

Dec. 18, 1951

H. R. AMES

2,578,772

CONTAINER CAPPING MACHINE

Filed Oct. 17, 1949

5 Sheets-Sheet 1

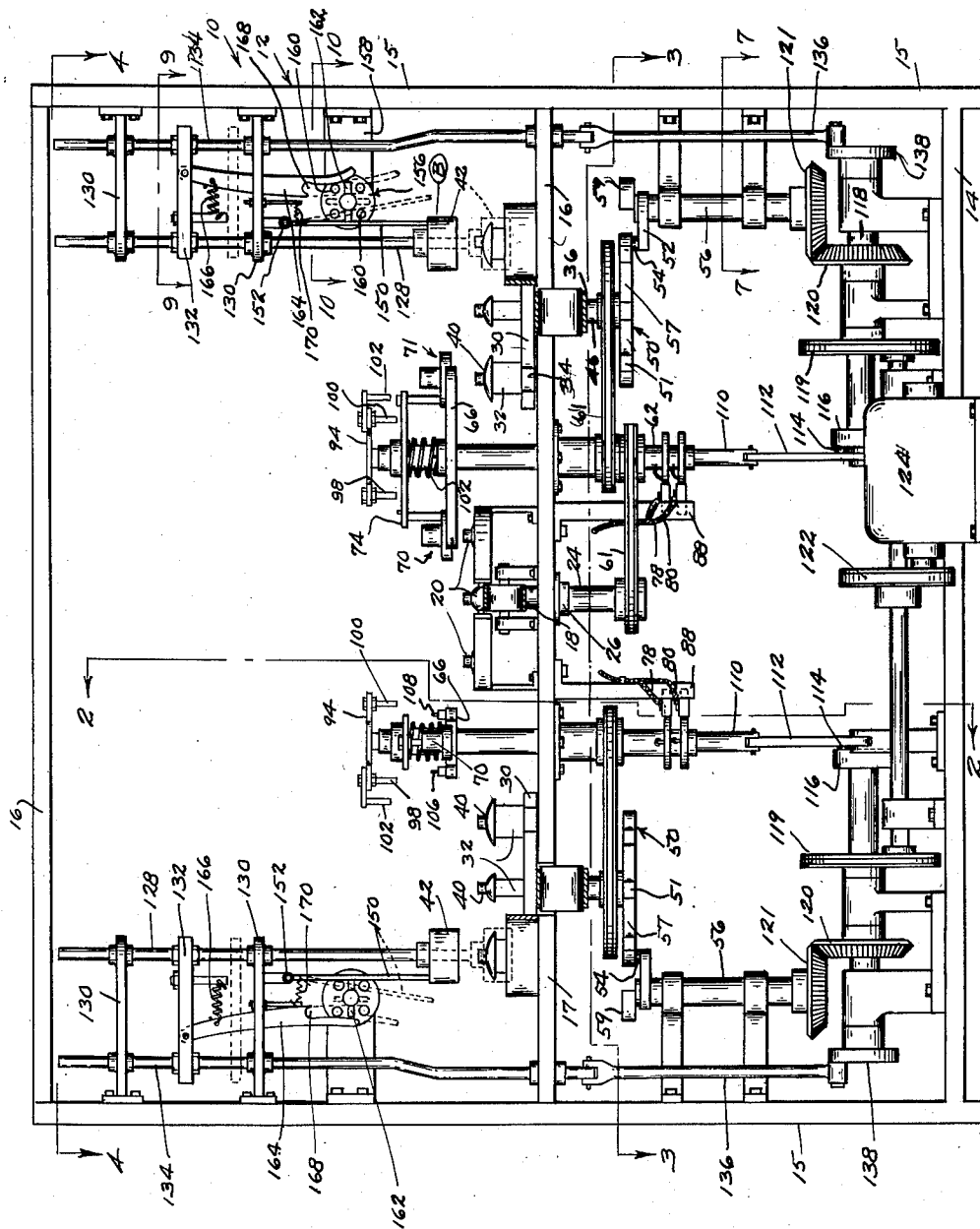


Fig. 1

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5 Sheets-Sheet 2

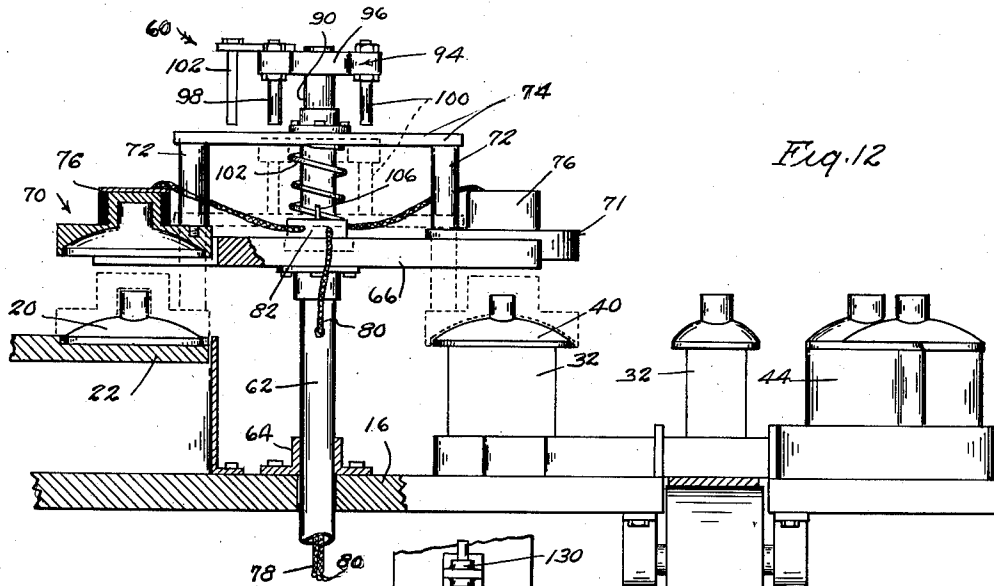


Fig. 12

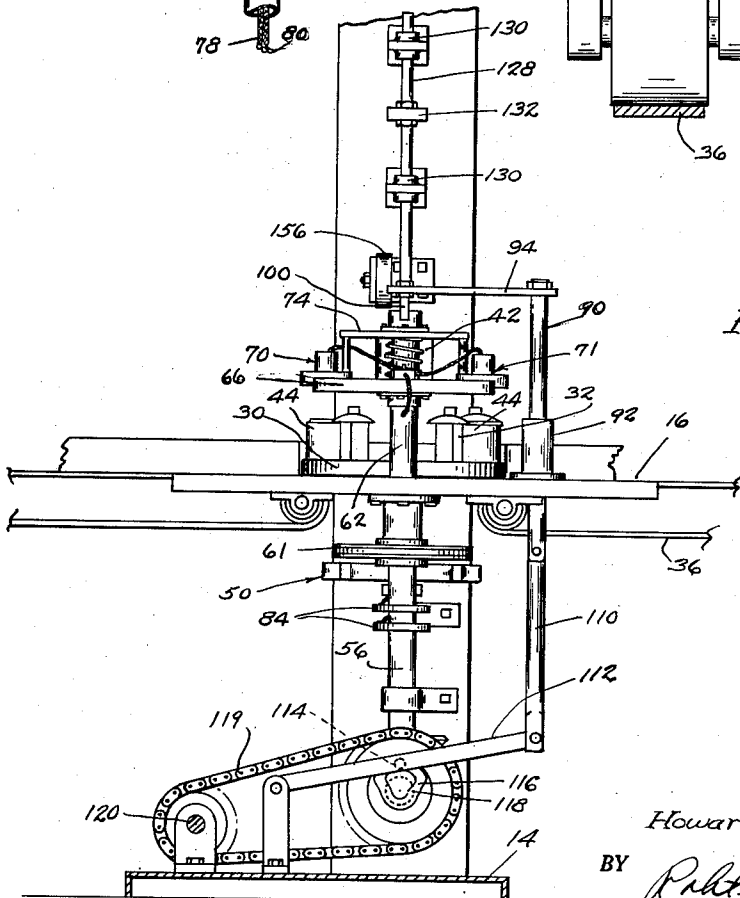


Fig. 2

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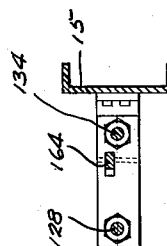
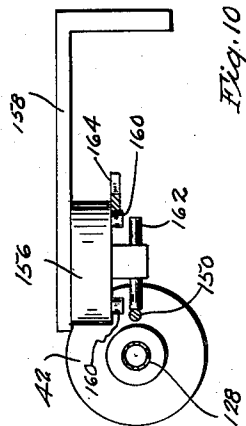
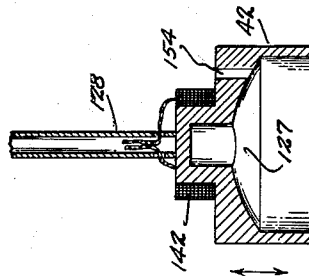
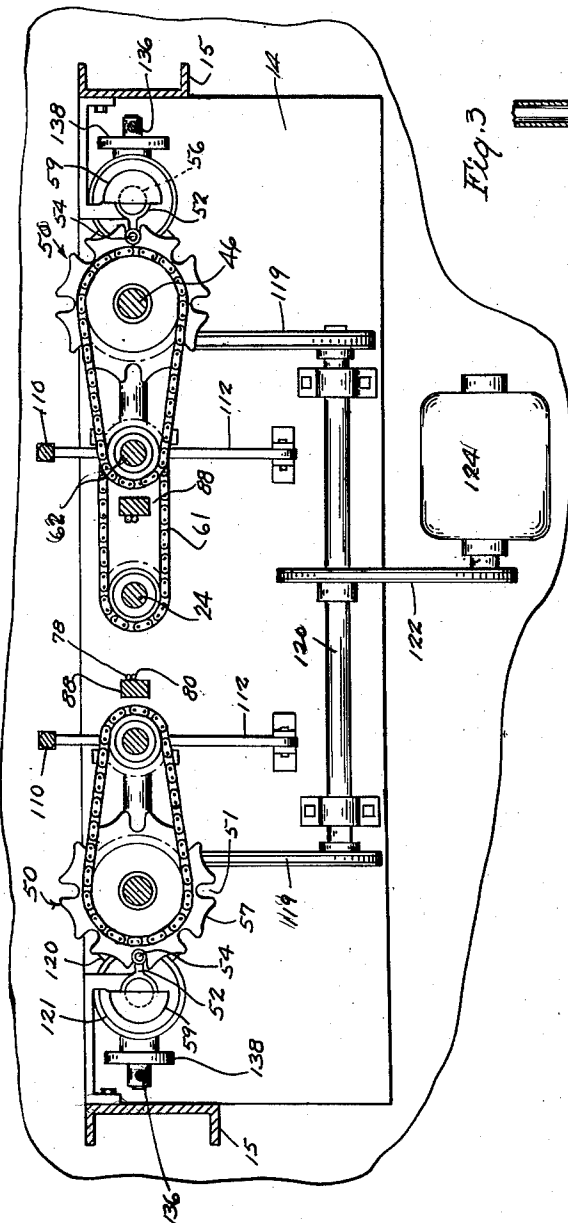
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CONTAINER CAPPING MACHINE

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5 Sheets-Sheet 3



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CONTAINER CAPPING MACHINE

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5 Sheets-Sheet 4

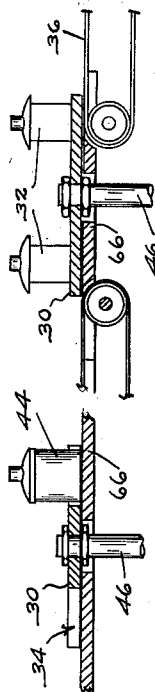
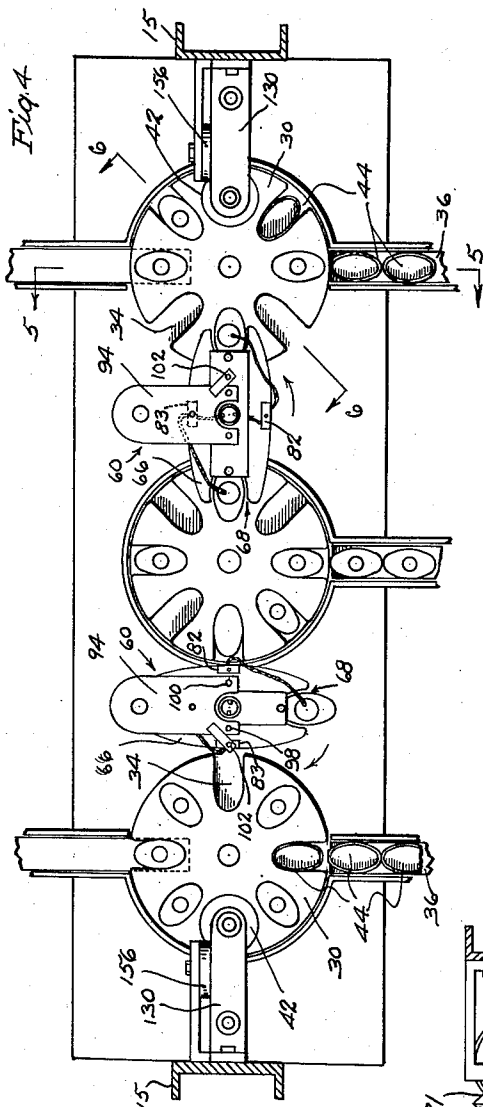


Fig. 5

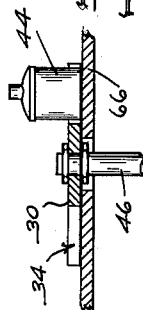


Fig. 6

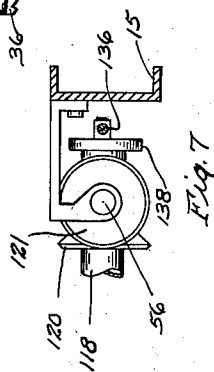


Fig. 7

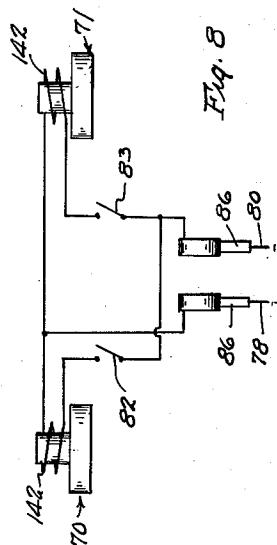


Fig. 8

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5 Sheets-Sheet 5

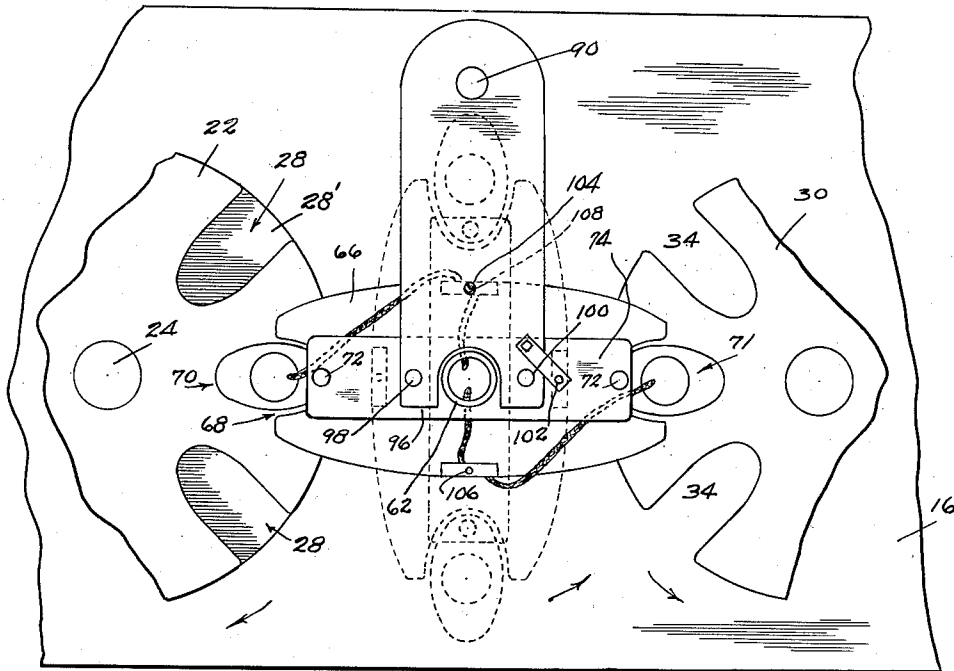


Fig. 13

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2,578,772

CONTAINER CAPPING MACHINE

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Application October 17, 1949, Serial No. 121,746

4 Claims. (Cl. 226—80)

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The machine of this invention relates to means adapted to automatically place a metallic cap or lid upon a container before or after merchandise has been placed therein, and the prime object of the invention is to provide an improved mechanical apparatus for such purpose.

Another object of the invention is to provide a machine which will magnetically transfer a metallic cap or lid from a point of supply to a place of repose intermediate the point of supply and a place of application thereof upon a container, and from which place of repose the cap is lifted and is applied under pressure to a container.

Another object of the invention is to provide a machine adapted to perform all functional operations involved in capping a container which exist between removing a cap or lid from a source of supply and application and the securing thereof upon a container.

A further object of the invention is to provide a machine of the character set forth which is simple, reliable and efficient in operation.

Other objects, as well as features and advantages of the invention may be noted from the accompanying drawing, the detailed description thereof, and the subjoined claims.

Figure 1 is a front elevational view of the capping machine of this invention; and,

Figure 2 is a vertical sectional view taken along line 2—2, Figure 1; and,

Figure 3 is a sectional view in plan as seen along line 3—3, Figure 1; while,

Figure 4 is a top plan view of the capping machine taken along line 4—4, Figure 1.

Figure 5 is a detail showing construction along line 5—5, Figure 4; while,

Figure 6 is a similar detail of construction taken along line 6—6, Figure 4.

Figure 7 is a detail taken along line 7—7, Figure 1, showing a bearing in its arrangement with respect to the frame of the machine.

Figure 8 is a simple wiring diagram of one of the two identical circuits used in operating the capping machine.

Figures 9 and 10 are details of construction not readily discernable in Figure 1, see lines 9—9 and 10—10, Figure 1.

Figure 11 is a mid-vertical sectional view through the pressure head employed to apply caps to the containers, this view shows one method of magnetizing the pressure head if desired.

Figure 12 is an enlarged detail showing the lid or cap transfer mechanism in relationship to the lid carrier table and the container carrier table; while,

Figure 13 is a plan view of the lid transferring mechanism.

In the drawing the capping machine 10 of this invention is shown as being embraced within a

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frame 12 which is comprised of a base 14, the vertical standards 15 and a horizontal beam 16, while a horizontal, stationary table 17 is secured to the standards 15 intermediately of the base and the beam.

An endless conveyor 18 is adapted to deliver a continuous supply of container lids 20 to a rotatable lid carrier table 22 which is formed of dielectric material, and is positioned above the level of the stationary table 16. The rotatable table 22 is supported upon and is carried by a shaft 24 which is journaled in a suitable bearing 26 upon the under-side of the table 16, and as the drawing shows, the table 22 is formed with a plural number of pockets 28, of which in the present instance there are eight, each of which is adapted to receive one of the lids 20 from a continuing supply thereof from the conveyor 18, and these pockets are shaped to conform with the side-wall contour of the lids being handled so that each of the lids being fed to the machine is held against lateral movement and is in alignment for subsequent handling as will be hereinafter described. A disc of 28' of like material lies across the underside of the pockets to provide a bottom support for the lids 20 when placed therein.

A rotatable container carrier table 30 is longitudinally aligned upon the table 16 with the lid carrier table 22, and as shown in the drawing, is located but slightly above the top surface of the table 16 so as to minimize the amount of vertical travel or movement of the lid transferring device in removing a lid from the table 22 to a lid supporting pedestal 32 upon the table 30.

The table 30 is also formed of dielectric material and in the present disclosure is provided with four pockets 34 which are shaped in the contour of the base of the container being capped, and these pockets receive their containers from an endless conveyor 36. Positioned intermediately of each of the container pockets 34, I place a pedestal 32 which is formed with a top or capping 40 which is contoured in the shape of the interior of the lid to be applied to the container so as to support the lid against sliding therefrom during the time interval that elapses between the moment of deposit thereon and the time the lid is picked-up by the pressure head 42 for direct application to a container 44.

The table 30 is supported in clearance of the table 16 upon a vertical shaft 46 journaled in a suitable bearing 48 upon the under-side of the table 16, and this shaft is provided with a star-wheel 50 upon its lower end for periodic rotational movement thereof. Since the table 30 rotates in increments of $\frac{1}{8}$ of a complete turn or through 45 degrees, the star-wheel is formed with eight recesses 51 for engagement by a stud 54 upon an eccentric 52 which is rotated by the

shaft 56. After the star-wheel has been rotated through 45 degrees, it is necessary that it be held in such position during the time interval necessary to apply a lid to a container, this holding action is obtained by forming the star-wheel with eight relatively shallow circular recesses 57 which are adapted to receive a like shaped shoulder 59 upon the eccentric 52. Thus it will be seen that the star-wheel is alternately forced through 45 degrees of travel by the stud upon the eccentric when in engagement with one of the recesses 51 and that upon release of the star-wheel by the stud, that the circular shoulder 59 upon the eccentric is caused to enter an appropriate one of the circular recesses 57. The momentarily interlocked relationship thus created between the recesses 57 and the shoulder 59 holds the star-wheel and its entrained assembly in stationary position during the period required to apply a lid upon a container.

Between the lid carrier table 22 and the container carrier table 30, I place a lid transferring mechanism 60, the supporting shaft 62 of which, is located upon the horizontal center line of the shafts 24 and 46. The shaft 62, which is hollow to receive an electrical circuit to be hereinafter described, is supported in a bearing 64 and is adapted to move both rotationally and vertically. Upon this shaft and in a plane somewhat above the top surface of the lid carrier table, I fixedly secure a piece of dielectric material 66 having ends which are recessed at 68 in the configuration of approximately one half of a container lid, and this provision is made to accommodate electro-magnets 70 and 71 which are partially set therein and to accommodate vertical movement of the lids from the pockets 28 to the magnets aforementioned. Each of the magnets are supported in this manner upon spacers 72 which are fixedly secured to the ends of an elongated plate 74 which is centered upon the shaft 62.

The core of each of the electro-magnets 70 and 71 is cast with a recess having the exterior contour of the lid to be transferred, while upon the top of the cores of these magnets I place an electric-coil 76 through which an electric current will flow from leads which extend upwardly through the hollow shaft 62 as aforementioned, and which circuits comprise the leads 78 and 80 in parallel circuit connection with micro-switches 82 and 83, which are positioned upon the plate 66, and the coils of each of the electro-magnets 70 and 71. A collector ring 84 upon the shaft 62 and brushes 86 upon a support 88 upon the under-side of the table 16, enables an electric current to continuously flow from a source not shown, to the circuit represented by the leads 78 and 80.

A vertically positioned shaft 90, adjacent to and at right angles to the horizontal center line upon which the shafts 24, 46 and 62 are located, is adapted to limited vertical movement within a sleeve 92 secured upon the table 16, and upon the upper end of this shaft I position a plate 94 having a cut-out or bifurcation 96 to accommodate the upper end of the shaft 68 upon relative movement thereof, and in the ends 96 of this bifurcated structure I place adjustable tappets 98 and 100 which are adapted to be brought into pressure contact with the plate 74 when the shaft 90 is lowered, thereby depressing the plate 74 and the attached electro-magnets against the resistance of a spring 102 which encircles the shaft 62 between the plates 66 and 74 so that a magnet 70 or 71 having a lid thereon may be precisely

lowered to an exact position over the contoured head of the pedestals 40 upon which the lids had previously been deposited after removal from the lid carrier table 22.

The plate 94 is also provided with adjustably positioned fingers 102 and 104 which extend downwardly therefrom and are adapted to depress the contacts 106 and 108 of the micro-switches upon rotation of the cap transferring mechanism 60 under these fingers during operation thereof so that during one complete rotation of the mechanism 60, one of the micro-switches is opened to de-energize the circuit to an electro-magnet, thereby releasing a lid for deposit upon a pedestal, while the other of the micro-switches has its circuit closed whereby the other of the electro-magnets is energized to pick-up a lid from the lid carrier table 22 for subsequent deposit upon a pedestal. This operation is continuous when the machine is in use.

Reference to Figures 3 and 4 will show that the shaft 90 is provided with a hinged link 110 connected to the rocker arm 112 which is fulcrumed at its other end to the base 14, and that it is provided with a roller 114 which is positioned within and which follows the grooved cam 116 upon the shaft 118, so that upon rotation of this shaft the entrained linkage is raised and lowered.

The shaft 118 is chain driven at 119 by a jack shaft 120 which in turn is chain or belt driven at 122 by means of a motor 124. Reference has previously been made to the shaft 56 as being in operative connection with the star-wheel 50, in Figure 1 it will be seen that this shaft is driven by the shaft 118 through intermediate gears 120 and 121.

After the lids have been deposited upon the pedestals 32 as a step precedent to application upon the containers, such application is effected by means of a presser head 42 which is cast or otherwise formed with a recess 127 in the lower face thereof to receive a lid nested therein. The presser head is supported upon the lower end of a pendently supported, vertical shaft 128 which is guided by brackets 130 upon the standards 15, and which shaft is attached to and supported by one end of an arm 132, the other end of which is connected to a shaft 134 which is guided for reciprocating movement by the brackets 130 through which it extends. The lower end of the shaft 134 is provided with a swingable link or pitman 136 which is fulcrumed upon an eccentric 138 upon the shaft 118, so that rotation of the shaft 118 is translated into vertical reciprocating movement of the presser head, which in timed sequence with rotation of the container carrier table 30 is adapted to move downwardly in medial-vertical alignment with and upon a lid on a pedestal to encompass the lid and to magnetically support it within the cavity or recess 127, the presser head is then raised in clearance of the pedestal and upon rotation of the table 30 through 45 degrees is again lowered for forcible application of the lid upon a container which has advanced during the preceding fractional rotation, to a point in medial-vertical alignment with the presser head. An electric coil 142 is wound around an extension of the presser head and is adapted upon excitation to convert the presser head into an electro-magnet to magnetically lift and support a lid during the interval of movement from a pedestal to application upon a container. The circuit to the coil 142 may be attached to the exterior surface of the shaft 128 or it may be

extended through the shaft as shown in Figure 1.

In handling lids of certain shapes I have found that if the cavity 127 is made slightly smaller than the exterior dimensions of the lid, that the lid may be picked up without resort to magnetic power, and that when this is the case that the lid may be applied to a container in the usual manner and that upon withdrawal of the presser-head the lid readily withdraws therefrom for the reason that the grip between the lid and the container is greater after union thereof, than is the resistance to withdrawal from the presser-head, however, I find that an occasional lid will remain lodged in the presser-head, and in such cases it is necessary to provide means to force the lid therefrom concurrently with operation of the capping machine, this operation I accomplish by means of a probe 150 which in practice comprises a rod which is hingedly attached at 152 to the lower of the brackets 130, and which probe is adapted to enter and to withdraw from having entered an opening 154 in the presser-head 42. A circular disc 156 which is rotatably mounted upon a bracket 158 attached to the adjacent standard or frame member 15, is provided with four studs 160 which extend therefrom and which are positioned 90 degrees apart and adjacent the periphery of the disc. A pin 162 extending through the nub upon which the disc is rotatable is adapted to have its ends bear upon the probe 150 to force it into vertical alignment with the opening 154 in the presser-head. A latch 164 hinged to the arm 132 is drawn under spring tension at 166 to constantly bear upon one of the studs 160. A notch 168 in the latch is adapted to engage each of the studs in sequence of operation and to rotate the disc through 90 degrees. A spring 170 attached to the probe and to an extension of the lower one of the brackets 130 is adapted to draw the probe in clearance of the presser-head when the probe is withdrawn therefrom. The position of the probe is constant with respect to the vertical, but each movement of the presser-head assembly also carries the latch 164 therewith and in moving downwardly the notch 168 of the latch engages one of the studs 160 and forces the disc through a one quarter revolution and in so doing, also rotates the pin 162 to or from the horizontal as shown in Figure 1.

In Figure 1, the presser-head "B" is shown with the probe inserted therein, and this position is identical with that which exists when the presser-head has applied a lid to a container and is being withdrawn from the operation, if a lid should remain in the presser-head, the probe would force it out at this time. When the presser-head is lowered to pick up a lid the probe is withdrawn therefrom and is pulled in clearance of the presser head under spring tension, and for the reason that positive pressure by the pin 162 has been relieved, for in this position the pin has been rotated 90 degrees in clearance thereof, however, as the head is again lowered to apply the lid to a container, the latch 164 rotates the disc through 90 degrees and carries the other of the ends of the pin into pressure contact with the probe which is forced to a point in alignment with the opening 154, so that as the presser-head is again raised after applying a lid, the probe enters the opening 154 to eject any lid remaining therein. If there is no lid present during this phase of the operating cycle, then the movement of the probe is an idle one.

Operation of the capping machine of this invention may be described as follows:

Lids 20 are placed by an attendant upon the endless conveyor 18 and are shunted into each of the pockets 28, concurrently therewith, open containers 44 are carried in like manner to each of the four pockets 34 upon the table 30.

The table 22 and the tables 30 find their prime mover in the motor 124 which is in belted drive connection with the jack shaft 120, which shaft is provided with a chain drive at 119 upon the ends thereof, and through the agency of bevel gears 120 and 121 rotates the vertical shafts 56, upon the upper end of which there is an eccentric 52 in operative drive connection with the star-wheel 50. Rotation of the eccentric 52 rotates the star-wheel in increments of 45 degrees or $\frac{1}{8}$ of a circle, thus the table 30 advances around its cyclic course in stepped movement, each step of which is equal to 45 degrees. As the drawing shows, the shaft 52 is driven in a one to one ratio by the shaft 46 upon which the star-wheel is located, and by the intermediate chain 61 and the shaft 62 rotates the shaft 24 upon which the table 22 is supported in a one to two ratio, that is, the shaft 24 rotates twice for each rotation of the shaft 62. The ratios of movement as above set forth is based upon the fact that the cap receiving table 22 serves two container carrying tables and capping pressure-heads 42.

As the cap or lid carrying table 22 rotates, it carries one of the lids under an electro-magnet 70 or 71, which being energized, is of sufficient strength to lift a lid from its pocket 28 and rotatingly carry it through 180 degrees at which point the magnet is medially aligned with and is over a pedestal, at which moment one of the adjustable fingers 102 or 104 upon the vertically movable arm 94 is brought into contact with one of the micro-switches 82 or 83 which is de-energized and hence gravitationally releases the lid for deposit upon an aligned pedestal 32. Rotation of the table 30 upon which the pedestals and the open containers are located, carries a lid under and in medial vertical alignment with the presser-head 42 which in timed relationship to operation of the machine as a whole, is lowered into pressure contact with a lid upon a pedestal and upon upward movement thereof carries the lid by reason of frictional engagement with the side-walls of the cavity 127 in which the lid reposes, or alternatively, as shown in the drawing, the lid may be magnetically lifted from the pedestal and thus supported during the period that the table 30 is rotating through 45 degrees under the presser-head, but in any event, as a container is carried under the presser-head, the timed movement of the machine is such that the presser-head is lowered to apply the lid upon an open container, thus completing one cycle of operation. If for any reason one of the caps or lids become lodged in the cavity 127, then in that case the probe 150, which is immovable in a vertical direction with respect to the presser-head, will bear upon the top of the lid and cause its ejection therefrom. Each vertical movement of the presser-head carries the pawl 164 upwardly so that upon a return or downward movement thereof, the recess 168 in the pawl engages one of the bosses 160 and hence rotates the disc 156 through 90 degrees, which motion alternately carries the pin 162 from and to the horizontal, in which position it forces the probe into alignment with the opening 154 in the presser-head. When the pin is in vertical position the probe is free to be

withdrawn under spring pressure from the presser-head when disengaged therefrom, see Figure 1.

Having thus described my invention in its presently preferred form, that which I believe to be novel and for which I seek Letters Patent, is as follows:

I claim:

1. In a container capping machine, a plural number of revolvable tables, one of said tables being adapted to receive and convey container caps from a point of supply thereof, and the other of said tables being adapted to receive and convey open containers from a point of supply thereof, said second mentioned table having a container cap support pedestal thereon in spaced relationship to a container thereon, and an electro-magnet, said electro-magnet being revolvable and adapted to magnetically lift a container cap from the first mentioned table for subsequent deposit upon said pedestal, and a presser-head, said presser-head being adapted in timed sequence with rotation of the second table to be lowered into pressure contact with a container cap upon said pedestal and subsequently raised in clearance of said pedestal and then lowered for pressurizing upon said container.

2. The structure defined in claim 1, in which the pressure-head is formed with a cavity in its under-face to receive said container cap in frictional support thereof and wherein frictional resistance to removal of the cap from a container after application thereof is greater than frictional resistance to withdrawal from said cavity.

3. A container capping machine including a frame therefor, a plural number of tables positioned in differential work planes, one of said tables having radially positioned cap receiving pockets therein, the other of said tables having radially positioned container receiving pockets, and pedestals, said pedestals being alternately positioned between said pockets, means to rotate said tables in differential speeds, means to supply container caps to the first mentioned table and means to supply open containers to the second mentioned table, means positioned intermediately of said tables to transfer a cap from the first mentioned table to a pedestal upon the second mentioned table, said means comprising an arm having an electro-magnet upon each of the ends thereof adapted upon cyclic rotation to be in medial vertical alignment with a pocket in said first mentioned table and upon rotation through 180 degrees to be aligned with a pedestal upon said second mentioned table, an electrical circuit to each of said electro-magnets including current interruptors so timed as to alternately energize and de-energize said electro-magnets for lifting and releasing container caps with respect to said first mentioned table and said

pedestals, and means operating in timed sequence with rotation of said second table to remove a container cap from a pedestal thereon for application to a container thereon, said means comprising a pressure-head adapted to reciprocal movement in timed sequence with rotation of the second mentioned table for lowering thereof upon a container cap and lifting thereof in clearance of its pedestal and for subsequent lowering in medial vertical alignment with a container for pressurized application thereto.

4. A capping machine for metallic containers including a frame therefor, a plural number of revolvable tables in differential work planes, radially positioned cap receiving pockets in one of said tables, radially positioned container receiving pockets in a second table and including radially positioned cap supporting pedestals alternating with said container pockets, means to rotate said tables at differential speeds, a cap conveyor to said first table and a container conveyor to said second table, a rotatable shaft adapted to support electro-magnets thereon in a plane super-adjacent said cap receiving pockets and said pedestals, an electrical circuit to each of said electro-magnets including a micro-switch in each thereof so as to alternately energize and de-energize each of said electro-magnets, a finger adapted to vertical reciprocating movement for each of said micro switches for opening of the circuits therethrough, a presser-head, said presser-head being mounted for reciprocal movement over said second table concurrently with rotation thereof so as to alternately be placed in pressure contact with a cap upon a pedestal and to subsequently apply said cap under pressure to a container advanced thereunder by rotation of the table, and means to eject caps from the pressure-head remaining subsequent to a capping operation, said means comprising a probe advanced to and withdrawn from alignment with an opening in said presser-head upon vertical reciprocation thereof, said probe being withdrawn laterally under spring pressure when clear of said presser-head and being advanced under pressure of a rotatable finger to alignment with the opening in the presser-head, said rotatable finger being advanced to and from probe pressure position by a pawl carried in direct relationship to movement of the presser-head.

HOWARD R. AMES.

REFERENCES CITED

The following references are of record in the file of this patent:

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