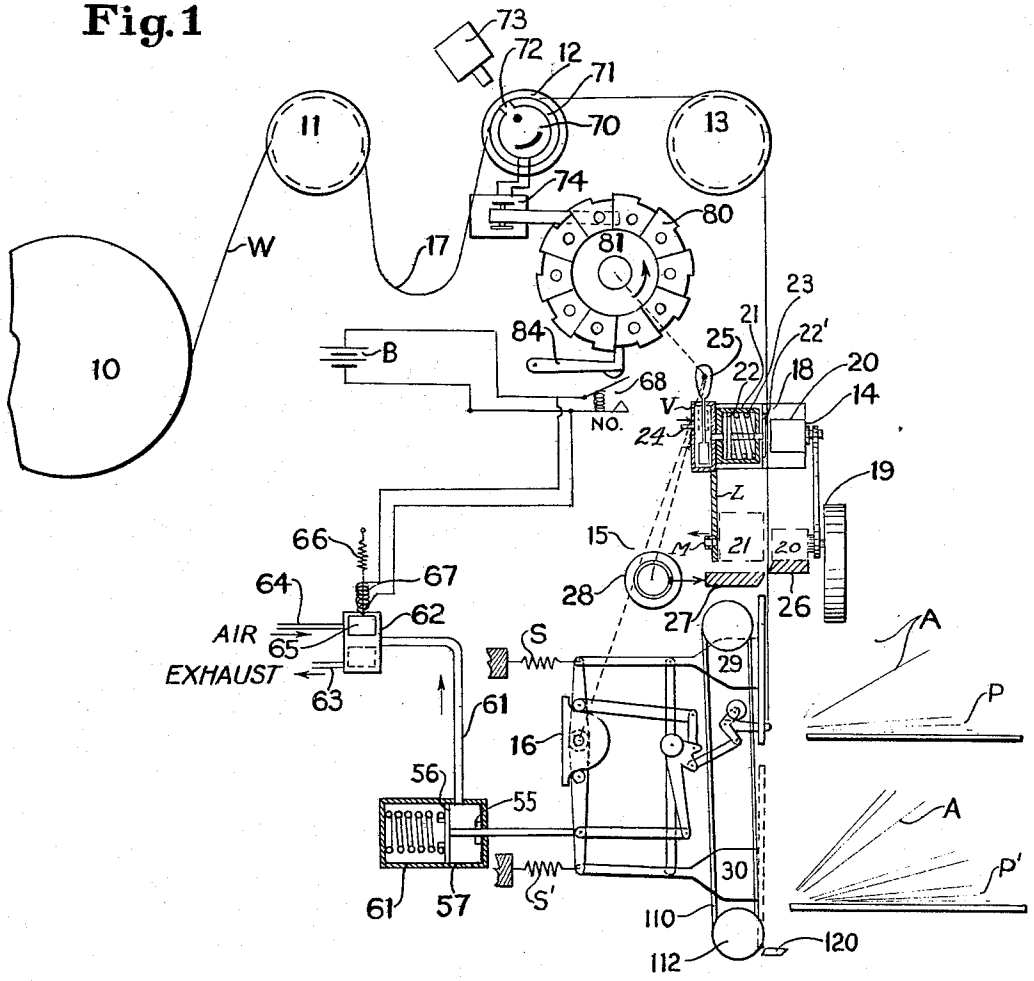
Sept. 27, 1955 L. A. CUNDALL ET AL 2,718,965

APPARATUS FOR SORTING INDIVIDUAL SHEETS INTO SEPARATE PILES

Filed Jan. 6, 1951 4 Sheets-Sheet 1

Fig. 1



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APPARATUS FOR SORTING INDIVIDUAL SHEETS INTO SEPARATE PILES

Filed Jan. 6, 1951 4 Sheets-Sheet 2

Fig.2

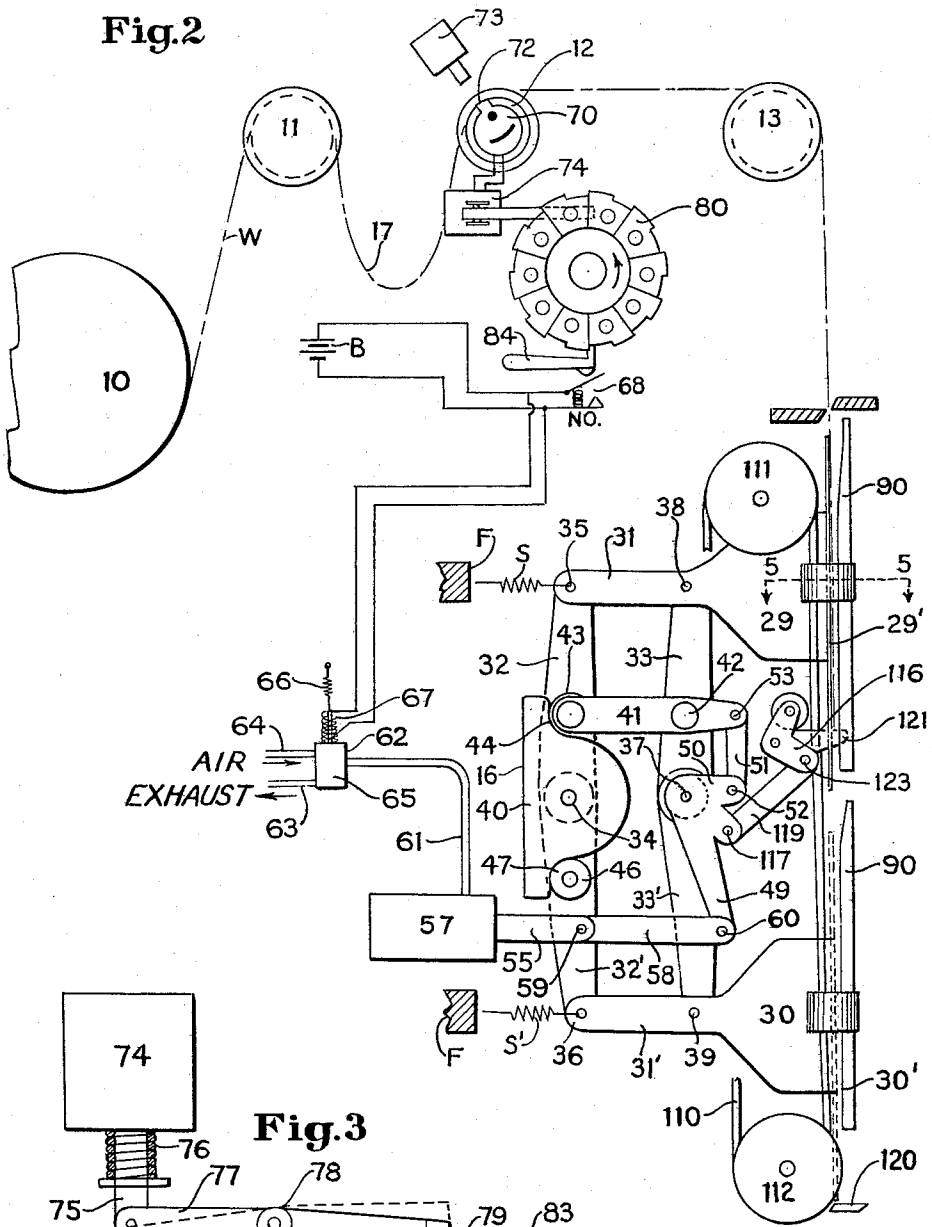
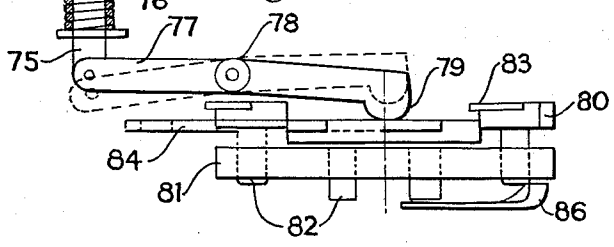


Fig.3



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APPARATUS FOR SORTING INDIVIDUAL SHEETS INTO SEPARATE PILES

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Fig. 5

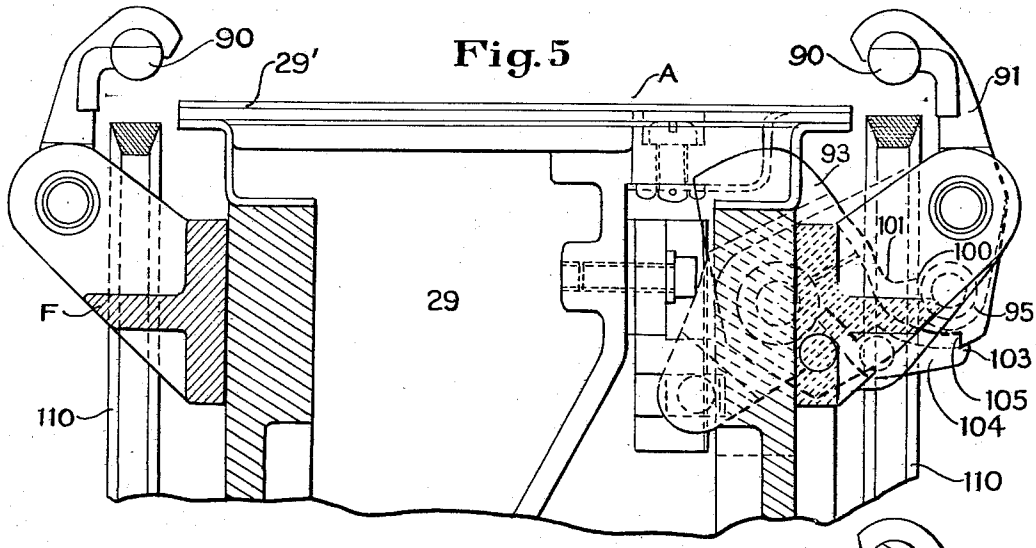


Fig. 6

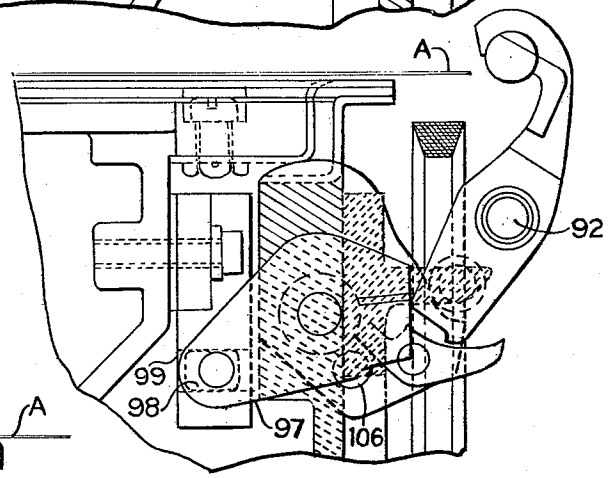
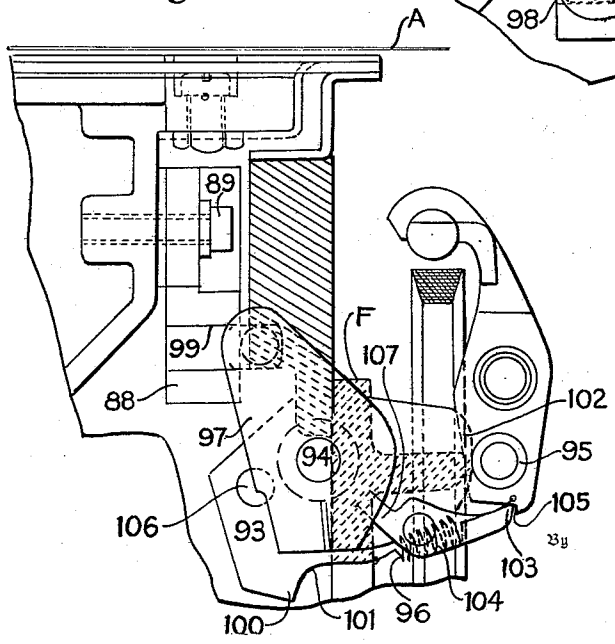


Fig. 7



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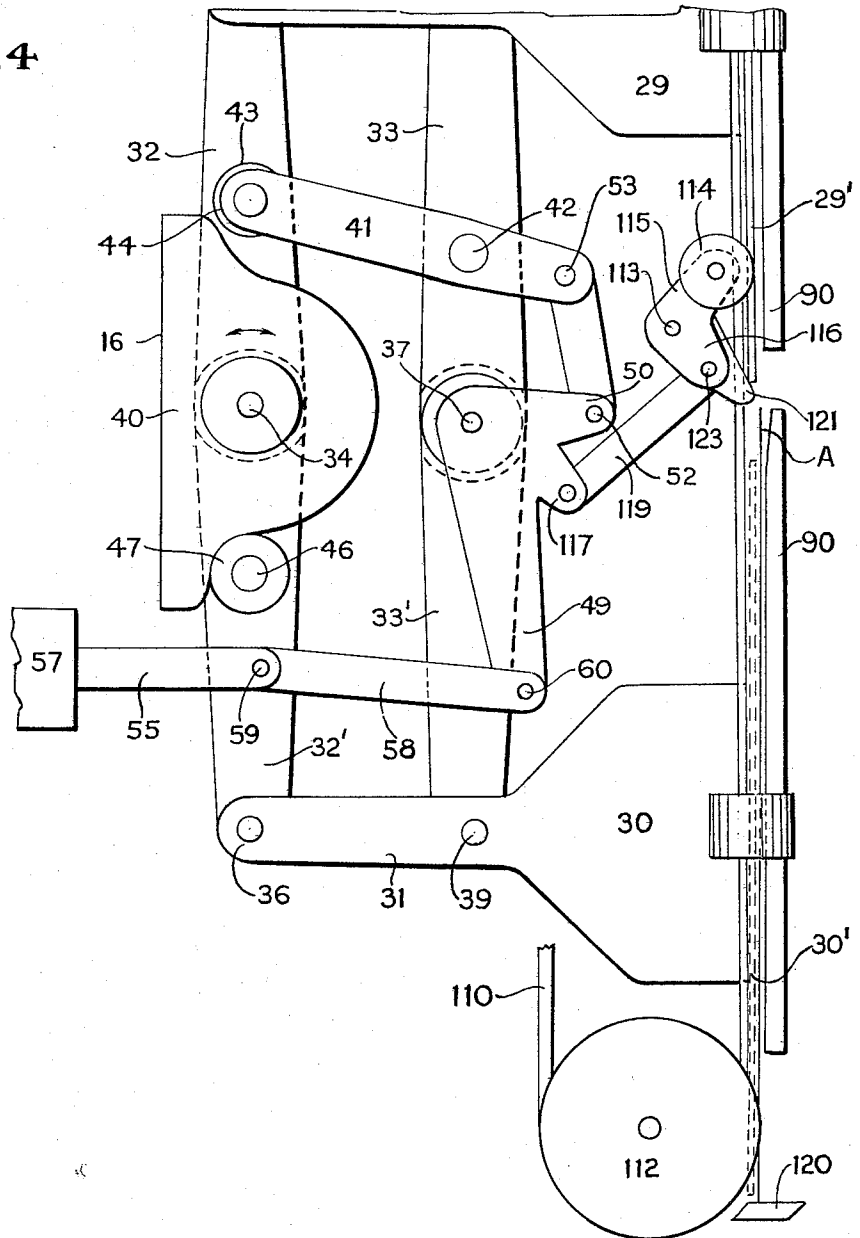
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APPARATUS FOR SORTING INDIVIDUAL SHEETS INTO SEPARATE PILES

Filed Jan. 6, 1951 4 Sheets-Sheet 4

Fig. 4



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APPARATUS FOR SORTING INDIVIDUAL SHEETS INTO SEPARATE PILES

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Application January 6, 1951, Serial No. 204,774

9 Claims. (Cl. 209—74)

The present invention relates to an apparatus for sorting individual sheets into separate piles dependent upon their characteristics, and particularly to a sorting mechanism which is adapted to handle sheets which are intermittently fed at a uniform rate to the sorting mechanism; said mechanism being controlled by a scanning means which inspects the sheets prior to their reaching the sorting station.

In the photographic art, paper is coated with a light-sensitive emulsion in long lengths and is later cut up into sheets of certain sizes for making photographic prints. In order to be sure that only paper having good coating gets to the customer, it is common practise to inspect the long webs of paper after coating and mark defective areas therein by punching perforations in and/or around the defective areas to designate them for future reference, and then rewind the paper on large rolls until the paper is to be chopped into given length sheets. When the roll of inspected paper is put on the chopping machine and cut into sheets, some means must be provided to stack the good sheets in one pile and the defective sheets (those designated by perforations in the web) in another pile. A suitable scanning means used for detecting perforations in the moving web is a photocell, or other light-sensitive optical means, arranged so that the amount of light striking the same is varied by the presence of a perforation, or other defect in the web, and which cell then gives a suitable signal of such fact which is then used to cause the operation of the sorting means to separate the sheet containing this perforation, or other defect, from good sheets.

The primary object of the present invention is to provide a combined web-chopping and sorting apparatus which is adapted to intermittently chop the web into sheets of a given length at a uniform rate, scan the web for perforations prior to chopping it into sheets, and to sort the sheets containing no perforations into one pile and those containing perforations into another pile in response to signals set up by a scanning means.

A further object is to provide a combined sheet-chopping and sorting mechanism of the type described wherein the web is intermittently fed between intermittently operated shearing knives, and to a sorting mechanism comprising a pair of reciprocally operated pusher members reciprocated in alternate relation and in timed relation with the web-feeding and chopping mechanism, so that the end of the web, as fed through the chopper, is moved in front of said first pusher member when in a retracted position. Therefore, if the sheets being chopped are all good ones, they are each pushed by the first pusher member into one pile and a sheet is fed in front of the second pusher member only if it is indicated as defective and the first pusher member is momentarily paralyzed by a signal set up by the scanning means acting on the web as it approaches the chopper.

And, another object is to provide a sorting mechanism of the type described which includes two pusher members reciprocated across the path of the sheets leaving the chopper, the first pusher member having a drive connection which can be readily momentarily disconnected so that the first pusher member will remain motionless for one or more strokes in its retracted or inoperative position to permit the sheets to pass to the second pusher member.

And yet, another object is to provide a sorting mechanism of the type described wherein the connection between the two pusher members is such that the first pusher member will always be returned to its inoperative position, even if disconnected from the driving means, and when reconnected to the driving means will take up its movement in proper synchronized relation with the second pusher member.

A further object is to provide a sorting mechanism of the type described which includes means for positively feeding a sheet from in front of said first pusher to a position in front of the second pusher, said feeding means being normally inoperative and rendered operative when the first pusher is disconnected from its driving means.

And, another object is to provide a sorting mechanism of the type described including a positive stop for positioning the sheet being chopped in front of the first pusher member, said stop member being so mounted and connected with the means for disconnecting the first pusher from its drive that it is moved out of the path of the sheets when the first pusher is rendered motionless.

And, another object is to provide a sorting mechanism of the type described which includes a pair of guide rods extending along opposite sides of each pusher member which are spaced from the face thereof and overhang the edges of the sheets to form, in combination with the pusher members, guideways into which the sheets may pass and be supported facewise against falling laterally forward or backward. These guide rods are pivotally mounted to swing from an operative guiding position to an inoperative position wherein they are swung away from overhanging relation with the edges of the sheets. They are connected with the pusher members so that they are moved to an inoperative position by the initial movement of the pusher members toward their operative positions and are returned to their guiding positions as the pusher members are retracted to their inoperative positions.

And yet, another object is to provide a sorting mechanism of the type described wherein the means for feeding the sheets from the first to the second pusher member comprises a pair of endless, constantly moving belts normally moved to a position out of engagement with the edges of the sheets and aligned with said guide rods to grip the edges of the sheets between themselves and said guide rods when moved to a feeding position. The belts are moved to their feeding position by a belt-shifting roller which is connected to the mechanism for disconnecting the first pusher member from its drive so that the feeding means is rendered operative only when the first pusher member is paralyzed.

The novel features that we consider characteristic of our invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and methods of operation, together with additional objects and advantages thereof, will best be understood from the following description when read in connection with the accompanying drawings, in which:

Fig. 1 is a diagrammatic showing of a combined chopping and sorting apparatus for cutting a long web into sheets and sorting the sheets, and constructed in accordance with one embodiment of the present invention;

Fig. 2 is a side elevational view showing a sorting mechanism constructed in accordance with a preferred embodiment of the present invention, and illustrating schematically its association with the web-scanning means which controls the selective sorting action of the mechanism. In this figure, the first pusher member is shown

connected to its driving cam for placing all cut sheets in one pile;

Fig. 3 is an enlarged top plan view of the delay or memory device which is set by the photocells scanning the web upon the appearance of a perforation in that portion of the web advancing to the chopper, but which does not apply that signal to the sorting mechanism until the instant that the perforated area of the web reaches its position in front of the first pusher member, at which time this pusher member is paralyzed;

Fig. 4 is an enlarged view of the major portion of the sorting mechanism, and particularly the means for disconnecting the first pusher member from its drive. This figure shows the first pusher member disconnected from its drive, the sheet stop removed from the path of the sheets at the lower end of the pusher member and the feed belt pushed forward to its sheet-feeding position;

Fig. 5 is an enlarged horizontal sectional detail taken substantially on line 5—5 of Fig. 2 and showing the pusher member in its retracted position and the guide rods along the edges thereof in their sheet-confining or operative positions;

Fig. 6 is a sectional detail corresponding to Fig. 5, but showing only one guide rod and one corner of the pusher member in the positions they assume when the pusher has just started forward and the guide rods are swung to an open position to allow the sheet to be pushed forward; and

Fig. 7 is a view similar to Figs. 5 and 6 but showing the guide rods in the position they assume after the pusher has reached its full forward position and returns to its retracted or inoperative position.

Like reference characters refer to corresponding parts throughout the drawings.

Briefly, our invention relates to a sorting mechanism for sorting into different piles sheets which are considered good and sheets which are considered defective, said sheets being intermittently fed to a given position occupied by the sorting mechanism at a uniform rate. The sorting mechanism comprises a pair of pusher members which are reciprocated alternately, the first pusher member moving transversely of said given position at a rate commensurate with the feeding of the sheets thereto so as to tend to push all of the sheets into one pile. Means are provided for selectively rendering the first pusher member inactive in its retracted position so that a given sheet may pass to the second pusher member and be pushed into the second pile thereby; and means responsive to a sheet-scanning system are provided for paralyzing said first pusher member at the time a defective sheet is fed in front thereof. The defective sheet is then fed in front of the second pusher member which sorts it into a defect pile. While the sorting mechanism is particularly adapted for use with a web-chopping mechanism, it can be used in connection with any source of sheet supply wherein the sheets are fed intermittently at a uniform rate, and are scanned in advance of the sorting operation.

Referring now to the schematic showing in Fig. 1, the overall operation of the sorting mechanism, when combined with a web-chopping apparatus, will be outlined. The web W to be chopped into sheets of a given length, and which has been previously inspected for surface defects and had the defective areas marked by perforations, is contained on a supply roll **10**. From the supply roll **10** the web W passes over a constantly driven feed roll **11**, over a feeding and scanning roll **12**, a holdback roll **13**, and thence to an intermittent advancing means, indicated generally at **14**, which intermittently feeds the web at a uniform rate past an intermittently operated chopper, indicated generally as **15**, to the sorting mechanism, indicated generally as **16**. A loop **17** is maintained in the web in advance of the intermittent feed to permit the intermittent feeding mechanism to operate, and the speed of the drive rolls **11** and **12** can be automatically adjusted by suitable means, not shown, in order to maintain a loop of sufficient size in the web at this point. The holdback roll **13**, which may be of any well-known construction, not shown, is to maintain that portion of the web in front of the intermittent feeding mechanism in a taut condition, so that the intermittent feed can be relied upon to advance a given length of web at each operation.

While any number of different forms of intermittent web-feeding means might be provided, it is preferable to have one of the gripping type, rather than the claw type, because the web is generally not provided with regular perforations along its lengths with which a claw can cooperate. As one form of intermittent pull down which might be used, we have shown a pair of web grippers mounted on a single block **18** which is reciprocated along the film path by a bull wheel and crank assembly indicated at **19**, the stroke of the wheel and crank assembly being adjustable to suit the length of web feed desired. Fixed to the block **18** on one side of the web is a stationary gripper member **20** having a web-gripping face of cloth, or other material which will not injure the surface of the web. On the other end of the block, and on the other side of the web is mounted an air cylinder **21** containing a piston **22** connected to a movable gripper member **22'** adapted to grip the web between itself and the stationary gripper member **20** at the top of the stroke of the block and pull the web down as the block moves down. This movable gripper is normally spring-pressed to its web-releasing position by a spring **23**, and is forced to its gripping position when air, under pressure, is introduced into the cylinder from a suitable supply through pipe **24** and stationary valve V. When the block **18** is at the top of its stroke, as shown, a port in the end thereof lines up with one in the valve V so that when the latter is opened by cam **25**, air enters the cylinder and moves piston **22** and gripper member **22'** toward the stationary gripper member **20** to grip the web. As the block moves down, the end of cylinder **21** slides along wall L so that the port in the end thereof is closed off and air is trapped in the cylinder to hold the gripper member **22'** in a web-gripping position throughout the pull-down stroke. When the block reaches the end of its stroke, the port in the end of cylinder **21** lines up with an exhaust port M in the wall L whereupon the gripper member **22'** is allowed to be moved to its web-releasing position under the action of spring **23**. The gripper member **22'** remains in this release position until the block **18** again reaches the top of its stroke, at which time cam **25** again opens valve V and air is again introduced into the cylinder **21**. The intermittent feeding mechanism advances a given length of web through the chopping apparatus which includes a stationary shear member **26** and a movable knife **27** which is operated in an intermittent manner by a cam **28**, as shown.

The web W when fed through the chopping mechanism is moved to a sorting mechanism comprising a first pusher member **29** and a second pusher member **30** which are alternately reciprocated across the path of the sheets A as they are chopped. As more clearly shown in Figs. 2 and 4, this sorting mechanism comprises a first pusher member **29** having a rectangular plate **29'** at its front end which is slightly smaller in area than the sheets to be handled, and which lies in a plane parallel to, and moves transversely across, the plane occupied by the sheet leaving the chopper. The second pusher member **30** is identical to the first pusher member in form, and is located below the same by approximately the length of a sheet. These two pusher members are mounted to be reciprocally moved in alternate relation across the path of the web sheets as they leave the chopper. To this end, rearwardly extending arm **31** of the first pusher member has a link **32** pivotally connected thereto at **35**, the other end of link **32** being pivotally mounted on shaft **34**. A rearwardly extending arm **31'** of the second pusher member **30** likewise has a link **32'** pivotally connected at **36** thereto, the other end of the link being pivotally

mounted on shaft 34 beside link 32. A link 33 and a link 33' are pivotally mounted on a fixed shaft 37 and are, in turn, pivotally connected to arm 31 of the first pusher member at point 38 and to arm 31' of the second pusher member at point 39, respectively. Pusher members 29 and 30 are normally moved to the left or to their retracted and inoperative positions by tension springs S and S', respectively, which are connected between a fixed part of the frame of the apparatus indicated at F and the arms 31 and 31' of the pusher members.

The prime mover for the pusher members comprises a cam 40 which is oscillatably mounted on shaft 34 and oscillated by means not shown. Power is transmitted from cam 40 to pusher member 29 by a rod 41 pivotally connected to a link 33 at point 42, said rod 41 having a roller 43 on one end engaging a concave portion 44 in the face of the cam. Thus, as the cam moves in a clockwise direction, rod 41 is pushed to the right and pusher member 29 is pushed to the right across the path of the sheets so as to push the sheet in front thereof into a pile, as indicated in Fig. 1. At the same time as pusher member 29 is moved to the right by cam 40, pusher member 30 is moved to the left or to a retracted and inoperative position by its spring S'.

Power is transmitted from cam 40 to pusher member 30 by a roller 46 fixed to the link 32' which engages a concave portion 47 in the cam. Thus, as cam 40 moves in a counterclockwise direction, roller 46 and link 32', to which it is connected, are moved in a counterclockwise direction, and since pusher member 30 is connected to link 32' at point 36, it is moved to the right across the path of the sheets and will move a sheet in front thereof into a separate pile, as indicated in Fig. 1. At the same time as pusher member 30 is being moved to the right, pusher member 29 is being moved to the left by its spring S. It will thus be seen that if the drive for the cam 40 and the drives for the intermittent pull down and web-chopping apparatus are connected together in any suitable way, as indicated by dotted lines connecting these parts, so as to be synchronized in operation, the web W will be advanced through the chopping mechanism to a point in front of the first pusher member 29 while the latter is in a retracted position, and the sheet will be chopped from the web in time to be pushed into the first pile P of good sheets when the pusher member is moved across the web or sheet path to its operative position. So long as only good sheets are coming along, the first pusher member handles them all, and the second pusher member 30 does nothing, although it keeps reciprocating. While the second pusher member 30 could be disconnected from the drive when not needed, there is no disadvantage in having it operate at all times. Since such an arrangement makes for a more simple mechanism, this is the manner in which we allow the pushers to operate.

When a defective sheet leaves the chopping apparatus, some means must be provided for disconnecting the first pusher member 29 from the drive while in its retracted position to allow the sheet to move on down in front of the second pusher member which then moves it into a separate pile P'. To this end, a bell crank 49 is pivoted on shaft 37 and has one arm 50 joined to rod 41 by a link 51 pivotally connected at points 52 and 53 to the rod and arm, respectively. Movement of the bell crank in a clockwise direction will thus cause rod 41 to be pivoted upwardly whereupon the roller 43 on the end thereof will be removed from engagement with the drive cam 40, see Fig. 4. Thus, when cam 40 moves in a clockwise direction, no force is transmitted to pusher member 29 to move it from its retracted position, but when moved counterclockwise the cam 40 will drive the second pusher member 30 by engaging roller 46 and driving link 32' to the right.

Any suitable means may be provided for moving bell crank 49 between its two positions depending upon the application of the sorting mechanism and the type of signal to which it is to respond. In the present application of this sorting mechanism to an apparatus for chopping a continuous web into sheets and sorting the chopped sheets in two different piles dependent upon the presence of perforations previously placed in the web to designate defective areas of the web, we have found the following mechanism very satisfactory.

As shown in Figs. 1 and 2, the end of the bell crank is connected to the rod 55 of a piston 56 of an air cylinder 57 by a link 58 pivoted to the rod at point 59 and to the arm of the bell crank 49 at point 60. This pivotal connection of link 58 is necessitated by the fact that the piston rod moves in a horizontal direction while the arm of the bell crank moves through an arc. The piston 56 is normally moved to the right, looking at Figs. 1 and 2, or to a position to move bell crank 49 to the position shown in Fig. 2, by a compression spring 61, and in which position the rod 41 is located to connect the first pusher member to the drive cam 40. Air under pressure is introduced into, and exhausted from, cylinder 57 through an air line 61 which is connected to a valve 62 which in one position connects the line to an exhaust port 63, see Fig. 1, and in the other position connects the line to an air supply 64 from which air under pressure issues. The plunger 65 of the valve is normally moved to an exhausting position by a spring 66 and is preferably solenoid-operated so that when its coil 67 is energized, the plunger moves down to close the exhaust port and allow air to enter the cylinder 57. The circuit of the solenoid operating the valve contains a source of potential "B" and a normally open switch 68.

All that is necessary is to determine when a defective area of the web will reach the chopping apparatus and to give a signal which will close the switch 68, thus causing the first pusher member to be paralyzed at the time the sheet including this area is chopped off, thus allowing it to move down in front of the second pusher member. To this end we choose to detect the presence of perforations in the web by photoelectric means at a point in advance of the chopper and to use the signal given out by this photoelectric means to close the switch 68 at a given time after the signal is originally given so that the area of the web, to which the signal pertains, will be in front of the first pusher member at the time the same is paralyzed in response to said signal. As shown, the scanning roll 12 may be transparent, or only engage the web at its edges, and within the roll is situated one or more light-sensitive cells 70 which are shielded by an opaque sleeve 71 having a narrow slit 72 extending across the width of the web. A suitable line of light is directed into this slit by a focused light source 73 which is disposed on the opposite side of the web from the photocell 70, and the web is normally sufficiently opaque to cut the light from the cell so that it gives no useful signal.

When a perforation in the web W passes over the slit 72, the photocell 70 is affected and gives out a current signal which causes energization of a solenoid 74 causing its plunger 75 to be drawn inwardly against the action of compression spring 76. As shown clearly in Fig. 3, this swings lever 77 about its pivot 78 from the dotted-line position to the full-line position and causes the rounded end 79 thereof to engage and axially slide a switch-actuating segment 80 in the rotating timing disk 81 to a switch-actuating position. This timing disk 81 comprises a plurality of switch-actuating segments 80 circumferentially disposed around the disk and including pins 82 slidably engaging the disk to permit the segments to move axially of the disk between an extended inoperative position in which the radially extending switch-actuating portions 83 are not in the plane of pivoted switch-actuating arm 84 to engage the same and close switch 68 as the disk rotates counterclockwise, and a depressed operative position in which the portions 83 are in the

plane of said switch arm **84** and will momentarily depress the same to close the switch as the disk rotates. As above described, closing of switch **68** energizes the solenoid **67** and opens valve **62** to permit air to enter cylinder **57** and paralyze the first pusher member. The drive for disk **81** is tied up or synchronized with the drive of the intermittent pulldown, as indicated by a dotted line, so that a given switch segment of the timing disk moves from a position opposite the rounded end of lever **77** to a switch-operating position, approximately 180° in Fig. 1, in the same time it takes a given point in the web W to move from a point opposite the scanning slit **72** to a point below the shear blades of the chopping apparatus. Accordingly, a perforation in the web which sets up a signal in the scanning system will be in the sheet opposite the first pusher member when the signal it set up in the photocell is impressed on the control system to paralyze the first member and this will allow this sheet to move to the second pusher for displacement thereby into the pile of defective sheets. For resetting the switch-operating segments **80** to their inoperative position after they have served a purpose and prior to again reaching the lever **77**, a stationary cam surface **86** is fixed to the frame of the apparatus in the path of the ends of the pins **82** of the segments **80**, said cam surface serving to cam said segments back to their inoperative positions as the disk rotates relative thereto, see Fig. 3.

In order to guide the sheets down in front of the pusher members and to keep the sheets from prematurely falling facewise from in front thereof, each pusher member has associated therewith a pair of guide rods **90** which will now be specifically described with reference to Figs. 5–7. Since each pusher member has the same guide rod construction and operation, only the combination of one pair of guide rods with its associated pusher member has been shown and will be described. Likewise, since the operative connection between each pair of guide rods and its respective pusher member is the same, only that between one guide rod and its pusher member is shown and will be described.

Referring now to Figs. 5–7, a pair of guide rods **90** are carried on the ends of arms **91** pivoted to the frame at **92** to move between an operative position shown in Fig. 5, wherein they overhang the edges of the sheet A positioned in front of the plate **29'** of the first pusher member **29**, and an inoperative position shown in Fig. 6 wherein they are swung outwardly from in front of the edges of said sheet to allow the same to be pushed forward by the pusher member. Looking at Fig. 5, it will be observed that the sheet engaging plate **29'** of the pusher member **29** is not as wide as the sheet A and can itself pass between the guide rods **90** when they are in their operative position. The guide rods merely form in combination with the plate **29'** of the pusher member a guideway into which the sheets may pass and be held in an upright position until this pusher member operates. In this capacity, the plate **29'** engages one face of the sheet and the guide rods **90** engage the vertical edges of the other face of the sheet.

In order that the pusher member **29** may push a sheet into one of the two piles, the guide rods must be swung to their inoperative position to permit the sheet to pass, and they must be returned to their operative position by the time the pusher member returns to its retracted position in order to be ready to accept the next sheet. To accomplish this, the guide rods **90** are operatively connected to the pusher members in a manner to be now described.

The guide rods **90** are operatively connected to the pusher member **29** so that during the initial part of the forward motion of the pusher member from its normal retracted position to its operative position, and prior to the sheet being pushed against the guide rods **90** thereby, the guide rods are swung to their inoperative position shown in Fig. 6. This is accomplished by a cam **93** of the form best shown in Fig. 7, which is fixed to a stub shaft **94** rotatably mounted on a fixed part of the frame. A roller **95** carried by the supporting arm **91** for the guide rods **90** is normally held in engagement with this cam through the action of a tension spring **96** acting on arm **91** and tending to rotate it in a clockwise direction and to a position wherein the guide rod is in an inoperative position. Also fixed to the rotatable stub shaft **94** above or below cam **93** is a driving member **97** having a slider **98** pivotally mounted thereon engaging a horizontal slot **99** in a block **88** fastened to the pusher member **29** by bolt **89** so as to move forward and back as the pusher member reciprocates, and in turn cause the driver member and the stub shaft **94** and cam **93** connected thereto to oscillate through substantially 90°. As the pusher member starts to move forward from the position shown in Fig. 5, the shaft **94** and cam **93** is rotated by drive member **97** until the roller **95** drops off the sharp corner **100** of the cam and into the recess **101** therein. This allows the arms **91** to move in a clockwise direction almost immediately by an amount sufficient to swing the guide rods to an inoperative position, see Fig. 6. As the pusher member continues to move forward, the cam **93** continues to rotate clockwise and roller **95** follows the contour thereof, under the action of spring **96** acting on arm **91**, until when the pusher member reaches its full operative position, the cam **93** assumes the position shown in Fig. 7 wherein portion **102** thereof engages the roller **95** and has swung the arm **91** back to its starting position wherein the guide rods are returned to their operative position. The radius of portion **102** of cam **93** relative to shaft **94** is slightly greater than the radius of that portion of the cam engaged by the roller during the retracted position of the pusher member, so that when the pusher member reaches its full operative position shown in Fig. 7, the nose **103** of a spring-operated latch member **104** is adapted to snap into engagement with a notch **105** in the end of arm **91** and positively hold the arm in its operative position during the return stroke of the pusher member. This prevents the roller **95** from following the contour of the cam **93** during the return stroke of the pusher member and eliminates the problem of getting the roller **95** over the sharp corner **100** of the cam **93** and also eliminates any unnecessary movement of the guide rods and their associated mechanism. The latch member **104** is swung clockwise to remove the nose **103** thereof from notch **105** and allow roller **95** to again drop down on the first portion of cam **93** when a pin **106**, carried by the cam, comes in contact with the tail **107** of the latch member upon the cam **93** returning to its starting position, as shown in Fig. 5.

It is not good practise to rely upon gravity to bring a defective sheet A down from in front of pusher member **29** to a position in front of pusher member **30**, so we provide a feeding means for this purpose which is operative only when the upper pusher member is paralyzed. To this end we mount two endless belts **110** at the side of each of the pusher members and behind the sheet path, each belt running over an upper pulley **111** and a lower pulley **112** with one reach of each belt extending along one edge of each sheet outside of the pusher members, see Figs. 2 and 5. As clearly indicated in Fig. 2, the axis of the upper pulley **111** is offset rearwardly of the axis of the lower pulley so that the reach of the belts lies at an angle to the path of the sheets and approaches the plane occupied by the sheets at a point adjacent the bottom of the first pusher member. The belts are arranged in this manner so that they will not normally engage a sheet A positioned in front of the first pusher member and tend to feed it to the second pusher member as they would do since they are continuously driven.

In order to render the feeding means operative, the reach of the belts adjacent the sheet path is moved for-

ward into engagement with the sheet by pivoting a bell crank **113** in a clockwise direction to move a belt-engaging roller **114** on the arm **115** thereof into engagement with the belts. It is to be understood there is a similar belt-engaging roller for each belt. To bring this operation about only at the time the first pusher member is paralyzed, and a sheet is to be fed to the second pusher member, the other arm **116** of the bell crank is connected to the arm **117** of bell crank **49** by a pivoted connecting link **119**. Consequently, when bell crank **49** is moved clockwise to disconnect the first pusher member from its drive, the roller **114** is swung toward the belt to move the downwardly moving reach thereof into engagement with the sheet A in front of the pusher. Looking at Fig. 5 it will be noticed that the downwardly moving reaches of the belts **110** line up with the guide rods **90**, so that when they are moved forward, they grip the edges of the sheet A between themselves and these rods to advance the same. Because of the inclined relation of the belts to the lower pusher member, and guide rods **90** associated therewith, just as soon as the sheet is moved from in front of the first pusher member **29** it is gripped and held by the belts despite the position of the roller **114**. The sheet A is stopped in front of the lower pusher member **30** by a stop member **120** fixed to the frame of the apparatus and extending into the path of the sheet, see Fig. 2.

The sheets A leaving the chopper mechanism are stopped in front of the first pusher member by a stop member **121** which the lower edge of the sheets engages. In order to remove this stop member **121** from the path of the sheets when a defective sheet comes along which is to be fed to the lower pusher member, this stop is pivotally mounted on the pivot for bell crank **113** and has a pivotal connection with the pivot point **123** between link **119** and arm **116** of bell crank **113**. Accordingly, when the bell crank **49** is moved clockwise to disconnect the first pusher member from driving cam **40**, it removes the stop member **121** from the path of the sheets at the same time it moves the belt shifting roller **114** into engagement with the belts **110**, see Fig. 4.

While we have shown our sheet-sorting mechanism in combination with a web-chopping machine wherein the web is scanned prior to being chopped, it will be readily understood that it is not limited to use in combination with such an apparatus. In the broadest sense, the only limitation to the operation of this sorting mechanism is that the sheets be intermittently fed at a uniform rate past a given position, such position being one at which the first pusher member **29** would be located. Likewise, the sorting mechanism is not limited to the particular scanning means disclosed for purposes of illustration or the particular means shown for paralyzing the first pusher member in response to a signal from said scanning means. This is true because the scanning could be done on individual sheets instead of a continuous web; could be visual or mechanical rather than electro-optical, and the paralyzing of the first pusher member could be affected manually as well as mechanically, if so desired. By the same token, the sorting means is not dependent upon the pusher members being vertically disposed and including a separate sheet-feeding means for advancing a sheet from in front of the first pusher member to the second one. The sheets could be fed horizontally over pushers arranged to work vertically, and the sheets could be fed to and from the pushers in succession by an intermittent feed independent of the pushers, except for a synchronous operation between the two.

Although we have shown and described certain specific embodiments of our invention, we are fully aware that many modifications thereof are possible. Our invention, therefore, is not to be restricted to the specific details of construction shown and described, but is intended to cover all modifications coming within the scope of the appended claims.

Having thus described our invention, what we claim is new and desire to secure by Letters Patent of the United States is:

1. A sorting mechanism for selectively sorting sheets intermittently fed into a given position at a uniform rate into one or the other of two different piles and comprising a first pusher member mounted to reciprocate across said given position between an inoperative position, wherein it allows the sheets to assume said given position, and an operative position, wherein it displaces a sheet from said position into a first pile; a second pusher member mounted to reciprocate in a direction parallel to that of the first pusher member to and from an operative position wherein it displaces a sheet passing the first pusher member into a second pile; means for reciprocating said pusher members between their two positions in alternate relation at a rate commensurate with the rate at which the sheets are fed to said given position whereby said first pusher member is adapted to displace each sheet into said first pile, said means including an oscillatable driving cam, a cam follower operatively connected to said first pusher member and mounted to move to and from an inoperative position wherein it is disengaged from said cam; a shifting linkage movable between a normal inoperative position and an operative position; and a connection between said shifting linkage and said cam follower whereby the follower is moved to an operative position in the normal position of said shifting linkage and is moved to an inoperative position to immobilize said first pusher member when said shifting linkage is moved to an operative position.

2. A sorting mechanism according to claim 1 including means for positively feeding a sheet from said given position in front of said first pusher member to a position in front of said second pusher member; said feeding means normally moved to an inoperative position; and an operative connection between said feeding means and said shifting linkage whereby said feeding means is moved to its operative position when said shifting linkage is moved to its inoperative position to immobilize said first pusher member.

3. A sorting mechanism according to claim 1 including means for positively feeding a sheet from said given position in front of said first pusher member to a position in front of said second pusher member; said feeding means normally moved to an inoperative position; and an operative connection between said feeding means and said shifting linkage whereby said feeding means is moved to its operative position when said shifting linkage is moved to its inoperative position to immobilize said first pusher member, a stop member movable to and from the path of said sheets to positively locate them in said given position in front of said first pusher member, said stop member connected to said shifting linkage to be moved from the path of said sheets when the shifting linkage is moved to an inoperative position to immobilize said first pusher member and move said sheet-feeding means to an operative position.

4. A sorting mechanism according to claim 1, including a pair of guide members movable between an operative position, wherein they are located at opposite sides of the first pusher member and are spaced from the pusher member when in its inoperative position to provide in combination therewith a guideway into which the sheet is fed when moved to said given position and is held against face-wise displacement, and an inoperative position, wherein said guide members are removed from in front of said sheet, means for moving said guide members between said two positions; and an operative connection between said last-mentioned means and said pusher member whereby the guide members are moved to their inoperative position during the initial part of the movement of said

pusher member toward its operative position and are returned to their operative position after the pusher member has moved to its operative position.

5. A sorting mechanism according to claim 1 including a pair of guide members adjacent each pusher member and each pair movable between a guiding position, wherein they extend along opposite sides of their corresponding pusher member when in its inoperative position to provide in combination therewith a guideway into which the sheets are fed and are held against face-wise displacement, and an inoperative position, wherein said guide members are removed from in front of said sheets, means for moving said guide members to said inoperative position when the pusher members are moved to their operative positions, and means for feeding a sheet from in front of said first pusher member in front of said second pusher member when the former is rendered inoperative, and including a pair of endless belts, one on each side of said second pusher and having a reach normally spaced behind the plane occupied by the sheet located in the guideway formed by the pusher member and its associated guide members and said reach extending along the edge of the sheet and aligned with one of said guide members, means for continually driving said belts in a direction to advance a sheet from in front of the first pusher member to in front of the second pusher member, and means for pressing said reach of the belts adjacent the sheet toward their corresponding guide members to grip the edges of the sheet between the same and said guide members when said first pusher member is rendered inoperative.

6. A sorting mechanism according to claim 1, including a stop member movable to and from an operative position wherein it extends across the path of the sheets adjacent the leaving edge of said first pusher member and positively limits the feed of the sheets at said given position in front of said first pusher member; said stop member operatively connected to said shifting linkage whereby said stop member is moved from its operative position when said shifting linkage is moved to an operative position.

7. A web sorting mechanism according to claim 1, including a stop member movable to and from an operative position wherein it extends across the path of the sheets adjacent the leaving edge of said pusher member and positively limits the feed of the sheets at said given position in front of said first pusher member; said stop member operatively connected to said shifting linkage whereby said stop member is moved from its operative position when said first pusher member is rendered inoperative; and means for positively feeding a cut sheet from in front of said first pusher member to a position in front of said second pusher member, said feeding means being normally inoperative and operatively connected to said shifting linkage so as to be rendered operative when said first pusher member is rendered inoperative by said linkage.

8. A sorting mechanism for selectively sorting sheets leaving a chopping mechanism at a uniform rate into one or the other of two different piles and comprising a first pusher member adapted to be mounted adjacent the leaving side of the shopping mechanism to move transversely across the path of the chopped sheets from a retracted position, wherein the sheets may move down in front thereof, to an extended position, wherein the pusher member has moved across the sheet path and pushed a sheet into one of two piles; a second pusher member adjacent the first and mounted to move transversely across the path of the sheets between a retracted position and an extended position to push the sheets passing said first pusher into a second pile; means for continuously reciprocating said pusher members between their two positions in alternate relation, the speed of said last-mentioned means being synchronized with that of the chopping mechanism so that the first pusher is moved from a retracted position each time a new sheet is moved in front thereof; means for disconnecting said first pusher member from said reciprocating means when it is in its retracted position to allow a sheet to pass in front of the second pusher member; means for feeding the sheets from in front of said first pusher member to in front of said second pusher member, said means being normally inoperative; means for rendering said sheet feeding means operative; and a connection between said last-mentioned means and said means for disconnecting said first pusher member from said reciprocating means for rendering said feeding means operative when the first pusher member is made inoperative.

9. A sorting mechanism for selectively sorting sheets leaving a chopping mechanism at a uniform rate into one or the other of two different piles and comprising a first pusher member adapted to be mounted adjacent the leaving side of the chopping mechanism to move transversely across the path of the chopped sheets from a retracted position, wherein the sheets may move down in front thereof, to an extended position, wherein the pusher member has moved across the sheet path and pushed a sheet into one of two piles; a second pusher member adjacent the first and mounted to move transversely across the path of the sheets between a retracted position and an extended position to push the sheets passing said first pusher into a second pile; means for continuously reciprocating said pusher members between their two positions in alternate relation, including an oscillatable driving cam and a driving link connected between the first pusher member and said cam which is pivotally mounted to be moved from driving engagement with said cam, the speed of said last-mentioned means being synchronized with that of the chopping mechanism so that the first pusher is moved from a retracted position each time a new sheet is moved in front thereof; and means for disconnecting said first pusher member from said reciprocating means when it is in its retracted position to allow a sheet to pass in front of the second pusher member and including a linkage for pivoting said driving link from engagement with said cam.

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