Aug. 7, 1951 D. A. MACKIN ET AL 2,563,654

SUCTION PICKER FOR CONTAINER CAPS

Filed April 8, 1947 3 Sheets-Sheet 1

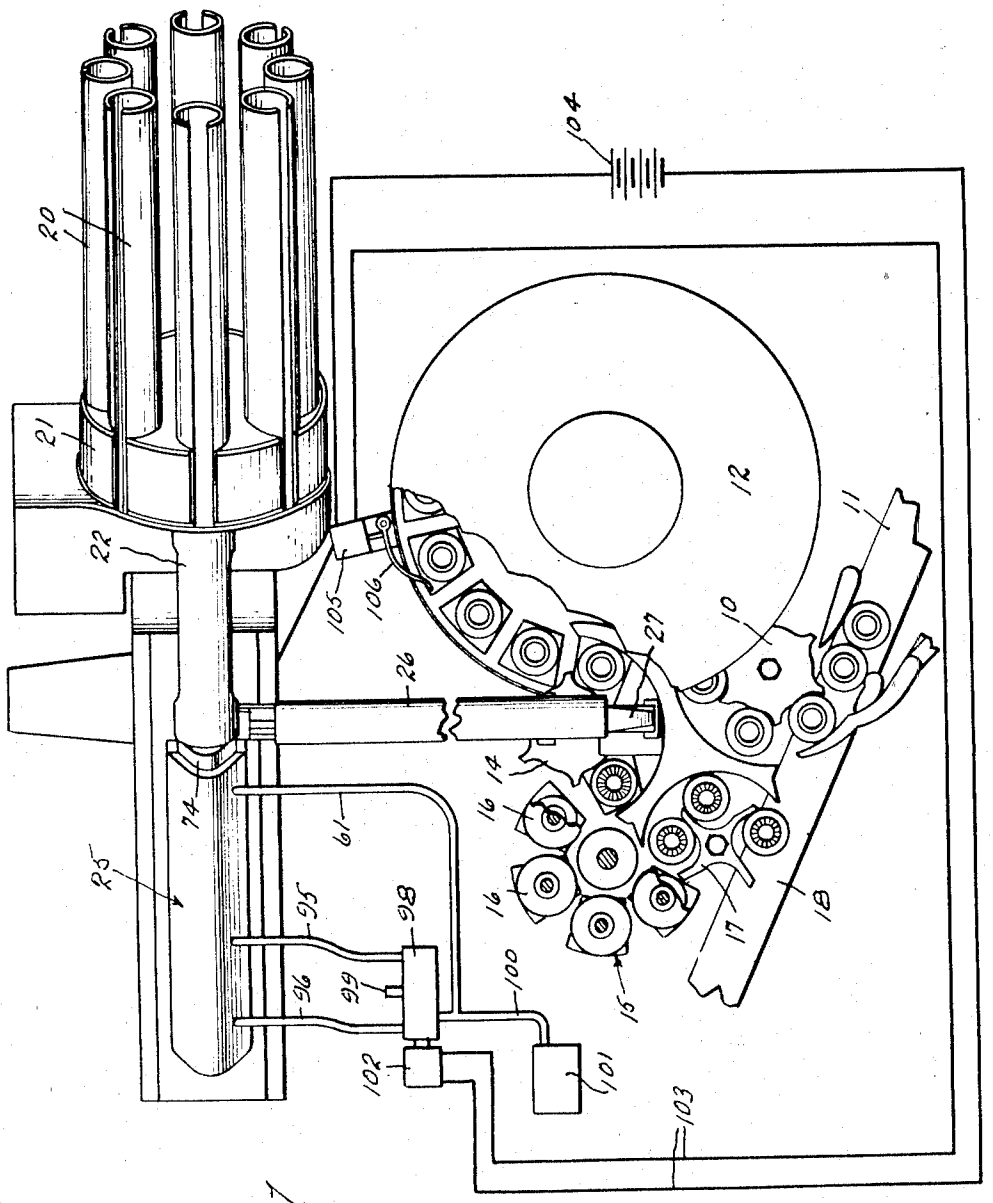


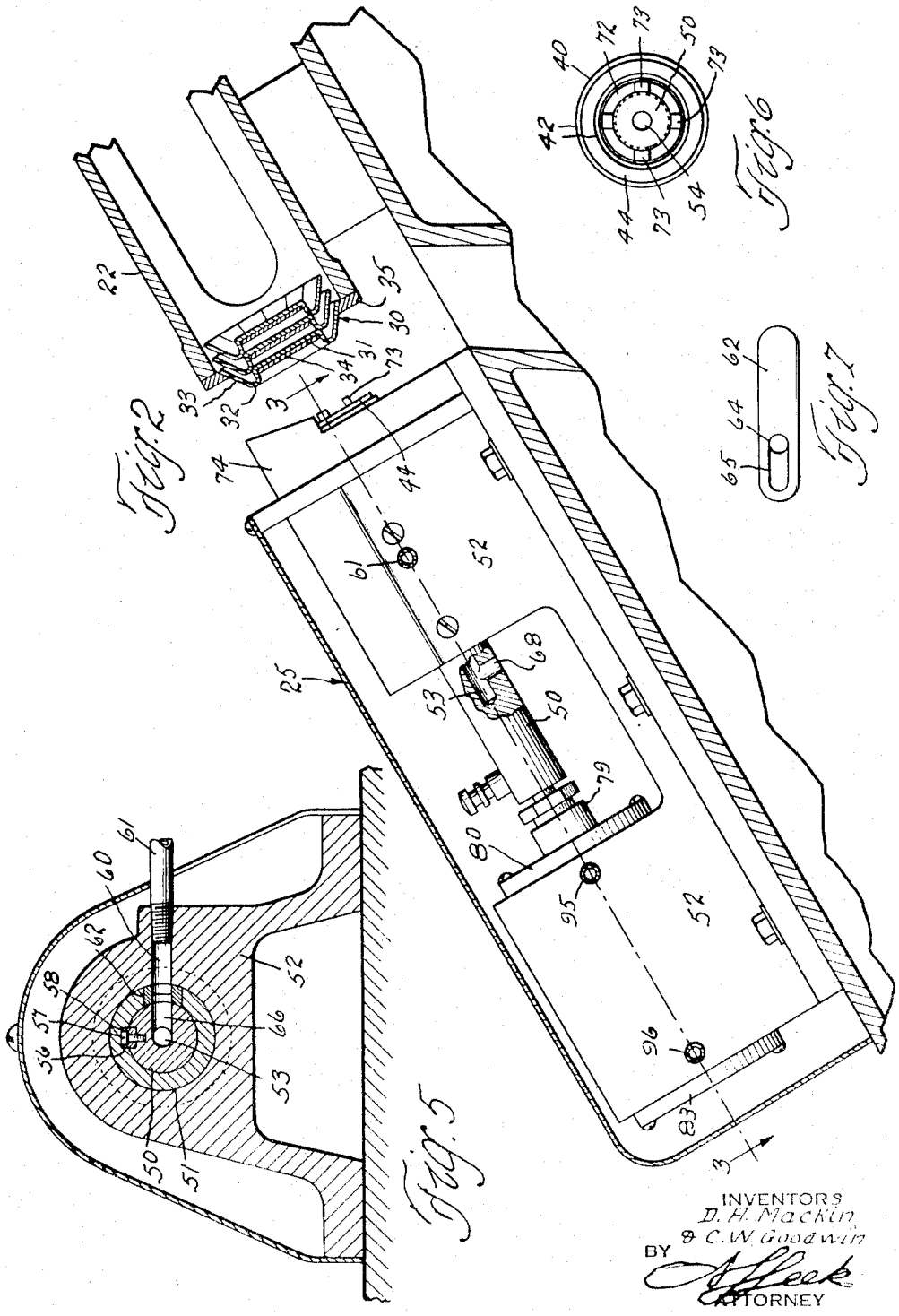
Fig. 1

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Filed April 8, 1947 3 Sheets-Sheet 3

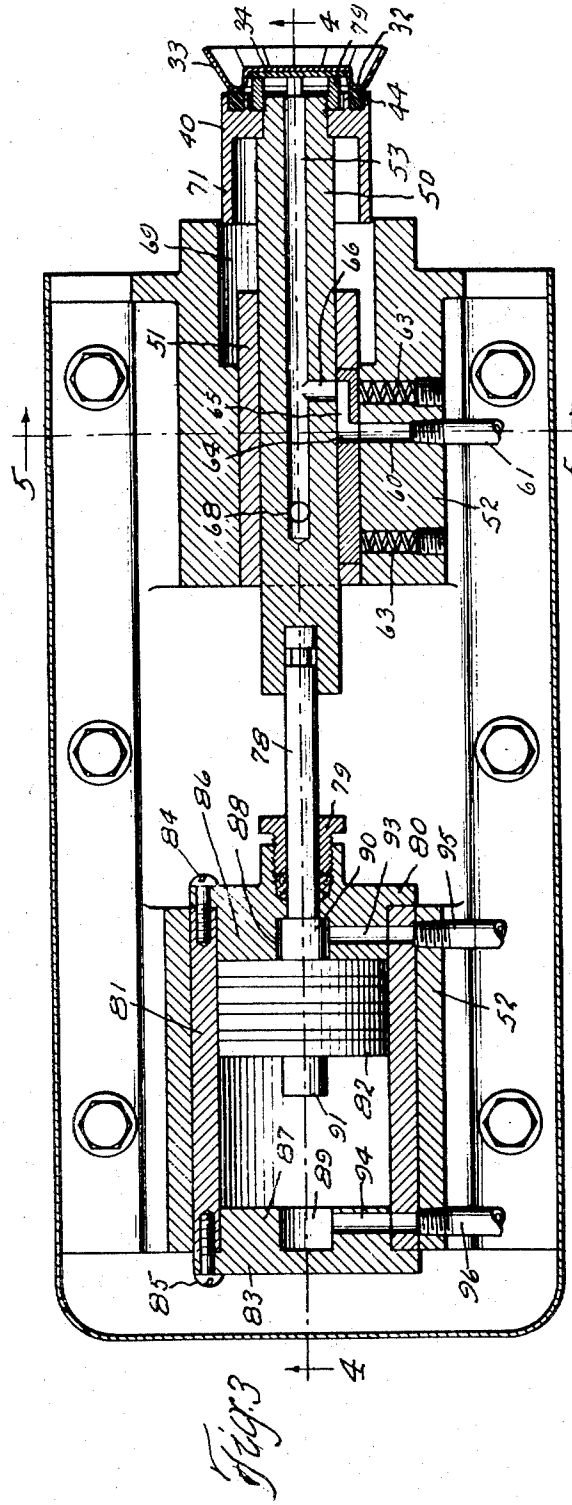


Fig. 3

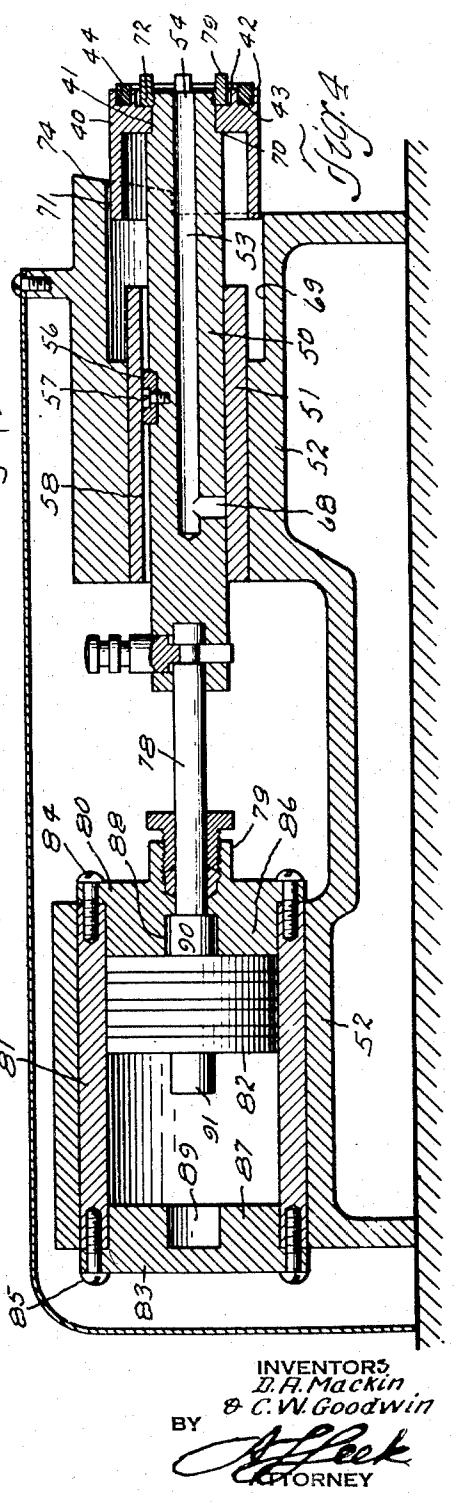


Fig. 4

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SUCTION PICKER FOR CONTAINER CAPS

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Application April 8, 1947, Serial No. 740,162

2 Claims. (Cl. 226—88.1)

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This invention relates to pickers for cap dispensing and applying machines of the type shown in the Goodwin et al. Patent No. 2,325,163 dated July 27, 1943, which is adapted to dispense and apply to milk bottles preformed caps having a central depressed diaphragm adapted to seat on the internal ledge of the bottle, a raised U-shaped pouring rim housing adapted to extend over the pouring rim of the bottle, and a flaring outer skirt which is adapted to be contracted and sealed around the neck of the bottle. A separate disc is usually seated against the depressed diaphragm.

The machine in general includes picker mechanism for picking individual caps successively from a stack of nested caps, means feeding a procession of such caps through a heating zone wherein they are conditioned for sealing, means applying the conditioned caps to the mouths of a procession of filled bottles, and means contracting the cap skirts for sealing about the neck of the bottles.

In the stack the nested caps advance with their tops foremost and with their flared skirts trailing. Hence the cupped portion comprising the pouring lip housing and central depressed diaphragm must be contacted by the picker means.

It is an object of the present invention to provide a novel and improved picker means which removes the caps successively from the nested stacks without removing or loosening the discs.

Another object is to provide a picker mechanism of the above type which is dependable and rapid in operation.

Another object is to provide a device of the above type which operates without distorting the cap shell.

Another object is to provide a mechanism of the above type in which the number of mechanical parts is reduced to a minimum.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

In accordance with the present invention, the picker is provided with a suction head including a ring of soft, resilient, deformable material such as sponge rubber which seats against the top of the pouring rim housing of the cap and conforms to any irregularities or ribs thereon for sealing the enclosed space. The head also carries a set of stop fingers which are adapted to engage the inner disc, or the diaphragm of the cap in the case of a cap without an inner disc, to prevent excessive deformation thereof due to the applied suction. The fingers limit the deformation of the shell to a value such that the inner disc is not displaced or loosened. The head is

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mounted on a plunger which is reciprocated for each cap picking operation. The supply to the suction head is automatically controlled by the plunger so that suction is applied to the head when in an advanced position and is removed therefrom when the head is retracted to the cap releasing position. A piston actuated by suction means is provided for actuating the plunger. The suction means to the piston cylinder is controlled by a solenoid actuated four-way valve which in turn is controlled by a bottle-actuated switch, the arrangement being such that the plunger is normally advanced to bring the suction head into picking engagement with the lowermost cap in the stack. When a bottle actuates the switch, the solenoid controlled valve is shifted to retract the plunger, thereby pulling the lowermost cap from the stack and dropping the same onto the cap conveyor. When the bottle releases the switch, the plunger is again advanced into a position to pick the next cap from the stack.

The same source of suction may be used for the suction head and for actuating the plunger. By maintaining the plunger normally in advanced position between actuations of the bottle-actuated switch a substantial period of dwell is obtained with the suction head against the cap which allows the cap to be securely gripped even when the machine is operating at high speed.

Although the novel features which are characteristic of this invention are pointed out more particularly in the claims, the nature of the invention will be better understood by referring to the following description, taken in connection with the accompanying drawings in which a specific embodiment thereof has been set forth for purposes of illustration.

In the drawings:

Fig. 1 is a top plan view of a cap-dispensing machine embodying the present invention, with the picker actuating mechanism shown diagrammatically;

Fig. 2 is a side elevation of the picker mechanism with parts broken away and parts in section;

Fig. 3 is a longitudinal section taken on the line 3—3 of Fig. 2;

Fig. 4 is a vertical longitudinal section taken on the line 4—4 of Fig. 3;

Fig. 5 is a transverse vertical section taken on the line 5—5 of Fig. 3;

Fig. 6 is a front elevation of the picker head; and

Fig. 7 is a detail view of the valve plate.

Referring to Fig. 1, a filling and capping ma-

chine is shown as comprising a star wheel 10 which conveys empty bottles from an empty bottle conveyor 11 to a rotary filler 12. The bottles pass counterclockwise around the filler 12 and the filled bottles are fed by a star wheel 14 through a cap applying station 27 to a sealing station comprising a rotary turret 15 around which the bottles pass while the skirts are contracted for sealing by traveling capping heads 16. The capped bottles are discharged from the turret 15 by a star wheel 17 to a filled bottle conveyor 18.

The caps to be applied are held in a plurality of stacks 20 which are carried by a rotary turret 21 registering with a feed magazine 22 to which the caps are fed from the various stacks 20 as the turret 21 is rotated to bring the stacks 20 successively into registration with the feed magazine. From the feed magazine the bottom cap is picked by a picker mechanism 25 to be described and is fed to a cap conveyor 26 which feeds the caps in a procession through a heating zone and discharges the conditioned caps to the cap applying station 27. Such a filling and capping machine is described more in detail in the Goodwin et al. patent above described and only so much thereof is set forth herein as is necessary to an understanding of the present invention.

Referring now to Fig. 2, the magazine 22 is shown as carrying a stack of caps 30, each cap having a central depressed diaphragm portion 31, a raised pouring rim housing 32, a depending skirt 33, and a disk 34 seated within the pouring rim housing 32 over the depressed diaphragm 31. The caps are held within the magazine 22 by a ring 35 which engages the depending skirt 33 of the lowermost cap and holds the caps in position for successive withdrawal from the stack by the picker means.

The picker means comprises a suction head 40, Figs. 3, 4 and 6, having a central opening 41 and having a pair of annular flanges 42 forming an annular recess 43 therebetween in which an annular sealing member 44 of soft, compressible, resilient material such as sponge rubber is seated. The annular sealing member 44 is positioned to register with the convex surface of the pouring rim housing 32 of the cap and is deformable so as to produce an effective seal therewith.

The head 40 is mounted on a plunger 50 which is slidable in a bushing 51 carried in a housing 52. The plunger 50 is provided with an axial bore 53 terminating in a port 54 in the forward end of the plunger. The plunger is prevented from rotating by means of a key 56 secured by a set screw 57 and engaging a keyway 58 in the bushing 51.

The housing 52 is provided with a bore forming a suction duct 60 which communicates with a suction pipe 61. A valve plate 62 (Fig. 7) is mounted in a suitable recess in the bushing 51 and is held against the plunger 50 by means of springs 63. The plate 62 is provided with a bore 64 registering with the duct 60 of the housing 52 and communicating with a recess 65 on the plunger side of the plate 62. A port 66 in the plunger establishes communication between the bore 53 and the recess 65 during a limited portion of the stroke of the plunger 50. The bore 53 also communicates with a port 68 (Fig. 4) which is normally closed by the bushing 51, but which is open to the atmosphere when the plunger 50 is retracted.

The head 40 is seated against a shoulder 70 on the plunger 50 and is provided with a protective skirt 71 which slides in an annular recess 69 in the housing 52 and is adapted to provide a safety guard for preventing the operator's fingers from being placed in back of the head 40 when the latter is in advanced position. The head 40 is secured against the shoulder 70 by a threaded ring 72 which is threaded onto the end of the plunger 50 and carries fingers 73 which project into the cupped portion of the cap toward the disk 34 or diaphragm 31 and are adapted to limit deformation of the diaphragm which might tend to loosen or unseat the disk 34 when suction is applied to the cap. The length of the fingers 73 may be varied by changing the threaded ring 72 or by introducing shims between the ring and the head 40.

The upper end of the housing 52 is provided with a forwardly extending shoulder 74 (Figs. 2 and 4) which is adapted to engage the cap when the head is fully retracted and positively remove the cap from the suction head.

The plunger 50 is actuated by a piston rod 78 which is slidable through a bushing 79 in the head 80 of a cylinder 81 and is attached to a piston 82 slidable in said cylinder. The cylinder 81 is closed by heads 80 and 83 which are secured thereto by screws 84 and 85. Blocks 86 and 87 are positioned within the cylinder 81 against the heads 80 and 83 or formed as a part thereof. These blocks 86 and 87 carry axial recesses 88 and 89 having a small clearance such as .0001 inch with a boss 90 on the piston rod 78 and with a plunger 91 attached to the piston 82 respectively. The plunger 91 may be formed as an extension of the boss 90 if desired. Bores 93 and 94 extend through the blocks 86 and 87 to registration with the axial recesses 88 and 89 and communicate respectively with pipes 95 and 96 by which the fluid pressure in the two ends of the cylinder 81 is controlled.

Referring to Fig. 1, the pipes 95 and 96 are shown as leading to a four-way valve 98 having a vent pipe 99 open to the atmosphere and having a suction pipe 100 connected to a suction pump 101. The pipe 61 is likewise connected to the suction pipe 100. The four-way valve 98 is actuated by a solenoid 102 which is connected by lines 103 through a source of potential indicated as a battery 104 to a bottle-actuated switch 105. The switch 105 is provided with an arm 106 which is adapted to be actuated by the successive bottles as they pass around the filler 12. While the solenoid has been shown as actuated from a battery, it is to be understood that an alternating current solenoid may be used and it may be connected directly to the outside supply line.

In the operation of this device, when suction is supplied to the pipe 95, the piston 82 is drawn to the forward end of the cylinder and the plunger 50 is advanced to bring the sealing ring 44 of the head 40 into sealing contact with the pouring rim housing 32 of the lowermost cap in the stack. When the plunger in its advance reaches a position such that the port 66 communicates with the recess 65, suction is applied through the bore 53 to the enclosed space defined by the ring 44, the pouring rim housing 32 and the diaphragm 31 of the cap. This suction causes the cap diaphragm or disc to be drawn against the fingers 73. The solenoid actuated valve 98 is spring-biased in such a direction that when the solenoid is de-energized suction is applied to the pipe 95 and the pipe 96 is vented to the atmosphere through the vent 99. Hence the piston and the plunger are normally maintained in their advanced position. When a bottle, in advancing around the filler 12, engages the

arm 106 and closes the switch 105 the solenoid 102 is energized, thereby reversing the position of the four-way valve, admitting suction to the line 96, and venting the line 95 through the port 99. This causes the piston 82 and the plunger 50 to be retracted. As the plunger 50 is retracted suction is retained on the cap until the port 66 passes the recess 65. During this portion of the return stroke of the plunger, the lowermost cap is removed from the stack by the head 40. When the plunger has been retracted sufficiently to close the port 66, the port 68 passes the end of the bushing 51 and vents the passage 53 to the atmosphere, thereby releasing the cap from the plunger head and allowing the same to drop onto the cap conveyor 26 (Fig. 1). In order to prevent the cap from adhering to the head 40, even though vented to the atmosphere, the shoulder 74 of the housing engages the top of the cap and forcibly removes the same from the head 40 as the latter is retracted.

As soon as the bottle passes the arm 106 and releases the same, the switch 105 again opens, de-energizing solenoid 102 and reversing the connections to the pipes 95 and 96 to again advance the piston 82 for the next picking operation.

It will be noted that the recesses 88 and 89 and the boss 90 and plunger 91 control the suction at the end of the working stroke so as to bring the piston 82 and plunger 50 to rest gradually without striking against the ends of the cylinder. When the boss 90 and plunger 91 enter their recesses 88 or 89 they form a valve to partially seal off the opening to the ducts 93 and 94, thereby reducing the suction applied to the cylinder 81. At the same time the air pressure built up by the movement of the boss 90 and plunger 91 into the recesses 88 or 89 forms an air cushion to oppose the movement of the piston.

The plate 62 is held against the surface of the plunger 50 by the springs 63 so as to form an effective seal and prevent the suction from being broken by leakage along the surface of the plunger.

The connections to the solenoid switch 102 may of course be reversed so that the piston 82 is normally maintained in its retracted position and is advanced for the picking operation when the switch 105 is closed. However, it has been found more effective when operating rapidly to maintain the head 40 in contact with the cap between picking operations in order to provide a longer period of dwell for the suction head against the cap. Inasmuch as the cap is pushed off of the head 40 by the shoulder 74 when the plunger is retracted no period of dwell is required for this portion of the operation.

It has been found that the above-described system operates effectively at a comparatively high speed, such as for example 160 operations per minute or more and effectively removes the individual caps from the stack without distortion and without displacing or loosening the inner discs.

Although a specific embodiment of the invention has been shown for purposes of illustration, it is to be understood that the invention may be applied to various uses and that changes and adaptations may be made therein as will be readily apparent to a person skilled in the art. The invention is only to be restricted in accordance with the scope of the following claims.

What is claimed is:

1. A machine for dispensing caps from a stack of nested bottle caps having a central depressed diaphragm and a raised annular pouring rim housing, comprising a plunger having an axial bore terminating in a suction port and an end of reduced diameter forming a shoulder, a suction head comprising a ring seated around said reduced diameter portion against said shoulder, a second ring of soft, compressible, sealing material secured to said first ring and projecting axially to engage the pouring rim housing of a cap, and a third ring threaded onto said reduced diameter portion of said plunger to secure said first ring against said shoulder, said third ring carrying a set of axially projecting fingers to enter the central cap recess and limit the deformation of said diaphragm when suction is applied to said head.

2. A suction picker head for dispensing caps from a stack of nested bottle caps having a central depressed diaphragm, a raised, annular pouring rim housing and a disc seated on said diaphragm, comprising a ring having an annular channel therein in alignment with said annular pouring rim housing, a ring of soft, resilient, compressible, sealing material secured in said channel and projecting axially to engage the pouring rim housing of said caps and form therewith a sealed suction chamber, and stop means within said last ring projecting axially into said suction chamber beyond said ring of sealing material to engage said disc to prevent withdrawal thereof from said diaphragm when suction is applied to said head.

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