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F. RECK

2,725,198

HAND-OPERATED WIRING TOOL

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FIG. 1

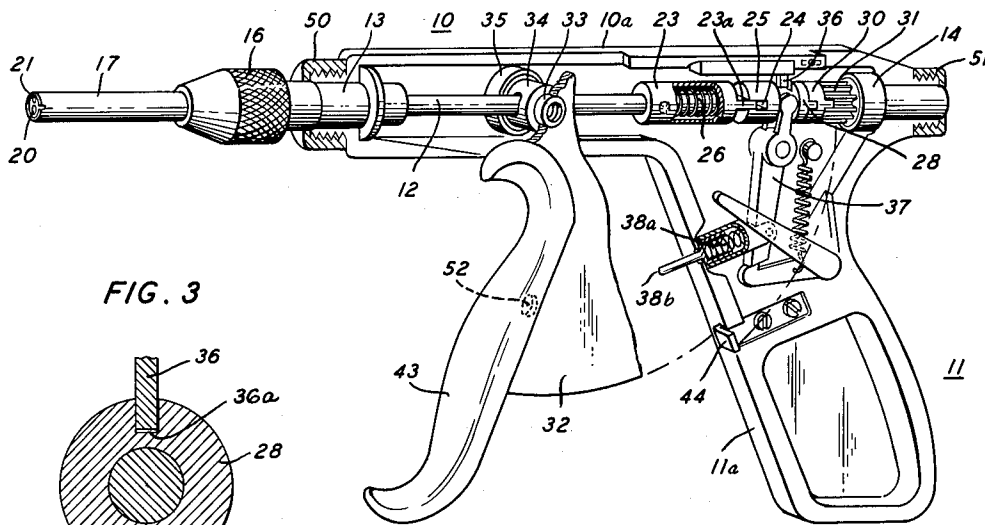


FIG. 3

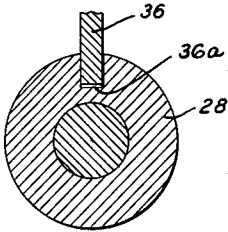


FIG. 4

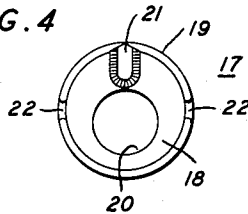


FIG. 5

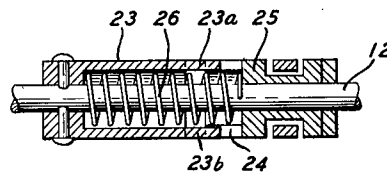
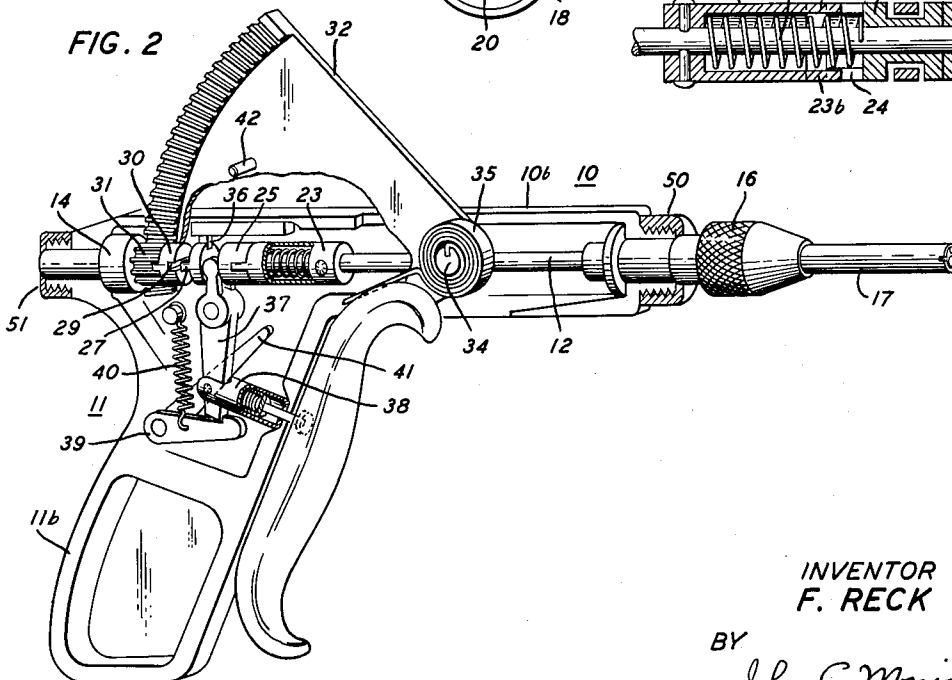


FIG. 2



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2,725,198

HAND-OPERATED WIRING TOOL

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12 Claims. (Cl. 242—7)

This invention relates to wiring tools and more particularly to a hand-operated tool for making wrapped wire connections on terminals and the like.

In making wrapped connections with a wiring tool of the type disclosed in Patent 2,585,010, granted to C. N. Hickman, R. F. Mallina, and F. Reck, it has been found desirable in some cases to make a connection having more turns than can be comfortably or conveniently made with one stroke of the hand lever. If the tool is geared to make a large number of turns by having a high gear ratio, the force required to operate it may be excessive or unreasonably fatiguing. The alternative of using a reasonable gear ratio from the force viewpoint and having a very long driving gear sector is undesirable because of the long travel.

It is an object of this invention to facilitate the making of wrapped wire connections with hand-powered tools. More specifically, an object is to enable the making of such connections without the necessity of applying excessive or unduly fatiguing force to the wiring tool.

Another object of this invention is to insure proper indexing of a hand-powered wire wrapping tool.

One feature of this invention resides in a ratchet-like reversible clutch mechanism that allows resetting of the hand lever without retrograde rotation of the wrapping means, thereby allowing the operator to make a many-turn wrap with successive operations of the hand lever.

A further feature of this invention lies in an operating linkage and cooperating detent means that insure proper indexing of the wrapping tool, i. e., return of the wrapping means to the same position after each operation of the hand lever.

Other and further objects and features of this invention will appear more fully and clearly from the following description of an illustrative embodiment thereof, taken in connection with the appended drawings in which:

Fig. 1 is a view partly in section and with parts removed to show the internal structure and arrangement of an illustrative embodiment of the invention before the hand lever has been operated;

Fig. 2 is a view similar to Fig. 1 taken from the other side of the same device and showing the internal structure after the hand lever has been operated;

Fig. 3 is an enlarged end view of a detent means;

Fig. 4 is an enlarged end view of the wire wrapping head; and

Fig. 5 is an enlarged view of a clutch biasing and connecting means.

The embodiment of the invention illustrated comprises a body or frame 10 having a handle or grip portion 11 comprising respectively mating parts 10a, 10b and 11a, 11b, which are held together by the screw caps or collars 50 and 51. A shaft or spindle 12 is mounted in bearings 13 and 14 secured to the frame 10.

The outer end of the shaft 12 is provided with a chuck 16 for receiving a wire handling member or wrapping head 17. The wrapping head may be of any suitable type. The head illustrated has a terminal receiving open-

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ing 20 and a wire receiving and guiding orifice 21. As may be seen more clearly in Fig. 4, the wrapping head 17 comprises a spindle 18 and a sleeve 19. The spindle is provided with the terminal receiving opening 20 and the sleeve and spindle cooperate to define the wire receiving and guiding orifice 21. Wire holding notches 22 are also provided in the sleeve. The spindle 18 may be constrained to rotate with the shaft 12 by a conventional key and slot connection not shown, the key being on the spindle. The sleeve 19 may be held in the stationary chuck 17 with its inner end bearing against the outer end of the spindle key to hold the spindle in place longitudinally.

Secured to an intermediate portion of the shaft 12 is a fitting or sleeve 23 having a bifurcated key portion comprising elements 23a and 23b that engage slot 24 in the part 25 of the shiftable member of a clutch. A spring 26 between the sleeve 23 and the clutch part 25 biases the clutch to engaged condition as shown in Fig. 1. The details of the biasing and connecting means are shown in Fig. 5. In this condition the tongue or key 27 on part 28 of the shiftable clutch member is in the slot 29 of the stationary clutch member 30. The clutch member 30 may be either keyed to or integral with a pinion 31 which meshes with a sector gear 32 mounted on a pivot 33 of a member 34 secured to the frame 10. A spring 35 for biasing the sector 32 to its initial position is also mounted on the member 34. The inner end of the shaft 12 passes through the sleeve 23, the spring 26, the clutch members, and the pinion to the bearing 14 mounted in the rear end of the frame 10.

A stop pin or key 36 secured to the frame 10 engages with a slot 36a in the clutch member 28 when the wrapping head 17 is positioned for initiating a wrapping operation and other conditions to be described are fulfilled. The member 36, although secured to the frame portion 10a as shown in Fig. 1, is shown also in Fig. 2 as if secured to the frame portion 10b in order to facilitate the explanation of the device.

Pivoted on the frame is a clutch shifting lever 37 having a connecting rod 38 pivoted thereto adjacent its lower end. The connecting rod includes a spring 38a and a plunger 38b passing through the handle 11 for a purpose to be described.

A latch 39 is pivoted to the handle 11 and is biased by a spring 40 anchored to the frame. The latch 39 is positioned to engage the lower end of the clutch shifting lever 37 and to latch it in one position under suitable conditions. Secured to the latch 39 is a latch tripping arm 41 which projects into the path of a pin 42 on the gear sector 32.

The sector 32 is provided with a manually operable or hand lever 43 and the handle portion 11 of the frame with a stop 44. A pad 52 on the lever 43 is for engaging the plunger 38b to operate the linkage that includes the connecting rod 38 and the clutch shifting lever 37.

In Fig. 1 the parts are shown in position to start a wrapping operation. For purposes of explanation, it may be assumed that the gear ratio is such that one full operation of the lever 43 to the stop 44 will drive the shaft and wire wrapping head through three full turns. It is further assumed that a six-turn wrap is required. The home or initial condition of the wiring head may be as shown with the wire receiving orifice straight up, or in some other convenient position as dictated by the task to be performed.

The clutch is in engaged condition connecting the pinion 31 to the shaft 12 by way of the sleeve 23. The slot 36a of the clutch member 28 is opposite the pin 36 on the frame 10, but they are not engaged for this clutch condition. To initiate the operation a wire is

inserted in the orifice 21 and the opening 20 is placed over a terminal.

When the lever 43 is moved toward the handle 11 the shaft is driven through the sector gear 32 and the pinion 31 to wrap the wire on the terminal. The lever 43 when it makes contact with the plunger 38b compresses the spring 38a to apply a clutch disengaging bias to the clutch shifting lever 37. This occurs during the last turn of the shaft after the slot 36a has passed the pin 36. The clutch is thus prevented from shifting until this last turn is completed, at which time the slot 36a engages the pin 36. This permits the clutch to be shifted to the disengaged condition where it is held by the latch 39. The parts are, at this stage of operation, in the positions shown in Fig. 2.

When the lever 43 is released it is biased to initial position by the spring 35. The sector gear 32 drives the pinion 31 in the reverse or retrograde direction, but the spindle remains stationary being locked by the pin 36 which remains in engagement with the slot 36a in the clutch member 28 due to the latching of the clutch in disengaged condition. At the end of the return stroke of the lever 43 the pin 42 on the sector 32 engages the latch tripping arm 41 to release the gear shifting lever 37. The spring 26 between the sleeve 23 and the clutch part 25 then biases the clutch to its engaged condition. The slot 36a is now again disengaged from but in line with the pin 36. Another operation of the lever will then wrap three more turns on the terminal, making six in all. If more than six turns are required, further operation will apply them. If less than six but more than three turns, say 5, are required, enough wire for five turns is inserted in the wrapping head and the tool is operated the same as for making six turns. Obviously, other combinations may be used depending upon the requirements of the particular connections being made.

Since the clutch cannot be disengaged unless the slot 36a is in line with the fixed stop pin 36, positive indexing of the shaft 12 and thus the wrapping spindle is provided. When the slot and pin are in line, the clutch is shifted to the disengaged condition, the slot 36a engages the pin 36 and the clutch is latched in this condition by the latch 39. The retrograde movement of the pinion can then occur with the shaft locked in the indexing position. If the lever 43 were to be released before the parts were locked in this indexing position, retrograde rotation of the shaft and wrapping head would occur thereby emphasizing the failure to fully operate the lever 43.

What is claimed is:

1. A tool for making a wrapped electrical connection comprising a frame, a rotatable shaft mounted on said frame and having means thereon for supporting a wire wrapping head; means for rotating the shaft comprising a hand lever and a sector gear, a pinion engaging said gear and rotatable on the frame, a normally engaged clutch having a driving member secured to the pinion and a driven member connected to the shaft through a sliding joint, said joint including a sleeve fixed to the shaft and having key elements cooperating with slots in the driven clutch member, a spring between said sleeve and the driven clutch member for biasing the clutch to engaged condition; a linkage on the frame and operable by the hand lever for urging the driven clutch member to disengaged condition, said linkage comprising a clutch shifting lever pivoted to the frame and a connecting rod secured to the shifting lever, said connecting rod including a plunger operable by said hand lever and an energy storing spring; a stop pin on the frame adjacent the driven clutch member for preventing clutch disengagement except at a specified rotational position when a notch in the driven clutch member is opposite said pin, and for locking the driven clutch member and shaft against rotation at said specified position; a latch for engaging the clutch shifting lever to maintain the driven clutch member in disengaged condition while the hand lever, sector gear, and pinion return to an initial position;

tion; and means on the sector gear for disengaging the latch as said initial position is reached.

2. A tool for making a wrapped electrical connection comprising a frame, a rotatable shaft mounted on said frame and having means thereon for supporting a wire wrapping head; means for rotating the shaft comprising a hand lever and a sector gear, a pinion engaging said gear and rotatable on the frame, a normally engaged clutch having a driving member secured to the pinion and a driven member connected to the shaft, means biasing the clutch to engaged condition; a linkage on the frame and operable by the hand lever for urging the driven clutch member to disengaged condition, said linkage comprising a clutch shifting lever pivoted to the frame and a connecting rod secured to the shifting lever, a stop pin on the frame adjacent the driven clutch member for preventing clutch disengagement except at a specified rotational position when a notch in the driven clutch member is opposite said pin, and for locking the driven clutch member and shaft against rotation at said specified position; a latch for engaging the clutch shifting lever to maintain the driven clutch member in disengaged condition while the hand lever, sector gear, and pinion return to an initial position, and means on the sector gear for disengaging the latch as said initial position is reached.

3. A tool for making a wrapped electrical connection comprising a frame, a rotatable shaft mounted on said frame and including a wire wrapping head; means for rotating the shaft comprising a lever and a driving gear, a pinion engaging said gear, a normally engaged clutch having a driving member connected to the pinion and a driven member connected to the shaft, means biasing the clutch to engaged condition; means on the frame and operable by the lever for urging the driven clutch member to disengaged condition, said means including a clutch shifting lever, stop means on the frame adjacent the driven clutch member for preventing clutch disengagement except at a specified rotational position, a latch for engaging the clutch shifting lever to maintain the driven clutch member in disengaged condition while the lever, driving gear, and pinion return to an initial position; and means on the driving gear for disengaging the latch as said initial position is reached.

4. A hand tool for making a wrapped electrical connection comprising a housing, a rotatable shaft mounted on said housing and including a wire wrapping head; means for rotating the shaft comprising a hand lever and a sector gear, a pinion engaging said gear, a normally engaged clutch having a driving member connected to the pinion and a driven member connected to the shaft, means biasing the clutch to engaged condition; a linkage operable by the hand lever for urging the driven clutch member to disengaged condition, said linkage including a clutch shifting lever, stop means adjacent the driven clutch member for preventing clutch disengagement except at a specified rotational position, a latch for engaging the clutch shifting lever to maintain the driven clutch member in disengaged condition while the hand lever sector gear, and pinion return to an initial position; and means on the sector gear for disengaging the latch.

5. A hand tool for making a wrapped electrical connection comprising a frame, a rotatable shaft mounted on said frame and having means thereon for supporting a wire wrapping head; means for rotating the shaft comprising a hand lever and sector gear, a pinion engaging said gear and rotatable on the frame, a normally engaged clutch having a driving member secured to the pinion and a driven member connected to the shaft through a sliding joint, said joint including a sleeve fixed to the shaft and having key elements cooperating with slots in the driven clutch member, means between said sleeve and the driven clutch member for biasing the clutch to engaged condition; a linkage on the frame and operable by the hand lever for urging the driven clutch member to disengaged condition, said linkage comprising a clutch

shifting lever pivoted to the frame and a connecting rod secured to the shifting lever, said connecting rod including a plunger operable by said hand lever and an energy storing spring operable by said plunger, a stop pin on the frame adjacent the driven clutch member for preventing clutch disengagement except at a specified rotational position when a notch in the driven clutch member is opposite said pin and for locking the driven clutch member and shaft against rotation at said specified position; a latch for engaging the clutch shifting lever to maintain the driven clutch member in disengaged condition while the hand lever, sector gear, and pinion return to an initial position; and means on the sector gear for disengaging the latch as said initial position is reached.

6. A hand tool for making a wrapped electrical connection comprising a frame, a shaft mounted on said frame and including a wire wrapping head; means for rotating the shaft, a normally engaged clutch having a driving member connected to the shaft rotating means and a driven member connected to the shaft, means biasing the clutch to engaged condition; a linkage on the frame and operable by the shaft rotating means for urging the driven clutch member to disengaged condition, a stop on the frame adjacent the driven clutch member for preventing clutch disengagement except at a specified rotational position, a latch associated with the linkage to maintain the driven clutch member in disengaged condition while the shaft rotating means returns to an initial position; and means for disengaging the latch.

7. A hand tool for securing wire to electrical terminals, said tool including a wire wrapping head, means for operating and indexing said head comprising a body member housing a rotatable shaft, means for rotating the shaft comprising a manually operable means including a lever and a rack, a cooperating pinion rotatable on the body member, a normally engaged clutch having a driving element secured to the pinion and a driven element connected to the shaft; a linkage on the body member and operable by the lever for urging the driven clutch element to disengaged position, stop means cooperating with the driven clutch element for preventing clutch disengagement except at a specified rotational position of the shaft and for locking the driven clutch element and shaft against rotation at said specified position, latch means for engaging a portion of the linkage to hold the driven clutch element in disengaged position while the lever, rack, and pinion return to an initial position; and means on the manually operable means for disengaging the latch means as said initial position is reached.

8. A tool for securing wire to electrical terminals, said tool including a wire wrapping head, means for operating and indexing said head comprising a body member housing a rotatable shaft, means for rotating the shaft including a lever and a rack, a cooperating pinion on the body member, a normally engaged clutch having a driving element connected to the pinion and a driven element connected to the shaft; a linkage on the body member and operable by the lever for urging the driven clutch element to disengaged position, stop means cooperating with the driven clutch element for preventing clutch disengagement except at a specified rotational position of the shaft, latch means for engaging a portion of the linkage to hold the driven clutch element in disengaged position while the lever, rack, and pinion return to an initial position; and means on the shaft rotating means for disengaging the latch means as said initial position is reached.

9. A hand tool for securing wire to electrical terminals, said tool including a wire wrapping head, means for operating and indexing said head comprising a body member housing a shaft, means for rotating the shaft comprising a manually operable lever and a rack, means biasing the lever and rack to an initial position, a pinion on the body

member and meshed with said rack, a normally engaged clutch having a driving element connected to the pinion and a driven element connected to the shaft; a linkage operable by the lever for urging the driven clutch element toward disengaged position, stop means cooperating with the driven clutch element for preventing clutch disengagement except at a specified rotational position of the shaft, and a latch for engaging a portion of the linkage to hold the driven clutch element in disengaged position while the lever, rack, and pinion return to the initial position; and means on the manually operable means for disengaging the latch means as said initial position is reached.

10. A hand tool for securing wire to electrical terminals, said tool including a wire wrapping head, means for operating and indexing said head comprising a body member, a shaft, means for rotating the shaft, a normally engaged clutch having a driving element connected to the shaft rotating means and a driven element connected to the shaft; means operable by the shaft rotating means for disengaging the clutch, stop means cooperating with the driven clutch element for preventing clutch disengagement except at a specified rotational position of the shaft, a latch for engaging a portion of the shaft operating means to hold the clutch in disengaged condition while the shaft operating means returns to an initial position; and means on the shaft operating means for disengaging the latch.

11. A tool for securing wire to electrical terminals, said tool including a wire wrapping head, means for operating and indexing said head comprising a body member, a shaft, means for rotating the shaft including a lever and a driving gear, a cooperating pinion on the body member, a normally engaged clutch having a driving element connected to the pinion and a driven element connected to the shaft; mechanical means on the body member and operable by the lever for urging the driven clutch element to disengaged position, stop means cooperating with the driven clutch element for preventing clutch disengagement except at a specified rotational position of the shaft and for locking the driven clutch element and shaft against rotation at said specified position, and latch means for engaging a portion of the mechanical means to hold the driven clutch element in disengaged position while the lever, driving gear, and pinion return to an initial position; and means operable for disengaging the latch means.

12. A hand tool for securing wire to electrical terminals, said tool including a wire wrapping head, means for operating and indexing said head comprising a body member, a shaft, manually operable means for rotating the shaft in one direction and biasing means for returning the shaft to an initial position, a normally engaged clutch having a driving element connected to the manually operable means and a driven element connected to the shaft; means operable by the manually operable means for urging the driven clutch element to disengaged position, stop means cooperating with the driven clutch element for preventing clutch disengagement except at a specified rotational position of the shaft, latch means for engaging a portion of the manually operable means to hold the driven clutch element in disengaged position while the manually operable means returns to the initial position; and means on the manually operable means for disengaging the latch means.

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