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[54] **ELECTRICALLY OPERATED STAPLERS**
16 Claims, 15 Drawing Figs.

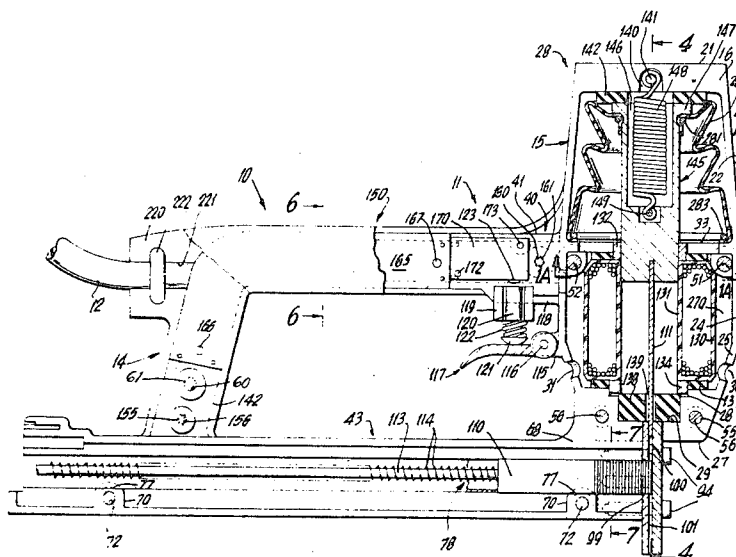
[52] **U.S. Cl.**..... **227/131**
 [51] **Int. Cl.**..... **B25c 1/06**
 [50] **Field of Search**..... **227/131**

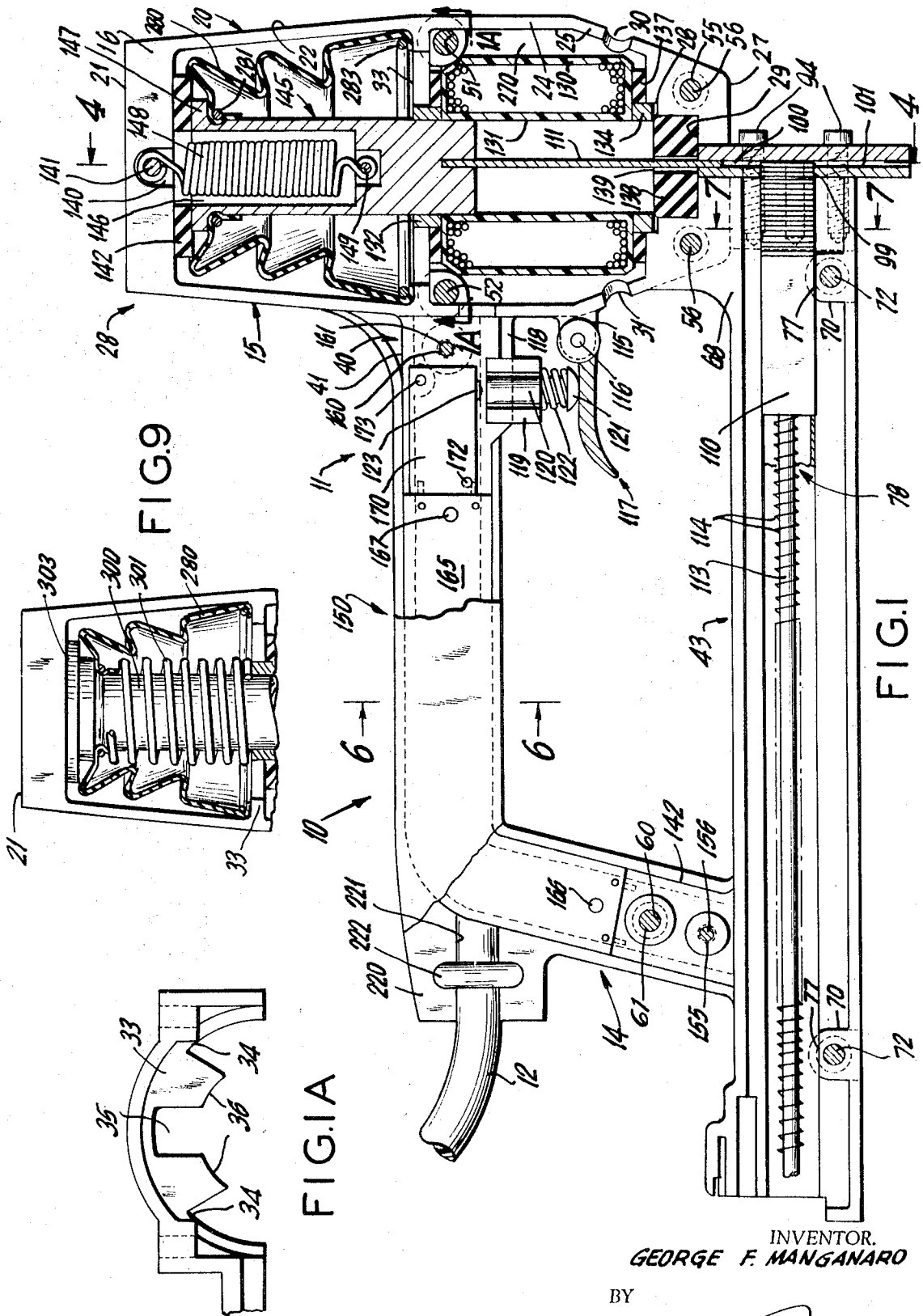
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ABSTRACT: The circuit is for control of a winding or load coil in a stapler tool which when energized moves a plunger carrying a staple-driving blade. A trigger switch on the tool is manually actuated. The circuit is such that if the switch is closed and held closed, the winding will pulse alternatively current at predetermined regular intervals to energize the coil. If the switch is closed and then opened in less than said predetermined interval, only one pulse will be produced, until the switch is again closed. The pulse takes place at the beginning of a positive cycle of the alternating current. If the switch is repeatedly alternately closed and opened, the pulsing will follow the closing of the switch. The interval between pulses is present or variable. The casing for the tool is made of two split sections which when assembled grip the load coil. Said sections are of metal. A plastic sleeve surrounds the handle of the casing. The electrical parts are housed in the tool body in one form of the invention. In another, some of the electrical elements are in the plug.





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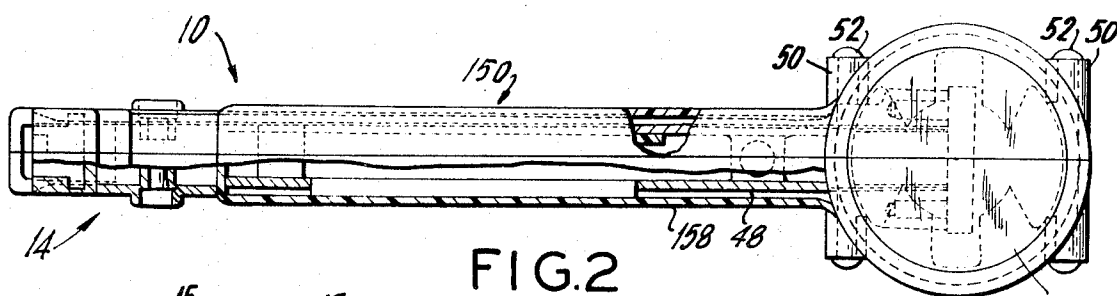


FIG. 2

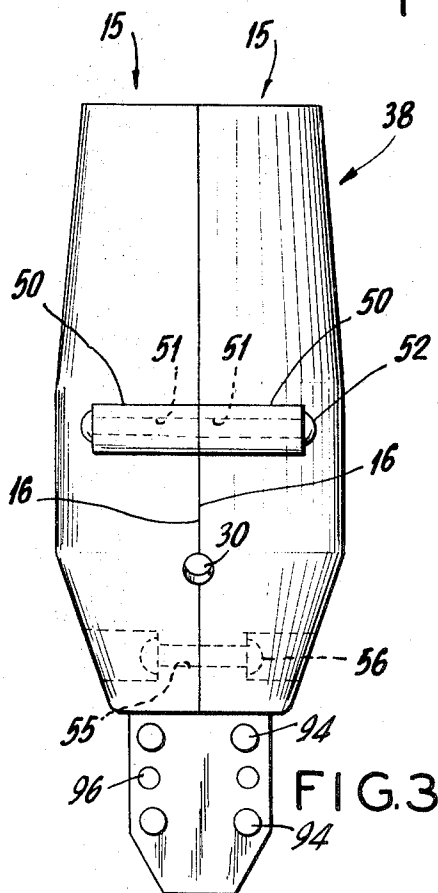


FIG. 3

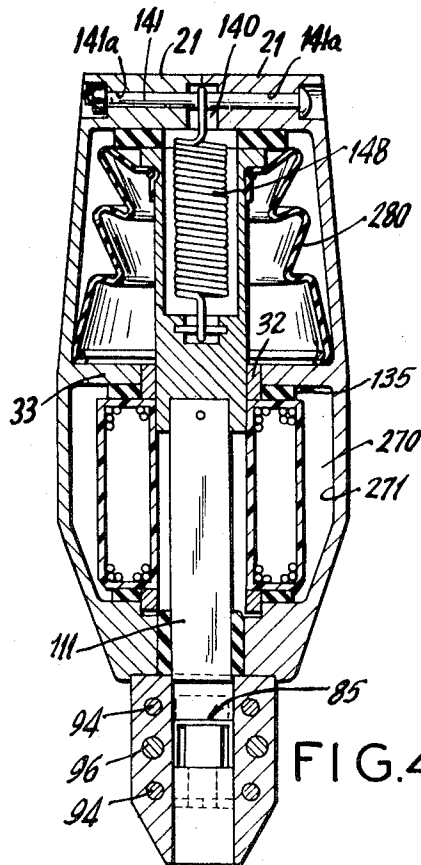


FIG. 4

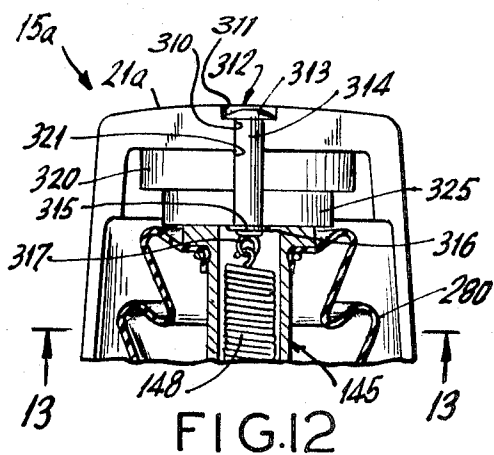


FIG. 12

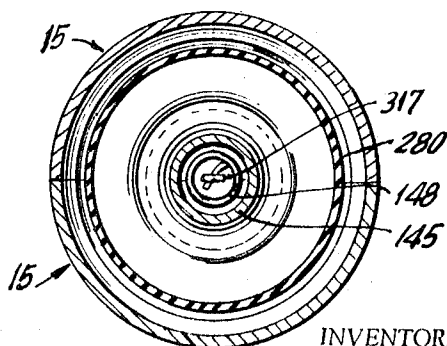


FIG. 13

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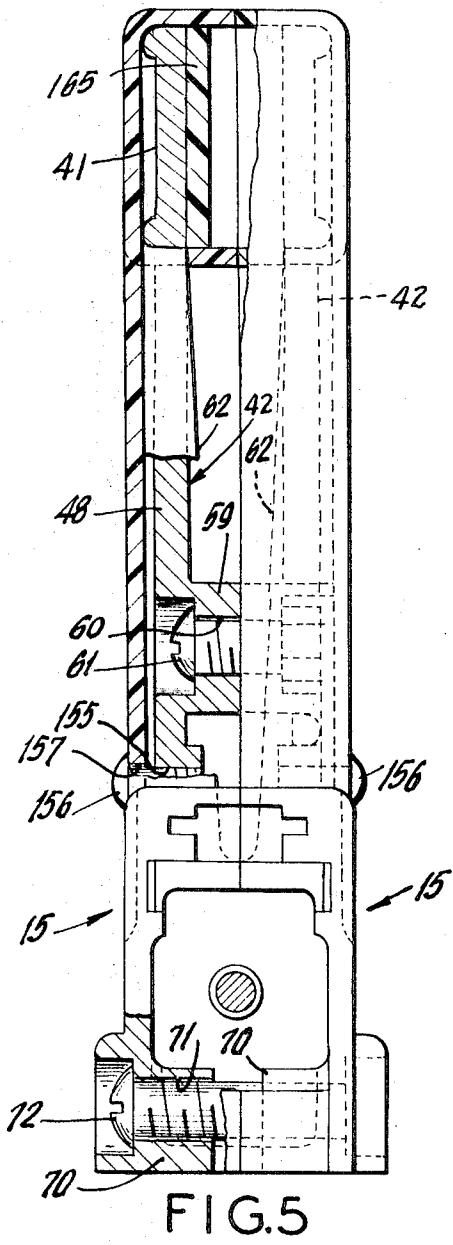


FIG. 5

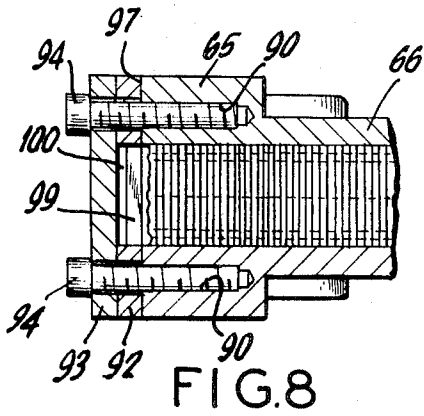


FIG. 8

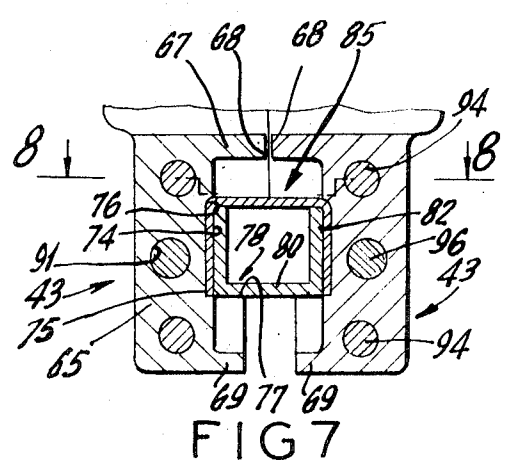


FIG. 7

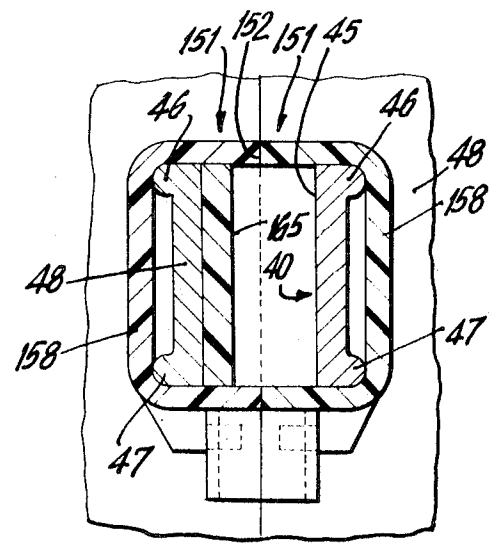


FIG. 6

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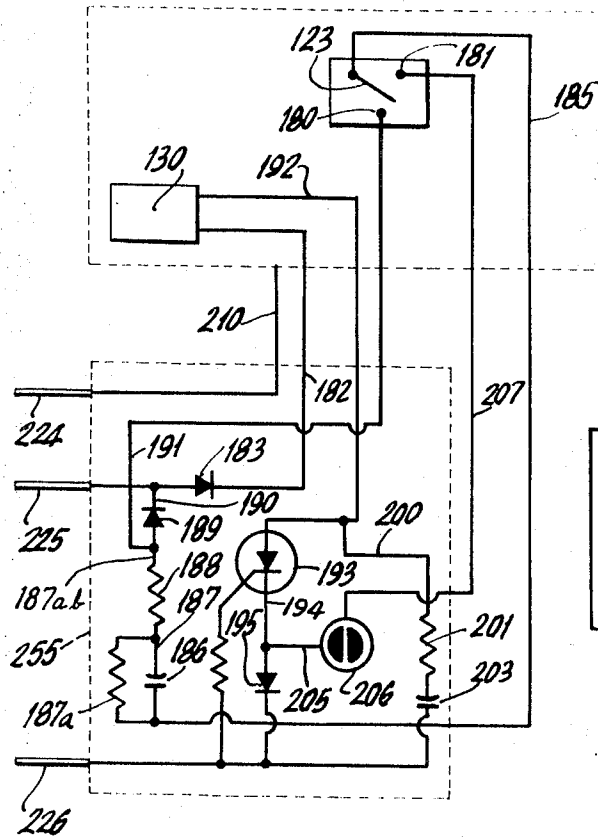


FIG. II

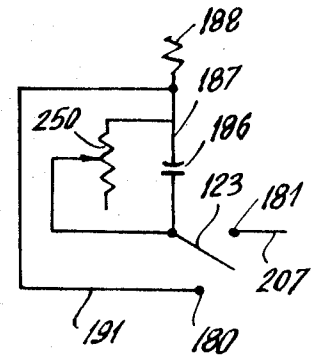


FIG. 10A

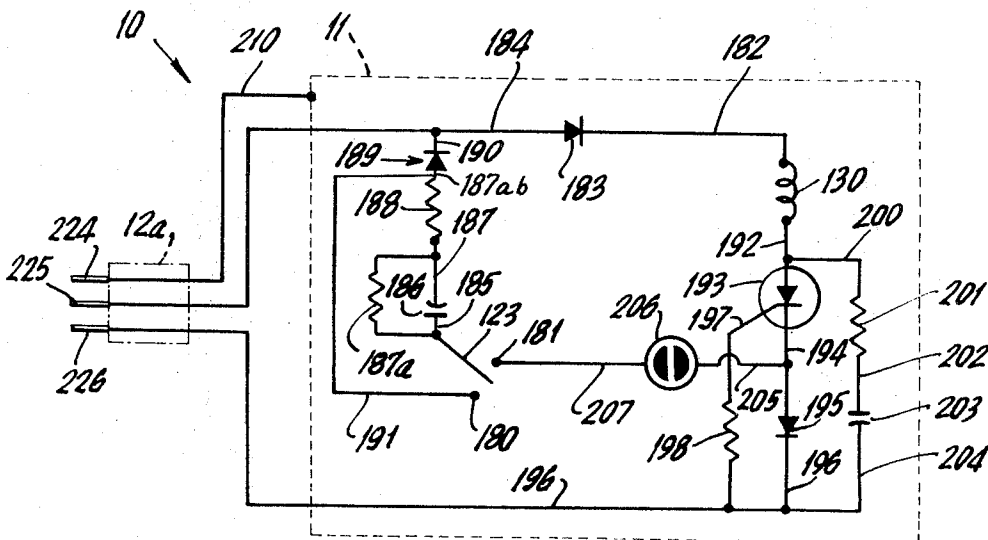


FIG. 10

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ELECTRICALLY OPERATED STAPLERS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to stapler tools and circuits for energizing a load coil of the tool on closing of a switch.

2. Description of the Prior Art

Circuits for energizing a coil only once upon closing a switch and necessitating opening of the switch and reclosing, to obtain a second pulse, are known. Such circuits are also known wherein the energizing of the coil takes place only upon the circuit becoming positive.

SUMMARY OF THE INVENTION

An object of this invention is to provide in a stapler tool circuit of the character described, a switch and means to obtain repeated pulses at regular predetermined intervals to energize a load coil in the tool to drive staples at said intervals, should the switch be closed and held closed, and in which only one pulse is produced to drive a single staple, should the switch be closed and thereafter opened in less than said predetermined interval.

Another object of this invention is to provide in a circuit of the character described, means to vary the interval between repeated pulses.

Still another object of this invention is to provide in a circuit of the character described, means to pulse a load coil only upon the current going positive after closure of the switch or after each reenergization of the circuit.

Still another object of this invention is to provide a circuit of the character described for controlling a winding in a stapler tool, which winding when energized causes movement of a magnetic plunger carrying a staple-driving blade, with the electric controls in the tool body and removable therefrom for repair or replacement.

Yet another object of this invention is to provide a tool of the character described comprising a split casing of complementary sections which when attached together grip the load coil and hold it in proper position, without necessity for any further fastening means.

A further object of this invention is to provide a tool of the character described comprising a casing made of two complementary metal sections attached together and forming a front vertical head or housing the load coil, a bottom staple magazine integrally formed with the lower end of said head, and a handle portion connecting the head with the rear of the staple magazine and a heat-insulating handle sleeve surrounding the handle portions of said casing sections, to be grasped by the operator.

Still another object of this invention is to provide a tool of the character described with an improved bellows means which on the driving stroke, forces air over the load coil and out of the housing and on the retraction stroke draws in air at room temperature, to thereby cool the load coil and prevent overheating.

Yet another object of this invention is to provide in a tool of the character described, complementary sections which, when attached together, have means on the head to hold the load coil spaced from the inner wall of the head to provide space around the coil through which air flows up to cool the coil, and said means to grip the coil being constructed with passages to allow air passing up through said space to enter a bellows in the upper end of the head, so that when the plunger is pulled down by energization of the coil, the bellows will push the air out through openings in the lower end of said head.

A still further object of this invention is to provide in a tool of the character described, means mounted on the inner side of the handle portion of one of said casing sections to support the electrical components of the circuit between said sections and inside the handle sleeve to facilitate repair, replacement, and protection of said components.

A further object of this invention is to provide in a tool of the character described, an improved staple magazine which shall be easy to assemble.

Yet a further object of this invention is to provide a strong, rugged and durable tool of the character described which shall be relatively inexpensive to manufacture, easy to assemble, operate and service and which shall yet be practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

This invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the construction hereinafter described, and of which the scope of invention will be indicated in the following claims.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevational view of tool embodying the invention, with parts broken away and in cross section;

FIG. 1A is a cross-sectional view taken on line 1A-1A of FIG. 1;

FIG. 2 is a top plan view of the tool with parts broken away and in cross section;

FIG. 3 is a front end view of the tool;

FIG. 4 is a cross-sectional view taken on line 4-4 of FIG. 1;

FIG. 5 is a rear end view of the tool with parts broken away and in cross section;

FIG. 6 is a cross-sectional view taken on line 6-6 of FIG. 1;

FIG. 7 is a cross-sectional view taken on line 7-7 of FIG. 1;

FIG. 8 is a cross-sectional view taken on line 8-8 of FIG. 7;

FIG. 9 is a vertical view of the upper end of the head of the tool but illustrating a modification;

FIG. 10 is a wiring diagram of the circuit embodying the invention;

FIG. 10A shows part of the circuit of FIG. 10 but illustrating a modification thereof;

FIG. 11 is a wiring diagram of said circuit but showing the load coil and trigger switch in the tool casing, and the remaining components of the circuit in a plug connected to the coil and switch by a line cord;

FIG. 12 is a vertical upper end view of the head of the tool, illustrating a modified construction; and

FIG. 13 is a cross-sectional view taken on line 13-13 of FIG. 12.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now in detail to the drawing, 10 designates a staple-driving tool embodying the invention. Said tool 10 comprises a hand-held portable member 11 connected by a line cord or cable 12 to a plug 12a (FIG. 10) for connection to a wall outlet for alternating current.

Member 11 comprises a medially split body 14 having complementary symmetrical body sections 15 meeting at mutual contacting vertical surfaces 16 and attached together in the manner hereinafter explained.

Each section 15 comprises a hollow front head part 20 having a top semicircular wall 21 from which there extends downwardly, a diverging tapering or semiconical wall 22 of semicircular cross section. Extending down from wall 22 is a semicylindrical wall 24 from the lower end of which there extends a downwardly converging semiconical wall 25. At the lower end of wall 25 is a semicircular bottom wall 27.

Wall 27 has a shallow semiannular central groove 28 from which a countersunk or depressed cup 29 is recessed downwardly. Wall 25 has semicircular notches 30, 31. When sections 15 are assembled, notches 30, 31 form air openings for the purpose hereinafter explained.

Between walls 22, 24 is an integral horizontal partition or web 33, (FIGS. 1, 1A, 2), formed with radial notches 34, 35 and with part circular, inner edges 36 coaxial with respect to the axis of the head 38 (which head comprises walls 21, 33, 24, 25, 27 of the matched sections).

Each body section 15 comprises a handle 40 integral with head part 20 and located in a vertical plane parallel to and spaced outwardly from surface 16. Said handle comprises a horizontal portion 41 extending rearwardly from substantially midheight of the head part 20.

Extending from the rear end of horizontal portion 41 is a downwardly and rearwardly inclined portion 42.

The lower end of each head part 20 is connected by a horizontal integral staple magazine portion 43, to the lower end of the handle portion 42, and extends rearwardly therebeyond.

The handle 40 has a flat inner face 45 and has parallel edge heads or flanges 46, 47 at its inner face forming a web 48 therebetween. The webs 48 are spaced apart when sections 15 are assembled, as shown in FIG. 6.

Head parts 20 are formed with horizontal transverse sleeves 50 having through holes 51 to receive bolts 52 for attaching the sections 15 together. The sleeves are located at the front and rear of the head parts, partly below the web 33, as shown in FIGS. 1, 3. Said head parts 20 are also formed in walls 27 thereof with countersunk through openings 55 located forwardly and rearwardly of the axis of the head, to receive attaching bolts 56.

The handle portions 42 have, adjacent their lower ends, inwardly extending mutually contacting socketed or countersunk bosses 59 formed with through openings 60 for an attaching bolt 61.

Extending from handle portions 42 are inclined strengthening ribs 62 as shown in FIG. 5.

Each portion 43 extends below wall 27 and is integral therewith at its front end. Each portion 43 has at its front end a thick vertical wall 65 from which a thinner wall 66 extends rearwardly (FIG. 8). Extending inwardly from the upper ends of walls 65, 66 of portions 43 are horizontal flanges 67 having inner, somewhat spaced inner surfaces 68 close to the plane of contacting surfaces 16. Said walls 65, 66 of portions 43 have lower inwardly extending horizontal flanges 69 spaced from each other.

Said portions 43 also have countersunk hubs 70 forming horizontal transverse through holes 71 for the attaching bolts 72. At the inside of walls 65, 66 of each portion 43 there is formed a horizontally extending, vertical through groove 74 having a lower shoulder 75 and an upper undershoulder 76. The tops of hubs 70 are cut down flat and horizontal to the level of shoulders 75, as at 77.

A staple channel 78 or staple guide is mounted within the staple magazine and has a bottom wall 80 resting on surfaces 77 and upwardly extending vertical flanges or walls 82. A staple strip 85 rests or rides in the staple guide 78, with the tops of the staple riding on the upper edges of walls 82 of the staple guide or channel, and the legs of the staples disposed within grooves 74 and between undershoulders 76 and shoulders 75.

The thick front walls 65 are formed with upper and lower pairs of horizontal, longitudinal threaded holes 90, and with a pair of smooth holes 91.

Attached to the front end of walls 65 are a pair of flat, vertical plates 92, 93 having holes registering with holes to receive studs 94 screwed into threaded holes 90. Locating pins 96 pass through holes 91 and through registering holes in plates 92, 93.

Plate 92 contacts front surfaces 97 of portions 43. Plate 93 contacts front face of plate 92. Plate 92 has a through hole 99 of such size and shape as to admit a staple from the staple strip to be pushed therethrough. The front face of plate 92 is formed with upper and lower grooves 100, 101 disposed above and below groove 99. Plates 92, 93 extend above and below the stapler magazine, as shown in FIG. 1. Groove 100 extends to the upper end of plates 92, 93. A vertical plane passing through the middle of grooves 100, 101 and at right angles to surfaces 16, passes through the axis of the head 38 of the body 14.

A usual channel-shaped pusher 110 is slidably mounted on the channel member 78 to push the staple strip forwardly so

that the foremost staple may pass through opening 99 into the space between grooves 100, 101, to be in position to be driven downwardly by a plunger blade 111 in the manner hereinafter explained. The pusher 110 is slidably mounted on a rod 113 and is pressed forwardly by a coil compression spring 114 on said rod in the well-known manner. The rod 113 has a latch (not shown) which may be of usual construction, at its rear end to latch onto the rear end of the staple magazine.

Extending rearwardly from each head part 20 is an apertured lug 115 carrying a cross pin 116 on which a trigger 117 is rotatably mounted. Integrally formed with each head part, and extending rearwardly therefrom is a web 118 connected to a vertical semicylinder 119. When the body sections are assembled, the semicylindrical parts 119 form a vertical tube or sleeve to receive a vertical pin 120. The axis of pin 120 is in the plane of surfaces 16. Said pin 120 has a head 121 at its lower end. A coil compression spring 122 on said pin and interposed between head 121 and the lower end of tube 119, 119 presses said head down against the trigger. The pin 120 is located to actuate a trigger switch 123 to be described hereinafter when the trigger is manually pulled up.

Within the lower chamber of head 38 of the body 14, and below partition 33 is winding or solenoid 130 coaxial with respect to said head. Said winding has a vertical central cylindrical through-opening 131. A ring 132 is fixed to the upper end of the coil. Said ring is gripped by edges 36 of the partition or web 33 of the two body sections. Fixed to the lower end of said load coil is a ring 134 which is received in the annular grooves 28 of the head parts 20. A gasket 135 surrounding ring 132 rests on top of the load coil and is disposed beneath partition 33. Another gasket 137 surrounds ring 134 and rests on top of wall 27 and engages beneath the coil.

A bumper 138 rests in cup 29 in the wall 27 and has a central diametric slot 139 through which blade 111 passes. Top walls 21 are formed with registering notches 140 at their undersides, adjacent surfaces 16. A transverse pin 141 is fixed in aligned openings 141a in said top wall 21 and extends through said notches 140. Attached to the underside of top wall 21 is a rubber bumper 142. Slidable in opening 131 of the coil 130, is a cylindrical plunger 145. Said plunger 145 is hollow at its upper end, having a cylindrical bore 146. At the upper end of member 145 is an annular outwardly extending flange 147 contacting the underside of bumper 142 when member 145 is in its uppermost position. A coil tension spring 148, within the hollow 146, hooked at its upper end to pin 141, and at its lower end to a pin 149 at the lower end of the hollow. Spring 148 is tensioned when the load coil 130 is energized, in the manner hereinafter explained, to cause the plunger, which is made of magnetic material to be pulled down by the energized coil. The upper end of blade 111 is fixed to the lower end of said plunger.

Thus, when the coil 130 is energized, the plunger is pulled down to drive a staple. When the coil is deenergized, as explained hereinafter, the tensioned spring 148 pulls the plunger up against the bumper.

A heat-insulating handle cover 150 surrounds the handle portions 40 for comfortable handling and to protect the users hand in case of overheating of the coil. Said cover 150 is also made of two similar, symmetrical sections 151. Said sections 151 are preferably made of heat-insulating plastic material. The sections are hollow and extend from the rear of the head 38 to the top of the magazine portion 43. The sections 151 have meeting edges 152 in the plane of surfaces 16, and are of channel-shaped cross section. Said sections have horizontal portions from which downwardly and rearwardly inclined portions extend.

The handle portions 42 are formed adjacent their lower ends, with aligned screw-threaded openings 155 to receive screws 156 which pass through openings 157 in the webs 158 of the handle cover sections.

The handle cover sections 151 are also attached together and to handle portions 40 by means of screws 160 passing through openings in the webs of said sections and screwed into

threaded openings 161 in said handles 40 adjacent the head parts 20.

Means is provided to energize the load coil repeatedly at predetermined intervals should the trigger switch 123 be closed and held closed, and to energize the coil only once and then deenergize the coil, should the trigger switch be closed and then opened in less than said predetermined interval. Said means is so arranged, as will be explained hereinafter, that the energization of the coil takes place only at the beginning of a positive cycle of alternating supply current.

To this end, a flat insulating plate 165 is attached to the inner flat surface of wall 48 of one of the handle portions 40. The plate 165 may extend partly along the horizontal portion 41 and partly along the inclined portion 42 of said handle. Said plate may be attached to the handle by means of screws 166, 167. A switch body 170 for the trigger switch 123 may be located between plate 165 and head part 20. It is fixed to the handle 40 to which plate 165 is attached by screws 172, 173, and may be removed.

FIG. 10 discloses a circuit for energizing the load coil in the manner described above. The trigger switch 123 is normally engaged with a fixed contact 180 housed in body 170, and when the trigger 117 is pulled up, switch 123 moves into engagement with a fixed contact 181, also housed in said body 170. In said circuit of FIG. 10 is the load coil 130. One side of said load coil is connected by wire 182 to a rectifier anode 183 which is connected by wire 184 to the plug 12a. Switch 123 is connected by wire 185 to a capacitor 186 which is connected by wire 187 to one side of a resistor 188. The other side of the resistor 188 is connected to rectifier 189, by a wire 187ab. Rectifier or anode 189 is connected by wire 190 to said wire 184.

Contact 180 is connected by wire 191 to a wire 187ab. The other side of load coil 130 is connected by wire 192 to the anode side of a gated silicon rectifier or SCR 193. The cathode side of said SCR 193 is connected by wire 194 to one side of a rectifier or diode 195. The other side of rectifier or diode 195 is connected by wire 196 to a blade 226 of the plug 12a. The gated leg 197 of the SCR 193 is connected to wire 196 through a resistor 198.

Connected to wire 192 is a wire 200 connected to one side of a resistor 201. The other side of resistor 201 is connected by wire 202 to one side of a capacitor 203. The other side of capacitor 203 is connected by wire 204 to wire 196.

Wire 194 is connected by wire 205 to a neon lamp 206. Said lamp is connected by wire 207 to contact 181. Wire 185 is connected to wire 187 by a resistor 187a so that resistor 187a and capacitor 186 are in parallel circuit.

The plug is connected by ground wire 210 to the body 14. The wires 210, 184, 196 passing from plug 12a to the tool comprise the line cord or cable 12.

The components of the circuit other than the load coil 130, the trigger switch 123 and contacts 180, 181 are mounted in any suitable manner on the insulating plate 165.

The heat-insulating handle cover 150 has at the rear of its horizontal portion, an extension 220 formed with a through opening 221 through which the line cord 12 passes. An annular groove 222 surrounding passage 221 may carry a strain-relief grip ring for the cable 12.

The plug 129 has blades 224, 225, 226 connected to wires 210, 184 and 196, respectively.

The load coil is locked in place when the body parts are assembled.

The tool can be serviced by separating the body parts 15 and handle cover parts 151. The electrical components are well protected against damage, being housed between the handle portions 40. By removing the plate 165 and switch body 170, they can be repaired with greater facility.

Circuit will now be described. The switch 123 is normally in engagement with contact 180. The capacitor 203 charges through rectifier or diode 183, load coil 130 and resistor 201, while the tool is not operating. The trigger switch may be closed randomly when the trigger switch 123 is actuated and

moves into engagement with contact 181, capacitor 186 draws current and turns on SCR 193 during the negative cycle of alternating current from an outlet to which the plug 12a is connected. If the switch should close during a positive half cycle of the supply rectifier or diode 189 prevents flow of current until the line reverses polarity. With the line negative gate current flows from the line through the SCR 193 gate, the switch 123, resistor 188 and rectifier or diode 189 to charge capacitor 186. Current has to take this path because diode 195 prevents current flow directly from the line in the reverse direction to the switch. SCR 193 will trigger as soon as gate current flows because the SCR's diode is always forwardly biased by previously charged capacitor 203. With SCR 193 gated on, the discharge time constant of the resistor 201, capacitor 203 network and SCR 193 is long enough to maintain SCR 193 in conduction until the line once more reverses polarity. However, SCR 193 does not conduct until the line turns positive. When line turns positive the neon lamp 206, fires, discharging the capacitor 203, thereby causing the SCR 193 to conduct.

The SCR 193 turns off when the line turns negative again. SCR 193 can only conduct when the capacitor 186 draws current. The delay period between pulses depends on the value of resistor 187a which acts as a bleeder resistor across capacitor 186. The larger the value of said resistor 187a, the slower the frequency of the pulse.

As long as switch 123 is kept in closed position, in engagement with contact 181, the tool will operate to drive a staple at predetermined intervals, repeatedly.

The SCR 193 will always become conductive at the beginning of a positive cycle of the alternating current and will automatically shut off until the next pulse.

If the trigger is actuated by a make-and-break device, the pulsing of the circuit will follow the makes and breaks.

If the switch is closed and then opened in less time than the predetermined interval, there will be only one pulse and no further pulsing will take place until the switch is closed again.

Opening of switch 123 (from contact 181 to contact 180 cuts out capacitor 186 and prevents further pulsing).

In FIG. 10A there is shown a modified part of the circuit of FIG. 10. The modification is for the purpose of providing means to vary the interval between pulses. In FIG. 10A the resistor 187a is replaced by a variable resistor 250. By varying the value of resistor 250, the time interval between repeated pulses is varied or adjusted.

In FIG. 11 the circuit is the same as in FIG. 10. The difference from FIG. 10 is that in FIG. 11, all the components of the circuit except the load coil 130, the switch 123, the contacts 180, 181 and their connecting wires, are in the plug 255. The load coil 130, and the trigger switch are in the tool body. The line cord or cable will then comprise the wires 210, 182, 192, 191, 207, 185.

It will be noted that the load coil is centered in the head 38 and that there is a space 270 between the coil and the inside surface 271 of the head. Air enters this space 270 through openings 30, 31. Thus space 270 is in communication with the space above partition or web 33 through the openings at cutouts 34, 35 in the partition.

In the upper chamber of said head 38 is a flexible bellows 280 which has its upper end clamped to the plunger 145, just below flange 147 by means of a split spring ring 281. The lower end of the bellows 280 may be held in the partition 33 by an inner split spring ring 283.

As the plunger 145 descends, air is pushed down by the bellows through cutouts or notches 34, 35, through space 270 and out through openings 30, 31, to cool the coil. When the plunger is raised, air is sucked into the head through said openings 30, 31 and space 270 and notches 35, 35.

In FIG. 9 there is shown a modified form of the head part of the tool. The head parts 20 of the body are the same as described above. However the plunger 145 of FIG. 1 is replaced by a plunger 300 which is solid at its upper end. The return coil compression spring 301 surrounds the plunger and

is located inside of the bellows 280. A rubber bumper disc 303 is located beneath the top walls 21 of the assembled body sections 15. The lower end of the spring rests on partition 33. The upper end of the bellows is held by a split ring to the plunger.

In FIGS. 12 and 13 there is shown a further modification. In said figures, the construction is the same as in FIG. 1, except that the body comprises body sections 15a having modified top wall portions 21a in the head parts thereof.

In FIGS. 12, 13, top walls 21a have complementary notches 310, countersunk at their upper ends as at 311. When the sections 15a are assembled notches 310, 311 form a vertical axial through opening enlarged at its upper end. A pin 312 passes through said opening and has a head 313 at its upper end received in enlarged openings 311. Said pin 312 has a shank 314 which extends down below top walls 21a. At the lower end of shank 314 is an annular groove 315 receiving a retaining ring 316. Below the groove is an eye 317 to which the upper end of spring 148 is hooked.

The plunger 145 has a flange 147 at its upper end for engagement with the bellows 280, as shown in FIG. 1.

On the shank 314 of the pin 312 is a rubber bumper disc 320 contacting the undersurface of walls 21a. Disc 320 has a central hole 321 to receive said shank 314.

Between disc 320 and the retainer ring 316 is a steel disc 325 contacting the underside of said disc.

It will be observed that pin 314, disc 320 and disc 325, are assembled and held in place when the body parts 15a are assembled, without necessity for any further fastening means.

It will thus be seen that there is provided an article in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As possible embodiments might be made of the above invention, and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings, is to be interpreted as illustrative only.

I claim:

1. A staple-driving tool comprising a body having a head, a load coil in said head, a magnetic member disposed in said head to be moved by the coil when said coil is energized, staple-driving means on said member, a switch on said body, and circuit means including said coil and switch, to automatically energize said coil repeatedly at predetermined intervals of time, should the switch be actuated and remain in actuated condition longer than said predetermined interval of time, means to supply alternating current to said circuit means, said circuit means including means to energize said coil during the first full half cycle of said alternating current supplied following actuation of said switch, and to energize said coil only once should said switch be actuated and then deactuated in less than said predetermined interval of time after said actuation.

2. A staple-driving tool comprising a body having a head, a load coil in said head, a magnetic member disposed in said head to be moved by the coil when said coil is energized, staple-driving means on said member, a switch on said body, and circuit means including said coil and switch, to automatically energize said coil repeatedly at predetermined intervals of time, should the switch be actuated and remain in actuated condition longer than said predetermined interval of time, means to supply alternating current to said circuit means, said circuit means including means to energize the coil only during similar half cycles of alternating current supplied to said circuit.

3. The combination of claim 1, and said circuit including means to vary said interval.

4. The combination of claim 1, said circuit means including a line cable, a plug at the end of said line cable connected to said switch and coil and components of said circuit means being mounted in said plug and electrically connected to said cable.

5. The combination of claim 1, said circuit means including means to energize the coil only during similar half cycles of al-

ternating current supplied to said circuit, while said switch remains actuated.

6. In a portable tool, a housing, a load coil in said housing, work-engaging means including a magnetic member disposed adjacent said load coil, a switch means comprising first and second contacts and a switch member mounted for manual movement from normally unactuated position in engagement with the first contact into actuated position in engagement with the second contact, first and second leads adopted to be connected to a supply of alternating current, a first conductor connecting the first lead to one side of said load coil, a gated rectifier, a second conductor connecting the other side of said load coil with the anode side of said gated rectifier, a first diode, a third conductor connecting the cathode side of said gated rectifier with the anode side of said first diode, a fourth conductor connecting the cathode side of said first diode with said second lead, a first resistor interconnecting said fourth conductor with the gated leg of said gated rectifier, a fifth conductor connecting said third conductor with said second contact, a first capacitor, a sixth conductor connecting said switch member to one side of said first capacitor, a second resistor and a second diode connected in series with each other and with the other side of said first capacitor, a seventh conductor connecting the cathode side of said second diode with said first conductor, an eighth conductor connecting said first contact between said second resistor and said second diode, a third resistor connected in parallel across said first capacitor, a third diode in series with said load coil and located between said first lead and said gated rectifier, a fourth resistor and a second capacitor connected in series with each other, and in parallel with said series connected gated rectifier and first diode.

7. The combination of claim 6, and a trigger means which will fire at a predetermined voltage, interposed in said fifth conductor.

8. The combination of claim 6, and a neon lamp interposed in said fifth conductor.

9. The combination of claim 6, said load coil, first and second contacts and switch member being located on said housing, an electrical connector fitting, said leads comprising terminals of said fitting, said gated rectifier, said first, second, third and fourth resistors, and said first, second and third diodes, and said first and second capacitors being located in said fitting, a cable connecting said fitting with said housing, and parts of said first, second, fifth, sixth and eighth conductors being disposed within said cable.

10. The combination of claim 1, said circuit means comprising said load coil and said switch, said switch comprising first and second contacts and a switch member normally engaging the first contact in unactuated position, but being manually movable out of engagement with respect to said first contact and into actuated position in engagement with said second contact; first and second leads adopted to be connected to said supply of alternating current, a gated rectifier, a first diode, means to connect said load coil, said gated rectifier and said first diode in series circuit with said leads, a first resistor connected to the gated leg of said gated rectifier and to one of said leads, conductor means connecting the second contact between said gated rectifier and said first diode, a first capacitor, a second resistor and a second diode connected in series with respect to each other, with said first capacitor connected to said switch member and said second diode connected to said other lead, a third resistor connected in parallel across said first capacitor, conductive means connecting said first contact between said second resistor and second diode, and a third resistor and a second capacitor connected in series with respect to each other and in parallel with said gated rectifier and first diode, and another diode in series with said load coil and located between said gated rectifier and said other lead.

11. The combination of claim 9, and a neon lamp interposed in said conductive means.

12. A tool comprising a load coil, work-engaging means including a magnetic member disposed adjacent said load coil,

first and second contacts, a switch member normally in engagement with the first contact in the unactuated position of said switch member, said switch member being movable into engagement with the second contact in the actuated position of said switch member, a pair of leads connectable to a supply of alternating current, a gated rectifier, a first diode, means to connect said load coil, said gated rectifier and said first diode in series circuit across said leads, a first resistor connected to the gated leg of said gated rectifier and to one of said leads, conductor means connecting the second contact between said gated rectifier and said first diode, a first capacitor, a second resistor and a second diode connected in series circuit with respect to each other, with one side of said first capacitor connected to said switch member and one side of said second diode connected to said other lead, a third resistor connected in parallel across said first capacitor, conductive means connecting said first contact between said second resistor and second diode, a third resistor and a second capacitor connected in series with respect to each other and in parallel across said gated rectifier and first diode, and another diode in series with said load coil and located between said other lead and said gated rectifier.

13. The combination of claim 12, and a trigger means which will fire at a predetermined voltage, interposed in said conductive means.

14. The combination of claim 12, and a neon lamp interposed in said conductive means.

15. A control circuit comprising a load coil, an alternating current supply, a controlled conduction means having a control electrode, circuit means connecting said load coil and said controlled conduction means in series with said current supply, switch means, control means controlled by said switch means for applying a signal to said control electrode to place said conduction means in a conductive state during a first predetermined poled half cycle of said alternating current supply after actuation of said switch means to energize said load coil during said half cycle, and means to automatically repeat said application of said signal to said control electrode to place said conductive means into a conductive state during such half cycles of said alternating current supply at predetermined intervals of time while said switch means remains in actuated condition, whereby to automatically and repeatedly energize said load coil at said predetermined intervals during such poled half cycles of said alternating current supply only, while said switch means remains in said actuated condition.

16. The combination of claim 15, and means to prevent placing said conduction means in a conductive state until a predetermined voltage is reached in said circuit means.

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