April 27, 1948. A. E. LITTLE ET AL 2,440,635

FEED TRAY FOR DUPLICATING APPARATUS

Filed Feb. 24, 1944 4 Sheets-Sheet 1

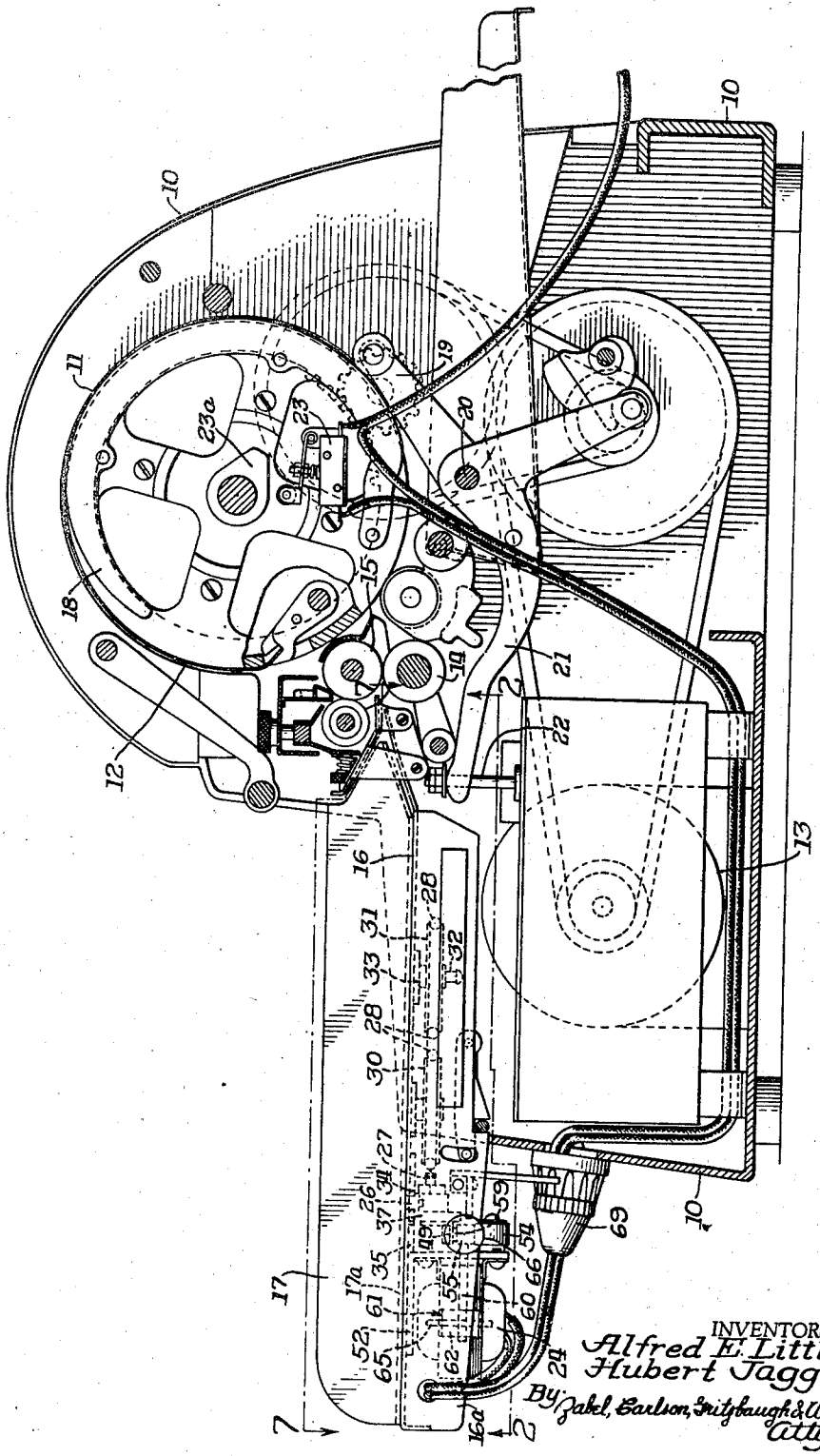



Fig. 1.

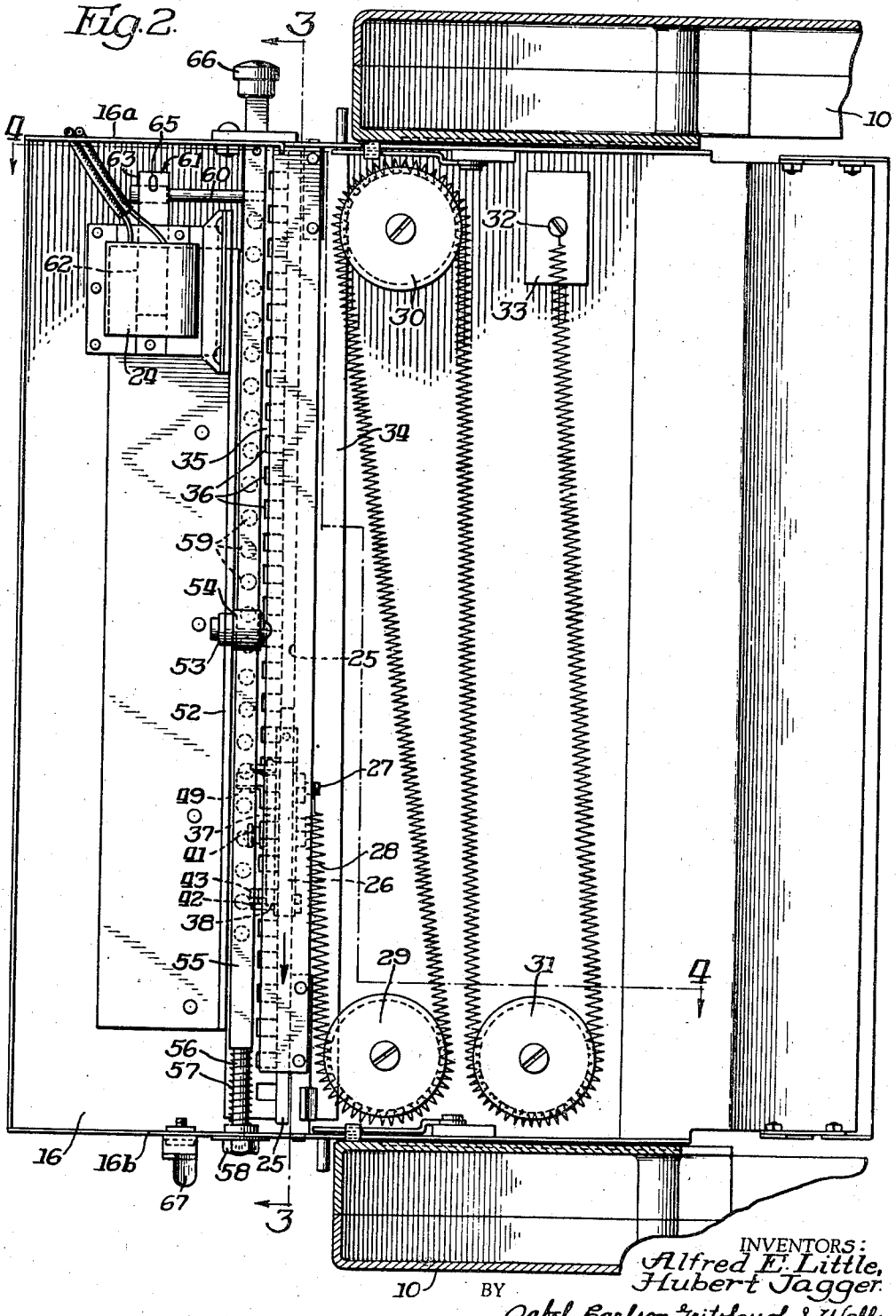
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FEED TRAY FOR DUPLICATING APPARATUS

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Fig. 2.




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FEED TRAY FOR DUPLICATING APPARATUS

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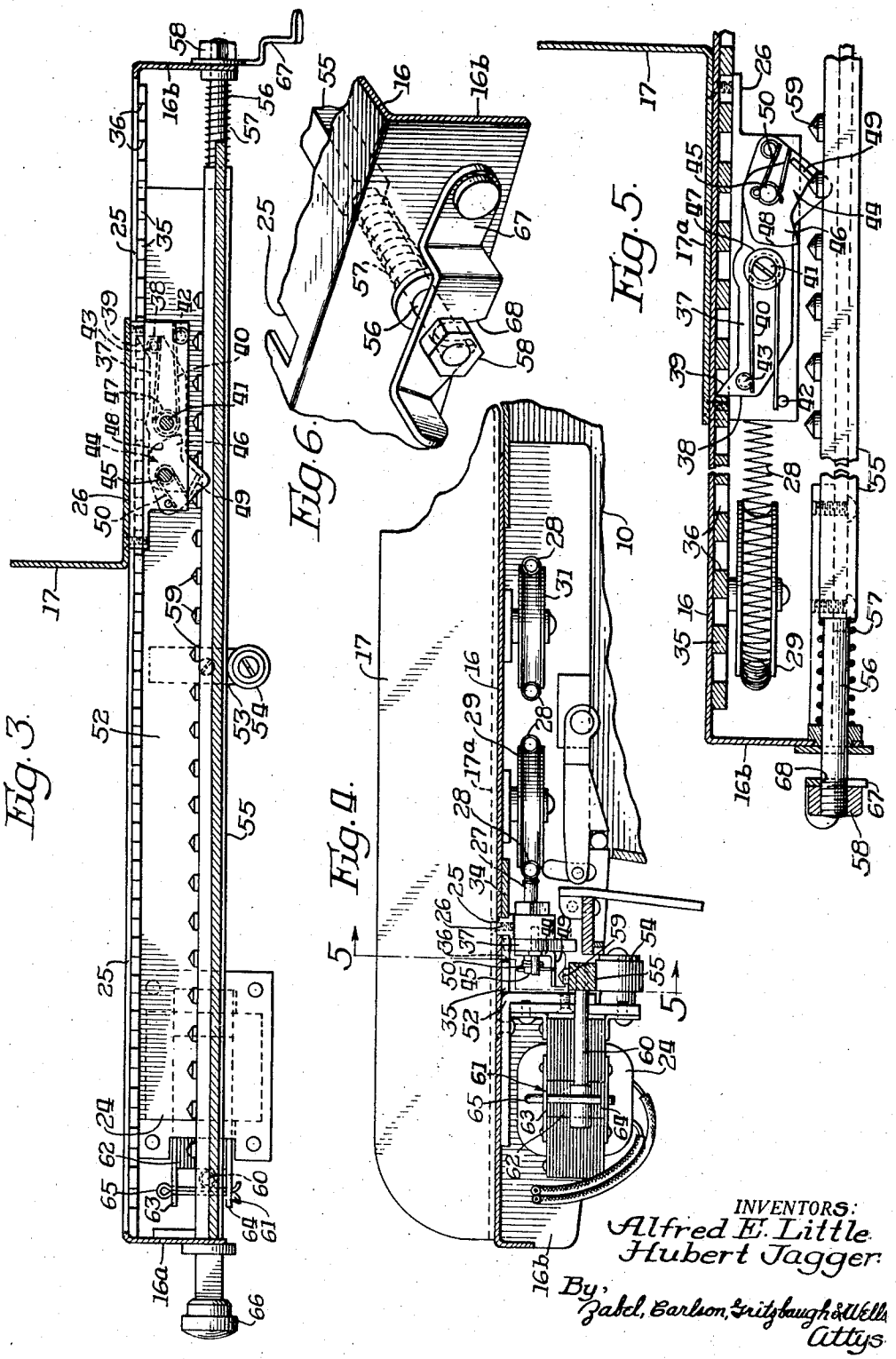


Fig. 3.

Fig. 6.

Fig. 4.

Fig. 5.

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Fig. 7.

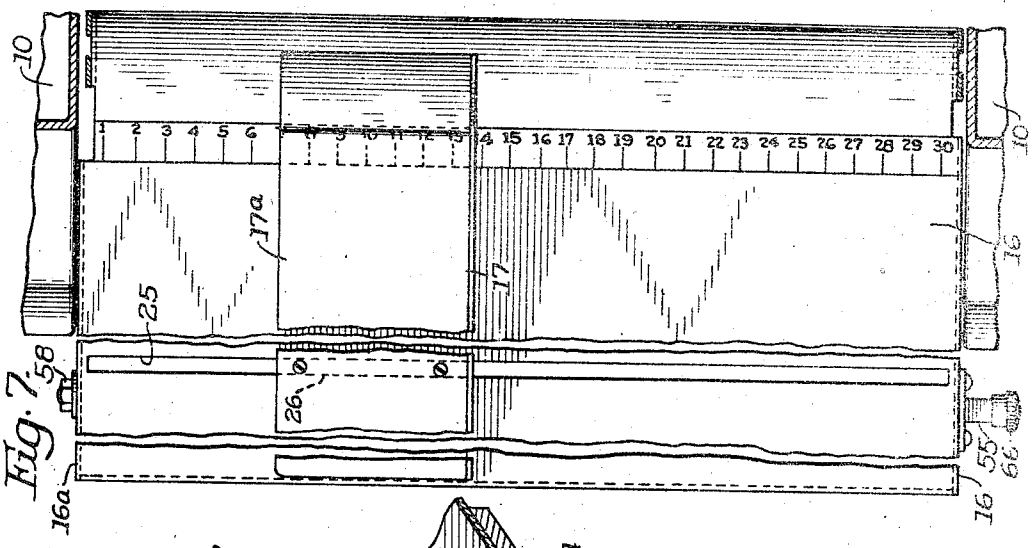
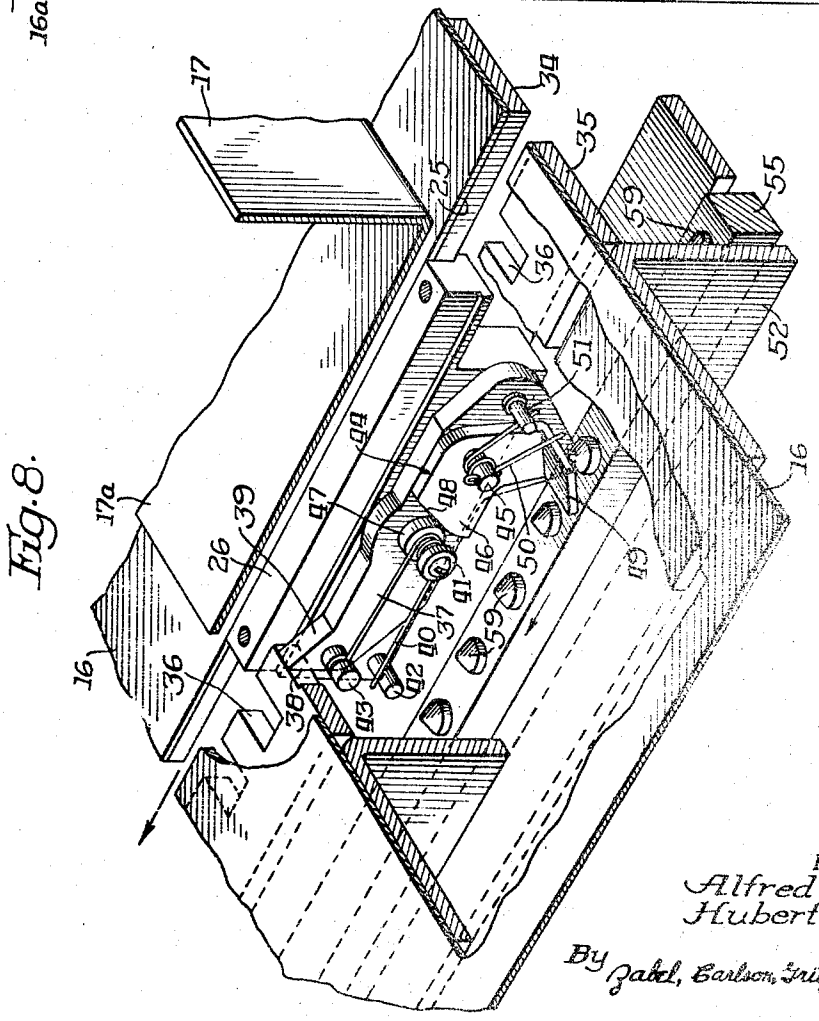



Fig. 8.




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# UNITED STATES PATENT OFFICE

2,440,635

## FEED TRAY FOR DUPLICATING APPARATUS

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Application February 24, 1944, Serial No. 523,632

9 Claims. (Cl. 185—38)

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The present invention relates to duplicating apparatus and more particularly to sheet feeding means whereby sheets are guided to the duplicating drum of the apparatus. In devices of this character the duplicating apparatus is commonly provided with a feed tray upon which the copy sheets are placed before they are advanced to the duplicating drum. A side guide is provided on the tray for aligning sheets with that portion of the drum to which the sheet is to be applied. For many of the duplicating operations it is desirable to have successive narrow sheets fed to the drum at different longitudinal positions with respect to the drum, the duplicating apparatus itself having means whereby different portions of a master sheet on the drum will be exposed to the successive copy sheets. As an example of an apparatus wherein this type of operation takes place see the application of John R. Roberts, Serial No. 455,573, filed October 21, 1942, for "Duplicating machine," now Patent No. 2,365,414.

It is the principal purpose of this invention to provide a novel mechanism whereby the side guide of the feed tray may be moved step by step across the feed tray from one side to the other thereof at the will of the operator.

The invention contemplates also a novel mechanism whereby the step by step movement of the side guide is accomplished in unison with the operation of the duplicating mechanism but under the control of the operator so that the side guide may be moved independently of the drum or held against movement by a simple mechanism convenient to the operator.

The features and advantages of the present invention will appear more fully as the description proceeds, reference being had to the accompanying drawings wherein a preferred form of the invention is shown. It is to be understood however, that the drawings and description are illustrative only and are not to be taken as limiting the invention except insofar as it is limited by the claims.

In the drawings:

Fig. 1 is a view in side elevation of a duplicating apparatus embodying my invention;

Fig. 2 is a bottom plan view of the feed tray of the duplicating apparatus, showing our improved side guide operating means thereon;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4;

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Fig. 6 is a fragmentary perspective view illustrating a lock-out device by which the side guide moving means is made inoperative;

Fig. 7 is a fragmentary plan view of the feed tray as viewed from the top; and

Fig. 8 is a fragmentary perspective view partly in section and with parts broken away to illustrate the details of the mechanism whereby the side guide is actuated.

Referring now in detail to the drawings, in Fig. 1 there is illustrated a duplicating apparatus wherein the numeral 10 indicates generally the framework of the apparatus. The apparatus comprises a drum 11 rotatably mounted in the framework 10 and adapted to have a master sheet 12 clamped thereto. This drum is driven through suitable mechanism from a motor 13 carried in the framework 10. The duplicating apparatus includes cooperating feeding and moistening rollers 14 and 15 which receive copy sheets from a feed tray 16 on which a side guide 17 is mounted. The drum 11 has a cam 18 thereon which operates an arm 19 fixed to a shaft 20 that in turn carries a bell crank 21 that is adapted to operate a pump plunger 22 and a second cam 25a on the drum operates a switch 23. The switch 23 controls the energization of an electromagnet 24 which is utilized to provide power operation of the side guide 17 as will be explained more fully hereinafter. It is believed that the general description above will be sufficient to provide the environment for the present invention which is directed to means for operating the side guide 17 to cause it to move step by step across the feed tray 16.

Referring now to Figs. 2, 3 and 7, the feed tray 16 is shown as provided with a transverse slot 25 extending from side to side thereof. The side guide 17 has a horizontal portion 17a which rests on the feed tray and this horizontal portion is fixed to a guide block 26 by screws or other suitable fastening means. The block 26 is shaped to fit the slot 25 as shown best by Fig. 8 of the drawings. The block 26 has a pin 27 projecting therefrom and this pin serves as an anchor for one end of a spring 28 which is under tension and which serves to urge the block in the direction of the arrow shown in Fig. 2. The spring 28 is is an elongated coil spring which is trained about a series of idler pulleys 29, 30 and 31 mounted on the lower surface of the tray 16, the fixed end of the spring 28 being connected to a screw 32 that is threaded into a plate 33 welded to the under surface of the tray 16.

The tray is provided on its under surface with

two bars 34 and 35 (Fig. 8) which serve to stiffen the tray along the slot 25. The bar 35 in addition is provided with a series of rectangular notches 36 so as to provide uniformly spaced stops which may be engaged by a pawl 37 that is pivoted on the block 26. The pawl, it will be noted, is provided with a steep face 38 adapted to engage the stop provided by the notches 36 and thus prevent movement of the block 26 in the direction of the arrows indicated in Figs. 2 and 8. The pawl also has a sloping face 39 which is adapted to ride over the notches 36 when the block 26 is being moved in the opposite direction to that indicated by the aforementioned arrows.

Means are provided whereby the pawl 37 may be released from one of the stops provided by the notches 35 so that the spring 28 can advance the block 26 and the side guide 17. It will be noted that the pawl itself is spring pressed upwardly by a spring 40 that is coiled about a post 41 fastened on the axis of the pawl. One end of the spring 40 engages a stop pin 42 on the block 26 while the other end engages a pin 43 at the stop engaging end of the pawl. The pawl at its other end carries a cam lever 44, the cam lever being pivoted on a pin 45 which is fixed to the pawl. The cam lever 44 has one end portion 46 that is adapted to engage a boss 47 formed on the pawl around the pivot post 41 which serves to mount the pawl on the block 26. As illustrated in Fig. 8, the tapered edge 48 of the end portion 46 of the cam lever is in engagement with the boss 47. In Fig. 5 however the cam lever 44 has been moved to separate the edge 48 from the boss 47. The cam lever 44 has a cam engaging extension 49 turned out at right angles to the main portion of the cam lever at the end thereof opposite the edge 48. This cam engaging portion 49, as shown, is diagonally arranged with respect to the plane of the tray 16. A spring 50 is coiled about the pin 45 so that one end thereof presses against the cam engaging extension 49 while the other end engages a pin 51 on the pawl. The function of the spring 50 is to urge the cam lever 44 into the position shown in Fig. 8.

Means for causing the pawl 37 to move out of engagement with one of the stops and into engagement with the next adjacent stop will now be described. The tray 16 is provided on its under surface with a bracket 52, one portion of which extends horizontally along the under surface of the tray and is fastened thereto, the other portion of which extends downwardly at right angles to the tray. This bracket carries a bar 53 about midway between its ends (see Figs. 2 and 3). This bar has a roller 54 mounted thereon. An operating bar 55 is mounted in the side flanges 16*a* and 16*b* of the tray and rides on the roller 54. This operating bar is generally rectangular in cross section but one end 56 thereof is reduced in cross section and rounded. On the rounded portion of the bar there is provided a coil spring 57 which is under compression between the squared portion of the bar and the bearing provided in the flange 16*b* of the tray. The rounded portion 56 of the bar extends through the tray flange 16*b* and has a nut 58 thereon. The bar 55 has on its top surface a multiplicity of cone-shaped cams 59, these cams being spaced the same distance apart as the notches 36 provided in the bar 35. The cam projections 59 are located in the path of the extension 49 on the cam lever 44 so that when the bar 55 is moved in either direction one of the cam projections will engage the extension 49.



The bar 55 has a pin 60 fastened thereto adjacent the flange 16*a* of the tray (see Figs. 3 and 4). The pin 60 extends through a yoke 61 which is provided on a solenoid bar 62 mounted in the electromagnet 24. The yoke 61 is comprised of two side bars 63 and 64 on the solenoid 62 and a cotter pin 65. The bar 55 also has a finger piece 66 thereon so that it can be manually pushed endwise against the force of the spring 57. The flange 16*b* of the tray carries a latch lever 67 which, as shown clearly in Figs. 3 and 6, is provided with a notch 68 adapted to engage over the portion 56 of the bar 55 when the bar is shoved to the right as illustrated in Fig. 3 so as to hold the bar in its position.

In normal use the side guide 17 may be actuated either manually by the bar 55 or from the drum of the machine which energizes the electromagnet 24 once for each revolution thereof. When the side guide is to be operated entirely manually the connections to the electromagnet from the switch 23 are broken by removing a plug 69 which is shown in Fig. 1 as connecting the leads from the electromagnet to the switch 23. When the bar 55 is actuated by the electromagnet or by the finger piece 66 its operation effects a step by step movement of the side guide in the following manner.

Referring now to Figs. 5 and 8, it will be observed that the pawl 37 is in its raised or stop position where the face 38 thereof is engaged with a stop face of one of the notches 36. Now if the finger piece 66 is pushed in, this will move the bar 55 in the direction of the arrow shown thereon in Fig. 8. This movement of the bar 55 causes the cam projection 59 to engage the extension 49 on the cam lever 44. However, the cam lever 44 cannot turn in a clockwise direction because it is already at the limit of its clockwise movement due to the spring 50 pressing on the extension 49. The cam projection 59 therefore raises the cam lever 44 and with it the associated end of the pawl 37 so as to move the face 38 of the pawl down out of engagement with the notch 36. As soon as the pawl disengages the notch 36 the force of the spring 28 will advance the pawl and with it the block 26 and the side guide 17. This movement of course moves the extension 49 away from the associated cam projection 59 which raised it.

As soon as the tip of the pawl reaches the next notch 36 it projects up into the notch and the face 38 thereof engages the corresponding stop face of the new notch 36 to stop the block 26 and the side guide 17 in the new position. The operator need not continue to hold the bar 55 but can let it return under the force of the spring 57. The return motion of the bar will not trip the pawl since the cam lever 44 is free to turn in a counterclockwise direction against the force of the spring 50 far enough to allow the extension 49 to ride over a cam projection 59. Thus repeated operation of the bar 55 will cause the side guide 17 to move step by step across the tray 16.

When it is desired to return the side guide to its original position it can be pushed back manually since the pawl 37 will not prevent this motion. The surface 39 of the pawl slopes sufficiently to force the pawl down, and this action of the pawl will cause the extension 49 to clear the cam projections 59.

If at any time it is desired to render the step by step mechanism inoperative this is accomplished by shoving the bar 55 to the right from the position shown in Fig. 3 far enough to enable

the lever 67 to be inserted behind the nut 58 on the reduced end of the bar 55. With the bar 55 latched in this position energization of the electromagnet 24 or pushing inward on the finger piece 66 will not release the pawl 37. This is because the cam projection 59 which would have to lift the pawl by engaging the extension 49 does not fully clear the extension 49 and permit it to drop down on the left-hand side of the projection, as shown in Fig. 5. It will be evident from an inspection of Fig. 5 that movement of the bar 55 to the left, as shown therein, cannot effect any shifting of the pawl 37.

From the foregoing description it is believed that the nature and advantages of the present invention will be readily apparent to those skilled in this art.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. Mechanism for causing step by step movement between two relatively movable elements which comprises, said elements, the first element having a transverse slot therein, means guided by said slot and affixed to the second element for adjusting said second element across said first element, and mechanism for operating said adjusting means, said mechanism comprising a plurality of spaced stops beneath the first element and fixed with respect thereto, a spring pressed pawl attached to said adjusting means having a latching face to engage the stops to prevent movement of said means in one direction along the slot and having a non-latching face to ride over the stops when said adjusting means is moved in the opposite direction along the slot, means urging said adjusting means in the first named direction, a trip member operable to release the pawl from one stop and allow said urging means to advance the adjusting means until the next stop engages the pawl, said trip member being inoperative in another position to disengage the pawl from a stop, and means to lock the trip member in inoperative position.

2. Mechanism for causing step by step movement between two relatively movable elements which comprises, said elements, the first element having a transverse slot therein, means guided by said slot and affixed to the second element for adjusting said second element across said first element, and mechanism for operating said adjusting means, said mechanism comprising a plurality of spaced stops beneath the first element and fixed with respect thereto, a spring pressed pawl attached to said adjusting means having a latching face to engage the stops to prevent movement of said means in one direction along the slot and having a non-latching face to ride over the stops when said adjusting means is moved in the opposite direction along the slot, means urging said adjusting means in the first named direction, an operating bar beneath the first element mounted to reciprocate endwise along said slot, cam projections on said bar spaced the same distance apart as said stops, a cam lever pivoted on said pawl for limited movement, said lever having a cam engaging part adapted to ride over a cam projection when the bar is moved in one direction without exceeding the limit of the angular motion of the cam lever on the pawl, the limit of movement of the cam lever when said part is engaged by a cam projection as the rod moves in the opposite direction being such that the pawl must be turned to release it from the associated stop.



3. Mechanism for causing step by step movement between two relatively slidable elements which comprises, said elements, the first element having the second element mounted to move across said first element, and means to move said second element step by step across said first element comprising means urging said second element toward one side of said first element, a row of stops affixed to the first element in spaced relation in the direction of movement of the second element, a pawl carried by the second element and normally in engagement with one of said stops to prevent movement of the second element, and means to release said pawl comprising a cam bar slidably mounted adjacent to and parallel with said row of stops, said bar having a series of cam surfaces thereon spaced to match the spacing of said stops, a cam lever on said pawl cooperating with said cam surfaces to shift the pawl when the bar is moved in one direction and cause the release of the pawl from a stop, means to return the pawl to normal position for engagement with the next stop, said cam lever being movable to pass over a cam surface when the bar is moved in the opposite direction.

4. Mechanism for causing step by step movement between two relatively slidable elements which comprises, said elements, the first element having the second element mounted to move across said first element, and means to move said second element step by step across said first element comprising means urging said second element toward one side of said first element, a row of stops affixed to the first element in spaced relation in the direction of movement of the second element, a pawl carried by the second element and normally in engagement with one of said stops to prevent movement of the second element, and means to release said pawl comprising a cam bar slidably mounted adjacent to and parallel with said row of stops, said bar having a series of cam surfaces thereon spaced to match the spacing of said stops, a cam lever pivoted on the pawl and having a cam part thereon in the path of said cam surfaces on the bar, cooperating means on the cam lever and pawl limiting the movement of the cam lever in one direction about its pivot whereby when a cam surface is engaged with said cam part by movement of the bar in one direction the pawl must turn on its pivot and disengage a stop in order to pass the cam part over the engaged cam surface, said cam lever being free to move in the other direction about its pivot when the cam part is engaged by a cam surface as a result of movement of the bar in the opposite direction.

5. Mechanism for causing step by step movement between two relatively movable elements which comprises, said elements, the first element having a transverse slot therein, means guided by said slot and affixed to the second element for adjusting said second element across said first element, and mechanism for operating said adjusting means, said mechanism comprising a plurality of spaced stops beneath the first element and fixed with respect thereto, a spring pressed pawl attached to said adjusting means having a latching face to engage the stops to prevent movement of said means in one direction along the slot and having a non-latching face to ride over the stops when said adjusting means is moved in the opposite direction along the slot, means urging said adjusting means in the first named direction, a trip member operable to release the pawl from one stop and allow said urg-

ing means to advance the adjusting means until the next stop engages the pawl, said trip means comprising a reciprocable bar, and power means for reciprocating said bar.

6. Mechanism for causing step by step movement between two relatively movable elements which comprises, said elements, the first element having a transverse slot therein, means guided by said slot and affixed to the second element for adjusting said second element across said first element, and mechanism for operating said adjusting means, said mechanism comprising a plurality of spaced stops beneath the first element and fixed with respect thereto, a spring pressed pawl attached to said adjusting means having a latching face to engage the stops to prevent movement of said means in one direction along the slot and having a non-latching face to ride over the stops when said adjusting means is moved in the opposite direction along the slot, means urging said adjusting means in the first named direction, a trip member operable to release the pawl from one stop and allow said urging means to advance the adjusting means until the next stop engages the pawl, said trip means comprising a bar having pawl tripping projections thereon at spaced points along its length whereby to engage the pawl at various positions of adjustment of the second element.

7. Mechanism for causing step by step movement between two relatively slidable elements which comprises, said elements, the first element having the second element mounted to move across said first element, and means to move said second element step by step across said first element, comprising means urging said second element toward one side of said first element, a row of stops affixed to the first element in spaced relation in the direction of movement of the second element, a pawl carried by the second element and normally in engagement with one of said stops to prevent movement of the second element, and means to release said pawl comprising a cam bar slidably mounted adjacent to and parallel with said row of stops, said bar having a series of cam surfaces thereon spaced to match the spacing of said stops.

8. Mechanism for causing step by step movement between two relatively slidable elements which comprises, said elements, the first element having the second element mounted to move across said first element, and means to move said second element step by step across said first element comprising means urging said second element toward one side of said first element, a row of stops affixed to the first element in spaced relation in the direction of movement of the second element, a pawl carried by the second element and normally in engagement with one of said stops to prevent movement of the second element, and means to release said pawl comprising a cam bar slidably mounted adjacent to and parallel with said row of stops, said bar having a series of cam surfaces thereon spaced to match the spacing of said stops, spring means urging said cam bar lengthwise in one direction, and a finger piece on said bar for moving it in the other direction.



9. Mechanism for causing step by step movement between two relatively slidable elements which comprises, said elements, the first element having the second element mounted to move across said first element, and means to move said second element step by step across said first element comprising means urging said second element toward one side of said first element, a row of stops affixed to the first element in spaced relation in the direction of movement of the second element, a pawl carried by the second element and normally in engagement with one of said stops to prevent movement of the second element, and means to release said pawl comprising a cam bar slidably mounted adjacent to and parallel with said row of stops, said bar having a series of cam surfaces thereon spaced to match the spacing of said stops, spring means urging said cam bar lengthwise in one direction, and a solenoid operatively connected with the bar to move it in the opposite direction.

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## Certificate of Correction

**Patent No. 2,440,635.** **April 27, 1948.**

ALFRED E. LITTLE ET AL.

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows: Column 1, line 20, filing date of application, for "October" read *August*; line 21, for the patent number "2,365,414" read *2,401,020*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of July, A. D. 1948.

[SEAL]

THOMAS F. MURPHY,
*Assistant Commissioner of Patents.*