

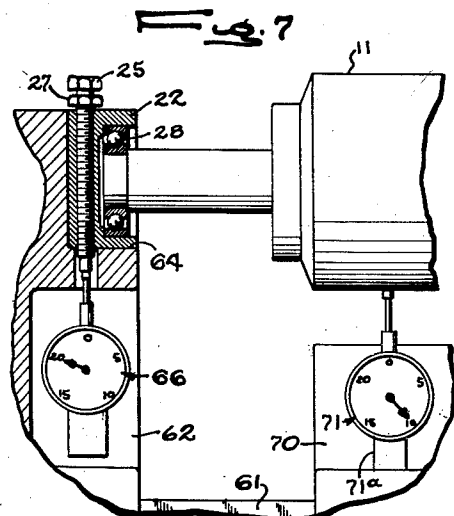
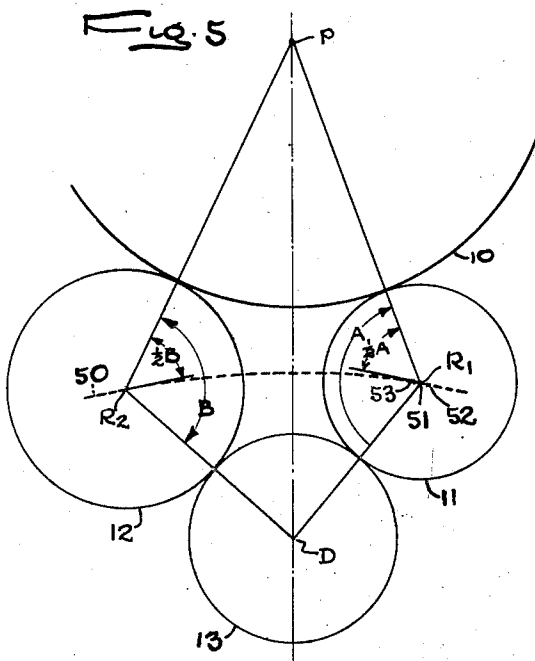
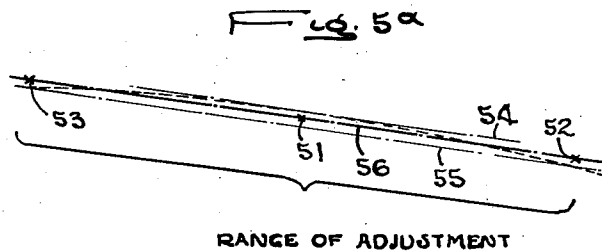
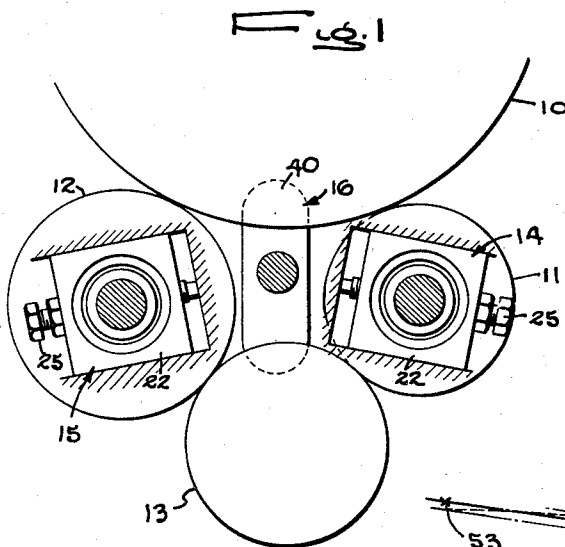
Sept. 18, 1956

H. L. McWHORTER
INK ROLLER ARRANGEMENT

2,763,207

Filed April 20, 1951

3 Sheets-Sheet 1



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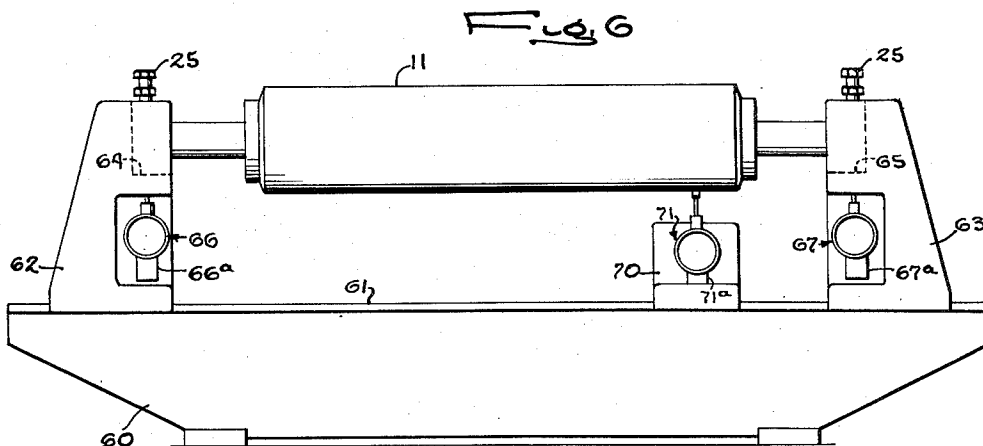
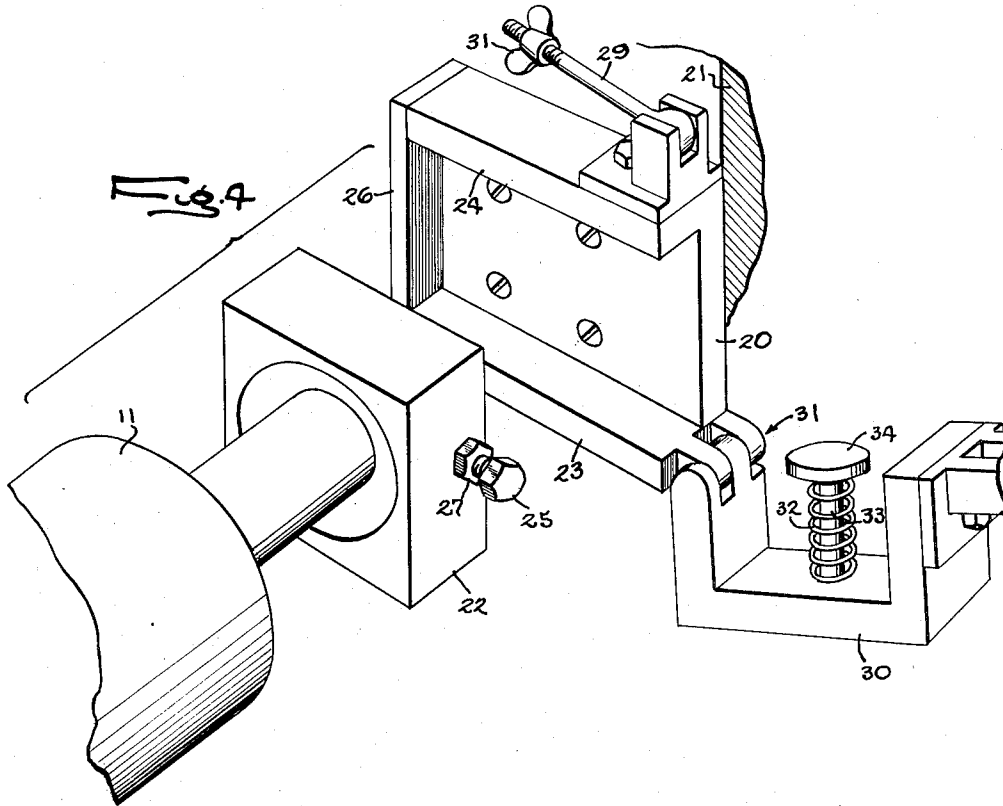
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INK ROLLER ARRANGEMENT

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Application April 20, 1951, Serial No. 222,135

5 Claims. (Cl. 101—348)

The present invention relates to printing presses and more particularly to a novel ink roller assembly for use therein.

It is the primary object of the present invention to provide an ink roller assembly which permits precise adjustment of the ink roller when the same is removed from the press. It is a related object to provide a novel jig arrangement for adjusting the ink roller when the latter is removed from the printing press.

It is another object of the invention to provide a socket assembly for an ink roller which permits the roller to be clamped securely in a pre-adjusted position relative to the press and yet which permits the roller to be easily and quickly removed.

It is a further object to provide an ink roller socket assembly which will accommodate a relatively large range of roller sizes and which permits adjustment to be made to allow for roller swelling and the like while the press is running.

It is a further object of the invention to provide a roller socket assembly which may be mounted in any position on a printing press and which may be applied to existing presses without necessity for drilling holes through the frame into gear housings, vibrators and the like.

It is still another object of the invention to provide a roller socket assembly which permits of a simple roller throw-off mechanism.

Other objects and advantages of the invention will be apparent upon reference to the attached detailed description and drawing in which:

Figure 1 shows more or less schematically a portion of a printing press to which the present invention is applicable;

Fig. 2 shows an ink roller socket assembly used for one of the ink rollers of Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 in Fig. 2;

Fig. 4 is an exploded view of the socket assembly of Figs. 2 and 3;

Fig. 5 is a diagram showing the geometrical relation of the rollers when mounted in accordance with the present invention;

Fig. 5a shows an enlarged fragment of the hyperbolic curve in Fig. 5.

Fig. 6 is a view in elevation of the jig employed for adjusting the rollers externally of the press and showing a roller mounted therein;

Fig. 7 is a fragmentary view of one end of the jig with a roller mount in partial section in order to illustrate the manner of adjustment.

While the invention is susceptible of various modifications and alternative constructions and uses, I have shown in the drawings and will herein describe in detail one embodiment of the invention. It is to be understood, however, that I do not intend to limit the invention by such disclosure but aim to cover all modifications and alternative constructions and uses falling within the spirit and scope of the invention as expressed in the appended claims.

Referring now to Fig. 1, the portion of a printing

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press which is there set forth includes a plate cylinder 10, a first form roller 11, a second form roller 12, both of the latter receiving ink from an ink drum 13. In order to adjust the form roller 11 relative to the plate cylinder and ink drum, a socket assembly is provided which is indicated generally at 14, and a similar socket assembly 15 is provided for the companion roller 12. A throw-off mechanism 16 produces simultaneous throw-off of both rollers 11 and 12, as will be apparent as the discussion proceeds.

Turning to Figs. 2, 3, and 4, the socket assembly 14 is set forth in greater detail. This socket assembly consists of two main parts, a frame 20 which is screwed or otherwise rigidly fastened to the inner surface of the printing press frame (indicated at 21) and a bearing block 22 which is arranged to slide freely in the frame. To this end, the frame includes side portions 23, 24 having opposed walls which function as a "way."

An anti-friction support for the roller is provided in the form of a ball bearing 28 which is recessed in a bore 29 in the face of the bearing block.

In order to fix the bearing block in a desired position relative to the frame an adjustable stop is used for limiting inward movement. This stop includes an adjusting screw 25 which is threaded into the bearing block and which is arranged to abut a stop plate 26 on the frame. A lock nut 27 enables the adjusting screw to be locked in a desired position.

For clamping the roller firmly in position during operation of the press while enabling the roller and its attached bearing blocks to be readily removed, a hinged clamp member 30 is employed. This member is hinged to one of the side portions of the frame as indicated at 31. The other end of the clamp member is held in place by a lock 28, which includes a pivoted bolt 29 which is received in a slotted lug 30a, the lug being drawn tight by a wing nut 31. The bearing block 22 is maintained in a downwardly seated position by a take-up spring 32, which is preferably captive in the hinged clamp member 30. The take-up spring is secured in the latter by means of a retaining bolt 33 which carries a pressure plate 34 at its lower end. The degree of expansion of the spring is limited by a nut 35 which is screwed to the upper end of the bolt 33.

To enable throw-off of the rollers a simple throw-off mechanism 16 is provided which includes a cam 40 pinned to a rotatable shaft 41. The cam 40 is double-ended as shown and is mounted between the socket assemblies 14, 15. Each of the bearing blocks is extended inwardly to provide a cam follower surface 42 lying in the path of movement of the cam 40. It will be apparent that upon rotating the cam 40 the bearing blocks of the opposed ink rollers will be simultaneously engaged and cammed into their retracted position, the movement being taken up by compression of the take-up spring 32 adjacent each block. Similar cam mechanisms are provided at each side of the press so that both ends of both of the ink rollers are moved simultaneously and to the same degree.

Initial adjustment of the form rollers with respect to the ink drum and plate cylinder is necessary since the form rollers, being rubber covered, are extremely difficult to hold to size. My observations show that there must be provision for adjustment through a range of diameter of $\frac{1}{2}$ ", the actual diameter varying plus or minus $\frac{1}{4}$ " from the nominal diameter. Even after the form roller is initially installed adjustments must be made from time to time to allow for swelling of the roller which occurs in use. The present arrangement permits these adjustments to be made easily and at frequent intervals.

In practicing the present invention a single adjustment at each end suffices to adjust the form roller toward and

away from both the ink drum and the plate cylinder. Referring to the diagram of Fig. 5 the theoretical path of adjustment of the form rollers 11, 12 is indicated by the dashed line 50. This line is the locus of points equidistant from the surface of the plate cylinder and the ink drum respectively. It can be shown mathematically that such locus is a hyperbolic curve. The curvature of the hyperbola is maximum when the form roller is small and the difference in the diameters of the plate cylinder and ink drum respectively is large. In this specification and in the claims the locus 50 will be referred to as the "central path of adjustment" of the form rollers.

Still referring to Fig. 5, the center of the plate cylinder is indicated at P, the center of the ink drum is indicated at D, and the centers of the two rubber rollers at R₁ and R₂, respectively. In the illustrated embodiment of the invention the diameter of the form roller 11 relative to the diameters and spacing of the plate cylinder and ink drum, respectively, is such that the included angle, P-R₁-D, indicated at A, is 120° for a roller of given nominal diameter. Further, the frame of the ink roller socket is so positioned that movement of the roller is guided along a straight line path which is the "average" of the hyperbolic curve 50 over the range of adjustment of the roller 11. This "average" will be made clear by reference to Fig. 5a which shows a portion of the curve 50 with curvature greatly magnified for purposes of clarity. In this figure and also in Fig. 5 the center of a form roller of nominal diameter is indicated at 51. As mentioned above, the rollers being of rubber, will vary somewhat from nominal size, the variation in diameter being plus or minus 1/4", a total variation range of 1/2". Since the included angle A is 120° the range of adjustment which is required to accommodate rollers within such dimensional limits is equal to the range of possible variation in diameter, namely, 1/2". Stated another way, the range of socket adjustment is equal to twice the variation in the radius of the ink roller.

In Fig. 5a the limits of adjusting movement of the roller socket are indicated at 52 and 53, the distance between them being labeled "range of adjustment," 53 being the position of a properly adjusted roller of minus 1/4" from nominal diameter and 52 the position of a properly adjusted roller of plus 1/4" from nominal diameter. To establish an average straight-line path of movement over this range a tangent 54 and a chord 55 are constructed. The "average" path 56 lies midway between the chord and tangent. The direction of this line will be found to bisect the angle A shown in Fig. 5.

Such arrangement of the roller sockets gives rise to a number of unexpected advantages. As I have shown, it is possible to substitute simple straight-line ways for the hyperbolic guides which would theoretically be necessary. One skilled in this art might assume that this would result in substantial error. As a matter of fact, it can be shown that even where the curvature of the hyperbola is maximum, the straight line approximates the curve to within .0006" through a range of roller diameter change of 1/2". This amount is inconsequential and may be disregarded.

A further advantage which results from the arrangement disclosed above lies in the fact that it permits precise adjustment of a replacement outside the press. Such adjustment may be conveniently performed in a jig. This will be apparent upon reference to the jig and roller disclosed in Figs. 6 and 7. The jig includes a bed 60 having ways 61. Roller supporting pedestals 62, 63 are mounted at each end of the jig and one or both of them may be slidably mounted on the ways. These pedestals include machined wells or sockets 64, 65 for receiving the bearing blocks 22 at the ends of the roller shaft. Means are provided in each of these supports for measuring the setting of the adjusting screws 25. Referring to the detailed view, Fig. 7, the setting of the adjusting screw 25 is measured by a dial indicator 66. A similar

dial indicator 67 is provided in the opposite pedestal, for simultaneously measuring the setting of the adjusting screw at the opposite end of the roller.

Also mounted on the ways 61 is a slidable support 70 having a dial indicator 71 which bears upon the underside of the roller, and serves as a measure of roller diameter. As will become apparent as the discussion proceeds, the indicators 66, 71 are employed in conjunction with one another in adjusting the left-hand socket and it is the adjustment of this socket which is portrayed in Fig. 7.

In calibrating the jig according to my invention, a properly adjusted "reference" roller is placed in the jig, after which the dial indicators are adjusted to their "reference" values. The proper roller adjustment may be determined from purely geometrical considerations for a particular press, but I prefer that it be determined by an experienced pressman using well-known techniques. For example, proper adjustment may be determined by inserting three layers of paper between the rollers and adjusting them so that the center layer "slips" with just the right amount of force as determined by past experience. The screws 25 at each end of the roller are turned back and forth until this condition is achieved. The "reference" roller used for this purpose should preferably have a diameter equal to the nominal diameter, this nominal diameter, in the preferred embodiment, being that which will cause the angle A (Fig. 5) to be 120°.

In order to more easily understand the operation of the jig and to bring out the principle involved, attention will first be directed to one alternative mode of adjustment in which the dial indicators are assumed to be of the "over and under" type capable of reading departure in either direction from a mean "zero" position of the plunger. Where indicators of this type are employed the "reference" roller, pre-adjusted as described above, is placed in the jig and the indicators 66, 67 and 71 are all adjusted bodily in a vertical direction so that they read zero. Bodily adjustment may be effected by any desired means. For example, the indicators 66, 67 and 71 may be slidably mounted on ways as indicated at 66a, 67a and 71a and maintained in an adjusted vertical position thereon by means of a set screw or the like (not shown). Final adjustment of the indicator dials to zero may be effected by an adjustment conventionally provided on the indicator itself.

After all of the indicators are "zeroed," the jig is in condition for the adjustment of replacement rubber rollers having a different diameter from the "reference" roller. A replacement roller is slipped into place as shown in Figures 6 and 7. This will cause the indicator 71 to read a certain value which represents the difference in radius of this roller as compared to the "reference" roller. For the sake of simplicity it has been assumed in Figure 7 that the indicator 71 on the roller reads 10 units. The adjusting screw 25 at the left-hand end of the roller (Fig. 7) is then turned until the indicator 66 associated therewith reads an amount which is just twice the reading previously noted on the scale 71, or 20 units. The process is repeated at the other end of the roller, whereupon the roller is completely and accurately adjusted and may be inserted in the press at any place where a roller of equivalent nominal diameter is used.

The same procedure is applicable to a replacement roller of any diameter provided it falls within the 1/2" range of diameter. In each instance the adjustment of the adjusting screws is made such as to give an indicator reading which is exactly twice the reading of the indicator associated with the roller. This relationship holds for either plus or minus readings, it being understood that both indicators read plus units or both indicators read minus units. The simple 2:1 ratio on identical dial indicators makes it possible for a new roller to be adjusted with precision by an unskilled operator. This is contrasted

with present practice in which each form roller must be adjusted in the press, such adjustment being extremely critical and time-consuming and requiring a high degree of skill on the part of the operator. Even where the operator has many years of experience he is not absolutely consistent and would not normally adjust the roller to exactly the same point in a succession of tries.

The significance of the 2:1 adjusting ratio, given by way of example, may be explained upon reference to the diagram of Fig. 5. Since the included angle A is, by hypothesis, 120° for a form roller of a given nominal diameter, the angular distance between either R₁-D or R₁-P and the direction of movement of the roller during adjustment will be ½A, or 60°. If K is assumed to be the calibration constant, in other words, the ratio of the readings of the two dial indicators, it may be expressed in terms of the angle A as follows:

$$K = \frac{1}{\cosine \frac{1}{2}A}$$

Where ½A is 60°, K becomes 2. This means that for proper adjustment of any new roller in the useful range, the dial indicators bearing against the respective adjusting screws should be adjusted to read just twice the reading noted on the dial indicator which rides on the roller surface.

It will be apparent that the above is an approximation because the angle ½A is 60° only when the actual roller diameter is within ¼" of the nominal roller diameter. Computations show that the maximum error to be expected when the roller is at the extreme of the ½ inch "useful" diameter range is .005 inch. Actual tests show that very few pressmen are capable of setting a roller to within this range over several repetitive tests with the same roller.

The above adjusting procedure has been discussed in connection with an "over and under" type of indicator. Adjustment may be effected equally well with a more conventional type of indicator in which indication occurs only in the "forward" direction. However, when such conventional indicators are used the adjusting procedure is varied slightly, as follows: First of all, in order to prevent "bottoming" the dial indicators 66, 67, I prefer to adjust the position of the dial indicators relative to their pedestals so that they read zero when the screws 25 are fully retracted to the surface level of the bearing blocks. This initial step can be simply performed by laying a straight edge along the bottoms of the sockets 64, 65 and in the path of movement of the indicator plunger. The indicator is then bodily positioned at its "way" until it reads zero. This insures that the full range of the indicator is available when adjusting the larger rollers so that the indicator will never be forced beyond its normal range and therefore damaged.

After the indicators have been "zeroed" the pre-adjusted "reference" roller is slipped into position. This will, of course, cause the indicators 66, 67 to show a certain reading which may, for example, be 20 units, as illustrated in Fig. 7. The two indicators 66, 67, should be checked at this point in order to insure that they read the same, and if they do not one of them should be adjusted slightly so that the readings are identical. As the next step in the adjusting procedure, the dial indicator 71 should be bodily adjusted so that the dial reading is exactly half of that of the indicators 66, 67. This reading should be the same for all positions of the indicator 71 along the surface of the roller. The "reference" roller may then be lifted out of the jig and the jig is then ready to be used for adjusting replacement rollers. The adjusting procedure for replacement rollers is exactly the same as that described above. The replacement roller is lowered into position and the adjusting screws 25 at each end thereof are turned until the dial indicators 66, 67 read exactly double the reading of the dial indicator 71.

The invention has thus far been discussed in connection with both the "over and under" and conventional types of dial indicators. In each instance identical indicators have been employed in the three positions on the jig.

It will be apparent to one skilled in the art that the invention is not so limited, but would include the use of dial indicators which are not identical. For example, a dial indicator could be used at 71 which includes a 2:1 gear train as a deflection multiplier. Thus, instead of reading 10 units, which was the desired position of adjustment in the foregoing two examples, the indicator would read twice this much, or 20 units. The latter is the same reading as that which was indicative of the desired adjustment on indicators 66, 67 in the previous example. The advantage of using a deflection multiplier in connection with the roller indicator 71 is that the desired 2:1 ratio of indicator readings would not have to be kept in mind by the operator. Instead, the operator would be instructed, in adjusting the jig, merely to insert a pre-adjusted "reference" roller and to adjust the dial indicators, particularly the indicator 71, until the reading on all three dial indicators was the same. Then, to adjust a replacement roller, it would be sufficient to rotate the adjusting screws 25 thereon until all the indicators again read the same.

Another simple way to "conform" the indicator 71 is to change the face of the scale so that for a given displacement it reads just twice as much as normal. Regardless of the indicators employed, it is apparent that the calibration and adjustment procedure is simplicity itself.

Turning attention now to the remaining roller 12, experience has shown that this roller should have a nominal diameter which is approximately one inch greater than the diameter of the form roller 11. Thus, in the case of the form roller 12 the included angle shown at B in Fig. 5 is less than 120° and the 2:1 ratio therefore will not apply to this roller. Preferably, the form roller 12 has a nominal diameter such that another convenient ratio may be employed. My observations show that where the nominal diameter of roller 12 produces an angle B of 106° 15' 35" the ratio 1:1⅓ will produce proper relative adjustment of the dial indicators. This may be verified as follows:

$$K \text{ (calibration constant)} = \frac{1}{\cosine \frac{1}{2}B}$$

If K is assumed to be 1⅓ or 1.666, then cosine ½B = .600, from which it is determined that ½B = 53° 7' 47½". This condition is met by a form roller 12 which is approximately one inch greater in diameter than the form roller 11 previously discussed.

In calibrating the jig for the large form roller the same adjustment procedure would be followed as in the case of the small form roller, the only difference being that the constant K instead of being 2 is 1⅓. Thus a replacement form roller having the same diameter as roller 12 is placed in position in the jig and the adjusting screws thereof rotated until the dial indicator 66 reads a deflection which is equal to 1⅓ times the deflection noted on the indicator 71. This is repeated at both ends of the roller and the replacement roller is then ready for installation in the press without further adjustment.

To make it unnecessary for the operator to keep the 1⅓:1 ratio in mind when adjusting rollers to be used at position 12, it will be apparent to one skilled in the art that a deflection multiplier in the form of a gear train or the like may be included in the indicator 71 to step up the deflection in the same ratio. This is completely analogous to the 2:1 step-up ratio which was previously mentioned in connection with rollers for position 11. Provided that deflection is stepped up in this ratio, proper adjustment of the roller adjusting screws 25 will be indicated when all of the three indicators read the same value.

Perhaps the most striking feature of the socket arrangement is the ease of adjustment which it affords, the adjusting means being an integral part of the roller and capable of being adjusted outside of the press rather than when the roller is installed in the press. Since each roller has its own set of adjusting screws, one at either end, pre-adjusted replacement rollers may be slipped into position with only momentary shut-down of the press. The socket frame is of simple construction and may be bolted to the inner face of the main press frame as shown without the necessity for drilling through the frame. Although the adjustment at each end of the roller is positive, nevertheless the roller may be resiliently backed away from the position of adjustment against the resilient force of the compression springs, for example, when the throw-off mechanism 16 is operated. The socket assembly is of universal application and may be used in any positions and for any roller diameters without change merely by fastening the guide frames to the press in a predetermined position to locate the center of nominal sized roller to be used and with the frames so oriented that straight line movement during installation and adjustment will fall along the average path 56. Since there are only two main parts, namely, the socket frame and the simple bearing block, the construction is eminently simple and therefore economical to construct and maintain.

The above description has been limited to the special case where the rubber roller contacts the plate cylinder and an ink drum. It will be apparent to anyone skilled in this art that the invention is not so limited and is equally applicable to a rubber roller contacting two ink drums. It will further be apparent that various resilient material may be substituted for rubber and consequently the latter shall be considered to be used as a generic designation in the claims which follow.

I claim as my invention:

1. In a printing press having a pair of rigidly spaced cylinders in spaced parallel relation, a rubber roller assembly comprising in combination a rubber roller, bearing blocks at each end of said roller, frames for mounting said bearing blocks for movement of the roller along a straight line path of adjustment between said cylinders, manually adjustable means on said bearing blocks for adjusting them to a desired operating position along said path of adjustment in which the roller rides in equal contact with said cylinders, said frames being fixedly attached to the press in such orientation that the straight line path of adjustment defined thereby causes the roller to remain equidistant from each of said cylinders throughout the range of adjusting movement.

2. In a printing press, having a pair of rigid cylinders in spaced parallel relation an ink roller assembly comprising a rubber ink roller having a predetermined nominal diameter, bearing blocks at each end of said ink roller for journaling the same, frames fixedly attached to the press for respective mounting of said bearing blocks for straight line adjusting movement of the blocks between an operating position and a retracted position, the path of adjusting movement being such as to maintain the ink roller equidistant from the cylinders over a range of adjustment extending approximately $\frac{1}{4}$ inch in both directions from the position occupied by the axis of said roller of nominal diameter when such roller is in normal running position, adjustable stops associated with said bearing blocks for positioning them relative to their respective frames to define the desired operating position of the roller, and releasable means for clamping said bearing blocks in their respective operating positions while permitting the roller and bearing blocks to be removed from the printing press as a unit.

3. In a printing press, the combination comprising a frame, a pair of rigid cylinders in spaced parallel relation and having unlike diameter for contact by a rubber roller, said cylinders defining a theoretical curved path of ad-

justment in which the rubber roller is maintained equidistant from said cylinders, a rubber roller, bearing blocks attached to each end of said roller, sockets fixedly attached to the press for mounting said bearing blocks for movement of the roller along a straight line path of adjustment between said cylinders, the sockets being permanently oriented so that said straight line path is parallel to the theoretical path of adjustment at a central point which corresponds to the axis location of a properly adjusted roller having a predetermined nominal diameter, and manually adjustable means interposed between said bearing blocks and same frame for adjusting the bearing blocks over a range which corresponds to the range of normally encountered variations in the diameter of rubber rollers having the same nominal diameter.

4. In a printing press, the combination comprising spaced frame members, a pair of ink cylinders rigidly journaled in said frame members in spaced parallel relation, a rubber roller assembly, said roller assembly including a rubber roller having rectangular bearing blocks at each end thereof, guide members fixedly fastened to the frame members and having parallel ways for engaging said bearing blocks for guiding said bearing blocks inwardly and outwardly relative to said cylinders along a straight line path of adjustment, said guide members being so arranged that the path of adjustment substantially coincides with a limited portion of the locus of points equidistant the surfaces of said cylinders, a pair of stops for limiting the inward movement of said bearing blocks, said bearing blocks having adjusting screws threaded therein for bottoming engagement against said stops, a pivoted clamping member bridgely arranged in the path of outward movement of each of said bearing blocks, and springs interposed between the clamping members and respective ones of said bearing blocks for resiliently maintaining said adjusting screws bottomed against said stops under operating conditions.

5. In a printing press having a pair of rigidly spaced cylinders in spaced parallel relation, a rubber roller assembly comprising in combination a rubber roller, bearing blocks at each end of said roller, frames for mounting said bearing blocks for movement of the roller along a straight line path of adjustment between said cylinders, manually adjustable means including threaded connections respectively coupled to said bearing blocks for adjusting them to a desired operating position along said path of adjustment in which the roller rides in equal contact with said cylinders, said frames being fixedly attached to the press in such orientation that the straight line path of adjustment defined thereby causes the roller to remain equidistant from each of said cylinders throughout the range of adjusting movement.

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