United States Patent

Balzer et al.

[15] **3,693,318**

[45] **Sept. 26, 1972**

[54] **TRAY COVERING AND SEALING APPARATUS**

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[52] **U.S. Cl.**.....**53/329**, 53/389

[51] **Int. Cl.**.....**B65b 7/28**, B65b 41/04, B65b 41/14

[58] **Field of Search**.....53/329, 389, 39, 184, 201; 198/131

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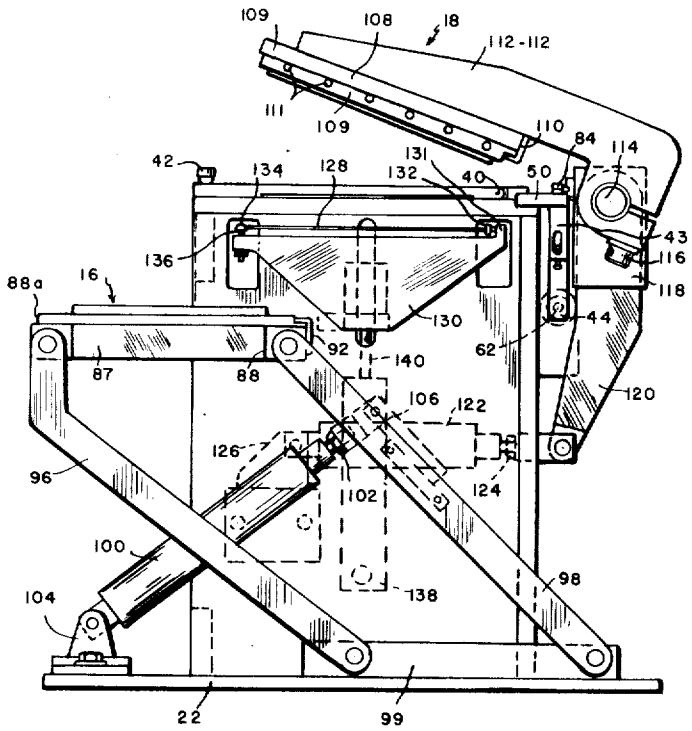
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Assistant Examiner—Horace M. Culver
Attorney—Roberts, Cushman & Grover

[57] **ABSTRACT**

A sheet holder comprising a flat plate overlain by a bar held in closely spaced parallel relation thereto for holding a sheet with a short portion of its leading end projecting therefrom, a reciprocably mounted pair of jaws movable toward and from the sheet holder for taking hold of the leading end of the sheet and drawing out a predetermined length thereof, a tray holder and a platen movable from below and above the plane of the sheet to press the sheet into engagement with the rim of a tray supported by the tray holder to effect sealing of the sheet to the rim of the tray, a sheet severing device for cutting off the sheet close to the sheet holder, and control means for effecting movement of the jaws, tray holder and platen in timed relation.

10 Claims, 14 Drawing Figures



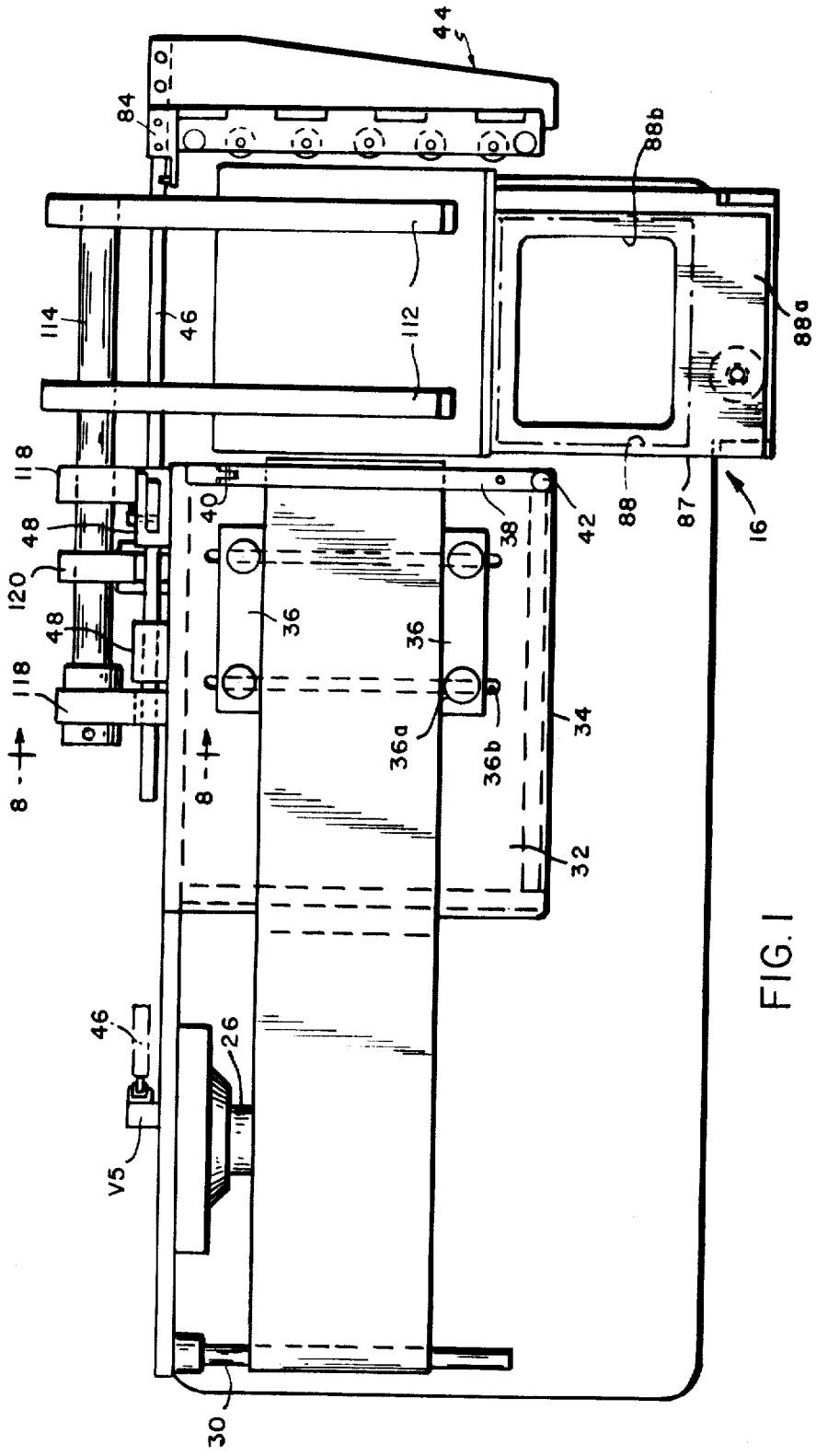

44
84
88b
88a
114
46
112
118
48
120
48
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40
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36a
36b
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V5
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FIG. 1

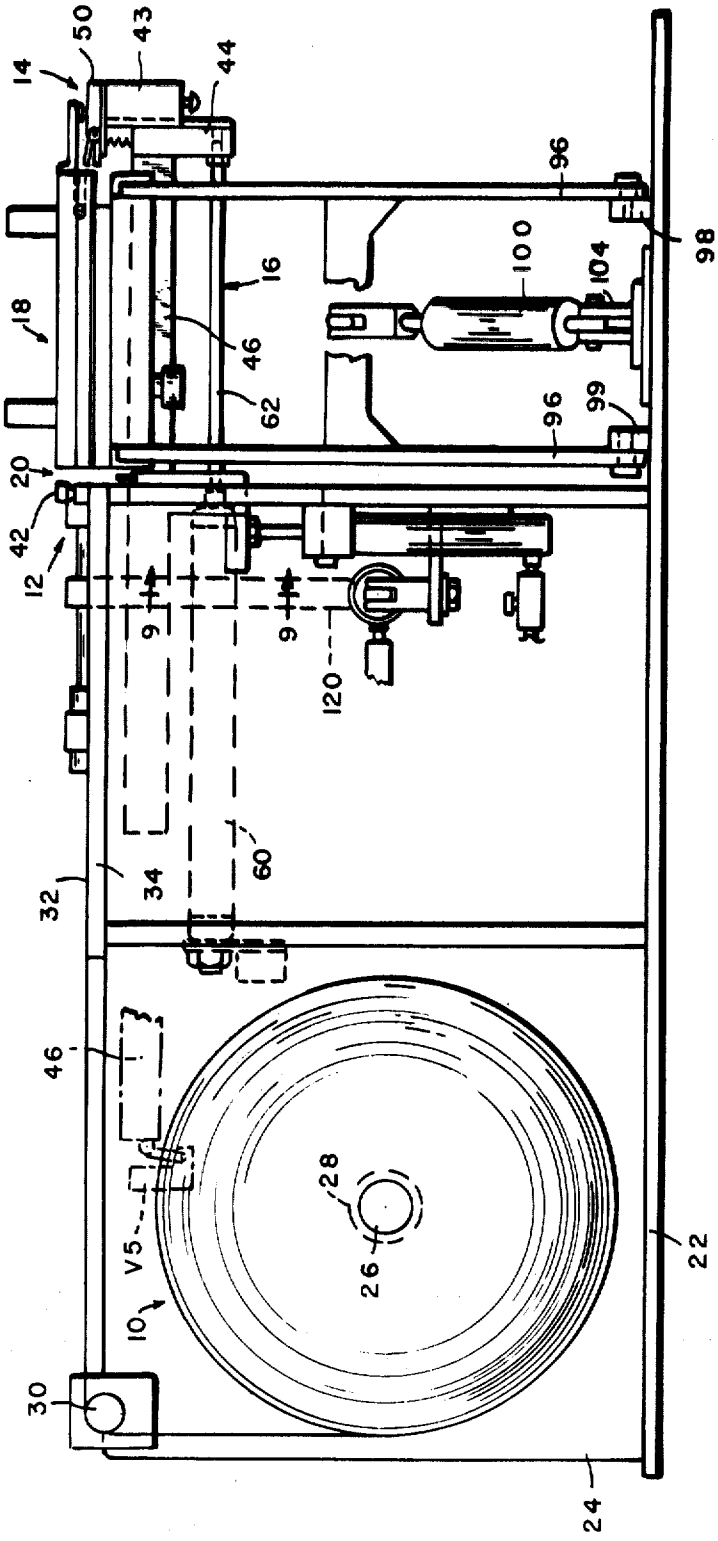

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100
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62
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V5
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FIG. 2

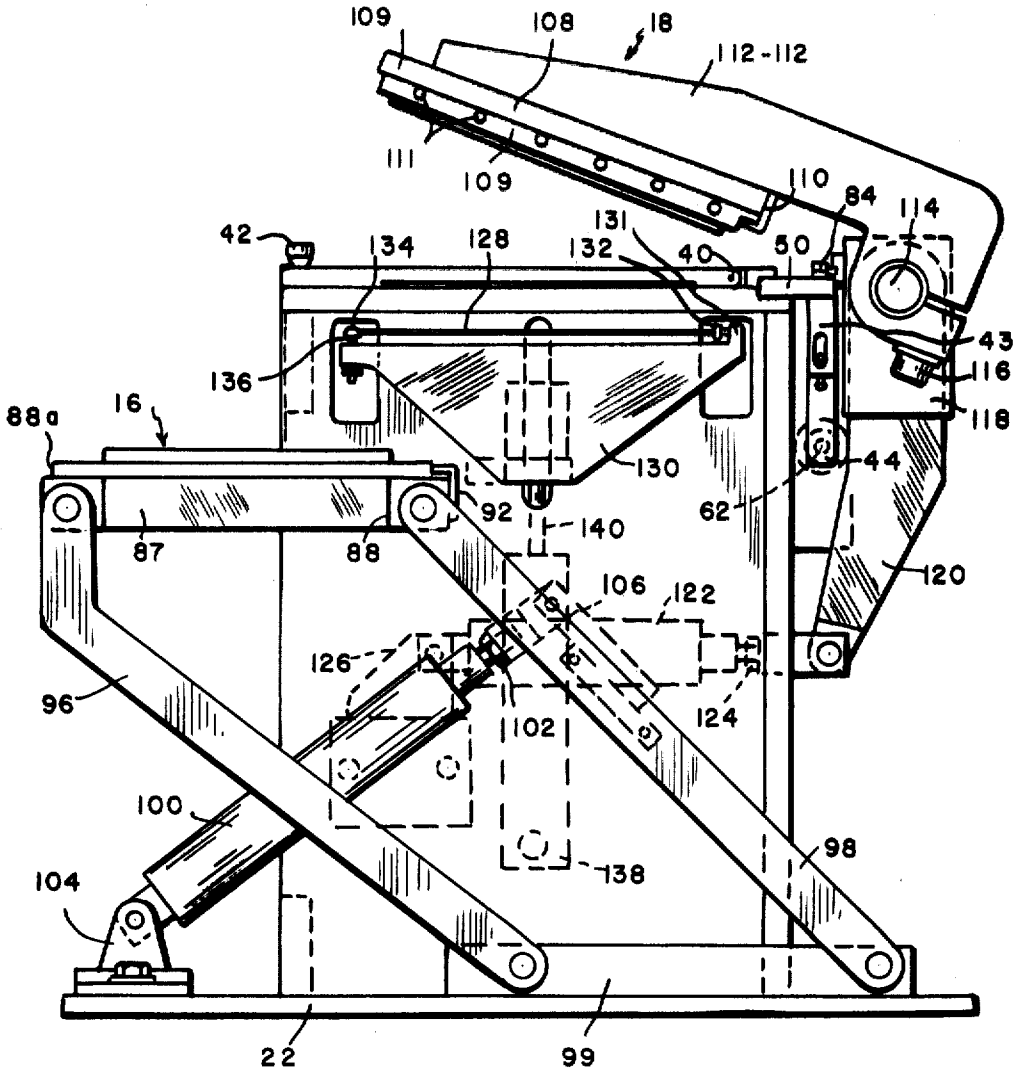

109
108
18
112-112
111
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114
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134
128
131
132
40
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43
116
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88a
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44
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140
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138
22
99

FIG.3

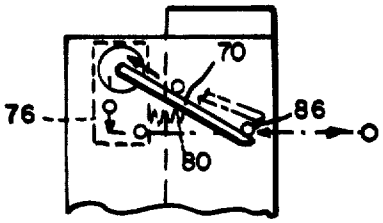


FIG. 5

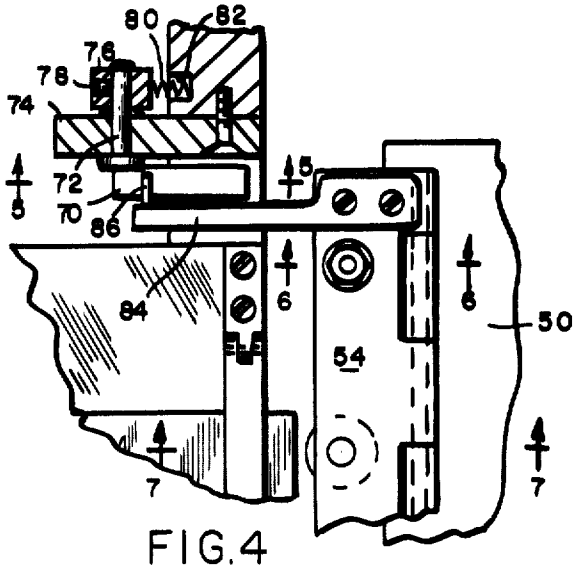


FIG. 4

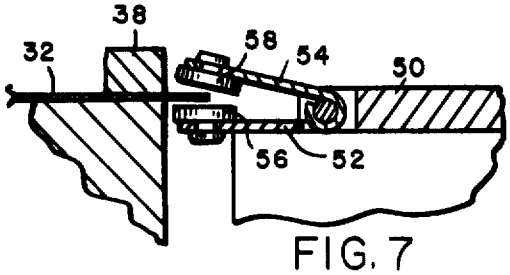


FIG. 7

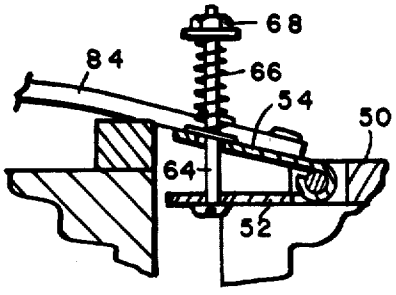


FIG. 6

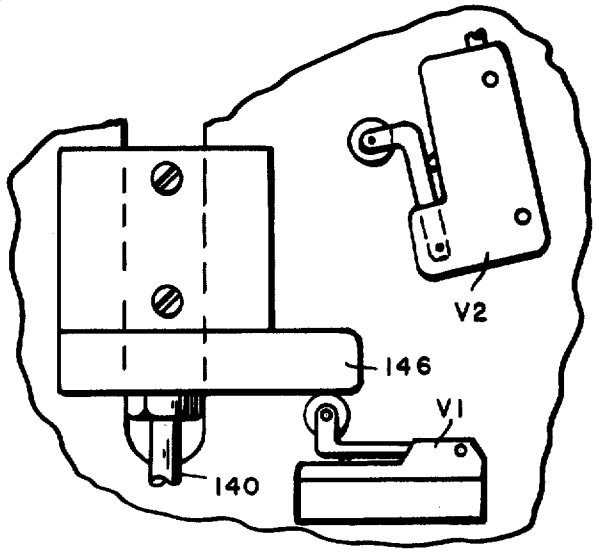


FIG. 9

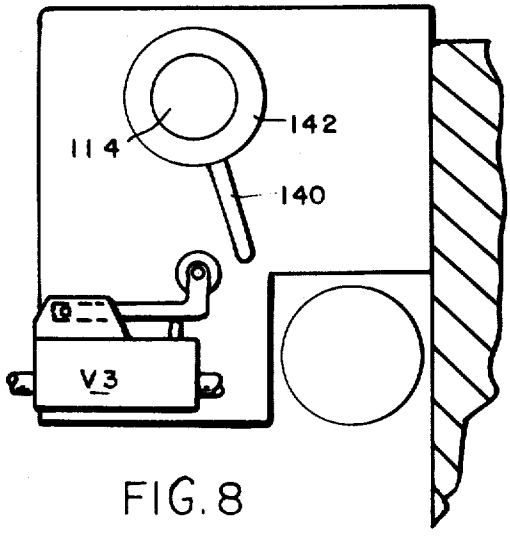


FIG. 8

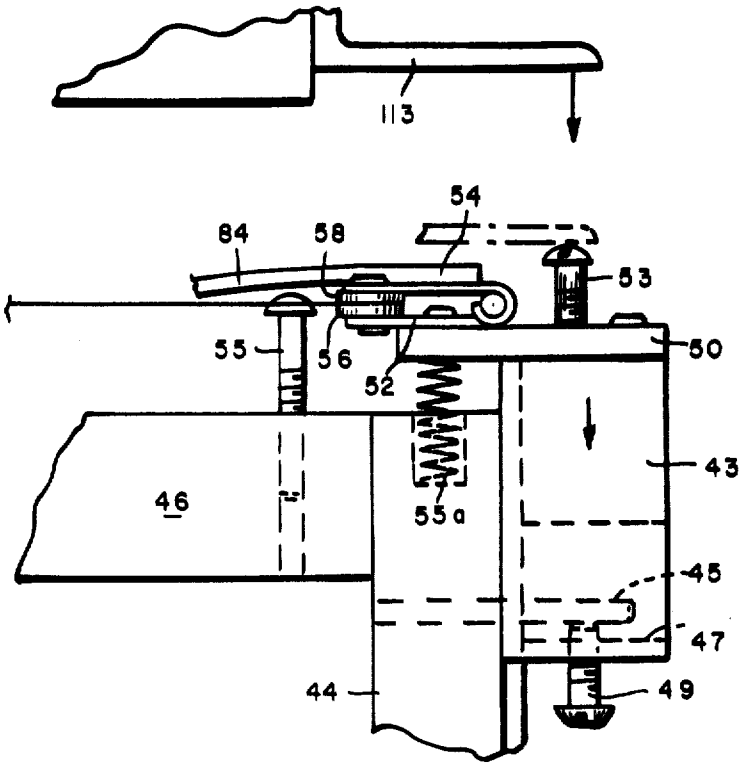

113
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55a
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FIG. 10

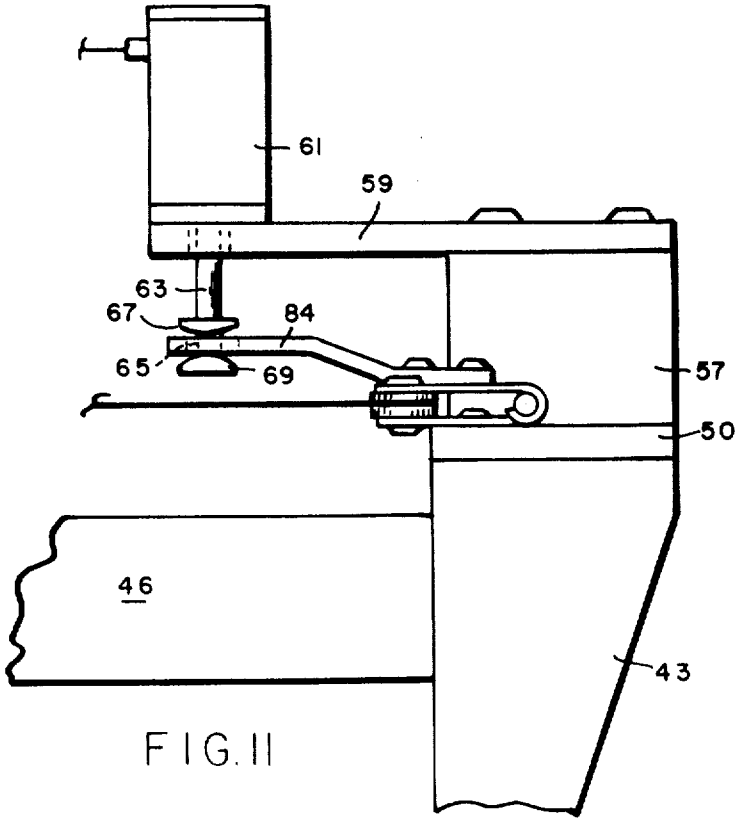

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FIG. 11

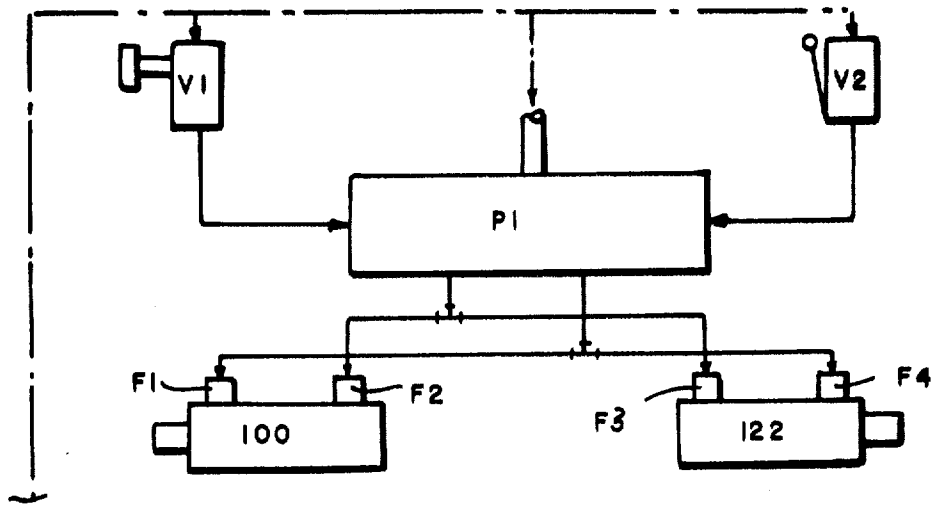


FIG. 12

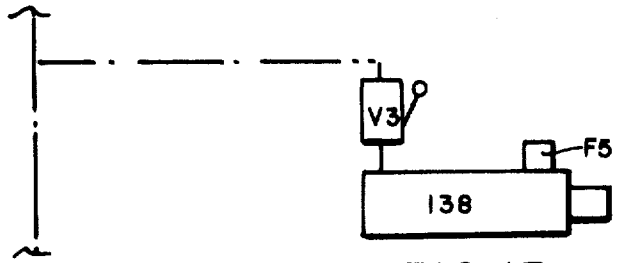


FIG. 13

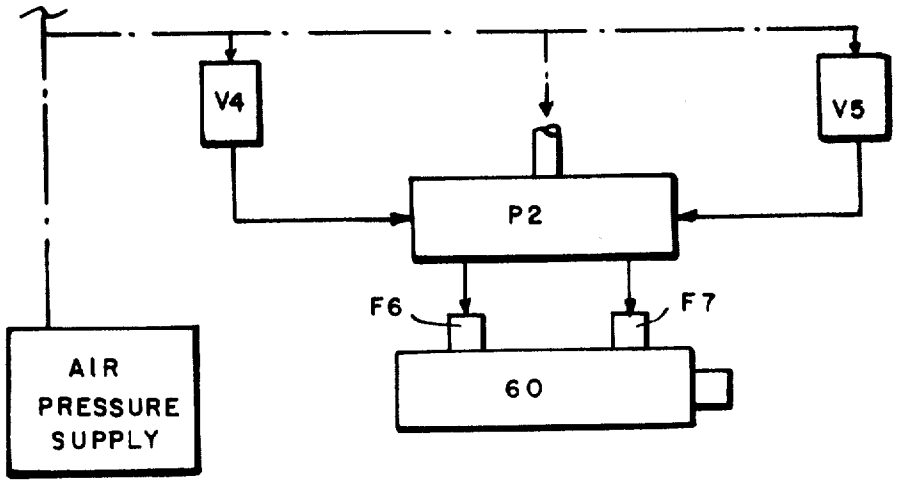


FIG. 14

TRAY COVERING AND SEALING APPARATUS

BACKGROUND OF THE INVENTION

Apparatus designed to apply sheet material to the tops of preformed trays is not new per se. The present apparatus is designed to withdraw sheet material from a coil in predetermined lengths, press the rim of a tray into engagement with it to effect sealing of the sheet to the rim and cut the sheet off, and to a control for effecting its operation so that all the operator has to do is to place the trays to be covered in the tray holder for covering and remove them therefrom after covering. Treadle operation of the control enables the operator to load and unload the trays and cycle the operation of the machine easily and at a rate compatible with his dexterity.

SUMMARY

As herein illustrated, the apparatus comprises a material holder adapted to support sheet material with a short portion thereof extending therefrom, sheet feeding means movable in reciprocation to and from the holder for taking hold of the leading end of the sheet and pulling a predetermined length therefrom, said sheet holder and sheet feeding means holding the withdrawn length in a predetermined horizontal plane, a tray holder and a heated platen movable, respectively, from below and above the plane of the sheet material to press the rim of a tray mounted on the tray holder into engagement with the sheet to effect sealing, sheet severing means for cutting off the sheet following application to the rim of the tray, and control means for effecting movement of the sheet feeding means, the tray holder and the platen in timed relation so that after the sheet feeding means has drawn off the predetermined length of sheet the tray support and platen move into sealing engagement, the sheet feeding means release the sheet and the sheet severing means cuts the sheet. The sheet feeding means comprise jaws, one of which is fixed and the other movable relative to the one, spring means which hold the jaws engaged, means for opening the jaws as they are moved toward the sheet holder to admit the leading end of the sheet and then to permit them to close on the sheet, and means for opening the jaws to release the sheet after application to the tray. The sheet severing means is a hot wire supported in parallel relation to the plane of the sheet material, movable perpendicularly thereto to effect cutting. The tray support is movable forwardly and downwardly to facilitate placing trays on it and upwardly and backwardly to bring the trays into a position beneath the sheet material and contains a replaceable adapter to provide a tray opening of the right configuration for the trays being covered. The platen is provided with means for heating and may comprise a flat plate or a replaceable ring corresponding in configuration to the rim of the tray being covered. The control includes means, for example a treadle, to initiate its operation, means for effecting movement of the tray support and platen into engagement with the sheet following withdrawal of the right amount of sheet material, means for initiating cutting following engagement of the tray support and platen, means for effecting separation of the tray support and platen following cutting and means for releasing the sheet material.

The invention will now be described in greater detail with reference to the accompanying drawings wherein:

FIG. 1 is a plan view of the apparatus;

FIG. 2 is a front elevation of the apparatus;

FIG. 3 is an end elevation as seen from the right end of FIG. 2;

FIG. 4 is a fragmentary plan view to much larger scale showing the sheet feeding means in a position about ready to engage the leading end of the sheet material;

FIG. 5 is a vertical section taken on the line 5—5 of FIG. 4;

FIG. 6 is a vertical section taken on the line 6—6 of FIG. 4;

FIG. 7 is a vertical section taken on the line 7—7 of FIG. 4;

FIG. 8 is a vertical section taken on the line 8—8 of FIG. 1;

FIG. 9 is a vertical elevation taken on the line 9—9 of FIG. 2;

FIG. 10 is a fragmentary elevation showing the mounting for the sheet feeding means and mechanical means for opening the jaws of the sheet feeding means to release the sheet following engagement of the platen with the tray holder;

FIG. 11 is a fragmentary elevation showing pneumatic means for opening the jaws of the sheet feeding means; and

FIGS. 12, 13 and 14 diagrammatically show the control means.

Referring to the drawings (FIG. 2), the apparatus comprises essentially a coil of sheet material **10** supported on a horizontal axis to permit withdrawing of the sheet material from the coil; sheet supporting means **12** for supporting an end of the sheet in a predetermined plane; sheet feeding means **14** movable relative to the supporting means for drawing off predetermined lengths of sheet material; a tray holder **16** and platen **18** movable toward and away from the sheet material to apply a sheet to the open top of a tray supported by the tray holder; and sheet severing means **20** for cutting off the sheet following attachment to the tray. The foregoing instrumentalities are supported in operative relation to each other together with means for effecting their operation by a frame comprising a base **22** on which there is mounted a housing **24** containing certain of the parts and supporting exteriorly thereof other of the parts and at one end pivotally mounted arms and linkage which support the tray holder and platen.

The coil of sheet material **10** is supported in the housing **24** on a horizontally disposed shaft **26** (FIG. 1), the latter being supported in the rear wall of the housing. The coil, as shown in FIG. 2, is mounted on the shaft so that the sheet material is unwound therefrom at the rear side of the coil and passes upwardly over a guide roll **30** mounted in the housing in a horizontal position. The sheet material passes forwardly from the guide roll **30** over a flat surface **32** provided by a plate **34** mounted at the top of the housing. A pair of transversely spaced parallel guide plates **36—36** (FIG. 1) provide for guiding the sheet along a straight line toward the sheet supporting means **12**. The guide plates **36—36** are secured to the plate **34** by clamp screws **36*a*** set into slots **36*b*** to enable adjustment of the distance between them. The means **12** for holding the leading end of the sheet in a predetermined plane comprises, in combination with the aforesaid

plate 34, a bar 38 pivotally supported at 40 on the plate with its underside in spaced parallel relation to the surface 32 by a screw 42 threaded through the bar with its lower end engaged with the surface 32. The bar 38 has a shallow rectangular recess in its underside and is so adjusted that it bears upon the sheet and holds it firmly clamped while at the same time permitting it to be drawn forwardly from the coil by the sheet feeding means as will be described hereinafter.

The sheet feeding means 14 (FIG. 2) comprises a carriage block 44 secured to a horizontal bar 46, the latter being mounted for horizontal sliding movement in a pair of longitudinally spaced guide blocks 48—48 secured to the rear side of the housing 24. A bracket 43 (FIGS. 2, 3 and 10) is mounted on the carriage block for movement vertically with respect thereto by a tongue and groove connection. Vertical movement is limited by a slot 47 in the bracket, a pin 45 fixed in the carriage block which extends through the slot and an adjustable screw bolt 49 screwed into the bracket so as to project into the slot for engagement with the pin. A jaw carrying plate 50 is secured to the bracket in a horizontal forwardly extending position and has fixed to it a lower jaw 52 and pivotally connected to it an upper jaw 54. The opposed faces of the jaws have disposed longitudinally thereof spaced pads 56 and 58 which may be of a resilient and/or frictional material to assist in obtaining a firm grip on the sheet material. The pads are shown as circular in horizontal section; however, the configuration of these pads may be modified in shape without departure from the intent and purposes of the invention. A spring 55 disposed between the carriage block and the plate 50 holds the plate elevated with respect to the carriage block.

As illustrated very clearly in FIG. 7, the sheet material is supported between the surface 32 and the bar 38 with a short portion extending forwardly therefrom, said portion being short enough to be self-supporting so that it does not droop, in a position to be taken hold of by the sheet feeding jaws. The sheet feeding jaws are reciprocated toward and from the sheet support at appropriate times by a cylinder and piston assembly 60 including a piston rod 62, the cylinder 60 being rigidly secured at one end to the housing at the back side with the piston rod 62 extending from left to right with its distal end secured to the carriage block 44.

The jaws 52 and 54 are normally held engaged by means of spindles 64—64 extending upwardly from the underside of the jaw 52 through openings therein and through openings in the upper jaw 54 on the upper ends of which there are coil springs 66—66 mounted with their lower ends engaged with the upper side of the jaw 54 and their upper ends engaged with nuts 68—68 on the spindles.

The jaws are opened as they approach the sheet by cam means comprising a cam plate 70 (FIGS. 4 and 5) secured at one end to a spindle 72 which is pivotally mounted in a vertically disposed block 74 secured to one of a pair of bearing blocks at the rear side of the housing. An arm 76 is secured at one end to the spindle by a set screw 78 and has at its other end a recess into which is set one end of a spring 80, the opposite end of which is set into a recess 82 in the bearing block. The spring 80 operates on the arm 76 to hold the cam 70 in a downwardly inclined position as shown in FIG. 5. The cam 70 is supported in a position such that it is substantially in alignment with the rear end of the carriage block 44, as shown in FIG. 4, and a curved arm 84 is secured to the rear end of the pivoted jaw 54 and has at its distal end a pin 86 which is adapted to engage the cam 70 as the carriage block moves forwardly, that is, from right to left to lift the pivoted jaw away from the fixed jaw so that as the carriage block is moved up to the sheet support the jaws will be separated to permit the end of the sheet to enter between them. When the pin 86 reaches the upper end of the cam 70 it falls off and the springs 66—66 bring the pivoted jaw into engagement with the fixed jaw, clamping the sheet between the jaws. As the carriage block moves from left to right withdrawing with it the sheet the pin 86 travels from left to right under the cam 70 which is permitted to yield upwardly in opposition to the spring 80. The jaws draw the sheet from the sheet support horizontally between the tray holder and platen 16 and 18 and hold it uniformly flat and taut in readiness for application to the rim of the tray.

The tray holder and platen are mounted on the base for movement into and out of engagement with the lower and upper sides of the sheet held by the sheet feeding means as described above. The tray holder 16 (FIGS. 1 and 3) comprises a plate 87 of rectangular configuration containing a rectangular opening 88 in which is removably mounted an adapter 88*a* containing an opening 88*b* corresponding in configuration to the tray to which the sheet material is to be applied. If a tray other than rectangular in configuration is to be covered the adapter 88*a* is removed and replaced by one containing an opening of suitable configuration. An angle bar 92 is employed to detachably secure the adapter to the plate 87. If desired, the adapter may be designed to hold more than one tray by, for example, constructing the adapter in the form of an open grid containing a plurality of openings into which a corresponding number of trays may be inserted.

The plate 87 is pivotally supported between transversely spaces arms 96—96 and 98—98, the arms 96—96 being pivotally connected at their upper ends to the front of the plate 87 and the arms 98—98 being pivotally connected at their upper ends to the rear end of the plate 87. The lower ends of the arms are pivotally connected to spaced parallel bars 99—99 on the base 22. The arms 96—96 and 98—98 are pivotal forwardly and rearwardly to move the plate 87 forwardly and downwardly to receive a tray and upwardly and rearwardly to move the tray into engagement with the underside of the sheet for covering. Movement of the arms is provided for by a cylinder and piston assembly 100 including a rod 102. The cylinder 102 is pivotally connected at one end to a bracket 104 secured to the base and the protruding end of the piston rod 102 is pivotally connected to a cross-bar 106 secured between the arms 98—98.

The platen 18 (FIG. 3) comprises a supporting plate 108 to which is detachably mounted by means of an angle bar 110 a flat sealing plate 109. The supporting plate 108 is fastened to a pair of longitudinally spaced parallel arms 112—112, the latter being secured at their rear ends to a horizontal shaft 114 for movement about a horizontal axis from an elevated position above the plane of the sheet to a depressed position in engage-

ment with the upper side of the sheet. Alternately, the flat sealing plate **109** may comprise a ring corresponding in configuration to the rim of the tray if it is undesirable to heat the content of the tray. The sealing plate is heated by resistance elements, there being a plurality of terminals **111** at the edge of the sealing plate to which electric conductors are adapted to be connected. The platen may be comprised of metal containing resistor elements or of silicon rubber within which the resistance heating elements are embedded. The arms **112—112** are split and rigidly secured to the shaft **114** by clamp bolts **116**. The shaft **114** is supported in the aforesaid horizontal position at the rear side of the housing by bearing blocks **118—118**. An arm **120** is clamped to the shaft **114** and extends downwardly therefrom. A cylinder and piston assembly comprising a cylinder **122** and a piston rod **124** provide for rocking the arm **120** and hence raising and lowering the arms **112—112** and the platen supported thereby into and out of engagement with the sheet to press the sheet against the rim of a tray supported by the tray holder. The cylinder **122** is pivotally connected to a bracket plate **126** and the rod **124** is pivotally connected to the lower end of the arm **120**.

Following attachment of the sheet to the rim of the tray the sheet is severed by the sheet severing means **20** and this, as shown in FIG. **3**, comprises a wire **128** supported in a horizontal position transversely of the sheet by a vertically movable plate **130**. The plate **130** has at its upper edge a lug **131** into which is screwed a bolt **132** to which one end of the wire is secured, for example, by welding. The other end of the wire is fixed to the head **134** of a bolt **136** by means of which the wire is anchored at this end to the plate **130**. By adjusting the screw **132** the level of the wire **128** may be adjusted to bring it into parallelism with the sheet. Suitable electric connection (not shown) are provided for heating the wire **128** to a temperature such as to melt through the sheet on contact therewith. The plate **132** is moved vertically from a position in which the wire is below the plane of the sheet through the plane of the sheet far enough to complete cutting and then returned to its lower position by a piston and cylinder assembly comprising a cylinder **138** and rod **140**, the cylinder being secured to the housing at its lower end and the rod being connected at its distal end to the plate **130**.

The hot wire is employed for severing covering material comprised of any of the sheet plastics available for this purpose. If paper or foils or other materials not susceptible to cutting by heat are employed, a cutter, for example a shear, will be substituted for the wire which may comprise a fixed blade supported above the plane of the sheet and a movable blade mounted in place of the wire on the support **130**. Conveniently, the fixed blade can be attached to the platen **108** so as to be movable downwardly therewith for cooperation with the shear blade when the latter is moved upwardly and thereafter to be moved to an out of the way position so as not to interfere with the reciprocal movement of the grippers.

The sheet is released from the jaws at approximately the same time that operation of the sheet severing means is initiated by movement of the platen into engagement with the sheet. This is effected by a screw bolt **53** screwed into the plate **50** (FIG. **10**) in a position such that a bracket arm **113** on one of the arms **112** engages the head of screw bolt and forces the bracket **43** downwardly relative to the carriage block. A second screw bolt **55** is set into the bar **46** below the arm **84** so that downward movement of the bracket **43** brings the arm **84** into engagement with the head of the screw bolt **55** which will prevent the upper jaw from moving downwardly and hence separate the jaws to release the sheet.

Optionally, as shown in FIG. **11**, the bracket **43** is fixed relative to the carriage block and a post **57** is mounted thereon to the top of which is secured an arm **59**. An air cylinder **61** is attached to the arm with its piston rod **63** extending downwardly therefrom through an opening **65** in the arm **84**. The piston rod has on it spaced collars **67** and **69** at opposite sides of the arm so that the air cylinder is adapted to raise and lower the arm and hence raise and lower the pivoted jaw. As thus constructed, the air cylinder is used in place of the earlier described cam to effect opening of the jaws to receive the sheet at the sheet holder and again to effect opening of the jaws after the sheet has been withdrawn and the platen has been moved into engagement with the sheet in place of the structure shown in FIG. **10**.

The sequence of operations is started after loading the tray manually or automatically into the tray holder by actuation of a foot treadle, hand control or by virtue of placing the tray in the tray holder. Initiation of a cycle first causes the tray holder and platen to move from below and above the sheet into engagement therewith to press the rim of the tray into sealing engagement with the sheet. At approximately the moment that the tray holder and platen engages the sheet the jaws are caused to release the sheet and the cutting means is moved upwardly to sever the sheet. At the upper limit of movement of the cutting means a switch is operated to effect separation of the tray holder and platen and as the platen reaches the upper limit of its upward movement initiates movement of the jaws toward the sheet holder to take hold of a new length of sheet and draw it out preparatory to the next cycle of operation.

The means for controlling the movement of the aforesaid parts of the machine are illustrated in FIGS. **10, 11, 12** and **13**, and comprises a valve V1 which may be manually operated by hand or by foot or if desired electrically operated and when operated shifts a pilot in a pilot valve P1 to permit air pressure from a supply C to the cylinder to cause the latter to raise the tray holder **16** into a position of engagement with the underside of the sheet. Simultaneously, air is supplied through the pilot valve P1 to the cylinder **122** to lower the platen **18** into engagement with the upper side of the sheet. Flow control devices F1, F2 at the opposite ends of the cylinder **100** and F3 and F4 at the opposite ends of the cylinder **122** are provided to enable controlling the flow of air pressure to these cylinders in such fashion as to bring the tray holder and platen simultaneously into engagement with the lower and upper surfaces of the sheet. As the platen moves into sealing position the arm **84** is operable, as related above, to lift the pivoted jaw away from the fixed jaw to release the sheet. Simultaneously, a finger **140** (FIG. **8**) secured by a collar **142** to the shaft **114** actuates an air

switch V3 which supplies air to the cylinder **138** to raise the plate **130** and the wire **128** to effect cutting of the sheet. A flow control member **F5** is provided at one end of the cylinder **138** to control the time taken to operate the sheet severing means and the sealing or dwell time. When the severing means reaches the upper extent of its movement an arm **141** on the rod **140** operates to open a valve **V2** to shift the pilot in the pilot valve **P1** in the opposite direction to supply pressure to the opposite ends of the cylinders **100** and **122** to retract the tray holder and platen. As the platen rises to its uppermost position it operates a valve **V4** to move a pilot in a pilot valve **P2** so as to supply pressure to the cylinder **60** to advance the carriage block **44** and the jaws toward the sheet support. When the jaws have advanced almost to the projecting edge of the sheet, as related above, they are open by the cam **70** to admit the sheet and then to close on the sheet. Simultaneously, with the closing of the jaws the bar **46**, by engagement with a valve **V5**, effects shifting of the spool in the pilot valve **P2** to cause the cylinder **60** to reverse and return the jaws closed on the sheet to their initial position against a mechanical stop **146**. This stop may be adjusted to allow for various lengths and so for trays of different lengths. Flow control members **F6** and **F7** are provided at the ends of the cylinder **60**.

A safety device is provided comprising a valve **V6** connected in series with the source of pressure in a position across the opening in the path of movement of the carrier so that if anything other than the carrier touches the member the valve will open and vent the air to the atmosphere.

Although the term "tray" has been employed herein in the description of the invention, it is not intended to be limiting but to include any and all paper, plastic and foil receptacles commonly used for packaging materials and items both edible and inedible.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents falling within the scope of the appended claims.

I claim:

1. Apparatus comprising sheet end supporting means for supporting the leading end of sheet material in a predetermined plane, a sheet severing device situated close to said sheet end supporting means, sheet feeding means supported in spaced relation to said sheet end supporting means for reciprocal movement toward and from the sheet supporting means, said sheet feeding means being operable to take hold of the leading end of the sheet at said sheet end supporting means and draw therefrom a predetermined length, a tray holder and sealing platen supported for movement toward and from the drawn out sheet to press the rim of a tray supported by the tray holder in engagement with the sheet, means controlling movement of said sheet feeding means, tray holder and platen in timed relation to each other so as to move the sheet feeding means toward said sheet end holding means to take hold of the leading end of the sheet and draw out said predetermined length while the tray supported platens are away from the plane of the sheet and when the tray holder and platen are moved into engagement with the sheet to effect release of the sheet feeding means from the sheet, means for effecting movement of the sheet severing device to sever the sheet adjacent the sheet end supporting means, means operable by movement of the platen into engagement with the sheet to initiate operation of the sheet severing means, and means operable by said sheet severing means following severing of the sheet to effect retraction of the tray holder and platen.

2. Apparatus according to claim 1, wherein the sheet end supporting means comprises, in closely spaced parallel relation, a flat plate and an overlying bar between which the sheet is adapted to be drawn.

3. Apparatus according to claim 2, comprising means pivotally supporting the bar at one end and a screw at the other end operable to adjust the bar relative to the flat plate to establish uniform pressure on the sheet drawn between the plate and bar.

4. Apparatus according to claim 1, comprising means operable by the platen as it moves away from said sealing position to initiate movement of the sheet feeding means toward the sheet end supporting means.

5. Apparatus comprising means for holding sheet material with an end projecting therefrom, sheet feeding means movable in reciprocation toward and from the holding means for taking hold of the projecting end of the sheet and drawing out a predetermined length thereof, and a tray holder and a sealing platen supported for movement toward and from the drawn out sheet to press the rim of a tray supported by the tray holder into engagement with the sheet, said sheet feeding means comprising a carriage block movable in reciprocation toward and from the sheet holding means, a pair of jaws, jaw supporting means yieldably supporting the jaws on the carriage block, means operable as the platen moves into engagement with the sheet to depress the jaw supporting means to move the jaws downwardly relative to said plane, and a member mounted in the path of downward movement of the jaw supporting means to intercept the upper jaw to effect separation thereof from the lower jaw.

6. Apparatus comprising means for holding sheet material with an end projecting therefrom, sheet feeding means movable in reciprocation toward and from the holding means for taking hold of the projecting end of the sheet and drawing out a predetermined length thereof, and a tray holder and a sealing platen supported for movement toward and from the drawn out sheet to press the rim of a tray supported by the tray holder into engagement with the sheet, said sheet feeding means comprising a reciprocable bar, a carriage block mounted on the bar for reciprocation therewith toward and from the sheet holding means, a pair of jaws, a vertically yieldable bracket member on the carriage block, said jaws being mounted on the bracket with one jaw fixed thereto and with the other jaw pivoted thereto, means yieldably holding the jaws engaged with each other, a post fixed to the bracket in a position to be engaged by a part moving downwardly with the platen to depress the bracket at the instant the platen moves into engagement with the sheet, and a second post situated below the bracket on the bar in a position to intercept the pivoted jaw as the bracket moves downwardly to open the jaws.

7. Apparatus according to claim 1, wherein the tray holder contains an opening corresponding in configuration to the tray into which the tray is adapted to be dropped and supported therein by engagement of the

rim with the holder, comprising pairs of transversely disposed arms pivotally connected at their upper ends to the front and rear sides of the tray holder and at their lower ends to a base, said arms being movable about the pivots at their lower ends to move the tray holder downwardly and forwardly to receive the tray and upwardly and rearwardly to engage the tray with the sheet, a cylinder and piston assembly, means pivotally connecting the cylinder to the base and means pivotally connecting the piston rod to one pair of said arms for effecting movement of the tray holder.

8. Apparatus according to claim 7, wherein arms are pivotally mounted on a shaft parallel to the course of movement of the sheet material to which the platen is mounted for movement of said platen from an elevated position to a position in engage ment with the sheet, a lever arm fixed to said shaft at an angle to the platen supporting arms, a cylinder and piston assembly, means pivotally connecting the cylinder to the base, and means pivotally connecting the piston rod to the lever arm.

9. Apparatus according to claim 1, wherein the platen is provided with a replaceable sealing ring corresponding in configuration to the rim of the tray.

10. Apparatus according to claim 1, wherein the tray holder is provided with a replaceable adapter containing an opening corresponding in configuration to the rim of the tray.

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