This invention relates to printing presses and more specifically to a printing press roller for carrying a flexible printing plate secured about the periphery thereof and constitutes an improvement of the apparatus shown and described in my application for patent entitled Printing Press Rollers, Serial No. 360,269, filed June 8, 1953, now Patent No. 2,900,904. It provides, among other things, improved means for mounting flexible printing plates on the surface of the roller and for aligning the plate relative to the roller.

In the printing art it is often necessary to superimpose impressions one upon the other, as in the case of multicoloered work. In so doing, it is essential that the plates carried by the several printing rollers be aligned accurately one relative to the other. This alignment not only involves longitudinal alignment of the plate relative to the roller, but also the angular adjustment of one end portion of the printing plate relative to the other so that all of the plates are, in effect, in parallel relationship. If a plate was skewed relative to the others, one edge of the skewed plate may be properly aligned with the other plates while the other edge of the plate may be substantially out of alignment.

As pointed out in my prior application, lateral alignment of a roller carrying a printing plate is accomplished by lateral or axial displacement of the entire roller. Correction of diagonal or skew errors presents a far more difficult problem and one solution constitutes the subject matter of my prior application. This invention concerns a further improvement in this direction in that it simplifies skew correction and provides a secure support for the printing plate that will take up any give or stretch in the plate during the printing operation.

Another object of the invention resides in a novel and improved printing roller having means for the attachment of a peripheral printing plate and means for holding it in a snug position on the roller throughout the printing process.

Another object of the invention resides in the provision of novel and improved means on a printing roller for holding and aligning a printing plate to correct for skew or diagonal errors.

A still further object of the invention resides in the provision of a novel and improved printing roller.

The above and other objects and advantages of the invention will become more apparent from the following description and accompanying drawings forming part of this application.

In the accompanying drawings:

Figure 1 is a plan view in partial section of a roller in accordance with the invention;

Figure 2 is a view of a printing roller similar to Figure 1 and illustrating the operation of the roller for skew correction;

Figure 3 is a fragmentary, cross-sectional view of Figure 1 taken along the line 3—3 thereof;

Figure 4 is a cross-sectional view of Figure 3 taken along the line 4—4 thereof;

Figure 5 is a cross-sectional view of Figure 3 taken along the line 5—5 thereof;

Figure 6 is a fragmentary end view of the roller of Figure 1 taken along the line 6—6 thereof;

Figure 7 is a side elevational view of one end of the roller in accordance with the invention;

Figure 8 is a side elevational view of one end of the roller in accordance with the invention;

Figure 9 is a cross sectional view of Figure 6 taken along the line 8—8 thereof;

Figure 10 is an exploded view of certain of the elements carried by the roller of Figure 9 for holding a printing plate and aligning it relative to the roller.

The roller in accordance with the invention is generally denoted by the numeral 10 and may be of any desired length and diameter. The roller further includes end shafts 11 for rotatably supporting the roller in a printing press and for the adjustment of the lateral position of the roller relative to the press. The roller 10, as may be observed more clearly in Figure 9, includes a cutout portion 12 which extends throughout the length of the roller body. The cutout portion 12 has a flat bottom part 13, a first side wall 14 substantially at right angles to the bottom 13 and an inclined face 15. Between the side wall 14 and inclined face 15 is a rectangular groove 16 for slidably receiving one of the printing plate holding members. The opposite side of the base 13 has a downwardly formed rectangular channel portion 17 and a side wall or face 18 at right angles to the base 13 and extending upwardly to intersect the periphery of the roller 10.

Figure 10 of the drawings illustrates certain of the elements which are contained within the elongated cutout or channel portion 12 of the roller. The first of these elements is generally denoted by the numeral 19 and for present purposes will be termed a filler block, inasmuch as it is fixedly secured to the roller when the printing plate holder assembly is installed in the roller. This filler block has an upper surface 20 of a radius conforming with the radius of the roller when positioned thereon. The bottom 21 of the filler block 19 rests flush against the bottom 13 of the channel 12 with the downwardly extending rectangular rib or extension 22 engaging the rectangular channel 17 and the side wall 18. The filler member is secured in place by any suitable means such as screws extending through openings 24 of the filler block and threadably engaging openings 25 in the roller. The outer edge of the filler block 19 is generally denoted by the numeral 26 and it is inclined at an angle roughly equal but opposite to the inclination of the surface 15 on the roller 10. Between the filler block 19 and the opposite wall of the cutout 12 there are inserted elements generally denoted by the numerals 27, 28 and 29, the latter being an elongated cam which cooperates with the elongated elements 27 and 28 when secured one to the other to shift the angular position of the elements 27 and 28 relative to the elongated cutout or channel 12 in the roller 10.

Referring now to Figures 1 through 5 of the drawings, and more specifically to Figure 3, the filler block 19 is shown in position on the roller 10 and is held in place by a plurality of cap screws 30. The elongated elements 27 and 28 are secured one to the other by a plurality of screws 31 which extend through openings 32 in the element 27 and threadably engage cooperating openings 33 in the elongated element 28. These two elements slidably engage the roller and filler block 19 and can be skewed in one direction or the other when in place, as shown in Figure 3. The elements are retained firmly against the bottom 13 of the cutout portion 12 by engagement of a lateral rib portion 34 of the
element 28 with the longitudinal channel 16 of the roller and by engagement of the shoulder 35 with a cooperating shoulder 36 on the roller member 19.

The assembled elements 27 and 28 are urged to the right as shown in Figure 3 by means of a plurality of springs 37 positioned within openings 38 of the roller block 29. These springs are preferably spaced uniformly throughout the length of the roller block so that substantially uniform pressure will be applied to the elements 27 and 28 throughout their lengths.

In order to adjust the elements 27 and 28 angularly relative to the longitudinal axis of the roller, a cam element 29 is slidably disposed between the side wall 14 of the recess 12 and the surface 39 of the element 28. The surface 39 actually is in the form of a cam which cooperates with the cam 29 so that as the latter is displaced axially it will tend to cause the elements 27 and 28 to be pivoted about a central point for displacement relative to the ends of the roller. This will be described more fully in connection with Figures 1 and 2.

The flexible printing plate generally denoted by the numeral 40 is held in place on the roller 10 by a key rod generally denoted by the numeral 41. The rod 41 is positioned within the opening 42 defined by the inclined portions 27' and 28' of the elements 27 and 28, respectively. The upper ends of the members 27' and 28' are disposed slightly below the periphery of the roller 10 and their inclinations are approximately equal to the inclinations of their adjoining wall surfaces of the roller member 19 and the roller 10. The key rod includes an elongated slot 41' into which the ends of the printing plate 40 are inserted. The ends of the key rod 41 have reduced end portions 42 journalled in end plate 43 secured to the roller by bolts or other suitable means such as the screws 44, as shown in Figure 6 of the drawings. The members of the shaft are provided with square shanks 45 or other suitable means for manually gripping the shaft with a wrench for rotation thereof. When the printing plate 40 is to be mounted on a roller, the elongated slot 41' is positioned in an upward direction as in Figure 3, so that the ends of the printing plate can be inserted into the slot. The key rod is then rotated to the right as in Figure 3 to tighten the printing plate and wedge the end portions between the key rod 41 and the member 28. In order to secure uniform pressure of the key rod 41 against the printing plate ends, the key rod is provided with a plurality of spaced angularly disposed openings 46 housing plungers 47 urged outwardly against the key rod by springs 48. The tension on the peripheral printing plate 40 is adjusted and maintained by an improved ratchet and pawl assembly that is illustrated in Figures 6, 7 and 8. While this assembly is shown on only one end of the roller, it is apparent that it may be utilized on both ends of the roller if desired. In the illustrated embodiment of the invention one shaft member 42 of the key rod carries a ratchet member 49 that is secured to the shaft 42 by means of a key 50. The cooperating pawl 51 is carried by a lever 52 pivoted to the end plate 43 by means of a suitable pivot screw or pin 53. The right hand end of the lever as shown in Figure 6 carries the pawl 51 which includes a spring (not shown) urging the pawl into engagement with the cooperating ratchet 49. The left hand end of the lever 52 is generically denoted by the numeral 55 and inclines downwardly to the left. The lever is provided with a bifurcated portion 55 having an opening 56 extending therethrough for receiving a rotatable pin 57. This pin has a threaded opening extending therethrough for threadably engaging a cooperating rod 58, as shown in Figure 6. The lower end of the rod extends through an opening 59 in a pin 60 fixed to the end of the roller 10. The opening 59 is somewhat larger than the diameter of the rod 58 to allow for angular movement of the rod in opening. The lower end of the rod 58 is provided with a spring 61 and a terminal nut 62 to hold the spring in place and tend to urge the rod in a downward direction as shown in Figure 6. A second nut 63 on the top side of the pin 60 limits the downward motion of the rod 58.

With the foregoing arrangement the printing plate is first secured on the roller by a hand operation engaging the squared portion 45. After adequate tension is applied by hand, the tension is finally adjusted by rotation of the threaded rod 58 by engaging the squared shank 58' on the outer end thereof with a suitable wrench. When the rod 58 is turned in one direction increased tension will be applied to the printing plate 40, while rotation of the rod in the other direction will relax the tension. The tension on the printing plate will be maintained throughout the printing process by means of the spring 61 with maximum displacement being ultimately limited by the position of the nut 63. The nut 63 also furnishes some indication of the amount of stretch of the plate 40 during the printing process.

After the printing plate 40 is in place on the roller as described above, the angular position or skew of the plate can be corrected by adjustment of the cam member 29, previously referred to. More specifically, and with reference to Figure 7 of the drawings, the cam 29 is provided with a series of inclined surfaces generally denoted by the numerals 64, 65, 66 and 67. It will be observed that the inclination of the surfaces 64 and 67 are equal and opposite. The inclination of the surfaces generally denoted by the numerals 65 and 66 are not as great as the inclination of the surfaces 64 and 67 and they are also equal and opposite. The surface 39 of the element 28 has a cooperating cam portion with inclined surfaces denoted by the numeral 64' through 67'. These surfaces correspond generally in slope to their corresponding surfaces 64 through 67 of the cam 29. With this arrangement the tension in the central portion of the printing plate is uniformly distributed between the cam and the element 28 which provides uniform support for the structure formed by the elements 27 and 28 and prevents bending of this structure that may result in relaxing tension in the central portion of the printing plate.

Figures 1 and 2 show the displacement of this cam 29 and its effect on the position of the elements 27 and 28. Displacement of the cam 29 is effected by a pair of screws 68 threadably engaging the end plates 43 and abutting the ends of the cam. By adjusting these screws the cam can be displaced the degree desired in order to properly align or correct for skew error of the printing plate 40 on the roller 10. Lock nuts 69 may be provided on the screws 68 to hold them in position after adjustment has been accomplished.

From the foregoing description it is evident that the apparatus in accordance with the invention provides a practical, dependable and highly versatile device for mounting printing plates on rollers. By reason of the arrangement and construction of the several elements and their cooperation one relative to the other, the machining processes for fabricating these elements are substantially facilitated, as is the installation of the several elements on a printing roller. The invention further provides means for adjusting the skew of a printing plate so that plates on two or more rollers can be accurately aligned one with the others when used in a single printing operation, and for maintaining the tension on the printing plates throughout the printing operation. This compensates for any give in the plates and facilitates the attainment of uniform tension on several plates so that all will be subjected to uniform stress during the printing operation.
While only one embodiment of the invention has been illustrated and described, it is apparent that modifications, alterations and changes may be made without departing from the true scope and spirit of the appended claims.

What is claimed is:

1. A printing roller for attachment of a peripheral printing plate, comprising a cylindrical roller member having a longitudinal channel in the surface thereof, printing plate holding means within said channel for engaging and holding said plate on the surface of the roller and single elongated camming means slidably disposed within said channel and extending substantially throughout the length of the roller, said camming means slidably engaging the walls of said channel and said holding means and said camming means having at least two sets of reversely acting portions and being longitudinally movable within said channel to adjust the angular skew position of the holding means relative to the axis of the roller.

2. A printing roller for attachment of a peripheral printing plate, comprising a cylindrical roller member having a longitudinal channel in the surface thereof, printing plate holding means within said channel for engaging and holding said plate on the surface of the roller and single elongated camming means within said channel and cooperating with the walls of said channel and said holding means, said camming means being longitudinally movable within said channel to adjust the angular skew position of the holding means relative to the axis of the roller, wherein said roller includes a spring loaded ratchet and pawl assembly coupled to said holding means for adjusting and automatically maintaining tension on said peripheral plate.

3. A printing roller comprising an elongated roller means having a channel extending lengthwise thereof, the sides of said channel diverging from the surface of the roller and terminating in undercut portions, elongated means of generally triangular configuration within said channel and engaging said undercut portions, the last said means further including a longitudinal channel of generally triangular configuration opening in the outer edge to receive the ends of a peripheral printing plate, a reel within the last said channel for receiving and holding said printing plate ends, an elongated cam within one of said undercut portions and having reversely curved surfaces thereon, and cooperating cam follower surfaces carried by at least one of the aforesaid means for angular adjustment of the elongated means relative to the roller means with longitudinal displacement of the cam.

4. A printing roller according to claim 3 wherein said elongated means includes a plurality of spring actuated means bearing against said reel.

5. A printing roller comprising an elongated roller having a channel extending lengthwise thereof, the sides of said channel diverging from the surface of the roller and terminating in undercut portions, elongated means of generally triangular configuration within said channel and engaging said undercut portions, the last said means further including a longitudinal channel of generally triangular configuration opening in the outer edge to receive the ends of a peripheral printing plate, a reel within the last said channel for receiving and holding said printing plate ends, an elongated cam within one of said undercut portions and having reversely curved surfaces thereon and cooperating cam follower surfaces carried by at least one of the aforesaid means for angular adjustment of the elongated means relative to the roller means with longitudinal displacement of the cam, said elongated means including a plurality of spring actuated means against said reel includes a longitudinal slot for receiving said plate ends and upon rotation wedging said plate ends between the reel and an adjoining wall portion of said elongated means.

6. A printing roller comprising an elongated roller means having a channel extending lengthwise thereof, the sides of said channel diverging from the surface of the roller and terminating in undercut portions, elongated means of generally triangular configuration within said channel and engaging said undercut portions, the last said means further including a longitudinal channel of generally triangular configuration opening in the outer edge to receive the ends of a peripheral printing plate, a reel within the last said channel for receiving and holding said printing plate ends, and an elongated cam within one of said undercut portions and having reversely curved surfaces thereon, and cooperating cam follower surfaces carried by at least one of the aforesaid means for angular adjustment of the elongated means relative to the roller means with longitudinal displacement of the cam, said roller further including an adjustable spring loaded ratchet and pawl assembly coupled with said reel for adjusting and automatically maintaining uniform tension on said printing plate.

7. A printing roller comprising an elongated roller having a channel formed therein extending lengthwise thereof and opening into the roller surface, elongated means within the channel for holding at least one end of a printing plate to be secured to the periphery of the roller, spring means between said ends of the said holding means and the channel for urging the holding means in one direction relative to the roller surface, said holding means having on its other side sets of spaced reversely inclined cam surfaces, a uniaxial elongated cam slidably disposed within said channel and having sets of spaced reversely inclined cam surfaces cooperating with the first said inclined surfaces and means for moving said cam relative to said holding means to adjust the angular position of the holding means relative to the axis of the roller whereby said holding means is provided in all skew positions with a plurality of spaced supports.

8. A printing roller for receiving and holding a peripheral printing plate comprising a cylindrical roller body having a channel formed in its surface and extending lengthwise thereof, plate holding means within said channel for receiving and holding the ends of the peripheral printing plate, said plate holding means further including means for applying tension to said peripheral printing plate to secure it tightly about said roller body, said plate holding means further including reversely carried cam follower surfaces and a single elongated cam within said channel and movable axially of said roller, the last said cam engaging the cam follower surfaces at least three spaced points for angularly adjusting the skew of said plate holding means relative to said roller.

9. In a printing roller according to claim 8 wherein said plate holding means includes an elongated reel having a slot therein for receiving the ends of said printing plate, means for rotating said reel to secure the plate in a position and tension controlling means coupled with the reel for maintaining substantially uniform tension on the plate.

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