

June 23, 1964

F. A. LYON ET AL.
ROTARY CAPPING MEANS

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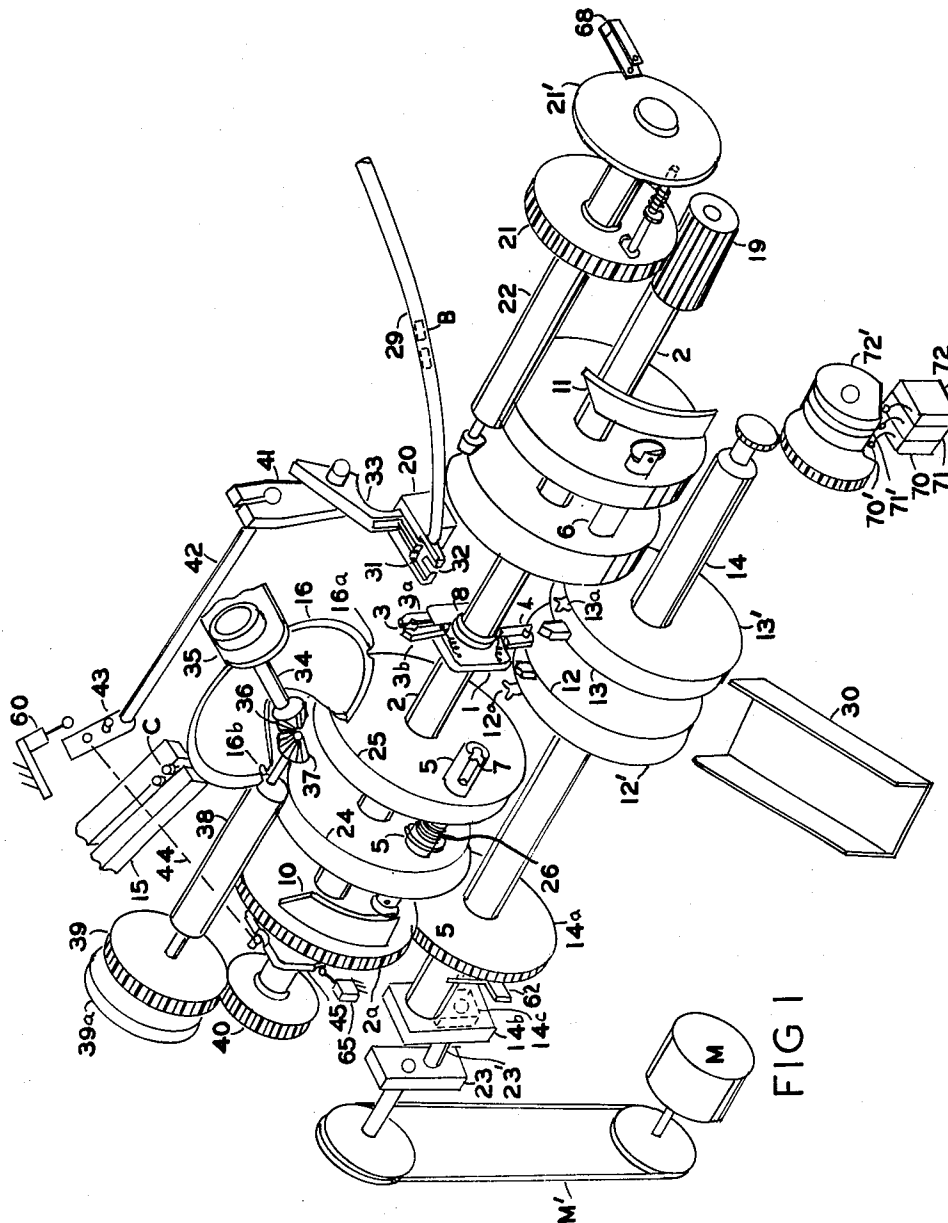


FIG 1

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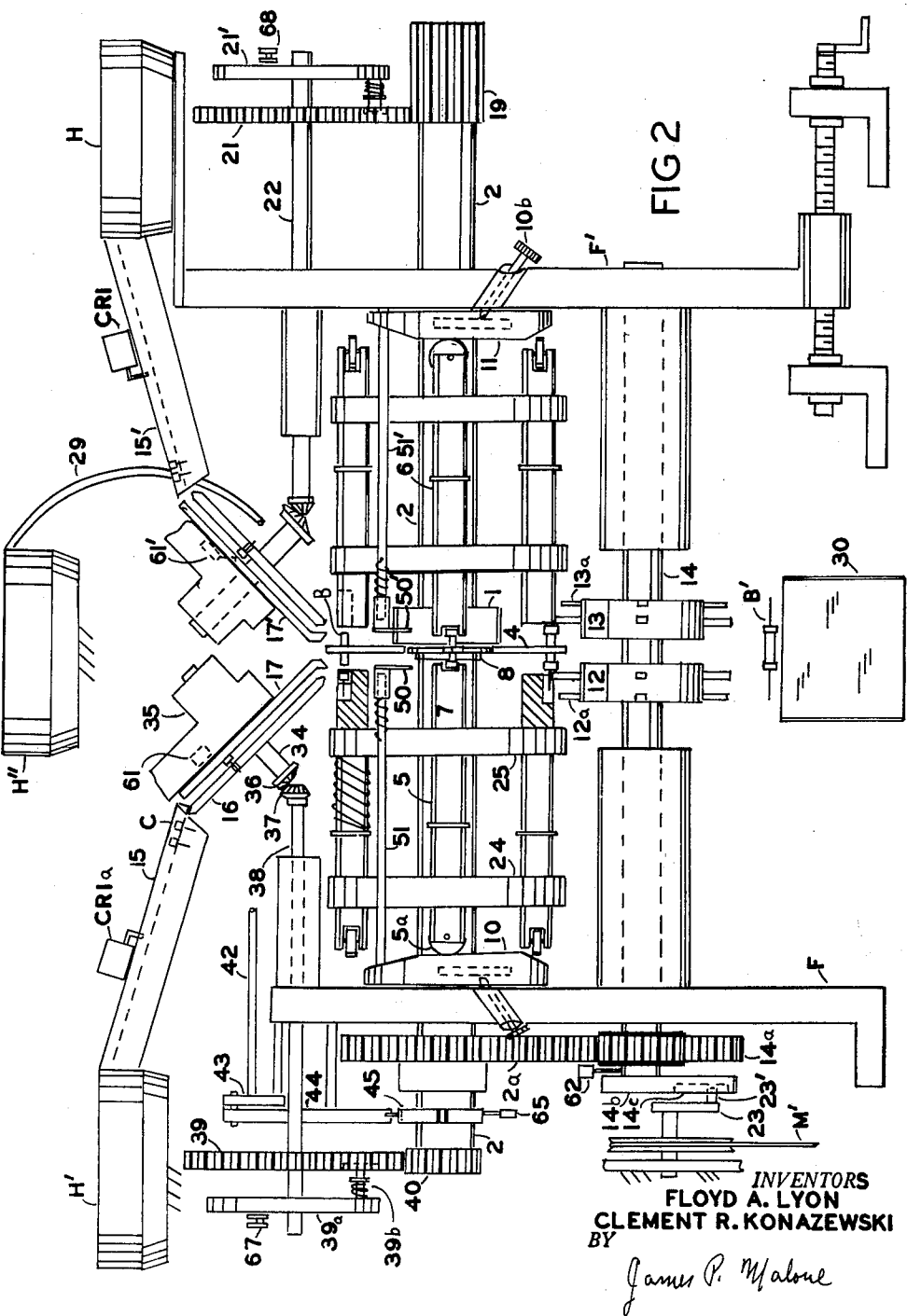
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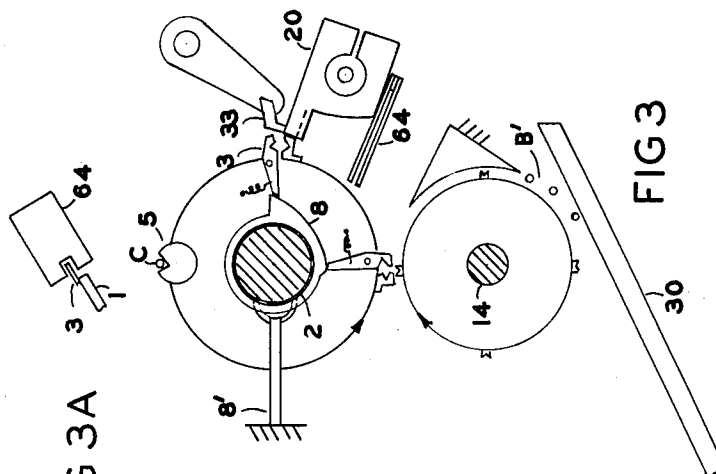


FIG 3A

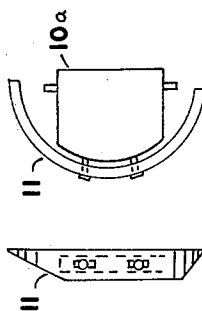
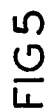


FIG 5A



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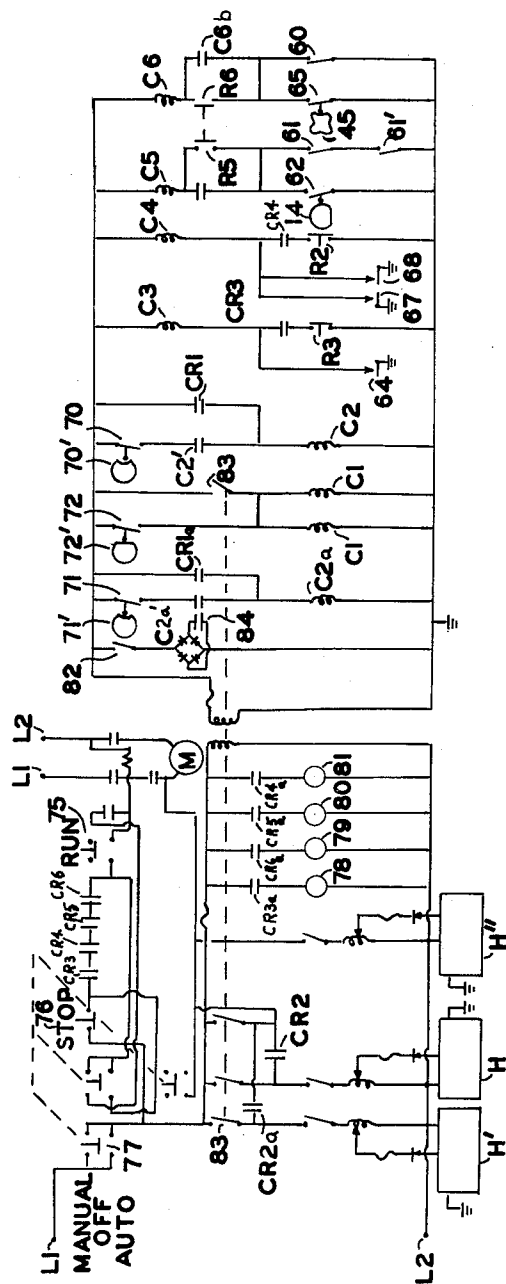


FIG 4

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ROTARY CAPPING MEANS

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9 Claims. (Cl. 29—203)

This invention relates to means for placing caps or leads on resistors, or other electrical components.

This application is an improvement of applicants' prior co-pending application for Resistor Capping Means, S.N. 51,468, filed August 23, 1960, now Patent No. 3,029,500, dated April 17, 1962. The present application differs from the previous application in that the caps are squeezed onto the body member by means of a pair of rams which are operated by fixed cams.

More specifically, the invention generally comprises means to feed the tubular bodies of the resistors to a work location, means to feed pairs of caps to the work location. A pair of rams are mounted on a rotatable member which rotates with the body member. One of the terminal caps with lead attached is placed in the end of each ram and the resistor body and cap holding members are rotated together. The rams are mounted so that they reciprocate along the axis of the body member and, as the holding member rotates, the ends of the rams are acted upon by a pair of fixed cams which squeeze the rams together, thereby force fitting the caps on the ends of the body. Upon further rotation of the article holding member, the capped body assemblies are ejected into a suitable chute, belt, chain or other equivalent takeaway means.

Suitable adjustments for the positioning of the cams is provided and a variable speed drive is provided to slow the operation during certain parts of the cycle, for instance when the caps are inserted in the rotary holding members. The caps and body members are fed to the work location by means of slanted chutes which are adapted to be automatically filled by conventional vibratory hoppers. The present invention is capable of 10,000 assemblies per hour.

Accordingly, a principal object of the invention is to provide new and improved resistor capping means.

Another object of the invention is to provide new and improved resistor capping means which are operated by a pair of fixed cams which are easily adjustable in position.

Another object of the invention is to provide new and improved high speed automatic means for placing and force fitting caps on the ends of small tubular articles such as resistors.

Another object of the invention is to provide new and improved capping means having safety control means to detect malfunctions and stop the apparatus.

Another object of the invention is to provide automatically controlled terminal cap feeding means.

Another object of the invention is to provide new and improved resistor capping means comprising means to feed resistor bodies to a work location, means to feed caps to said work location, a rotatable body holding means at said work location and cap holding means mounted on said rotatable means, said cap holding means comprising a pair of rams adapted to receive one cap each, a pair of fixed cams, said cams being positioned so that as said rotatable member carrying the rams is rotated, the cams cause the rams to squeeze together to thereby force fit the caps on the body.

These and other objects of the invention will be apparent from the following drawings and specification, of which

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FIG. 1 is a perspective view of an embodiment of the invention.

FIG. 2 is a front detail view of the embodiment of FIG. 1.

FIGS. 3 and 3A are detail views of the embodiment of FIG. 2.

FIG. 4 is a schematic circuit of the electrical control means.

FIGS. 5 and 5A are detail views of the cam mounting.

Referring generally to the figures, FIG. 1 shows a centrally located rotatable holding apparatus comprising a body B holding member 1 which is fixedly mounted on the main shaft 2. The body holding member 1 has four or more equally spaced body holding clamps 3, 4, etc. A pair of rams 5 and 6 are rotatably mounted in line with each body holding clamp. Each ram has a cutout slot 7 which is adapted to hold one of the caps to be inserted on the body. A pair of cams 10 and 11 are adjustably mounted on the frames F, F' and taper inwardly so that, as the rams are rotated down to the front as shown in FIG. 1, the rams are squeezed together to insert the caps on the bodies.

The capped body assemblies B' are then ejected into chute 30 by means of the rotatable pick-up members 12 and 13 which are mounted on the shaft 14 which rotates in the opposite direction to that of the main shaft 2.

The caps C are supplied down a chute 15 to a notched wheel 16 which is synchronized with the motion of the ram 5 so as to place one cap in each slot 7. A similar chute 15' and notched wheel 16' are provided on the other side to insert caps in the ram 6 and the other rams on that side. The rams are cut out to receive the caps and leads.

The bodies B are supplied down a chute 29 to a body inserting escapement 20 which is adapted to insert a body in each clamping finger as will be explained in detail.

More specifically the body holding member 1 is fixedly mounted on the shaft 2, journaled to the frame, which is adapted to be driven by means of the gear 2a mounted on the shaft 2 and the gear 14a mounted on the shaft 14. The shaft 14 driven by motor M through belt M' on a variable speed drive comprising the driven arm 23 which is mounted off-center with respect to the arm 14b on shaft 14. The driving connection comprises a pin 23' which fits into a corresponding slot 14c on the arm 14b. Since the driven arm 23 is mounted eccentrically with respect to the arm 14b the driving radius changes so that a predetermined variable speed is imparted to the driven shaft 14. The purpose of this is to provide a slow speed portion of the cycle at certain points, for instance when transferring the caps and body members from a stationary part to the rotatable holding devices. In this way the maximum speed is obtained without being unduly limited by the slow speed required by certain parts of the cycle.

The body holding clamp 3 comprises a finger 3a which is fixed to the member 1 and a second finger 3b which is pivotally mounted and spring loaded against the fixed finger 3a. The movable finger 3b is longer than the fixed member 3a so that the fingers may be opened by stationary cam 8 (FIG. 3). Both fingers are notched to receive the bodies B from the body inserting means 31, 33. Cam 8 also opens the fingers in the bottom eject position. Cam 8 is held stationary by fork 8' (FIG. 3) connected to the frame.

Each ram is slidably mounted on a pair of rotatable disc members which are fixedly mounted on the main shaft 2. For instance, the ram 5 is slidably mounted on the disc members 24 and 25, fixedly mounted on shaft 2, and the ram is spring loaded in the outer position by means of a spring 26 which bears against the disc 25 and a suitable projection on the ram. Each ram has a cam follower mounted at its outer end, for instance the ram

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5 has a cam follower 5a which is adapted to bear against the fixed cam 10 as the rotatable article holding assembly is rotated. The inserting operation takes place as the rams ride along the tapering-in portion of the fixed cams 10 and 11, which are adjustable by means of adjustment bracket 10a, FIGS. 5 and 5A, and adjustment knob 10b, in FIG. 2, and a corresponding mounting for cam 10. When the rams come to the bottom of the fixed cams, they retract. At the same time cam 8 opens the holding fingers and the capped body drops on the takeaway fingers 12a, 13a.

The completed capped body assemblies B' are removed from the body holding fingers by means of the stripping fingers 12 and 13 which extend into the slots in the rams and strip the assemblies as the rams are retracted. The body assemblies fall onto the forked takeaway fingers 12a and 13a which are mounted on the discs 12' and 13' which are fixedly mounted on the shaft 14 which rotates in the opposite direction from the shaft 2. The fingers 12, 12a and 13, 13a are mounted on the ejector discs 12' and 13', for the purpose of receiving the capped bodies from the holding fingers 3, 4 so that the capped assembly is taken and ejected down the output chute 30.

Cap Feeding Means

More specifically referring to the cap feeding means the caps are fed down the slotted chutes 15, 15'. The chutes may be fed by conventional vibratory hoppers H, H'. At the bottom of the chute 15 each cap is received by a notch 16a, 16b, etc. which are spaced around the driven wheels 16, 16'. Suitable guide rails, 17, 17' are provided around the wheels 16, 16' to maintain the caps in position in the notched wheels. The wheel 16 is driven in synchronism with the rams so that a ram comes into position under a notch on the wheel 16 so as to receive a cap from the wheel 16. The variable speed drive is adjusted for its slowest speed at this particular portion of the cycle.

Wheel 16 is mounted on shaft 34 which is journaled to frame bracket 35. Shaft 34 is driven by gears 36 and meshing gear 37 on shaft 38. Shaft 38 is driven by clutch 39, 39a and meshing gear 40 on main shaft 2. The clutch comprises driven gear 39 freely rotatable on shaft 38 and disc 39a fixed to shaft upon which is mounted spring loaded pin 39b which rides in a slot in gear 39. If the caps become jammed the clutch will slip. Wheel 16' is similarly driven on shaft 22 which is driven by clutch 21, 21', and gear 19 on shaft 2.

The cap hoppers H and H' are automatically turned on and off as will be explained in connection with FIG. 4.

Body Feeding Means

The tubular bodies are fed down a chute 29 into holding recess 31 in the stationary body inserting assembly 20. The recess portion 31 of the member 20 has a slot 32 which is adapted to pass spring loaded fingers 3a, 4a, etc. of the body holding clamps. The member 20 is fixedly mounted on the rod 20'. Injecting arm 33 is pivotally mounted on arm 41 and is operated in synchronism with the movement of the body holding clamps 3 and 4, by means of the linkage comprising arm 41 fixedly mounted on shaft 42. Shaft 42 is connected to pivotally mounted arm 43 which is operated by link 44 which is cam operated by cam 45, on shaft 2. The fingers 3, 4, etc. are opened and closed by cam 8 (FIG. 3).

Cap seating strips 50, 50' (FIG. 2) are slidably mounted on the ends of fixed rods 51, 51' and spring loaded against the ends of the rams. As the rams converge inwardly at the beginning of the cams 10, 11, the cap seating strips operate to seat the caps in the cutout slots of the rams.

FIG. 4 shows a schematic circuit diagram of the electrical control for the apparatus. The machine is operated by the motor M which is connected to the lines L1 and L2 through contacts CR3, CR4, CR5, CR6 which

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contacts are operated by trouble sensing devices to stop the machine if any jamming occurs in order to prevent damage to the machine. The motor circuit also includes a conventional run switch 75, stop switch 76 and a manual-automatic switch 77. The conventional vibrator hoppers H, H' and H'', namely, the two cap hoppers and the body hopper, are connected to be controlled automatically as will be described. A group of trouble lights 78, 79, 80 and 81 are also connected to light up when the motor is stopped by one of the trouble sensing means.

Referring to FIG. 4 the switch 64 comprises a pair of plates (FIGS. 3 and 3A) which are cut out so that they will pass the body holding fingers only. This switch is located after the capped body should have been ejected. If it is no ejected for any reason then the switch 64 will be closed, thereby energizing coil C3 which will stop the motor and light the trouble light 78. Contact CR3 holds coil C3 energized. The circuit is reset by opening button switch R3.

The switch 60 bears against the body injecting arm 43 (FIG. 1) and it is paralleled by the switch 65 which is operated by the four-sided cam 45. The switch 65 is opened by the detent in the cam 45 during the time and with a slight overlap, that the arm 43 should close the switch 60. If the arm 60 is stopped, for instance by jamming, then it will not close. Since at that time both the switches 60 and 65 will be open the coil C6 will be deenergized, thereby stopping the motor and lighting the trouble lamp 79. The contact C6b is a holding contact in series with the coil C6 in parallel with reset button R6.

Switches 61 and 61' are micro switches mounted to ride on the caps in the wheels 16, 16' (FIG. 2) and they are connected in series with the coil C5. Switch 62 is connected in parallel with series switches 61 and 61' and is actuated by a flat portion on the drive shaft 14. The circuit is normally energized and switch 62 is opened once each cycle by the flat on shaft 14. If there is no cap under each of the switches 61 and 61' at this time then the coil C5 will be deenergized, thereby stopping the motor by means of contact CR5 and lighting the trouble light 80 by means of contact CR5a. The contact C5b is a holding contact operated by coil C5, and is in parallel with reset button R5. The circuit is reset by closing R-5.

Switch 68 is mounted on the clutches 21, 21' and switch 67 is mounted on the clutch 39, 39a. If there is any jamming of caps, which places a load on the clutch, then the clutch will slip and the outer disc, for instance 21', will move outwardly along its shaft and close the switch 68. The switch 67 operates similarly. If either one of these switches is closed, then the circuit is completed through the coil C4 which stops the motor by means of the contact CR4 and lights the trouble light 81 by means of the contact CR4a. After the trouble is cleared the circuit is reset by opening button switch R4. CR4 is a holding contact operated by C4.

Sequence of Cap Sensing and Feeding Means

The flat detent on cam 72' opens switch 72 before detent on cams 70' and 71' opens switches 70 and 71. Switch 72 operates the cam sensing fingers CR1 and CR1A via relay C1.

(A) If no caps are under sensing finger CR1, when it is released by coil C1 and dropped, it is closed, and C2 is therefore energized. CR2 is also thereby closed causing cap feeder synton H to operate. As cam 70' rotates, switch 70 closes at end of detent and keeps C2 energized by virtue of holding contact C2' which is operated by C2. Switch 72 then closes at end of detent, energizing CR1, causing cap sensing finger CR1 (1) to lift.

(B) As the cams continue to next depression, switch 72 opens first causing cap sensing finger at CR1 to drop. If there are no caps CR1 will close and energize C2. Switch 70 then opens.

(C) If there are caps, the cap sensing finger will not

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drop and CR1 will remain open. When switch 70 then opens, C2 will become de-energized since CR1 is open, and syntron H will stop operating.

Switch 71 and cam 71' operate identically to operate coil C2A which is connected to the other cap sensing finger CR1A. C2A operates contacts CR2A to operate cap feeder H'. C2A also operates holding contact C2A'.

If desired bypass switch 83 and coil C1A may keep the sensing fingers lifted and remove the sensing. Switch 82 is connected to operate counter 84.

The apparatus is easily changed over and adjusted to accommodate different size articles. The cams are adjustable even while the machine is running which is an important feature.

Many modifications may be made by those who desire to practice the invention without departing from the scope thereof which is defined by the following claims.

We claim:

1. Resistor capping means comprising means to feed bodies to a work location, means to feed caps to said work location, rotatable body holding means at said work location, comprising at least one pair of spring loaded clamping fingers, and cam means to synchronize the operation of said clamping fingers, synchronized means to positively push a body between each pair of said clamping fingers, rotatable cap holding means at said work location, rotatable cap escapement means rotating at substantially the same speed as said cap holding means, said cap holding means comprising a pair of rams slotted at one end to hold said caps, a pair of fixed position cams, a cam follower on each of said rams, each cam follower being adapted to ride on one of said cams, and means to rotate said body holding means and said cap holding means so that said rams are squeezed in toward said body by said cams and thereby insert said caps on said body.
2. Resistor capping means comprising means to feed bodies to a work location, means to feed caps to said work location, rotatable body holding means at said work location, rotatable cap holding means at said work location, said cap holding means comprising a pair of rams slotted at one end on one side only to hold said caps, a pair of fixed position cams, a cam follower on each of said rams, each cam follower being adapted to ride on one of said cams, means to rotate said body holding means and said cap holding means so that said rams are squeezed in toward said body by said cams and thereby force fit said caps on said body, and means to eject said capped bodies from said body holding means, comprising rotatably mounted stripping fingers adapted to mesh with and extend into said slots.
3. Resistor capping means comprising means to feed bodies to a work location, means to feed caps to said work location, rotatable body holding means at said work location, rotatable cap holding means at said work location, said cap holding means comprising a pair of rams slotted only at one end to hold said caps, a pair of fixed cams, a cam follower on the end of each of said rams, each cam follower being adapted to ride on one of said cams, and variable speed drive connected means to rotate said body holding means and said cap holding means so that said rams are squeezed in toward said body by said cams and thereby insert said caps on said body, said variable speed drive having a slow speed when

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said caps and bodies are being transferred to said rotatable holding means, said variable speed drive means comprising, a driven shaft, a second shaft connected to drive said rotatable body holder means, said driven shaft being mounted eccentrically with respect to said second shaft and connected thereto with a pin and slot connection to thereby impart variable speed to said second shaft when said driven shaft is driven at constant speed.

4. Resistor capping means comprising means to feed bodies to a work location, means to feed caps to said work location, rotatable body holding means at said work location, comprising at least one pair of spring loaded clamping fingers, and cam means to synchronize the operation of said clamping fingers, synchronized means to positively push a body between each pair of said clamping fingers, rotatable cap escapement means rotating at substantially the same speed as said cap holding means, rotatable cap holding means at said work location, said cap holding means comprising a pair of rams slotted at one end to hold said caps, a pair of adjustable fixed position cams, a cam follower on the other end of each of said rams, each cam follower being adapted to ride on one of said cams, and means to rotate said body holding means and said cap holding means so that said rams are squeezed in toward said body by said cams and thereby insert said caps on said body, said body holding means comprising a pair of spring loaded clamping fingers.
5. Resistor capping means comprising means to feed bodies to a work location, means to feed caps to said work location, rotatable body holding means at said work location, comprising at least one pair of spring loaded clamping fingers, and cam means to synchronize the operation of said clamping fingers, escapement means to insert bodies in said body holding means, rotatable cap holding means at said work location, said cap holding means comprising a pair of rams slotted at one end to hold said caps, means to feed caps to said rams comprising a pair of notched wheels geared to said rotatable body holding and cap holding means, a pair of fixed position cams, a cam follower on each of said rams, each cam follower being adapted to ride on one of said cams, means to rotate said body holding means and said cap holding means so that said rams are squeezed in toward said body by said cams and thereby insert said caps on said body.
6. Body capping means comprising a frame, means to feed bodies to a work location inside said frame, means to feed caps to said work location, rotatable body holding means at said work location, escapement means to insert bodies in said body holding means, rotatable cap holding means at said work location, said cap holding means comprising a pair of rams each slotted at one end to hold said caps, a pair of notched wheels geared to said cap holding means, said wheels being connected to drop caps into said slots, a pair of stationary spring loaded cap setting fingers mounted on said frame and positioned to push said caps into said slots as said rams rotate, a pair of fixed cams, a cam follower on the end of each of said rams, each cam follower being adapted to ride on one of said cams, and

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variable speed drive means to rotate said body holding means and said cap holding means so that said rams are squeezed in toward said body by said cams and thereby insert said caps on said body, said variable speed drive means comprising, a driven shaft, 5 a second shaft connected to drive said rotatable body holder means, said driven shaft being mounted eccentrically with respect to said second shaft and connected thereto with a pin and slot connection to thereby impart variable speed to said second shaft 10 when said driven shaft is driven at constant speed.

7. Apparatus as in claim 6 having means to detect improperly seated bodies and means responsive to said detecting means to stop said drive means.

8. Apparatus as in claim 6 having a pair of vibratory 15

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cap feeders, and control means for said cap feeders comprising cap sensing fingers and means responsive to said cap sensing fingers to energize said cap feeders.

9. Apparatus as in claim 6 having a pair of rotating stripping discs having fingers adapted to rotatably mesh with and extend into the slots of said cap holding means so as to strip the completed assemblies from said cap holding means as said cap holding means are retracted.

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