

Aug. 8, 1967

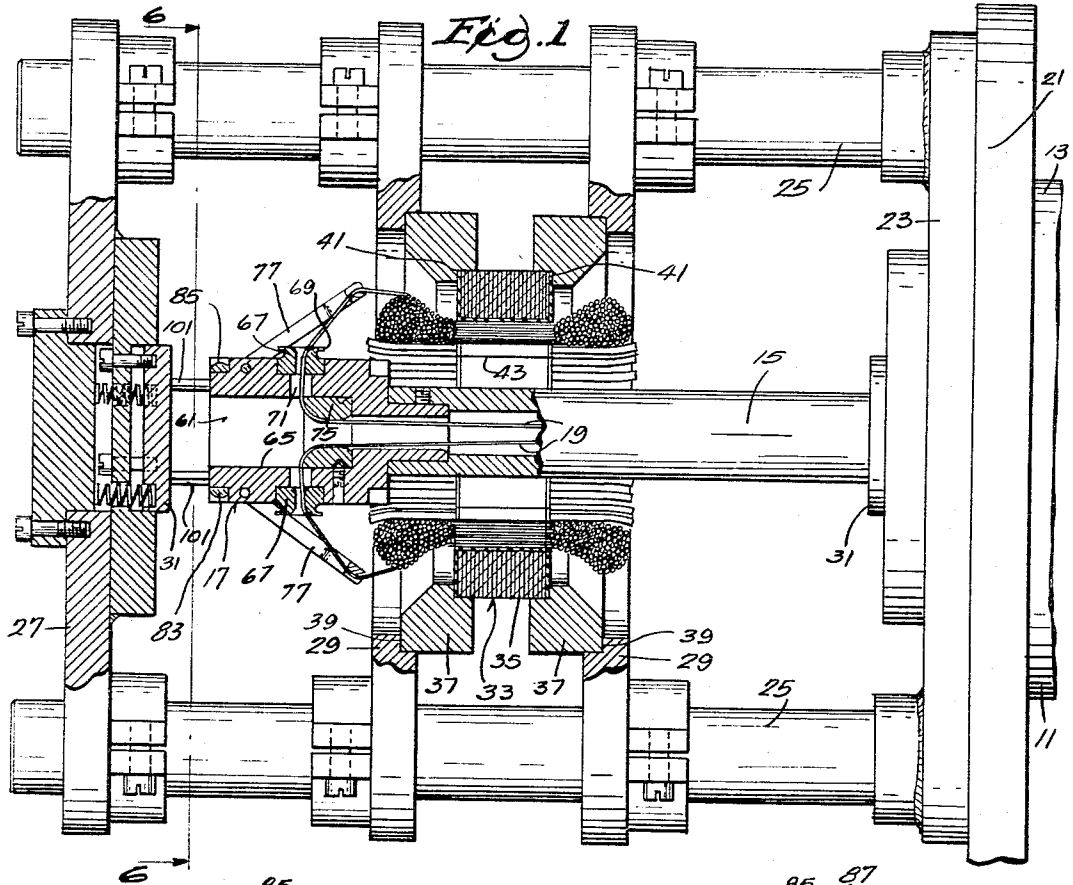
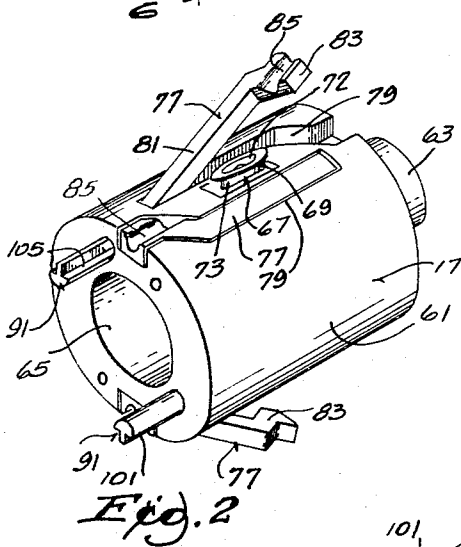
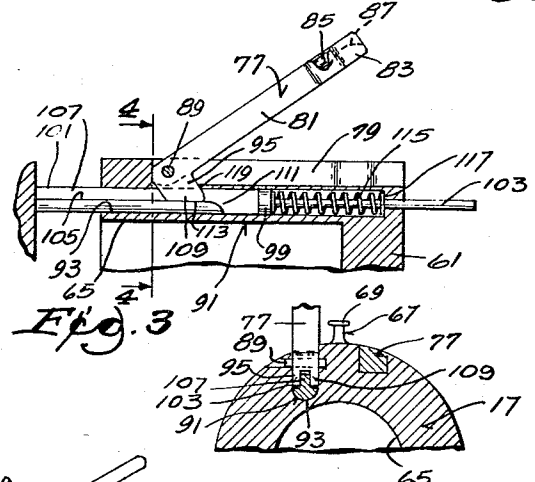
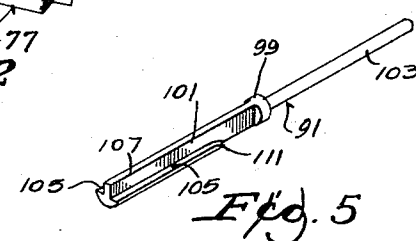
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3,334,825

STATOR COIL WINDING MACHINE

Filed Jan. 27, 1964

3 Sheets-Sheet 1



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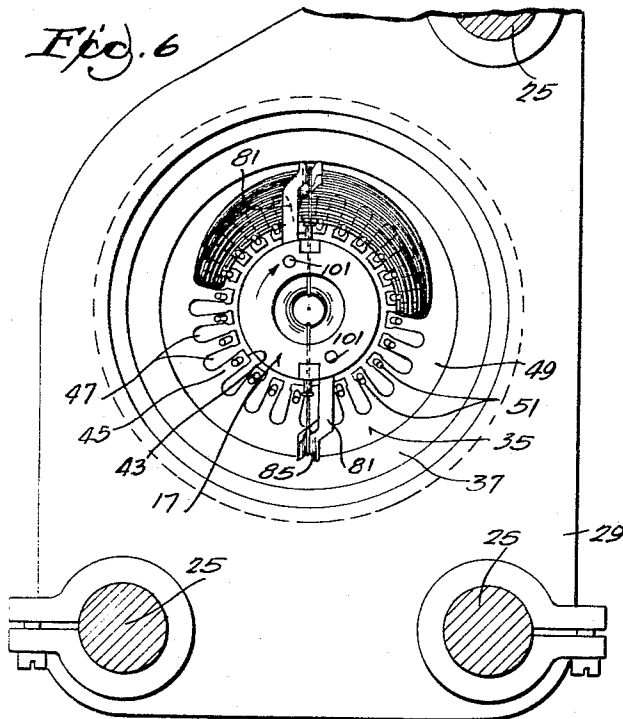
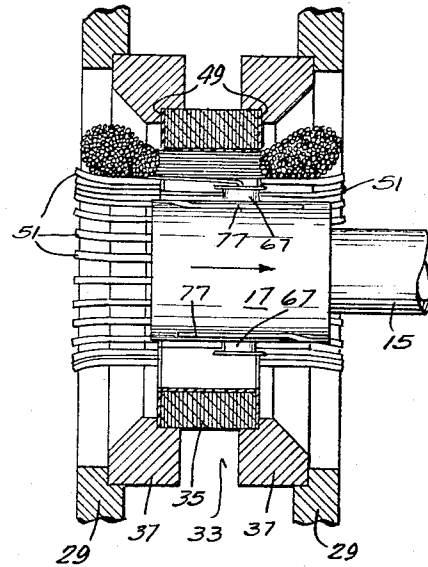
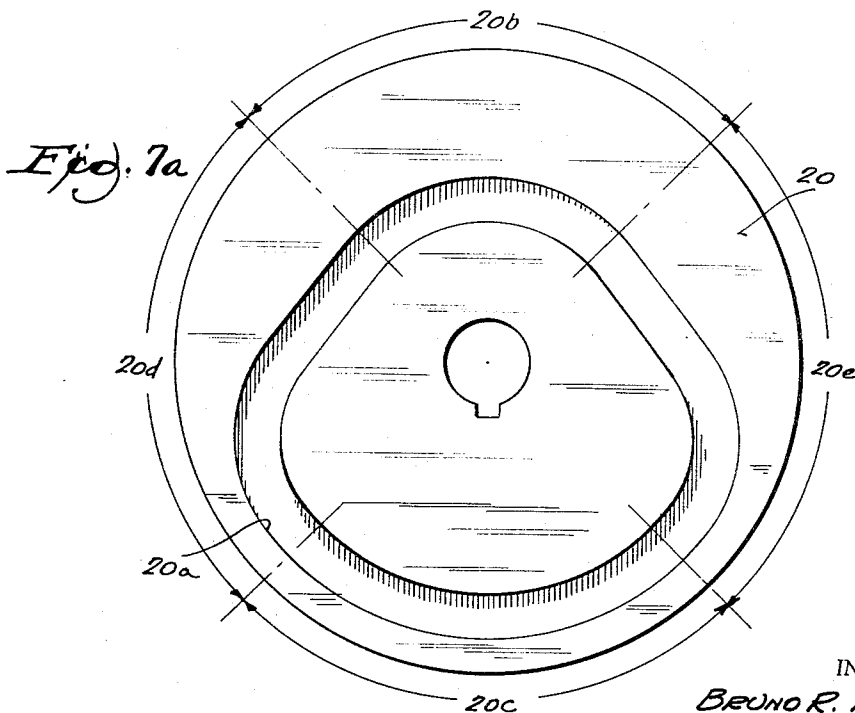


Fig. 7



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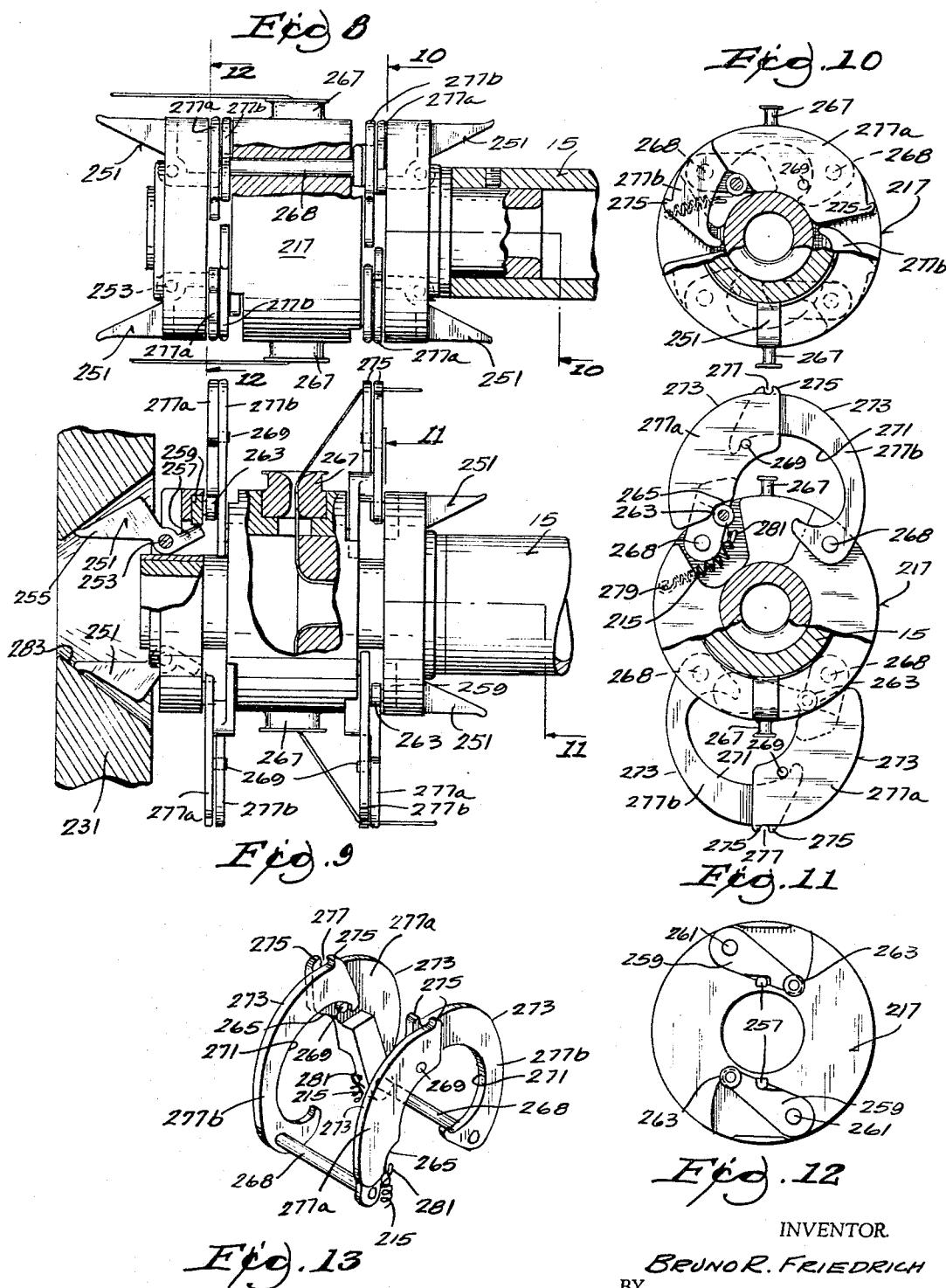
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3 Sheets-Sheet 3



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STATOR COIL WINDING MACHINE

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10 Claims. (Cl. 242—1.1)

The invention relates generally to winding heads. More particularly, the invention relates to winding heads for stator winding machines, such as for example, the winding machine disclosed in the Gorski et al. Patent 3,052,418.

The invention provides a novel winding head which is adapted to be reciprocated through the bore of a stator for winding coils thereon. The head includes a main body having movably mounted thereon one or more lift levers, each including a wire guide movable relative to a retracted position adjacent to the main body. Also carried by the main body is means for displacing the wire guide in response to reciprocation of the winding head. The invention also provides for the combination of such a winding head, together with associated tooling, and a winding machine which supports such tooling and which includes a reciprocable shuttle carrying the head.

In a preferred embodiment, the winding head includes, for each needle, a pair of pivotally carried lift levers which extend in opposite directions from each other. At their outer ends, the lift levers include wire guides movable in a plane which extends radially of the axis of head reciprocation and which includes the eye of the associated needle. Preferably, the wire guides are carried on lift lever portions which are offset with respect to the lift lever part which is pivotally mounted to the main body.

Carried in the body for each lift lever is a projecting actuating rod which, incident to movement inwardly of the body, serves to pivot the wire guide outwardly from its retracted position. Spring means are employed to bias the lift levers for movement of their wire guides to their retracted positions and to bias the actuating rods into outwardly projecting relation to the body. The rods are actuated to effect outward movement of the wire guides in response to reciprocation of the winding head and engagement by the rods with associated tooling. Such tooling takes the form of a pair of spaced abutments or plates engageable by the respective actuating rods in response to approach of the winding head toward the respective abutments. Preferably, the abutments are adjustably mounted on the winding machine.

Other objects and advantages of the invention will become known by reference to the following description and the accompanying drawings of two embodiments.

In the drawings:

FIGURE 1 is a side elevational view, partially broken away and in section, of a stator winding arrangement incorporating a winding head in accordance with the invention;

FIGURE 2 is a perspective view of the head shown in FIGURE 1;

FIGURE 3 is a fragmentary sectional view of the head shown in FIGURE 2;

FIGURE 4 is a fragmentary sectional view taken along line 4—4 of FIGURE 3;

FIGURE 5 is a perspective view of one of the components of the winding head;

FIGURE 6 is a sectional view taken along line 6—6 of FIGURE 1;

FIGURE 7 is a fragmentary view similar to FIGURE 1, illustrating passage of the head through the stator;

FIGURE 7a is a plan view of a movement controlling cam employed in the machine;

FIGURE 8 is a side elevational view, partially broken

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away and in section, of another embodiment of the winding head in accordance with the invention;

FIGURE 9 is a view similar to FIGURE 8 showing the winding head engaged with one of the abutment plates and the lift levers in their elevated positions;

FIGURE 10 is a sectional view taken along line 10—10 of FIGURE 8;

FIGURE 11 is a sectional view taken along line 11—11 of FIGURE 9;

FIGURE 12 is a sectional view taken along line 12—12 of FIGURE 8; and

FIGURE 13 is a perspective view of a pair of lift lever assemblies incorporated in the head shown in FIGURES 8 and 9.

Shown fragmentarily in FIGURE 1 is a coil winding machine 11 of the type shown generally in the Gorski et al. Patent 3,052,418, which machine includes a frame or support 13 carrying a shuttle 15 and means for reciprocating the shuttle along, and oscillating the shuttle about, a common axis. Carried by the shuttle 15 at its free or outer end is a winding head 17. As is common in this type of coil winding machine, the shuttle 15 is hollow to afford passage therethrough of wire, indicated at 19, which is laid in coils by the winding head.

Also included in the machine is means for completing each reciprocatory stroke before commencing the succeeding oscillatory movement, and for completing each oscillatory movement before commencing each succeeding reciprocatory stroke. In the disclosed construction, such means takes the form of a cam 20 seen best in FIGURE 7a. The cam 20 is carried in the machine 11 in the same manner as the cam 47 in the machine shown in the Gorski et al. Patent 3,052,418 in FIGURE 8 thereof and operates in like manner to the last mentioned cam to effect shuttle reciprocation and shuttle oscillation.

More particularly, the cam 20 includes a cam slot 20a which receives followers similar to the followers 49 and 85 shown in the Gorski et al. Patent 3,052,418. The cam slot 20a includes diametrically opposed 90 degree segments 20b and 20c, each respectively having a common radius of different length, and opposed connecting segments 20d and 20e which effect the oscillatory and reciprocatory movement.

The resulting shuttle movement which may be referred to as a square or rectangular movement, in co-operation with the winding head still to be described, advantageously provides for a symmetrical coil shape employing less wire and serves to stress the wire to a lesser extent, thereby affording greater control over the resulting wire resistance and permitting a saving in the amount of copper.

Also incorporated in the coil winding machine 11 is a face plate 21 which is apertured for passage therethrough of the shuttle 15 and which supports a mounting plate 23 which is also apertured for shuttle passage. Fixed to the mounting plate 23 are a plurality (three in the disclosed construction) of spaced supporting rods 25. If desired, the supporting rods 25 could extend from the face plate 21, with the mounting plate being adjustably carried on the rods 25.

Carried on the supporting rods 25 by means affording adjustable positioning is a second mounting plate 27 and a pair of stator assembly holding plates 29 located between the mounting plates 23 and 27. Yieldably supported on the mounting plates 23 and 27 are abutment plates 31, which co-operate with the winding head 17, as will be described, to effect coil winding operation.

The holding plates 29 are adapted to hold a stator assembly 33 comprising a stator 35 and a pair of stator clamps 37. The holding plates 29 are each generally identical except for being left and right handed, are

each centrally apertured, and are respectively provided with facing seats or shoulders 39 along the aperture peripheries for receiving the stator assembly 33.

The stator clamps 37 are formed to be received in the holding plates 29, are centrally apertured, and are respectively provided with facing seats or shoulders 41 along their aperture peripheries to receive the stator 35 to be wound. Various means can be employed to maintain the stator clamps 37 and stator 33 in assembled relation and to retain the stator assembly holding plates 29 in adjusted position on the rods 25 to afford releasable support of the stator assembly.

The stator 35 to be wound conventionally includes a series of laminae which are assembled in registry with each other. In addition, the stator includes a central bore 43 (see especially FIGURE 6) bounded in part by a series of fingers 45 which are defined by a series of slots 47 extending radially outwardly from the bore 43. The wire coils are laid, in part, in the slots 47, and, in part, in arcuate form between the ends of the slots, and clear of the bore 43.

Means are also provided for forming the arcuate portion of the coils between the slots and for retaining such arcuate portions clear of the bore. Such means can include, as shown in FIGURES 1, 6, and 7, annular guide rings 49 which form a part of the assembled stator 35 and which include projections 51 as disclosed in application Ser. No. 326,896, now abandoned. Alternatively, the stator clamps 37 can incorporate fingers or projections around which the arcuate coil portions are laid.

The winding head 17 includes a main part 61 and an extending hub 63 which is fixed by suitable means to the free end of the shuttle 15. Extending through the main part and through the hub is a main bore 65 which communicates with the hollow interior of the shuttle 15. Mounted on the main part 61 of the winding head 17 are one or more needles 67 which are elongated in the direction of shuttle reciprocation, and which are adapted for travel through the stator slots 47 during winding head travel in response to shuttle reciprocation. Each of the needles 67 includes a flanged eye 69 (see FIGURE 2) in communication with an aperture 71 in the head 17 (see FIGURE 1) communicating with a main bore 65, whereby wire can be played out of the eye 69 of the needle 67 from the shuttle 15.

In order to avoid sharp bending of the wire, the needle eye 67 includes a mouth 72 which has an elliptical opening and a convex transition part 73 joining the elliptical opening and the aperture 71. Also included in the head 17 within the main bore 65, is an annular wire guide 75 having a convex formation to afford gradual change in direction of the wire travel from the shuttle 15 to the needle 67.

Associated with each needle 67 are a pair of opposed lift levers 77 which are normally received in respective recesses 79 (see FIGURE 2) in the head 17, and which include wire guide means serving, when the head 17 has emerged from the stator 35, to lift the wire radially outwardly for disposition radially outwardly of the before-mentioned guides or projections 51.

More specifically, the lift levers 77 are each generally identical, each lever including a main elongated portion or stem 81 and a portion 83 at the outer end which is bodily offset from the stem 81 to permit travel between the guides or projections 51. This feature has the advantage of permitting lifting of the levers 77 for movement between the projections 51 prior to travel of the head beyond the ends of the projections 51, thereby shortening the stroke of the head and permitting more rapid winding action. The offset portion 83 includes the before-mentioned wire guide means which is located in the radial plane of the associated needle 67 and comprises a trough 85 which has a convexly shaped wire guiding surface 87 to afford gradual change in direction

of wire travel. Avoidance of sharp changes in wire direction reduces to a minimum any possibility of insulation fracture or removal, decreases work hardening, and lessens stretch, thereby minimizing resistance increases and variance in resistance before and after winding. The wire guiding means also serves to prevent wire from being drawn from the needle in a transverse direction because such transverse bending takes place only at the outer end of the trough. As the radii which define the wire guiding surface at the outer end of the trough are generally of greater dimension than the radius which define the transverse surfaces at the mouth of the needle, there is less acute or sharp bending of wire with the disclosed arrangement as compared to prior coil winding arrangements. At their other ends, each stem 81 is supported by the pin 89 extending transversely of a radial plane, whereby the lift lever is radially outwardly pivotal relative to the head from a retracted position in its associated recess 79.

Means are provided for displacing each lift lever 77 from its retracted position to an extended or elevated position and for normally biasing the lift lever to its retracted position. More specifically, the lift lever displacing means includes, in addition to the before-mentioned abutment plates 31, a plunger or rod 91 (see FIGURES 2, 3, and 5) for each lift lever. The rods 91 are carried in respective guide bores 93 in the head for sliding movement relative to the head and parallel to the direction of head reciprocation. In addition, each lift lever 77 includes a bifurcated lug 95 (see FIGURE 3) extending from the stem 81 for co-operation with its associated plunger 91.

More specifically, as shown best in FIGURES 3 and 5, each plunger 91 includes a central piston part 99 and a pair of end segments 101 and 103. The end segments 101 each include a pair of shoulders 105 which are defined by an upstanding ridge 107 which passes between the legs 109 of the bifurcated lug 95. At their inner ends, the shoulders 105 terminate in camming surfaces 111 which, in turn, terminate in spaced relation from the piston part 99 to accommodate therebetween the legs 109 of the bifurcated lug 95. The legs 109 each include camming edges 113 (see FIGURE 3) which coact with the camming surfaces 111 and with the shoulders 105 so that, in response to movement of the plunger to the right, as shown in FIGURE 3, the associated lift lever 77 is pivoted out of its recess 79 and held in elevated position.

Movement of the plunger to the right, as shown in FIGURE 3, is provided by engagement of the end of the segment 101 with the adjacent abutment plate 31 after emergence of the head 17 from the stator bore 43 and as the head approaches one end of its reciprocatory movement or stroke.

The lift levers 77 are each biased to their retracted positions by a respective spring 115 (see FIGURE 3) which encircles a portion of the plunger segment 103 and which bears against the plunger piston part 99 and a stop 117 in the guide bore 93. Such confinement of the spring serves to displace the plunger 91 to the left, as seen in FIGURE 3, so as to engage the piston part 99 with the edges 119 of the legs 109 of the bifurcated lug 95 to thereby rock the associated lift lever 77 into its retracted position.

While the embodiment just disclosed utilizes a plunger to shift the lift lever, other arrangements including, but not limited to, direct engagement of a lift lever portion with a camming surface on the abutment plate, can be used.

In operation, the needle 67 travels through a selected one of the slots 47, playing out wire into the slot. After emergence of the needle from the slot, and after emergence of the head 17 from the stator bore 43, the segment 101 of the plunger 91 engages the adjacent one of the abutment plates 31 to cause plunger movement relative to the

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head in the direction of the stator 35, thereby causing the associated lift lever 77 to swing radially outwardly from its retracted position. Such lever movement picks up the wire 19 in the guide trough 85 and lifts the wire radially outwardly into position so that, in response to subsequent oscillation of the head, the wire will be laid radially outwardly of the guides or projections 51. During such oscillation, the plunger remains in engagement with the abutment plate 31, thereby insuring continued elevation of the lift lever 77.

When oscillation is completed, the head 17 again begins to travel toward the stator 35, thereby affording relative movement of the plunger 91 and the head 17 by action of the spring 115 until the lift lever 77 is returned to its retracted position. After retraction of the lift lever, the head 17 enters the stator 35 and the needle 67 enters in and travels through another one of the stator slots 47. The same sequence of events is then repeated at the other side of the stator in response to emergence of the winding head from the stator.

While the above description has been confined to one needle, a plurality of needles and associated pairs of lift lever mechanisms can be employed, thereby permitting the simultaneous winding of several coils, as when wiring a three phase alternator with one wire per phase. In addition, multiple coils can be simultaneously laid at differing radial distances from the stator bore by employment of abutment plates with separate tracks for the plungers which operate the various lift levers. Still further, the disclosed arrangement also permits lap as well as concentric winding, which feature has generally been heretofore unavailable. Moreover, the disclosed arrangement affords laying of the arcuate portions of the windings in either a clockwise or counterclockwise direction, as desired, and through any arc up to 360 degrees.

A further particularly significant advantage of the invention resides in the reduced stroke length of the head which is made possible because the head need only emerge from the stator sufficiently to avoid interference by the stator of lift lever movement. In prior arrangements, it was necessary for the head to advance beyond the outer ends of the projections or horns which served to guide the wire and form the coils in arcuate disposition between the slots. The reduced stroke length results in less wear on the equipment for each winding and in faster winding operation.

Another significant advantage of the invention resides in the ability of the disclosed arrangement to lay more coils in each slot. This advantage is principally achieved because radially outward movement of the lift levers serves initially to position the wire as far as possible toward the closed end or back of the slot before rotation of the head, and consequent arcuate displacement of the wire, takes place.

The disclosed arrangement can also be modified to vary the extent of pivotal lift lever elevation by formation of the mating camming surfaces as desired. In addition, the abutment plates can be located relative to the ends of the stroke of the head to afford less than the full amount of lift lever elevation. Thus, the amount of lift lever elevation can be controlled either by being built into the head or independently of the head. The disclosed arrangement can be utilized on any existing machinery having a reciprocable and oscillatable shuttle and provides increased winding speed by affording a reduced winding head stroke length. This latter feature is afforded because of the lift lever action which draws the wire radially outwardly immediately upon the emergence of the winding head from the stator. In addition, the disclosed arrangement permits the interchanging of various winding heads without otherwise requiring adjustment of the winding machine, and reduces operator time. Tooling costs, when using the disclosed arrangement, are also reduced because the tooling is generally simplified as compared to prior arrangements, particularly in that development of wire guiding horns or shoes, and the like, is necessary.

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In the embodiment shown in FIGURES 8 through 13, the winding head 217 is provided, at each end and for each needle 267, with a pair of lift levers 277a and 277b (see FIGURE 13) which operate, in co-ordination with each other and with a similar pair at the opposite end of the head, in response to head movement against either of a pair of abutment plates 231.

More specifically, each needle 267 has associated therewith, at each end of the head, a rocker cam 251 which is centrally supported about a pivot pin 253 extending normal to the axis of reciprocation. At its outer end, the rocker cam 251 includes an arm 255 which functions in co-operation with the adjacent abutment plate 231 in a manner still to be described. At its inner end, the rocker cam 251 includes a lug 257 (see FIGURE 9) which moves radially of the head 217 upon pivotal movement of the rocker cam 251. The lug 257 engages an intermediate portion of an actuating arm 259 (see FIGURES 9 and 12) which is pivoted at one end on a pin 261 extending parallel to the axis of reciprocation. At its other end, the actuating arm 259 carries a roller 263 which travels through a generally radially extending arc. The roller 263 engages a complementary cam surface 265 (see FIGURES 11 and 13) intermediate the ends of the adjacent lift lever 277a.

The lift lever 277a is, as shown best in FIGURES 11 and 13, an arcuate member which, at one end, is fixed to one end of a rock shaft 268 which is journaled within the head 217 in parallel relation to the axis of reciprocation. At its other end, the rock shaft 268 is fixed to a lift lever 277b which comprises one of the pair of lift levers at the other end of the head and which is also generally of arcuate form. The first-mentioned lift lever 277a is provided, adjacent its outer end, with a stud 269 which engages the inner periphery 271 of the adjacent lift lever 277b so that in response to outward swinging of the lift lever 277a from its retracted position, the adjacent lift lever 277b is also swung outwardly. As a consequence, and due to the connection of the lift levers at opposite ends of the head through the rock shaft 268, the lift levers at both ends are simultaneously elevated and retracted.

Each of the lift levers 277a and 277b respectively includes a smoothly arcuate, outer surface 273 which, when the lift levers are in their retracted positions, either conforms generally with or is disposed slightly below the outer surface of the head. At the outer end of the surface 273, each lift lever is provided with a hook or tab 275 which, when the lift levers are in their fully extended positions, provide an eye 277 adapted to guide the wire.

Each of the rock shafts 268 and its connected lift levers 277a and 277b comprise a lift lever assembly. Each lift lever assembly is biased toward a retracted position by means in the form of a tension spring 215 which extends between an anchoring stud 279 on the head 217 and a hook 281 extending from the lift lever 277a. As a consequence, each lift lever is urged toward its retracted position.

Co-operating with the head are a pair of abutment plates 231 which can be supported in the same manner as the abutment plates 31 and which respectively include conically shaped camming surfaces 283. As the head 217 approaches either of the abutment plates 231, the adjacent rocker cam or arm 255, depending upon the number of needles, is engaged by the camming surface 283 to effect displacement of the lift levers 277a and 277b outwardly from their retracted positions. During oscillation of the head, engagement between the rocker cam arms 255 and the camming surfaces 283 retains the lift levers in their extended positions. Upon head movement away from the abutment plates 231, the rocker cam arms 255 are disengaged from the camming surfaces 283 and the springs 215 act to restore the lift levers in their normal retracted positions. In the embodiment shown in FIGURES 8 through 13, the lift levers at both ends of the head are raised to their elevated or extended positions simultaneously when the head approaches either of the

abutment plates 231. However, only one pair of lift levers is effective at any one time to lift the wire radially outwardly due to the disposition of the wire in one direction only from the associated needle.

Various of the features of the invention are set forth in the following claims.

What is claimed is:

1. In a winding head adapted for linear reciprocation along and angular oscillation about a common axis, the combination of a body having therein a bore extending in the direction of said common axis, a needle carried by said body in radially spaced relation from said common axis, said needle having an eye communicating with said bore for passage therethrough of a wire, an elongated lift lever having a stem, a portion at one end bodily offset from said stem and including wire guiding means, and a lug adjacent the other end, means adjacent the other end of said lift lever for mounting said lift lever on said body for pivotal movement transverse to said common axis from a retracted position adjacent to said body with said stem disposed in adjacent relation to said needle and with said wire guiding means located in alignment with said needle in the direction of said axis, a plunger carried by said body for rectilinear sliding movement in the direction of said common axis, means on said plunger and on said lug for effecting pivotal movement of said lift lever in response to sliding movement of said plunger, and means biasing said plunger for normally projecting a part of said plunger outwardly of said body and for disposing said lift lever in its retracted position, whereby when said plunger part is moved inwardly of said body, said lift lever is pivoted from its retracted position.

2. The combination of a winding machine including a mounting plate having an abutment and a shuttle reciprocably and oscillatably movable relative to said abutment, a winding head mounted on said shuttle, said head including a body, a needle mounted on said body, a lift lever having means for guiding wire travel from said needle, means mounting said lift lever on said body for pivotal movement of said wire guiding means outwardly from said body and relative to said needle, said lift lever having a portion engageable with said wire when said lift lever is moved outwardly and disengageable from said wire when moved inwardly, means displaceable longitudinally for moving said lift lever outwardly, and means carrying said displaceable means on said body for relative movement thereto and to said lift levers and with a part thereof in projecting relation to said body for engagement with said abutment to cause outward movement of said lift lever relative to said retracted position in response to movement of said body toward said abutment.

3. A combination in accordance with claim 2 in further combination with means connected to said body and to said lift lever for biasing said lift lever toward a position in adjacent relation to said body.

4. A combination in accordance with claim 2 wherein said means mounting said lift lever on said body comprises a pivot, and means mounting said pivot for affording pivotal movement of said lift lever from a retracted position adjacent to said body about an axis extending transversely of the direction of reciprocation.

5. The combination of a winding machine including first and second spaced abutment plates, a shuttle carried by said machine for linear reciprocation and angular oscillation, a winding head mounted on said shuttle, said head being movable to and from between said plates and including a body, a needle mounted on said body and including an eye adapted for passage therethrough of wire, first and second lift levers each having means for guiding the travel of wire from said eye, means respectively mounting said lift levers on said body for movement of said wire guiding means outwardly from retracted positions with respect to said body, first and second displaceable members respectively associated with said first and second lift levers for moving said lift levers outwardly

in response to engagement of said members with said abutment plates, means carrying said first displaceable member on said body with a part thereof in projecting relation to one end of said body for engagement with said first abutment plate to cause outward movement of said first lift lever relative to its said retracted position in response to movement of said body toward said first abutment plate, and means carrying said second displaceable member on said body with a part thereof in projecting relation to the other end of said body for engagement with said second abutment plate to cause outward movement of said second lift lever relative to its retracted position in response to movement of said body toward said second abutment plate.

6. A head for winding the slots of a stator comprising a body adapted for reciprocation, a needle carried by said body and adapted for travel within the slots of the stator during axial travel of the head through the stator, said needle having an eye adapted for passage therethrough of a wire, whereby the wire is laid in the slot incident to travel of said needle through the slot, a pair of lift levers, means mounting said lift levers on said body in oppositely extending relation to each other on opposite sides of said needle for pivotal movement of said lift levers outwardly from retracted positions located inwardly of said needle, said lift levers having means for temporarily engaging the wire and guiding wire travel from said eye when said lift levers are displaced from said retracted positions, and a member movable on said body in the direction of reciprocation thereof relative to said body and said lift levers and located at all times radially inwardly of the outermost portion of said needle, whereby to afford passage thereof through the bore of the stator, and operably associated with said lift levers for producing lift lever movement in response to movement of said head.

7. A head for winding the slots of a stator comprising a body, three needles carried by said body, each of said needles having an eye adapted for passage therethrough of a wire, a pair of lift levers associated with each of said needles, means mounting the respective pairs of lift levers on said body in oppositely extending relation to each other on opposite sides of the associated one of said needles for lift lever pivotal movement outwardly from retracted positions adjacent to said body, said lift levers each having means for temporarily engaging the wire and guiding wire travel from said eyes when said lift levers are displaced from said retracted positions, and at least one member associated with each pair of lift levers, said members being movable on said body relative to said body and to said lift levers and being located at all times radially inwardly of the outermost portion of the associated one of said needles, whereby to afford passage thereof through the bore of the stator, and operable with the associated lift levers for producing lift lever movement in response to movement of said head.

8. The combination of a winding machine including a supporting frame, a shuttle movably carried by said frame, means on said frame for alternatively oscillating and reciprocating said shuttle relative to said machine, a winding head mounted on said shuttle, said head including a body, a needle mounted on said body, a pair of lift levers having means for guiding wire travel from said needle, and means mounting said lift levers on said body in oppositely extending relation to each other on opposite sides of said needle for pivotal movement of said lift levers relative to said body, and means carried at least partially on said head and moveable in the direction of reciprocation relative to said body and to said lift levers for displacing said lift levers outwardly in response to movement of said head toward one end of its reciprocatory stroke, whereby said wire guide means is moved relative to said needle and outwardly from retracted position adjacent to said body for temporarily engaging and guiding the wire only when said head approaches the end of head reciprocating movement and during head oscillatory movement, the part

of said last mentioned means on said head being located at all times radially inwardly of said needle.

9. The combination of a winding machine including a support frame having an abutment surface, a shuttle movably carried by said frame, means on said frame for alternately oscillating and reciprocating said shuttle relative to said machine, a winding head mounted on said shuttle, said head including a body, three needles mounted on said body, each needle having an eye adapted for passage therethrough of a wire, a lift lever having wire guiding means associated with each of said needles, means mounting said lift levers on said body for movement of said wire guiding means outwardly from retracted positions so as to temporarily engage the wire and guide wire travel when said lift levers are displaced from said retracted positions, and a member associated with each of said lift levers, said members being movable on said body in the direction of reciprocation relative to said body and relative to said lift levers and being located at all times radially inwardly of the outermost portion of the associated one of said needles, whereby to afford passage thereof through the bore of the stator, and operable with the associated one of said lift levers for producing lift lever movement in response to reciprocating movement of said head, whereby said lift levers are actuated to engage and guide the wire only as said members engage said abutment surface during head oscillatory movement.

10. A head for winding the slots of a stator comprising a body, three needles carried by said body and adapted for travel within the slots of the stator during axial movement of the head through the stator, each of said needles having an eye adapted for passage therethrough of a wire, whereby wire is laid in the slot incident to travel of said needle through the slot, a pair of lift levers associated with each of said needles, means mounting the respective pairs of lift levers on said body in oppositely

extending relation to each other on opposite sides of the associated one of said needles for lift lever pivotal movement outwardly from retracted positions located inwardly of the associated one of said needles, said lift levers each having means for temporarily engaging the wire and guiding wire travel from said eyes when said lift levers are displaced from said retracted positions, and at least one member associated with each pair of lift levers, said members being movable on said body relative to said body and relative to said lift levers and being located at all times radially inwardly of the outermost portion of the associated one of said needles, whereby to afford passage thereof through the bore of the stator, and operable with the associated one of said lift levers for producing lift lever movement in response to reciprocating movement of said head, whereby said lift levers are actuated to engage and guide the wire only as said head approaches one end of head reciprocating movement and during head oscillatory movement.

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