

Feb. 19, 1963

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3,077,824

STEP AND REPEAT PHOTOGRAPHIC PRINTER

Filed Sept. 29, 1960

3 Sheets-Sheet 1

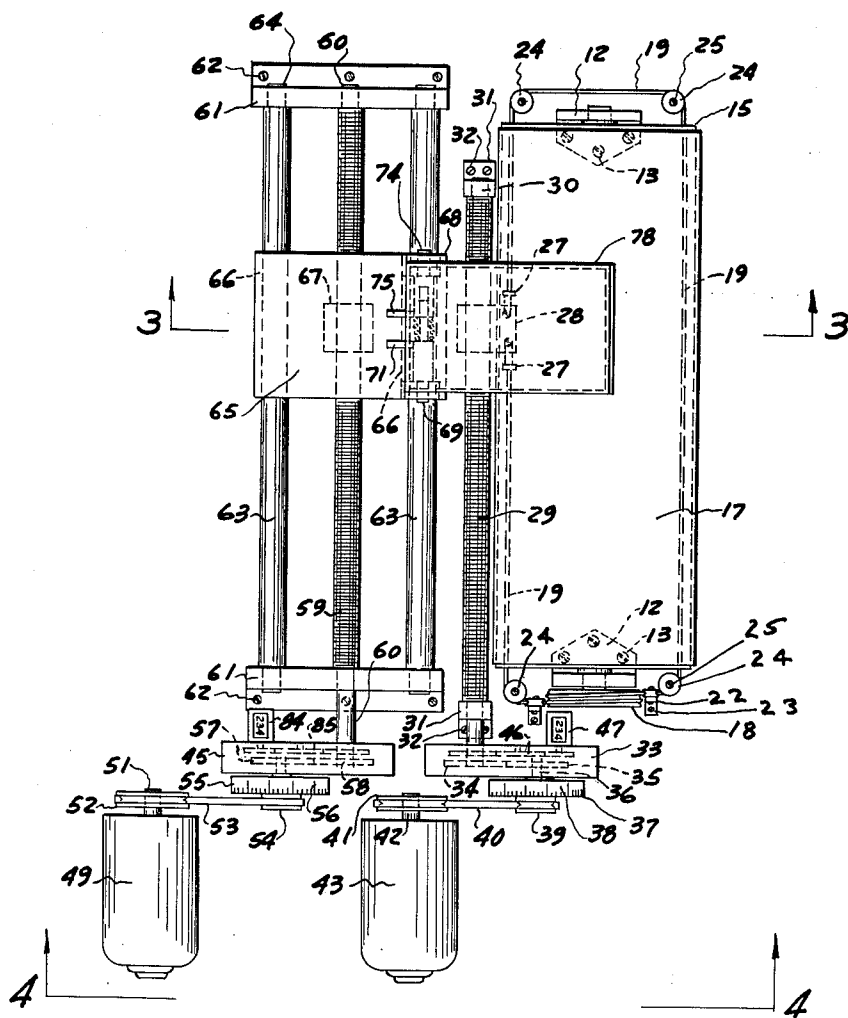


Fig. 1

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3 Sheets-Sheet 2

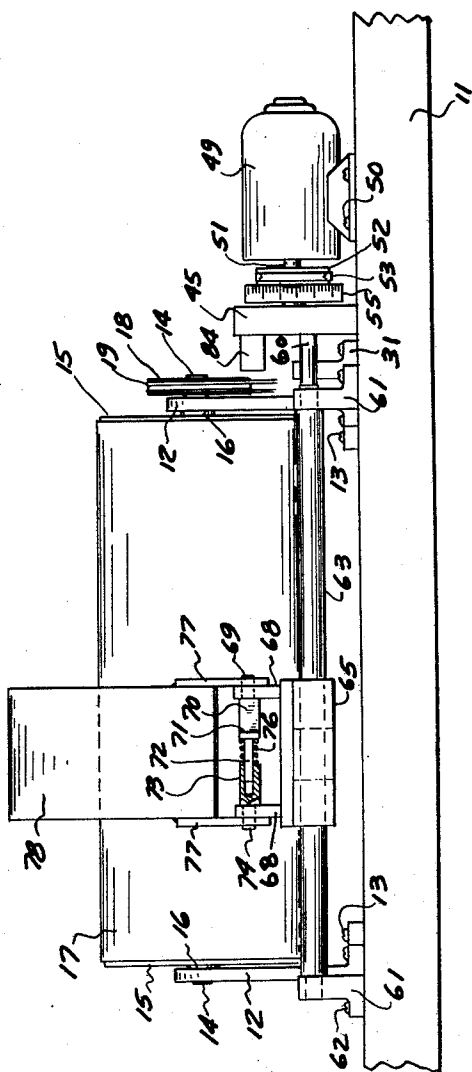


Fig. 2

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3 Sheets-Sheet 3

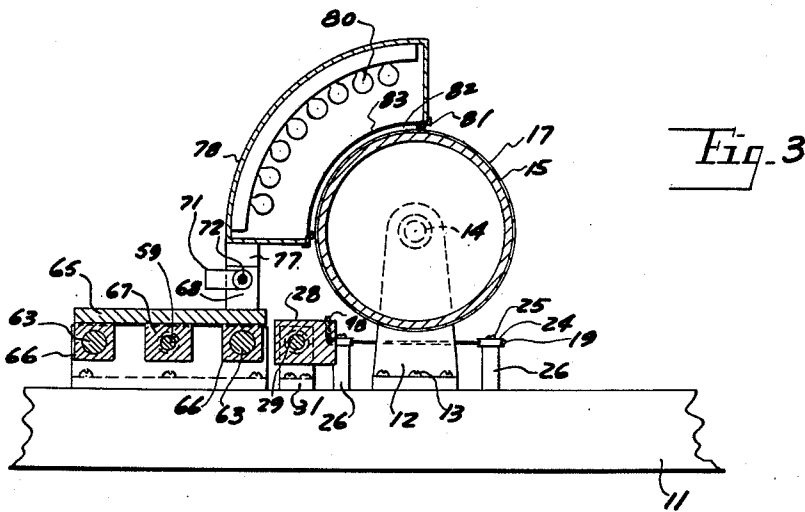
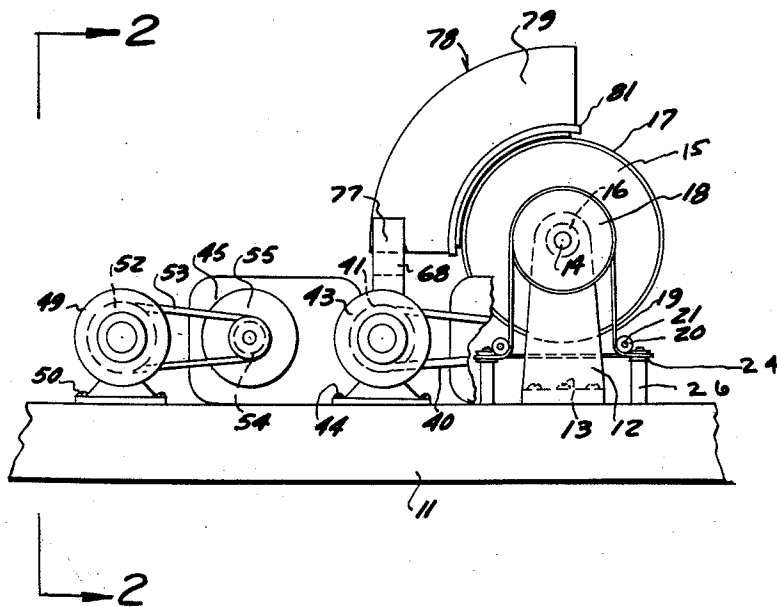


Fig. 4

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1

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STEP AND REPEAT PHOTOGRAPHIC PRINTER
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Filed Sept. 29, 1960, Ser. No. 59,218
2 Claims. (Cl. 95-77.5)

This invention relates to a step and repeat photographic printer and more particularly to a machine used to print one or a set of images from a film onto a larger piece of sensitized material, evenly spaced horizontally and vertically.

It is the object of the present invention to provide a rotatable drum upon which a sensitized strip of material is mounted therearound and wherein there is employed upon a carriage adjustable throughout the length of the drum, a photographic printing device adapted for intermittently exposing a negative with respect to an area of said sensitized surface on the drum, and wherein means are employed for feeding the printing device longitudinally of the drum and for effecting a second exposure of the said image with respect to the sensitized surface and thereafter effecting successive additional longitudinal feedable movements of the printer with respect to the drum until the full surface of the sensitized surface has been exposed successively, together with means for effecting a limited rotary movement of the drum and for returning the printing device to its initial position to thus provide in succession a series of exposures upon the said sensitized surface, etc., until there is thus printed upon the single strip of sensitized material mounted upon the drum, a series of images which are evenly spaced horizontally throughout the length of the drum and vertically throughout the circumference of said drum.

It is a further object of the present invention to provide a novel method of mounting the drum upon a support and for effecting intermittent incremental rotational movements thereof.

It is a further object to provide in conjunction with said drum, a longitudinally adjustable carriage mounting a photographic printer with means for effecting successive and intermediate longitudinal feed movements of the said carriage with respect to said drum and parallel thereto.

It is a further object of the present invention to provide power operated feed screws for effecting longitudinal feed movements of the said carriage and for effecting intermittent rotational movements of the said drum, together with visual counter means for controlling the extent of said movements.

These and other objects will be seen from the following specification and claims in conjunction with the appended drawings in which:

FIG. 1 is a plan view of the present step and repeat photographic printer.

FIG. 2 is a left side elevational view thereof taken on line 2-2 of FIG. 4 hereunder.

FIG. 3 is a fragmentary section taken on line 3-3 of FIG. 1.

FIG. 4 is a fragmentary section or view taken on line 4-4 of FIG. 1.

It will be understood that the above drawings illustrate merely a preferred embodiment of the invention and that other embodiments are contemplated within the scope of the claims hereafter set forth.

Referring to the drawings the present step and repeat photographic printer includes a base 11 having mounted thereon a pair of longitudinally spaced upright drum supports 12 secured to said base at 13 and at their respective upper ends apertured to receive the axial shaft 14 of the elongated rotatable drum 15. Suitable spacers 16 are employed upon the end shafts 14 for spacing the drum inwardly of the respective supports 12.

2

An elongated strip of photo sensitized material 17 is mounted completely around the drum 15 and suitably secured thereto, said strip of sensitized material being available commercially in the photographic trade and capable of having printed and developed thereon a series of images from a film in the manner hereafter described.

The pulley 18 is fixedly secured to one of the shaft ends 14, as shown in FIG. 1 and mounts therearound the cable 19 which extends downwardly and around the pair of transversely spaced upright pulleys 20 journaled at 21 upon the upright supports 22 secured to the base 11, as at 23 by suitable fasteners.

The said pulleys 20 are arranged adjacent the pulley end of the drum 15 and therebelow. Additional pairs of horizontally disposed transversely spaced pulleys 24 are journaled as at 25 upon the supports 26 arranged adjacent the opposite ends of drum 15, said supports being suitably secured to the base 11, as best illustrated in FIG. 3.

The cable 19 which extends over pulley 18 and around the upright pulleys 20 also extends around the horizontally disposed pulleys 24, with the free ends of the cable 19 connected to the adjusting screws 27 which are threaded into the nut 28 movably mounted upon the threaded lead screw 29.

Lead screw 29 is arranged adjacent one side of and longitudinally of the drum 15 with its reduced ends 30 projected and journaled through the upright supports 31 anchored to the base 11 as at points 32, FIG. 1.

An end of lead screw 29 extends into the gear box 33 and is adapted for driven connection with the electric motor 43. For this purpose, and for illustration, gear 34 within gear box 33 is secured to lead screw 29 and is in mesh with a similar gear 35 on the shaft 36 which projects from said gear box and carries the vernier drum 37 having a series of calibrations 38.

The pulley 39 also secured to an extension of the shaft 36 is joined by belt 40 to a second pulley 41 on the driven shaft 42 of motor 43 anchored as shown in FIG. 4 to the base 11 as by the fasteners 44.

There is also provisioned within gear box 33 a reduction gear chain 46 which interconnects lead screw 29 and the shaft of the counter 47, FIG. 1. Accordingly by watching the counter 47 the motor 43 may be energized and de-energized manually as desired, depending upon the rotational incremental movement of the drum for that particular printing operation.

While the free ends of the cable 19 which control rotation of the drum 15, are shown secured adjustably by the screws 27 to the nut 28 threaded on lead screw 29, power operated by the motor 43, it is contemplated that instead of such adjustable connection, the said cable 19 may be continuous and project through the nut 28 and merely fixedly secured thereto by a suitable set screw, as shown at 48, FIG. 3, for illustration.

A second preferably electric motor 49 is mounted upon base 11 and secured thereto as at 50 with its axis parallel to motor 43, and includes the shaft 51 driving the pulley 52, which through belt 53 rotates the pulley 54 on a shaft projecting from gear box 45, and upon which is secured theretobetween a vernier or calibrated drum 55, FIG. 1, with calibrations 56.

The same shaft that mounts the pulley 54 and the drum 55 projects into gear box 45 and through the gears 57 and 58 for illustration, within the said gear box operatively rotate the lead screw 59. The reduced ends 60 of said lead screw extend through corresponding openings or bearings within the longitudinally spaced pair of upright supports 61 anchored to the base 11 as by fasteners 62, FIGS. 1 and 2.

A pair of longitudinal guide rods 63 are arranged upon opposite sides of lead screw 59 in parallel spaced relation thereto with their respective reduced ends 64 projected

through corresponding apertures in the upright supports 61, FIG. 1.

The said rods 63 thus define a guide means guidably and movably supporting the longitudinally reciprocal carriage 65. For this purpose, there are provided upon the undersurface of the carriage 65 adjacent its opposite longitudinal edges, a pair of apertured blocks 66 which are slidably positioned over the guide rods 63 for establishing a path of longitudinal movement of carriage 65 parallel to and spaced from the longitudinal axis of rotatable drum 15.

The interiorly threaded nut 67 depends from a central portion of carriage 65 and threadedly receives lead screw 59 wherein on rotation of said lead screw the said carriage 65 is fed longitudinally of the drum 15 in one direction or the other, depending upon the direction of rotation of the lead screw 59.

As shown in the various views of the drawing, and particularly FIG. 2, arranged upon the inner edge of the carriage 65 are a pair of longitudinally spaced uprights 68 which at their upper ends are transversely apertured to receive the stud shafts 69 and 74 respectively. The stud 69 has an integral shoulder 70 which engages the interior surface of one of the supports 68 and terminates in the right angular handle 71, also shown in FIG. 1.

Shaft extension 72 projects axially from the assembly 69-70-71 and slidably extends into the bore of the tube 73 which cooperatively bears against the inner surface of the second upright support 68. The tube 73 includes a reduced diameter stud shaft 74 which projects through an aperture in the support 68 and laterally thereof.

As best shown in FIG. 1, the tube 73 also has an outwardly extending handle 75 which is normally spaced from handle 71, there being a suitable coil spring 76 interposed between handle 71 and the corresponding end of the tube 73 normally urging the members 70 and 73 against the interior surfaces of the supports 68 on the said carriage 65. The said carriage provides a means of supporting a transverse arcuate lamp housing generally indicated at 78. For this purpose and as best shown in FIGS. 2 and 3, the arcuate lamp housing 78 adjacent a rear edge thereof includes a pair of depending supports 77, whose lower ends are transversely apertured so as to cooperatively receive the free ends of the studs 69 and 74, by which the lower rear portion of the lamp housing is pivotally mounted upon the said carriage 65.

The assembly, above described, particularly with respect to FIG. 2, and including the handles 71 and 75 provides a means by which the said light housing 78 may be removed, if desired from the said carriage. The lamp housing 78 is enclosed on all sides, including the end wall 79, with the exception of its inner under surface, which is open as at 82, and is arcuate in cross section so as to correspond to the shape of the curvature of the drum 15, upon which light housing rests during the photographic printing operation, as hereinafter described.

The light housing 78 includes upon its interior a series or bank of bulbs 80 adapted for momentary activation in a conventional manner. An elongated transversely arcuate chase 81 is provisioned over the interior arcuate surface of the light housing 78 and suitably secured thereto.

The chase 81 underlies the inner open arcuate portion of the lighthouse 78 and is suitably secured thereto, being apertured so as to suitably mount therein the arcuate film negative 83 which is normally spaced slightly away from the photosensitized strip of material 17 on drum 15, with the said chase 81 in engagement therewith during the period of exposure by the activation momentarily of the lamps 80, in a conventional manner for the purpose of exposing a portion of the sensitized strip 17 to thus transmit the image of the film 83 thereonto in a conventional manner.

Accordingly the present lamp housing, mounted upon the longitudinally adjustable carriage 65, is adapted to

print a set of longitudinally spaced images upon the surface of the cylindrically shaped strip of sensitized material 17 by the provision of longitudinal and intermittent adjustments of the said carriage relative to the surface of the said sensitized surface and drum 15.

In the present preferred embodiment of the invention, the rear edge of the lamp housing is pivotally mounted upon the carriage as by the pivot members 69 and 74, FIG. 2, whereas the forward portion of the lamp housing 78 is supported upon the sensitized strip 17 on drum 15. It is contemplated as a part of the present invention that, if desired, and during power operation of the lead screw 59, the said lamp housing 78 may be rotated in a counter-clockwise position about its pivot mountings; accordingly without rotating the drum 15 but by effecting intermittent longitudinal adjustments of the carriage 65, a series of like images may be exposed upon the sensitized strip 17 in a line, or horizontally.

Once there has been a traverse of the carriage 65, throughout the length of the drum 15, the lead screw 59 may be activated in a reverse direction by reversing the operation of motor 49 for the purpose of returning the carriage 65, for illustration, to the opposite end of the drum 15, as shown in FIG. 1. When this has been done, the motor 43 may be temporarily energized for effecting an intermittent rotation of the drum 15, as for example, throughout an arc of 90 degrees.

Thereafter the process may be repeated and thus a series of exposures of the image of the film 83 may be made upon the sensitized strip 17 throughout its length, after which the carriage 65 is returned to the end again of its support corresponding to the drum 15 shown in FIG. 1.

At this time, though another activation of the motor 43, and noting the counter 47 for guidance, the said drum 15 may be rotated still another 90 degrees, for illustration, to thus present another strip of the sensitized material 17 to exposure from the film 83, as the said carriage is intermittently and successively moved throughout the length of the drum.

By this process, it appears that a large number of images may be projected upon and applied to the sensitized strip 17 throughout its length and around its circumference.

For the purpose of determining the extent of longitudinal movement of the carriage 65, there is also provided, under the control of the lead screw 59 and the gear chain 85 within the gear box 45, a second counter 84, to thus visibly indicate and provide a guidance to the operator as to when the motor 49 should be energized during the successive printing operations.

From the foregoing description, it appears that by visual observance of the respective counters 84 and 47, the operator may know exactly when to energize and de-energize the motors 49 and 43 respectively to thus effect the incremental longitudinal adjustments of carriage 65, and the successive and incremental rotary adjustments of the drum 15.

Having described my invention, reference should now be had to the following claims.

I claim:

1. A step and repeat photographic printer comprising a base, an elongated horizontally disposed rotatable drum mounted on said base adapted to have mounted therearound an elongated photosensitive strip, guide means on said base spaced from and parallel to said drum, a carriage slidably mounted on said guide means, a lamp housing pivotally mounted upon said carriage and at its inner undersurface being curved corresponding to said drum, a similarly curved apertured chase within said underside adapted to supportably receive a film negative, said chase adapted for supported contact with said photosensitive strip, means operatively engaging said carriage for effecting intermittent longitudinal movements of said chase relative to said strip throughout its length, and means operatively engaging said drum for effecting intermittent

5

rotary movements thereof throughout its circumference, the pivotal mounting of said lamp housing including a pair of longitudinally spaced upright apertured supports on said carriage, a corresponding pair of apertured support arms depending from one side of said lamp housing, and a pivot pin assembly extending through said supports and support arms respectively, said pivot pin assembly including a spring-biased telescoping pin and tube, shoulders on said pin and tube engaging said supports respectively, stud shafts extending axially outward from said shoulders and projected through said supports and support arms respectively.

2. A step and repeat photographic printer comprising a base, an elongated horizontally disposed rotatable drum mounted on said base adapted to have mounted therearound an elongated photosensitive strip, guide means on said base spaced from and parallel to said drum, a carriage slidably mounted on said guide means, a lamp housing pivotally mounted upon said carriage and at its inner undersurface being curved corresponding to said drum, a similarly curved apertured chase within said underside adapted to supportably receive a film negative, said chase adapted for supported contact with said photosensitive

6

strip, means operatively engaging said carriage for effecting intermittent longitudinal movements of said chase relative to said strip throughout its length, and means operatively engaging said drum for effecting intermittent rotary movements thereof throughout its circumference, the mounting of said drum, including a pair of longitudinally spaced apertured upright supports secured to said base, axial stud shafts projecting from opposite ends of said drum and through said supports respectively, and a power driven pulley secured on one of said shafts, the means operatively engaging said drum including a motor operated lead screw, a nut movably mounted thereon, a series of spaced guide pulleys on said base, a cable movably mounted over said series of pulleys and over said drum pulley, with the ends of said cable secured to opposite sides of said nut.

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