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F. E. HOOK ET AL
COIL SHAPING APPARATUS

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2 Sheets-Sheet 1

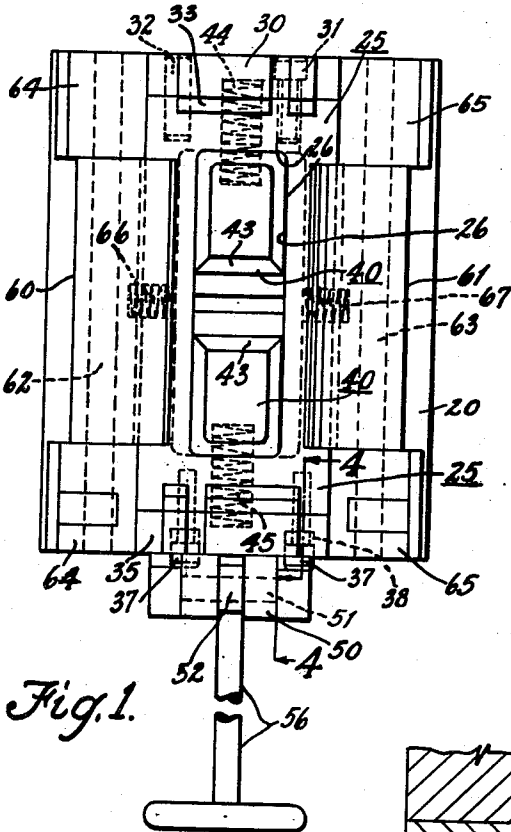


Fig. 1.

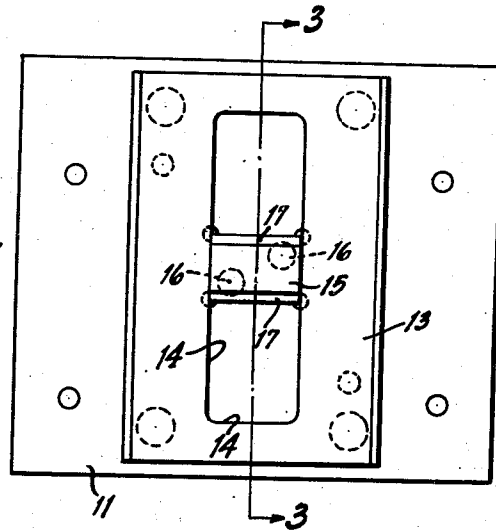


Fig. 2

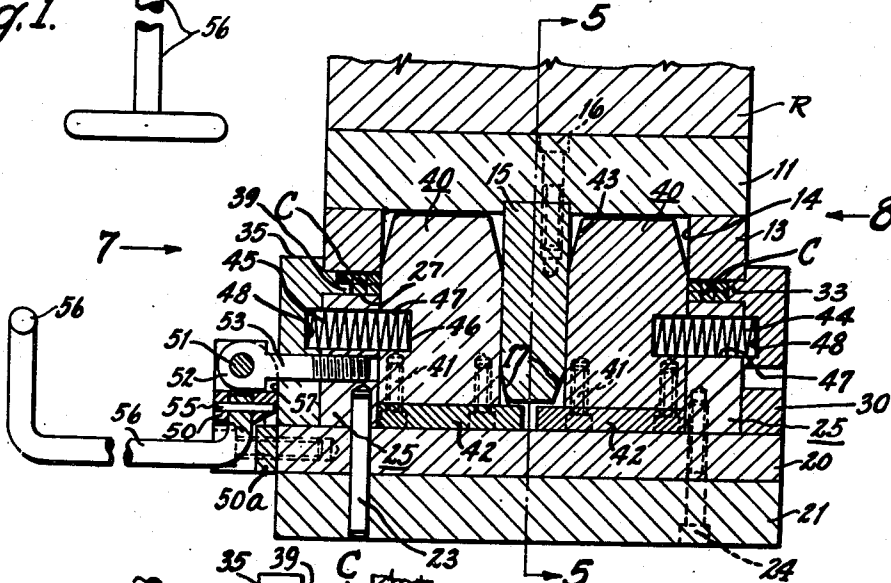


Fig. 3

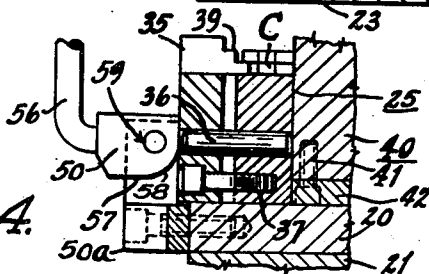


Fig. 4.

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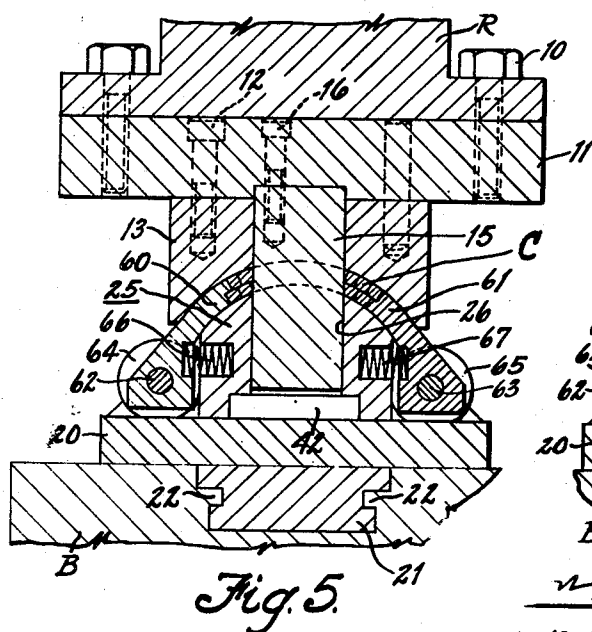
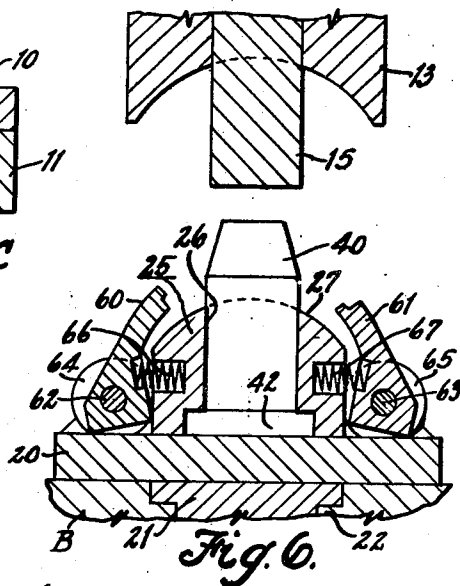
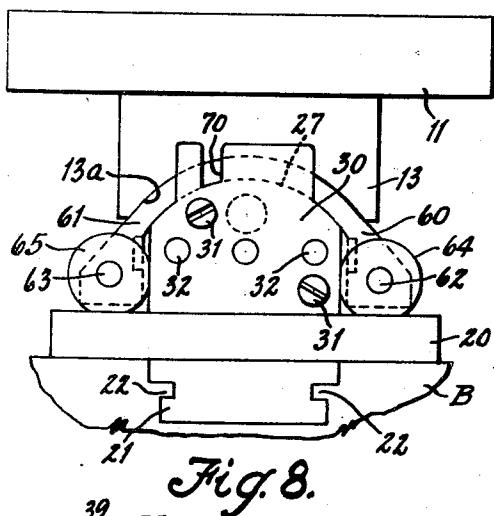
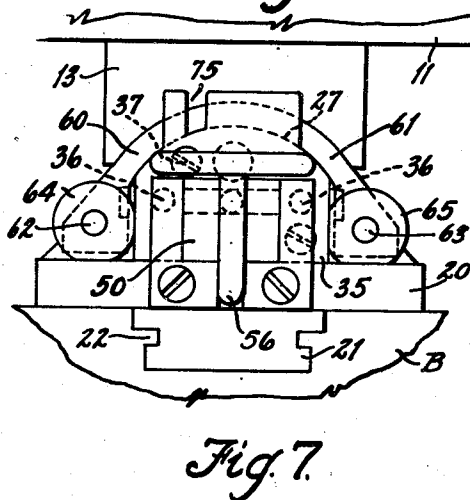
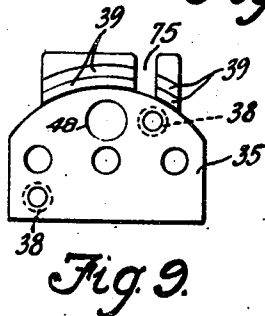
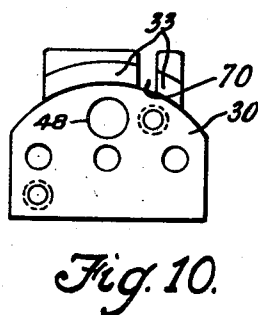
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COIL SHAPING APPARATUS

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Application September 6, 1947, Serial No. 772,554

3 Claims. (Cl. 153—3)

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This invention relates to tools for electrical coils formed of heavy wire such as the motor field coil disclosed in the copending application of Thornburg and Hershberger Ser. No. 772,562, filed September 6, 1947, and now abandoned.

The object of this invention is to provide forming dies adapted to be operated by an hydraulic press and which provide for shaping the coil cylindrically so that it will conform to the shape of a dynamo field frame and at the same time confining the edges of the coil in such way that the coil will not bulge out of shape while being formed cylindrically.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a plan view of the lower die member.

Fig. 2 is a plan view of the upper die member inverted.

Fig. 3 is a sectional view on lines 3—3 of Figs. 1 and 2, when the parts shown in Figs. 1 and 2 are placed together.

Fig. 4 is a fragmentary sectional view on line 4—4 of Fig. 1 showing certain parts of figures separated.

Fig. 5 is a sectional view on line 5—5 of Fig. 3.

Fig. 6 is a view similar to Fig. 5 showing the dies separated.

Fig. 7 is a view in the direction of arrow 7 of Fig. 3.

Fig. 8 is a view in the direction of arrow 8 of Fig. 3.

Fig. 9 is an inside view of block 35.

Fig. 10 is an inside view of block 30.

Referring to Fig. 5, B designates a fragment of the bed of the hydraulic press and R designates a fragment of the ram. To the ram R screws 10 attach a plate 11 with screws 12 attached to a block 13 having an oblong opening 14 (Fig. 2) through which there extends a wedge bar 15 secured to plate 11 by screws 16. The bar 15 provides wedging surfaces 17, Fig. 3.

The lower die member comprises a plate 20 to which is attached a bar 21 which slides on ways 22 provided by base B. Part 21 is located with respect to part 20 by dowel pins 23 (Fig. 3) and is secured thereto by screws 24 which also secure a block 25 having an oblong central opening 26 (Fig. 1) and a cylindrical upper surface 27 (Fig. 6) parallel to the cylindrical surface 13a of block 13. Between these surfaces the coil C is formed.

To the right end of block 25 there is attached

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a block 30 (Fig. 3) by screws 31 and dowels 32 (Fig. 1). To the left end of block 25 a block 35 is slidably connected therewith. Block 35 slides on dowels 36 extending from block 25 as shown in Fig. 7 and screws 37 (Fig. 1) pass through the block 35 and are threaded into block 25. The heads of the screws are received in counterbored recesses 38 in block 35, but these screws do not bottom in these recesses except when block 35 moves to the position shown in Fig. 4. Block 30 has an arcuate rib 33 (Fig. 10) which confines the coil C as shown in the right part of Fig. 3. Block 35 has a stepped arcuate rib 39 which confines the coil C as shown at the left part of Fig. 3.

Within the central opening 26 of block 25, are located two blocks 40 (Fig. 1) attached by screws 41 to plates 42 (Fig. 3) which rest upon the plate 20. The blocks 40 have tapered surfaces 43 which are engaged by the surfaces 17 of the wedge block 15 as it descends into the position shown in Fig. 3 to wedge the blocks 40 apart in order to confine the coil C and prevent it from bulging inwardly. This wedging action is opposed by springs 44 and 45 received by recesses 46 in blocks 40 extending through holes 47 in block 25 and extending into recesses 48 in plates 30 and 35. When the upper die is lifted so as to clear the lower die, the springs 44 and 45 urge the blocks together so as to relieve the pressure on the inside of the coil C. The coil C is still confined between the ribs 33 and 39 of blocks 30 and 35. To release this clamping action, it is necessary that block 35 be moved toward the left. This is accomplished by the spring 45 when a stop is moved out of the way. This stop is provided by a block 50 pivotally attached by rod 51 to the head 52 of a screw 53 passing through a plain hole in the block 35 and threaded into the block 25. A pin 55 secures a handle 56 to the block 50. When the handle 56 is turned clockwise from the position shown in Fig. 3 to the position shown in Fig. 4, the stop provided by the right vertical surface 57 of block 50 is moved away from the left surface of block 35 thereby permitting the latter to move toward the left so as to relieve the pressure exerted by it upon the coil C. When the handle is pushed down, as shown in Fig. 3, the cylindrical surface 58 having its center of curvature at the point 59 eccentric to the center of the pin 51 provides a cam for pushing the block 35 in against the coil C when placed in flat formation between the blocks 25 and 13. Block 50 is guided by a cradle 50a attached to plate 20.

The side edges of the coil C as well as the end edges are confined while the coil is being shaped

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cylindrically. The confining of the side edges is shown in Fig. 5. This is accomplished by plates 60 and 61 which are pivoted respectively upon rods 62 and 63 which are supported respectively by pairs of ears 64 and 65 welded to the plate 26. The plates 60 and 61 are urged normally away from the block 25 by springs 66 and 67 respectively. When the upper die block 13 descends upon the coil C to form it cylindrically against the lower die 25, the plates 60 and 61 are pushed down against the lower die 25, thereby confining the side edges of the coil as it is being formed cylindrically. When the upper die 13 ascends, as shown in Fig. 6 the springs 66 and 67 move the plates 60 and 61 respectively away from the die block 25 to relieve the pressure on the side edges of the coil C so that it can be removed after being formed cylindrically.

After the die 13 has been separated from the die 25, the operator grasps the handle 56 and pulls it toward him (to the left in Fig. 3) thereby moving the die 25, and plate 20 and bar 21 from positions under die 13 and pulls it upwardly to the position shown in Fig. 4, to disengage block 35 from the coil which can be removed and replaced with a flat, unshaped coil. The operator pushes handle 56 down to clamp the flat coil between blocks 35 and 30 and pushes the handle away from him to place the lower die 25 in alignment with the upper die 13, movement of die 25 being limited by a suitable stop (not shown) which stops movement of die 25 when aligned vertically with die 13. The ram R is then caused to descend by a suitable means such as a piston connected with the ram and moving in a cylinder into which pressure fluid is caused to flow.

The end leads or terminals of the coil extend beyond one or the other of blocks 30, 35 which are provided respectively with notches 70 and 75 for receiving one of these leads.

While the 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.

What is claimed is as follows:

1. Apparatus for cylindrically shaping a flat coil comprising dies having concentric cylindrical surfaces between which the coil is formed, members between which the outer end edges of the coil are confined during formation one being movable away from the other to facilitate placing an unformed coil between them, members between which the outer side edges of the coil are confined during formation and normally out of confining position when the dies are separated, members around which the coil is placed before formation and normally separated from the inner end edges of the coil, the closing of the dies causing the second mentioned members to confine the side portions of the coil between them and the third mentioned members, and means carried by one of the dies for wedging apart the third mentioned members so that the end portions of the coil are confined between them and the first mentioned members.

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2. Apparatus for cylindrically shaping a flat coil comprising dies having concentric cylindrical surfaces between which the coil is formed, one of the dies having a recess therein, two blocks within the recess and extending beyond the cylindrical surface of one of said dies, the other die having a recess therein for receiving said blocks when the dies close upon the coil, blocks at the ends of the first mentioned die, one being movable relative to the other, spring means for normally urging the first mentioned blocks together, and for causing separation of the second mentioned blocks, means for moving said movable second mentioned block against the first mentioned die, means carried by the second mentioned die for wedging apart the first mentioned blocks as the dies close so that the end portions of the coil are confined between the first mentioned blocks and the second mentioned blocks during formation, and plates caused to move by engagement therewith of the second mentioned die into position for contacting the sides of the coil whereby the side portions of the coil are confined between said plates and the first mentioned blocks.

3. Apparatus for cylindrically shaping a flat coil comprising an upper die and a lower die having concentric cylindrical surfaces between which the coil is formed, said lower die having a recess therein, a plurality of inner blocks within the recess and extending beyond the cylindrical surface of the lower die, said upper die having a recess therein for receiving the inner blocks when the dies close upon the coil; outer blocks located outside the ends of the lower die, one being movable; spring means for normally urging the inner blocks together and for urging the movable outer blocks from the lower die; means for actuating and locking the movable outer block against the lower die; wedge means carried by the upper die for separating the inner blocks as the upper die moves toward the lower die so that the end portions of the coil are confined between the inner and outer blocks during cylindrical formation; and pivoted members caused to move by engagement with the upper die into position for contacting the sides of the coil whereby the side portions of the coil are confined between the members and the inner blocks.

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