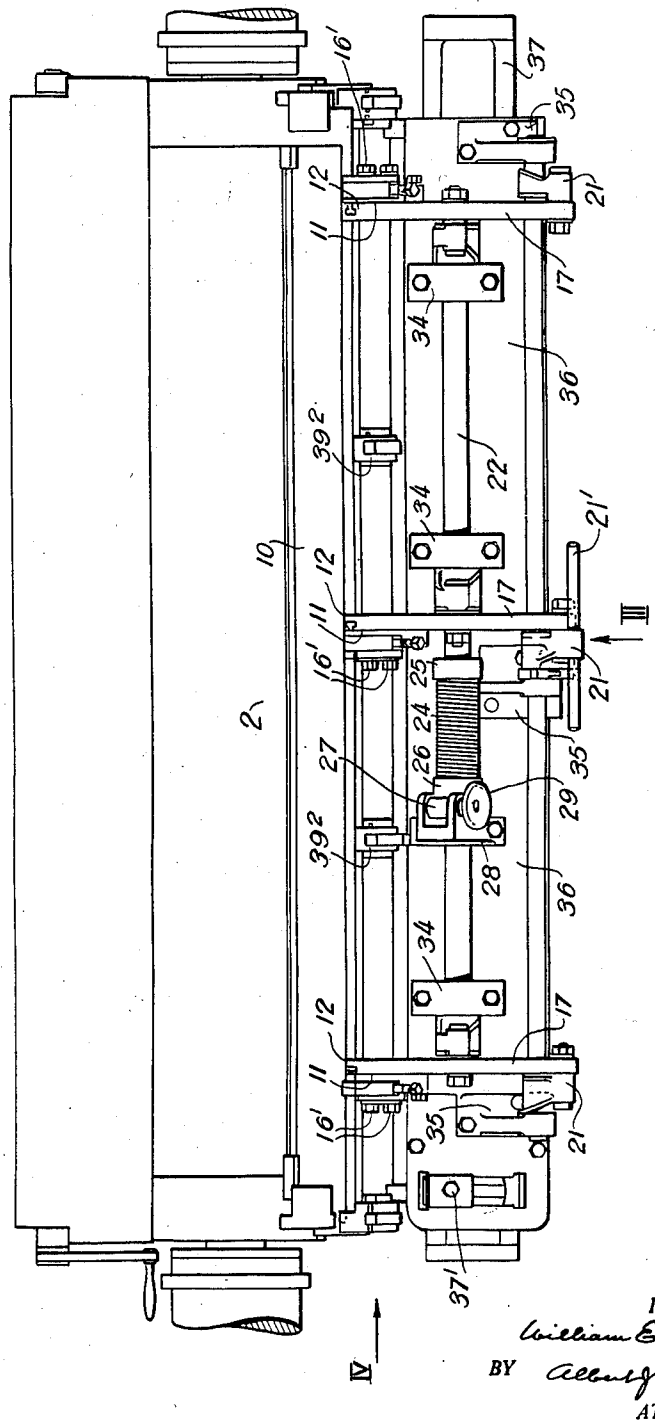
Sept. 26, 1950 W. E. BENNISON 2,523,643

DOCTOR BLADE MECHANISM FOR ROTARY INTAGLIO PRINTING MACHINES

Filed Dec. 5, 1945 5 Sheets-Sheet 1

FIG. 1.



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DOCTOR BLADE MECHANISM FOR ROTARY INTAGLIO PRINTING MACHINES

Filed Dec. 5, 1945 5 Sheets-Sheet 2

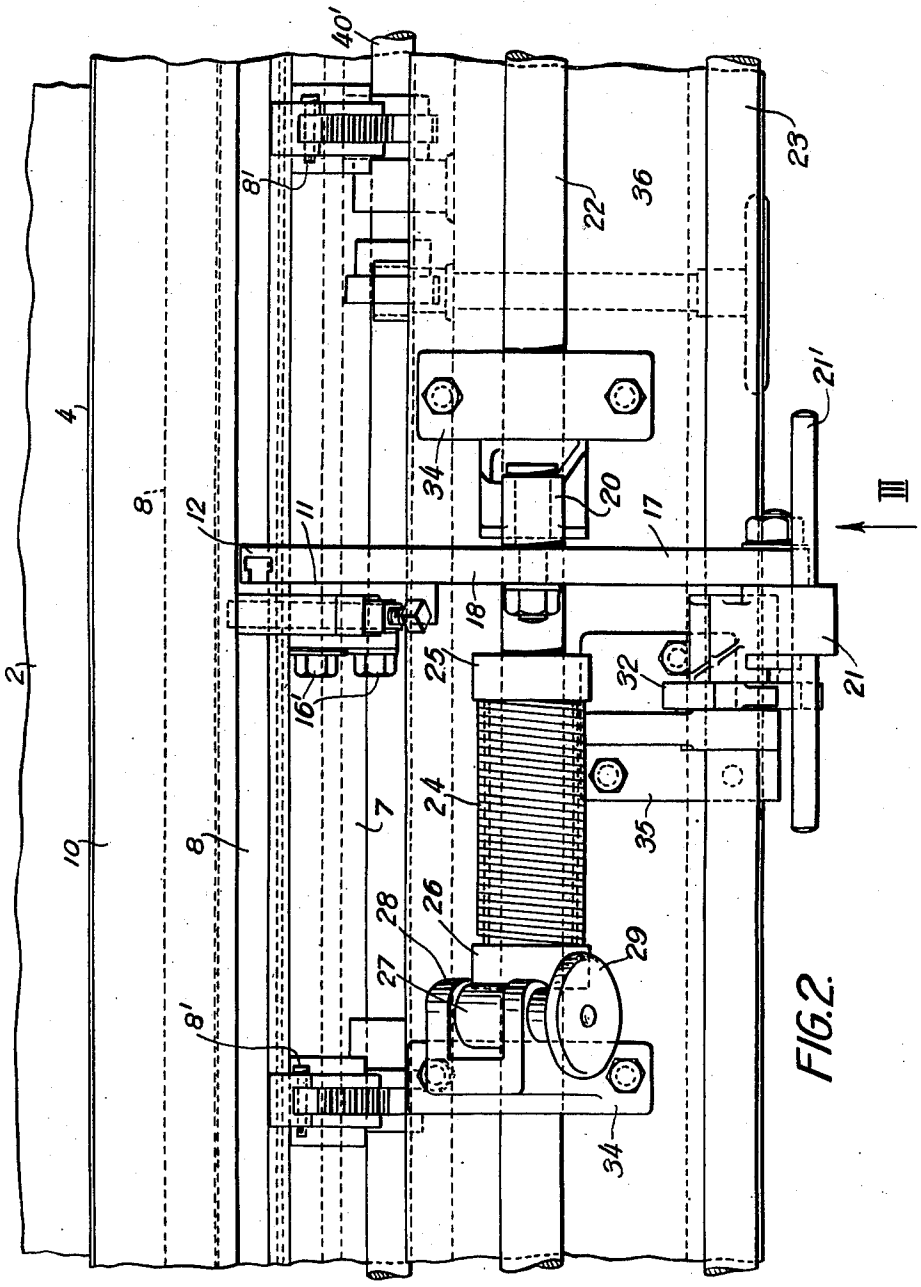

FIG.2.

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DOCTOR BLADE MECHANISM FOR ROTARY INTAGLIO PRINTING MACHINES

Filed Dec. 5, 1945 5 Sheets-Sheet 3

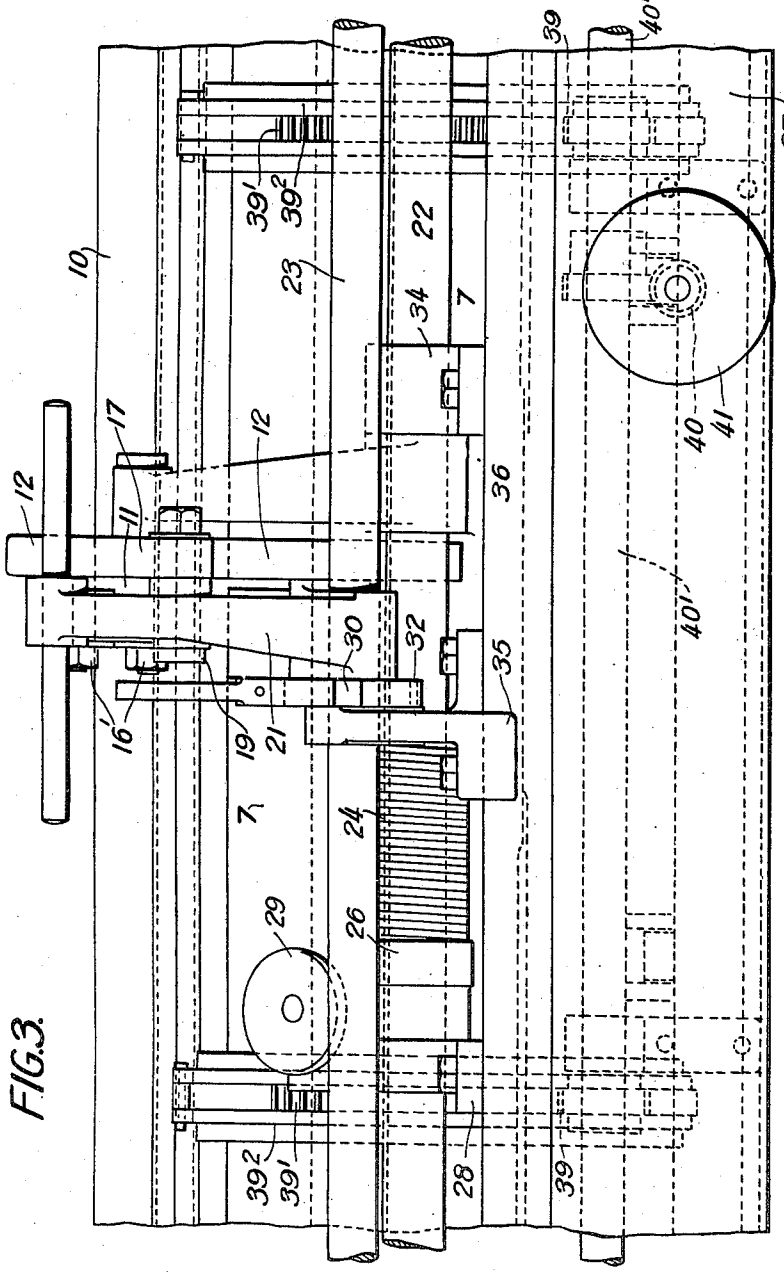

FIG.3.

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DOCTOR BLADE MECHANISM FOR ROTARY INTAGLIO PRINTING MACHINES

2,523,643

Filed Dec. 5, 1945

5 Sheets-Sheet 4

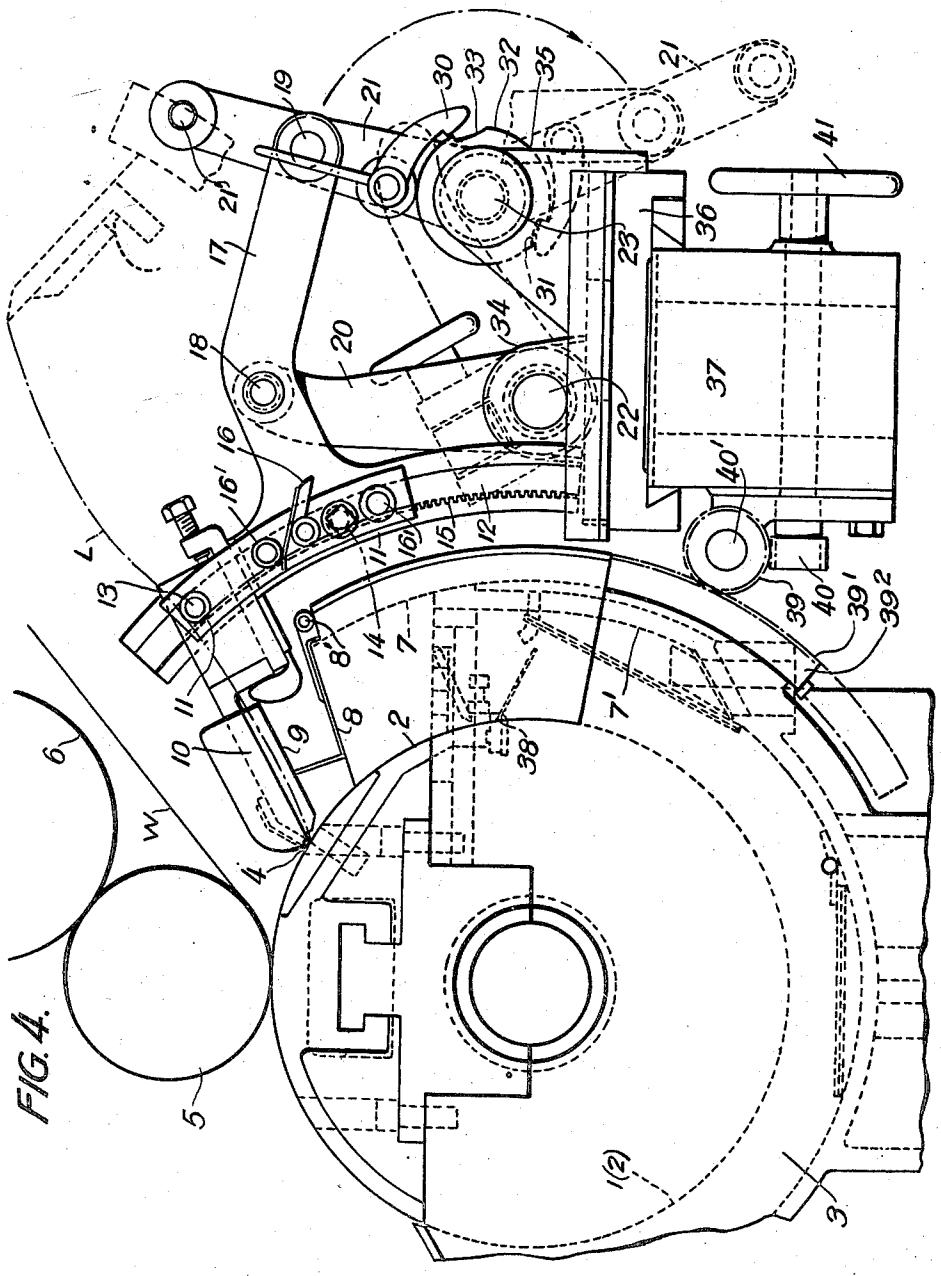

FIG. 4.

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Sept. 26, 1950 W. E. BENNISON 2,523,643

DOCTOR BLADE MECHANISM FOR ROTARY INTAGLIO PRINTING MACHINES

Filed Dec. 5, 1945 5 Sheets-Sheet 5

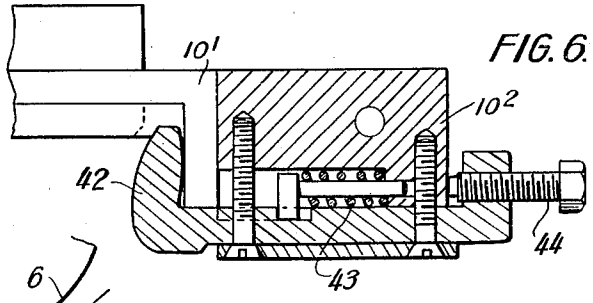

FIG. 6.

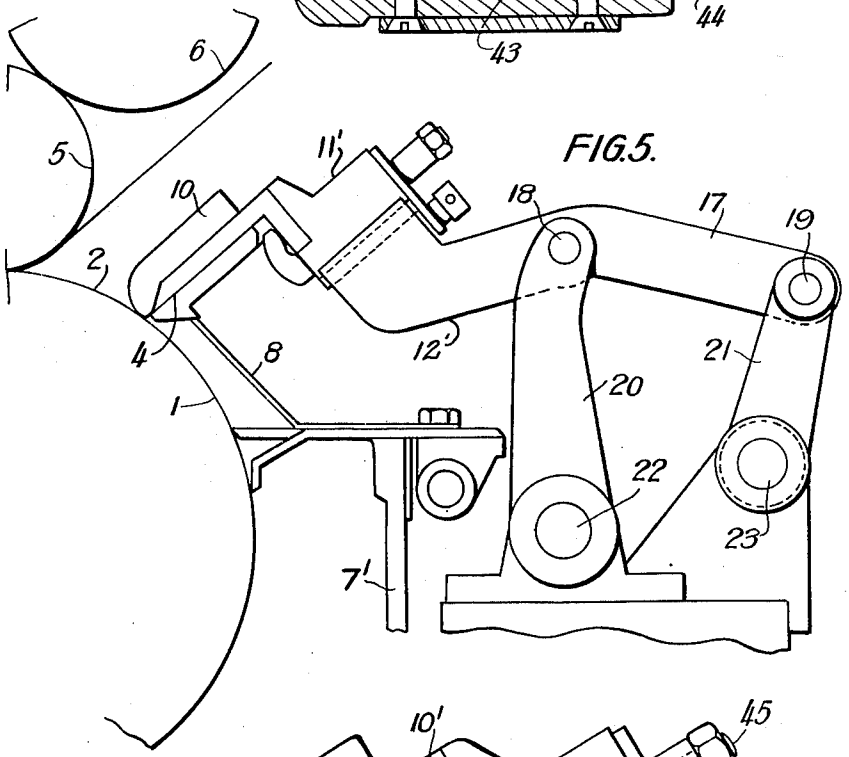

FIG. 5.

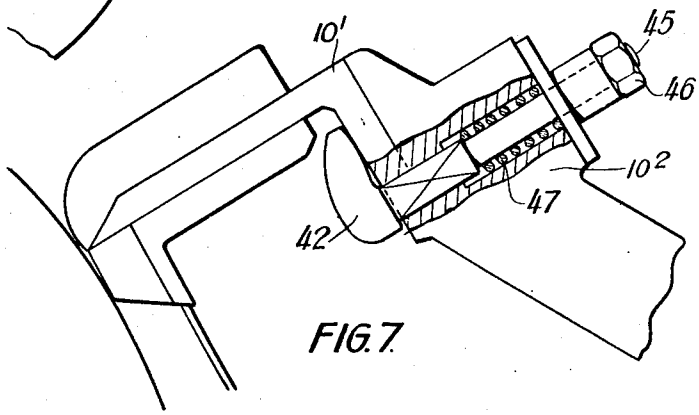

FIG. 7.

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Patented Sept. 26, 1950 2,523,643

UNITED STATES PATENT OFFICE

2,523,643

DOCTOR BLADE MECHANISM FOR ROTARY INTAGLIO PRINTING MACHINES

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In Great Britain December 19, 1944

5 Claims. (Cl. 101—167)

1

This invention relates to improvements in doctor blade mechanism for rotary intaglio printing machines.

In the use of rotary intaglio printing machines an important operating condition is the nature of the ink which is either available or has to be used for a certain type of product.

It may be observed that at one extreme, what is termed a "high speed" ink may be used, this including a highly volatile medium so that it is necessary to apply the ink (in the printing process) to the paper (or other material being printed upon) as soon as possible after the printing surface has passed the doctor or wiper blade which removes surplus ink from the printing surface; if this is not effected, there is difficulty due to the partial hardening of the ink in the etching especially when, as is common, the printing surface after passing the doctor blade is exposed to the air. At the other extreme, a slow drying ink may be employed and certain forms of such ink require the maximum exposure to free air after the printing surface has been wiped so that, by the time the impression zone (i. e. the printing zone) is reached, the ink will be in the proper condition for satisfactory printing.

Now, one object of this invention is to provide a doctor blade mechanism which is readily adaptable to the different kinds of ink. This object is achieved, broadly stated, by mounting the doctor blade (or at least the carrier for the doctor blade) in such manner that it can be progressively adjusted bodily about the periphery of the printing cylinder so as to be movable towards and away from the impression zone to any desired setting.

Another variable factor in the operation of such machines is the diameter of the printing cylinder. To enable the doctor blade mechanism to be set for different cylinder diameters, the doctor blade may, according to this invention, be additionally mounted so that it can be adjusted bodily towards and away from the axis of the printing cylinder.

Furthermore, the angle which the doctor blade makes with the cylinder is arranged to be adjusted, and the mechanism of this invention may be such that adjustment of the doctor blade about the periphery of the cylinder can be effected without altering the effective angular setting of the blade.

2

Furthermore, it is necessary to arrange that the doctor blade assembly shall be movable clear of the cylinder for the purpose of changing the doctor blade itself and for cleaning the cylinder; when however the doctor blade assembly is adjustable so that it can be moved close up to the impression zone or in cases where the assembly is constructed so as to be fixed in such a position, difficulty arises in view of the possibility of damaging the web passing to the impression zone or of fouling the rollers at the printing zone and this consideration would with the usual mechanism place a limit on the closeness at which the doctor blade assembly could be arranged with respect to the impression zone.

A further feature of this invention consists in so mounting the doctor blade that when it is moved away from the printing cylinder it is caused to sweep away from and clear of the web; for this purpose the doctor blade assembly is carried by a system of links and levers so arranged relatively to one another as to cause the assembly to take the desired path.

The invention is illustrated in the accompanying drawings in which Figure 1 is a plan view of the ink fountain arrangement of a printing machine in which this invention is embodied; Figure 2 a plan view of part of the mechanism shown in Figure 1; Figure 3 an elevation looking in the direction of the arrow III in Figures 1 and 2, and Figure 4 an end elevation looking in the direction of the arrow IV—IV, Figures 2, 3 and 4 being to a larger scale than Figure 1. Figure 5 is an end elevation of a modified arrangement, Figure 6 a sectional elevation of the doctor clamping mechanism employed in the arrangements shown in Figures 1–5 while Figure 7 is a sectional elevation of a modified doctor clamping mechanism.

Referring firstly to Figures 1–4, and especially Figure 4, the printing cylinder is indicated at 1, this cylinder having on its periphery an etched printing surface 2; this cylinder in its rotation carries its periphery through ink in an ink fountain 3 and (regarding any one part of its periphery) after that part has passed through the ink and has emerged therefrom it passes a doctor blade 4 which wipes surplus ink from the periphery leaving ink in the etched parts of the periph-

ery; this ink in the etching is then applied to the surface to be printed, this surface being in the particular case shown that of a web W which passes between the cylinder 1 and an impression roll 5 which may be backed by a counter-pressure roll (or rollers) 6. The side wall 7 of the fountain 3 on the doctor blade side of the press extends upwardly and has pivoted to it at 8' an extension flap 8 which in effect carries the side wall 7 up to a clamping plate 9 clamping the doctor blade 4 in position in its holder 10; the effect of this arrangement is effectively to shield from the atmosphere the periphery of the cylinder after it has passed from the ink in the fountain and as it passes up to the doctor blade 4.

In order now to enable the doctor blade 4 to be adjusted towards and away from the printing zone the doctor blade carrier or holder 10 is mounted at each of its ends and at its centre on a slide 11 of arcuate form which is itself slidable on an arcuate supporting member or guide 12 having its centre co-axial with the axis of the cylinder. The angle included by each arcuate guide 12 is such that it extends upwardly from the region of the top of the fountain 3 towards and close to the impression cylinder 5 or to the counter-impression roller 6 backing the impression cylinder.

The doctor-blade holder 10 may be of any desired type but preferably it is arranged to employ a thin doctor blade 4 which is stretched endwise to give rigidity to the actual wiping tip of the blade; whatever form of blade be employed, the holder 10 in any case extends inwardly of the guides to present the tip of the blade to the periphery of the cylinder.

It will be obvious that the arc through which the periphery 2 of the cylinder 1 travels, after leaving the doctor blade 4 up to the impression zone is capable of progressive variation to suit the requirements of the different inks by adjusting the slides 11 along the arcuate guides 12 to the desired extent; it will be observed that the angle which the doctor blade 4 makes to the periphery 2 of the cylinder 1 (i. e. say the angle between the plane of the doctor blade and a plane radial to the cylinder 1) is unaffected by the adjustment of the slides 11 on their guides 12. This angle of the blade 4 is however itself arranged for adjustment by pivotally mounting at 13 the holders 10 on the slides 11.

To effect the movement of the slides 11 in the guide 12 each slide may have rotatably mounted in it a pinion 14 meshing with an arcuate rack 15 on the guide so that by turning the pinion the slide is caused to travel along the guide. In order to prevent the slides from running down the guides by reason of the weight of the parts, a one-way strut pawl 16 may be provided and locking bolts 16' are provided to lock the slides in position.

Each of the slides 11 is capable of individual operation so that the blade 4 can be adjusted at separated zones along its length.

In order to effect movement of the doctor blade assembly clear of the cylinder 1 for the purpose of for example changing the doctor blade 4 and of cleaning the cylinder itself an arrangement is provided such that there is firstly no danger that the blade 4 will damage the web W or any other part at the printing or impression zone and secondly that the setting of the parts shall be unaffected; this is achieved by carrying the arcuate guides 12 by a link and lever system such that the guides (and with them the doctor blade

holder and blade) can be swung away from the cylinder with the tip of the blade 4 following a path indicated at L having at least a component downwardly away from the web W. For this purpose each guide 12 has a rearward extension 17 at about its mid-point and at two points on this extension are pivotally connected at 18, 19, the upper ends of the two arms 20, 21 spaced apart and pivotally mounted at 22, 23 at their lower ends, the outer arms 21 (i. e. the arms more remote from the cylinder 1) being of shorter length than the other arms 20.

With this arrangement when the guides 12 are drawn rearwardly (i. e. away from the cylinder) the tip of the blade follows the path L referred to and in the extreme position the parts of the doctor blade assembly are folded back well clear of the cylinder 1 with the blade 4 readily available for removal or cleaning and the periphery 2 of the cylinder exposed for cleaning and so on, this position being indicated in chain dotted lines in Figure 4.

This mechanism also allows the doctor blade 4 to be accommodated to cylinders 1 of different diameters, the ink and lever system enabling the tip of the doctor blade to move into engagement with the cylinder within a range in diameter; in other words assuming the assembly to be drawn back, an operation which is effected by a hand grip 21' on the central arm 21 then in its forward travel to operative position the assembly travels just so far as it is necessary to engage the cylinder.

The guides 12 are biased to the normal (i. e. wiping) position by a spring 24 which is a coil spring disposed about the shaft forming the pivot 22 and to which the arms 20 are all secured the spring being anchored at one end to a collar 25 secured to the shaft and at the other end to a collar 26 loose on the shaft and formed with gear teeth to mesh with an adjusting screw or worm 27 rotatable in a fixed bracket 28 by a hand-wheel 29. The turning of this hand wheel causes the spring to be "wound-up" or "unwound" and so regulates the torque exerted on the shaft 22 and in turn the force with which the arms 20 cause the wiper blade 4 to be applied to the cylinder 1. When the guides 12 are drawn back in the manner referred to, the spring 24 is further loaded and in order to hold the guides in their drawn back position the central arm 21 is provided with a detent 30 which snaps into a recess 31 in a stationary disc 32 and so holds the arm 21 (and hence the whole assembly) against the return action of the spring 24; by releasing this detent 30 the assembly is freed to return to normal position but to obviate the possibility that the assembly would accidentally be free to return by uncontrolled spring action (which would possibly damage the doctor blade 4 and printing surface 2 by impact) there is provided a second recess 33 into which the pawl 30 drops just before the tip of the blade 4 engages the printing surface 2. Thus should the assembly pass out of control, this second recess 33 will arrest movement of the assembly under the action of the spring 24 and so prevent damage. To enable the doctor finally to pass into wiping position the pawl has to be deliberately released from the second recess.

The doctor blade mechanism would preferably be arranged in known manner for reciprocation longitudinally of the periphery of the cylinder and to effect this the bearings 34, 35 for the shafts

22, 23 of the link and lever system are carried on a longitudinal slide 36 slidably mounted on the stationary part 37 of the frame, the longitudinal slide being reciprocated in any well known manner as by an eccentric or adjustable crank pin arrangement indicated generally at 37'.

In addition to the wiping action effected by the doctor blade 4 there may be a preliminary action to remove surplus ink before the cylinder 1 passes under the doctor blade; this can be effected by providing a blade 38 positioned close to the periphery 2 of the cylinder, this blade being adjustable as to its separation from the cylinder.

As the mechanism of this invention is adaptable for using high speed inks, the fountain arrangement may be of the closed type for which purpose the doctor blade 4 and its holder form a part of the enclosure of the fountain and in order to adapt the enclosure to the adjustment of the doctor blade, the wall 7 of the fountain on the doctor blade side is curved and slidable on the lower main wall 7' and is moved up or down by a gear 39 each in mesh with an arcuate rack 39' on part ring 39^2 secured to the wall 7, the gears 39 being on a shaft 40' operated by a hand-wheel 41 through gearing 40 so as to bring the upper edge of the curved plate 7 (or the part 8 more precisely) into contact with a part of the doctor blade holder 10.

Referring now to Figure 5, this illustrates the application of one feature of this invention to a machine in which the position of engagement of the doctor blade 4 is set (i. e. is non-adjustable about the axis of the cylinder 1) and close to the impression zone. The mechanism previously described for causing the doctor blade to follow the path L referred to would be employed in such a case, with the exception that (as shown in Figure 5) blocks 11' would be substituted for the slides 11 (shown in Figures 1 to 4) and supporting members 12' of Figure 5, would be substituted for the arcuate guides 12 of Figures 1 to 4. Otherwise the parts shown in this figure are given reference numerals to correspond with corresponding parts already described with reference to Figures 1–4.

Preferably as is shown in Figures 6 and 7 the doctor blade holder 10 is formed in two separable parts 10' and 10^2, these two parts being held together releasably by a jaw 42. In Figure 6 the jaw piece is slidable on the part 10^2 and is urged by a spring 43 to its release position and a screw 44 screws into the jaw-piece and abuts against the part 10^2, this screw being employed to move the jaw piece positively into locking position against the action of the spring 43. In Figure 6 the jaw piece is slidable outside the part 10^2 but in the arrangement shown in Figure 7 the jaw piece is slidable in a bore in the part 10^2 and the jaw piece has a screwed extension 45 receiving a nut 46 to draw by reaction against the part 10^2 the jaw into positive clamping engagement against the action of a spring 47 disposed around the jaw piece.

What I claim is:

1. In an intaglio printing machine, the combination of a printing cylinder, an impression mechanism co-operating with said cylinder, means to guide a web to be printed between said cylinder and said impression mechanism, a doctor blade holder, a doctor blade held by said holder normally wiping the peripheral surface of the cylinder and movable supporting means for said holder, the said supporting means including a pair of arms of different lengths, means articulating the arms respectively to spaced points with the longer arm closer to the axis of the cylinder than the shorter arm, and means articulating the free ends of the arms to spaced points on the said holder whereby the holder can be moved to carry the doctor blade away from the cylinder with a movement which initially at least has a component away from the web as it passes to the impression zone.

2. In an intaglio printing machine, the combination of a printing cylinder, an impression mechanism co-operating with said cylinder, means to guide a web to be printed between said cylinder and said impression mechanism, a doctor blade holder, a doctor blade held by said holder normally wiping the peripheral surface of the cylinder and movable supporting means for said holder, the said supporting means including a pair of arms of different lengths, means articulating the arms respectively to spaced points with the longer arm closer to the axis of the cylinder than the shorter arm, means articulating the free ends of the arms to spaced points on the said holder and means to rock one of the arms whereby the holder is moved to carry the doctor blade away from the cylinder with a movement which initially at least has a component away from the web as it passes to the impression zone.

3. In an intaglio printing machine, the combination of a printing cylinder, an impression mechanism co-operating with said cylinder, means to guide a web to be printed between said cylinder and said impression mechanism, a doctor blade holder, a doctor blade held by said holder normally wiping the peripheral surface of the cylinder, a supporting means for the holder, a pair of arms of different lengths, means articulating the arms respectively to spaced points with the longer arm closer to the axis of the cylinder than the shorter arm, and means articulating the free ends of the arms to spaced points on the said supporting means whereby the holder can be moved to carry the doctor blade away from the cylinder with a movement which initially at least has a component away from the web as it passes to the impression zone.

4. In a printing machine having a printing cylinder, a doctor blade, a plurality of doctor blade supporting members each having a pivot connection and an extension projecting away from the pivot in a direction opposite from the blade, a reciprocable slide, first arms pivotally supported on the slide and supporting the supporting members at their pivot connections, shorter arms pivotally supported on the base and pivotally connected to the extensions, at other pivot points, and means to swing the shorter arms to move the supporting members and the blade bodily toward and from the cylinder.

5. In an intaglio printing machine having a printing cylinder, an impression mechanism co-operating with said cylinder, means to guide a web to be printed between said cylinder and said impression mechanism, a reciprocable slide having a doctor blade supported thereon to wipe the peripheral surface of the cylinder, and means for supporting the doctor blade including a doctor blade holder to which the doctor blade is secured, a plurality of holder supporting members, one end of each member being fixed to the holder, first and second shafts rotatably supported on the slide, first arms, each having one end se-

cured to the first shaft and its opposite end pivotally connected to a holder supporting member at a point spaced from the holder, shorter arms each having one end secured to the second shaft and an opposite end pivotally connected to a holder supporting member at a point spaced farther from the holder, and means to rotate the shafts and thereby move the doctor blade toward and away from the cylinder in a path which as the blade is retracted, has at least initially a component away from the path followed by a web as it passes to the impression zone.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,981,912	Frankboner	Nov. 27, 1934
2,097,791	Heller	Nov. 2, 1937
2,278,138	Paardecamp	Mar. 31, 1942
2,292,344	Heller et al.	Aug. 11, 1942
2,368,776	Piazze	Feb. 6, 1945