

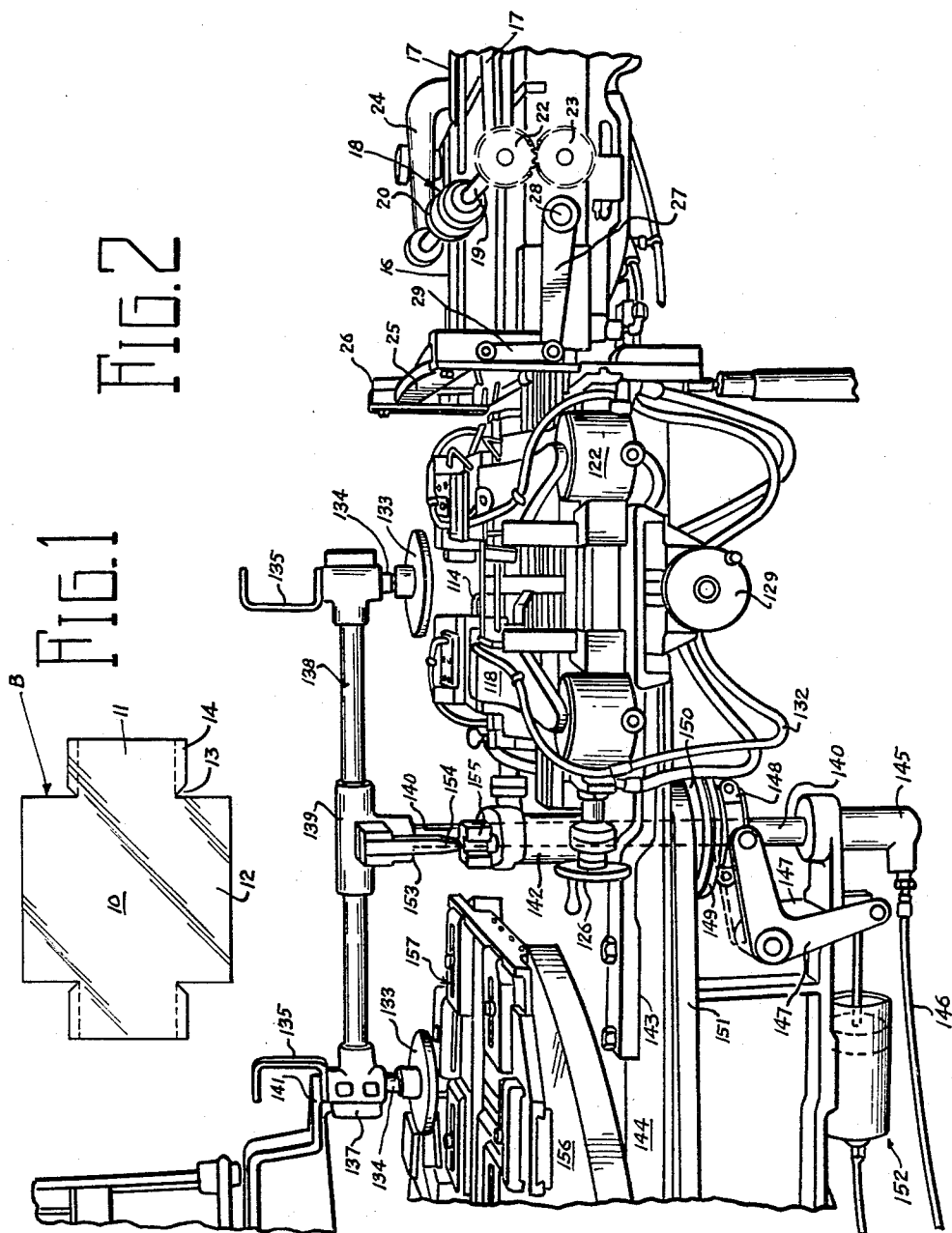
June 7, 1960

L. E. SEVISON
WEB SEVERING APPARATUS WITH RECIPROCATING
FEEDING AND BLANK DELIVERING MEANS

2,939,355

Original Filed Jan. 10, 1952

4 Sheets-Sheet 1



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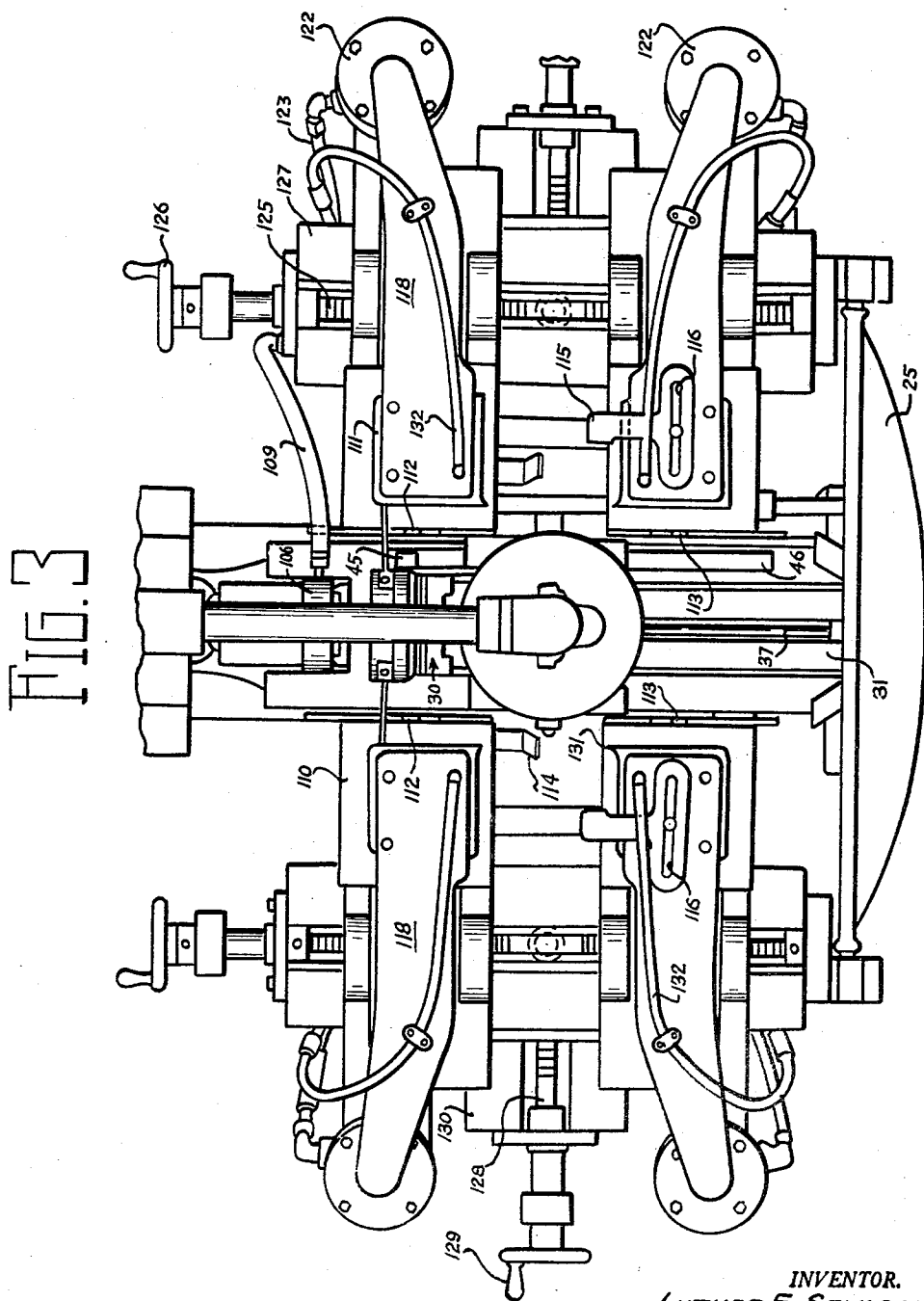
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4 Sheets-Sheet 2



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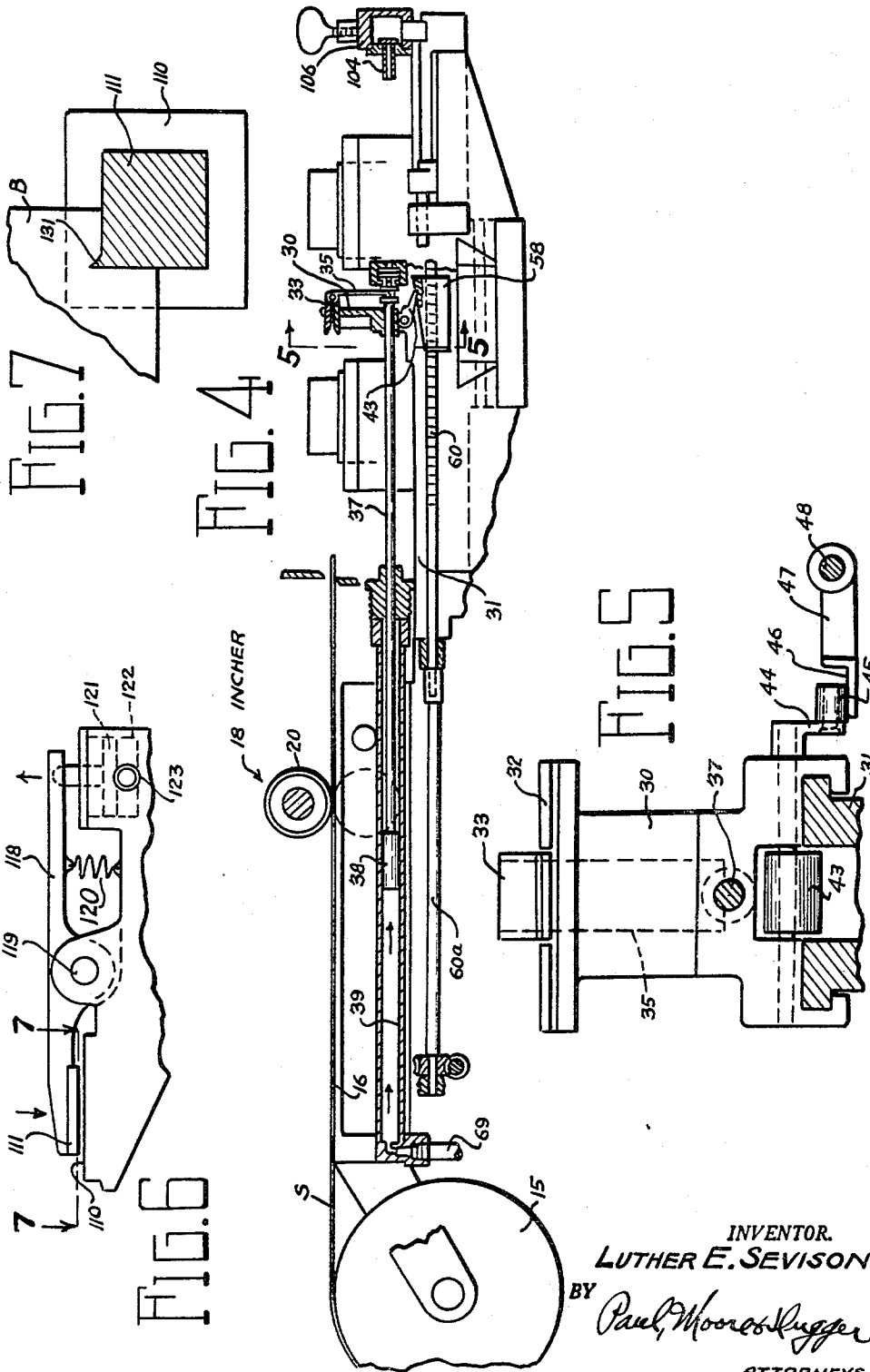
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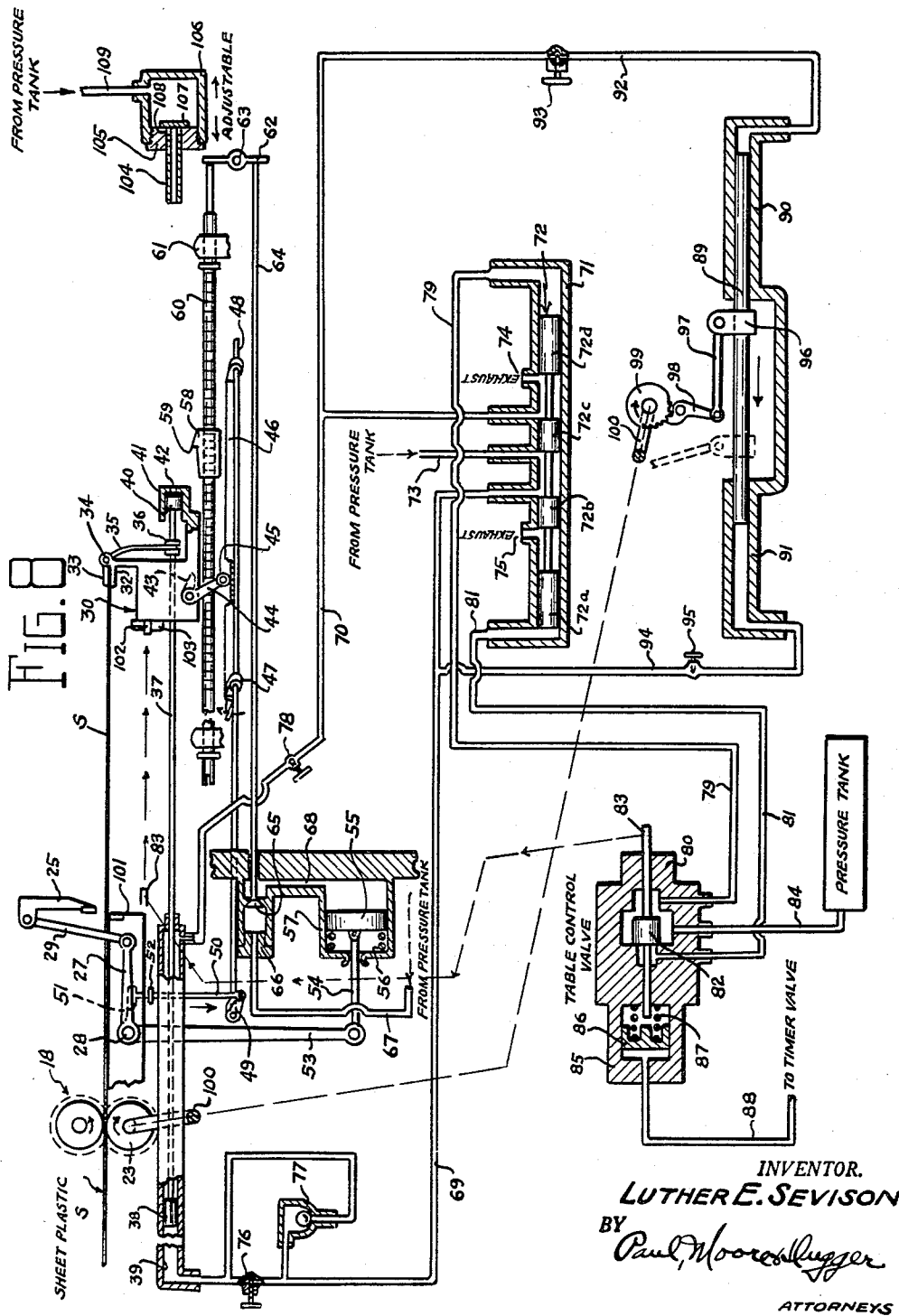
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4 Sheets-Sheet 4



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2,939,355

WEB SEVERING APPARATUS WITH RECIPROCATING FEEDING AND BLANK DELIVERING MEANS

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Original application Jan. 10, 1952, Ser. No. 265,734, now Patent No. 2,843,027, dated July 15, 1958. Divided and this application July 25, 1955, Ser. No. 524,121

1 Claim. (Cl. 83—222)

This invention relates to box making machinery, but particularly to machines for making boxes from thermoplastic sheet material. This application is a division of my copending application Serial No. 265,734 filed January 10, 1952, now Patent No. 2,843,027.

The principal object of this invention is to provide a machine embodying intermittently operable feeding mechanism for advancing a continuous strip of sheet material, severing a section from the continuous sheet, and then blanking the severed section to a form suitable for a box.

Other objects and advantages of the invention will hereinafter appear, and for purposes of illustration but not of limitation, an embodiment of the invention is shown on the accompanying drawings, in which

Figure 1 is a plan view of the box blank which is formed from a severed section of strip material by the blanking unit of this invention;

Figure 2 is a side elevation of a portion of a box making machine showing the position of the feeding and blanking mechanism of this invention relative to the box-forming machine and blank transfer mechanism;

Figure 3 is a top plan view of the blanking mechanism;

Figure 4 is a fragmentary view showing the incher feed and feeding mechanism for advancing the severed sheet section to the blanking mechanism;

Figure 5 is an enlarged transverse sectional view on the line 5—5 of Figure 4, showing the gripper mechanism and associated parts;

Figure 6 is a fragmentary view showing the operating mechanism for the punch and associated parts;

Figure 7 is an enlarged transverse sectional view on the line 7—7 of Figure 6; and

Figure 8 is a diagrammatic view of the sheet feeding and severing mechanism and associated operating and control devices.

The overall embodiment of the invention comprises a machine for making boxes from plastic sheet material, such as cellulose acetate, flexible Vinylite, and other similar thermoplastic materials. These materials are particularly desirable not only because of their transparency, but also because they can be folded to the desired shape by the application of heat; also because they lend themselves to welding, which is employed to close and seal the corners of the box.

From the general aspect, the plastic sheet material in this instance, is in roll form and the strip from the roll is first fed to a decurler, which straightens out the sheet so that when it is delivered to the machine for blanking operation, it is flat and can be properly and satisfactorily handled. From the decurler a continuous strip of plastic sheet material is fed in a step-by-step manner to a mechanism which performs the blanking operation. The blanks are successively fed or delivered to a table which has a step-by-step rotary motion. On the table is a series of jigs which are rigid with the table and move with it. It

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may be said that a blank passes through five stages and these stages may be briefly described as follows:

In the first stage the blank is delivered to a jig. In the second stage, after the table has indexed to a predetermined extent, four tabs are bent or folded upwardly from the blank. In the third stage, the side walls are folded upwardly, relative to the bottom wall of the blank, the tabs being arranged on the inside between the side and end walls of the box. In the fourth stage and after a further indexing movement of the table, the bottom wall of the box is embossed in a desired or predetermined manner. In the final or fifth stage, and after a further indexing movement of the table, the tabs are welded, the box thus being finally formed and closed and then ejected from the machine.

This invention relates to apparatus for severing a section of material from a continuous strip after it has passed through a decurler and cutting a blank suitable for forming a box from the severed section before feeding it to a turntable for the folding, embossing and welding operations. Only so much of the accessory box making machine as is necessary for a complete understanding of this invention is shown and described herein. For details of construction of the other elements of the box making machine reference is made to the copending application Serial No. 265,734 of which this application is a division.

Referring now to the drawings, there is shown in Figure 1 a flat box blank which is the product of the apparatus of this invention. The blank B comprises a portion 10 which will be the bottom wall of the box, portions 11 which will be the oppositely disposed end walls and portions 12 which will be the oppositely disposed side walls of the box. The blank has notches 13 between the end wall portions 11 and the bottom wall portion 10 at each corner or side of the end wall portions. These notches permit tabs 14 to be folded inwardly for welding the box in the final stages of the box making operation.

The strip S of thermoplastic material from the supply roll first passes through the decurler (not shown) and thence over a guide roll 15 to a table 16 (Figures 2 and 4). A pair of adjustable laterally spaced elongated finger-like guides 17 are mounted on the table 16 for guiding the advancing movement of the sheet S.

For imparting recurrent advancing movement to the strip S for a relatively short distance, a feeder or incher 18 is provided and consists of pairs of vertically aligned friction rolls for gripping the strip S therebetween. The incher includes a transverse shaft 19 on which are fixed for rotation a pair of rubber covered rolls 20. On one end of the shaft 19 is a knurled manual operating knob 21 and at the opposite end is an actuating gear 22. As shown on Figure 2, the gear 22 meshes with a gear 23 on a similar shaft-roller-arrangement disposed beneath the table. The shaft 19 is rotatable at its opposite end portions in bracket arms 24, the opposite ends of which are pivotally connected to the sides of the table 16.

It will be understood that the incher 18 advances the strip of plastic sheet material a short distance sufficient to enable certain gripping elements to engage it and advance it further to the blanking stage, as will hereinafter be described. After the strip has been advanced a sufficient distance suitable for a blank, that portion is severed from the continuous strip by a cutoff mechanism now to be described. A transversely arranged vertically reciprocable knife carrying crosshead 25 is guided in its vertical movements by upright guides 26 supported by the table 16. The crosshead 25 is reciprocated by an actuating arm 27 which is secured to a transverse shaft 28 at one end, the opposite end being connected to the

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crosshead by a link 29. Thus it will be apparent that by a rocking movement of the shaft 28 the crosshead 25 may be moved downwardly or upwardly and in its downward movement it severs a section from the continuous strip S of plastic material.

Referring particularly to Figure 8, it will be understood that after the incher 18 has advanced the continuous strip S of sheet material a short distance beyond the cutoff 25, a reciprocatory feeding device grips the advanced edge of the sheet and pulls it forwardly for a distance suitable for a box blank, thereupon the cutoff operates to sever that section from the continuous strip S. As shown a carriage 30 is adapted to reciprocate horizontally toward and away from the cutoff 25. The carriage 30 is guided in its to and fro movements by a guide platform 31, forming an advanced portion of the table 16. On the upper portion of the carriage 30 is a notched head 32 adapted to receive the forward free end of the strip therein. As indicated on Figure 5, the notched head 32 has an intermediate recess in which a pivoted clamping or gripping plate or finger 33 operates. The clamping or gripping plate 33 is pivotally mounted at 34 at its rearward end and has a depending actuating arm 35, the lower end of which is in the form of a yoke to straddle a spool 36. The spool 36 forms a part of an elongated piston rod 37 which, as shown on Figure 8, has a piston 38 at one end mounted for reciprocation within a cylinder 39. At the opposite end of the piston rod 37 is a piston 40 which, as will hereinafter appear, operates to release the gripping or clamping plate 33. The piston 40 operates within a cylinder 41 forming an integral part of the carriage 30, one end of the cylinder 41 being open and the opposite end being produced with a port 42.

Carried centrally by the reciprocable carriage 30 is a latch arm 43 and fixedly associated with the arm 43 is a bell crank arm 44 which depends from the lower end of the carriage 30 and carries at its free end a roller 45. The roller 45 is adapted to ride along a horizontal track 46 which has integral laterally extending supporting arms 47 secured at their free ends to a horizontally disposed rock shaft 48. Secured to one end of the shaft 100 is a lever 49 to the free end of which is pivoted an upstanding arm 50. The upper end of the arm 50 is slidable through an apertured end portion of a lever 51, the opposite end of which is secured for turning movements with the shaft 28. On the upper end portion of the upstanding arm 50 is fixed a disc 52 which is adapted to be engaged by the lever arm 51 upon clockwise movement of the shaft 28 thereby to rock the shaft 48 and the track 46 for imparting counterclockwise movement to the arm 44 and thereby lifting the latch arm 43 for a purpose which will hereinafter appear.

Secured to the shaft 28 and depending therefrom is a relatively long operating arm 53 to the lower end of which is pivoted a piston rod 54 which has a piston 55 reciprocable within a cylinder 57, a coil spring 56 being arranged between the piston and the outer end of the cylinder. As will appear as the description proceeds, air under pressure is supplied to the piston 55 for actuating it and through the connections described operating the cut-off 25 to sever a section from the continuous strip S. Arranged underneath the path of travel of the carriage 30 is a block 58 which is provided at its upper portion with a vertical wall 59 constituting a stop surface against which the latch arm 43 is adapted to abut. The block 58 is threadedly mounted on a horizontal screw threaded shaft 60 which may be manually adjusted for predetermining the position of the block 58 as by an extension rod 60a and associated mechanism (Figure 4). The connection between the screw shaft 60 and its supporting brackets 61 is such as to afford a limited longitudinal movement so that the shaft can move slightly horizontally relatively to its support.

Engageable by one end of the shaft 60 is a vertically disposed lever 62 which is pivoted intermediate its ends

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at 63. Engaging the opposite end of the lever 62 is a horizontally disposed valve rod 64 which has a poppet type valve 65 at its opposite end, the latter seating within a housing 66. Pressure in the form of compressed air is supplied to the valve housing 66 at one side of the valve 65 from a tube 67. The opposite side of the housing 66 communicates with the cylinder 57 through a passage 68.

For effecting advancing movement of the piston 38 and associated parts, a tube 69 delivers compressed air to the left hand end of the cylinder 39 (Figure 8) and for effecting retracting movement of the piston 38 a tube 70 delivers compressed air to the right hand end of the cylinder 39. Both the tubes 69 and 70 extend to a relay valve housing 71 and within the housing 71 is a relay valve 72 which is horizontally reciprocable and has piston-like heads 72a, 72b, 72c and 72d. Leading to the relay valve housing 71 is a tube 73 which leads from a source of air under pressure. Provided in the housing 71 are exhaust ports 74 and 75, the port 74 being arranged to the right of the tube 70 and the exhaust 75 being disposed to the left of the tube 69. For controlling the volume of air under pressure supplied to the cylinder 39 through the tube 69, there is arranged in the line a manually operated needle valve 76, the adjustment of which controls the speed of advancing movement of the piston 38. Connected to opposite sides of the valve 76 is a ball valve controlled bypass 77 which seats when air under pressure is being delivered through the tube 69 to the cylinder 39 for advancing the piston 38 but which opens when the cylinder 39 is being exhausted of its air upon movement of the piston 38 to the left of the cylinder or during the retracting movement of the piston. A similar manually operated needle valve 78 is disposed in the line or tube 70 for controlling the speed of movement of the piston 38 during its retracting movement.

Leading from the right hand end of the relay valve housing 71 is a tube 79 which extends to a housing 80 for the main control valve. Extending from the left hand end of the relay housing 71 is a tube 81 which similarly extends to the control valve housing 80. Within the housing 80 is a piston-like control valve 82 which is carried by an elongated stem or pin 83 slidable in the housing 80, the ends of the pin projecting beyond opposite ends of the housing. Leading to the housing 80 intermediate the tubes 79 and 81 is a tube 84 which supplies air under pressure from any suitable source such, for example, as a pressure tank. It will be understood that when the valve 82 is in its left hand position compressed air from tube 84 may flow to the tube 79. When the valve 82 is in its right hand position then the tube 79 is shut off and compressed air flows from the tube 84 to the tube 81.

Secured to one side of the housing 80 is an extension 85 in which a piston 86 is slidable horizontally, the piston 86 having a projecting portion for engaging the adjacent end of the valve stem or pin 83. A coil spring 87 is interposed between the end of the housing 80 and the piston 86 for urging the latter forward to the left or in a direction away from the housing 80. Leading to the housing extension 85 for delivering air under pressure for actuating the piston 86 to the left of Figure 8 is a tube 88 which extends from a timer valve which will be hereinafter described.

For actuating the incher 18 and, as shown on Figure 8, a piston-like rod 89 has its opposite end portions reciprocable within cylinders 90 and 91. The outer end of the cylinder 90 is connected by a tube 92 to the tube 70 so that depending upon the position of the relay valve 72, air under pressure is delivered to the tube 92 and is allowed to exhaust through the exhaust port 74. Leading from the cylinder 91 is a tube 94 which connects to the tube 69 and similarly this tube receives its air under pressure from the pressure line 73 depending upon the position of the relay valve 72 and also can exhaust through the port 75 on a predetermined positioning of the relay valve. In the tube 92 is a manually controlled valve 93

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for regulating the speed of movement of the piston rod 89 and similarly a manual speed regulating valve 95 is disposed in the tube 94.

Engaging a central portion of the piston rod 89 is a clamp 96 to which is pivoted one end of an arm 97. The opposite end of the arm 97 is pivoted to the outer end of a pivotally mounted pawl 98. The pawl 98 is adapted operatively to engage a ratchet wheel 99 fixed to the shaft 100 which forms a part of the shaft-roller assembly 23. It will be clear that upon movement of the rod-like piston 89 to the left of Figure 8, the ratchet wheel 99 is rotated in a clockwise direction thereby to actuate the incher 18 for advancing the continuous strip S of plastic material a short distance. This positions the free forward end of the strip S a short distance beyond the cutoff 25 and in position to be gripped by the gripping plate 33.

In the operation of the mechanism as shown on Figure 8, let it be assumed that the timer valve has operated to introduce air under pressure to the tube 88 thereby to actuate the piston 86 to the right and thereby shifting the valve 82 to the extreme right hand position, closing off the tube 79 but opening the tube 81 to the pressure line 84. Fluid under pressure from the line 81 shifts the relay valve 72 to its right hand position, enabling compressed air from the line 73 to pass through the line or tube 70 for moving the piston 38 to the left of the Figure 8 in a retracting direction. At the same time, air under pressure passes through the tube 92 to shift the piston rod 89 to the left of the figure and impart a short rotary motion to the incher through the pawl and ratchet wheel and thereby advancing the forward end portion of the continuous strip S a short distance beyond the table.

The movement of the piston 38 to the left imparts retracting movement to the carriage 30 and associated parts and this movement continues until the forward face 101 of the table is engaged by a permanent magnet 102 forming a part of the rearward face of the carriage 30. The permanent magnet 102 engages the metal surface 101 and retains the carriage in such retracted position against accidental or unwarranted movement. A pin 103 which projects rearwardly of the carriage 30 engages the outwardly projecting right hand end of the valve stem 83 and shifts the valve 82 from its extreme right hand position to its extreme left hand position, such as shown on Figure 8. When the valve 82 is in this position, air under pressure from line 84 passes through the tube 79 to shift the relay valve 72 to the extreme left hand position. When the relay valve is in this position, air under pressure from the tube 73 passes through the relay housing 71 to the tube 69 for advancing the piston 38 to the right of the figure. The first thing that happens upon such movement of the piston 38 is to actuate the clamping plate 33 through the spool 36 and actuating arm 35 to grip the portion of the sheet S advanced by the incher 18.

It will be understood that the plastic sheet S is first gripped upon the advancing movement of the piston 38 and its piston rod 37 due to the lost motion between the piston rod 37 and the carriage 30. As shown on Figure 8, the piston rod 37 can move in an advancing direction independently of the carriage 30 a sufficient amount to effect actuation of the clamping plate 33 through the movement of the spool 36 by which the arm 35 is actuated. Thus as the piston 38 continues its advancing movement to the right, the sheet S of plastic material is drawn forward. This advancing movement of the carriage 30 and sheet S continues until the latch arm 43 engages the stop 59 on the block 58, whereupon the movement is arrested.

Due to the lost motion of the shaft 60 and its supporting brackets 61, a slight additional movement is imparted to the shaft 60 by the piston rod 37 and this movement is sufficient to rock the lever 62 to actuate the valve stem or rod 64 for unseating the valve 65. When the valve 65 is unseated, compressed air from the tube 67 passes to the cylinder 57 to force the piston 55 to the

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left of Figure 8 and through the connections described, actuating the cut-off 25 thereby to cut or sever a section from the plastic strip S which is, as established by the stop 59, of predetermined size sufficient from which to form the box, as will hereinafter appear. Since the movement to the left of the piston 55 compresses the coil spring 56, the latter promptly returns the parts to their normal position, elevating the cut-off 25 above the table in position for the next succeeding cut-off operation. Compressed air immediately returns the valve 65 to its seat and sufficient clearance is afforded between the piston 55 and the walls of the cylinder 57 to allow the compressed air to bleed out past the piston, permitting the piston 55 to move to the right of the figure by the coil spring 56.

As above pointed out, when the cut-off 25 is actuated to sever the plastic strip S, the arm 51 is rocked downwardly (Figure 8) to engage the disc 52 on the upright arm 50 and move the latter downwardly rocking the arm 49 and shaft 48 and thereby the track 46 in an upward direction, thereby to swing the arm 44 is a counter-clockwise direction. Such upward movement of the arm 44 lifts the latch arm 43 away from the stop surface 59 and permits the piston 38 and its piston rod 37 to resume the advancing movement of the carriage 30 to the right of the figure, it being understood that the forward edge portion of the section severed from the plastic strip S continues to be clamped by the clamping plate 33 so that as the carriage 30 advances, the severed plastic section advances with it.

Arranged at a predetermined position for engagement by the carriage cylinder 41 substantially at the end of the advancing movement of the carriage 30 is a horizontally slidable elongated release tube 104, the free end of which is adapted to register with the port 42 in the cylinder 41. The release tube 104 is slidable within the vertical wall 105 forming a part of a compressed air housing 106 which is mounted in any suitable manner for to and fro horizontal adjustment. The release tube 104 has at its inner end an enlarged imperforate head or cap 107 disposed within the housing 106. Adjacent the head 107 is a lateral port 108 which when the release tube is in its extreme left-hand position, as shown on Figure 8, is covered by the end wall 105. Air under pressure is delivered to the housing 106 through a pressure line or tube 109, leading from a pressure tank or other source of compressed air.

When the carriage 30 is released by the latch 43 for further advancing movement, it resumes its movement to the right of Figure 8 until the outer end of the cylinder 41 engages the release tube 104, moving the latter to the right and uncovering the port 108. When the port 108 is uncovered, air under pressure from the line 109 passes through the port 108 and through the tube 104 and into the cylinder 41 through the port 42 thereby actuating the cylinder 41 and the carriage 30 to the right of the figure to cause the clamping plate 33 to be rocked to its open or releasing position through the movement of the carriage 30 and actuating arm 35. When the severed section of the plastic strip S is released, it is disposed in the proper position to be blanked.

As will hereinafter more fully appear, the timer valve again operates to introduce air under pressure to the tube 88 thereby to actuate the piston 86 to the right of Figure 8 and shift the valve 82 to its right-hand position. When the valve 82 is in the right-hand position; then the relay valve 72 is shifted to the right of the figure to cause compressed air to pass into the line 70 and impart retracting movement to the piston 38 and carriage 30. The incher 18 is again operated to advance a portion of the plastic strip S, as previously described, to a position to be engaged by the clamping plate 33 on the carriage 30 and the cycle of operation above described again takes place. It will also be understood that when the carriage 30 is moved away from the releasing tube

104, the air pressure on the head 107 will return the tube to the position shown in Figure 8 where it remains until again engaged by the end of the cylinder 41 upon the advancing movement of the carriage 30.

Referring particularly to Figure 3, the severed section of the continuous plastic strip S is delivered by the mechanism just described to the blanking mechanism which comprises punches and dies for forming the box blank, as shown on Figure 1 of the drawings. The feeding mechanism carries the severed section of the continuous strip so that portions of the latter lie above dies 110 which are arranged in pairs on opposite sides of the table guide 31. When the severed sheet section is released, its forward edge abuts adjustable stops 112, one being arranged on each side of the guide 31. These stops 112 are formed on upright plates and constitute upright extensions on these plates and are suitably mounted for longitudinal adjustment in guides suitably formed on the support. The rear edges of the severed section abut against stops 113 similarly arranged for adjustment on opposite sides of the guides 31. To insure that the sheet sections advance properly, ramp guide strips 114 are disposed in the path of travel of these severed sections. Further to insure the proper positioning of the severed section relative to the punches and dies, a pair of adjustable side positioners 115 are provided. The side positioners 115 have a screw and slot adjustment 116 so that proper adjustment of them can be made to accommodate sheets of different widths.

Each punch 111 is carried by an arm 118 which is pivotally mounted intermediate its ends on a pivot 119 (Figure 6). Each arm 118 is tensioned by a coil spring 120 which operates to hold the punches 111 normally in their open position or in positions spaced from the respective dies 110. For operating each punch a pneumatic device is provided, and as shown on Figure 6, a piston 121 has its piston rod operating against the outer end of the arm 118, the piston 121 operating within a cylinder 122 so that when air under pressure is introduced to the cylinder 122, the piston is forced upwardly thereby to impart downward movement to the punch 111 which is carried by the opposite end of the pivoted arm. As shown on Figures 2 and 3, air under pressure is admitted to the cylinders 122 through tubes 123 which lead from a common junction connected to the timer valve mechanism hereinafter described so that all of the punches operate together.

The pairs of punches and dies on each side of the table can be conjointly adjusted either in a longitudinal or in a lateral direction to accommodate different sized sheets. As shown, a screw-threaded shaft 125 provides for lateral adjustment of a pair of punches and dies. On the outer end of each of the shafts 125 is a hand wheel 126 and suitable guideways 127 support the punch and die assemblies for such adjustment. Lateral adjustment of each pair of punch and die assemblies is made possible by a screw shaft 128 which has a hand wheel 129, guideways 130 being provided for this purpose. From the above description, it will be manifest that the pairs of punches and dies can be readily and conveniently adjusted to the desired position depending upon the size of the sheet being handled.

The punches and dies are constructed to cut the corners of the sheet to form the notches 13 in the box blank as indicated on Figure 1. As shown on Figure 7, each punch has a corner projection 131 for this purpose, and the dies receiving the punches are accordingly formed with notches. After the corner portions have been cut from the sheet, the severed portion of scrap is blown from each die by air under pressure introduced through the tubes 132, the distributor valve mechanism 124 operating to deliver a puff of air to each of the units as soon as the corners of the blank have been severed.

After each box blank B has been formed, it is picked up by a vacuum operated pick-up disc, which conveys

it to a rotary table where subsequent operations on the box blank are performed, as will be hereinafter described. As shown on Figure 2, the pick-up device comprises a pair of pick-up discs 133, which are spaced 180° from each other, the arrangement being such that one pick-up disc 133 operates to pick up one of the box blanks and at the same time, the other disc discharges its blank. Thereafter the discs revolve and the above operation is repeated.

The construction and mounting of the two pick-up discs 133 are identical so that detail description of one is considered sufficient. As shown, each of the pick-up discs 133 is in the form of a circular disc having a depending annular flange. The hub of the disc 133 is detachably secured to the lower end of a vertically disposed tube 134, the bore of the tube 134 aligning with a vertical opening through the hub of the disc 133. Secured to the opposite end of the vertical tube 134 is an upright C-shaped operating member 135, from one arm of which depends a plug which is fixed to and closes the upper end of the tube 134. The tube 134 is slidable vertically within a bracket 137, the inner side of which is socketed to receive a horizontal tube 138. The opposite end of the tube 138 fits into and is fixed to a T-shaped fitting 139. Secured to the depending portion of the fitting 139 is a vertically disposed tubular shaft 140. In the upper portion of the vertical shaft 134 is a relatively large laterally disposed port which when the shaft is in its lowermost position, communicates with a relatively small port in the adjacent wall of the bracket 137.

It will be understood that a partial vacuum is imposed at all times within the vertical shaft 140 so that when the two ports are brought into communication, a suction is imparted through the vertical shaft 134 to the underside of the circular disc 133, this suction holding the box blank B to the outer edge flange. As will hereinafter appear, the pick-up device rises vertically and then swings through an arc of 180° to dispose the blank in the position for its discharge to an operating table hereinafter to be described. When the disc 133 carrying the blank B reaches a position over the table, the C-shaped actuating member 135 engages a rigid arm 141 which projects outwardly above the operating table so that when the assembly moves downwardly, the upper portion of the C-shaped arm engages the fixed laterally extending arm 141, thereby retaining the C-shaped arm 135 and associated parts in the elevated position while the remainder of the assembly moves downwardly for a short distance. When the assembly moves downwardly and the arm 135 engages the rigid arm 141 to hold the left-hand disc 133 in its elevated position, the relatively large port in the vertical shaft 134 registers with a relatively large lateral atmospheric port in the bracket 137. This enables air under atmospheric pressure to pass through the large lateral atmospheric port, the port in shaft 134 and through the vertical shaft 134 to the disc 133 to free the blank B therefrom, it being apparent that the adjacent small port is shut off by the wall of the shaft 134. The reason for employing the relatively small ports is to maintain at all times subatmospheric pressure in the tubes 138 of sufficient magnitude so that when one or another of the larger ports is brought into registry with a smaller port, a suction is immediately available for holding a box blank B to the respective pick-up disc 133.

The vertical shaft 140 is freely mounted intermediate its ends in an upright guide 142 which is carried by a horizontal table-like part 143, the latter being secured to and supported by a lateral arm 144 embracing a post or column rising from the base of the turntable. The lower end of the upright tubular shaft 140 is disposed within a housing 145 in which the shaft can turn and also can move vertically. Leading from the housing 145 is a tubular line 146 for creating a suction or subatmospheric pressure within the tubular shaft 140 and the pick-up assembly as above indicated.

Suitably mounted on a bracket adjacent the housing 145 is a pair of laterally spaced bell cranks 147, one end of which extends to a hub 148 which is integral with and depends from a driven friction disc 149. The friction disc 149 can move up and down with the tubular shaft 140 and also is operatively connected to rotate the shaft 140. Disposed immediately above the friction disc 149 is a driving friction disc 150, which has integral with it and disposed on its upper face, a small sheave receiving an endless belt 151. The belt 151 is trained about a driving sheave which is considerably larger than the small sheave on friction disk 150. The large sheave is intermittently driven in timed relation to other portions of the mechanism, the arrangement being such that upon such intermittent movement, the tubular shaft 140 is rotated sufficient to move the pick-up discs through an arc of 180°.

A pneumatic device 152 including a cylinder and piston is connected to operate the bell cranks 47, it being understood that upon operation of the pneumatic device 152, the bell cranks lift the tubular shaft 140 until the friction discs 149 and 150 are in engagement whereupon the shaft 140 is imparted a predetermined turning movement sufficient, as above mentioned, to move the pick-up discs 133 through an arc of 180°. Prior to the revolving movement of the discs 133, the lower portion of the left-hand actuating member 135 (Figure 2) abuts the underside of the arm 141, thereby shifting the associated valve or tube 134 to its lowermost position. After such revolving movement of the discs has been effected, the pneumatic device 152 is at once rendered ineffective and the weight of the parts returns or lowers the assembly to its downward position.

In order to insure that the pick-up assembly will lower to its desired position with the pick-up discs 133 properly positioned, a vertical arm or spike 153 depends from opposite sides of the T-shaped fitting 139 and the lower end of each spike has a tapered end 154. When the pick-up assembly is lowered, the tapered ends 154 extend into grooves formed in brackets 155 carried by the stationary guide 142. Manifestly as the pick-up assembly lowers, the tapered or pointed ends of the spikes 153 slide downwardly through the grooves in the brackets 155 and as a consequence, the two pick-up discs 133 are accurately positioned for picking up and discharging the box blanks B.

The box blanks B are delivered by the pick-up device above described to a turntable 156 which is mounted for rotary movements upon a vertical post. As described in the above mentioned copending application, the turntable 156 is imparted positive step by step movements and on the turntable are arranged a series of five jigs 157 to which the box blanks 10 are successively delivered. As the turntable 156 is indexed, the box blanks are progressively formed into boxes.

A timer valve mechanism controls the delivery of air under pressure to the various parts of the machine as heretofore described. Since mechanisms for performing this function are conventional and available commercially the particular timer valve mechanism will not be described in detail. A specific form of timer valve is disclosed in the forementioned copending application. That disclosure is incorporated herein by reference to the extent necessary for a full understanding of this invention.

In order to synchronize the operation of the various parts of the machine, the compressed air must be de-

livered to the right place at the right time. The valves which control the admission and exhaustion of compressed air are cam-actuated, the various cams being positively driven and coordinated to the movement of the turntable. The positions and angularity of the several cams are predetermined and selected to effect compressed air delivery and exhaust at the proper time. Compressed air is delivered to the timing mechanism from any suitable source such as from a pressure tank to which air is delivered by a suitable compressor.

The above described machine enables large quantity production of boxes of plastic material to be effected in an exceedingly rapid and efficient manner, greatly decreasing the cost of production and making possible the economical manufacture of plastic boxes of uniform size, shape and with uniformly welded walls.

It is to be understood that numerous changes may be effected in details of construction, arrangement, operation and choice of materials without departing from the spirit of the invention, especially as defined in the appended claim.

What I claim is:

A machine for making separate box blanks from an inherently flexible continuous strip of thin sheet material such as rolled plastic strip material, comprising roll means for initially delivering the strip to project a severed end of the strip a short distance for gripping, gripper means and means mounting it on a reciprocable frame, means for guiding said frame along a line of motion generally aligned with the direction in which the severed end of said strip is initially delivered and from a gripping position in which said gripper means can grip said severed end to a prescribed position, actuating means connected to said gripper means and to said reciprocable frame for initially actuating said gripper means to cause it to grip said severed end and then to move said frame and gripper means to draw said strip out to said prescribed position, cutoff means mounted transversely to the path of motion of the strip near the roll means, stop means located in the path of travel of said reciprocating frame for stopping said frame upon engagement therewith, means actuated by the engagement of said frame with said stop means to actuate said cutoff means for severing said strip adjacent said roll means, and means operated by the actuation of said cutter means to release said frame from engagement with said stop means to allow said frame to travel to said prescribed position.

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