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R. F. MALLINA
MOTOR-DRIVEN HAND TOOL FOR MAKING
WRAPPED WIRE CONNECTIONS
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2,649,122

FIG. 1

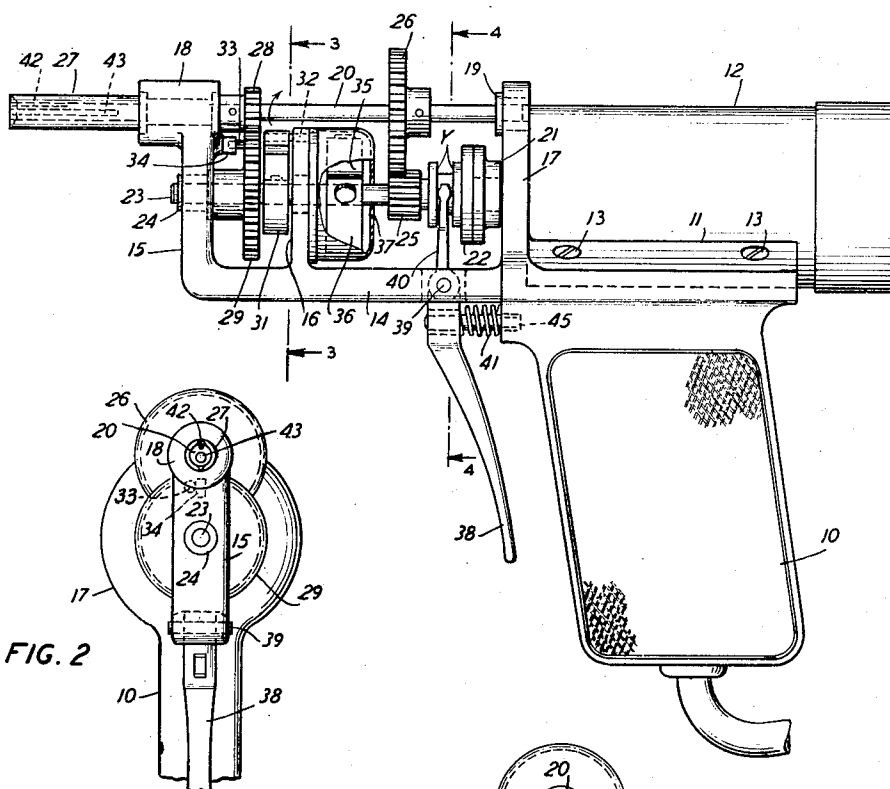


FIG. 2

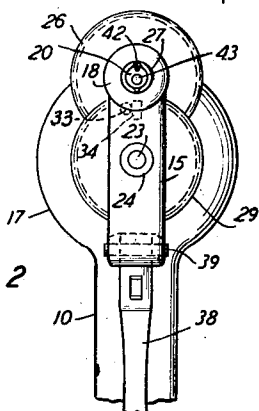


FIG. 3

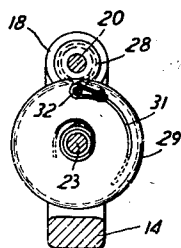
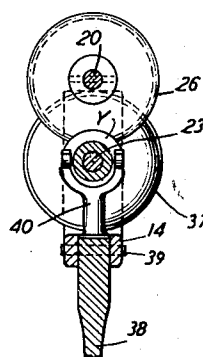


FIG. 4



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5 Claims. (Cl. 140—122)

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This invention relates to wiring tools and more specifically to a tool for effecting solderless connections between connecting wires and terminals, for example, of the type used in electrical apparatus.

The object of the present invention is the provision of a wiring tool of the type above-mentioned by which a wire is wound or wrapped on a terminal to effect an electrical connection therebetween without requiring the soldering of the joint for efficient electrical conductivity between the wire and the terminal.

A feature of the invention is the provision of two motors, one electrical and the other in the form of a clock spring for rotating a wire winding spindle in opposite directions, in one direction by the operation of the electric motor for tensioning the motor spring and in the opposite direction by the tension of the motor spring for rotating the spindle which winds the wire around the terminal.

Another novel feature of the invention is the provision of a friction clutch mechanism for preventing the stalling of the electric motor following the tensioning of the motor spring preparatory to the operation of the winding spindle by the motor spring.

Another novel feature is the provision of a speed gear reduction mechanism operatively connecting the clutch device to a shaft coupled to the motor spring for tensioning the latter upon the operation of the electric motor, a gear in the speed reduction mechanism having means cooperating with means carried by a frame for the tool for arresting the movement of the gear mechanism both during the tensioning cycle of the motor spring by the electric motor and at the end of the winding of the wire on the terminal by the tension of the motor spring.

Another novel feature is the provision of manually operable means for disengaging the friction clutch device for permitting the movement of the winding spindle by the operation of the motor spring.

Another novel feature is the provision of a centrifugal governor actuated by the tension of the motor spring for controlling the operation of the wire twisting spindle during the winding operation of the wire on the terminal.

Other novel features and advantages of the invention will appear from the following description and by the claims appended thereto reference being had to the accompanying drawing, in which:

Fig. 1 is a side assembly view;

Fig. 2 is a front view shown with a number of operating parts with portions broken away;

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Fig. 3 is a vertical cross-sectional view taken on line 3—3 of Fig. 1; and

Fig. 4 is a vertical cross-sectional view taken on line 4—4 of Fig. 1.

In accordance with the construction of the wiring tool of this invention, a mounting for the mechanism is formed with a handle 10 having on each of its opposite sides a flange portion 11, serving as a base for receiving an electric motor 12 which is secured to the flange portions 11 as by a plurality of screws 13. The mounting is also formed with a projection in the form of a rib 14 having upright supports 15, 16 and 17. Upright 15 terminates with an enlarged portion 18 for receiving a sleeve 27 cooperating with a bearing 19 in upright 17 for rotatably supporting a spindle 20 the function of which will be hereinafter described in detail.

On the armature shaft of motor 12 is keyed a friction clutch element 21 disposed in engageable relation with a complement clutch element 22 formed with a collar Y and a pinion 25. The unit thus constructed is mounted for free movement on a shaft 23 journaled at one end in a bearing 24 in upright 15 and its opposite end in a bore in the armature shaft of motor 12 as best seen in Fig. 1. Pinion 25 meshes with a gear 26 keyed on spindle 20 for rotating the latter and a pinion 28 keyed on this spindle upon the operation of motor 12. Pinion 28 meshes with a gear 29 keyed on shaft 23 and on this shaft is attached the inner convolution of a clock spring 31, the outer disposed convolution of which is hooked to a pin 32 laterally extending from upright 16. A pin 33 carried by the gear 29 cooperates with a projection 34 laterally extending from upright 15 for holding the gear 29 and thereby the pinions 28 and therefore spindle 20 in normal starting position against the normal tension of clock spring 31.

A centrifugal speed governor in the form of two fly weights 35 and 36 operated by shaft 23 frictionally engage the inner periphery of a drum 37 secured to the upright 16 for controlling the speed of motor 12 when winding the spring 31, in addition to controlling the speed of spindle 20 when actuated by the tension of clock spring 31 which occurs upon the manual operation of a trigger member 38 pivoted at 39 in the projection 14 as shown in Figs. 1, 2 and 4. This trigger member has a forked end portion 40 fitted in collar Y to move the clutch element 22 out of engagement from clutch element 21 against the tension of a spring 41 coiled around a stud 45 to serve for holding the clutch elements 21 and 22 normally in the engaged position as shown in Fig. 1.

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The spindle 20 at its front disposed end is provided at its periphery with a longitudinally disposed groove or slot 42 for receiving the end of the wire to be wound around a terminal, not shown, inserted in a drilled hole 43 in the spindle 20 for winding the wire therearound in a manner fully described in a copending application in the name of Hickman-Mallina-Reck Serial No. 753,066 filed June 6, 1947, now Patent No. 2,585,010.

A typical example of operation of this tool in the winding or wrapping of a wire around a terminal for effecting a solderless connection therebetween is as follows: Considering the operating parts in the position shown in Fig. 1, that is, the friction clutch elements 21—22 engaged by the tension of spring 41 and the stop pins 33—34 abutting against each other by the normal tension of clock spring 31, the operation of motor 12 is effective to rotate the pinion 25 mounted for free rotation on shaft 23 and thereby the spindle 20 through gear 26, the pinion 28 keyed on this shaft and gear 29 in engagement with pinion 28 thus rotating shaft 23 carrying the fly weights 35—36 of the governor. Rotation of shaft 23 is effective to tension the clock spring 31 to a point wherein the pin 33 engages the opposite side of stop pin 34 from the position shown in Fig. 1. The terminal and wire are then inserted into the spindle. The trigger 38 is manually operated for releasing the clutch elements 21—22 so as to permit the rotation of shaft 23 and that of spindle 20 in the opposite direction under control of governor 35—36 for winding the wire around the terminal until the pin 33 carried by gear 29 reengages the stop pin 34 carried by upright 15. The terminal is then removed from the spindle and the tool is now ready for another wire winding operation, upon the release of trigger member 38, the consequent reengagement of clutch elements 21—22 under the tension of retractile spring 41 and the resulting rewinding of spring 31.

During the tensioning of clock spring 31 the fly weights 35 and 36 of the governor do not offer an appreciable restraining torque to the operation of the motor because of the gear reduction from pinion 28 to gear 29, but the fly weights effectively control the operation of spindle 20 when rotated under tension of the clock spring 31 which thus serves as a motor for driving the spindle.

What is claimed is:

1. A wiring tool for wrapping a wire on a terminal, said tool comprising an electric motor, a wrapping spindle, a motor spring, a rotatable shaft connected to the motor spring, a gear mechanism operatively connecting said spindle to said electric motor, another gear mechanism operatively connecting said spindle to said shaft for tensioning said motor spring upon the operation of said electric motor, and a clutch mechanism manually operable for disconnecting the first-mentioned gear mechanism from said electric motor to allow the operation of said spindle by said motor spring by way of the last-mentioned gear mechanism for wrapping the wire on the terminal.

2. A wiring tool for effecting a wrapped electrical connection between a wire and a terminal, said tool comprising a motor, a first clutch element on the armature shaft of said motor, a shaft disposed in coaxial relation to said armature shaft, a complementary clutch element mounted for free rotation on said shaft and normally engaged to said first clutch element, said

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clutch element having a collar portion and a pinion secured thereto, a spindle shaft mounted parallel to said shaft, a first gear on said spindle shaft mating with said pinion forming a first gear mechanism, a second pinion on said spindle shaft, a gear on said shaft mating with said second pinion forming a second gear mechanism operatively connecting said shaft and said spindle shaft, a motor spring on said shaft between said gear on said shaft and the first mentioned pinion, said motor spring being tensioned by said motor through said two gear mechanisms and through said spindle shaft when said clutch elements are normally engaged, a wire winding spindle carried by said spindle shaft, and manually operable means connected to said collar portion for disengaging said normally engaged clutch elements, whereby said motor spring rotates said spindle through said second gear mechanism to wrap the connection.

3. A wiring tool for effecting a wrapped electrical connection between a wire and a terminal in accordance with claim 2, wherein said tool comprises also three uprights, the first of said uprights supporting the one end of said shaft and one end of said spindle shaft, said first upright having a projection thereon, a pin on said gear on said shaft mating with said projection to limit the motion of said shaft in either direction, the second of said uprights being adjacent said motor spring and between said motor spring and said pinion, one end of said motor spring being secured to said second upright, the other end of said motor spring being secured to said shaft, said shaft passing through said second upright and being supported thereby, and said third upright supporting the other end of said spindle shaft.

4. A wire wrapping tool comprising a frame, an electric motor and a spring motor mounted on the frame, a gear train interconnecting the motors through a normally engaged clutch for winding up the spring motor, a pin on an element of the gear train and a stop on the frame for limiting the wind up and thus the energy stored by the spring, a wire wrapping spindle connected to the spring motor through a portion of the gear train, and manually operable means for disengaging the clutch to allow the spring motor to drive the spindle for a limited number of turns as determined by the pin and stop to perform a wire wrapping operation.

5. A wire wrapping tool comprising a frame, a motor, and energy storage means, a gear train interconnecting the motor and the storage means through a normally engaged clutch for biasing the storage means to an energy storing condition, pin and stop means mounted respectively on an element of the gear train and on the frame, for limiting the energy stored in the storage means, a wire wrapping spindle including a wire receiving slot adjacent to its outer extremity, the spindle being connected to the energy storage means through a portion of the gear train including the element on which the pin is mounted, said pin and stop thereby determining the location of the wire receiving slot with respect to the frame, and means for optionally disengaging the clutch to allow the energy storage means to supply power to the spindle for a wire wrapping operation.

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