APPARATUS FOR FASTENING SCREW NECKS TO CAN TOPS

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This invention relates generally to the assembly of screw neck can tops and specifically to a machine for attaching screw necks to rectangular can tops.

In the prior art, screw neck fastening to oblong can tops required a two-step bumping operation calling for the services of four operators, during which operation the closure between the metal of the screw neck and the can top was partially formed in the first step of the operation, and then made secure in a second step of the operation. The duties of the operators involved (1) the application of a gasket filler material to the end of the screw neck to be attached to the can top; (2) the operation of a press for the first or crimping step; (3) the operation of another press for the second or bumping step; and (4) the stacking of the finished (assembled) can tops into boxes for transportation to another department in which they were utilized in making rectangular cans. A typical daily output of four operators and two presses would amount to approximately 8,000 units.

By mechanical operation of steps (2) and (3) above, only two operators are required to provide for the supply of screw necks and can tops and for the removal of assembled can tops for transfer to shipping boxes, as well as for starting and stopping the bumping machine as necessary, with an increase in daily production from 2,000 units per operator to 9,000 units per operator.

Accordingly, it is an object of this invention to provide an improved machine to fasten screw necks to can tops.

It is another object of the invention to provide an improved machine for attaching screw necks to can tops wherein the can tops are moved automatically into proper position for the assembly with the screw necks.

Still another object of the invention is to provide an improved screw neck bumping machine having means for the proper positioning of screw necks on can tops during their assembly.

And another object of this invention is to provide an improved bumping machine for fastening screw necks to can tops wherein the proper degree of contact is obtained between these elements and the machine during the assembly of the screw neck and can top in two simultaneous but different fastening operations.

These and other objects, features and advantages of the invention will become apparent from the following description when read in conjunction with the accompanying drawings in which:

FIG. 1 is a diagrammatic side elevation view of the machine for fastening screw necks to can tops, with a general showing of the mechanism for actuating the can top feed means and the means for raising the dies for the bumping operation;

FIG. 2 is a diagrammatic end elevation view of the machine of FIG. 1, with a general showing of the screw neck positioning means;

FIG. 3 is a diagrammatic partial plan view of the machine of FIG. 1, showing several of the stations of the can tops as they are fed along;

FIGS. 3a and 3b are, respectively, plan and elevation views of the can top separator and feed elements taken at the section 3b—3b of FIG. 3.

FIG. 4 is a diagrammatic plan view of the machine of FIG. 1, with a general showing of the automatic stop devices and thecams for actuating the means for properly positioning the screw necks on the can tops;

FIG. 5 is a diagrammatic plan view showing can tops at the various stations and the screw necks positioned on them as they are fed through the machine;

FIG. 6 is a cross section of the screw neck resting in place on the can top prior to the first step of the bumping operation for fastening to the can top;

FIG. 7 is a cross section of the seam between the can top and screw neck after the first or crimping operation;

FIG. 8 is a view similar to FIG. 7, showing the finished leak-proof seam when the screw neck is fixed to the can top after the second bumping operation;

FIG. 9 is a plan view of the mechanism by which the screw tops are moved into position over the can top;

FIG. 10 is a side elevation view of FIG. 9 showing the means by which vertical motion of the screw neck feed mechanism is obtained;

FIG. 11 is an end elevation view of FIGS. 9 and 10 showing more details of the means by which the screw necks are placed in position on the can tops;

FIG. 12 is a diagrammatic view as a general end elevation through section of the machine of FIG. 11, to show the dies in position ready for bumping; and

FIG. 13 is a cross section of a side elevation of FIG. 12 showing the means by which the dies are raised into bumping position.

The objects of the invention are achieved by the use of an apparatus having a mechanism for automatically placing screw necks in proper position on can tops as the latter are passed at regularly spaced intervals through a two-step bumping operation using dies having the proper degree of contact to fasten screw necks with a leak proof joint to can tops.

Referring to FIGS. 1, 2 and 3 of the drawings to follow the description of the can top feed mechanism, the actuating means therefor includes the feed bar lever arm at 10 and the crank at 11, which imparts the required oscillating motion to the feed assembly. As it moves in slot 12 in the lever arm 10, while the latter moves radially about the pivot rod at 13. Connecting bars 14, 14, are fastened to opposite ends of crank pin 15 extending through the eye end of the lever arm 10 and are joined at 16, 16, to the feed bars 17, 17, FIG. 2, which travel in the feed bar slides 18, 18, and retained in position by the feed bar gibbs at 19, 19. The can tops are fed from the holder at 20, FIGS. 1 and 3, by means of the separator and feed elements, 21 and 22 respectively. FIG. 3 supported by the feed bars, and detailed in FIGS. 3a and 3b, constituting the means by which the bottom can top is separated from the stack and started moving along the feed line.

The stacked can tops without the screw necks rest upon the feed elements 22, 22. When the feed mechanism moves to the left from the position shown in FIGS. 3, 3a or 3b, the separators 21, 21, each with a knife edge at 21a, 21a, on the end facing the can tops, slide over the bottom can top of the stack and separate it therefrom. When the slide assembly starts to move to the right as in FIG. 3, the feed elements 22, 22, contact the can top at the edges 22a, 22a, and move it into the position indicated as #1 in FIG. 3. The separator and feed elements (21 and 22) move together and are positioned in the slides relative to each other with the knife edges 21a, 21a, slightly overlapping the edges 22a, 22a, thus permitting the separated can top to fall below separator element 21 and in proper position with respect to the feed element 22 for movement thereby when the elements 21 and 22 return to the right as shown in FIG. 3.

On the next reciprocating cycle of the feed mechanism,
the can top which has been extracted from the bottom of the stack and now in the #1 position, is pushed to the #2 position and on each succeeding cycle, into each succeeding position until it has completed its travel through the machine, during which time a screw neck has been fastened to it. Spring actuated dogs at 23, carry the can tops along the feed mechanism on the feed stroke and are retracted into recesses in the sides of the feed bars on the separating stroke, during which time, the can tops are held in position by the stop dog at 24 at the can top feed station, and stop dogs at 25 at the numbered positions down along the line. The spacing between the can tops is fixed by the radius of the crank 11, the length of the lever arm 10 and the distance from the axis of the crank to the pivot rod 13. The position of the slide bars 17, 17, relative to the lever arm 10 may be varied by means of the adjustable connecting links 14a, 14a on each connecting bar.

The same spacing between can tops is used for all sizes of tops. However, when larger can tops are to be processed, the top holder at 20 may be enlarged to take care of the greater length and the distance between the slides may be increased by adjusting one bar slide at the necessary distance away from the other.

The apparatus for placing the screw necks in proper position on the can tops will now be described, referring to FIGS. 9, 10 and 11. Screw necks are delivered through the screw neck chute extension at 30 through the nose at 30a, FIG. 2, which is arranged so that the engaging plug 31 of the feed apparatus engages the screw neck lying therein and moves it quickly into such position that it covers exactly the opening in the can top in position #3. The horizontal arc through which this engaging plug 31 swings is shown on FIG. 9.

A rod 32 pivoting above its driver hub 33 carries the plug 31 at its outer end for engagement with a screw neck lying in the nose of the chute and moves it into position on a can top. The required horizontal motion is obtained through the action of the grooved cam 34, FIGS. 9 and 10, on the lever 35 and the feed arm shaft 35a. When the screw neck is in proper position on the can top, the plug 31 is lifted from the screw neck and returned in lifted position to a point above another screw neck, which will have moved into position in the nose of the chute, and then lowered to engage this screw neck. The lifting and dropping motion of feed arm 32 is obtained by means of feed arm lever arm 36, the lift rod link 37, the lift rod 38 and the feed arm lift as at 39 working on pivot screw 40 in the extension 32a of feed arm 32. The feed arm lift 39 is pulled down by action of the cam 41 and the roller 36a mounted on arm 36 pivoted about the lift lever stud at 42. The relative positions of the cams 34 and 41 must be such that there is perfect synchronization between the lifting and the swinging action required to transfer a screw neck from the nose of the chute to the proper position on a can top and then return plug 31 to the nose chute in perfect sequence with the stop and, go, i.e., reciprocating motion of the can tops as they pass through the #3 position on the machine. With cam 41 in the position shown, the feed arm 32 would be lifted. The cam 41 should be rotated 90° clockwise for the lift rod and lifter to be in the position shown in FIG. 11 and the feed arm 32 to be in horizontal position.

As mentioned previously, the screw necks are fastened to the can tops in a two-step bumping operation. Referring to FIGS. 12 and 13, in the first step of the operation, punch 50 engages the die 51 to crimp the metal to the screw neck around the metal of the can top, as shown in FIG. 7, and although the screw neck can be turned by hand, it is securely fastened to the can top. In the second step of the operation, the punch 52 engages die 53 to flatten the crimped edge and to obtain a permanent, leak-proof seal. If the dies 51, 53 were to be rigidly fixed in position for bumping, the can tops could not be fed over them properly. If they were to be kept recessed enough for the can tops to clear them, then the tops would be bent in the bumping operation. Therefore, it is necessary for the dies to be clear of the can tops as they are positioned for bumping before the bumping operation occurs. This is done by means of the die lifting apparatus shown in section in FIG. 13.

The dies 51, 53, are mounted in die holders 54 and 55 respectively, which are free to move vertically. The die holders rest on a bar 56 in which there are recesses 54a, 55a, of such depth that the can tops will clear the die holder when they are in position shown in FIG. 13. When the bumping operation is about to take place, the bar or die lifter 56 is moved to the right in FIG. 13 by means of link 56a and lever 57 actuated by the grooved die lifting cam 58 and the cam roll arm 59, pivoted on shaft 59a, FIG. 1, the die holders being lifted by a distance equal to the depth of the recesses in bar 56. This brings the dies into contact with the bottom of the can top and provides a firm foundation on which contact between the punches and the dies can be made. Studs 60, 60, on the sides of the die holders are joined to the die holder support 61 by coil springs 62, 62, to insure rapid return of the die holders to the recessed position, when bar 56 moves back into the position shown in FIG. 13.

The method used to obtain the proper degree of contact between the punches and the dies will be described by referring to FIGS. 7 and 8. The rod 74 has the usual means T for adjusting the length of the rod. The length of the punch 50 for the first step of the operation is variable by means of the adjustment 50a. The desired degree of contact between the punches and the dies is obtained by first shortening punch 50 by the adjustment 50a, then making the adjustment in the connecting rod adjustment T, so that the punch 52 makes the desired degree of contact with the die 53 when the screw neck and the can top are in bumping position for the permanent seam. With the position of the punch support 70 and so punch 52 fixed by this operation, the position of punch 50 is adjusted by means of the adjusting device 50a to give the desired degree of contact between the punch 50 and the die 51 when screw necks and can tops are in the first step of the operation. If it were not for the adjustment at T and at 50a, it would be virtually impossible to obtain the desired degree of contact in the two simultaneous bumping operations disclosed herein.

The machine is equipped with several devices which can either shut it down or halt the action of the screw neck mechanism in case either the can tops or screw necks are not available or if the machine is out of alignment. If there is no can top in position #1, the lever actuated switch at 80, FIG. 4, shuts the unit down by energizing the solenoid 81, FIG. 1, connected to the release lever 81a. If the can tops are not in proper position on the feed bars 17, 17, i.e., properly retained between the feed bar gibs 19, 19, the lanced flap at 82, FIG. 4 is lifted, and, by means of a microswitch at 83, actuates solenoid 81, FIG. 1, to stop the machine.

The device indicated at 84, FIG. 4, with arcuate ends, is mounted so that it will rest on the screw necks when they are in position on the can tops. If there is no screw neck on the can top moving under this device or if the screw neck is not in the proper position on the can top, this device actuates the microswitch at 85, FIG. 4, to energize the solenoid 81 and stop the machine. Solenoid 81 also may be actuated by the stop switch 86, FIG. 1, on the front end of the machine.

This bumping machine may be driven from an overhead shaft, but as disclosed herein, an individual motor drive is provided. Referring to FIG. 2, there is disclosed a base 2 mounted on the machine, a motor support 3, for supporting the motor 4 in proper position relative to the fly wheel W, with the connection of the fly wheel W to the motor 4 being made by means of the coupling at 5 and
a groove pulley at 6. The power for operating the various cam shafts is taken off the fly wheel shaft X, FIG. 2, by means of a chain drive at Y and the sprocket connection at Z.

Referring back to FIGS. 1 and 2 there is disclosed also a screw neck hopper at A and a sorter wheel at a, while the frame on which the bumping machine is built is shown dotted at F, FIG. 1.

It is common practice in the handling of can tops and similar small metal pieces to hold them in position in machines by means of magnets. Although such magnets are omitted in the present figures, it is mentioned that they are located beneath the several positions indicated in FIG. 3 and midway between the slide bars. The faces of the magnets lie just below the top of the feed bar so that the magnetic forces which they create hold the can tops firmly against the slide bar.

Thus there has been shown and described, a machine having the various operations of automatically withdrawing a can top from a supply stock and feeding it by a reciprocating can top feeding mechanism into positions where a screw neck is sealed thereto with a leak proof seam in a two step operation, one of the separations of the bumping operation being accomplished simultaneously.

Obviously, many modifications and variations in the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore, only such limitations should be imposed as are indicated in the appended claims.

1. In combination, in an apparatus for the automatic assembly of screw necks to can tops, means for positioning a screw neck in a feed line including longitudinally reciprocating members and means for separating individual can tops from a plurality thereof including separator and feed elements, said elements being supported by said reciprocating members whereby their movements cause individual can tops to feed along said feed line, reciprocating crank and lever means interconnecting said reciprocating elements for actuation thereby, each of the separator elements having a knife edge in the direction of separating motion for separating individual can tops from said plurality thereof when said reciprocating members move in one longitudinal direction, the feed elements and a die being mounted in spaced relationship to the separator elements for receiving separated individual can tops for movement into positions in said feed line when said reciprocating members return longitudinally to starting position, the knife edge of each of said separator elements ending adjacent the downstream edge of each of said feed elements whereby an individual can top is dropped into position for engagement by the latter for movement to feed positions, the improvement comprising a screw neck positioning structure for placing screw necks on can tops fed automatically along the feed line comprising means having oscillatory rotational and translational movement for removing a screw neck from a supply thereof and positioning the same on a can top including a pivoted lever arm having a plug for engagement with said screw neck and a pivot screw at the opposite end of said lever arm, means for imparting rotational movement to said pivot lever arm including a grooved cam and a lever member controlled thereby and means for imparting translational movement to said pivot feed arm after rotational movement thereof of comprising pivoted lever members acting on said pivot screw and a compound cam acting said pivot members, said grooved cam and said compound cam being related in position for synchronization between the rotational and translational movements, said cams being actuated from a cam shaft providing automatic feed of spaced can tops.

2. In a machine for fastening screw necks to can tops in a two step operation by automatic feeding and positioning of can tops along a feed line, reciprocating means for separating individual can tops from a supply thereof and for feeding the separated can tops, said reciprocating means being joined to interconnected lever arm and crank members for their reciprocating movement and comprising can top separator and feed means including a first member having a knife edge in the direction of separating motion, and a second member in spaced relationship to said first member arranged so that the separated can top is positioned in the path of the reciprocating return movement whereby feeding of said separated can top to a forward position is obtained in a direction opposite the direction of separating motion; and means for reorienting a screw neck from a supply thereof, placing the same on a properly positioned can top and returning to position for removing a succeeding screw neck including a pivoted feed arm with a neck engaging plug and means for swinging said feed arm from said removing position to said placing position and return to said removing position comprising interconnected lever members and a grooved cam acting thereon, and means for lifting said pivoted feed arm following neck positioning for disengagement therewith, connected lever members in contact with said pivoted feed arm and a compound cam for actuating said pivoted lever members; said reciprocating means for separating and feeding can tops and the screw neck positioning structure being interconnected at the source of power therefor, the improvement comprising means for simultaneously applying an initial crimp lock fastening between parts of a unit comprising a screw neck positioned on a can top in said feed line and permitting loose frictional movement between said neck and said can top and applying a final permanent seal by a bumping device to the preceding unit of said feed line to which the initial crimp lock fastening has been applied, said last mentioned means including a punch and die assembly for therefor with a plurality of corresponding punches and dies housed therein including means for lowering said dies as said can tops and screw necks positioned thereon are fed into bumping position and for raising said dies in proper sequence for the bumping operation including a sliding die lifting member and a die holder housing the same, said lifting member having a groove for receiving the end of said die, and means for sliding said lifting member including lever and cam means actuated by the means actuating the can top feed mechanism and the screw neck positioning mechanism.

3. In the machine as defined in claim 2, the first punch with respect to the approaching can tops housed in said punch and die assembly having means for adjusting the amount of contact between the first punch and die required for the initial crimping operation of fastening a screw neck to a can top.

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