March 16, 1965 R. J. VERLIK 3,173,361

PRINTING ROLL MOUNTING MEANS FOR PRINTING APPARATUS

Original Filed Aug. 10, 1962 5 Sheets-Sheet 1

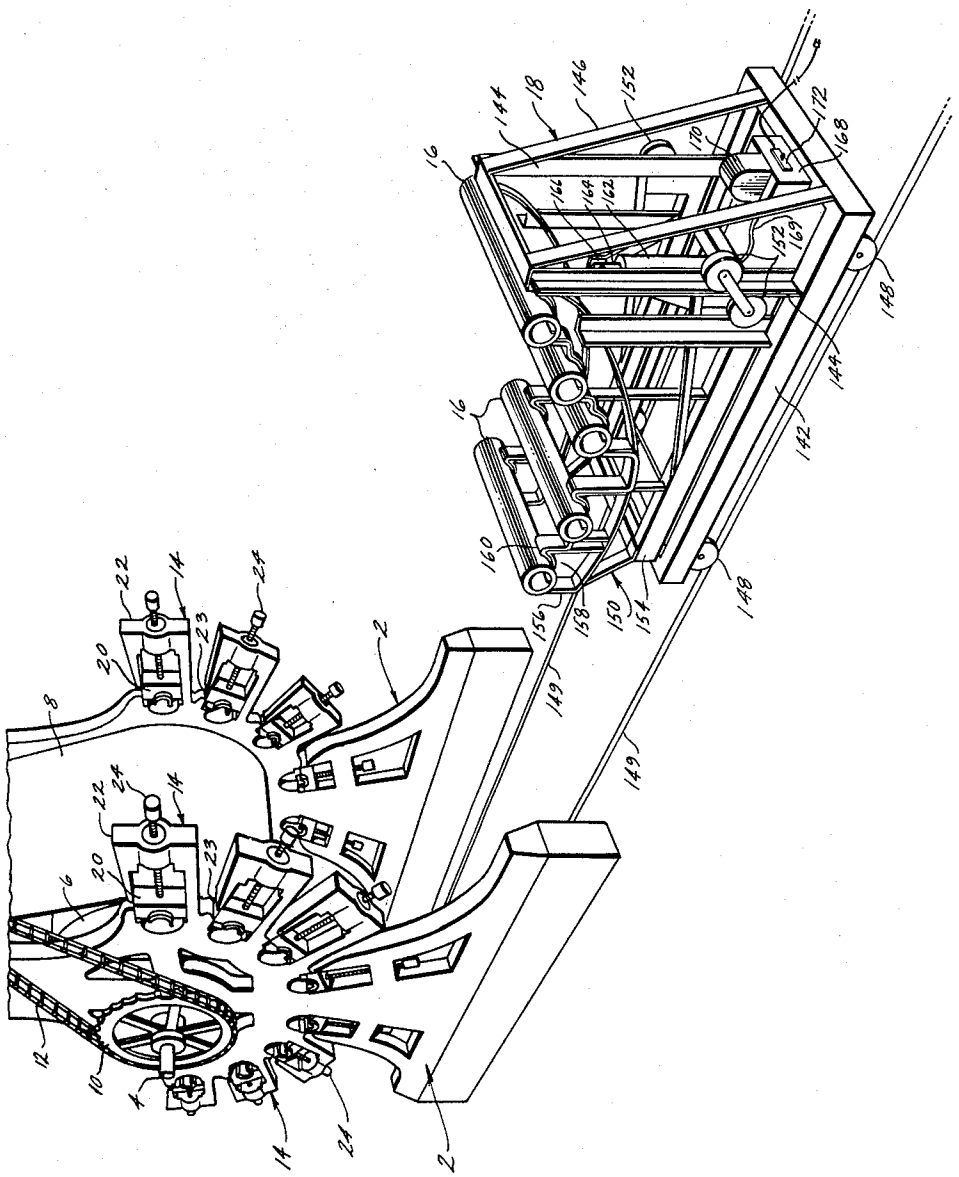


FIG. 1

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PRINTING ROLL MOUNTING MEANS FOR PRINTING APPARATUS

Original Filed Aug. 10, 1962 5 Sheets-Sheet 2

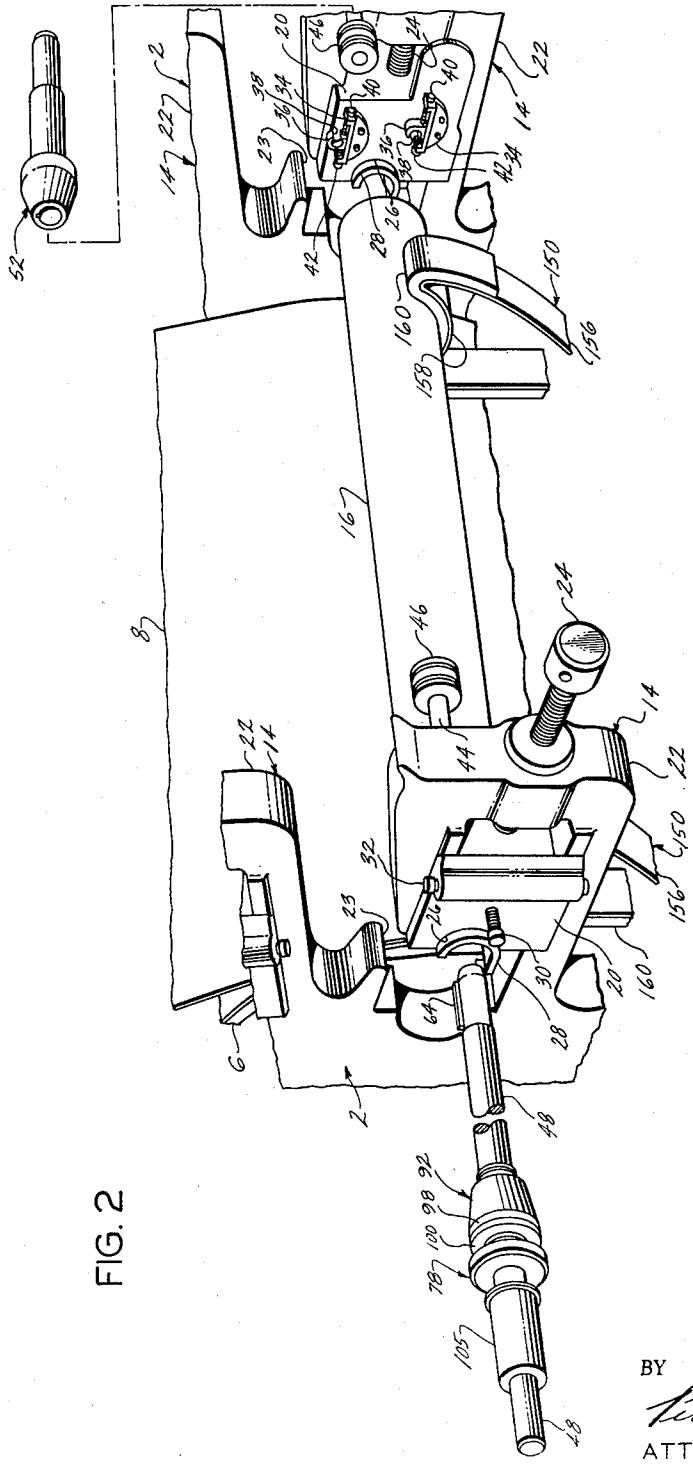


FIG. 2

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PRINTING ROLL MOUNTING MEANS FOR PRINTING APPARATUS

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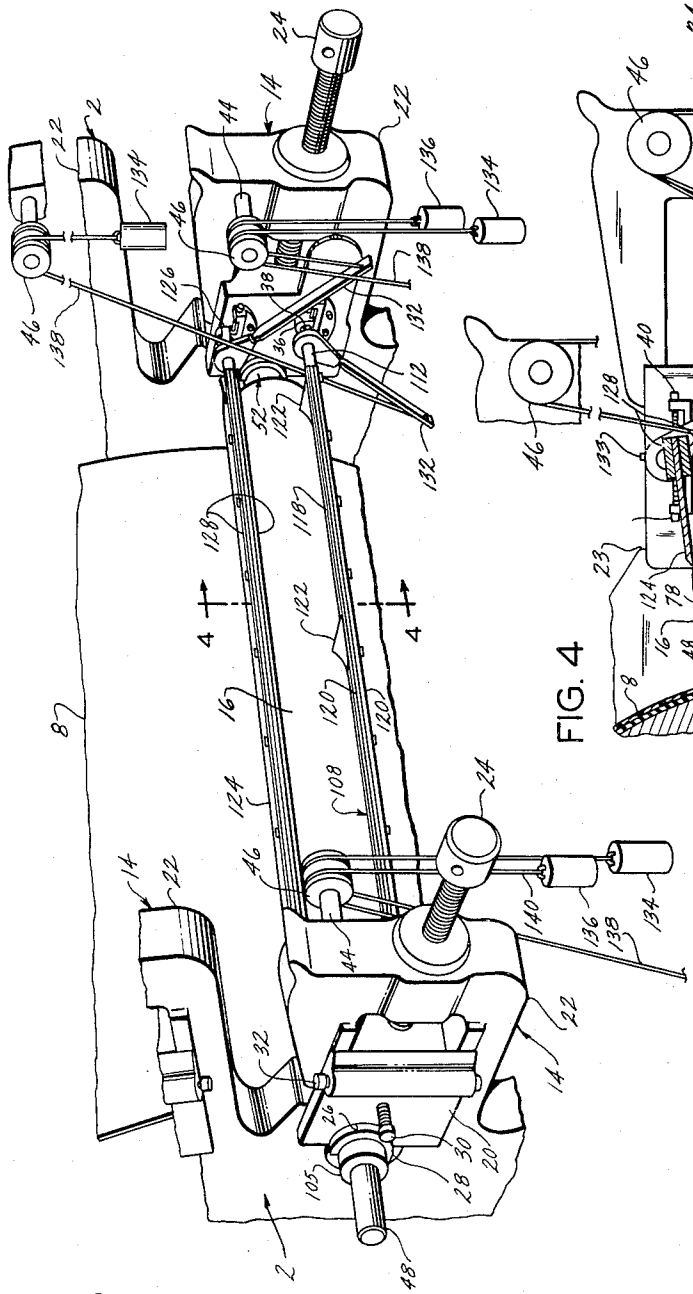


FIG. 3

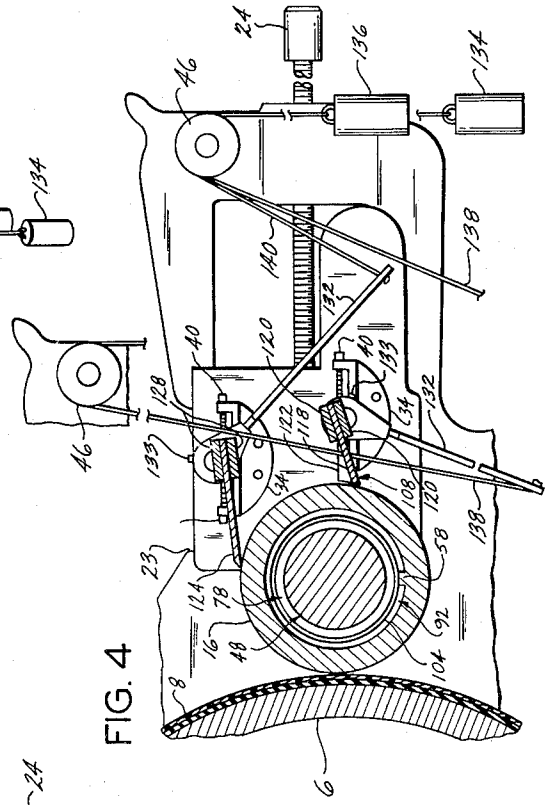


FIG. 4

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PRINTING ROLL MOUNTING MEANS FOR PRINTING APPARATUS

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FIG. 5

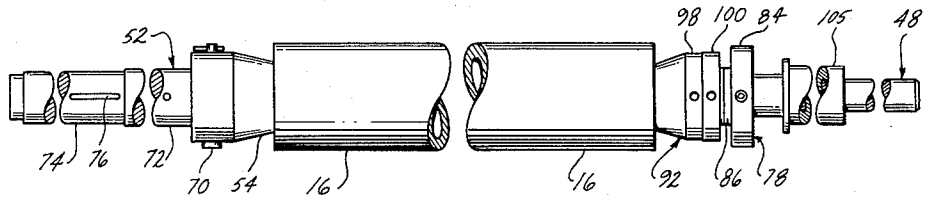


FIG. 6

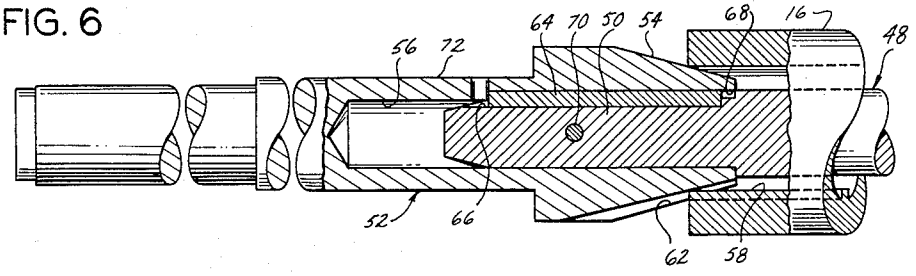
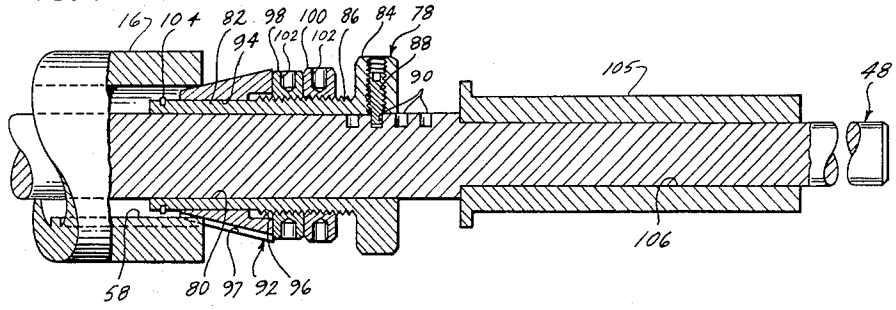


FIG. 7



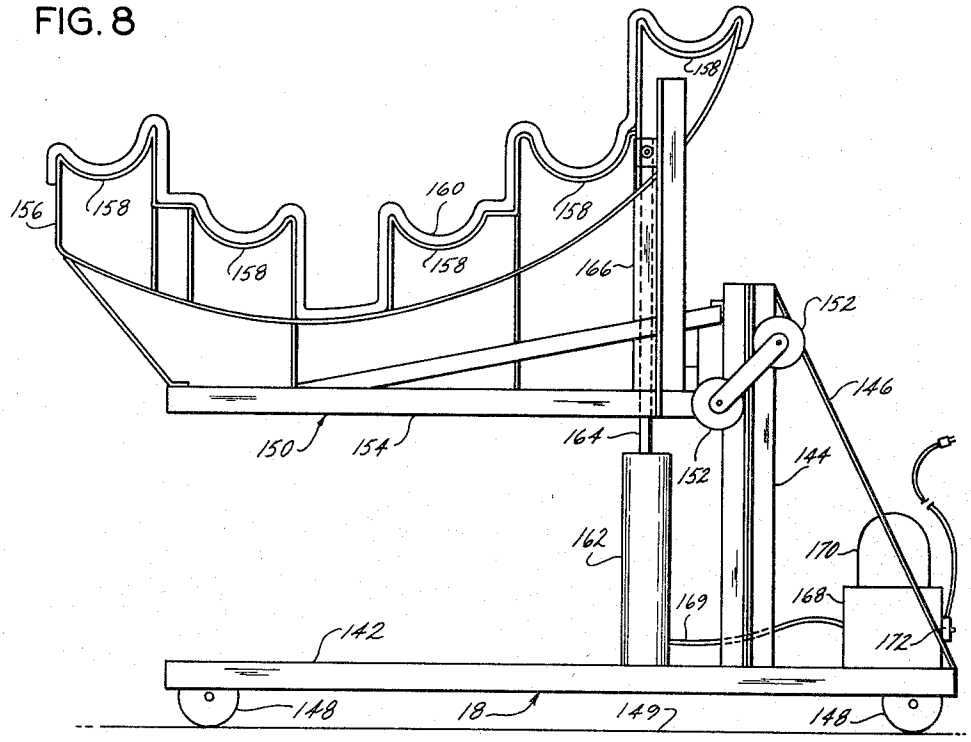
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FIG. 8



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United States Patent Office 3,173,361 Patented Mar. 16, 1965

3,173,361

PRINTING ROLL MOUNTING MEANS FOR PRINTING APPARATUS

Robert Joseph Verlik, West Stafford, Conn., assignor to Stafford Printers, Inc., Stafford Springs, Conn., a corporation of New York

Original application Aug. 10, 1962, Ser. No. 216,160. Divided and this application July 31, 1963, Ser. No. 299,017

15 Claims. (Cl. 101—216)

The present invention relates to printing apparatus and, more particularly, to an improved apparatus and method for printing textiles and the like which is particularly adapted to the printing of short lengths or strike-offs of a pattern for pattern and color evaluation.

This application is a division of my copending application Serial Number 216,160 filed August 10, 1962.

Textile printing apparatus employs a plurality of engraved printing rolls which are spaced about the periphery of the backing cylinder to apply to the fabric the individual colors which combine to produce the printed pattern. Conventionally, the printing rolls are rotatably mounted upon the frame of the apparatus by shafts which extend therethrough and seat in bearings secured in bearing supports or center boxes upon the frame, and the shafts are driven by fitting gears on one end thereof which mesh with the powered star gear. Generally, the shafts for the printing rolls are of solid steel dimensioned to fit tightly within the cylindrical printing roll and provide firm support therefor, and these heavy shafts are driven through the cylinder by a hydraulic press. The weight of the resultant assembly generally requires each roll assembly to be handled and hoisted individually onto the frame by block and tackle or a hydraulic lift and further requires three men for efficiency in the installation operation.

Conventionally, the color or dye is fed onto the surface of the printing roll by a brush which rotates through a color box containing a volume of the desired color. Because of the nature of the brush and the surface area to be covered, it is necessary to introduce 3 to 4 gallons of color into the color box to print even a small length of fabric. If it is desired to alter the color being delivered to a feed roll, it is necessary to remove and clean the feed brush and color box as well as to clean the surface of the printing roll and associated doctor blade, the cleaning operation generally requiring about ten to twenty minutes per roll.

In printing textiles, it is a desirable trade practice to run a strike-off or sample length of the pattern using the engraved rolls and the proposed dyes for preliminary customer or designer approval. Since the engraved rolls are of large width, a production-type machine ideally is required for the striking-off operation; however, it has been proposed to use a test apparatus wherein the rolls would be mounted individually for a sample strike-off, although subject to the objection that the colors would not be true to the production operation wherein "wet" color is printed upon "wet" color.

Because of the time required to insert the shafts in the printing rolls and to mount the printing rolls upon the frame, it has been customary to make the commercial run after receiving customer or designer approval and to maintain the machine idle while awaiting such approval. Since the customer or designer very frequently requires the color or shade of the several dyes to be varied before giving approval, it is necessary to remove and clean the color boxes and brushes involved as well as to clean the surfaces of the roll and doctor blade. About one hour is expended for each sample strike-off with a change in color until approval is obtained. Oftentimes as much as eight hours, and even sixteen hours, will be required to set up the rolls and obtain approval for the production run with a resultant cost in lost production from the inoperative machine. Additionally, each change in color will result in a loss of substantially all the color added to the color box and taken up by the brush with a further considerable expense due to the costs of the dyes.

It is an object of the present invention to provide novel and improved apparatus for printing textiles and the like having a facile mounting for the printing rolls to enable rapid assembly to the frame and particularly adapted to the printing of sample strike-offs of patterns.

Another object is to provide an improved method for rapidly mounting printing rolls upon the frame of apparatus for printing textiles and the like and for rapidly and easily printing strike-offs of a pattern.

A specific object is to provide such an improved roll mounting and a method of printing samples which are adapted to conventional textile printing apparatus to enable facile use thereof for printing samples or strike-offs to reduce down time on commercial production equipment.

Other objects and advantages will be apparent from the following detailed description and claims and the attached drawing wherein:

FIGURE 1 is a fragmentary perspective view of a conventional textile printing apparatus of a type with which the present invention is desirably employed and of a roll-carrying apparatus of the present invention for use therewith;

FIGURE 2 is a fragmentary perspective view to an enlarged scale showing the printing apparatus and roll-carrying apparatus during the assembly operation with a roll-mounting assembly embodying the present invention;

FIGURE 3 is a similar fragmentary perspective view of the assembled apparatus;

FIGURE 4 is a fragmentary cross-sectional view to an enlarged scale along the line 4—4 of FIGURE 3;

FIGURE 5 is a fragmentary front view to an enlarged scale of the printing roll assembly;

FIGURE 6 is a fragmentary front elevational view to an enlarged scale of the fixed roll mounting end of the printing roll assembly in partial section to reveal internal construction;

FIGURE 7 is a similar fragmentary front elevational view of the adjustable roll mounting end of the printing roll assembly; and

FIGURE 8 is a side elevational view of the roll-carrying apparatus in elevated position.

It has now been found that the foregoing and related objects can be readily attained by a method and apparatus wherein a plurality of printing rolls are initially arranged on a carrier to establish the desired print pattern. The roll-supporting cradle portion of the carrier is dimensioned and configured to cooperate with the printing apparatus and to locate simultaneously the plurality of printing rolls in substantial alignment with the bearing supports upon the frame of the cooperating printing apparatus. After the desired pattern has been established the carrier is moved into registry under the print apparatus and the cradle portion is elevated to locate simultaneously the plurality of rolls in substantial alignment with the bearing supports. Roll-mounting assemblies are rotatably seated in the bearing supports to rotatably mount the printing rolls upon the apparatus, and the cradle portion is then lowered. Lastly, the carrier is removed from under the printing apparatus. The steps may be inverted for removal of the rolls from the apparatus and two or more carriers are desirably provided for most speedy operation.

The roll-mounting assemblies of the present invention are relatively light weight and quickly assembled with or disassembled from the printing rolls. Each assembly includes a pair of interfitting shaft components insertable into opposite ends of the printing roll and providing a shaft portion extending through the roll and of lesser width than the aperture through the roll to provide radial spacing therebetween. More particularly, the first shaft component is rotatably mounted in one of a cooperating pair of bearing supports coaxial with the printing roll and has a first mandrel means or portion thereon which is of generally frustoconical configuration and extends inwardly of the adjacent end of the printing roll with its external periphery in firm contact with the inner wall of the printing roll at the end thereof. The first shaft component also has a coaxial aperture therein opening at the inner end thereof within the printing roll. A second shaft component is rotatably mounted in the other of the cooperating pair of bearing supports and has a portion which extends coaxially inwardly of the printing roll and into the coaxial aperture of the first shaft component and which is of lesser width than the aperture through the printing roll to provide radial spacing therebetween. The second shaft component has second mandrel means thereon of generally frustoconical configuration and extending inwardly of the other end of the printing roll with the external periphery thereof in firm contact with the inner wall of the printing roll at the end thereof. Locking and adjusting means releasably lock the second shaft component to the first and provide axial adjustment of the second mandrel means relative to the first to obtain and ensure continued firm support of the printing roll upon the shaft components by moving the mandrel means into tight engagement within the ends of the printing roll. The second shaft component is readily disengageable from the first shaft component and withdrawable from the printing roll to permit speedy removal of the printing roll from the frame.

In accordance with the preferred aspect of the roll mounting assembly of the present invention, the first shaft component is integrally formed with a generally frustoconical mandrel portion at one end thereof and a shaft portion extending coaxially outwardly therefrom. The coaxial aperture is formed in the mandrel portion and may extend into the shaft portion. The second shaft component is comprised of a separate mandrel of generally frustoconical configuration slidably mounted upon a shaft of considerably lesser diameter than the aperture through the printing roll for reduced weight and is configured and dimensioned to fit snugly within the coaxial aperture of the first shaft component. To prevent relative rotation between the shaft components and the printing roll, the printing roll has an axially extending key on its inner surface and the outer surfaces of the mandrels are provided with axially elongated keyways in which the key seats.

To facilitate moving of the mandrels relative to each other and into firm engagement within the ends of the printing roll, a threaded adjustment is most desirably employed. In accordance with the preferred aspect of the present invention, the second mandrel is slidably mounted upon a sleeve on the shaft which has a threaded portion having engaged therewith threaded adjusting and locking means so as to permit threaded adjustment effecting or permitting sliding movement of the second mandrel upon the shaft relative to the first mandrel.

Referring now in detail to FIGURE 1 of the drawings, a conventional printing apparatus for textiles and the like is therein illustrated and includes the frame **2** on which the shaft **4** rotatably mounts the backing cylinder **6** about which the cloth or backing grey **8** extends. The gear **10** and chain **12** drive elements of the apparatus in the superstructure (not shown) in accordance with conventional practice. Outwardly of the backing cylinder **6** and generally along the lower half of the periphery thereof, the frame **2** is provided with a plurality of pairs of bearing supports generally designated by the numeral **14** which are adapted to rotatably support a plurality of engraved tubular printing rolls **16** of generally cylindrical configuration which are being transported on the roll carrier generally designated by the numeral **18** and which will be described more in detail hereinafter.

Other conventional elements of the apparatus have not been shown for simplicity and clarity of illustration including the spider or main gear and the fitting gears which drive the individual printing rolls.

Referring now to FIGURE 2 wherein the bearing supports **14** are illustrated in greater detail, each of the several pairs of bearing supports is comprised of a fitting box **20** which is slidably mounted in the generally U-shaped support arm **22** of the frame **2** and is movable towards and away from the backing cylinder **6** by the lead screw **24**. In the retracted position of the fitting box **20**, the access slot **23** provided by the shorter upper leg of the U-shaped support arm is open for passage of elements therethrough. The inner face of the fitting box is provided with a transversely extending arcuate groove **26** in which is seated the bearing liner **28**. As seen at the left of FIGURE 2, the bearing liner **28** is movable axially relative to the fitting box **20** and backing cylinder **6** by the backing-out screw **30** and the entire fitting box **20** is movable generally vertically within the support arm **22** tangentially of the backing cylinder **6** by the side screw **32**. On the inner sides of the fitting boxes **20** are provided support brackets **34** and slidably supported thereon are the holders **36** which have a generally arcuate notch **38** therein. The holders **36** are slidable towards and away from the bearing liner **28** by the adjusting screws **40** which are rotatably seated in the support brackets **34** and threadably engaged with the holders **36**. The collars **42** limit axial movement of the adjusting screws **40** relative to the brackets **34** so that rotation thereof moves the holders **36** along the threaded screws **40**. Mounted on the inner sides of the support arms **22** are shafts **44** which rotatably support pulley members **46** for a purpose to be described hereinafter.

The mounting assembly for rotatably supporting the printing rolls **16** in the bearing liners **28** of the bearing supports **14** is illustrated in detail in FIGURES 5–7. Extending through the generally cylindrical roll **16** is a shaft element **48** of generally cylindrical configuration and of reduced diameter relative to the inner diameter of the roll **16** so as to provide substantial radial spacing therebetween and which is dimensioned to extend outwardly of one end of the printing roll **16** on the side opposite the star or main gear (the left side in the drawings) and to seat in the bearing liner of the adjacent bearing support.

As seen in FIGURE 6, on the star or main gear side (the right side in the drawings), the shaft **48** is provided with an end portion **50** of reduced diameter. The first or fixed mandrel shaft and mandrel component generally designated by the numeral **52** is integrally formed and has a generally frustoconical mandrel portion **54** which extends into the end of the roll **16** and has a cylindrical coaxial bore **56** extending thereinto in which the shaft end portion **50** is received in tight-fitting engagement. Relative rotation between the shaft and mandrel component **52** and roll **16** is prevented by an axially extending key **58** integrally formed on the inner surface of the roll **16** which seats in an axially elongated slot or keyway **62** in the outer surface of the mandrel portion **54**. Relative rotation between shaft and mandrel component **52** and the shaft element **48** is prevented by the key **64** which seats in aligned axially extending slots or keyways **66**, **68** in the outer surface of the shaft element **48** and in the bore **56** of the mandrel component **52**, respectively. Axial movement of the shaft and mandrel component **52** relative to the shaft **48** in the direction of the roll **16** is limited by the abutment of the inner end of the shaft and

mandrel component 52 against the shoulder formed at the inner extremity of the reduced end portion 50 of the shaft element and movement away from the roll is prevented by the locking pin 70 which extends through the shaft and mandrel component 52 and shaft element 48 and which also serves to position the mandrel component on the shaft element. The cylindrical shaft portion 72 extends outwardly from the mandrel portion 54 and rotatably seats in the bearing liner 28. As best seen in FIGURE 5, the outer cylindrical gear portion 74 thereof has an axial keyway or groove 76 therein which is adapted to receive a key (not shown) for locking the fitting gear (not shown) thereon in full assembly of the apparatus.

On the opposite end of the shaft element 48 is a sleeve generally designated by the numeral 78 which has a cylindrical bore 80 extending therethrough dimensioned for tight-fitting engagement upon the shaft element and which extends outwardly of the printing roll 16. The cylindrical end portion 82 on the shaft element extends inwardly of the end of the roll 16 and is spaced from a radial collar 84 at the opposite end thereof by an externally threaded portion 86. A locking screw 88 in the collar 84 seats in one of the several axially spaced radial apertures 90 in the shaft element to lock the sleeve against axail movement on the shaft element 48, and variations in length or distortion of the roll ends can be compensated by varying the location of the sleeve on the shaft element to ensure firm fit.

Slidably mounted on the cylindrical end portion 82 of the sleeve 78 is the movable mandrel element 92 which is of generally frustoconical configuration and has a cylindrical bore 94 extending therethrough dimensioned to provide a tight sliding fit upon the sleeve with a counterbore 96 at its outer end to permit extension over the threaded portion 86 without interference therewith. The mandrel element 92 extends inwardly of the end of the roll 16 and has an axially elongated slot or keyway 97 in its outer surface in which is received the key 58 in the roll 16 to prevent relative rotation therebetween. A take-up or adjusting nut 98 adjacent the mandrel element 92 and a locking nut 100 are threadably engaged upon the threaded portion 86 of the sleeve to move the mandrels and roll into tight assembly and maintain tight assembly during operation of the apparatus. More particularly, the adjusting nut 98 is rotated to drive the several components into tight assembly and then the locking nut 100 is rotated against the adjusting nut 98 to maintain the mandrels and roll in tight assembly. Radial apertures 102 are provided in the nuts 98, 100 for insertion of wrenches or other suitable tools to apply turning force thereto.

To limit movement of the mandrel element 92 thereon, a locking ring 104 is seated in a circumferential groove at the inner end of the sleeve 78. A flanged bushing 105 is provided on the reduced end portion 106 of the shaft element 48 to equal the diameter of the bearing portion 72 of the fixed shaft and mandrel component 52 and to seat snugly in the bearing liner 28, thus completing the roll-mounting assembly.

Referring now in detail to FIGURES 3 and 4, a gravity color feed member generally designated by the numeral 108 has projecting support rods 112 at its ends which seat rotatably in the arcuate notch 38 of the lower holder 36. The color feed member 108 has a planar bottom wall 118 which has a beveled inner edge and slopes downwardly towards the printing roll 16 and is carried between the clamping plates 120 along its outer edge. At the ends and intermediate the length of the bottom wall 118 are provided vertical walls 122 defining a plurality of compartments therebetween so that colors or dyes placed therein will be confined and flow by gravity along the downwardly sloping bottom wall 118 onto the printing roll 16. To remove excess color from the surface of the printing roll 16, a doctor blade 124 is provided which has a beveled inner edge wiping the surface of the roll 16. The blade 124 is carried between clamping plates 128 and support rods 126 at its ends seat rotatably in the arcuate notches 38 of the upper holders 36.

The inner edges of the color feed member 108 and doctor blade 124 are biased against the surface of the printing roll 16 by dogs 132 which are locked on their respective support rods by set screws 133 and are subjected to the torque of weights 134, 136 on the ends of the cords 138, 140 extending about the pulley members 46. By use of weights 134, 136, the pressure exerted by the inner edges of the color feed member 108 and the doctor blade 124 on the surface of the printing roll 16 can be readily adjusted to ensure a close fit without injury to the surface of the roll.

Referring now to FIGURES 1 and 8, the roll carrier 18 has a frame or carriage 142 with a pair of upright posts 144 braced by the diagonal straps 146 and which is supported upon wheels 148 for movement along the tracks 149. The support member 150 is slidably supported for vertical movement on the upright posts 144 by the tied pairs of rollers 152 and has a base portion 154 and a cradle portion 156 is formed with a plurality of arcurate seats 158 for the several rolls 16 with the axes of the seats 158 and thereby the rolls 16 received therein being located along an arc conforming substantially to the arc defined by the bearing supports 14 of the printing apparatus, and the seats 158 are spaced along the arc so as to conform to the spacing between the bearing supports 14. To prevent injury to the surface of the printing rolls 16, the seats 158 have a lining 160 of soft, resilient material such as rubber or vinyl plastisol.

Vertical movement of the support member 150 on the frame or carriage 142 is effected by operation of a hydraulic lifter having a vertical cylinder 162 mounted on the frame 142 and a piston 164 reciprocable therein which is fixed at its upper end to the diagonal straps 166 of the support member base portion 154. When fluid under pressure is supplied to the bottom of the cylinder 162 from the reservoir 168 through the conduit 169 upon actuation of the motor 170 by the three-position switch 172, the piston 164 and thereby the support member 150 are driven upwardly.

After elevation of the support member 150, the switch 172 is moved to neutral position in which the valve for the conduit 169 is closed and the motor 170 is deenergized. The support element 150 is lowered simply by moving the switch to the third position wherein the valve for the conduit 169 is opened and the weight of the support member returns the fluid to the reservoir 168.

In operation of the apparatus of the present invention, the several printing rolls 16 are placed in seats 158 of the roll carrier 18 corresponding to the desired location about the periphery of the backing cylinder 6 to establish the desired pattern. In the initial position, the center boxes 20 are backed away from the backing cylinder 6 to open the access slots 23 in the support arms 22. The carrier 18 is moved into position under the backing cylinder 6 and the switch 172 is moved into position to open the valve and actuate the motor 170 to supply fluid to the cylinder 162 and raise the support member 150 until the axes of the printing rolls 16 are aligned substantially with the several bearing supports 14, as shown in FIGURE 2.

The switch 172 is then moved into neutral position to continue to support the rolls 16 in the desired position during further operation. Into the end of each roll 16 opposite the star or main gear (the left side in the drawings) is inserted a shaft element 48 which has been preassembled with the bushing 105 and the adjustable sleeve and mandrel subassembly until the key 58 in the roll 16 seats in the keyway 97 of the mandrel 92 and the bushing 105 is properly seated within the bearing liner 28. Into the star or main gear end of the roll (the right side in the drawings) is inserted the fixed shaft and mandrel component 52 with the end of the shaft element 48 fitting

into the cylindrical bore 56 and the key 58 of the roll into the keyway 62 of the mandrel while the keyways 66, 68 on the shaft element and mandrel respectively are aligned and locked by the key 64. The bearing portion 72 of the shaft and mandrel component 52 is properly seated in the bearing liner 28 of its bearing support 14 and the locking pin 70 is inserted and fastened.

After the several rolls 16 have been mounted on the frame, the switch 172 on the carrier 18 is moved to open the valve and allow the support member 150 to descend, and the carrier 18 is then removed from the apparatus frame 2. The roll mounting assemblies are then tightened to ensure a very firm fit by using a wrench or other tool to turn the adjusting nut 98 and drive the movable mandrel element 92 inwardly against the end of the roll 16 and the roll 16 against the fixed mandrel portion 54. The locking nut 100 is then tightened against the adjusting nut 98 to lock the assembly. The several rolls are rotated to move the pitch marks thereon (not shown) into proper position for alignment of the patterns thereon. The lead screws 24 are then tightened to move the rolls 16 against the backing grey 8 and backing cylinder 6 and then the fitting gears (not shown) are mounted on the outer gear portions 74 of the fixed mandrels 52 in meshing engagement with the star or main gear (not shown).

After the rolls 16 have been mounted and positioned, the end rods 112 of the color feed member 108 are assembled with dogs 132 and seated in the notches 38 of the lower holder 36. Any necessary adjustment of the holder 36 relative to the print roll 16 is effected by the adjusting screws 40, and weights 134 are placed on the cords 138 to adjust the rotational force on the feed member 108 and thereby the closeness of the fit between its beveled edge and the surface of the print roll. The doctor blade 124 is similarly mounted and adjusted. Those printing rolls which pass through the color before reaching the bottom wall 118 of the color feed member 108 (the rear of the machine in the drawings) do not require separate wipers or doctor blades since the bottom wall 118 will wipe the surface of the roll 16 as it passes thereby. The vertical walls 122 may be provided conveniently by plastic inserts or an inert putty so as to enable ready variation of the width of pattern being printed by a given color and to permit printing of several different colors and color combinations simultaneously. Generally, the printing of sample strike-off lengths of a yard in length and a yard in width requires only a cup of color. In running the sample strike-off, a machine speed of 3 to 10 yards per minute has been found satisfactory with a speed of about 6 to 8 yards being most advantageously utilized.

If it is desired to alter the colors, the color feed members 108 involved are pivoted to spill the excess color, and the operator then readily wipes or sponges the surfaces of the roll 16, feed member 108 and doctor blade 124 without removing any of the elements from the machine.

To remove the rolls 16, the color feed member 108 and doctor blade 124 are removed and the fitting gears are also removed. The fitting boxes 20 are then backed away from the backing cylinder 6 and the roll carrier 18 moved into position and elevated to seat the several rolls 16 in the seats 158. The locking pin 70 is removed from the fixed shaft and mandrel component 52 which is then slid outwardly from the end of the roll. The shaft element 48 and adjustable mandrel subassembly are then extracted from the other end of the printing roll and machine frame. After all the rolls have been dismounted, the support member 150 is depressed and the roll carrier 18 moved away.

By the structure and method of the present invention, it has been found that the apparatus can be fully assembled for a strike-off with a set of five printing rolls in fifteen to twenty-five minutes and disassembled in ten to fifteen minutes, most conveniently by a pair of workmen. The pattern of the rolls can be prearranged upon the carrier to ensure the desired positioning of the several rolls about the printing apparatus by a master printer or foreman enabling the assembly to be effected by less experienced workmen. Very small amounts of color are required for each strike-off, and a color used in a feed member can be altered in three to five minutes, thus enabling rapid variation to obtain customer or designer approval. By use of the present invention in a production-type machine separate from the normal production equipment, a number of strike-offs can be quickly effected while maintaining full production on the remaining equipment, and the sample strike-offs can be made well in advance of the time for the production run to ensure unbroken production on the commercial units.

Although but one specific embodiment of the invention has been shown and described herein, it will be understood that modifications may be made within the spirit of the invention.

Having thus described the invention, I claim:

1. A printing apparatus having a frame; a backing cylinder rotatably mounted in said frame; a pair of bearing supports on said frame outwardly of said cylinder at opposite ends thereof and providing arcuate bearing seats; a printing roll of generally cylindrical configuration with an aperture extending axially therethrough; and a roll mounting assembly rotatably seated in said bearing supports and supporting said printing roll for rotation during operation of the apparatus but quickly disengageable therefrom for removal of said roll, said roll mounting assembly including a first shaft component rotatably seated in one of said pair of bearing supports and extending therethrough, said first shaft component being coaxial with said printing roll and having first mandrel means thereon of generally frustoconical configuration, and at the inner end thereof said first mandrel means extending inwardly of the adjacent end of said printing roll with the external periphery thereof in firm contact with the inner wall of said printing roll at the end thereof and said first shaft component having a coaxial aperture therein opening at the inner end thereof, a second shaft component rotatably seated in the other of said pair of bearing supports and having a first portion extending coaxially inwardly of said printing roll with its end extending into and seated in said coaxial aperture of said first shaft component and a second portion extending through said other bearing support, said first portion being of lesser width than the aperture through said printing roll to provide radial spacing therebetween, said second shaft component having second mandrel means thereon of generally frustoconical configuration and extending inwardly of the other end of said printing roll with the external periphery thereof in firm contact with the inner wall of said printing roll at said other end thereof, and means releasably locking said second shaft component to said first shaft component and providing axial adjustment of said second mandrel means relative to said first mandrel means to obtain and ensure continued firm support of said printing roll upon said shaft components, said bearing supports providing bearing seats for said shaft components and said frame and bearing supports substantially encompassing the periphery thereof to provide firm seating of said shaft components and said printing roll in fixed axial position during operation of the apparatus in combination with said backing cylinder, said second shaft component being readily disengageable from said first shaft component and being withdrawable from said axial aperture therein, said second shaft component and said other bearing support being cooperatively dimensioned and configured for withdrawal of said second shaft component axially outwardly from said printing roll and generally axially outwardly in said other bearing support while said printing roll is in generally axial alignment between said pair of bearing supports, thereby permitting speedy removal of said printing roll from said frame.

2. The printing apparatus of claim 1 wherein the outer surfaces of each of said frustoconical mandrel means are

provided with an axially elongated keyway and the inner surface of said printing roll is provided with an axially extending key seated in said keyways to lock said roll and mandrel means against relative rotation.

3. A printing apparatus having a frame; a backing cylinder rotatably mounted in said frame; a pair of bearing supports on said frame outwardly of said cylinder at opposite ends thereof providing arcuate bearing seats, a printing roll of generally cylindrical configuration; and a readily disengageable roll mounting assembly rotatably seated in said bearing supports and supporting said printing roll for rotation during operation of the apparatus but readily disengageable therefrom for removal of said roll, said roll mounting assembly including a shaft and mandrel component having a mandrel portion of generally frustoconical configuration at the inner end thereof and a shaft portion extending coaxially outwardly therefrom and rotatably seated in one of said pair of bearing supports and extending therethrough, said mandrel portion extending coaxially inwardly of the adjacent end of said roll with its external periphery in firm contact with the inner wall of said printing roll at said end and having a coaxial aperture opening at the inner end thereof, a shaft element rotatably seated in and extending through the other of said pair of bearing supports and extending coaxially through said printing roll, said shaft element being of lesser diameter than the aperture through said printing roll to provide radial spacing therebetween and having its inner end extending into said coaxial aperture in said mandrel portion, said aperture and shaft element being dimensioned to provide a snug fit therebetween, a mandrel element of generally frustoconical configuration mounted on said shaft element and extending inwardly of the other end of said roll with its external periphery in firm contact with the inner wall of said other end of said roll, and means releasably locking said shaft element in said coaxial aperture of said shaft and mandrel component and providing axial adjustment of said mandrel element relative to said mandrel portion to obtain and ensure continued firm support of said printing roll upon said mandrel element and mandrel portion and thereby upon said shaft element and shaft component, said bearing supports providing bearing seats for said shaft element and shaft portion, said frame and bearing supports substantially encompassing the periphery of said shaft element and shaft portion to provide firm seating thereof and of said printing roll in fixed axial position during operation of the apparatus in combination with said backing cylinder, said shaft element being readily disengageable from said shaft and mandrel component and being withdrawable from said axial aperture therein, said shaft element and mandrel element and said other bearing support being cooperatively dimensioned and configured for withdrawal of said shaft element and said mandrel element axially outwardly from said printing roll and for withdrawal of said shaft element generally axially outwardly in said other bearing support while said printing roll is in generally axial alignment between said pair of bearing supports, thereby permitting speedy removal of said printing roll from said frame.

4. The printing apparatus of claim 3 wherein the outer surfaces of said frustoconical mandrel element and said frustoconical mandrel portion are provided with axially elongated keyways and the inner surface of said roll is provided with an axially extending key seated in said keyways to lock said roll and mandrel element and portion against relative rotation.

5. The printing apparatus of claim 4 wherein said locking and adjusting means locks said shaft and said shaft and mandrel component against relative rotation and wherein said mandrel element is prevented from rotation relative to said shaft during operation of the apparatus.

6. A printing apparatus having a frame; a main shaft rotatably mounted in said frame; a backing cylinder rotatably supported on said main shaft; a pair of bearing supports on said frame outwardly of said cylinder at opposite ends thereof providing arcuate bearing seats; a printing roll of generally cylindrical configuration having an axially extending aperture therethrough with an axially extending key therein; a shaft and mandrel component having a mandrel portion of generally frustoconical configuration at the inner end thereof and a shaft portion extending coaxially outwardly therefrom and rotatably seated in one of said pair of bearing supports and extending therethrough, said mandrel portion extending coaxially inwardly of the adjacent end of said roll with its external periphery in firm contact with the inner wall of said printing roll at said end and having a coaxial aperture opening at the inner end thereof, the outer surface of said mandrel portion having an axially elongated keyway seating said key of said roll to prevent relative rotation therebetween; a shaft element rotatably seated in the other of said pair of bearing supports and extending coaxially through said printing roll and through said other bearing support, said shaft element being of lesser diameter than the aperture through said printing roll to provide radial spacing therebetween and having its end extending into and seated in said coaxial aperture in said mandrel portion, said aperture and shaft element being dimensioned to provide a snug fit therebetween; a mandrel element of generally frustoconical configuration mounted on said shaft element and extending inwardly of the other end of said roll with its external periphery in firm contact with the inner wall of said other end of said roll, the outer surface of said mandrel element having an axially elongated keyway seating said key of said roll to prevent relative rotation therebetween; means releasably locking said shaft element in said coaxial aperture of said shaft and mandrel component and providing axial adjustment of said mandrel element relative to said mandrel portion to obtain and ensure continued firm support of said printing roll upon said mandrel element and mandrel portion and thereby upon said shaft element and shaft mandrel component, said bearing supports providing bearing seats for said shaft element and shaft portion, said frame and bearing supports substantially encompassing the periphery of said shaft element and shaft portion to provide firm seating thereof and of said printing roll in fixed axial position during operation of the apparatus in combination with said backing cylinder, said shaft element being readily disengageable from said shaft and mandrel component and being withdrawable from said axial aperture therein, said shaft element and mandrel element and said other bearing support being cooperatively dimensioned and configured for withdrawal of said shaft element and said mandrel element axially outwardly from said printing roll and for withdrawal of said shaft element generally axially outwardly in said other bearing support while said printing roll is in generally axial alignment between said pair of bearing supports, thereby permitting speedy removal of said printing roll from said frame; a main gear on the end of said main shaft adjacent the shaft portion of said shaft and mandrel component; and a driven gear on said shaft portion outwardly of said one bearing support drivingly engaged with said main gear.

7. A printing apparatus having a frame; a backing cylinder rotatably mounted in said frame; a pair of bearing supports on said frame outwardly of said cylinder and at opposite ends thereof providing arcuate bearing seats; a printing roll of generally cylindrical configuration with a cylindrical aperture extending axially therethrough; a roll mounting assembly rotatably seated in said bearing supports and supporting said printing roll for rotation during operation of said apparatus but quickly disengageable therefrom for removal of said roll, said roll mounting assembly including a shaft element rotatably seated at one end in one of said bearing supports and having a portion extending coaxially through said printing roll of lesser diameter than the aperture through said roll

so as to provide radial spacing therebetween, a shaft and mandrel component having a generally frustoconical mandrel portion at the inner end thereof with a generally cylindrical coaxial bore extending thereinto from the inner end thereof and coaxially mounted in close-fitting relationship on the other end of said shaft element and extending inwardly of the adjacent end of the printing roll with its external periphery in firm contact with the inner wall of the printing roll at the end thereof to provide firm radial support between the cylinder and the shaft, said shaft and mandrel component having a shaft portion extending coaxially outwardly from said mandrel portion, said shaft portion extending through and being rotatably seated in the other of said pair of bearing supports, means locking said shaft and mandrel component to said shaft element, a sleeve having a generally cylindrical bore extending therethrough coaxially mounted in close-fitting relationship on the other end of said shaft element and having a generally cylindrical external portion extending inwardly of the other end of said roll, means locking said sleeve in position on said shaft element, a mandrel element having a generally frustoconical portion with a generally cylindrical bore extending therethrough slidably mounted in close-fitting relationship on said cylindrical portion of said sleeve and extending inwardly of the other end of said roll with its external periphery in firm contact with the inner wall of said printing roll at the end thereof to provide radial support between the printing roll and sleeve, and means on said sleeve for adjustably positioning said mandrel element axially thereof to obtain and ensure continued firm support for the printing roll on said roll mounting assembly, said bearing supports providing bearing seats for said shaft element and shaft portion, said frame and bearing supports substantially encompassing the periphery of said shaft element and shaft portion to provide firm seating thereof and of said printing roll in fixed axial position during operation of the apparatus in combination with said backing cylinder, said shaft element being readily disengageable from said shaft and mandrel component and being withdrawable from said axial aperture therein, said shaft element and said other bearing support being cooperatively dimensioned and configured for withdrawal of said shaft element and said mandrel element axially outwardly from said printing roll and for withdrawal of said shaft element generally axially outwardly in said other bearing support while said printing roll is in generally axial alignment between said pair of bearing supports, thereby permitting speedy removal of said printing roll from said frame.

8. The printing apparatus of claim 7 wherein the outer surfaces of the frustoconical mandrel element and mandrel portion are provided with an axially elongated keyway and are locked against rotation relative to said roll by a key seated in said keyways.

9. The printing apparatus of claim 7 wherein said adjustable positioning means for said mandrel element includes an externally threaded portion on said sleeve outwardly of said mandrel element and a pair of threaded members threadably engaged on said threaded portion, the inner of said threaded members being movable against the outer end of said mandrel element to press it inwardly of the printing roll and to press the roll tightly upon the mandrel portion and ensure firm engagement between the mandrel element and mandrel portion and the printing roll, and the outer of said threaded members being movable into locking engagement with the inner of said threaded members to maintain firm engagement during operation of the apparatus.

10. The printing apparatus of claim 7 wherein the cylindrical bore of said mandrel portion and said one end of said shaft element are provided with aligned axially extending keyways and are locked against relative rotation by a key seated therein.

11. In printing apparatus, the combination comprising a frame; a backing cylinder rotatably mounted in said frame; a pair of bearing supports on opposite sides of said frame outwardly of said cylinder and providing arcuate bearing seats; a tubular printing roll of generally cylindrical configuration; a shaft element rotatably seated adjacent one end in and extending through one of said pair of bearing supports and having a portion extending coaxially through said printing roll of lesser diameter than the aperture through said cylindrical roll to provide radial spacing therebetween; a shaft and mandrel component having a generally frustoconical mandrel portion at the inner end thereof with a generally cylindrical coaxial bore extending thereinto from the inner end thereof coaxially mounted in close-fitting relationship on the other end of said shaft element and extending inwardly of one end of the printing roll, said shaft and mandrel component having the external periphery of the frustoconical mandrel portion in firm contact with the inner wall of said printing roll at the end thereof and having the surface of its bore in close-fitting relationship with the surface of the shaft element to provide firm radial support between the cylinder and the shaft element, said shaft and mandrel component having a cylindrical shaft portion extending coaxially outwardly from said mandrel portion, said shaft portion extending through and being rotatably seated in the other of said bearing supports; means locking said shaft and mandrel component on said shaft element; a sleeve having a generally cylindrical bore extending therethrough coaxially mounted on said shaft element adjacent said one end with the surface of its bore in close-fitting relationship with the surface of said shaft element, said sleeve having a generally cylindrical external portion extending inwardly of the other end of said roll; means locking said sleeve in position on said shaft element against relative axial movement; a mandrel element of generally frustoconical configuration with a generally cylindrical bore extending therethrough slidably mounted on said cylindrical portion of said sleeve and extending inwardly of said other end of said roll, said mandrel element having its frustoconical external periphery in firm contact with the inner wall of the printing roll at the end thereof to provide firm radial support between said other end of the printing roll and sleeve; and means on the said sleeve for adjustably positioning said mandrel element axially thereof to obtain and ensure continued firm support for the printing roll on said shaft element and component, said bearing supports providing bearing seats for said shaft element and shaft portion, said frame and bearing supports substantially encompassing the periphery of said shaft element and shaft portion to provide firm seating thereof and of said printing roll in fixed axial position during operation of the apparatus in combination with said backing cylinder, said shaft element being readily disengageable from said shaft and mandrel component and being withdrawable from said axial aperture therein, said shaft element and said other bearing support being cooperatively dimensioned and configured for withdrawal of said shaft element and said mandrel element axially outwardly from said printing roll and for withdrawal of said shaft element generally axially outwardly in said other bearing support while said printing roll is in generally axial alignment between said pair of bearing supports, thereby permitting speedy removal of said printing roll from said frame.

12. The printing apparatus of claim 11 wherein the outer surfaces of the frustoconical portions of said mandrels are provided with an axially elongated keyway and are locked against rotation relative to said roll by a key on said roll seated in said keyway and wherein said adjustable positioning means for said mandrel element includes an externally threaded portion on said sleeve outwardly of said mandrel element and a pair of threaded members threadably engaged on said threaded portion, the inner of said threaded members being mov-

able against the outer end of said mandrel element to press it inwardly of the printing roll and to press the roll tightly upon the mandrel portion and ensure firm engagement between the mandrel portion and printing roll, and the outer of said threaded members being movable into locking engagement with the inner of said threaded members to maintain firm engagment during operation of the apparatus.

13. In the printing of textiles and the like using apparatus having a frame with a pair of bearing supports on opposite sides thereof, the steps comprising elevating a tubular printing roll of generally cylindrical configuration into alignment with a pair of axially aligned bearing supports of a printing apparatus; inserting axially into said pair of bearing supports into opposite ends of said roll and interfitting a pair of interfitting shaft components rotatably seatable in said bearing supports and providing a shaft portion extending through said roll of lesser width than the aperture therethrough to provide a radial spacing therebetween, said shaft components each having mandrel means thereon of generally frustoconical configuration; and adjusting said mandrel means axially relative to each other to move the frustoconical external surfaces of said mandrel means into firm peripheral contact with the inner surface of said printing roll at the ends thereof to firmly engage and support said printing roll therebetween.

14. In the printing of textiles and the like using apparatus having a frame with a plurality of pairs of bearing supports on opposite sides thereof, the steps comprising elevating a plurality of tubular printing rolls of generally cylindrical configuration into alignment with axially aligned pairs of bearing supports of a printing apparatus; inserting axially within one bearing support of each of said pairs of bearing supports and into one end of each of said rolls a shaft and mandrel component and inserting axially into the other bearing support of each of said pairs of bearing supports and into the other end of each of said rolls a shaft element and a mandrel element of generally frustoconical configuration mounted on said shaft element and interfitting said shaft element and said mandrel component, said shaft and mandrel component having a mandrel portion of generally frustoconical configuration at the inner end thereof and a shaft portion extending coaxially outwardly therefrom and through said other bearing support for rotatable seating in said one bearing support, said mandrel portion having a coaxial aperture therein opening at the inner end thereof and said shaft element having a portion extending through said printing roll and into said coaxial aperture, said shaft element portion being of lesser diameter than the aperture through said printing roll to provide radial spacing therebetween;

and adjusting said mandrel element axially relative to said mandrel portion to move the frustoconical external surfaces of said mandrel element and mandrel portion into firm peripheral contact with the inner surface of said printing roll adjacent the ends thereof to firmly engage and support said printing roll therebetween.

15. In the printing of textiles and the like using apparatus having a frame with a pair of bearing supports on opposite sides thereof, the steps comprising elevating a tubular printing roll of generally cylindrical configuration into alignment with a pair of axially aligned bearing supports of a printing apparatus; inserting axially into one of said pair of bearing supports and into one end of said roll one end of a shaft element of lesser diameter than the aperture through said printing roll and having a mandrel element of generally frustoconical configuration slidably mounted adjacent the opposite end thereof until said one end of said shaft element extends through the opposite end of said roll and said mandrel element engages within said one end of said roll and inserting axially into the other of said bearing supports and into the other end of said roll a shaft and mandrel component having a generally frustoconical mandrel portion at the inner end thereof with a cylindrical bore therein to seat and interfitting with said one end of said shaft element and inwardly of said opposite end of said printing roll into surface engagement with the inner surface of said printing roll; locking said shaft and mandrel component in position to said shaft element; slidably adjusting said mandrel element on said shaft element relative to said mandrel portion to drive said opposite end of said printing roll into firm peripheral contact with said mandrel portion and said mandrel element into firm peripheral contact with the said one end of said printing roll to firmly engage and support the printing roll therebetween; and locking said mandrel element in position against axial movement relative to said shaft element and roll.

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