May 11, 1965 L. R. WILLIAMS, JR 3,182,539

PAPER FEEDING AND CUTTING MACHINE

Filed March 14, 1961 4 Sheets-Sheet 1

FIG. 1

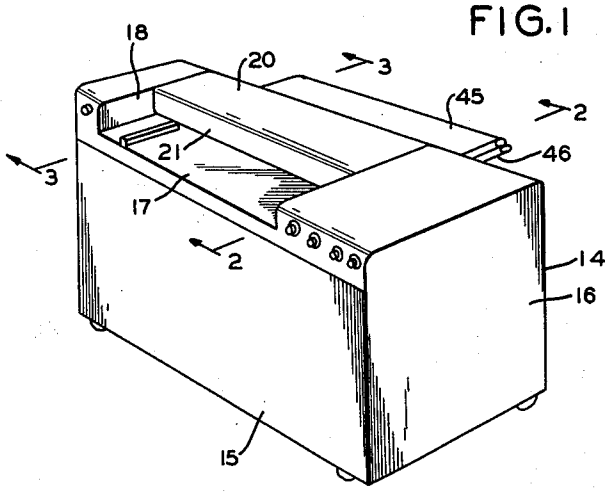
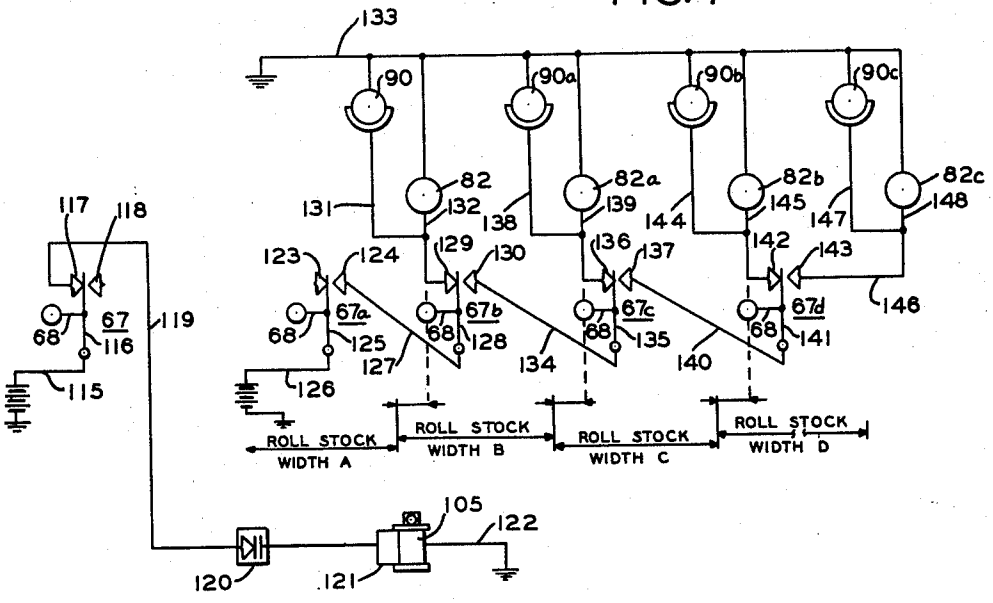


FIG. 7



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PAPER FEEDING AND CUTTING MACHINE

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FIG. 2

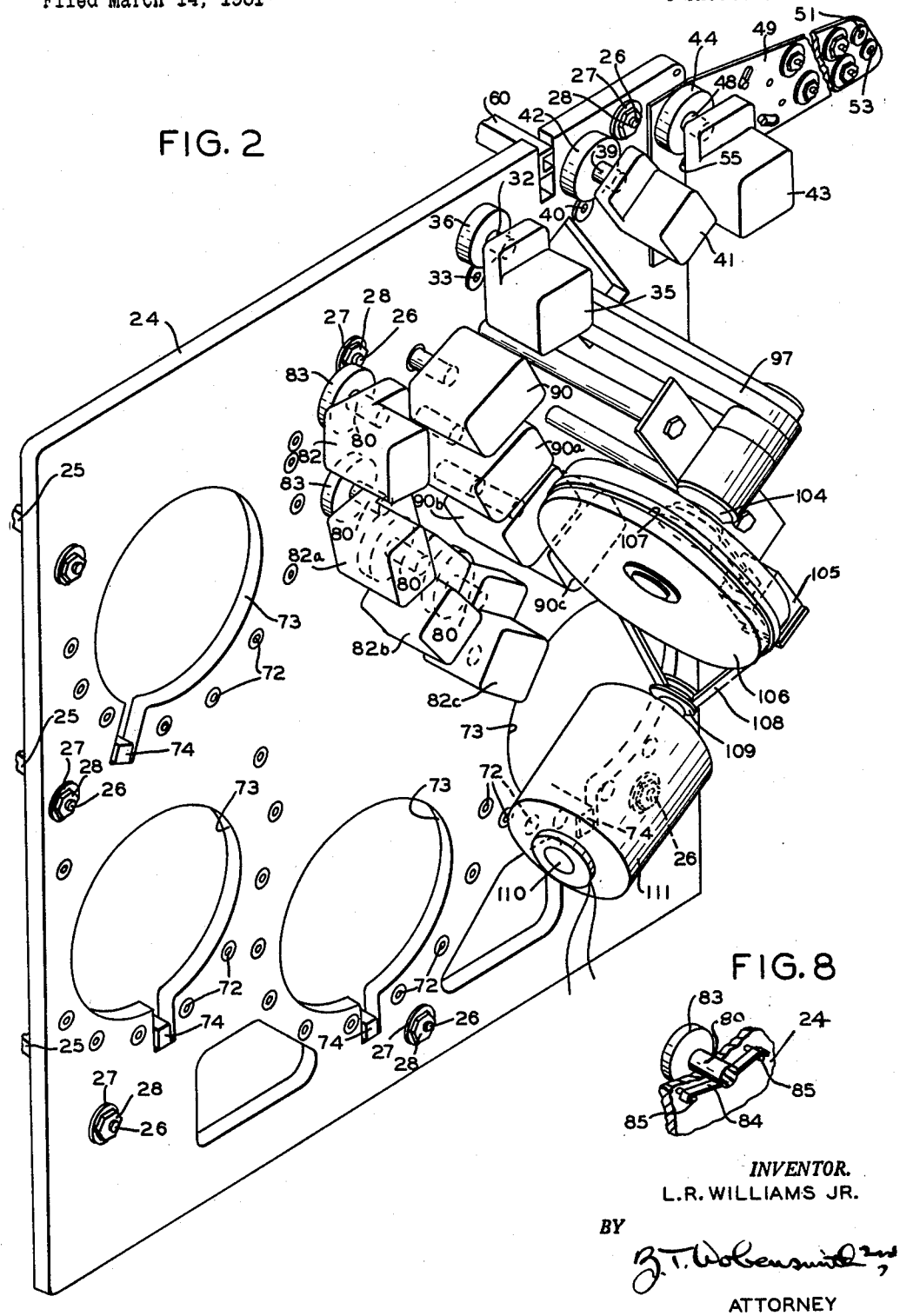


FIG. 8

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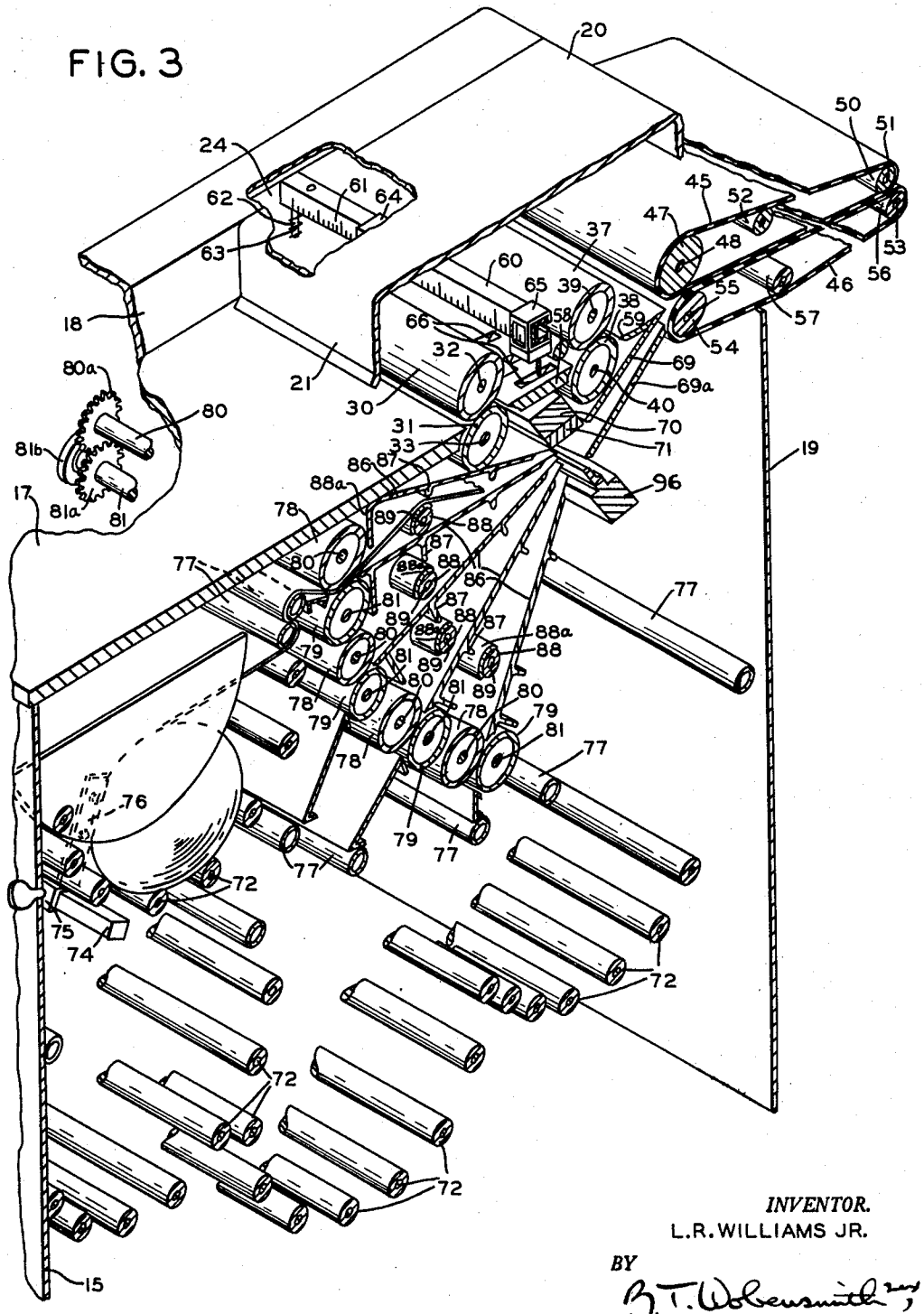
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PAPER FEEDING AND CUTTING MACHINE

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FIG. 3



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PAPER FEEDING AND CUTTING MACHINE

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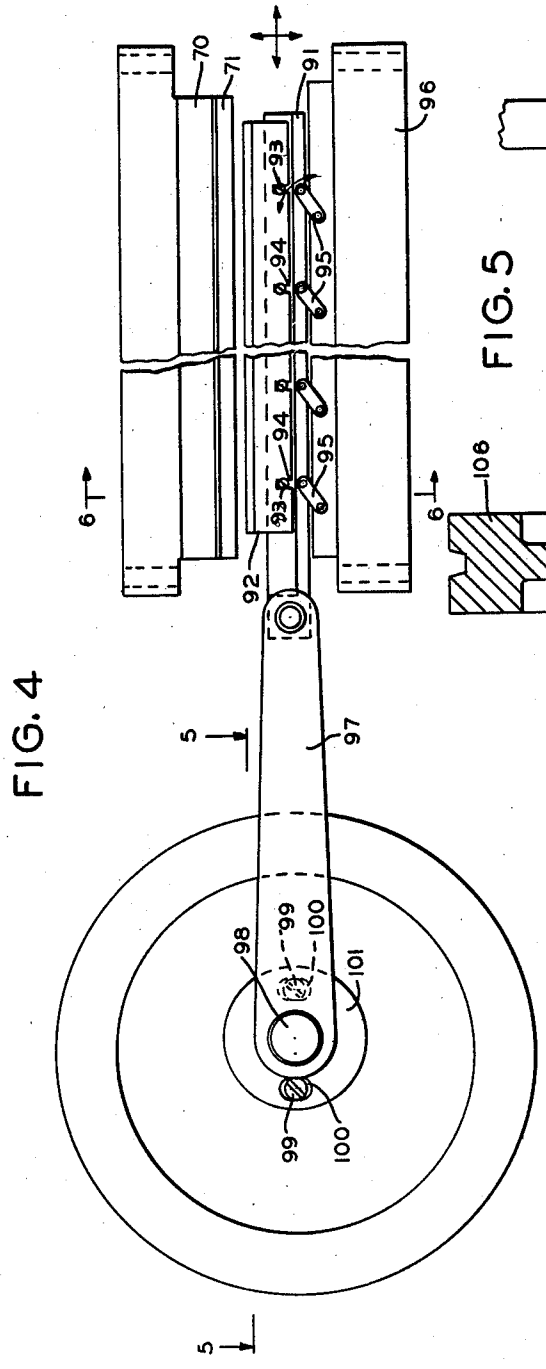


FIG. 4

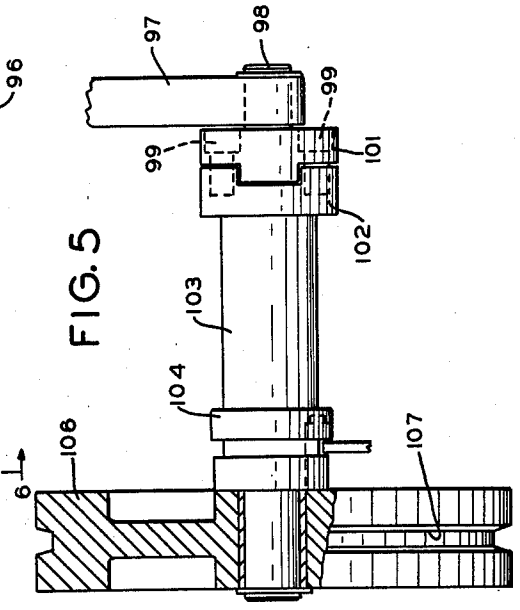


FIG. 5

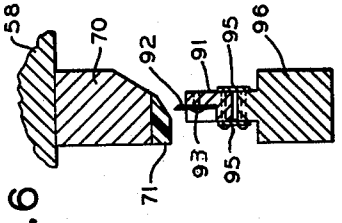


FIG. 6

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United States Patent Office 3,182,539 Patented May 11, 1965

3,182,539

PAPER FEEDING AND CUTTING MACHINE

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Filed Mar. 14, 1961, Ser. No. 95,715
4 Claims. (Cl. 83—209)

This invention relates to a paper feeding and cutting machine, and more particularly to a machine for selecting and supplying paper, such as sensitive paper, of desired width from available supplies of different widths, and cutting the selected paper to the desired length to accord with a master sheet with which the same is to be used.

Reproduction machines for rapid production of copies from negatives or master sheets are in common use. No satisfactory equipment is available for supplying the copy paper of a width and length to conform to the master sheet with a minimum of waste and as called for by the size of the master sheet.

The feeding of the master and sensitive sheets to the copying machine is currently performed as a manual operation in which the original is picked up and a selection is made by the operator of a copy sheet of the desired size from a stock of copy material cut to size. The original and copy sheet are aligned and the two sheets are fed together into the machine. In most instances, these operations cannot be performed with sufficient rapidity to utilize the capacity of the reproduction equipment and there is no accommodation to still different sizes of master sheets.

While some efforts have been made to feed a continuous strip of copy paper into the machine accompanied by the master sheet, this does not permit of accommodating the print to the size of the master sheet, results in excessive waste of the sensitized material, and requires excessive cutting subsequent to severing from the strip to trim the copy sheet to size.

It is the principal object of the present invention to provide a machine for delivering an original and copy sheet of correct size in alignment to a machine for producing copies in which a measurement is made of the width of the master sheet, a selection is made of copy sheet material of suitable width, the master sheet and copy strip are aligned, the master sheet and selected copy strip are advanced, a proper length of copy sheet is transversely severed from the selected copy strip, and the master sheet and transversely severed copy sheet are advanced together to the reproduction machine.

It is a further object of the present invention to provide a paper feeding and cutting machine having a plurality of rolls of printing or copy paper of differing widths therein, together with simple but effective structure for measuring the width of the master or original from which a copy is to be made, and selecting and causing the advance of material of appropriate width to conform to the width of the master sheet.

It is a further object of the present invention to provide a paper feeding and cutting machine having a plurality of rolls of printing or copy paper of differing widths therein, together with structure for selecting a copy sheet of proper width and aligning the leading edge of the original and the leading edge of the selected copy sheet.

It is a further object of the present invention to provide a paper feeding and cutting machine having provisions for simultaneously advancing the original or master sheet and a strip of copy sheet with the leading edges of the original and the copy sheet aligned, and severing the copy sheet at a length determined by the length of the original or master sheet.

It is a further object of the present invention to provide a paper feeding and cutting machine having a plurality of sources of paper of different widths and simple but effective transverse paper cutting mechanism acting on the selected strip of paper.

It is a further object of the present invention to provide a paper feeding and cutting machine in which the measuring, selecting, edge alignment, transverse severing, and feeding are carried out as a continuous and automatic operation.

Other objects and advantageous features of the invention will be apparent from the description and claims.

The nature and characteristic features of the invention will be more readily understood from the following description, taken in connection with the accompanying drawings forming part thereof, in which:

FIGURE 1 is a view in perspective of a machine in accordance with the invention with the external housing in place;

FIG. 2 is an internal perspective sectional view with the cover housing removed, taken approximately on the line 2—2 of FIG. 1, and showing the right end frame plate and the structure carried thereby;

FIG. 3 is a fragmentary perspective sectional view taken approximately on the line 3—3 of FIG. 1, and at a portion of the machine intermediate its sides and showing the details of the feeding mechanism;

FIG. 4 is a fragmentary elevational view showing the transverse cutting mechanism as seen from the rear;

FIG. 5 is a fragmentary sectional view taken approximately on the line 5—5 of FIG. 4;

FIG. 6 is a fragmentary vertical sectional view taken approximately on the line 6—6 of FIG. 4;

FIG. 7 is a diagrammatic view showing the electrical circuit connections for the control of the machine; and

FIG. 8 is a fragmentary perspective view showing a spring clip for the drive shafts in accordance with the invention.

It should, of course, be understood that the description and drawings herein are illustrative merely, and that various modifications and changes may be made in the structure disclosed, without departing from the spirit of the invention.

Like numerals refer to like parts throughout the several views.

Referring now more particularly to FIGURE 1 of the drawings, an external enclosing housing **14** is provided to prevent undesired access of light to the interior and which includes a front wall **15**, outer side walls **16**, a rear wall **19**, a platform or feed table **17** at the upper part of the front wall **15** to which the master sheet is manually delivered, inner end walls **18** at either side of the feed table **17**, and a top wall section **20** having a downwardly extending skirt **21** in spaced relation to the feed table **17** for introduction of the master sheet.

Within the interior of the housing **14**, a pair of end frame plates **24** are provided similar in construction, the plates **24** being held in separated relation by a plurality of frame bars **25** having threaded ends **26** which extend through the frame plates **24** for the reception of washers **27** and retaining nuts **28**. The washers **27** and nuts **28** when in position retain the plates **24** in assembled relation.

At the inner margin of the feed table **17** and beneath the top wall section **20**, a front pair of master sheet feed rollers **30** and **31** is provided in engagement. The rollers **30** and **31** are carried respectively by shafts **32** and **33** journalled in the plates **24**, one of the feed rollers, such as the roller **30**, being driven by a gear motor **35** connected to the shaft **32** through an overriding clutch **36** and controlled as hereinafter pointed out.

Rearwardly of the rollers **30** and **31** and beneath the

top wall section 20, an intermediate pair of master sheet feed rollers 37 and 38 is provided carried by shafts 39 and 40 journalled in the end plates 24, one of the rollers such as the roller 37 being driven by a gear motor 41 connected to the shaft 39 through an overriding clutch 42 and controlled as hereinafter pointed out.

Rearwardly of the rollers 37 and 38 endless delivery conveyor belts 45 and 46 are provided with feed portions in closely spaced relation. The upper belt 45 is carried on a conveyor belt drive roll 47 which is mounted on a shaft 48. The shaft 48 extends through brackets 49 carried by each of the frame plates 24, and is driven by a gear motor 43 through an overriding clutch 44. The rear end of the upper belt 45 is supported on a conveyor belt roll 50 mounted on a shaft 51 which is journalled at its ends in the brackets 49. A belt tensioning roller 52 can be provided intermediate the roll 47 and the roll 50.

The motors 35, 41 and 43, are electric motors and are energized from any suitable source of electric energy.

The lower conveyor belt 46 is carried on a front belt support roll 54, is mounted on a shaft 55, which is journalled in the end frame plates 24 and on a rear support roll 56 which is carried on a shaft 53 and is journalled at its ends in the brackets 49. A tensioning roller 57 can be provided internally in the lower conveyor belt 46 for controlling the tensioning thereof.

In the space between the front rollers 30 and 31 and the intermediate rollers 37 and 38, a transversely disposed supporting gage plate 58 is provided and beyond the rollers 37 and 38 a guide plate 59 is provided with its face disposed tangential to the meeting location of the upper and lower conveyor belts 45 and 46.

A detector mounting channel bar 60 is provided having a dimensional scale 61 along the front margin thereof. The bar 60 has end pins 62 extending downwardly therefrom and slidable in the frame plates 24, springs 63 surrounding the pins 62 and abutting against the bar 60 and the frame plates 24 providing a resilient support for the bar 60.

A plurality of detector holders is provided, the detector holder 64 aiding in master sheet length measurement, and the detector holders 65 being provided one for each width control desired.

The gage plate 58 preferably has a plurality of detector pockets 66 provided therein at predetermined transversely spaced intervals, and preferably at each inch transversely of the gage plate 58 and aligned with the markings on the scale 61. Each of the detector holders 64 and 65 carries a detector element which may be a microswitch 67, 67*a*, 67*b*, 67*c*, 67*d*, actuated by a switch arm 68. Each arm 68 normally extends into a pocket 66 unless moved outwardly therefrom by the master sheet coming into contact therewith, as hereinafter explained.

In the space below the gage plate 58 an anvil mounting bar 70 is provided secured at its ends to the plate 58 and carries an anvil plate 71, preferably of nylon, on the lower face thereof for aiding in transverse strip severing, as hereinafter explained.

Upper and lower stock guide plates 69 and 69*a* are provided, the upper guide plate 69 extending downwardly from the master sheet guide plate 59 to the anvil plate 71. The space between the stock guide plates 69 and 69*a* faces to the entrance to the conveyor belts 45 and 46.

In accordance with the number of rolls of copying paper which it is desired to mount or store in the machine for availability for selection and supporting of stock, cradle rolls 72 are provided for supporting rolls of sensitized or copy paper for feeding. The cradle rolls 72 are rotatably supported at their ends in the end frame plates 24, access openings 73 being provided in the frame plates 24 for the insertion of a roll of sensitized or copy paper.

As shown, and merely by way of illustration, four sets of cradle rolls 72 are provided. Each set of cradle rolls 72 preferably has a stock holder bar 74 associated therewith with clamps 75 adjustably mounted thereon at one or both ends and each having an upwardly extending arm 76 for end abutment against the paper roll to limit the sidewise displacement thereof.

Each set of cradle rolls 72 also has contiguous thereto antidrag rollers 77 about which the paper from the paper supply rolls is directed. The rollers 77 are rotatably supported in the end frame plates 24.

Each set of cradle rolls 72 has a pair of contacting stock feed rollers 78 and 79 associated therewith. The rollers 78 and 79 are respectively carried on shafts 80 and 81 journalled in the end frame plates 24, and the shafts 80 and 81 are moved in unison by gears 80*a* and 81*a* secured thereto. One of the shafts, such as the shaft 81, can have a hand wheel 81*b* thereon for manual turning to initially adjust the paper to be advanced thereby.

One of the stock feed rollers 78 and 79, such as the roller 78, is driven in any desired manner, such as by electrically driven gear motors 82, 82*a*, 82*b*, 82*c*, each connected thereto through an overrding clutch 83.

A spring clip 84 can be provided engaging each of the shafts 80, the spring clips 84 each being carried on pins 85 on the end frame plate 24, each acting as a brake and accommodating various thicknesses of stock.

Sensitized paper feed passageways are provided from each set of stock feed rollers 78 and 79 to the anvil plate 71, formed by guide plates 86 in converging relation toward the anvil plate 71. The guide plates 86 are provided with guiding ribs 87 and have disposed therebetween advancing rolls 88 carried on shafts 89 journaled in the end frame plates 24. The advancing rolls 88 preferably have friction facings 88*a* over portions of their circumferences so that upon rotation of any of the rolls 88, the sheet material is prevented brom bunching or collecting in the passageways between the guide plates 86.

The shafts 89 are connected to and selectively driven by rotary solenoids 90, 90*a*, 90*b* and 90*c*.

It will be noted that the centers of the feed rolls 78 and 79, as seen from the ends, are arranged on a common center so as to have the meeting portions of the rolls 78 and 79 all at the same distance from a predetermined line on the anvil plate 71 to insure uniformity of linear paper feed from each roll of sensitized or copy paper.

The paper cut-off mechanism, shown in detail in FIGS. 4, 5 and 6, preferably includes, for coaction with the anvil plate 71, previously referred to, a cutter bar 91 having a steel rule 92 secured thereto by a plurality of studs 93 extending through slots 94 in the rule 92.

The cutter bar 91 is pivotally connected by guide links 95 to a supporting bar 96 which is supported by the end frame plates 24. In order to move the cutter bar 91 toward the anvil plate 71, an actuating link 97 is provided.

The actuating link 97 is connected to an eccentric pin 98 which is adjustably mounted by studs 99 extending through elongated slots 100 in a pin carrying head 101. The studs 99 extend into a driving block 102 which is secured to a shaft 103, the shaft 103 in turn being connected through a single revolution clutch 104 controlled by a solenoid 105 to a flywheel 106. The flywheel 106 has a groove 107 on the periphery thereof for engagement by a driving belt 108 which is in engagement with a driving pulley 109 on a shaft 110 of a continuously operating electric motor 111. The motor 111 is supported by the end frame plate 24 at the right.

The structure for selectively controlling the paper feed and paper cutoff will now be described.

The microswitch 67 in the detector holder 64(see FIG. 7) has a conductor 115 extending from a suitable source of electrical energy to a movable contact 116, which contact 116 is controlled by the arm 68 of the microswitch 67. The arm 68 is actuated and moved to microswitch actuating position by the presence of the master sheet in engagement therewith. The microswitch 67 has a pair of fixed contacts 117 and 118, the contact 117 being con-

nected by a conductor **119** through a single impulse pass device **120**, commercially available under the name "Pulse-Pak," and through an adjustable time delay relay **121** to one terminal of the winding of the clutch operating solenoid **105**. The other terminal of the winding of the solenoid **105** can be connected by a suitable conductor **122** to ground.

The detector holders **65** are each provided with microswitches **67***a* to **67***d*, respectively, the number being dependent upon the number of rolls of sensitized paper carried on the respective groups of cradle rolls **72**.

The microswitch **67***a* has a pair of fixed spaced contacts **123** and **124**, and has a movable contact **125** which is connected by a conductor **126** to any suitable source of electrical energy. The movable contact **125** of the microswitch **67***a* is controlled by its actuating arm **68**, which is in turn actuated by the presence of the master sheet in engagement with its arm **68**. The contact **124** of the microswitch **67***a* is connected by a conductor **127** to the movable contact **128** of the microswitch **67***b* which microswitch **67***b* is positioned by its arm **68**.

It will be noted that unless and until the microswitch **67***a* has its movable contact **125** moved into engagement with the fixed contact **124**, that no energizing circuit is set up therethrough.

The microswitch **67***b* has a pair of fixed spaced contacts **129** and **130** for selective engagement by the movable contact **128**. The contact **129** is connected by a conductor **131** to the rotary solenoid **90** for rotating the shaft **89** and the roller **88** thereon and by a conductor **132** to the motor **82** for actuating the rolls **78** and **79**. The rotary solenoid **90** and the motor **82** are connected by a conductor **133** to ground.

The contact **130** of the microswitch **67***b* is connected by a conductor **134** to the movable contact **135** of the microswitch **67***c* which contact **135** is positioned by its arm **68**. The microswitch **67***c* has a pair of fixed spaced contacts **136** and **137** for selective engagement by the movable contact **135**.

The contact **136** is connected by a conductor **138** to the next rotary solenoid **90***a* for rotating the next shaft **89** and roller **88** thereon and by a conductor **139** to the next rotor **82***a* for actuating the next set of rolls **78** and **79**. The rotary solenoid **90***a* and the motor **82***a* are connected as before by the conductor **133** to ground.

The contact **137** of the microswitch **67***c* is connected by a conductor **140** to the movable contact **141** of the microswitch **67***d* which contact **141** is positioned by its arm **68**. The microswitch **67***d* has a pair of fixed spaced contacts **142** and **143** for selective engagement by the movable contact **141**. The contact **142** is connected by a conductor **144** to the next rotary solenoid **90***b* for rotating the next shaft **89** and the roller **88** thereon and by a conductor **145** to the next motor **82***b* for actuating the next set of rolls **78** and **79**. The rotary solenoid **90***b* and the motor **82***b* are connected as before by the conductor **133** to ground.

The contact **143** of the microswitch **67***d* is connected by a conductor **146** through branch **147** to the next rotary solenoid **90***c* for rotating the next shaft **89** and the roller **88** thereon, and through branch **148** to the next motor **82***c* for actuating the next set of rolls **78** and **79**. The rotary solenoid **90***c* and the motor **82***c* are connected as before by the conductor **133** to ground.

The mode of operation will now be pointed out.

The motor **111** is energized to rotate the flywheel **106** and the motors **35** and **41** are also energized to drive the feed rollers **30** and **31** and the feed rollers **37** and **38**.

The motor **43** is energized to operate the drive rolls **47** and **54** and to operate the upper and lower conveyor belts **45** and **46**.

The machine is now ready for use. If now a master sheet is advanced rearwardly over the platform or feed table **17** with its margin along the inner end wall **18** at the left as a gage, the master sheet strikes and moves the actuator arm **68** of the microswitch **67** to move the movable contact **116** to the unenergized contact **118** so that the cutter bar **91** and rule **92** are in their retracted positions preliminary to but ready for movement for subsequent cutting, as hereinafter explained.

One or more of the actuating arms **68** of the microswitches **67***a*, **67***b*, **67***c*, and **67***d*, will be moved, dependent upon the width of the master sheet to select the proper roll stock width for sensitized paper delivery.

Assume a relatively narrow width of master sheet but sufficient to move the arm **68** of the microswitch **67***a*, then the minimum width of roll stock will be made available in the manner to be explained.

The movement by the arm **68** of the movable contact **125** of the microswitch **67***a* to engage the contact **124** will set up an energizing circuit through the conductor **127**, the contact **129**, and the conductors **131** and **132** to the solenoid **90** and the motor **82**.

Upon energization of the motor **82** the shaft **80** rotated thereby is effective to rotate the feed roller **78** thereon, the feed roller **79** being driven in unison by the gears **80***a* and **81***a*. At the same time, energization of the rotary solenoid **90** is effective to rotate the shaft **89** and the advancing roll **88** thereon. Paper from the roll supported on the cradle rolls **72** and threaded around the antidrag roller **77**, is advanced by the feed rollers **78** and **79** and in the passageway between a pair of guide plates **86** past the anvil plate **71** to meet the leading edge of the master sheet at the entrance to the conveyor belts **45** and **46**. The master sheet and paper from the sensitized roll advance together between the conveyor belts **45** and **46**. This feeding continues until the trailing edge of the master sheet permits the actuating arm **68** of the microswitch **67** to be returned so that the movable contact **116** of the microswitch **67** will engage with the fixed contact **117** and set up a paper cutoff energizing circuit through the conductor **119**, the impulse control unit **120**, the time delay relay **121**, and the solenoid **105** to actuate the clutch **104** to connect the shaft **103** for effecting movement of the link **97** to move the cutter bar **91** and the rule **92** toward the anvil plate **71** to sever the roll stock as determined by the delayed timed operation of the cutter bar **91**.

The severed sensitized sheet is fed with the master sheet by the conveyor belts **45** and **46** to the machine at which the exposure or developing action is accomplished.

If wider roll stock is called for by movement of the actuating arm **68** of the microswitch **67***b*, an energizing circuit is set up through the contact **130**, the conductor **134**, the movable contact **135**, and the contact **136**, and conductors **138** and **139**, to energize the rotary solenoid **90***a* and the motor **82***a* to feed stock from a roll of greater width. It will be noted that if the rotary solenoid **90***a* and the motor **82***a* are energized, the rotary solenoid **90** and the motor **82** are not energized by reason of the selection by the movable contact **128**.

If still wider roll stock is called for by movement of the actuating arm **68** of the microswitch **67***c* or the microswitch **67***d*, energizing circuits will be set up similar to those previously explained for operating the feed rollers **78** and **79** to supply the proper width of sensitized paper.

The leading edge of the paper which has been severed is available for advance if and when called for by the master sheet whose width is related to the stock required. In the event that the same or a different width is called for by the next master sheet, the appropriate gear motor **82** to **82***c* and rotary solenoid **90** to **90***c* for feed are actuated to feed the sensitized sheet of selected width and for longitudinal severing as determined by the distance between the leading and trailing edge of the master sheet and the timing as set at the time delay relay **121**.

I claim:

1. A paper feeding machine for selectively supplying paper of a width not less than that of a master sheet ad-

vanced to the machine comprising a frame, a master sheet receiving member in said frame, members in said frame for advancing a master sheet supplied to said receiving member, said last members comprising pairs of feed rollers in spaced relation, spaced master sheet width detector members interposed between said advancing members and transversely aligned relative to the direction of advancing movement of said master sheet, a plurality of separate paper stock supporting members for rolls of paper stock of different widths, feed rolls in pairs for selectively feeding paper stock from one of said supporting members to facing engagement with the master sheet with the leading edges of said master sheet and stock together at a line of convergence, selective control members interposed between said detector members and said feed rollers and controlled by said detector members for controlling the actuation of said feed rolls, delivery members for delivering said master sheet and said selectively fed stock together with one superposed on the other, and means for severing said stock to a length equal to the length of the master sheet, said means including stock severing members and master sheet length detector members for controlling the actuation of said severing members, said severing members and said width and length detector members being equidistant from the line of convergence of the master sheet and the stock.

2. A paper feeding machine as defined in claim 1 in which said feed rolls are motor operated and said selective control members include microswitches.

3. A paper feeding machine as defined in claim 1 in which a plurality of guide plates are provided in spaced relation interposed between said roll members and said severing members and converging toward said severing members.

4. A paper feeding machine for selectively feeding paper related in width to a width called for by a master sheet advanced to the machine comprising a frame, a master sheet supporting member in said frame, spaced master sheet advancing members in said frame for advancing a master sheet supplied to said supporting member, a width and length detector station between said advancing members, master sheet width detector members at said station interposed between said advancing members horizontally spaced and transversely aligned relative to the path of the movement of the master sheet, a plurality of separate paper stock supporting members for rolls of paper stock of different widths, feed rolls in pairs for selectively advancing paper from one of said paper rolls to said supporting member in facing engagement with the master sheet and with the leading edges of the master sheet and paper stock together at a line of convergence, means for simultaneously advancing said selectively advanced paper stock and said master sheet with one superposed on the other, and means for severing said stock to the length of the master sheet, said means including stock severing members, and master sheet length detector members transversely aligned with said width detector members, said length detector members including a feeler arm at said detector station engaging the master sheet and actuated by the trailing edge thereof for controlling said stock severing members, said severing members and said width and length detector members being equidistant from the line of convergence of the master sheet and the stock.

References Cited by the Examiner

UNITED STATES PATENTS

2,791,931	5/57	Summerhayes	250—219.1
2,802,665	8/57	Birchler	226—110
2,868,059	1/59	Summerhayes	250—219.1
2,931,917	4/60	Beelitz	250—219.1
2,941,086	6/60	Gottschall et al.	250—219.1
2,958,243	11/60	Foster	83—72
3,029,571	5/62	Douthit	53—66
3,045,402	7/62	Kelly et al.	53—66

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