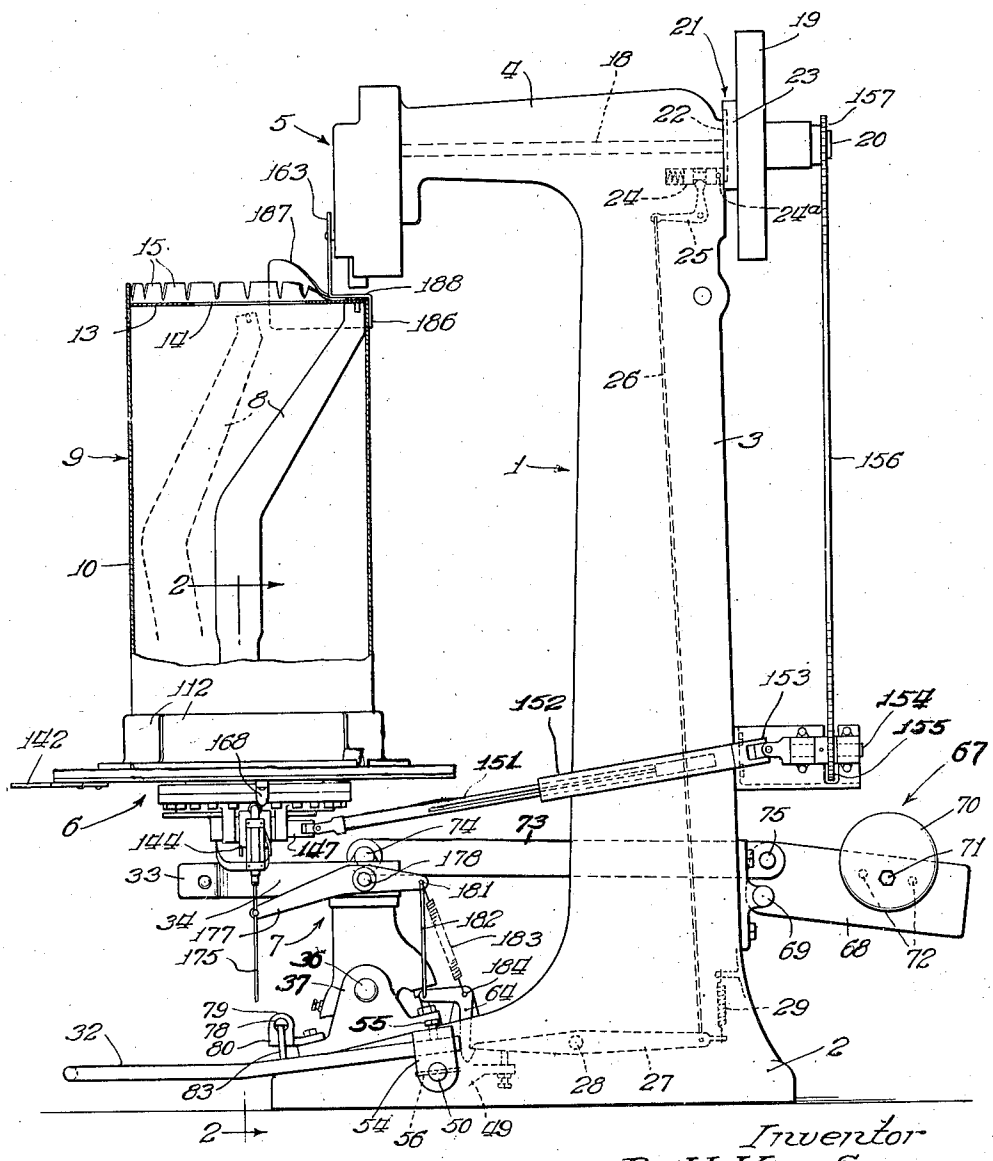
June 1, 1943. R. H. VAN SAUN ET AL 2,320,684

STAPLING MACHINE

Filed June 15, 1940 7 Sheets-Sheet 1

Fig. 1



Inventor
R. H. Van Saun

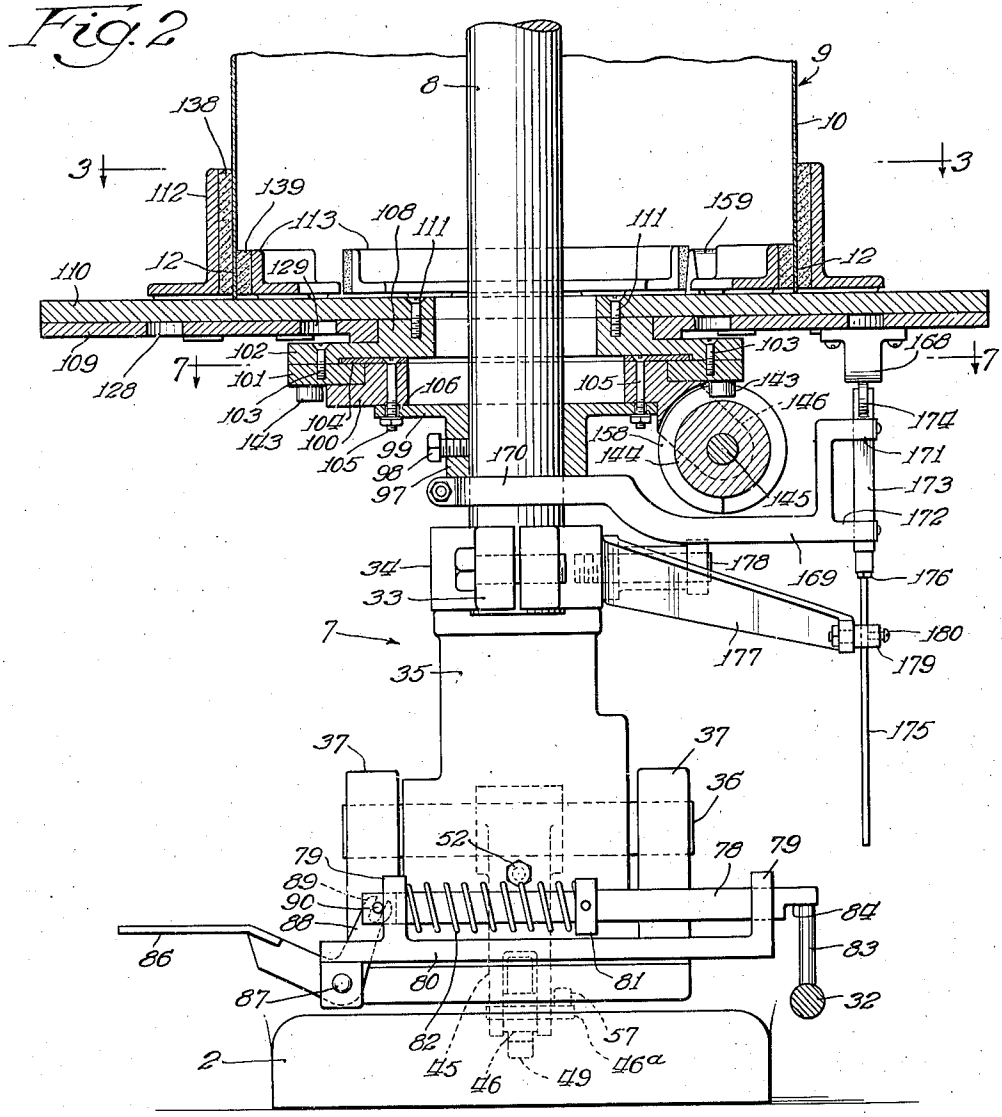
By: E. A. Wagonseller
Atty.

June 1, 1943. R. H. VAN SAUN ET AL 2,320,684

STAPLING MACHINE

Filed June 15, 1940 7 Sheets-Sheet 2

Fig. 2



Inventor
R. H. Van Saun

By: E. A. Wagonseller
Atty.

June 1, 1943. R. H. VAN SAUN ET AL 2,320,684

STAPLING MACHINE

Filed June 15, 1940 7 Sheets-Sheet 3

Fig. 3

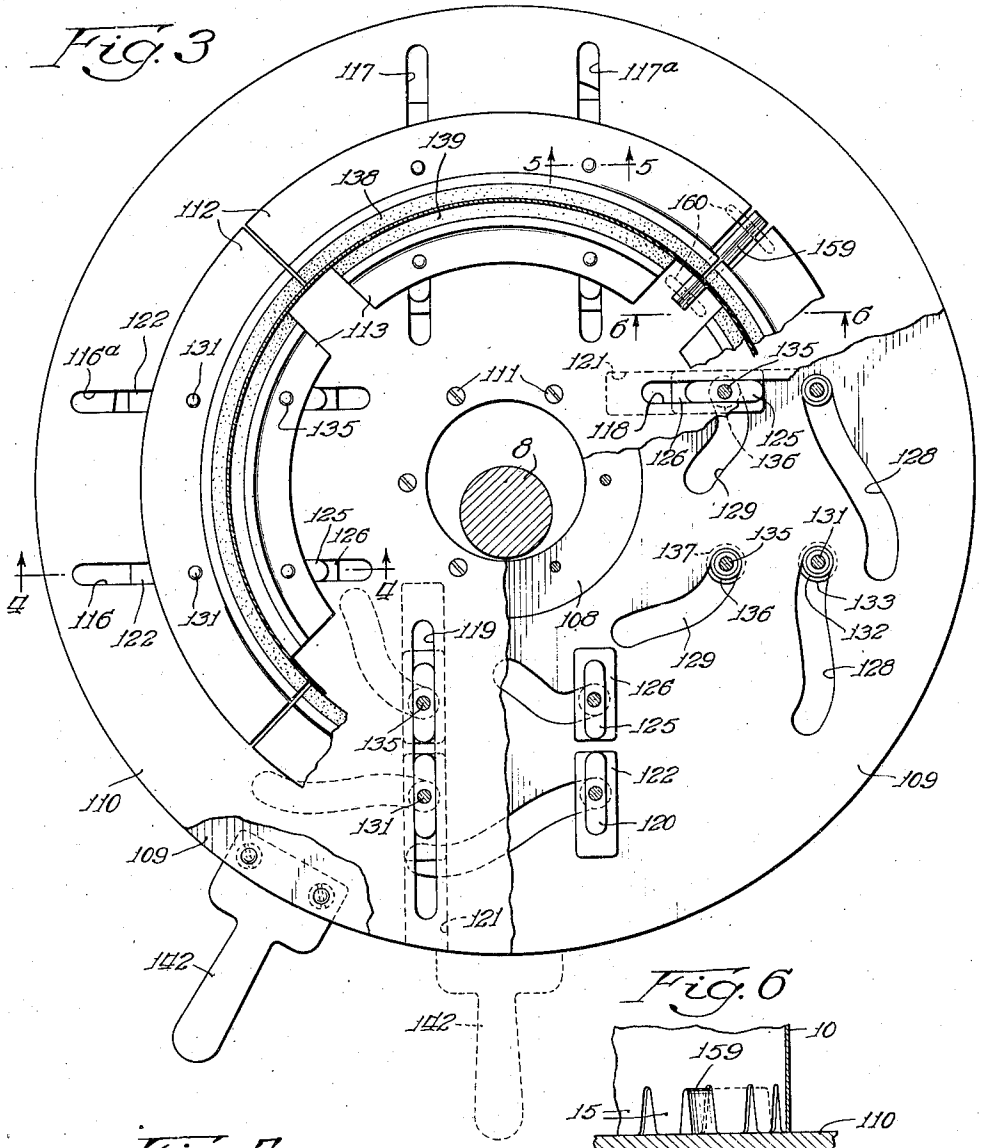


Fig. 6

Fig. 4

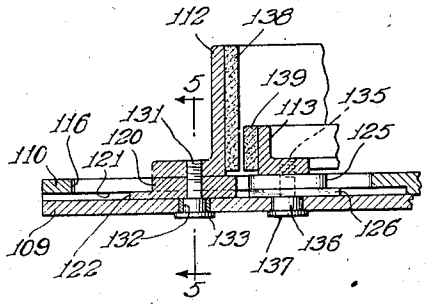
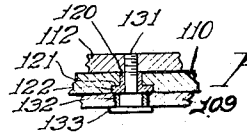


Fig. 5



Inventor
R. H. Van Saun

By: E. A. Wagonseller Atty.

June 1, 1943. R. H. VAN SAUN ET AL 2,320,684

STAPLING MACHINE

Filed June 15, 1940 7 Sheets-Sheet 4

Fig. 11

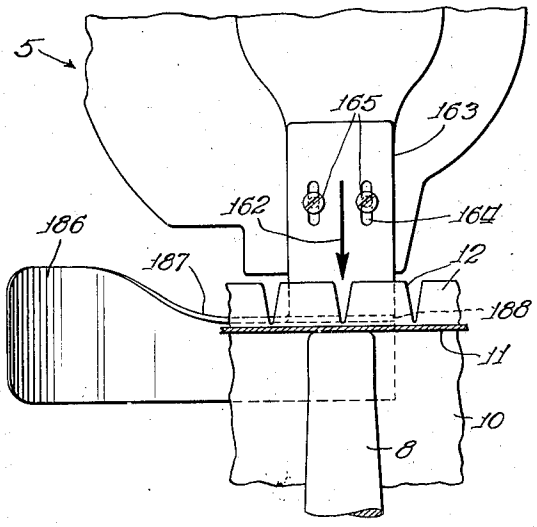


Fig. 12

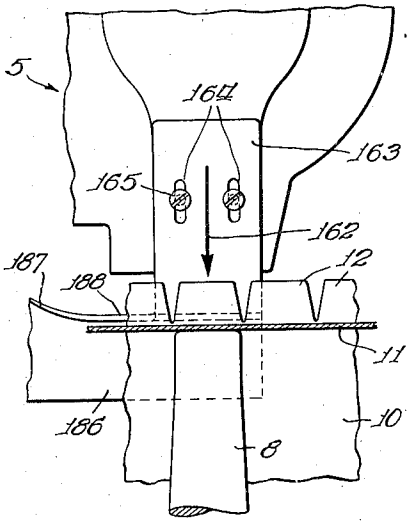
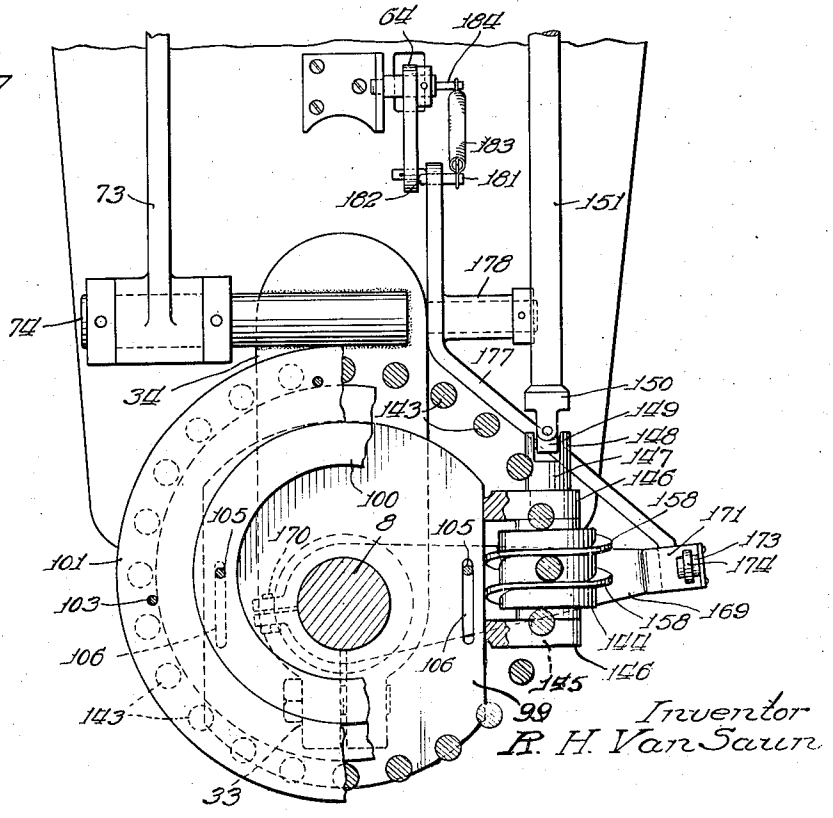


Fig. 7



Inventor
R. H. Van Saun

By: E. A. Wagoneller Atty.

June 1, 1943. R. H. VAN SAUN ET AL 2,320,684

STAPLING MACHINE

Filed June 15, 1940 7 Sheets-Sheet 5

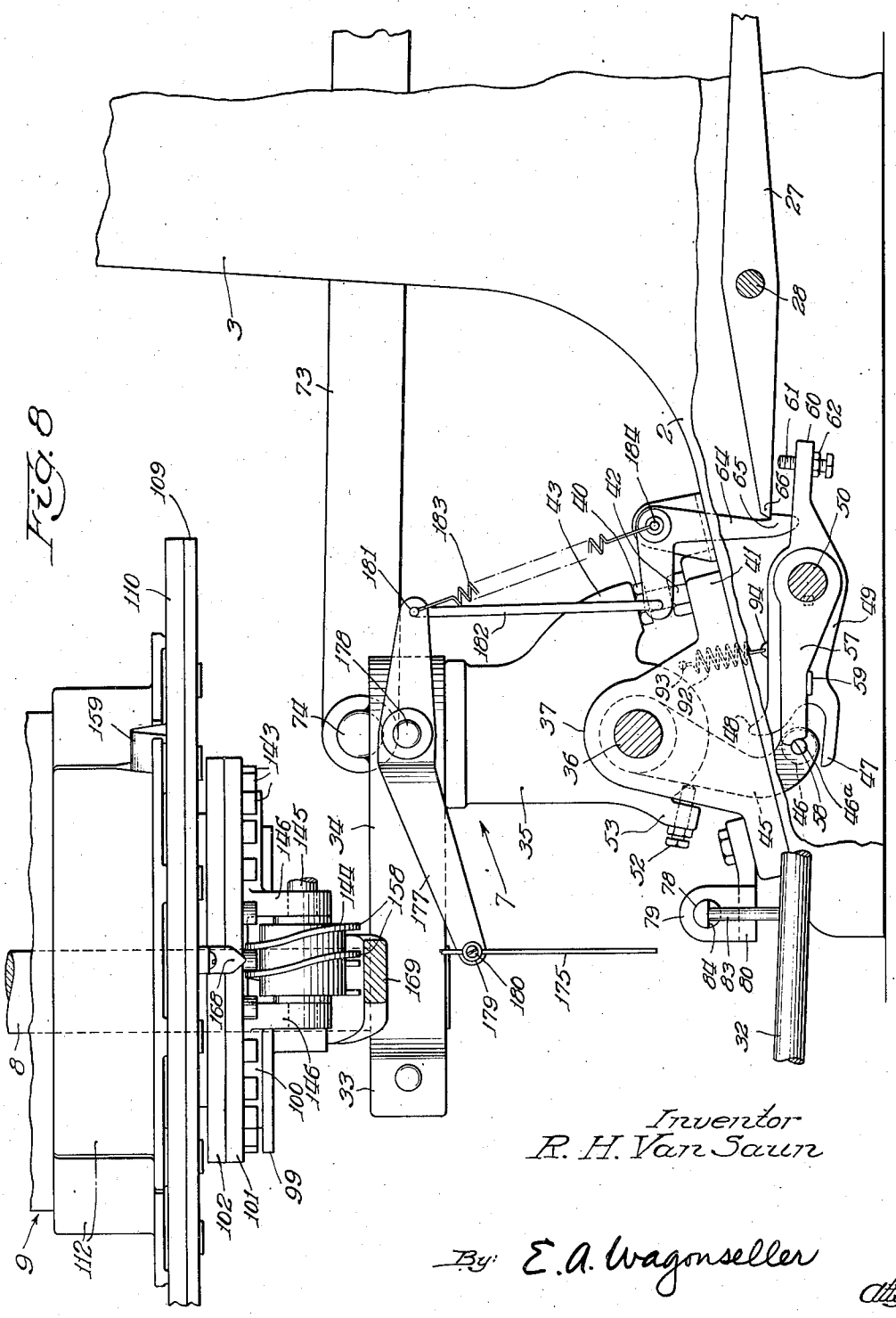


Fig. 8

Inventor
R. H. Van Saun

By: E. A. Wagonseller
Atty.

June 1, 1943. R. H. VAN SAUN ET AL 2,320,684

STAPLING MACHINE

Filed June 15, 1940 7 Sheets-Sheet 6

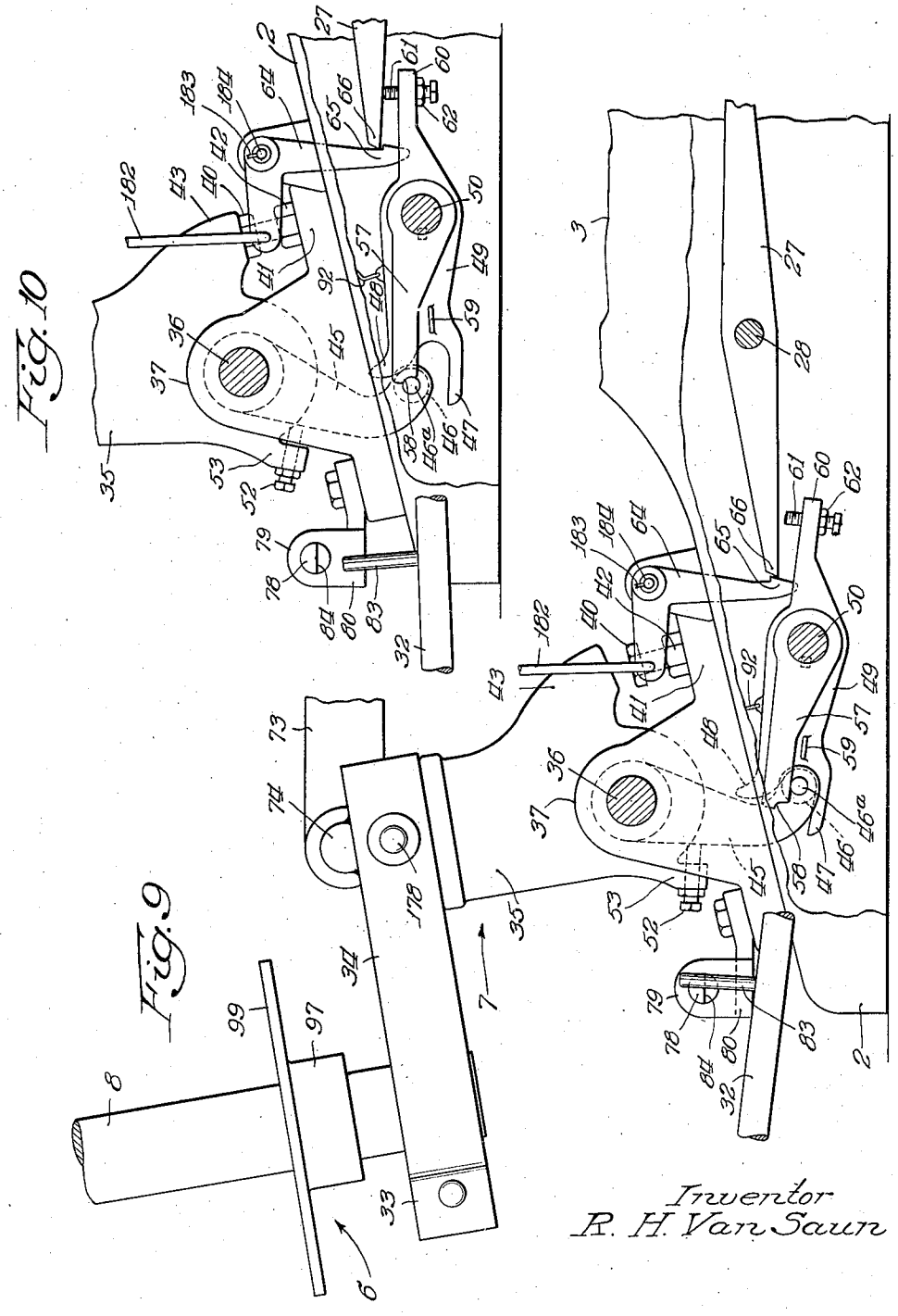


Fig. 10

Fig. 9

Inventor
R. H. Van Saun

By: E. A. Wagonseller
Atty.

June 1, 1943. R. H. VAN SAUN ET AL 2,320,684

STAPLING MACHINE

Filed June 15, 1940 7 Sheets-Sheet 7

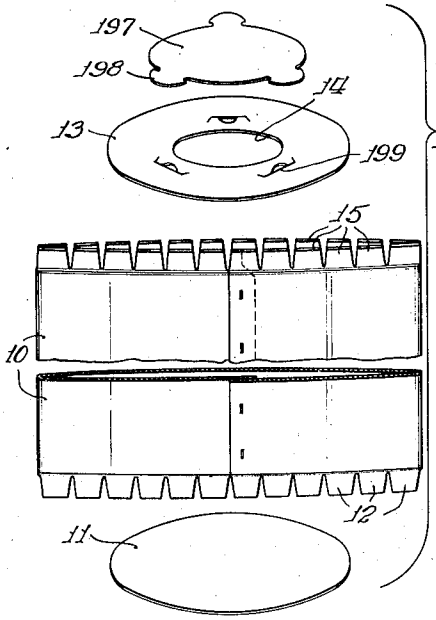


Fig. 13

Fig. 14

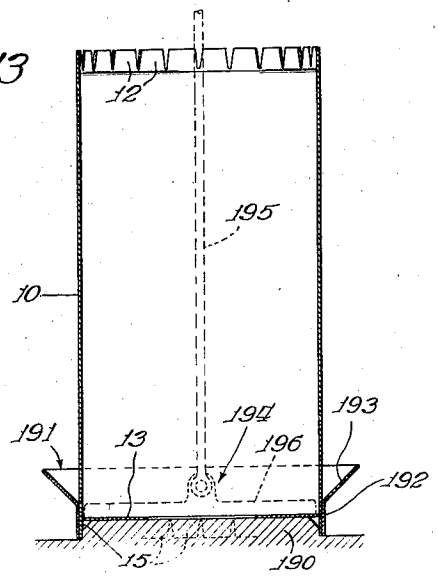


Fig. 15

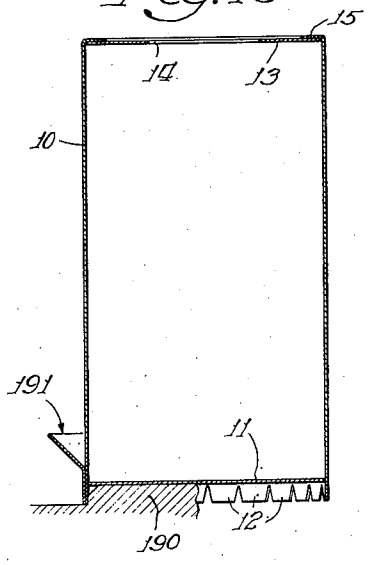
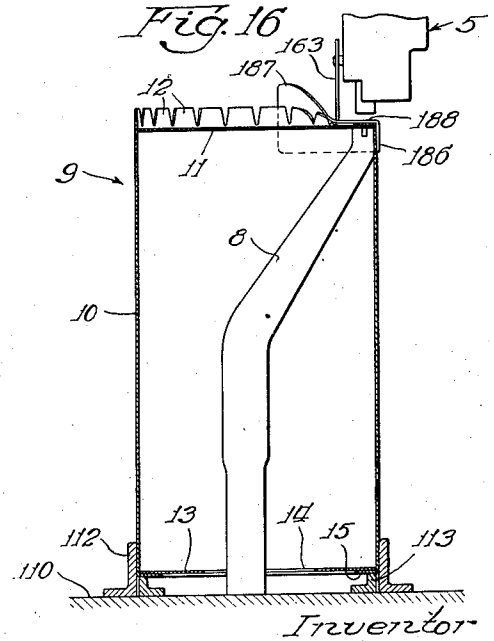


Fig. 16



Inventor
R. H. Van Saun

By: E. A. Wagonseller Atty.

Patented June 1, 1943 2,320,684

UNITED STATES PATENT OFFICE

2,320,684

STAPLING MACHINE

Raymond H. Van Saun, Chicago, Ill., assignor to Container Corporation of America, Chicago, Ill., a corporation of Delaware

Application June 15, 1940, Serial No. 340,790

10 Claims. (Cl. 93—55.1)

The present invention relates to stapling machines and, more particularly, to a form of stapling machine capable of securing a flat disc closure element in both top and bottom of a tubular container.

One object of the present invention is to combine stapling mechanism with a tiltable, rotary support for a tubular container to enable the container to be placed on the support while in one position and then brought to operative relation with the stapling mechanism in which latter position the container can be rotated to bring successive portions of the closure element of the container into staple receiving position.

Another object of the invention is to provide a simple and efficient form of clamping device for rotary supports adapted to retain a tubular container in proper relation to a stapling mechanism.

Another object of the invention is to provide an improved stapling mechanism including a rotary support adapted to retain a tubular container in proper stapling position, the rotary support being controlled to rotate with a step-by-step movement in synchronism with the operation of the stapling mechanism, the rotary support being further adapted to be tilted to enable the container to be moved into and out of operative position with respect to the stapling mechanism.

Another object of the invention is to provide container supporting means to retain a container in proper relation to stapling mechanism, the supporting means being adjustable for accommodating varying sizes of drums, both as to height and diameter.

Another object of the invention is to provide a stapling mechanism, including a rotary table for supporting containers in proper stapling position, in which the table is power driven and is provided with means for automatically stopping the rotation of the table after the proper number of staples has been inserted.

Another object of the invention is to provide a stapling mechanism for containers in the form of cylindrical drums having extending tabs on the body portion of the drums adapted to be secured to circular closure discs, there being means provided in conjunction with the stapling mechanism for automatically folding the tabs on the body of the drum into engagement with the closure disc just prior to the insertion of staples.

Other objects and advantages of the present invention will become apparent as the description proceeds.

In the drawings:

Fiig. 1 is a side elevation of a stapling machine constructed in accordance with the present invention illustrating the machine supporting a container as it appears in position ready to have a flat closure element or closure disc stapled in one end thereof;

Fig. 2 is a fragmentary vertical sectional view, taken substantially along line 2—2 of Fig. 1, illustrating details of the rotary supporting table for the container;

Fig. 3 is a fragmentary horizontal sectional view, taken along line 3—3 of Fig. 2, illustrating constructional details of the rotary table;

Fig. 4 is a fragmentary sectional detail view, taken along line 4—4 of Fig. 3, illustrating the container clamping elements;

Fig. 5 is a fragmentary detail view, taken on line 5—5 of Fig. 4, illustrating the pin and cam slot arrangement for the container clamping elements;

Fig. 6 is a fragmentary vertical sectional view, taken along line 6—6 of Fig. 3, illustrating the device for properly positioning a container on the rotary table;

Fig. 7 is a fragmentary horizontal sectional view, taken on line 7—7 of Fig. 2, illustrating the driving means for the rotary table;

Fig. 8 is fragmentary, enlarged, side elevational view, certain parts being broken away, illustrating the position of various controlling parts when the supporting table is in container stapling position;

Fig. 9 is a view similar to Fig. 8, illustrating the position of various control parts when the supporting table is in tilted position;

Fig. 10 is a view similar to Figs. 8 and 9, illustrating the control parts as they appear upon engagement of the clutch elements to initiate actuation of the staple driving mechanism and rotation of the supporting table;

Fig. 11 is a fragmentary front elevational view, illustrating the indicating means for determining the position of the container with respect to the staple driving mechanism;

Fig. 12 is a view similar to Fig. 11, illustrating a different position of the container with respect to the staple driving mechanism;

Fig. 13 is a view showing various separated parts of one form of container upon which the stapling machine of the present invention is adapted to operate:

Fig. 14 is a sectional view of a container positioned in a device for effecting a preliminary insertion of one closure disc;

Fig. 15 is a view somewhat similar to Fig. 14, illustrating the container positioned in the same device after the closure disc at the opposite end of the container has been inserted in a preliminary manner; and

Fig. 16 is a somewhat schematic view illustrating the position and arrangement of the parts of the stapling machine and rotary table when a container, having its top closure disc previously inserted, is ready to have the bottom closure disc stapled in place.

The present invention, as herein disclosed, is embodied in a stapling machine having a staple driving head mounted in a horizontal arm projecting from an upright frame, the lower part or base of the frame, including container supporting elements, arranged to present a container to be stapled in proper position with respect to the stapling head, there being also a staple clinching element or anvil arranged to be disposed within the container to be stapled, whereby a closure element of fibre board or other sheet material may be secured to a tubular body element of similar material by providing tabs or flaps on the body blank arranged to overlap the closure element and receive staples driven through both the tabs and the closure.

Referring more particularly to the drawings the frame of the stapling machine, indicated as a whole at 1, preferably comprises a horizontal base portion 2, an upright portion 3 and a horizontally extending arm 4. The arm 4 carries a staple driving head 5. A container supporting table, indicated as a whole at 6, is carried on a suitable supporting device 7 mounted on the base portion 2. A staple clinching element or post indicated at 8 is suitably mounted on the supporting device 7, preferably independently of the container supporting table.

The container to be stapled, indicated at 9, preferably comprises a tubular body blank 10 of sheet material such as fibre board, a closure 11 of similar sheet material is arranged to be secured in proper relation to the body portion 10 by means of tabs 12, 12 which, when folded over flat against the closure, are stapled thereto.

As illustrated in Figs. 13, 15 and 16, the closure 11 is preferably a bottom closure and a closure indicated at 13 is employed as a top closure, this closure having an opening 14 therein to accommodate the staple clinching post 8 as will be presently more fully described. The closure 13 is preferably secured to the body member 10 by stapling the closure to foldable tabs 15, 15 similar to tabs 12, 12.

The stapling head 5, as herein disclosed, may be of conventional form and is preferably of the type wherein a roll of flat wire is fed to a suitable cutting and forming device for bringing the wire to staple form just prior to its being driven into the parts to be secured together. For the purpose of driving the mechanism in the head 5, a shaft 18 is suitably mounted in the horizontal arm 4. This shaft is driven by a pulley 19 mounted on a stub shaft 20 provided wih a clutch element 21 enabling the shafts 18 and 20 to be connected or disconnected at will. The pulley 19 is suitably connected to a source of power (not shown) such as an electric motor mounted on the frame 1.

The clutch 21 is preferably provided with a spring-pressed element 24 arranged to constantly urge the clutch toward its open position. For the purpose of moving the element 24 to cause clutch engagement, there is provided a bell crank lever 25 having one end engageable with the element 24 and the other end connected with the upper end of a rod 26 which is connected at its lower end to a lever 27 pivoted at 28 on the base portion 2 of the frame. The lever 27 is provided with a spring 29 urging it toward counterclockwise movement as viewed in Fig. 1. For the purpose of disengaging the clutch and controlling other parts of the stapling machine, a foot lever 32 is provided. This foot lever is connected through mechanism to be presently described to cause counterclockwise movement of the lever 27 which causes the clutch parts to be engaged through intervention of the mechanism above described.

The clutch 21 comprises separable parts 22 and 23, the part 23 being the driving and the part 22 being the driven part. When the element 24 is moved to the left, as illustrated in Fig. 1, the parts 22 and 23 will be brought into engagement so as to cause the rotation of the shaft 18 with the shaft 20 and the mechanism of the stapling head 5 is so constructed as to cause the insertion of a staple for each revolution of the shaft 18. When the lever 27 is moved into clutch disengaging position the control element 24 will move toward the right, as shown in Fig. 1, causing disengagement of the clutch parts and cause stoppage of the part 22 fixed on the shaft 18 at a fixed point by reason of the movement of the reduced end 24a of the element 24 into an aperture in the face of the clutch element 22. Thus, the stapling mechanism will be caused to operate through one or more exact cycles during the time between engagement and disengagement of the clutch elements and the staple inserting cycle will always start at exactly the same point.

A type of clutch suitable for this purpose is illustrated in the patents to Maynard No. 1,495,342, dated May 27, 1924, and No. 1,802,822, dated April 28, 1931.

The container supporting table 6 is supported upon the lower part of the staple clinching post 8 by construction presently to be described. The lowermost part of the post 8 is arranged to be clamped within the jaw portion 33 of an arm 34 forming part of the supporting device 7. The inner end of arm 34 is fixed to a rocker element 35 supported on a rod 36 having its ends mounted in bearing elements 37 bolted to the base portion 2 of the stapling machine frame 1. By reason of the mounting of the rocker element the supporting device 7 for the table 6 is arranged to be tilted so that the clinching post 8 can be moved from its full line position, indicated in Fig. 1 to the dotted line position shown in this figure.

For the purpose of limiting the swinging movement of the clinching post and supporting table in a clockwise direction, as viewed in Fig. 1, there is provided an adjustable stop element, which, in the present instance, is in the form of a machine screw 40 threaded into the extension 41 on the bearing element 37 and arranged to be held in adjusted position by means of a lock nut 42. An extension on the rocker element 35 is arranged to contact the head of the machine screw 40 and when this extension has contacted the machine screw the rocker element 35 is limited from further movement in this direction.

The means for limiting the swinging of the rocker element toward the left, as viewed in Fig. 1, will now be described. An arm 45, see Figs. 2, 8, 9 and 10, is freely mounted at its upper end on the rod 36 and is provided with an end portion carrying a roller 46 mounted on a pin 46a se-

cured in the end of arm 45. The roller 46 is receivable into an open jaw portion formed by parts 47 and 48 on an arm 49, keyed on a rod 50, and having its ends supported in suitable bearings, not shown, formed in the base portion 2 of the stapling machine frame.

A set screw 52, threaded into an extension 53 on the rocker element 35, is arranged so that its inner end will bear on the arm 45. Adjustment of the set screw will change the relative arrangement of the arm 45 and rocker element 35 to different angular positions. Thus, the forward position of the clinching post 8, as illustrated in broken lines in Fig. 1, may be suitably varied according to the desires of the operator.

When the supporting table and clinching post are in a forward, tilted position, as shown in Fig. 9, and as suggested by the broken lines as to the position of the post 8 in Fig. 1, these parts can be moved to their rearward or stapling position by downward pressure upon the foot lever 32. For this purpose, the end of foot lever 32 is preferably secured in a rocker element 54 by means of a set screw 55, the rocker element being secured on the end of the rod 50 by means of a pin 56 passing through the rod and rocker element. Thus, when the end of the foot lever 32 is depressed, as it appears in the position illustrated in Fig. 1, it will cause the rod 50 to turn in a counterclockwise direction and cause a consequent counterclockwise movement of the arm 49. As the arm 49 moves downward from the position shown in Fig. 9, to that shown in Fig. 10, the inner surface of the portion 48 on the arm 49 will have, due to its configuration, a camming action on the roller 46 mounted in the lower end of the arm 45. This forces the arm 45 toward the left, as viewed in Fig. 10, and the pressure of the front edge of the arm against the set screw 52 causes the rocker element 35 to move in a clockwise direction until the extension 43 strikes the head of machine screw 40. See particularly Figs. 1, 8 and 10.

Means are preferably provided for locking the rocker element 35 when it has reached the end of its clockwise movement, as illustrated in Fig. 10. For this purpose, an arm 57 is mounted to rock freely on rod 50. This arm 57 has a detent portion 58 formed at its outer end which drops down into engagement with the pin 46a upon which the roller 46 is mounted in the lower end of arm 45. Downward swinging movement of arm 57 is limited by a projecting lug 59 on the arm 49 so that if the arm 49 is moving upward it will cause a release of the arm 57 from its engagement with the pin 46a.

Another effect produced by downward pressure upon the foot lever 32 is to cause the extended portion 60 of the arm 49 to contact the adjacent end of clutch control lever 27, thus causing engagement of the clutch parts 22 and 23. The point at which locking of the lever 27 is initiated may be suitably varied by means of a set screw 61 and lock nut 62 provided in the extended portion 60 of the arm 49.

The lever 27 is prefarbly arranged so as to be automatically locked in its clutch actuating position. For this purpose a bell crank lever 64 is rockably mounted on the base frame and is formed with a latch portion 65 at its lower end adapted to engage beneath the tapered end 66 of the lever 27. The means for mounting and controlling the bell crank lever 64 will presently be described.

For the purpose of facilitating rearward swinging movement of the supporting table 6, there is provided a counterbalance means, indicated generally at 67, which is arranged to urge the table in a swinging movement to the right, as viewed in Fig. 1. In the present instance there is provided a counterbalance arm 68 pivoted at 69 on the upright portion 3 of the stapling machine frame. A counterweight 70 is provided which may be supported in any one of several positions on the arm 68 by securing it, as by means of a bolt 71, in a selected one of several bolt openings 72, 72. The arm 68 is connected with the rocker element 7 by a link 73 having one end pivoted at 74 to the rocker element 7 and the other end pivoted at 75 to the arm 68 at a point above and somewhat spaced from the pivotal connection 69 of the arm 68 with the stapling machine frame.

Means are provided for locking the foot lever 32 in its lowermost position in which the supporting table 6 will assume the position illustrated in Fig. 1 and the clutch elements 22 and 23 will be in engaged relation. For this purpose there is provided a rod 78 (see Fig. 2) movable endwise in guides 79, 79, carried by a frame element 80 suitably bolted to the bearing element 37 which supports the rod 36 for the rocker element. The rod 78 is provided with a collar 81 against which the end of a coil spring 82 is arranged to press, this spring having its other end abutted against the guide 79 so as to constantly urge the rod 78 toward the right, as viewed in Fig. 2.

For the purpose of providing for suitable engagement between the rod 78 and the foot lever 32 there is provided, in the present instance, an upstanding pin 83 on the foot lever 32 in such position that the pin engages a flattened surface portion 84 formed on the rod 78. Thus, as viewed in Fig. 2, when the flattened portion 84 of the rod 78 is bearing against the upper end of the pin 83, the foot lever 32 will be held against upward movement.

In order to release the foot lever for upward movement there is provided a foot pedal 86 pivoted at 87 on the frame 80 and having a bell crank portion 88 provided with a slotted end 89 engageable with a pin 90 projecting from the end of the rod 78. Thus, by depressing the pedal 86, the bell crank lever 88 will be caused to swing toward the left, as viewed in Fig. 2 and will retract the rod 78 so that this rod will no longer bear on the pin 83.

Means are provided for bringing the foot lever to its uppermost position when it has been released by the mechanism just described. For this purpose a coil spring 92 is provided having one end secured to a stationary point on the stapling machine frame, this being, in the present instance, illustrated as a pin 93 positioned on the bearing 37, the other end of the spring being secured to the arm 49 within a suitable opening formed in a lug 94 provided on the arm.

The arrangement of the parts 49 and 57 and lug 59 is such that, when the rod 78 is retracted, the spring 92 will tend to lift the arm 49, carrying with it the arm 57 due to the position of the lug 59 and will raise the detent portion 58 of the arm 57 from its engagement with the pin 46a thus freeing the arm 45 for movement in a counter-clockwise direction, as viewed in Figs. 8, 9 and 10.

When the parts have been moved to the positions just described the rocker element 7 will then be free to swing outward or forward from the position illustrated in Fig. 1 to that suggested

by the broken line position of the clinching post 8 in the same figure. Due to the arrangement of the counterbalance mechanism 67 the table will swing outward as the counterbalance tends to exert somewhat less than the necessary degree of leverage to hold it in rearward position.

It is also to be noted that when the table 6 has been brought to its forward or inclined position, as illustrated in Fig. 9, the roller 46 will have moved entirely into the jaw opening provided between parts 47 and 48 in the free end of arm 49, and the detent member 57 will have its end resting upon pin 46a. Previous to the initial tilting of the table the detent 65 will have been removed from its engagement with the latch end 66 of the lever 27 by mechanism presently to be described.

The container supporting table and means for adjustment for different sizes of containers, for different diameters of containers, and for different heights of containers, as well as means for causing rotation of table, will now be described.

In the present instance the entire container supporting table is carried on the lower portion of the clinching post 8 which, as previously described, is supported in the clamping parts 33 of the arm 34. The main supporting member comprises a flanged collar element 97 closely fitting the lower end of the clinching post 8 and held from rotation on the post by means of a set screw 98. The member 97 has an outwardly projecting flange 99 on its upper part which supports an element 100 which acts as the hub upon which the rotary part of the table 6 is supported.

The rotary part of the table which is directly supported on the hub element 100 comprises a lower ring 101 and an upper ring 102 held together by machine screws 103, 103, there being, however, an annular space provided between the rings 101 and 102 arranged to receive a retaining ring 104 held to the hub element 100 by countersunk head screws 105, 105 which pass through the hub element 100 and through suitable openings 106 in the flanged collar element 99 and being secured to the element 99 by nuts on the end of the bolt 105. The openings 106 which receive the bolts 105 are preferably elongated as illustrated in Fig. 7 for the purpose of moving the hub element 100 toward or from the upright frame element 3 of the stapling machine so as to adapt the table for containers of different cross-sectional sizes or diameters.

The ring member 102 has an upwardly extending hub portion 108 around which an annular plate 109 is positioned for limited rotary or oscillating movement, the plate 109 resting on the ring member 102. On the upper surface of the hub element 108 and resting closely above the plate 109 is a base plate 110 upon the upper surface of which the container 9 is adapted to rest prior to the assembly of a closure in the upper part thereof as illustrated in Fig. 2. The base plate 110 is secured against relative movement with respect to the hub element 102 by means of countersunk head machine screws 111, 111.

Carried on the base plate 110 are suitable exterior clamps 112 and interior clamps 113 arranged for movement on the surface of the plates 110. As illustrated in Fig. 3, the clamps are preferably arranged in four groups, each group comprising an exterior and interior clamp element. For the purpose of controlling the position of the clamps the base plate 110 is formed with four pairs of slots; two pairs of which are indicated at 116, 116—a and 117, 117—a, another slot being indicated at 118 and another at 119. The slots are preferably arranged on each side of and parallel to a radial line passing through the center of the hub element 102 and through the central portion of the respective pairs of clamps 112 and 113.

As shown in Fig. 4 the clamp element 112 preferably comprises an angle element of segmental shape on the lower flange of which is secured a pair of blocks 120, 120 fitted into the slots 116, 116a, 117, 117a, etc. For the purpose of retaining the block elements 120, 120 within the slots 116, 117, etc., the circular base plate 110 is provided with machined-out portions indicated at 121 in Fig. 5 into which the flange pieces 122, 122 on the block portions 120 are adapted to be received.

The inner clamp elements 113, 113 are likewise in the form of angle elements of segmental shape, the lower flange of which is supplied with block elements 125, 125 having laterally extending flange pieces 126, 126 received within the machined-out portions 121, 121 of the base plate 110. See Figs. 4 and 5.

For the purpose of positively moving the clamp elements 112 and 113 toward and from each other, suitably shaped cam elements in the form of slots formed in the rotary plate 109 are provided. As illustrated in Fig. 3, the slots 128, 128 are provided to control the outer clamp elements 112 and the slots 129, 129 are provided for controlling the inner clamp elements 113.

As illustrated in Figs. 4 and 5 the clamping elements 112 are provided with suitably threaded openings for the reception of the threaded ends of machine screws 131, 131 having their lower ends fitted with roller elements 132, 132 which are retained on the ends of machine screws by means of head or flange portions 133, 133. The roller elements 132 are received in the cam slot 128 in the plate 109.

In like manner, the interior clamps 113 are provided with threaded openings to receive machine screws 135, 135 having rollers 136 at their ends and retained on the machine screws by means of head or flange elements 137. The rollers 136 are arranged to be received in the cam slots 129 on the plate 109. By particular reference to Fig. 3, it can be seen that when the plate 109 is moved in a counter-clockwise direction, the roller on the clamps 112 will be forced toward the outside of plate 109 and the rollers on clamp 113 will be forced toward the central portion of plate 109. In other words, the two sets of clamps will be forced in opposite directions. This counter-clockwise movement of the plate 109 will cause an opening of the clamps and reversely a clockwise movement of the plate 109 will cause the respective groups of clamps to approach each other to clamp the lower end of the body of the container 9 as illustrated in Fig. 2.

Yielding lining elements 138 and 139 are provided respectively upon the clamps 112, 113 to effect necessary gripping of the lower edges of the container walls and to compensate for any slight inaccuracy of the machining of the parts of plates 109 and 110 and the clamps 112 and 113.

It is to be noted that the cam slots 128 and 129 are so shaped at their ends as to be slightly eccentric to the axis of rotation of plate 110 so that the final portion of movement of the plate 109 will tend to cause a more or less firm clamping effect upon the container 9 clamped therein. The cam slots 129, 129 are formed the same shape as the cam slots 128 at the end of slot corresponding to the clamping position so as to produce a relatively firm clamping effect upon the inner clamps.

The outer ends of each of the slots 128 and 129 are likewise made to be substantially concentric with the center of rotation of the plate 110 although this particular curvature as to the open position of the clamps is not entirely necessary.

For convenience in moving the clamping plate 109 there is provided a handle 142 bolted to the edge of the plate as seen in Fig. 3.

Due to the removability of the clamps 112, 113 from the plate 110 it is apparent that larger or smaller diameter clamps may be provided and used so as to accomodate larger or smaller diameters of containers.

As illustrated in Figs. 2 and 16 the inner clamps 113 are formed of such a height as to permit a container with the lower closure secured therein (in this case the final top closure) to be placed so that when resting on the upper edges of the clamps 113 the upwardly directed flanges 12, 12 of the container will be brought into proper position in respect to the stapling head. In this position of the container the outer clamps only will function to hold the container in fixed relation to the plate 110 of the supporting table 6. In the event a different size of tab 12 is employed it will, of course, be necessary to select a different height of clamp 113.

While it is within the scope of this invention to rotate the table 6 by hand, it is preferable to provide means for rotating the table in a step-by-step manner and to coordinate the step-by-step rotation with the operation of the stapling head so that the table will rotate one step and then come to a stop upon which one staple will be inserted in a down-turned tab 12 or 15, as the case may be, after which the table will then be rotated one more step to bring another tab into stapling position and so on until all of the tabs have been stapled.

For the purpose of providing step-by-step rotation of the table there is provided a series of suitably placed pins 143, 143 projecting downwardly from the under face of the ring element 101. The number of these pins 143 corresponds to the number of tabs 12 and 15 on the container to be staple. A rotary cam element 144 is provided for engagement with pins 143. This cam element is mounted on a shaft 145 supported in bearings 146, 146 projecting from the hub element 100 which is mounted on the flanged collar 97. The shaft 145 has a projecting part 147 having a jaw portion 148 in which a block 149 is mounted on a laterally extending pin for a slight rocking movement. An element 150 similar to the part 147 is connected to the block 149 by means of a pin which also provides for a slight rocking movement. This element 150 is connected to a shaft 151. It is to be noted that the parts 147, 148, 149 and 150 form a universal joint connecting the shafts 151 and 145. As shown in Fig. 1, the shaft 151 is keyed to telescope within a hollow shaft 152 which, in turn, is connected through a suitable universal joint 153 to a short shaft 154 provided with a sprocket 155 over which a suitable chain 156 is arranged which will pass over a sprocket 157 of the same size on the driven shaft 20 connected with driven pulley 19. It will now be seen that, through the mechanism just described, the cam 144 will be driven in coordination with the stapling mechanism.

The cam 144 is supplied with suitably shaped cam guide elements 158, 158 engaging one on each side of the pins 143, 143. The members 158, 158 terminate at each end in an open portion so that pins 143 will pass into and out of engagement with the cams. Adjacent the open end of the cam 158, 158 the shape of the cams is spiral so that it will rotate the table due to movement of the cams relative to the pins 143, 143 at the beginning and the end of engagement of these pins with the cam guides. Intermediate the open ends of cam guides as seen in Fig. 7 there is a dwell portion provided which tends to hold the rotating table stationary during the time that the dwell portion is passing a given pin 143. The dwell provided by the dwell portion of the cam 156, 156 is just sufficient to enable the stapling mechanism to pass through the staple driving portion of the stapling cycle and, just after the stable has been driven in and clinched, the spiral portion of the cams will again cause movement of the table to bring a succeeding tab into a stapling position.

The provision of the universal joints on the shafts 151, 152 allow for inner and outer swinging movements of the container supporting table without requiring disconnection of the cam element from the table driving mechanism. This construction also accommodates the vertical adjustment of the supporting table.

For the purpose of properly positioning a container to staple the first closure in position there is provided on the table 110 an upstanding wedge-shaped positioning or guiding member 159 which is arranged to fit within one of the notches between adjacent tabs 12, 12. The positioning member 159 is provided with suitably downwardly projecting bolts arranged to be received within spaced slots 160, 160 in the baseplate 110 so that the member 159 may be disposed in different positions circumferentially of the plate to insure the positioning of the tabs 15, 15 in proper position with respect to the staple driving mechanism. In one position of the member 159 the staple may be arranged to be inserted centrally of the tabs 15, 15 and, in another position of the member 159 the staples may be arranged to be inserted so as to bridge over the space between adjacent tabs 15, 15.

As the member 159 is adapted to function only when projecting tabs are present at the lower portion of the container, other means are preferably provided for indicating when the container is properly positioned after the top closure element 14 has been stapled in position and the container has been inverted preparatory to stapling the bottom closure 11 in place as illustrated in Fig. 16. For this purpose (see Figs. 11 and 12) an indicating means 162 is provided. This indicating means may be in the form of an arrow marked directly on the upright portion of the stapling machine frame but, in the present instance, it is marked or affixed on a plate 163 having elongated apertures 164 through which securing bolts 165 are arranged to pass. The additional purpose of the plate 163 will presently be explained.

Fig. 11 illustrates the position of the tabs 15, 15 when it is desired to insert staples so as to bridge the space between the tabs, and Fig. 12 illustrates the position of the container in which staples will be inserted centrally of the tabs.

After the container 9 has been clamped in position on the rotary table, as above described, the table having first been moved from its forward to its rearward position, as illustrated in Fig. 1, the table is ready to be set in rotation, the stapling mechanism being at the same time actuated so that, as the table rotates with a step-by-step motion, a staple will be inserted at each stop in the

table movement. When the table has completed one revolution and a staple has been driven into each tab it is desirable to cause the mechanism to stop automatically. For this purpose a trip element 168 is secured at a suitable point on the under side of the table 109 (see Fig. 2). This trip element 168 is arranged to actuate automatic stop mechanism which will now be described.

An arm 169 (see Figs. 2 and 7) is provided with a clamping portion 170 by which the arm may be secured in varying angular positions around the lower end of the clinching post 8. The outer end of the arm 169 has suitable guide portions 171 and 172 thereon having suitable openings through which is received a slidable rod 173 having a roller 174 at its upper end arranged to contact the trip element 168. The rod 173 is preferably hollow and has a threaded portion at its lower end into which a threaded stem 175 is adapted to be received and held in fixed adjusted position by a lock nut 176. A trip lever 177 is rockably mounted at 178 on the upper end of the rocker element 35 and has its forward end connected with the threaded stem 175 by means of a block 179 carried on the end of the lever 177 providing for a small amount of freedom for rocking movement. A set screw 180 is threaded into the block 179 so that its end may bear against the stem 175 to provide for adjustment of the end of the lever 177 along the length of the stem 175. The other end of the lever 177 is provided with a suitable opening 181 for reception of the end of a link 182 which has its lower end connected through one arm of the bell crank lever 64 (see Figs. 1, 8 and 10). Also connected at 181 to the lever 177 is a spring 183 which is secured at its lower end to a fixed point on the frame of the stapling machine, herein indicated as a projecting portion of a pin 184 upon which the bell crank lever 64 is mounted. The spring 183 is held under tension so that the forward end of the lever 177 will be urged to swing upwardly, as viewed in Figs. 2 and 8. Due to the provision of the mechanism just described, after the table has made one revolution, and the trip element 168 on the underside of the table has moved into position where it will engage and depress the roller 174 on the rod 173, this rod will be forced downwardly at its forward end, causing upward movement of the link 182 and consequent swinging of the bell crank lever 64 to remove its detent end from the end of lever 27 and allowing this lever to move in a direction to disengage the clutch parts 22 and 23, thus effecting instant stoppage of the driving means for the stapling mechanism and the rotary table. The control elements are thus brought to an inoperative position so that manual intervention will be required to again set the rotary table and stapling mechanism into operation.

The tabs for attaching the closure elements to the body blank of the container are preferably moved from upright to downturned position just prior to bringing the tabs into operative position with respect to the staple driving mechanism. For this purpose the plate 163 carries a suitably shaped extension 186 having a spirally curved guiding portion 187 formed thereon which will engage the upstanding tabs and progressively move them into downturned position as the container is rotated with the rotary table. The forward edge portions of the spirally shaped plate portion 187 are unobstructed so that when a drum 9 has been placed upon and clamped with relation to the rotary table while in forward tilted position and then moved to the rear, that is, to the horizontal position of the table, the tabs immediately beneath the spirally curved portion 187 will be engaged and turned downwardly depending upon the positions of the tabs with respect to the portion 187 (see Fig. 1). The horizontal portion of the plate 186 indicated at 188 retains the tab in downfolded position over the closure disc 11 or 13, as the case may be. This horizontal portion 188 is provided with a suitable opening large enough to admit the passage of staples into the tabs without interference with the stapling mechanism but not so large as to permit the tabs to become displaced.

The manner of attachment of the plate 163 to the frame of the stapling machine enables the horizontal portion of the extension 186 to be lowered or raised toward or away from the top of the container whereby the pressure under which the tabs are held against the closure discs of the container may be suitably varied. When it is desired to adjust the position of the horizontal plate portion 188 it is only necessary to loosen the bolts 165 then raise or lower the plate as permitted by the elongated apertures 164, then tighten the bolts against the plate.

When it is desired to adapt the table for different diameters of containers, this is done by removing the clamping elements 112, 113 and replacing them with similar clamping elements having a radius conforming to the radius of the containers which it is desired to staple. Assuming that it is desired to staple containers of larger radius than indicated in Fig. 1, it is apparent that the rotary axis of the table must be moved to a somewhat greater distance from a vertical line passing down through the stapling head. For this purpose the bolts 105 which connect the hub element 100 to the flanged element 99 are loosened and the hub element is moved rearwardly or to the left, as viewed in Fig. 1. This is possible by reason of the fact that the bolts 105 are received in slots 106. See Figs. 2 and 7.

Movement of the table in the manner just described has the effect of displacing the trip element 168 with respect to the arm 169 which supports the trip mechanism for effecting a stoppage of the rotary table. It is thus necessary to loosen the clamping jaws 170 and turn the arm to a new angular position in which the roller 174 will be contacted by the advancing bevel edge of the trip 168, as illustrated in Fig. 1. For this purpose, the rod 175 is formed of material which will permit a slight bending so that it will not be necessary to change the point of attachment of the rod 175 to the lever 177 which, otherwise, can be done.

When it is desired to adjust the rotary table for different heights of containers, this may be done by raising or lowering the flanged element 99 along the staple clinching post 8. For this purpose, the set screw 98 is loosened and the flanged element moved up or down along the staple clinching post to the desired position after which the set screw 98 is again tightened. The jaw portion 170 of the arm 169 is also preferably repositioned so that it will engage the lower portion of the flanged element 99 in which position it will serve as additional supporting means for the table.

To summarize the operation of the device, let it be assumed that the table 6 is in forward, tilted position as illustrated in Fig. 9 and as suggested by the broken line position of the stapling anvil post 8 in Fig. 1. A container 9, with an apertured

top closure disc 13 assembled therewith, in a preliminary manner as illustrated in Fig. 14, and with both sets of tabs 12 and 15 extending in alignment with the body blank of the container, is placed on the table in position so that the edges of the tabs 12, 12 will rest on the upper surface of the table. (See Fig. 2.) The clamping members 112 and 113 will then be actuated by moving the handle 142 in a clockwise direction, as illustrated in Fig. 3, to firmly clamp the end of the container on the table. The table is now ready to be moved to horizontal position. This is done by exerting downward pressure on the foot lever 32 and continuing the movement until the lever is locked in its intermediate position by means of the sliding rod 78. See Figs. 1, 2 and 8.

In placing the container on the table, care is exercised on the part of the operator to have the positioning member 159 properly positioned so that when this member is received in between two tabs at the lower end of the container, the tabs at the upper end will be properly positioned with respect to the stapling mechanism. When the container has been moved to the position indicated in Fig. 1, several tabs will be engaged by the plate portions 187 and 188 so that one tab will be bent entirely over ready to be stapled and adjacent tabs will be folded over at varying angles depending upon their positions with respect to the curved plate portion 187.

The operator next will depress the foot lever to its lowermost position as illustrated in Fig. 10. This will cause the lever 27 to be swung to clutch-actuating position wherein the driving mechanisms for rotating the table and for inserting the staples will be actuated.

The arrangement is such that a staple will be driven into the first tab while the cam mechanism which drives the table is moving through the dwell portion of its cycle and, as soon as the staple has been driven, the table will be moved forward one step to bring an adjacent tab into stapling position beneath the horizontal portion 188 of the part 187, whereupon the tab is stapled and the alternate step by step movement of the table and the insertion of staples will continue until a staple has been driven into each tab, after which the driving mechanism will be disconnected by reason of the trip element 168 striking the roller 174 and causing the separation of the clutch parts as previously described.

After the upper closure disc 13 has been secured in place and the machine has come to a stop, as just described, the table 6 is released for rearward tilting movement by depressing the treadle 86 which withdraws the rod 78 allowing foot lever 32 to be pulled upwardly by the spring 92, causing disengagement of the detent 57 from the arm 45 and releasing the table so that it will swing from the position illustrated in Figs. 1 and 8 to that indicated in Fig. 9. The container is then removed from the table after releasing the clamps and lifting it off of the clinching post 8.

The next step is to insert the bottom closure disc 11 in preliminary position substantially in alignment with the bases of the tabs 12, 12 and next replace the container on the table by passing the top closure end, having the apertured closure 13 secured therein, down over the clinching post 8. In this position the lower end of the container will not rest upon the surface of the table but will be supported on the upper edges of the clamping members 113, 113 as previously described, see Fig. 16. After so placing the container on the clamp 113, the handle 142 is moved to draw the clamp 112 inwardly to engage the exterior of the container. Before stapling is begun the operator will see that the tabs are properly aligned with the indicating arrow 162, see Figs. 11 and 12.

With the container clamped in proper position, it is then only necessary to move the table to horizontal position, bringing the container into operative stapling position and then continue by actuating the clutch control elements by further downward movement on the foot lever 32, as previously described, which will cause the stapling of the final closure disc to be completed with the operation stopping, as previously explained, after the final staple has been inserted. The container can then be removed by tilting the table rearwardly, releasing the clamp, and lifting the container off of the clinching post 8.

The closure discs may be assembled with the containers in any suitable manner. One convenient arrangement for facilitating the insertion of the closure discs into the containers preparatory to stapling the attaching tabs to the discs is illustrated in Figs. 14 and 15. As illustrated in Fig. 14 there is provided a suitable base block 190 around which is disposed a collar element 191 having a straight portion 192 and a flared portion 193, the straight portion being separated from the edges of the base block a distance somewhat greater than the thickness of the material of the container. By the use of this construction the container, being in the form of a collapsed cylindrical drum, as illustrated in Fig. 13, may be expanded and inserted within the collar element 191 until the tabs 15 come to rest against the shoulders of the base block. It is to be noted that the distance between the upper surface of the base block and the shoulders is equal to or slightly greater than the length of the tabs. After the container is in place it is preferred to first insert the top closure disc 13. This is done by dropping the disc down through the open end of the container and pressing it with a tamping tool 194 having a handle portion 195 hingedly connected to an elongated head portion 196. When the disc is properly forced into place the tamping tool is removed and the container is ready to have the top closure disc stapled in position.

After the top closure disc has been secured in place, the container is ready to receive the bottom closure disc. This may conveniently be done by first inserting the disc in the open end of the container, then inserting the tabs 12, 12 into the channel between the base block and the collar 191. The tamping device 194 is then inserted through the opening in the top closure disc 13 and for this purpose the tamping head 196 is made narrow enough to pass through the aperture in this disc. After the disc 11 is in place, the tamping device is removed and the disc 11 will be stapled in closure forming position as previously described.

If it is desired to provide a supplemental closure for the aperture in the closure disc 13, this may be accomplished by providing a disc 197 having tabs 198 receivable into slots 199 formed in the closure disc. See Fig. 13.

It is apparent from the foregoing that the present invention provides a stapling machine with ancillary apparatus enabling cylindrical drums to be set up from collapsed condition with closure discs in place and thereafter stapled in an easy and rapid manner to provide a durable and efficient container. Containers so con-

structed are found to be quite advantageous in the packaging of raw materials, such as asphalt, rosin, waxes and similar products adapted to be packaged in a molten condition.

Due to the construction of the stapling machine and the control therefor, drums, such as described, may be quickly assembled and made ready for the reception of merchandise to be packed therein with a minimum of time and effort and without requiring operators who are particularly skilled.

While the present description sets forth a preferred embodiment of the invention, numerous changes may be made in the construction without departing from the spirit of the invention, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

I claim.

1. A mechanism for stapling tubular containers having flat closure elements adapted to be secured to a tubular body blank provided with tab parts extending from the body blank and arranged, when folded down, to overlap the flat closure element; said stapling mechanism comprising a rotary table adapted to support a tubular container, a staple driving mechanism, a staple clinching anvil, means for clamping the container to the rotary table, and means for rotating the table and the container clamped thereto in a step-by-step manner whereby rotation of the table will cause successive edge portions of the container and closure element to be presented to the stapling mechanism, and means operative upon movement of the container to move the tabs on the tubular body from aligned position with the tubular body wall into flatwise engagement with the closure element to present successive portions thereof to the stapling mechanism.

2. A stapling mechanism adapted for use with tubular containers having overlapping closure foming parts closing the open ends of the container; said stapling mechanism comprising, in combination, a rotary table, means for securing a tubular container to said table, said table having an open portion at its axis of rotation, a base element rotatably supporting the table, means for rotating said table and the supported container with reference to the base element, a staple driving head, a staple clinching anvil comprising a post supported on the base element and projecting upwardly through the open portion at the rotary axis of the table, said clinching anvil post having its upper portion offset to position the clinching anvil away from the center of the container and adjacent the outer portions thereof.

3. A stapling mechanism for tubular containers comprising a rotary, horizontal table, means for securing a tubular container to the table, a base element rotatably supporting said table, the table having an open part adjacent its rotary axis, a staple driving mechanism, a clinching anvil post supported on the base portion and extending through the open part of the table and arranged to cooperate with the staple driving mechanism whereby staples can be inserted through overlapping container parts at the ends of the tubular container, means for moving the table support and the clinching anvil post into and out of operative position with respect to the staple driving mechanism, driving means for rotating the table, and means for automatically rendering the table driving means inoperative as the table support and clinching anvil post are moved to the inoperative position, in which the clinching anvil is separated from the staple driving mechanism.

4. A stapling machine for tubular containers having flat closure elements adapted to be secured to a tubular body blank provided with tab parts extending from the body blank and arranged, when folded down, to overlap the flat closure element, the stapling mechanism comprising staple driving means, a staple clinching anvil, means for supporting a container in operative relation to the staple clinching anvil, means for rotating the container supporting means to bring successive portions of a container into operative relation with the staple driving mechanism and clinching anvil, means for moving the clinching anvil and container supporting means to a position in which the container on the container supporting means will be maintained out of operative relation to the staple driving mechanism, and means for automatically rendering the container rotating means inoperative as the clinching anvil and container supporting means are moved to such inoperative position.

5. A stapling mechanism for tubular containers having overlapping closure forming parts for closing the open ends of a container, said stapling mechanism comprising, in combination, a staple driving mechanism, a clinching anvil, means for supporting a container for rotation to bring successive portions thereof into operative relation with the staple driving mechanism and clinching anvil, means for rotating the container supporting means in step-by-step relation, means for driving staples when the container supporting means is stationary between periods of movement, and means for automatically disconnecting the operation of the container rotating means and actuation of the staple driving mechanism after the container has been rotated through a predetermined angular distance.

6. A stapling mechanism adapted to secure closure discs in the ends of cylindrical drums having attaching tabs at the open ends thereof, said mechanism comprising a rotary table for supporting a cylindrical drum for movement about an axis concentric with its cylindrical surface, means for rotating said table, means for clamping the drum to the table, a staple driving mechanism located in a position offset from the axis of rotation of a cylindrical drum on the drum supporting table, a clinching anvil post extending centrally through the table and having a clinching anvil surface disposed in operative relation to the staple driving mechanism, said clinching anvil post being arranged to accommodate a cylindrical drum placed in encompassing relation to the post, the portion of the post remote from its clinching anvil surface being offset from such surface so that the offset portion of the post will be disposed substantially concentrically of the cylindrical surface of a drum to be stapled.

7. A stapling mechanism comprising, in combination, staple driving means, a rotary table for supporting a cylindrical container having flat closure discs adapted to be secured to the walls of the container by attaching flaps overlapping the closure disc, means for rotating said table, a clinching anvil post having an anvil surface disposed in operative position with respect to the staple driving mechanism, means associated with the table for clamping a container thereon, the

clamping means comprising cooperative gripping shoes adapted to engage the container walls, whereby rotation of the table will present to the staple driving mechanism successive portions of the closure of a container clamped on the table.

8. A stapling mechanism for cylindrical containers having flat closure elements adapted to be secured to a cylindrical body blank provided with a plurality of tabs extending from the body blank and arranged, when folded down, to overlap the closure element, the stapling mechanism comprising staple driving means, a staple clinching anvil, a rotary table adapted to support the cylindrical container on an open end to present the other end in proper relation to the staple driving mechanism, means for securing the container to the table, driving means for rotating the table in step-by-step relation, means for so synchronizing the driving of staples that a staple is driven into a tab when the table is stationary between periods of movement, and means disposed on the table for engagement between two adjacent tabs on the lower end of the container for insuring proper positioning of the tabs with respect to the staple driving mechanism at the upped end of the container.

9. A stapling mechanism for tubular containers having overlapping closure-forming parts adapted to close an open end of each of said contwainers, said stapling mechanism comprising, in combination, a staple-driving mechanism, a clinching anvil, means for gripping one of said containers and rotating the same in a step-by-step manner to bring successive portions thereof into operative relation with said staple-driving mechanism and clinching anvil, means for so synchronizing said staple-driving mechanism and said container rotating means that staples are driven only when said container is stationary between periods of movement, means for retaining said staple-driving mechanism and rotating means in operation while a plurality of staples are driven, and means for automatically rendering said retaining means inoperative when said container has been rotated through a predetermined angle.

10. A mechanism for stapling tubular containers having flat closure elements adapted to be secured to a tubular body blank provided with tab parts extending from the body blank and arranged, when folded down, to overlap the flat closure element; said stapling mechanism comprising a rotary table adapted to support a tubular container, means for clamping a container to said table to rotate therewith, a staple driving mechanism, a staple clinching anvil, means for rotating the table in a step-by-step manner to bring successive portions of the container into operative relation to the staple driving mechanism and the clinching anvil, and means for so synchronizing the table rotating means and said stapling mechanism that staples are driven only when the container is stationary between periods of movement.

RAYMOND H. VAN SAUN.

CERTIFICATE OF CORRECTION.

Patent No. 2,320,684. June 1, 1943.

RAYMOND H. VAN SAUN.

It is hereby certified that error appears in the above numbered patent requiring correction as follows: In the heading to the drawings, Sheets 1 to 7 inclusive, name of inventor, for "R. H. VAN SAUN, ET AL" read --R. H. VAN SAUN--; page 2, first column, line 65, for "wih" read --with--; page 5, first column, line 46, for "staple" read --stapled--; and second column, line 15, for "stable" read --staple--; page 8, first column, line 45, claim 2, for "foming" read --forming--; page 9, first column, line 27, claim 8, for "upped" read --upper--; line 30-31, claim 9, for "contwainers" read --containers--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of July, A. D. 1943.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)