 regardless of the rotary adjustment of the shaft 19.

A four-way reciprocatory control valve 106 may be actuated by opposed electrical solenoids 107 and 108 connected therewith. Pressure lines 109 and 110 are connected with the valve 106 to convey fluid under pressure to or from the servomotor 95 on opposite sides of the piston 97. The valve 106 is connected with a pressure line 112 and an exhaust or return line 112', and at least the line 112 is connected with a pressure fluid sources 111.

The solenoids 107, 108 are electrically connected by a wire 113 to a source of current 114 which, in turn, is connected by a wire 115 with one terminal each of two pairs of terminals 116, 117 respectively cooperative with the switch elements 104, 105. The other terminal of the pair 116 is connected by a wire with the solenoid 108, and the other terminal of the pair 117 is connected by a wire 119 with the solenoid 107. A master switch 120 may be

interposed in the connection 113 between the solenoids and current source.

When the apparatus is at rest, the valve 106 will always be in one of its two positions for supplying pressure fluid to one end of the servomotor 95. For example, as shown in FIG. 1, the valve 106 is in its position for supplying pressure fluid to the inner end of the servomotor 95 which would drive the doctor bar to the right and assuming that the fluid is under pressure even with the master switch 120 open, the cam 103 would be moved to its extreme position wherein it would depress the switch member 105 to close the contacts 117.

Even if the fluid is not under pressure, the valve 106 will be in position to supply pressure fluid to effect movement to the right in the event that the doctor bar is stopped in an intermediate position. In either case, upon closing the master switch 120 and upon bridging of the contacts 117 by the switch member 105, the solenoid 107 will then be energized to reverse the valve 106 whereupon the pressure fluid is supplied to the outer end of the servomotor 95 to drive the doctor bar to the left. The switch elements 104, 105 are biased to open position so that immediately upon their release by the cam 103, they break the connection across their respective contacts 116, 117 so that the respective solenoids 107, 108 are deenergized.

While the master switch 120 is closed, the doctor bar 14 is continuously reciprocated by the servomotor 95. With the system as illustrated in FIG. 1, the doctor bar is in an intermediate position and is being driven to the right by pressure fluid from the supply 111 through line 112, valve 106, line 110 to the inner end of the servomotor 95, the fluid in the outer end of the servomotor being expelled by the piston 97 through the line 109, valve 106 and line 112'.

Upon reaching the end of its stroke, the cam 103 carried by the doctor bar engages switch member 105 to bridge contacts 117, and thereby supply current from source 114 through wires 115 and 119 to the solenoid 107 and back through wire 113 to the source. The solenoid 107 then moves the valve 106 to its opposite position wherein pressure fluid from source 111 is supplied through line 112 to line 109 to the outer end of the servomotor 95, and the fluid in the inner end of the servomotor is expelled by the piston 97 through line 110, valve 106 and line 112'. This immediately reverses the operation of the servomotor and drives the doctor bar to the left whereupon switch member 105 is released and solenoid 107 is deenergized.

Upon reaching the end of the stroke to the left, cam 103 depresses switch member 104 to bridge contacts 116 and closes the circuit from source 114 through wires 115 and 118 to solenoid 108 and back through wire 113 to source 114. Energization of solenoid 108 moves valve 106 back to its initial position, as shown, and again drives the doctor bar 14 to the right. The foregoing operations will be repeated as long as the master switch 120 is closed and the pressure of the fluid to the servomotor is maintained.

The servomotor 95 drives the doctor bar 14 by driving the inner shaft 17 axially within its bearings 118, and the motion of the inner shaft 17 is transmitted by the key 40, which moves within the clearance slot 48 within the intermediate tubular shaft 15, to the outer tubular shaft 19 which carries the support arms 84 and 80 which in turn support the doctor blade holder 71 therebetween. Thus reciprocation of the doctor bar assembly 14 causes reciprocation of the doctor blade 75 longitudinally of the cylinder with which it is associated so as to preclude constant wear at given regions of the doctor blade, and to dislodge foreign matter that may accumulate behind the doctor blade.

The reciprocation of the outer tubular shaft 19 on the intermediate shaft 15 is frictionless due to the support of the outer shaft by the rollers 37 moving within the slots 24 of the intermediate shaft 15. Moreover, the movement is chatter free because of the snug engagement of the rollers 37 with the walls of the slots 24 which may be effected and maintained by means of the two eccentrically mounted rollers 37.

The doctor blade 75 may be swung toward and from the surface of the cylinder with which it is associated or to enable cooperation with cylinders of different sizes, and this adjustment may be effected by worm 93 turning worm gear 92 which through shaft 91 turns spur gear 90 to drive the gear 89 that is keyed to the intermediate tubular shaft 15. While the intermediate shaft 15 does not reciprocate, it can rotate within its bushings 16 and transmit such rotation through the snugly engaging rollers 37 and slots 24 to the outer tubular shaft 19, the inner shaft 17 rotating therewith both by means of the bearings 18 carried by the intermediate shaft 15 and the key 40 connecting the outer shaft 19 with the inner shaft 17.

Rotation of the outer shaft 19 swings the arms 84 which are mounted thereon and the doctor blade holder 71 carried thereby. Further adjustment of the blade holder 71 for adjusting the angle of the blade 75 relative to the cylinder surface may be effected by swinging the arms 80 relative to the arms 84 about their connecting pivots 81 by the handwheel 67 driving worm 63 and through the intermediate gearing swinging the sector 88. If necessary, final and accurate adjustment of the doctor blade 75 toward or from the surface of the cylinder with which it is associated may be effected by operating the wrench 78 to adjust the screw means 77 for moving the blade holder clamp 72, 73.

The adjustment necessary to adapt the doctor blade 75 for cooperation with cylinders of different sizes may be minimized by locating the axis of the doctor bar assembly 14 in given relation to the cylinder axis and prescribed in relation to the maximum and minimum cylinder diameters to be accommodated. By so locating the doctor bar axis, the doctor blade 75 may always be maintained within an allowable distance from the nip of the printing cylinder and impression roller and permissive angle relative to the cylinder surface regardless of changes in cylinders between known limits of, say, six inches and twelve inches in diameter.

This arrangement is schematically illustrated in FIG. 10 with a minimum diameter cylinder 127 and a maximum diameter cylinder 128 axially superimposed, and an impression roll 129 engageable and forming a nip with both cylinders. The doctor blade 75 desirably engages the peripheries of the cylinders 127 and 128 closely adjacent the nip regardless of the size of cylinder and from a structural standpoint, the points of engagement may lie approximately upon a theoretical line 130 radial to the axis of the cylinders. The axis of the doctor bar assembly 14, that is, the axis of the rotatable shaft 15 is disposed on a theoretical line 131 perpendicular to and intersecting the line 130 midway between the points of engagement of the blade 75 with the peripheries of the cylinders 127 and 128.

Thus, the radius from the doctor bar axis to the two extreme points of engagement is equal and the variation relative to intermediate cylinders is within substantially permissible limits. Consequently, the doctor blade may always be brought to bear on the periphery of any size printing cylinder between the prescribed maximum and minimum diameters thereof along the line 130 and without material adjustment, and will be substantially within the required angular tolerance between the nip and the doctor blade and the angle of the doctor blade to the periphery of the cylinder.

From the foregoing description, it is obvious that the operation of the entire doctor bar assembly 14 is smooth and chatter free and frictionless in operation. Additionally, the doctor bar structure is enclosed and protected from contact with the printing ink or the like. Moreover, the reciprocation of the doctor blade is under the direct influence of the reciprocating doctor bar so that no separate timing cams or like means is required and no adjusting means are necessary, and the action of the control

for operating the servomotor is direct and positive without the need for intermediate adjustable timing mechanism.

While the doctor blade mechanism of the invention has been described throughout in connection with a printing press or printing cylinder, it should be understood that the invention is not restricted to printing presses and the mechanism may have equal utility in connection with laminating machines and other like machines where glue or other fluid is applied to a rotating cylinder and the excess fluid must be scraped away by a doctor blade.

Although a certain specific embodiment of the invention has been shown and described, it is obvious that many modifications thereof are possible. The invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

What is claimed is:

1. In doctor bar mechanism, supporting means, an intermediate rotatable tubular shaft journaled upon the supporting means, an inner axially reciprocatory shaft coaxially mounted telescopically within said intermediate tubular shaft and movable relative thereto, an outer tubular shaft engaging telescopically over the intermediate tubular shaft and enclosing a major portion of the latter, rigid key means interconnecting the inner reciprocatory shaft and the outer tubular shaft whereby the same may reciprocate as a unit relative to the intermediate tubular shaft, the intermediate tubular shaft having a slot receiving the key means movably, substantially frictionless roller means interconnecting the intermediate and outer tubular shafts so that the same may turn as a unit and have relative axial movement, doctor blade holder means mounted bodily upon the outer tubular shaft and movable therewith, means connected with the intermediate tubular shaft to adjust the same rotatably to swing the doctor blade holder means in an arc about the axis of the inner shaft, a servomotor connected with said shaft to reciprocate the same and thereby reciprocate the outer tubular shaft and doctor blade holder means, and control means for the servomotor operated directly by the movement of the inner reciprocatory shaft.

2. Doctor bar mechanism comprising supporting means, a first tubular shaft journaled for rotation upon the supporting means, means to turn the first tubular shaft in opposite directions upon its axis, an axially reciprocatory shaft movably mounted inside of the first tubular shaft, fluid pressure operated means mounted upon the support means and connected with the reciprocatory shaft to reciprocate the same, a second tubular shaft surrounding the first tubular shaft, means rigidly connecting the reciprocatory shaft with the second tubular shaft and movable relative to the first tubular shaft so that the same may move as a unit, substantially frictionless bearing means interconnecting the first and second tubular shafts and allowing relative axial movement therebetween and enabling the first and second tubular shafts to turn as a unit, doctor blade holder means on the second tubular shaft and movable therewith, a doctor blade carried by said holder means, a control element connected with the reciprocatory shaft to move therewith, fluid pressure control means operated directly by the control element and connected with said fluid pressure operated means to activate the same in response to movement of the reciprocatory shaft.

3. Doctor bar mechanism as defined by claim 2, wherein said frictionless bearing means comprises a ring secured to the first tubular shaft to turn therewith, said ring having a plurality of circumferentially equidistantly spaced slots extending axially of the first tubular shaft, radially arranged frictionless rollers engaging within said slots, bearing means for said rollers and connected with the second tubular shaft, at least a pair of said bearing means for said rollers being eccentric to the rollers and rotatably adjustable upon the second tubular shaft for adjusting said rollers relative to the walls of their respective slots to eliminate clearance between the rollers and said slot walls, and means to releasably lock said eccentric bearing means in selected adjusted positions.

4. Doctor bar mechanism as defined by claim 3, wherein said rollers and bearing means are four in number and an adjacent pair of the bearing means are eccentric to the rollers.

5. Doctor bar mechanism comprising supporting means, a doctor bar assembly mounted upon the supporting means and including telescopically interfitting parts forming a substantially enclosed structure, one of said parts adapted to rotate, another of said parts adapted to reciprocate, means for rotating said rotatable part of said assembly, servomotor means to reciprocate said reciprocatory part, said assembly including another part adapted to reciprocate and rotate and drivingly connected with the reciprocatory and rotary parts of said assembly, cam means on the last named part and movable therewith, switch means in the path of movement of the cam means and operated thereby, control means for the servomotor means connected with and operated by said switch means, carrier means on the last named part of the doctor bar assembly and movable therewith, a doctor blade holder pivotally secured to the carrier means, and gearing interconnecting the carrier means and holder and operable to swing the holder in an arc relative to the carrier means.

6. A doctor bar mechanism comprising supporting means, a doctor bar assembly mounted upon the supporting means and including a first reciprocatory part, a second rotary part and a third part adapted to reciprocate and rotate, said parts telescopically interfitting and forming a substantially enclosed structure, means to rotate said second part, means to reciprocate said first part, a control element movable with the reciprocatory part, control means for said reciprocating means and actuated by movement of the control element, means rigidly interconnecting the first part and said third part to reciprocate the latter, frictionless bearing means interconnecting said second part and said third part to rotatively connect said parts and permit reciprocation therebetween, and doctor blade carrier means mounted upon said third part.

7. A doctor bar mechanism as defined by claim 6, wherein said carrier means includes a rockable doctor blade holder, and movable means on said third part and connected with said holder to rock the same.

8. A doctor bar assembly adapted to support doctor blade carrier means, said assembly comprising an inner shaft, bearing means supporting said shaft for rotary movement, means for rotatively adjusting said shaft, said shaft having near and inwardly of its opposite ends four circumferentially equidistantly spaced axially extending slots, an outer shaft surrounding said inner shaft and overlying said slots, four circumferentially equidistantly spaced frictionless rollers adjacent each end and disposed inwardly of said outer shaft on substantially radial axes and engaging in the slots of said inner shaft to reciprocally support said outer shaft concentrically on said inner shaft, said rollers being journaled on axles carried by cylinders rotatably mounted on the outer shaft, means connected with the outer shaft to reciprocate it axially, end shielding means on the outer shaft substantially enclosing the space between said outer and inner shafts, the roller axles of two of said cylinders being eccentric to the peripheries of the cylinders, wrench engaging means on said two cylinders to enable turning of said cylinders to shift their rollers into positive contact with sides of the respective slots, whereby to eliminate play between the inner and outer shafts, and means to releasably secure said two cylinders in selected positions.

9. A doctor bar assembly adapted to support doctor blade carrier means, said assembly comprising an inner

axially reciprocatory shaft, bearing means for the reciprocatory shaft near opposite ends thereof, an intermediate nonreciprocatory rotary shaft surrounding the reciprocatory shaft and spaced therefrom and engaging the bearing means of the reciprocatory shaft, bearing means supporting said rotary shaft near its opposite ends, a gear fixed on the rotary shaft adjacent one end thereof, ring members fixedly mounted upon the rotary shaft near and inwardly of its opposite ends and each having a plurality of circumferentially equidistantly spaced slots formed therein longitudinally of the rotary shaft, an outer shaft surrounding the ring members and intermediate shaft and being shorter than but enclosing a major portion of the length of the intermediate shaft, end shielding means on the outer shaft substantially enclosing the space between said outer and intermediate shafts, the intermediate shaft having a longitudinal slot formed through its side wall, a key disposed radially through said slot and rigidly interconnecting the inner and outer shafts so that the same may reciprocate together, means connected with the inner shaft to reciprocate it axially, radially disposed frictionless rollers engaging the slots of said rings and having shafts projecting radially outwardly of said rings, radial cylinders rotatably carried by the outer shaft and having bores receiving the shafts of the rollers, said cylinders having wrench engageable means to facilitate turning them relative to the outer shaft, the bores of some of said cylinders being eccentric to the peripheries of the cylinders, whereby turning of said latter cylinders shifts their rollers into positive contact with sides of the adjacent slots of the ring and eliminates play between the intermediate and outer shafts, and means to releasably secure said cylinders having eccentric bores in selected positions.

10. A doctor bar assembly as defined in claim 9, wherein said cylinders have internally screw-threaded plug inserts rigid therewith, the shafts of said rollers being screw-threaded and having threaded engagement with said screw-threaded plug inserts.

11. Doctor bar mechanism comprising a pair of spaced frame sides, a rotatable tubular shaft journaled for rotation upon the frame sides and extending therebetween, an axially reciprocatory shaft mounted within the rotatable tubular shaft and substantially coextensive therewith, bearing means for the reciprocatory shaft within the rotatable tubular shaft, an outer rotatable and axially reciprocatory tubular shaft surrounding said rotatable tubular shaft and being shorter than the latter but enclosing a major portion of the length thereof, frictionless substantially clearance free bearing means for the outer tubular shaft and connected with said rotatable tubular shaft and forming a driving connection between the tubular shafts so that the same may turn in unison and allowing the outer tubular shaft to reciprocate axially relative to the rotatable tubular shaft, key means rigidly interconnecting said reciprocatory shaft and outer tubular shaft, said rotatable tubular shaft having side opening means receiving the key means therethrough movably, fluid pressure operated means upon one frame side and connected with one end of the reciprocatory shaft to reciprocate the same, control means for the fluid pressure operated means including a pair of switches, a cam element connected with the outer tubular shaft and movable therewith and adapted during reciprocation thereof to operate said switches alternately, manually operated gearing connected with the rotatable tubular shaft near one end thereof to rotate the same, a pair of brackets including generally radial arms secured to the outer tubular shaft near opposite ends thereof, coacting arms pivotally secured to the last named arms and swingable relative thereto, a doctor blade holder carried by the last named arms to swing bodily therewith, a doctor blade secured to said holder, a gear sector secured to said holder, bracket means mounted upon the outer tubular shaft in juxtaposition with said gear sector, manually operated gearing on the bracket means and engaging said sector to drive the same for swinging said doctor blade holder, and clamp means to lock said last named gearing in selected adjusted positions.

12. In doctor bar mechanism for printing presses or the like, supporting means, a rotary tubular shaft journaled upon the supporting means, an axially reciprocatory shaft arranged telescopically within said rotary tubular shaft, an outer rotary and axially reciprocatory tubular shaft surrounding the rotary tubular shaft, driving connecting means between said reciprocatory and outer shaft, driving connecting means between said rotary and outer tubular shafts, gearing connected with said rotary tubular shaft to turn the same, doctor blade carrier means mounted upon the outer tubular shaft and movable bodily therewith, a reciprocatory driving device secured to the supporting means in axial alignment with one end of the reciprocatory shaft and connected therewith to actuate the latter, means including a pair of switches operatively connected with and controlling said driving device to operate the same, said switches including contact elements arranged near one side of the rotary tubular shaft in spaced relation longitudinally thereof, a sleeve extension secured to the outer tubular shaft in surrounding relation to the rotary tubular shaft near said switches, and an annular switch actuating cam element carried by the sleeve extension and adapted to alternately engage said switches upon axial reciprocation of the sleeve extension with said outer tubular shaft and reciprocatory shaft.

13. A doctor bar mechanism comprising an inner axially reciprocatory shaft, bearing means for the reciprocatory shaft near opposite ends thereof, an intermediate nonreciprocatory rotary shaft surrounding the reciprocatory shaft and spaced therefrom and carrying the bearing means of the reciprocatory shaft, bearing means supporting said rotary shaft near its opposite ends, means fixed on the rotary shaft adjacent one end thereof for rotatively adjusting said shaft, ring members fixedly mounted upon the rotary shaft near and inwardly of its opposite ends and each having four circumferentially equidistantly spaced slots formed therein longitudinally of the rotary shaft, an outer shaft surrounding the ring members and intermediate shaft and being shorter than but enclosing a major portion of the length of the intermediate shaft, doctor blade carrier means on said outer shaft, end shielding means on the outer shaft substantially enclosing the space between said outer and intermediate shafts, the intermediate shaft having a longitudinal slot formed through its side wall, a key disposed radially through said slot and rigidly interconnecting the inner and outer shafts so that the same may reciprocate together, a driving device connected with the inner shaft to reciprocate it axially, radially disposed frictionless rollers engaged in the slots of said rings and having shafts projecting radially outwardly of said rings, four radial cylinders rotatably carried adjacent each end by the outer shaft and having bores receiving the shafts of the rollers, said cylinders having wrench engageable means to facilitate turning them relative to the outer shaft, the bores of two adjacent cylinders at each end of said outer shaft being concentric to the peripheries of their cylinders and the bores of the other two adjacent cylinders being eccentric to the peripheries of their cylinders, whereby the rollers of the concentric bore cylinders disposes said outer shaft concentric to said intermediate shaft and turning of said eccentric bore cylinders shifts their rollers into positive contact with sides of the ajacent slots of the rings and eliminates play between the intermediate and outer shafts, and means to releasably secure said cylinders having eccentric bores in selected positions.

14. A doctor bar mechanism as defined by claim 13, wherein said carrier means includes a rockable doctor

blade holder, and movable means on said outer shaft and connected with said holder to rock the same.

15. A doctor bar mechanism according to claim 13 comprising means including a pair of switches operatively connected with and controlling said driving device to operate the same, said switches including contact elements arranged near one side of the rotary intermediate shaft in spaced relation longitudinally thereof, a sleeve extension secured to the outer tubular shaft in surrounding relation to the rotary intermediate shaft near said switches, and an annular switch actuating cam element carried by the sleeve extension and adapted to alternately engage said switches upon axial reciprocation of the sleeve extension with said outer tubular shaft and reciprocatory inner shaft.

16. A doctor bar mechanism comprising supporting means, a doctor bar assembly mounted upon the supporting means and including a first reciprocatory part, a second rotary part and a third part adapted to reciprocate and rotate, said parts telescopically interfitting and forming a substantially enclosed structure, means to rotate said second part, means to reciprocate said first part, means rigidly interconnecting the first part and said third part to reciprocate the latter, frictionless bearing means interconnecting said second part and said third part to rotatively connect said parts and permit reciprocation therebetween, and doctor blade carrier means mounted upon said third part.

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