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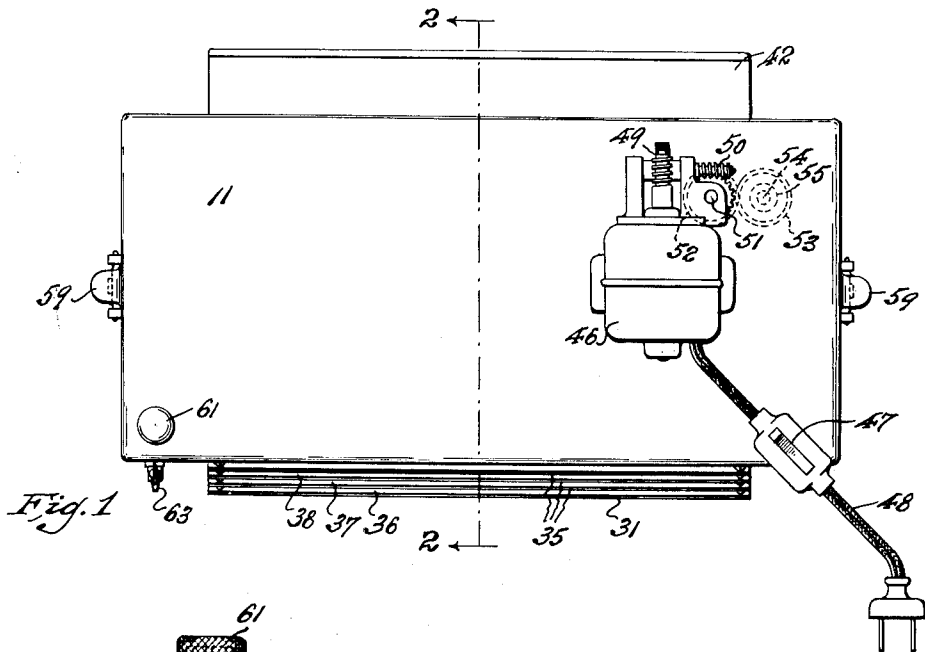
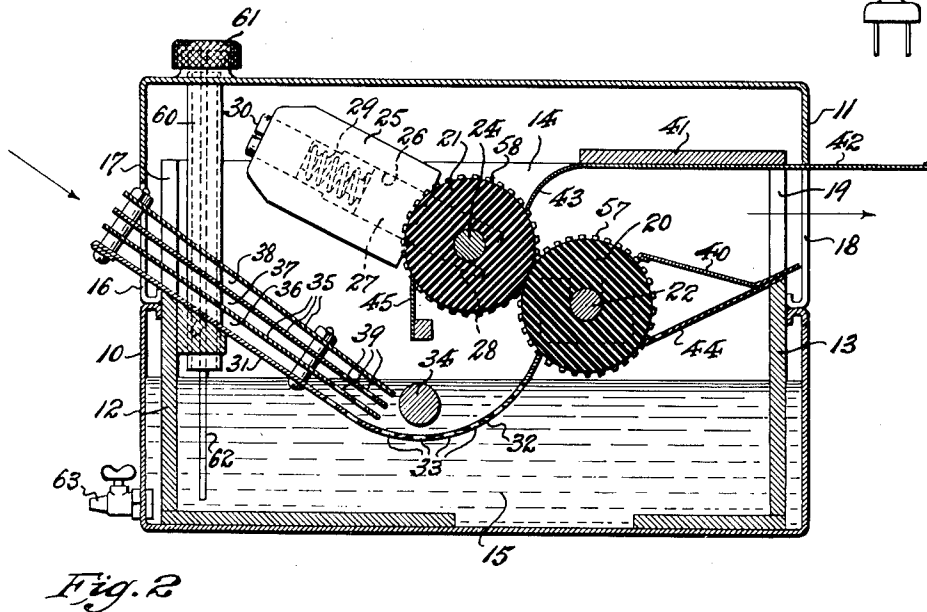
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APPARATUS FOR PRODUCING PHOTOCOPY PRINTS

Filed Feb. 16, 1952

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

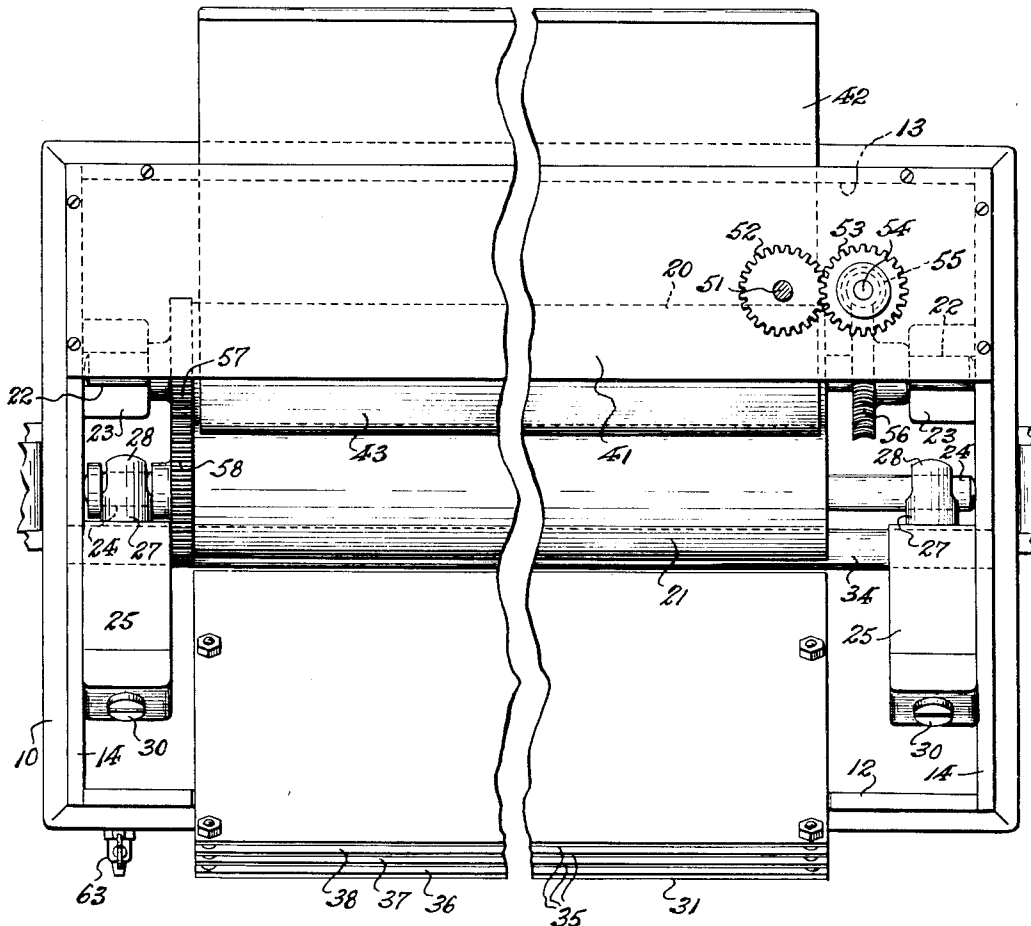


Fig. 3

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APPARATUS FOR PRODUCING PHOTOCOPY PRINTS

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1 Claim. (Cl. 95—89)

This invention relates to improvements in apparatus for rapidly developing a negative photographic print (which has been produced by exposure of light-sensitive photographic paper to the subject matter to be copied) and transferring the image thereof to sensitized reception material, whereby to convert the latter to a positive photocopy of the original subject matter from which the negative print was produced.

The invention has for an object to provide improved apparatus by which an undeveloped photographic negative print and sensitized reception material can be simultaneously passed, in separated relation, through a developing solution and, upon emerging from said solution, thereupon superposed in intimate face to face contact to permit transfer of the developed image of the negative print in reverse to the sensitized reception material, while at the same time substantially removing the developing solution from the negative print and reception material, so that the same are discharged from the apparatus in a comparatively dry condition, whereafter the negative print can be peeled away from the reception material to which the image of said negative print has been transferred, whereupon the reception material then provides a substantially dry positive photocopy print of the original subject matter from which the negative print was produced.

Another object of this invention is to provide an improved apparatus for the stated purpose adapted to contain a supply of developing solution and having means to receive and guide the undeveloped photographic negative and sensitized reception material sheets in separated but opposed relation while being passed through said developing solution, and a pair of opposed propulsion rollers mounted above the level of the developing solution, with means to guide the opposed negative and reception material sheets to and for engagement by said rollers as said sheets emerge from the developing solution, whereupon said rollers function to press said sheets together in intimate face to face contact, so as to permit transfer of the developed image of the negative sheet to the reception material sheet, while at the same time removing developing solution from the superposed sheets, whereafter said rollers discharge the superposed sheets from the apparatus in a comparatively dry condition subject to the peeling away of the negative sheet from the printed reception material sheet.

A further object of the invention is to provide means cooperative with the propulsion rollers of the apparatus for wiping away from the surfaces thereof any developing solution tending to accumulate thereon, and thus to maintain said rollers in substantially dry condition.

Another object of the invention is to provide a power source and transmission means for driving the propulsion rollers of the apparatus.

The above and other objects of this invention will be understood from a reading of the following detailed description thereof in connection with the accompanying drawings, in which:

Fig. 1 is a top view of an illustrative embodiment

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of the apparatus of this invention; Fig. 2 is a vertical cross-sectional view of the same, taken on line 2—2 in Fig. 1, but drawn on an enlarged scale; and Fig. 3 is a plan view of the apparatus with the casing cover thereof removed, this view being also drawn on an enlarged scale.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

The apparatus of this invention is adapted to be used for developing treatment of photographic emulsion coated printing paper upon which a negative image of subject matter to be copied has been printed by either direct or reflex method, while at the same time subjecting an accompanying transfer emulsion coated reception material to developing treatment, and then intimately contacting the coated faces of said printing paper and reception material so as to permit chemical reaction between their developed emulsions which results in transfer of the negative image of the former to the latter in reverse, and thus converts the reception material to a positive photocopy of said image.

The illustrative embodiment of the apparatus as shown in the drawings comprises a casing provided by a rectangular, upwardly open body member 10 and a removable cover member 11. Fitted within the body member 10 is a rectangular frame provided by a front side panel 12 and a rear side panel 13, corresponding ends of which are joined by end panels 14. The interior bottom portion of the casing body member 10 provides a reservoir to contain a suitable quantity of developing solution 15. The lower marginal portion of the front side of the casing cover member 11 is cut away between its ends to provide the casing with an admission opening 16. The upper marginal portion of the front side panel 12 of the interior frame is correspondingly cut away to provide an entrance way 17 leading from said admission opening into the interior of the casing. Similarly, the lower marginal portion of the rear side of the casing cover member 11 is cut away between its ends to provide the casing with a discharge opening 18, and the upper marginal portion of the rear side panel 13 of the interior frame is correspondingly cut away to provide a passageway 19 leading from the interior of the casing to said discharge opening 18.

Mounted within the apparatus, to extend between the end panels 14 of the interior frame, behind and parallelly adjacent to the discharge opening 18 of the casing, and above the normal level of developing solution 15 contained in the casing body member 10, are a pair of opposed propulsion rollers 20 and 21. Said rollers are preferably made of resilient material, such as rubber. The shaft 22 of roller 20 is journaled in stationary bearings 23 which are respectively affixed to the respective end panels 14 of the frame. The shaft 24 of roller 21 is journaled in and between thrust bearings, whereby said roller 21 is yieldably urged toward roller 20 so as to propel material engaged by the nip of these rollers. Each thrust bearing comprises a housing 25 which is affixed to an end panel 14 of the frame, and which is provided toward the roller 21 with a bore 26 in which is slidably mounted a movable bearing member 27. Said bearing member 27 terminates at its outer end in a bearing fork 28 which is adapted to embrace and support the shaft 24 of said roller 21. Within the bore 26 of the housing 25 is a compression spring 29 which is operative to exercise thrust against the bearing member 27. Tension of said spring 29 is subject to regulating adjustment by an adjusting screw 30 which is threaded into the outer end of the housing 25.

Supported in connection with the frame within the casing body member 10, to enter the interior of the latter through the casing admission opening 16 and frame entrance way 17, is a bottom guide plate 31. This bottom

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guide plate 31 is obliquely disposed to incline downwardly and inwardly from the casing admission opening 16, so that its lower inner end enters the developing solution 15 contained in the casing body member. Said lower inner end of the guide plate 31 terminates in an upwardly curved deflector section 32 which emerges from the developing solution to abut the periphery of the roller 20 adjacent to the receiving side of the nip between the same and roller 21. Said deflector section 32 is provided with a plurality of openings or perforations 33 whereby to freely admit developing solution 15 into the basin defined by said deflector section. Affixed to and between the end panels 14 of the frame, so as to be spaced closely to and above the upper surface of the deflector section 32 within the basin defined thereby, is a guide bar 34. Supported above and in connection with the guide plate 31 is a plurality of auxiliary guide plates 35, the same being spaced relative to each other and to said guide plate 31 so as to provide separate passageways 36, 37 and 38. Said auxiliary guide plates 35 and the passageways defined thereby terminate adjacent to the guide bar 34, so that negative and reception material sheets, passed through two or more of said passageways, will be held in separated relation as they move into the developing solution 15, and, upon emerging from said passageways, will be caused to move beneath the guide bar 34 for guidance thereby in continued advance through the developing solution 15, and so as to be finally led by the deflector section 32 of guide plate 31 to and for engagement by the nip of the rollers 20—21. The inner end portions of the auxiliary guide plates 35, which dip into the developing solution 15, may also be provided with openings or perforations 39 to freely admit developing solution into the adjacent portions of the passageways defined by said auxiliary guide plates.

Affixed to the frame within the casing body member to extend from the bottom margin of the casing discharge opening 18 to the lower roller 20, in substantially tangent relation to its top periphery, is a bottom discharge guide plate 40. Affixed to the underside of a bridge member 41 with which the frame within the casing body member is provided, to extend from the top margin of the casing discharge opening 18 to the upper roller 21, is a top discharge guide plate 42, the same having a downwardly curved inner end portion 43 to abut said upper roller 21 substantially tangent to the rear side of its periphery. These bottom and top guide plates define a discharge passage for the treated material which leads from the propulsion rollers 20—21 outwardly through the casing discharge opening 18.

A doctor or wiper blade 44 is supported from the frame for engagement with the periphery of the roller 20, whereby to assist in removing developing solution from the roller surface. Similarly a suitably supported doctor or wiper blade 45 engages the periphery of the roller 21 for like purpose. These doctor or wiper blades aid in maintaining the roller surfaces comparatively dry.

The propulsion rollers 20—21 can be actuated either by hand or by power. Preferably said rollers are power driven, and to this end an electric motor 46 is mounted on the top of the casing cover member 11, and is controlled by a suitable switch, such as a switch 47 connected in the service wiring 48 by which the motor can be connected to a source of electrical energy. The lower roller is driven by the motor through suitable transmission means. One arrangement of transmission mechanism, as shown by way of illustration, comprises worm and worm wheel reduction gearing 49 and 50 which transmits power of the motor armature shaft through a vertical shaft 51 to a drive gear 52 within the casing cover member interior. Said drive gear 52 is adapted to be detachably meshed with a driven gear 53 positioned on the bridge member 41 of the frame within the casing body member 10 when the casing cover member 11 is disposed in closed relation to said casing body member. Said driven gear 53 is fixed on a ver-

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tical shaft 54 which is journaled in said frame, and fixed on said shaft 54 is a drive worm 55 which meshes with a worm wheel 56 fixed on the shaft 22 of roller 20, whereby to drive said roller 20. Roller 20 drives roller 21 through meshed gears 57 and 58 which are respectively fixed on their respective shafts 22 and 24.

The cover member 11 is releasably secured in closing relation to the body member 10 of the casing by suitable latch fasteners 59. Connected with the casing cover member 11, to depend therefrom into the developing solution reservoir of the casing body member 10, is a filling duct or pipe 60, which is normally closed by a removable cap 61. When the cap 61 is removed, developing solution 15 can be filled into the casing body member 10 through said filling duct or pipe 60. Said cap 61 is provided with a measuring or indicator rod 62 which depends therefrom to extend axially downward through the filling duct or pipe 60 to the bottom of the casing body member 10. This measuring or indicator rod 62 can be used to determine the quantity of developing solution 15 contained in the casing body member 10, and thus to ascertain when replenishment thereof is required. Connected in communication with the casing body member 10, to project exteriorly therefrom, is a manipulatable valve or cock 63 through which the developing solution content of the casing body member can be drained off when desired.

In the use of the apparatus, an undeveloped negative print of the subject matter to be copied and sensitized reception material are respectively entered in respective adjacent passageways, as e. g. passageways 36 and 37, in such relation that their emulsion coated surfaces are opposed and yet separated one from the other. The propulsion rollers 20—21 being put in operation, the inserted negative print and reception material are pushed downwardly through said passageways, being thus caused to enter the developing solution 15, and then to pass between the guide bar 34 and deflector section 32 of guide plate 31, whereby the same are maintained submerged in the developing solution 15 as they move therethrough, so that said solution exercises its developing effect upon the negative print and at the same time activates the emulsion coating of the reception material. As the thus treated negative print and reception material continue to be advanced, the same are guided by the deflector section 32 of guide plate 31, whereby their leading ends are caused to emerge from the developing solution and thereupon directed to be engaged by the nip of the rotated rollers 20—21. When engaged by said rollers, the treated faces of the negative print and reception material are brought into intimate contact, and pressed firmly together in mutually adhering relation as the sheets are advanced through said rollers, thereby to permit chemical reaction between the developed emulsions of said sheets, which results in transfer of the negative image of the print to the reception material in reverse, thus producing a positive copy of the image of the negative print upon the reception material. In passing through the rollers 20—21, the developing solution is squeezed out of the sheets, so that said sheets are discharged by the rollers in a comparatively dry condition, passing thence through the discharge passage defined by the bottom and top discharge guide plates 40 and 42, and thence through the discharge opening 18 and out of the apparatus. After discharge of the sheets from the apparatus, the negative print is peeled away from the reception material, so that the latter thereupon furnishes a positive photocopy of the subject matter of the negative print.

If it is desired to produce on opposite faces of reception material photocopies of opposite faces of subject matter to be copied, a separate negative print of each face of said subject matter to be copied is prepared, and then, using reception material, both faces or sides of which are coated with transfer emulsion, said reception material is entered in the intermediate passageway 37

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of the apparatus, and the respective negative prints in the respective contiguous passageways 36 and 38, so that their emulsion coated faces respectively oppose the respective emulsion coated faces of the intermediate reception material. As so related the three sheets are passed through the developing solution 15, and thence through the rollers 20—21 by which they are ultimately discharged from the apparatus. Upon discharge, the negative prints are stripped away from the opposite faces of the reception material, whereupon the latter furnishes positive photocopies of the opposite faces of the original subject matter.

It may be here pointed out that in practice and in order to provide a unitary apparatus for both the printing and developing and copying phases of the photocopying process, a negative printing apparatus, such e. g. as disclosed in my copending application for Letters Patent Ser. No. 271,890, filed February 16, 1952, now abandoned, may be combined in a single casing or housing with my above described developing and copying apparatus.

Having now described my invention, I claim:

In apparatus for producing photocopy prints provided by a casing the lower portion of which is adapted to contain developing solution and a pair of opposed driven squeeze rollers mounted across the upper interior of the casing above the developing solution and adapted to discharge the treated sheet materials from the casing in a substantially dry condition, means to guide sheet materials to be treated through the solution to the squeeze rollers, said guide means comprising a bottom guide plate inclining downwardly into the solution from a sheet materials admission opening of the casing and terminating in a perforate upwardly curved deflector section which emerges from the solution, whereby to oppose the

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receiving side of the nip of the squeeze rollers above the level of the solution, a transverse guide bar spaced above the submerged portion of the deflector section of said bottom guide plate, and a plurality of spaced apart auxiliary guide plates providing separate sheet material passages between the casing admission opening and said guide bar, so as to terminate within the solution adjacent to said guide bar and the curved deflector section of the bottom guide plate, whereby the sheet materials, upon emerging from said passages and while traversing said deflector section of the bottom guide plate, are unobstructedly exposed to the action of the developing solution, and then led out of the latter to the squeeze rollers which function to press said sheet materials together in photocopy transfer relation, while at the same time expressing solution therefrom.

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