

Oct. 6, 1936.

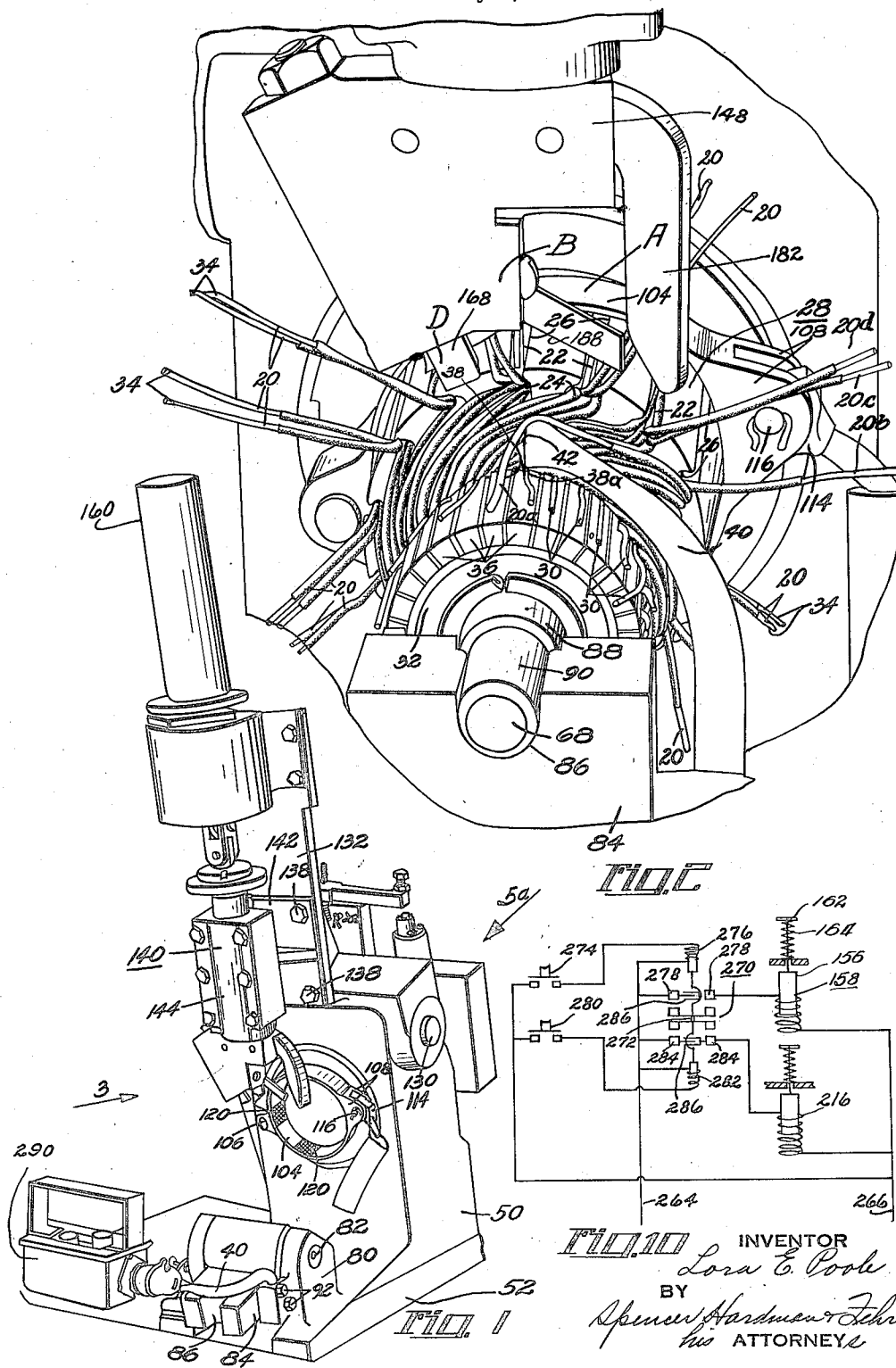
L. E. POOLE

2,056,534

COIL LEAD STAKING DEVICE

Filed July 9, 1934

4 Sheets-Sheet 1



Oct. 6, 1936.

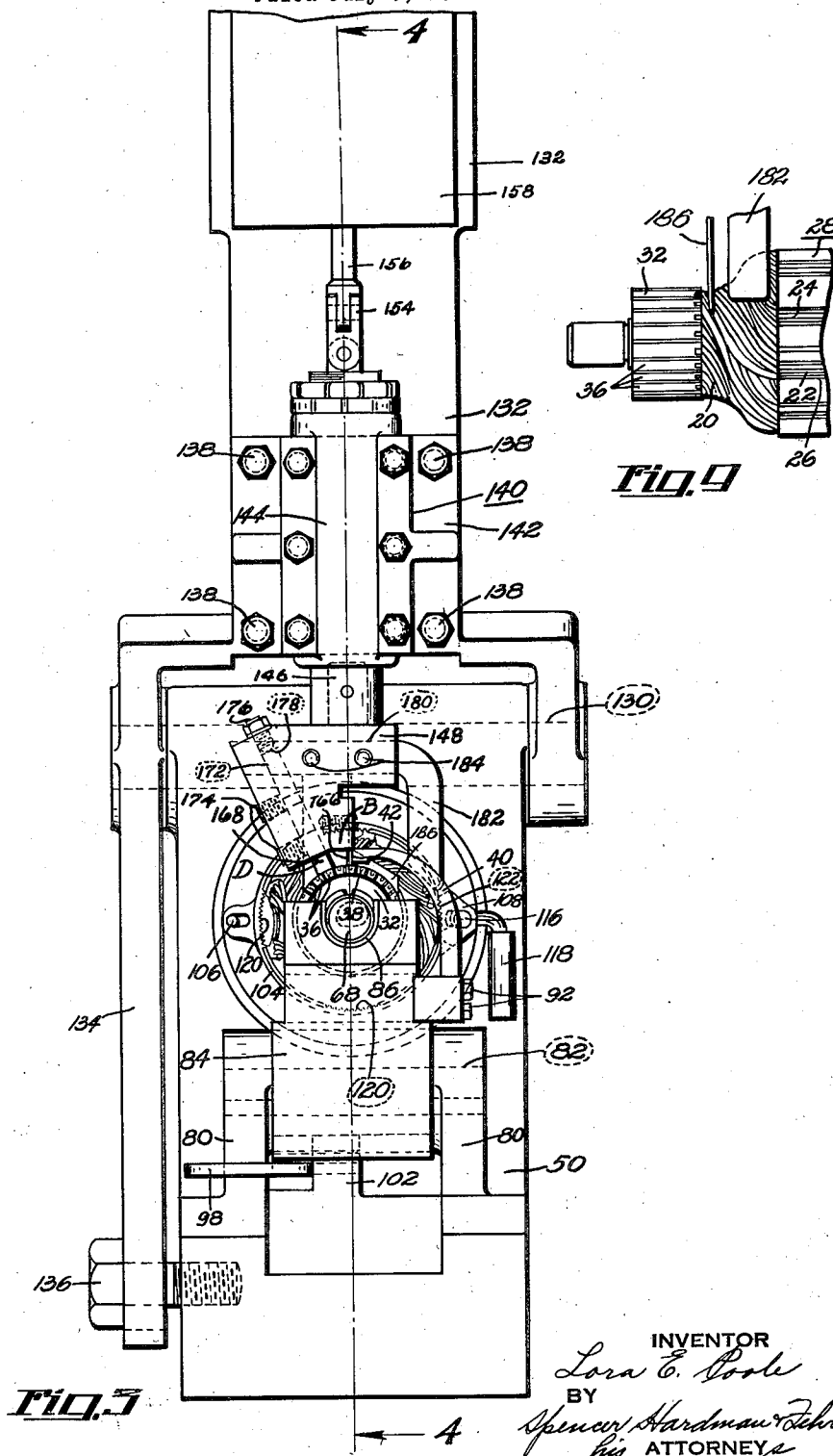
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4 Sheets-Sheet 2



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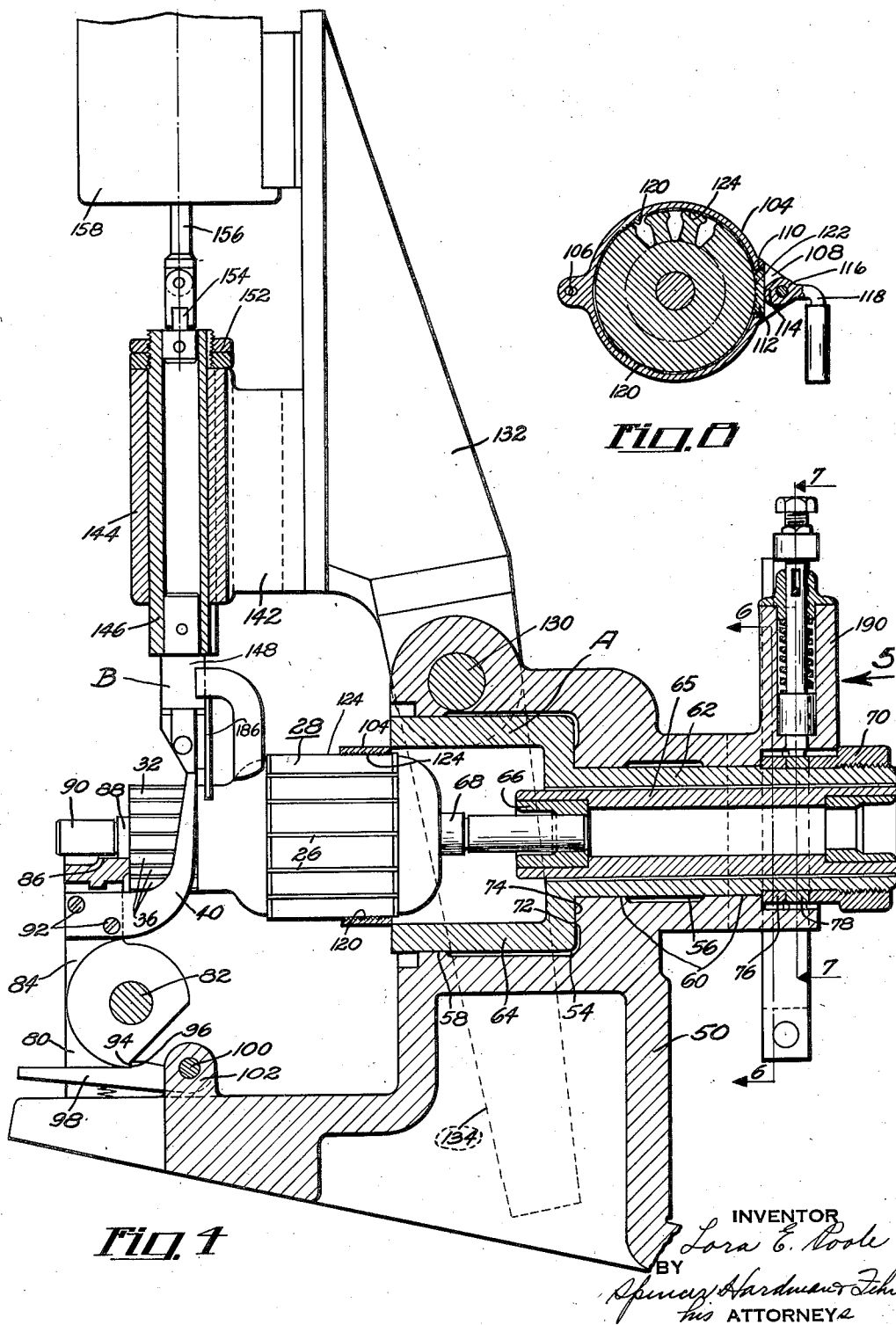
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COIL LEAD STAKING DEVICE

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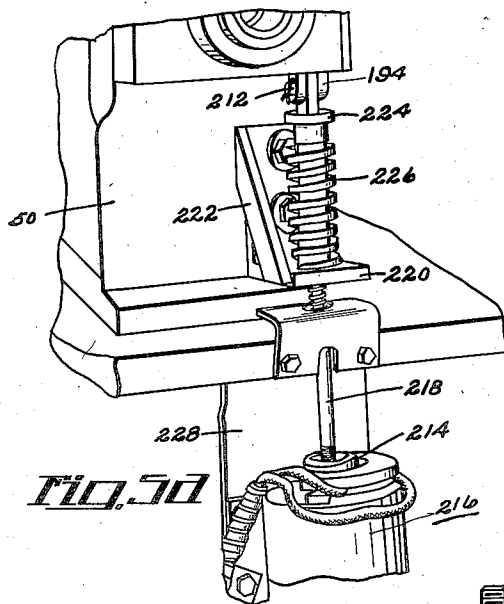
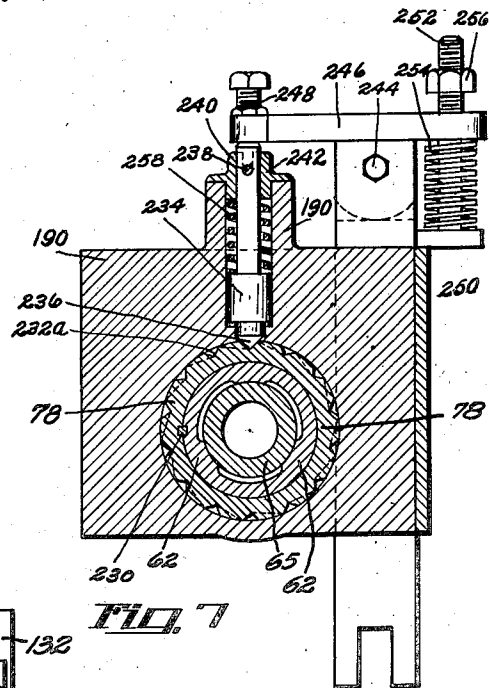
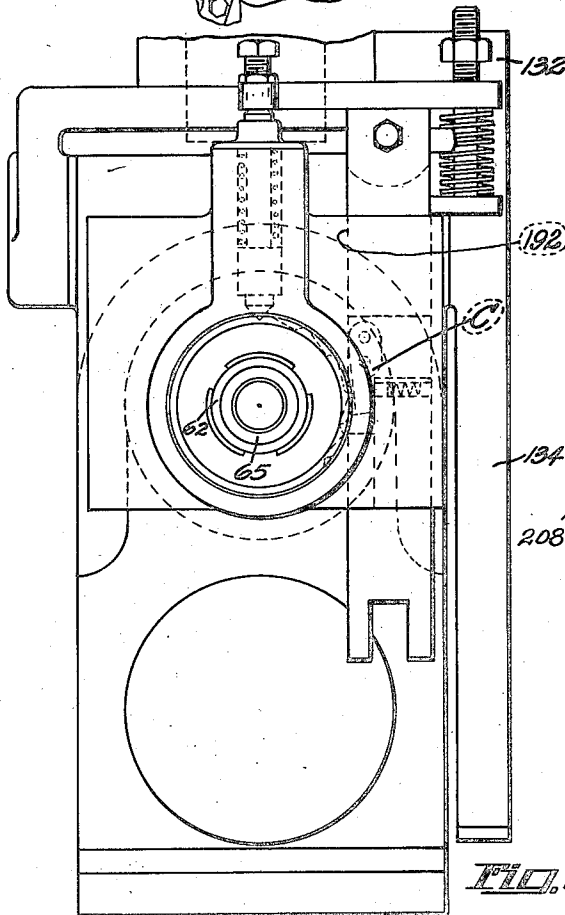
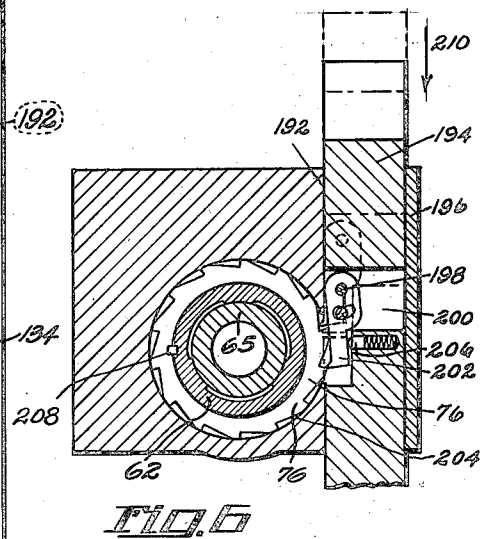
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COIL LEAD STAKING DEVICE

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4 Sheets-Sheet 4



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2,056,534

UNITED STATES PATENT OFFICE

2,056,534

50 which, as shown in Fig. 1, is mounted on a supporting bed or table 52. Carried by frame 50 are the various elements and devices of the machine such as workholder A, the staking device B and the indexing device C. Frame 50 is provided with two annular recesses 54 and 56 providing bearing surfaces 58 and 60, respectively, for a sleeve 62, having a cup-shaped end 64 which is adapted to receive part of an armature 28. Press-fitted into sleeve 62 is another sleeve 65, one end of which is provided with a bushing 66, adapted to receive one end of the armature shaft 68. Sleeve 62 is retained within frame 50 by means of a nut 70 threadedly received by one end of sleeve 62 and normally retaining the shoulder 72 thereof in engagement with the annular surface 74 of frame 50 by intermediation of an indexing ratchet 76 and a notched ring member 78, both on sleeve 62. As best shown in Fig. 3, frame 50 is provided with two spaced bearing lugs 80 which pivotally receive at 82 a bearing block 84, having a semi-cylindrical bearing surface 86 on which rests an enlarged cylindrical portion 88 of the armature shaft so that the proper bearing end 90 thereof is not in the least damaged by pressure exertion caused by a stacking and cutting operation which takes place close to said bearing end 90. The earlier described pilot 40 is attached by a plurality of screws 92 to the bearing block 84. As best shown in Fig. 4 the greater mass of the bearing block is above and to one side of the pivot support 82 so that the bearing block has a tendency to gravitate into the position shown in Fig. 1. In order to retain the bearing block 84 in bearing position as shown in Fig. 4, the same is provided with a shoulder 94 with which cooperates the shoulder 96 of a spring urged lever 98 which is pivotally mounted at 100 to a depending lug 102 of frame 50. After all top leads 20 of an armature have been staked into their respective commutator slots 38, the operator merely depresses lever 98 whereupon the bearing block 84 gravitates from the position shown in Fig. 4 to that shown in Fig. 1, thereby permitting the ready removal of the assembled armature from the workholder.

It may be stated in advance that the sleeve 62 is indexed wherefore the armature 28, in order to be indexed, must be clamped to said sleeve 62. As best shown in Fig. 8 a clamping ring 104 of sheet metal is floatingly pivotally mounted at 106 to the cup-shaped end 64 of sleeve 62. This clamping ring 104 is also provided with two spaced lugs 108 diagonally opposite the floating pivot support 106 and receives in a peripheral slot 110 intermediate the two lugs 108 a movable jaw 112 which cooperates with an eccentric 114, pivoted at 116 to the lugs 108, the pivot connection extending into the cup-shaped end 64 of sleeve 62 thereby establishing a second pivotal support for the clamping ring 104. Integral with the eccentric 114 is an operating lever 118. The clamping ring 104 is provided with a plurality of angularly spaced, internal serrated portions 120 and the jaw 112 is similarly serrated, so that upon manual rotation of the eccentric 114 clockwise as viewed in Fig. 8 into the position shown therein, the serrated internal portions 120 of the clamping ring and the serrated face 122 of jaw 112 grip the periphery 124 of armature 28 thereby clamping the latter to the intermittently rotated sleeve 62. It is obvious that the clamping ring 124 is sufficiently floatingly supported

so as not to exert unequal radial pressures against the periphery of the armature 28. It has been explained earlier that the operator, before clamping a new armature to the sleeve 62, aligns one of the commutator slots 38 with the face 42 of the pilot 40. Since all of the commutator slots are equi-angularly spaced and since the sleeve 62 is indexed an angular distance equal to that between consecutive commutator slots, it follows that with each indexing of the armature a new commutator slot aligns with the face 42 of pilot 40.

Staking device B and cutting knife D

Referring particularly to Figs. 2, 3 and 4, frame 50 pivotally supports at 130 a pedestal 132, having a depending arm 134 which is secured to frame 50 by means of a bolt 136 so as to prevent rocking of the pedestal on its pivot support 130. Mounted on pedestal 132 by a plurality of bolts 138 is a bearing 140, consisting of two halves 142 and 144, in which is slidable a cylindrical sleeve 146, carrying at its lower end a block 148 of the shape shown more particularly in Figs. 2 and 3. A plurality of nuts 152, threaded over the opposite end of sleeve 146, serve as a stop means against vertical downward movement of the sleeve beyond the position shown in Fig. 4. Connected to sleeve 146 by a clevis 154 is the core 156 of a solenoid 158 which is attached in any suitable manner to pedestal 132. The solenoid core 156 extends considerably into a shell 160 and is provided at the top with a collar 162 against which bears one end of a compressed spring 164 (see Fig. 10), the opposite end of said spring bearing against the top of the solenoid 158 so that the solenoid core 156, sleeve 146 and block 148 are normally retained in the inoperative position shown in Figs. 1 or 2. Upon energization of the solenoid 158, the solenoid core 156 and the parts connected therewith are moved into the position shown in Figs. 3 or 4, during which movement a staking blade 166, secured to block 148, engages and moves a top-lead 20, held by the operator against the guiding face 42 of pilot 40, along this guiding face 42 and into the aligned commutator slot 38. During such movement of block 148, a knife 168 also approaches and severs a length of a previously staked coil lead which protrudes from a commutator slot. This knife 168 is received in a rectangular groove 172 of block 148 and retained therein in properly adjusted position by means of a plurality of set screws 174 and 176, set screws 174 engaging a side surface and set screw 176 engaging the top surface 178 of the cutting knife 168.

It appears from Fig. 2 that the leads 20 to be staked by this machine are displaced by the operator toward the left as viewed in Fig. 2 and with respect to the armature grooves 26 from which they emerge. In order firmly to pack the angularly displaced leads against the underlying coil leads, block 148 receives in a groove 180 a packing bar 182 which is retained therein by a plurality of screws 184. As best shown in Fig. 9, this packing bar 182 firmly packs that portion of a lead 20 which is closest to the armature core. Attached in any suitable manner to block 148 adjacent the commutator of the armature is a packing blade 186, having a V-shaped surface 188 (see Fig. 1) which is adapted during a work stroke of block 148 firmly to pack those portions of the top leads 20 which are ad-

jacent the commutator against the earlier staked bottom leads.

Indexing device C

Referring more particularly to Figs. 4 to 7 inclusive, frame 50 is provided with an extension 190, providing a rectangular groove 192 in which is received a vertically slidable bar 194, retained in said groove by a cover plate 196. Piv-
otally mounted at 198 within a recess 200 of bar 194 is a pawl 202 which is in alignment with the earlier mentioned indexing ratchet 76 and urged into engagement with the teeth 204 thereof by a spring urged plunger 206. As best shown in Fig. 6, the indexing ratchet 76 is keyed to the sleeve 62 as at 208. It appears from Fig. 6 that during movement of bar 194 in the direction of arrow 210, the ratchet disc 76 and the parts connected therewith will be indexed an angular distance equal to that between consecutive teeth 204 of said ratchet disc. As best shown in Fig. 5a, bar 194 is pivotally connected at 212 to the core 214 of a solenoid 216 by means of a rod 218. This rod 218 passes through the base portion 220 of a bracket 222 which is secured in any suitable manner to frame 50. Interposed between a collar 224 of rod 218 and the base portion 220 of bracket 222 is a compression spring 226 which normally urges bar 194 into the dot-and-dash position disclosed in Fig. 6. The solenoid 216 is secured to an angle 228 which in turn is mounted in any suitable manner on table 52. Energization of solenoid 216 results in movement of solenoid core 214 and bar 194 in the direction of arrow 210 in Fig. 6, against the tendency of spring 226, whereby the pawl 202 indexes the ratchet disc and therewith the armature 28 which is clamped to sleeve 62.

Since the bar 194 travels very rapidly in the indexing direction, under the influence of the energized solenoid the ratchet disc 204 gains such momentum as to have a tendency to over-travel its assigned indexing movement. In order to prevent such over-travel of the ratchet disc and therewith of the armature assembly in the workholder A, the earlier mentioned ring member 78 is keyed at 230 to the sleeve 62. This ring member 78 is provided with as many equi-
angularly spaced, V-shaped peripheral notches 232a as the ratchet disc 76 has teeth 204. Received by the frame extension 190 is a spring pressed plunger 234 which has a V-shaped end 236, adapted to register with the notches 232a. In order to prevent rotation of the plunger end 236 relative to the notches 232 of ring member 78, the plunger carries a pin 238 the projecting ends of which are received in diametrically opposite longitudinal slots 240 of a spring retainer 242 which is secured to the frame extension 190 in any suitable manner. Bar 194 pivotally supports at 244 an arm 246, one end of which receives an adjustable set screw in axial alignment with the plunger 234. Interposed between the opposite end of arm 246 and a depending plate 250 which is secured to the frame extension 190, and surrounding a bolt 252, extending from said plate 250, is a compressed spring 254 which normally tends to rock arm 246 counter-clockwise as viewed in Fig. 7 into engagement with a stop nut 256 which is received by the bolt 252. It is obvious that during the rapid indexing movement of bar 194 the set screw 248 of arm 246 engages the plunger 234 whereby said arm is rocked clockwise as viewed in Fig. 7 and the spring 254 is further compressed. Such increasing compression of spring 254 is transmit-

ted to the plunger 234 in support of compression spring 258 which directly urges the plunger 234 into registry with the notch 232a after a completed indexing operation and effectively resists the tendency of the ratchet disc to over-travel. Upon de-energization of the solenoid 216, spring 226 returns bar 194 into the position shown in Fig. 5a in which the arm 246 is clearly out of engagement with plunger 234 and instead is in engagement with the stop nut 256. Incidentally the ratchet 76 has the same number of teeth 204 as the commutator has bars.

Control of machine

Once an armature has been properly located by the operator in the machine; the two solenoids 158 and 216 operate the machine until all coil leads 20 have been staked into the commutator slots. Referring particularly to Fig. 10, there will now be described the switch arrangement by which the energization of the two mentioned solenoids is effected. The solenoids 158, 216 are connectible across a D. C. power line 264, 266 through an interlocking magnetic switch 270 having a movable switch element 272 which is normally held in the open position shown in Fig. 10 by any suitable spring means (not shown). A control circuit, connected across the D. C. line 264, 266, includes a normally open push-button switch 274 and a holding coil 276. Upon closing of switch 274 by the operator, the holding coil 276 is energized and causes movement of switch element 272 into closing engagement with the contacts 278 of switch 270 whereby the solenoid 158 is energized and a staking operation takes place. Another control circuit, connected also across the D. C. line 264, 266, includes a normally open push button switch 280 and a holding coil 282. Upon closing of switch 280 by the operator, the holding coil 282 is energized and causes movement of switch element 272 into closing engagement with the contacts 284 of switch 270 whereby the solenoid 216 is energized and an indexing operation takes place. In order to prevent arc formation between the breaking contacts of switch 270, condensers 286 are provided in the manner indicated in Fig. 10. As shown in Fig. 1, the two switches 274, 280 are mounted in any conventional switch box 290, whereas the magnetic switch 270 (not shown) may be located underneath the table 52.

It is obvious from the foregoing description that with the switch arrangement disclosed, the operator cannot cause the simultaneous operation of the staking device and the indexing device, even though he accidentally actuates both switches 274, 280 at the same time.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

I claim:

1. In a staking device, the combination of a rotatable support receiving one end of the shaft of an armature assembly including armature core, coils and a slotted commutator; a relatively stationary member for rotatably supporting the other end of the armature shaft; means engageable with the armature core for coupling the armature to said rotatable support; and means for staking an armature coil lead into a commutator slot.

2. In a staking device, the combination of a rotatable support receiving one end of the shaft

of an armature assembly including armature coils and a slotted commutator; a relatively stationary member for rotatably supporting the other end of the armature shaft; means for coupling the armature to said rotatable support; means for staking an armature coil lead into a commutator slot; and means for indexing the rotatable support to bring successive commutator slots into alignment with the staking means.

3. In a staking device, the combination of means including a member rotatable about the axis of the shaft of an armature assembly including armature coils and a slotted commutator to support said assembly for unitary rotation with the member; means providing a face against which an armature coil lead is held, said face extending in close proximity to the commutator periphery; means for moving the lead along said face and into an aligned commutator slot; and means for indexing the member to align consecutive commutator slots with said face.

4. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator; means guiding an armature coil lead into an aligned commutator slot; and yielding means for moving the coil lead along said guiding means and into the aligned commutator slot.

5. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator; means providing a face against which an armature coil lead is held, said face extending in close proximity to the commutator periphery; a blade movable on said face and into an aligned commutator slot to force the lead on said face into said slot; and means for yieldingly moving the blade toward the commutator.

6. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator; means providing a face against which an armature coil lead is held, said face extending in close proximity to the commutator periphery; a blade movable on said face and into an aligned commutator slot to force the lead on said face into said slot; and a solenoid for yieldingly moving the blade toward the commutator.

7. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator; and means for simultaneously staking an armature coil lead into a commutator slot and severing the end of a previously staked coil lead which protrudes from another commutator slot.

8. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator; means guiding a coil lead into a commutator slot; and means for simultaneously moving a coil lead along said guiding means and into an aligned commutator slot and severing the end of a previously staked coil lead which protrudes from another commutator slot.

9. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator; means guiding an armature coil lead into a commutator slot; a reciprocable member; a blade on said member for moving a coil lead along said guiding means and into an aligned commutator slot; and means on said

member cooperating with the periphery of the commutator for severing the end of a previously staked coil lead which protrudes from another commutator slot.

10. In a staking device, the combination with coil lead staking means, of a rotatable support receiving one end of the shaft of an armature assembly which includes armature coils and a slotted commutator; a pivotally mounted member for rotatably supporting the other end of the armature shaft, said member normally gravitating into non-supporting position in which the armature assembly may be longitudinally removed from the support; and a manually releasable latch normally retaining the member in supporting position.

11. In a staking device, the combination of a rotatable support receiving one end of the shaft of an armature assembly which includes armature coils and a slotted commutator; a pivotally mounted member for rotatably supporting the other end of the armature shaft, said member normally gravitating into non-supporting position in which the armature assembly may be longitudinally removed from the support; a manually releasable latch normally retaining the member in supporting position; and means for simultaneously staking an armature coil lead into a commutator slot and severing the end of a previously staked coil lead which protrudes from another commutator slot.

12. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator, said means including a pivotally mounted member for rotatably supporting one end of the armature shaft, said member normally gravitating into non-supporting position in which the armature assembly may be longitudinally removed from the supporting means; means carried by said member to guide a coil lead into a commutator slot when said member is in supporting position; a manually releasable latch normally retaining the member in supporting position; and means for moving a coil lead along said guiding means and into an aligned commutator slot.

13. In a staking device, the combination of a rotatable support receiving one end of the shaft of an armature assembly which includes armature coils and a slotted commutator; a pivotally mounted member for rotatably supporting the other end of the armature shaft, said member normally gravitating into non-supporting position in which the armature assembly may be longitudinally removed from the support; means carried by said member and providing a face against which an armature coil lead is held and which in the supporting position of the member extends in close proximity to the commutator periphery; a manually releasable latch normally retaining the member in supporting position; and means for moving a coil lead along said face and into an aligned commutator slot.

14. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator, said means including an element rotatable coaxially of the armature assembly; means for coupling the armature assembly to said element for unitary rotation; a ratchet on said element; a reciprocable pawl for indexing the ratchet; means for staking a coil lead into a commutator slot; and solenoids for recipro-

cating the pawl and for operating the staking means.

15. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator, said means including an element rotatable coaxially of the armature assembly; means for coupling the armature assembly to said element for unitary rotation; means for staking an armature coil lead into a commutator slot; a ratchet on said element; a reciprocable pawl for indexing the ratchet; solenoids for reciprocating the pawl and for operating the staking means; and a manually operable control instrumentality permitting the energization of only one solenoid at one time.

16. In a staking device, the combination of means rotatably supporting an armature assembly including armature coils and a slotted commutator; and a reciprocable member carrying means for staking a coil lead into a commutator slot, and means for forcing a portion of said coil lead adjacent the commutator below its periphery and another portion of said coil lead adjacent the armature core below its periphery.

17. In a staking device, the combination of means rotatably supporting an armature assembly including armature coils and a slotted commutator; and a reciprocable member carrying means for staking a coil lead into a commutator slot, means for severing the end of a previously staked coil lead which protrudes from another commutator slot, and means for forcing a portion of said one coil lead adjacent the commutator below its periphery and another portion of said one coil lead adjacent the armature core below its periphery.

18. In a staking device, the combination of means rotatably supporting an armature assembly including armature coils and a slotted commutator; a reciprocable member carrying means for staking a coil lead into a commutator slot, means for severing the end of a previously staked coil lead which protrudes from another commutator slot, and means for forcing a portion of said one coil lead adjacent the commutator below its periphery and another portion of said one coil lead adjacent the armature core below its periphery; and a solenoid for reciprocating the members.

19. In a staking device, the combination with means for rotatably supporting an armature assembly including armature coils and a slotted commutator, of means providing a face terminating in a corner and extending in close proximity to the commutator periphery, a coil lead being forced into engagement with said face by drawing the lead over said corner and the face guiding the lead into an aligned commutator slot upon movement of said lead along said face.

20. In a staking device, the combination with means for rotatably supporting an armature assembly including armature coils and a slotted commutator, of means providing a face terminating in a corner and extending radially of the commutator and in close proximity to the periphery thereof, a coil lead being forced into engagement with said face by drawing the lead over said corner and the face guiding the lead into an aligned commutator slot upon movement of said lead along said face.

21. In a staking device, the combination with means for rotatably supporting an armature assembly including armature coils and a slotted commutator, of means providing a face terminat-

ing in a corner and extending in close proximity to the commutator periphery, a coil lead being forced into engagement with said face by drawing the lead over said corner; and means for moving the coil lead along said face and into an aligned commutator slot.

22. In a staking device, the combination with means for rotatably supporting an armature assembly including armature coils and a slotted commutator, of means providing a face terminating in a corner and extending radially of the commutator and in close proximity to the periphery thereof, a coil lead being forced into engagement with said face by drawing the lead over said corner; and a blade movable on said face for forcing the lead thereon into an aligned commutator slot.

23. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator; means providing a face extending in close proximity to the commutator periphery; and yielding means for moving along the face and into an aligned commutator slot a coil lead held against said face.

24. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator; means for simultaneously staking an armature coil lead into a commutator slot and severing the end of a previously staked coil lead which protrudes from another commutator slot; and means for indexing the armature assembly.

25. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator; means guiding an armature coil lead into a commutator slot; a reciprocable member; a blade on said member for moving a coil lead along said guiding means and into an aligned commutator slot; means on said member cooperating with the periphery of the commutator for severing the end of a previously staked coil lead which protrudes from another commutator slot; and yielding means for moving the member toward the commutator.

26. In a staking device, the combination of a rotatable support receiving one end of the shaft of an armature assembly which includes armature coils and a slotted commutator; a pivotally mounted member for rotatably supporting the other end of the armature shaft, said member normally gravitating into non-supporting position in which the armature assembly may be longitudinally removed from the support; a manually releasable latch normally retaining the member in supporting position; means for coupling the armature assembly to the support; means for staking a coil lead into a commutator slot; and means for indexing the support.

27. In a staking device, the combination of a rotatable support receiving one end of the shaft of an armature assembly which includes armature coils and a slotted commutator; a pivotally mounted member for rotatably supporting the other end of the armature shaft, said member normally gravitating into non-supporting position in which the armature assembly may be longitudinally removed from the support; a manually releasable latch normally retaining the member in supporting position; means for simultaneously staking an armature coil lead into a commutator slot and severing the end of a

previously staked coil lead which protrudes from another commutator slot; means for coupling the armature assembly to the support; and means for indexing the support.

- 5 28. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator, said means including an element
10 rotatable coaxially of the armature assembly; means for coupling the armature assembly to said element for unitary rotation; a ratchet on said element; a reciprocable pawl for indexing

the ratchet; and means for staking a coil lead into a commutator slot.

29. In a staking device, the combination of means for rotatably supporting an armature assembly including armature coils and a slotted commutator, said means including an element rotatable coaxially of the armature assembly; means for coupling the armature assembly to said element for unitary rotation; a ratchet on said element; a reciprocable pawl for indexing the ratchet; means for staking a coil lead into a commutator slot; and a solenoid for reciprocating the pawl.
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