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APPARATUS FOR CAPSULING BOTTLES

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2 Sheets-Sheet 1

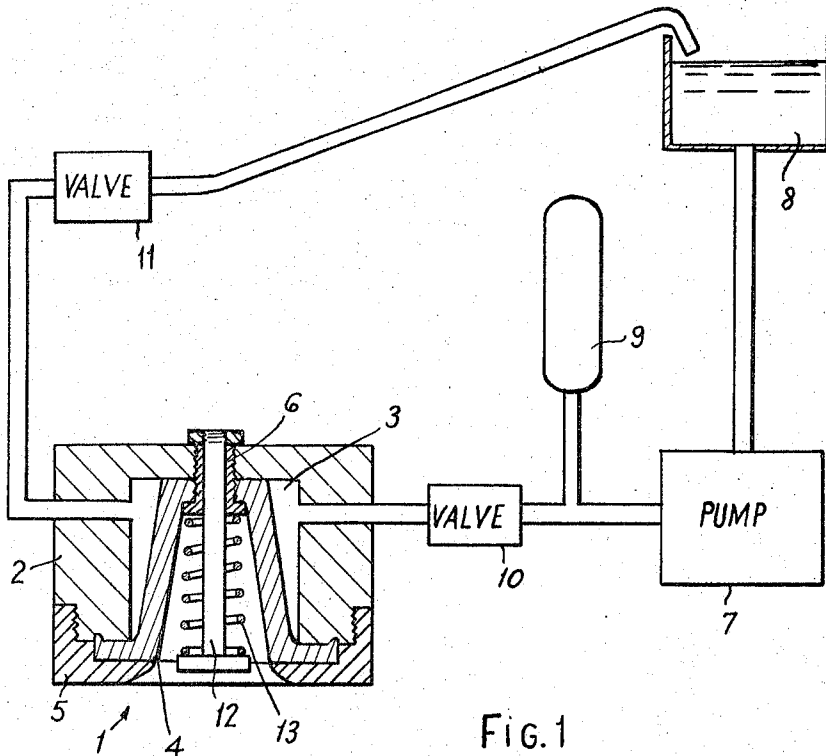


FIG. 1

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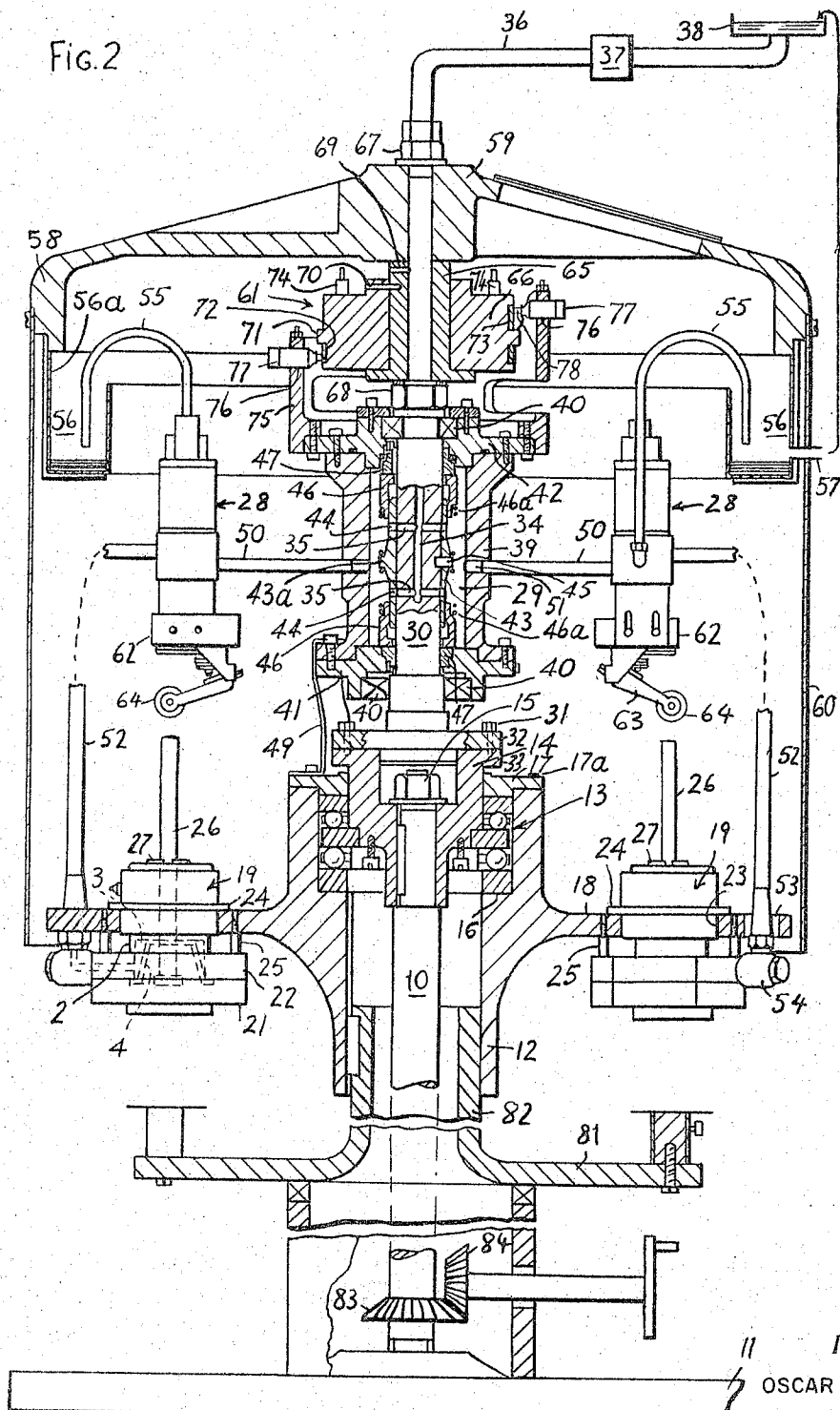
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Fig. 2



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APPARATUS FOR CAPSULING BOTTLES

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8 Claims. (Cl. 53—67)

The present invention relates to apparatus for closing a capsule, such as a pleated metal capsule, over the top and part of the neck of a bottle. Generally such apparatus includes a capsuling head comprising a liquid-containing chamber having a hollow cavity which is adapted to receive the upper end of the bottle neck, the walls of the cavity being formed by a flexible diaphragm adapted to be deformed by liquid pressure applied to the chamber to deform and press the capsule on to the bottle neck.

Hitherto, in such apparatus, the liquid pressure has been generated by a ram operable by a shaft to force liquid under pressure through a pipe to the liquid containing chamber. Due, however, to the considerable variation in the sizes of bottle necks, the displacement of the ram is not always sufficient fully to compress the capsule on to the bottle neck.

The present invention has for an object to provide improved capsuling apparatus which overcomes this disadvantage.

The invention consists in capsuling apparatus including at least one capsuling head comprising a liquid-containing chamber having a hollow cavity which is adapted to receive the upper end of a bottle neck, the walls of the cavity being flexible and being deformable by liquid pressure to compress a capsule on to the bottle neck, wherein the liquid pressure is generated by a pump, the supply of pressurised liquid to and from the chamber in said at least one capsuling head being controlled by valve means. Thus, the invention provides for the supply, to the or each capsuling head, of an unlimited volume of liquid at approximately constant pressure, the supply of liquid being controlled by an inlet and outlet valve arrangement which may be operated manually or automatically in accordance with the cycle of operation of the apparatus.

The output from the pump may be connected to an accumulator in which the pressurised liquid can be stored at a substantially constant pressure. Moreover, the pump may be arranged to draw its supply of liquid from a reservoir and means may be provided for returning liquid removed from the or each capsuling head to the reservoir.

According to a feature of the invention, a plunger is arranged in the cavity in the or each head into which a bottle neck is inserted, the movement of the plunger to an elevated position upon insertion of the bottle neck causing, or establishing a condition which will subsequently cause, the valve means to operate to supply pressurised liquid to the liquid-containing chamber for compressing the capsule on to the bottle neck. Thus the valve means can only be operated by insertion of a bottle into the cavity and this safeguards against damaging the flexible walls of the cavity due to over-inflation.

In order that the present invention may be more readily understood, reference will now be made to the accompanying drawings, in which:

FIGURE 1 is a schematic diagram of a basic form of the invention, the capsuling head being shown in section, and

FIGURE 2 is a view of another form of the invention, the multi-head capsuling machine employed being shown in section.

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Referring to FIGURE 1, the capsuling head 1 comprises a body part 2 having a recess 3 in which is disposed a flexible diaphragm 4 shaped approximately to the profile of the upper end the neck of a bottle and clamped to the bottom of the body part 2 by a clamping ring 5. The diaphragm 4 may also be secured to the body part at its upper end, for example by a tubular bolt 6.

The space between the wall of the recess 3 and the diaphragm 4 constitutes a chamber to which liquid under pressure is fed to deform the diaphragm and thereby compress a capsule on to a bottle neck inserted into the cavity defined by the diaphragm. The liquid pressure is generated by a pump 7 which draws its supply from a reservoir 8. The outlet from the pump leads to an accumulator 9 and also to a valve 10 controlling the flow of liquid to the chamber. The outlet from the chamber is also provided with a valve 11 which connects with a pipe discharging into the reservoir 8.

Slidable in the tubular passage in the bolt 6 is a plunger 12 which is disposed within the diaphragm 4 and is moved upwards, when a bottle neck is inserted into the capsuling head, against the pressure of a spring 13. The plunger 12 presses on the top of the capsule to hold it on the bottle neck as the latter is inserted into the head. The movement of the plunger may also be used to cause, or control, the operation of the valves so that the capsuling head cannot be pressurised until a bottle has been inserted.

Capsuling apparatus in accordance with the present invention may be constructed with a plurality of capsuling heads which may be pressurised from a single pump and such apparatus embodying a rotary capsuling machine having twelve heads is illustrated in FIGURE 2. The machine comprises a central supporting pillar 10 mounted on a base 11 and surrounding the upper end of the pillar, in coaxial relation therewith, is a hollow rotatable shaft 12. The shaft 12 is rotatably supported on the pillar 10 by means of a double, thrust ball bearing 13 fixed to a coupling member 14 which is keyed to the upper end of the pillar 10 and is retained thereon by a nut 15 screwed onto the upper end. The shaft is fixed to the bearing by the latter being clamped between an internal annular shoulder 16 on the shaft and an annular plate 17 secured to the upper end of the shaft by screws 17a.

Formed integrally with the shaft 12 is a radial platform 18 carrying twelve capsuling heads 19 which are equally spaced around the platform, only two of the heads being shown in FIGURE 2. Similarly to the head shown in FIGURE 1, each head 19 comprises a body part 2 having a liquid-containing chamber defined between the wall of a recess 3 in the body part and a flexible diaphragm 4 disposed in the recess and shaped approximately to the profile of a bottle neck. The diaphragm 4 is clamped in position by a clamping ring 21 co-operating with a flange 22 on the body part 2. Each head extends through a circular opening 23 in the platform 18 and is vertically slidable in the opening to provide for different heights of bottles. The head is prevented from falling out of the opening 23 by a flange 24 thereon engaging the upper surface of the platform 18 and is guided for vertical movement only by bolts 25 screwed into the platform 18 and sliding in apertures through the flange 22 and clamping ring 21.

In each head 19, a plunger 26 is slidably mounted in the central bore of the tubular bolt securing the diaphragm 4 to the body part 2, the plunger being movable downwards under the action of its own weight and prevented from falling out of the head by a circlip 27 attached thereto and engaging the upper end of the body part. As shown

in FIGURE 2, in its lowermost position, the upper end of each plunger projects above the body part of the head.

Located above each capsuling head 19 is a solenoid-operated, three-way valve 28 for controlling the flow of liquid, in this case water, to and from the head. As will now be described, the twelve valves 28 are mounted to rotate with the platform 18 and are supplied with water through an annular accumulator chamber 29 which distributes the water to all the valves.

Mounted on the pillar 10 coaxially therewith is another pillar 30 which is fixed to the coupling member 14 by bolts 31 passing through a flange 32 at the lower end of the pillar 30 and screwing into a flange 33 at the upper end of the coupling member. The annular chamber 29 surrounds the pillar 30 adjacent the lower end thereof and is supplied with water under pressure through the pillar 30 by means of an axial bore 34 extending downwardly from the upper end of the pillar and radial bores 35. A pipe 36 connects the upper end of the bore 34 to a pump 37 drawing water from a reservoir or header tank 38.

The outer wall of the annular chamber 29 is formed by a sleeve 39 which is coaxial with the pillar 30 and is rotatably supported thereon by ball bearings 40. The sleeve is mounted on the ball bearings, which are disposed outside its ends, through annular members 41 and 42 bolted respectively to the ends of the sleeve and attached to the outer races of the bearings. The inner wall of the chamber 29 is partially formed by a sleeve 43 which fits on the pillar and which is provided with ports 44 aligned with the radial bores 35 and is positively prevented from moving relative to the pillar by a set screw 45. The inner wall also includes two sealing collars 46 slidable respectively on opposite ends of the sleeve 43. The collars are resiliently urged outwardly of the sleeve 43 by compression springs 46a acting between the collars and an annular rib 43a on the sleeve 43 and have their outer end faces abutting carbon sealing rings 47 disposed between the collars and the rotatable annular members 41 and 42. O-ring seals, such as 48, are also provided at various places between the parts adjacent the annular chamber 29 in order to seal against escape of water from the chamber.

The sleeve 39 is connected to the shaft 12 for rotation therewith by a strap 49 bolted to the sleeve 39 and to the shaft.

The solenoid-operated, three-way valves 28 are supported from the sleeve 39 by pipes 50 projecting radially from the sleeve and connecting first ports of the valves to the chamber 29 via ports 51 in the sleeve 39. Each valve has a second port connected to the liquid-containing chamber in its associated capsuling head 19 by a hose 52 passing freely through an aperture 53 in the platform 18 and attached to a coupling 54 on the flange 22 of the head. The third port of each valve is connected to an inverted U-shaped pipe 55, the free end of which is directed into a stationary, annular trough 56 passing around the machine outside the valves and having an outlet pipe 57 discharging into the header tank 38. With its solenoid de-energized, each valve 28 shuts off the supply of water under pressure from the chamber 29 to the hose 52 and connects the latter to the pipe 55.

The trough 56 is supported in position by having its outer peripheral wall 56a secured to a depending peripheral flange 58 of a circular top cover 59 for the machine which is secured in the centre to the upper end of the pillar 30. Also attached to the flange 58 is a cylindrical skirt 60 which encloses the machine mechanism above the platform 18.

Electric current for energising the solenoids of the valves 28 is supplied to the solenoids through a slip ring arrangement 61 and normally open microswitches 62 secured to the bottoms of the valves. Each microswitch is adapted to be actuated by a lever 63 having an end, on which is mounted a follower wheel 64, disposed above

the upper end of the plunger 26 of its associated capsuling head 19 so that the microswitch is closed by upward movement of the plunger 26 when the neck of a bottle is inserted into the head.

The slip ring arrangement 61 includes a sleeve 65 disposed on the pillar 30 between the cover 59 and the upper bearing 40 and carrying a ring of insulating material 66. The sleeve 65 is retained on the pillar 30, together with the cover 59, in the correct axial position by upper and lower nuts 67 and 68 screwed on to the pillar, and the sleeve 65 is prevented from rotating relative to the pillar by a set screw 69 whilst the ring 66 is prevented from rotating relative to the sleeve 65 by a set screw 70. Formed on the outer cylindrical surface of the ring 66 is an annular rib 71, which serves to divide the outer surface into upper and lower parts, and secured around the lower surface part is a slip ring 72 and secured to the upper part is an interrupted slip ring 73 which only extends for approximately 180° around the insulating ring 66. The rings 72 and 73 can be connected to an external electrical source through terminals 74 on the ring 66.

Bolted to the annular member 42 so as to rotate therewith and extending upwardly therefrom into surrounding relation with the insulating ring 66 is a hollow cylindrical member 75, and secured in apertures 76 in the cylindrical walls of this member are thirteen brush holders 77 having carbon brushes 78. Twelve of the holders 77 are so positioned that their brushes can contact the interrupted slip ring 73 and, these brushes are electrically connected respectively to the solenoids of the valves 28. The remaining holder, shown on the left of the ring 66, is positioned with its brush in contact with the slip ring 72 and provides a common connection for all the valves to complete the electrical circuits therefor.

The arrangement of the interrupted slip ring 73 is such that the carbon brush connected to a particular valve is in contact with the ring 73 when the neck of a bottle is initially inserted into the associated head, so that closing of the microswitch in response to insertion of the bottle effects energisation of the solenoid and thus operation of the valve to apply water under pressure from the chamber 29 to the associated head to compress the capsule on to the bottle neck. Once water pressure has been applied to the head, the bottle cannot be removed until the pressure is released and this occurs when the solenoid is de-energised upon its associated carbon brush moving off the ring 73 on to the portion of the insulating ring 66 over which the ring does not extend.

Mounted below the platform 18 for rotation coaxially therewith is a conventional table 81 carrying twelve rams for lifting bottles into engagement with the heads 19. The table is mounted on a hollow shaft 82 through which the pillar 10 extends and which is keyed to the shaft 12. Bottles with capsules positioned on the upper ends of their necks, are fed on to the ram table 81 from an adjacent conveyor belt by a conventional star wheel (not shown) and are removed from the ram table by another conventional star wheel (not shown) after the capsules have been compressed on to the bottle necks by the capsuling heads. The star wheels and capsuling machine are driven in synchronism from a single electric motor through a sprocket and chain mechanism.

In order to enable adjustment of the machine to provide for different heights of bottles, the pillar 10 may be screwed into the base 11 so that the capsuling heads 19 can be raised or lowered with respect to the ram table by rotating the pillar 10, the shaft 12 being slidable relative to the shaft 82. For this purpose a bevel gear 83 may be secured on the pillar adjacent its lower end and a manually rotatable bevel gear 84 may be supported in mesh therewith.

An advantage of the present invention is that it enables the bottle handling part of the capsuling machine to be of relatively light, and therefore cheap, construction since the power required to compress the diaphragm in the

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capsuling head or heads is obtained from an independent source. In hitherto known machines, the mechanical operation of the liquid-pressurising ram, which is generally effected in the case of multi-head machines by rotating the whole of the sealing head assembly, necessitates a massive construction to enable the required force to be applied.

It will be understood that the embodiments hereinbefore described are only given by way of example and that modifications can be made without departing from the scope of the invention as defined by the appended claims. For example, instead of having means operative independently of the plunger for actuating the valve to release the pressure in the liquid-containing chamber for removal of a bottle, the apparatus may be so constructed that the bottle can be slightly withdrawn from the head to allow movement of the plunger for effecting such actuation of the valve.

I claim:

1. In capsuling apparatus having at least one capsuling head comprising a liquid-containing chamber having a hollow cavity which is shaped to receive the upper end of the neck of a bottle, the walls of said cavity being flexible and being deformable by liquid pressure to compress a capsule on to the bottle neck, the improvement comprising a liquid pump, a liquid reservoir, pipe means connecting the inlet of said pump to said reservoir, an accumulator chamber in which pressurised liquid can be stored connected to the outlet from said pump, a three-way valve associated with said at least one capsuling head and having a first port connected to said accumulator chamber, a second port connected to said liquid-containing chamber and the third port connected to discharge into an open trough, said valve normally blocking said first port and connecting said second port to said third port, a plunger arranged in said hollow cavity for movement by a bottle neck inserted into said cavity, said plunger being adapted to operate said valve to connect said first port to said second port in response to insertion of a bottle neck into said cavity, and means operative independently of said plunger for causing return of said valve to its normal position prior to removal of the bottle neck from said cavity.

2. A capsuling machine comprising a plurality of capsuling heads, each of which comprises a liquid-containing chamber having a hollow cavity which is adapted to receive the upper end of a bottle neck, the walls of the cavity being flexible and being deformable by liquid pressure to compress a capsule on to the bottle neck, a pump for supplying pressurised liquid to the capsuling head, a plurality of valves associated respectively with the capsuling heads and controlling the supply of pressurised liquid from the pump to the liquid-containing chambers of the heads, a pump reservoir from which the pump draws liquid, conduit means permanently connecting the outlet of the pump to all the valves, a plurality

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of members associated respectively with the valves and each responsive to the insertion of a bottle neck into the cavity of the associated capsuling head for controlling the opening of the valve and closing of an outlet from the chamber of the head leading to the pump reservoir, whereby to pressurise the chamber, and means independent of said members and operable to close each valve and open the outlet from the associated chamber after the capsule has been compressed on to the bottle neck.

3. A machine as claimed in claim 2, wherein each of the valves comprise a three-way valve having first, second and third ports connected respectively to the conduit means, the liquid-containing chamber of the associated head and an outlet leading to the pump reservoir, each valve normally connecting its second and third ports and being operated upon actuation of the associated member to connect the first port to the second port and pressurise the chamber, said independent means effecting reconnection of said second and third ports.

4. A capsuling machine as claimed in claim 3, wherein each valve is an electrically operated valve and the associated member is arranged to switch-on an electrical circuit to energize the valve and effect connection of the first and second ports upon actuation of said member, and said independent means breaks said electrical circuit for a period enabling removal of the bottle neck from the head and opening of said switch.

5. A capsuling machine as claimed in claim 2, wherein each of said members comprises a plunger located in the cavity of the associated head and mounted in said head for vertical sliding movement.

6. A capsuling machine as claimed in claim 2, wherein the conduit means through which pressurised liquid is supplied from the pump to the capsuling heads is connected to an accumulator in which pressurised liquid is stored at a substantially constant pressure.

7. A capsuling machine as claimed in claim 2, wherein each capsuling head is mounted in the machine for limited vertical sliding movement.

8. A capsuling machine as claimed in claim 2, wherein the capsuling heads are mounted on a rotatable platform and said independent means comprise a device which operates in response to arrival of each head at a pre-selected position along its circular path of movement, which position is between those at which a bottle neck is moved into and out of the cavity in each head.

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