United States Patent

[11] **3,630,807**

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[21] Appl. No. **936**
[22] Filed **Jan. 6, 1970**
[45] Patented **Dec. 28, 1971**

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[32] Priority **Feb. 26, 1969**
[33] **Japan**
[31] **44/14942**

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[54] **MACHINE FOR APPLYING SEALING MATERIAL FOR A CROWN CAP AND THE LIKE**
2 Claims, 11 Drawing Figs.

[52] U.S. Cl. **156/567,** 156/357, 118/3
[51] Int. Cl. **B05c 11/08,** B05b 1/06
[50] Field of Search ..... 156/350, 352, 356, 357, 556, 558, 566, 567; 118/DIG. 3, 3, 12, 55, 56, 318, 319, 409; 18/DIG. 6, DIG. 47

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Assistant Examiner—James M. Hanley
Attorney—Waters, Roditi, Schwartz & Nissen

ABSTRACT: A machine for applying sealing material for crown caps and the like wherein the crown caps travel along a circular path at a fixed rotational speed for attaining a smooth sealing material or lining operation in an uninterrupted manner.

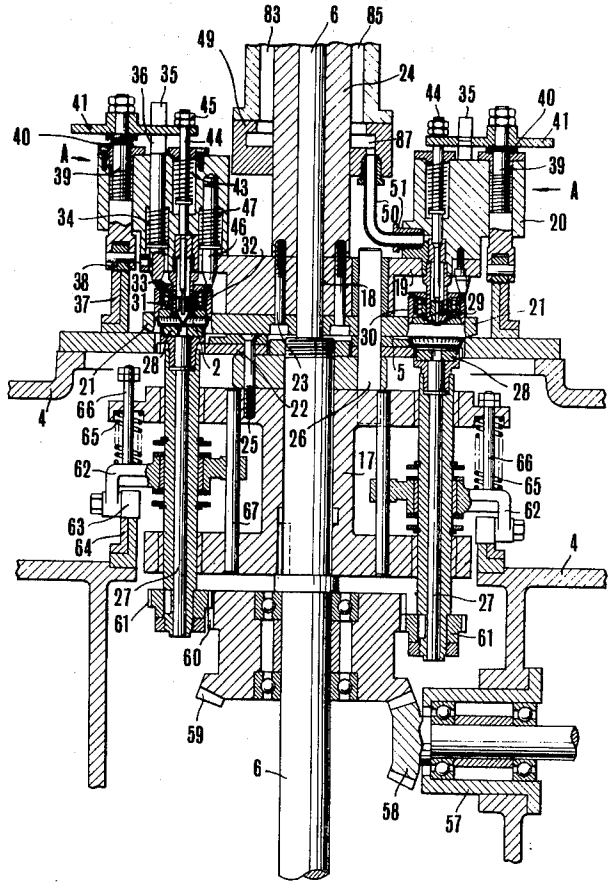


FIG. 1

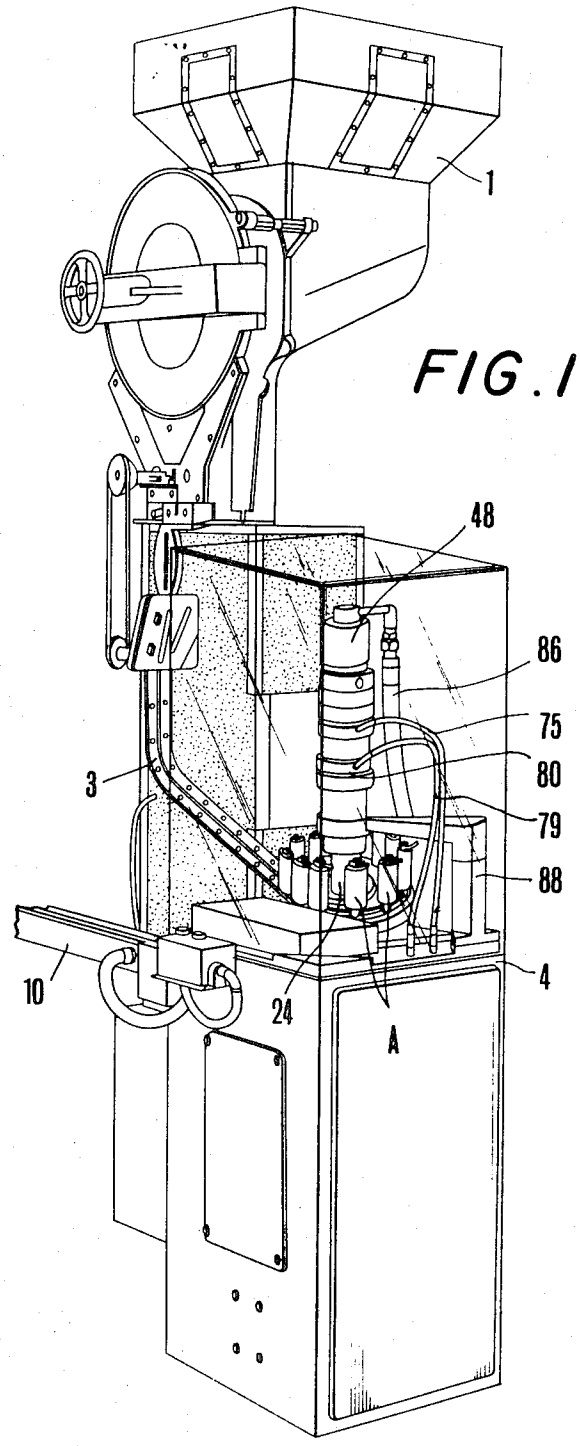


FIG. 7



FIG. 2

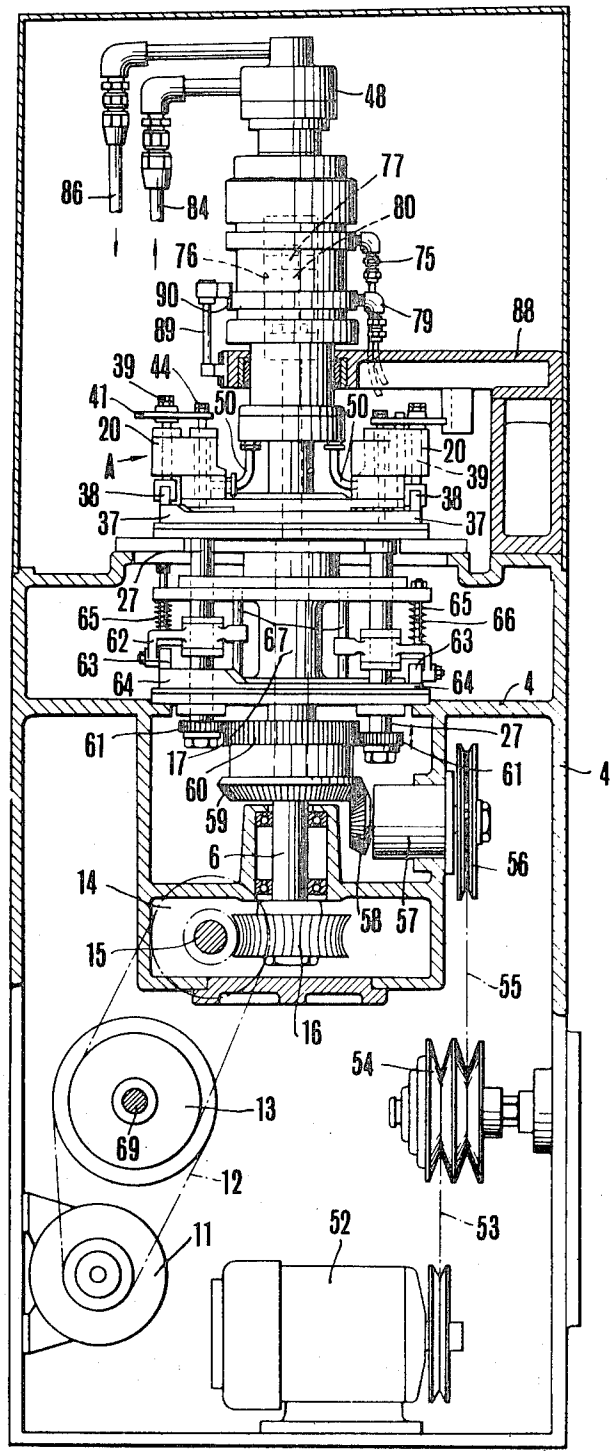

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FIG. 3

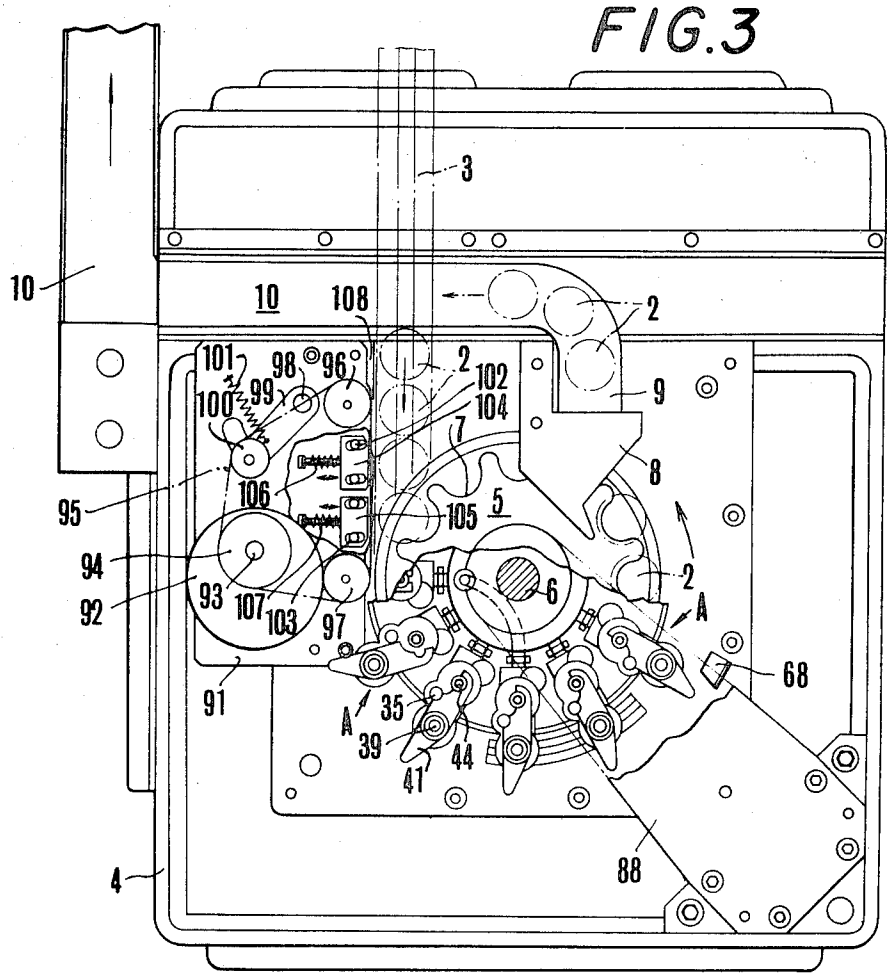

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FIG. 11

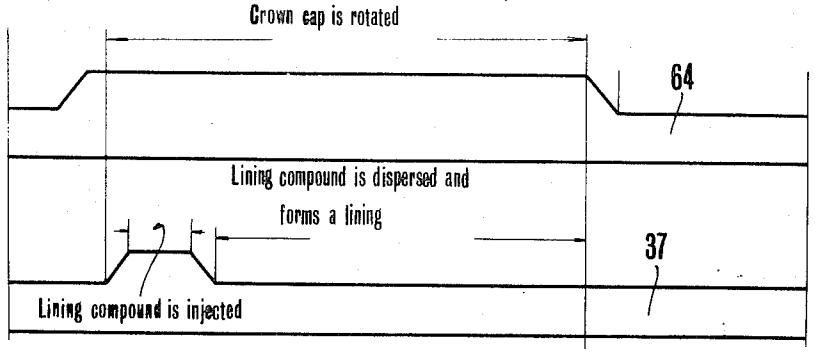

Crown cap is rotated
64
Lining compound is dispersed and
forms a lining
37
Lining compound is injected

FIG. 4

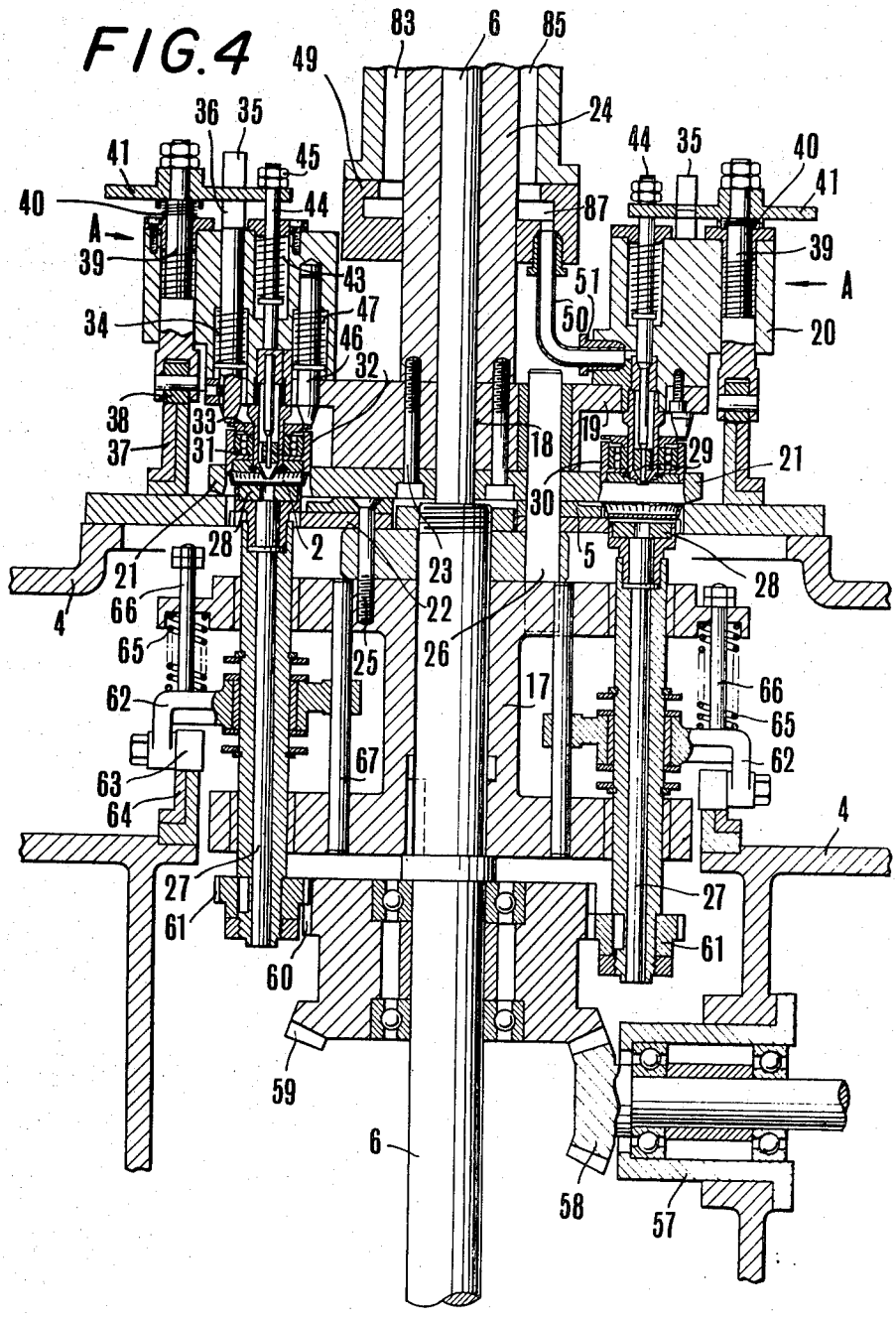

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FIG.8

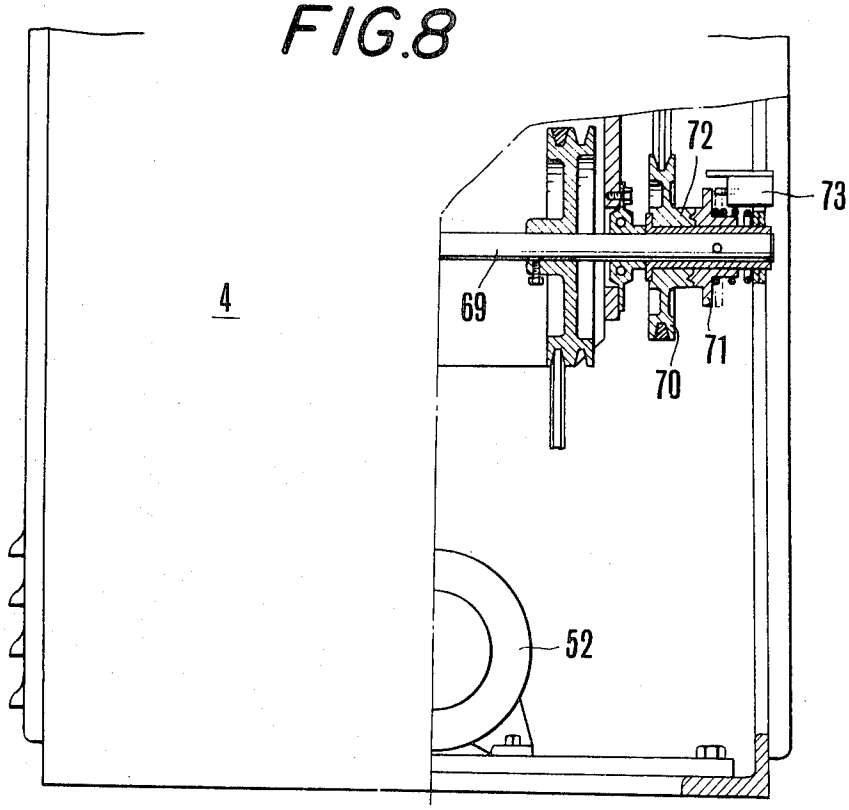
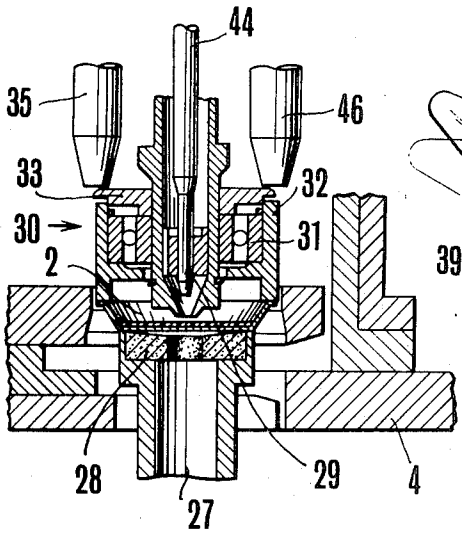


FIG.6



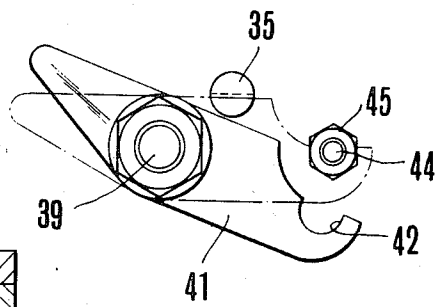


FIG.5

FIG. 9

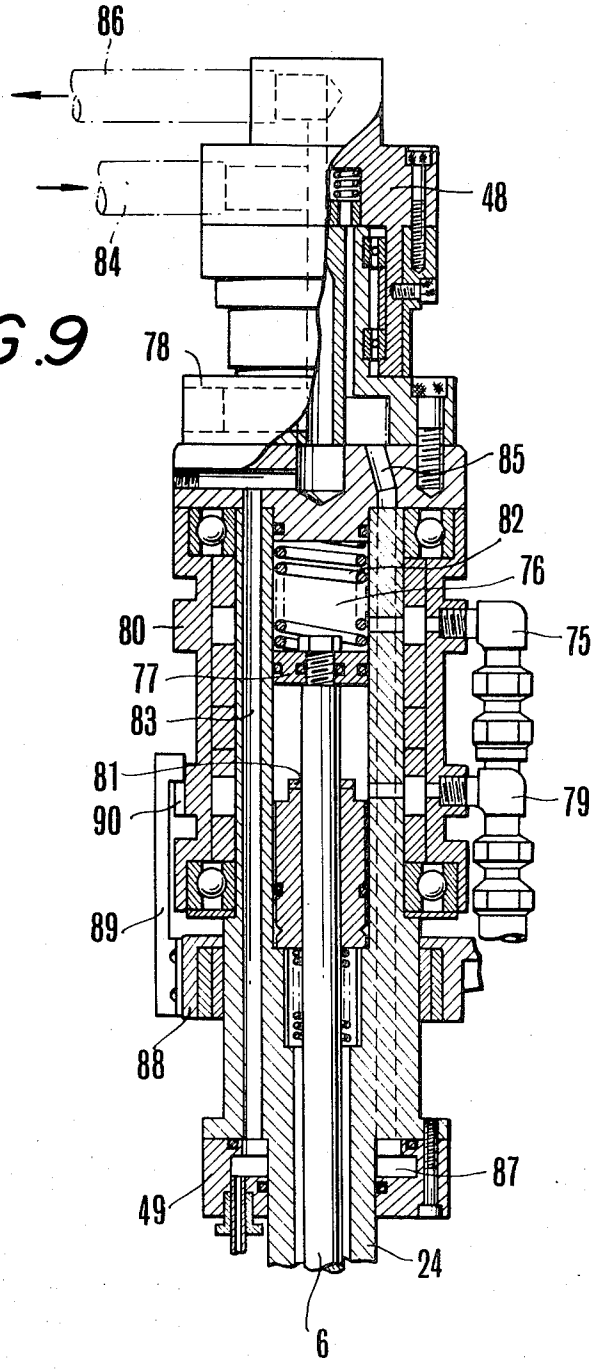
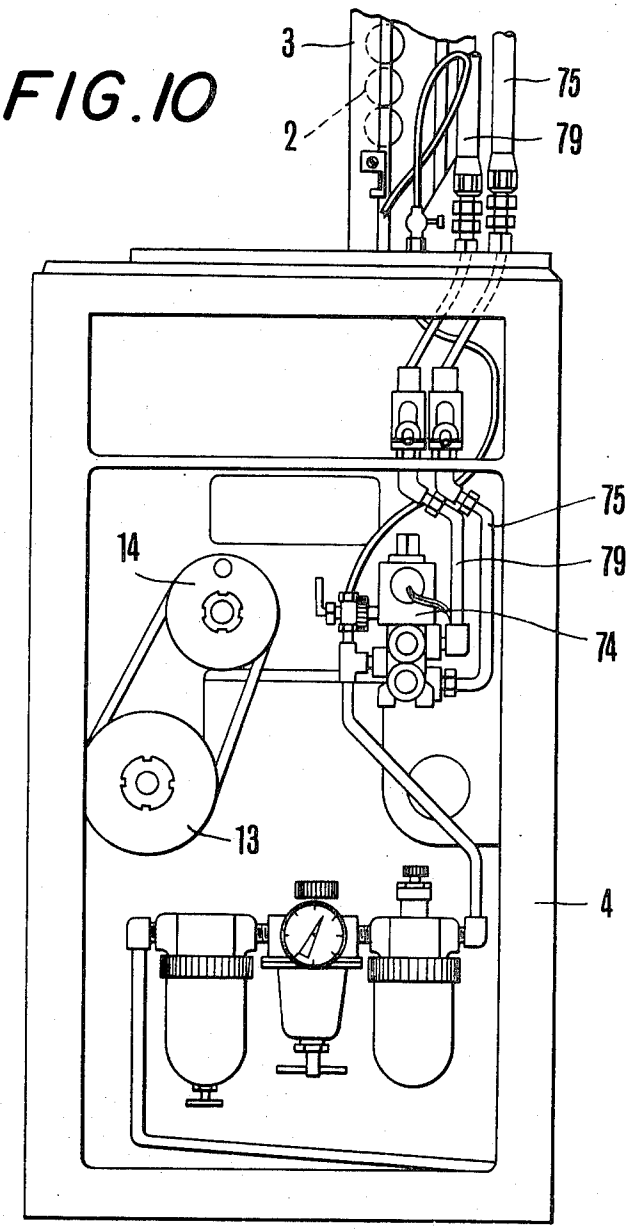


FIG. 10



MACHINE FOR APPLYING SEALING MATERIAL FOR A CROWN CAP AND THE LIKE

This invention relates to a machine for applying sealing material for crown caps and the like, wherein the sealing material is ejected to and distributed evenly on the opened bottom of the crown caps supplied to the processing section of the machine via a supply chute which is connected to a feed hopper, the sealing material applying operation being carried into effect while the crown cap travels a full revolution along a circular path in the said processing section.

An object of the present invention is to provide the machine of the above kind wherein the crown caps travel along the said circular path at a fixed rotational speed for attaining a smooth sealing material or lining operation in an uninterrupted manner.

The conventional machines of the above kind are mostly driven with an intermittent motion. According to such conventional machines so far known and used in the art, the indexing operation of the indexing dial is carried into effect in an intermittent manner so that the crowns are supplied successively beneath an ejection nozzle and applied with sealing material, the feeding and the rotatory motions of the crown caps being terminated during such application of the sealing material. The crowns applied with the sealing material are then transferred to some other place where they are subjected to the rotatory motion for attaining the uniform distribution of the sealing material.

Thus, in the case of the intermittent indexing operation so far described, the ejection of sealing compound is terminated during indexing of the dial, thus resulting in a considerable loss of time and reduction in the operational efficiency. When the indexing speed is increased, the life of the machine is shortened due to the overmuch vibrations produced on account of the overload applied on the indexing dial. Moreover, when the cycle of the intermittent motion of the indexing dial is enhanced, the proceeding crown caps would very often be deviated from their intended course. In addition, the compound is ejected to some other spot than the central section of the crown caps thus resulting in the crowns applied with the sealing material of uneven thickness.

Therefore, a further object of the present invention is to provide a machine of the above kind wherein the nozzle assemblies are arranged equiangularly on the indexing dial and rotated continuously with the crown cars and the indexing dial for attaining a successive sealing material applying operation.

A further object of the present invention is to provide a machine of the above kind wherein the ejection of sealing material is not carried into effect through a nozzle assembly which is occasionally disposed in registry with the recessed part of the indexing dial not supplied with a crown cap.

In the drawing:

FIG. 1 is a perspective view of the present invention machine for applying sealing material to crown caps;

FIG. 2 is a front view of the machine partly cut open;

FIG. 3 is a plan view of the sealing part of the machine partially cut open:

FIG. 4 is a vertical cross-sectional view of a valve and driving means;

FIG. 5 is an enlarged cross-sectional view of the principal part of the sealing part of the machine:

FIG. 6 is an enlarged plan view of an operating lever provided to the valve means;

FIGS 7(*a*) and 7(*b*) are explanatory views illustrating the operating connection of the lever with a follower rod;

FIG. 8 is a cross-sectional view of a clutch mechanism for connecting and disconnecting the driving connection between a motor and a main spindle driven by the former;

FIG. 9 is a cross-sectional view of a cylinder provided to the machine;

FIG. 10 shows tube connections for operating the cylinder of the machine; and

FIG. 11 shows diagrams of cams which control the rotary speed of crown caps to be processed by the machine.

Bottle crowns 2 stored in a hopper 1 as shown in FIG. 1 are conveyed in succession to the sealing part of the machine 4 via a supply chute 3 shown at the upper left-hand side of FIG. 3. The numeral 5 in FIG. 3 denotes a dial fixed to a main shaft 6 for rotation therewith and having a desired number of recessed 7 which are arranged equiangularly around its periphery for receiving the crown caps 2 supplied thereto. In the present embodiment, the dial 5 is formed with the 12 crowns. The dial 5 is rotated a full revolution with the crown caps 2 received in its recesses 7 with rotation of the main shaft 6. On the top of the driving part 4 of the machine, there are provided sealing material ejecting units A in facing relation with said recessed parts 7 and for rotation with the dial 5. In the present embodiment, 12 such units are provided, although only one is shown in the drawing.

The numeral 8 denotes a guide plate whereby the lined crown caps 2 are taken out from the recessed parts 7 and crown caps 2 are taken out from the recessed parts 7 and placed on a discharge chute 9. The lined crowns are conveyed to a cure or drying oven via a conveyor belt 10 connected to the chute 9.

In FIG. 2, there is shown generally at 4 a sealing unit of the machine. Rotation of motor 11 is transmitted via a belt 12 to an intermediate speed-reducing pulley 13 and thence to a further pulley 14 which is housed in a frame enclosed in a sealing unit 4 and mounted coaxially with a worm 15 on a rotatable shaft, not shown. The worm 15 meshes with a worm gear 16 secured to the lower end of the main spindle 6 and the latter is set into rotation at a reduced rate.

Said main shaft 6 mounts 12 drums 17 and 12 support sleeves 18 for the sealing material ejection units A, said drums and support sleeves being arranged equiangularly on the main shaft 6 for rotation therewith, although only one drum and support sleeve are shown in the drawing for simplicity. Each of said sleeve 18 carries a mounting member 19 which in turn carries a block 20 of the sealing material ejection units A. A crown-positioning disc 21 as well as a receiving plate 22 and the above-mentioned dial 5 are mounted coaxially on the unit 4 and beneath the mounting member 19. The positioning disc 21 is secured by means of a bolt 23 to a sleeve 24 encircling said main shaft 6. On the other hand, dial 5 and receiving plate 22 are mounted on the drum 17 by means of a bolt 17. A guide bar 26 is secured at the lower end to the drum 17 and passed through the mounting member 19 at the upper end for guiding the block 20.

The numeral 27 in FIG. 4 denotes a spindle suspendedly mounted on the drum 17 for axial rotation and limited vertical sliding motion by means of a drive to be later described. Although only one is shown in the drawing, there are provided 12 spindles 27 in registry with the recessed parts 7 of the dial 5 mounted on top of the driving unit 4. A permanent magnet pieces 28 is secured to the top of each of the spindles 27 and serves as the seats for the crown caps. A nozzle 29 secured to the block 20 is arranged so that the ejection orifice faces the top of the spindle 27. A sensor ring 30 is slidably passed through the lower part of the nozzle 29. Said sensor ring 30 is composed of a ball bearing 31 and an annular frame 32 as well as a support plate 33. The outer race of the ball bearing 31 and the frame 32 rotate about and slide longitudinally along the nozzle 29, but the inner race of the ball bearing 31 and the support disc 33 can not rotate but can only slide along the nozzle 29. A follower rod 35 made integral with the nozzle 29 is urged into abutting contact at its lower end with the support disc 33 under the action of a spring 34. The rod 35 has a recessed part 36 near its upper end for engagement with an oscillable lever 42 to be described later.

Mounted integrally on the nozzle 20 is a vertically movable rod 39 mounting a roller 38 thereon and engaged at all times with a control cam 37 which is formed on a circular frame erected on the drive unit 4. On account of the provision of the control cam 37, the rod 39 may be elevated and lowered according to the configuration of cam 37. On top of the rod 38, there is provided an oscillable lever 4l abutting laterally on the

follower rod 3 under the action of a spring 40. The free oscillable arm of the lever 41 is formed with an arcuate groove near its foremost part. Said groove 42 is detachably engaged by a mating flange 45 on a needle valve lever 44 which is received in an axial bore of the nozzle 29 and urged to move downwards vertically under the action of a spring 43.

The numeral 46 denotes an auxiliary follower rod which is urged to move downwards vertically under the force of a spring 47 and abuts on the support disc 33 of the sensor ring 30. The rod 46 serves as a weight adapted for balancing the vertical motion of the follower rod 35. The material is supplied under pressure from the hopper 1 to the socket 51 on the nozzle 29 through a rotary coupling 48, a support 49 and a connection hose 50. The drive for lifting and rotating the crown caps 2 is shown in FIG. 2. Rotation of motor 52 is transmitted to a belt 53, a stepless speed reducer 54, a further belt 55 and a pulley 56 in the order described for rotating the bevel gear shaft 57 provided with ball bearing means shown in way of the dotted line. Rotation of the bevel gear shaft 57 is transmitted in turn to bevel gears 58 and 59, a spur gear 60 and 12 spur gears 61 mounted therearound, only two of such spur gears 61 being illustrated in the drawing. Said spur gear 61 is loosely fitted on the main shaft 6, so that the latter rotates axially and separately from the rotation of the spur gear 60 and hence the spindles 27. Each of the spindles 27 arranged directly beneath the nozzle 29 and secured to the drum 17 which in turn is secured to the main spindle 6, so that the rotating spindle 27 rotates about the main shaft 6 in confronting relation with the nozzle 29. About the median point of the spindle 27, there is provided a lever 62 mounting a roller 63 which abuts and slides pressurizingly against the upper surface of a cam 64 arranged circularly around the outer periphery of drum 17. Said lever 62 is held loosely by the lateral projection on a sleeve adapted for simultaneous axial displacement with the spindle 27. Thus, the spindle 27 can move vertically as it rotates.

Assuming that the roller 63 rides on the raised part of the cam surface, the revolving spindle 27 is elevated in its position. The crown cap 2 so far retained by the dial 5 and the disc 22 on top of the drive unit 4 is attracted magnetically onto the magnet piece 28 arranged on the top of the revolving spindle 27. Thus, the crown cap 2 is raised in its position as it is rotated axially with the revolving spindle 21 until it is received in the tapered section of the disc 21 disposed right above the dial 5, at the same time that the passage of the nozzle 29 gives way and the liquid is ejected through the opened nozzle passage. After the ejection and distribution of the liquid on the bottom of the crown cap 2, the roller 63 travels circularly and rests on the recessed part of the surface of cam 64. At this time, the spindle 27 is caused to descend under the action of a spring 65 placed between the lever 62 and the drum 17.

The numeral 66 denotes a rod passed loosely through the drum 17 and serving as the support for the spring 65 and the lever 62. The numeral 67 denotes a shaft mounted on the drum 17 and serving for preventing the occasional rotation of lever 62 with the rotation of spindle 27. The liquid ejected onto the bottom of the crown cap 2 is distributed evenly around the skirt of the crown 2 as the latter rotates axially with rotation of spindle 27.

Referring again to FIG. 3, there is shown a motor 92 which is placed on a support plate 91 mounted on the table of the lining section 4. The output shaft 93 of the motor is secured to a sprocket gear 94. The sprocket chain 95 is entrained on the sprocket gear 94 and a pair of sprocket gears arranged in the proximity of the supply chute 3. Said support plate 91 mounts a stud shaft 98 which carries the one end of a movable arm 99. A sprocket gear 100 is secured to the other end of the arm 99 and meshes with the chain 95 above referred to. Said movable arm 99 is urged to turn outwards under the action of a spring 101, the sprocket gear serving in this way for tensioning the sprocket chain 95. The run of the sprocket chain 95 tensioned between the sprocket gears 96, 97 is parallel to the supply chute 3. A pair of movable bars 104, 105 which can slide in the left- and right-hand directions in FIG. 3 are arranged inside the run of the sprocket chain 95 in engagement with a pair of guide pins 102 and 103. Said bars 104, 105 fit into the mating recessed parts on the chain 95 and urged to move towards the chain 95 under the action of a spring 106.

When the motor 92 is actuated into rotation, the chain 95 is driven by the sprocket gear 94 secured to the output shaft of motor 92 and travels around the sprocket gears 96, 97 and 100. The straight run of the sprocket chain 94 guides the crown caps 2 cooperatively with the guide frame 108. The supplied caps 2 are forced into the recessed parts 7 of the dial 5 in this way by moving chain 95 so that the crown caps 2 run smooth on the chute 3. If the supplied crown caps should be shifted astray and about to be crushed by the projection on the dial 5, the sprocket chain 95 is pushed by the edge of the crowns 2 so that the bars 104, 105 are receded towards the left in FIG. 3. In this way, the crown caps 2 may be placed in position into the recessed parts 7 of the dial 5 without the risk of crushing and interrupting the lining operation.

Although the description has been made with reference to one of the lining unit equipped on the machine, it is to be noted that the other 11 units have the same construction and operate in the same way as the one described in the foregoing.

The mechanism operates in the following manner:

A number of crown caps 2 are supplied from the hopper 1 and into the lining section of the machine on the top of the drive unit 4. On the top of drum 17, there are mounted such component parts as the crown-positioning discs 21, dial 5 and receiving discs 22 all of which are rotated in unison with the main shaft 6. The supplied crowns are received one by one into the recessed parts of the dial 5 and start to rotate with the latter.

The component parts such as nozzle 29, dial 5, positioning disc 21, receiving disc 22 and the spindle 27 are arranged concentrically and the crown caps 2 received by the dial 5 are disposed right beneath the nozzles 29. As the crown 2 received in the recessed part 7 of the dial has traveled circularly a certain distance, the lever 62 is raised in its position on account of its engagement with the cam 64, thus the spindle 27 being raised in its position as it revolves. The crown 2 attracted magnetically to the magnet piece 28 secured on the top of the spindle 27 is also rotated with rotation of the latter and enters the tapered part of the positioning disc 21 so as to be positioned concentrically with the nozzle 29. As the spindle is raised further, the crown 2 urges the sensor ring 30 upwards with its skirt so that the follower rod 35 is elevated with the auxiliary follower rod 46, until the recessed part 36 on the rod 35 comes into registry with the arm of the oscillating lever 41 which is oscillated thus into engagement into the recessed part under the force of the spring 40 as at *b* in FIG. 7 from the nonengaging position shown at *a* in FIG. 7. Simultaneously with the oscillating movement of the lever 41, the needle valve lever 44 snaps into the groove 42 on the lever 41.

When the rod 39 rests on the raised section of the cam 37, the needle valve lever 44 is raised in its position with the follower rod 35 for opening the valve passage and the liquid is ejected onto the central area of the bottom of the crown cap 2 which is now disposed in the proximity of the nozzle passage. The ejection cycle is determined and controlled by the configuration of the cam 37.

After injection of the sealing material, the spindle 27 is caused to descend, at the same time that the rod 39 engaged with the recessed part of the cam 37 is also caused to descend with the needle valve lever 44 so that the nozzle passage is now closed. When the ejection assembly A comes around to the takeout position, the lever 41 impinges on the release member 68 and is actuated into rotation so as to be detached from the engagement with the needle valve lever 44. In this way, the follower rod 35 and the needle valve lever 44 are lowered to the position shown in FIG. 4.

The lined crowns 2 are taken out from the recessed parts 7 on the dial 5 on account of the provision of a guide plate 8, as will be understood by referring to FIG. 3.

When the crown 2 should not be supplied into the recessed parts 7 of the dial 5 by haphazard on account of the retarded flow of the crowns through the chute 3 or the like reason, the spindle 27 rotates and is raised as before, but the sensor ring 30 is not urged upwards. Therefore, the relative position of the follower rod 35 and the lever 41 is as shown in FIG. 7(*a*) and by the full line of FIG. 6, the nozzle 29 being closed by the needle valve lever 44. After the injection of the lining material, the rotation and axial displacement of spindle 27 is continued without interruption and the crown 2 rotates axially with the spindle 27 as it rotates about the main shaft 6, thus the lining material being distributed evenly from the central to the skirt portion. The crown cap thus lined evenly with the liquid is lowered in its position with the descent of the spindle already described in the foregoing, until it is detached from the revolving magnet piece 28 by means of the receiving disc 22 and recharged into the recessed parts 7 of the dial 5.

As the processed crown 2 has rotated a full revolution about the main shaft 6, it is detached from the dial 5 by its engagement with the guide plate 8 and conveyed to a drying oven, not shown, by way of the discharge chute 9 and the conveyor belt 10.

The above-mentioned procedure is repeated in succession in such a way that the sets of 12 crowns are charged continuously into the recessed parts 7 of the dial 5 for lining operation. Thus, the processing speed of the crowns is determined by the rotary speed of the main shaft 6. The various factors such as the location of injection of sealing material, the quantity of material to be injected, the rotary speed of the crowns to be processed, and so forth, may be controlled as desired by the combination of the two cam diagrams for cams 64 and 37, for example of which is illustrated in FIG. 11.

The placing of more than one crown in the recessed part of the dial may be positively avoided by having the supply chute so designed as to receive only one crown horizontally. In addition, a cam should be provided halfway along the supply chute for rejecting the crowns being conveyed with the bottom resting on the chute surface.

The present machine includes a safety device adapted for automatically stopping the machine operation when the rotation of the main spindle 6 or other moving parts should be accidentally retarded in the course of the processing operation. Referring to FIGS. 2, 8, and 10, the shaft 69 for pulley 13 carries a clutch serving for connecting and disconnecting the driving connection between the motor 11 and the main spindle 6. Whenever the rotation of the main spindle 6 should be retarded accidentally, the clutch plate 71 on the driving side is shifted away from its abutting contact with the clutch plate 72 on the load side for interrupting the above-mentioned driving connection. Upon the separation of the clutch plates 71 and 72 from each other, the microswitch 73 provided on the lining section 4 of the machine will be closed for opening the circuit of motor 11 and actuating the solenoid valve 74. At this time, the red lamp, not shown, is illuminated indicating that the clutch is now in its "off" position. The solenoid valve 74 is of the commonplace type wherein one of the valves operates under high pressure while the other operates under low pressure, and vice versa.

When the solenoid valve 74 is set into actuation, the air maintained at a higher pressure than that in the airhose 75 is supplied into a cylinder 76 formed integrally with the sleeve 24 for acting in the upper cylinder chamber 76 above the piston 77 secured to the main shaft 6 and elevating the cover member 78 in its position. At this time, the other airhose 79 is communicated with atmospheric air. When the cover 78 is raised in this way, the outer sleeve 80 and airhoses 75, 79 are also elevated with the sleeve 24 connected mechanically with the sleeve 24. In this way, the block 20 mounted to the lower part of the sleeve 24 is also raised in its position as a unit.

When the block 20 is thus elevated, the roller 38 of the rod 39 riding on the cam 37 is moved away from the latter, so that the needle valve lever 44 is lowered in its position for closing the nozzle passage and stopping the ejection of the liquid compound. Then, the table rotary lever, not shown, is turned manually for discharging the crowns disposed on the table.

The pulley shaft 69 is then turned manually and bringing the clutch plates 71 and 72 into contact with each other. The clutch plate 72 may be separated from the microswitch 73 which is turned off and the red lamp is now extinguished.

When the start button is depressed, flow of air is switched over from hose 79 to hose 75 so that the sleeve 24 is lowered with the cover 78 and the block 20 shifted to its lower position as shown in FIG. 4. A cushion 81 serves for cushioning the impact exerted by the upwardly moving sleeve 24 and a spring serves for cushioning the impact exerted by the downwardly moving sleeve 24.

The numeral 83 denotes a compound supply aperture formed axially through sleeve 24 for delivery of the compound from the supply hose towards the nozzle 29. The numeral 85 denotes a compound discharge opening formed in the sleeve 24. Said discharge opening 84 is fluidically connected with the discharge hose 86. Excess compound supplied from the supply aperture 83 is returned to the discharge hose 86 through an annular opening 87 on the sleeve 24 and the discharge opening 84 and recirculated to the system by way of the supply hose 84.

A guide member 89 secured to the arm 88 carrying the sleeve 24 is formed with a strait upper section which is loosely inserted into a groove 90 on the outer casing 80. In this way, the outer sleeve 80 is positively held against rotation with the sleeve 24 while it can be moved vertically.

It will be realized readily to those skilled in the art that the location of the block carrying the compound injecting unit may be adjusted suitably for obtaining the crown which is lined along its skirt portion, and that the processing of practically any crown caps may be enabled by the proper selection of the positioning discs and the dial.

As already described in the foregoing, the sensor ring does not come into play when the crown should not be supplied to the spindle cooperating with the sensor ring so that the nozzle may be kept in its closed position.

In addition, any loss of the compound and the resulting adhesion of the compound to the machine parts as encountered in the conventional machine of this kind may be avoided positively thus promoting the operational efficacy of the lining machine.

I claim:

1. A machine for applying sealing material for crown caps and the like, in which each crown is arranged with the opened bottom directing upwards on top of a spindle for causing the same to rotate and be raised in its position, a nozzle unit being secured to a block and disposed right above said spindle, a sensor ring being passed through said nozzle unit and adapted to be raised in its position solely by coming into contact with said crown cap, a follower rod being rested in abutting contact at its lower end with said sensor ring, said rod being formed with a recessed part in the proximity of its upper end extremity and urged normally downwards under the action of an urging spring, a vertically movable rod being suspended to said block, a cam cooperating with said movable rod for controlling the times of its elevation and descent, an oscillable lever connected mechanically to said rod and urged into engagement with said recessed part on the follower rod and with a needle valve lever passed through said nozzle unit, a release member being arranged along the side of said block for releasing the engagement between said oscillable lever on the one hand and said follower rod and said needle valve lever on the other.

2. A machine for applying sealing material for crown caps and the like which comprises an axially rotatable indexing dial formed with a predetermined number of crown-receiving parts, the same number of spindle assemblies mounted beneath said indexing dial and adapted for both axial rotation and rotation with said indexing dial, the same number of nozzle units adapted for rotation with said indexing dial for supplying sealing material to the crown caps carried by said indexing dial, same number of valve assemblies housing said

nozzle units, a main shaft provided with a piston at the top, a cylinder covering said mainshaft, said cylinder being mechanically connected with said valve assembly including said nozzle unit, said cylinder being raised in its position under the action of a high-pressure fluid at the time of the haphazard cessation of operation of the machine for stopping the injection of the sealing material, the operation of the machine being restarted as the said cylinder is lowered in its position under the action of high-pressure fluids.

* * * * *