

July 7, 1964

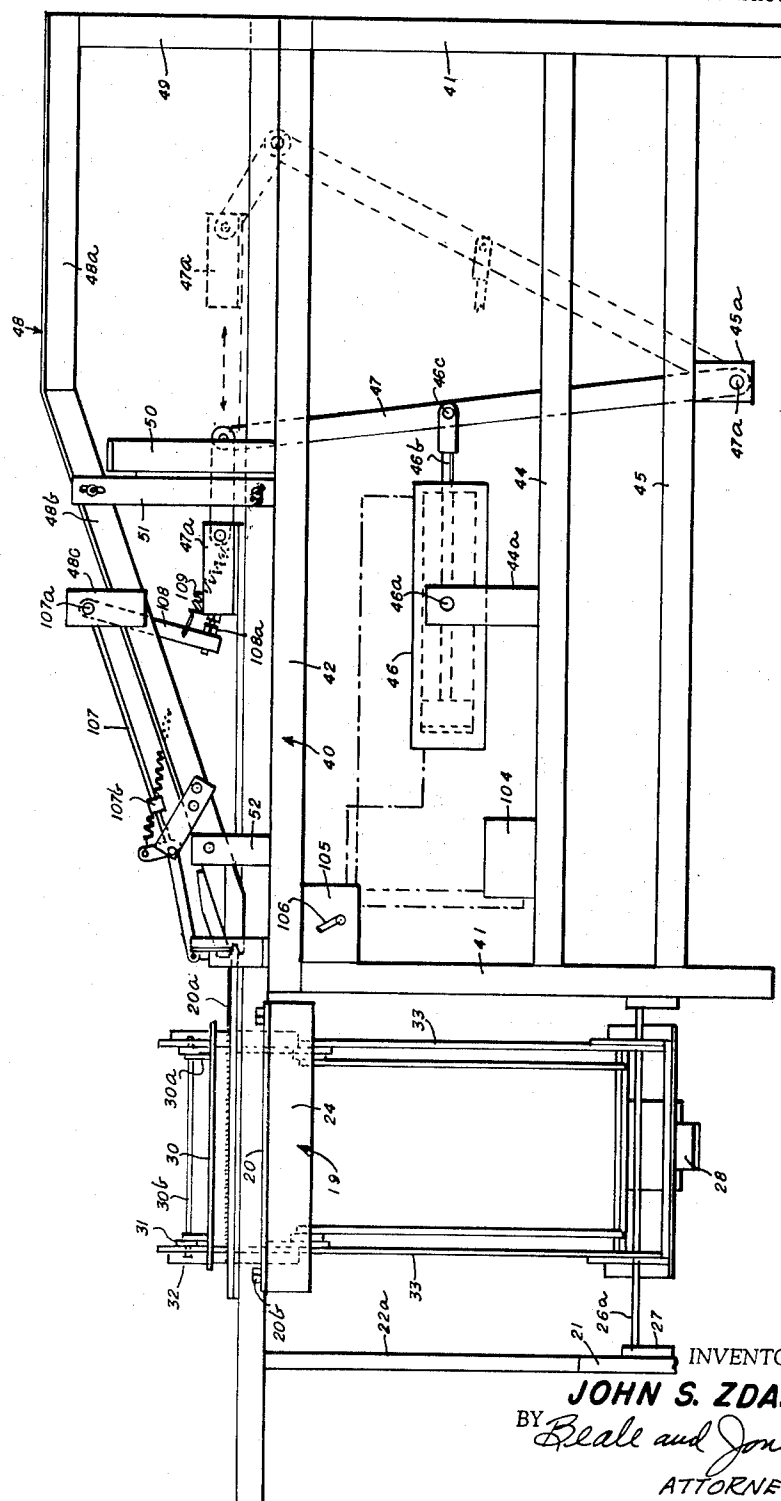
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3,139,673

MACHINE FOR ASSEMBLING CONNECTOR PLATES IN TERMINAL BLOCK

Filed Dec. 20, 1962

5 Sheets-Sheet 1



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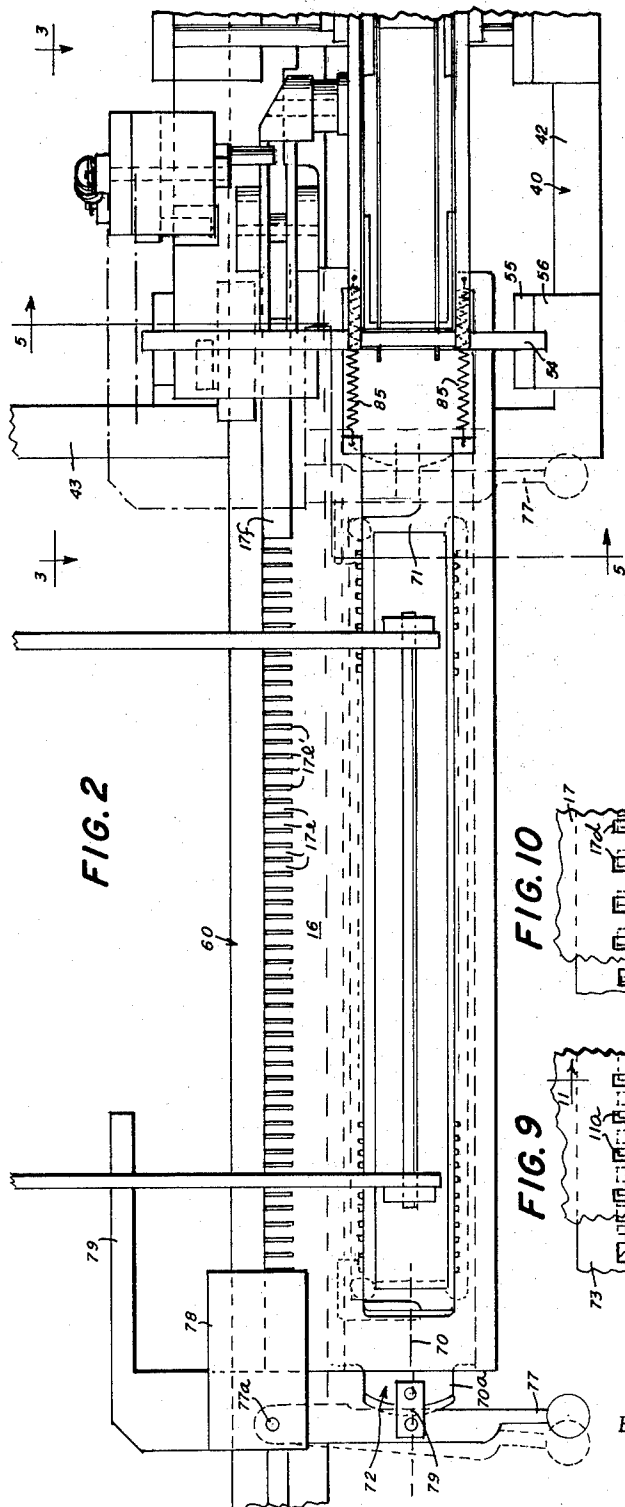


FIG. 11

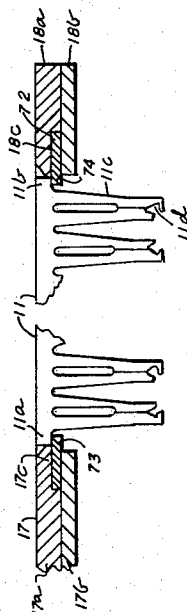


FIG. 10

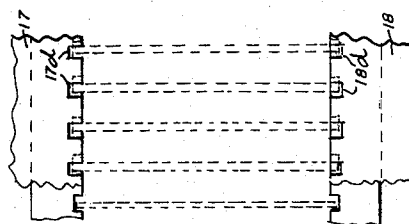
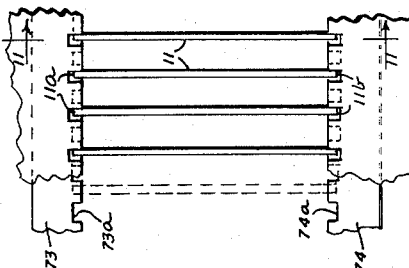


FIG. 9



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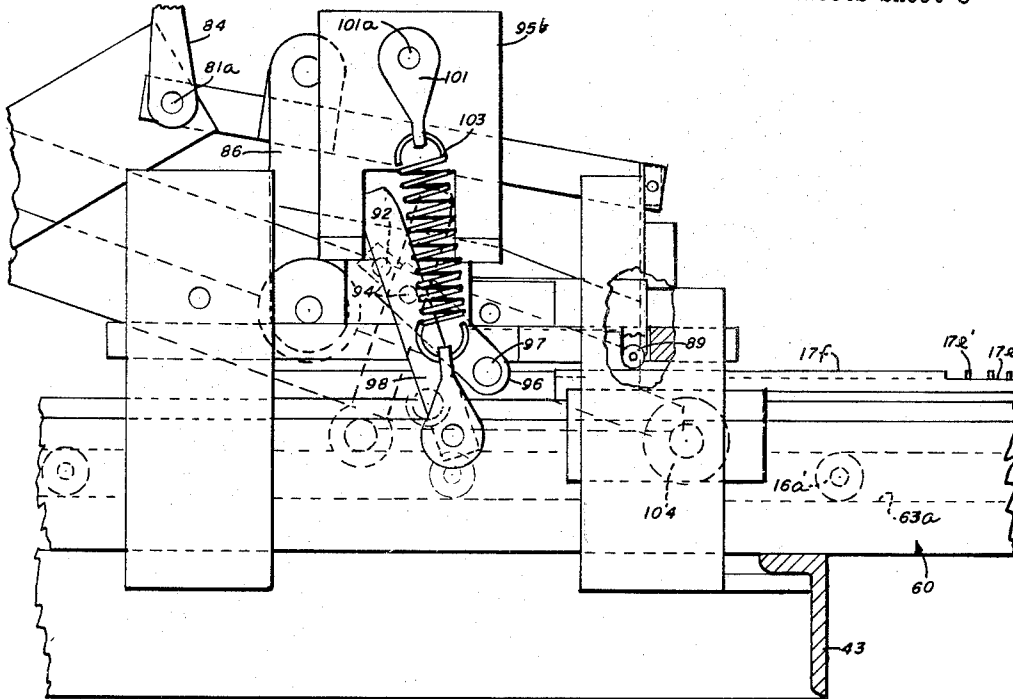


FIG. 3

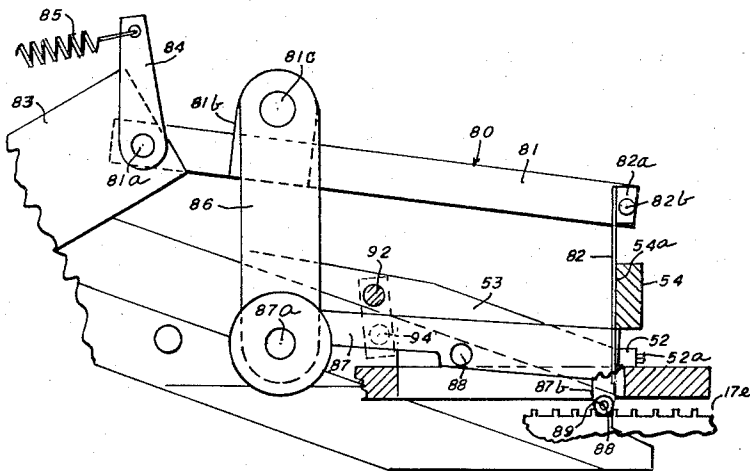


FIG. 4

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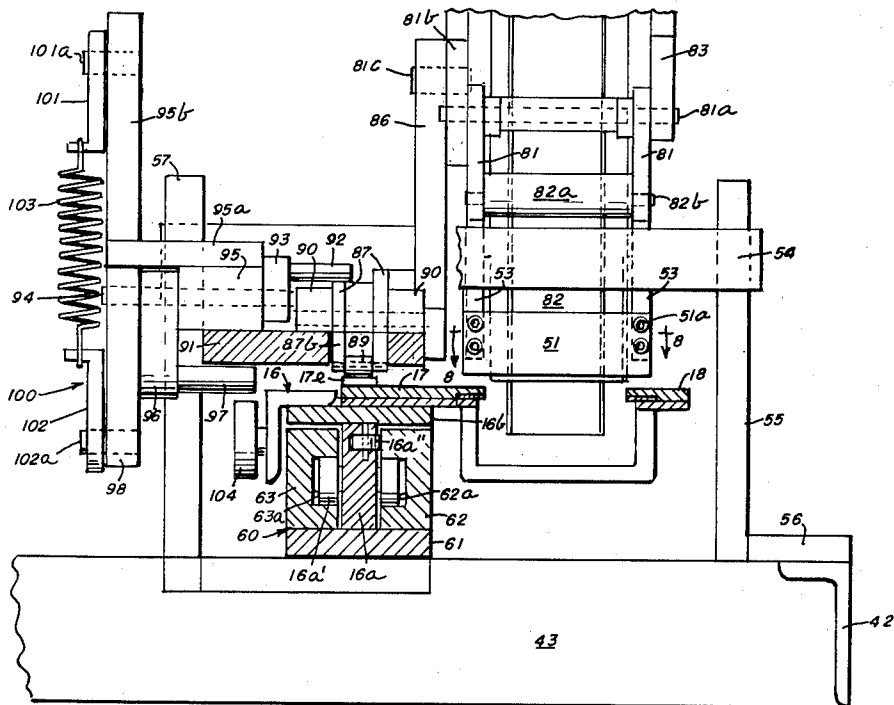


FIG. 5

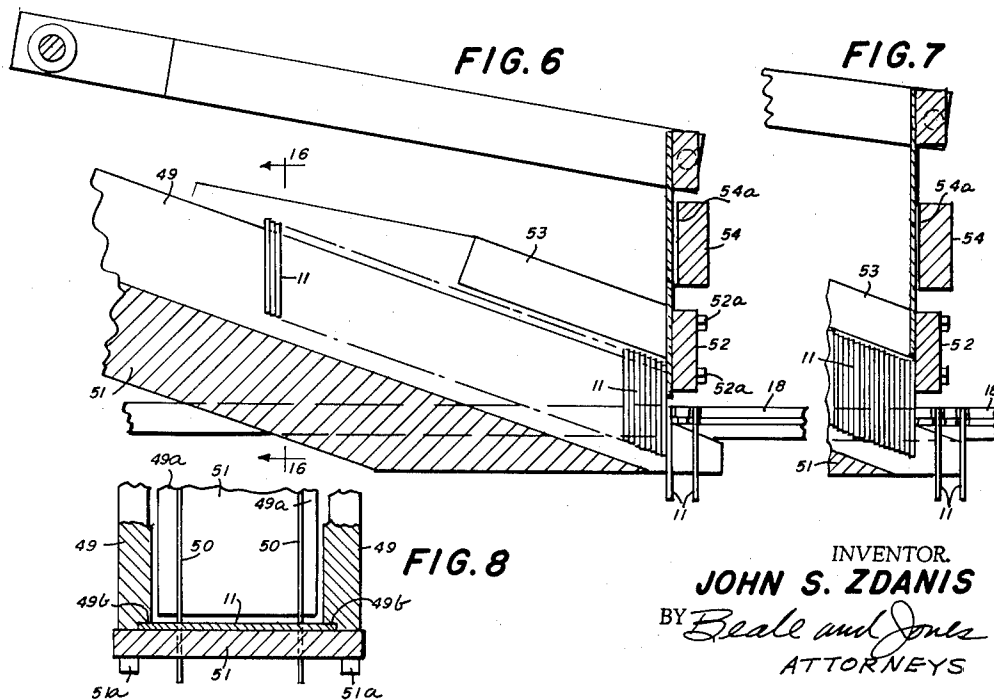


FIG. 6

FIG. 7

FIG. 8

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FIG. 12

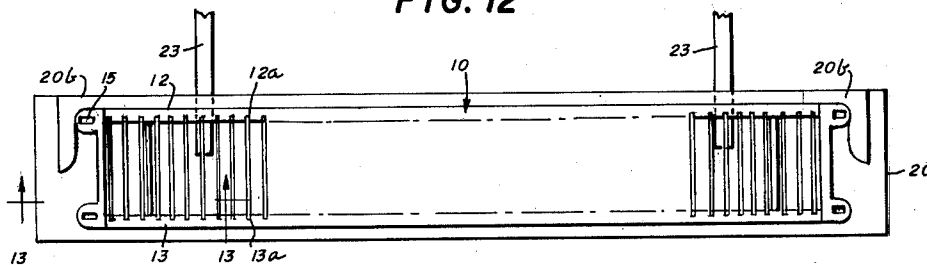


FIG. 13

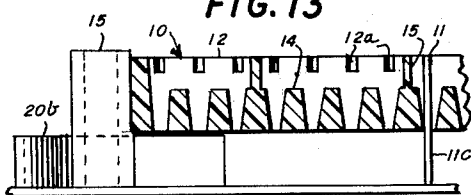


FIG. 15

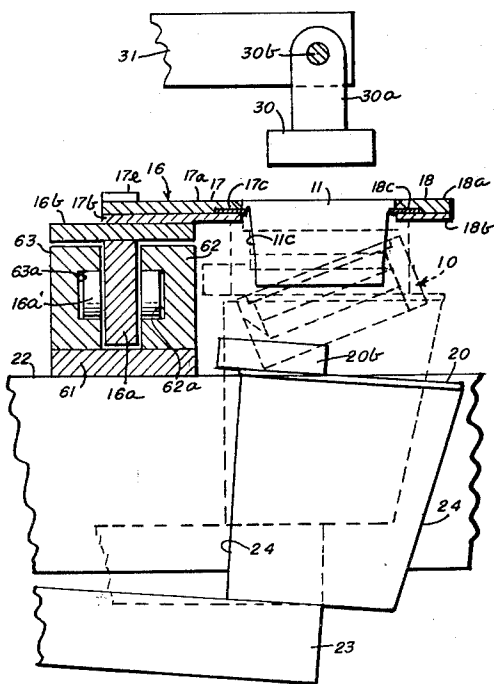


FIG. 14

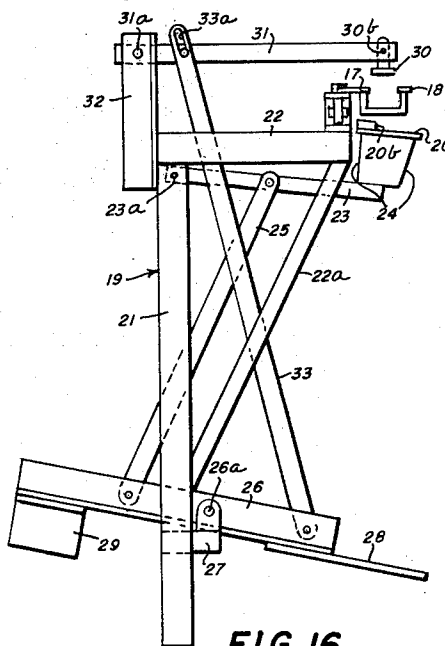
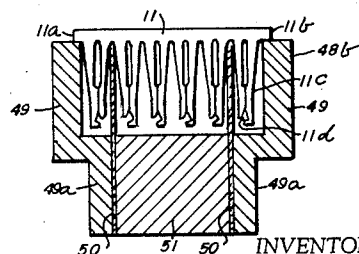


FIG. 16



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MACHINE FOR ASSEMBLING CONNECTOR PLATES IN TERMINAL BLOCK

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6 Claims. (Cl. 29—203)

This invention is directed to improvements in assembly machines and particularly in the feeding of connector plates into a loading position and transferring the plates from the loading position into terminal or carrying blocks.

An object of the invention is to provide mechanism for feeding relatively small elongated plates from an inclined trough into a horizontally movable support means.

Another object of the invention is to provide a co-operating block support means for moving the block into position to receive elongated plates moved into position thereabove.

A further object of the invention is to provide timer feeding means to move individual plates from an inclined trough down into a horizontally moving support means.

A still further object of the invention is to provide timer feeder means for plates that is under the control of horizontally movable support means so that the timer feeder means is deactivated when the support means has been fully loaded and reactivated when the support means is moved to a position to again receive a load of plates.

A further object of the invention is to provide a feeder and loading apparatus for feeding and loading connector plates into a terminal block in an expeditious and economical manner.

Still further objects and the entire scope of applicability of the present invention will become apparent from the detailed description given hereinafter. It should be understood, however, that the detailed description and specific example is given by way of illustration only and, while indicating a preferred embodiment of the invention, is not given by way of limitation, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

For a more complete understanding of the nature and scope of the invention reference is had to the drawings and following description in which:

FIG. 1 is side elevation of the assembly machine;

FIG. 2 is a top plan view of the machine on an enlarged side with a part of the right hand end of the frame broken away;

FIG. 3 is a section view on an enlarged scale on line 3—3 of FIG. 2 showing the connector plate carriage retracted and the connector plate feeder mechanism held in retracted position;

FIG. 4 is a side elevation view similar to FIG. 3 but on an enlarged scale showing the connector plate feeder mechanism and its actuation by outward movement of the connector plate carriage;

FIG. 5 is sectional view along line 5—5 of FIG. 2 on an enlarged scale;

FIG. 6 is a side elevational view similar to FIG. 4 but with some of the linkage removed and showing the inclined trough of connector plates with the ejection from the trough of the lowermost plate;

FIG. 7 is a view similar to FIG. 6 but showing only the right hand end with the connector feeder raised in position above the next to be fed connector plate;

FIG. 8 is a top plan view along line 8—8 of FIG. 5 of the connector plate feeder on an enlarged scale;

FIG. 9 is a fragmentary top plan view of the two spaced apart arms of the connector plate carriage with supporting slides in position in the arms supporting the opposite ends of the connector plates in their slots;

FIG. 10 is a view similar to FIG. 9 but with the supporting slides moved to release the connector plates from the slots in the arms;

FIG. 11 is sectional view along line 11—11 of FIG. 9 showing a connector plate being supported at its opposite ends by the supporting slides;

FIG. 12 is a top plan view of a terminal block on its movable supporting platform;

FIG. 13 depicts an enlarged vertical side elevation of the terminal block and its supporting platform along line 13—13 of FIG. 12 with a connector plate supported in a slot thereof;

FIG. 14 is a side elevation of the terminal block supported platform and its operating mechanism with top pusher platen for connector plates;

FIG. 15 is a fragmentary partial sectional view of a terminal block being moved up into receiving position under a load of connector plates supported in the spaced apart arms of the carriage; and

FIG. 16 is sectional view along line 16—16 of FIG. 6 showing the support for the connector plates in the inclined feeding trough;

Throughout the description like reference numbers refer to similar parts.

This assembly machine is used to fill elongated terminal blocks 10, see FIGS. 12, 13, and 15 with connector plates 11, see FIG. 16. These connector plates 11 are generally rectangular with oppositely projecting ears 11a and 11b at each end at the top and depending spaced apart legs 11c having suitable spring bifurcations to receive the end of a connector wire as at 11d. The elongated terminal block 10 that receives and carries these connector plates 11 in spaced apart parallel relation is of suitable dielectric material and is here shown as relatively long and narrow. It has a pair of spaced apart sides 12 and 13 each having spaced apart and oppositely disposed from each other notches 12a and 13a in the top inner edges so as to receive the ears 11a and 11b, respectively on the connector plates and thereby support the same. Spaced apart cross ribbing 14 and 15 is positioned between the slots 12a and 13a and serves as insulation barriers yet the legs 11c of the connector plates 11 can extend therebeneath, see FIG. 13, so that wire end may be connected with facility into the bifurcated ends 11d. A guide (not shown) for wires may be molded with one of the sides 12 or 13 in a position along the lower edge. The blocks 10 are provided with suitable corner mounting lugs 15 which are apertured to receive mounting screws. Having described a terminal block 10 and the connector plates 11 that it carries, the apparatus that facilitates easy emplacement of these connector plates 11 into the slotted openings of the block for support by the slots 12a and 13a will be described.

The connector plates 11, of sufficient number to fill a block, have been previously inserted in supported spaced apart relation into spaced apart arms 17 and 18 in a carriage generally indicated at 16 as will be later described.

A block 10 is placed on vertically removable platform 20 of a block lifting apparatus generally indicated at 19, see FIGS. 14 and 15. This block lifting apparatus has adequate support legs 21, a horizontally disposed fixed platform structure 22, and movable arms 23 pivoted at 23a to the upper end of legs 21 under fixed platform 22 and supporting movable platform 20 on vertically disposed and longitudinally extending supports 24—24. The arms 23 are pivotally connected by links 25 to a bottom lever 26 pivoted intermediate its ends as at 26a on a bracket 27 attached to leg 21. The lever 26 has rigidly attached at one end a foot pedal 28 below the movable platform 20 and a counter weight 29 on its other end. Suitable cross bracing 22a is provided for the stationary

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platform structure 22. The movable platform 20 has suitable spaced apart guides or abutments 20b on the top back portion thereof to receive and position the ends of a block 10 to be filled with connector plates 11. Slide release means having spaced apart apertures therein and described later are provided for the arms 17 and 18 to permit the connector plates 11 to be released at their supporting ears 11a and 11b and to drop into the slots of the block 10. In order to insure prompt emptying of the arms of a load of connector plates, a pusher or platen 30 is provided, see FIGS. 14 and 15. The platen 30 is of elongated shape of a width less than the length of a connector plate 11 so that it may engage the top of a group of plates 11 and pass down between the arms 17 and 18 to push the plates 11 into the receiving slots in the block 10 as carried by the movable platform 20 that has brought the block 10 up under the arms 17 and 18. The platen 30 has vertical mounting ears 30a pivoted at their upper ends at 30b to the end of supporting arms 31 which are pivotally mounted at their other end at 31a on a vertical support 32 attached to the rear edge of stationary platform 22.

In FIG. 15 there is shown the positioning of a block 10 wherein the platform 20 is brought into position in spaced relation below the arms 17 and 18 and the block 10 is placed in tilted position against the guides 20b so that its outer edge is first guided into position under the depending legs 11c of the connector plates 11 and then the platform 20 is moved upwardly into position by foot pressure on pedal 28. At the same time platen 30 is moved down under the control of link 33 interconnecting the foot pedal lever 26 with the platen support arm 31. The upper end of link 33 is provided with a suitable slotted portion 33a for connection with arm 31 so that there may be relative movement of platen 30 with respect to the pedal 28 so that the plates 30 may exert its weight downward due to the elongated slot 33a while the pedal 28 is pushed downward to lower the platform 20 and block 10 carried thereon which now is loaded with connector plates. The platen 30 is of course partially hand manipulatable.

Reference to FIGS. 1 and 2 shows the mechanism for loading the connector plates 11 into the spaced apart movable in and out arms 17 and 18 that move out as they are loaded with connector plates 11 from an inclined storage trough 48b as will be explained. A main frame is generally indicated at 40 and it has vertically extending legs 41 which are preferably of angle iron that support longitudinal extending side angle iron top members 42 and cross angle iron members 43 interconnecting the top members 42. Suitable longitudinal supports 44 and 45 are best shown in FIG. 1 in spaced apart relation in the bottom of the main frame 40. Support 44 has an attached bracket 44a pivotally supporting at 46a a power cylinder 46 and 45 having a depending bracket 45a having pivotally mounted thereon at 47a the lower end of a drive link 47 which is pivotally connected intermediate its ends at 46c to a piston rod 46b of power cylinder 46.

A supply trough generally indicated at 48, see FIG. 1, has a horizontal top portion 48a and an inclined portion 48b, inclined at about a 45° angle, with the horizontal end supported by vertical members 49, 50, 51 and 52 extending up from longitudinal frame members 42.

In FIGS. 8 and 16 the inclined trough portion 48b is shown made up of two oppositely disposed spaced apart side pieces 49—49 that support the connector plates 11 by the ears 11a and 11b thereof riding on the oppositely disposed inner top edges of each of the side members 49. The lower end of the trough portion 48b, see FIGS. 6 and 16 has its side portions attached to offset lower spaced apart sides 49a—49a. Disposed in abutting relation on the inner vertical faces of 49a—49a are thin longitudinally extending supports 50—50 that are

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held secured in upright spaced apart position by a center fitting member 51. These members 50—50 extend up between the legs 11c of the connector plates 11 and help to support and guide them in the trough.

In FIGS. 6 and 8 there is shown the structure at the lower end of the trough portion 48b, particularly FIG. 8, wherein the side members 49—49 are connected at their lower end by an end plate 52 as by cap screws 52a. The oppositely disposed inner edge portions on the lower ends of side members 49—49 are formed with vertically extending notches 49b, see FIG. 8, that provide with the end plate 52 a vertical slot the thickness of a connector plate 11 for vertical sliding therethrough as shown herein and with a width of the slot to permit each successive lowermost plate 11 to be pushed downwardly therethrough for insertion into suitable slots provided in the arms 17 and 18 as will be described. An elongated top support member 53 is positioned over each top portion at lower end of side plates 49 and affixed thereto and serves as a support for the upper portion of end plate 52 and enclosing means for the top cap screws 52a. Positioned in spaced relation above end plate 52 and parallel thereto is a cross support member 54 attached at its right hand end, see FIG. 5 to upright member 55 screwed to mounting plate 56 attached to the top of longitudinal frame member 42.

The left hand end of cross member 54 is supported by a vertical member whose lower end is attached to the main frame. The inner face 54a, see FIG. 4, of this cross support member 54 is in alignment with the inner face of end plate 52 and serves as a guide for a vertical pusher for ejecting the lowermost connector plate 11.

The structure of the assembly machine that mounts and controls the movable in and out connector plate receiving arms 17 and 18 mounted on carriage 16 will now be described. These arms 17 and 18 receive the connector plates 11 as they are ejected from the lower end of trough 48b as shown in FIGS. 6 and 7 as referred to heretofore. Reference to FIGS. 1, 2 and 5 show the track assembly generally indicated by 60 which is supported on and projects out from the main frame 40. In FIGS. 5 and 15 the detail makeup of the track assembly 60 is best shown. It consists of a bottom member 61 and two oppositely disposed spaced apart vertically extending track members 62a and 63a respectively, facing each other. Mounted between these track members for sliding movement is the depending stem 16a of the T-shaped carriage 16 having an integral top portion 16b. The stem portion 16a of the carriage has attached oppositely disposed rollers 16a spaced therealong which are received within the recesses 62a and 63a. Stabilizing rollers 16a", see FIG. 5, are mounted on a vertical axis in a suitable recess in the stem portion 16a of the carriage 16 and roll against the inner adjacent face of track member 62 to provide for stable support and movement of the carriage 16.

The carriage 16 has mounted thereon the spaced apart arms 17 and 18. These arms are made up of two horizontally disposed laminar pieces 17a and 17b and 18a and 18b, respectively, with the upper laminate 17a and 18a of each formed with an oppositely disposed recess 17a and 18a therein to provide therebetween a horizontal slideway. Each of the arms 17 and 18 are connected at their opposite ends by integral cross pieces, 70 at the outer end and 71 at the inner end. The ends 70 and 71 have horizontal slots therein in alignment with the slideways 17c and 18c in the arms. A slide generally indicated at 72 is received in these slideways and is of elongated rectangular shape with oppositely disposed side legs 73 in slideway 17c and 74 in slideway 18c and inner cross piece end 75 and onto cross piece end 76 joining the legs. This slide 72 is an integral thin plate.

Each of the arms 17 and 18 have in their oppositely facing inner edges spaced apart vertical notches 17d and 18d of the same spacing as the slots 12a and 13a in the legs of

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the terminal block 10. The legs 73 and 74 of the slide 72, see FIGS. 9 and 10, have spaced apart notches 73a and 74a in the opposite inner edges of the respective legs 73 and 74. A control lever 77 for slide 72 is pivotally mounted at its inner end on vertical pivot 77a in a plate 78 attached to move with the carriage 16. This lever 77 is pivotally connected by a link 79 to the outer end portion 70a of cross piece 70 of the slide 72.

In FIG. 9 it will be noted that the slide 72 is pulled out to the left and its slots 73a are out of alignment with their respective slots 17d in the leg 17 and the slots 74a are out of alignment with the slots 18d in leg 18 and thus the intervening portions of slide between the slots in the slide are under respective slots 17d and 18d in the legs 17 and 18 and support the connector plates 11. Whereas, in FIG. 10 when the slide 72 is moved to the right under the control of lever 77, the slots are all in alignment and the connector plates 11 thus are not supported at their ears 11a and 11b at each top slot and the plates 11 drop down into and are received by the slots in the terminal block 10 where the notches in the slots 12a and 13a in the legs of block 10 now support the ears 11a and 11b of the connector plates 11.

The carriage 16, as shown in FIGS. 2, 5 and 15 has its leg 16 provided with a raised toothed track portion 17e extending longitudinally and joining in a flat portion 17f at its inner end whose top surface is in alignment with the top level of the teeth 17e. The toothed portion 17e and the flat portion 17f in alignment therewith cooperates as a timer to actuate the pusher plate to push down the lowest connector plate 11 from the inclined trough into the space between the arms 17 and 18 where the ears 11a and 11b of the plate 11 are supported in the notches 17d and 18d in the arms 17 and 18. This pusher mechanism will now be described.

The pusher mechanism is generally indicated at 80 and comprises a pair of parallel levers 81, see FIGS. 3, 4 and 5, carrying a depending vertically movable pusher plate 82 attached to a cross member 82a at its top that is pivoted at 82b to the free ends of levers 81. The other ends of levers 81 are fixedly attached to pivot pin 81a that pivots in frame members 83. Arms 84 are fixedly attached to pivot pin 81a and each has a biasing spring 85 attached at its outer end tending to pivot the pin 81a and levers 81 counterclockwise. Levers 81 receive their clockwise rocking motion to move vertically downward pusher plate 82 through a linkage and lever arrangement. This arrangement includes a link 86 pivotally connected at 81c to a lug 81b affixed to and extending upward on the adjacent lever 81 and spaced apart parallel rocking levers 87 pivotally mounted intermediate their ends on pivot pin 88 and pivotally connected at 87a to the lower end of link 86. The other ends of rocking levers 87 are formed with depending lugs 87b that carry a pivot pin 88 therebetween on which is mounted timer roller 89. This timer roller 89 rides upon the teeth 17e and down therebetween at 17e. The timer roller also rides on the flat surface 17f when the carriage 16 is in position to bring the flat portion under roller 89 as when in the out position of the carriage.

In FIG. 5 it will be noted that the pivot pin 88 mounting the levers 87 is supported in upstanding spaced apart lugs 90 attached to the frame portion 91.

In order to keep the levers 87 from rocking when the carriage 16 is returned to within the frame from its extended position to receive another load of connector plates, a control pin 92, see FIGS. 3, 4 and 5, is brought into position over the lever 87 adjacent thereto. The control pin 92 is positioned to the left of pivot 88 as viewed in FIGS. 3 and 4. This control pin 92 is attached to the top end of a lever 93 which is fixed to rotate with a horizontally extending pivot pin 94 suitably mounted in a lug portion 95 on the main frame. The control of the rotation in one direction and in the opposite direction of pin 94 is under the control of two arms. One of these arms is 96 having a pin 97 attached thereto and

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the other is arm 98. Both arms 96 and 98 are fixed to shaft 94 and thus control its rotation, one in one direction and the other in the reverse direction to thus place in holding position control pin 92 into engagement with and out of engagement with lever 87. The rotation of shaft 94 is also under the influence of an over center spring biased mechanism generally indicated at 100. This over center mechanism 100 is mounted on an upstanding lug 95b supported on cross member 95a attached to lug 95 on the main frame. Pivot link 101 is pivoted at 101a on lug 95 and a second pivot link 102 is pivoted at 102a to the lower end of control arm 98. Pivot links 101 and 102 which lie in the same vertically extending plane are interconnected by a tension spring 103.

The control arm 96 and its attached pin 97 is moved in counter-clockwise direction by a roller 104 that is pivotally mounted on carriage 16 towards its rear end. Thus, as carriage 16 moves out the roller 104 carried thereby hits pin 97 and moves it counter-clockwise to rotate arm 96 and shaft 94 also counter-clockwise whereupon lever 93 and pin 92 carried thereby are rotated counter-clockwise and pin 92 engages the top of adjacent lever 87 to hold it from rocking and thereby the timer roller 89 is held out of operation by teeth 17e on arm 17.

As the carriage 16 is moved back with the frame to start to receive another load, the bracket 79 extending from the outer end of carriage 16 moves to strike the second control arm 98 with which it is in alignment and this trips the over center mechanism to rotate shaft 94 fixed to arm 98 and thus the arm 93 mounting pin 92 is rotated clockwise and pin 92 moves out of engagement with adjacent rocker arm 87 allowing the pusher plate 82 to again be operated.

The carriage now moves out from the frame under the influence of the power cylinder 46 and its linkage and as the arms 17 and 18 on carriage 16 move out the pusher 82 moves up and down to push down the plates 11 between the arms 17 and 18. When the arms are full, as explained heretofore, a block 10 is placed on platform 20 and brought up under a load of connector plates 11. The slide control lever 77 is moved to the left and the load of plates 11 is dropped into the block 10.

Suitable pneumatic or hydraulic source and control means 104 and 105 under the control of hand lever 106 to supply power to power cylinder 46.

When the inclined trough 48b has a load of plates 11 therein, a lever 107 pivoted at 107a and attached to a bell crank 108 applies a resistance on the top of the plates 11 as by the shoe 107b riding on and applying pressure on the top of the plates. The bell crank lever 108 is spring biased by a spring 109. As the pusher 47a attached to and moving the carriage 16 moves to its extreme left position, the lever 108 and 108a is struck by the pusher portion 47a and the arm 107 is raised to allow a new group of plates 11 to move down the trough 48b.

The assembly machine provide a highly advantageous and expeditious means of feeding the connector plates 11 into a supported position to be received by the terminal blocks 10.

What is claimed is:

1. An assembly machine for inserting connector plates in an elongated block having spaced apart oppositely disposed support slots for receiving connector plates, comprising, in combination, a frame, vertically movable support means for an elongated terminal block, a carriage member horizontally movable in and out of said frame and over said vertically movable support means supporting a terminal block, said carriage having a pair of spaced apart arms with spaced apart oppositely disposed receiving means for opposite ends of a connector plate, said spaced apart receiving means in the arms having like spacing to that of the slots in the terminal block, releasable

support means on at least one of said arms for movement to drop a supported end of a connector plate from said receiving means into a slot in said block, an inclined trough on said frame for receiving a stock of connector plates to be inserted in said connector receiving means on said arms of the carriage, said trough having its lower end proximal above said carriage and feed means for feeding a connector plate from said trough into said receiving means on said carriage arms, whereby said receiving means in the arms of the carriage are filled with connector plates as the carriage moves out from the frame, said terminal block support means moving a terminal block in position under the connector plates in said arms of the carriage for receiving the connector plates therein when said releasable support means is released.

2. An assembly machine for inserting connector plates in an elongated terminal block having spaced apart oppositely disposed slots for receiving connector plates, comprising, in combination, a frame, a pair of spaced apart arms horizontally movable in and out on said frame, said arms having spaced apart oppositely disposed receiving means for opposite ends of a connector plate with the spacing of like spacing in that of the slots in the terminal block, releasable support means on at least one of said arms for movement to drop a supported end of a connector plate from said receiving means into a slot in said terminal block, an inclined trough on said frame for receiving a stock of connector plates to be inserted in said receiving slots in said arms and having its lower end proximal over said arms for feeding connector plates thereto and feed means for feeding a connector plate from said trough into said receiving means on said arms, whereby said receiving means in the arms are filled with connector plates as the arms move out from the frame, said releasable support means being released after

a terminal block is placed under the connectors carried by said arms to release said connector plates permitting them to move into said block.

3. An assembly machine according to claim 2 including a terminal block support means disposed under the pair of spaced apart arms when in this position extending out from the frame, said support means having mounting means for moving the same and a terminal block carried thereon into position under the arms for receiving connector plates in the slots thereof.

4. An assembly machine according to claim 2 wherein each of the arms of the spaced apart pair of arms have releasable support means for said connector plates carried by said arms.

5. An assembly machine for inserting elongated plates in an elongated block having spaced apart slots therein for receiving the plates, comprising, in combination, a frame, a pair of spaced apart arms horizontally movable in and out of said frame, said arms having spaced apart and oppositely disposed receiving means for receiving and holding connector plates, means for feeding plates to said support means in the arms as the arms move out from said frame, releasable support means in said arms for releasing a load of plates in said arms.

6. An assembly machine according to claim 5 including means for supporting a block to receive the plates held by said arms, said means including a platform for receiving and holding a block under said arms and means for moving the platform to position the block under said arms to receive a load of plates therewithin on release of said releasing means on said arms.

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