Nov. 11, 1952 K. M. DAVIS 2,617,647

PAPER HANDLING MACHINERY

Filed March 24, 1949 11 Sheets-Sheet 1

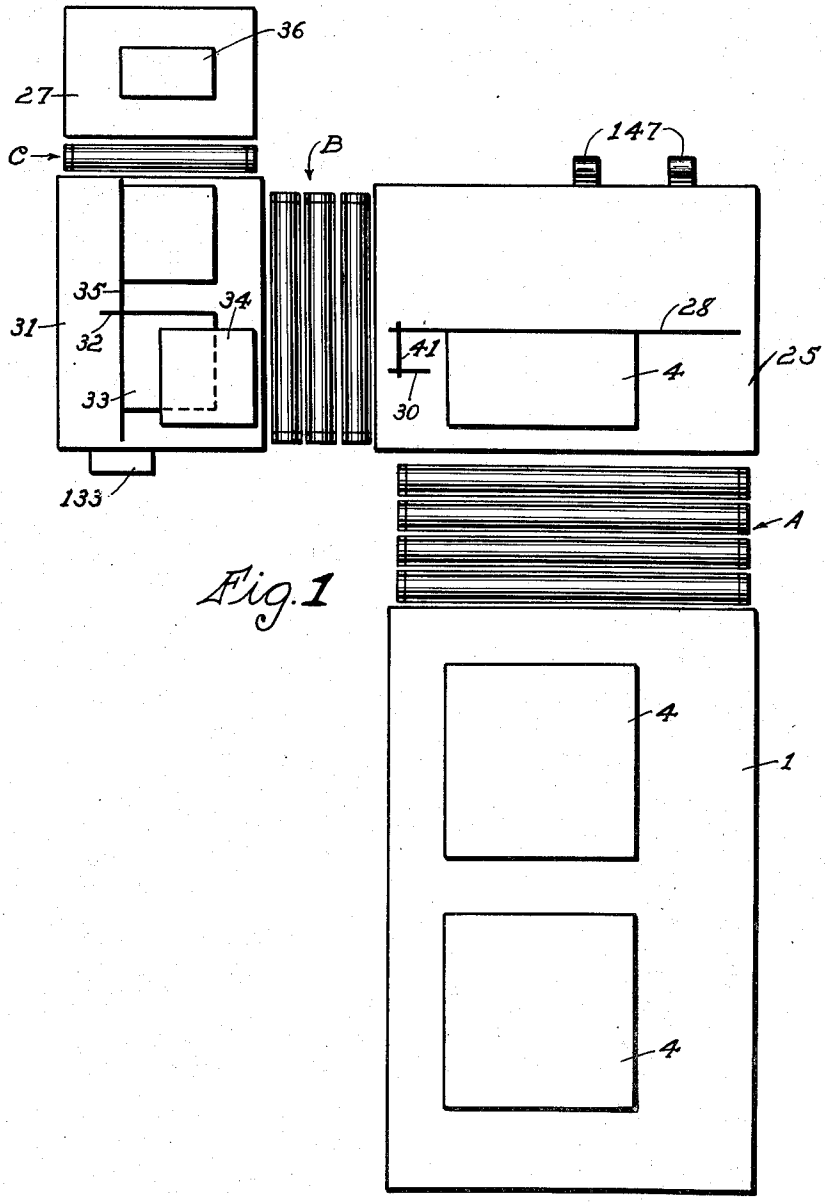

Fig. 1

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Filed March 24, 1949 11 Sheets-Sheet 2

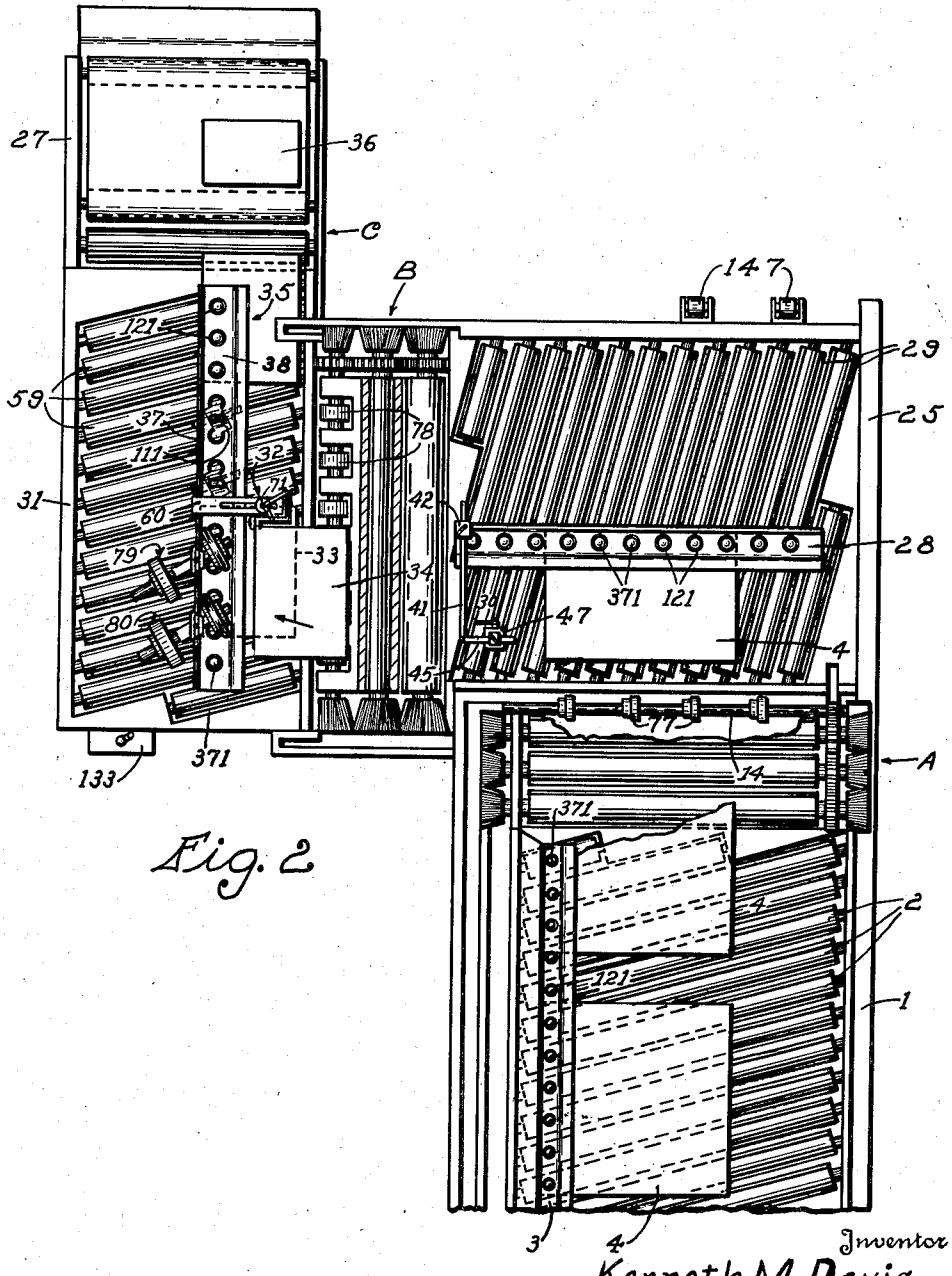

Fig. 2.

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Filed March 24, 1949 11 Sheets-Sheet 3

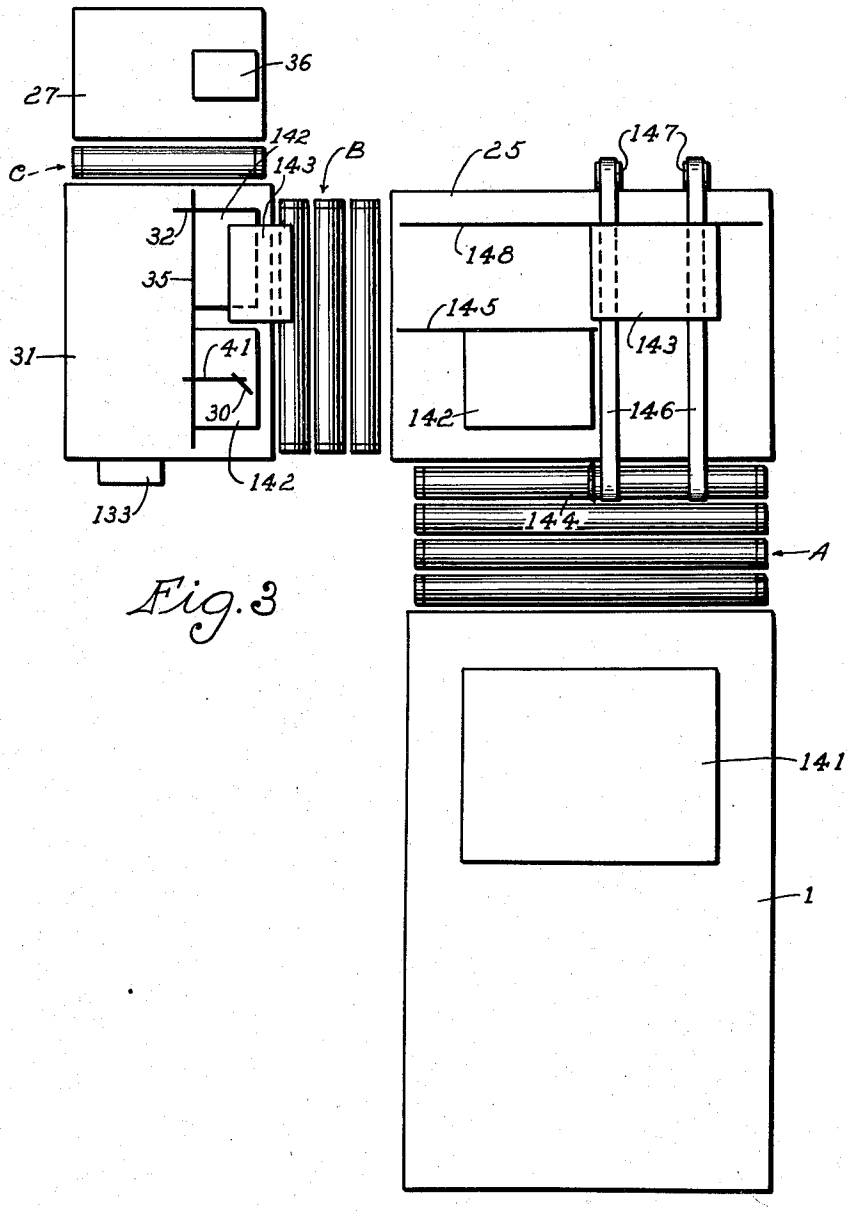

Fig. 3

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PAPER HANDLING MACHINERY

Filed March 24, 1949 11 Sheets-Sheet 4

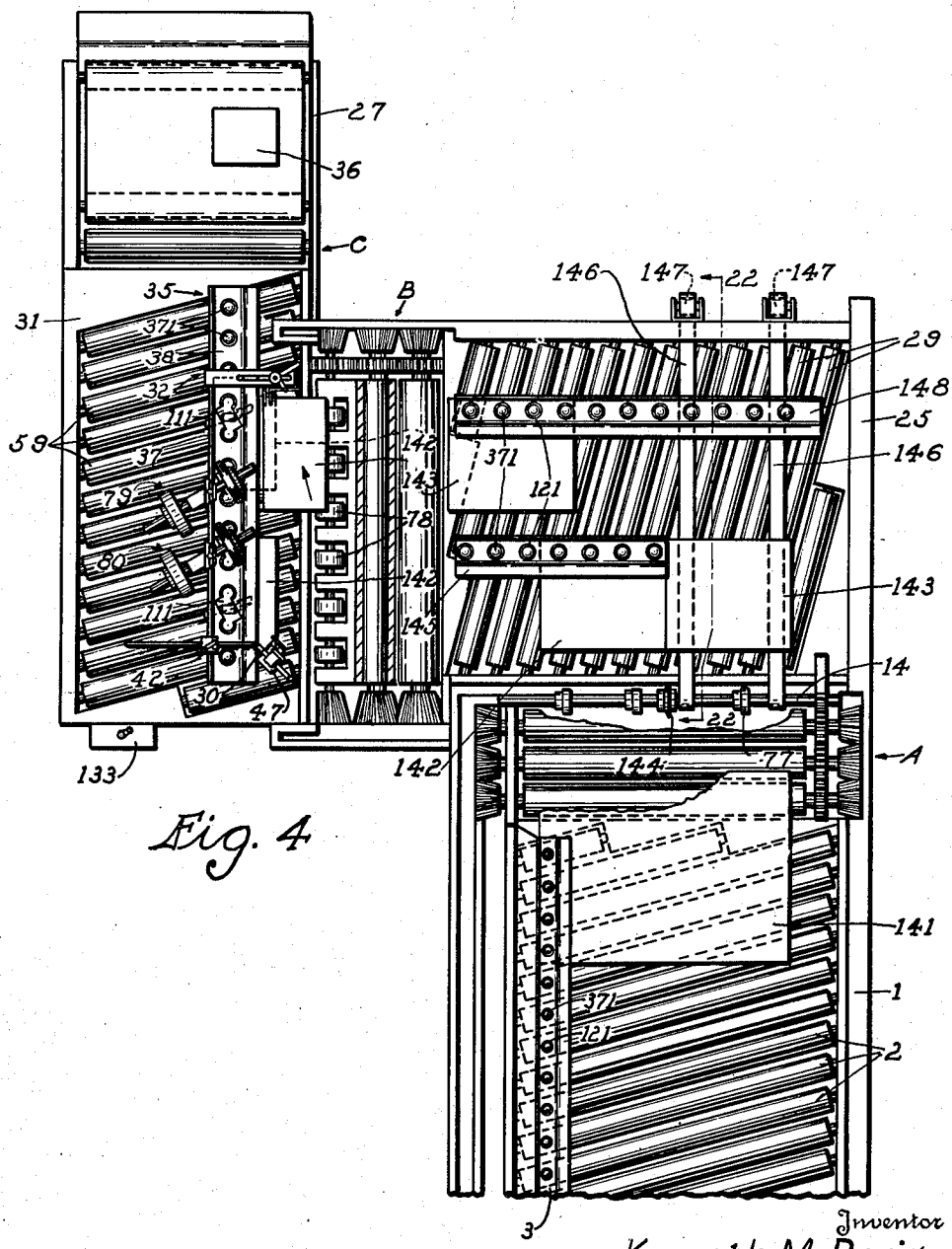

Fig. 4

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PAPER HANDLING MACHINERY

Filed March 24, 1949 11 Sheets-Sheet 5

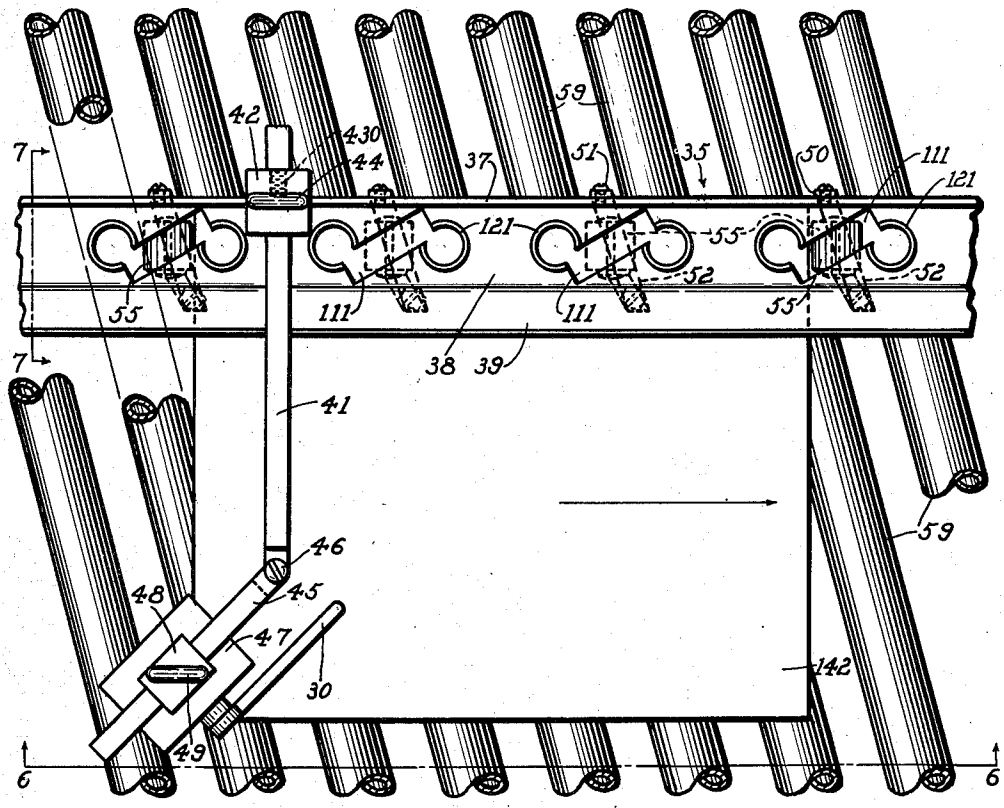

Fig. 5

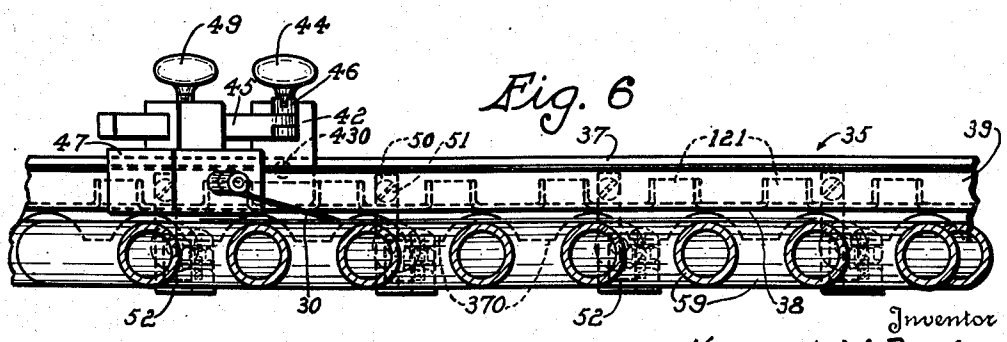

Fig. 6

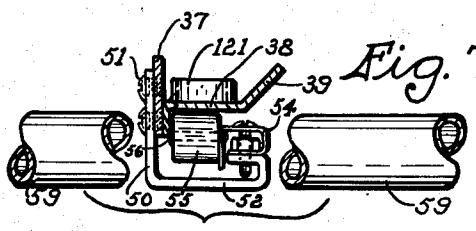

Fig. 7

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PAPER HANDLING MACHINERY

Filed March 24, 1949 11 Sheets-Sheet 6

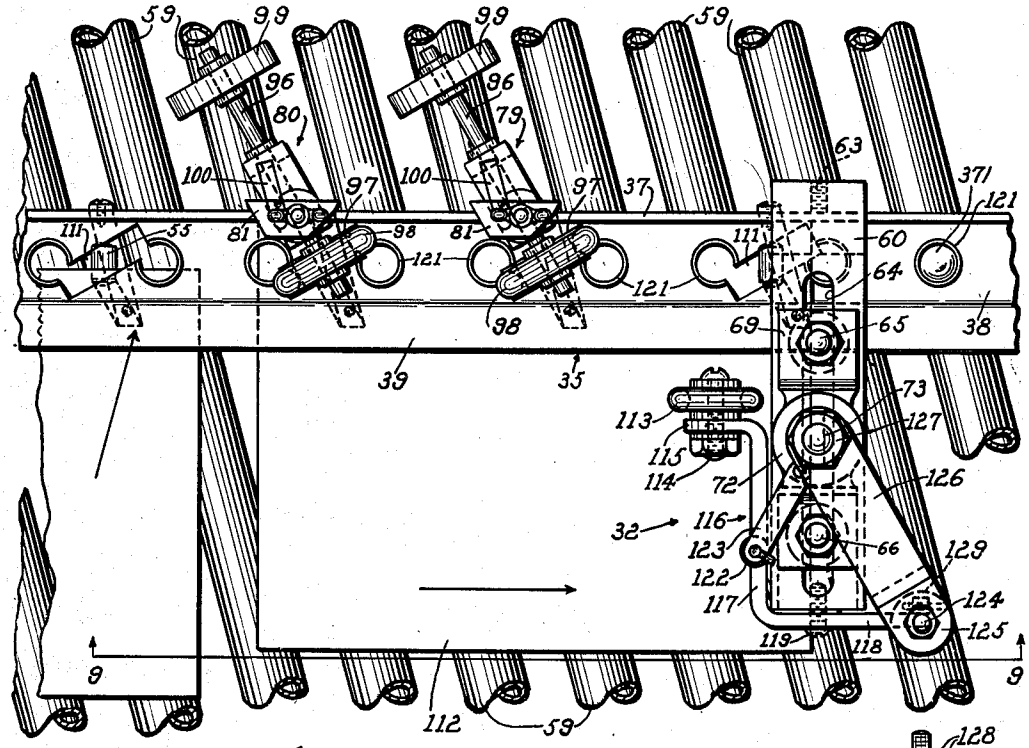

Fig. 8

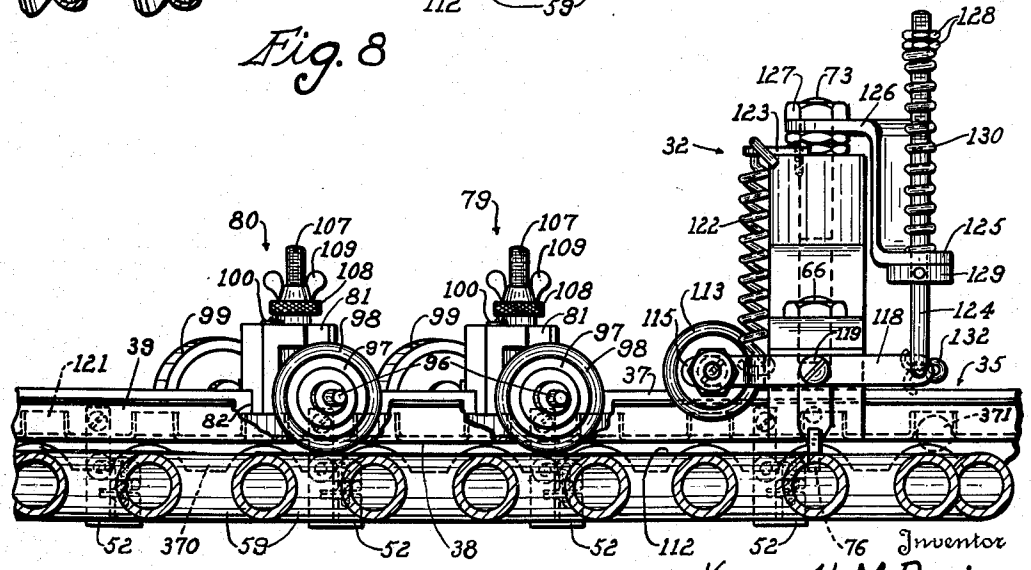

Fig. 9

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PAPER HANDLING MACHINERY

Filed March 24, 1949 11 Sheets-Sheet 7

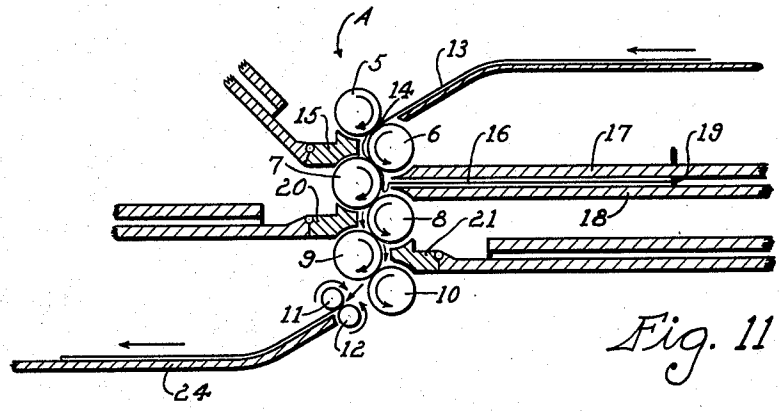

Fig. 11

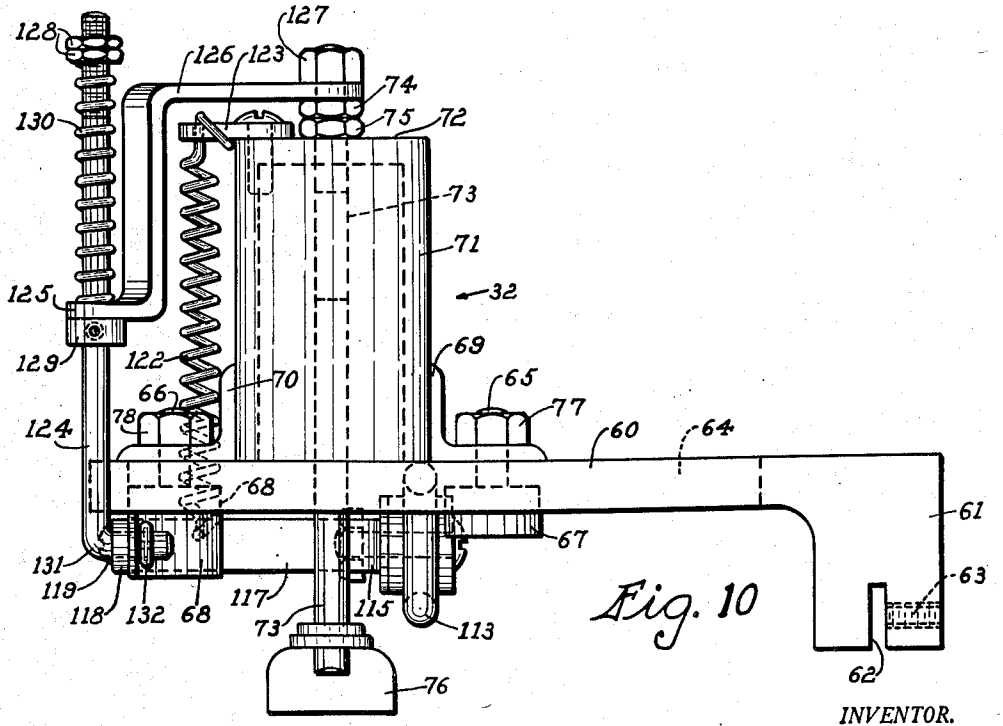

Fig. 10

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PAPER HANDLING MACHINERY

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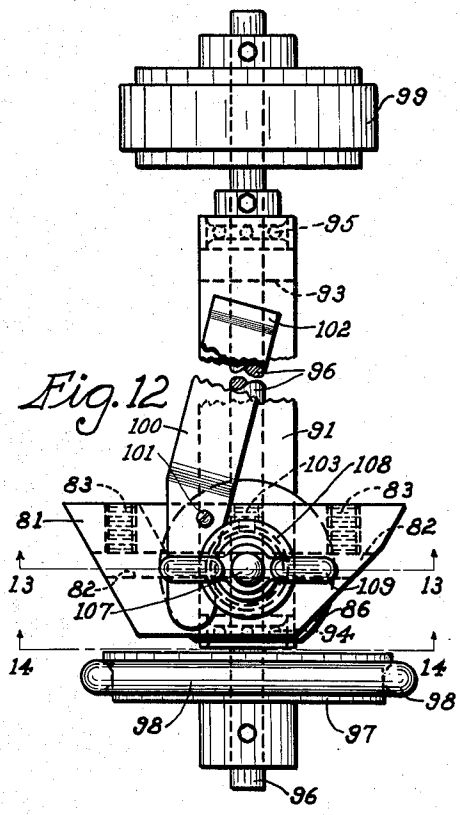

Fig. 12

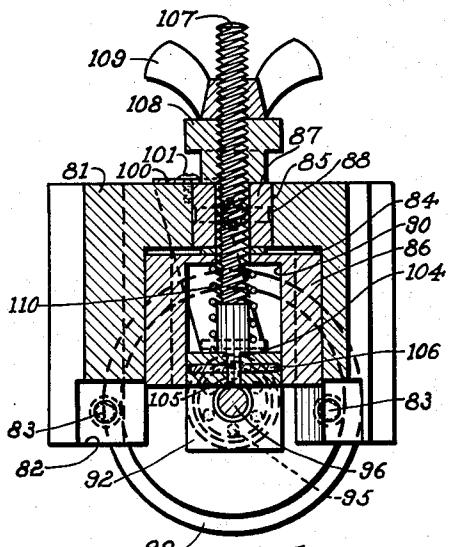

Fig. 13

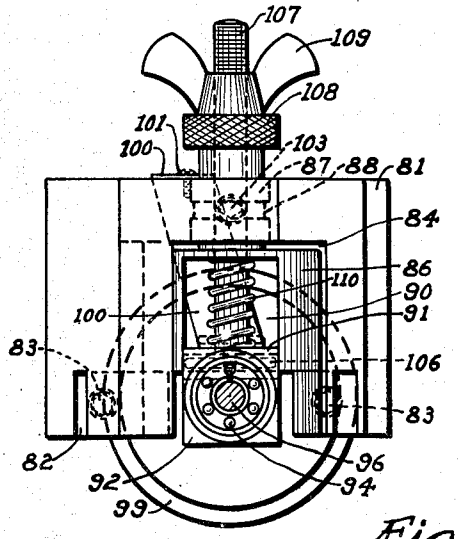

Fig. 14

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Nov. 11, 1952 K. M. DAVIS 2,617,647

PAPER HANDLING MACHINERY

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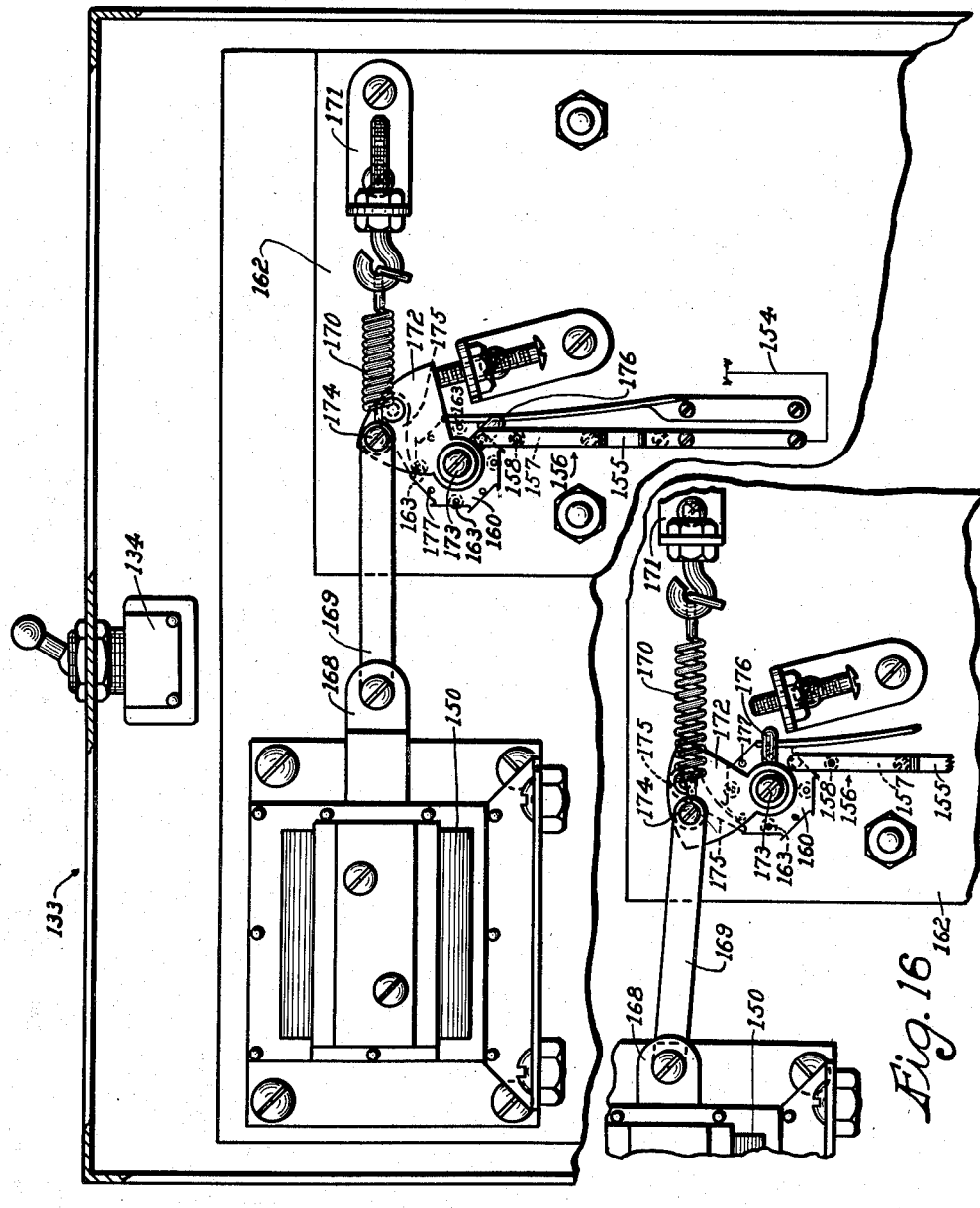

Fig. 15

Fig. 16

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PAPER HANDLING MACHINERY

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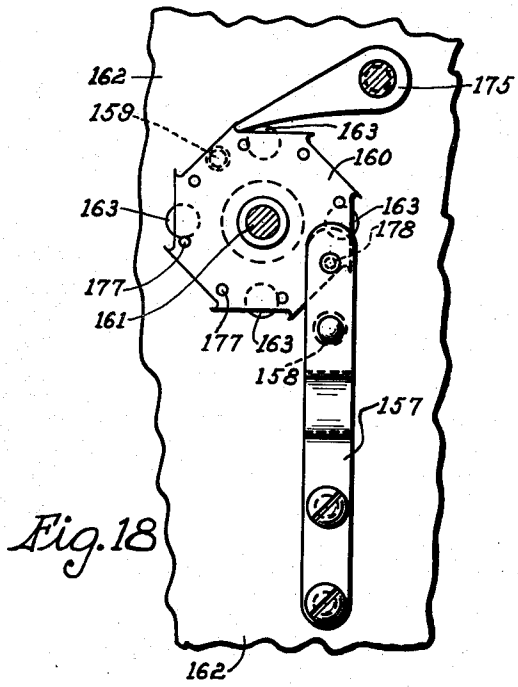

Fig. 18

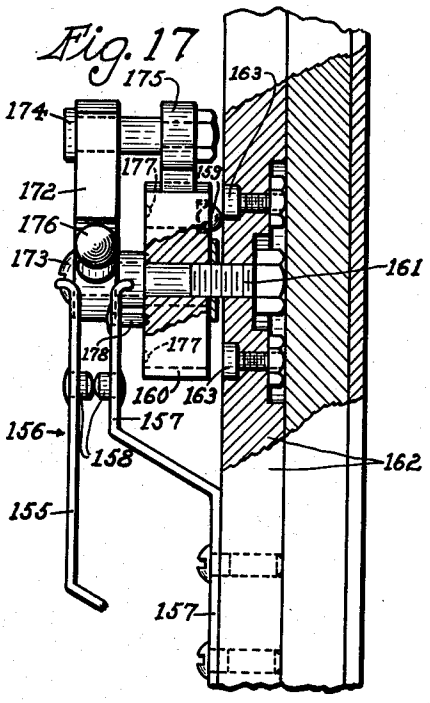

Fig. 17

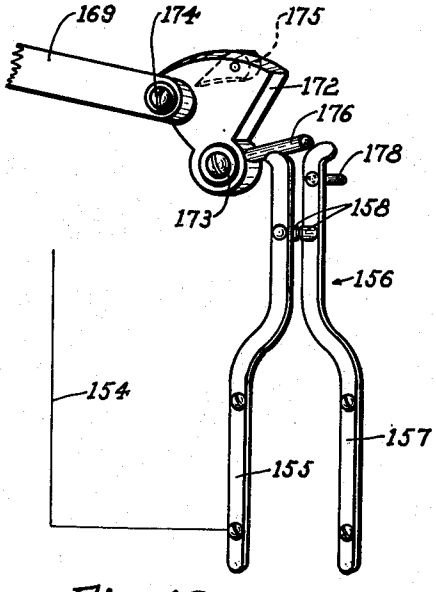

Fig. 19

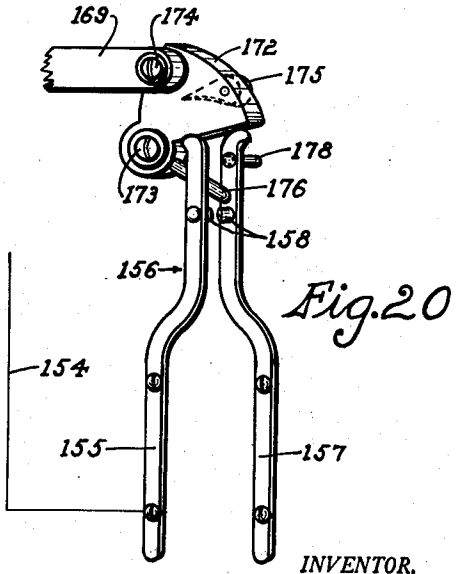

Fig. 20

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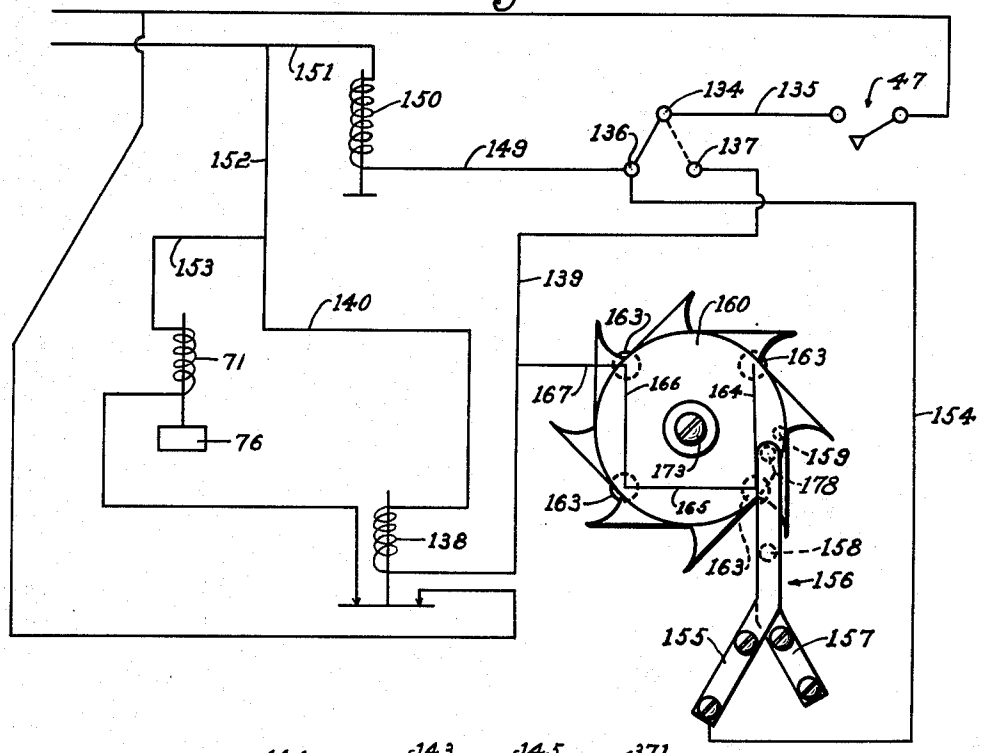
Fig. 21



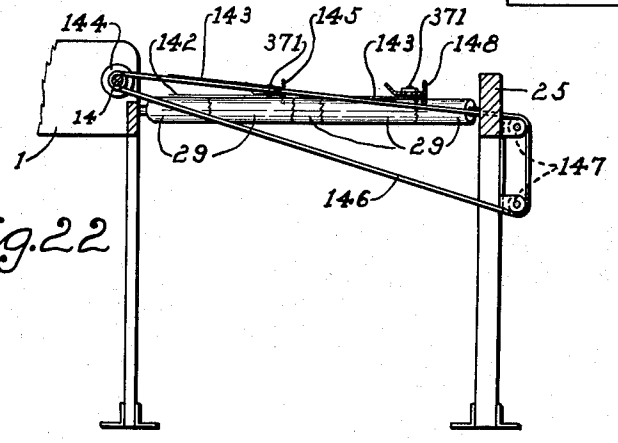


Fig. 22

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Patented Nov. 11, 1952

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UNITED STATES PATENT OFFICE

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PAPER-HANDLING MACHINERY

Kenneth M. Davis, Washington, D. C.

Application March 24, 1949, Serial No. 87,323

11 Claims. (Cl. 270—59)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

1

The invention described herein may be manufactured and used by or for the Government of the United States for governmental purposes without payment to me of any royalty thereon in accordance with the provisions of the act of April 30, 1928 (ch. 460. 45 Stat. L. 467).

This invention relates to paper handling machinery, generally, and, specifically, to means adapted for attachment to a standard sheet-folding machine to effect the stacking of two or more sheets—usually in multiple folded or "signature" form—prior to the final folding operation so that the latter, in effect, results in the insertion or folding in of one signature inside another.

An object of the invention is to provide attachment means of the kind indicated which effect the stacking and insertion functions described during the uninterrupted course and without modification of the folding operations of the machine.

Another object is to provide such means adapted to be readily attached to a folding machine and as readily removed therefrom when the stacking and insertion operations are not required.

Another object is to provide means for stacking sheets or signatures in such fashion as to avoid the trapping of air therebetween and the displacement and wrinkling of paper and jamming of machinery that result from such trapping of air.

Another object is to provide means of the character indicated for stacking sheets in continuous succession from a single line of advancing sheets, and also for stacking sheets in alternating relation from a double line of advancing sheets.

Another object of the invention is the provision of novel switch means for effecting automatically the assembling of paper sheets or signatures, as described.

These and other objects are attained by the means described herein and illustrated in the accompanying drawings, in which:

Figure 1 is a diagrammatic top plan view of a folding machine showing the sequence of operations employed by the present invention in the stacking of sheets in continuous succession from a single line of advancing sheets.

Figure 2 is a top plan view of a paper folding machine having the attachment means of the present invention associated therewith for carrying out the same sequence of operations as in Figure 1, the machine proper being shown somewhat conventionally and partly in cross section.

Figure 3 is a view similar to Figure 1, but illustrating the use of the invention as employed for stacking sheets in staggered or alternate relation from a double line of advancing sheets.

Figure 4 is a top plan view similar to Figure 2, but showing the attachment means for stacking from a double line of advancing sheets.

Figure 5 is a fragmental top plan view of a sheet-carrying "table" forming part of a paper folding machine and having a sheet-actuated

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switch and related means of the present invention associated therewith;

Figure 6 is a view taken on the line 6—6 of Figure 5.

Figure 7 is a detail view, with parts broken away, on the line 7—7 of Figure 5.

Figure 8 is a top plan view of sheet-stacking apparatus of the invention associated with a sheet-carrying table, the latter shown fragmentally.

Figure 9 is a cross-sectional view taken on the line 9—9 of Figure 8.

Figure 10 is a rear elevational view of the solenoid-actuated stop or gate unit forming part of this invention.

Figure 11 is a fragmental conventional view of one of the paper-folding stages or sections of a buckle-fold type machine, showing the progress of a sheet through one folding operation, including its movement from one level to the next.

Figure 12 is a detail top plan view of a sheet-moving or rotor unit, of the present invention.

Figure 13 is a cross-sectional view on the line 13—13 of Figure 12.

Figure 14 is a view taken on the line 14—14 of Figure 12.

Figure 15 is a plan view showing a selector switch assembly of the present invention shown in open position.

Figure 16 is a view similar to Figure 15 showing the switch in closed position.

Figure 17 is a vertical cross-sectional view through a portion of the selector switch showing the contact points in closed position, as in Figure 16.

Figure 18 is a front view of the pawl and ratchet and the associated contact elements disclosed in the preceding three figures.

Figures 19 and 20 are detail perspective views showing the contact members of the actuator switch in closed and open position, respectively.

Figure 21 is a wiring diagram of the electrical circuit employed in the present invention.

Figure 22 is a cross-sectional view on line 22—22 of Figure 4.

Paper folding machines, as at present generally used, are either of the buckle-fold or the knife-fold type. The buckle-fold machine operates on the principle of passing a sheet of paper through a series of rollers and, at one point, causing the sheet to buckle intermediate its length, at which points the paper is nipped or engaged by a succeeding pair of rollers and thus folded. This folding operation may be repeated two or three times at a given stage or fold section of the machine before being carried on to another similar stage or section. In the knife-fold type of machine, the folding operation is effected by a knife member, which descends across an intermediate portion of a sheet and introduces the same into position between a pair of rollers for folding the sheet.

The present invention may be used with other types of machine, but is illustrated herein as ap-

plied to the buckle-fold type, for example, the "Cleveland Model-K Folder." The principal elements and operations of this machine, as they are related to the present invention, will first be disclosed.

The machine comprises an initial table or carrying section 1 which is provided with a series of diagonally-disposed rollers 2 rotated in a common direction by suitable means not shown. The table 1 has a guide bar 3 disposed thereon immediately above the rollers 2. Said bar serves as a contact for one side edge of each sheet 4 of paper disposed on the rollers 2. The sheets 4 are advanced toward a folding section indicated generally at A where, as illustrated herein, each sheet is folded once and then passed on downwardly to a succeeding carrying table disposed at right angles with the table 1. Figure 11 indicates conventionally one of the fold sections, such as section A, comprising a vertically-related series of rollers 5, 6, 7, 8, 9, 10, 11, and 12 whose directions of rotation are indicated by the small arrows associated therewith.

A sheet of paper, indicated at 13, is shown as entering between the top pair of rollers 5 and 6, as at 14. From here the sheet proceeds between rollers 6 and 7, directed thereto by a deflecting member 15. Thereafter the sheet is projected into a space 16 between two plates 17 and 18 until the sheet abuts a stop member 19. The latter causes the sheet to buckle intermediate its ends and the buckled portion is nipped or engaged by the rollers 7 and 8 which advance the folded sheet downwardly between rollers 8 and 9. Suitable deflecting members indicated at 20 and 21 determine the course of the sheet into position for engagement by the lowermost rollers 9 and 10. These project the sheet into position between the small pair of rollers 11 and 12, which advance the sheet, as indicated by the arrow, along a suitable support 24 to a set of rotating discs or wheels 77 which complete the movement of the sheet onto a subsequent sheet-carrying table 25.

The sheets are in a like manner carried on table 25 to another folding section B similar to section A, above described, and thence to a third sheet-carrying table 31 from whence the folded sheet units or "signatures" are deposited on a suitable receiving table or platform 27.

The foregoing operations are common to buckle-fold machines generally and, inasmuch as these are well known, it will be unnecessary to further detail their make-up and operation except insofar as the present invention is cooperatively related thereto.

Reference is now made to Figures 1 and 2, illustrating the sequence of operations and the means employed where a series of identically printed sheets 4, such as blank or ruled sheets, is being run, and where, accordingly, the sheets may be stacked in successive order from a single line of advancing sheets. Sheets 4 pass along table 1 and through the folding seciton A to the second sheet-carrying table 25, disposed at right angles to table 1. On table 25 a guide bar 28, of the same character as the presently-known guide bar 3, is positioned, against which a lateral edge of the sheet 4, now folded in half, comes into contact. The diagonal rollers 29 (Fig. 2) carry this sheet to the left as seen in Figures 1 and 2, and beneath a switch lever 30 to the next folding section B, from whence each sheet, after a further fold, is advanced to the third sheet-carrying table 31, which is also provided with a guide bar 35. On table 31, according to the present invention, a solenoid-operated stop unit 32 is positioned to block the advance of one sheet, indicated at 33, until one or more subsequent sheets, such as sheet 34, has been deposited thereon and moved into registration therewith. This blocking operation occurs when a sheet 4 passes beneath and clears the switch lever 30, whereupon the solenoid unit 32 is de-energized and the stop returned to blocking position, as will be further described. The stacking or deposit of a second sheet on top of the one held by the stop occurs at this interval. Then the switch lever 30 is contacted by a succeeding sheet 4 causing energizing of unit 32 and raising of the stop which permits the stacked sheets to pass on. After the passage of succeeding sheet 4 beyond the switch, the latter causes the stop unit 32 to return to blocking position.

After the desired number of sheets has been assembled at the stop unit 32, the latter releases the stacked sheets which pass as a unit to a third folding section C. The folded signature 36 is thereafter moved out onto the final receiving table or platform 27.

In greater detail, the means for carrying out the stacking and interfolding or "insertion" of sheets advanced in a single line, as in Figures 1 and 2, comprise the guide bars 28 and 35, suitably positioned just above their respective sheet-carrying tables 25 and 31. Each guide bar has a vertical flange 37 (Fig. 7) and a horizontal flange 38, the outer edge portion of the latter being turned somewhat upwardly as indicated at 39 to obviate any interference therewith of a sheet advanced beneath the horizontal flange 38. The vertical flange 37, as indicated in Figure 6, is of scallop formation along its bottom edge to provide sheet-contacting extensions 370 depending between the diagonal rollers beneath. The horizontal flange 38 of guide bar 28 may be provided with flanged openings or sockets 121 in which small spherical weights, such as marbles 371 may be placed for bearing against and stabilizing the sheets as they are moved along the sheet-carrying rollers 29. It may be pointed out that the diagonal disposition of these and the other similar rollers shown is, in accordance with well-known practice, such as to actuate the sheets not only forwardly but somewhat laterally in the direction of the associated guide bar so that the sheets are moved and maintained in linear succession.

The guide bar 28 has associated therewith, adjacent the left-hand end, a support shaft 41 passing through a block 42 which is attached to the guide bar 28. For the double-line operation to be later described, shaft 41 and related parts are attached to guide bar 35. A set screw 430 (Fig. 5) in the block 42 secures the latter to flange 37. A threaded wing bolt 44 in block 42 is adapted to be tightened against shaft 41 for securing the latter in adjusted positions. Shaft 41 has an arm 45 mounted at its outer end, for pivotal adjustment thereon as indicated at 46 (Fig. 5). An electrical switch unit 47 is mounted for longitudinal adjustment on arm 45 by means of a slotted top stud 48 through which arm 45 passes and into which a threaded bolt 49 enters for impingement against said arm. The switch lever 30, previously mentioned, is attached at one side of switch unit 47 (Figs. 5 and 6) and extends downwardly at a slant in the direction in which paper sheets pass therebeneath, as indicated by the arrow in Figure 5

Depending on the size of the sheets, the switch unit 47 and its lever 30 are, by the several adjustments described above, disposed in suitable position for contact and operation by the sheets. A characteristic position is shown in Figure 5. The switch is electrically connected with the stop unit 32 for actuating the same and the details in that relation will be described hereafter.

Reference is particularly made to Figures 2, 4, 8, 9, and 10 in connection with stop unit 32. The guide bar 35 on table 31, as already mentioned, is similar in form to guide bar 28 on table 25 and is disposed just above the diagonal rollers 59 of the second sheet carrying table 31. The stop unit 32 is mounted on guide bar 35 and is shown as made up of a support arm 60 formed at one end with an extension 61 (Fig. 10) slotted as at 62 for slidably engaging vertical flange 37 of said guide bar. A set screw 63 in extension 61 is adapted to be tightened against flange 37 of guide bar 35 for maintaining arm 60 in longitudinally-adjustable positions relative to the guide bar. Arm 60 is formed with a longitudinally-extending slot 64 (Fig. 8) for receiving the threaded shanks 65 and 66 of a pair of lugs, 67 and 68, respectively. Said threaded shanks pass upwardly through a pair of lateral brackets 69 and 70, secured to opposite sides of a cylindrical solenoid unit 71 having a closed top 72. Nuts 77 and 78 engage the ends of threaded shanks 65 and 66 and bear against said brackets. The solenoid unit thus mounted on arm 60 is adjustable longitudinally thereof by means of the slot and lug connections described. A solenoid arm 73 is positioned for vertical reciprocation in its casing and comprises a threaded upper end projecting outwardly of casing top 72 and having thereon a pair of nuts 74 and 75 (Fig. 10) for adjustably limiting downward projection of the solenoid arm. The latter extends through slot 64 of supporting arm 60 and has secured to its lower end a stop member 76 which, when the solenoid arm moves downwardly, is projected into the space between two of the sheet-carrying rollers 59 for blocking advance of paper sheets, as will be further described.

As illustrated in Figures 1 and 2, a sheet of paper is held blocked by said stop until a subsequent sheet is positioned on the under sheet. The second sheet is initially deposited in partially overlying relation on the blocked sheet by means of a set of rotating discs or wheels 78 (Fig. 2) on table 25, but the further movement of the sheet into full overlying relation with the first sheet is not possible through the medium of the diagonal rollers 59 since the latter contact the top sheet to a limited extent only. Consequently, it is necessary to provide means for moving the top sheet into such position. For this purpose, the invention contemplates the use of rotor units 79 and 80. These units are identical, so that description of one will suffice for both. In this connection, reference will be made to Figures 8, 9, 12, 13, and 14. Each unit comprises a support block 81, slotted as at 82, for receiving the vertical flange 37 of guide bar 35. Set screws 83 hold the block removably in position on said flange. The block 81 is formed with an interior recess 84 opening at the bottom of the block and communicating with the top thereof through a restricted opening 85. A swivel member 86 is positioned in the recess 84 and comprises an extension 87 projecting through the opening 85. This extension has an annular groove 88 for slidably receiving an annular bead 89 formed on the inner surface of opening 85. The swivel member 86 is thus

positioned for rotational movement and precluded from vertical actuation in the support block 81. A set screw 103 projects through block 81 into contact with extension 87 of swivel member 86 for holding the latter in selected positions.

Swivel member 86 is recessed, as at 90, and through this recess there passes an elongated strip 91 having secured at its respective ends a depending journal block, 92 and 93, the former vertically slidable in recess 90. The blocks are provided with ball bearings 94 and 95, through which a shaft 96 extends, in parallel, spaced alignment with strip 91. One end of said shaft, as seen in Figures 8 and 9, extends on one side of flange 37 of guide bar 35 and has secured thereon a paper-sheet-contacting wheel 97 provided with a soft non-slip tire or rim 98. The other end of shaft 96 extends beyond the opposite side of flange 37 and has secured thereon a drive wheel 99 which contacts one of the rollers 59 and is rotated thereby for driving the shaft 96 and imparting rotation to the paper-contacting wheel 97. A spring strip 100 has one end secured as at 101 (Fig. 12) to the top of block 81, the other end 102 bearing resiliently against strip 91 for urging the adjacent end of shaft 96 downwardly whereby wheel 99 is maintained in good drive relation with one of the rollers 59.

For applying a selected degree of downward resilient pressure on wheel shaft 96, a threaded adjustment bolt 107 projects slidably through extension 85 into recess 90 (Figs. 13 and 14). Bolt 107 has a reduced inner end 104 extending through an opening 105 in strip 91 and impinging against shaft 96. A retaining pin 106 projects through said shaft end 104 beneath strip 91. An expansion spring 110 encircles bolt 103 within the recess 90, bearing against strip 91 and the top of said recess, respectively. The upper part of adjustment bolt 107 extends above block 81 and is there threadedly engaged by an adjusting nut 108 and a lock nut 109. Upward and downward movement of adjusting nut 108 respectively decreases and increases the resilient pressure of reduced shaft end 104 against shaft 96 resulting from the action of expansion spring 110.

It will be seen in Figures 8 and 9 that certain of the flanged openings 121 in guide bar 35 are connected in pairs by diagonally-extending slots 111 and through these slots the lower portions of sheet-contacting wheels 97 are adapted to project for bearing against a paper sheet 112 to be moved forward into contact against the stop member 76.

In Figures 5 and 7 means are disclosed for precluding pressing of the sheets downwardly between rollers 59 as a result of the pressure of the sheet-contacting wheels 97. These means comprise brackets 50 secured at intervals, as at 51, to the vertical flange 37 of guide bar 35 and each projecting beneath the latter, as at 52, and having secured thereto, as at 53, a mounting clip 54 whereon a small roller 55 is mounted as at 56. Each of these small rollers is positioned between two of the large rollers 59 in the same level as the upper surface line of the latter. The sheets, therefore, as their lateral edge portions pass along beneath the horizontal flange 38 of guide bar 35, contact these small rollers 55 and are thereby prevented from being pressed downwardly between the large rollers 59, and possibly displaced, torn or distorted.

Solenoid unit 71, as already mentioned, is electrically connected by suitable wiring with switch unit 47 (Fig. 2) and solenoid arm 73 is actuated upwardly upon contact of switch lever 30 with paper sheets passing therebeneath. For lower-

ing the solenoid arm, a contraction spring 122 is provided, having one end secured to a projecting strip 123 (Figs. 8 and 9) attached to the top 72 of solenoid 71, and its other end connected to the transverse section 117 of a bracket 116. The latter also comprises a lateral section 118 pivotally connected intermediate its length, as at 119, to lug 68 (Fig. 10). An angle bracket 126 is connected, as by a nut 127, to the upper end of solenoid arm 73, and comprises a foot 125 through which a vertical rod 124 passes slidably. The lower end of this rod is offset as at 131 and projects through an aperture in the outer end of said lateral bracket section 118, being secured thereto as by a cotter pin 132. An expansion spring 130 on rod 124 is confined between said foot 125 and a pair of nuts 128 at the top of the rod. Tension of said spring may be modified by means of collar 129 on rod 124 beneath foot 125. It will now be seen that upward actuation of section 117 of the pivoted bracket 116, under the influence of contraction spring 122, results in downward movement of solenoid arm 73, by virtue of the several cooperating elements just described.

As an aid to smooth forward movement of sheets beneath and past stop member 76 an idling wheel 113 (Figs. 8 and 9) is mounted, as at 114, on an outward projection 115 of the bracket 116. Raising of the stop member results in lowering of wheel 113 against the top surface of the signature or sheets being carried by rollers 59 and wheels 97, for stabilizing and assuring uninterrupted movement of the sheets in proper stacked order. The contact of wheel 113 against the sheets is of course sufficiently light to avoid impeding their movement, and the pressure of such contact may be modified by adjustment of nuts 128 on rod 124 to vary the downward pressure of spring 130 on the adjacent end of bracket-section 118.

The stacking of unlike sheets or signatures requires that two parallel lines of sheets be carried on table 25 for deposit on table 31 where they are stacked by stop member 76. For this purpose, as indicated in Figures 3, 4, and 22, an initially large paper sheet 141, as carried on table 1, is, after being folded at fold section A, divided in half sections 142 and 143 by a cutter wheel 144 fixed on the shaft 14. The half section 142 is deposited at once on rollers 29 of table 25, is moved into contact with a shortened form of guide bar 145 and is carried toward table 31 by the rollers 29. The other half section 143 of the sheet, as it is divided off by the cutter 144, instead of being depositied at once on rollers 29, is taken on by a pair of belts 146 which pass around and are moved by shaft 14 and extend at a diagonal (see Fig. 22) across the table 25 and around a pair of idling rollers 147 positioned for this purpose on table 25. Adjacent this side of the latter, a longer guide bar 148 is placed above rollers 29. The belts 146 pass beneath this bar which stops further transverse movement of sheet section 143, whereupon rollers 29 assume control of said sheet section and carry it toward table 31. Thus two separate parallel lines of sheets or signatures are advanced to the table 31.

The switch unit 47, in this operation, is associated with table 31, adjacent one end of the guide bar 35 in such position that each sheet section 142 passes beneath the trip lever 30, as will be seen in Figure 4. The initial sheet section 142 is advanced at once to and held by the solenoid stop unit 32, reaching it before the other sheet section 143, so that the latter is deposited on and then moved into registration with the sheet section 142. The stop member 76 remains closed until the next sheet section 142 enters beneath the switch lever 30 whereupon solenoid stop unit 32 is energized and stop member 76 raised for releasing the stacked signatures. The succeeding sheet section 142 then passes under switch 30 causing the stop unit to return to blocking position. This sequence of operation, once established, continues during the handling of unlike signatures.

As mentioned earlier, the operation of solenoid 32 and its plunger or arm, to which stop member 76 is attached, is controlled by the switch 47 as tripped by switch lever 30. The latter is, in turn, actuated by paper sheets passing therebeneath. When identical sheets or signatures are operated on, switch unit 47 is positioned on guide bars 28 on table 25, as shown in Figures 1 and 2. When unlike signatures are operated on—that is, signatures which must be stacked in alternating, as distinguished from successive order—the switch unit 47 is positioned on the guide bar 35 of table 31, as seen in Figures 3 and 4. In the case of like signatures, the stop member 76 is opened only by alternate sheets passing under switch lever 30, whereas, with unlike signatures, stop member 76 is opened every time a sheet passes under switch lever 30.

To facilitate positioning and conditioning of the related parts for the operations described, a selector switch unit 133 is utilized, placed conveniently at one end of table 31. This switch has suitable plug-in connections with the sheet-actuated switch unit 47 and with the stop unit 32. As indicated more particularly in Figures 15 and 21, the selector switch unit comprises a selector switch 134 connected as at 135 with the sheet-actuated switch unit 47. Selector switch 134 includes a pair of contacts 136 and 137. When unlike signatures are being folded and stacked, the contact 137 is closed manually. Thereafter, upon closing of switch 47 by a sheet, a relay 138, connected as at 139, with said contact 137, energizes the solenoid 71 and operates the associated stop member 76, through the electrical connection 140 between said relay and solenoid.

When like signatures are being folded, switch 134 is manually moved to contact 136 and when a sheet thereafter closes switch 47, current flows through line 149 to a selector switch solenoid 150 connected, by lines 151, 152, and 153, with solenoid unit 71 of which stop member 76 forms a part. Simultaneously, current flows from contact 136 through line 154 to a contactor arm 155 of a breaker unit 156 constituting an element of the selector switch unit 133. In this connection, reference is made to Figures 15 through 21. The breaker unit 156 and elements cooperating therewith are shown as mounted on a support plate 162 (Fig. 17). Said unit 156 comprises a second arm 157 in resilient contact, through breaker points 158, with arm 155. Current passes through these points, when the latter are closed, to a contactor 159 (Fig. 17) provided on a ratchet wheel 160 which is mounted on a stud shaft 161 fixed to a wall plate 162. The latter likewise has fixed thereon in quadrangular spaced relation (Figs. 17, 18, and 21) a set of four selector switch contactors 163, adapted to be contacted successively by contactor 159 of the ratchet wheel 160, as the latter is rotated. Current therefore passes from contactor 159 into the adjacently-disposed one of the selector switch

contactors 163. The latter are electrically interconnected, as indicated in Figure 21 at 164, 165, 166, and 167, with line 139 which proceeds to relay 138 associated, as already described, with the solenoid 71.

The function of the ratchet unit pertains to the handling of like signatures. By its action the stop member 76 is operated at alternating rather than at successive intervals. Said action is effected by the selector switch solenoid 150 (Figs. 15 and 16) which comprises an arm 168 and link 169 normally urged in one direction (to the right as seen in Fig. 15) by a spring 170 positioned as at 171 in switch unit 133. A segment member 172 is pivotally mounted as at 173 on ratchet shaft 161 and is pivotally connected at an upper corner extremity, as at 174, with the outer end of link 169. The segment member carries a pawl 175 adapted to engage the ratchet wheel teeth for rotating the wheel, in a step by step manner, to the left (see Fig. 16) when solenoid arm 168 is actuated in that direction. For further controlling such actuation of the ratchet wheel, the latter may be provided on its face with spaced sockets 177 (Figs. 17 and 18) into which, in succession, a pin 178 enters, said pin projecting rearwardly from the top part of resilient arm 157. The segment member 172 has projecting from its hub portion a separator element 176 which, when segment member 172 is returned to the right by the action of spring 170, as in Figures 15 and 20, enters between the upper ends of resilient contactor arms 155 and 157 and separates the breaker points 158. Upon energizing of solenoid 150, the solenoid arm 168 and segment member 172 are moved to the left (Figs. 16 and 19) and the separator element 176 moves upwardly to permit contact of breaker points 158.

The solenoid arm 168 has a length of stroke equal to one-eighth of a revolution of ratchet wheel 160. The four selector switch contactors 163 are so located that at alternate strokes of solenoid arm 168 a circuit is completed through ratchet wheel contactor 159, as already described. While the ratchet wheel is moved with each stroke of arm 169, the circuit for opening stop member 76 is not closed until contact is made between ratchet wheel contactor 159 and one of the spaced selector switch contactors 163. Thus, in the stacking of like sheets or signatures, two of the latter are conveyed to the lowered stop member 76 before it is opened to release position.

Modifications, such as for the purpose of "stacking" a greater number of signatures before release by stop member 76, and other modifications of structure and operation, will be readily apparent to those acquainted with the field. Such changes are considered to be comprised within the spirit and scope of the invention.

What is claimed is:

1. The combination with a paper sheet carrier and means for the movement thereon of sheets in spaced linear succession, of a stop adjacent the carrier and movable into and out of the path of the sheets for blocking advance of sheets prior to discharge thereof from the carrier; and an actuator for said stop and comprising an arm projecting into the path of the sheets in advance of the stop and adapted to be contacted by the sheets for actuating the stop into positions for alternately blocking and releasing sheets carried by the carrier.

2. The combination with a paper sheet carrier and means for the movement thereon of sheets in spaced linear succession, of an electrically-actuated stop adjacent the carrier and movable into and out of the path of the sheets for blocking advance of sheets prior to discharge thereof from the carrier; and an electric switch for controlling the stop and comprising an arm projecting into the path of the sheets in advance of the stop and adapted to be contacted by the sheets for actuating the stop into positions for alternately blocking and releasing sheets carried by the carrier.

3. The combination with a paper sheet carrier and means for the movement thereon of sheets in spaced linear succession, of an electrically actuated stop adjacent the carrier and movable into and out of the path of the sheets for blocking advance of sheets prior to discharge thereof from the carrier; an electric switch for controlling the stop and comprising an arm projecting into the path of the sheets in advance of the stop and adapted to be contacted by the sheets for actuating the stop, and means for retaining the stop in position to block advance of one sheet until the following sheet has been advanced to the stop.

4. The combination with a paper sheet carrier and means for the movement thereon of sheets in spaced linear succession, of an electrically actuated stop adjacent the carrier and movable into and out of the path of the sheets for blocking advance of sheets prior to discharge thereof from the carrier; an electric switch for controlling the stop and comprising an arm projecting into the path of the sheets in advance of the stop and adapted to be contacted by the sheets for actuating the stop, means for disposing the stop in position to block advance of the sheets, means for advancing the sheet following a blocked sheet into overlying position on the blocked sheet, and means for raising the stop to release the stacked sheets to the action of the carrier.

5. The combination with means for performing a series of operations on paper sheets and intervening carriers for moving the sheets in succession from one operation to the next, of an electrically-operated stop adjacent one of the carriers and movable into and out of the path of the sheets for blocking advance of sheets prior to discharge thereof from the carrier; and an electric switch positioned adjacent the preceding carrier and comprising an arm projecting into the path of the sheets and adapted to be contacted thereby for alternately actuating the stop to open and closed positions for respectively releasing and blocking sheets advanced thereto by the associated carrier.

6. The combination with a paper sheet carrier, a cross carrier associated therewith, means for delivering sheets from the first carrier to the cross carrier, and means for holding to a fixed line the sheets delivered to the cross carrier, of means associated with the first carrier to dispose sheets thereon for movement along two parallel lines and in spaced staggered relation, the sheets of one line being presented for delivery to the cross carrier at a point relatively remote from the discharge end thereof and the sheets of the second line at a point relatively adjacent said end, an electrically-actuated stop on the cross carrier located beyond the point of delivery thereto of the sheets of said second line, the stop being adapted to be moved into and out of the path of the sheets, and an electric switch for controlling the stop and comprising an arm projecting into the path of said remotely-delivered sheets and contacted in succession thereby for actuating the stop, release of the arm from each contact effect-

ing actuation of the stop to position for blocking advance of the actuating sheet and such actuation coinciding with delivery of a sheet from said second line onto the blocked sheet, and means for moving the overlying sheet into contact with the stop and registry with the under sheet, said stop being actuated for release of the stacked sheets by initial contact with said arm of the next-in-order of said remotely-delivered sheets.

7. A machine for insert-folding of paper sheets and comprising a sheet carrier, a cross carrier associated therewith, means for delivering sheets from the first carrier to the cross carrier, means for holding to a fixed line the sheets delivered to the cross carrier, means associated with the first carrier to dispose sheets thereon for movement along two parallel lines and in staggered relation, the sheets of one line being presented for delivery to the cross carrier at a point relatively remote from the discharge end thereof and the sheets of the second line, at a point relatively adjacent said end, an electrically-actuated stop on the cross carrier located beyond the point of delivery of the sheets of said second line, said stop being adapted to be moved into and out of the path of the sheets, an electric switch for controlling the stop and comprising an arm projecting into the path of said remotely-delivered sheets and contacted in turn by each of said sheets for actuating the stop, release of the arm from such contact serving to actuate the stop into position for blocking advance of the sheet and such actuation coinciding with delivery of a sheet from said second line onto the blocked sheet, means for moving the overlying sheet into complete register with the under sheet, said stop being raised for release of the stacked sheets by initial contact with said arm of the next-in-order of said remotely-delivered sheets, and means for folding the release stacked sheets into inserted relation one to the other.

8. The combination with a paper sheet carrier, means for delivering sheets thereto in spaced succession, a cross carrier associated with the first carrier, means for delivering sheets in spaced succession from the first carrier to the cross carrier, and means for holding to a fixed line the sheets carried on the respective carriers, of an electrically-actuated stop on the cross carrier and movable into and out of the path of the sheets, and an electric control switch positioned on the first carrier and comprising an arm projecting into the path of the sheets and contacted thereby for actuating the stop, release of the arm from contact by a sheet serving to actuate the stop for blocking advance of the sheet last-delivered to the cross carrier, said stop being positioned for blocking said sheet at a location to effect deposition thereon of the next-delivered sheet, and means for moving the overlying sheet into register with the under sheet, the stop being raised for release of the stacked sheets by initial contact of a sheet on the first carrier with said arm.

9. The combination with a paper sheet carrier, means for delivering sheets thereto in spaced succession, a cross carrier associated with the first carrier, means for delivering sheets in spaced succession from the first carrier to the cross carrier, and means for holding to a fixed line the sheets carried on the respective carriers, of an electrically-actuated stop on the cross carrier and movable into and out of the path of the sheets, and an electric control switch positioned on the first carrier and comprising an arm projecting into the path of the sheets and contacted thereby for actuating the stop, release of the arm from contact by a sheet serving to actuate the stop for blocking advance of the sheet last-delivered to the cross carrier, said stop being positioned for blocking said sheet at a location to effect deposition thereon of the next-delivered sheet, means for moving the overlying sheet into register with the under sheet, the stop being raised for release of the stacked sheets by initial contact of a sheet on the first carrier with said arm, and means associated with the stop and the switch to provide for release-actuation of the stop by intermittent sheets only of the sheets on the first carrier to provide a time interval for said registering of sheets on the cross carrier.

10. The combination with a paper sheet carrier, means for delivering sheets thereto in spaced succession, a cross carrier associated with the first carrier, means for delivering sheets in spaced succession from the first carrier to the cross carrier, and means for holding to a fixed line the sheets carried on the respective carriers, of an electrically-actuated stop on the cross carrier and movable into and out of the path of the sheets, and an electric control switch positioned on the first carrier and comprising an arm projecting into the path of the sheets and contacted thereby for actuating the stop, release of the arm from contact by a sheet serving to actuate the stop for blocking advance of the sheet last-delivered to the cross carrier, said stop being positioned for blocking said sheet at a location to effect deposition thereon of the next-delivered sheet, means for moving the overlying sheet into register with the under sheet, the stop being raised for release of the stacked sheets by initial contact of a sheet on the first carrier with said arm, and a selector switch interposed between the stop and the switch to provide for release-actuation of the stop by intermittent sheets only of the sheets on the first carrier to provide a time interval for said registering of sheets on the cross carrier.

11. The combination with a paper-sheet carrier table, of an electrically-actuated stop movable into and out of the path of sheets carried on the table for respectively blocking and releasing the sheets, a switch controlling said stop and positioned on the table in advance of the stop, said switch being adapted to be actuated by the moving sheets for operating the stop, and a selector switch unit associated with said stop-controlling switch and comprising manually-set means operative on said stop and adapted in one position to effect actuation of the switch by successive sheets and in another position by alternate sheets contacting said switch.

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