

Jan. 21, 1958

CHUNG SHU KWEI
PHOTOPRINTING APPARATUS

2,820,404

Filed Nov. 23, 1954

4 Sheets-Sheet 1

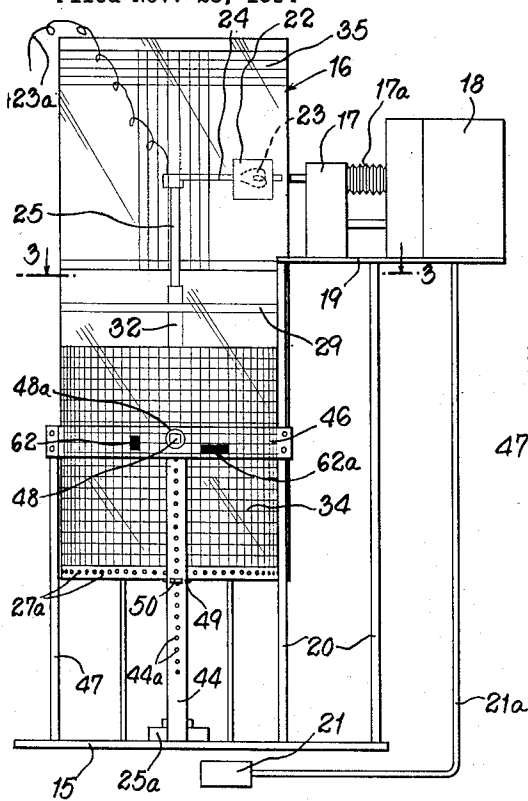


Fig. 1.

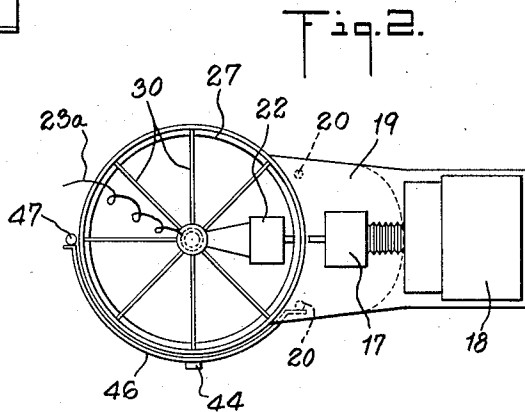


Fig. 2.

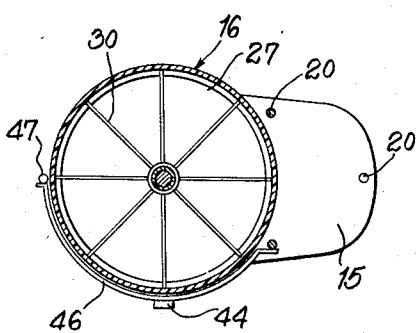


Fig. 3.

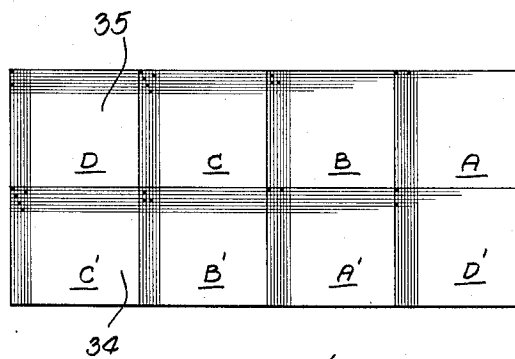


Fig. 4.

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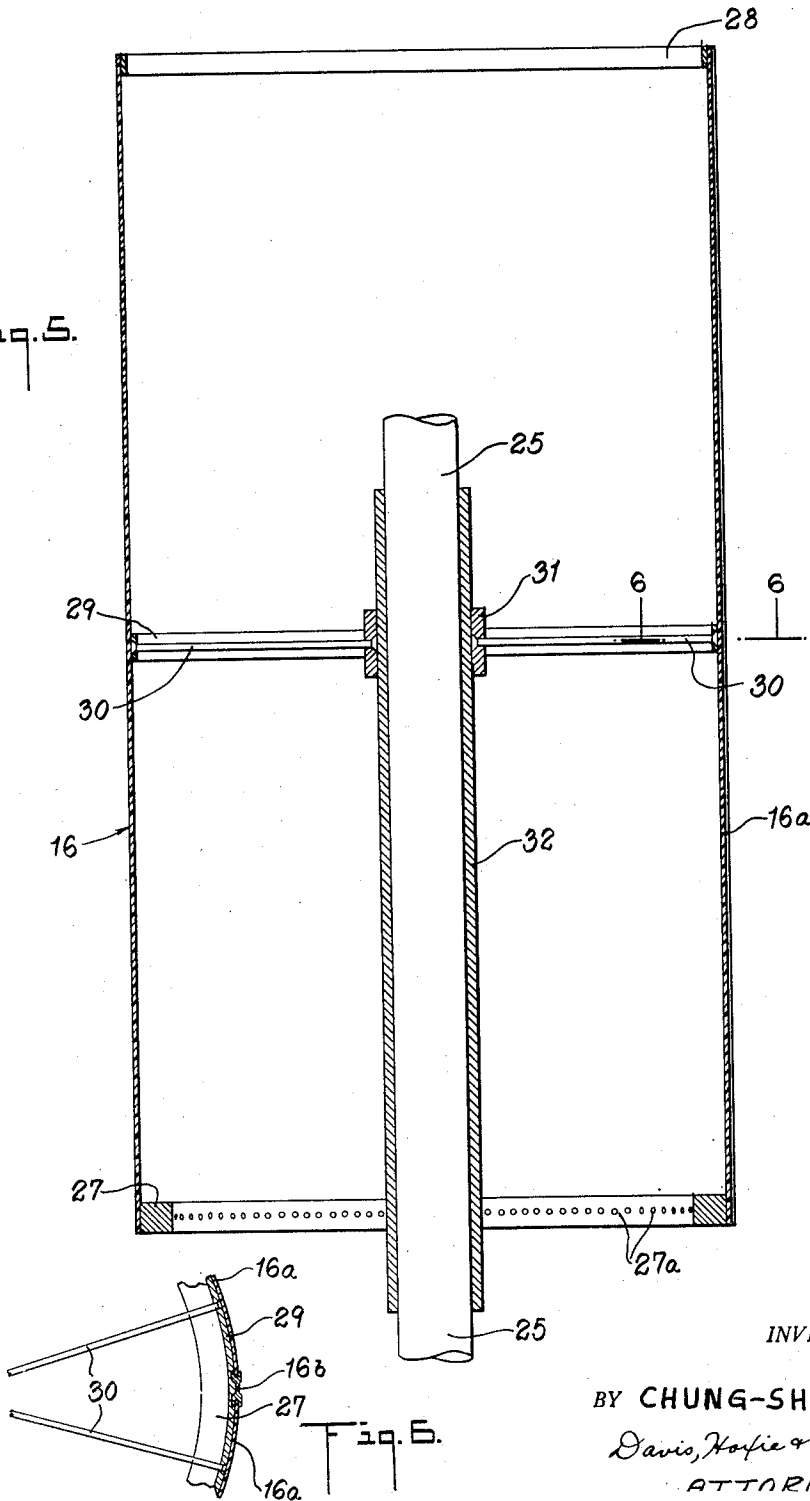
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Fig. 5.



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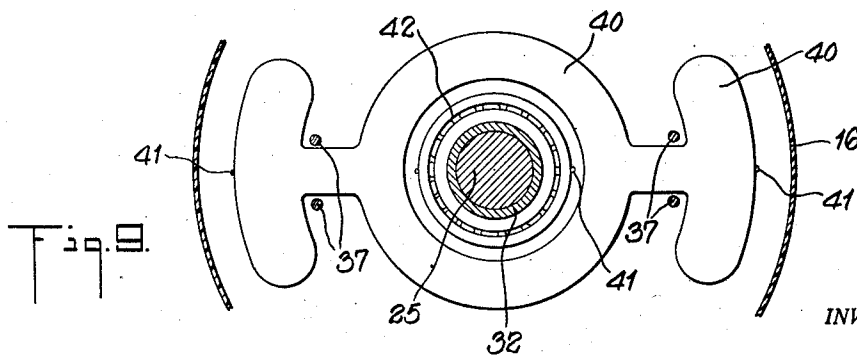
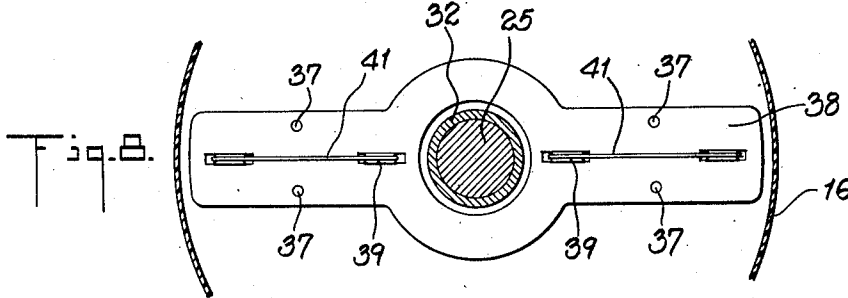
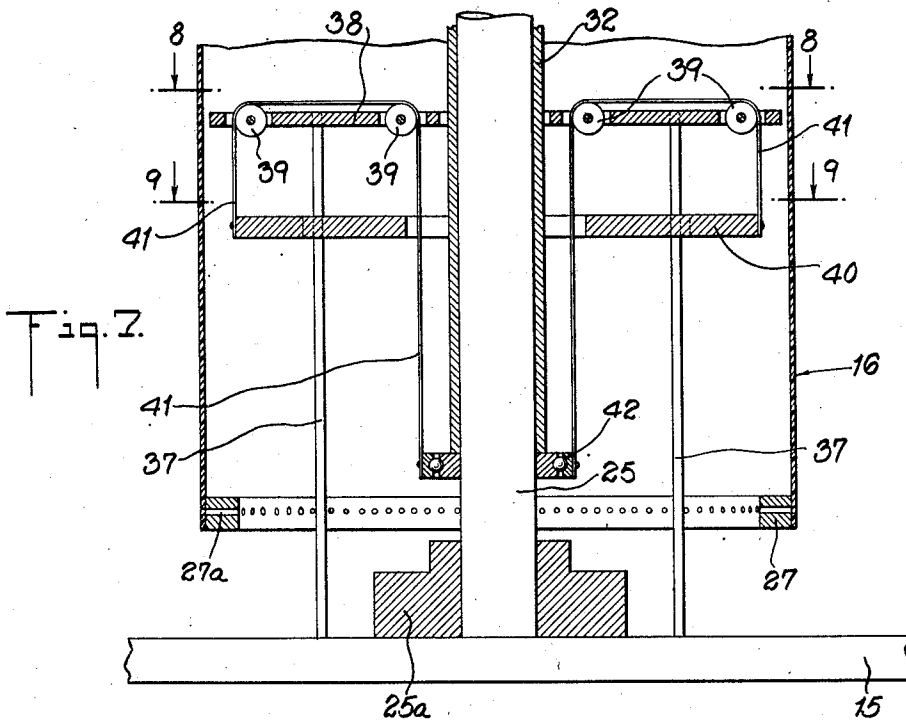
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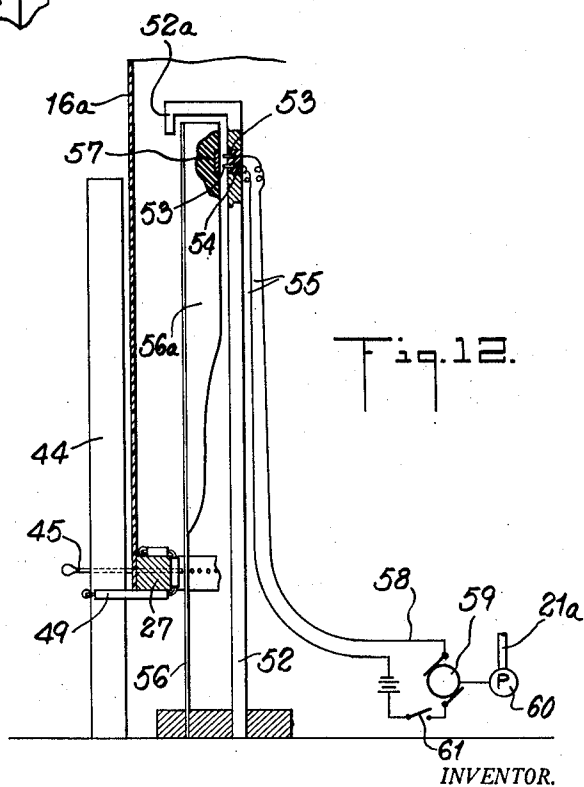
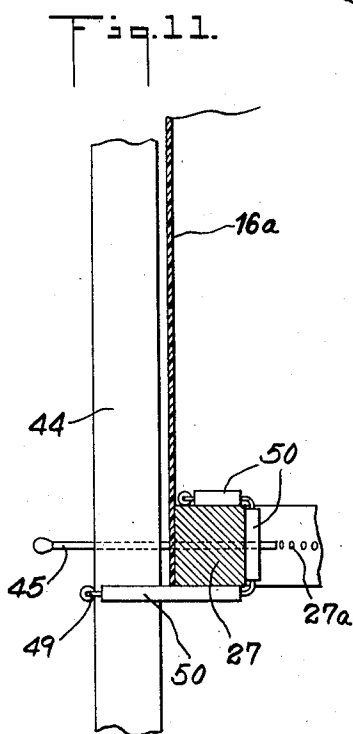
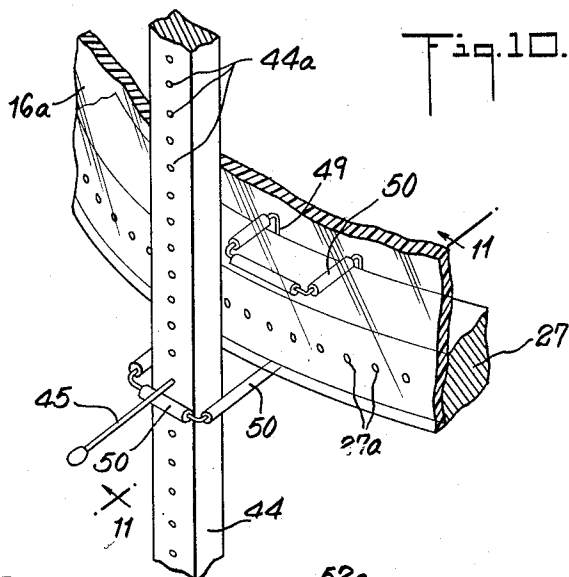
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2,820,404

PHOTOPRINTING APPARATUS

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Application November 23, 1954, Serial No. 470,645

6 Claims. (Cl. 95—4.5)

This invention relates to apparatus for use in photographically composing characters to be printed. The new apparatus is an improvement of the apparatus disclosed in my copending application Serial No. 386,933, filed October 19, 1953, now U. S. Patent No. 2,787,200 of which the present application is a continuation-in-part.

In my above-identified copending application, there is disclosed a photoprinting apparatus comprising a hollow drum mounted for rotary and axial movement. The periphery of the drum is formed by a transparent negative having super-imposed arcuate rows of the characters to be projected for photographing. A stationary light source is mounted at one side of the drum periphery and a stationary exposure station at the other side, so that any of the characters can be photographed at the exposure station by adjusting the drum rotationally and axially so as to position a selected character in the line of projection between the light source and the exposure station. To facilitate adjustment of the drum by the operator, the drum is provided with an indexing member having a pointer movable with the drum over a stationary rack having a table of characters similar to those on the drum negative and arranged in similar arcuate rows. Thus, the pointer indicates on the stationary rack the particular one of the characters on the negative which is positioned for projection. An apparatus of this type has the advantage of simplicity, will accommodate a large number of characters, and can be quickly and easily adjusted for projecting the characters in the desired sequence.

The present invention has particular reference to an apparatus of this type having improved means for facilitating the selective positioning of the drum by the operator to project the characters in the desired sequence, and for assuring that each selected character on the negative will be accurately positioned between the light source and the exposure station.

An apparatus made according to the present invention comprises a drum having at one portion of its periphery a transparent negative provided with arcuate rows of characters to be photographed, and at another portion of its periphery a table of characters corresponding to the negative characters and arranged in arcuate rows similar to those on the negative. A light source and an exposure station are mounted at opposite sides of the drum periphery; and the drum is supported on a mount for rotary and axial movement relative to the light source and exposure station, so that a selected negative character on the drum can be positioned for projection upon the exposure station by means of the light source. A stationary index is mounted adjacent the drum periphery and coacts with the table of characters to indicate thereon the character corresponding to the negative character positioned for the projecting operation. Preferably, the table characters are displaced angularly about the drum axis from the corresponding negative characters, the index

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member having a similar angular displacement from the line of projection between the light source and the exposure station, whereby the index can be used by the operator for selectively positioning the drum without interference from the photographic device formed by the exposure station and light source.

In the preferred construction, the drum mount includes a vertical member or shaft on which the drum is movable axially and rotatable, and a biasing element is connected to the drum for urging it upward on the vertical shaft so as to counteract the weight of the drum. In this way, the biasing element permits axial adjustment of the drum on the vertical shaft but retains the drum in any axial position to which it is raised or lowered. The biasing element preferably comprises a counterweight connected to the drum and disposed in its lower portion, where it is supported by vertical posts or legs extending through the open bottom end of the drum, and the drum is supported on the vertical shaft by means of a hub, or the like, through which the shaft extends and which is connected to the drum periphery intermediate the ends of the drum. With this structure, the drum may be conveniently arranged with the table of characters, below the hub and the transparent negative above the hub, and the upper end of the drum may also be open to accommodate wiring for a light source mounted on the upper end of the shaft within the negative portion of the drum.

A further feature of the invention resides in means for facilitating accurate positioning of a selected negative character on the drum prior to the projecting operation. According to this feature, the apparatus includes a stationary locking part, such as a vertical indexing stand, disposed adjacent the drum periphery, and a releasable locking element coacting with this part for locking the drum against both rotational and axial displacement from a selected projecting position. Preferably, the drum also has a locking part adjacent the stationary locking part, and one of these parts has a plurality of locking positions spaced longitudinally of the drum and corresponding in number and spacing to the arcuate rows in the table on the drum, while the other part has a plurality of locking positions spaced circumferentially of the drum and corresponding in number and spacing to the characters in each arcuate row. Thus, the drum can be locked only when a selected locking position on the drum part is opposite a selected locking position on the stationary part, at which time the selected negative character on the drum will be accurately positioned for projection upon the exposure station. The locking positions on the drum and stationary parts may be formed by holes, so that the locking means may be in the form of a releasable pin engageable simultaneously in two selected holes of the respective parts to interlock the drum and the stationary part. In one form of the invention, the photographing device formed by the light source and the exposure station is interconnected with the releasable locking means for the drum, whereby the selected negative character can be photographed only when the pin or other releasable locking element is in position to lock the drum. Since the locking element can be so positioned only when a locking position on the drum is in alignment with a locking position on the indexing stand or other stationary part, as previously described, accurate positioning of the selected negative character is assured.

These and other features of the invention will be better understood by reference to the accompanying drawing, in which

Fig. 1 is a front elevational view of a preferred form of the new apparatus;

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Fig. 2 is a top view of the apparatus shown in Fig. 1; Fig. 3 is a horizontal sectional view on the line 3—3 in Fig. 1;

Fig. 4 is a development, on a reduced scale, of the peripheral surface of the drum, showing the arrangement of several sets of negative characters and corresponding tables of characters;

Fig. 5 is an enlarged vertical sectional view of the drum and the shaft on which it is mounted, but omitting the biasing element for the drum;

Fig. 6 is a horizontal sectional view on the line 6—6 in Fig. 5;

Fig. 7 is an enlarged vertical sectional view of the lower portion of the drum and the drum mount, showing the biasing element for the drum;

Figs. 8 and 9 are sectional views on the lines 8—8 and 9—9, respectively in Fig. 7;

Fig. 10 is a perspective view of part of the bottom end of the drum and the stationary index stand, showing the locking means for the drum;

Fig. 11 is a side view, partly in vertical section, of the structure shown in Fig. 10, and

Fig. 12 is a view similar to Fig. 11, but on a reduced scale, showing the interconnection between the drum locking means and the photographic device.

Referring to the drawings, the apparatus there shown comprises a base 15 on which a hollow drum 16 is mounted for rotary and axial movement, the axis of the drum being vertical. The peripheral surface of the drum 16 is made of a flexible transparent sheet material, such as "Plexiglas." A camera 17 forms an exposure station outside the drum periphery opposite its upper portion. The camera has a magazine 18 for the film or other photographic material, which is exposed through the camera lens and shutters and the pleated part 17a when the camera is operated. The camera and its magazine are mounted on a stationary support consisting of a platform 19 having three legs 20 secured to the base 15 at one side of the drum 16. The shutters of the camera 17 may be of the Duoflex type, and the magazine 18 may be of the Graphlex Photorecord type. The photographic equipment 17—18 may be of the well-known type having mechanism (not shown) which, under control of a manually operable member 21, advances a strip of the photographic material in the magazine 18 to prevent a new film frame and actuates the camera shutters, so that each operation of the control member 21 will cause a new frame on the photographic strip to be exposed. The operating member 21 may be a foot pump connected through a pneumatic hose 21a to the photographic equipment 17—18 and located in front of the apparatus where it is readily accessible to the operator.

Within the drum 16 is a light box 22 containing an electric lamp 23. The light box 22 is located opposite the lens of camera 17 and is held stationary on a bracket 24 secured to the top of a vertical member 25 mounted on the base 15 and forming a main supporting shaft for the drum 16. The vertical shaft 25 is secured to the base 15 by means of a fitting 25a, as shown particularly in Fig. 7. It will be understood that the parts 22—23 form a light source by means of which the image of a character on the adjacent part of the transparent drum periphery is projected upon the exposure station formed by the camera 17.

As best shown in Fig. 5, the drum 16 comprises a bottom ring 27, a top ring 28, and an intermediate ring 29. The transparent sheet forming the drum periphery is folded around these rings and secured to them in any suitable manner, as by cementing, the opposing edges of the transparent sheet being secured together by means of a grooved strip 16a. The rings 27 and 28 form open ends of the drum. The intermediate ring 29, however, is connected by radial spokes 30 to a central hub 31 which is brazed or otherwise secured to a metal sleeve 32 within the hub. Sleeve 32 receives the vertical shaft 25, which

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has a close sliding fit in the sleeve and projects upwardly through the latter to the bracket 24 for the light source. As shown in Fig. 5, the upper end of sleeve 32 terminates near the central hub 31, while the lower end of the sleeve projects through the open bottom of the drum.

The lower portion of the drum 16 is marked into squares 34 on its periphery, and these squares contain the various characters to be printed (not shown), such as letters of the alphabet, numbers, etc. Thus, the characters are arranged in arcuate rows extending circumferentially around the drum periphery and superimposed one above the other. The upper portion 35 of the drum periphery forms a negative provided with arcuate rows of the characters to be photographed (not shown). These negative characters correspond to the characters on the lower portion 34 of the drum and are arranged in arcuate rows similar to the rows formed by the squared-off portion 34. In other words, the lower portion 34 of the drum forms a table of characters which duplicates the arrangement of negative characters on the upper portion 35 of the drum.

While the squares and their contained negative characters on the upper portion 35 of the drum are not readily visible, due to this upper portion being a negative, I have shown in Fig. 4 a preferred arrangement of the character squares on both the negative and table portions of the drum. As shown in Fig. 4, the negative or upper portion of the drum periphery 35 is divided into four sets of characters, these sets being designated A, B, C and D and each occupying a 90° angle of the drum periphery. The lower or table portion 34 of the drum is divided into four sets of characters A', B', C' and D', which correspond, respectively, to the negative sets A, B, C and D. It will be observed that each of the character sets on the negative portion 35 is displaced 90° from the corresponding character set on the table portion 34. Consequently, when one of the negative sets A, B, C or D is positioned between the light source 23 and the camera 17 at one side of the drum, the corresponding character set of the table 34 will be positioned in front of the drum where it is used for selecting the particular negative character to be photographed, as will be described in more detail presently. The characters of the sets A—A', may be small letters of an alphabet, those of B—B' may be capital letters, those of the sets C—C' may be numbers, and those of the sets D—D' may be letters which are less frequently used than those in the other sets. In any case, the drum can accommodate a large number of different characters arranged in one or more matching sets on the table portion 34 and negative portion 35, so that the apparatus is well suited for photographic printing in languages having large numbers of characters in the alphabet.

Secured to the base 15 are four vertical posts 37 which extend upward through the open bottom of the drum and support at their upper ends a cross bar 38, as shown in Figs. 7—9. The cross bar 38 has pulleys 39 mounted in recesses in the cross bar, the pulleys being arranged at diametrically opposite sides of the vertical shaft 25 which extends through the cross bar. Below the cross bar 38 is a biasing element in the form of a counterweight 40 having a central opening through which the shaft 25 and sleeve 32 extend. The counterweight 40 is secured at opposite ends to wires 41 extending upwardly over the outer pulleys 39, then radially inward and over the inner pulleys 39, and then downward through the cross bar 38 and counterweight 40 to the outer race of a ball bearing assembly 42. The inner race of the bearing 42 has a close sliding fit around the vertical shaft 25 and supports the lower end of sleeve 32. With this arrangement, the drum 16 may be rotated on the vertical shaft 25 without affecting the counterweight 40, and the latter will hold the drum 16 in any vertical position to which it is adjusted by sliding the sleeve 32 up or down on shaft 25. In other words, the counterweight 40 operates through

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the wires 41 and bearing 42 to urge the drum upward so as to counteract the weight of the drum. Thus, the drum can be easily adjusted both rotationally and axially, as by grasping the bottom portion of the drum periphery and turning the drum or raising or lowering it.

An indexing stand 44 is mounted in front of the drum 16 on the base 15 and forms a stationary locking part for the drum. As shown in Figs. 1 and 10, the indexing stand 44 has a series of vertically spaced holes 44a which form locking positions corresponding in number and spacing to the circumferential rows of characters in the table portion 34 of the drum. The bottom ring 27 of the drum also constitutes a locking part having holes 27a forming locking positions spaced circumferentially of the drum and corresponding in number and spacing to the characters in each circumferential row on the drum. A pin 45 is adapted to be inserted through two aligned holes 44a and 27a to lock the drum to the indexing stand 44. Thus, the pin 45 constitutes a releasable locking element for locking the drum only when one of its holes 27a is aligned with one of the holes 44a, such alignment taking place only when a selected negative character on the drum portion 35 is accurately positioned between the light source 23 and the camera 17.

It will be understood that there are as many combinations of two holes in the parts 27 and 44 as there are characters on each of the drum portions 34 and 35.

A transverse bar 46 of transparent material, such as "Plexiglas," is secured to the upper end of the indexing stand 44. At one end, the bar 46 is attached to one of the legs 20, and at the other end it is attached to a relatively short leg 47 on the base 15. The cross bar 46 as thus supported extends in an arc partly around the periphery of lower portion 34 of the drum but is spaced slightly from the drum. On the cross bar 46 directly above the stand 44 is an index 48 which, as shown in Fig. 1, consists of lines marked on the cross bar and forming a square of the same size as the squares marked on the table portion 34 of the drum. Since the bar 46 is transparent, the part of table 34 directly behind the index 48 is visible to the operator so that he can align any particular square on the table with the square of the index 48. To increase the visibility of the character within the particular table square which is thus aligned with the index square 48, a magnifying glass 48a, such as a linen tester, is secured to the cross bar 46 over the index 48.

The drum 16 is provided with a trailer which moves vertically with the drum along the indexing stand 44 to indicate the particular hole 44a in which the locking pin 45 is to be inserted to lock the drum. As shown particularly in Figs. 10 and 11, the trailer comprises a wire loop 49 extending around the front and sides of the stand 44, then under the bottom ring 27 of the drum, and then upward and outward along the top of this ring to form a hook. The wire loop 49 is provided with rollers 50 contacting the stand 44 and ring 27, to reduce friction between the parts. The drum 16 can be rotated freely without moving the trailer 49, but the front portion of the trailer will follow the vertical movements of the drum. As shown in Fig. 10, the proper hole 44a for insertion of the locking pin 45 is the first hole above the front roller 50 of the trailer.

Referring now to Fig. 12, a post 52 extends upward through the open bottom of the drum from the base of the apparatus. This post is located between the index stand 44 and the drum axis. At its upper portion, the post 52 carries a pair of electrical contacts 53 mounted in an insulating block 54 and connected to conducting wires 55. Directly in front of the post 52 is a vertical spring strip 56 secured to the base of the apparatus and having at its upper portion an insulating member 56a. A conducting plate 57 is secured to the insulating member 56a opposite the contacts 53. When the pin 45 is inserted in a pair of aligned holes in the parts 44—27, the inner end of the pin engages the spring strip 56 and

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forces the conducting plate 57 against contacts 53 so as to bridge these contacts; and when the pin 45 is withdrawn from its locking position, the spring strip 56 returns the conducting plate 57 to its normal position so as to open the switch formed by the contacts 53. This return movement of the spring strip 56 is limited by a hook 52a at the top of the post 52.

The wires 55 connect the contacts 53 into the circuit 58 of an electric motor 59. This motor drives a compressor pump 60 connected through the pneumatic hose 21a to the photographic equipment 17—18. When the motor circuit 58 is closed, the camera 17 operates automatically to actuate the camera shutters and expose a film frame to an image projected by the light source 23. The motor circuit 58 may be controlled by a manually operable switch 61 located near the indexing stand 44, or it may be controlled entirely by the switch 53—57 which is actuated by the releasable locking means for the drum. In either case, the switch 53—57 will prevent exposure of a film frame at the exposure station 17 until the particular character to be photographed has been accurately positioned by insertion of the pin 45 into the corresponding aligned holes in the parts 44—27.

It will be apparent from the foregoing that the new apparatus is of simple construction and yet can be operated quickly and easily with assurance that each negative character is properly located for photographing by the camera 17. The photographing device including the camera 17 and light source 23 is displaced from the region where the operator sets the drum 16 at the front of the apparatus, so that the photographing device cannot interfere with the drum setting operations; but at the same time, the operating element 21 (or 61) for the photographing device may be conveniently located at the front of the apparatus where it is readily accessible to the operator. The open ends of the drum 16 make it possible to accommodate the counterweight 40 and the switching means 53—57 within the drum and enable the wiring 23a for the light source to be led into the drum through the top. The operator can readily position any desired negative character for photographing by adjusting the drum rotationally and vertically until the corresponding character on the table portion 34 appears in the index square 48, and then inserting the locking pin 45 into the appropriate hole 44a (as indicated by the trailer 49) and the hole 27a aligned therewith. The trailer 49 will assist the operator in obtaining the proper vertical positioning of the drum for insertion of the pin 45, by the position of the trailer relative to the next hole 44a below that in which the pin is to be inserted. To facilitate the proper angular positioning of the drum, for insertion of the pin 45, transparent cross bar 46 may be provided with an index mark 62 (Fig. 1) so positioned that when the drum 34 is in the proper angular adjustment, the right-hand edge of the mark 62 coincides with the left-hand edge of one of the squares 34, such as the fourth square from the square 34 behind the index 48.

Also, the cross bar 46 may have another index mark 62a so positioned that when the drum is in the proper vertical adjustment, the upper edge of mark 62a coincides with the bottom edge of one of the squares 34.

I claim:

1. In a photographic apparatus for composing printed matter and the like, the combination of a drum having at one portion of its periphery a negative provided with arcuate rows of characters to be photographed, the drum having at another portion of its periphery a table of characters corresponding to said first characters and arranged in arcuate rows similar to said first rows, a drum mount on which the drum is rotatable on its axis and movable longitudinally of said axis, a light source disposed on one side of the drum periphery, an exposure station mounted at the opposite side of the drum periphery in position to receive an image of one of said negative characters

projected by the light source, the drum being axially and rotatably adjustable on its mount relative to said source and station to position a selected negative character for said projection, a stationary index mounted adjacent the drum periphery and coacting with said table to indicate the character thereon corresponding to the negative character positioned for said projection, a stationary locking part disposed adjacent the drum periphery and having a plurality of holes spaced longitudinally of the drum and corresponding in number and spacing to the arcuate rows in said table, the drum having a locking part provided with a plurality of holes spaced circumferentially of the drum and corresponding in number and spacing to the characters in each arcuate row, and a releasable pin engageable simultaneously in two selected holes of the respective parts for interlocking said parts.

2. A combination according to claim 1, comprising also a trailer carried by the drum and movable therewith longitudinally along said stationary part to indicate the locking hole therein corresponding to a selected axial position of the drum.

3. A combination according to claim 1, comprising also a trailer carried by the drum and movable therewith longitudinally along said stationary part to indicate the locking hole therein corresponding to a selected axial position of the drum, the trailer engaging the stationary part to prevent lateral movement of the trailer relative to said last part, and the trailer having a hook, the drum having an internal ring at one end engaged by said hook.

4. In a photographic apparatus for composing printed matter and the like, the combination of a drum having at one portion of its periphery a negative provided with arcuate rows of characters to be photographed, the drum having at another portion of its periphery a table of characters corresponding to said first characters and arranged in arcuate rows similar to said first rows, a drum mount on which the drum is rotatable on its axis and movable longitudinally of said axis, a light source disposed at one side of the drum periphery, an exposure station mounted at the opposite side of the drum periphery in position to receive an image of one of said negative characters projected by the light source, the drum being axially and rotatably adjustable on its mount relative to said source and station to position a selected negative character for said projection, a stationary index mounted adjacent the drum periphery and coacting with said table to indicate the character thereon corresponding to the negative character positioned for said projection, the exposure station including a camera for receiving the projected image, the camera and light source forming a photographing device, the combination comprising also a stationary locking part disposed adjacent the drum periphery, a releasable locking element coacting with said part for locking the drum against both rotatable and axial displacement from a selected projecting position, and operating means connected to the photographing device for operating it only when said locking element is in locking position, said operating means including a switch actuable by said locking element in response to movement thereof to its locking position.

5. In a photographic apparatus for composing printed matter and the like, the combination of a drum having at one portion of its periphery a negative provided with arcuate rows of characters to be photographed, the drum having at another portion of its periphery a table of

characters corresponding to said first characters and arranged in arcuate rows similar to said first rows, a drum mount on which the drum is rotatable on its axis and movable longitudinally of said axis, a light source disposed at one side of the drum periphery, an exposure station mounted at the opposite side of the drum periphery in position to receive an image of one of said negative characters projected by the light source, the drum being axially and rotatably adjustable on its mount relative to said source and station to position a selected negative character for said projection, a stationary index mounted adjacent the drum periphery and coacting with said table to indicate the character thereon corresponding to the negative character positioned for said projection, the drum having a vertical axis, a vertical indexing stand mounted adjacent the drum periphery and supporting said index, the stand having vertically spaced holes corresponding in number and spacing to the arcuate rows of said table, the drum having circumferentially spaced holes corresponding in number and spacing to the characters in each arcuate row, and a releasable pin engageable simultaneously in two selected holes of the stand and drum, respectively, for locking the drum in a selected projecting position.

6. In a photographic apparatus for composing printed matter and the like, the combination of a drum having at one portion of its periphery a negative provided with arcuate rows of characters to be photographed, the drum having at another portion of its periphery a table of characters corresponding to said first characters and arranged in arcuate rows similar to said first rows, a drum mount on which the drum is rotatable on its axis and movable longitudinally of said axis, a light source disposed at one side of the drum periphery, an exposure station mounted at the opposite side of the drum periphery in position to receive an image of one of said negative characters projected by the light source, the drum being axially and rotatably adjustable on its mount relative to said source and station to position a selected negative character for said projection, a stationary index mounted adjacent the drum periphery and coacting with said table to indicate the character thereon corresponding to the negative character positioned for said projection, the drum having a vertical axis, a vertical indexing stand mounted adjacent the drum periphery and supporting said index, the stand having vertically spaced holes corresponding in number and spacing to arcuate rows of said table, the drum having circumferentially spaced holes corresponding in number and spacing to the characters in each arcuate row, a transparent member extending laterally from the stand and having an index adjacent said table for indicating vertical alignment of a drum hole with the stand holes, and a releasable pin engageable simultaneously in two selected holes of the stand and drum, respectively, for locking the drum in a selected projecting position.

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