# United States Patent

[11] **3,579,789**


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[54] **MACHINE FOR THE MANUFACTURE OF RELAY COIL BOBBINS**
**9 Claims, 17 Drawing Figs.**


[52] **U.S. Cl.** ..... **29/203D,** 29/602
[51] **Int. Cl.** ..... **H01r 43/00**
[50] **Field of Search** ..... 29/203, 205, 602, 605; 228/4



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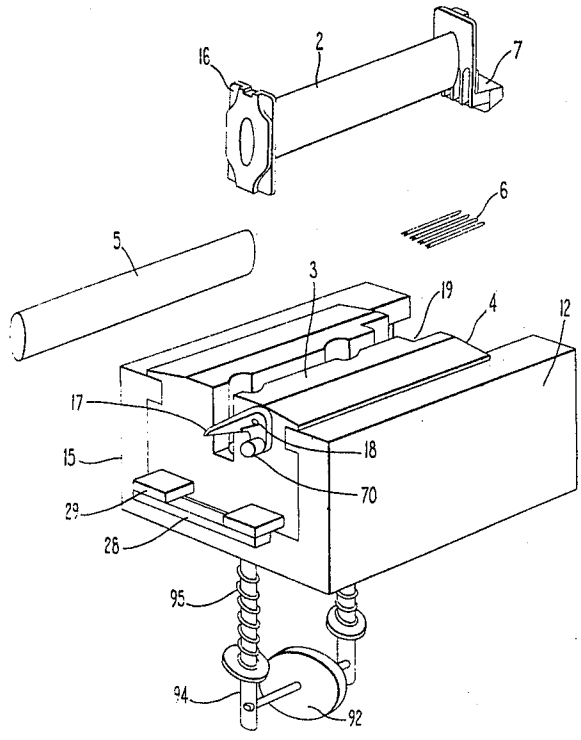
**ABSTRACT:** A machine is provided for manufacturing electromagnetic relays. Bare relay bobbins are introduced into the machine and these bobbins are then equipped with magnetic cores and connection prongs. Thereafter, the finished relays are ejected from the machine.

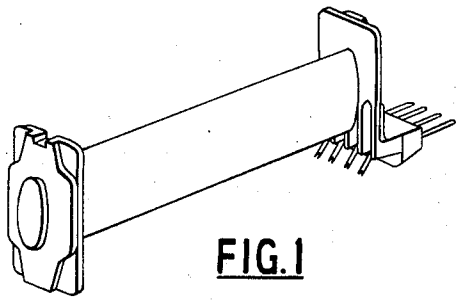


FIG. 1

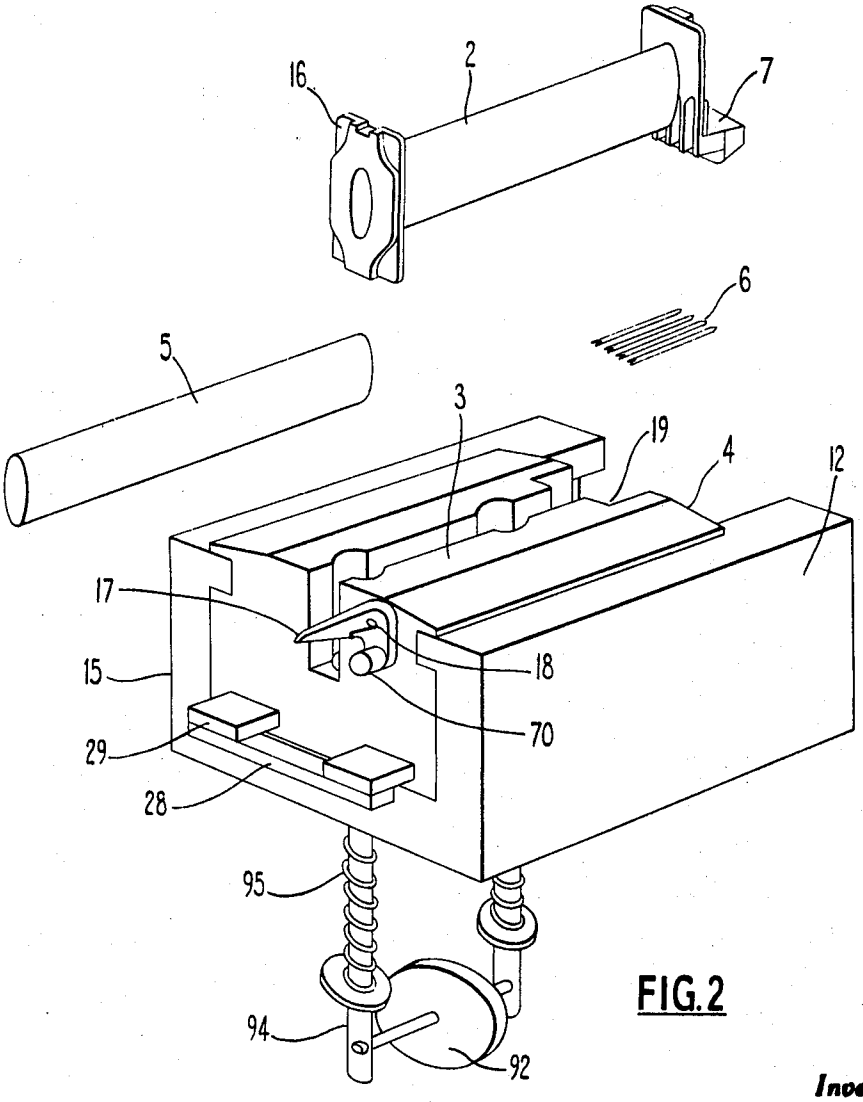



FIG. 2

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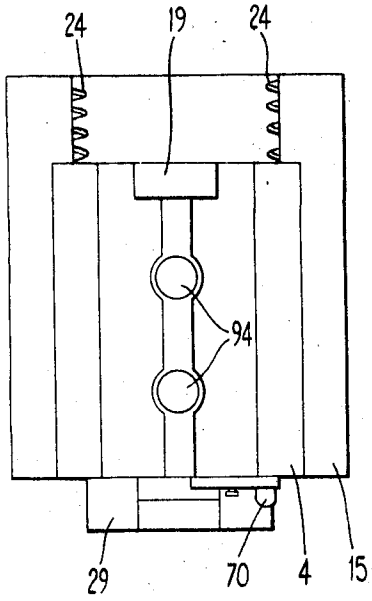


FIG. 3

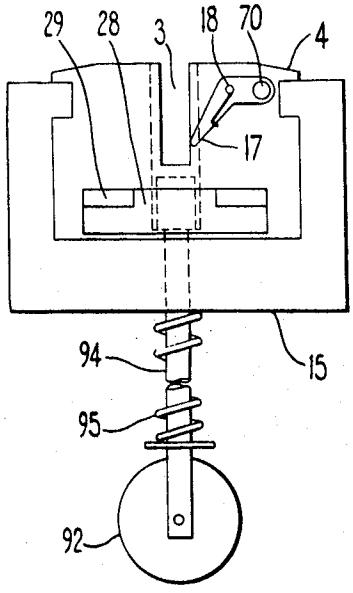


FIG. 4

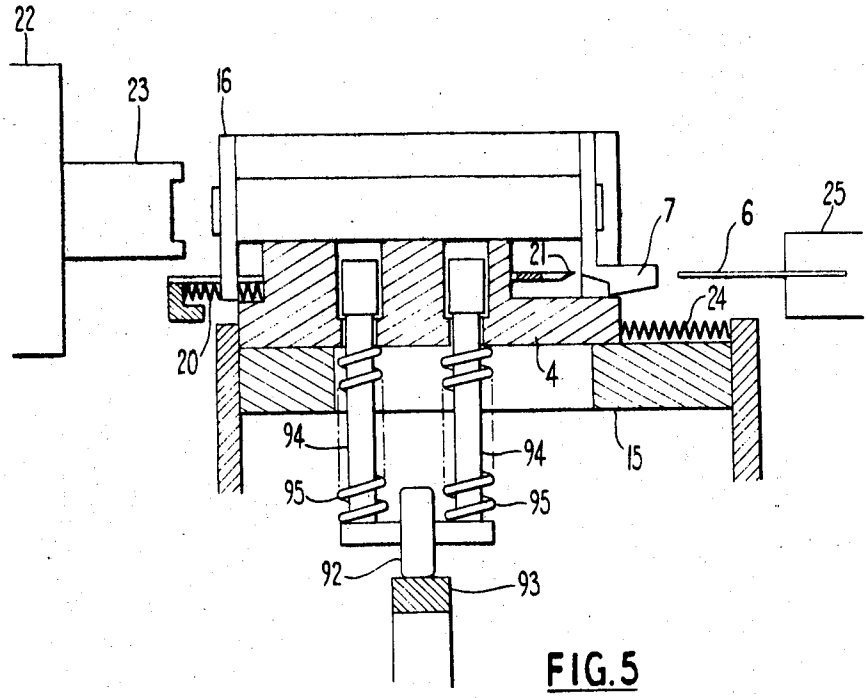
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FIG.5

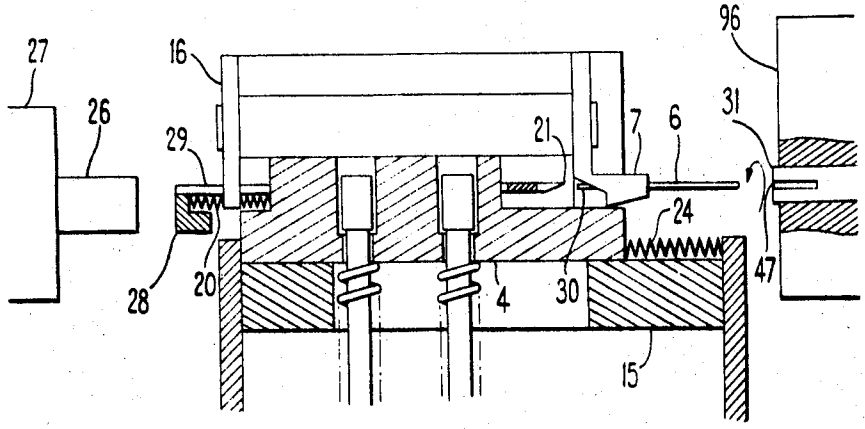
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FIG.11

FIG.6

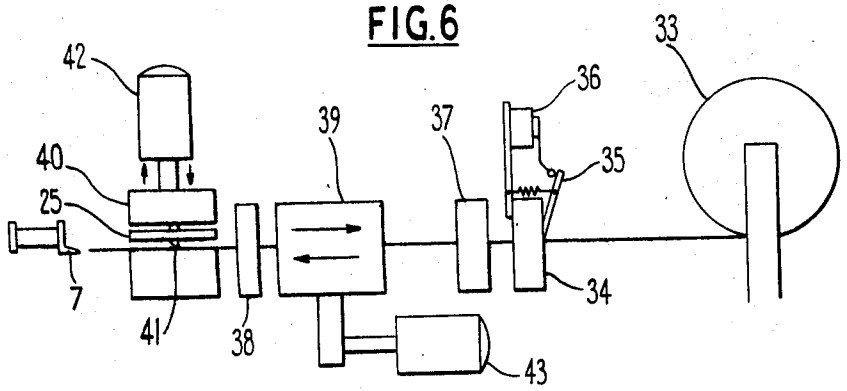
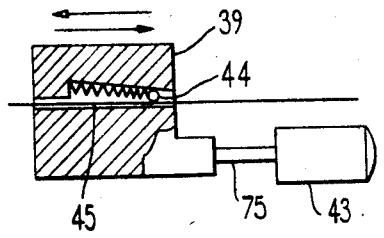



FIG.7



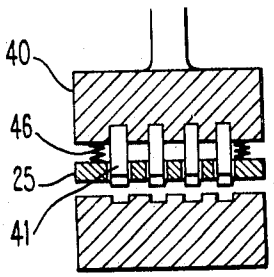




FIG.8

FIG.9

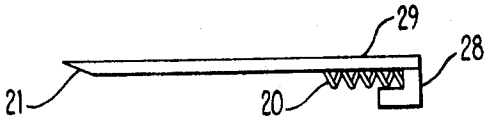
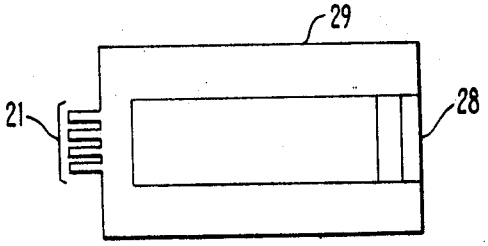



FIG.10



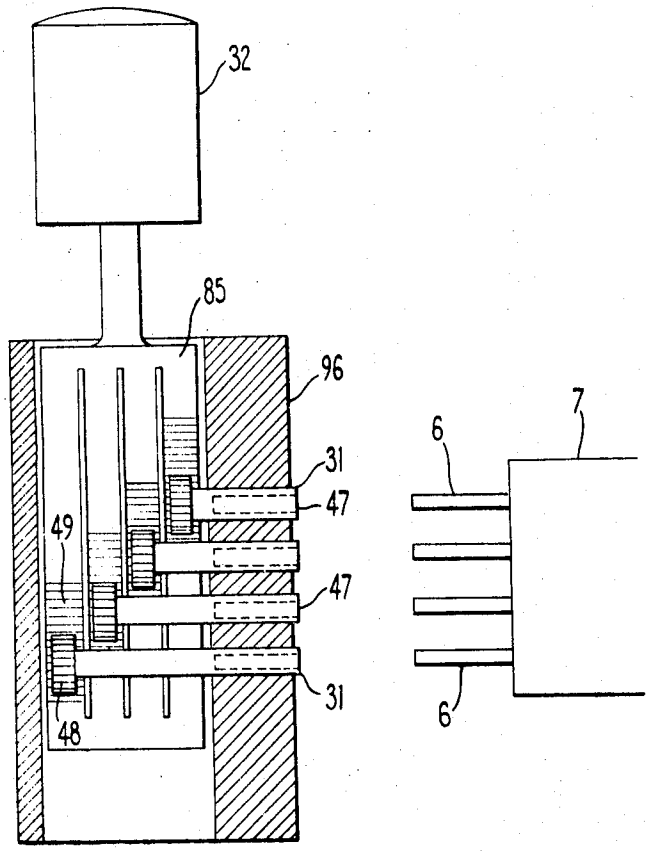



FIG. 12

FIG. 13

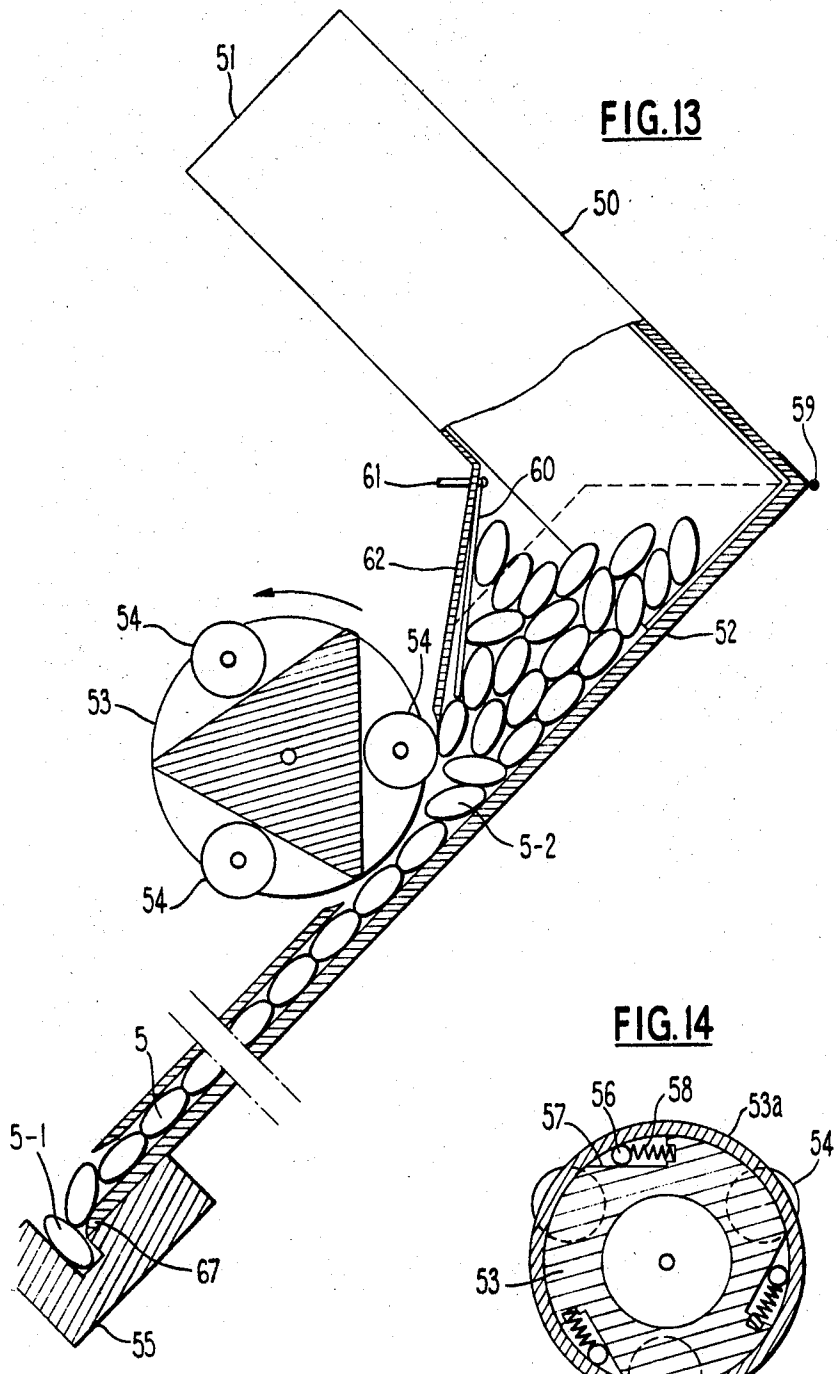



FIG. 14

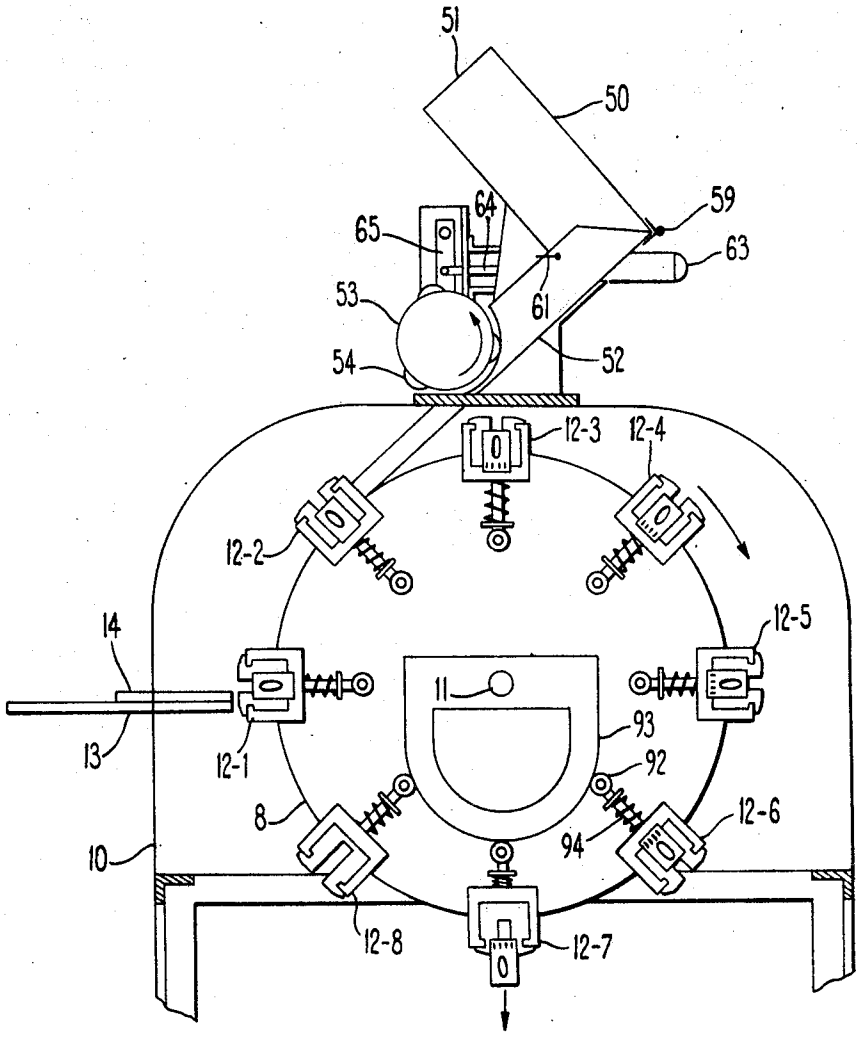

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FIG. 15

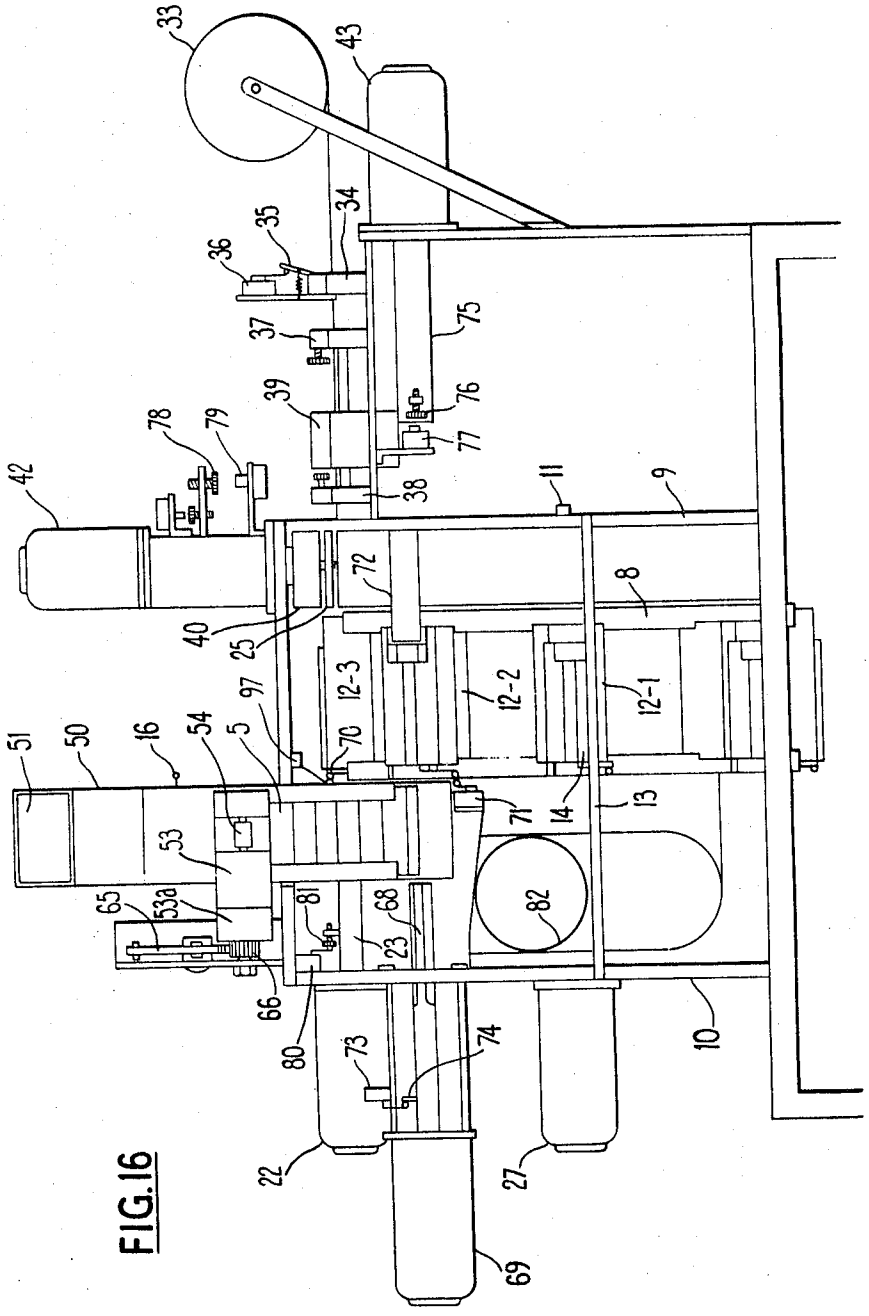
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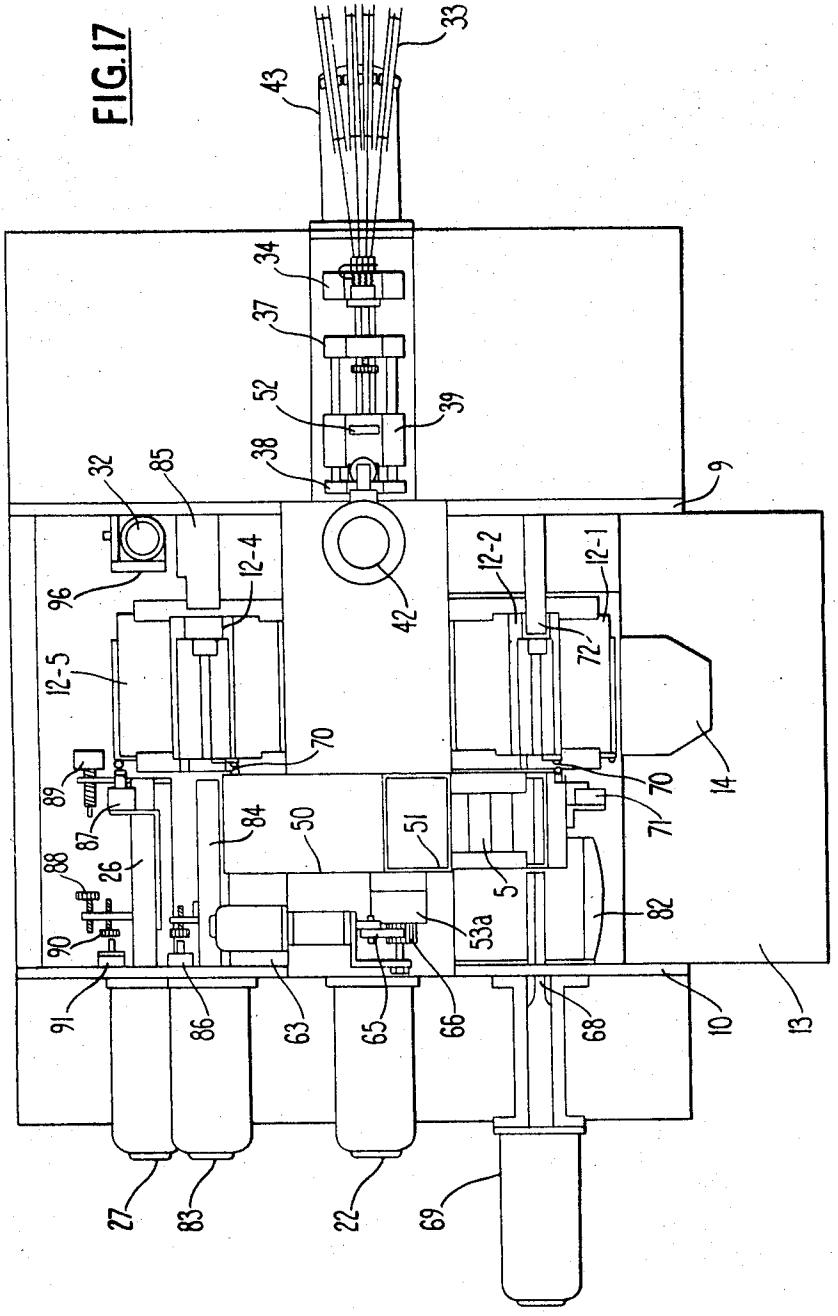
FIG. 16

FIG.17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# MACHINE FOR THE MANUFACTURE OF RELAY COIL BOBBINS

The present invention relates to machines used in the manufacture of coils for electromagnetic relays. Its aim is the design of a machine for assembling connection prongs, and in particular, flat prongs, on bare bobbins of the type in which the prongs go through a raised edge of the bobbin flange. This machine makes it possible to insert these prongs in the flange, to raise their inside ends (to facilitate the soldering and expansion of the wires) and, when flat prongs are used, to twist their outside ends which will receive the wound connections. The invention makes it possible to use continuous prong wire; in addition, the invention provides for magnetic cores and, in particular oval cores, to be simultaneously inserted in the said bobbins.

According to a feature of the invention, the machine comprises a coil bobbin bearing device made up of a mount and a cradle designed to receive a bare bobbin and mounted to slide in guides on the said mount; a prong feed device, adapted to feed a set of prongs and to hold them in feed position, and outside means for driving the cradle on its mount, with the bare bobbin therein, towards the prong feed device, so as to engage the bobbin flange on the said prongs; a slide member assembled in the cradle so as to fit under the inside ends of the prongs inserted in the flange in order to raise them, and outside means to drive the slide member in the cradle for this operation; if needs be, a twisting device, adapted to twist the prongs, and outside means for driving the cradle on its mount, with the bobbin bearing its prongs, towards the said device, so as to present the outside ends of the prongs for twisting an ejector assembled underneath the cradle, so as to eject the bobbin from the cradle at the output of the machine; and outside means to drive this ejector during the ejection operation.

According to a further feature of the invention, the prong feed device has a supply of several continuous prong wires (for instance, several reels of prong wire), means to feed out wire, a prong length at a time, and means to cut these wires in order to sever a set of prongs and to hold the said set of prongs in feed position while the cradle containing a bare bobbin moves forward to engage a flange of the bobbin on this set of prongs.

In an embodiment of the invention, the prong feed device comprises a prong wire reel bearer; wire straightening guide, a sliding puller which reverses along the continuous wires (at the output of the straightening guide) and which then moves forward pulling out a fresh prong length of wire; and a trimmer which cuts the wires moved forward by the puller and which is associated to a press which holds the prongs severed as above in feed position while the cradle containing a bare bobbin moves forward to engage a flange of the bobbin, and which reverts to position of rest to enable the cradle to reverse with the bobbin bearing the prongs and to enable the puller to move forward pulling out a fresh prong length of wire.

This device preferably operates as follows: (1) the trimmer and its press starting from rest, working stroke of these devices; (2) working stroke of cradle and reverse stroke of the puller; (3) trimmer and press revert to rest position; (4) reverse stroke of cradle and pulling stroke of the puller.

According to another feature of the invention, the slide member comprises a frame assembled for sliding between the bobbin and the bottom of the cradle, said frame having two slanting ends which fit under the prongs to raise them and a thrust member which restricts its travel in the cradle.

According to a further feature of the invention, the twisting device is located in such a way, and travel of the means which drive the said slide members is such that the said means control both the travel of the slide member in the cradle and the travel of the cradle on its mount towards the said device, so that both operations, which raise the inside ends of the prongs and feed their outside ends to the twisting device, are effected in a single movement.

According to another feature of the invention, the twisting device comprises a set of revolving hollow shafts which have ends adapted to accommodate the ends of the flat connection prongs, and means such as pinions solid with the said revolving hollow shafts and associated rack bars to make all these shafts revolve in a limited rotation so as to twist the connection prongs which are fed in, by 90°.



According to another feature of the invention, the machine comprises a wheel which bears several bobbin bearing devices and which revolves and stops in front of work positions which include in particular (*a*) a position where a bare bobbin is placed in an empty cradle; (*b*) a position in front of prong feed device and which cooperates with the outside means that drive the cradle towards this device; (*c*) a position which cooperates with the outside means that drive the slide member into the cradle and in front of the twisting device, in case there is one, towards which these same means will drive the cradle; (*d*) output position of the machine at which the bobbin bearing its prongs is ejected from the cradle, outside means such as an inclined plane, designed to push the ejector, and which are located so as to operate during the transfer between positions (*c*) and (*d*).

According to another feature of the invention, the machine also comprises a magnetic core feed device, in particular for oval magnetic cores, which comprises a hopper adapted to receive a load of cores, a slanting shoot equipped with means to push the cores forward, side by side, down to an outlet spout, and outside means to push one core at a time forward into the bobbin located in the cradle.

According to another feature of the invention, the machine comprises a device adapted to align and push forward, side by side, on a flat surface, the cores into a slanting shoot from a loading funnel which receives the loose cores. This device comprises a cylinder equipped with three small peripheral rollers which revolve freely around their axes and are located at 120° from one another. The rollers, during the rotation of the roller-carrier cylinder, pass under the shoot at a distance corresponding to the gauge of a core, and the cylinder effects about one-third revolution every time a core is inserted in the bobbin.

In an embodiment example, the machine comprises a vertical turret wheel which bears eight bearing devices spaced out at 45° intervals, and which revolves and stops in front of the following eight positions: (1) horizontal rising position designed to place a bare bobbin in an empty cradle; (2) position located 45° above the former, in front of the core feed device and which cooperates with the outside means which push a core into bobbin; (3) high vertical position, in front of the prong feed device, which cooperates with outside means which drive the cradle towards the said device; (4) position located 45° below the former, in front of a device which adjusts the position of the core in the bobbin; (5) horizontal descending position, in front of the twisting device, which cooperates with the outside means which drive the slide member into the cradle and also drive the cradle on its mount towards the said device; (6) position located 45° below the former not equipped; (7) low vertical position where the bobbin equipped with prongs and a core is ejected from the cradle, outside means, such as a sloping rail, being located so as to drive the ejector between positions (5) and (7); and (8) position located 45° higher than the former, not equipped as such, the said outside means, such as a sloping rail, being possibly extended up to this position (8) and even beyond this point to ensure the progressive return of the ejector.

In this particular embodiment, the four upright positions (1), (3), (5) and (7) are used to arrange conveniently devices such as the prong feed device and the twisting device, to conveniently place the bare bobbins in the empty cradles, and to discharge the bobbins ejected from the machine. The intermediate positions located at 45°; in particular (2) and (4), serve as work positions for feeding in and adjusting the magnetic cores.

The invention will be described with particular reference to an embodiment example, illustrated by the appended drawings, in which:

FIG. 1 shows a completed bobbin equipped with its connection prongs and a core,

FIG. 2 shows in perspective a receiving cradle and its mount, a bare bobbin which will be placed in said cradle, a magnetic core which will be housed in the bobbin and a set of four prongs which will be inserted in a flange of the bobbin,

FIG. 3 shows, in a plane, the cradle recipient of bobbins and its mount,

FIG. 4 shows a side view of the recipient cradle and its mount,

FIG. 5 shows a schematic vertical cross section of the cradle recipient of bobbins, in cooperation with a prong feed device and a jack destined to push the cradle bearing a bobbin towards this device,

FIG. 6 shows schematically the device which supplies the prongs from a reel of flat wire,

FIG. 7 shows a vertical cross section of a portion of the device in the preceding diagram, allowing for the feeding of the prong wire,

FIG. 8 shows a frontal cross section of a further portion of the diagram shown in FIG. 6, allowing for the holding and length sectioning of the connection prongs,

FIG. 9 shows a side view of a part of the cradle recipient of bobbins, called slide member, and which allows for the cambering of the inside ends of the connection prongs,

FIG. 10 shows a plane view of the same part,

FIG. 11 shows a schematic cross section of the cradle recipient of bobbins showing a portion of the cradle in cooperation with the prong twisting device and the jack destined to push the cradle and the slide member, bearing a bobbin equipped with prongs, towards the twisting device,

FIG. 12 shows a schematic vertical cross section of the twisting device for the connection prongs,

FIG. 13 shows a vertical cross section of the core feed device,

FIG. 14 shows a portion of the device shown in FIG. 13,

FIG. 15 shows a schematic side view of a machine capable of carrying out the operations described with reference to the above figures,

FIG. 16 shows a front view of this machine, and

FIG. 17 shows a plane view of the said machine.

FIG. 1 shows a completed bobbin with a magnetic core and connection prongs, the inside parts of the latter, which will have the winding wire soldered to them, being cambered to facilitate the hooking on of the said wires.

FIG. 2 shows one of the grips 1 used in the machine according to the invention. This figure shows:

- above the grip, a relay bobbin 2 aligned with a seating 3 in cradle 4 which will receive the said bobbin,
- facing bobbin 2 assumed to have been inserted in cradle 4 of the grip, a magnetic core 5 and, finally, connection prongs 6 opposite the bores provided for them in the rear flange 7 of bobbin 2.

With reference to FIG. 15, it will be seen that the coil manufacturing machine comprises a turret wheel 8, mounted between two flanges 9 and 10, disc 10 being absent in order to show the wheel; the turret revolves around a shaft 11 and comprises on its circumference eight grips 12—1 to 12—8 located at 45° from one another and designed to receive the relay bobbins. Narrow board 13 and member 14 serve as a guide to engage a bobbin (FIG. 2) in recipient cradle 4 of the grip in position 12—1.

FIGS. 2 to 5 show a grip like the one shown in 12—1, 12—2, etc. of FIG. 15. This grip has two main parts; mount 15 and cradle 4; the cradle 4 can slide in fixed mount 15 whilst connection prongs 6 are being fitted. The relay bobbin 2 shown in FIG. 2 is assembled with slight friction in seating 3 of cradle 4 (FIGS. 2, 3 and 4), front flange 16 projecting beyond and on the left of mobile cradle 4 and causing level 17, mobile around shaft 18 to rock, thus indicating the presence of a bobbin in the grip. Rear flange 7 takes up its position in a recess 19 of mobile cradle 4.

The part shown in FIGS. 9 and 10 can slide along the bottom of the recipient cradle and is maintained in the position shown in FIGS. 5 and 11 thanks to spring 20. This part, thanks to its sloping ends 21, allows the cambering of connection prongs 6 once they have been inserted in flange 7 of the bobbin.

FIG. 5 shows a grip in its work position in which prongs 6 are about to be inserted in the bores of rear flange 7 of the bobbin.

In this position jack 22 is energized, its piston 23 bears on front flange 16 of the bobbin which moves with cradle 4 from left to right of the figure compressing spring 24 in its travel. Prongs 6 are moved into feed position and maintained by pressing device 25 in the position shown in the said figure.

FIG. 6 shows the device which feeds the connection prongs 6 starting from the prong wire reels. It comprises:

- as many reels 33 as there are prongs to be supplied in the relay bobbin;
- a device 34 through which the prong wires are fed and which comprises testing spikes 35 to control miniswitches 36 in order to ascertain that prong wire is present in the feed channel of the device;
- two devices 37 and 38 through which the prong wires are fed and which maintain the said wires between the puller 39;
- a puller 39 which moves to and fro over a distance equal to the length of the prongs and the operation of which will be described with reference to FIG. 10;
- finally, a trimmer 40 having as many blades 41 as there are prongs 6, a pressing device 25 and a jack 42 which drive them.

In its travel from reel 33 to trimmer 40, puller 39, moved by jack 43, pulls out a length of wire equal to the length of a prong; at the end of its travel, jack 42 of the trimmer is energized, pressing device 25 comes into contact with the wire and maintains its, then, while the piston continues its stroke, blades 41 cut the wires; jack 43, the other side of which is energized, causes the return of the puller, which reverts to its rear position in view of pulling out another length of wire for the next operation. Pressure is maintained in jack 42 in order to hold the prongs during the insertion of the said prongs in the bobbin.

FIG. 7 is a schematic cross section of puller 39. It can be seen that a roller 44 held in the wire feed channel via spring 45 and which forms a wedge, blocks this wire and drives it as the puller moves in one direction (from right to left) whereas the wire slides in its channel when the puller moves in the opposite direction, the roller slightly compressing the springs.

FIG. 8 shows a schematic cross section of the trimmer, perpendicular to the feed of the prong wires. The two parts comprising the head of the trimmer are also shown: the head proper 40, in which the four blades such as 41 are mounted, and the pressing device 25 through which the blades pass freely, while the said pressing device is held in its remote position by springs 46.

FIG. 9 shows a side view of the slide member which, at the lower part of the grip cradle, allows for the cambering of the inside of the connection prongs. It comprises a frame 29 shown in a plane in FIG. 10, a heel 28 on which bears the piston of the jack which is designed to drive the frame. It also comprises sloping ends 21 which slide under the inner prongs and cambers them several degrees. Two springs 20, housed under the long sides of the frame 29 and held by heel 28, push the slide member back into its position of rest after the prongs have been cambered.

FIG. 11 shows, in section, a grip in the work position in which the connection prongs will be sent and twisted.

To obtain this dual effect, piston 26 of jack 27 bears on heel 28 of the device shown in FIGS. 5 and 6. Since a spring 24 is used which has less resistance than spring 20, cradle 4 is moved by the jack from left to right. The outside part of each prong 6 thus engages a corresponding recess in hollow shafts 31 shown in FIG. 12. At this point, the cradle is butting against the twisting device 96 and slide member 29 moves forward compressing spring 20. During their stroke, sloping ends 21 of slide member 29 come into contact with the ends 30 of prongs 6 and camber them towards the bottom of the figure. An end-

of-stroke stop (not shown) energizes jack **32** which drives the racks, thereby causing the hollow shafts to effect a quarter revolution. Jack **26**, after a delay, reverts to its rest position under the action of springs **24** and **20**, the bobbin bearing cradle and the cambering part **29** revert to their original position.

FIG. **12** is a schematic section of the device which effects the twisting of the tails of the prongs. The device comprises four shafts **31** comprising a longitudinal recess **47** designed to receive the end of the tail **6** to be twisted; each shaft comprises at its rear end a pinion **48** geared on a rack **49**, all racks being solid with the piston of jack **32**. During their downward stroke, the racks cause the shafts **31** to effect a quarter revolution.

FIG. **13** shows, in section, the magnetic core feed device. It is made up of a loading funnel **50** which, at its open end **51**, receives loads of magnetic cores, and of a spout **52** in which the cores **5** are laid side by side, by a cylinder **53** equipped with three rollers **54**. Finally an outlet spout **55** is adapted to present a core opposite an empty bobbin conveyed by the machine at the beginning of the operation cycle (grip in position **12—2**).

FIG. **14** shows part of cylinder **53** and of the three rollers **54**. This figure illustrates the implementation according to a known structure, of a free wheel comprising three balls **56** held by means of springs **58**, in the angle formed by the inside of a cylinder **53***a* solid with a toothed wheel hidden behind the cylinder, and by flats **57** in cylinder **53** that bears rollers **54**. The utility of the said free wheel will be discussed in conjunction with the general description of the operation of the machine.

Shoot **52** shown in FIG. **13** guides the relay cores one by one down to position **5—1** where they fall into spout **55** located on the axis of a grip which has reached position **12—2** (FIG. **15**). The cores are loaded into loading funnel **50** above the shoot. The said loading funnel is connected to swivel round hinge **59** so that when it is horizontal a box of cores can be introduced via side **51**. Despite the rotary movement imparted to loading funnel **50** to place it in the position shown in FIG. **13**, the cores retained by lid **60** remain in the box. When loading funnel **50** takes up its position, key **61** is operated. It drives lid **60** towards cant **62** and releases the cores which fall into the shoot and are stopped by cylinder **53**.

Said cylinder **53** equipped with three nylon rollers **54**, is made to revolve by jack **63** every time a core is placed in a bobbin. Jack **63** drives piston **64** hinged to a toothed sector **65** (FIG. **16**) which operates a gear wheel **66** solid with cylinder **53***a*, in order to arrange the cores side by side in the shoot in such a way that the said cores are suitably fed into a grip in position **12—2**. FIG. **13** shows cores **5** which fall due to gravity, in the neck of the shoot; core **5—1** which has effected a quarter revolution, triggered off by cant **67**, has moved into a position perpendicular to the axis of shoot **52**, i.e., the position desired for it to be introduced by piston **68** of jack **69** in the bobbin presented by a grip in position **12—2** (FIGS. **16** and **17**). On the other hand, it can be seen that core **5—2** for instance, will be turned round when a roller **54** passes over it so as to pass between the bottom of shoot **52** and cylinder **53** in a flat position so as to slide down in turn and reach position **5—1**.

The general operation of the machine shown in FIGS. **15**, **16** and **17** is as follows:

Movement of wheel: the turret wheel revolves 45° at a time and is suitably locked in each position. Each of its movements comprises:

checking of departing conditions in all the working positions

unlocking 45° revolution and locking in the following position.

Bobbin loading (position **1**): This operation is effected by hand. It does not entail any departing condition, even if no bobbin has been placed in the cradle.

Insertion of core (position **2**): After checking that a bobbin is present in the cradle and simultaneously:

to and fro stroke of thrust-core piston **68** (FIG. **17**) which does not, however, complete the operation of placing the core in the cradle since the shift magnitude is too great to be effected in a single operation,

movement of mechanism which controls the cords along the sloping shoot. The condition of departing from this position is the return of the piston. The above-mentioned mechanism cannot effect its movement while the wheel is in motion.

Insertion of prongs (position **3**): After bobbin check:

1°. work stroke of trimmer and its press,

2°. work stroke of cradle and reverse stroke of puller,

3°. trimmer and its press revert to rest position,

4°. reverse stroke of cradle,

5°. pulling stroke of puller.

The return to rest position of the cradle-thrust piston and of the trimmer piston and the end-of-stroke of the puller are the conditions of departing from this position.

Core adjusting (position **4**): After checking of the bobbin:

to and fro stroke of a thrust core piston which adjusts the core in the bobbin by cooperating with a fixed butt member located at the other side of the cradle.

The return to rest position of this piston is the condition of departing from this position.

Prong shaping (position **5**): After checking of the bobbin:

work stroke of slide-driving piston,

work stroke of twisting device piston,

return to initial position of slide-driving piston,

return to initial position of twisting device.

The return to rest position of the two pistons is the condition of departing from this position.

Bobbin ejection: After position **5**, the movement of the wheel causes the roller of the ejector associated to the cradle to rise on a fixed rail. The rise of the roller is suspended during the halt at position **6** which is not equipped. At position **7**, the roller reaches its high position, and the coil falls out of the cradle (which is turned upside down at this position) and into the outlet shoot of the machine. The ejector operates regardless of the presence or absence of a bobbin in the cradle.

Return of ejector: the fixed rail changes its direction after position **7** thus enabling the ejector to revert to rest position before position **1** due to the action of the drawback-springs. The operation of the ejector is suspended during the halt at position **8** which is not equipped.

A more detailed description of the operation of the machine will now be given with reference to FIGS. **15**, **16** and **17**. A bobbin is introduced into the grip at position **12—1** being guided on device **14** (FIG. **17**), rear flange **7** designed to receive the connection prongs being located on the right of the figure. The placing of the bobbin entails the following: front flange **16** slides on lever **17** (FIGS. **2** and **4**) thus causing the shift of thrust member **70**. Said thrust member will close the contact of miniswitch **71** which will signal that a bobbin is set at position **12—2**.

If, for any reason, a grip not loaded with a bobbin reached position **12—2**, lever **17** would be at rest and contact maker **71** would not be operated, thus preventing power from reaching jack **69**. Similarly, the contact makers corresponding to the subsequent positions of the grip would not be energized and the corresponding jacks would not operate.

After a certain time lapse fixed by a timing mechanism (lapse corresponding to the time required for the completion of all the operations) the turret wheel effects one-eighth of a revolution. At position **12—2**, contact maker **71** the cam of which is repelled by boss **70** is operated thus allowing jacks **69** and **63** to operate. Jack **69**, via its piston **68**, pushes a core which has reached position **5—1** (FIG. **13**) into the bobbin presented by the grip standing in position **12—2**. A thrust member **72** (FIGS. **16** and **17**) prevents the mobile part or cradle **4** of the grip from moving while the core is being placed in the bobbin. After the timed delay, the compressed air inlet to jack **69** is cut and the piston reverts to its initial position. Dur-

ing this time, jack 63 supplied by the same valve as 69, has pushed rod 64 (FIG. 15) and driven toothed sector 65 (FIGS. 15, 16 and 17), toothed wheel 66 drives cylinder 53*a* which effects one-third revolution. When the air inlet is closed at the end of the travel of 63, toothed device 65 reverts via a drawback spring, not shown, to its initial position without driving the cylinder 53, thanks to the free wheel device accommodated in the left-hand part of cylinder 53*a*, solid with toothed wheel 66 (FIG. 14).

When piston 68 of jack 69 has reverted to its rest position, a contact maker 73 is set to work by a thrust member 74, solid with 68, and allows the turret wheel to again effect a one-eighth revolution, provided that all the means required to effect the various operations are in rest position (checking of return of the jacks). The grip, now bearing a bobbin and a core moves on to position 12—3 in which four connection prongs will be inserted in the openings of flange 7 of the relay bobbin (FIG. 16).

At position 12—3, boss 70 operates a contact maker 97 whereby jack 42 operates. The latter makes the trimmer-press (unit 25—40) descend and pinch the strips and trim the prongs. Adjusting screw 78, solid with piston of 42, closes the contact 79 which supplies jacks 22 and 43. Via its piston 23, (FIG. 5) the mobile part 4 shifts towards the prongs pinched by 25; the bores in flange 7 then meet the prongs and the latter are inserted into the bores.

During this time, jack 43, via its piston 75, reverses to pull forward another length of wire for the next operation.

After a timed delay, jack 42 and piston 23 revert to rest position. The press-trimmer unit (25—40) having released the inserted prongs, the mobile cradle reverts to its initial position and by s9 doing, attracts a contact maker, not shown, supplying jack 43, piston 75 drives puller 39. In this movement, the strips from which the next prongs will be cut and which travel through devices 34, 37, 39 and 38, gripped by the four rollers 44 (FIG. 7) are driven forward and a length of strips corresponding to the length of a prong is engaged under press-trimmer 40. When it reaches the end of its travel, adjusting screw 76 operates contact maker 77, the latter checks that jack 43 has returned and the return of all devices 69, 22, 83, 27, 32, 42 and 43 (FIG. 17) is checked by the respective contact makers, this being the departing condition for the turret wheel.

When the grip reaches position 12—4, jack 83 (FIG. 17) is supplied by a contact maker hidden by loading funnel 50. This contact maker is operated by boss 70 which checks that a bobbin is present in the grip. Jack 83 thrusts its piston 84, which comes into contact with the core to accurately set it in the bobbin.

The movement of translation caused by piston 84 is limited by thrust member 85 which presents a face on which the bobbin and the core come to abut so as to take up their final position. After a timed delay the supply of jack 83 is switched and reverts to rest position, followed by the mobile cradle due to its drawback springs 24.

Upon reaching its rest position, piston 84 operates end-of-stroke contact maker 86 thus allowing the turret wheel to be supplied; the latter again effects one-eighth revolution.

At position 12—5 the lower part of the connection prongs are cambered several degrees to facilitate the soldering of the wires and the outside part is twisted 90° so as to place the connection ends in a vertical plane.

Boss 70 of the lever of the grip bearing a bobbin which arrives at position 12—5, operates contact maker 87, which enables power to be supplied to jack 27 (FIGS. 17 and 11).

The end of piston 26 bears on heel 28 of slide member 29 of cradle 4, which then moves towards the base 96 of jack 32. The outer part 6 of connection ends engages rectangular recesses 47 in shafts 31 solid with toothed pinions engaged with the racks which are solid with piston 32 (FIG. 12).

Cradle 4, butting against base 96, and the end of piston 26, still bearing on heel 28, compress springs 24 and wedges 21, provided on the slide member, bend the ends 30 of the connection prongs. At the end of the stroke of piston 26, adjusting screw 88 (FIG. 17) operates the contact maker 89 which supplies power to jack 32. The latter when descending causes recesses 47 to effect a one-fourth revolution. The said recesses contain portion 6 of connection prongs. The end of temporization cuts pressure in 27 and its piston 26 goes back, followed by the cradle under the effect of springs 20 and 24. During this return movement, lever 17 operates contact maker 87 which cuts pressure on piston 32 and enables said piston to rise to its rest position, moreover, by reaching rest position; contact 91 allows the turret wheel to effect one-eighth revolution (departing condition for the wheel).

The grip, discussed during the above description, then moves from position 12—5 to position 12—6. In this position, roller 92 (FIG. 15) comes into contact with the eccentric rail 93 and pistons 94 thrusts the relay bobbin out of the grip cradle seating. When it reaches position 12—7, the bobbin is completely ejected from its housing and falls into a basket.

The grip, now empty, continues revolving and leaves position 12—7 (which is not equipped), moves on to position 12—8, not equipped either, and then again arrives at position 12—1. During this travel from 12—7 to 12—1, the ejection pistons for the bobbin revert to their normal position due to the action of drawback springs 95, since the curve of rail 93 has changed directions.

It must be understood besides that there has been described above only an example of carrying out the invention and that the latter is not limited by this particular example.

We claim:

1. A machine for manufacturing coils for electromagnetic relays comprising cradle means for mounting a bare bobbin inserted in to guides on a mount in said cradle, prong feeding means for inserting prongs into said bobbin, slide means in said cradle for engaging the flange of said bobbin under the inside ends of said inserted prongs to raise said ends in said bobbin; means for driving said cradle bearing said bobbin to a twisting means so as to engage the outside ends of said prongs attached to said bobbin for a twisting operation, and an ejector means mounted under said cradle to slide through the bottom of said cradle for ejecting said bobbin from said cradle at the output of said machine.

2. The machine of claim 1 wherein a supply of continuous prong wires is provided in said prong feed means and including means for feeding out said wire a prong length at a time, and means for cutting said wire to sever said prongs and to hold the said prongs in feed position while said cradle containing a bare bobbin moves forward to engage said flange of said bobbin.

3. The machine of claim 2 including prong wire reel bearer means, wire straightening guide means, puller means which reverse along said continuous wires and moves forward pulling out a fresh prong length of wire, a trimmer means for cutting said wires moved forward by said puller means, said trimmer means being associated with a press means which holds said severed prongs in feed position while said cradle containing said bare bobbin moves forward to engage said flange of said bobbin and thereafter reverts to rest position to enable said cradle to reverse with said bobbin bearing said prongs.

4. The machine of claim 3 including said slide means further comprising a frame assembled in guides between said bobbin and the bottom of said cradle, said frame having two slanting ends which fit under the inside ends of said prongs to raise them, and a thrust means which limits the stroke of said frame in said cradle.

5. The machine of claim 4 wherein said twisting means comprises hollow shafts, the number of hollow shafts being equivalent to the number of prongs borne by said bobbin, said shafts effecting a one-fourth revolution responsive to a single movement comprising the completion of the cambering operation of the inside ends of said prongs and the continuation of the movement of said cradle to engage the outside ends of said prongs in said hollow shafts.

6. The machine of claim 5 wherein said twisting means comprises revolving hollow shafts having at their ends a recess adapted to accommodate the ends of flat connection prongs, and means connected to said revolving hollow shafts and associated rack means for revolving said shafts so as to twist said connection prongs which are engaged therein.

7. The machine of claim 6 including a turret wheel bearing several bobbin bearing means, said turret wheel revolving and halting in front of a plurality of work positions.

8. The machine of claim 7 including magnetic core feed means comprising a loading funnel means for receiving a load of cores, means for causing the cores to move forward, side by side, up to an outlet spout, and means for feeding said cores into said bobbin positioned in said cradle.

9. The machine of claim 8 including cylinder means having around its circumference three roller means, said roller means turning freely about their axis and positioned at intervals of 120° from one another, said rollers passing under said shoot at a distance corresponding to the gauge of a core responsive to the rotary movement of said cylinder causing said cores to align and move forward on their flat side, side by side, in said core feed means.