Sept. 3, 1940. F. H. MARSHALL 2,213,712

METHOD OF AND APPARATUS FOR SURFACING INKING ROLLS

Filed Aug. 9, 1937 4 Sheets-Sheet 1

Fig. 1

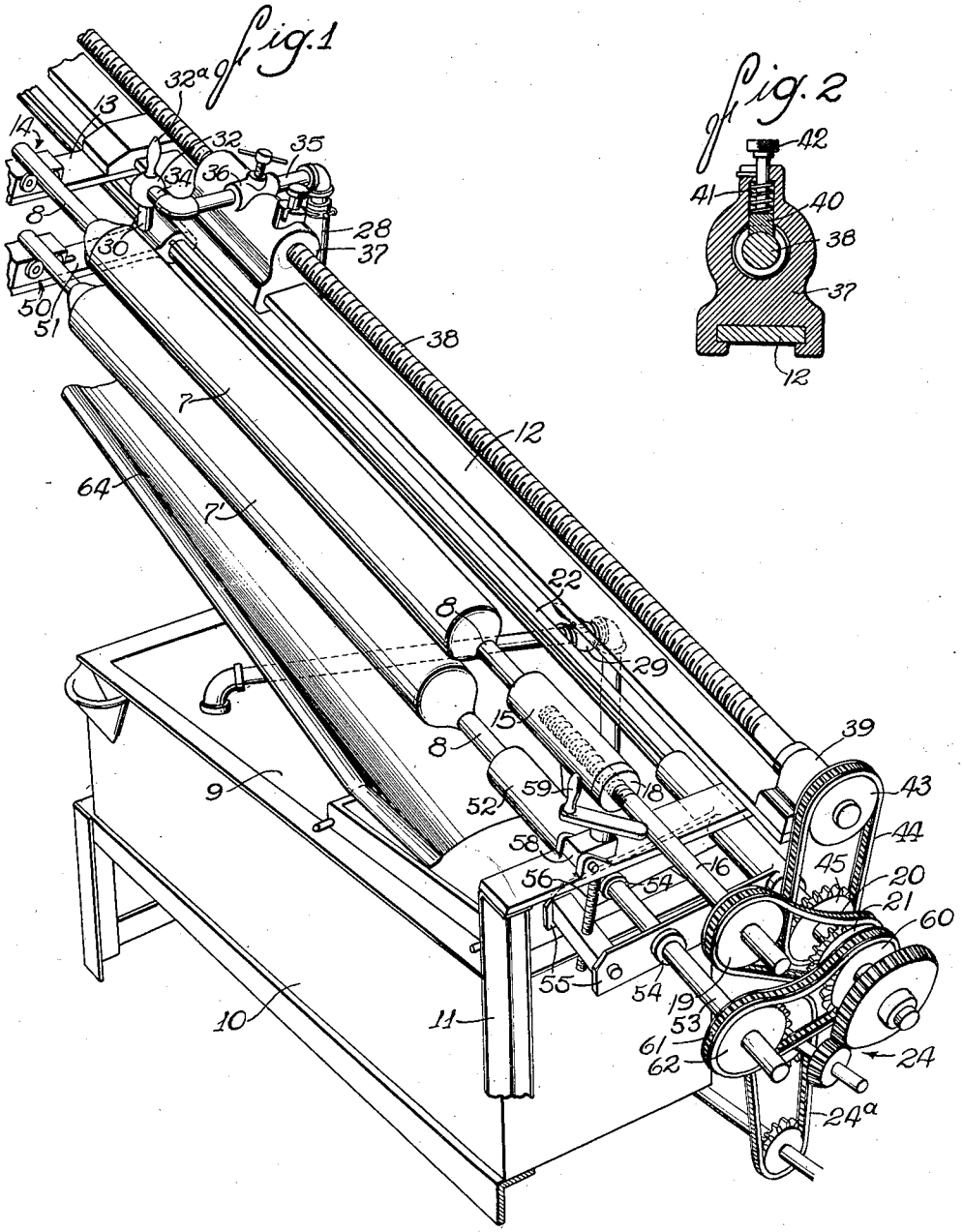

Fig. 2

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Fig. 3

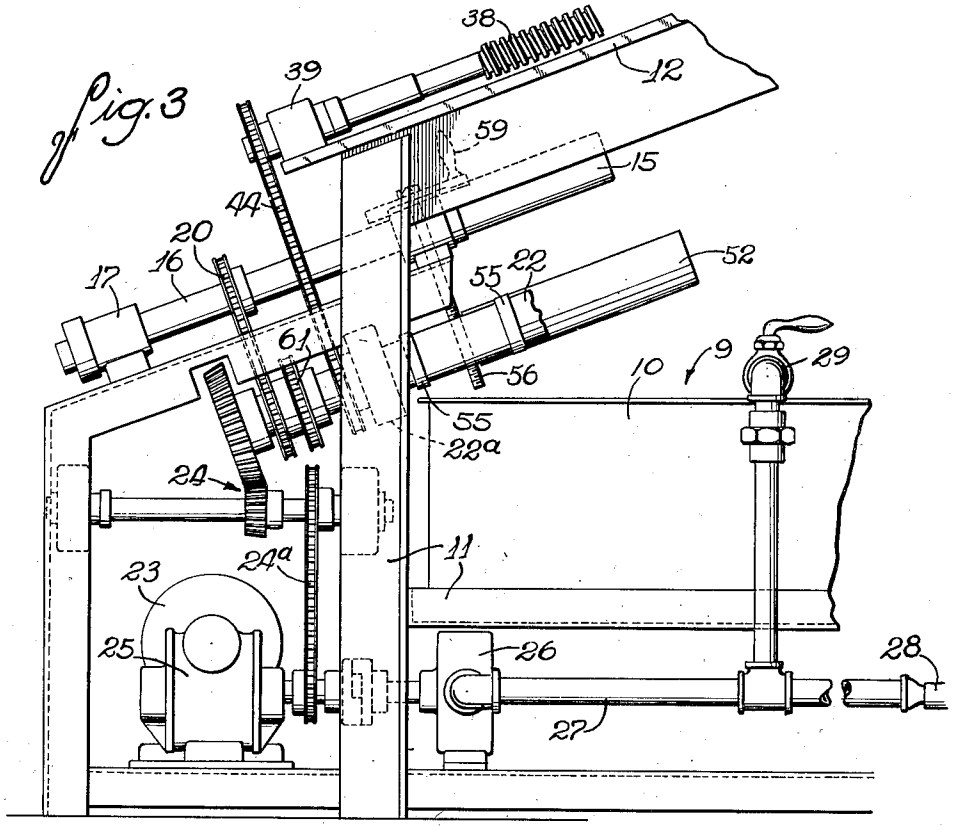


Fig. 4

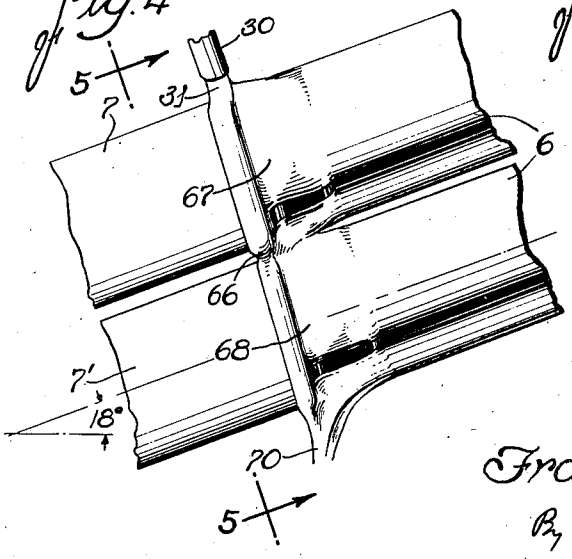
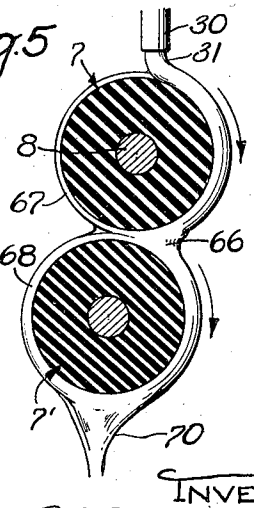


Fig. 5



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METHOD OF AND APPARATUS FOR SURFACING INKING ROLLS

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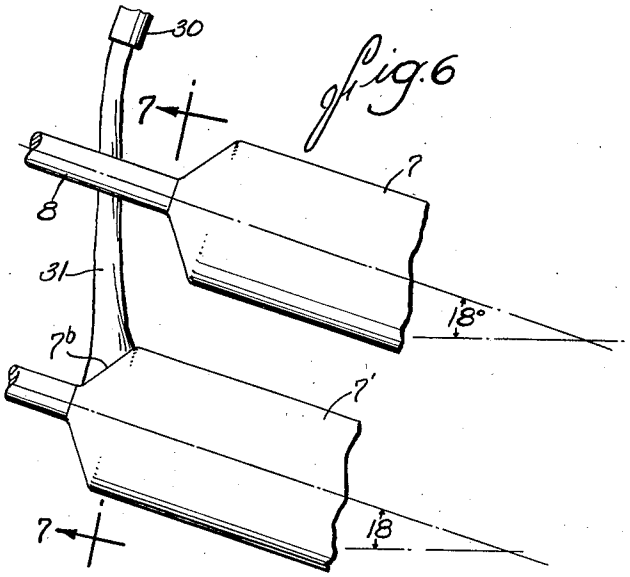

Fig. 6

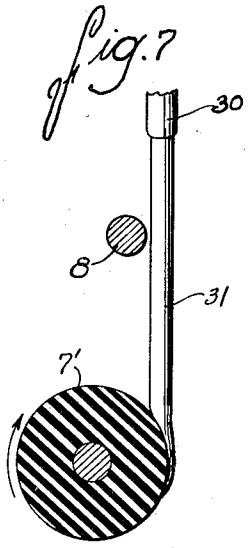

Fig. 7

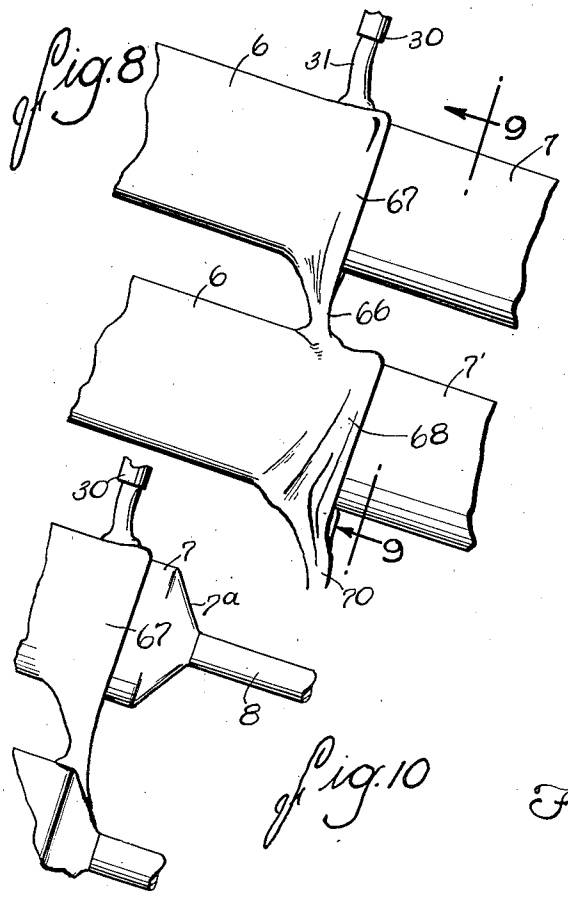

Fig. 8

Fig. 10

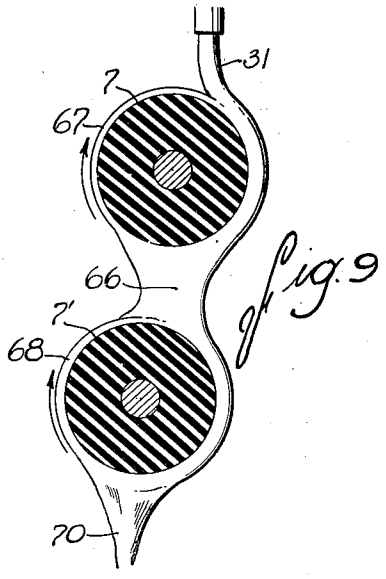

Fig. 9

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METHOD OF AND APPARATUS FOR SURFACING INKING ROLLS

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Fig. 11

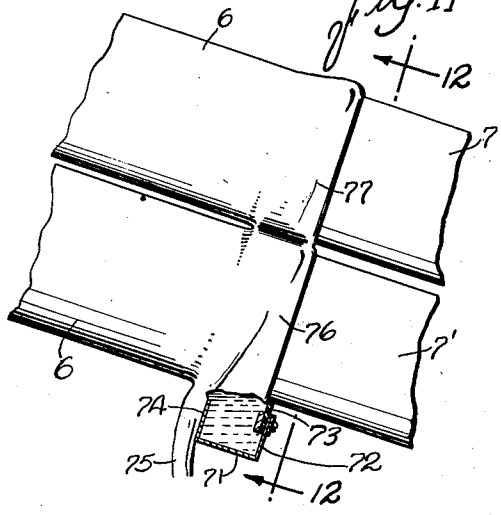


Fig. 12

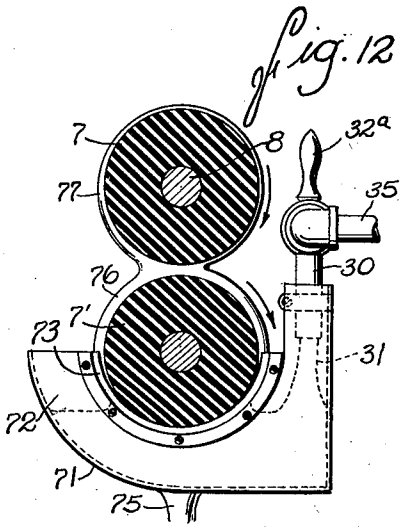


Fig. 13

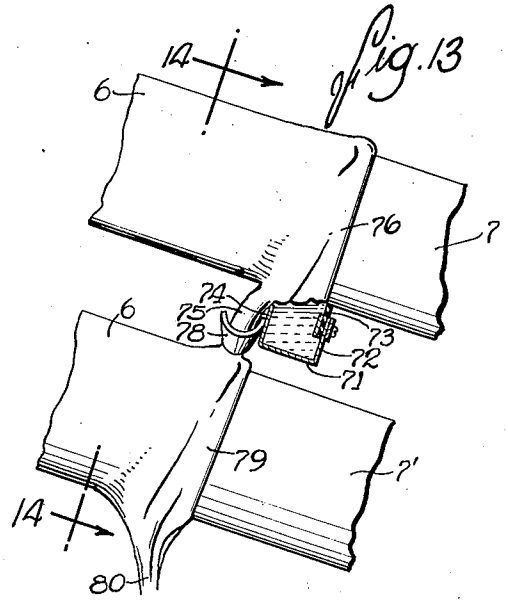
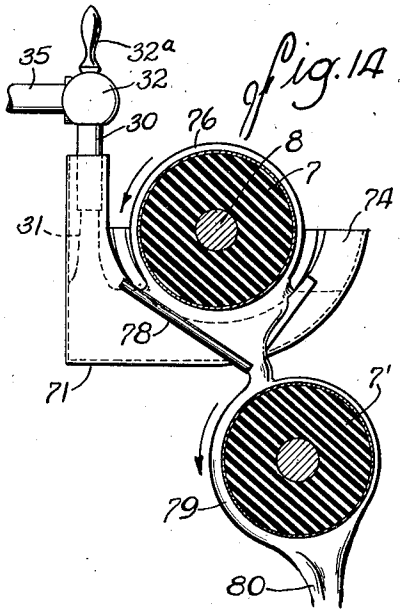


Fig. 14



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Patented Sept. 3, 1940 2,213,712

UNITED STATES PATENT OFFICE

2,213,712

METHOD OF AND APPARATUS FOR SURFACING INKING ROLLS

Frank H. Marshall, Chicago, Ill., assignor to Ideal Roller & Manufacturing Company, Chicago, Ill., a corporation of Illinois

Application August 9, 1937, Serial No. 158,037

13 Claims. (Cl. 91—43)

This invention relates to the surfacing of inking rolls for printing presses with a thin film of composition which congeals on cooling from a molten state and has more particular reference to a method and apparatus of the type in which the roller is rotated with its axis inclined and is coated by applying molten composition substantially in excess of the amount required to form the final surface film beginning at the upper end of the roller and progressing downwardly along the latter.

The primary object of the present invention is to increase the capacity of roller surfacing apparatus heretofore used through the provision of a novel method and apparatus by which a plurality of rollers may be coated simultaneously without the use of duplicate equipment.

A more detailed object is to provide a novel method and apparatus of the above general character by which a second roller may be surfaced simultaneously with the coating of a first roller by utilizing the excess of molten composition applied to and draining from the first roller.

The invention also resides in the novel construction of the apparatus which facilitates loading and unloading of the several rollers from the same side of the apparatus, which permits of adjustment of the apparatus to accommodate rollers of different diameters, and by which the number of added parts are reduced to a minimum.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

Figure 1 is a fragmentary perspective view of an apparatus for surfacing rollers in accordance with the present invention.

Fig. 2 is a detail section through a part of the nozzle drive mechanism.

Fig. 3 is a fragmentary side elevational view.

Fig. 4 is a fragmentary elevational view showing the flow of the molten composition during a coating operation.

Fig. 5 is a section taken along the line 5—5 of Fig. 4.

Figs 6, 8, and 10 are fragmentary elevational views showing different parts of the rollers during a coating operation.

Figs. 7 and 9 are fragmentary sectional views taken along the lines 7—7 and 9—9 of Figs. 6 and 8 respectively.

Fig. 11 is a view similar to Fig. 8 illustrating a modified method and apparatus.

Fig. 12 is a section taken along the line 12—12 of Fig. 11.

Fig. 13 is a view similar to Fig. 11 illustrating another modified method and apparatus.

Fig. 14 is a section taken along the line 14—14 of Fig. 13.

While the invention is susceptible of various modifications, I have illustrated in the drawings and will herein describe in detail the preferred embodiment and method of practicing 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 methods and constructions falling within the spirit and scope of the invention as expressed in the appended claims.

In the drawings, the invention is shown for purposes of illustration embodied in machines for applying a thin film 6 of molten printers' composition to the surface of a plurality of base rolls 7 and 7' each comprising a layer of rubber or the like carried by a shaft 8 the ends of which project beyond the rubber. Molten composition in a quantity sufficient to coat several rollers is contained in a tank 9 and heated to and maintained at a uniform temperature by a water jacket 10 to which heat is supplied in any suitable way. A mixture of water, glue and glycerine commonly known as printers' composition may be used to form the film 6. The temperature preferably employed is approximately 150 degrees Fahrenheit at which temperature such composition will flow very freely.

While being coated, the roller 7 is supported above the tank by a suitable framework 11 including an inclined rail or bar 12 supporting a laterally projecting arm 13 which is adjustable longitudinally of the roll to accommodate rollers of different lengths. The arm provides a bearing 14 for rotatably supporting the upper end of the roller shaft 8, the other end of which is received in a chuck 15 carried by and rotatable with a shaft 16 supported by the machine framework in a bearing 17. To permit of axial adjustment of the chuck 15, the latter is threaded onto the shaft 16 and locked in adjusted position by a nut 18. The shaft 16 carries a sprocket 19 driven through a chain 20 from a sprocket 21 loose on a shaft 22 and driven from a constant speed electric motor 23 through gears 24, a chain 24a, and suitable speed reduction mechanism 25.

Molten composition is withdrawn from the tank by a constant delivery gear pump 26 driven from the motor 23 and discharging the composition through a pipe 27 and a flexible hose 28, the rate of flow from the latter being regulated by a by-pass valve 29. The molten composition thus

delivered at a uniform rate is applied to the roller 7 by means of an applicator which, in the preferred form of the invention illustrated in Figs. 1 to 10, comprises a nozzle 30 disposed in vertical position with its lower end located a short distance above the roller so as to direct a stream 31 onto the roller surface. During a coating operation, the nozzle is preferably offset laterally from the center of the roller in the direction of movement of the upper surface of the roller so that the stream 31 strikes the downwardly moving surface as shown in Figs. 5 and 9. The nozzle is supported through a swivel joint 32 and may be swung laterally of the roller by moving a handle 32a. The joint communicates with a right angular extension 34 of a pipe 35 connected to the hose 28. The pipe extends through and is supported for axial adjustment by a lug 36 on a carriage 37 arranged to slide along the rail 12.

Extending through the carriage is a screw 38 rotatably supported in bearings 39 on the machine frame. A partial nut 40 slidably mounted on the carriage 37 is urged into engagement with the screw by a spring 41 and may be retracted and latched in disengaged position by manipulating a projecting knob 42. At its lower end, the screw carries a sprocket 43 driven through a chain 44 from a sprocket 45 rotatable with the sprocket 21.

While the motor 23 is running, the roller drive shaft 16 and the screw 38 will rotate in synchronism, and molten composition will be withdrawn from the tank and discharged from the nozzle 30 at a uniform rate of flow correlated with the speed of the roller drive shaft and screw. The arrangement is such that molten composition at a temperature of approximately 150 degrees will flow from the nozzle at the rate of approximately three and one-half gallons per minute, the roller will be turned at approximately sixty revolutions per minute, and the nozzle will be moved along the roller at approximately thirteen inches per minute when the carriage is connected to the screw. For a purpose to appear later, the bearing 14 and the chuck 15 are constructed to support the roller at an angle of approximately eighteen degrees to the horizontal.

The apparatus described above is adapted for the coating of one roller during each operating cycle which involves movement of the composition nozzle along the roller from the upper to the lower end thereof. To increase the production capacity of the apparatus without substantial duplication of parts, the present invention contemplates the coating of one or more additional rollers simultaneously by utilizing for this purpose the excess of molten composition which is applied to the first roller. Advantage is thus taken of the fact that this excess drains from the first roller in a well defined position, without appreciable reduction in temperature, and at a uniform rate of flow sufficient to provide the excess required to form a coating of the desired uniformity.

In the present instance, provision is made for coating one additional roller indicated at 7' and, in the preferred form of the invention, mounted beneath and adjacent the first roller to turn on an axis extending parallel to the latter. For this purpose, the upper end trunnion of the second roller is rotatably supported in a bearing 50 on the free end of an arm 51 which is splined on the shaft 22 which is journaled in bearings 22a on the machine frame for rocking movement. The arm 51 is thus adjustable longitudinally of the shaft 22 to accommodate rollers of different lengths. The lower end of the second roller is received in a chuck 52 on a shaft 53 which is journaled in bearings 54 on the free ends of arms 55 fast on the rock shaft 22.

By rocking the shaft 22 about its axis, the second roller may be moved bodily and vertically relative to the upper roller so as to permit rollers of different sizes to be positioned in the desired spaced relation. The adjusted position is maintained by a screw 56 which threads through a block 57 connecting the arms 55 and bears at its upper end against a part 58 on the machine frame. By turning a crank 59 on the screw, the lower roller mounting may be raised and lowered as desired.

The lower roller 7' is rotated at the same speed as the upper roller. To accomplish this in all positions of adjustment of the lower roller, a sprocket 60 rotatable with the sprockets 21 and 45 is connected by a chain 61 to a sprocket 62 fast on the shaft 53. The driving connection thus formed remains uninterrupted during pivotal adjustment of the lower roller.

In order that the composition will be applied to the lower roller at substantially the same point as to the upper roller, the former is offset horizontally from the latter in a direction opposite and substantially equal to that of the nozzle 30. With the rollers thus positioned as shown in Fig. 5, the stream 66 formed by the excess of molten composition draining from the under side of the upper roller will strike the downwardly moving portion of the lower roller surface. If desired, the mounting for one of the rollers may be constructed to permit of lateral adjustment so that the degree of offset between the two rollers may be changed as desired.

To avoid any detrimental effect that might result from the slight change in direction of the stream 66 which occurs when the stream reaches the extreme lower end of the cylindrical portion of the roller 7 and encounters the conical portion 7a, the lower roller is shifted in an axial direction relative to the upper roller as shown in Figs. 6 and 10 and in an upward direction. The extent of shift is such that the stream 66 passes the lower end of the cylindrical portion of the lower roller and encounters the conical end portion thereof before the stream reaches the lower cylindrical end of the upper roller.

During a coating operation, the two rollers may be supported only a fraction, for example one-half or more, of an inch apart as illustrated in Figs. 4 and 5 or several inches as shown in Figs. 6 to 10.

Preparatory to coating, the two rollers are loaded onto their respective bearing supports and, by turning the crank 59, the lower roller is raised to the desired position adjacent the upper roller. The nozzle carriage is then slid along the rail 12 to the upper end of the rollers and, by operation of the motor 23, molten composition is circulated for a brief interval through the circulating system with the nozzle discharging directly into a trough 64 above the tank. Then, the nut 40 is engaged with the screw 38.

To initiate the operation proper, the operator swings the handle 32a to position the stream 31 closely adjacent the shaft of the upper roller and thereby directs molten composition onto the conical upper end portion 7b of the lower roller as illustrated in Fig. 6. As the nozzle advances, the stream next encounters the conical portion of the upper roller and then reaches the cylindrical portion or roller proper whereupon the

stream 66 begins to form. The large excess of molten composition which is thus applied assumes the form of a thick collar 67 which encircles the roller adjacent the point of application to the roller and progresses downwardly therealong due to natural drainage induced by virtue of the inclination of the roller. The roller surface is thus heated uniformly so that the film 6 which is retained by continued drainage and congeals gradually upon cooling is of accurate uniformity in thickness. All of the excess which would otherwise fall from the under side of the collar 67 is transferred onto the lower roller in the form of the stream 66 and forms a similar thick collar 68 around this roller adjacent the point of application. When the two rollers are spaced close together as shown in Figs. 4 and 5, the two collars 67 and 68 are in peripheral contact with each other through a short distance. With either a close or more remote spacing of the rollers, the stream 66 will form in a position such that most of the molten composition will strike the lower roller at a point offset from the center and on a downwardly moving portion of the surface as shown in Figs. 5 and 9. The collar 68 progresses down along the lower roller in the same way as the collar 67 and, by drainage of the excess from the lower roller, a thin film is retained and finally congeals thereon.

Before the nozzle 30 reaches the lower end of the upper roller, the stream 66 will have passed the lower end of the roller 7' and encountered the tapered portion 7^a thereof. In this way, coating of the lower roller is completed by the time the tapered portion of the upper roller is reached by the stream 66. Any change in the direction of the latter has no effect on the uniformity of the film retained on the lower roller.

With the parts arranged as described above and under the preferred conditions of composition flow, roller rotation, and nozzle travel above set forth, the collars 67 and 68 move downwardly in unison with each other and with the nozzle 30, and there is no substantial run-down of the molten composition on either roller surface ahead of the collars proper. As a result, the flow of molten composition onto the roller surfaces is controlled accurately, and each unit area is heated with the uniformity required for the formation of a finished film of uniform thickness. This advantageous action and the elimination of objectionable run-down of the molten composition are obtained in part by the use of composition in a very fluid state resulting from heating to approximately 150 degrees and by inclining the rollers at a smaller angle, such as eighteen degrees, than that employed heretofore. In addition, the streams 31 and 66 are applied to downwardly moving portions of the roller surfaces thereby reducing the tendency of the stream to spread out on the surface adjacent the point of initial contact. The amount of horizontal offset between the composition streams and the axes of the respective rollers is correlated with the other factors mentioned above and is sufficient to avoid running down of the molten composition more than the short distance shown ahead of the point of application to the roller surface.

It will be observed from the foregoing that all of the molten composition which would otherwise drain along and fall from the under side of the upper roller is transferred to the lower roller shortly after its discharge from the nozzle. Thus, molten composition in the desired excess and flowing at a uniform rate is applied to the lower roller without appreciable reduction in temperatures and at a point which progresses down the latter at a uniform rate. Accordingly, the composition is applied at a uniform temperature, at a uniform rate of flow, and at a point which travels at a uniform rate along the roller which is rotated at a uniform speed. All of these four factors contribute to the formation of a final film of accurate uniformity in thickness on the lower roller.

It will be observed that coating of the second or lower roller in the manner above described is affected without the interposition of any parts between the rollers, the two being mounted in a manner such that all of the composition draining from the first roller is applied at the proper point on the second. Similarly, no means is required for eliminating objectionable run-down of the composition ahead of the points of application to the roller. Thus, the production capacity of coating apparatus of the type used heretofore has been multiplied substantially two-fold merely by the addition of mechanism for supporting and rotating the second roller. The present arrangement of the parts is also advantageous in that both rollers may be loaded into and unloaded from the machine by an operator standing on one side thereof. Handling of the rollers is thus facilitated and a minimum of floor space is required.

The excess of the composition applied to the lower roller falls from the under side of the collar 68 as indicated at 70. In the present instance, this is caught by the trough 64 and is returned to the tank. It will be apparent, however, that this excess may, if desired, be utilized for surfacing a third roller in the same manner that the second roller is coated by the excess from the first. In this way, a further increase in the capacity of the machine may be obtained.

It is contemplated that the molten composition may be applied to one roller and the excess transferred to another in various other ways. For example, as shown in Figs. 11 to 14, the composition flowing from the nozzle 30 may be discharged upwardly against the under side of one roller. To this end, an upwardly opening trough 71 may be arranged to underlie and partially encircle one roller. Herein, the trough is clamped to the end of the nozzle 30 so as to move with the carriage 37 and receives the molten composition discharged from the nozzle. Attached to the forward side wall 72 of the trough is a strip 73 of flexible material such as rubber which bears against the roller surfaces and prevents molten composition in the trough from overflowing in a direction downwardly along the roller. The other wall 74 curves around the roller surface but is spaced therefrom so that the composition may overflow upwardly along the under side of the roller and form a stream 75, the composition in the trough always being maintained at a level substantially above the under side of the roller. Since the ends of the trough are open, some of the molten composition discharged upwardly against the under side of the roller adheres and forms a thick collar 76 around the roller. The composition thus applied drains down along the roller following the movement of the trough leaving the thin film 6 which congeals upon cooling.

In the form of the invention illustrated in Figs. 11 and 12, the trough 71 is disposed below the lower roller 7' and the latter is, by adjustment of its supports, disposed in such close proximity to the upper roller that the collar 76

will contact the surface of the latter. In this way, a quantity of molten composition substantially in excess of that required to form the final film will be transferred to the surface of the roller 7 and will assume the form of a collar 77. Drainage of this collar down along the roller results in the formation thereon of the thin final film. When the second roller is coated in this manner, it should, of course, be supported with the ends of its cylindrical surface disposed directly opposite the ends of the surface of the first roller.

Another method of simultaneously coating a second roller is to utilize the excess of molten composition overflowing from the trough 71. This method, which is illustrated in Figs. 13 and 14, involves mounting the second roller 7' beneath the roller 7 and directing the stream 75 onto the surface of the former roller. For this purpose, the roller 7' may be mounted directly beneath the roller 7 or, an auxiliary trough 78 may be attached to the wall 74 and arranged to lead the stream 75 to the desired point of application on the lower roller. The molten composition thus discharged onto the lower roller forms a thick collar 79 which moves downwardly along the roller and results in the formation of the final film in the manner previously described, the excess falling as a stream 80 from the under side of the roller.

I claim as my invention:

1. Apparatus for coating inking rollers with printers' composition having, in combination, means rotatably supporting a roller to be coated in inclined position, means rotatably supporting a second roller adjacent the first roller to turn about an axis substantially parallel to and disposed beneath the first roller, an applicator mounted for movement along the rollers for flooding molten composition onto the upper one of the rollers whereby to form a thick collar of composition thereon, a quantity of such composition draining from the under side of the upper roller being transferred to the second roller to form a similar thick collar of molten composition thereon, means for rotating said rollers in unison, and means for moving said applicator from the upper to the lower end of the rotating rollers.

2. Apparatus for coating inking rollers with printers' composition having, in combination, means rotatably supporting a roller to be coated in inclined position, means rotatably supporting a second roller adjacent the first roller to turn about an axis substantially parallel to the latter, an applicator mounted for movement along the roller for applying a quantity of molten composition to each unit area of one roller substantially in excess of that required to form a film of the desired thickness, means for rotating said rollers, and means for moving said applicator from the upper to the lower end of the rotating rollers, the excess of composition applied to the first roller assuming the form of a thick collar encircling the first roller and a portion of said excess being transferred to the second roller to form a similar collar thereon, the inclination of said rollers being such that said collars progress in unison down along the rollers with said applicator and without substantial run-down of the composition ahead of the applicator.

3. Apparatus for coating inking rollers with printers' composition having, in combination, means rotatably supporting a roller to be coated in inclined position, a support for a second roller mounted to swing about an axis extending longitudinally of the first roller whereby to permit of bodily adjustment of the second roller toward and into close proximity to the first roller, means for rotating said first roller and simultaneously rotating the second roller in all of its different positions of adjustment, and an applicator movable longitudinally of said rollers and operable to flow molten composition onto one of said rollers in excess of the amount required for coating the latter, the excess being transferred onto the second roller for coating the latter.

4. Apparatus for coating inking rollers with printers' composition having, in combination, means rotatably supporting a roller to be coated in inclined position, means rotatably supporting a second roller to turn about an axis substantially parallel to the first roller and disposed so that at least some of the excess of molten composition applied to one roller will be transferred to a corresponding portion of the other roller, an applicator mounted for movement along the roller for applying a quantity of molten composition to each unit area of one roller substantially in excess of that required to form a film of the desired thickness, the second roller being coated simultaneously by the excess of composition so applied, means for rotating said rollers simultaneously, and means for moving said applicator from the upper to the lower end of the rotating rollers.

5. Apparatus for coating inking rollers with printers' composition having, in combination, means rotatably supporting a roller to be coated in inclined position, an applicator mounted for movement lengthwise of said roller for directing a stream of molten composition onto a downwardly moving portion of the roller which portion is offset horizontally from the roller axis, means supporting a second roller to be coated to turn about an axis extending parallel to the first roller and disposed therebelow so that all of the excess of molten composition draining from the under side of the first roller will be directed onto a downwardly moving portion of the second roller surface offset horizontally from the center of the second roller, means for rotating said rollers in unison, and means for moving said applicator from the upper to the lower end of the first roller.

6. Apparatus for coating a roller with printers' composition having, in combination, means rotatably supporting the roller in inclined position, means rotatably supporting a cylinder to turn about an axis substantially parallel to said roller with the adjacent sides disposed in close proximity whereby the collar of molten composition formed by the excess applied to said cylinder will contact the second roller and form a similar collar thereon, means for supplying molten composition onto said cylinder to form said first mentioned collar thereon whereby the latter moves progressively from the upper to the lower end of said roller, and means for rotating said roller and cylinder.

7. The method of coating inking rollers with a thin film of printers' composition comprising supporting a plurality of rollers to turn about substantially parallel axes inclined relative to the horizontal with the peripheral surfaces of the rollers disposed so that the excess of molten composition applied to one roller will drain off onto the other roller, rotating the rollers, directing onto one of said rollers a stream of molten composition to apply to each unit area of the roller surface a quantity of composition many times in excess of that required to form a film of the desired thickness, and relatively moving said stream

and said rollers lengthwise of said axes beginning at the upper end thereof whereby to subject the entire roller surface to said stream, the excess of molten composition draining from said one roller onto a corresponding portion of the other roller.

8. The method of coating inking rollers with a thin film of printers' composition comprising supporting a plurality of rollers to turn about substantially parallel axes inclined relative to the horizontal and with the adjacent portions of the rollers disposed in close proximity so that a collar of molten composition formed on one roller will engage a corresponding portion of the other roller, rotating the rollers in unison, directing onto one of said rollers molten composition flowing at a rate sufficient to form a collar of composition which progresses down along the roller, relatively moving said rollers and the point of application of composition lengthwise of said axes beginning at the upper end thereof whereby to subject the entire surface of one roller to an excess of molten omposition, the other roller being similarly coated by the excess of molten composition applied to the first roller.

9. The method of coating rollers with a film of printers' composition which comprises rotating a plurality of rollers with the latter supported one above the other and inclined to permit of natural drainage of molten composition from the surface of one roller onto the surface of the other roller at a point offset laterally from the roller center, and directing a stream of molten printers' composition onto the first roller at a point similarly offset from the roller center, advancing the stream progressively from the upper to the lower end of the first roller, said other roller being simultaneously coated by the excess of composition draining from the first roller.

10. Apparatus for coating inking rollers with printers' composition having, in combination, means rotatably supporting a roller to be coated in inclined position, means rotatably supporting a second roller to turn about an axis extending substantially parallel to the first roller and disposed therebelow so that all of the excess of molten composition draining from the under side of the first roller will be directed onto a substantially corresponding longitudinal portion of the other roller, means for rotating said rollers in unison, an applicator mounted for movement lengthwise of said rollers for directing a continuous stream of molten composition onto the upper roller, the rate of flow being such that the amunt of composition applied to each unit area is substantially in excess of that required to form a film of the desired thickness, the second roller being coated simultaneously with the first roller by the excess of composition draining from the under side thereof, and means for moving said applicator from the upper to the lower end of the rotating rollers.

11. Apparatus for coating inking rollers with printers' composition having, in combination, means rotatably supporting a roller to be coated in inclined position, means rotatably supporting a second roller below and substantially parallel to the first roller but offset relative thereto both laterally and longitudinally whereby the excess of molten composition draining from the under side of the first roller will be directed onto the other roller and the upper end of the lower roller projects beyond the upper roller, means for rotating said rollers in unison, an applicator mounted for movement lengthwise of said rollers for directing a stream of molten composition onto said rollers substantially in excess of that required to form a film of the desired thickness, and means for moving said applicator from the upper to the lower end of the rotating rollers along a path such that the stream first strikes said projecting end of the lower roller and then contacts the upper roller and travels throughout the length of the latter, the remaining portion of the lower roller being coated simultaneously by the excess of composition draining from the under side of the upper roller.

12. Apparatus for coating inking rolls with a composition which congeals on cooling from a molten state having, in combination, means rotatably supporting a roller to be coated in a position inclined relative to the horizontal to permit of natural drainage of molten composition lengthwise thereof, means rotatably supporting a second roller adjacent to and inclined in the same direction as said first roller and positioned for the transfer onto successive portions of the second roller the excess of molten composition initially applied to the corresponding portions of the first roller, an applicator mounted for movement along the rollers and operable to apply molten composition onto the first roller progressively from the upper to the lower end thereof in an amount substantially in excess of that required to form a finished film of a desired thickness on both of said rollers.

13. The method of simultaneously coating a plurality of rollers with films of printers' composition comprising rotating a plurality of rollers about their longitudinal axes with the latter inclined in the same direction relative to the horizontal to permit of natural drainage of molten composition lengthwise of the rollers, flowing molten composition onto one of said rollers progressively from the upper to the lower end thereof in an amount substantially in excess of that required to form the finished films on both of said rollers, and transferring the excess of molten composition applied to successive portions of said first roller to corresponding portions of the other roller progressively from the upper to the lower end of the latter.

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