March 20, 1962 J. M. BIDDISON 3,025,977

COIL WINDING MACHINE

Original Filed May 5, 1953 4 Sheets-Sheet 1

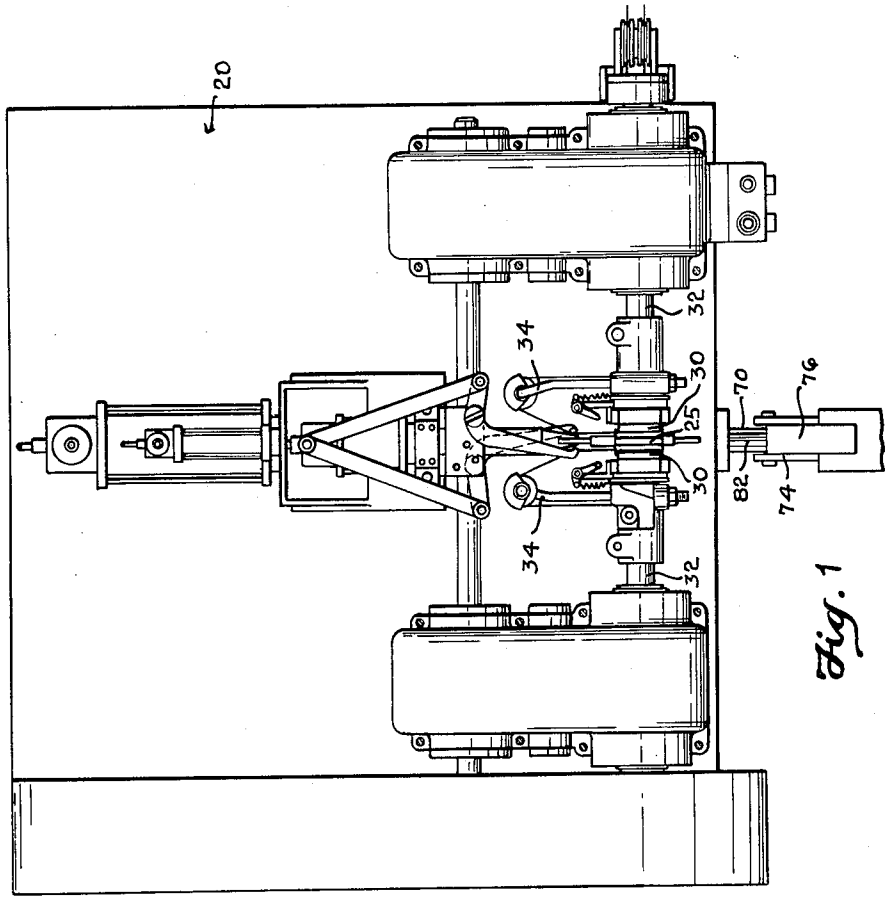


Fig. 1

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Original Filed May 5, 1953 4 Sheets-Sheet 2

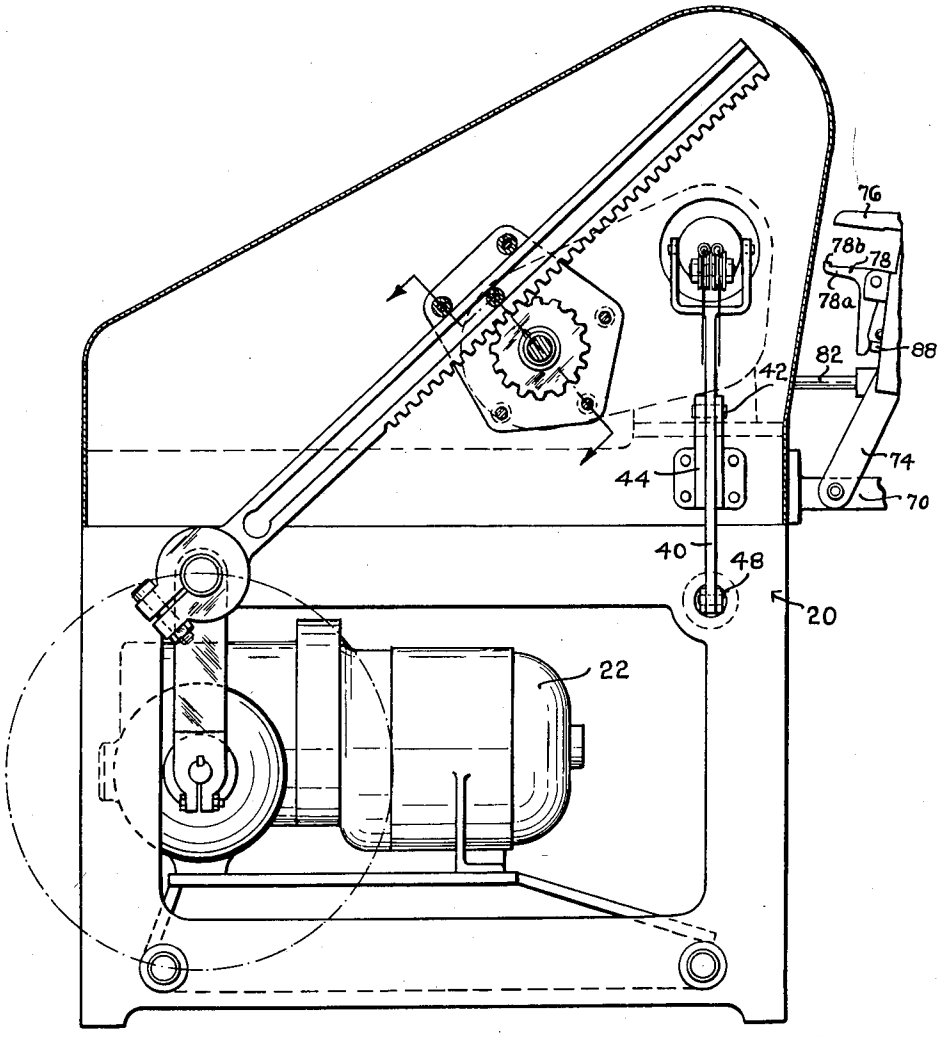


Fig. 2

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Original Filed May 5, 1953 4 Sheets-Sheet 3

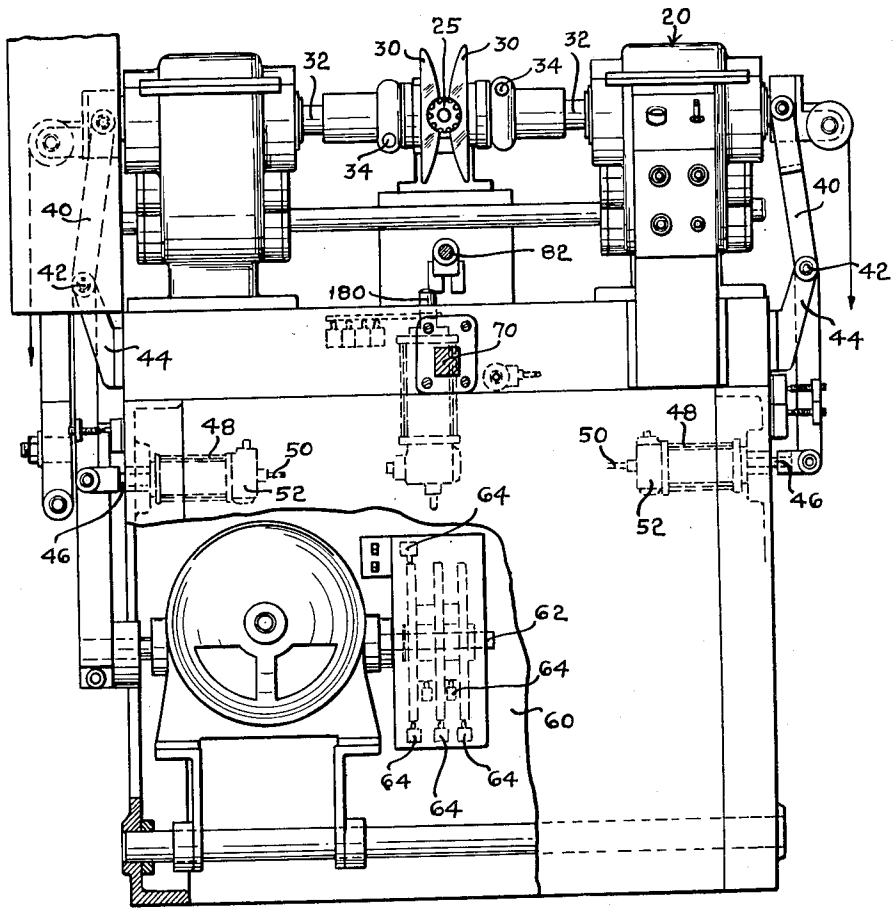


Fig. 3

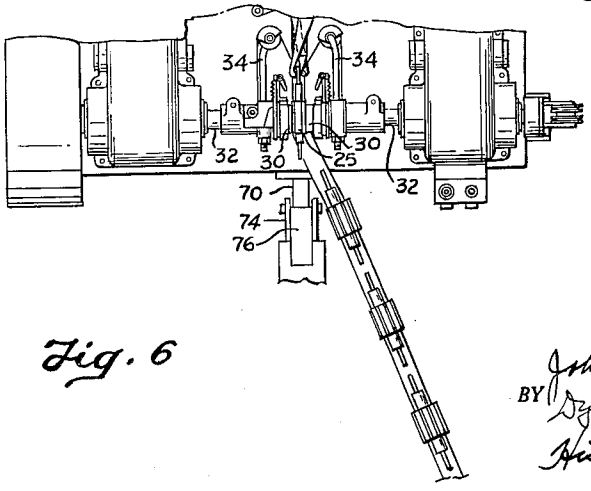


Fig. 6

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March 20, 1962 J. M. BIDDISON 3,025,977

COIL WINDING MACHINE

Original Filed May 5, 1953 4 Sheets-Sheet 4

Fig. 4

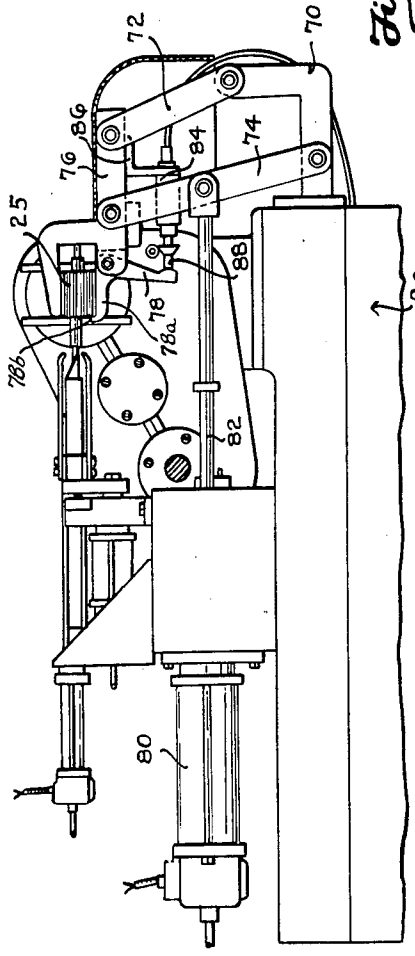
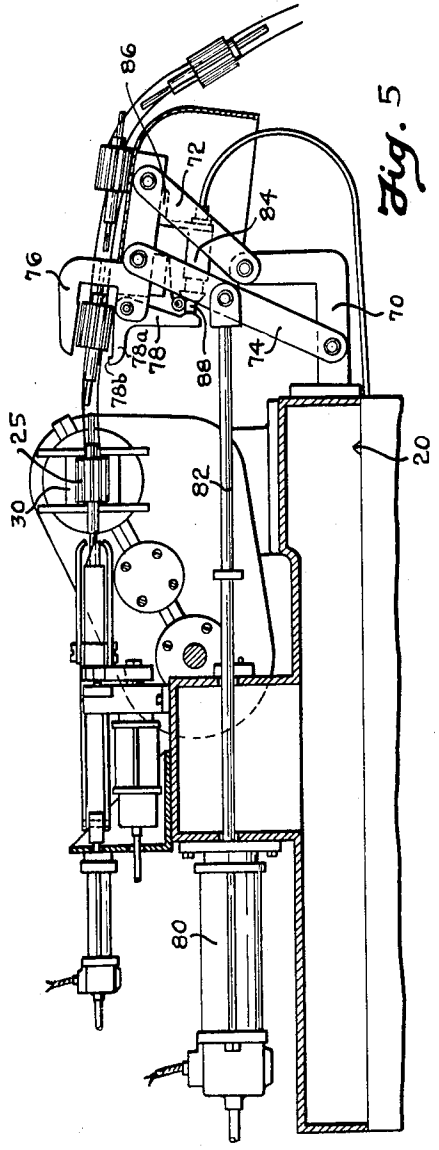


Fig. 5



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United States Patent Office 3,025,977 Patented Mar. 20, 1962

3,025,977
COIL WINDING MACHINE

John M. Biddison, Dayton, Ohio, assignor to Harry W. Moore, Dayton, Ohio

Original applications May 5, 1953, Ser. No. 353,160, and Apr. 4, 1956, Ser. No. 576,193, now Patent No. 2,949,554, dated Aug. 16, 1960. Divided and this application Feb. 25, 1959, Ser. No. 795,537
2 Claims. (Cl. 214—1)

This invention relates to a coil winding machine, such as an armature winding machine, and more particularly to a device for automatically removing the wound coils and their core from the coil winding machine after the windings have been completed.

This is a divisional application of my application Serial No. 353,160, filed May 5, 1953, for Coil Winding Machine, now abandoned, and a divisional application of my copending application Serial No. 576,193, filed April 4, 1956, now Patent No. 2,949,554, for Coil Winding Machine.

In the manufacture of armatures, at times it is desirable to use a double wire, so as to form two coils side by side arranged in parallel. These wires are wound under tension. That being the case, it is difficult to remove the armatures from the coil winding machine after an armature has been wound, for the reason that the tension of the wires resists the removal of the armatures. It is not feasible to cut the wires before removing the armatures, in that the machine is designed to wind the initial winding of the succeeding armature, the windings continuing from the previously wound armature. In other words, the previously wound armature is used for holding the ends of the first coil to be wound on the succeeding armature.

An object of this invention is to provide a mechanism for positively withdrawing the armature after it is completely wound from the coil winding machine against the tension of the wires used in winding the coils.

Another object of this invention is to provide fluid actuated controls for manipulating the mechanism for withdrawing the armature from the coil winding machine.

Other objects and advantages reside in the construction of parts, the combination thereof, the method of manufacture and the mode of operation, as will become more apparent from the following description.

In the drawings,

FIGURE 1 is a top plan view of a major portion of a coil winding machine, parts being broken away which did not go on this sheet.

FIGURE 2 is a side elevational view with parts broken away and other parts shown in section.

FIGURE 3 is a front elevational view with parts broken away and other parts shown in section.

FIGURE 4 is a fragmentary side elevational view disclosing the armature removing mechanism with parts shown in section and other parts broken away.

FIGURE 5 is another view similar to the one in FIGURE 4, with the armature removing mechanism shown in position after an armature has been removed.

FIGURE 6 is a fragmentary view drawn to a smaller scale than FIGURE 1, showing the direction of flow of the armatures from the coil winding machine.

The coil winding machine 20 is driven from an electric motor 22 through a suitable driving mechanism which has been more fully described in my application Serial No. 576,193. The armature 25 is mounted between a pair of winding heads 30 that are journalled upon a pair of shafts 32 driving the fliers 34 used in winding the coils. The winding heads 30 remain stationary when the shafts 32 are driven.

After a pair of coils have been wound, the armature

25 is indexed by first separating the winding heads 30 a slight distance. This is accomplished by a pair of levers 40, one for each of the shafts 32, pivotally mounted at 42 upon brackets 44 attached to the frame of the coil winding machine, the lower ends of the levers 40 having pivotally attached thereto a piston rod 46 connected to a piston mounted in a cylinder 48 connected through a conduit 50 to a suitable source of hydraulic fluid, not shown, which may be either air or liquid. Electromagnetic valves 52 are used for controlling the position of the piston in the cylinder 48. When the armature is being wound, the piston actuates the piston rods 46 outwardly, as viewed in FIGURE 3, so as to cause the upper ends of the levers 40 to exert a pressure against the outer ends of the shafts 32 to push the two winding heads together to clamp the armature in position.

When a coil has been wound, the cylinders 48 are energized so as to release the pressure upon the ends of the shafts 32 to thereby permit the armatures to be indexed by a suitable indexing device which has been more fully described in my application Serial No. 576,193. After a pair of coils have been wound on the armature, the armature is indexed to present a succeeding pair of slots into winding position. These operations are continued cyclically until all of the armatures have been wound. This cyclic winding operation and indexing operation are controlled by a cam mechanism shown schematically in the housing 60 shown in FIGURE 3. A stinger 180 hydraulically or pneumatically driven is used to register succeeding slots of the armature core into registry with the winding heads as more fully described in application Serial No. 576,193. As soon as all of the coils on the armature have been wound, it is necessary to withdraw the wound armature. A device for withdrawing the armature will now be described.

An L-shaped bracket 70 is attached to the forward portion of the coil winding machine and below the winding heads 30 and the winding mechanism per se. This L-shaped bracket 70 pivotally supports a link 72 and a lever 74. The end of the link 72 and the end of the lever 74 have pivotally attached thereto a gripper jaw member 76. The gripper jaw member 76 has pivotally attached thereto a bell crank member 78 including a gripper jaw 78*a*. This gripper jaw 78*a* has a projection 78*b* extending beyond the armature to positively engage the armature during the withdrawal thereof. A hydraulic piston 80 is provided with a piston rod 82 pivotally attached to the lever 74. This piston rod 82 has a considerable length and is light weight, so that it may flex sufficiently to accommodate the curved path of its connection to the lever 74. FIGURE 5 shows the position of the armature ejector mechanism when an armature is being wound.

As soon as the winding operation has been completed, the piston 80 actuates the piston rod 82, so as to cause the jaw member 76 and bell crank member 78 to be actuated into a position to grasp the newly wound armature, as clearly shown in FIGURE 4. After it has been actuated into the armature grabbing position, a hydraulic or pneumatic cylinder 84 attached by an L-shaped bracket 86 to the jaw member 76, is energized, so as to actuate a plunger 88, which in reality is a piston rod, into engagement with the lower arm of bell crank lever or member 78 to rigidly clamp the armature between the jaw member 76 and the bell crank member 78. The two jaws are held in gripping position while the piston rod 82 is moved outwardly or forwardly by the piston in the cylinder 80, so as to actuate the members 76 and 78 into the position shown in FIGURE 5. After the jaws have been actuated into this position, the jaws are disengaged. The wires used in winding the coils are not severed after each armature is wound, so that the wound

armatures form a string of armatures, as clearly shown in FIGURES 5 and 6. The armatures flow towards one side as they are withdrawn, the weight of the previously withdrawn armatures immediately removing the armature to one side of the clamping jaws as soon as the clamping jaws are opened.

As soon as the armature has been ejected from winding position into the position shown in FIGURE 5, the operator inserts a new armature into winding position. As soon as a new armature has been inserted into winding position and the start switch has been actuated by the operator, the winding heads are caused to clamp the armature into position, then the armature is released slightly, so as to permit the stinger 180, shown in FIGURE 3, to index two pairs of slots in the armature core into registry with the winding surface of the winding heads. The winding heads are then clamped against the armature, at which time the winding operation is again resumed, so as to wind a series of coils cyclically into the various pairs of armature slots, until all of the armature slots have been properly wound, a proper loop being formed between the coils of the armature, as fully described in my application Serial No. 576,193. As stated above, the coil winding machine operates cyclically, each operation being controlled by a series of cams in a cam housing 60 mounted on a shaft 62 actuating a micro-switch 64.

The use of cams and micro-switches for controlling fluid circuits has been disclosed and described in my United States Letters Patent No. 2,670,145, issued February 23, 1954, for Armature Winding Machine.

Although the coil winding machine has been shown and described in connection with an armature, the same machine could be used in winding certain types of other forms, such as stators, it being expressly provided that the use to which the windings are to be put is not to be construed as a limitation, but merely for the purpose of illustration. The cores for the coils when completely wound may be gripped by the gripper jaws 76 and 78 and removed by the armature ejecting mechanism disclosed herein.

Although the preferred embodiment of the device has been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation, which generally stated consist in a device capable of carrying out the objects set forth, as disclosed and defined in the appended claims.

Having thus described my invention, I claim:

1. An armature removing mechanism for removing a wound armature mounted between the winding heads of a coil winding machine, said armature removing mechanism including a gripper mechanism having a substantially horizontally disposed frame member terminating in a jaw member integral therewith and a jaw member pivotally mounted thereon so as to be movable from open to close position and vice versa, and a pair of pivotally mounted links for supporting the frame member, one of said gripper jaw members having a projection at the outer end thereof, a hydraulic drive mechanism for actuating said gripper jaw members towards and between the winding heads to grip the armature, said jaw members advancing towards the armature in a plane parallel to the axis of rotation of the armature, and a hydraulic control mechanism for the pivotally mounted jaw member, said hydraulic control mechanism holding the movable jaw member in open position when the jaw members are moving towards and into engagement with the armature in the winding machine, said hydraulic control mechanism closing the jaw members to grip positively a wound armature, the projection engaging the armature mounted between the winding heads in the winding machine, the hydraulic drive mechanism withdrawing the jaw members and the wound armature from the winding heads of the winding machine, and means for releasing the hydraulic control mechanism to disengage the grip of the jaw members upon the armature being withdrawn from the winding machine, said links extending in generally parallel relation to each other only when the gripper mechanism engages the armature while mounted between the winding heads, the longer link having one end pivotally attached to the frame member in close proximity to the jaw members, and the other end pivotally attached to a fixed support, the shorter link having one end pivotally attached to the frame member adjacent its end furthest removed from the jaw members and the other end pivotally attached to a fixed support, the links cooperating to actuate said integral jaw member over the top of a wound armature in the winding machine and into contact with the wound armature when the jaw members are in armature gripping position.

2. An armature removing mechanism for removing a wound armature mounted between the winding heads of a coil winding machine, said armature removing mechanism including a gripper mechanism having a substantially horizontally disposed frame member terminating in a jaw member integral therewith and a jaw member pivotally mounted thereon so as to be movable from open to close position and vice versa, and a pair of pivotally mounted links for supporting the frame member, one of said gripper jaw members having a projection at the outer end thereof, a hydraulic drive mechanism for actuating said gripper jaw members towards and between the winding heads to grip the armature, said jaw members advancing towards the armature in a plane parallel to the axis of rotation of the armature, and a hydraulic control mechanism for the pivotally mounted jaw member, said hydraulic control mechanism holding the movable jaw member in open position when the jaw members are moving towards and into engagement with the armature in the winding machine, said hydraulic control mechanism closing the jaw members to grip positively a wound armature, the projection engaging the armature mounted between the winding heads in the winding machine, the hydraulic drive mechanism withdrawing the jaw members and the wound armature from the winding heads of the winding machine, and means for releasing the hydraulic control mechanism to disengage the grip of the jaw members upon the armature being withdrawn from the winding machine, said links extending in generally parallel relation to each other only when the gripper mechanism engages the armature while mounted between the winding heads, the longer link having one end pivotally attached to the frame member in close proximity to the jaw members, and the other end pivotally attached to a fixed support, the shorter link having one end pivotally attached to the frame member adjacent its end furthest removed from the jaw members and the other end pivotally attached to a fixed support, the links cooperating to actuate said integral jaw member over the top of a wound armature in the winding machine and into contact with the wound armature when the jaw members are in armature gripping position, said frame member supporting a cylinder and piston of the hydraulic control mechanism actuating the pivotally mounted jaw member.

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