

Jan. 4, 1944.

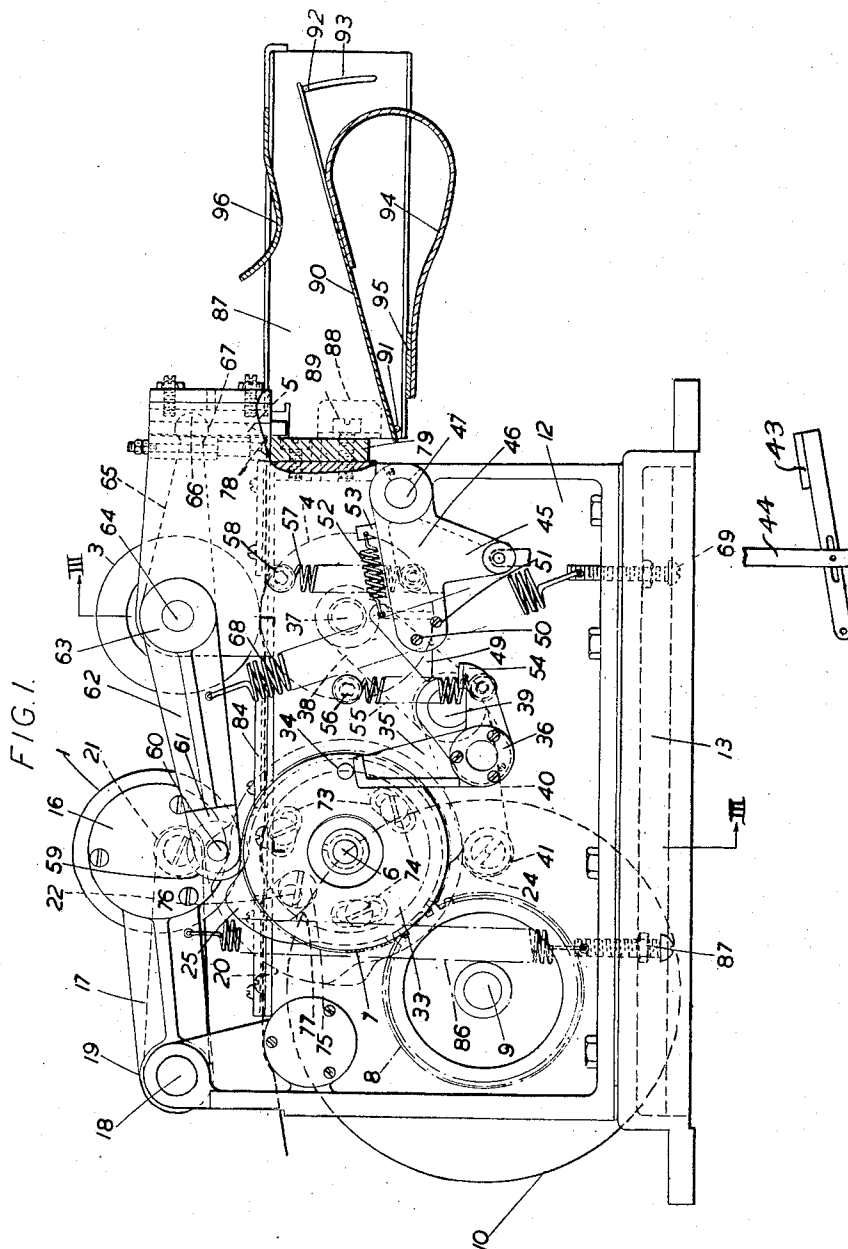
F. H. G. PITT ET AL

2,338,596

FEEDING AND SEVERING MEANS FOR STRIP MATERIAL

Filed Dec. 11, 1942

4 Sheets-Sheet 1



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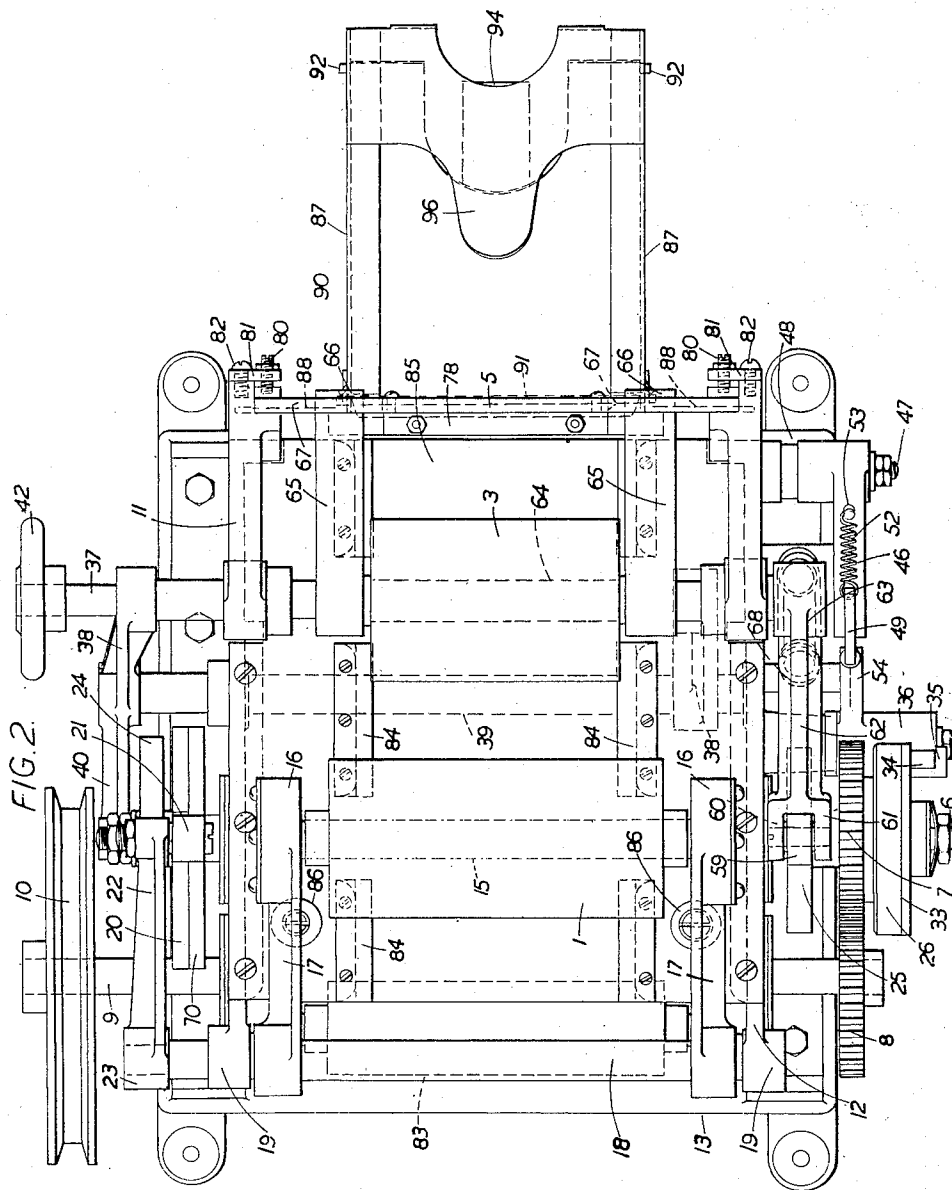
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FEEDING AND SEVERING MEANS FOR STRIP MATERIAL

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4 Sheets-Sheet 2



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FEEDING AND SEVERING MEANS FOR STRIP MATERIAL

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4 Sheets-Sheet 3

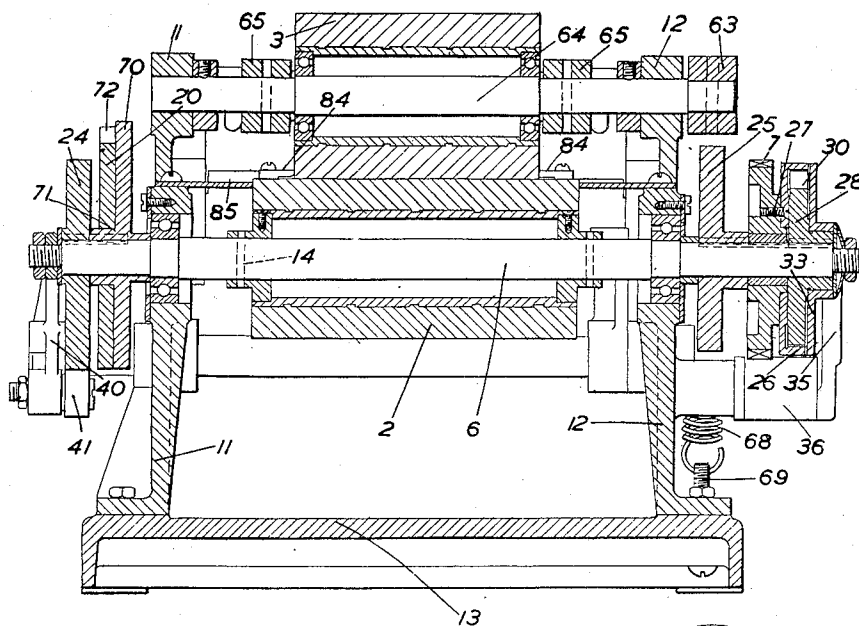


FIG. 3.

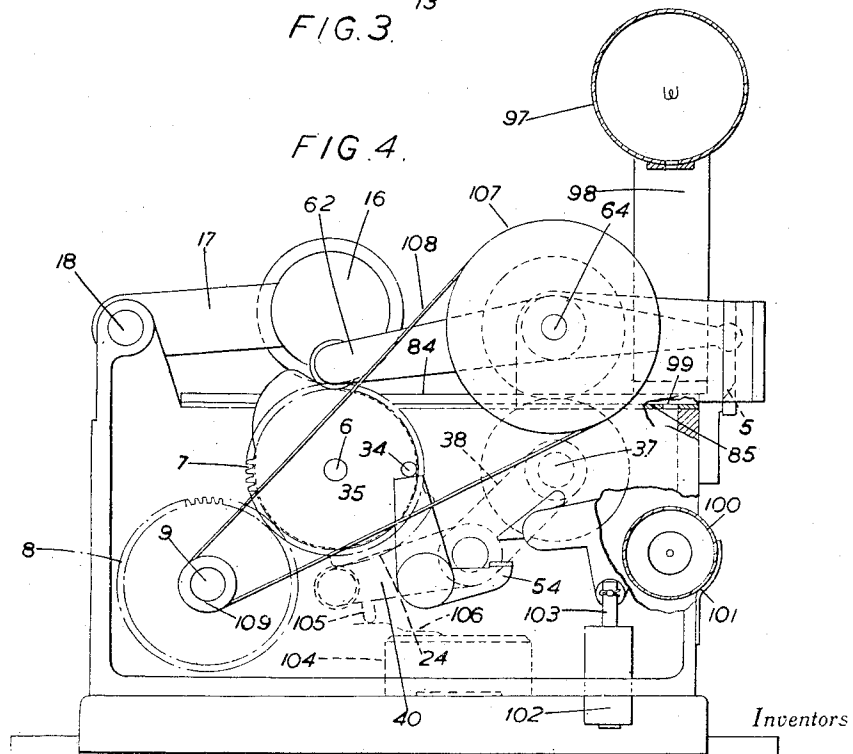


FIG. 4.

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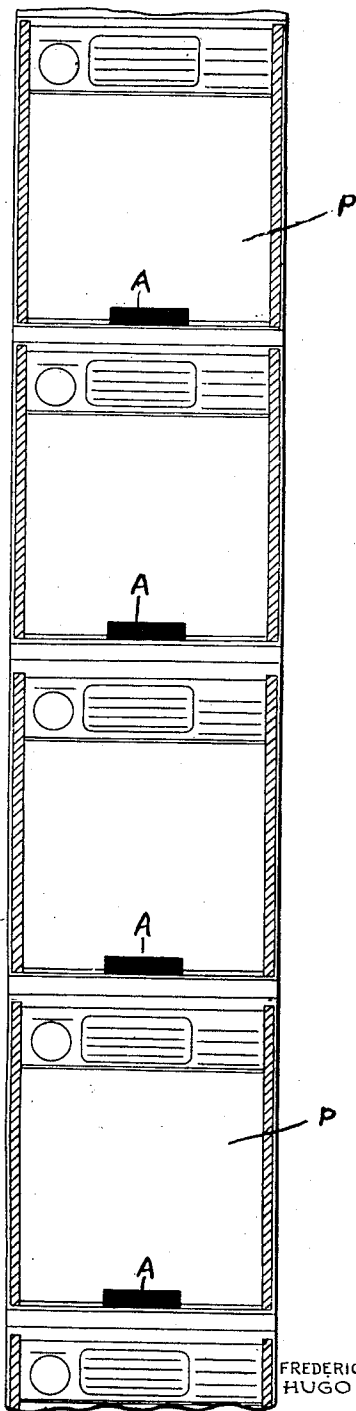
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FIG. 5.



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FEEDING AND SEVERING MEANS FOR
STRIP MATERIAL

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5 Claims. (Cl. 164—49)

This invention relates to feeding and severing apparatus for strip material and particularly, though not exclusively, for a continuous strip of photographic paper bearing a plurality of photographic images which comprise photographic reproductions of airmail forms intended to be individually severed at each intermittent feeding movement of the paper strip.

In practice, it has been found that the images on the photographic paper are not uniform in length, this being due to one or more factors. For instance, the original letter forms may not be identical in size, slippage of the film may occur in the camera used for photographically copying the letters, relative movement of the letters may occur during their passage through the photographic field of the camera, slight discrepancies in magnification may occur in the use of continuous enlargers for producing enlarged reproductions of the film images and, finally, the paper bearing the reproduced images may undergo shrinkage or expansion during treatment in the various photographic processing baths. Since, therefore, the continuous strip of paper bears photographic images which may vary slightly in length, it is not desirable to operate the severing means at constant intervals as this would result in some of the reproduced letters being severed at incorrect places.

According to the present invention these difficulties are overcome in a feeding and severing apparatus in which after the strip material has been fed forward a predetermined distance, means is rendered operative to interrupt the feeding movement so as to enable the strip to be finely adjusted in relation to the severing means.

In carrying the invention into effect according to one form, apparatus for feeding and severing a continuous strip of material bearing images of slightly varying length, comprises power-operated means for feeding the strip forward a distance substantially equal to the length of an image thereon, means for automatically rendering said feeding means inoperative at the end of each feeding movement, and auxiliary means which is automatically engaged with the strip when the power-operated feeding means is rendered inoperative and is operable manually to position the strip in relation to severing means which is then operated to sever the strip.

According to a modification of this form of the present invention, the strip is fed forward a distance slightly less than the minimum length of the images thereon, and the severing means is rendered operative during or after the auxiliary

movement due to the intensity of light incident on a photo-cell or other light responsive means being varied by a predetermined part of the strip. In carrying this modification of the invention into effect, the severing means is rendered operative by the operation of electromagnetic means connected with amplifying means for the photo-cell current and controlled by a switch which is closed only at the commencement of or during auxiliary feeding movement of the strip.

Referring now to the accompanying drawings:

Fig. 1 is a side elevation of an apparatus for feeding and severing the images of airmail letter forms on a continuous strip of photographic paper.

Fig. 2 is a plan view of Fig. 1;

Fig. 3 is an irregular sectional elevation on the line III—III, Fig. 1;

Fig. 4 is a view similar to Fig. 1 but illustrating photoelectric means for controlling operation of the severing means.

Fig. 5 is an illustration of part of a continuous strip bearing photographic images of airmail forms.

The apparatus illustrated in Figs. 1-3 comprises upper and lower paper feeding rollers 1, 2, register or auxiliary feeding rollers 3, 4 and severing means in the form of a guillotine cutter 5. When the photographic paper P bearing the images to be severed individually is being fed by and between the rollers 1, 2, the register rollers 3, 4, are spaced apart. When the paper strip has been fed forward a predetermined distance, the main feeding rollers 1, 2 are adapted to be separated and the register rollers 3, 4, brought into engagement. Upon rotation of one of these register rollers, the paper strip may then be finely adjusted, if necessary, in relation to the cutter 5 which may then be operated to sever the image. The above sequence of operations is then automatically repeated.

The operations are performed in the right sequence through mechanism controlled by three cams mounted for rotation with a main driving shaft 6 which may be driven through a clutch from gear wheels 7, 8. The gear wheel 7 is freely rotatable on the shaft 6 and the gear wheel 8 is secured to a shaft 9 continuously driven by an electric motor, not shown, which through a belt drive drives a pulley 10 secured to the shaft 9. The shafts 6 and 9 are rotatably supported in ball bearings mounted in the side frame members 11, 12, bolted to a base plate 13. The lower feed roller 2 is secured by pins 14 to the shaft 6 so as to rotate therewith while the upper feed-

ing roller 1 is secured to a shaft 15 which is mounted at its ends for rotation in ball races contained in housings 16. These housings are carried at one end of arms 17. The opposite ends of the arms 17 are secured to a rock shaft 18 mounted in bosses 19 formed on the frame members 11, 12. The disengagement of the feeding rollers is effected in the example illustrated by swinging the upper roller 1 away from the lower roller 2. To effect this, a double cam 20 is secured to the main driving shaft 6 and is engaged by a roller 21 rotatably mounted at one end of an arm 22, the other end 23 of which is secured to the shaft 18. Another cam 24 is secured to the shaft 6 adjacent the cam 20 and operates to engage and disengage the register roller 4 with respect to the corresponding roller 3. A third cam 25 is secured on the shaft 6 adjacent the frame member 12 remote from the cams 20, 24; this cam actuates the cutter 5.

The clutch which connects the driven gear wheel 7 with the shaft 6 is of a known type and comprises a circular clutch housing 26 connected by screws 27 with the gear wheel 7. These two members are thus freely rotatable on the shaft 6. The housing contains a driven clutch plate 28 splined to the shaft 6. The clutch plate is formed in its face with three equi-spaced triangular slots, as is well known for accommodating rollers 30 which serve as a driving connection between the clutch members 26 and 28. The rollers are urged into driving engagement with such parts by springs seated in drilled holes formed in the clutch plate 28. A cover plate 33 for the clutch is provided with an external projection 34 for co-operation with a stop arm 35 secured to a boss 36, Fig. 2, pivotally mounted on a stub shaft carried by the frame member 12. When the stop arm 35 occupies the position illustrated in Fig. 1, it obstructs clockwise movement of the cover plate 33 which normally rotates with the clutch when the members 26 and 28 thereof are in driving engagement. In such position, the cam 20 is effective to lift the upper feeding roller 1 away from the lower feeding roller 2. The cam 24 is effective at the same time to hold the lower register roller 4 in engagement with the upper register roller 3. For this purpose, the roller 4 is secured to a shaft 37 rotatably carried at its ends in arms 38 mounted for pivotal movement on a shaft 39 carried by the frame members 11, 12. The arm 38 adjacent the frame member 11 is provided with an extension 40 which carries a roller 41 kept in engagement with the cam 24 by the gravity action of the register roller 4. With the register rollers 3, 4, in engagement, as illustrated in Fig. 1, the lower roller 4 may be turned in a clockwise direction by rotating a hand wheel 42 secured to one end of the shaft 37. This rotation of the hand wheel need only be effected if it is necessary to register the image to be severed with respect to the cutter 5. When such registration obtains, the operator presses a pedal 43 connected by a link 44 to a downward extension 45 of an arm 46 pivoted on a shaft 47 carried by the side frames 11, 12. This arm 46 is provided with a nose 49 pivotally mounted on a pin 50 carried by the arm 46. The nose is normally held against a stop 51, on the arm 46, by means of a spring 52 secured at one end to the nose and at the other end to a projection 53 of the arm 46. Upon depression of the pedal 43, the arm 46 is lowered to enable the nose 49 to depress a horizontal extension 54 of the boss 36 which is thereby piv-

oted in a clockwise direction to remove the stop arm 35 away from the pin 34 of the clutch plate cover 33. The spring pressed rollers 30 of the clutch are then able to re-establish driving engagement of the clutch members 26, 28; consequently, the shaft 6 is driven. The arm 35 is restored to its normal vertical position by means of a coiled spring 55 anchored at one end to the extension 54 and at the other end to a stud 56 secured to the frame member 12. Also, the arm 46 is returned to the position illustrated in Fig. 1 by means of a coiled spring 57 secured at one end to the arm and at the other end to a stud 58 also carried by the frame member 12. The spring mounting of the nose 49 permits the latter to slip past the extension 54 of the boss 36.

Upon rotation of the shaft 6, the cam 25 secured thereto adjacent the frame member 12 operates a roller 59 rotatably mounted on a pin 60 carried by the bifurcated end 61 of an arm 62, the other end 63 of which is secured to a rock shaft 64 mounted in the frame members 11, 12. The roller 59 is maintained in engagement with the cam 25 by means of a coiled spring 68 secured at one end to the arm 62 and at the other end to a screw 69 mounted in the base 13. The upper register roller 3 is freely rotatable on the shaft 64 between a pair of forwardly extending arms 65 fixed to the shaft 64 and having rounded ends 66 which engage in slots 67 formed in the guillotine cutter 5. It will be understood that when the cam 25 rotates in the clockwise direction from the position indicated in Fig. 1, the arms 65 will be caused to descend to operate the cutter 5.

A spring pressure pad 78 is carried by the rear face of the guillotine cutter 5 so that just before the cutter severs the strip material, the strip is held adjacent the cutter against a lower abutment plate 79 secured to the side frame members 11, 12. The cutter 5 is adapted to be adjusted horizontally with respect to the plate 79 by means of a pair of adjusting devices; for this purpose, the knife 5 is carried at its ends by means of screws 80 mounted in plates 81 connected by screws 82 to the frame members 11, 12. By turning the screws 80, the horizontal position of the cutter 5 may be adjusted with respect to the plate 79.

After the severing operation, the roller 59 runs down on to the low part of the cam 25; the cutter 5 is thus raised to permit the paper strip to be fed forward again by the main feeding rollers 1, 2. These are brought into engagement through operation of the cam 20 immediately after the raising of the cutter; simultaneously, the cam 24 operates the roller arm 40 to lower the register roller 4 with respect to the upper register roller 3. The paper strip between the main feeding rollers 1, 2 is now fed forward by rotation of the roller 2 until the cam 20 again operates to separate the roller 1 from the roller 2. This occurs when the clutch plate cover pin 34 engages the stop arm 35; this results in disengagement of the clutch parts 26, 28, through internal pins on the cover plate acting on the clutch springs. The rotation of the shaft 6 and the parts mounted to rotate therewith is therefore interrupted.

The cam 20 is shaped so that such feeding movement is equal to the length of a single image on the paper strip. In practice, the image length may vary from time to time for any of the reasons hereinbefore referred to, and it is then necessary for the hand wheel 42 to be rotated, when

the register rollers 3, 4 are in engagement, to position the paper strip accurately with respect to the cutter 5.

As the image length may vary slightly from roll to roll of the paper strip fed into the apparatus, the cam 20 is made adjustable to compensate for such variations. For this purpose, the cam 20 comprises an inner member 70 splined to the shaft 6 and formed with a boss 71 on which a similar outer cam member 72 is angularly adjustable. The cam plate 72 is provided with three equi-spaced arcuate slots 73 for receiving screws 74 screwed into the cam plate 70. The screws 74 are normally screwed in to clamp the two cams 70, 72 together. When it is desired to adjust the length of the feeding movement, the screws 74 are loosened. An eccentric, grooved stud 75 is carried by a pin 76 mounted in the inner cam plate 70. Stud 75 engages in a radial slot 77 formed in the outer cam 72. By rotation of the eccentric stud 75 within such slot, the cam 72 may be angularly adjusted with respect to the cam plate 70. After such adjustment the screws 74 are tightened up to clamp cam plates 70, 72. It will be understood that this arrangement permits the length of the high part of cam 20 to be regulated to suit the required feed of the paper strip.

The roll of photographic paper bearing the images to be severed may be carried by a support at the rear of the feeding apparatus. The paper from such support is passed over a roller 83, Fig. 2, rotatably mounted at the rear of the feeding apparatus. The paper is then edge guided by channel-shaped guides 84 connected by screws to a cover plate 85, Fig. 3. These guides serve to keep the paper strip aligned with respect to the feeding rollers 1, 2, and register rollers 3, 4. The feeding rollers 1, 2 and register rollers 3, 4 are rubber covered and the roller 1 is urged into close contact with the roller 2 during the feeding operation thereof by means of coiled springs 86 connected at one end to the arms 17 which support the roller 1 and at the other end to screws 87 screwed into the base plate 13.

The paper sections or prints severed by the cutter 5 are delivered to a receptacle, a convenient form of which comprises channel side plates 87 having extensions 88 connected by screws 89 to the abutment plate 79. The parallel side walls of the plates 87 are spaced apart a distance substantially equal to the width of the paper strip. The severed prints entering the receptacle fall onto a platform 90 which is connected at its inner end to a hinge pin 91 carried in the side plates 87 and is connected at its outer end to pins 92 guided in slots 93 in the side plates. The platform 90 is urged upwardly by a bow spring 94 connected to the underside thereof and to a cross plate 95 carried underneath the side plates 87. A spring plate 96 secured across the top of the side plates 87 acts as the deflector for the prints entering the receptacle. As the receptacle fills, the platform 90 is pressed down by the stack of prints against the action of the bow spring 94. When the receptacle is full, the stack of prints may be removed manually through the front thereof.

The feeding and severing apparatus hereinbefore described is semi-automatic as the adjustment of the auxiliary rollers and the release of the clutch are effected manually. According to another embodiment of the invention, the release of the clutch to initiate the action of the

guillotine cutter may be effected automatically as by electro-magnetic means connected with an amplifier for the current of a photo-cell or other light responsive device, the intensity of light incident thereon being varied by predetermined parts of the paper strip. This development of the invention is somewhat diagrammatically illustrated in Fig. 4. The parts in this figure corresponding to similar parts in Figs. 1-3 are designated with the same reference numerals. A source of light 97 is supported by a bracket 98 at the delivery end of the apparatus so that a beam of light is directed vertically downwards through an aperture 99 provided in the plate 85 adjacent the guillotine cutter 5, and strikes a photo-electric cell 100 diagrammatically illustrated in Fig. 4. The cell is supported by a bracket 101 connected to one of the frame members of the apparatus. The photo-cell is connected with an amplifier, not illustrated, for the photo-cell current, and the amplifier is connected with an electro-magnetic device comprising a solenoid 102 and a solenoid plunger 103. The solenoid is supported by brackets, not shown, connected to the base 13 of the apparatus. The plunger 103 projects at its upper end from the solenoid and is connected to the downward extension 45 of the pivoted arm 46. The paper strip P bearing the images to be severed is provided at predetermined positions, preferably adjacent the line where an image is to be severed, with areas A having a density different from that generally characteristic of the strip, for example, coloured black, which modulate the intensity of the light beam on the photo-cell 100 when they pass across the aperture 99 in the plate 85. It will be understood by those skilled in the art, that the resulting drop in the photo-cell current may be converted by the amplifier into an increase in the current through the solenoid 102. Upon such an increase in the solenoid current, the plunger 103 is pulled downwardly and in the manner hereinbefore described trips the arm 35, thereby releasing the clutch controlling the cam shaft 6.

Since the images on the paper strip are reproductions of airmail forms they may include black areas in addition to the predetermined black areas adjacent the severing line. The present embodiment, therefore, includes means for limiting the operation of the solenoid to the period during which the auxiliary rollers 3, 4, are being operated to position the strip relatively to the guillotine cutter 5. The means illustrated comprises a switch 104 connected in series in the solenoid circuit and supported by the base 13 adjacent the side frame member 11. The extension 40 of one of the arms 38 which rotatably support the auxiliary roller 4 is provided with a pin 105 which co-operates with the closing arm 106 of the switch 104 in such a manner that when the register rollers are brought into engagement upon separation of the main feeding rollers 1, 2, the pin 105 presses the spring arm 106 downwards to close the switch. It will now be understood that when a predetermined black area A in the paper strip crosses the aperture 99 the solenoid 102 operates as above described to release the clutch. The sequence of operations described with reference to Figs. 1-3 thereupon takes place, and when the register roller 4 is lowered after the guillotine cutter 5 has operated to sever a print, the extension 40 on the arm moves in a clockwise direction and the pin 105 permits the

opening of the switch 104, thereby interrupting the solenoid circuit.

It will be appreciated from the foregoing description that the switch 104 controlling the operation of the solenoid 102 is closed only at the commencement of the auxiliary feeding movement of the strip so that modulation of the light beam incident on the photo-cell by areas on the strip other than the predetermined areas cannot cause operation of the solenoid; this avoids the possibility of the paper strip being severed at incorrect places.

In the photo-cell embodiment of the invention above described, the auxiliary feeding rollers may be operated either manually or automatically. Preferably, the apparatus is rendered fully automatic by providing a power-drive for the auxiliary rollers so that the latter may be driven at a much reduced speed compared with the speed of rotation of the rollers 1, 2. Conveniently, the shaft 64 carrying the roller 3 may be provided with a large diameter pulley 107 driven by an endless belt 108 which passes over a smaller diameter pulley 109 splined to the shaft 9. When this power-drive is employed to effect a fine feeding adjustment of the register rollers 3, 4, the hand wheel 42 may be omitted.

In the form of the present invention described with reference to Figs. 1-3, the cam controlling the operation of the main feeding rollers 1, 2, is designed so that the paper strip is fed forward intermittently a distance substantially equal to the length of a given image on the paper strip. The fine feeding movement which may be necessary to position an image to be severed correctly in relation to the guillotine cutter 5 may be either forwards or backwards and can be effected by the operator turning the handwheel 42 in the clockwise or anti-clockwise direction. In the modification of the invention according to Fig. 4, however, the cam 20 is so designed that each constant feeding movement of the rollers 1, 2 advances the paper strip a distance slightly less than the minimum length of the images on the paper strip. The paper strip is then fed forward slowly by the auxiliary feeding rollers 3, 4, until the predetermined black area, modulating the transmission of the light from the lamp 97, passes across the aperture 99. When this happens, the sequence of operations above described are performed by the apparatus.

In the modification according to Fig. 4, the switch 104 is closed at the commencement of the fine feed movement of the strip material, i. e., when the roller 4 is moved by its cam into engagement with the paper strip. It will be understood, however, that the switch could be closed during such fine feed movement providing it has occurred by the time a predetermined black area in the paper strip passes across the aperture 99. It will be further understood that depending upon the timing of the operation of the cams, the severing means instead of operating to sever the strip during the auxiliary feeding movement thereof, could be arranged to operate when the paper strip is stationary, i. e., when the roller 4 is in its inoperative position and prior to the main feeding movement of the rollers 1, 2.

Although the apparatus illustrated has been designed for feeding and severing photographic paper bearing images which vary slightly in length, it is to be understood that any strip material requiring to be severed at slightly uneven lengths may be used with the apparatus according to the present invention.

What we claim and desire to secure by Letters Patent of the United States is:

1. In an apparatus for feeding and severing a continuous web bearing images of slightly varying length, the combination of a normally inoperative cutter, a primary feeding means for rapidly feeding the web toward said cutter by a predetermined amount and comprising a driven roll, a driving member therefor, and an idler roll movable to and from rolling contact with said driven roll, means for automatically declutching said driven roll from its driven member at the end of each feeding movement, a normally inoperative auxiliary web feeding means for advancing said web slowly into proper relation with said cutter independently of said primary feeding means, and including a driven roll and an idler roll movable from a normal inoperative position in which they are spaced apart to an operative position in which they are in rolling contact with the web held therebetween, a pair of cams connected to the driving member for the driven roll of the primary feeding means for automatically moving the rolls of the auxiliary feed into operative engagement with the web and the rolls of the primary feed out of driving engagement with said web the instant the primary feed is automatically stopped, means for rotating the driven roll of the auxiliary feed to advance the web, and means for operating said cutter when the web has been properly positioned relative thereto by the auxiliary feed, said means including a third cam connected to the driven roll of the primary feed for operating the cutter, and means for clutching said driven roll to the driving member therefor to operate said cutter during the time the primary feed is held out of driving engagement with the web.

2. In an apparatus for feeding and severing a continuous strip of material bearing images of slightly varying length the combination with a normally inoperative cutter, a primary strip feeding means for rapidly feeding the strip toward said cutter by a predetermined amount, means for automatically rendering said feeding means inoperative at the end of each feeding movement, normally inoperative auxiliary feeding means for advancing said strip slowly into proper relation with said cutter independently of said primary feeding means, means for automatically moving said auxiliary feeding means into driving engagement with the strip and the primary feeding means out of driving engagement with the strip when said primary feed is rendered inoperative, and means for automatically operating said cutter when the strip is properly positioned relative thereto, said last mentioned means including means for directing a beam of light onto one side of said strip, and a photo-electric cell in alignment with said beam of light and responsive to a change in the intensity of the beam caused by a signal area on a predetermined point on the strip.

3. Apparatus according to claim 2, in which the means for automatically operating said cutter includes an electro-magnetic tripper, a photo-electric cell controlled trigger circuit adapted to close a switch in the circuit of the electro-magnetic tripper when a signal area on a predetermined part of the strip intercepts the beam of light directed through the strip and onto the cell, a second normally open switch in circuit of the electro-magnetic tripper, and means for automatically closing said last mentioned switch sub-

sequent to the disconnection of the primary feed from driving engagement with the strip.

4. Apparatus according to claim 2, in which the primary and auxiliary feeding means each comprise a pair of rollers movable to and from rolling contact with the strip located therebetween, the pair of rollers constituting the primary feed being normally in rolling contact and the pair constituting the auxiliary feed being normally separated, a clutch controlled shaft for driving one of the rollers of the primary feed, means for disconnecting said shaft when the primary feed has advanced the strip a predetermined amount, a pair of cams on said shaft for separating the rollers of the primary feed and bringing the rollers of the auxiliary feed into rolling contact the instant the shaft is declutched, means for re clutching said shaft when the strip has been fed to a given position relative to said cutter, and a third cam on said shaft for operating said cutter while one of the first two mentioned cams holds the primary feed out of engagement with the strip.

5. Apparatus according to claim 2, in which the auxiliary feeding means comprises a pair of rollers, one fixed and the other movable to and from rolling contact therewith with the strip located therebetween, means for continuously driving said movable roller at a slower speed than said primary feeding means, a pair of cams for simultaneously disengaging and engaging said primary and secondary feeding means, respectively, with the strip the instant said primary feeding means is stopped, whereby the auxiliary feed assumes control of the strip independently of the primary feed, and means for automatically operating said cutter when the strip is fed into proper position relative thereto by the auxiliary feed, said last mentioned means including a third cam, movement of which is initiated by a photo-electric trigger circuit in response to a signal area on a predetermined part of the strip passing a scanning beam forming a part of said circuit.

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