March 2, 1971 A. C. OCCHIPINTI 3,566,577

MULTIPLE PAPER CUP CAPPER

Filed July 15, 1969 4 Sheets-Sheet 1

FIG. 1.

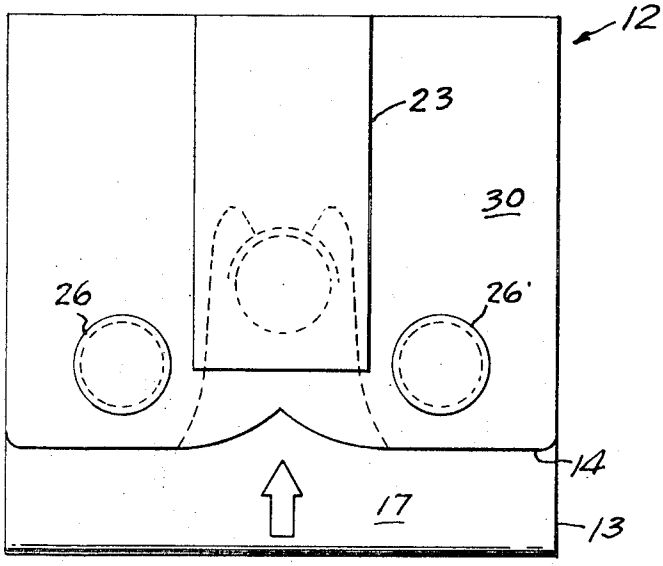


FIG. 2.

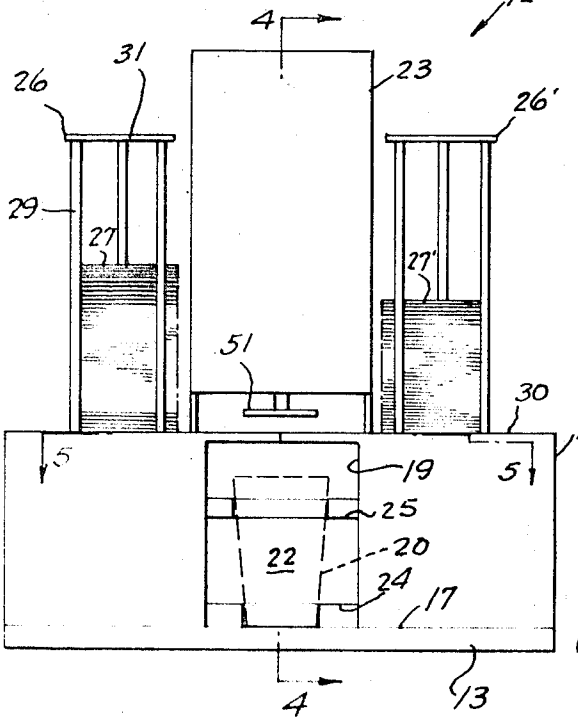
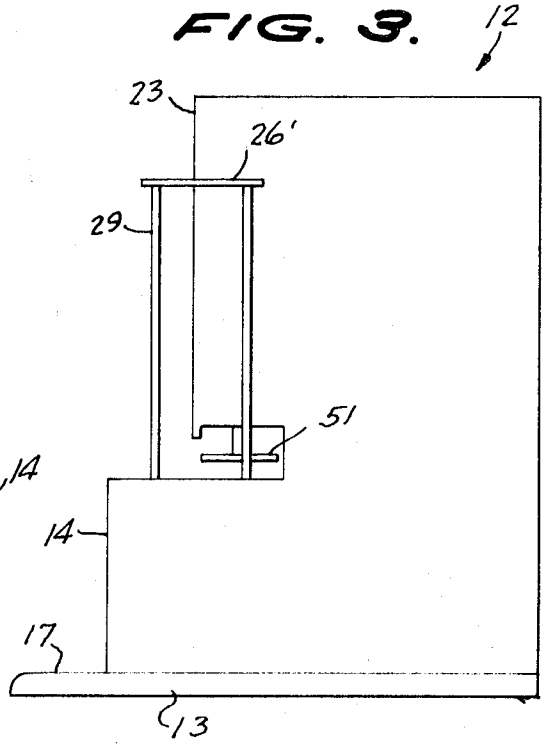


FIG. 3.



INVENTOR.
ANTHONY C. OCCHIPINTI,
BY
Berman, Davidson & Berman.
ATTORNEYS.

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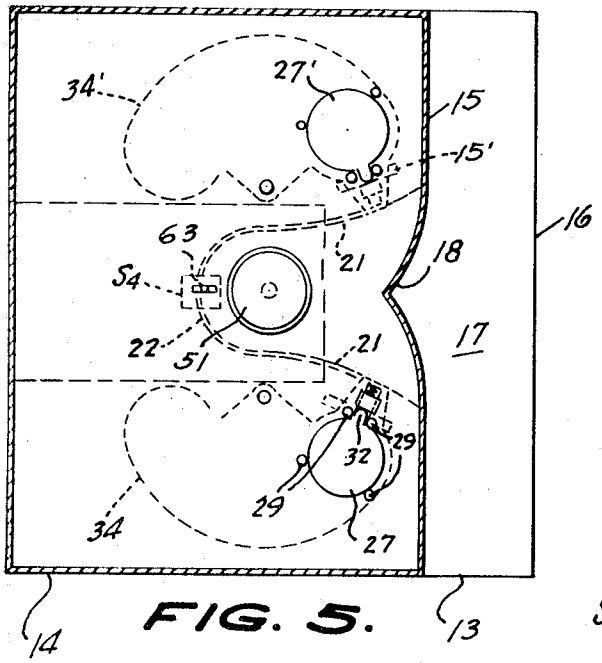


FIG. 5.

FIG. 10.

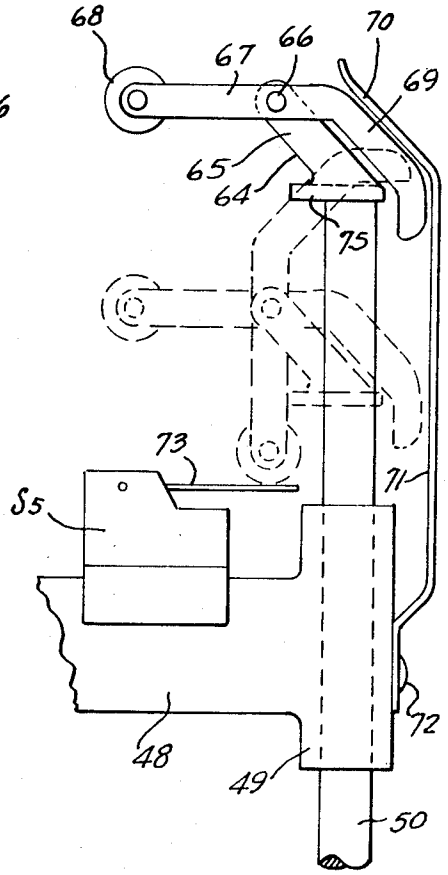
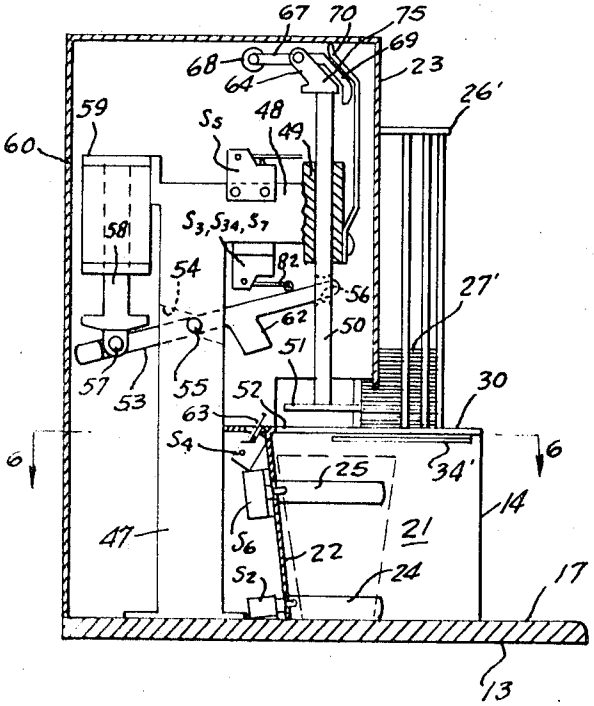


FIG. 4.



INVENTOR.
ANTHONY C. OCCHIPINTI,
BY
Berman, Davidson & Berman,
ATTORNEYS.

March 2, 1971 A. C. OCCHIPINTI 3,566,577

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FIG. 6.

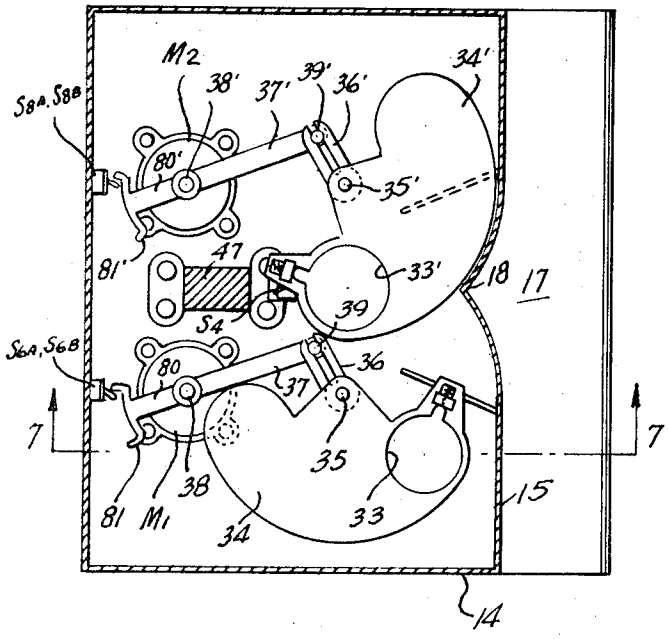


FIG. 9.

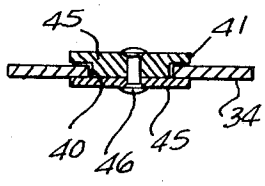


FIG. 7.

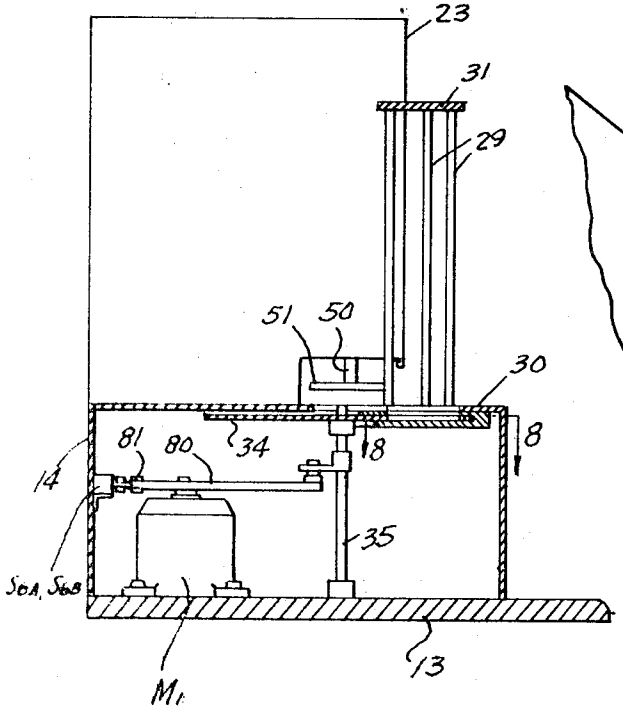
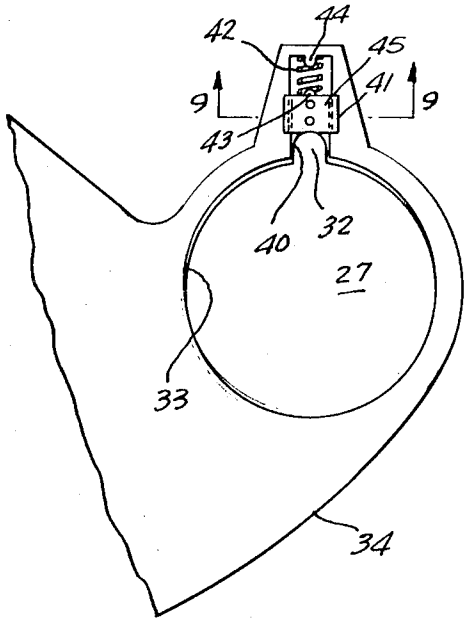


FIG. 8.



INVENTOR.
ANTHONY C. OCCHIPINTI,
BY
Berman, Davidson & Berman,
ATTORNEYS.

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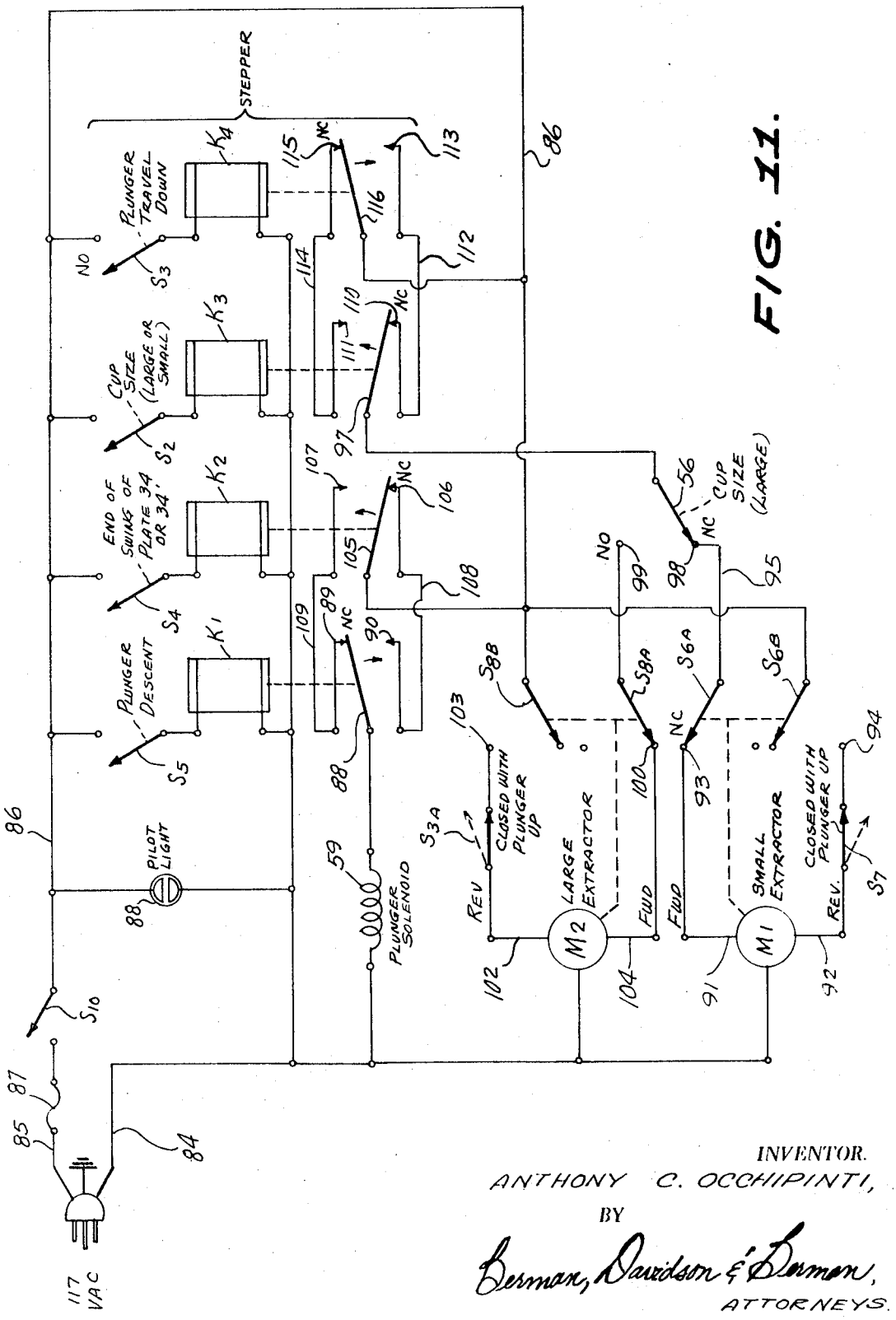


FIG. 11.

INVENTOR.
ANTHONY C. OCCHIPINTI,
BY
Berman, Davidson & Berman,
ATTORNEYS.

United States Patent Office 3,566,577 Patented Mar. 2, 1971

3,566,577

MULTIPLE PAPER CUP CAPPER

Anthony C. Occhipinti, 219 Carondelet St., New Orleans, La. 70130

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Int. Cl. B65b 57/02, 7/28
U.S. Cl. 53—67 14 Claims

ABSTRACT OF THE DISCLOSURE

A device for dispensing and installing cover caps on paper cups containing beverage. The device senses whether a cup therein is large or small and selects and installs the appropriate size cover cap.

This invention relates to container capping machines, and more particularly to a device for dispensing and installing cover caps on paper cups.

A main object of the invention is to provide a novel and improved apparatus for dispensing and installing cover caps on paper cups, the device being relatively simple in construction, being reliable in operation, and being arranged so that it can sense whether a cup placed therein is large or small and can then select and install the appropriate size cover cap thereon.

A further object of the invention is to provide an improved device for dispensing and installing cover caps on paper cups, said device being relatively inexpensive to fabricate, being durable in construction, being smooth in operation, and enabling a paper cup or similar container containing beverage to be quickly and efficiently capped with a minimum amount of manual effort.

A still further object of the invention is to provide an improved automatic capping machine for placing cover caps on paper cups and similar containers, the machine being compact in size, being quiet in operation, and being self-monitoring with respect to the detection of cups which are cover-filled and which reacts in a manner to compensate for such over-filling.

Further objects and advantages of the invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

FIG. 1 is a top plan view of an improved capping machine for paper cups constructed in accordance with the present invention.

FIG. 2 is a front eleveational view of the capping machine of FIG. 1.

FIG. 3 is a side elevational view of the capping machine of FIGS. 1 and 2.

FIG. 4 is a transverse vertical cross-sectional view taken substantially on the line 4—4 of FIG. 2.

FIG. 5 is a horizontal cross-sectional view taken substantially on the line 5—5 of FIG. 2.

FIG. 6 is a horizontal cross-sectional view taken substantially on the line 6—6 of FIG. 4 with parts shown in a capping position.

FIG. 7 is a vertical cross-sectional view taken substantially on the line 7—7 of FIG. 6.

FIG. 8 is an enlarged fragmentary horizontal detailed view taken substantially on the line 8—8 of FIG. 7.

FIG. 9 is an enlarged cross-sectional detailed view taken substantially on the line 9—9 of FIG. 8.

FIG. 10 is an enlarged fragmentary elevational view of a portion of the over-fill-compensating mechanism employed in the paper cup capping machine of FIGS. 1 to 9.

FIG. 11 is an electrical wiring diagram showing the circuit connections of the various electrical elements employed in the paper cup capping machine of FIGS. 1 to 10.

Referring to the drawings, 12 generally designates an improved multiple-size cup-lid dispenser and positioner according to the present invention. The device 12 comprises a base plate 13 on which is mounted a housing portion 14 of generally rectangular shape and having a front wall 15 which is set back relative to the front edge 16 of base plate 13 to define a shelf space 17. The vertical front wall 15 of the housing is recessed at its intermediate portion, as shown at 18, to define a guide notch and said front wall is cut away, as shown at 19, to define a rectangular insertion opening through which a beverage cup 20 may be moved. Thus, the opening 19 leads to an interior chamber having sidewalls 21, 21, said sidewalls converging rearwardly and merging in an arcuately-curved inner end wall portion 2 which slopes upwardly and rearwardly, as shown in FIG. 4, so as to conformably-receive a conventional upwardly-flaring beverage cup.

The main housing 14 is formed at its intermediate portion with an upwardly-rising auxiliary housing portion 23 of generally rectangular horizontal cross-sectional shape which overlies and extends rearwardly from the cup-receiving inner end portion of the cavity defined by the sidewalls 21, 21 and their inner joining portion 22.

As shown in FIG. 4, the inner cavity defined by the wall elements 21, 21 and 22 includes a horizontal slot 24 at its lower portion and mounted adjacent said cavity lower portion is a microswitch S_2 having its operating element projecting into the central portion of the slot 24, the operating element of said microswitch being engaged by a cup of either large or small size inserted into the cup-receiving cavity, since the operating element of microswitch S_2 is engaged by the lower portion of a cup of either size.

The cup-receiving cavity is provided at an upper level thereof with another horizontal slot 25, with a microswitch S_6 mounted adjacent thereto with its operating element projecting into the central portion of the slot 25 and located so as to be engaged only by a large cup and so as not to be affected by the presence of a small cup in the cup-receiving cavity.

Symmetrically-located on opposite sides of the upstanding central housing portion 23 are respective cup lid-dispensing racks 26 and 26', the rack 26 being dimensioned to receive a stack of cup lids 27 of a size to be employed on small-sized beverage cups, and the rack 26' being dimensioned to receive a corresponding stack of cup lids 27' of a size to be employed with a larger-sized paper cup. Thus, the racks 26 and 26' may comprise a plurality of upstanding vertical rods 29 rigidly-secured on the horizontal wall 30 of the main housing 14 and rigidly-secured at their top ends to a top cover disc 31, thereby forming an enclosure in which a stack of paper cup cover discs may be retained with the discs being freely slidable downwardly by gravity relative to the rods 29. As shown in FIG. 5, the cover discs 27 and 27' are of the type provided with finger tabs 32, and the guide rods 29 are arranged so that the finger tabs 32 are received between a pair of guide rods 29, 29, whereby the cover discs 27 and 27' are held against rotation although they are free to slide downwardly.

Horizontal wall 30 is suitably apertured to allow the passage therethrough of the cover discs 27 and 27', the lowermost of said cover discs 27 and 27' being respectively received in conformably-shaped apertures 33 and 33' provided in respective horizontally-pivoted, horizontally-extending plate members 34 and 34' provided below top wall 30 of the main housing 14. Thus, the plate members 34 and 34' are rigidly-mounted on vertical shaft elements 35 and 35' journaled in main housing portion 14 and being located symmetrically on opposite sides of the central vertical plane of the housing. The plate mem-

bers 34 and 34' are pivoted so that their apertures 33 and 33' can be brought into vertical registry with a cup placed in the enclosure defined between the walls 21, 21, with the cup substantially in abutment with the inner end wall portion 22 of the enclosure.

The plate members 34 and 34' are provided with slotted drive arms 36 and 36' which are drivingly-connected to respective horizontal lever arms 37 and 37' which are, in turn, connected to the shafts 38 and 38' of vertically-positioned reversible electric motors M_1 and M_2 mounted on brace plate 13 and located symmetrically on opposite sides of the transverse vertical central plane of housing 14. The arms 37 and 37' are thus drivingly-connected to the arms 36 and 36' by upstanding drive pins 39 and 39' provided on the forward ends of arms 37 and 37' and engaging slidably in the slots of the respective arms 36 and 36'. The upstanding pins 39 and 39' thus exert camming action on the respective arms 36 and 36' responsive to the rotation of arms 37 and 37', which results in corresponding rotational movement of the plate members 34 and 34'. Thus, in FIG. 6, the plate member 34 is shown in normal position with its aperture 33 in vertical registry with the rack 26 whereby the lowermost cover cap 27 is received in the aperture 33. If motor M_1 is energized in its forward direction, the arm 37 is rotated in a clockwise direction, as viewed in FIG. 6, causing the plate member 34 to be rotated in a counterclockwise direction and causing the aperture 33 to move toward a position in vertical registry with a beverage cup positioned in the cavity defined between walls 21, 21 with the beverage cup substantially in abutment with the inner end wall portion 22. As will be presently described, a cap 27 carried in the aperture 33 is then pushed downwardly in sealing relationship with the cup. Meanwhile another cap 27 is deposited on the plate member 34 by gravity and when the plate member 34 returns to its normal position, in a manner presently to be described, the newly-deposited cap 27 moves into the aperture 33.

As shown in FIG. 8, the aperture 33 is provided with an outwardly-extending radial end slot 40 adapted to receive a cover tab 32, the tab being engaged by a slide element 41 which is spring-biased against the tab by a coil spring 42 mounted in the outer end portion of the slot 40 with its ends engaged on respective lugs 43 and 44 provided on slide 41 and the transverse end portion of slot 40.

As shown in FIG. 9, the slide 41 may comprise upper and lower segments 44 and 45 held together by a rivet 46 with the side edges of the segments suitably recessed to slidably-receive the side edges of the slot 40. The spring 42 exerts sufficient retaining force on the slide member 41 to hold a cap 27 in the aperture 33 until it is pushed downwardly, in a manner presently to be described, to force it into the top of a beverage cup to be capped. The slide member 41 is sufficiently retracted to easily allow the tab 32 of the next cover cap to move into the slot 40 when the next cover cap slips into the aperture 33 responsive to the return of plate member 34 to its normal position shown in FIG. 6 as will be presently described.

Cenerally-mounted in the rear portion of the combined housing sections 14 and 23 is an upstanding bracket member 47 which is rigidly-secured to base plate 13. At its top end bracket member 47 is formed with the forwardly-extending horizontal arm 48 which is formed at its forward end with a vertical sleeve 49 through which is slidably-engaged a vertical plunger rod 50. Plunger 50 is provided at its bottom end with a circular plunger disc 51 which overlies an aperture 52 formed in horizontal wall 30 substantially in vertical registry with the position of a beverage cup when it is inserted in the cavity defined between walls 21, 21 and substantially abuts the inner end wall portion 22, as shown in dotted view in FIG. 4. The aperture 52 is of the same general shape as the disc 51, but is substantially larger than the disc so as to allow the disc to pass freely therethrough when the plunger rod 50 is reciprocated in a manner presently to be described.

A drive lever 53 extends through and is pivoted in a transverse aperture 54 provided in the upper portion of the upstanding bracket member 47, the lever 53 being pivoted to the bracket 47 and aperture 54 by a transverse pivot pin 55. The forward portion of lever 53 extends through and is pivotally engaged in an aperture 56 provided in the plunger rod 50. The rear end portion of the lever 53 is piovtally connected at 57 to the bottom end of the plunger 58 of a solenoid 59 which is vertically secured to the top end portion of bracket member 47 and is thus located adjacent the rear end wall of housing portion 23.

As will be readily apparent, energization of the solenoid 59 elevates its plunger 58 and rotates the lever 53 in a clockwise direction, as viewed in FIG. 4, which thus moves the plunger rod 50 and its capping disc 51 downwardly through the aperture 52 to force subjacent cap 27 or 27' into the top end of a beverage cap disposed below aperture 52.

Rigidly-mounted on the top end of plunger rod 50 is a clevis bracket 64 having upwardly and rearwardly-inclined spaced parallel arms 65. Pivoted at 66 between the clevis arms 65 is a lever 67. Rotatably-connected to the rear end of the lever 67 is a weighted roller 68. The forward end of lever 67 is formed with a downwardly and forwardly-inclined cam arm 69 which is yieldably-engaged by the inclined top arm 70 of an upstanding leaf spring 71 whose lower end is secured at 72 to the lower portion of the vertical sleeve element 49. Thus, the inclined top arm portion 70 normally bears against the downwardly and forwardly-inclined forward end portion of lever 67 and biases the lever 67 to the full-line position thereof shown in FIG. 10, namely, to a substantially horizontal position. During the descent of the plunger rod 50, in a manner presently to be described, for example, from the full-line top position of arm 67 to the lowered dotted-view position thereof, if such descent should be retarded to a substantial degree, for example, when a subjacent cup being capped is over-filled, the excessive retardation will cause the weighted lever 67 to swing from its horizontal position to its vertical position, due to the inertia of the weighted roller 68. Thus, lever 67 with its weighted roller 68 acts as an over-fill detection means, whereby in the event of an over-filled cup being capped, the lever 67 will swing to the vertical position thereof shown in dotted view in FIG. 10 during the descent of the plunger rod 50. A microswitch S_5 is mounted on the horizontal bracket arm 48 with its operating element 73 located in the path of the weight roller 68 when arm 67 is swung to its vertical position shown in dotted view in FIG. 10. Thus, as will be presently described, the microswitch S_5 is employed to provide the appropriate control action responsive to the detection of an over-filled cup.

As will be presently explained, the operation of the microswitch S_5 de-energizes the solenoid 59 at a sufficiently early stage in the capping operation to prevent excessive force from being exerted on the cap being placed on the over-filled cup. Thus, the over-filled cup will be capped, but its cap will not be driven into the top of the cup to the same degree as in the case of a cup which is not over-filled.

Upon the return of the plunger rod 50 to its elevated position at the end of a capping stroke the lever 67 is returned to its normal horizontal position because of the biasing action thereagainst of leaf spring 71 and the engagement of the portion 69 of the lever with the top portion 70 of the leaf spring as the plunger rod 50 returns to its fully elevated position.

As shown in FIG. 10, the counterclockwise rotation of the lever 67, which occurs responsive to the above-described excessive retardation of plunger rod 50 which de-

velops in the case of an over-filled cup, is limited by the provision of a stop flange **75** on the clevis member **64**. Thus, when the lever **67** is rotated to its vertical position, shown in dotted view in FIG. 10, its counterclockwise rotation is limited by its engagement with the edge of stop flange **75**. In this position of the lever **67** the weight roller **68** is properly located so as to engage the operating arm **73** of microswitch S_5.

The lever **37** is provided with a rear extension **80** provided at its rear end with a yoke **81** operatively-engageable with the operating element of a toggle switch of the double-pole, double-throw type, designated at S_{6A}, S_{6B}. In the normal position of the plate member **34**, shown in FIG. 6, the switch units S_{6A}, S_{6B}, are placed in the positions thereof shown diagrammatically in FIG. 11, namely, the poles of S_{6A} and S_{6B} are in their upper positions. When the plate member **34** is rotated to capping position with the aperture **33** thereof in vertical registry with the apperture **52**, the yoke **81** operates the multiple-contact switch assembly S_{6A}, S_{6B}, and the plate member operates a microswitch S_4 so as to move the poles of S_{6A} and S_{6B} to their lower contacting positions and to close switch S_4.

The lever member **37'** is provided with a similar rear extension **80'** having a yoke **81'** which coacts with double-pole, double-throw toggle switch assembly S_{8A}, S_{8B}, controlling the forward or reverse energization of the motor M_2, as will be presently described. The poles of switch units S_{8A} and S_{8B} are normally in their downward position, but are elevated to their upward positions responsive to the rotation of plate member **34'** to the capping position thereof shown in FIG. 6, because of the cooperation of yoke member **81'** with the operating arm of switch assembly S_{8A}, S_{8B}.

A further multiple-unit microswitch assembly S_3, S_{3A}, S_7 is secured to the horizontal bracket arm **48** with its operating element **82** in a position to be engaged by the top edge of lever **53**. Thus, when the lever **53** is in the position thereof shown in FIG. 4, namely, with capping rod **50** elevated, the operating element **82** is engaged by the top edge of lever **53** and switch unit S_3 is opened, switch unit S_{3A} is closed, and also switch unit S_7 is closed. When solenoid **59** is energized, causing lever **53** to rotate in a clockwise direction from the position of FIG. 4, the switch operating element **32** is released, allowing switch unit S_3 to close and switch units S_7 and S_{3A} to open. Solenoid **59** is of the conventional type provided with biasing means urging its plunger **58** downwardly, namely, toward the position thereof shown in FIG. 4, wherein the capping plunger **50** is in elevated position.

FIG. 11 shows the electrical circuit connections of the various elements of the apparatus, with the parts in normal positions, namely, with the plate members **34** and **34'** in the dotted view position shown in FIG. 5, wherein the apertures **33** and **33'** are located beneath and in vertical registry with the respective stacks of cup lids **27** and **27'**. It is to be noted that FIG. 6 differs from FIG. 5 in that FIG. 6 shows the plate member **34'** rotated to its capping position, wherein its aperture **33'** carrying a cup lid **27'** has been rotated to a position beneath and in vertical registry with the capping disc element **51** carried by the capping plunger rod **50**.

As shown in FIG. 11, the operating circuit of the device is energized from a pair of alternating current supply wires **84** and **85**. The active circuit is energized from the wire **84** and a wire **86** which is connected to the line wire **85** through the main control switch S_{10} and a fuse **87**. A pilot light **88** is connected between the wire **84** and **86**, as shown. One terminal of the plunger solenoid **59** is connected to line wire **84**, and the other terminal thereof is connected to the pole **88** of a relay K_1, pole **88** normally engaging an upper contact **89** of the relay and being movable downwardly to engage a lower contact **90** thereof responsive to the energization of the relay. One terminal of the winding of the relay K_1 is connected to the line wire **84**, and the other terminal thereof is connected to the wire **86** through the normally open microswitch S_5. As above-mentioned, the microswitch S_5 closes responsive to the movement of plunger rod **50** downwardly whereby by the operating element of the microswitch S_5 is engaged either by the flange **75** or by the inertia-actuated roller **68**.

The motor M_1, associated with the plate member **34**, has one terminal thereof connected to line wire **84**. This is the common terminal associated with respective forward and reverse windings included in motor M_1, which is of conventional construction. Thus, said motor has a "forward" terminal wire **91** and a "reverse" terminal wire **92**. Terminal wire **91** is connected to an upper contact **93** of switch S_{6A} normally engaged by its pole. Terminal wire **92** is connected through the normally closed reversing switch S_7 to a bottom contact **94** of switch S_{6B}. The pole of switch S_{6B} engages contact **94** responsive to the operation of said switch by the yoke **81** when the lever arm **37** rotates clockwise from the position thereof shown in FIG. 6 to its limit position wherein aperture **33** is in registry with the capping disc **51** beneath the aperture **52**.

Microswitch S_7 closes responsive to the descent of the plunger rod **50**, namely, responsive to release of the operating lever **82** when lever arm **53** rotates clockwise from the position thereof shown in FIG. 4.

The pole of switch S_{6B} is connected to wire **86**.

The "forward" terminal wire **91** is normally connected to a wire **95** through the upper contact **93** of switch S_{6A} and the pole thereof. Wire **95** is normally connected to the pole **97** of a relay K_3 through the normally closed microswitch S_6. Thus, the pole of microswitch S_6 is normally in its lower position and engages a contact **98**. When a large cup is placed in capping position beneath the aperture **52**, the engagement of the cup with the operating element of microswitch S_6 causes its pole to disengage from contact **98** and engage an upper contact **99**.

The "forward" terminal wire of the motor M_2 is connected to a contact **100** normally engaged by the pole of the switch S_{8A}, which is, in turn, connected to contact **99** of microswitch S_6. The common terminal of motor M_2 is connected to the line wire **84**. The "reverse" terminal wire, shown at **102**, is connected to an upper contact **103** of switch S_{8B} through the normally open microswitch S_{3A}. Microswitch S_{3A} closes when the operating arm **82** is released by the clockwise rotation of lever **53**, as above-described. This occurs when plunger **50** descends. Thus, the "forward" terminal wire **104** of motor M_2 is connected to the lower contact **100** of switch S_{8A}, whereas the "reverse" terminal wire **102** thereof is connected through the microswitch S_{3A} to the upper contact **103** of the switch S_{8B}. The poles of the switches S_{8B} and S_{8A} are moved to their upper positions responsive to the rotation of the plate **34'** to its capping position, shown in FIG. 6, by the action of the yoke member **81'** as previously described.

The pole of switch S_{8B} is connected to wire **86**. Also connected to wire **86** is the pole **105** of a relay K_2, said pole normally engaging the lower contact **106** of the relay and being engageable with an upper contact **107** thereof responsive to the energization of said relay K_2. Contact **106** is connected to the lower contact **90** of relay K_1 by a wire **108**. Upper contact **107** is connected to the upper contact **89** of relay K_1 by a wire **109**. One terminal of the winding of relay K_2 is connected to line wire **84**, and the other terminal thereof is connected through the microswitch S_4 to the wire **86**.

The pole **97** of the relay K_3 normally engages its lower contact **110** and is elevated to engage its upper contact **111** responsive to the energization of the relay.

Lower contact **110** is connected by a wire **112** to the lower contact **113** of a relay K_4 and upper contact **111** is connected by a wire **114** to the upper contact **115** of said relay K_4. The pole **116** of relay K_4 is connected to wire **86**. One terminal of the winding of relay K_3 is con-

nected to line wire **84**, and the other terminal thereof is connected to wire **86** through the microswitch S_2, which is normally open, but which closes when a beverage cup to be capped is placed in position for capping, namely, when the cup is placed against the inner end wall portion **22** of the capping recess.

One terminal of the relay K_4 is connected to line wire **84**, and the other terminal thereof is connected through the microswitch S_3 to the wire **86**. Switch S_3 is normally open, but closes responsive to the release of operating element **82** as arm **53** rotates in a clockwise direction from the position of FIG. 4, namely, responsive to the descent of the capping plunger rod **50**. Thus, microswitch S_3 closes when the plunger rod begins its downward travel and the microswitch S_4 which controls the energization of the relay K_2 closes when a plate member **34** or **34'** has substantially completed its travel in a normal capping operation, by the engagement of the plate member with the operating element **63** of microswitch S_4.

In operation, the main control switch S_{10} is closed to place the device in condition for operation. Let it be assumed that a small cup filled with beverage to a normal level is then placed in the enclosure defined between the wall elements **21**, **21** with the cup inserted sufficiently so that it engages the operating element of microswitch S_2. The closure of switch S_2 energizes the relay K_3 since it connects the winding of said relay to the wires **86** and **84**. Pole **97** of said relay then is elevated into engagement with contact **111**. This energizes the "forward" winding of motor M_1 through a circuit comprising wire **84**, said "forward" winding, lead wire **91**, contact **93**, the pole of switch S_{6A}, wire **95**, contact **98**, the pole of microswitch S_6 in its lower position, relay pole **97**, contact **111**, wire **114**, the upper contact **115** of relay K_4, the pole **116** of said last-named relay, and wire **86**. This rotates the plate member **34** in a counterclockwise direction, from its position of FIG. 6, bringing the aperture **33** and a cap **27** carried therein beneath and in registry with aperture **52** and the capping plunger disc **51**. In this position of lever arm **37**, the yoke **81** engages the operating element of toggle switches S_{6A}, S_{6B} and moves the poles thereof downwardly so that the pole of switch S_{6B} engages contact **94**, preparing the "reverse" circuit for the motor M_1.

It will be noted that the microswitch S_4 is located so that its operating element is in the path of movement of either plate element **34** or **34'**, and is so located that the switch S_4 will be closed when either of said plate elements reaches capping position. Thus, when plate element **34**, as above-described, reaches its capping position, switch S_4 closes and energizes relay K_2 by connecting its winding across wires **86** and **84**. Pole **105**, therefore, is elevated into engagement with contact **107** and the plunger solenoid **59** becomes energized through a circuit comprising wire **84**, the winding of the solenoid, pole **88** of relay K_1, contact **89**, wire **109**, contact **107** of relay K_2, pole **105** and wire **86**. Plunger rod **50** thus descends, whereby the operating element **82** is released, which causes microswitch S_7 to open and microswitch S_3 to close. The opening of microswitch S_7 prevents motor M_1 from reversing at this point.

The closure of microswitch S_3 energizes relay K_4 by connecting its winding across wires **84** and **86**, whereby its pole **116** descends to engage contact **113**. The plunger rod **50** descends and the disc **51** forces the cap **27** into the top of the cup, thus performing the required capping operation. Flange **75** engages the operating arm of microswitch S_5, closing said microswitch and energizing relay K_1 by connecting it across wires **84** and **86**. This causes pole **88** to disengage from contact **89** and to engage lower contact **90**, thereby de-energizing the plunger solenoid **59**. The capping plunger rod **50**, therefore, returns toward its normal elevated position. When lever **53** engages the operating element **82**, switch S_3 opens, de-energizing relay K_4, and returns pole **116** to its normal elevated position in engagement with contact **115**. Also, switch S_7 closes which completes the "reverse" circuit of motor M_1 through a circuit comprising wire **84**, the "reverse" winding of motor M_1, wire **92**, switch S_7, the pole of switch S_{6B} and wire **86**. Plate member **34** is thus returned to its starting position, and when it has reached this position the yoke **81** returns switch S_{6A} and switch S_{6B} to their normal condition wherein their poles are elevated, as shown in FIG. 11, and wherein the pole of switch S_{6A} engages contact **93**, preparing the motor M_1 for the next cycle. When the cup is removed, the parts are all in their original starting positions.

When a large cup, filled to the normal level with beverage is inserted in the enclosure between walls **21**, **21** and engages the operating elements of microswitches S_2 and S_6, a similar operation occurs, except that the pole of microswitch S_6 engages its upper contact **99**, which removes the motor M_1 from the circuit and substitutes the motor M_2. The closure of the pole of microswitch S_6 with upper contact **99** occurs prior to the closure of switch S_2. Thus, when S_2 closes relay K_3 is energized and its pole **97** engages its upper contact **111**, as before-described, thereby completing the circuit through the "forward" winding of the motor M_2. This rotates the plate member **34'** to the position thereof shown in FIG. 6, elevating the pole of switch S_{8B} into engagement with contact **103**, but also closing microswitch S_5, whereby the plunger solenoid **59** is energized, causing plunger rod **50** to descend and opening the switch S_{3A} whereby reversal of motor M_2 is temporarily prevented. The capping operation proceeds as before-described in connection with the small cup, and the reversing circuit of motor M_2 is closed when the plunger returns to its elevated position, as previously described.

If a cup should be over-filled, namely, if the level of beverage in the cup is substantially above the desired normal level, the capping plunger disc **51** will encounter resistance as it moves the cap into the top of the cup, which causes the descent of the rod **50** to be retarded, or decelerated sufficiently to cause the weighed roller **68** and arm **67** to swing to the depending dotted-view position thereof shown in FIG. 10. This causes the roller **68** to engage the operating element **73** of switch S_5, opening the circuit of the relay K_1 which, in turn, opens the circuit of the plunger solenoid **59** by allowing the relay pole **88** to disengage from the lower contact **90** of the relay. This immediately terminates the downward movement of the capping plunger and causes the plunger rod **50** to return to its normal elevated position. Thus, the cycle is shortened appropriately to compensate for the over-filled condition of the cup.

It will be noted that the lever **53** is provided with a depending projection, or cam element **62** which is engageable with either plate element **34** or **34'** when the plate element is in capping position to limit the downward movement of the plunger rod **50**. Thus, in capping a normally-filled cup, the plunger rod **50** is allowed to move downwardly until the stop projection **62** engages the plate element **34** or **34'**. With a normally-filled cup, this action occurs substantially at the same time that the flange **75** engages the operating element of the microswitch S_5. With an over-filled cup, as above-described, microswitch S_5 is operated before projection **62** can engage the plate member **34** or **34'**.

As previously-mentioned, the lowermost cup lid of the stack of lids **27** or **27'** slips into the aperture **33** or **33'** upon the return of the corresponding plate member **34** or **34'** to its normal position. The pressure clip element **41** associated with the lid-receiving aperture engages the corresponding finger tab **32** with spring pressure while the lid is being rotated toward capping position over the cup to be capped. Upon the return of the plate member **34** or **34'** to normal position, its pressure clip element **41** may be retracted by the provision of suitable depending abutment means carried by horizontal wall member **30**,

so as to allow the lowermost lid of the associated stack to slip into the lid aperture of the plate member. For example, depending abutment means such as shown at **15'** in FIG. 5 may be provided, the abutment means depending from the bottom surface of top wall **30** and being so located that it engages the pressure clip **41** as the associated plate member returns to its normal position and retracts the pressure clip sufficiently against the biasing force of its spring **42** to allow clearance for the finger tab **32** of the lid dropping into the aperture **33** or **33'**.

As previously-described, the device automatically compensates for over-filled cups by causing the plunger rod **50** to terminate its descent responsive to unusual resistance effected thereby by the action of the weighted lever **67** with its roller **68**. This inertia mechanism not only provides compensation for over-filled cups, but also provides a means for appropriately deenergizing the plunger solenoid when odd-sized cups are employed, namely, when cups of different size, other than the two specified sizes are employed with the apparatus.

While a specific embodiment of an improved beverage cup capping machine has been disclosed in the foregoing description, it will be understood that various modifications with the spirit of the invention may occur to those skilled in the art. Therefore, it is intended that no limitations be placed on the invention except as defined by the scope of the appended claims.

What is claimed is:

1. A beverage cup capping machine comprising a support having a cup-receiving location thereon, a reciprocatory capping plunger mounted on the support above said cup-receiving location, and closure means adapted to contain caps on said support, and means to move a cap from said enclosure means and position it over said cup-receiving location responsive to the insertion of a cup in said cup-receiving location, wherein said enclosure means comprises a plurality of respective enclosures adapted to contain stacks of caps of different sizes, and wherein said means to move a cap includes means to select a cap from one of said enclosures in accordance with the size of the cup inserted in said cup-receiving location.

2. A beverage cup capping machine comprising a support having a cup-receiving location thereon, a reciprocatory capping plunger mounted on the support above said cup-receiving location, enclosure means adapted to contain caps on said support, means to move a cap from said enclosure means and position it over said cup-receiving location responsive to the insertion of a cup in said cup-receiving location, and means to reciprocate said capping plunger responsive to the positioning of a cap by said cap moving means substantially over said cup-receiving location.

3. A beverage cup capping machine comprising a support having a cup-receiving location thereon, a reciprocatory capping plunger mounted on the support above said cup-receiving location, enclosure means adapted to contain caps on said support, and means to move a cap from said enclosure means and position it over said cup-receiving location responsive to the insertion of a cup in said cup-receiving location, wherein the cap-moving means comprises a plate member rotatively mounted on the support and having an aperture in which a cap is receivable from said enclosure means, the axis of rotation of said plate member being located so that said aperture can be positioned over said cup-receiving location.

4. The beverage cup capping machine of claim **3**, and wherein the means to position the cap over the cup-receiving location comprises means to rotate said plate member to bring said aperture over the cup-receiving location responsive to said insertion of a cup into said cup-receiving location.

5. The beverage cup capping machine of claim **2**, and wherein the means to reciprocate said capping plunger comprises an electromagnetic driving means connected to said capping plunger.

6. The beverage cup capping machine of claim **5**, and means to energize said electromagnetic driving means responsive to the positioning of said cap by said cap-moving means over said cup-receiving location, whereby to operate said capping plunger through a nominal capping stroke, and means to de-energize said electromagnetic means at the end of the nominal capping stroke.

7. The beverage cup capping machine of claim **6**, and means to de-energize said electromagnetic means before the end of said nominal capping stroke responsive to deceleration of said capping plunger.

8. The beverage cup capping machine of claim **6**, and wherein said electromagnetic means is provided with energizing circuit means including normally closed switch means, and wherein said means to de-energize said electromagnetic means comprises switch-operating means opening said switch means at the end of said nominal capping stroke.

9. The beverage cup capping machine of claim **8**, and wherein said switch-operating means comprises a relay operatively-controlling said normally closed switch means, and energizing circuit means connected to said relay and including a limit switch on said support engageable by a portion of the capping plunger when it reaches the end of said nominal capping stroke.

10. The beverage cup capping machine of claim **9**, and inertia-operated means on said capping plunger movable into operative relation to said limit switch responsive to deceleration of the capping plunger.

11. The beverage cup capping machine of claim **10**, and wherein said inertia-operated means comprises a weighted lever pivoted to said capping plunger, and yieldable means normally holding said lever in an inoperative position relative to said limit switch, said weighted lever being swingable into an operative position relative to said limit switch responsive to deceleration of the capping plunger during its capping stroke.

12. The beverage cup capping machine of claim **1**, and wherein the cap-selecting means comprises respective plate members rotatably-mounted on the support and having cap-receiving apertures, said plate members being located so that their cap-receiving apertures are registrable beneath the respective enclosures to receive caps therefrom, said plate members being further located so that said apertures can be selectively-positioned over said cup-receiving locations.

13. The beverage cup capping machine of claim **12**, and respective reversible electric motors drivingly-connected to said plate members.

14. The beverage cup capping machine of claim **13**, and wherein said means to select a cap comprises means to selectively-operate said electric motors in accordance with the size of a cup inserted in said cup-receiving location.

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TRAVIS S. McGEHEE, Primary Examiner

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