April 17, 1962 T. F. ARONSON ETAL 3,029,500

RESISTOR CAPPING MEANS

Filed Aug. 23, 1960 3 Sheets-Sheet 1

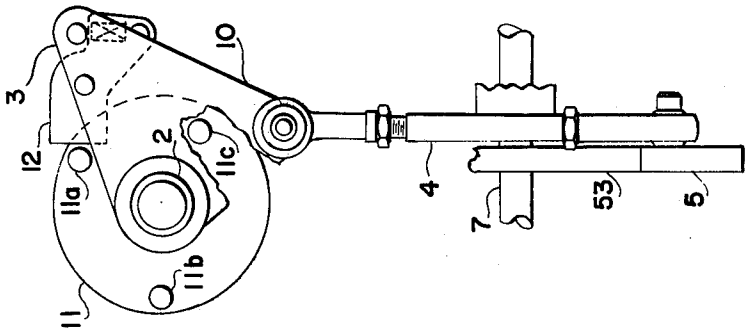


FIG 1A

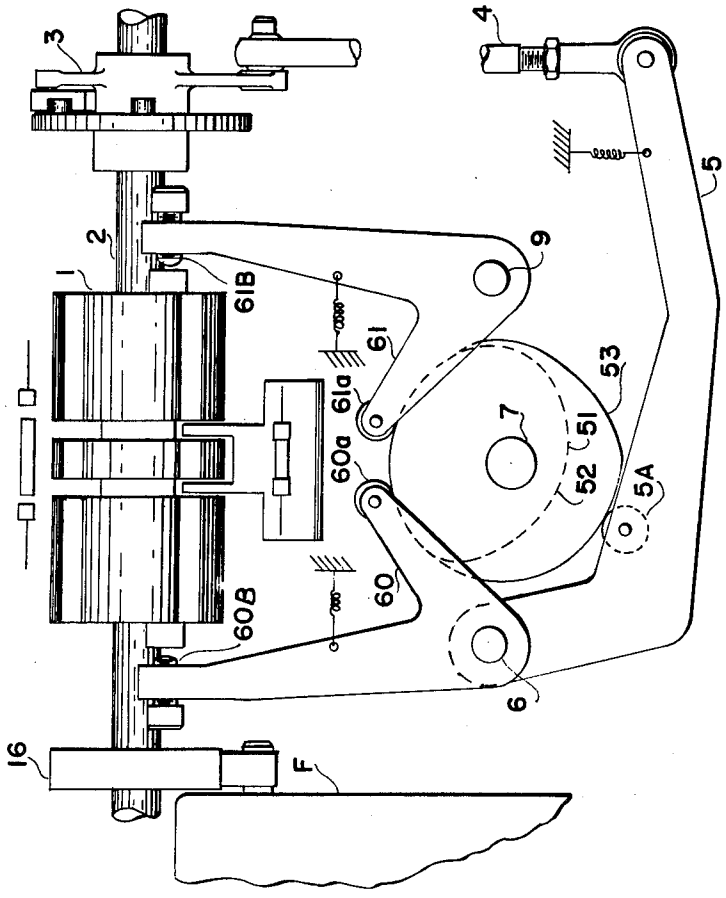


FIG 1

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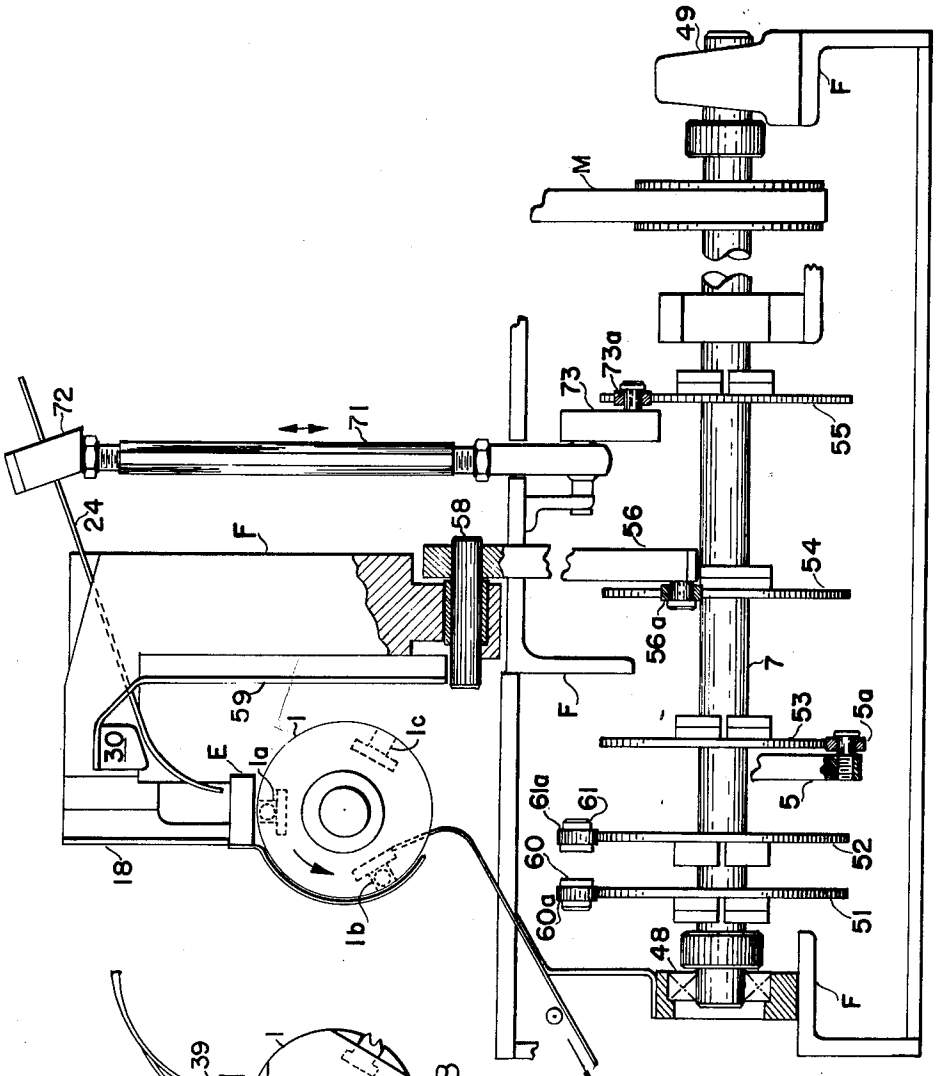


FIG 2

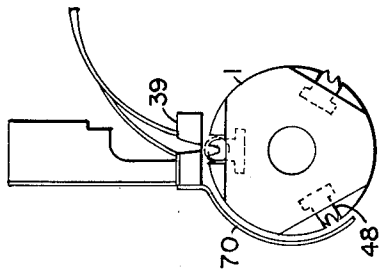


FIG.3B

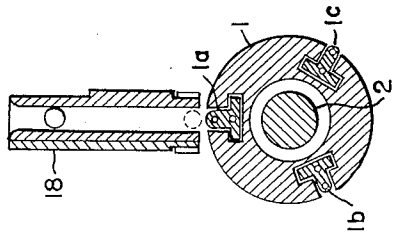


FIG.3A

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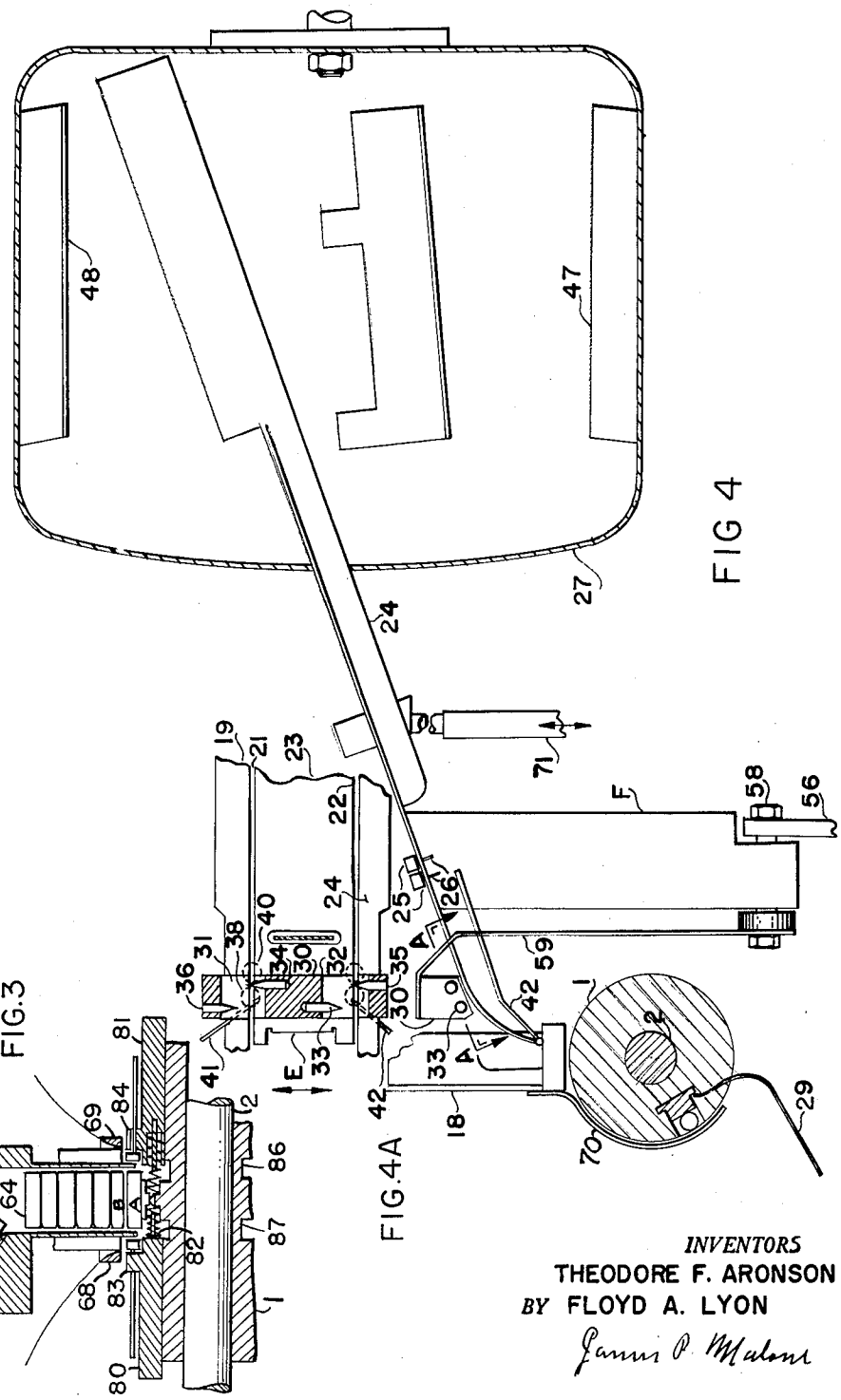


FIG 4

FIG.3

FIG.4A

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RESISTOR CAPPING MEANS

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5 Claims. (Cl. 29—211)

This invention relates to means for placing terminal caps on electrical resistors and more particularly to automatic means for feeding resistors of the type having a cylindrical body and means for feeding terminal caps to each end thereof and affixing the caps to the body.

Electrical resistors, for instance of the type having a solid carbon body, have to have lead wires attached to the ends of the resistor in order to connect them in electrical circuits. These leads are generally affixed by providing the leads with caps or cups and squeezing the caps onto the ends of the resistor.

This operation is generally performed by hand with hand operated jigs and fixtures and it is a tedious and expensive operation in view of the low cost and mass production requirements for electrical resistors.

This invention generally comprises a cylindrical holding member at a work location which is adapted to be indexed with a ratchet type mechanism. The work holding means may comprise a solid cylinder having slots parallel its axis for holding the resistor bodies. The bodies are fed down a chute mounted above the holder. The caps are fed down a pair of rails and there is an oscillatory escapement means adapted to feed a pair of caps to each end of the holder each time the holder is indexed. A pair of cam operated rams then squeeze the caps onto the body and the holder is then indexed to the next position. All of these operations are cam controlled from the same cam shaft to provide perfect synchronism.

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

Another object of the invention is to provide new and improved capping means for cylindrical or equivalent bodies wherein terminal caps or cups are placed on the ends of the body with a frictional fit.

Another object of the invention is to provide new and improved means for automatically making electrical resistors.

Another object of the invention is to provide new and improved high speed means for automatically feeding resistor bodies singly to a work location, means for feeding caps for the ends of said bodies to said work location, means for squeezing the caps onto the body and means for indexing the workholding means in synchronism with the squeezing and feeding operations.

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

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

FIG. 1A is a side detail view of FIG. 1.

FIG. 2 is a side view of the embodiment of FIG. 1.

FIGS. 3, 3A, 4 4A are detail views of the embodiment of FIG. 1.

Referring to the figures the invention generally comprises a cylindrical holding member **1** which is mounted on a shaft **2** which is adapted to be notably indexed by the ratchet mechanism **3** in response to the linkage comprising the arm **4** and rocker arm **5** which is pivoted on rocker arm shaft **6** which has a cam follower **5A** which rides on a cam **53** mounted on the cam shaft **7**. Cam shaft **7** is rotatably mounted on the frame F and is adapted to be motor driven my motor driven belt M, FIG. 2.

FIG. 1A shows a side view of the ratchet indexing mechanism which comprises the arms **4** and **5** which are actuated by the cam **53**. At the upper end of the arm **4** is connected a triangular member **10** which is pivotally mounted adjacent one corner of the triangle to the shaft **2**. The shaft **2** has attached thereto a ratchet wheel **11** having pins **11***a*, **11***b* and **11***c* which is adapted to be indexed by means of the pawl **12** which is pivotally connected to the triangular member **10**. Therefore as the arm **4** is reciprocated up and down in response to the cam action the body **1** will be rotatably indexed. Suitable spring detent or brake **16** means are preferably provided. The body **1** has a plurality of recesses **1***a*, **1***b*, **1***c* in its periphery which are parallel its long axis and which are adapted to hold the resistor bodies as indicated in FIG. 2.

The slots **1***a*, **1***b* and **1***c* in the rotatable member **1** are adapted to receive the resistor bodies A, B, etc. from the vertical chute **17** in the feed member **18**, FIG. 5. The bodies may be placed in the chute by hand or may be fed to the top of the chute on a sloping rail **20**. FIG. 2 shows a side view of the embodiment of FIG. 1 illustrating the cam shaft **7** which is rotatably mounted in the bearings **48**, **49** which are mounted on the frame F. Cams **51** and **52** are mounted on the cam shaft **7** and are connected to operate the rocker arms **60** and **61** which are mounted on the rocker shafts **6** and **9**, FIG. 1, mounted on the frame F. The arm **60** has a cam follower **60A** which rides on the cam **51** and the arm **61** has a cam follower **61A** which rides on the cam **52**. At the other end of the arms **60** and **61** are adjustable members **60B**, **61B** which are adapted to operate with a scissor-like motion in response to the cam action to operate sliding ram members, FIG. 3, in holding member **1** to squeeze the caps onto the body as it is held by the rotatable member **1** along the axis of the ram members **60B** and **61B**. The suqeezing position is the first indexed position of member **1** after receiving the bodies.

The cam **53** operates the ratchet mechanism described in connection with FIG. 1A.

The cam **54** operates the cap escapement mechanism shown in FIGS. 2 and 4 by means of the linkage comprising the arm **56** having a cam follower **56A** which rides on the cam **54**. The escapement block **30** has an extending member **59** which is fixedly mounted on the shaft **58** together with the arm **56**. The arm **56** is fixedly mounted to the arm **59** so that as the cam **54** rotates the arm **56**, the block **30** oscillates about the shaft **58**. The cam **54** is a one rise or one flat cam shaped in conventional manner to provide the desired oscillatory movement each cycle.

The cam **55** is circular with serrations to impart vibrations to the cap rails via rod **71**, and arm **73** connected thereto and having cam follower **73***a* riding on vibrator cam **55**.

FIGS. 3, 3A and 3B show details of the holding member **1** illustrating how the body and caps are fed into the holding member and held. The bodies **63**, **64**, etc. are fed down a chute **17** by gravity into a recess in the holding member **1**. The caps are fed down the side rails through guides **68**, **69** and into position in the holding member on either side of the body. The caps come to rest on the slidable ram members **80**, **81** which are keyed to and slidably mounted in the member **1**, and which are normally held apart by the spring **82** which is positioned by the positioning pins in the ram members. Each ram member has an upwardly projecting portion **83**, **84** which fit behind the cap member and which are slotted to permit the lead wire of the cap to extend through them. As the member **1** is rotated the bodies are held from falling out by means of the curved spring **70**. The circular slots **86**, **87** in the member **1** are for the purpose of inserting removing fingers **29** for removing the assembled bodies, and guiding them to an output chute.

Member 1 has three work holding slots each having a pair of rams which are spaced equally around the member 1 at intervals of 60°. The ram members are adapted to be actuated by the scissor arms 60 and 61 as previously described which act on the rams in the second position of the member 1 shown at 1b in FIG. 3A. Other types of mechanisms besides the scissor arms could be used, for instance the fixed cams at the ends of the member 1 could be used to squeeze the remains together. However this arrangement would place a greatly increased load on the indexing mechanism of the member 1 which would tend to limit highspeed operation and make the indexing mechanism much more complex.

Referring to FIG. 4 and 4A which is a section along A—A of FIG. 4, the caps are fed down a pair of slots 21, 22 formed by rails 19, 23, 24 so that the caps 25 may ride down the rails with the lead wires 26 hanging down through the slots. The caps may be fed into the rails from a barrel type hopper 27 which may be a conventional one of the type which rotates, and which has scoops 47, 48 on the side which pick up the caps and spill them onto the upper ends of the rails which extend into the hopper and which preferably flare out at their upper ends in order to receive the caps. The rails are preferably vibrated continuously by arm 71 to seat the caps and prevent jamming and also to provide that the caps will slide down the rails to the work location. The rails extend down to each side of the rotatable member 1.

In order to feed one cap per cycle to each side of the body member an oscillatory escapement device E is provided near the lower end of the rails. The escapement device comprises a block 30 suspended over the rails on arm 59 and having two large slots 31, 32 to accommodate the rails. A pair of pointed separators 33, 34 are mounted on the center portion of the block 30 and a second pair of pointed separators 35, 36 are mounted on the outer ends of the block. The separating points are spaced a distance equivalent to the diameter of one cap and the block 30 is adapted to oscillate transversely to the rail slots 21 and 22 on cam operated arm 59, so that the pointed separating members cut off the caps on the rails. Therefore, when the block oscillates upwardly FIG. 4A, the point 36 will be retracted and the cap 38 will be free to ride down the rail. However, at the same time the point member 34 will stop the next cap 40. The other pair of point members 33, 35 operate in the same manner.

A pair of spring members 41, 42 are mounted under the rail slots 21 and 22 and flare outwardly from the rails at the lower end thereof and raise the vertically hanging lead wires to a horizontal position as they are deposited in the rotatable member 1.

In operation, assuming the bodies have been fed into the chute 17 and the caps are sliding down the rails, the rotatable member 1 will normally be indexed so that one of the slots, for instance slot 1a in FIG. 3A will be under the chute to receive the lowest body. As the escapement oscillates to one side a pair of caps will be fed to either side of the body A resting in the recess. As the caps slide down into the rotatable member 1 they are tilted over by the springs 41 and 42 so that they lie horizontally.

The rotatable member 1 is then indexed one position by the ratchet mechanism so that the body A takes the position of slot 1b in FIG. 3A. The body and the separate caps are held against falling out of the rotatable member 1 by means of the spring 70. When the rotatable member 1 is stopped in the position illustrated by the slot 1b in FIG. 3A the scissor-type rams enter the slot of the rotatable member and squeeze the caps onto the resistor body. At the same time the slot recess of the member 1, which is now in the up position, will receive a new resistor body and two caps. When the movable member 1 is again indexed the completed resistor will fall out the bottom of the rotatable member 1 or extracted by fingers 29 FIG. 4, onto a take-away belt or other output device.

The scissor action of the rams could be provided by having slidable members mounted in the slots of the rotatable member 1 and using fixed cams which taper together to force the ram members towards each other as the rotatable member 1 rotates. However this method places a certain strain on the ratchet mechanism.

In order to keep the caps moving smoothly down the rails and to minimize the possibility of jamming, the rails are preferably vibrated continuously, which action is provided by the cam 55 which may have a series of serrations. The vibrations are transmitted to the rails by means of the connecting rod 71 the upper end of which is connected by the adaptor 72 to the rails and the lower end of which is connected by means of the arm 73 and cam follower 73A to ride on the cam 55 whereby as the cam shaft rotates vibration will be imparted to the rails.

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. Capping means comprising a generally cylindrical rotatable member having slots in its periphery parallel its axis, means to rotate said member about said axis, means to insert single body members into said slots comprising a vertical chute mounted above said rotatable member, means to feed pairs of cap members to said slots in said rotatable member comprising a hopper, a double chute extending into said hopper, escapement means connected to said chute adjacent the bottom thereof, said escapement means being operated to feed said caps in pairs, guide means connected to said escapement means to feed said caps into said slots on either side of said bodies, and means to insert said caps on the ends of said bodies comprising a pair of rams slidably mounted in said rotatable member along the axis of said slots, a pair of pivotally mounted arms connected to squeeze said ram members together, and cam means connected to operate said arms simultaneously.

2. Capping means comprising a generally cylindrical rotatable member having slots in its periphery parallel its axis, means to rotate said member about said axis, means to feed and insert body members singly into said slots comprising vertical chute means mounted above said rotatable member, the bottom of said chute being spaced from said rotatable member a distance less than the size of said body members so that the remaining bodies are retained in said chute, means to feed pairs of cap members to said slots in said rotatable member comprising a hopper, a double chute extending into said hopper, escapement means connected to said chute adjacent the bottom thereof, said escapement means being operated to feed said caps in pairs, guide means connected to said escapement means to feed said caps into said slots on either side of said bodies, and means to insert said caps on the ends of said bodies comprising a pair of rams slidably mounted in said rotatable member along the axis of said slots, a pair of pivotally mounted arms connected to squeeze said ram members together, and cam means connected to operate said arms simultaneously.

3. Capping means comprising a generally cylindrical rotatable member having slots in its periphery parallel its axis, means to rotate said member about said axis, means to insert single body members into said slots comprising a vertical chute mounted above said rotatable member, means to feed pairs of cap members to said slots in said rotatable member comprising a hopper, a double chute extending into said hopper, escapement means connected to said chute adjacent the bottom thereof, said escapement means comprising a block oscillatably mounted on said double chute, means connected to rotate said rotatable member and to oscillate said escapement means in a synchronized manner, said escapement means being con-

nected to feed said caps in pairs, guide means connected to said escapement means to feed said caps into said slots on either side of said bodies, and means to insert said caps on the ends of said bodies comprising a pair of rams slidably mounted in said rotatable member along the axis of said slots, a pair of pivotally mounted arms connected to squeeze said ram members together, and cam means connected to operate said arms simultaneously.

4. Capping means comprising a generally cylindrical rotatable member having holding means on its periphery parallel its axis, means to rotate said member about said axis, means to insert single body members into said holding means comprising a chute mounted adjacent said rotatable member, means to feed pairs of cap members to said holding means in said rotatable member comprising a hopper, a double chute extending to said hopper, escapement means connected to said chute, said escapement means being operated to feed said caps in pairs, guide means connected to said escapement means to feed said caps into said holding means on either side of said bodies, and means to insert said caps on the ends of said bodies comprising a pair of rams slidably mounted for movement longitudinally of the periphery of said rotatable member along the axis of said holding means, and means connected to squeeze said rams together, including cam means connected to operate said rams simultaneously.

5. Capping means comprising a generally cylindrical rotatable member having slots in its periphery parallel its axis, means to rotate said member about said axis, means to insert single body members into said slots comprising a vertical chute mounted adjacent said rotatable member, means to feed pairs of cap members to said slots in said rotatable member comprising a hopper, a double chute extending into said hopper, escapement means connected to said chute adjacent the bottom thereof, said escapement means being operated to feed said caps in pairs, guide means connected to said escapement means to feed said caps into said slots on either side of said bodies, and means to insert said caps on the ends of said bodies comprising a pair of rams slidably mounted in said rotatable member along the axis of said slots and means connected to squeeze said rams together, including cam means connected to operate said rams simultaneously.

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