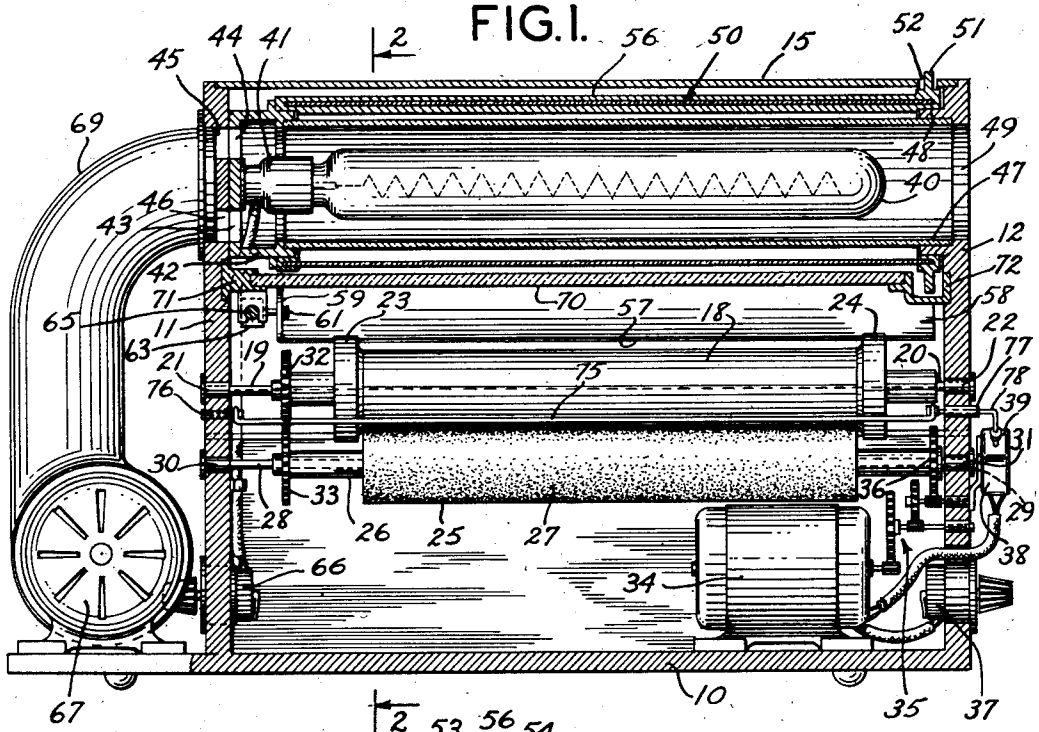
Nov. 4, 1952 W. R. PATIENCE ET AL 2,616,344

ROLLER PRINTER

Filed Nov. 24, 1948

FIG. 1.



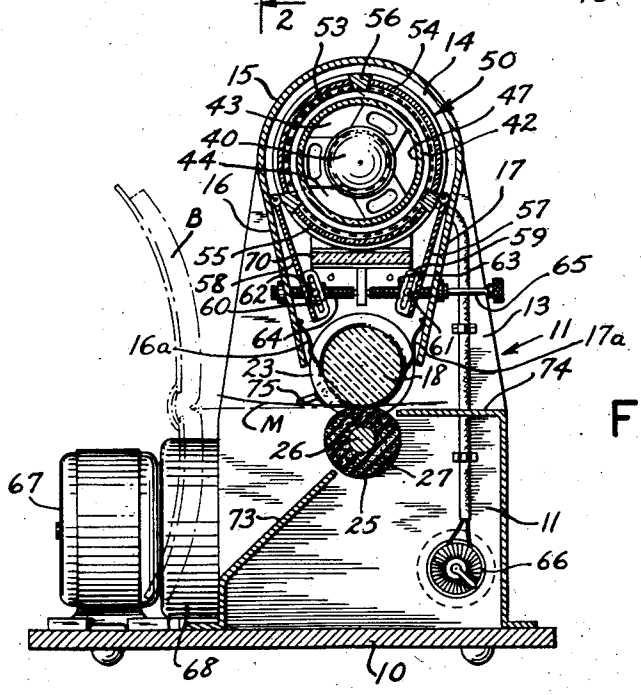


FIG. 2.

INVENTORS.
WARREN R. PATIENCE &
EDWIN S. PATIENCE.
BY
Campbell, Brumbaugh, Free & Graves
Their ATTORNEYS.

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ROLLER PRINTER

Warren R. Patience, Franklin Square, and
Edwin S. Patience, Hempstead, N. Y.

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4 Claims. (Cl. 95—77.5)

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This invention relates to improvements in phototprinting and photocopying apparatus. It relates particularly to an improved form of copying and printing device which is adapted to be used in making photographic prints from strip film, copying from separate papers or from pages of books, either by transmitted light or by reflex, and for many other purposes.

A great many kinds of copying or printing machines have been devised heretofore, largely for commercial printing operations with different types of light-sensitive materials. Usually, the prior machines have been one purpose machines, made primarily to handle one type of copy material. In the automatic type of copying machine, the copy is fed forwardly in contact with the light-sensitive material from one end of the machine to the other. Articles such as the pages in books cannot be handled in these machines for the pages cannot be fed between the supporting and feeding elements far enough to permit a copy of a complete page to be made without tearing the page from the book. Also, unless these prior devices are especially constructed, they are not very satisfactory for copying strip film, for example, motion picture film, for the reason that the light source is not regulated to give the narrow beam of light required for sharp copying with the highly sensitive positive or negative materials used in such copying operation.

Another problem encountered with the prior devices is that of providing efficient cooling without loss of copying efficiency by the introduction of dust by the cooling system. Usually, these prior devices are provided with air cooling means whereby air is circulated around the light source and through the shell or housing enclosing the light source. Unless great care is exercized, the air will carry dust into the housing of the machine and this dust will collect on the cylinders or other light-collecting or transmitting surfaces and on the material being copied with the result that frequent cleaning is required to avoid dust marks on the copies and decreased light transmission.

An object of the present invention is to provide a very versatile photoprinting and copying machine of compact form by means of which many different types of materials can be copied or printed, for example, the pages in books, motion picture films, blueprints, printed matter, either by reflected or transmitted light and which can even be used to make color separation negatives or positives.

Another object of the invention is to provide

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a copying machine which, because of its structure, permits the easy and automatic copying of pages of books without danger of tearing the pages from the books, the machine, however, without modification being equally adapted to handle continuous strip material such as motion picture film and the like.

A further object of the invention is to provide a photocopying or photoprinting machine having an improved cooling system and a light concentrating system therein which to a large degree eliminates problems of dust and heat while providing a very concentrated beam of light for producing sharp copies of the copy material.

Other objects of the invention will become apparent from the following description of a typical form of copying and printing apparatus embodying the present invention.

Devices of the type embodying the present invention may include a pair of cooperating rollers of small diameter between which the copy material and the light-sensitive material are passed in contact with each other, one of the rollers being made of or having a covering of soft rubber-like material. The roller cooperating with the soft roller is made of transparent material such as glass or transparent plastic, this roller being of such diameter that it acts as a condensing lens to concentrate light from a source of light located adjacent to it in the form of a sharp narrow beam essentially at the zone of contact of the two rollers to prevent scattering of the light and resulting fogging or distortion of the copy.

In addition to the foregoing features, the device is provided with a light housing which is disposed adjacent to the transparent roller, the source of light being housed preferably in a tubular transparent member through which air may be circulated in order to cool the light source without the air being directed against the transparent roller or other mechanism. By providing filtered air, the problem of dirt or dust in the housing is to a very large degree eliminated so that loss of efficiency or marring of the prints is largely overcome.

A further feature of the invention is the provision of a filter mechanism associated with the light source whereby different filters may be interposed between the light source and the transparent roller to permit, if desired, separation negatives or positives to be printed through several different separation filters. Moreover, the device may be provided with suitable light baffles whereby the light may be concentrated di-

rectly upon a narrow zone of the copy material or may be spread out over a somewhat wider zone to control the amount of light and the exposing of the copy material.

The use of small rollers of the type referred to above makes the device particularly suitable for copying the pages of books because these small rollers do not interfere with the entry of the page almost completely between the rollers into a position to be copied. To prevent damage to the book or its pages, an automatic reversing mechanism has been provided whereby the page is advanced between the rollers until the back or adjacent pages of the book come in contact with a control member, whereupon the direction of rotation of the rollers is reversed, the light source is shut off and the page is backed out of the rollers.

An apparatus of the type described generally above can be made very compact and is of relatively light weight so that it is readily portable and does not require a large amount of space for its installation and use. It will be understood, of course, that the length of the rollers may be varied to accommodate various widths of the copy material. Because of the versatility of the device, it lends itself particularly to office use for making copies of letters and other papers and does away with the need for a photostatic camera or other similar device.

For a better understanding of the present invention, reference may be had to the accompanying drawings, in which:

Fig. 1 is a view in elevation of a typical form of device embodying the invention with a part of the housing removed and also shown partly in section to disclose details thereof; and

Fig. 2 is a view in section taken on line 2—2 of Fig. 1.

The device chosen for purposes of illustration is of the portable type including elements of such size as to make it suitable for copying books, letters and manuscripts of ordinary legal and similar sizes. The device, of course, may be made larger, if desired, or even smaller, for copying photographic negatives of the conventional sizes.

The device includes a flat supporting base 10 provided with uprights 11 and 12 near its opposite ends, these uprights being of any desired shape and size, and, as illustrated, each includes a generally rectangular lower portion 13 and an upwardly tapering portion terminating in a curved or rounded upper end portion 14. A metallic housing or cover portion 15 having a semicylindrical upper portion and downwardly converging side portions 16 and 17 is mounted on and between the uprights 11 and 12. The side portions 16 and 17 terminate at about the horizontal diameter of a transparent roller 18 and may be provided with thin, inwardly directed baffles 16*a* and 17*a* closely adjacent to the surface of the roller 18.

The roller 18 is supported rotatably by means of stub shafts 19 and 20 at its opposite ends engaging in the bearings 21 and 22 in the side frame. The roller 18 is provided with end flanges 23 and 24 in order to guide large or relatively wide copy material but these end flanges can be omitted if desired.

The roller 18 cooperates with a roller 25 which may include a hard metal core 26 and a relatively thick covering 27 formed of soft spongy rubber or rubberlike material. The roller 25 is supported at its opposite ends by means of the projecting ends 28 and 29 of the core 26 in suitable bearings 30 and 31 in the uprights 11 and 12. The rollers 18 and 27 are so related in position that the transparent roller 18 indents the surface of the rubber roller to a substantial extent in order to assure intimate surface contact of the copy material, for example, the page of a book B and the photosensitive copying material M shown in Fig. 2.

The left-hand ends of the rollers 18 and 27 are connected by means of the gears 32 and 33 so that they are rotated in opposite directions by means of the reversible motor 34. The motor 34 is connected by means of the reducing gearing 35 to a gear 36 at the righthand end of the roller 27 so that the roller 27 can be driven in either direction.

The speed of the motor can be controlled by means of a rheostat 37 connected between the motor 34 and the power line in order to regulate the printing time.

The motor may be reversed by means of a switch 38 mounted on the side plate 12 and having an upwardly extending switch plunger 39.

Light is supplied for the printing operation by means of a lamp 40 which may be of incandescent, gas, or arc type which is supported in a socket 41.

The socket is mounted in the center of a cup-shaped element 42 which is secured at its left-hand end to the upright 11. The base of the cup-shaped member 42 is provided with a plurality of relatively large openings 43, 44, these openings being in alignment with similar openings 45, 46 in the upright 11. The cup-shaped member 42 is adapted to receive one end of a hollow glass tube 47 which is substantially concentric with the lamp 40 and is supported at its opposite end in an annular collar 48 on the upright 12. The upright is provided with a hole 49 in alignment with the tube 47.

The cup-shaped member 42 and the collar 48 also form a support for a generally cylindrical tubular filter member 50 which is rotatably mounted on the collar 42 and the collar 48. The filter member is provided with a knurled disc member 51 which extends through a slot 52 in the housing 15 so that the filter can be rotated to position any part of it between the light source 40 and the roller 18. As shown in Fig. 2, the filter 50 may have three differently colored segmental filter elements 53, 54 and 55 suitable for making separation negatives or it may have more of the filter elements if desired. In order to reinforce the filter member 50, it may be provided with longitudinally spaced bars 56 extending from end to end.

In order to further control the amount of light directed against the roller 18, the housing may be provided with a pair of shutters 57 and 58 which extend lengthwise of the housing 15 below the center of the filter 15 and are pivotally supported in the housing at their upper edges. The lower ends of the shutters 57 and 58 are provided with slotted brackets 59 and 60 which receive pins 61 and 62 mounted on the nuts 63 and 64. These nuts are threaded on the shaft 65 which is rotatably mounted in the converging walls of the housing 15 and is provided with oppositely directed threads so that upon rotation of the shaft 65, the shutters swing inwardly or outwardly to vary the width of the beam of light directed against the roller 18.

The intensity of the light 40 may be varied by means of a rheostat 66 mounted on the upright 11.

Cooling of the light source may be effected by

means of a suitable motor 67 driving a blower 68 which is connected by means of a conduit 69 to the openings 45 and 46 in the upright and the openings 42, 44 in the cup-shaped member 42. The air flows through the tube 47 and is discharged to atmosphere through the opening 49 in the upright 12.

By providing a suitable filter at the intake of the blower 68, relatively dust-free air can be directed around the lamp to keep the transparent member free of dust. Also, the cooling air is confined within the transparent member 47 and thus does not pass over the surface of the roller 18 or other cooperating parts. Transfer of heat to the copy material may be further reduced by mounting a glass plate 70 between the filter member 50 and the roller 18, this plate being supported by means of suitable brackets 71 and 72 on the uprights 11 and 12.

In order to support copy material and the sensitive material while passing between the rollers 18 and 25, the device may be provided with an upwardly inclined platform 73 which is mounted on the base 10 and terminates adjacent the periphery of the roller 25. The material is supported on the opposite side of the nip between the rollers 18 and 25 by a horiontal platform 74 extending between the uprights 11 and 12 and mounted on the base 10 of the device.

The motor 34 for driving the rollers 18 and 27 is reversible under the control of the switch 38, as described above. Advantage of this arrangement is taken to permit the copying of pages of books; thus, for example, as shown in Fig. 2, a page of a book and a sheet of photosensitive material thereon may be introduced between the rollers 18 and 25 and the motor 34 started so that the page advances from left to right between the rollers 18 and 20. When the covers or adjacent pages of the book come into substantial contact with the rollers 18 and 25, a bail or tripping member 75 formed of wire or the like is engaged by the book and is moved downwardly about its pivots 76 and 77 in the uprights 11 and 12. Downward movement of the bail member trips the switch 38 by engagement of the arm 78 on the tripping member with the push button 39 so that the motor is immediately reversed, thereby backing the book away from the rollers. The switch 38 may also be used to deenergize the light 40 when the motor is reversed to prevent double exposures.

This reversing mechanism does not, however, interfere with the passage of sheet or strip material between the rollers for the bail member merely rests upon the surface of the copy material or photosensitive material and is not displaced thereby.

The use of the soft rubber roller 25 and the transparent roller 28 is effective in producing very sharp copies of copy material such as motion picture film and the like. Inasmuch as the soft rubber roller is indented by the transparent roller, very tight contact is obtained between the copy material and the copying material. Moreover, the use of the transparent roller as a focusing element assures a sharp concentration of light at the zone where the materials are forced most intimately into engagement.

From the preceding description, it will be apparent that we have provided a very versatile type of photoprinting or photocopying device and one which is capable of handling a very large variety of materials with a minimum of attention. Moreover, the device is so arranged that very accurately timed exposures can be made by adjustment of the speed of the drive motor 34 and variation in the spacing of the shutters 57 and 58.

It will be understood that the device is susceptible to considerable modification in its details and that the filter structure may be modified to render it suitable for the copy work being done and that the device may be modified in size and shape depending upon requirements. Therefore, the form of the invention described herein should be considered as illustrative and not as limiting the scope of the following claims.

We claim:

1. A photoprinting and photocopying device comprising a frame, a pair of cylindrical rollers of about the same relatively small diameter, said rollers being rotatably mounted at their opposite ends in said frame, one of said rollers being transparent and the other soft and rubbery and being indented normally by peripheral engagement with said transparent roller, a source of light mounted in said frame to one side of and in spaced relation to said transparent roller for directing light therethrough toward said rubbery roller, a reversible electric motor for rotating said rollers to advance copy material between said rollers and retract said copy material, switching means for reversing the direction of rotation of said rollers by said motor, and a bail member pivotally mounted in said frame in advance of said rollers and in the path of a part projecting from the plane of the copy material advancing between said rollers, said bail member being displaceable by engagement with said part to actuate said switch and reverse said motor to retract said copy material.

2. A photoprinting and photocopying device comprising a base member, a pair of end plates spaced apart lengthwise of said base member, a pair of relatively small rollers rotatably mounted in peripheral engagement in and extending between said end plates in spaced relation to said base member, said rollers being of about the same diameter and having their axes in substantially a vertical plane, the lower roller having a soft rubbery surface and the upper roller being transparent, gear means at the ends of said rollers connecting them for simultaneous rotation in opposite directions and at the same peripheral speed, a motor connected to one of said rollers to rotate them, a source of light including a housing extending between and supported at its ends at the upper ends of said end plates, said light source and housing directing a band of light lengthwise of said transparent roller, the latter being of such small diameter as to act as a lens to focus the band in a narrow beam at the surface of said lower roller, a shelf to one side of said rollers extending substantially horizontally between said end plates and approximately in alignment with the engaging peripheries of said rollers to receive copy material, the opposite sides of the rollers being otherwise substantially unobstructed to permit a page in an open book to be passed between the rollers to substantially the full width of the page before the remainder of the book comes into engagement with said rollers.

3. A photoprinting and photocopying device comprising a base member, a pair of end plates spaced apart lengthwise of said base member, a pair of relatively small rollers rotatably mounted in peripheral engagement in and extending between said end plates in spaced relation to said base member, said rollers being of about the same diameter and having their axes in substan-

tially a vertical plane, the lower roller having a soft rubbery surface and the upper roller being transparent, means connecting said rollers for simultaneous rotation in opposite directions, a motor connected to said rollers to rotate them, a source of light including a housing extending between and supported at its ends at the upper ends of said end plates, said light source and housing directing a band of light lengthwise of said transparent roller, the latter being of such small diameter as to act as a lens to focus the band in a narrow beam at the surface of said lower roller, a shelf to one side of said rollers extending substantially horizontally between said end plates and approximately in alignment with the engaging peripheries of said rollers to receive copy material, the opposite sides of the rollers being otherwise substantially unobstructed to permit a page in an open book to be passed between the rollers to substantially the full width of the page before the remainder of the book comes into engagement with said rollers, a contacting member pivotally mounted between said end plates and having an outer portion adjacent to said unobstructed side of said rollers, said pivotally mounted member being movable toward said rollers by a part projecting from the plane of the page being advanced by and between said rollers, and means to reverse the direction of rotation of said rollers actuated by movement of said member toward said rollers.

4. A photoprinting and copying device comprising a substantially flat, long and narrow base member, a pair of end plates mounted in spaced substantially parallel upwardly extending relation from and on opposite ends of said base member, a pair of relatively small diameter rollers rotatably mounted at opposite ends in said end plates, extending between said end plates above said base member and arranged one above the other, the lower roller having a flexible deformable friction surface normally engaging the surface of said upper roller between said end plates, said upper roller being transparent, gear means connecting said rollers for simultaneous rotation at the same peripheral speeds, motor driven means for rotating said rollers, a light housing connecting said end plates above said rollers having an opening at the bottom directed toward said upper roller throughout the length thereof, and a source of light in said light housing extending between said end plates for directing a band of light throughout the length of said housing between said end plates toward said transparent roller for focussing by said transparent roller in a narrow beam at the surface of said lower roller, the space between said end plates along one side of said rollers above said base member being substantially unobstructed for feeding sheet material between said rollers throughout the length thereof from one side of said device for delivery outwardly beyond the opposite side.

WARREN R. PATIENCE.
EDWIN S. PATIENCE.

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