

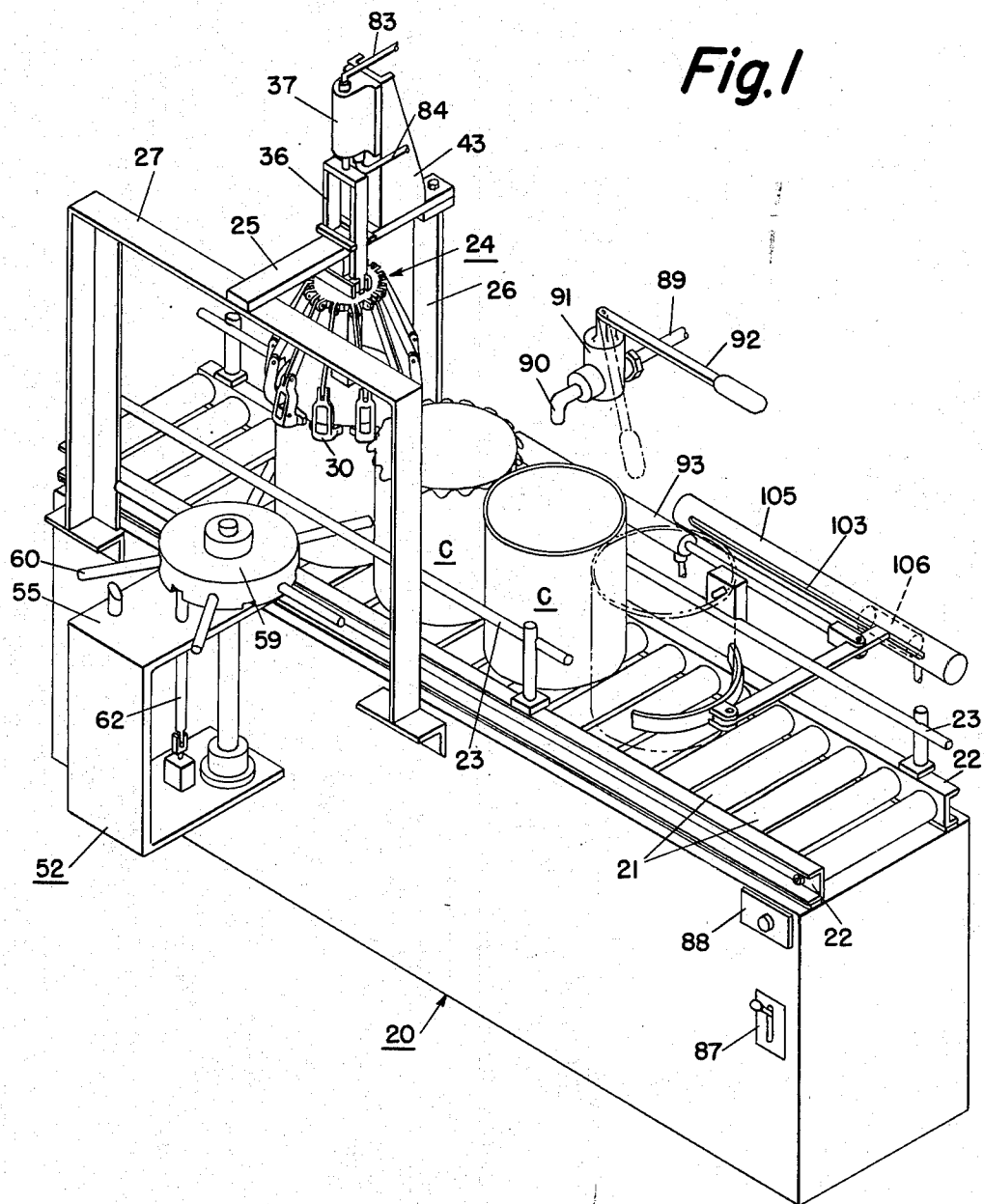
June 22, 1954

B. LIPSON
CAN-CLOSING MACHINE

2,681,758

Filed June 24, 1952

6 Sheets-Sheet 1



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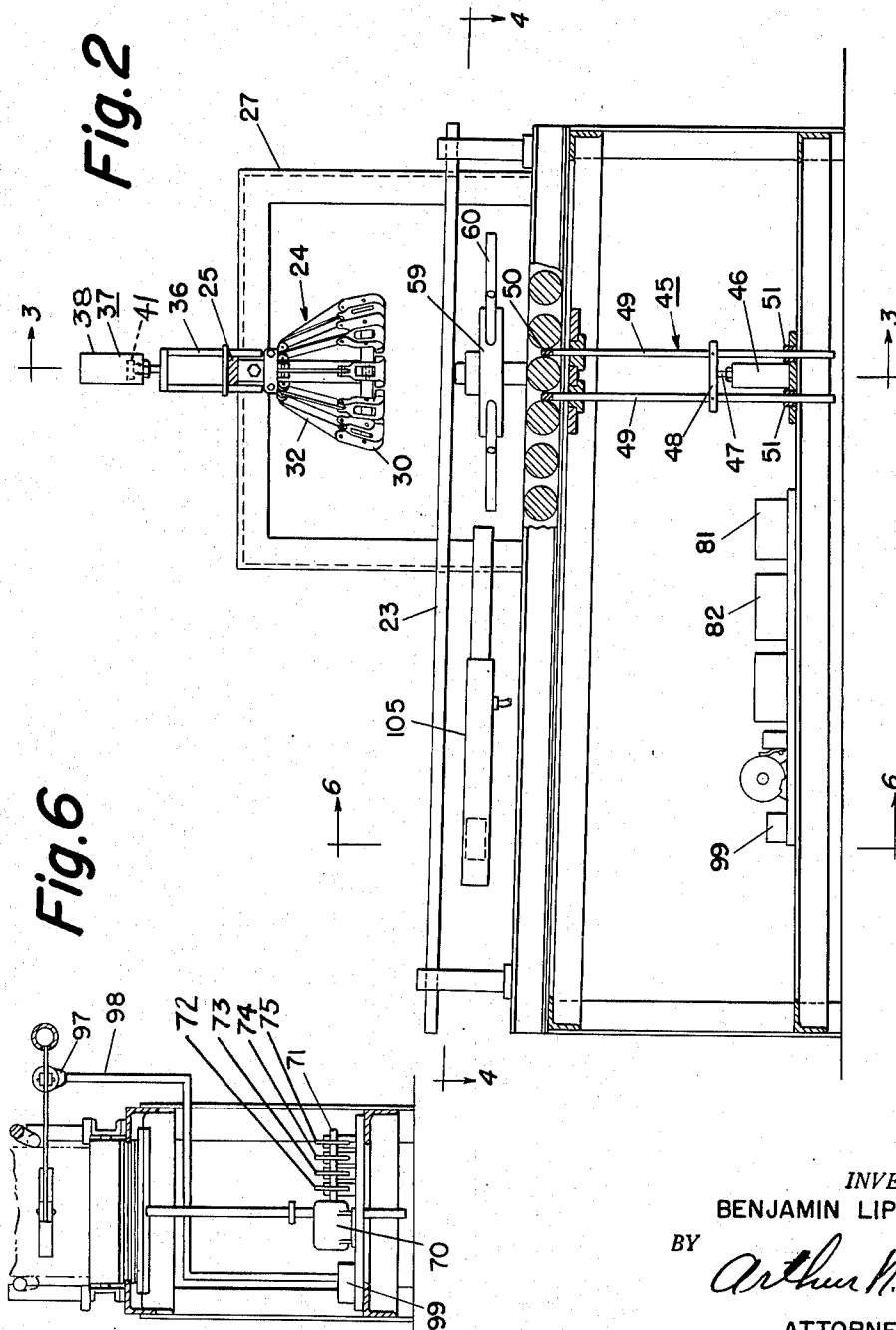
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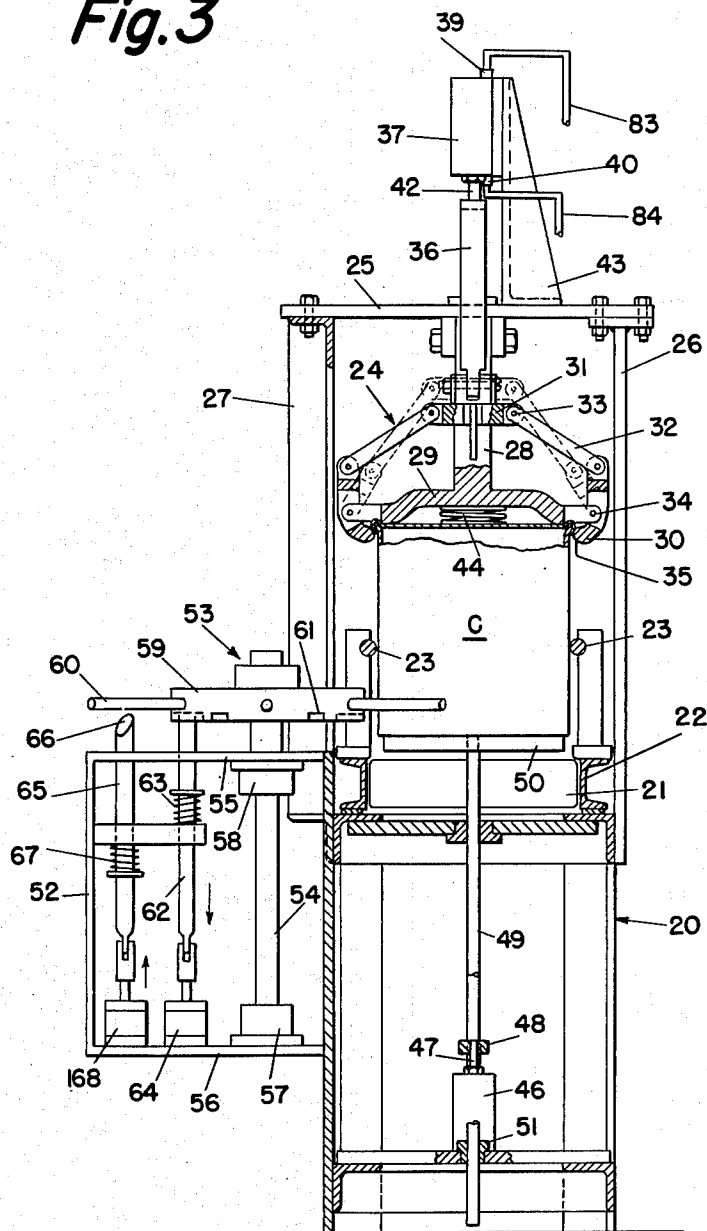
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Fig. 3



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Fig. 5

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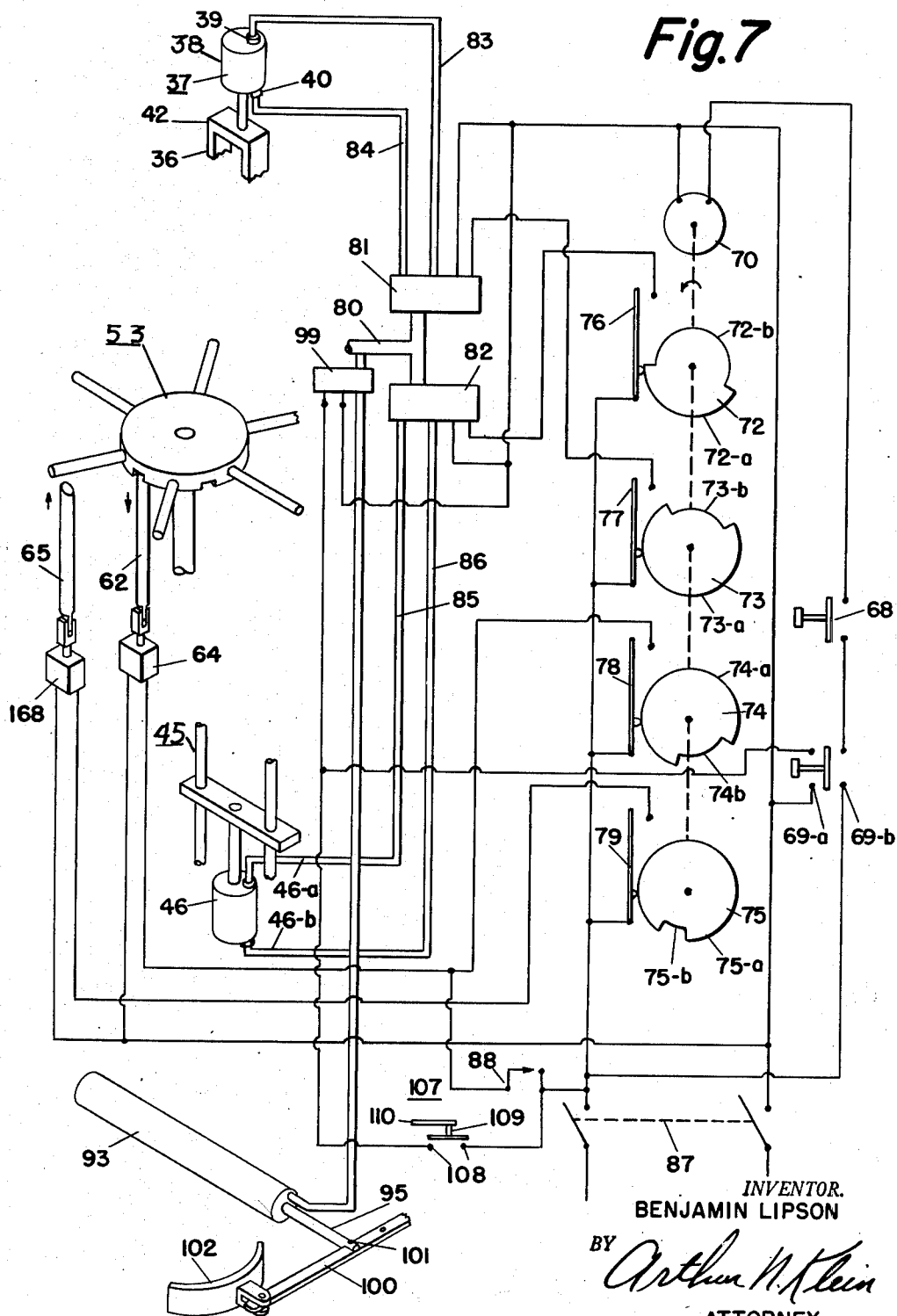
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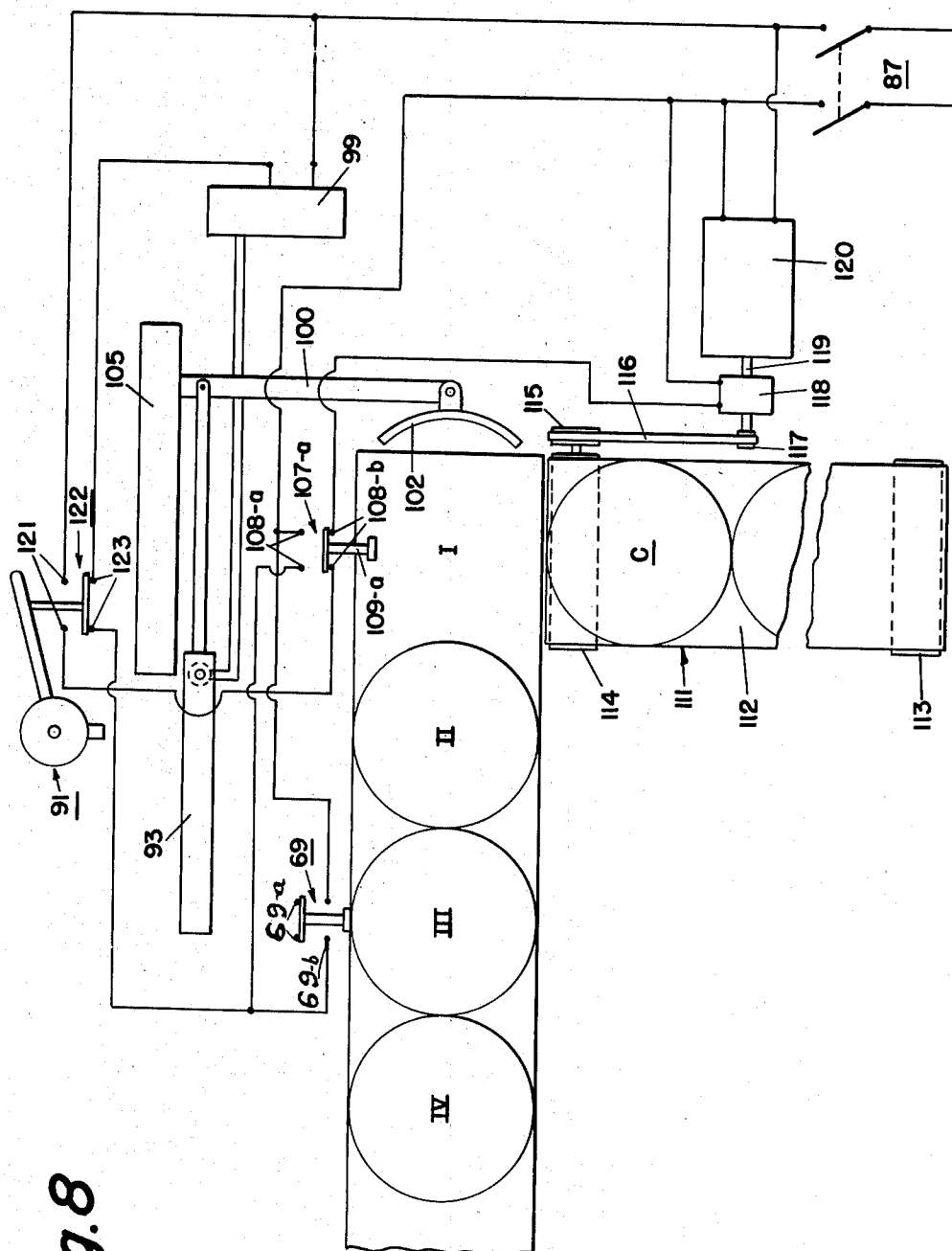


Fig. 8

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UNITED STATES PATENT OFFICE

2,681,758

CAN-CLOSING MACHINE

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Application June 24, 1952, Serial No. 295,231

14 Claims. (Cl. 226—86)

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The present invention relates generally to can filling and closing mechanism and it relates more particularly to mechanism for automatically feeding, filling and closing cans of the type provided with lids having a plurality of small peripheral fastening lugs adapted to be crimped beneath the rim of the can.

An object of the present invention is to provide new and improved mechanism for automatically feeding, filling and closing cans or like containers having lids provided with a plurality of small peripheral fastening lugs adapted to be crimped beneath the rim of the can. Another object of the present invention is to provide feeding, filling and closing mechanism for cans of the type mentioned above, which mechanism is relatively simple and inexpensive to manufacture and which, at the same time, is positive and dependable in operation.

Other objects and advantages of the present invention are apparent in the following detailed description, appended claims and accompanying drawings.

For the purpose of illustrating the invention, there are shown in the accompanying drawings forms thereof which are presently preferred; it being understood, however, that the invention is not limited to the precise arrangements and instrumentalities shown, and that the several parts and elements can be variously arranged and organized, without departing from the spirit or essential attributes of the invention.

Referring to the accompanying drawings, in which like reference characters indicate like parts throughout:

Figure 1 is a perspective view of an automatic can feeding, filling and closing machine constituting one embodiment of the present invention.

Figure 2 is a longitudinal vertical cross-sectional view taken generally along the line 2—2 of Fig. 1, showing the crimping head in non-crimping position.

Figure 3 is a transverse vertical cross-sectional view taken generally along the line 3—3 of Fig. 2, but showing the crimping head in crimping position.

Figure 4 is a generally horizontal cross-sectional view taken generally along the line 4—4 of Fig. 2.

Figure 5 is a vertical cross-sectional view taken generally along the line 5—5 of Fig. 4.

Figure 6 is a cross-sectional view taken generally along the line 6—6 of Fig. 2.

Figure 7 is a schematic view and wiring dia-

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gram of the crimping head and can-positioning stile automatic controls.

Figure 8 is a schematic view and wiring diagram of a modified embodiment incorporating an automatic conveyor for feeding empty cans to the filling and closing mechanism of the embodiment of Figs. 1—7.

In one embodiment of the present invention shown generally in Fig. 1, I may provide a suitable frame indicated generally by the reference character 20 and including a plurality of ball-bearing rollers 21 mounted intermediate a pair of longitudinally extending channel members 22. The channel members 22 may be tilted slightly from the horizontal (from right to left in Fig. 1 and from left to right in Fig. 2), so as to facilitate the feeding of empty cans to the can-closing mechanism, as will be more fully described hereinafter.

Guide-rails 23 are mounted on top of the channel members 22 and serve to maintain the cans C upon the rollers 21 as indicated in Fig. 1.

Mounted above the rollers 21, generally adjacent the lower take-off end of the frame 20 is a crimper indicated generally by the reference character 24, which is illustrated in Figs. 1, 2 and 3. The crimper 24 is supported below an elevated horizontal cross-bar 25, which in turn is supported at its rear end by a vertical structural member 26 extending upward from the rear of the frame 20, and, at its front end by a vertically-disposed generally U-shaped structural member 27 extending upward from the front of the frame 20.

The crimper 24 includes a center-post 28 fastened to, and extending downward from, the cross-bar 25 and terminating, at its lower end, in an enlarged, generally horizontally-disposed fixed circular head 29 provided with a plurality of peripherally-distributed pivotally-mounted crimping-fingers 30.

Slidably mounted upon the center-post 28 is a ring-member 31 to which the upper ends of a plurality of circumferentially-distributed links 32 are connected by pins 33; the lower ends of the links 32 being connected, by pins 34, to the upper free ends of the pivoted crimping-fingers 30.

When the slidable ring-member 31 is in lowered position upon the center-post 28, the crimping-fingers 30 are tilted so that their lowermost jaw-ports 35 are shifted inwardly and upwardly relative to the head 29, as indicated in Fig. 3. On the other hand, when the ring-member 31 is in raised position upon the center-post 28, the crimping-fingers 30 are oppositely tilted so that

their jaw-portions 35 are shifted downwardly and outwardly relative to the head 29, as indicated in Figs. 1 and 2.

A generally U-shaped slide 36 straddles the cross-bar 25 and is connected, at its lower end, to the ring-member 31.

The U-shaped slide 36 and the ring-member 31 are adapted to be moved up or down by a conventional double-acting compressed-air motor 37 which includes a generally vertically-disposed cylinder 38 having upper and lower compressed-air inlet-connections 39 and 40 respectively, and a piston or plunger 41 slidably mounted within the cylinder intermediate the connections 39 and 40 and movable therewithin either up or down, responsive to air-pressure exerted below or above it.

A rod 42 extends downward from the piston 41 through the bottom end wall of the cylinder 38 (appropriate packing, not shown, being provided to give a fluid-tight seal therebetween) and connects at its lower end to the top of the U-shaped slide 36. A supporting-member 43 extends upward from the cross-bar 25 and holds the motor 37 in vertical alignment with the U-shaped slide 36 and center-post 28.

It is apparent that, when compressed-air is introduced into the lower portion of the cylinder 38, through the lower connection 40, the piston 41, the U-shaped slide 36 and the ring-member 31 will move upward; and that introduction of compressed-air into the upper portion of the cylinder 38 through the connection 39 will cause downward movement of the aforesaid parts; appropriate bleeder-openings or vents (not shown) being provided in the cylinder 38, in conventional manner, to permit movement of the piston in either direction.

A helical spring 44 is mounted upon the underside of the head 29; the spring 44 serving to eject the can from the crimper at the end of the closing operation, in a manner to be more fully described hereinbelow.

Disposed below the rollers 21 in vertical alignment with the crimper 24 is a can elevator indicated generally by the reference character 45. The elevator 45 includes a double-acting compressed-air motor 46, similar to the motor 37, described above, and provided with an upwardly extending rod 47 terminating in a generally horizontal connecting bar 48 extending intermediate a pair of vertically-disposed arms 49. At the upper ends of the two arms 49 are mounted a pair of generally horizontal members 50 which extend transversely generally parallel to the rollers 21 and which are disposed within the clearances intermediate adjoining rollers when the elevator is in lowermost position, as indicated in Fig. 2. However, when the vertical arms 49 are moved upward (bushings 51 providing slidable supports therefor), the horizontal members 50 are raised above the level of the rollers 21, as indicated in Figure 3. This upward movement of the elevator 45 lifts the superimposed can so that its lid L is pressed upward against the underside of the crimper head 29 and compresses the spring 44 in the manner indicated in Fig. 3, with the peripheral fastening lugs of the lid in position to be crimped inward and upward against the rim of the can when the crimper is actuated to shift the crimping-fingers 30 from the position of Figs. 1 and 2 to the position of Fig. 3 in the manner described above.

When the motor 46 is oppositely actuated, the elevator 45 is moved downward to the retracted

position of Fig. 2. Thus, the can is no longer supported by the horizontal members 50 and the spring 44 forces the closed can downward, away from the head 29 and upon the rollers, assuming that the crimping-fingers 30 have been returned to their original open-position of Figs. 1 and 2.

I also provide novel mechanism for accurately positioning successive cans in vertical alignment with the crimper 24 and the elevator 45. This can-positioning mechanism, which is best shown in Figs. 1, 3, 4 and 5, includes a generally U-shaped bracket 52 attached to the front of the frame 20 and extending generally outward therefrom, and supporting a rotatable stile indicated generally by the reference character 53. The stile 53 includes a generally vertical shaft 54 extending through the upper horizontal panel 55 of the bracket 52. The lower horizontal panel 56 of the bracket 52 is provided with a bearing-block 57 in which the lower end of the shaft 54 is journaled; another bearing-block 58 being provided for the shaft 54 on the underside of the upper panel 55.

The upper end of the shaft 54 carries an enlarged hub 59 from which a plurality (for example six) of uniformly circumferentially distributed spokes 60 extend radially outwardly in a generally horizontal plane. The underside of the hub 59 is provided with a plurality (for example six) of uniformly circumferentially distributed, radially extending locking-grooves 61; the locking-grooves preferably being disposed in alternating circumferential position with the spokes, as best indicated in Fig. 4.

A generally vertical locking-bar 62 is slidably supported on the bracket 52 and is provided with a spring 63 which normally tensions it upward so that its upper end is disposed within one of the locking-grooves 61 so as to lock the stile 53 against rotation. The lower end of the locking-bar 62 is connected to a solenoid 64 mounted on the panel 56 and adapted, when energized, to pull the locking-bar 62 downward (against the pressure of the spring 63) so as to disengage it from the locking-groove 61 and thereby to permit rotation of the stile 53. When the solenoid 64 is de-energized, the spring 63 again moves the locking-bar 62 upward and against the underside of the hub 59, so that the upper end of the locking-bar automatically snaps into the next locking-groove 61 when the latter is brought into alignment with the locking-bar upon rotation of the hub.

Also slidably mounted on the bracket 52 is a vertical push-bar 65 having an inclined upper camming end 66 which is in vertical alignment with one of the spokes 60 when the locking-bar 62 is engaged within one of the locking-grooves 61, as indicated particularly in Figs. 1 and 5. The push-bar 65 is provided with a spring 67 which normally urges it downward so that its camming end 66 is somewhat below the spoke 60. The lower end of the push-bar 65 is connected to a solenoid 68, which is mounted on the lower panel 56, and which is adapted, when energized, to move the push-bar 65 upward (against the pressure of its spring 67) so as to bring the upper inclined end 66 into camming engagement with the spoke. The camming action resulting from this upward movement of the push-bar 65 causes rotational movement of the spoke 60 and the hub 59 (counterclockwise in Figs. 1 and 4), assuming that the locking-bar 62 has first been moved downward so as to free the hub; the rotation continuing until the next locking-groove comes

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into alignment with the locking-bar, assuming that, in the interim, the locking-bar has moved back upward to locking position, in the manner described above.

When the solenoid 168 is de-energized, the spring 67 moves the push-bar 65 downward to its original position enabling the next spoke to swing into the aligned position shown in Figs. 1 and 5.

As indicated in Figs. 1 and 4, the spokes 60 are so angularly related and of such a length as to receive a can between two adjoining spokes, while the locking grooves and locking-bar are so positioned that, when the stile is locked, a can is held in vertical alignment with the crimper 24. As best indicated in Fig. 4, the next successive can bears against the end of the trailing spoke, assuming that the cans on the rollers 21 are urged from left to right in Fig. 4, either under the action of gravity (resulting from the inclination of the channel members 22 as described above) or under the push of automatic can-shifting mechanism (to be described hereinbelow). Thus, after the first can has been closed (by operation of the crimper and elevator as described above), the next one-sixth revolution of the stile will position the next successive can beneath the crimper simultaneously with removal of the first, now-closed can.

A single-throw "on-off" limit switch 68 is mounted just above the guide-rail 23 at the rear of the frame 20, along the center-line of the stile 53; the switch 68 being normally open and being adapted to be pushed closed by the side of a can positioned beneath the crimper 24 by adjoining spokes of the stile.

This last-mentioned can position, which can be called the lid-attaching or crimping position, is designated, in Fig. 4, by the reference character IV. Other can positions, as shown in Fig. 4 and as will be more fully described hereinbelow, are: lid-applying position III; can filling position II; and indexing position I. If desired, additional can positions (not shown) could be provided for on the conveyor between positions II and III. The cans occupying such additional positions would serve merely to space the crimper further away from the other mechanism, to give additional working room and also additional time in which to place the lids upon the filled cans preliminary to crimping.

A double-throw limit switch 69 is positioned above the guide-rail 23 at the rear of the frame 20 on the transverse center-line of can position III. Limit switch 69 is normally spring-tensioned to finger-extended position wherein its contacts 69-a are closed and contacts 69-b are open. However, when a can is placed in position III, its side forces the limit switch finger to retracted position opening the contacts 69-a and closing the contacts 69-b.

As indicated in the wiring diagram of Fig. 7, the contacts of limit switch 68 and the contacts 69-b of the limit switch 69 are connected in series within an electrical circuit for automatically actuating the crimper 24 and the stile 53 in a manner to be described hereinbelow.

This last-mentioned actuating mechanism includes a constant-speed synchronous motor 70 mounted within the lower portion of the frame 20 and having a shaft 71, upon which are mounted four cam-discs 72, 73, 74 and 75, as best shown in Figs. 6 and 7. Micro-switches 76, 77, 78 and 79 are mounted in operative juxtaposition to the cam-discs 72-75 respectively. The peripheral

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edges (72-a, 73-a, 74-a and 75-a, respectively) of the cam-discs are provided with arcuate grooves (72-b, 73-b, 74-b and 75-b, respectively) of varying extent. The micro-switches are spring-tensioned to normally closed position in which their fingers (76-a, 77-a, 78-a and 79-a, respectively) extend outwardly.

When the higher portions of the peripheries of the cam-discs are adjacent the fingers of the micro-switches, the fingers are forced inward to retracted switch-open position, as indicated in Fig. 7. However, when the cam-discs rotate so as to bring their peripheral grooves adjacent the micro-switch fingers, the latter are free to move outward to extended, switch-closed position.

Compressed-air inlet pipe 80 extends from any suitable air-compressor (not shown) and to the lower portion of the frame 20 at which it connects to two air-distributor valves 81 and 82, of conventional construction. The valve 81 is connected, by pipes 83 and 84, to the upper and lower connections 39 and 40, respectively, of the crimper-actuating motor 37, described above.

Similarly, the valve 82 is connected, by pipes 85 and 86, to the upper and lower connections 46-a and 46-b of the motor 46 actuating the can elevator 45.

The air-distributor valve 81 is connected in series with the micro-switch or relay 77 and is provided with conventional means (not shown) for admitting air to the pipe 83 and simultaneously closing the pipe 84 when the micro-switch is closed to complete the circuit; and for closing the pipe 83 and simultaneously admitting air to the pipe 84 when the circuit is broken.

Similarly, the air-distributor valve 82 is connected in series with the micro-switch or relay 76 and is provided with conventional means (not shown) for admitting air to the pipe 85 and simultaneously closing the pipe 86 when the micro-switch is closed and the circuit is completed; and for closing the pipe 86 and simultaneously admitting air to the pipe 85 when the circuit is broken.

The solenoid 64 operating the locking-bar 62 is connected in series with the micro-switch or relay 78, so that, when the micro-switch 78 is closed, the solenoid is energized to move the locking-bar 62 downward and out of engagement with the stile 53, in the manner described above.

The solenoid 168 operating the push-bar 65, is connected in series with the micro-switch or relay 79, so that, when the micro-switch 79 is closed, the solenoid 168 is energized to move the push-bar 65 upward into camming engagement with one of the spokes of the stile, as described above.

The motor 70 (which may, optionally, operate at 20 R. P. M., so as to give a 3-second cycle) is constructed and arranged to rotate the cam-discs 72-75 (counterclockwise in Fig. 7) so as to cause opening and closing of the micro-switches or relays 76-79 in predetermined sequence, and thereby to cause operation of the crimper, elevator and stile in the following manner.

Assuming that a manual "on-off" switch 87 (located at the front of the frame 20) has been closed to complete the electrical circuit leading to any external electrical outlet (not shown), and assuming further that limit switch 68 is maintained in the closed position, described above, by a filled can located at position IV and having a lid thereon ready to be crimped shut; and assuming further that another filled can is at position III so that contacts 69-b of limit switch 69 are

closed, thereby completing the electrical circuit to the motor 70 and causing synchronous rotation thereof, as described above; rotation of the motor and the cam-discs 72-75 (counterclockwise in Fig. 7) will first bring the cam-groove 72-b of the cam-disc 72 adjacent the finger 76-a of the micro-switch or relay 76, thereby closing the micro-switch and actuating the air-distributor valve 82 to send compressed-air through the pipe 86 and the lower air connection 46-b of the lower compressed-air motor 46 so as to raise the can elevator 45 and to lift the can from the rollers and up against the head 29 of the crimper 24 and compressing the spring 44, in the manner shown in Fig. 3. In this stage of operation, the crimping-fingers 30 of the crimper 24 are in open position as indicated in dash-dot lines in Fig. 3.

Upon continued rotation of the motor 70 and the shaft 71, the groove 73-b of the cam-disc 73 reaches the finger 77-a of the micro-switch or relay 77 so as to close the micro-switch and thereby to complete the circuit to the air-distributor valve 81, sending compressed air through the pipe 83 and the upper air-inlet 39 of the crimper cylinder 38; thereby forcing downward the U-shaped member 27 and the slidable ring-member 31, which results in pivotal movement of the crimping-fingers 30 from the dash-dot-line position of Fig. 3 to the solid-line position, forcing the jaw-portions 35 of the crimping-fingers 30 inwardly and upwardly against the lugs of the can-lid, so as to lock them against the underside of the can-rim and thereby to fasten the lid in position upon the can.

During the crimping operation last described, the can has been maintained in raised position by the elevator 45.

The peripheral dimension of the groove 73-b is less than that of the groove 72-b so that, upon continued rotation of the motor and the cam-discs, the groove 73-b passes completely past its micro-switch finger 77-a before the groove 72-b has completely passed its micro-switch finger 76-a. In other words, the greater radius peripheral portion 73-a contacts the finger 77-a and opens the micro-switch 77 while the micro-switch 76 still remains closed.

When the greater radius peripheral portion 73-a thus opens the micro-switch 77, the air-distributor valve 81 is oppositely actuated so as to close off the pipe 83 and to open the pipe 84, thereby sending compressed-air through the connection 40, into the lower end of the cylinder 38. This drives the piston 41 of the compressed-air motor 37 upward so as to shift the crimper to the open non-crimping position shown in dash-dot lines in Fig. 3.

Thereafter, upon continued rotation of the motor 70, the larger radius peripheral portion 72-a of the cam-disc 72 contacts the finger 76-a of the micro-switch 76, thereby opening the micro-switch and oppositely actuating the air-distributor valve 82 so as to close off the pipe 86 and to open the pipe 85. This sends compressed-air through the connection 46-a into the upper portion of the motor 46, thereby driving the elevator 45 downward from the position of Fig. 3 to its original lowermost position of Fig. 2, so as to return the can (upon which the lid has now been crimped as described above) to the rollers 21.

Further rotation of the motor 70 brings the groove 74-b of the cam-disc 74 opposite the finger 78-a of the micro-switch 78, thereby closing the micro-switch and actuating the solenoid 64, so

as to move the locking-bar 62 downward and out of engagement with the locking-groove 61 of the stile hub 59.

While the solenoid 64 is still kept energized, the groove 75-b of the cam-disc 75 comes opposite the finger 79-a of the micro-switch 79 so as to close the micro-switch and thereby to energize the solenoid 168 which moves the push-bar 65 upward so that its uppermost inclined camming end 66 contacts the adjoining spoke 60, imparting to the latter a horizontal movement (counterclockwise in Figs. 1, 4 and 7), causing rotation of the stile 53.

This rotation of the stile shifts the first can (upon which a lid has been crimped as described above) so that it moves away from its position beneath the crimper (the can sliding on the rollers toward the left in Fig. 1 and toward the right in Figs. 2 and 4) and is shoved toward the lowermost take-off end of the frame 20, from which it can be removed by hand or by a conventional conveyor (not shown) or the like and can go to a shipping room.

At the same time, this rotation of the stile permits the second can (which has been filled and upon which a lid has been placed) to enter between the next two adjoining spokes of the stile and to be shifted thereby toward the crimping position originally occupied by the first can.

It is essential, of course, that the second can be urged toward the first of the two spokes which will encompass it, to make sure that it will move into position to be engaged by the spokes upon rotation of the stile. It is possible to rely on the force of gravity, resulting from the inclination of the channel-members 22, to urge the second can (and succeeding cans) toward the crimping position. However, as will be described hereinbelow, I prefer to employ mechanism for maintaining positive pressure upon the cans, in the interest of greater dependability and uniformity of operation.

Shortly after the push-bar 65 has been actuated to initiate rotation of the stile, as described above, continued rotation of the motor 70 brings the larger radius peripheral portion 74-a of the cam-disc 74 opposite the finger 78-a of the micro-switch 78 so as to open the micro-switch and to de-energize the solenoid 64, thereby permitting the locking-bar 62 to be moved upward, by its spring 63, against the underside of the hub 59 so that it automatically engages within the next locking-groove 61 and re-locks the stile after it has completed one-sixth of a revolution. This one-sixth revolution of the stile shifts the second can to the position originally occupied by the first can, namely in vertical alignment with the crimper and elevator, as indicated in Fig. 2.

Upon further rotation of the motor 70, the larger radius peripheral portion 75-a of the cam-disc 75 is brought opposite the finger 79-a of the micro-switch 79 so as to open the micro-switch and thereby to de-energize the solenoid 168, thereby enabling the spring 67 to drive the push-bar 65 downward to its original lowermost position.

Further rotation of the motor 70 brings the groove 72-b of the first cam-disc 72 opposite the finger 76-b of the micro-switch 76 so as to close the micro-switch and to initiate a second cycle of operations, identical to those described above, resulting in crimping of the lid of the second can, and positioning of the third can beneath the crimper.

It is obvious that, for continued operation of

the stile, the crimper and the elevator as described above, it is essential that there always be a can in position III, ready to be shifted to position IV. Thus, if through inadvertance or mishap, there is no can in position III, there is nothing to retract the plunger of the limit switch 69, so that the latter assumes its normal position, opening the contacts 69-b and breaking the circuit to the motor 70 so as to stop further rotation of the cam-discs and to prevent actuation of the crimper, stile or elevator.

A manual switch 88, also mounted on the front of the frame 20, permits the locking-bar solenoid 64 to be energized independently of the automatic circuit, and enables operator manually to shift the stile 53, as for example in starting or ending a crimping sequence.

A generally horizontal delivery pipe 89 is disposed above the frame 20 and is provided with a downwardly-directed spout 90 which, as indicated particularly in Fig. 1, is adapted to deliver fluid or the like into an open-top can located on the rollers 21 at position II. Operatively connected within the delivery pipe 89 is a flow-control valve 91 having a pivoted operating handle 92; the handle being normally spring-tensioned to the position shown in solid lines in Fig. 1 (wherein the valve is closed) and being manually shiftable to the position shown in dash-dot lines in Fig. 1 (wherein the valve is open).

As mentioned above, automatic operation of the machine requires that four (4) cans be placed upon the rollers 21 in positions IV, III, II and I, respectively; the can in position I being shown in phantom in Fig. 1 for greater clarity of illustration.

As indicated above, it is possible to place an empty can on the rollers at position I manually and to rely upon the force of gravity (resulting from the inclination of the channel-members 22) to urge the cans toward the crimper (from right to left in Fig. 1).

However, I prefer to provide positive can indexing and shifting mechanism, which may include a generally horizontal cylinder 93 mounted upon the rear channel-member 22 and disposed slightly above the level thereof. A piston 94 is mounted within the cylinder 93 in fluid-tight sliding relationship therewith, and is provided with a rod 95 extending therefrom axially beyond the end of the cylinder; suitable packing-means (not shown) being provided at the end of the cylinder to maintain a fluid-tight seal between the piston rod and the cylinder. Disposed within the cylinder 93 is a compression spring 96 which normally urges the piston and the piston rod to outermost extended position.

The cylinder 93 is provided with an air-inlet opening disposed adjacent that end of the cylinder through which the piston rod emerges. An air-delivery pipe 98 leads to the opening 97 from an air-distributor valve 99 also connected to the pipe 80 mentioned above; the valve 99 being provided with conventional control mechanism (not shown) for sending compressed air through the pipe 98 when its electrical circuit is closed (so as to drive the piston and piston rod forward to retracted position within the cylinder, against the pressure of the spring 96) and for venting the cylinder when its electrical circuit is open (so as to permit the spring 96 to return the piston and piston rod to their original extended position).

A pusher-arm is connected, as at 101, to the free end of the rod 95 and extends generally horizontally at right angles thereto. An arcuate

pusher 102 is mounted at one end of the pusher-arm 101 and is adapted to conform to the curvature of the cans, so as to guide them and maintain them in centered relationship upon the rollers 21 during shifting thereof, as will be described below.

The other end of the pusher-arm 100 extends through an elongated axial slot 103 formed in a cylinder 105 supported upon the frame 20 in generally the same horizontal plane as, but slightly rearwardly of, the cylinder 93; a somewhat elongated cylindrical guide-member 106 being rigidly connected to the end of the pusher-arm 100. The guide-member 106 conforms relatively accurately to the bore of the cylinder 105 so that it maintains the pusher-arm in rigid right-angular relationship to the rod 95 during axial movement of the latter.

The cylinders 93 and 105 are so dimensioned that they permit movement of the piston rod and pusher-arm, just sufficient to shift a can from position I on the rollers to position II; the two positions being indicated in solid lines and dash-dot lines, respectively, in Fig. 4.

As shown in Fig. 7, the electrical contacts of the valve 99 are connected in series with the contacts 69-a of the double-throw limit switch 69 located at can position III, so that, when a can is at position III, the circuit to the valve 99 will be open. However, when there is no can precisely at position III, the spring-action of the limit switch 69 will cause it to move to position in which contacts 69-a will be closed, and the valve will be energized to send compressed air through the pipe 98 to drive the piston, piston rod and pusher-arm forward, as described above.

Located at can position I, is another limit switch 107 provided with contacts 108 and a finger 109; the finger 109 being normally spring-tensioned to extended position wherein the contacts 108 are open, but being forced to retracted position when a can is placed at position I, so as to close the contacts 108. The end 110 of the finger 109 is enlarged laterally so that it maintains contact with the can, even after the can is shifted somewhat from its original position I. In contrast, the plunger of the limit switch 69 is free to spring to extended position almost immediately after shifting of the can from position III. It is apparent that the enlarged end 110 results in delayed operation of the limit switch 107 as compared to the limit switch 69.

The contacts 108 are connected in series with the electrical contacts of the valve 99, in a separate circuit which is in parallel with the contacts 69-a of the limit switch 69. In other words, the valve 99 is energized to send air to the cylinder 93 when the contacts 69-a or the contacts 108 are closed, and is de-energized only when both sets of contacts 69-a and 108 are open.

The operation of the pusher mechanism will now be described. Assuming that there are three cans at positions IV, III and II, it is apparent that the pusher mechanism can not operate because there is no can at position I to close the contacts 108 and because the presence of a can at position III keeps contacts 69-a open.

However, when a can is placed at position I (either manually or by operation of an automatic feed conveyor to be described hereinafter), contacts 108 are closed thereby energizing the valve 99 and actuating the pusher mechanism so as to shift all four cans along the rollers (from right to left in Fig. 1 and from left to right in Figs. 2 and 4). The enlarged end 110 maintains the

contacts 108 in closed position during the initial portion of the shifting operation and until after the can has been moved away from position III sufficiently to permit the limit switch 69 to shift to position closing contacts 69-a.

In this way, the circuit through the contacts 108 supplies power to the valve 99 during the initial portion of the shifting operation, after which the circuit through the contacts 69-a takes over to supply power to the valve 99 during the remainder of the shifting operation.

However, as soon as the can which was originally in position II reaches position III, it shifts the limit switch 69 so as to open the contacts 69-a, thereby breaking both circuits to the valve 99 and shunting off the valve so as to permit spring-urged retraction of the pusher mechanism to its original position.

It is apparent that, by placing another empty can at position I, the shifting cycle will be repeated.

However, before placing another empty can at position I, the operator pulls the handle 92 to open the valve 91 and fill the can at position II and also places a lid upon the previously-filled can occupying position III.

In this way, every time the pusher mechanism operates, it moves an empty can from position I to position II; it moves a filled can from position II to position III; it moves a can which has been filled and upon which a lid has been placed, from position III to position IV; and it moves a can, upon which a lid has been crimped, from position IV to the take-off end of the frame 20.

Since the other contacts 69-b of the limit switch 69 are connected in series with the motor 70 driving the cam-discs 72-75, the crimper and stile actuating operations are synchronized with the operation of the pusher mechanism. That is, it is only after a filled can has been delivered to position III by the pusher mechanism that the stile and crimper can operate in the manner described above.

If the operator requires additional time in which to fill a can at position III, it is possible, simply by lengthening the frame 20, to provide an additional can position (not shown) intermediate positions II and III, this additional position being the one at which the lid is placed in position.

In Fig. 8 there is shown, more or less schematically, a modified embodiment of the present invention in which mechanism is provided for automatically feeding empty cans to position I on the frame 20. In this embodiment, the crimper mechanism and the stile mechanism are the same as in the embodiment of Figs. 1-7 described above, and accordingly, no showing of these parts is incorporated in Fig. 8.

The pusher mechanism of this embodiment is also the same as that of Figs. 1-7, with the exception that, in place of the single throw limit switch 107 described above, there is provided, at position I on the frame 20, a double throw limit switch 107-a having two sets of contacts 108-a (corresponding to the contacts 108 described above) and 108-b; the finger 109-a carrying the enlarged end 110-a being normally spring-tensioned to outermost extended position in which the contacts 108-a are open and the contacts 108-b are closed.

Positioned at right angles to the frame 20, there is provided a conveyor 111 having an endless belt 112 supported upon an idler drum 113 and a

power drum 114; the endless belt leading to position I on frame 20.

The power drum 114 is provided with a pulley wheel 115. A V-belt 116 is looped around the pulley wheel 115 and also around another pulley wheel 117 operatively connected, by means of an electromagnetic clutch 118, to the drive shaft 119 of a motor 120. The motor 120 is operatively connected to the source of electric current so that it runs continuously at constant speed. The clutch 118 is of conventional construction and is normally spring-tensioned to open position wherein the wheel 117 is disengaged from the motor, so that the conveyor belt 112 is stationary. However, when an electrical circuit to its contacts is closed, its solenoid element is energized to close the clutch and to cause rotation of the pulley wheel 117, the V-belt 116, the pulley wheel 115, the power drum 114 and the conveyor belt 112.

As indicated in Fig. 8, the contacts of the clutch 118 are connected in a series circuit with the contacts 108-b of the limit switch 107-a and also one pair of contacts 121 of a double throw limit switch 122 having another pair of contacts 123, to be referred to hereinbelow. The limit switch 122 is operatively connected to the operating handle 92 of the filling valve 91, so that when the operating handle 92 is in its normal closed position, the contacts 121 are open and the contacts 123 are closed. Manual movement of the operating handle 92 to position opening the filling valve 91 opens the contacts 123 and closes the contacts 121.

The contacts 123 mentioned above are connected in series with the contacts 108-a of the limit switch 107-a which controls the operation of the pusher mechanism as referred to above.

The operation of this embodiment is as follows:

Assuming that there are cans at positions II, III and IV, as described above, but no can at position I, and assuming also that there are a number of empty cans upon the conveyor belt 112 with the endmost can ready to be transferred to position I on operation of the conveyor 111, it can be seen that with the operating handle 92 in valve-closed position, the circuit to the clutch 118 is completed and the clutch is shifted to closed position causing movement of the conveyor belt 112 so as to shift the endmost can on the conveyor belt into position I on the rollers 21 of the frame 20.

When the endmost can is shifted fully to the rollers 21 at position I, it pushes the finger 109-a of the limit switch 107-a inward so as to open the contacts 108-b, thereby breaking the circuit to the clutch and stopping the conveyor belt 112.

With the finger 109-a in this retracted position, the contacts 108-a of the limit switch 107-a are in closed position. However, the circuit to the air-distributor valve 99 is still open due to the fact that the contacts 123 of the limit switch 122 are open.

When the can at position II has been filled, the operator returns the operating handle 92 to valve-closed position thereby opening the contacts 121 and closing the contacts 123. Closing of the contacts 123 completes the circuit to the air-distributor valve 99 and sends compressed air to the cylinder 93, initiating the can-shifting cycle, as described hereinabove, so as to transfer the empty can from position I to position II (and also to transfer the cans at positions II, III and IV) and thereafter to return the pusher-arm 109 to its original position, in the manner described above. While the limit switch 107-a will auto-

matically shift to position closing contacts 108-b as soon as the can has been shifted away from position I, the fact that the contacts 121 of the limit switch 122 are open prevents closing of the clutch 118 and movement of the conveyor belt 112 until the operating handle 92 has again been shifted to position opening the filling valve 91.

In other words, movement of the conveyor belt 112 is initiated by opening of the valve handle 92 and is automatically terminated upon delivery of a can to position I; while movement of the pusher mechanism is initiated upon closing of the valve handle 92.

Since, as described above, the crimper mechanism and the stile mechanism are integrated with the operation of the pusher mechanism, it can be seen that manual operation of the valve handle 92 controls the entire operation of the machine.

In other words, when an empty can is delivered to position II, the operator manually shifts the handle 92 to position opening the valve 91 so as to deliver fluid or the like from the pipe 89 into that can. In so doing, he automatically initiates movement of the conveyor belt 112 so as to shift another empty can from conveyor 111 to position I, this shifting taking place during the filling operation.

When the can has been filled, the operator moves the handle 92 to position closing the valve and, in so doing, automatically initiates a complete cycle of can shifting, crimping and stile rotating operations, whereby the empty can at position I is transferred to position II, the filled can at position II is transferred to position III, the previously-filled can at position III (upon which a lid has been placed by the operator) is transferred to position IV and, the closed can at position IV is transferred to the take-off end of the frame 20.

If desired, conventional means (not shown) can be added, above position III, to feed lids automatically to filled cans so as to eliminate the need for the operator to do this manually.

The present invention may be embodied in other specific forms and, accordingly, the above description is intended to be illustrative and not restrictive, reference being made to the appended claims rather than to the foregoing specification as indicative of the scope of this invention.

Having thus described my invention, I claim as new and desire to protect by Letters Patent:

1. In a machine for crimping lug-type lids to cans or the like, an elongated frame having a generally horizontal track for slidably supporting a plurality of cans thereon; a crimper mounted adjacent one end of said frame above said track, said crimper having a downwardly-directed head, a plurality of pivoted crimping-fingers mounted on the periphery of said head and means including a cylinder and a double-acting compressed air operated piston operatively connected to the crimping fingers for actuating said crimping-fingers so as to force them inward and upward against the lugs of a lid after a can and its lid have been positioned against the underside of the head and thereby to crimp the lugs into locking engagement with the rim of the can and thereafter to return the crimping-fingers to their original position; means mounted on said frame for positioning successive cans on the track beneath the crimper; said crimper also having a spring mounted on the underside of its head, the spring being compressed when a can is forced upward against the head and operating forcibly

to eject the can from the crimper at the end of the crimping operation; and elevator mechanism mounted on the frame beneath the track in vertical alignment with the crimper and constructed and arranged to lift the aforesaid can up off the track and against the head of the crimper preliminary to the crimping operation and thereafter to lower the closed can back on to the track.

2. A construction according to claim 1 wherein the can positioning means comprise a rotatable turnstile mounted on the side of the frame and having a plurality of uniformly spaced radial spokes extending horizontally above the track, the space between adjoining spokes being just sufficient to accommodate a single can, and means for releasably locking the turnstile against rotation in successive positions wherein the center line between successive pairs of spokes is generally in vertical alignment with the crimper.

3. In a machine for crimping lug-type lids to cans or the like, an elongated frame having a generally horizontal track for slidably supporting a plurality of cans thereon; a crimper mounted adjacent one end of said frame above said track; elevator mechanism mounted on the frame beneath the track in vertical alignment with the crimper for lifting a can up off the track and against the crimper and thereafter to lower the can back onto the track; means mounted on said frame for positioning successive cans on the track beneath the crimper and above the elevator mechanism, said can positioning means comprising a rotatable turnstile mounted on the side of the frame and having a plurality of uniformly spaced radial spokes extending horizontally above the track with space between adjoining spokes just sufficient to accommodate a single can, and means for releasably locking the turnstile against rotation in successive positions wherein the center line between successive pairs of spokes is generally in vertical alignment with the crimper, said turnstile locking means comprising a plurality of uniformly circumferentially distributed grooves formed in the turnstile hub and a movable locking-bar normally spring-urged so that its end extends into one of the grooves in locking engagement therewith and solenoid-actuated means for periodically momentarily retracting the locking-bar to permit rotation of the turnstile until the next groove is engaged by the locking-bar.

4. A construction according to claim 3 wherein the turnstile is also provided with means for positively rotating it after the locking-bar has been retracted.

5. A construction according to claim 4 wherein the turnstile rotating means comprise a movable push-bar normally spring-urged to retracted position and means for moving said push-bar into extended position so that its end strikes one of the turnstile spokes and causes rotation thereof.

6. A construction according to claim 5 wherein the means for moving the push-bar is solenoid-actuated in timed relation to the solenoid-actuated movement of the locking-bar.

7. A construction according to claim 6 wherein the push-bar moves in a generally vertical plane and is provided with an inclined end adapted to make camming engagement with the spoke.

8. A construction according to claim 1 wherein the elevator is also provided with means including a cylinder and a double-acting compressed air operated piston for raising and low-

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ering it in timed relation to the operation of the crimper, the raising of the elevator preceding the closing of the crimping-fingers and the lowering of the elevator following the opening of the crimping-fingers.

9. A construction according to claim 8 wherein the crimper and the elevator are actuated by separate double-acting compressed-air motors, each motor being provided by an electrically-controlled air-distributor valve constructed and arranged to deliver compressed-air alternately to opposite ends of the valve so as to cause reciprocation of the motor in predetermined timed relationship.

10. A construction according to claim 8 wherein a pair of limit switches are mounted on the frame adjacent the crimping position and the next preceding position, said limit switches being connected in series and being constructed and arranged to cause operation of the air-distributor valves only when both of the aforesaid can positions are occupied.

11. In a machine for crimping lug-type lines of cans or the like, an elongated frame having a generally horizontal track for slidably supporting a plurality of cans thereon; a crimper mounted adjacent one end of said frame above said track; means mounted on said frame for positioning successive cans on the track beneath the crimper; elevator mechanism mounted on the frame beneath the track in vertical alignment with the crimper and constructed and arranged to lift the aforesaid can up off the track and against the crimper and thereafter to lower the can back onto the track; and automatic means mounted on the frame, for positively moving a plurality of cans along the track and toward the crimper, said can-moving means comprising a reciprocating pusher-arm extending over the track and electrically controlled mechanism for moving the pusher-arm forward only when there is a continuous line of cans on the track intermediate the crimper and the pusher-arm and means for thereafter returning the pusher-arm to original position, the pusher-arm actuating mechanism including an electrical circuit having a limit switch mounted on the frame adjacent the pusher-arm can positions, said limit switch being maintained in depressed circuit-closing position only when there is a can at the pusher-arm posi-

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tion so as to cause forward movement of the pusher-arm, and shifting to extended circuit-opening position after the can has been shifted appreciably forward of its original position.

12. A construction according to claim 11 wherein the pusher-arm actuating mechanism also includes a second electrical circuit connected in parallel with the first circuit and having a limit switch mounted on the frame at the position preceding the crimper, said limit switch being maintained in depressed circuit-opening position when there is a can centered at the aforesaid crimper-preceding position and shifting to extended circuit-closing position when there is no can precisely at the crimper-preceding position.

13. A construction according to claim 12 wherein the pusher-arm is connected to a piston disposed within a cylinder and spring-urged to position retracting the pusher-arm and wherein an electrically-controlled air-distributor valve is operatively connected to the cylinder and to the aforesaid electrical circuits whereby closing of either circuit sends compressed air to the cylinder so as to move the piston, against the pressure of the spring, to advance the pusher-arm and whereby opening of both circuits vents the cylinder and permits spring-actuated return of the piston and pusher-arm.

14. A construction according to claim 13 wherein the pusher-arm is provided with a cylindrical guide-member at one end, the guide-member being slidably disposed within an elongated axially-slotted cylindrical-bore chamber mounted on the frame.

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