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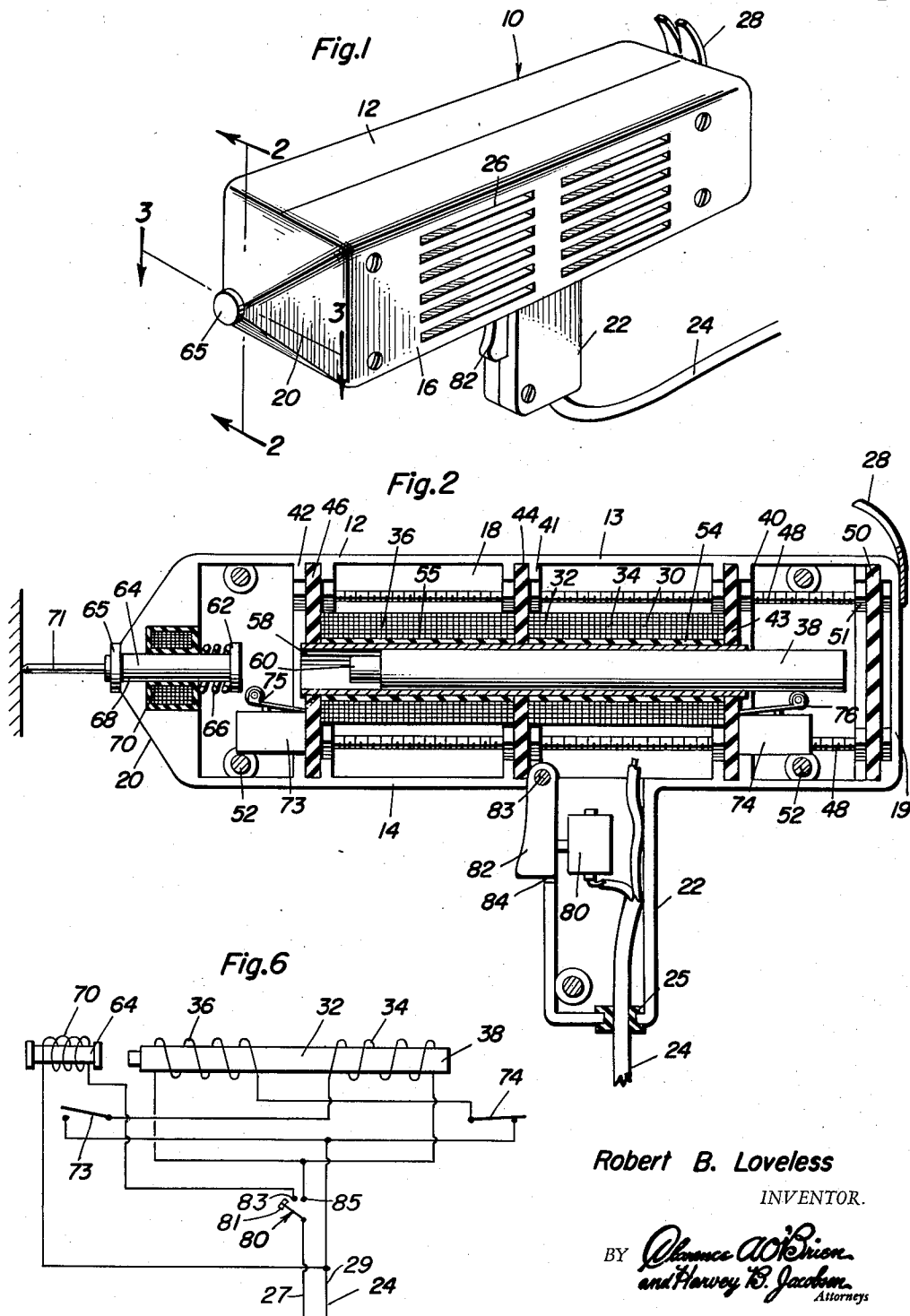
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ELECTRIC HAMMER

Filed July 1, 1958

2 Sheets-Sheet 1



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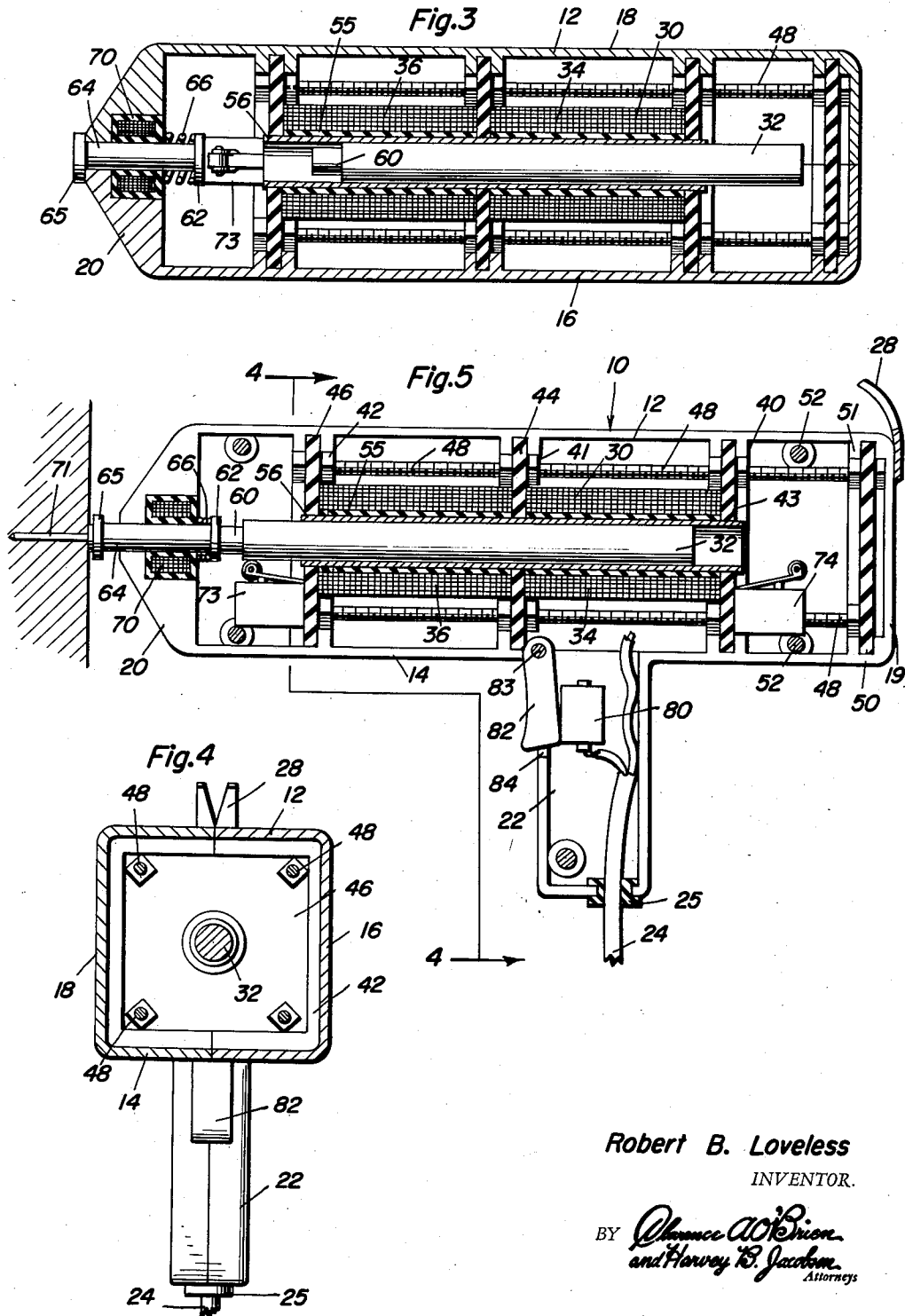
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ELECTRIC HAMMER

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3 Claims. (Cl. 1—47)

This invention relates to power tools and more particularly to a portable electric hammer.

An object of the invention is to provide an electric hammer for driving nails or other fasteners, the electric hammer so constructed that it can be made large or small depending on the prerogative of the manufacturer. The hammer constructed in accordance with the invention is exceedingly simple from a mechanical and electrical standpoint, yet, it serves its intended purpose exceedingly well.

A further object of the invention is to provide an electric air hammer that relies on a double wound solenoid whose armature is driven forward and then returned electromagnetically. In the reciprocation of the solenoid armature, control is achieved by the armature itself moving into the driving position and returning from the nail driving position. A pair of switches located in the path of travel of the armature reverse the polarity of the solenoid to achieve this end.

A further object of the invention is to provide a holding coil adjacent to the nail driving anvil so that the anvil is magnetized holding the nail in place for driving. The holding coil is constructed and arranged in circuit so that the magnetism is present in the anvil only as long as the user of the hammer desires this. A very handy single movement switch first closes the circuit having the holding coil in it and then further movement of the trigger operated switch opens the holding coil part of the circuit while the solenoid continues to be energized and continually reciprocates the armature until the user decides that the nail has been driven sufficiently.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawing forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a perspective view of a hammer constructed in accordance with the invention;

Figure 2 is a sectional view taken on the line 2—2 of Figure 1;

Figure 3 is a sectional view taken on the line 3—3 of Figure 1;

Figure 4 is a transverse sectional view on enlarged scale and taken on the line 4—4 of Figure 5;

Figure 5 is a longitudinal sectional view similar to that of Figure 2 but showing the armature in the nail driving position;

Figure 6 is a diagrammatic circuit illustration of the electrical parts of the hammer.

In the accompanying drawings there is a hammer 10 exemplifying the principles of the invention. This hammer is made of a light weight metal and includes a casing 12 that has a top wall 13, a bottom wall 14 and two side walls 16 and 18 respectively. There is an end wall 19 and a front wall 20. Handle 22 is attached to bottom wall 14 and has line cord 24 passing through

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a grommet 25 therein in order to enter the hollow handle. Although the case is square in cross-section (Figure 4) having the mentioned walls, it is understood that the configuration of the case can be changed. However, it is suggested that there be copious ventilation area, for instance a number of slots 26 so that the interior of the case is well ventilated. Also, a nail pulling claw 28 can be attached to any one of the walls, preferably the end wall 19, to serve the usual purpose of pulling nails.

The motor 30 located in case 12 is a reverse wound multiple coil solenoid 32. It has two windings 34 and 36 that are wound opposite to each other (Figure 6) so that the electromagnetic field generated by energization of the coils will be in opposite directions in order to move the armature 38 toward the nail driving position and then to return the armature to the return position.

The construction of the solenoid 32 is important. It must be of high quality sturdy and strong arrangement and therefore the interior of the case 12 has a plurality of spaced pairs of brackets 40, 41 and 42. Insulating mounting plates 43, 44 and 46 respectively are fitted between the brackets of each pair and extend transversely across the case 12. Stay bolts 48 extend longitudinally through aligned openings in the pairs of brackets and the mounting plates 43, 44 and 46 and also extend through the end wall insulating plate 50 that is in between the brackets of the pair 51 of brackets. The end wall mounting plate 50 constitutes a part of wall 19 (Figures 2 and 5). The case can be made in two sections to facilitate assembly and manufacture. Accordingly, transverse bolts 52 extend through aligned openings in the two sections of the case, holding them assembled.

The solenoid has its two windings 34 and 36 on insulating sleeves 54 and 55, and these sleeves are concentrically disposed on the guide sleeve 58 held supported in aligned openings in the insulating support plates 43, 44 and 46. Sleeve 58 is open ended and has the iron armature 38 slidably disposed therein. The armature can have a hardened impact end 60 adapted to contact the hardened disk 62 of anvil 64.

The anvil is in longitudinal alignment with the armature 38 and has the ends 62 and 65 enlarged, for instance as collars, one forming a seat for return spring 66 and the other forming a stop to limit the inward movement of the anvil 64 with respect to the case 12. This is achieved by having the end 65 abut the outer surface of the wall 20 of the case. Passageway 68 is formed in wall 20 and has the anvil 64 located therein and arranged for reciprocation with the return spring 66 reacting on end 62 and also on a surface of wall 20. The impact end 60 of armature 38 is adapted to strike the anvil and propel it in passageway 68.

Holding coil 70 is concentrically arranged around the passageway 68 in order to magnetize the anvil 64. Then, nail 71 which is a typical fastener adapted to be driven by the hammer, is held by magnetic attraction to the anvil, this being especially helpful in starting the nail.

Two limit switches 73 and 74 are mounted in the casing and have switch arms 75 and 76, preferably with rolls thereon, mounted in the path of travel of the armature 38. A simple two-wire circuit has the coils 34 and 36 alternately energized in response to movement of the armature (Figure 6) with switch 73 controlling coil 34 and switch 74 controlling the coil or winding 36. The line cord 24 includes conductors 27 and 29 which are adapted to be connected to either side of an electrical energy source, not shown. A main control switch 80 is provided which is operated by trigger 82. The main control switch 80 includes a bridging bar 81 and a pair of terminals 83 and 85. The bridging bar 81 is electrically connected to conductor 27. The terminal 83

extends to one side of the holding coil 70, while the holding coil 70 extends to the conductor 29. The terminal 85 is connected to a common point joining the two solenoid coils 34 and 36, with the opposite ends of the solenoid coils respectively passing through the serially connected switches 73 and 74 to conductor 29. The trigger 82 of switch 80 is mounted on a pivot 83 carried by a portion of the case and is movable in an opening 84 of the handle 22. The operator for switch 80 is in the path of movement of the trigger 82 so that switch 80 is actuated in response to pulling the trigger. When the trigger 82 is initially pulled, it will be apparent that the bridging bar 81 will contact the terminal 83 to connect holding coil 70 across the conductors 27 and 29 so that the nail 70 may be attracted to and held by the anvil 54. It will be seen that a slight further movement of the trigger will cause the bridging bar 81 to contact the terminal 85 which will cause the armature 32 to reciprocally move within the coils 34 and 36. If the bridging bar 81 is still in contact with terminal 83, of course the nail 71 will still be held by the anvil 54. The reciprocable motion of the armature should be well understood inasmuch as the coils 34 and 36 are alternately energized to positively draw the armature in reverse directions as the switches 73 and 74 are alternately opened and closed as the armature 38 passes over the operators 75 and 76. Still further rearward movement of the trigger 82 will release the magnetic hold of the anvil 64 on the nail 71 and the armature 38 will continue to reciprocate within the coils 34 and 36.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. An electric hammer construction including a first solenoid coil and a second solenoid coil, said first and second coils being oppositely wound and spaced along a common axis, an armature reciprocally movable through said coils, a first switch serially connected to said first coil, a second switch serially connected to said second coil, each of said first and second switches having a switch operator positioned in the path of travel of said armature for alternately positively drawing said armature in reverse directions, an anvil, said anvil being aligned with said armature, a holding coil, said anvil being reciprocally movable through said holding coil whereby said anvil will become magnetized, and a three position control switch for selectively connecting said coils to a source of electrical energy.

2. An electric hammer comprising a case, a solenoid

in said case and having a pair of oppositely wound coils, a guide sleeve on which said coils are disposed in said case, an armature in said guide sleeve and adapted to be reciprocated by the electromagnetic field produced by said coil, switches to alternately energize said coils and having switch operators located in the path of travel of said armature, an anvil carried by said case and in longitudinal alignment with said armature, a holding coil adjacent to said anvil to magnetize said anvil, a trigger carried by said case, and means including a control switch for controlling the energization of said holding coil and said solenoid, a flange carried by said anvil, and spring return means carried on said anvil between said casing and said flange, said solenoid coils electrically connected in parallel, said control switch including a bridging bar and a pair of spaced terminals, a first of said spaced terminals connected to one side of said first and second solenoid coils adapted to be connected through said first and second switches to a second side of said source, a second side of said holding coil adapted to be connected to a second side of said source.

3. An electric hammer comprising a case, a solenoid in said case and having a pair of oppositely wound coils, a guide sleeve on which said coils are disposed in said case, an armature in said guide sleeve and adapted to be reciprocated by the electro-magnetic field produced by said coil, switches to alternately energize said coils and having switch operators located in the path of travel of said armature, an anvil carried by said case and in longitudinal alignment with said armature, a holding coil adjacent to said anvil to magnetize said anvil, a trigger carried by said case, and means including a control switch for controlling the energization of said holding coil and said solenoid, said means including a control switch having an electrical conductor extending from said control switch to said holding coil and another electrical conductor extending from said holding coil to a source of electrical potential, a switch movable contact constituting a part of said control switch and movable to a position closing a circuit with said holding coil through said conductors, an electrical circuit connection in said control switch and adapted to be contacted by said movable contact to close a circuit including said solenoid after said holding coil is energized whereby said holding coil may be first energized to magnetize said anvil and thereby hold a fastener thereon and then while energized said solenoid may be energized to drive said anvil while it is magnetically holding the fastener.

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