Nov. 24, 1942. C. P. GARMAN 2,303,206

PHOTOGRAPHIC CONTACT PRINTING APPARATUS

Filed Feb. 24, 1940 2 Sheets-Sheet 1

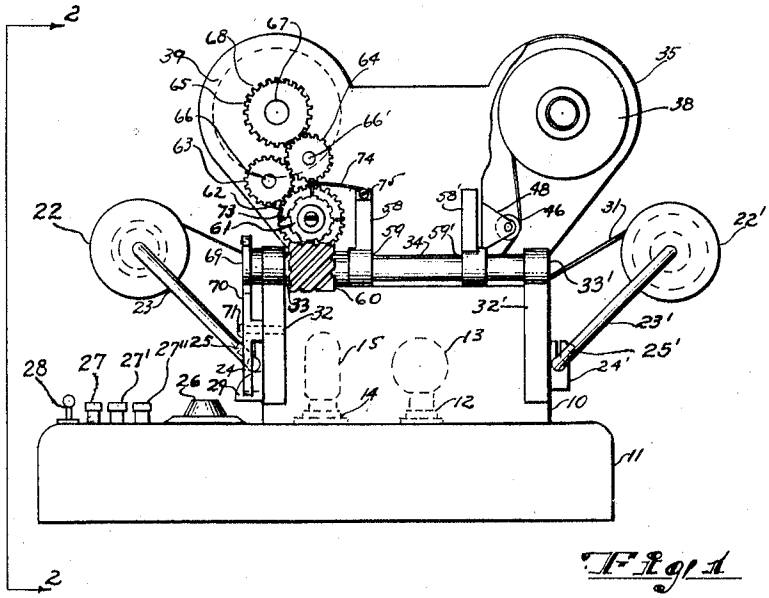


Fig. 1

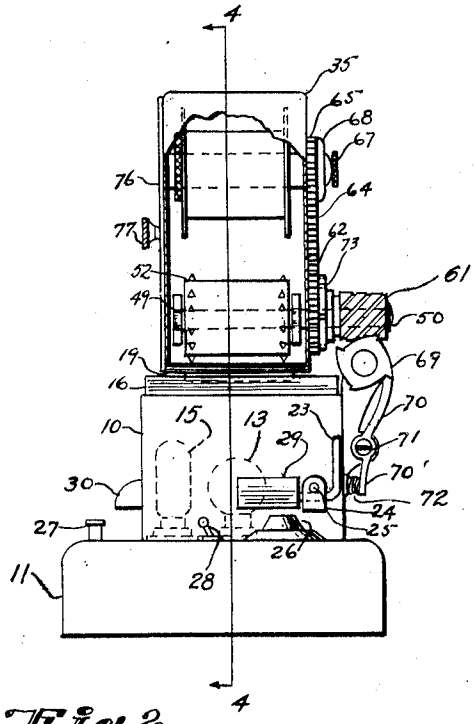


Fig. 2

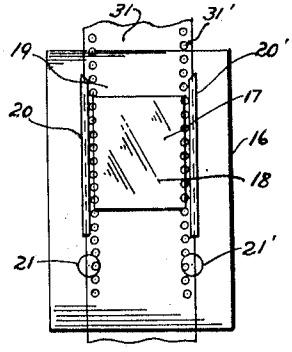


Fig. 3

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PHOTOGRAPHIC CONTACT PRINTING APPARATUS

Filed Feb. 24, 1940 2 Sheets-Sheet 2

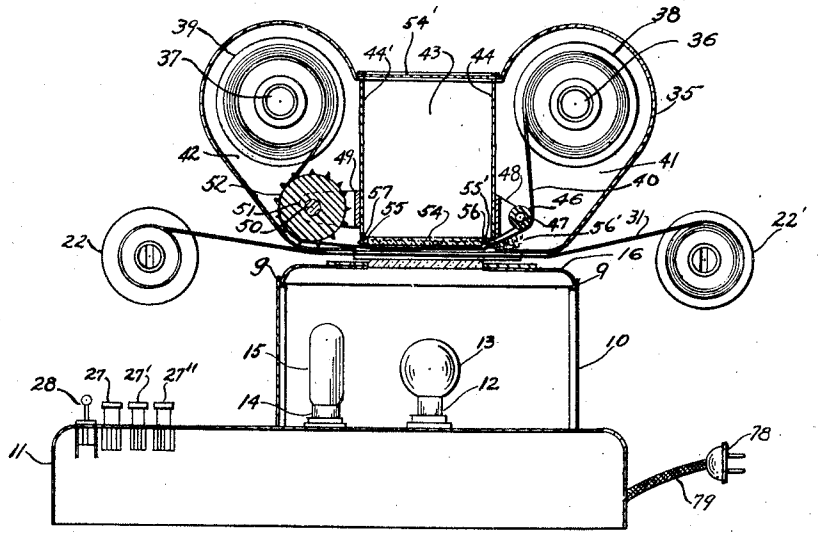


Fig 7

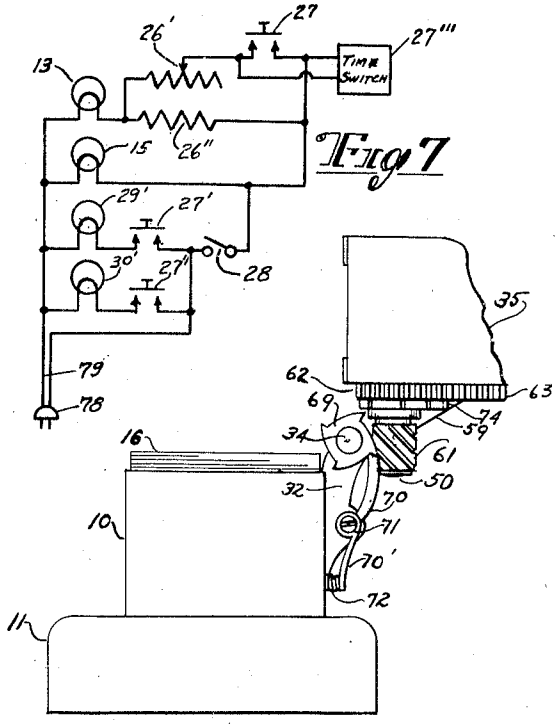


Fig 5

Fig 4

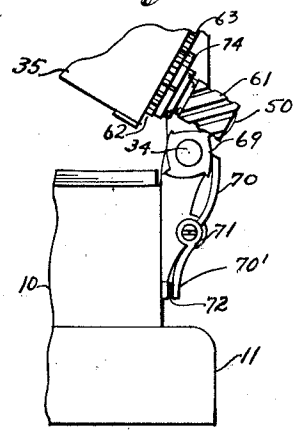


Fig 6

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UNITED STATES PATENT OFFICE

2,303,206

PHOTOGRAPHIC CONTACT PRINTING APPARATUS

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Application February 24, 1940, Serial No. 320,692

4 Claims. (Cl. 95—75)

This invention relates to photography, and more particularly to improvements in photographic contact printing apparatus for reproducing, in positive form, a series of images which have been initially produced on a negative film by the usual photographic processes.

Negative images on a strip film appear in the order in which the exposures were made. It is highly desirable to be able to print images from such negatives in varied sequences, and to omit those negatives which are not desired. It is also desirable to print the images a predetermined distance apart. In printing a series of images on a strip positive, it is desirable to have no double exposures and no spaces in which a print has not been made.

At present printers of the type to which the present invention relates depend upon the memory of the operator to move the positive film into position for printing. Blank spaces and double exposures commonly result. In manually advancing the positive printing material, it is difficult to obtain the predetermined distance between prints on the positive printing material.

The principal object of the invention is to provide a contact printing device of the character described, by which the positive printing material is automatically advanced a predetermined distance prior to each exposure.

Another object of the invention is to provide a photographic printing device of the character described which may be readily operated to reproduce a series of images in the same order or sequence that they appear on the negative film strip, or, to reproduce the images in any other desired sequential order, or, to omit particular images, the reproduction of which is not desired, without leaving blank spaces, or double exposures on the resultant positive strip.

Another object of the invention is to provide a printing device of the character described wherein unintentional exposure of several images to a single positive receiving surface, or double exposure is effectively prevented and to prevent the unintentional advancing of the positive printing material without having exposed the same to the desired negative.

Another object of this invention is to provide a printing device of the character described in which the distance between successive images on the positive strip are the same, and to provide means for predetermining this distance.

A further object of this invention is to provide a more critical control of the time of exposure of the printing material.

The foregoing and other objects and advantages are attained in a photographic contact printer comprising, briefly, a light box supporting a negative platen having an exposure aperture and means of holding a strip negative in place over said aperture. Said light box contains an electric lamp arranged in a circuit so as to be continuously energized at a voltage below that at which the lamp emits actinic light. Switch means are provided to place full voltage across the lamp for the time of the desired exposure. A film magazine is provided. This magazine is so made that unexposed film or other strip photographic material can be placed in one section thereof and threaded to a second section thereof. The upper casing or magazine is supported by a shaft which in turn is supported by the light box. The magazine can be rotated on said shaft to bring the positive film in contact with the negative film over the exposure aperture, and in turn rotated away from printing position so that the negative can be observed by the operator. Secured to this shaft is a spiral gear, and a ratchet wheel. Normal to this shaft is a spindle to which are secured a mating gear to the aforesaid spiral gear, a slotted disc, one member of a gear train and a film sprocket. A pawl engaging the ratchet wheel holds the shaft stationary while the positive film magazine is being rotated about the shaft out of printing position causing the mating spiral gear to rotate, thus giving rotary motion to the film sprocket which serves to advance the positive film within the positive film magazine. The slotted disc and engaging spring member serve to index the advance of the positive printing material within the magazine.

The invention is disclosed by the following detailed description of a presently preferred embodiment of the invention wherein reference is made to the accompanying drawings in which like characters denote like and corresponding parts throughout the several views.

Fig. 1 is a partially cut away side elevation of a photographic contact printer embodying the invention, the magazine being in printing position;

Fig. 2 is a partially cut away end elevation, viewed on the line 2—2 of Fig. 1;

Fig. 3 is a plan view of the negative film platen removed from the light box;

Fig. 4 is a transverse section taken on the line 4—4 of Fig. 2;

Fig. 5 is a fragmental end elevation with the magazine out of printing position;

Fig. 6 is a fragmental end elevation with the magazine approaching the printing position;

Fig. 7 is a wiring diagram of the printer.

Referring more particularly to the drawings, 10 is a light box or base structure with hollow base 11. Within the light box 10 and supported by base 11 which forms the bottom of the light box 10 are two electric lamp sockets 12 and 14. Lamp socket 12 contains lamp 13 which when energized emits white or actinic light. Socket 14 contains ruby lamp 15 which is a safe light for ordinary photographic emulsions. 16 is a removable metal platen supported by shoulder 9 of light box 10 and forms the cover of the light box 10. 17 is an exposure aperture extending through platen 16. 18 is a transparent glass window set in aperture 17 so as to be flush with the metal surface 19 of platen 16. 20 and 20' are negative film guides attached to platen 16 on either side of aperture 17. 22 is a negative film spool supported by bracket 23, which in turn is attached by means of clamp 24 and screw 25 to one end of the light box 10. Attached to the opposite end of light box 10 by screw 25' is clamp 24' which supports brackets 23' which in turn supports negative film spools 22'. Film spool 22 and 22' are frictionally coupled to bracket 23 and 23' respectively. 31 is a negative film and is usually indexed by numerals (not shown) placed between the perforations 31' and the edge of the film which serve to identify individual exposures. Apertures 21, 21' extending through platen 16 are placed so as to be under the film 31 and between the perforations 31' and the edge of the film permitting observation of the above mentioned numerals. It is preferable that these apertures 21, 21' contain ruby or red transparencies.

Plug 78 connected to lamp cord 79 is adapted to be plugged into a conventional source of electrical energy. Wiring connected to cord 79 is provided in hollow base 11 to provide means of energizing lamps 13 and 15. The circuits to lamps 13 and 15 pass through toggle switch 28 which has "on" and "off" positions. Between lamp 13 and switch 28 is resistance 26''. This resistance has a value such that the voltage applied to lamp 13 is insufficient to permit lamp 13 to emit actinic light. Shunting resistance 26'' is a momentary contact switch 27 in series with variable rheostat 26'. Shunting the momentary contact push button switch 27 is an automatic time switch 27''' which is a conventional time switch which can be set and actuated to close a circuit for a definite period of time and then open the circuit. Lamp shade 29 containing lamp 29' is positioned to illuminate rheostat knob 26. Lamp 29' is controlled by push button switch 27'. In turn lamp shade 30 containing lamp 30' is positioned to illuminate a small area on the front of base 11. This lamp 30' is controlled by push button switch 27''. This illuminated area provides the operator with means of reading cards upon which he has previously written the correct exposures and rheostat settings for particular negatives.

32 and 32' are brackets extending from the rear wall of light box 10. Shaft 34 is journalled to brackets 32—32' at 33 and 33' respectively. 35 is a printing material magazine or supporting means. This magazine is divided into three compartments 41, 42, 43 by walls 44, 44'. 41 is the unexposed film compartment and 42 is the exposed film compartment. 43 is the center compartment. 36 is a spindle journalled on the rear wall of compartment 41. 38 is a film spool removably secured to spindle 36. 37 is a spindle journalled in the rear wall of compartment 42. 39 is a film spool removably secured to spindle 37. 40 is perforated positive film. Roller 46 is journalled at 47 to bracket 48 secured to wall 44. Bracket 49 is secured to wall 44' in compartment 42. Shaft or spindle 50 is journalled to bracket 49 at 51. As a film advancing and feeding means, I provide a sprocket wheel 52 secured to spindle 50. Shaft or spindle 50 extends through and is journalled to the rear wall of compartment 42. 54 is a glass platen mounted in the bottom face of compartment 43 and held in place by spring clips 55, 55'. These spring clips limit the pressure between platen 54 and negative platen 16. 54' is a glass top for center compartment 43. 56 is a slit-like opening in wall 44. 56' is a felt material masking slit 56. 57 is a slit-like opening in wall 44'. Film magazine 35 is supported by bracket arms 58, 58' secured to the rear wall of film magazine 35. Bracket arms 58, 58' are journalled to shaft 34 at 59, 59'. Secured to shaft 34 is a spiral gear 60 which meshes with mating spiral gear 61. Spiral gear 61 is secured to spindle 50 outside of compartment 41 of magazine 35. Also secured to spindle 50 between spiral gear 61 and the rear wall of compartment 42 is gear 62. Gear 62 meshes with idler gear 63 which in turn meshes with idler gear 64 which in turn meshes with gear 65. Idler gears 63 and 64 are secured to spindles 66, 66' respectively, which are journalled to the rear wall of compartment 42. Gear 65 is secured to frictional clutch 68 (details not shown). Frictional clutch 68 is secured to spindle 37 outside of the rear wall of compartment 42. 67 is an adjusting screw for frictional clutch 68.

Secured to one end of shaft 34 is a ratchet wheel 69. Pawl 70 is secured to bracket 32 by screw 71. 70' is an extension to pawl 70. 72 is a spring in compression between extension 70' and bracket 32. Between spiral gear 61 and gear 62 is slotted disc 73 secured to spindle 50. 74 is an indexing spring member or detent engaging slotted disc or ratchet 73, and is secured to bracket 58 by means of screw 75. 76 is a cover for compartment 42 held in place by thumb screw 77.

In operation cover 76 is removed from compartment 42 by loosening thumb screw 77. In a similar manner the cover of compartment 41 is removed. Film spool 36 containing unexposed perforated positive film 40 is placed on spindle 36. Film 40 is threaded over roller 46, through slit-like opening 56, under platen 54, through slit-like opening 57, over sprocket wheel 52, and connected to receiving film spool 39 on spindle 37. The covers are then replaced on their respective compartments 42 and 41 respectively. The negative film 31 whose images are to be printed is placed on negative film spool 22 and threaded through guides 20, 20' to film spool 22'. Plug 78 is plugged into a suitable source of electric current. Toggle switch 28 is operated into the "on" position energizing ruby lamp 15 and also energizing lamp 13 through resistance 26''. The operator moves the negative film 31 by rotating film spools 22 and 22' manually to bring the desired image into position over aperture 17. He is enabled to see the image of negative 31 by the ruby light 15 shining through glass 18. If the negative film 31 is indexed by numerals, he is able to read these numerals by means of light shining through apertures 21 and 21'.

Magazine 35 is rotated about shaft 34 into a vertical position so that positive film 40 under platen 54 is directly over and in contact with

negative film 31 on glass window 18. Push button 27 is depressed thus shunting resistance 26'' causing lamp 13 to emit actinic light which passes through glass 18, the image of negative film 31, to positive film 40, exposing that portion of positive film 40 directly over the single image of negative 31 which is over glass 18. Aperture 17 and glass 18 are of such a size that a single image on negative 31 covers the glass and aperture completely. After the proper time of exposure has elapsed push button 27 is released by removing the pressure from it, opening the shunting circuit, thus cutting the supply of actinic light. If the time switch 27''' is used the operator causes this switch to actuate, shunting resistance 26'' in a similar manner. During the exposure the light passing through the films 31 and 40 passes through the glasses 54 and 54' permitting the operator to observe if the lamp 13 functioned to expose the film 40.

The magazine 35 is then rotated on shaft 34 away from the vertical. Pawl 70 engages ratchet wheel 69 preventing shaft 34 from rotating. Spiral gear 60 being held stationary causes spiral gear 61 to rotate, rotating spindle 50 to which it is secured. This causes sprocket wheel 52 to rotate, which in turn advances the film 40 over platen 54. Gear 62 rotates with spindle 50 causing gear 65 to rotate through idler gears 63 and 64. Gear 65 rotates spindle 37 through frictional clutch 68. Rotation of spindle 37 rotates film spool 39 thus taking up the film fed into compartment 42 by film sprocket 52. Magazine 35 is rotated about shaft 34 until stopped by base 11. As spindle 50 rotates, slotted disc 73 also rotates. Slotted disc 73 has 4 slots placed ninety degrees apart. Spring member 74 in contact with the periphery of slotted disc 73, due to friction, tends to prevent rotation of slotted disc 73. When the magazine travels through 90 degrees, spring member 74 drops into a slot of slotted disc 73 which increases the resistance to rotation of disc 73. Spring member 74 engaged in a slot of slotted disc 73 is not a positive resistance to rotation. Since pawl 70 engages ratchet wheel 69 positively and prevents rotation of shaft 34, continuing the rotation of magazine 35 beyond 90° causes spring member 74 to leave the slot and travel on the periphery of disc 73. When film magazine 35 reaches the limit of its travel of 180 degrees the spiral gears being of a ratio of 1 to 1 slotted disc 73 has also travelled through 180 degrees and spring member 74 engages a second slot in disc 73. Sprocket wheel 52 is of such a diameter as to move the predetermined length of film over platen 54. The operator then moves the negative film 31 so as to place a desired negative image over aperture 17.

Rotating the film magazine 35 back to the printing position, pawl 70 rides on the face of the ratchet wheel 69 and does not engage the ratchet wheel 69. Shaft 34 is thus free to rotate. However spring member 74 in a slot of slotted disc 73 tends to prevent rotation of spindle 50. Thus spindle 50 and spiral gear 61 remain stationary causing spiral gear 60 and shaft 34 to rotate. Spindle 50 being stationary, sprocket wheel 52 and positive film 40 also remain stationary. If the magazine 35 in traveling out of printing position travels more than 180°, spring member 74 will travel beyond the slot in slotted disc 73. In moving magazine 35 back to the printing position the frictional engagement of pawl 70 against the face of ratchet wheel 69 is maintained by spring 72, which exceeds the frictional engagement of spring member 74 against the face of slotted disc 73, but is less than the resistance to movement when the spring member 74 engages a slot in slotted disc 73. Therefore spindle 50 will rotate in a direction opposite to the rotation of spindle 50 when magazine 35 was being rotated out of printing position until spring member 74 engages a slot in slotted disc 73, at which time spindle 50 will cease to rotate and shaft 34 will continue to rotate. This opposite rotation by spindle 50 causes film 40 to be fed backward by sprocket 52 through slit-like opening 57. As positive film 40 comes in contact with negative film 31 the positive film 40 tends to be pushed into compartments 41 and 42. Due to the short column of film 40 between sprocket 52 and slit-like opening 57 film cannot be pushed into compartment 42. No such column effect is present in compartment 41. Thus the slight excess length of film is pushed back into compartment 41. Having exposed the negatives in the desired sequential order, the operator removes cover 76 of compartment 42 thus permitting the removal of film spool 39 making available the exposed positive film 40 for development.

Having described the invention with reference to a single, preferred embodiment thereof, it should be understood that various changes may be made in the construction and mechanism set forth in the present specification, without departing from the spirit and full intendment of the invention so defined by the appended claims.

I claim as my invention:

1. A photographic printing device comprising a light source having an exposure aperture, a pivotally mounted film magazine reciprocable between printing and non-printing positions with respect to said aperture, a rotatable gear mounted independently of said magazine, a ratchet having a rigid connection with said gear, a spring pressed pawl in engagement with said ratchet to yieldingly resist rotation of the ratchet and gear in one direction and to prevent rotation thereof in the opposite direction, a mating gear carried by said magazine meshing with said independently mounted gear, gearing operatively connected with the mating gear and the film for feeding the latter, a notched disc having a rigid connection with said mating gear, and a spring pressed detent for engagement with the notches of said disc and with the periphery thereof between the notches to yieldingly resist rotation of said disc and mating gear, the resistance effected by said detent exceeding the resistance effected by said pawl when the detent is engaged with a notch of the disc and being less than that of the pawl when engaged with the periphery of the disc between the notches.

2. A photographic printing device comprising a light source having an exposure aperture, a pivotally mounted film magazine reciprocable between printing and non-printing positions with respect to said aperture, a rotatable gear mounted independently of said magazine, means associated with said gear to yieldingly resist rotation thereof in one direction and to prevent rotation thereof in the opposite direction, a mating gear carried by said magazine meshing with said independently mounted gear, gearing operatively connected with the mating gear and the film for feeding the latter, a notched disc having a rigid connection with said mating gear, and a spring pressed detent for engagement with the notches of said disc and with the periphery thereof between the notches to yieldingly resist

rotation of said disc and mating gear, the resistance effected by said detent exceeding the resistance effected by the means associated with the independently mounted gear when the detent is engaged with a notch of the disc and being less than that of said means when engaged with the periphery of the disc between the notches.

3. A photographic printing device comprising a light source having an exposure aperture, a pivotally mounted film magazine reciprocable between printing and non-printing positions with respect to said aperture, a rotatable gear mounted independently of said magazine, a ratchet having a rigid connection with said gear, a spring pressed pawl in engagement with said ratchet to yieldingly resist rotation of the ratchet and gear in one direction and to prevent rotation thereof in the opposite direction, a mating gear carried by said magazine meshing with said independently mounted gear, gearing operatively connected with said mating gear to effect two degrees of yielding resistance to the rotation thereof, one of said degrees of resistance being greater, and the other being less than the resistance effected by said pawl.

4. A photographic printing device comprising a light source having an exposure aperture, a pivotally mounted film magazine reciprocable between printing and non-printing positions with respect to said aperture, a rotatable gear mounted independently of said magazine, means associated with said gear to yieldingly resist rotation thereof in one direction and to prevent rotation thereof in the opposite direction, a mating gear carried by said magazine meshing with said independently mounted gear, means operatively connected with the mating gear and the film for feeding the latter, and means associated with said mating gear to effect two degrees of yielding resistance to the rotation thereof, one of said degrees of resistance being greater, and the other being less than the resistance effected by said means associated with the independently mounted gear.

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