Nov. 19, 1940. C. H. FETTER 2,222,257

PHOTOGRAPHY

Filed Nov. 10, 1937

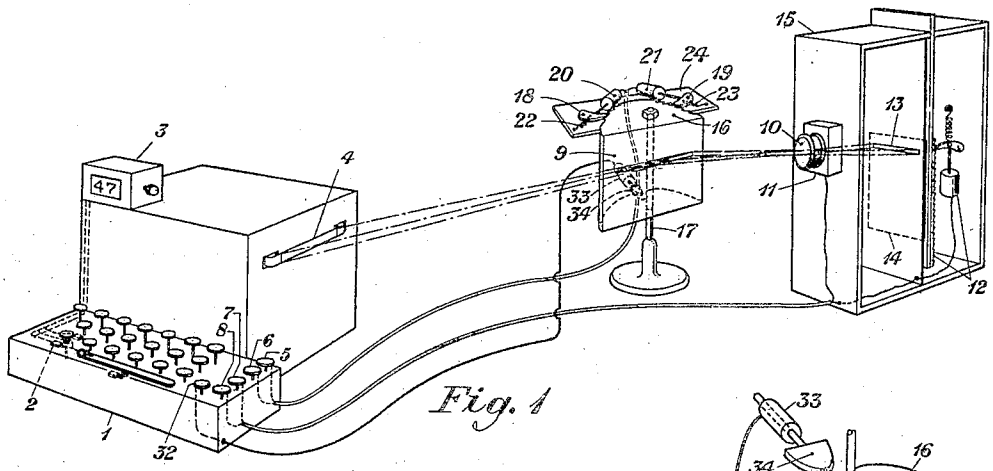


Fig. 1

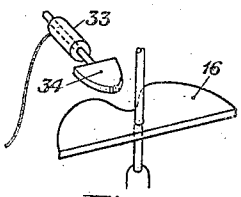


Fig. 1a

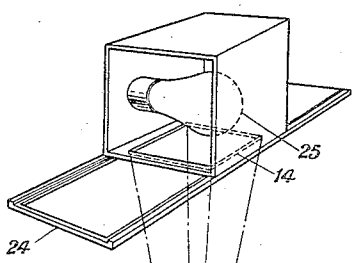
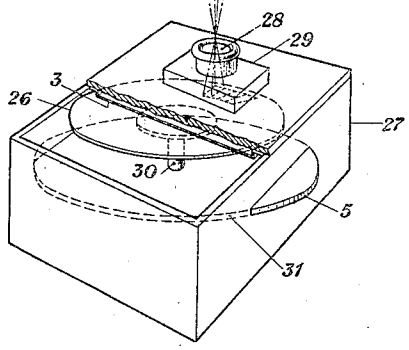


Fig. 2



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PHOTOGRAPHY

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Application November 10, 1937, Serial No. 173,742

6 Claims. (Cl. 95—4.5)

This invention relates to the art of photography and particularly to the production, in photographic form, of printed or written matter.

The broad objective of this invention is to create, photographically, pages of reading matter, each of which is substantially similar to that produced by the art of printing. In the production of each photographed page, each line is optically justified during and as a part of the photographic step. The type of the said photographed pages may be either of such proportions as to be easily read or it may be of micro size so that a vast number of micro size pages may be recorded upon a relatively small surface.

By means of this invention it is possible to record photographically upon a single plate the contents of a printed book of four or five hundred pages, thus effecting great economy in storage and transportation. The reading matter thus recorded upon such plates is rendered readable with great ease by means of the enlarging projector shown in the copending application of Fetter, Serial No. 173,741, filed Nov. 10, 1937. This broad object is obtained by several steps.

One of the steps of this invention is to produce in photographic form a page of typed or written matter by separately photographing each line of such matter, and justifying each line during and as a step in the photographic process.

The next step to attain the broad objective of this invention is to produce a master positive upon which will be recorded photographically the pages previously created photographically, which, in effect, constitute the plates from which are made the records to be used in the Fetter projector mentioned hereinbefore.

Other objects of this invention will be apparent from the following description when read in connection with the attached drawing of which Fig. 1 shows an arrangement for photographing, in succession, each of a plurality of lines which have been typed or otherwise set up for display; Fig. 1a shows in fragmentary form a detail of Fig. 1; and Fig. 2 shows means for producing a master record upon which is micro-photographed a plurality of the pages produced by the apparatus of Fig. 1, so as to constitute a continuous record of the subject matter, the successive microphotographs upon the master record being preferably keystoned.

At the left hand side of Fig. 1 is shown a line typewriting machine 1 which may be one of a plurality of well known types. That machine comprises a keyboard having the usual keys for letters, numerals and symbols by means of which the subject matter to be written may be produced in line form upon a tape, as indicated by 4, at the side wall of the machine. The machine 1 has associated with it an indicator 3 which shows the number of letters, numerals, symbols and spaces that appear in the typed line 4. The indicator 3 may be controlled by the letter, numeral or symbol keys or the space bar of the typewriter in such way that the movement of such keys or bar to produce a corresponding effect upon the tape will cause the operation of the said indicator. The indicator may be restored to its zero setting by means of a knob at the side of the indicator casing which actuates gears or other mechanism within the indicator. Other keys, shown at the right hand side of the keyboard and designated 5, 6, 7 and 8 control the operation of the mirror 9 and of the camera, the manner of doing which will presently be described.

The mirror 9 is positioned between the typewriting machine 1 and the camera 15 so that the image of the typed matter upon the tape 4 will be reflected into the lens 10 of the camera and therein will be photographically recorded upon a light sensitive plate or film 14. A framework 16, comprising two horizontal members and a vertical member, is designed to support the said mirror which is fastened to the said vertical member. The mirror may be of the same size as the vertical member, or it may be smaller, the essential thing being that the mirror shall be large enough to embrace the image of the typed line that appears upon the tape 4. The framework 16 is rotatably supported by the spindle 17 which passes through the said horizontal members. The upper member of said framework, which is semicircular in form, has a serrated edge which coacts with two pawls 18 and 19, which are adapted to be operated by the electromagnets 20 and 21 respectively, and, after operation, to be restored by springs 22 and 23, respectively. The magnets, pawls and springs are supported in any suitable manner, as, for example, by a framework 24 which is so positioned that the pawls will engage the teeth formed by the serrated edge of the upper member of the framework 16. The electromagnets 20 and 21 are energized by the closing of a circuit containing a suitable source of power (not shown), the closing being effected by the operation of the keys 5 and 6 shown at the right hand side of the keyboard of the machine 1. When the key 5 is pressed the magnet 20 will be energized and that, in turn, will pull the pawl 18 toward it, thereby

causing the framework 16 to move in clockwise direction (when viewed from the top). The said pawl will be restored by the action of the spring 22 so as to disengage the pawl and be ready for the next tooth engagement.

In like manner, the actuation of the key 6 will energize the magnet 21, which, in turn, will cause the pawl 19 to engage a tooth of the member 16 and will cause the rotation of that member in a counter-clockwise direction to the extent to which said pawl moves. By the retractile force of the spring 23 the pawl 19 will be disengaged from the tooth, and will be held, disengaged, ready for the next tooth engagement.

The manner in which this apparatus functions will be clearly understood from the following illustrative case. Let it be assumed that each line of the finished product represents or contains a total of fifty letters or spaces or a combination of both, which will be considered standard. The mirror is normally set at such an angle for the assumed "standard" length, that, if, 50 letters or spaces (or both combined) appear upon the tape 4, that line will be slightly foreshortened by the mirror so that the line upon the film will be of the correct length.

Now, let it be assumed that the total number of spaces and letters on the tape 4 is 47. Key 6 will then be punched three times and the mirror will be shifted to the correct position to optically lengthen the image of the line so that it will, when subsequently photographed, have the same length as the "standard" line. If, on the other hand, the line on tape 4 comprises 52 letters and spaces, key 5 will be pressed twice and the mirror will automatically take the position to optically bring that line down to the length of the "standard" line.

This automatic adjustment of the mirror is attained by correctly proportioning the size of the teeth in each quadrant on top of the member 16 with respect to the number of spaces to be added or subtracted from each line to make its image equal in length to a "standard" line. In fact, the teeth engaged by the pawl may have different spacings so that the angle of the mirror will always be such as to give the correct length of line upon the camera film or plate.

When the image of the line 4 is properly justified the operator will then press key 7 which will operate the shutter of the camera and thus cause the said typed line to be photographed upon the negative 14, the light passing through a slit in the mask 13 which, of course, limits the area of the said plate that may be exposed at any time. After the said line has been photographed, the operator will press the key 8 which operates the magnet 12 and thereby causes the carriage of the sensitized plate to move to the next line position. The extent of such motion is determined by the separation desired between successive lines upon the said plate. The camera is then ready for photographing the next line set up on the tape 4.

During the process of stepping the member 16 around by the action of the magnets and the pawls, the said member will remain in any given position by virtue of the friction between the said member and the support around which it rotates. After a line has been photographed it is necessary to return the mirror to its normal position. This is accomplished by operating key 32 which energizes the magnet 33 and causes the movable member 34 to move towards and against the curved back part of the lower horizontal side of member 16, as shown in Fig. 1 and in enlarged form in Fig. 1a. The movable member will press against the curved edge until it brings the said member 16 back to its normal position. The releasing of the key 32 will deenergize the magnet 33 and permit the withdrawal of the member 34 from the curved part of the lower side of member 16, thereby permitting the rotation thereof by the magnets 20 and 21.

When the number of lines required to fill a page have been photographed upon the plate 14, it will be removed and developed and thus made ready for use in the making of a master positive record, the apparatus for doing which is shown in Fig. 2.

In that figure, the negative 14 is supported by a suitable framework 24 which is preferably slidable so that the said negative may be brought in front of a lamp (or other light source) 25. The picture, viz., the page of printed matter, upon the negative 14 will be projected through the lens 28 upon the light sensitive surface of the plate or film 26 in the camera 27, whenever the shutter 29 is opened. The plate or film 26, which is shown circular in form, is supported upon a spindle 30 which is fixedly mounted upon a disk 31 that projects through the side of the camera to such extent that it may be moved by the thumb and fingers. That disk, and its supporting member which preferably are of the same type as are shown in Figs. 1 and 1b of the copending application of Fetter, Serial No. 173,741, filed Nov. 10, 1937, are designed and intended to move the sensisitized plate through an angular distance equal to the space required for photographing upon the plate 26 the matter appearing upon the negative 14. The disk 31 is, likewise, designed to hold the plate 26 fixedly after it has been moved through the required angular distance, such holding being effected through the coaction of a pin and properly spaced holes in the said disk, all of which is fully shown in the said copending application.

In order to obtain the most efficient use of the sensitized surface 26 the successive positive pictures appearing upon the plate 26 should preferably be of micro size and may be keystoned. They should also appear upon the said plate in spiral form in order that, when subsequently projected by suitable apparatus the pictures, as thus projected, will follow in unbroken sequence. That result is obtained by means of the apparatus shown in Fig. 1 of the said copending application of Fetter. The same principles may be applied to the making of a cylindrical master record of the type shown in Figs. 4b, 4c and 4d of the copending Fetter application.

After the positive master record has been made in the manner just described, any number of negatives of such positive record may be made for use in the projection apparatus described and shown in the said copending application of Fetter. It is to be understood, of course, that the size of the film may be other than the micro size stated above, without departing from the scope of the invention.

It is to be further understood that the invention is not limited to apparatus of the particular form shown and described herein. For example, the subject matter that is to be photographed by the camera 15 may be hand-written; or it may be set up by type held in a frame in such fashion that the face of the type may be readily photographed. Furthermore, the mirror supporting means may assume a variety of dif-

ferent forms, the essential requirement being that it shall be able to vary at will the length of the image of the typed or written material appearing in the camera. If desired, the mirror or a system of mirrors could be employed to vary the height of the letters appearing in the camera; and, furthermore, the size of the letters could be enlarged or reduced by the use of a lens or a system of lenses interposed between the typewriting machine and the camera. Other variations may be made without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In a device for producing a master photographic record of reading matter, the combination with means to produce a visible representation of the matter to be produced upon said record, of means to photograph said reading matter, line by line, the successive lines being photographed upon the same light sensitive surface, a mirror positioned to reflect each line of reading matter into the said photographing means the said mirror being capable of adjustment to justify the successive lines during the process of photographing to form a finished page of reading matter, and means to photograph the successive pages upon a master record, the successive views being arranged in a spiral from the outer rim to the center of the said master record.

2. In an apparatus for producing a photographic record of reading matter, the combination with means for setting up in visible form a line of typed matter of a reflecting surface upon which will appear the image of the said typed matter and a photographic device having means to support a light sensitive surface therein upon which the said image may be reflected, the said reflecting surface having means for adjusting the surface with respect to the said typed matter so that the reflection of said image appearing upon said light sensitive surface may be of the same size, or a lengthened or shortened reproduction of the said typed matter, whereby the successive reproduced lines may be justified.

3. In an apparatus for producing a photographic record of reading matter, the combination with a device to set up, in line form, characters representing reading matter, photographic means having means to support a light sensitive surface therein upon which the said reading matter in line form is to be reproduced, a reflecting surface so positioned with respect to the said device and said photographic means as to reflect upon said sensitive surface the image of each line of reading matter set up by said device, and means to change the angle between said surface and the plane in which the said line of reading matter lies whereby the length of the image of the said line appearing upon said light sensitive surface may be caused to differ from the length of the line originally set up by the said device.

4. In an apparatus for producing a photographic record of reading matter, the combination with a device to set up, in line form, characters representing reading matter, of means to photograph each line of such reading matter, reflecting means so positioned with respect to the said device and the said photographing means as to reflect upon said photographing means the image of each of the said lines set up by the said device and positioning means connected with the said reflecting means to control the angle of incidence and reflection whereby the length of the image appearing upon the light sensitive surface may be of the same length as that originally set up by the said device or may be longer or shorter, thereby justifying the successive lines of reading matter.

5. In an apparatus for producing a photographic record of reading matter, the combination with a typewriter of a camera and a mirror interposed between said typewriter and said camera so as to reflect in the camera each line of reading matter set up upon said typewriter, the said mirror having positioning means connected therewith to rotate the mirror so as to regulate the angle of incidence and reflection, and the said typewriter having keys connected therewith to operate the said positioning means whereby each successive line appearing in the said camera may be justified.

6. The device defined by claim 5 characterized by the inclusion of means to restore the mirror to its normal position after its operation for justifying a line of reading matter.

CHARLES H. FETTER.