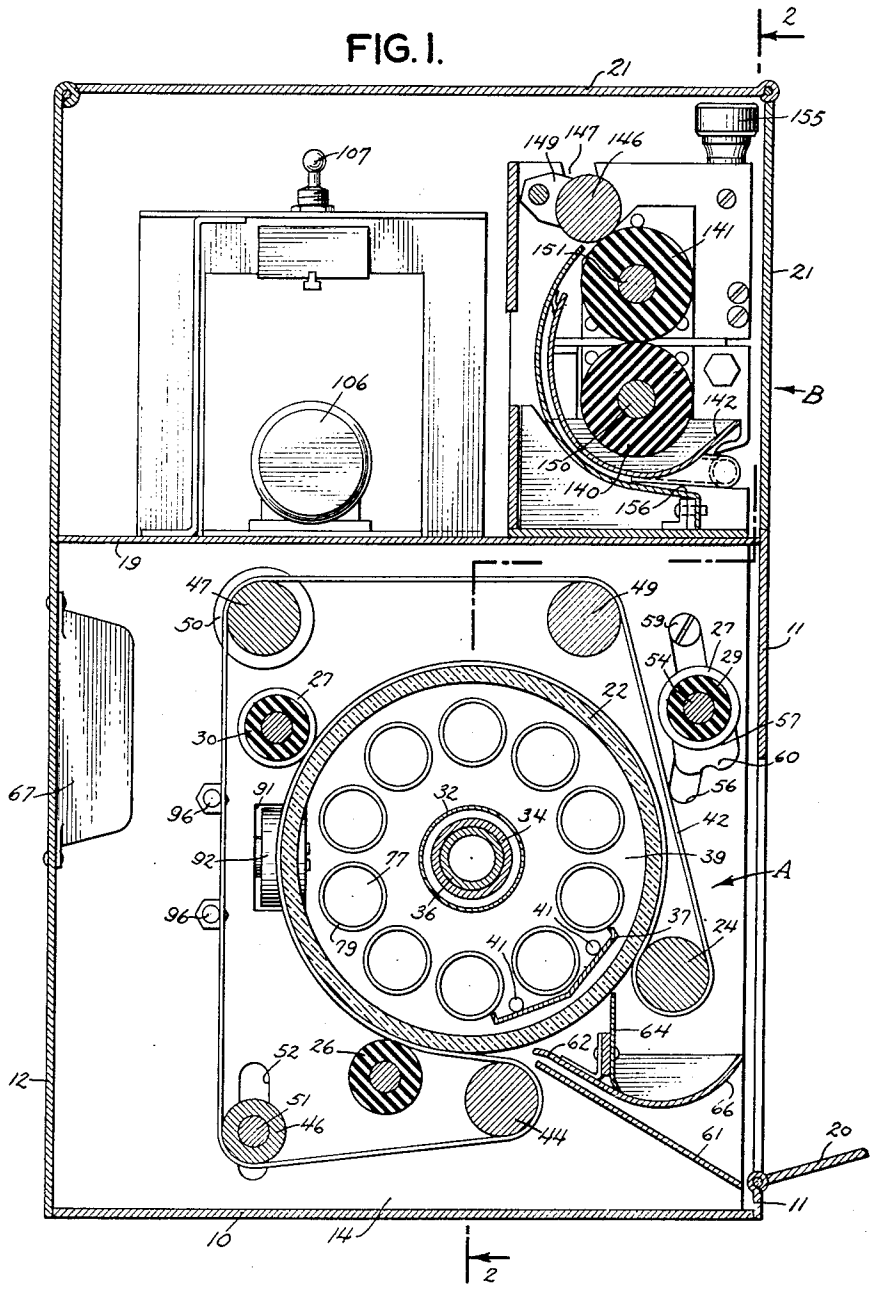
July 3, 1951 J. HRUBY 2,559,159

REMOVABLE LAMP ASSEMBLY FOR PRINTING AND DEVELOPING APPARATUS

Filed June 22, 1948 4 Sheets-Sheet 1

FIG. 1.



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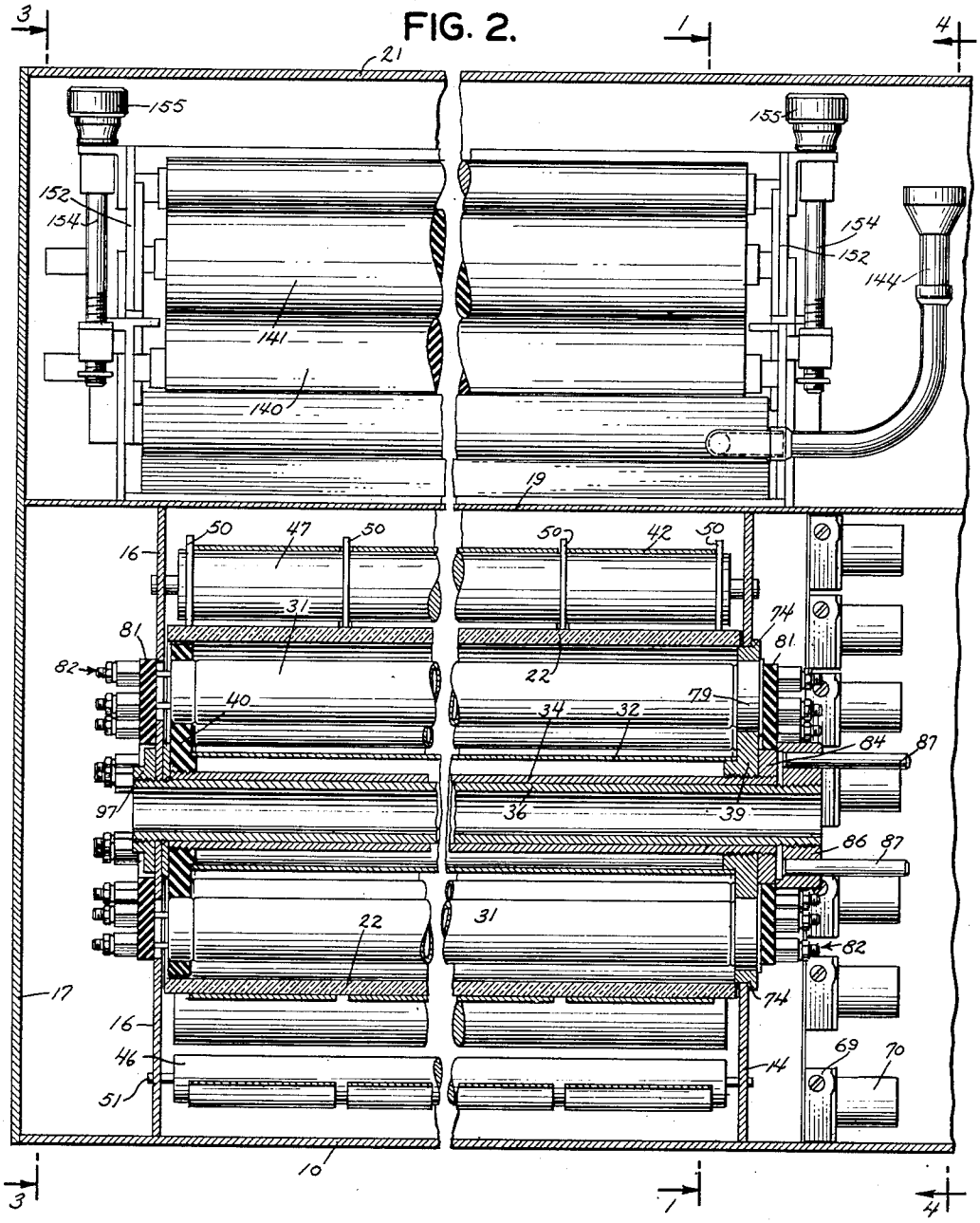
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REMOVABLE LAMP ASSEMBLY FOR PRINTING AND DEVELOPING APPARATUS

Filed June 22, 1948 4 Sheets-Sheet 2

FIG. 2.



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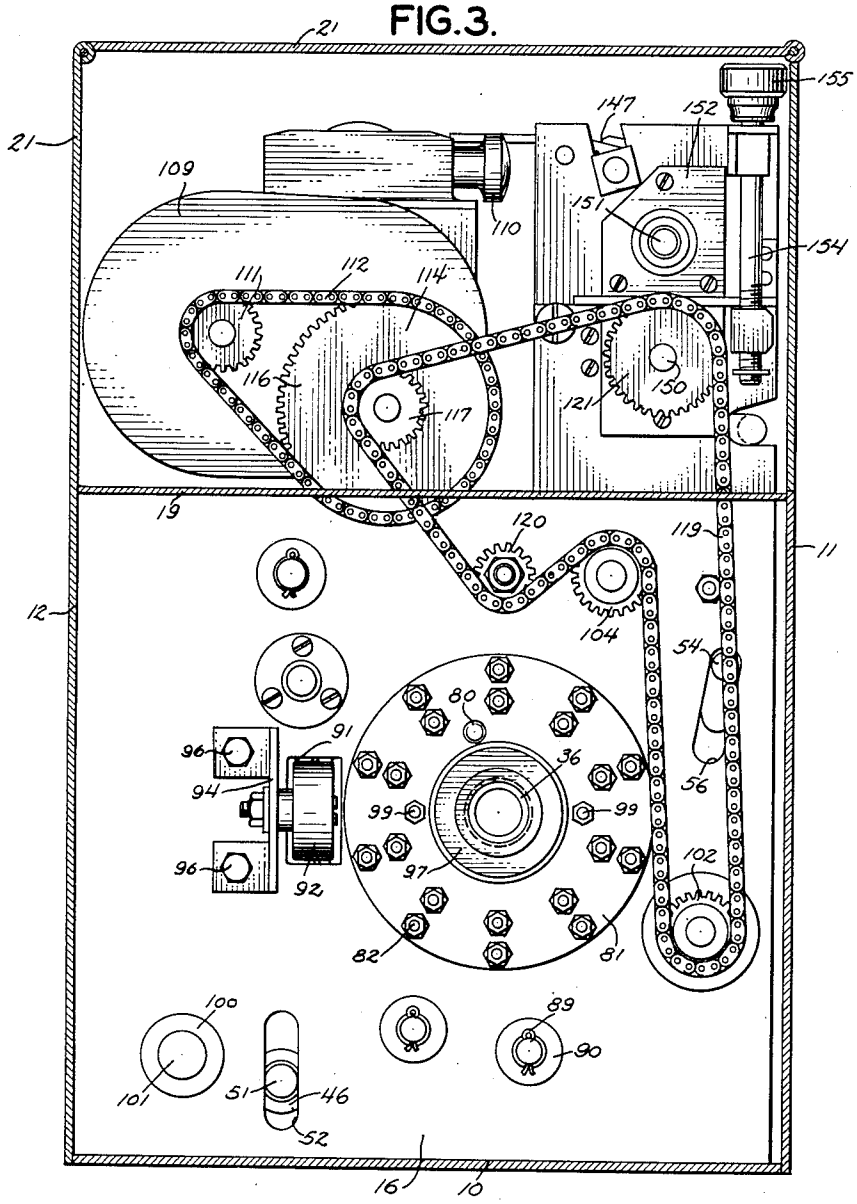
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REMOVABLE LAMP ASSEMBLY FOR PRINTING AND DEVELOPING APPARATUS

Filed June 22, 1948 4 Sheets-Sheet 3

FIG.3.



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REMOVABLE LAMP ASSEMBLY FOR PRINTING AND DEVELOPING APPARATUS

Filed June 22, 1948 4 Sheets-Sheet 4

FIG. 4.

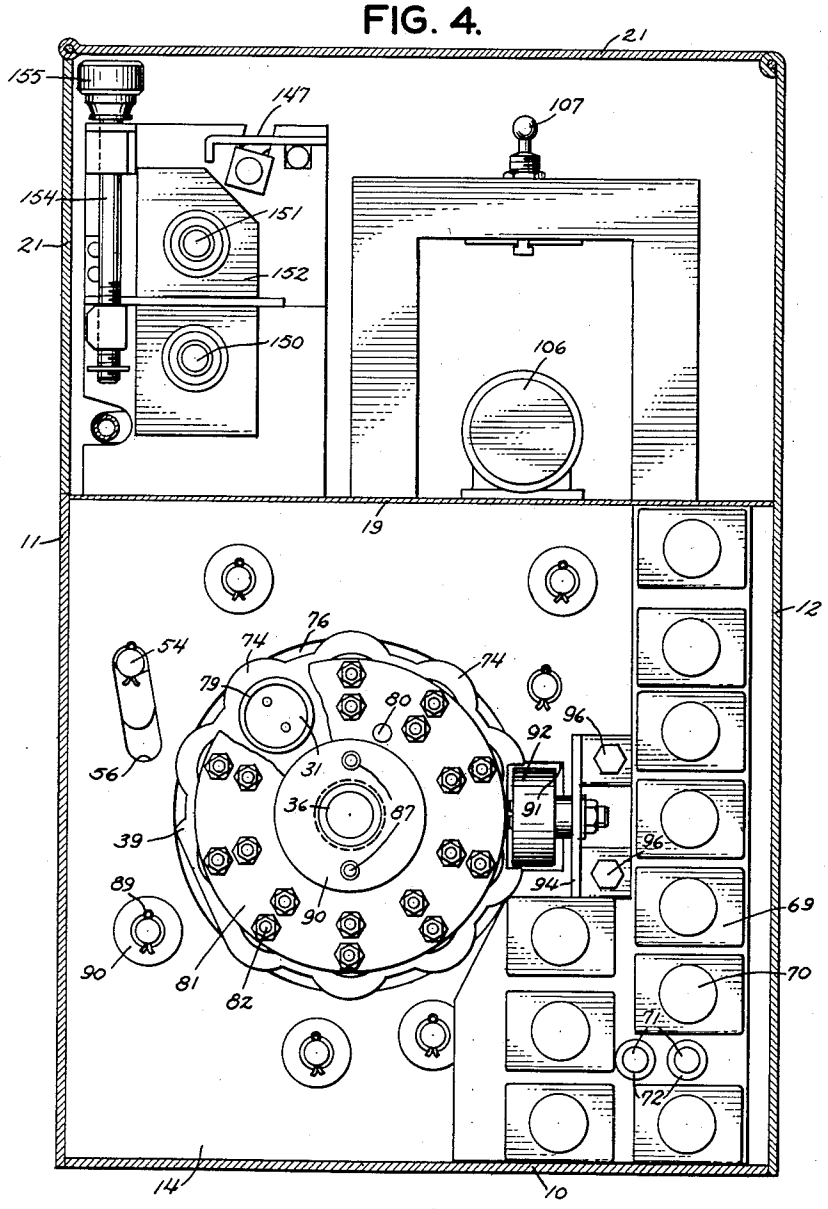
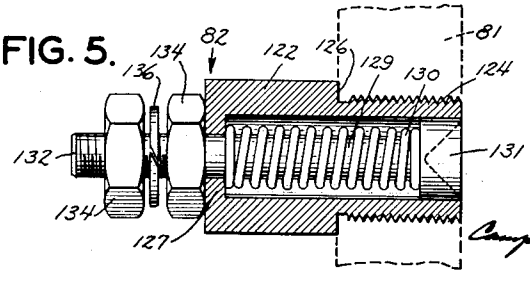


FIG. 5.



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2,559,159

UNITED STATES PATENT OFFICE

2,559,159

REMOVABLE LAMP ASSEMBLY FOR PRINTING AND DEVELOPING APPARATUS

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Application June 22, 1948, Serial No. 34,526

1 Claim. (Cl. 240—11.4)

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This invention relates to improvements in printing and developing devices for the reproduction of transparencies and more particularly to a novel lamp supporting structure and a novel socket assembly in the printing portion of such devices.

One object of the invention is to provide a device for reproducing transparencies at high speed that is extremely rugged and compact and therefore portable and suitable for use in the field.

Another object of the invention is to provide a structure that is capable of supporting a cluster or plurality of lamps in a manner that permits collective or individual removal or replacement of the lamps.

Still another object of the invention is to provide a socket assembly having, among many other advantageous features, an extremely small diameter that is capable of engaging, in an electrically conductive manner, an electrical terminal of a lamp without requiring a twisting or turning of the lamp to lock it in place.

One of the improvements in printing and developing machines forming a part of this invention is an arrangement for supporting a cylinder of light transmitting material for rotation in the printing portion of the machine. At least three retaining rollers having resilient surfaces are spaced around and disposed parallel and adjacent to the periphery of the cylinder to prevent lateral or vertical displacement thereof. At least one side roller, with its axis of rotation substantially perpendicular to the axis of rotation of the cylinder, is provided for rolling engagement with each end of the cylinder to prevent axial displacement thereof.

Among the advantages of this improvement are the non-necessity for a central axle or spindle to support the cylinder for rotation and the prevention of injury to the cylinder due to the sudden shocks to which a portable machine is inevitably subjected during transport and while in use in the field.

Another of the improvements forming a part of this invention is in making adjustable the pressure of contact between the rolls conveying the developing liquid to an exposed print. This embodiment of the invention includes a pair of adjusting screws or the like suitably mounted upon supports for the developer conveying rolls which, when turned, increase or decrease the pressure between the rolls or separate the peripheral surfaces thereof.

This improvement has the advantages, among

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others, or providing means for regulating the thickness of the film of developing agent applied to exposed prints and for avoiding the formation of flats on the peripheries of the rolls due to pressure between them when they are not in use for any considerable period of time.

The novel lamp supporting structure of this invention includes a pair of spaced disk-like members having perforations suitable for the reception of the ends or bases of elongated lamps. In the preferred form, the disk-like members are mounted at opposite ends of a tubular member that is slidable over a fixed supporting shaft.

This structure has a number of advantages in that it provides an assembly capable of securely supporting a plurality or cluster of elongated lamps, it is adapted to be securely supported within a cylinder without touching it, permits the removal or replacement of the lamps individually or collectively and, when used in a printing machine, affords easy access to the interior of the light transmitting cylinder thereof.

The novel socket assembly of this invention includes a tubular element of small diameter adapted to be supported in any suitable supporting structure and having slideable within it a spring-biased conductor member, one end of which is formed to engage resiliently the prong or base pin of a lamp and the other end of which is adapted to be connected to a source of electrical energy.

The advantages of this socket assembly are numerous. The small diameter of the assembly makes it possible to crowd elongated lamps together to such an extent that they may actually touch, to provide an individual socket assembly for each prong of an elongated lamp having as many as four prongs, two on each end, and to simplify individual removal or replacement of a socket assembly or lamp. The resilient engagement feature of the socket assembly obviates the necessity for holding or twisting the lamp to lock it into operating position and automatically allows for variations in the lengths of the lamps. Furthermore, when a plurality of socket assemblies are utilized to transmit electrical energy to a cluster of lamps, it is feasible to connect one terminal of each lamp to a common lead by means of a bus bar or the like that may, for example, be in the form of a ring stamped from thin and flexible metal.

As a result of the combination of the various aspects of this invention, the machine as a whole has a number of remarkable advantages. The

constructions of the socket assemblies and of lamp supporting assembly combine to make possible the shock resistant support within the printing cylinder of a cluster of closely spaced lamps, all of which combine to generate a source of light that is of sufficiently high intensity to permit printing at high speeds and the failure of one or several of which will not necessitate an immediate interruption of printing operations.

These and other advantages, as well as the utility of the invention, will become more apparent from the following description with reference to the accompanying drawing illustrating one specific embodiment exemplary of the invention.

In the drawing:

Figure 1 is a sectional view in elevation taken along section line 1—1 of Figure 2, the lamps being not shown for clarity of illustration;

Figure 2 is a sectional front view in elevation taken along section line 2—2 of Figure 1;

Figure 3 is an end view in elevation of the right side of the machine taken along section line 3—3 of Figure 2;

Figure 4 is an end view in elevation of the left side of the machine taken along section line 4—4 of Figure 2; and

Figure 5 is a detailed sectional view of a lamp socket sub-assembly.

General arrangement of the apparatus

As shown in Figures 1 to 4, the apparatus of this invention is housed in a casing having a base 10, a front wall 11, a rear wall 12, two inner side walls 14 and 16 and outer side walls 17. A partition 19 separates a printing chamber A and a developing chamber B. The front wall 11 is provided with a hinged door 20, the front and top of the developing chamber B is provided with a hinged cover 21 and the two outer side walls 17 and the rear wall 12 are provided with removable cover plates to permit access to the interior of the machine.

The printing section

Referring now particularly to the printing section A illustrated in Figures 1–4, a cylinder 22 of light transmitting material, such as glass, is supported for rotation in a fixed axial position on a drive roll 24 and a retaining or supporting roll 26. It is maintained against displacement from its axial position by means of resilient and peripheral protuberances 27 on shock or retaining rolls 29 and 30 as described hereinafter. Inside the cylinder 22 there is mounted a cluster of ten elongated lamps 31 surrounding a reflector 32 which in turn surrounds a tubular member in the form of a collar shaft 34 concentric with and slidable upon a fixed center support shaft 36. A shield 37 is secured to two disk-like lamp brackets 39 and 40 by means of retaining pins 41 as shown.

A plurality of bands 42 are trained around the greater portion of the glass cylinder 22 by means of a lower band roll 44, a take-up roll 46, a spacer roll 47, a front band roll 49 and drive roll 24. The spacer roll 47 is provided with a number of upstanding flanges 50 to maintain the proper distance between adjacent belts 42 and to prevent creep thereof to one side or the other.

The ends of the shaft 51 of the take-up roll 46 are mounted in vertical slots 52 in each of the inner end walls 14 and 16 to take up any slack that might develop in the bands 42. The ends of the shaft 54 of the front shock roll 29 are likewise mounted in slots 56 in the inner side walls 14 and 16. During normal operation the roll 29 is retained out of contact with the glass cylinder 22 and the bands 42 by means of a hook 57 pivotally secured to the inner side walls with a shoulder screw 59 or the like. The rounded lower end 60 of the hook 57 and the lower extremities of the slots 56 are so shaped that when the shaft 54 of the front shock roll 29 is released from the hooks, the lower rounded ends 60 of the hooks will force the ends of the shaft 54 against the lower extremities of the slots 56 to bring the protuberances 27 on the roll 29 into pressing contact with the belts 42 and thereby prevent the glass cylinder 22 from being displaced upwardly from its normal position when the machine is subjected to the shocks inevitably encountered during transport.

Toward the bottom of the front of the machine there is disposed a feed and return tray comprising feed guide plates 61 and 62, a scraper 64 and a return tray 66.

At the rear of the machine there are a plurality of ballasts 67, one for each lamp 31 within the glass cylinder 22.

The inner side wall 14 at the left side of the machine, as shown in Figure 4, is provided with a plurality of starter sockets 69 upon which starters 70 for the lamps 31 are mounted, the starters being wired in the conventional manner to the ballasts 67. Two apertures 71, surrounded by insulating grommets 72 are provided at any suitable location, such as that shown in Figure 4 for the passage of electrical wiring.

Lamp bracket 39 is mounted upon or, if desired, integral with shaft 34. It is provided with recessed shoulders 74 for abutting engagement with the rim of a substantially circular opening 76 in the inner side wall 14. The bracket 39 has ten openings or recesses 77 each provided with an insulating grommet 79 having an internal diameter just sufficient to accommodate the base of a lamp 31, and a protruding locating pin 80.

Adjacent the lamp bracket 39, there is a lamp socket holder 81 of any stiff insulating material such as fiber board that is provided with ten pairs of perforations to accommodate twenty socket assemblies 82 and an additional perforation to accommodate the locating pin 80 protruding from the lamp bracket 39. This socket holder 81 has a central aperture enabling it to clear the periphery of a lock nut 84 and is held against the lamp bracket 39 by means of an outer lock nut 86 that screws onto the threaded end portion of the central supporting shaft 36 and is easily manipulated by grasping two projecting stud members 87.

The various rollers within the printing section A are rotatably secured at the left end to the inner side wall 14 by any suitable means such as cotter pins 89 and washers 90. A rectangular opening 91 in the inner side wall 14 is provided to accommodate a portion of the periphery of a side roller 92 mounted for rotation on an angle iron 94 secured to the inner side wall 14 by any suitable means such as bolts 96. The periphery of the side roller 92 engages the left end of the glass cylinder 22.

Referring now to Figure 3, which illustrates the right side of the machine, the inner side wall 16 has rigidly affixed thereto a collar 97 which in turn supports the central supporting shaft 36. A second socket holder 81 is secured to the inner

side wall 16 by any suitable means such as nuts and bolts 99.

Rollers 26, 30, 44, 47 and 49 are secured to the inner side wall 16 on the right side of the machine in the same fashion as they are on the left side and a second side roller 92 projecting through a rectangular opening 91 in the inner side wall 16 is likewise mounted for rotation on an angle iron 94 secured to the inner side wall by any suitable means such as bolts 96. A slot 52 is provided to accommodate one end of the shaft 51 of the take-up roll 46 and a second slot 56 is provided to accommodate one end of the shaft 54 of the front shock roll 29.

An insulating bushing 100 is provided to surround an opening 101 and for the passage of electrical wiring from the rear of the machine to the socket assemblies 82.

The belts 42 are driven by means of drive roller 24 having a sprocket 102 at the right end thereof. The glass cylinder 22 is rotated by friction with the belts 42. Power from an electric motor 106 actuated by a starter switch 107 is transmitted to roller 24 by way of a variable speed transmission 109 controllable by means of a control knob 110, and having an output sprocket 111, a sprocket chain 112, an idler gear 114 having sprockets 116 and 117, and a sprocket chain 119 which passes under and over two idler sprockets 120 and 104, respectively, as well as under the sprocket 102 and over a sprocket 121.

The socket assembly

Referring now to Figure 5, each of the forty socket assemblies 82 in the socket holders 81 include a tubular element 122 having an open end that is threaded at 124, a shoulder portion 126 and, at the other end, an inwardly turned flange 127. A threaded conductor or stud member 129 of electrically conductive material is slidable within the tubular element 122 and is spring-biased by coil spring 130 to move toward the open or threaded end 124. The spring 130 abuts at one end against a conical prong or base pin engaging element 131 and at the other end against the inwardly turned flange 127. The threaded end 132 of the conductor member 129 is provided with a pair of hexagonal nuts 134 and a lock washer 136.

The lamp socket assemblies 82 are fixed to the socket holders 81, shown in phantom, by screwing the threaded ends 124 into the holders until the shoulder portions 126 engage the surface of the socket holder. The terminal or threaded ends 132 of the stud members 129 may conveniently be connected in series or parallel by means of a bus bar or wires and the conical prong engaging element 131 resiliently engages one of the prongs of a lamp 31. The position of the nut 134 limits the extent to which the prong engaging element 131 can move toward the open end of the tubular member 122.

The developing section

The developing section B of the apparatus is mounted over the printing section A and includes a driving roll 140 and a driven roll 141, both of said rolls suitably being of a resilient material, such as rubber, that is receptive to a liquid developer in a tray 142 provided with a flexible feed funnel 144 for keeping it filled to the proper level. A pressure roll 146 is mounted in a slot 147 and is provided with any suitable locking mechanism shown schematically at 149 to prevent dislocation thereof when the machine is subjected to shock.

The ends of the shaft 150 of the driving roll 140 are mounted for rotation only and the ends of the shaft 151 of the driven roll 141 are mounted in frames 152 movable vertically by means of threaded adjusting screws 154 provided with a knurled knob 155 or the like for the purpose of adjusting the pressure or distance between the driving and driven rolls 140 and 141.

A feed tray 156 is provided immediately underneath the tray 142 for the developing agent.

Operation

In operation, a transparency and a sheet of sensitized material are fed into the machine by way of the feed tray 61. They advance around the glass cylinder 22 due to the motion of the belts 42 and the cylinder and are picked off the surface of the glass cylinder by means of the scraper 64 which deposits them in the return tray 66. The exposed sensitized material is then fed into the feed tray 156 of the developing section B and passes between the driven roll 141 and the pressure roll 146. The driving roll 140 picks up developer from the tray 142 and deposits an even film thereof upon the surface of the driven roll 141, which in turn, deposits it upon the exposed surface of the sensitized material. The developer used in apparatus of this type is preferably of the quick acting and quick drying type so that the printed sheet is available for use almost immediately after it is released from driven roll 141 and pressure roll 146.

In order to obtain access to the lamps 31, the cover plate is removed from the left side of the machine, the outer lock nut 86 is unscrewed, and the socket holder 81 is slid off the inner lock nut 84 and the threaded end of the center support shaft 36 without the necessity of disconnecting any of the electrical leads to the socket assemblies 82.

If one of the lamps should fail for any reason, it can quickly be replaced individually simply by removing the grommet 79 around the inoperative lamp, withdrawing the lamp, inserting a new lamp, and replacing the grommet.

If, on the other hand, it is desired to clean the interior of the glass cylinder 22 or the reflector 32, or for some other reason to remove the lamps 31 collectively, the entire lamp assembly, including the lamps 31, the reflector 32, the collar shaft 34, the lamp brackets 39 and 40, and the shield 37 is withdrawn from the left side of the machine. When the assembly is replaced, the locating pin 90 on the right lamp socket bracket 40 fits into the proper perforation in the right socket holder 81 to assure a proper positioning of the assembly. The machine is placed into operating condition again simply by putting the left socket holder 61 into the position over the inner lock nut 84, as determined by the locating pin 80 on the left lamp bracket 39 and tightening the outer lock nut 86 by grasping the stud members 87.

Should any of the socket assemblies 82 become faulty, it is a simple matter to replace them individually by disconnecting the proper lead wire, unscrewing the socket assembly, inserting a new one and connecting the lead line. Inasmuch as each lamp is supported at one end by lamp bracket 40 and at the other end by a grommet 79 in lamp holder 39, the other lamps need not be disturbed by this operation.

When it is desired to transport the machine, the tray 142 is emptied of developer by lowering the level of the flexible feed funnel 144, and the front shock roll 29 is clamped into its lowermost

position with the lower ends 60 of the hooks 57. If desired, the adjusting screws 154 may be turned to separate the rolls 140 and 141 to prevent the formation of flats thereon. The machine is then completely enclosed by closing the top cover 21 over the developing section B and the door 20 in front of the printing section A. In this condition, vertical and lateral motion of the glass cylinder is effectively prevented by means of shock rolls 29 and 30 and by rolls 24 and 26. Longitudinal movement is prevented by side rollers 92 with the result that the possibility of breakage of glass cylinder 22 due to shock in transport is reduced to a minimum.

It is to be understood that many alterations and modifications will suggest themselves to those skilled in the art upon reading this description. Thus, for example, it is not necessary that the light transmitting cylinder be mounted for rotation since it is possible to slide the transparencies and sheets of sensitized material around it. Furthermore, it is possible to replace the cylinder with a plane or curved light transmitting surface over which the sheet materials can be slid. It is also within the contemplation of the invention to modify the lamp supporting structure to accommodate elongated lamps having electrical terminals at only one end thereof. All such alterations and modifications are intended to be included within the scope of the invention as defined in the following claim.

I claim:

In an apparatus for exposing light sensitive sheet material to light wherein a transparent cylinder is supported between two end walls, one adjacent each end of the cylinder, one end wall having a circular opening coaxial with and substantially equal in diameter to the diameter of the cylinder and the other end wall supporting a fixed shaft coaxial with and terminating beyond the

circular opening in the first named end wall, the improvement which comprises an assembly for supporting a cluster of elongated lamps within the cylinder for individual and collective removal and replacement, said assembly comprising a central hollow shaft receivable and slidable on said fixed shaft, a first disk on one end of said hollow shaft and having a diameter no greater than the inside diameter of the cylinder, a second disk adjacent the other end of the hollow shaft, the periphery of said second disk being adapted to seat in the circular opening of the first end wall, oppositely disposed perforations in the first and second disks for receiving said elongated lamps endwise, and means engageable with the terminal portion of the fixed shaft releasably to lock the assembly in operative position within the cylinder.

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