

Feb. 14, 1950

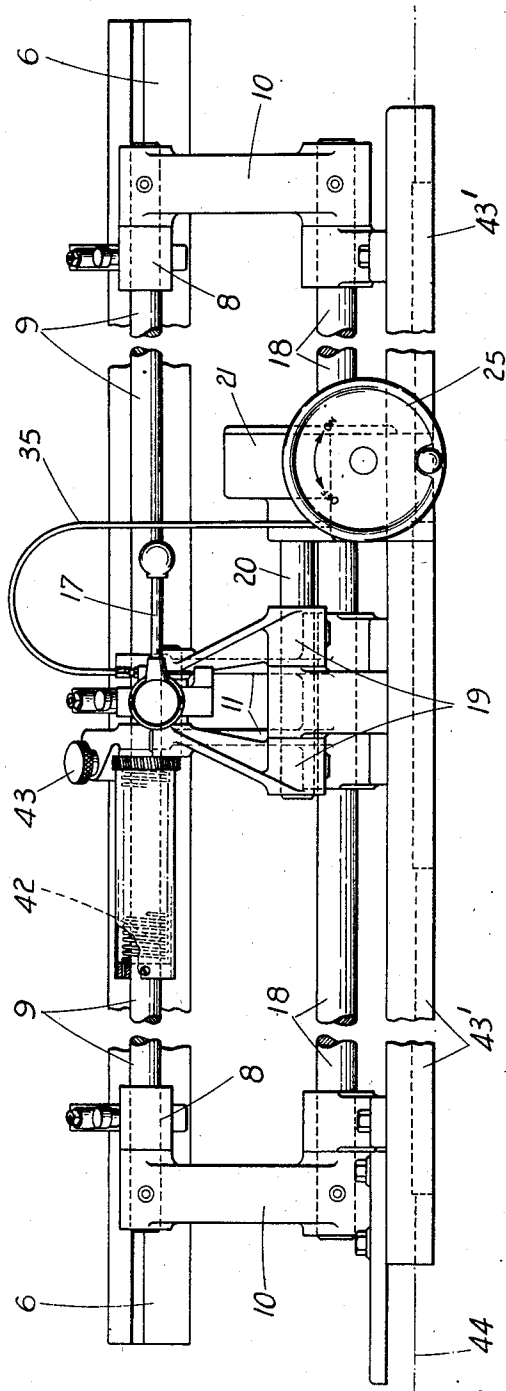
N. P. TOFT
DOCTOR BLADE MECHANISM FOR USE IN ROTARY
INTAGLIO PRINTING MACHINES

2,497,520

Filed Oct. 23, 1946

4 Sheets-Sheet 1

FIG. 1.



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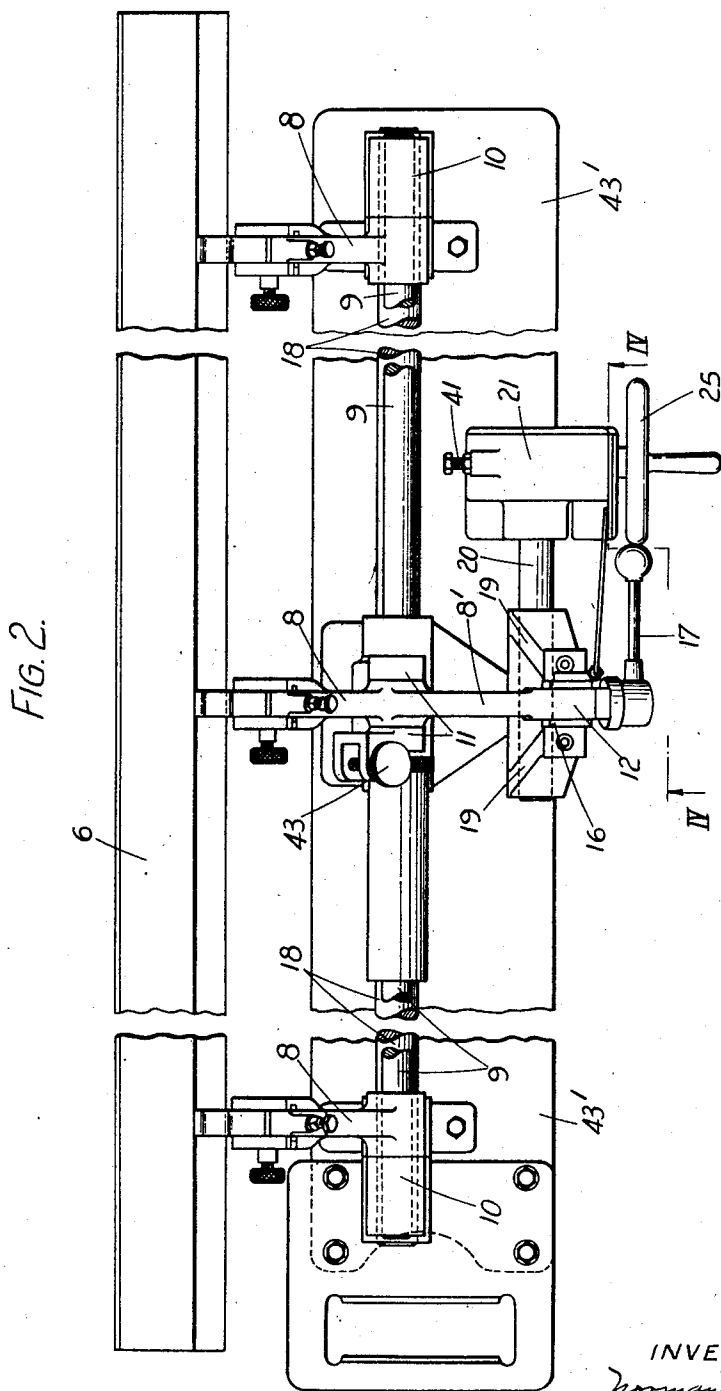
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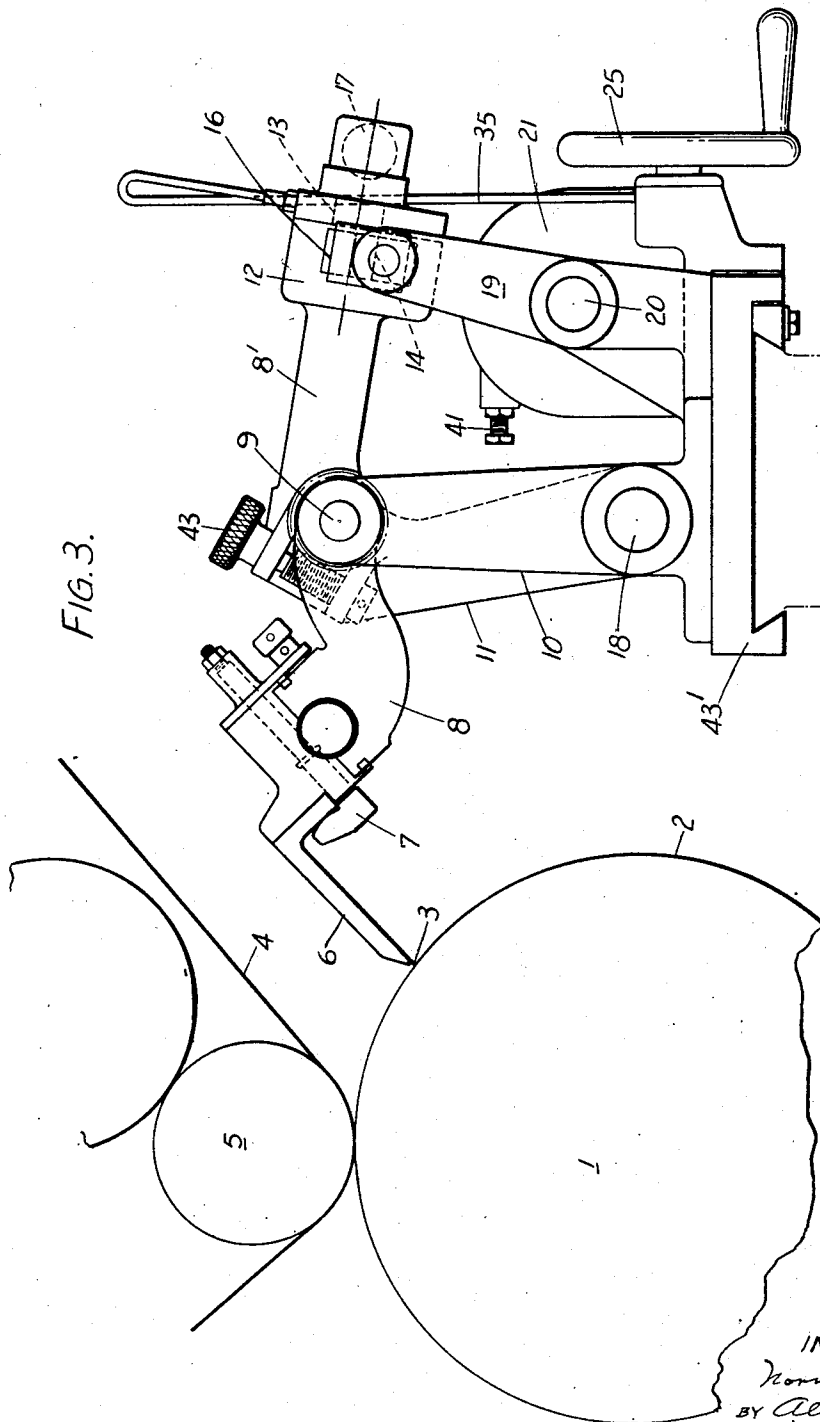
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FIG. 3.



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FIG. 4.

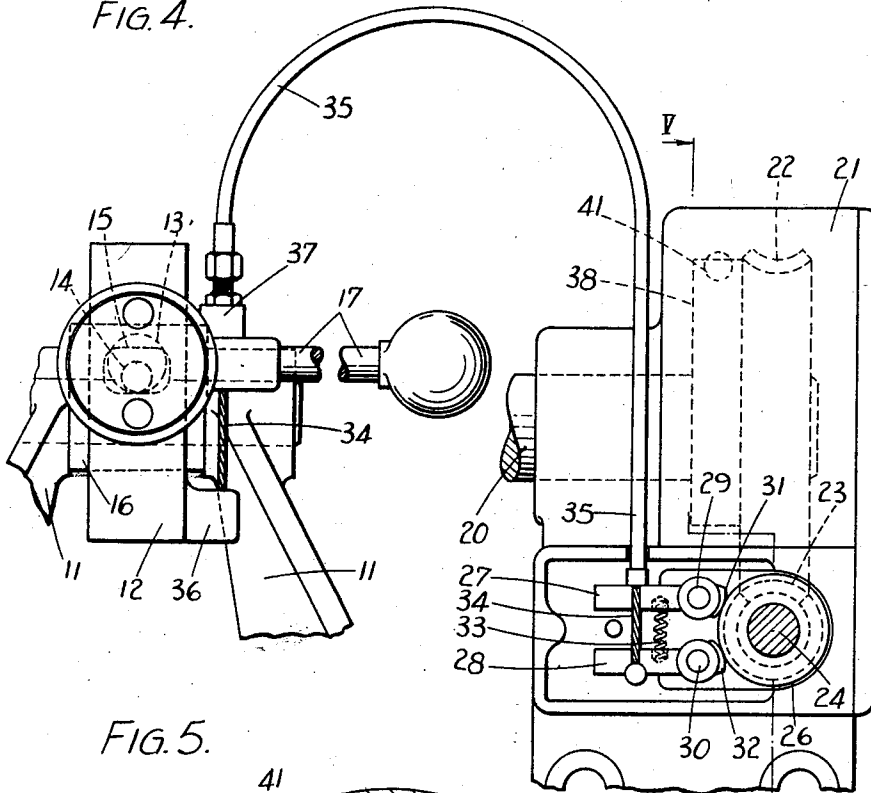
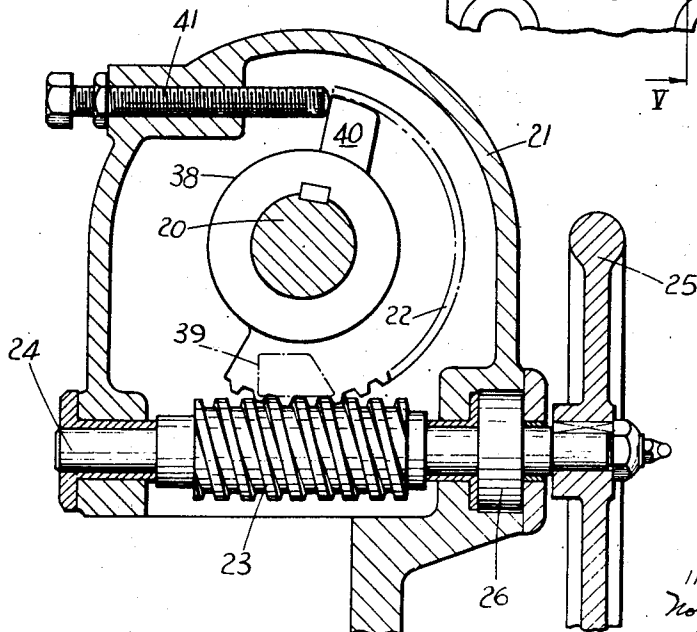


FIG. 5.



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UNITED STATES PATENT OFFICE

2,497,520

DOCTOR BLADE MECHANISM FOR USE IN
ROTARY INTAGLIO PRINTING MACHINES

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Application October 23, 1946, Serial No. 705,022
In Great Britain November 2, 1945

7 Claims. (Cl. 101—157)

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This invention relates to doctor blade or wiper mechanism for use in rotary intaglio printing machines. Such mechanism in modern practice comprises a flexible blade usually of steel the tip i. e. the longitudinal free edge of which is presented to the printing surface to exercise its wiping action by removing ink from the printing surface and leaving it in the engraved parts in the surface. By employing a flexible blade an efficient wiping action is obtained for the blade is applied to the surface under a pressure such that the tip of the blade is flexed in the direction of rotation of the cylinder. As the printing surface is easily marked, it is clear that in presenting the tip of the blade to the printing surface it is desirable to "lay" the blade as "flat" as possible on the surface i. e. as distinct from applying the blade edge-on; in other words it is desirable to present the blade with a movement having a direction approximating to the normal to the plane surface of the blade before flexure.

In the use of an intaglio printing machine it is frequently necessary to move the doctor blade well clear of the printing surface as for example for inspection of both. In those cases where it is possible to apply the doctor blade to the cylinder at a zone well spaced from the impression or printing zone and where the doctor blade is required to be at an angle tending towards the tangential to the cylinder, the desired conditions of approach of the blade to the cylinder present no great difficulty; but when as is now sometimes required the blade is required to be applied close to the impression zone or at an angle approximating to the radial to the cylinder or both, much greater difficulty is experienced by reason of the limited space available for the movement of the doctor blade, the freedom of action being controlled for example by the necessity of avoiding the fouling of the web as it passes to the impression zone.

Now the main object of this invention is to provide a doctor blade arrangement in which the requirements as to "laying" the blade on to the cylinder can be accomplished even in the extreme case where the doctor blade has a steep angle (i. e. approaching if not at the radial) and is close to the impression zone.

According to the present invention, the movement of the doctor blade from working position to an inspection position clear of the cylinder is effected in two stages; in one stage the blade is merely "lifted" from the cylinder (or in the reverse operation is merely "laid-on" the cylinder) by movement in a substantially vertical di-

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rection. This movement is a small one in comparison with the main movement in the other stage which is one in which the doctor blade is moved to a position well clear of the cylinder (or in the reverse sense to one adjacent the cylinder). This other movement can be effected in any desired direction as may be found most convenient since the limitation as to the laying on or lifting of the blade does not now apply. In addition, the two stages of movement are interlocked so that, when the blade is to be moved back to operative position the main movement can be effected only when the blade is in the "lifted" position so that it is impossible for the blade to be "laid-on" the cylinder by the main movement, this operation being effected only by the relatively small movement referred to.

The invention is illustrated in the accompanying drawings in which Figure 1 is a side elevation of a doctor blade mechanism, Figure 2 a plan view of Figure 1, Figure 3 an end elevation to a larger scale, Figure 4 a section on the line IV—IV, Figure 2, and to a larger scale and Figure 5 a section on the line V—V, Figure 4.

In the drawings 1 indicates a printing cylinder having an engraved printing surface at its periphery 2, ink having been applied to this surface before it passes below a doctor blade 3 which removes ink from the surface but leaves ink in the etching; this ink is applied to the surface of a paper or other web 4 where it passes between the cylinder 1 and an impression roller 5. Such a printing operation is in itself well known and further description thereof is believed to be unnecessary.

The present invention is concerned with the mounting of the doctor blade 3. This blade is clamped to a blade holder 6 so that the edge of the blade, which is formed of resilient metal, extends slightly beyond the holder, this edge forming the effective or wiping edge of the blade and being free to flex. The holder 6 is itself clamped by clamping components 7 to three arms 8 arranged one at or near each end of the holder 6 and one at the centre of the length of the holder.

These arms or carriers 8 are themselves secured to a shaft 9 which is journaled in arms or supporting members 10 at its end regions and in a bifurcated arm 11 at its central region. The axis of the shaft 9 is that about which the arms 8 are swung to lift the blade 3 from the printing surface 2 and to lay the blade to that surface. The axis of the shaft 9 is, as is seen from Figure 3, disposed in such a position that when the arms

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8 are pivoted about that axis the doctor blade 3 is caused to be moved in a generally vertical direction.

To effect the rocking movement of the arms 8, the shaft 9 is rocked and this is effected by extending the central arm 8 at 8' and providing on the extension a head 12 in which is journaled an operating spindle 13 having an eccentrically disposed pin 14 which engages in a slot 15 in a reaction block 16. To the spindle 13 is secured an operating hand lever 17 so that by turning this lever the eccentric pin 14 reacts against the walls of the slot 15 to raise and lower the spindle 13 and hence the head 12 in which it is journaled.

The mechanism so far described is for the purpose of merely lifting the doctor blade from the cylinder and for reapplying it. It is also required that the doctor blade and its assembly shall be movable to a position well clear of the cylinder 1; this is effected in a different stage from that of the lifting and laying of the blade and to accomplish this movement, the arms 10 and 11 are carried by a shaft 18 about the axis of which the arms are swung to move the doctor blade assembly clear of the cylinder 1. This movement of the arms is achieved by securing them to the shaft 18 and by pivoting the reaction block 16 at the outer end of a bicurcated arm 19 secured at its inner end to a spindle 20 extending into a gear casing 21. Within this casing the spindle 20 is fast with a worm wheel 22 in mesh with a worm 23 on an operating spindle 24 having outside the casing an operating hand-wheel 25. The worm is preferably of the multi-thread type so that this additional movement of the doctor blade assembly can be fairly rapid.

It will be apparent that by rotating the hand-wheel 25 the spindle 20 is rocked and this in turn operates through the arm 19 and the extension 8' of the arm 8 to rock the arm 11 and hence the shaft 18 and the arms 10.

The operation of lifting and lowering the doctor blade 3 (i. e. the operation effected by the hand lever 17) and the operation of moving the assembly clear of the cylinder 1 (i. e. the operation effected by the hand-wheel 25) are interlocked. To effect this, the worm spindle 24 which is operated by the hand wheel 25 has fast on it a control disc 26 about the periphery of which are disposed two locking arms 27, 28 pivoted at 29, 30. The arms have at one side of and close to the pivotal point wedge surfaces 31, 32 respectively to wedge against the periphery of the disc 26 the wedge surfaces being oppositely directed to operate respectively in opposite directions of rotation of the worm shaft; the outer ends of the arms 27, 28 (i. e. on the side of their pivot remote from the wedge shaped ends) are urged apart by a spring 33 so that the wedge ends are biased to their operating position (i. e. to hold the disc 26 against rotation).

To the outer end of the arm 28 is connected the flexible inner cable 34 of a flexible transmission device the outer casing 35 of which abuts the outer end of the other arm 27. The other ends of the inner cable and the casing are taken respectively to an extension 36 of the head 12 and an extension 37 of the reaction block 16 which move relatively to one another when the doctor blade is lifted; the arrangement is such that when the blade has been lifted in the manner described, the inner cable 34 and outer casing 35 are moved over one another and so move together the outer ends of the locking arms 27, 28. This causes the wedge ends of these arms

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to be moved clear of the disc 26 on the worm shaft 24 and so frees the disc and hence the worm from restraint. The doctor blade assembly can now be moved to carry it clear of the cylinder and back again. If, in any position of the assembly, the hand lever 17 is operated to lower the doctor blade 3, the locking arms are returned to locking position and so hold the assembly fixed against bodily movement.

The bodily movement of the assembly is permitted only between certain limits for which purpose the worm-wheel shaft 20 has fixed to it a limit plate 38 having a lug 40 arranged to engage either of two limiting abutments 39 and 41. The limit of movement in the direction in which the assembly is moved towards the cylinder is regulated by an adjustable bolt 41 and the limit of movement in the opposite direction, by the abutment 39.

The spindle 9 carrying the doctor blade is biased by a spring 42 coiled about it so that the lifting of the doctor blade is effected against the action of the spring the loading of which can be adjusted by an adjusting device 43. In order to enable the doctor to be retained in its lifted position the operating lever 17 for the pin and slot arrangement may be arranged to be latched. When the lever is freed from the latch, the spring 42 causes the doctor blade 3 to be returned to normal position against the cylinder, in which its ability to rise and fall resiliently under the bias of the spring is unrestrained.

It is to be observed that the particular mounting of the doctor blade assembly described is given by way of example. It would for example be possible merely to mount the spindle 9 on a slide which is movable towards and away from the cylinder. The arrangement described forms the subject of a pending application Serial No. 632,873 and it may be observed that the arms 10 and 11 on the one hand and the arms 19 on the other hand are of different effective lengths, with the longer arm disposed closer to the cylinder than the shorter arm. In utilizing this particular arrangement the pivoted arms 8 are pivoted at the outer end of the longer arm and are effectively connected to the other arm through the pin and slot arrangement so that the doctor blade is caused to be retracted along a path having at least initially a component away from the path followed by the web 4.

The doctor blade holder 6 is arranged to be reciprocated as is the usual practice and to achieve this the whole doctor blade assembly described is supported on a base slide 43' which is slidable (parallel with the axis of the cylinder 1) on a bed indicated at 44, the slide being reciprocated by any of the mechanisms in common use.

What I claim is:

1. In a rotary printing machine having a rotatable printing member, a doctor blade mechanism comprising a doctor blade, a carrier for the blade, a supporting member, means mounting the carrier for pivotal movement on the supporting member, means mounting the supporting member for pivotal movement, an arm, means pivotally mounting the arm about an axis parallel with the pivotal axis of the carrier and the supporting member, means extending the carrier into pivotal relationship with said arm, means reacting between said extension means and said arm to rock the carrier on said supporting member to effect the lifting and laying of the blade to and from the surface of the printing member, and

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means to rock the arm to carry the carrier between the operative zone and an inspection zone remote therefrom.

2. In a rotary printing machine having a rotatable printing member, a doctor blade mechanism comprising a doctor blade, a carrier for the blade, a supporting member, means mounting the carrier for pivotal movement on the supporting member, means mounting the supporting member for pivotal movement, an arm, means pivotally mounting the arm about an axis parallel with the pivotal axes of the carrier and the supporting member, means extending the carrier into pivotal relationship with said arm, means reacting between said extension means and said arm to rock the carrier on said supporting member to effect the lifting and laying of the blade to and from the surface of the printing member, means to rock the arm to carry the carrier between the operative zone and an inspection zone remote therefrom, and means to hold the arm against rocking movement until the carrier has been rocked to lift the blade.

3. In a rotary printing machine having a rotatable printing member, a doctor blade mechanism comprising a doctor blade, a carrier for the blade, a supporting member, means mounting the carrier for pivotal movement on the supporting member, means mounting the supporting member for pivotal movement, an arm, means pivotally mounting the arm about an axis parallel with the pivotal axes of the carrier and the supporting member, means extending the carrier into pivotal relationship with said arm, means reacting between said extension means and said arm to rock the carrier on said supporting member to effect the lifting and laying of the blade to and from the surface of the printing member, means to rock the arm to carry the carrier between the operative zone and an inspection zone remote therefrom, the said arm-rocking means including a rotatable component, locking struts to hold the component against rotation and a mechanical transmission from the said carrier rocking means to free the struts from the rotatable component when the carriers is moved to blade lifted position.

4. In a rotary printing machine having a rotatable printing member, a doctor blade mechanism comprising a doctor blade, a carrier for the blade, a supporting member, means mounting the carrier for pivotal movement on the supporting member, means mounting the supporting member for pivotal movement, an arm, means pivotally mounting the arm about an axis parallel with the pivotal axes of the carrier and the supporting member, means extending the carrier into pivotal relationship with said arm, the effective length of said arm being smaller than the effective length of said supporting member, means reacting between said extension means and said arm to rock the carrier on said supporting member to effect the lifting and laying of the blade to and from the surface of the printing member, and means to rock the arm to carry

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the carrier between the operative zone and an inspection zone remote therefrom.

5. In a rotary printing machine having a rotatable printing member, a doctor blade mechanism comprising a doctor blade, a carrier for the blade, a supporting member, means mounting the carrier for pivotal movement on the supporting member, means mounting the supporting member for pivotal movement, an arm, means pivotally mounting the arm about an axis parallel with the pivotal axes of the carrier and the supporting member, means extending the carrier into pivotal relationship with said arm, the effective length of said arm being smaller than the effective length of said supporting member, means reacting between said extension means and said arm to rock the carrier on said supporting member to effect the lifting and laying of the blade to and from the surface of the printing member, means to rock the arm to carry the carrier between the operative zone and an inspection zone remote therefrom, and means to hold the arm against rocking movement until the carrier has been rocked to lift the blade.

6. In a printing machine having a printing cylinder, a doctor blade, a blade carrier with an extension, first arms pivotally supported on the base and pivotally supporting the carrier, second arms pivotally supported on the base and pivotally connected to the extension, means to swing the second arms to move the carrier and the blade bodily toward and from the cylinder in a major movement, and in combination, means to move the extension relative to the second arms to rock the carrier and thereby move the blade toward and from the cylinder in a minor movement.

7. In a printing machine having a printing cylinder, a doctor blade, a blade carrier with an extension, a base, first arms pivotally supported on the base and pivotally supporting the carrier, second arms pivotally supported on the base and pivotally connected to the extension, first means to swing the second arms to move the carrier and the blade bodily toward and from the cylinder in a major movement, and in combination, second means to move the extension relative to the second arms to rock the carrier and thereby move the blade toward and from the cylinder in a minor movement, and an interlock device connected between the first and second means to prevent operation of the first means unless the carrier has been rocked to move the blade away from the cylinder.

NORMAN PETER TOFT.

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