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F. C. GLEASON ET AL  
AEROSOL VALVE INSERTING MACHINE

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3 Sheets-Sheet 1

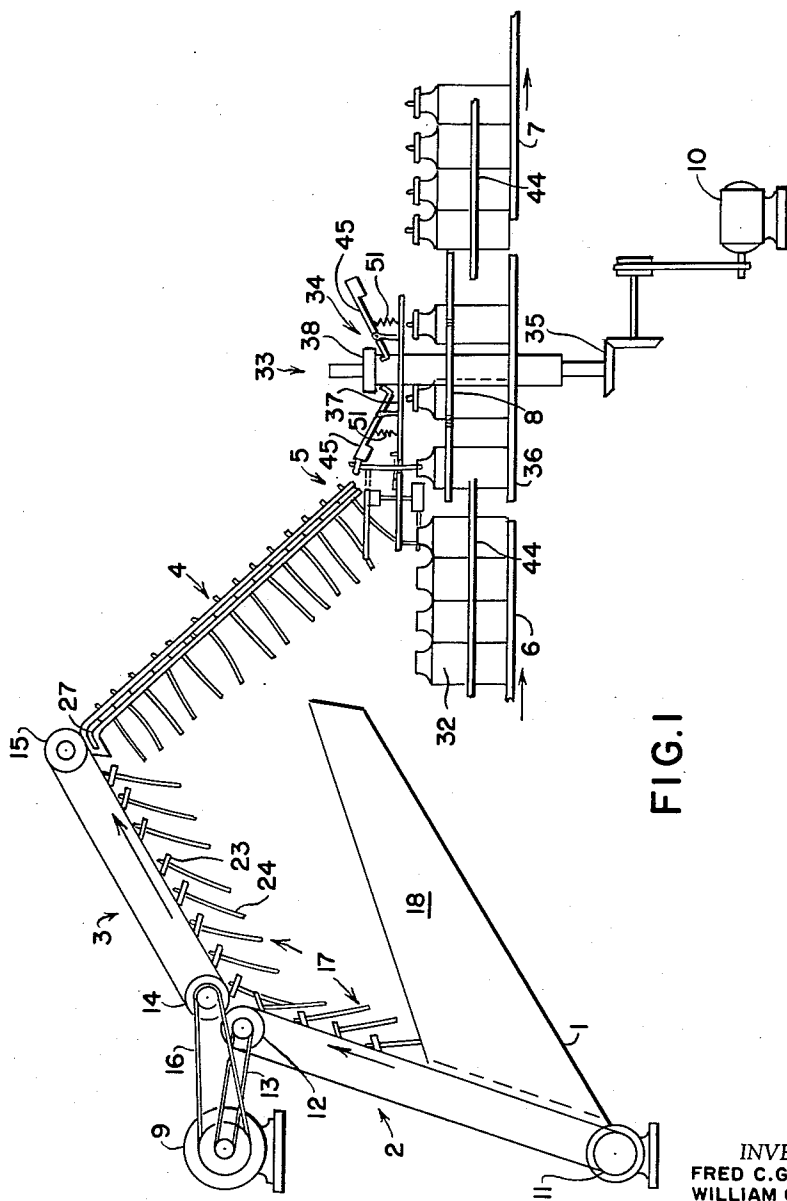


FIG. 1

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3 Sheets-Sheet 2

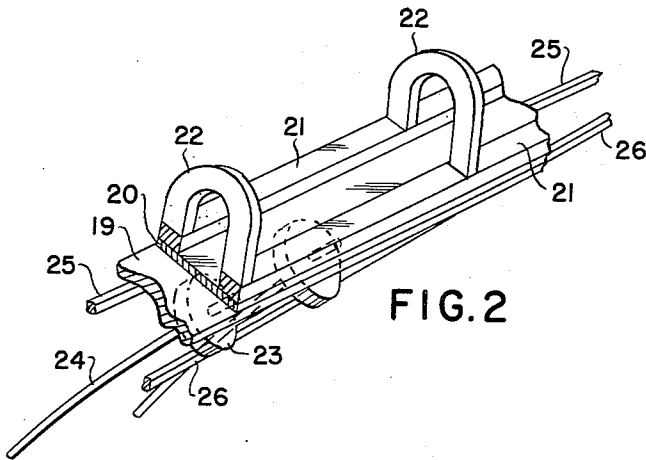


FIG. 2

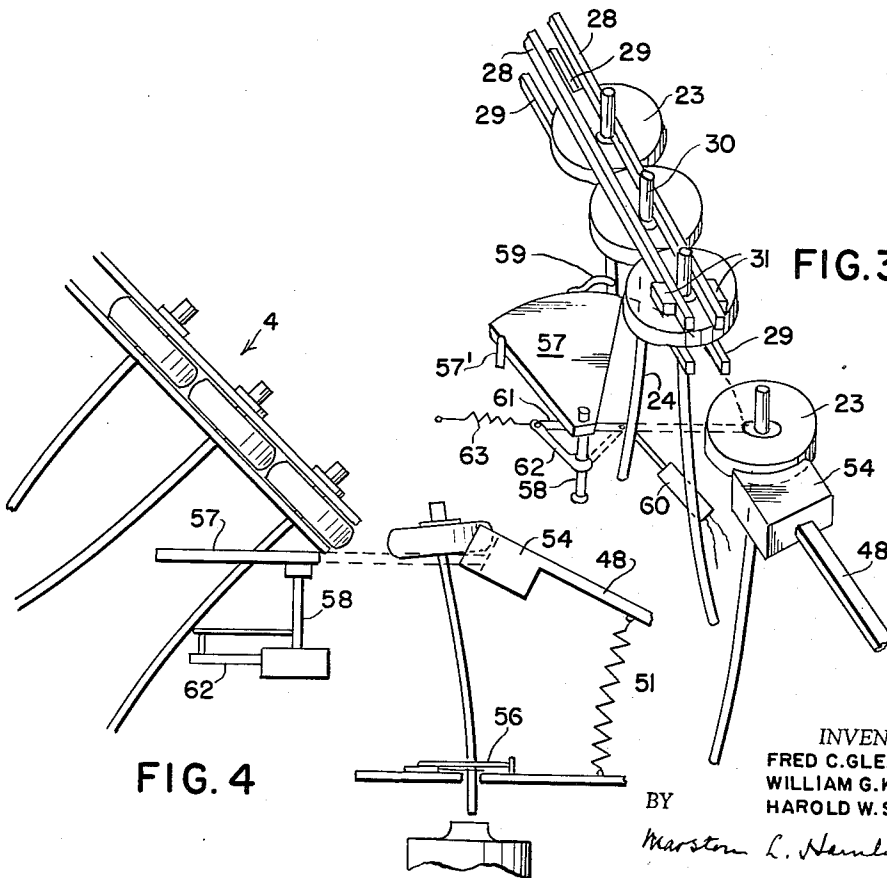


FIG. 4

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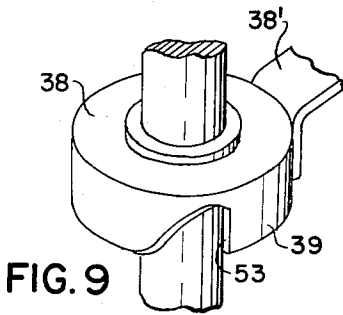
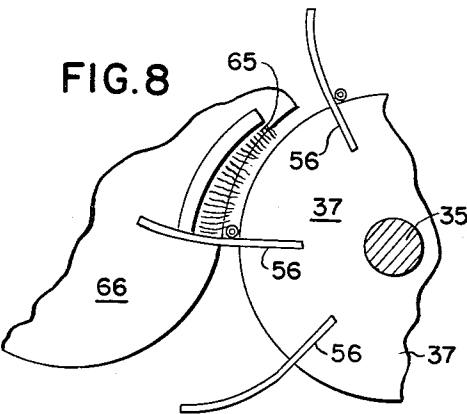
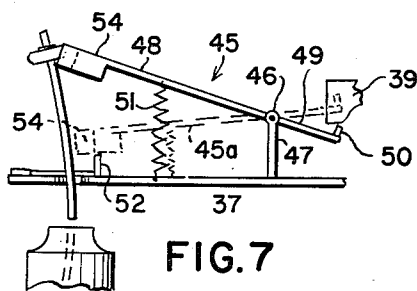
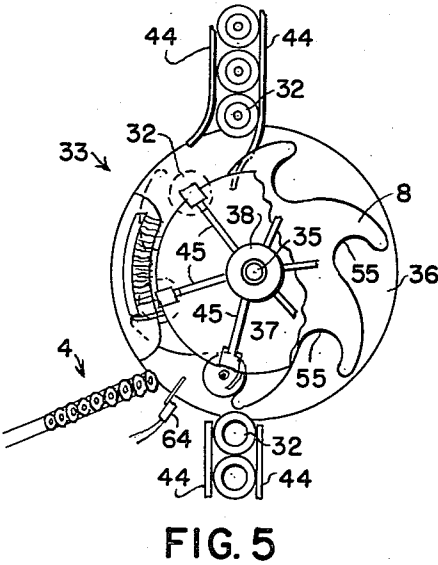
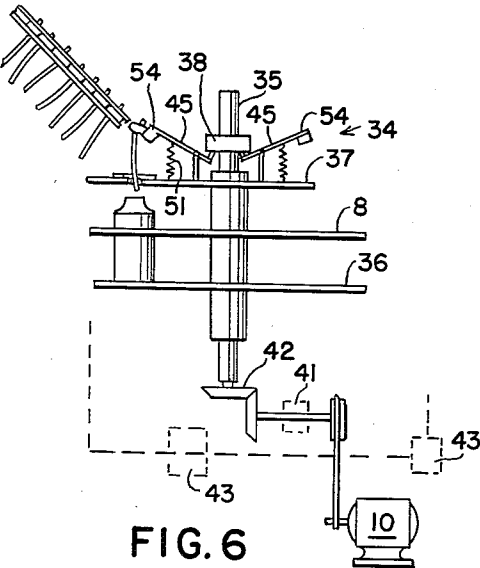
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AEROSOL VALVE INSERTING MACHINE

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3 Sheets-Sheet 3



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## AEROSOL VALVE INSERTING MACHINE

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3 Claims. (Cl. 29—200)

This invention relates to an aerosol-valve-inserting machine. More particularly it relates to a machine for aligning and orienting aerosol valves, each of which comprises a ferrous metal cap and a non-ferrous dip tube and a non-ferrous finger valve by the action of a magnetic field on the ferrous metal cap, transporting said valves in aligned and oriented relation to a position above a feed line of aerosol cans, and inserting one of said valves in each of said cans.

It is an object of this invention to provide a simple, efficient and economical device and method for automatically positioning a valve in each of a series of aerosol cans preparatory to crimping or otherwise permanently affixing the valves on the cans.

Other objects and advantages of our invention will be apparent to those skilled in the art from the following description.

The cans, before being fed to our machine, may be either empty or filled with material to be dispensed as an aerosol, depending on the character of such material and other features of the filling process. Our machine and method is equally applicable in either case.

In one embodiment of our machine scrambled valve assemblies contained in a hopper are picked up by an inclined conveyor belt and raised to a position just below the bottom run of a second conveyor belt inclined upwardly from the top of the first conveyor belt. The bottom run of the second conveyor belt passes for its entire length in contact with or close to an elongated permanent magnet or series of magnets so arranged as to produce an attractive field along the under side of the second belt, the bottom run of which is moved continuously upwards. The effect of this magnetic field is to pick each valve from the first conveyor belt as it reaches the top of the latter and hold it with its ferrous cap pressed against the bottom run of the second conveyor belt and its dip tube pendent. In this position it is moved to the top of the said second belt. Vibrating or oscillating guide bars tend to form a single line of valves.

Each valve at the top of the second conveyor belt moves out of the magnetic field and drops off the belt, still in the dip-tube-pendent position, into a gravity chute down which it slides to a position over a feed line of aerosol cans moved serially forward on a conventional can conveyor. The gravity chute is so arranged as to maintain the orientation of the valves. Means is provided for returning excess valves to the hopper.

At the bottom of the gravity chute, means is provided to alternately retain and release the bottom-most valve and to align its dip tube for insertion in synchronism with the presentation of a can on the can conveyor to a valve-inserting station. This means comprises a valve-retaining means, a stem-aligning means, a pick-up permanent magnet, a solenoid-operated valve escapement plate and a micro switch arranged to be operated in synchronism with the presentation of individual cans successively to the valve-inserting station and to activate the valve escapement member. The arrangement is such that, as a can approaches this station, the micro switch is closed, causing the valve escapement member to sweep a valve off the gravity chute against the tension of the retaining means. At this point the valve aligning

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means, in part operated by the can-advancing means, positions the dip tube directly over the center of the can in the valve-inserting station, the valve cap being held by a permanent magnet on a valve-inserting arm. As the can progresses, cam action causes the permanent magnet to snap down against a stop, the inertia of the valve freeing it from the magnet and permitting the valve assembly to drop into position on the can. In the meantime another valve has slid down the gravity chute to a bottommost position against the retaining means.

As additional cans approach the inserting station, the cycle is repeated.

A preferred embodiment of our invention is disclosed in the following description and drawings but the description and drawings are intended to be illustrative only and not to limit the invention, the scope of which is defined in the appended claims.

In the drawings:

FIG. 1 diagrammatically illustrates a side view of the general arrangement of our invention;

FIG. 2 is a perspective view of a portion of the second conveyor belt and associated magnets;

FIG. 3 is a perspective view of the lower end of the gravity chute;

FIG. 4 is a side view of the lower end of the gravity chute and associated aligning and selecting means;

FIG. 5 is a plan view of the star wheel, a portion of the conveyor belts and associated positioning devices;

FIG. 6 is a side view of the indexing and inserting means;

FIG. 7 is a side view of an inserting arm and its support;

FIG. 8 is a fragmentary plan view of aligning fingers and brush guide; and

FIG. 9 is a perspective view of the fixed cam.

Our machine as illustrated comprises in general a hopper 1, a first ascending conveyor belt 2, a second ascending conveyor belt 3, a gravity chute 4, valve-selecting and -aligning mechanism 5, a feed belt 6, a take-away belt 7, a can-selecting star wheel 8, and conventional synchronized drive means for the moving parts indicated diagrammatically in part at 9 and 10.

The structural features of our machine can best be understood in connection with the operation of the machine and they will be so described. The supports for the operating parts are of a conventional nature and subject to variation to suit the location of the machine, so that it is thought unnecessary to illustrate them.

The elements of the machine are suitably mounted by conventional means in the spaced relationship indicated in FIG. 1.

Aerosol valves comprising a ferrous metal cap, a plastic dip tube depending from the cap and a finger valve on the top of the cap, are placed helter-skelter in hopper 1, and are raised therefrom in oriented position by conveyor belt 2. The latter passes over pulleys 11 and 12, pulley 12 being operated at a desired speed by motor 9 and belt 13. Conveyor belt 2 may be of any useable type but is preferably a magnetic belt of the same construction as conveyor belt 3 described below. The lower run of belt 2 moves upward as indicated by the arrow.

Conveyor belt 3 passes over pulleys 14 and 15, the former also being driven by motor 9 through belt 16. The speed of travel of belt 3 is greater than that of belt 2, to avoid a piling up of valves at the junction of the belts. Valves 17 raised by belt 2 are transferred to belt 3 at the point of near tangency of the belts. An extension 18 of hopper 1 is provided to receive any excess valves that may fall from belts 2 or 3.

The construction of belt 3 (and of belt 2, if so chosen) is illustrated in FIG. 2. The belt comprises an endless moving web of belting material 19 driven, as indicated

in FIG. 1, along a fixed smooth non-magnetic plate 20 on which are fixed two parallel ferrous metal bars 21 constituting the N and S poles of a permanent magnet. Permanent horseshoe magnets 22 at spaced intervals provide a suitable path for the magnetic flux. The ferrous caps 23 of the valve assemblies, when brought into the magnetic field of a belt, are drawn against the moving web 19 and so carried upwards as shown in FIG. 1. To ensure alinement of the plastic dip tubes 24, pairs of upwardly converging rods 25, 26, between which the pendent dip tubes move, may be fixedly mounted below the belts. These rods are advantageously vibrated or oscillated with a small amplitude in a plane parallel to the moving web by well known conventional means.

As the moving valves approach pulley 15, they are carried into the receiving throat 27 of gravity chute 4, down which they slide to the selecting and alining mechanism 5.

Chute 4 is constructed of a pair of upper parallel bars 28, and a pair of lower parallel bars 29, spaced as shown in FIG. 3 to receive caps 23 between the upper and lower bars and dip tubes 24 and finger valves 30 between the right and lefthand pairs of bars. The clearance between the bars is such as to allow the valves to slide down the chute freely by gravity. At the bottom of the chute two permanent retaining magnets 31 are placed to hold the bottommost valve in the chute by their attraction for its ferrous metallic cap until the valve is swept away by the selecting and alining mechanism 5.

Turning now to the can supply, aerosol cans 32 with open tops are moved by conveyor belt 6 at a suitable rate to valve inserting station 33. Here they are transferred to indexing unit 34 consisting of a shaft 35 rotated on a fixed vertical axis, a circular table 36, a star wheel 8 and an inserting arm plate 37 mounted on and turning with shaft 35. The upper end of shaft 35 passes through fixed bearings 38, the lower surface of which constitutes a fixed cam 39. The bearing and cam are supported on arm 38'. The arrangement is shown in FIG. 5. The drive of conveyor belts 6 and 7 and of indexing unit 34 is indicated diagrammatically. Electric motor 10 furnishes the motive power through speed-control unit 41, gears 42, and synchronizing units 43 to operate the conveyor belts 6 and 7 and continuously indexing unit 34 at suitable interrelated speeds as described below. Gears 42 and units 41 and 43 being conventional do not require further description. Rails 44 maintain cans 32 in alinement and guide them onto and off table 36 as they approach and leave inserting station 33.

Six inserter arms 45 are carried on plate 37 by pivots 46 mounted in studs 47 upstanding from the surface of the plate. The studs are arranged in a circle around shaft 35 at 60° intervals and the pivots are so placed as to permit inserter arms 45 to oscillate in radial planes passing through the axis of shaft 35.

In the inserter arms the pivots are placed closer to shaft 35 than to the periphery of plate 37 thus providing a long outboard lever arm 48 and a short inboard lever arm 49. The heights of studs 47 and cam 39 are such that the inboard ends of five of the inserter arms, provided with cam followers 50, are maintained depressed below the horizontal, thus raising the five outboard ends. The outboard end of the sixth inserter arm remains depressed momentarily as described below. A tension spring 51 is provided for each arm as shown in FIGS. 1, 6 and 7, which snaps the outboard end of the inserter arm down smartly against stop 52 when the inboard end is released by a discontinuity 53 in the surface of cam 39 as the unit rotates. The extreme outer end of each inserter arm is provided with a permanent magnet 54 having an outwardly directed concavity designed to mate with the edge of a valve cap 23 for somewhat less than half its circumference, and the length of the outboard lever arm is so chosen that, when it is in its depressed position, the

concavity in its magnet is centered on the circle of centers of the star wheel recesses 55.

As a result of this arrangement, rotation of the indexing unit 34 causes the outer end of each one of the six inserter arms 45a to be suddenly snapped down against stop 52 (FIG. 7) at a chosen angular position in the rotation and to be raised and kept raised in other positions.

Plate 37 is also provided with six equally spaced radial alining fingers 56 projecting beyond the rim of the plate as shown in FIG. 8; as described below, these aid in positioning dip tubes 24 for insertion into the cans.

As shown in FIG. 1, chute 4 terminates at its lower end at the level of the raised outboard ends of inserter arms 45. At this point escapement means is provided for removing one valve at a time from the chute. The escapement means comprises an arcuate segmental plate 57 mounted for angular reciprocation on vertical shaft 58 rotating on a fixed vertical axis.

The radius of arc is such that, when the plate is rotated clockwise as seen in FIG. 3, the valve-pick-up spring 59, mounted near the intersection of the leading edge and the arcuate edge, cooperates with the latter to pick off and remove the pendent dip tube of the valve held by retaining magnets 31, and the trailing portion of its arcuate edge will prevent the advance of the next valve in the chute until plate 57 returns counterclockwise to its previous position. Clockwise rotation of the plate is effected by sucking solenoid 60 acting through link 61 on arm 62 attached to shaft 58. Tension spring 63 returns plate 57 counterclockwise to its rest position against stop 57' when solenoid 60 is deenergised. The operation of the solenoid is controlled in timed relation to the operation of indexing unit 34 by micro switch 64 activated by the passage of cans 32.

The timing is so adjusted that, as the indexing unit brings a raised end of an inserter arm 48 into alinement with the lower end of chute 4, the micro switch is closed by the next can approaching the valve pick-up position as shown in FIG. 5, causing escapement plate 57 to sweep a valve from the end of chute 4 against the pull of retaining magnets 31 and bring the valve cap 23 into the field of associated magnet 54 by which it is seized. Further rotation of the indexing unit carries the valve, suspended from magnet 54, towards the inserting position, while a radial alining finger 56 carries the pendent dip tube along vertically below the cap. Meanwhile the rotation has caused the opening of micro switch 64, so that escapement plate snaps back to its rest position and permits the next valve in chute 4 to slide into the field of retaining magnets 31.

In order to ensure that dip tubes 24 are properly placed over the open throats of cans 32, an arcuate brush 65 is provided on a level with plate 37 forming with the rim of plate 37 a narrow arcuate channel centered on shaft 35. This brush as shown in FIG. 8 is mounted on fixed plate 66 with the bristles centrally directed. The dip tube of the valve suspended from the inserter arm is moved through the arcuate channel by alining finger 56 against the slight dragging friction of the brush which steadies the dip tube directly under its associated cap.

The rotation of indexing unit 34 carries the valve, suspended from magnet 54 on inserter arm 45 and propelled by alining finger 56, to inserting station 33, to which point a can 32 has been moved by star wheel 37. Coordinated with this point, a cut-away portion 53 of cam 39 relieves pressure on cam follower 50 on the inboard end of inserter arm 45 permitting spring 51 to snap the inserter arm smartly against stop 52. The inertia of the valve frees it from the magnet and allows it to drop into position in the throat of the can which is then moved out of the range of alining finger 56 by guide rail 44 (FIG. 5). The can with valve in place is then moved away by take-away belt 7 for further processing.

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This cycle is repeated as long as cans and valves are fed to the machine.

We claim:

1. A machine to place valves in aerosol cans preparatory to affixing said valves to said cans, said valves comprising a ferrous metal cap and a pendent non-ferrous dip tube, said machine comprising: means for feeding alined valves successively to a selector station, escapement means at the selector station adapted to remove successively one valve at a time from said feed means, means to activate said escapement means in a desired time sequence, first conveyor belt means to advance open aerosol cans through the selector station to a valve-inserting station, a continuous indexing unit at the valve-inserting station, said unit comprising a vertical shaft rotatable on a fixed axis, a circular table carried by the shaft at the level of the conveyor belt and adapted to receive cans from the belt, a star wheel carried by the shaft having curved rays adapted to partially encircle the cans on said circular table, an inserting-arm plate carried by said shaft at the level of the tops of the cans on said circular table, and a fixed bearing ring surrounding the top of said shaft, the under side of said bearing ring constituting a fixed cam having a single deep depression, radially directed inserter arms pivotally mounted on the inserter arm plate for oscillating in a vertical plane, the inboard ends of said arms bearing against said cam, tension springs adapted to depress the outboard end of each arm when the inboard end mates with the depression of the fixed cam, a magnet at the end of each inserter arm adapted to seize and hold a valve cap removed from the valve feed by the escapement means when the outboard end of the arm is in a raised position, power means adapted to activate said escapement means and rotate said indexing unit at inter-related rates to effect the release of a valve from the feeding means as a can is brought to the inserter station, the depression in the fixed cam being so located as to

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permit the sudden drop of the outboard end of an inserter arm with retained valve over the open neck of a can, whereby the valve is released and positioned on the can, and second conveyor belt means to remove cans with inserted valves from the valve-inserting station, and means for supporting said feed means, said selector station, said first conveyor belt means, said valve-inserting station, and said second conveyor belt means in spaced and cooperative relationship.

2. A machine as defined in claim 1 in which the valve-feeding means comprises a conveyor belt adapted to raise said valves to a position above the selector station and deliver them to a gravity chute, and a gravity chute adapted to deliver said valves to the selector station, the conveyor belt being of non-magnetic material and passing through the magnetic field of a fixed permanent magnet positioned on the side of the belt opposite to its working face, whereby the ferrous caps of the valves are attracted to the working face of the belt and advanced by the travel of the belt, the gravity chute being provided at its lower end with at least one permanent magnet adapted to retain the lowermost valve in the chute until removed by the escapement means.

3. A machine as defined in claim 1, in which the escapement means comprises an arcuate segmental plate oscillating on a vertical axis and adapted, on oscillating, to engage a pendent tube of a valve in the feeding means and remove said valve from the feeding means, a solenoid adapted when energized to oscillate said plate, and a micro switch adapted to energize said solenoid when closed, the micro switch having an actuating arm adapted to contact an aerosol can approaching the selector station.

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