United States Patent

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[72] Inventor George E. Leonard
Davenport, Iowa

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[73] Assignee The Kartridge Pak Co.
Davenport, Iowa

[54] APPARATUS FOR PLACING AEROSOL VALVE ASSEMBLIES IN AEROSOL CONTAINERS
13 Claims, 13 Drawing Figs.

[52] U.S. Cl. ..... 29/208 B, 29/211 R
[51] Int. Cl. B23p 19/04, B23a 7/00
[50] Field of Search ..... 29/208, 211, 208 B, 211 D, 208 D, 208 I

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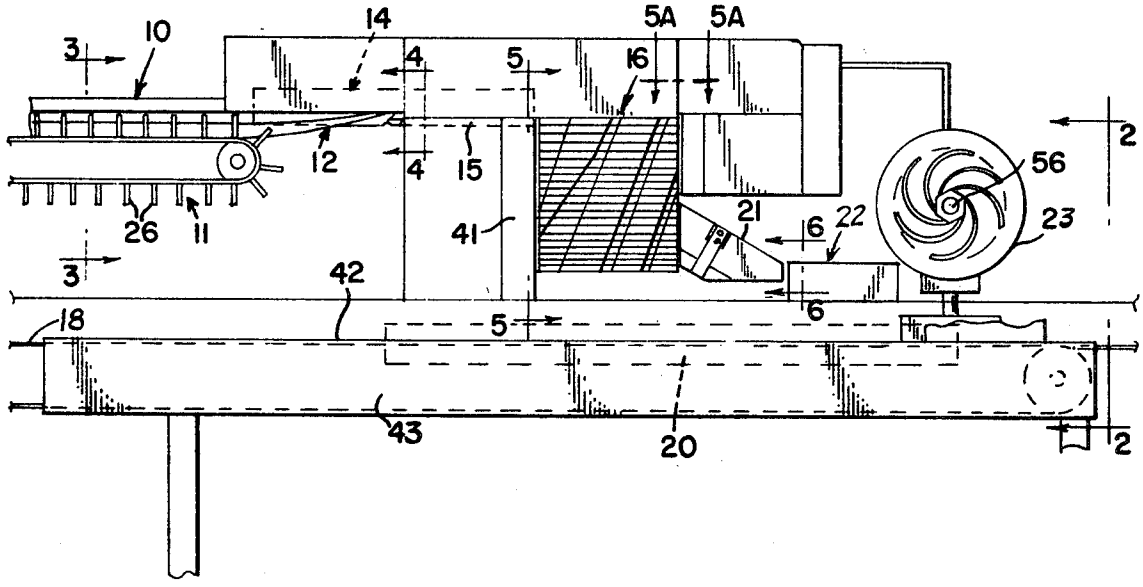
Primary Examiner—Thomas H. Eager
Attorney—Greist, Lockwood, Greenwalt & Dewey

ABSTRACT: An apparatus for placing aerosol valve assemblies into aerosol containers which comprises mechanism for feeding aerosol valve assemblies which are mounted in closure caps to a placing head with the assemblies properly spaced and the dip tubes brought into downwardly extending relation relative to the closure caps, the placing head comprising a beltlike endless conveyor arranged with a run thereof traveling in a vertical plane closely adjacent to a vertically disposed plate member and having a generally spiral groove for receiving and confining the dip tube as the cap portion of the valve assembly is advanced horizontally in a guide channel across the top of the plate and lowered in a vertical path along the side of the grooved belt so as to guide the free end of the dip tube into the mouth of a container which has been advanced along the bottom of the vertical belt run in timed relation with the travel of the placing belt and the mouth thereof aligned with the bottom end of the groove. The apparatus also includes a device for centering the cap on the mouth of the container and a pressure-applying wheel for seating the cap on the rim defining the container mouth.



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SHEET 1 OF 2

FIG. 1

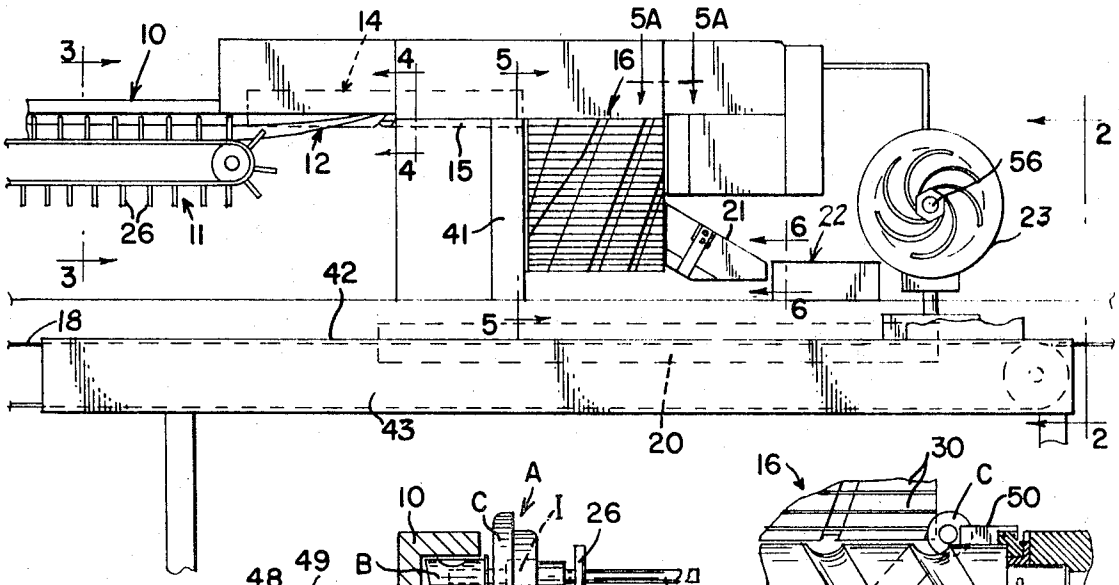


FIG. 3

FIG. 5A

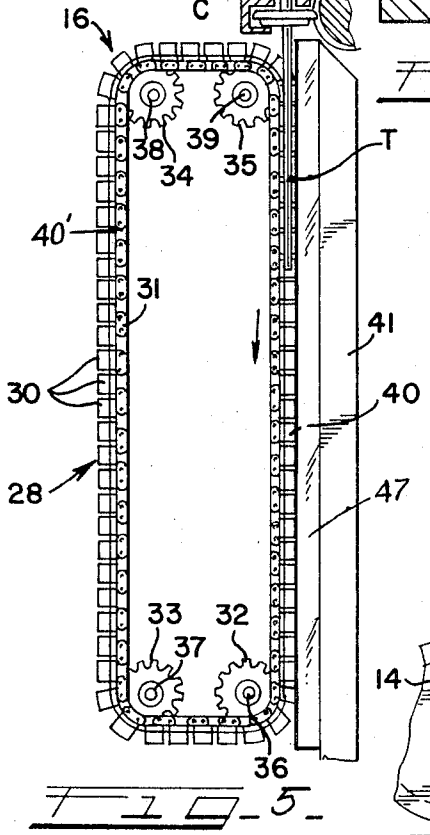


FIG. 5

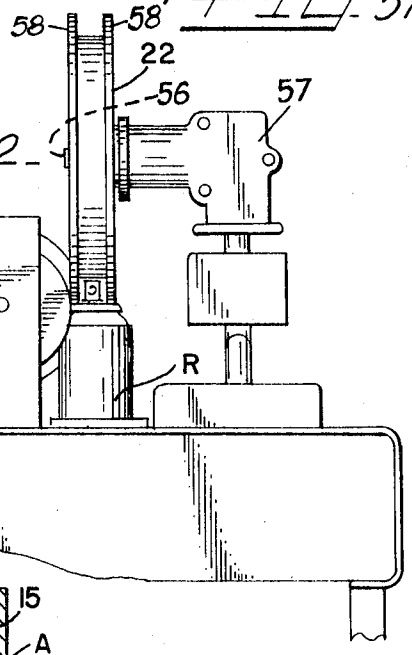


FIG. 2

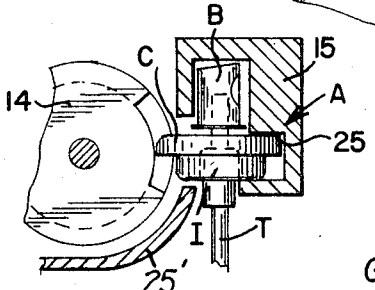


FIG. 4

INVENTOR

GEORGE E. LEONARD

BY Griss, Lockwood, Granewalt & Dewey

ATT'YS

FIG. 7

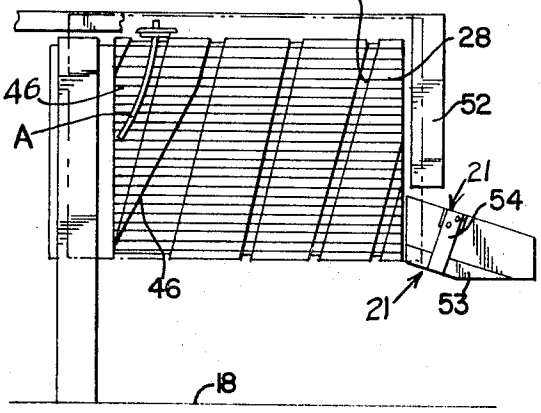


FIG. 10

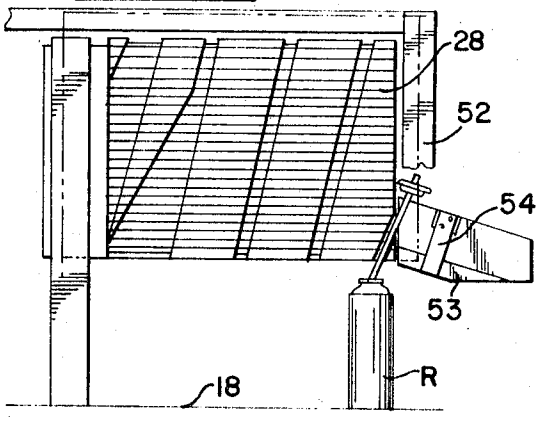


FIG. 8

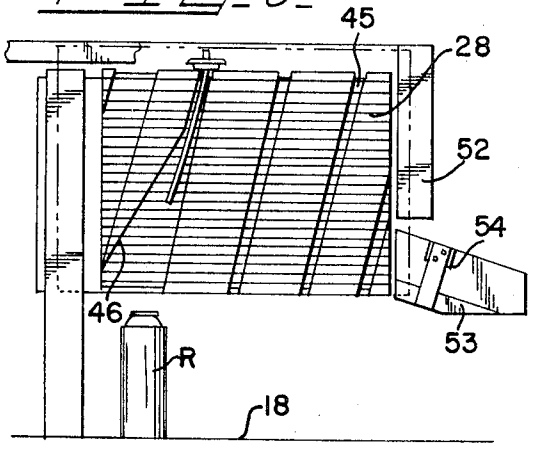


FIG. 11

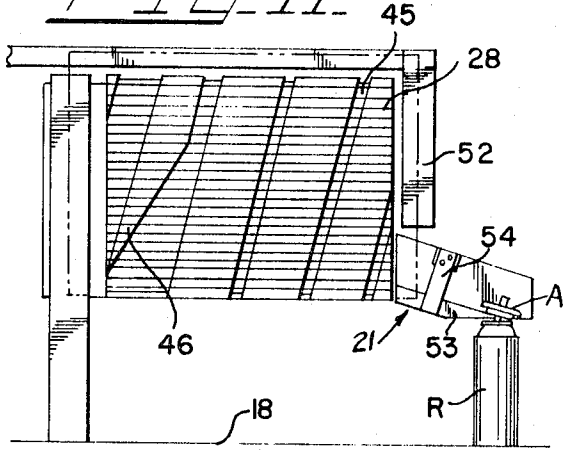


FIG. 9

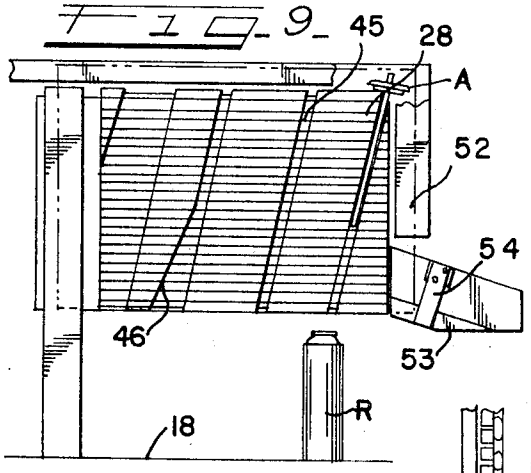


FIG. 12

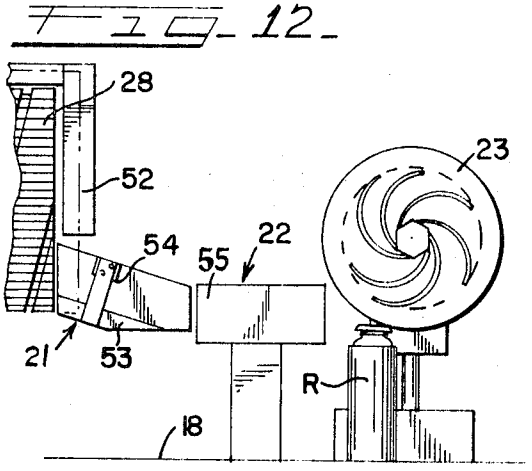
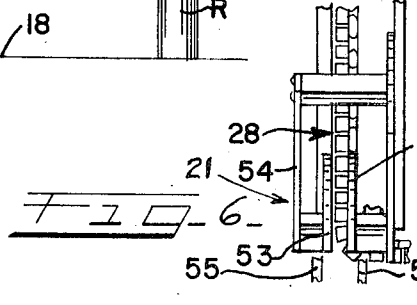


FIG. 6



INVENTOR
GEORGE E. LEONARD
BY Dressler, Goldsmith, Shivley & Dewey
ATT'YS.

APPARATUS FOR PLACING AEROSOL VALVE ASSEMBLIES IN AEROSOL CONTAINERS

This invention relates to article-handling apparatus and is more particularly concerned with improvements in an apparatus for inserting aerosol valve and container closure cap assemblies in the mouths of aerosol containers.

It has been the general practice in the filling and closing of aerosol containers of the type which are commonly referred to as "spray cans" to initially assemble the valve structure, the valve-operating button and the associated dip tube with a closure cap for the container and thereafter to place the assembled units in the mouths of the containers in the course of filling and closing the containers, the caps being sealed onto the rim portions defining the mouths of the containers for closing the latter. Most often the insertion of the valve and cap assemblies into the containers has been accomplished manually. Because of the irregular shape and nonuniform condition of the units, particularly the dip tube, which is normally curved, it has been difficult to design machinery for automatically placing these units in the containers. The use of nonrigid or semiflexible dip tubes, particularly, which normally have a curved configuration, has created a control problem which has proven difficult of solution. It is an object therefore of the present invention to provide an apparatus which will move aerosol valve assemblies through a predetermined path and confine the dip tube so as to bring it under control and enable it to be properly aligned for insertion into the mouth of an aerosol container.

It is a more specific object of the invention to provide an apparatus which will accept aerosol valve and closure cap assemblies and advance the same through a predetermined path while bringing the dip tube into a confined position, where it is relatively straight, and aligning the same with the mouth of a traveling container so as to enable the assembly to be dropped into the container with the cap positioned for crimping in closed relation on the same.

It is another object of the invention to provide an apparatus for handling aerosol valve and closure cap assemblies so as to move the same through a predetermined path and bring the free end of the dip tube into predetermined position where it may be inserted into the mouth of a traveling aerosol container with the cap positioned for a crimping operation to close the mouth of the container.

A further object of the invention is to provide an apparatus for aligning the dip tube of an aerosol valve and closure cap assembly with the mouth of an aerosol container wherein a relatively wide endless belt formation is mounted for travel in a closed, generally rectangular path, with a forward run thereof in a vertical plane and having its outermost surface engaging with a guard-forming vertical plate surface, which belt has a groove formation in the outer surface arranged in spiraled relation across the belt width and providing a relatively wide entrance opening at one side of the belt which permits the assembly to be fed into the groove when the entrance end is at the top of the vertical run with the closure cap confined for travel in a guideway extending across the top of said run and down along the other side edge of the belt and with the width of the groove becoming progressively narrower across the belt width so as to confine the dip tube and cause the free end thereof to be brought into predetermined position as the assembly is advanced across the belt and then lowered along the edge of the belt into the mouth of the container.

These and other objects and advantages of the invention will be apparent from a consideration of the apparatus which is shown by way of illustration in the accompanying drawings wherein:

FIG. 1 is a front elevation of a machine for placing valve assemblies in aerosol cans which incorporates therein the principal features of the invention;

FIG. 2 is an end elevation of the discharge end of the machine;

FIG 3 is a fragmentary vertical section taken on the line 3–3 of FIG. 1, to an enlarged scale;

FIG. 4 is a fragmentary vertical section taken on the line 4–4 of FIG. 1, to a larger scale;

FIG 5 is a vertical section taken on the line 5–5 of FIG. 1, to a larger scale;

FIG. 5A is a fragmentary plan view taken on the line 5A–5A of FIG. 1 to a larger scale;

FIG. 6 is a fragmentary vertical section taken on the line 6–6 of FIG. 1, to a larger scale;

FIG. 7 is a fragmentary elevational view with parts omitted or broken away which illustrates the start of a valve assembly into the groove of the placing head;

FIGS. 8 to 10 are similar to FIG. 7 and illustrate the travel of a valve assembly through the placing head and the insertion of the end of the dip tube into the mouth of a container;

FIG. 11 is a view similar to FIG. 7 illustrating the lowering of the closure cap on the rim of the container mouth; and

FIG. 12 is a fragmentary elevational view with parts omitted or broken away illustrating the final seating of the closure cap on the rim of the container mouth.

Referring first to FIG. 1 of the drawings, the apparatus illustrated comprises a track formation 10 along which a supply of valve assemblies A (FIG. 3) are advanced by a pusher-type conveyor 11. The track 10 has a twisting or turning section 12 in which the assemblies are turned through 90° to bring the dip tube T (FIG. 4) into downwardly extending relation to the closure cap C of each assembly. A worm-type feeding and indexing screw, indicated at 14, extends along the extension 15 of the track 10 and along the top of the placing head 16 and, in cooperation with the head 16, advances the assemblies A one by one across the head. Aerosol containers or receptacles R (FIG. 2) are fed on a conveyor, indicated at 18, traveling in a horizontal path below the head 16 and having a worm-type spacing device, indicated at 20 (FIGS. 1 and 2), associated therewith which advances the containers R in timed relation to the operation of the head 16. The head 16 places successive valve assemblies A in the open mouths of the containers R as they are fed along by the feed screw 20. The dip tube T is first inserted in the container mouth and thereafter the cap portion C of each valve assembly A passes down a ramp 21 through a centering device 22 and advances to a setting wheel 23 which completes the placing of the valve assembly A in the container R.

The valve and closure cap assembly A is of well-known construction and comprises a closure cap C (FIGS, 3 and 4) having mounted therein a valve assembly with an operating button B extending from the top face of the cap C and a dip tube T extending in the opposite direction from the bottom face of the island I in which the valve assembly is mounted.

The valve assemblies A are fed into the machine in the position shown in FIG. 3 with the cap C supported in the guideway 25 in the track member 10, the guideway 25 being shaped to accommodate the cap C and valve-operating button B with the dip tube T extending horizontally and adapted to be carried along or advanced in the guideway 25 by flexible pusher fingers 26 which are spaced along an endless traveling chain 27 constituting the feed conveyor 11. The assemblies A are advanced by the pushers 26 to a turning track section 12 which turns through an angle of 90° so as to bring the cap C into a generally horizontal plane (FIG. 4) with the dip tube T in depending relation and in a generally vertical plane. A feed screw or worm of conventional design which is indicated at 14, but not shown in detail, spaces the assemblies A along the track extension 15 by engaging the caps C and advances the assemblies A across the placing head 16. The track section 15 (FIG. 4) includes an extension of guideway 25 in which the button B and cap C are confined and a cooperating guard plate 25' which is partially wrapped about the feed screw 14 and prevents twisting of the assembly in the guideway.

The placing head 16 comprises an endless traveling member in the form of a belt 28 which may be constructed, for example, of a series of narrow bars or slats 30 mounted on a pair of

laterally spaced chains 31 which are supported on pairs of sprockets 32, 33, 34 and 35 arranged in axially spaced relation on supporting shafts 36, 37, 38 and 39. The shafts 36, 37, 38 and 39 are arranged in generally rectangular relation as shown in FIG. 5 with one of the shafts connected to a suitable drive mechanism (not shown). The arrangement of the shafts and sprockets is such that the belt member 28 advances in generally horizontal planes extending between the top and bottom of front and back runs 40 and 40' which operate in vertical planes.

The head 16 is mounted on a frame structure 41 (FIGS. 1 and 5) upstanding from the top 42 of a tablelike support 43 for the machine. The shafts 36, 37, 38 and 39 are journaled in the frame 41 so as to extend horizontally in cantilever fashion, on the one side thereof with the lowermost shafts 36 and 37 being spaced above the tabletop 42 a predetermined distance so that the bottom of the front run 40 of the belt 38 is spaced above the table 42 a sufficient distance to accommodate a line of aerosol containers R which are advanced beneath the head 16 on the conveyor 18. The outermost face or outer exposed surface of the belt member 28 is provided with groove formation 45 which extends in a spirallike or slanted arrangement diagonally across the width of the belt member 28. The groove formation 45 is fashioned like the threads of a screw but has a width which becomes progressively less across the width of the belt member 28 as shown in FIGS. 7 to 11 so that there is a minimum width at the right side, as viewed in these Figures, which is only slightly greater than the diameter of the dip tube T. At the left side of the belt 28, as viewed in FIGS. 7 to 11, which constitutes the entrance side of the head 16, each groove formation 45 is widened, as indicated at 46, to form an entrance which opens along the left side of the belt member, when the vertical front run 40 is in the position shown in FIG. 1, and is of sufficient length in a vertical direction to permit an assembly A to be moved onto the head 16. The entrance portion 46 is opened at the top and side of run 40 to receive an assembly A, by advance of the belt 28 to the position shown in FIG. 1 and just prior to the position shown in FIG. 7. A faceplate 47, of transparent material, is mounted on the frame 41 and spring loaded so that it engages with the confronting face of the belt member 28 and cooperates with the groove 45 to confine the dip tubes therein. The cap C of each assembly A which is fed onto the head 16 is guided for movement in a horizontal path by a guide member or track section 48 (FIG. 5) which is grooved at 49 to form a guideway of the same character as 25 which accommodates the top button B and the cap C of the assembly A and permits the same to advance across the top of the belt member 28 as the latter is advanced while the dip tube T is confined and straightened out in the groove 45 and the entire assembly is caused to move in a horizontal direction across the front face of the belt 28. When the assembly A reaches the far side of the belt 28 due to the progression of the groove 45 across the belt face the cap portion C moves into position for dropping downwardly along the side edge of the belt 28, principally by gravity. This allows the assembly to move downwardly with the dip tube T being held in the groove 45 by friction, due to the normal curvature of the flexible dip tube, as the latter progresses toward the edge of the belt run 40 so that the bottom end of the dip tube T will be confined for movement in a definite path and guided into the top of a container R which is advancing on the conveyor 18 in proper timed relation to the movement of the belt member 28, and the progression across the width of the belt member of the bottom opening formed in the groove 45 due to the right angle change in direction of the belt member 28 and the spiraled direction of the groove 45.

The end of the screw 14 carries a radially extending spring finger 50 (FIG. 5A) which strikes the top of each assembly A with a downward force as the latter reaches the end of the horizontal guideway 49 so as to prevent jamming and insure smooth movement as the caps turn into a vertical path down which they are caused to advance. A guard or cover plate 52 extends along the edge of the conveyor 28 to insure that there is no interference with the cap assembly as it rides down the path which is provided by the edge of the conveyor 28.

As the assembly A approaches the bottom of the belt run 45 the cap C moves off of the belt 28 and out of the groove 45 into a lowering ramp 21 (FIGS. 1, 6 and 7) which comprises a pair of laterally spaced, track forming bar members 53 and 53' supported on a bracket 54 with the top edges in downwardly inclined track forming relation so as to lower the cap C of the assembly A into proper position on the mouth of the container R as the latter is advanced by the conveyor 18 and the associated spacing worm 20. The ramp 21 is effective to insure that the assembly will drop into the container when the dip tube T is relatively short and there is a tendency for it to fall out of the mouth of the container R.

While only one assembly A is illustrated in FIGS. 7 to 12, the groove formation 45 is designed to transport successive assemblies A as they are fed into the groove and to simultaneously advance them across the belt 40, that is, an assembly A would be transported in each diagonal section of the groove shown in FIGS. 7 to 12 and containers R would be spaced to align the tops with the open bottom of each diagonally extending groove section as it progresses across the width of the belt 28.

The centering device 22 comprises a pair of vertically disposed, parallel plate members 55 and 55' (FIGS. 1, 6 and 12) which are suitably mounted on the frame and spaced apart so that the cap C tends to rub against one or the other of the confronting faces as it advances between the same and centers in proper position on the container mouth.

The containers and valve assemblies advance to a setting wheel 23 (FIGS. 1, 2 and 12) which is spaced in advance of the ramp 21 and which is mounted on a shaft 56 extending from a right-angled drive 57 with the latter being driven in any suitable manner. The setting wheel illustrated comprises a pair of spring mounted, parallel, spaced plates 58 and 58' having the rims thereof covered by rubber, or the like, which are mounted for engaging the cap C as shown in FIG. 2. As the container 12 is advanced beneath the setting wheel 23 by the conveyor 18 the cap C is pressed down onto the rim defining the mouth of the container so as to set the same in position for crimping onto the rim.

The chains 31, in the form of the head 16 which is illustrated, are mounted on spaced sprockets. However, other mounting structure may be employed, for example, all but one of the sprockets may be replaced by roller supports or fixed edges over which the chains may slide. Also, the supports for the chains or other belt members need not be arranged to provide a rectangular belt path but it is necessary only to provide for opening of the groove formations at the top and bottom ends of the dip tube carrying run so that the assemblies may be fed into and discharged from the groove formations.

The operation of the apparatus will be apparent from the foregoing description thereof. The assemblies A are fed one by one through the track 25 by the conveyor fingers 26 to the turning track section 12 where they are turned through 90° to bring the same into upright position with the dip tube T depending from the cap C and in position to be fed to an entrance portion 46 of the groove 45 on the belt member 28 which constitutes the head 16. As successive assemblies A are fed onto the head 16 by the feed worm 14 the cap portion C of the assembly is restrained and guided in a horizontal path and then drops in a vertical path with the dip tube T being confined in the groove 45 and guided into the mouth of a receptacle R as it drops down to the bottom of the belt run and the cap C is guided by the lowering device 21 into position on the rim of the container R. The travel of the belt member 28 moves successive assemblies A through horizontal and vertical paths and brings the free end of each dip tube into alignment for insertion in the mouth of a container R so that it may advance to the device 22 for centering and to the setting wheel 23.

I claim:

1. Apparatus for placing aerosol valve and closure cap assemblies in the open mouths of aerosol containers which comprises means for advancing the assemblies with the dip tubes depending from the bottom faces of the closure caps, a track forming means for guiding the closure caps in a predetermined horizontal path and then in a downward vertical path, a continuous flexible beltlike member mounted for travel in a closed path having a vertical run extending downwardly in the plane of said horizontal path and along said vertical path, said beltlike member having a groove for receiving the dip tubes which groove extends diagonally in spirallike fashion in the outer face of said beltlike member, a member providing a plain vertical surface disposed closely adjacent to said outer belt face and cooperating with the grooved surface thereof to form an enclosure for confining the dip tube of each assembly and holding the same in said groove, said groove being arranged so that as the beltlike member advances the groove travels across the vertical run of said beltlike member whereby each assembly is moved by advance of said beltlike member along said track forming means toward a bottom edge of said vertical path where it turns into a path at an angle to the vertical so as to clear the space below the same and also provide a discharge opening for movement of each dip tube downwardly for delivery out of said groove, said groove being of a size to confine the dip tube to a predetermined position and having entry portions opening at the top and side of the vertical run of said beltlike member as the latter advances for receiving the dip tube into the groove, said groove having diagonally extending portions moving across said vertical run as said beltlike member advances an opening first at the top and one side of said vertical run to receive a dip tube and then at the opposite side and bottom of said vertical run to release the dip tube thereby enabling the lower end of the dip tube to be guided into the mouth of a container which is moved into aligned relation with the portion of said groove in which the dip tube is confined at the bottom of said vertical run.

2. Apparatus for placing aerosol valve and closure cap assemblies in aerosol containers comprising means for feeding the assemblies to an inserting station, a track-forming means at said inserting station for guiding the closure caps as assemblies are advanced along the same with the dip tube of each assembly in depending relation to the bottom face of the associated closure cap, said track-forming means having a horizontally disposed track section terminating at the top of a means defining a generally vertical path down which the closure caps pass and means operative on each successive dip tube for advancing successive assemblies with the closure caps moving along said horizontally disposed track section and into said vertical path, said dip tube-advancing means comprising a conveyor having a traveling belt member with a run thereof in the plane of said track-forming means and a dip tube confining groove arranged in the face thereof so as to provide a traveling path progressing across the face of said belt member in which groove the dip tube is free to move axially, whereby each dip tube is brought into a predetermined, generally straight line position as the assembly is advanced and the free end of each dip tube is guided in a predetermined downward path for insertion into the mouth of a container which is fed beneath said dip tube-advancing means in timed relation to the movement of the dip tube.

3. Apparatus as set forth in claim 2, and said groove being arranged with an entrance opening at the beginning of said run for receiving the dip tube therein and said groove terminating at the end of said run so as to release the dip tube from said groove.

4. Apparatus as set forth in claim 3, and said entrance opening being formed by increasing the width of said groove and said groove becoming progressively less in cross-sectional area across the width of said belt member so as to limit the movement of the dip tube in an axial direction to a predetermined path.

5. Apparatus as set forth in claim 2, and said track-forming means comprising an endless beltlike member having cross strips connecting laterally spaced endless side members with slots cut in the outer faces which form continuous groove formations extending diagonally across the face of said beltlike member.

6. Apparatus for placing aerosol valve and closure cap assemblies in aerosol containers comprising means for feeding the assemblies to an inserting station, a track-forming means at said inserting station for guiding the closure caps as assemblies are advanced along the same with the dip tube of each assembly in depending relation to the bottom face of the associated closure cap, said track-forming means defining a horizontally disposed path terminating at a vertically disposed path in which the closure caps advance and pass downwardly and endless conveyor means for advancing successive assemblies with the closure caps moving along said horizontally disposed path and into said vertically disposed path, said conveyor means having a run thereof traveling in a vertical path in the same plane as said horizontally and vertically disposed paths and having a dip tube-confining guideway in the face thereof which provides a traveling path progressing across the face of said run for bringing each dip tube into a predetermined generally straight line position as the assembly is advanced and for guiding the free end of each dip tube downwardly for insertion into the mouth of a container which is fed beneath said dip tube advancing conveyor means in timed relation to the movement of the dip tube across the face of said conveyor run.

7. Apparatus for placing aerosol valve and closure cap assemblies in aerosol containers as set forth in claim 6, and means adjacent the bottom of said vertical path for lowering each closure cap on the container mouth.

8. Apparatus for placing aerosol valve and closure cap assemblies in aerosol containers as set forth in claim 6, and means adjacent the lower end of said vertical path for lowering the closure caps on the container mouths which comprises ramp forming, downwardly inclined guide members along which the caps are advanced.

9. Apparatus for placing aerosol valve and closure cap assemblies in aerosol containers as set forth in claim 6, and means adjacent the lower end of said vertical path for lowering the closure caps on the mouths of the containers and means for seating the caps on the mouth-defining rims of the containers for subsequent sealing operations.

10. Apparatus for placing valve and closure cap assemblies in aerosol containers as set forth in claim 6, and said conveyor means for advancing the assemblies comprising a flexible beltlike member of substantial width mounted to travel in an endless path with a vertical run extending downwardly of said horizontally disposed track section and having an edge forming a vertically disposed track and said guideway in the outer face of said beltlike member for confining the dip tubes of successive assemblies moving the same across the width of the beltlike member while the caps of said assemblies are confined for horizontal and vertical movement.

11. Apparatus for placing aerosol valve and closure cap assemblies in aerosol containers comprising means for feeding the assemblies to an inserting station, a track-forming means at said inserting station for guiding the closure caps as assemblies are advanced along the same with the dip tube of each assembly in depending relation to the bottom face of the associated closure cap, said track-forming means having a horizontal section defining a horizontally disposed path terminating at a vertically disposed path in which the closure caps advance and pass downwardly and conveyor means for advancing successive assemblies with the closure caps moving along said horizontally disposed path and into said vertically disposed path, said conveyor means comprising a flexible beltlike member of substantial width mounted to travel in an endless path with a vertical run extending downwardly of said horizontally disposed track section and having an edge defining said vertically disposed path, said beltlike member having a groove formation in the outer face thereof which provides an open ended enclosure in the exposed face of said beltlike

member constituting a traveling path progressing across the face for confining the dip tubes of successive assemblies while simultaneously advancing the same across the width of the beltlike member to a point where the closure caps are free to drop vertically along the edge thereof, said groove being formed to bring each dip tube into a predetermined generally straight line position as the assembly is advanced and to enable the free end of each dip tube to be guided downwardly for insertion into the mouth of a container which is fed beneath said dip tube advancing means in timed relation to the movement of the dip tube.

12. Apparatus for placing valve and closure cap assemblies in aerosol containers as set forth in claim 11, and said groove formation extending in diagonally disposed reaches across the width of said beltlike member.

13. Apparatus for placing valve and closure cap assemblies in aerosol containers as set forth in claim 11, and said groove formation being arranged to provide connected sections extending diagonally across said vertical run so as to provide a diagonally extending guideway thereon which moves across the width of said beltlike member as the latter advances and confines the dip tubes to a predetermined horizontal and vertical path.