

July 13, 1943.

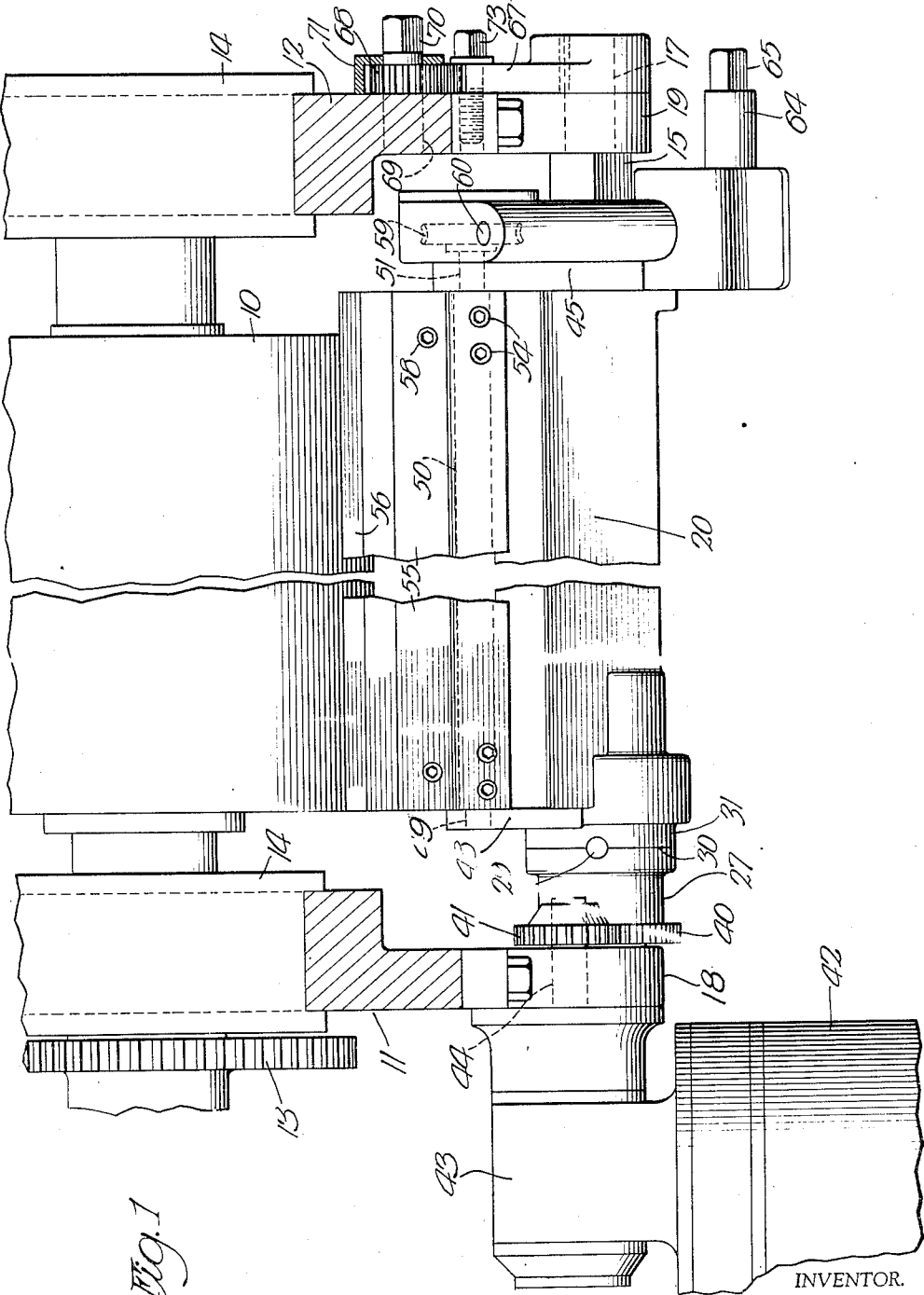
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2,323,983

DOCTOR BLADE MECHANISM

Filed June 21, 1941

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

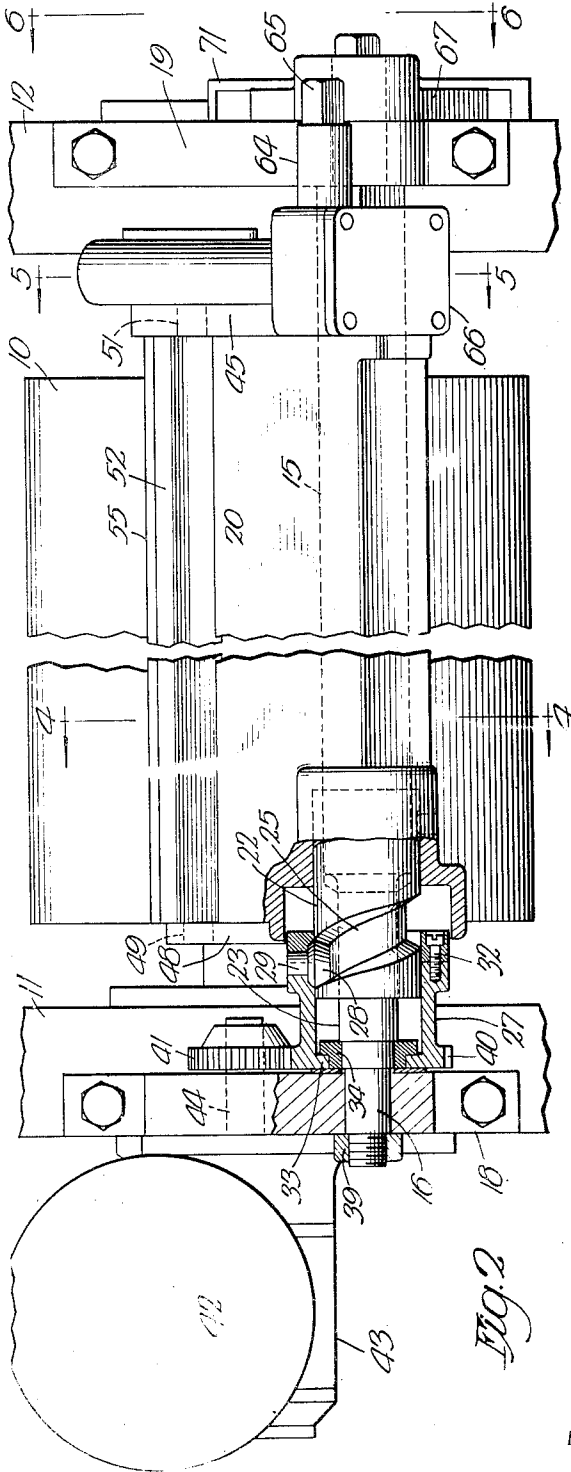


Fig. 2

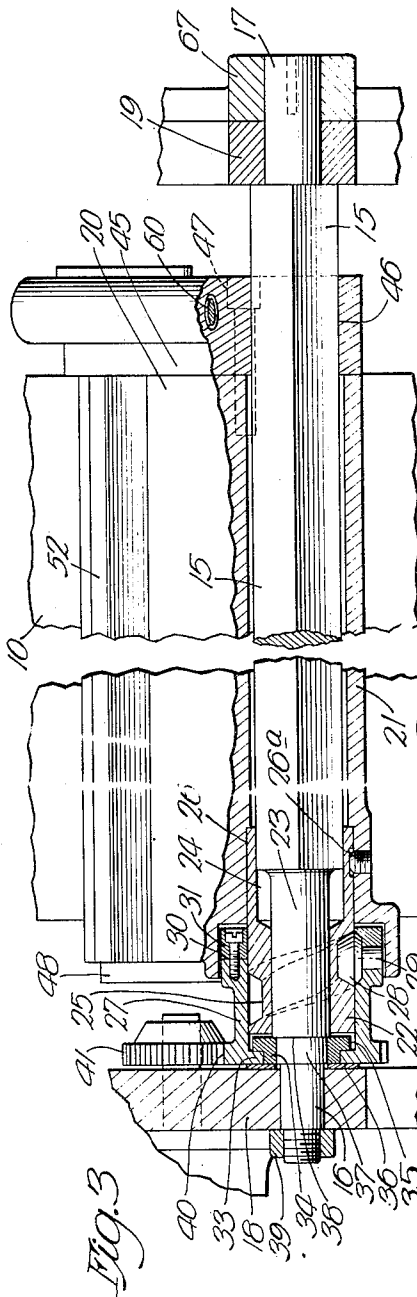


Fig. 3

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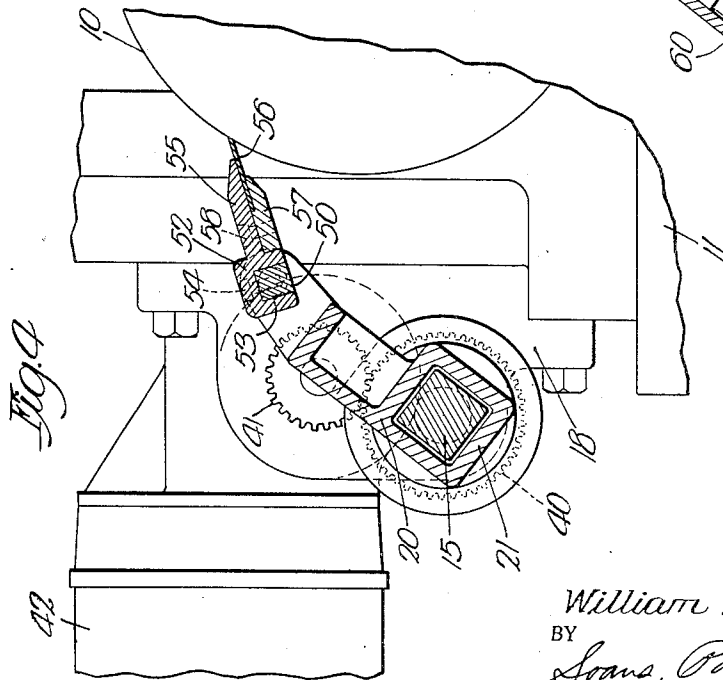
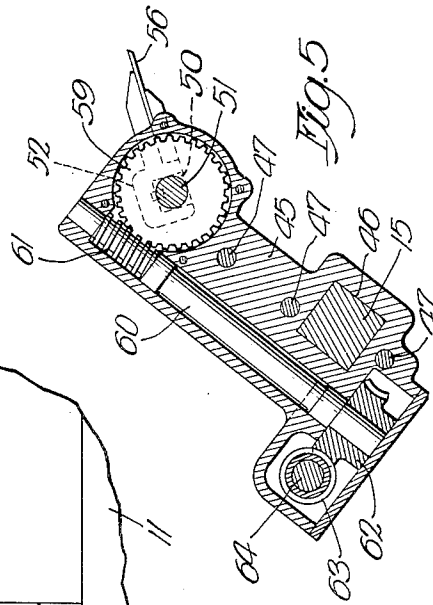
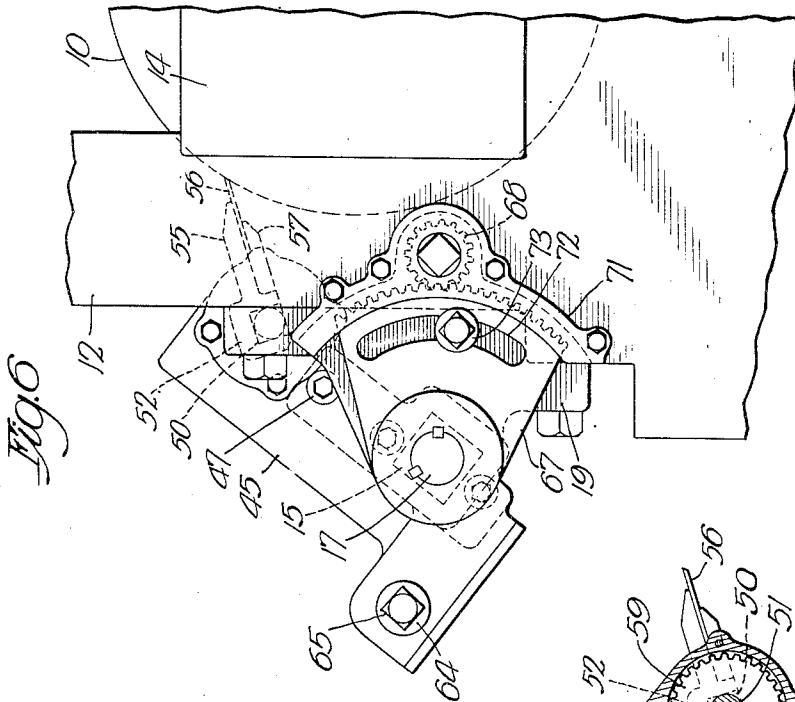
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## UNITED STATES PATENT OFFICE

2,323,983

## DOCTOR BLADE MECHANISM

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Application June 21, 1941, Serial No. 399,103

10 Claims. (Cl. 101—157)

This invention relates to doctor mechanism and more particularly to adjustable and reciprocating doctor mechanism such as used for removing surplus ink from the printing cylinder of an intaglio printing press. The mechanism may, however, be employed in other similar relationships such as in web coating apparatus and other places where the reciprocating and adjustment features of the present invention may be desirable.

The main objects of the invention are to provide a relatively simple but nevertheless highly efficient, smoothly operating mechanism for effecting longitudinal reciprocation of a doctor blade; to provide such mechanism which will be substantially self-enclosed or housed; to provide in connection with such reciprocating mechanism means for facilitating lateral adjustment of the doctor blade structure in its entirety and also of the doctor blade proper, it being understood, however, that the lateral adjustment features of the structure about to be described may be employed independently of the longitudinal reciprocating mechanism if desired; to provide adjustable doctor blade structure of the character indicated which may be built up as a unitary structure capable of removal from and application to a printing press or other mechanism as a unitary structure; and in general it is the object of the invention to provide an improved doctor mechanism of the character referred to.

Other objects and advantages of the invention will also be understood by reference to the following specification and accompanying drawings wherein there is illustrated reciprocating and laterally adjustable doctor mechanism embodying a selected form of the invention.

In the drawings:

Fig. 1 is a plan;

Fig. 2 is a front elevation, a portion being broken away and shown in section to illustrate certain details of construction;

Fig. 3 is a view similar to Fig. 2 but showing a changed position of certain of the parts to more fully illustrate certain details; and

Figs. 4, 5 and 6 are sections on the lines 4—4, 5—5 and 6—6, respectively, of Fig. 2.

For the purpose of typifying one installation of the improved doctor blade mechanism as shown in the drawings, there is represented in the drawings an intaglio or like printing cylinder 10, the same being suitably journaled in side frames 11 and 12 of a printing press mechanism. The printing roll may be rotated by any suitable mechanism which may include a driving gear

such as indicated at 13 secured to the shaft of the roll at one end, and as best indicated in Figure 1, the roll may be journaled in bearing blocks 14, 14 vertically slidably adjustably mounted in the frame sides 11 and 12.

For removing surplus ink from the surface of the roll 10, there is provided a doctor blade structure which in this instance comprises a square shaft 15 provided at its extremities with round end portions 16 and 17 which are journaled in appropriate bearing openings provided in bracket members 18 and 19, respectively. The bracket members 18 and 19 are fixedly mounted on the frame sides 11 and 12 so that the shaft 15 is supported in a fixed relationship to the printing cylinder 10.

A doctor blade supporting member 20 is longitudinally slidably mounted on the shaft 15. Said member 20 is provided with a tubular bottom or hub portion 21 which freely fits around the shaft 15, other means being provided as will be presently explained for actually supporting the member 20 on the shaft 15.

For effecting reciprocation of the doctor blade supporting member 20 and various parts carried thereby, there is provided a cylindrical cam member 22, the same being rotatably mounted on a cylindrical portion 23 of the shaft 15. At one end, the cam member 22 is bored and broached out to provide a square socket 24 which slidably receives the adjacent end portion of the squared shaft 15 so that the member 22 is capable of endwise or axial movement relative to the shaft 15 without disengaging the square end portion of the shaft 15 from the socket 24. The cam member 22 is also provided with a cam groove 25 which extends circumferentially around the outside of the member 22 and has an axial extent as clearly indicated in Figures 2 and 3.

The socketed end portion of the cam member 22 snugly fits within a counter-bored end portion 26 of the doctor blade supporting member 20, and it is locked thereto against relative endwise movement by suitable means such as one or more set screws as indicated at 26a.

For cooperating with the cam member 22 to effect axial reciprocation of said member 22 and the doctor blade supporting member 20, there is provided a cam engaging member 27 which is of hollow or sleeve-like form telescopically fitting around the portion of the cam member 22 which includes the cam groove 25. Said cam engaging member 27 is provided with an inwardly projecting roller 28 which fits in the cam groove 25, so that upon rotation of the member 27 without the

axial movement thereof, the cam member 22 and parts rigidly connected thereto will be reciprocated.

The cam groove engaging roller 28 may be mounted on the member 27 through the agency of an outwardly extending stud 29 which may be journaled in a suitable bearing opening formed between the end face 30 of the member 27 and a ring 31 which may be rigidly secured to the member 27 by a suitable number of cap screws such as indicated at 32.

The cam engaging member 27 is rotatably supported by its bearing engagement with the cylindrical surface of the cam member 22 on opposite sides of the cam groove 25, and it may also be rotatably supported adjacent its outer end by means of an inwardly extending flange 33 having bearing engagement with a bushing member 34. The bushing member 34 is provided with an outwardly extending flange portion 35 which fits inside of the internal flange 33 and said flange 35 cooperates with a washer-like bushing 36 to confine the internal flange 33 of the cam engaging member 27.

The bushings 34 and 36 are clamped in fixed position relative to the bracket 18 by being seated on a shaft portion 37 of a diameter intermediate the diameters of the shaft portions 16 and 23 and by being clamped against the inner face of the bracket 18 through the agency of the shoulder 38 at the outer end of the shaft portion 23 and a clamping nut 39 carried by a threaded extension of the shaft portion 16.

The cam engaging member 27 is provided adjacent its outer end with an integrally formed gear 40 which meshes with a driving pinion 41. The driving pinion 41 is driven by means of an electric motor 42 through the agency of suitable speed reduction means indicated generally at 43 on the driving shaft 44 of which the said driving pinion 41 is mounted.

At the end of the doctor blade supporting member 20 which is remote from the cam operating mechanism above described, there is provided an arm 45 suitably bored and broached out as indicated at 46 (see Figures 3 and 5) to slidably fit on the squared shaft 15. The arm or bracket 45 is rigidly secured to the doctor blade supporting member 20 by a suitable number of bolts or the like indicated at 47, so that said arm 45 is capable of slidably supporting the adjacent end of the doctor blade supporting member 20 on said squared shaft 15.

At one end of the doctor blade supporting member 20 there is provided an arm extension or lug 48 in which there is rotatably mounted a round end portion 49 of another squared shaft 50. The other end of the squared shaft 50 has a round end extension 51 which is rotatably mounted in an end portion of the arm 45 which constitutes, in effect, a counterpart for the lug 48.

The squared shaft 50 has removably mounted on it a doctor blade holder 52, the same being formed with a recess 53 for snugly receiving the shaft 50 and being rigidly secured to the shaft by means of a suitable number of cap screws such as indicated at 54. The doctor blade holder 52 has a lip-like portion 55 to which a doctor blade 56 may be clamped by means of a clamping bar 57 and screws such as indicated at 58.

The arm 45 is so formed as to provide a recess for housing a worm wheel 59, which is mounted on and keyed to the shaft portion 51. Said arm 45 is also provided with an opening for rotatably supporting a shaft 60 which is provided at one

end with a worm gear 61 meshing with the worm wheel 59. At its other end, the shaft 60 has secured to it a worm wheel gear 62 which meshes with a worm gear 63 carried by a short shaft 64.

The shaft 64 is suitably journaled in portions of the arm 45 and has a squared end portion 65 outside of the arm 45 to which a wrench or operating hand wheel may be applied for facilitating manual turning of the said shaft 64. It will be apparent that such adjustment of the shaft 64 will be transmitted through the shaft 60 to the shaft 50 with corresponding rotary or rocking adjustment of the doctor blade holder 55 and doctor blade 56. A suitable cover plate such as indicated at 66 is provided for closing the recessed end of the arm 45 wherein are housed the shaft 64 and the worm and worm wheel 63 and 62, respectively.

In addition to providing the above described adjustment of the doctor blade holder and doctor blade, the entire doctor blade structure may be rotatably adjusted about the axis of the shaft 15, it being understood that the shaft portions 16 and 17 are journaled in the brackets 18 and 19 and that the clamping function of the nut 39 does not require that the nut be tightened to such an extent as to lock the shaft 15 against rotary adjustment.

To facilitate rotary adjustment of the shaft 15 and the parts carried thereby, the round end portion 17 thereof is extended beyond the outside of the bracket 19 and has mounted on and keyed to it a gear segment 67. The gear segment 67 meshes with a pinion 68 carried by a short shaft which is journaled as indicated at 69 (Figure 1) in the bracket member 12. The shaft of the pinion 68 is extended outwardly from the pinion and is squared as indicated at 70 to facilitate the application of a wrench, or an operating hand wheel or the like, whereby the shaft and pinion 68 may be manually rotated thereby to actuate the segment 67 and effect corresponding adjustment of the shaft 15.

The pinion gear 68 and the teeth of the segment 67 may be housed between the outer face of the bracket 12 and a suitable housing member 71 which may be secured to the bracket 12 by suitable bolts or the like as indicated in Figure 6.

For locking the shaft 15 in selected position of adjustment, the segment 67 is provided with an arcuate slot 72 through which passes a clamping bolt 73, the latter being threaded into a suitably tapped opening in the bracket 12.

It will be observed that the doctor blade structure described is carried in its entirety by the brackets 11 and 12, and that the entire doctor blade structure including its driving motor 42 may be removed or applied as a unit. This facilitates various maintenance operations both in respect of the press itself and in respect of the doctor blade structure. The driving motor 42 may be supported in its entirety from the bracket 11 through the agency of the housing of the speed reducing unit 43 but it will be apparent, of course, that additional support may be provided if found desirable.

The described rotary cam arrangement for effecting reciprocation of the doctor blade is concentric with the pivot axis on which the doctor blade structure in its entirety may be rotatably adjusted so that rotary adjustment of the doctor blade structure involves no additional or supplemental adjustment of the reciprocating mechanism. It will also be noted that the cam means

for reciprocating the doctor blade structure is of such form that it is substantially self-enclosing, i. e., the cam member 27 itself constitutes a housing for the operating connections between the cam members 27 and 22. If desired, the rotary cam arrangement may be reversed to cause the grooved member to be rotated and the roller carrying member to be reciprocated, and other modifications of this type may be made by those skilled in the art. The described arrangement has, however, been found to be practical and highly efficient.

In the foregoing description, the shafts 15 and 50 have been described as being squared shafts but it will be apparent, of course, that other arrangements may be employed, the only import of the square shape being that of facilitating the mounting of certain of the parts described on the respective shafts, so that the mounted members are not rotatable relative to the respective shafts.

Other modifications in the described structure may be made without departing from the spirit of the invention, the scope of which should be determined by reference to the following claims, the same being construed as broadly as possible, consistent with the state of the art.

I claim:

1. In doctor mechanism, the combination of an axially fixed but rotatably adjustably mounted shaft, a doctor blade structure longitudinally slidably and non-rotatably mounted on said shaft, relatively rotatable and axially shiftable cam and cam engaging members concentric with said shaft, said members being relatively axially shiftable as an incident to relative rotation therebetween, one of said members being anchored to said doctor blade structure in fixed relation thereto, means for holding the other of said members in axially fixed position, means for effecting relative rotation of said cam and cam engaging members, and means for effecting rotary adjustment of said shaft, thereby to effect corresponding adjustment of the doctor blade structure mounted thereon.

2. In doctor mechanism, the combination of a shaft journaled adjacent its ends for rotary adjustment, a doctor blade structure longitudinally adjustably slidably mounted on said shaft, relatively rotatable and axially shiftable cam and cam engaging members concentric with said shaft, said members being relatively axially shiftable as an incident to relative rotation therebetween, one of said members being anchored to said doctor blade structure in longitudinally fixed relation thereto, means for holding the other of said members in axially fixed position, means for effecting relative rotation of said cam and cam engaging members, and gear means for facilitating rotary adjustment of said shaft to thereby effect corresponding lateral adjustment of said doctor blade mechanism.

3. In apparatus of the class described, a supporting frame, a doctor blade structure comprising a pair of relatively spaced arms, means mounting said arms on said frame for reciprocation in the direction in which they are spaced and for rotary transverse adjustment, cam and cam engaging members co-axial with the axis of said rotary arm adjustment for reciprocating said arms, a shaft journaled in said arms in spaced relation to said arm adjustment axis, a doctor blade mounted on said shaft and means carried by one of said arms and accessible for manual operation adjacent said axis for rotatably adjust-

ing said shaft and the doctor blade carried thereby.

4. In apparatus of the class described, a supporting frame, doctor blade structure comprising a pair of relatively spaced arms, means mounting said arms on said frame for reciprocation in the direction in which they are spaced and for rotary transverse adjustment, cam and cam engaging members co-axial with the axis of said rotary arm adjustment for reciprocating said arms, a shaft journaled in said arms in spaced relation to said arm adjustment axis, a doctor blade mounted on said shaft, and self-locking gear means carried by one of said arms and accessible for manual operation adjacent said axis for rotatably adjusting said shaft and the doctor blade carried thereby.

5. In a printing press or like structure, spaced frame members, a pair of brackets respectively detachably mounted on said frame members, a shaft extending between and axially fixedly and rotatably mounted in said brackets, a doctor blade structure longitudinally slidably and non-rotatably mounted on said shaft, relatively rotatable and axially shiftable cam and cam engaging members concentric with and positioned about said shaft adjacent one of said brackets, said members being relatively axially shiftable as an incident to relative rotation therebetween, one of said members being anchored to said doctor blade structure in fixed relation thereto, means for holding the other of said members in axially fixed position, means mounted on one of said brackets for effecting relative rotation of said cam and cam engaging members, and means carried by said shaft adjacent one of said brackets for effecting rotary adjustment of said shaft, thereby to effect corresponding adjustment of the doctor blade structure mounted thereon.

6. Apparatus according to claim 3 wherein the means mounting the arms on the frame comprise a pair of brackets detachably mounted on the frame, and a shaft axially fixedly mounted adjacent its ends in said brackets, the arms being mounted on said shaft, whereby the doctor blade structure is, in effect, a unitary structure.

7. In apparatus of the class described, spaced frame members, a shaft normally fixedly mounted in said frame members, an elongated supporting member extending longitudinally of said shaft, mounted thereon for longitudinal sliding movement and extending laterally therefrom, rotary cam and cam engaging members one of which is partially enclosed by and non-rotatably secured to said supporting member and slidable therewith longitudinally of said shaft, the other of said members being mounted for rotation and anchored to one of said frame members against axial movement and serving to complete the enclosure of said other cam member, a rockable doctor blade shaft adjacent the free edge of said laterally extended portion of said supporting member, gear means adjacent one end of said supporting member for effecting rocking adjustment of said doctor blade shaft, means for mounting said doctor blade shaft on said supporting member comprising an arm-like housing enclosing said gear means, said housing being secured to the adjacent end of said supporting member and being slidable therewith, said gear means including a part adjacent said first mentioned shaft and accessible from the outside of said housing for facilitating manual adjustment of said doctor blade shaft, and means for rockably adjusting said first mentioned shaft and said sup-

porting member as a unit about the axis of said first mentioned shaft.

8. In apparatus of the class described, a normally stationary shaft, a doctor blade support extending laterally from said shaft, relatively independent bearing members secured to said support at its ends and having a sliding fit on said shaft for slidably supporting said doctor blade support on said shaft, one of said bearing members having a portion co-axial with said shaft, a doctor blade actuating member rotatably mounted concentrically with said bearing member portion in telescopically fitting relation thereto, means intermediate the relatively telescoped portions of said actuating member and said bearing member portion for effecting reciprocation of the latter and of said doctor blade support as an incident to rotation of said actuating member, means for rotating said actuating member, and said support having a portion telescopically receiving a part of said telescopically interfitting members at least when the support is moved to its extreme limit of reciprocation toward said telescopically interfitting members.

9. In apparatus of the class described, a normally stationary shaft, a doctor blade support extending laterally from said shaft, relatively independent bearing members secured to said support at its ends and having a sliding fit on said shaft for slidably supporting said doctor blade support on said shaft, one of said bearing members having a portion co-axial with said shaft, an axially fixed, cylindrical actuating member rotatably mounted concentrically with said shaft and surrounding at least a portion of said bearing member in telescopically fitting relation thereto, means intermediate the relatively telescoped por-

tions of said actuating member and said bearing member for effecting reciprocation of the latter and of said support as an incident to rotation of said actuating member, means for rotating said actuating member, and said support having a recessed portion telescopically receiving at least a portion of said cylindrical actuating member when the support is moved to its extreme limit of reciprocation toward said telescopically interfitting members.

10. In apparatus of the class described, spaced frame members, a shaft normally fixedly mounted in said frame members, an elongated supporting member extending longitudinally of said shaft, mounted thereon for longitudinal sliding movement and extending laterally therefrom, means for reciprocating said supporting member on said shaft, a doctor blade shaft substantially parallel to said fixed shaft and rotatably mounted on said supporting member adjacent its free edge, gear means adjacent one end of said supporting member for effecting rotary adjustment of said doctor blade shaft, means for mounting said doctor blade shaft on said supporting member comprising an arm-like housing enclosing said gear means and fixedly secured to the adjacent end of said supporting member, said gear means embodying a shaft extending transversely of said doctor blade shaft, an adjusting shaft extending substantially parallel with said fixed shaft, worm and worm wheel gear connections between the opposite ends of said transversed shaft and said doctor blade and adjusting shaft respectively, and means for rotatably adjusting said first-mentioned shaft and said supporting member as a unit about the axis of said first mentioned shaft.

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