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SCREWING DEVICE FOR SCREW-STOPPERED VESSELS

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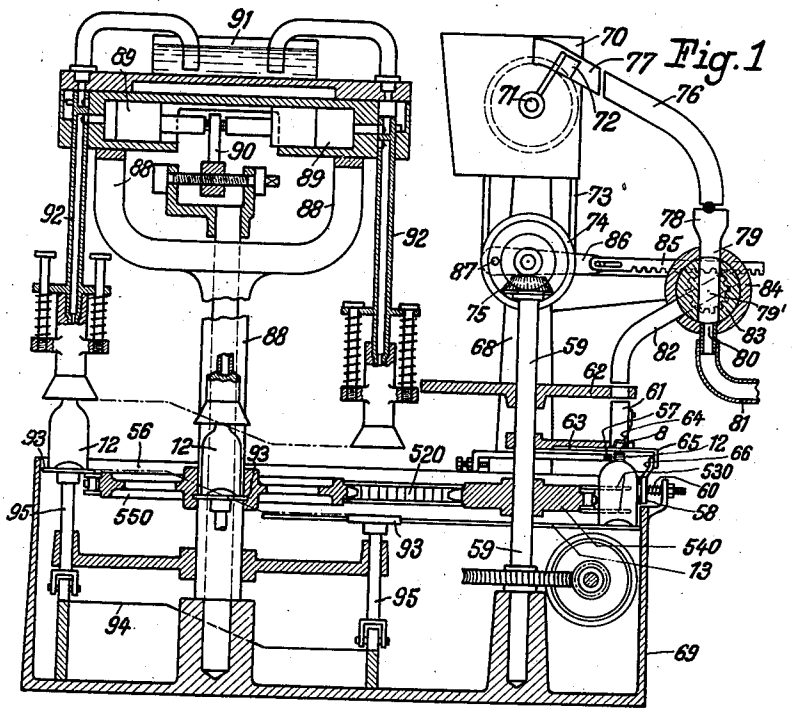


Fig. 1

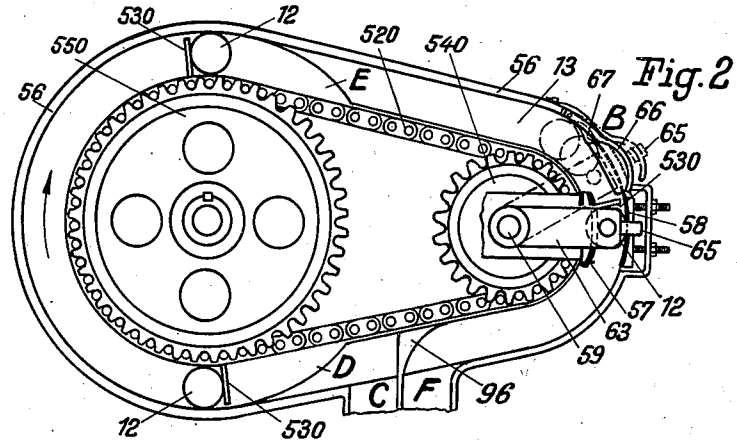


Fig. 2

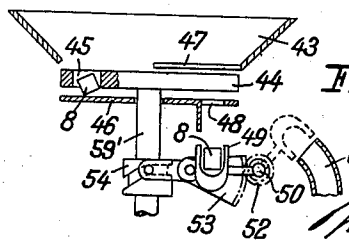


Fig. 3

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SCREWING DEVICE FOR SCREW-STOPPERED VESSELS

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9 Claims. (Cl. 226—88)

This invention relates to devices for mechanically screwing caps for screw-stoppered vessels.

The use of screw-stoppered vessels, which is constantly increasing, involves at present the drawback that manual tightening of the caps requires much time and, owing to the strain put on the fingers, can be carried out by a person for a limited period only.

It is the object of the invention to provide devices for overcoming these difficulties. To prevent straining of the fingers one of the parts to be united, for instance the screw cap, is mechanically rotated by means having only frictional connection therewith in such manner that the part will engage the thread of the other part, i. e., the vessel, manually or mechanically brought into contact with the first part.

The screwing means coming only into frictional connection with the cap or cover operates independently of the number of threads and may comprise a friction band, friction bar, etc. Until it engages the threads of the vessel the cap is prevented from dropping down by a support entering the opening thereof or by means which loosely surround it and may be a ring, tube, etc. A tube is particularly advantageous, as it can serve also for feeding caps.

The device according to the invention permits a much larger output than is obtainable by hand and the output can be increased still more by feeding both caps and vessels mechanically instead of manually. The caps may be fed from a magazine containing them in proper order to the vessel or to cap holding means or a closing station. If caps are irregularly kept in a container, a special device is required for picking them out one by one, straightening them and bringing them into uniform position relative to the vessel.

In the mechanical straightening of irregularly disposed screw caps the invention takes advantage of the fact that the cover or screw cap is a hollow body open on one side, with its center of gravity located outside its spatial center. A cap may therefore be picked up from a heap by a means so constructed that the cap can enter it and remain therein only when its opening has a certain position, whilst the position corresponding to the center of gravity can be brought about for instance by letting the cap drop. A cap can be prevented from occupying a wrong position or remaining therein by being fed to a straightening device with sufficient force to overcome frictional resistances, and the same effect can be attained by an air current directed against the cap. Particularly favorable results can be obtained by dropping the caps in receptacles formed according to the type of cap used and having for instance the shape of an egg cup. The caps positioned with their opening on top in the direction of the center of gravity are then passed by a turning device to the receptacle or magazine; in case of a receptacle having egg cup shape this is done in a very simple manner by dumping the caps into a tube which may serve as magazine or be connected with one.

The device according to the invention permits an additional considerable increase in output or an essential simplification of operations if the vessels are mechanically conveyed to the screwing station and, within range of the conveying means, the filling device as well as other appliances, such as a labelling machine, required for the proper finishing of the vessels are arranged.

By way of example, one of various possible embodiments of the invention is illustrated in the accompanying drawing, in which Figure 1 shows a machine for filling and closing vessels, wherein the filling and closing operations occur during the motion of the vessels; and Fig. 2 is a sectional top view of the machine shown in Fig. 1. Fig. 3 shows a modified cap sorting device for use in connection with the machine shown in Figs. 1 and 2.

In the construction shown in Figs. 1 and 2, **13** is a base plate on which the vessels **12** are displaced. Displacement is continually effected by a chain **520** with drivers **530** which push the vessels in front of them. The chain **520** is guided over sprocket wheels **540, 550**. A wall **56** surrounding the path of motion of the vessels prevents them from turning out laterally. At the point B in Fig. 2 a cap **8** is placed on the vessel **12**. During further motion in the direction of the arrows in Fig. 2 the cap **8** placed on the vessel **12** and held in proper position thereon meets a friction surface **57** by which it is rotated and thus screwed on the vessel **12**. The vessel, too, strikes a friction surface **58** which is oppositely arranged relative to the friction surface **57** for the caps, so that while the vessel **12** is passing along this friction surface **58** rotation is imparted to it in a direction opposite to that of the cap **8**. When the cap **8** is firmly screwed to the vessel **12**, the forces effecting rotation of the cap and vessel counteract and neutralize each other with the result that the vessel with its cap attached to it slides along the remaining portion of the surfaces **57** and **58** without any rota-

tion. The friction surfaces 57, 58 are radially adjustable relative to the shaft 59 supporting the toothed wheel 540 and may also be under spring action, as indicated at 60. The frictional covering for the surfaces 57, 58 as well as for the friction wheels and discs in the previously described constructions consists of leather, rubber, etc.

Caps are put on vessels at B by a supply tube 61 which is carried by an arm 63 disposed on the shaft 59 and which thus moves at the same speed as the portion of the chain 520 passed about the sprocket wheel 540. The superposed caps contained in the tube 61 lie therein with their opening downwards and are normally retained by a clamping springs 64 provided at the lower outlet and acting against the lowermost cap. The spring 64 is connected with a slide 65 guided on the arm 63 and drawn back at B at the proper time by a stop 66 disposed in its path in such manner that the spring 64 permits the lowermost cap to leave the tube 61 and to sit on the neck of the vessel 12 positioned underneath while still remaining with its end in the tube 61 to be held in correct position for screwing. The cap is thus kept in position until, owing to the rotation of the parts to be screwed together, the threads are in engagement.

As the tube 61 must discharge a cap 8 only when a vessel 12 is in proper position to receive it, means must therefore be provided for preventing discharge of a cap from the tube if a vessel happens not to be there. This safeguard consists in that abutment or stop 66 is movable with respect to the wall 56 and forming a lever, which is provided with a projection or nose 67 protruding into the path of motion of the vessels 12. Normally, said stop 66 is held in a position not to influence the slide 65 which moves past. When, however, a vessel moves along the path, it pushes said nose 67 of lever 66 in an outward direction whereby the said lever retracts the slide 65, when the latter impinges upon the lever. To fill the tube 61, which can accommodate only a limited number of caps, a special device is provided to replace hand filling which would require stopping of the machine and interruption of working. This device comprises a reservoir 70 disposed on a pillar 68 of the machine frame 69 and containing one or more scoops which circulate about a shaft 71 and at each motion pick one cap out of the pile. The shaft 71 is driven by a belt 73 from a rope pulley 74 which is connected with the shaft 59 by a bevel gear 75. When a scoop 72 has passed the zenith, the cap held by it drops owing to centrifugal force out of it and into a tube 76 in front of which two walls 77 are provided between which the scoop can pass and which prevent lateral deviation of the cap. The tube 76 opens into a funnel 78 into which the cap drops and the inner space of which is large enough to permit free rotation of the cap in any direction. The funnel 78 forms the end of a piping 79 with which at 80 a compressed air delivery pipe 81 is connected. The compressed air coming through the pipe 81 subjects the cap that has dropped in the funnel 78 to a whirling motion until the cap has occupied a position where its opening is on top. When the air current is interrupted, the cap slides down in the tube 79 up to the compressed air connection 80. The portion 79' of the tube 79 into which the cap passes can be moved out of the full line position in Fig. 1 into the dotted line position where the pipe member 79' is disposed in front of the opening of a tube 82. The portion 79' of the tube 79 is preferably constructed as bore of a plug of cock 83 rotatable in a casing 84. For turning the plug 83 a toothed wheel, secured to the outside, is provided which is engaged by a rack 85 moved to and fro by a connecting rod 86 which with its other end is articulated to a crank pin 87 of the rope pulley 74.

During rotation of the pipe portion 79' the upwardly directed opening of the cap is turned down, so that the cap is passed to the tube 82 substantially in the position which it must have to engage the vessel 12. The tube 82 opens above the disc 62 at such a distance from the shaft 59 that the upper opening of the tube 61 periodically passes under the opening of the tube 82, when a cap in the tube 82 may enter the tube 61. At any other position of the disc 62 or tube 61 the tube 82 is closed by the disc 62.

The filling device shown on the left of Figs. 1, 2 comprises a rotating column 88 driven from the chain 520. Above said column 88, there is provided a double pump 89 the pistons of which are connected with a pin 90 which is stationary and eccentrically arranged relative to the column 88. During rotation of the column one pump draws liquid from a reservoir 91 placed on the column 88 whilst out of the other cylinder previously sucked up liquid is forced. The cylinders are provided with downwardly directed filling pipes 92 which are displaceable and serve also as slide valves. Liquid can enter the filling pipes 92 from the pump cylinders only when the pipes are pressed back, which is automatically effected by the vessels to be filled and placed underneath. For this purpose, the vessels are conveyed in this part of the machine on plates 93 that can be raised and lowered while rotating with the column 88 by means of a stationary cam path 94 on which the members 95 carrying the plates 93 move with their lower end. At lowermost position the plates 93 are on a level with the base plate 13 on which the vessels 12 are moved past the screwing station, so that the vessels without difficulty can be pushed from the base plate 13 on which they pass to the introduction station C at D upon a plate 93 and at E again from the plate 93 onto the base plate 13, the arrangement of a vessel coming from the base plate 13 on a plate 93 at D and the removal of a vessel from a plate 93 to the base plate 13 at E being simultaneously effected by means of the arms 530 of the chain 520. The position of the filling device shown in Fig. 1 does not coincide with the position of the arms 530 in Fig. 2, and relative to Fig. 2 the filling device in Fig. 1 should be turned 90°. The representation in Fig. 1 has been chosen, however, to give a clear idea of all the details of the filling device.

The outlet of the vessels at F is located directly near the inlet C, and both are separated by a curved wall 96 provided with slots for the passage of the arms 530.

If compressed air is not available, another cap sorting device (shown in Fig. 3) for refilling the tube 61 could be inserted into the machine shown in Figs. 1 and 2 instead of the parts 76 to 87 in such a manner that 59' takes the place of 59 and 82' the place of 82. This device possesses a receptacle 43 into which any amount of caps is thrown. The bottom of the receptacle 43 is formed by a rotary disc 44 having an opening 45 which can accommodate just one cap which is guided along the stationary base plate 46. Under

the covering plate 47 preventing the succession of more caps a hole 48 is provided in the base plate 46, through which the cap drops in a container 49 arranged below and formed so that the cap, owing to its eccentric center of gravity, can come to a position of rest only with its opening directed upwardly. This can be facilitated by shaking the container 49 which is tiltable about the pivot 50. During tilting the container 49 conveys the cap into a tube 82' leading to the tube 61' in such manner that the opening of the cap points downwardly. Tilting motion of the container 49 is effected by a toothed wheel 52 disposed on its bearing journal and engaging a toothed segment 53 which is controlled by a curved piece 54 on the shaft 59'. When the tube 82' is filled, caps additionally supplied by the container 49 will drop out laterally and into a collector, not shown.

I claim:

1. A machine for closing vessels by screw caps comprising a carrier for said vessels, said carrier continuously moving said vessels in a predetermined path, a reservoir for said caps movable in another path coinciding for a distance with said path of said vessels, means for discharging the lowermost cap from said movable reservoir at a definite point and at a time when a vessel is located underneath said reservoir, and means adapted to frictionally engage the circumference of said cap placed upon said vessel and to actuate for firmly screwing said cap on said vessel independently of the number of the threads thereof.

2. A machine for closing vessels by screw caps comprising in combination a carrier for said vessels, said carrier continuously moving said vessels in a predetermined path, a reservoir for said caps movable in another path coinciding for a distance with said path of said vessels, means for discharging the lowermost cap from said movable reservoir at a definite point and at a time when a vessel is located underneath said reservoir, means adapted to frictionally engage the circumference of said cap placed upon said vessel for firmly screwing said cap on said vessel, and a stationary reservoir for refilling the movable reservoir during its passage under the outlet of said stationary reservoir.

3. A machine for closing vessels by screw threaded caps comprising means for continuously moving said vessels in a predetermined path, a reservoir for said caps, means for conveying one of said caps from said reservoir to a respective vessel, rotatable means loosely holding said one of said caps in proper position on said respective vessel, means disposed at a portion of said path for frictionally engaging the circumference of said cap while being rotated to firmly screw the same on said vessel, and means for engaging said vessel to hold the latter against a rotation at a speed at which said cap is rotating during the cap-screwing operation.

4. A machine for closing vessels by screw threaded caps comprising means for continuously moving said vessels in a predetermined path, a chute for superposing therein said caps, means for releasing the lowermost cap from said chute at a time when a respective vessel is located underneath said chute, rotatable means loosely holding said one of said caps in proper position on said respective vessel, means disposed at a portion of said path for frictionally engaging the circumference of said cap while being rotated to firmly screw the same on said vessel, and means for engaging said vessel to hold the latter against a rotation at a speed at which said cap is rotating during the cap-screwing operation.

5. A machine for closing vessels by screw threaded caps comprising means for continuously moving said vessels in a predetermined path, a reservoir for said caps movable in another path coinciding for a distance with said path of said vessels, means for intermittently discharging the lowermost cap from said movable reservoir at a predetermined point and at a time when a respective vessel is located underneath said reservoir, means for loosely holding said one of said caps in proper position on said respective vessel, means disposed at a portion of said path for frictionally engaging the circumference of said cap to firmly screw the same on said vessel, means for engaging said vessel to hold the latter against a rotation at a speed at which said cap is rotating during the cap-screwing operation.

6. A machine for closing vessels by screw threaded caps comprising means for continuously moving said vessels in a predetermined path, a reservoir for said caps movable in another path coinciding for a distance with said path of said vessels, means for intermittently discharging the lowermost cap from said movable reservoir at a predetermined point and at a time when a respective vessel is located underneath said reservoir, and a stationary reservoir having an outlet, said stationary reservoir for refilling the movable reservoir during its passage under the outlet of said stationary reservoir, means for loosely holding said one of said caps in proper position on said respective vessel, means disposed at a portion of said path for frictionally engaging the circumference of said cap to firmly screw the same on said vessel, means for engaging said vessel to hold the latter against a rotation at a speed at which said cap is rotating during the cap-screwing operation.

7. A machine for closing vessels by screw threaded caps comprising means for continuously moving said vessels in a predetermined path, a reservoir containing said caps in a disordered heap, means for successively transferring said caps from said reservoir to respective vessels and in proper position, an outlet provided in said reservoir for discharge of one cap at a time, said transferring means including a scoop-like container disposed at said outlet for holding said one cap with its opening upwardly directed caused by the centre of gravity thereof, and a chute, said container movable toward said chute for placing said one cap with its opening downwards into said chute for directing said cap therethrough to a respective vessel, means for loosely holding said one of said caps in proper position on said respective vessel, means disposed at a portion of said path for frictionally engaging the circumference of said cap to firmly screw the same on said vessel, means for engaging said vessel to hold the latter against a rotation at a speed at which said cap is rotating during the cap-screwing operation.

8. A machine for closing vessels by screw threaded caps comprising means for continuously moving said vessels in a predetermined path, a reservoir containing said caps in a disordered heap, means for successively transferring said caps from said reservoir to respective vessels and in proper position, said transferring means including at least a rotatable scoop in said reservoir, a chute having an outlet and successively receiving caps from said reservoir by said scoop, a funnel provided with a pipe connection dis-

posed at said outlet of said chute, a piping for compressed air for supplying the latter toward said funnel for positioning a cap in said funnel, a vertical duct directed toward said path, and a turnable member adjacent said funnel and said duct for intermittently discharging said positioned cap from said funnel to said duct for placing said cap on a respective vessel, means for loosely holding said one of said caps in proper position on said respective vessel, means disposed at a portion of said path for frictionally engaging the circumference of said cap to firmly screw the same on said vessel, means for engaging said vessel to hold the latter against a rotation at a speed at which said cap is rotating during the cap-screwing operation.

9. A machine for closing vessels by screw threaded caps comprising means for continuously moving said vessels in a predetermined path, a reservoir for said caps, means for conveying one of said caps from said reservoir to a respective vessel, rotatable means loosely holding said one of said caps in proper position on said respective vessel, means disposed at a portion of said path for frictionally engaging the circumference of said cap while being rotated to firmly screw the same on said vessel, and friction means opposite said engaging means for causing rotation of said vessel in a direction opposite to that of said cap, said vessel friction means being adjustably and resiliently arranged with respect to said path.

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