

June 10, 1958

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2,838,113

METHOD AND APPARATUS FOR CUTTING PRINT

Filed Dec. 21, 1953

7 Sheets-Sheet 1

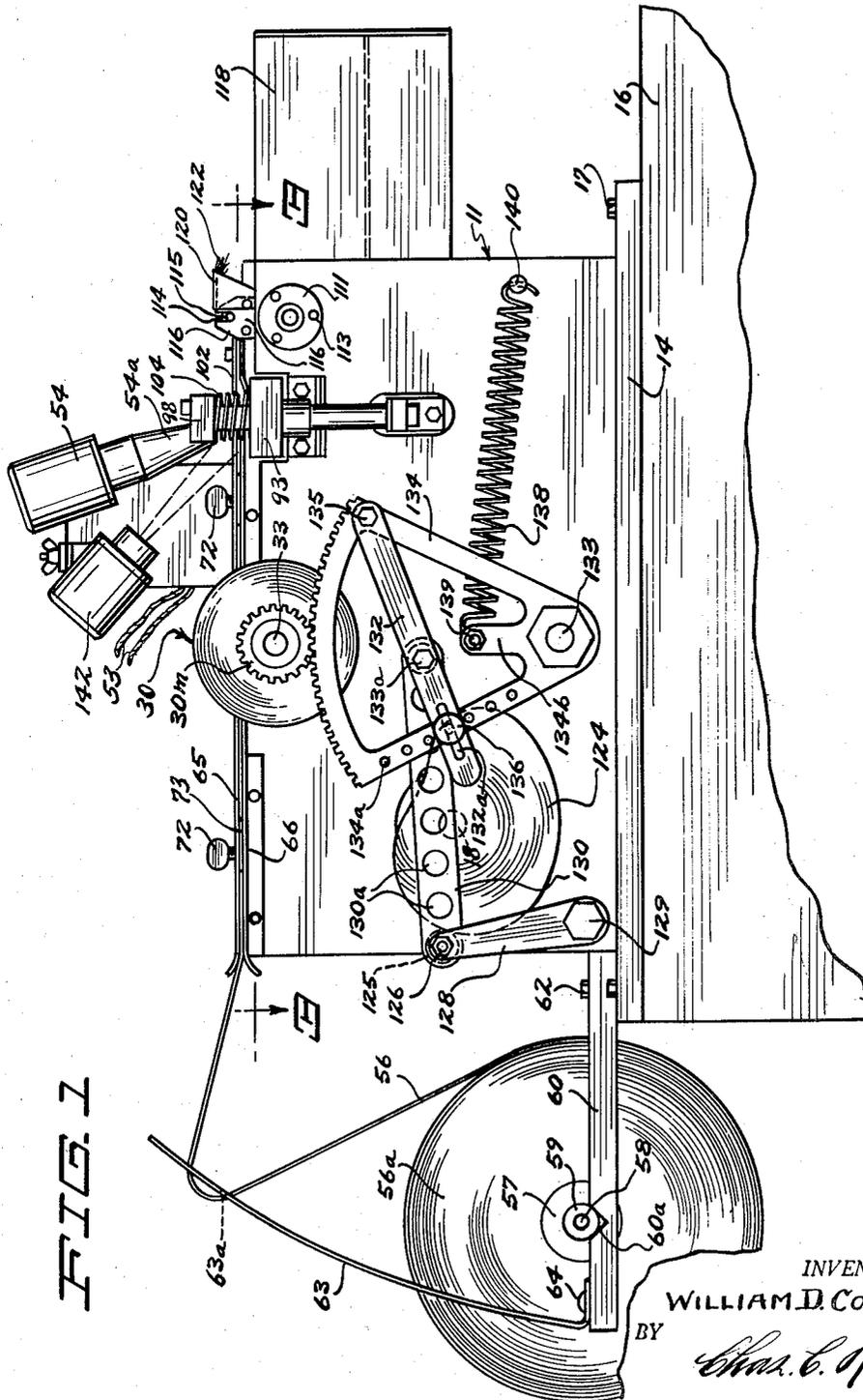


FIG. 1

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7 Sheets-Sheet 2

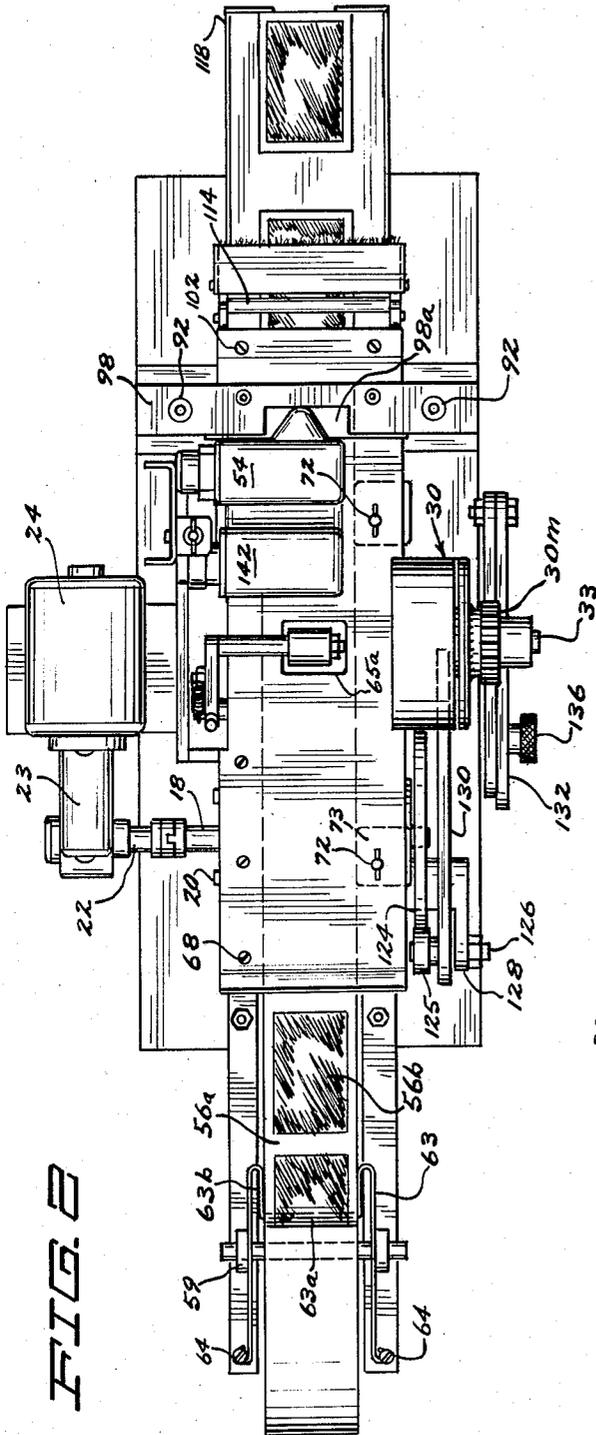


FIG. 2

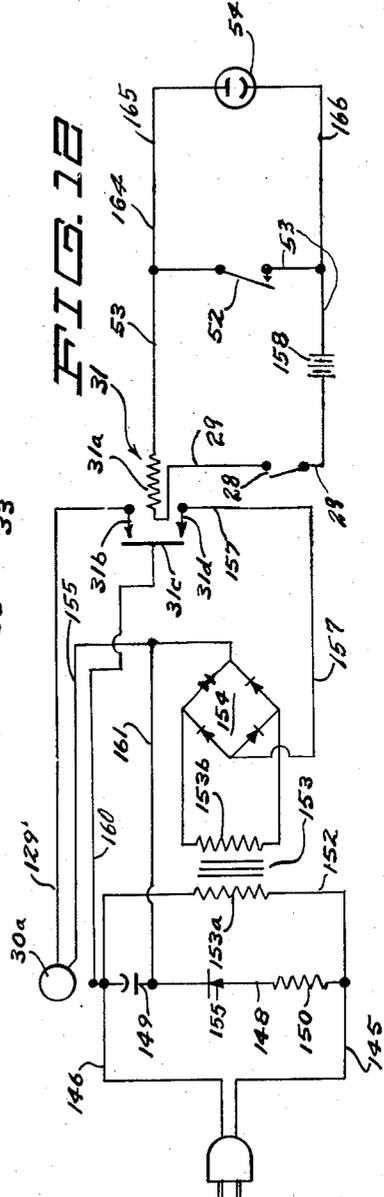


FIG. 1B

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7 Sheets-Sheet 3

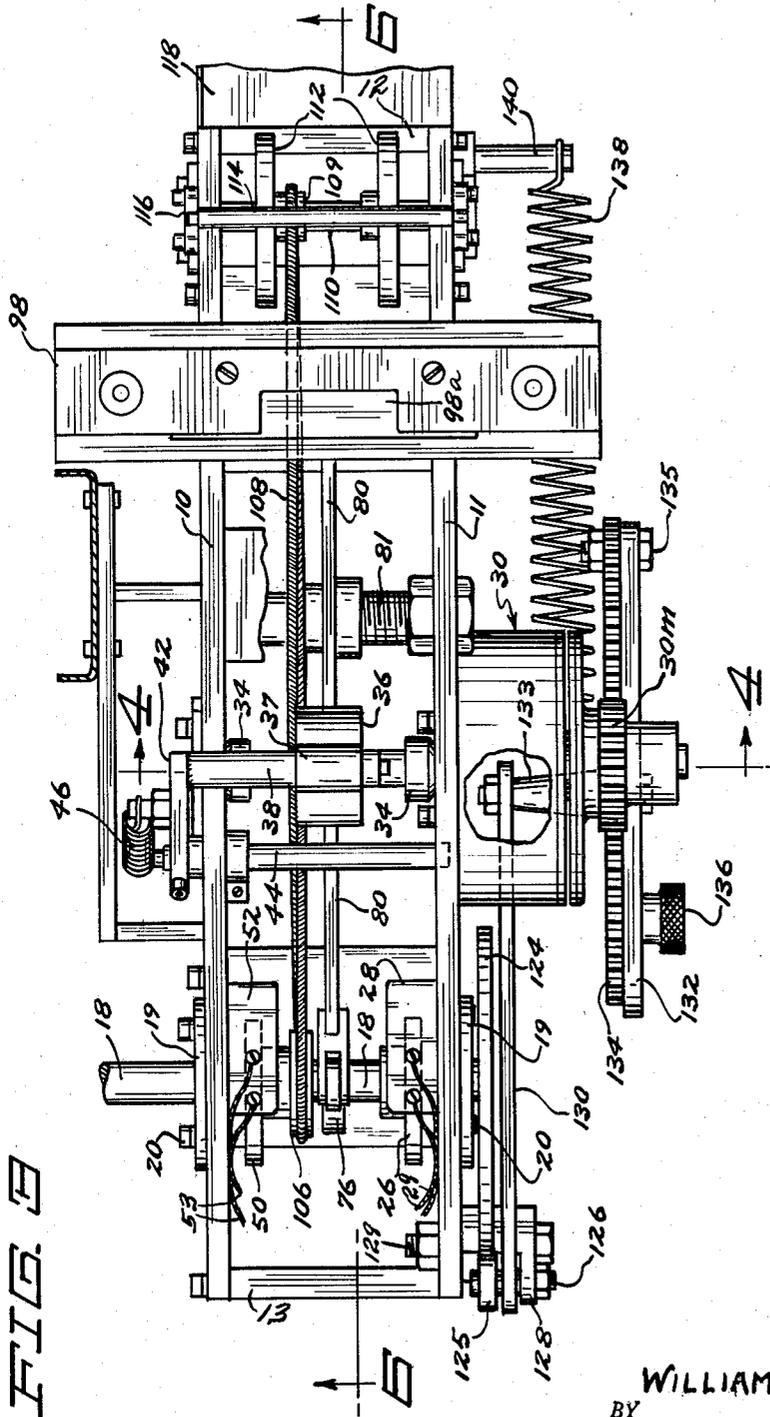


FIG. 9

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7 Sheets-Sheet 4

FIG. 4

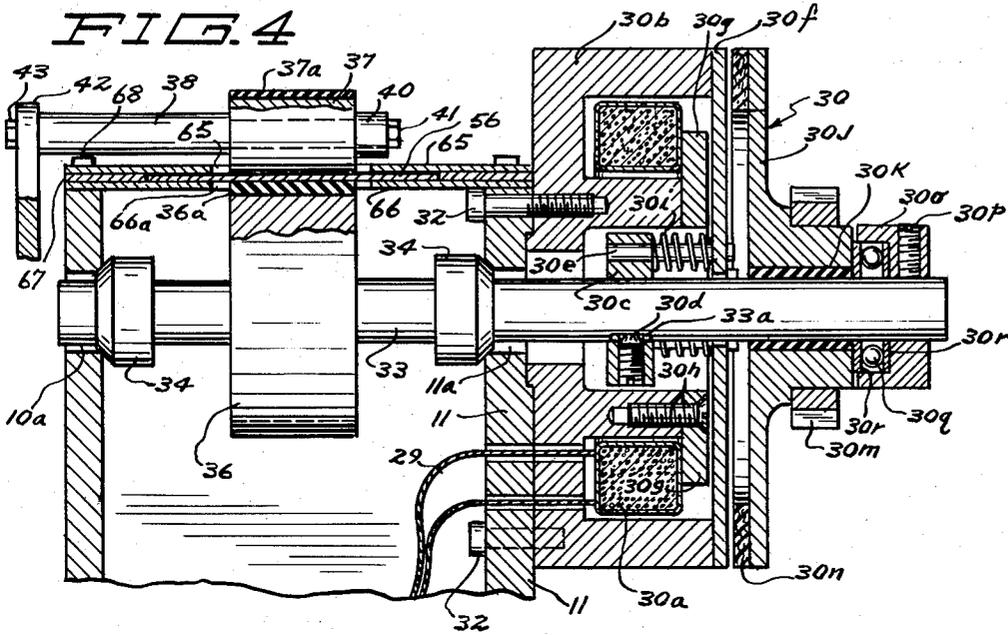
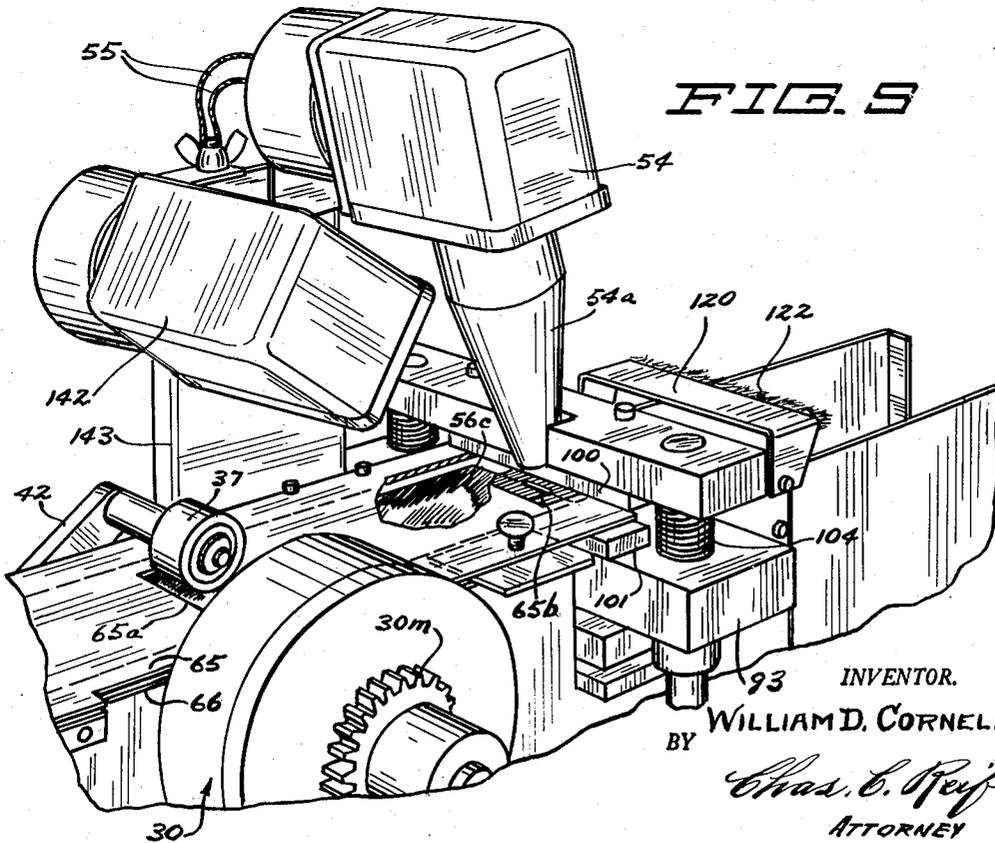


FIG. 5



June 10, 1958

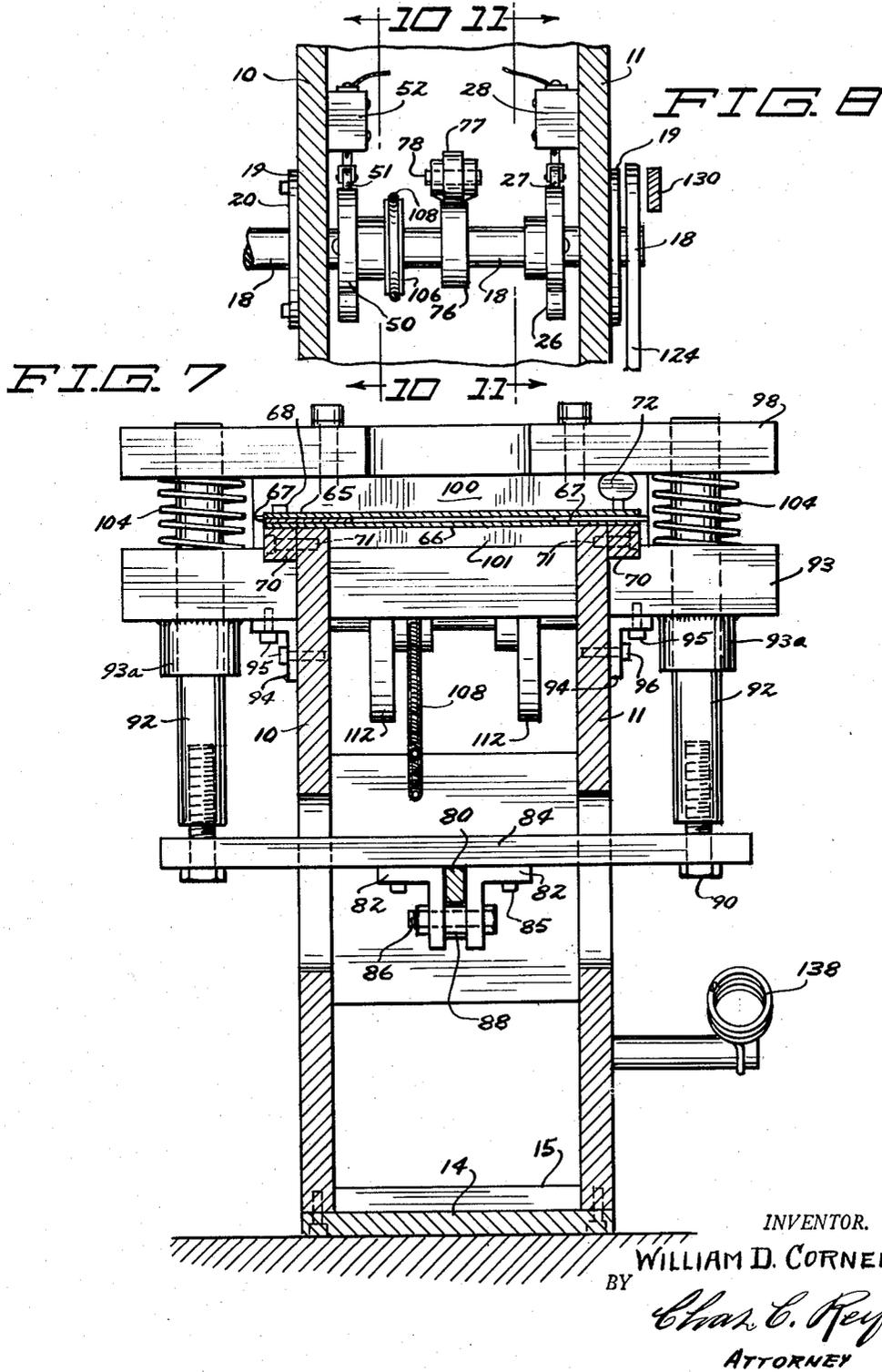
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2,838,113

METHOD AND APPARATUS FOR CUTTING PRINT

Filed Dec. 21, 1953

7 Sheets-Sheet 6



June 10, 1958

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2,838,113

METHOD AND APPARATUS FOR CUTTING PRINT

Filed Dec. 21, 1953

7 Sheets-Sheet 7

FIG. 9

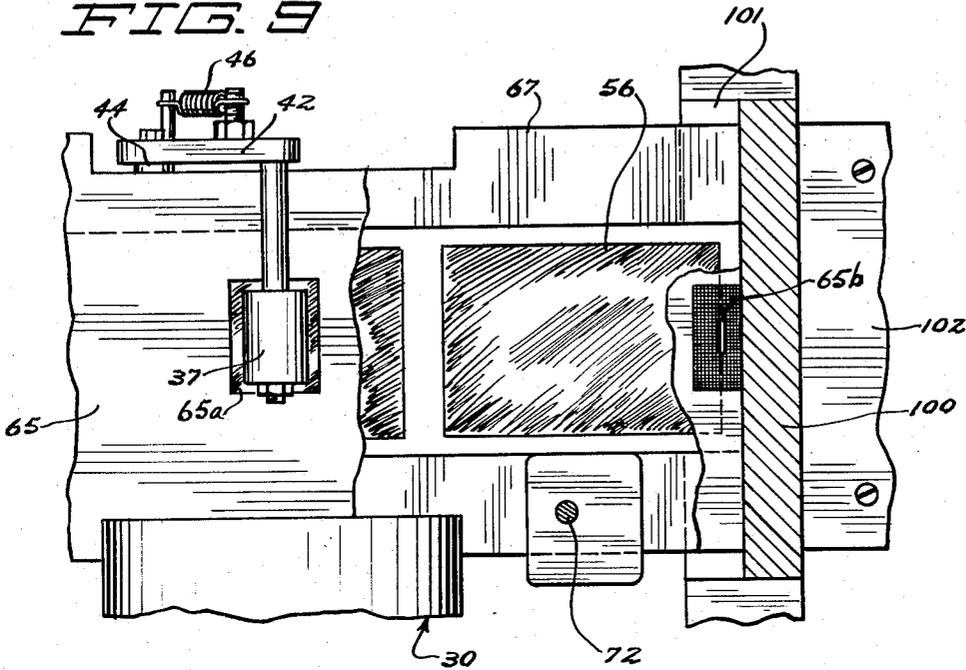


FIG. 10

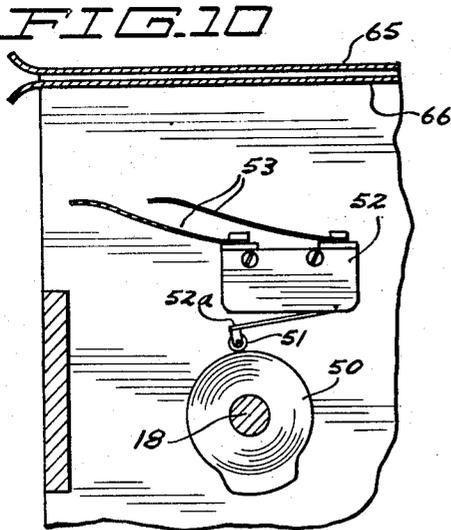
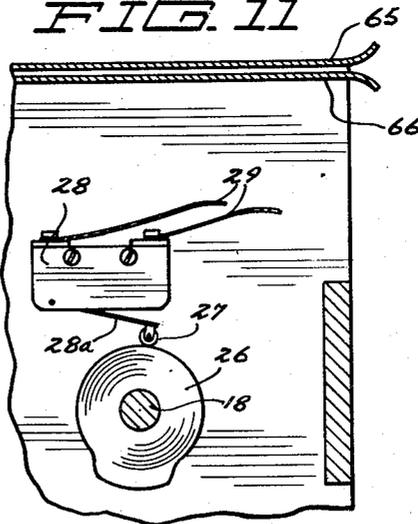


FIG. 11



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METHOD AND APPARATUS FOR CUTTING PRINT

William D. Cornell, Kenmore, N. Y.

Application December 21, 1953, Serial No. 399,553

5 Claims. (Cl. 164—49)

This invention relates to a machine for severing a continuous strip of sheet material having images thereon into portions bearing said images. More specifically the machine is designed for cutting photographic prints from a strip having the spaced photographic images thereon. It has long been a problem to cut prints from a continuous strip automatically and to keep the line of cutting or severing at the desired point. The strip or sheet must be stopped for cutting and it must be advanced a distance between each severing operation. Theoretically the strip would be stopped at a point where the severing means would cut the strip on a line midway between two of the images. This has not been accomplished in practice. It has been the common practice to advance the sheet or strip a distance equal to the distance between two of the images plus a small increment. This increment is added to compensate for the lag due to the mechanism for starting and stopping the strip. It will be seen that if the strip is moved each time the distance between the images plus said increment, the line of cutting will progressively be moved away from the line midway between the images and would soon cross one of the images plus said increment. Some correcting means is therefore necessary to keep the line of severing between the images.

It is one object of this invention to provide a method and apparatus for severing a strip or sheet of material having spaced images thereon into portions bearing said images respectively and for controlling the point or line of such severing.

It is an object of this invention to provide an apparatus having comparatively simple and efficient means for controlling the position of the line of severing of a strip bearing spaced images to keep said line at a desirable point between said images.

It is another object of the invention to provide an apparatus for severing a strip bearing uniformly spaced images into parts containing said images respectively which comprises means for advancing said strip a distance equal to the distance between said images plus a small increment, together with a second means for stopping said strip actuated by the position of portions of one of said images which are of different shades or colors, and a cutting means for severing said strip, said second means being so arranged in relation to said cutting means to sever said strip along a line midway between said images whereby if said second means is not actuated to stop said strip, said first mentioned means will stop said strip and said cutting means will be operated.

It is more specifically an object of the invention to provide an apparatus for severing a sheet or strip of material having substantially uniformly spaced images thereon and controlling the position of the line of severing comprising means for advancing said strip or sheet, means for stopping said strip or sheet after it has been advanced a distance equal to the distance between said images plus a small increment, a photo-electric cell trained on said strip, means for energizing said cell when the light space between said images is in the field of said

cell, said cell being operated when a dark portion of the next image moves into the field of said cell and severing means actuated when said stopping means is operated.

It is still another object of the invention to provide such an apparatus as set forth in the preceding paragraph, in which said stopping means is in the form of an electro-magnetic device, and said energizing of said photo-electric cell and said first mentioned stopping means are actuated by cams carried on a driving shaft.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a view in side elevation of the machine of this invention;

Fig. 2 is a top plan view of said machine;

Fig. 3 is a partial top plan view similar to Fig. 2 but shown on an enlarged scale, some portions being broken away and others shown in horizontal section;

Fig. 4 is a vertical section taken on line 4—4 of Fig. 3, as indicated by the arrows;

Fig. 5 is a partial perspective view of the machine, some parts being broken away and others shown in vertical section;

Fig. 6 is a partial vertical section taken on line 6—6 of Fig. 3, as indicated by the arrows;

Fig. 7 is a vertical section taken on line 7—7 of Fig. 6, as indicated by the arrows;

Fig. 8 is a vertical section taken on line 8—8 of Fig. 6, as indicated by the arrows;

Fig. 9 is a partial horizontal section taken on a plane slightly above line 3—3 of Fig. 1;

Fig. 10 is a vertical section taken on line 10—10 of Fig. 8;

Fig. 11 is a vertical section taken on line 11—11 of Fig. 8; and

Fig. 12 illustrates a wiring diagram for parts used in the device.

Referring to the drawings, a machine is shown comprising a frame including vertically disposed spaced plate members 10 and 11 extending longitudinally of the machine and front and rear plate members 12 and 13 vertically disposed and connected to members 10 and 11. Spaced bottom horizontal plate members 15 are provided which are adapted to rest upon some suitable table or support 16. Plates 15 extend between plates 10 and 11. A plate 14 extends longitudinally of the machine on which plates 10, 11 and 15 rest. Plate 14 extends beyond plates 10 and 11 and is shown as secured to support 16 by headed bolts 17. A driving shaft 18 is journaled in bearings 19 secured to frame members 10 and 11 respectively by bolts 20. Shaft 18 is coupled to a shaft 22 extending into a speed reducing mechanism 23 into which also extends the driving shaft of a motor 24. Shaft 18 has secured thereto a cam 26, (see Figs. 3, 8 and 11). Cam 26 is engaged by a cam follower 27 in the form of a roller 27 secured to the actuating arm 28a of an electric switch 28. An electrical conductor 29 extends from switch 28 to the coil 31a (see Fig. 12) of a photo-electric cell amplifier control relay 31. Another conductor 29 extends from switch 28 to a source of electric current, such as a battery 158, to be later described. With each rotation of shaft 18, switch 28 will be operated by cam 26 and switch 28 will be actuated.

Device 30 includes an electro-magnet coil 30a to which conductors 29 are secured. Member 30 comprises a frame 30b secured to frame member 11 by bolts 32. Member 30 also includes a cylindrical member 30c secured to a shaft 33 by any suitable means, such as the set screw 30d, the inner end of which is disposed in a slot 33a in shaft 33. Member 30c has secured therein a plurality of cir-

cumferentially spaced pins 30e which extend through a circular plate 30f shown as having the same diameter as frame 30b and as being movable into engagement with said frame. A plate 30g is disposed closely adjacent to a plate 30f and is secured by screws 30h to frame member 30b. A compression coiled spring 30i surrounds each pin 30e, the same engaging one side of member 30c at one end and engaging plate 30f at the other end. A member 30j carries a bushing 30k which is journaled on shaft 33. A gear or pinion 30m is secured to member 30j. Member 30j is shown as having the same diameter as members 30b and 30f and the same has thereon adjacent its periphery an annular member 30n which will be made of some frictional material. A member 30o is secured to the outer portion of shaft 33 in any suitable manner, as by the set screw 30p. A thrust bearing comprising balls 30q engaging spaced plates 30r is carried in a recess in member 30o, one of said plates engaging the outer end of member 30j. Shaft 33 has members 34 secured thereto having their remote ends beveled and partially disposed in openings 11a and 10a in members 10 and 11 respectively. Shaft 33 is thus rotatably mounted in members 10 and 11 and is held from longitudinal movement.

A roller 36 is secured to shaft 33, the same having a peripheral portion 36a made of some frictional material which is preferably resilient. Roller 36 has its periphery adjacent another roller 37 also having a peripheral portion 37a, of frictional and preferably resilient material, such as rubber or rubber composition. Roller 37 is journaled on a stationary shaft 38 and is held on said shaft by a collar 40 held in place by a headed screw 41. The other end of shaft 38 has its end reduced and disposed in an arm 42, said shaft being held therein by a headed screw 43. Arm 42 is secured to a shaft 44 journaled in members 10 and 11. A tensile coiled spring 46 is secured to arm 42 at one end and is secured to a portion of the frame at its other end, said spring acting to move arm 42 and to move roller 37 toward roller 36.

Shaft 18 has another cam 50 secured thereto (see Figs. 3, 8 and 10), said cam being engaged by a cam follower 51 in the form of a roller carried on the actuating arm 52a of an electrical switch 52. Electric conductors 53 extend from switch 52 and one of the same extends to and is connected to said relay coil of an amplifier for a photo-electric cell 54, and the other extends to and is connected to one of conductors 29. (See Fig. 12.) With each rotation of cam 50, switch 52 will be closed and the said strip will be stopped, as hereinafter described. The photo-electric cell 54 has a directing or scanning head 54a in the form of a frusto-conical tube, so that said cell is directed onto or trained on the strip to be cut.

The strip or sheet 56 to be cut, such as a strip 56 containing spaced photographic images thereon, is carried in the form of a roll 56a on a supporting roll 57. Roll 57 is carried on a shaft 58 having collars 59 thereon disposed in slots 60a formed in spaced bars 60 extending from plate 14 and secured thereto by bolts 62. Slots 60a are shown as V-shape in form. The strip 56 passes upwardly over a horizontal portion 63a of a tensioning member 63 having its ends secured to bars 60 respectively by bolts 64. Member 63, as shown in Fig. 2, has reversely bent substantially parallel portions 63b which join portion 63a. Strip 56 then passes between guide plates 65 and 66 which are vertically spaced and have their free ends curved in diverging relation. Plates 65 and 66 have therebetween at their side portions, plates 67 which act to space plates 65 and 66. Said plates are secured by screws 68 to strips 70 in turn secured to the remote sides of members 10 and 11 by bolts 71. A plate 73 of general rectangular form is disposed between plates 65 and 66 (see Figs. 1 and 2) and the same has secured thereto a pin 72 having a winged head thereon. The center of pin 72 is offset from the center of plate 73 and said plate can be rotated to

different positions. Each side of plate 73 can thus form a guide for the strip and strips of different width can thus be accommodated in the machine.

The plates 65 and 66 are provided with vertically alined openings 65a and 66a. The adjacent portions of rollers 36 and 37 are disposed in said openings. Plate 65 has a small transversely elongated slot or opening 65b there-through to permit the rays to be reflected from print 56 to reach photo-electric cell 54. The area about opening 65b is darkened to prevent reflection from the lamp in casing 142. Adjacent the rear ends of plates 65 and 66 another plate 74 is disposed below plate 66, the same being supported on a bar 75 extending between plates 10 and 11. Plate 74 extends beyond the rear end of plate 66 and then extends upwardly beneath plate 65 and is spaced from plate 65 a smaller distance than is plate 66. Plates 65 and 74 terminate in substantially the same vertical plane.

Shaft 18 carries a third cam 76 (see Figs. 3 and 6). Cam 76 is engaged by a follower in the form of a roller 77 which is carried on a pin 78 held in the bifurcated end of a lever 80. Lever 80 is pivoted on a shaft 81 secured in plates 10 and 11. Lever 80 has its other end disposed between angle brackets 82 which are oppositely disposed and secured to a bar 84 by bolts 85. Brackets 82 have spaced vertical portions depending from bar 84 in which is secured a headed and nutted pin 86. A roller 88 is journaled on pin 86. The end of lever 80 is disposed between bar 84 and roller 88. Bar 84 has connected thereto by headed bolts 90, a pair of posts 92 which extend upwardly from bar 84. Posts 92 pass through and are movable in a bar 93 having depending hub portions 93a adjacent each end thereof through which posts 92 also pass. Bar or member 93 is secured to plates 10 and 11, as shown in Fig. 7, by angle brackets 94 secured to the same and to plates 10 and 11 by bolts 95 and 96 respectively. Posts 92 extend above member 93 and have their upper ends secured in a bar 98 which extends transversely of the machine and carries a cutting member 100. Cutting member 100 cooperates with a cutting block or member 101 disposed below and engaging plate 74. As shown in Fig. 2, bar 98 is cut away at its central portion forming a recess 98a. The front vertical edge of member 100 is substantially in vertical alinement with the rear vertical edge of member 101. Plates 65 and 74 terminate closely adjacent the plane of said edges. Beyond members 100 and 101, vertically spaced plates 102 and 103 are disposed, the same being vertically spaced substantially the same distance as plates 65 and 66. The lower front end of plate 103 is bent downwardly. Compression coiled springs 104 surround posts 92, having their lower ends engaging bar 93 and their upper ends engaging bar 98. It will be seen that with each revolution of shaft 18, lever 80 will be oscillated and bar 98 will be moved downwardly, thus moving cutting member 100 downwardly to sever the strip or sheet.

Shaft 18 also carries a pulley 106 over which runs a spring or resilient belt 108 also running over a pulley 109 secured to a shaft 110 journaled in bearings 111 secured to plates 10 and 11 respectively by bolts 113. Shaft 110 has secured thereto spaced rollers 112 having peripheral portions 112a which will be made of some frictional and preferably resilient material, such as rubber or rubber composition. The tops of rollers 112 are disposed substantially at the top of plate 103. Above rollers 112 are disposed rollers 114 vertically alined with rollers 112 respectively and carried on a shaft 115 having its ends seated in slots in brackets 116 secured respectively to plates 10 and 11. A receptacle 118 is secured to the ends of members 10 and 11 and is adapted to receive the cut portions or prints. A bracket 120 has a horizontal top portion and depending side portions which are secured to plates 10 and 11 respectively. A body

of tinsel 122 is secured to the rear edge of bracket 120 and acts as a static eliminator.

Shaft 18 also has secured thereto at the outer side of plate 11 a disk cam 124. Cam 124, as shown in Fig. 1, is of distorted elliptical form. A cam follower 125 engages cam 124, the same being in the form of a roller carried on a headed and nutted pin 126 in one end of an arm 128 pivoted to swing about a headed bolt 129 secured in plate 11. Pin 126 extends through one end portion of a link 130, the other end of which is pivotally secured intermediate the ends of a bar 132 by a headed and nutted bolt 133a. Bar 132 is pivotally connected at one end to the side of a segmental gear 134 by a headed and nutted bolt 135. Bolt 135 is disposed adjacent one end of the toothed portion of gear 134. Bar 132 extends across the other side of gear 134 and has an elongated slot 132a therein. A screw 136, shown as having a knurled head, extends through slot 132a and may be secured in any one of a plurality of spaced holes 134a in said latter side of gear 134. Link 130 is shown as having a plurality of spaced holes 130a therethrough. A tensile coiled spring 138 is secured to a central lug 134b on gear 134 by a headed and nutted bolt 139, the other end of said spring being secured to a pin 140 secured in the side of plate 11. Segmental gear 134 meshes with gear 30m above described. Gear 134 oscillates about a headed member 133.

A light source or lamp is carried in a casing 142 supported upon a bracket 143 secured to member 10. Said light is directed onto the portion of strip 56 visible through opening 65a and thus reflected onto the field of photo-electric cell 54.

In Fig. 12 a wiring diagram for the parts used is illustrated. Conductors 145 and 146 are shown which lead to a source of electrical current which will be the usual 110 volt 60 cycle current. A conductor 148 extends between lines 145 and 146, the same having therein a capacitor 149, a rectifier 155 and a coil 150. Another conductor 152 extends between lines 145 and 146 and has therein the primary coil 153a of a transformer 153, the secondary coil of which is shown as 153b. The 110 volt current in coil 153a will be transformed to a 24 volt current in coil 153b. This 24 volt alternating current is rectified by a bridge rectifier 154 to 24 volt direct current. A conductor 129' leads from magnet coil 30a to a contact 31b of the control relay 31 used in the customary amplifier (not shown) used with the photo-electric cell 54. A conductor 155 leads from rectifier 154 to magnet coil 30a. A conductor 157 leads from another contact 31d of relay 31 to rectifier 154. One of the conductors 53 leads from relay coil 31a to one pole of switch 52. The other conductor 53 leads from the other pole of switch 52 to one conductor 29. A circuit is shown for relay 31 which includes a battery 158 or other source of power in conductor 53, switch 28, conductors 29, conductors 53 and switch 52. A conductor 160 extends from armature 31c to capacitor 149. Conductors 165 and 166 lead respectively from conductors 53 to the photo-electric cell 54.

In operation, the strip 56 will be fed through member 63 and between plates 65 and 66, between rollers 36 and 37, between members 100 and 101, between plates 102 and 103 and between rollers 112 and 114. The strip will be positioned so that the vertical plane of the front portion of member 100 and the rear portion of member 101 is midway between images on said strip. Said images on strip 52 are spaced substantially uniformly. Motor 24 will now be started. Shaft 18 will also rotate cam 124 and this will oscillate arm 128 which through link 130 will oscillate gear 134. Gear 134 will be oscillated to the left, as shown in Fig. 1, so that gear 30m and roller 36 are rotated clockwise. This will move the strip 56 to the right, as shown in Figs. 3 and 6. The amount of oscillation of gear 134 and thus the distance the strip 56 is moved can be varied by positioning bar

132 in its different positions as described. In practice, bar 132 is so positioned that the strip 56 will be moved or advanced a distance equal to the distance between the centers or midpoints of the images on the strip plus a small increment, which in practice has been $\frac{1}{32}$ of an inch. It will readily be seen that if the strip 36 were always so moved, that the line of cut would progressively move away from a position midway between the images toward an image. Eventually the strip would be cut with the line of cut through one of the images. This of course is not desirable. The movement of roller 36 advances the strip 56 and at this time the magnetic device 30 is in position with plate 30f held against portion 30n by the springs 30i. Plate 30f is thus clutched to member 30j and plate 30f through the pins 30e rotates member 30c and thus shaft 33. Shaft 33 moves roller 36 so the strip is advanced between rollers 36 and 37.

When cam 124 reaches a certain position, the white or light portion between the images on print 66 is under the scanning head 54a of the photo-electric cell. The cam 26 will actuate switch 28 and said switch will be closed.

The feed of the strip 56 takes place during a certain portion of the movement of cam 124 and while the gear sector 134 is swinging to the left, as seen in Fig. 1. When the cam follower 125 reaches a certain position on cam 124, cam 50 operates switch 52. The closing of switch 52 completes the circuit through relay coil 31a and armature 31c is drawn into engagement with contacts 31b and 31d. A circuit is now closed from capacitor 149 through conductor 160, through armature 31c, through conductor 129', through magnet coil 30a, through conductor 155, and through conductor 161 to capacitor 149. The closing of said latter circuit actuates magnet 30a and plate 30f is drawn by said magnet to the position shown in Fig. 4 and against frame member 30b. Said plate is held stationary in this position. The rotation of shaft 33 is thus instantly stopped. The capacitor 149 acts to accumulate a higher voltage than the 110 volts. In practice, the voltage is built up to about 156 volts. When the circuit is closed from the capacitor 149, this voltage is delivered to the circuit through magnet 30a. This is done to get a quicker action. When relay 31 is actuated, another circuit is closed from the rectifier 154 through conductor 155, to magnet coil 30a; through conductor 129' and through armature 31c, and through conductor 157 to rectifier 154. 24 volt direct current is now applied to the magnet 30a and holds the same energized. While the strip 56 is stopped, member 30j is free to rotate and gear segment 134 is swung to the right, as seen in Fig. 1, by cam 124. The gear segment 134 and roller 36 are now in position to again advance the strip when the brake formed by plate 30f and frame 30b is released. Gear 30m of course moves freely with member 30j in the movement of the latter. It will thus be seen from the above description the strip 56 will be stopped at each revolution of cam 50.

The cutting member 100 is continuously reciprocated by cam 76 so that the strip is cut with each revolution of shaft 18.

As the strip is moved, if a dark portion of an image on the strip moves under the scanning head 54c of the photo-electric cell and under slot 65b, the photo-electric cell will be operated and this will also close the circuit through relay 31, and the strip will be instantly stopped. The photo-electric cell is so arranged that when it actuates the stopping means for the strip, the strip will be cut midway of the white portion between the images. It will be seen that if a dark portion of the image actuates the photo-electric cell 54, that this will occur before cam 50 actuates switch 52 to stop the strip. Thus the strip will either be stopped by the photo-electric cell 54 or it will be stopped by the actuation of switch 52. Should there be no dark portion on the image, the photo-electric cell will not be operated and the print will be

cut in response to cam 50. This would continue until an image passes under the scanning head 54 which has a dark portion on its advancing edge portion. It is highly improbable that there will be a great many of the images which will not have the dark portion at their advancing edges. Each time that an image actuates the photo-electric cell by a dark portion thereon, the mechanism will be corrected so that the strip is cut at the midpoint between two images.

Bar 98 and cutting member 100 are moved upwardly each time after being lowered by lever 80 by the springs 104. The photo-electric cell 54 could be actuated by a light portion of the print passing thereunder if so desired.

When the portion is cut from the strip it passes between rollers 112 and 114 and is given a quick movement into receptacle 118. While the strip is held stationary by the magnetic member 30, during which period the strip is cut, ejector rollers 112 and 114 are prevented from operating. Belt 108 is resilient and is placed under tension when rollers 112 are stopped, and when the strip is again released, belt 108 will give a quick impulse to rollers 112 and the severed print will be quickly discharged. The light source in casing 142 is provided so that the strip will be well illuminated and the cell 54 will be sure to operate and a stronger action will be had by said cell.

From the above description it will be seen that I have provided a comparatively simple and yet highly efficient machine which will cut prints or similar pieces from a strip of material and will control said strip so that the line of cut can be kept in the space between the images. The positioning of the line of cut is done entirely by the machine. The machine is of a convenient size for use in photographic establishments. The same is very compact and requires no extra equipment. It is obvious that the machine will save a great deal of labor. The device has been amply demonstrated in actual practice, found to be very successful and efficient, and the same is in progress toward commercial production.

It will of course be understood that various changes may be made in the form, details, arrangement and proportions of the apparatus and in the steps and sequence of steps of the method without departing from the scope of applicant's invention, which, generally stated, consists in a method and apparatus capable of carrying out the objects above set forth, such as disclosed and defined in the appended claims.

What is claimed is:

1. A machine for cutting prints from a film strip having spaced images thereon with light spaces therebetween having in combination, means for carrying said strip, a pair of rollers for advancing said strip having said strip pass therebetween, a cutting means, a segmental gear having positive engagement with one of said rollers for driving the same to advance said strip to bring said light spaces into register with said cutting means, a cam for oscillating said gear, means for driving said cam and said cutting means, said driving means actuating a second cam at fixed intervals, means for stopping the advance of said strip, said second cam actuating said stopping means to register said light spaces with said cutting means, a photo-electric cell focused on said strip, means

associated with said photo-electric cell for stopping said strip, said cell being actuated to operate said stopping means when said strip has advanced too far to be stopped in register with said cutting means by the operation of said stopping means by said second cam, and means for returning said segmental gear to starting position by operatively disengaging said gear from said one of said rollers to automatically adjust its position on said film strip to move said strip in order to have the same stopped in register with said cutting means by said second cam.

2. The structure set forth in claim 1, and resilient means for automatically returning said segmental gear to starting position when said film strip is stopped.

3. The structure set forth in claim 1, a third cam operated continuously by said driving means to energize said photo-electric cell at fixed intervals to be ready to be actuated by an advancing image on said film strip whenever said strip has advanced too far to be stopped in register with said cutting means by the operation of said second mentioned cam.

4. A machine for cutting prints from a film strip having spaced images thereon and having light spaces therebetween having in combination, a severing means, mechanical means for advancing said strip, a stopping means operatively connected to said advancing means for stopping the movement of said advancing means to bring said strip into position to be cut by said severing means, means for actuating said stopping means at regular intervals, a photo-electric cell trained on said strip adjacent said severing means, said cell being in effective condition until said stopping means is operated so that when one of contrasting portions of an image, such as a dark portion, enters into the field of said cell prior to the actuation of said stopping means, said cell will be actuated to cause said stopping means to stop said strip to bring said strip into position to be cut by said severing means whereby said stopping means is actuated mechanically and said cell is only actuated to bring the strip into corrected position to be cut by said severing means when necessary.

5. The structure set forth in claim 4, and means for automatically adjusting the position of said advancing means in its alinement with said strip when said stopping means is actuated by said cell.

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