May 24, 1960 F. C. LEMKE 2,937,669

COMBINATION SCREW DRIVER AND WIRE APPLICATOR TOOL

Filed June 18, 1956

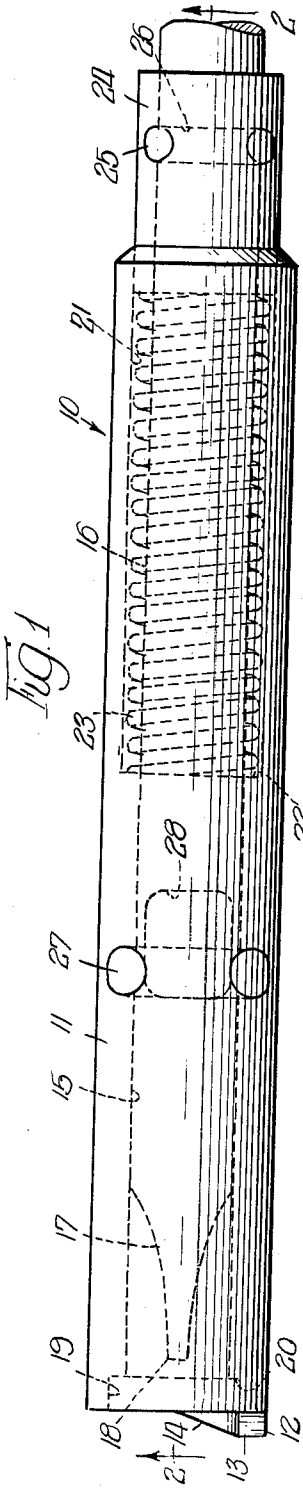


Fig. 1

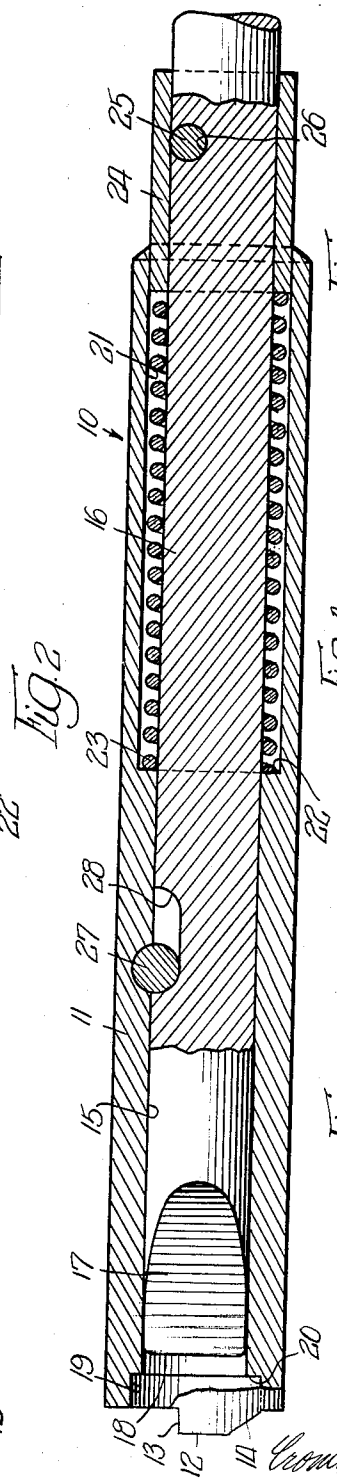


Fig. 2

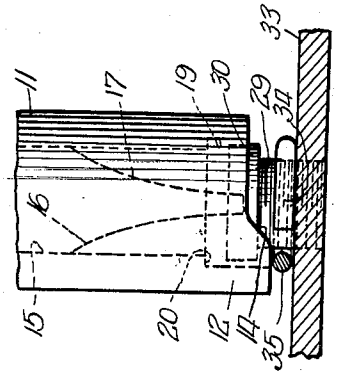


Fig. 5

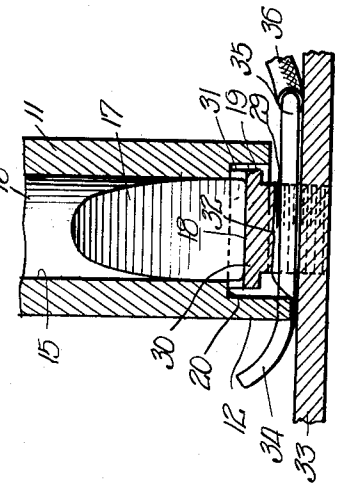


Fig. 4

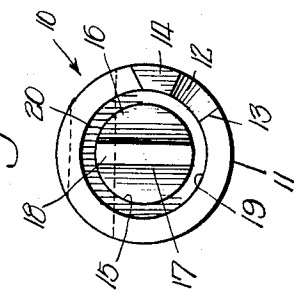


Fig. 3

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COMBINATION SCREW DRIVER AND WIRE APPLICATOR TOOL

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The present invention is directed to a combination tool which utilizes wire wrapping and terminal screw advancing elements of improved design cooperating with one another during the use of the tool in a new and improved manner.

It is an object of the present invention to provide a combination screw driver and wire applicator tool of an improved nature which includes cooperating wire-wrapping or turning means carried by a terminal screw driver, the driver portion of the tool including a bit adapted to maintain direct bearing on the head of the screw at all times during and subsequent to the wire-wrapping operation performed by the cooperating wire-wrapping means carried thereby.

Another object is to provide a combination tool including separate wire-turning or wrapping means carried by terminal screw advancing means, the separate means cooperating with one another in a new and improved manner to wrap or turn the free end of a wire about the shank of a terminal screw while the latter is being advanced into wire-clamping position, the wire-wrapping means further cooperating with the screw advancing means to initially center the same relative to the terminal screw and maintain the centered relation during the wire-turning and clamping operation.

Still another object, taken in conjunction with the foregoing, it is provide a new and improved combination screw driver and wire applicator tool having separate means cooperatively arranged with respect to one another to functionally cooperate in wrapping or turning the free end of a wire about the shank of a terminal screw while advancing the latter into wire-clamping position, the wrapping operation being capable of completion in a single revolution of the tool after the wire is engaged, the wire applicator means forming a part of the tool being associated with the screw driving means to initially center the same relative to the terminal screw and maintain this centered relation during the operation of the tool, the wire applicator means being further arranged with respect to the screw driving means to be cam actuatable by the main body portion of the wire inwardly of the wrapped end thereof upon continued rotation of the tool following the initial single revolution wire-wrapping operation to allow the wire applicator means to move past the main portion of the wire while continuing its centering function performed with respect to the screw driver means.

A further object is to provide a combination tool of the type described above which is improved in functioning and is of uncomplicated design and arrangement, the tool utilizing a main turning torque application member carrying the screw driver means to provide for direct application of the turning torque through a single member to the terminal screw during and following the wire-wrapping operation to clamp the wrapped wire end against displacement with respect to the terminal screw.

Other objects not specifically set forth will become apparent from the following detailed description made in conjunction with the drawings wherein:

Fig. 1 is a top plan view of the combination tool of the present invention;

Fig. 2 is a partial vertical section of the tool taken generally along line 2—2 of Fig. 1;

Fig. 3 is an end elevation of the screw driving and wire-wrapping end of the tool;

Fig. 4 is a fragmentary view partly in section of the wire-wrapping and screw driving end portion of the tool illustrating its operative positioning relative to a terminal screw and the free end of a terminal wire during the initial stage of the use of the tool; and

Fig. 5 is a fragmentary view similar to Fig. 4 illustrating the final stage in the use of the tool following the wire-wrapping operation and during continued advancing of the terminal screw into wire-clamping position.

Referring particularly to Figs. 1–3, a combination tool **10** is illustrated as including an outer cylindrical sleeve **11** which at one end thereof is provided with an axially, outwardly directed wire-wrapping lug **12**. The lug **12** is arcuate in shape and is provided with a substantially flat wire engaging face **13** and a rear inwardly sloping wall **14**.

The sleeve **11** is provided with an axially extending bore **15** located near the end of the sleeve **11** carrying the lug **12** which receives therethrough, in telescopic, relatively slidable relation, a screw driver shank **16**. The end of the shank **16** positioned in close association with the lug **12** is provided with inwardly curved, convergent and relatively flat faces **17** forming a bit **18** adapted to be received in the kerf of a known type of screw. The shank **16** extends outwardly of the end of the sleeve **11** opposite the lug **12** and is freely slidable wtihin the bore **15**.

The end portion of the bore **15** adjacent the lug **12** is enlarged to provide a counterbore **19** which in cooperation with the bore **15** defines an annular, radially inwardly directed shoulder **20** spaced inwardly from the end of the sleeve **11**. The opposite end of the bore **15** communicates with a counterbore **21** of substantial axial length defining with the bore **15** an annular, radially inwardly directed shoulder **22**. Carried within the bore **21** and about that portion of the shank **16** positioned therein is a resilient compressible means **23** in the form of a coil spring having an end maintained in abutment with the shoulder **22**, this shoulder functioning as a spring retaining seat. The remaining end of the spring **23** is in abutment with an annular radial edge of a collar **24**, in the form of a short annular sleeve, which is received about a portion of the shank **16** in association with the end of the sleeve **11** opposite the end carrying the lug **12**. The collar **24** is fixed to the shank **16** against relative slidable movement by a pin **25** which is passed through aligned off-center apertures in the collar **24**. The central portion of the pin **25** received within the interior of the collar **24** is partially received in a tangential, radially opening groove **26** in the form of a ream carried by the shank **16**. The pin **25** fixes the collar **24** relative to the shank **16** and the outer diameter of the collar **24** is less than the diameter of the bore **21** to be receivable therein as illustrated.

The sleeve **11** and shank **16** are slidably movable relative to one another against the biasing action of the spring **23** and the total relative movement is limited by a pin **27** passed through aligned off-center apertures in the sleeve **11**. The central portion of the pin **27** carried interiorly of the sleeve **11** is received within a tangentially reamed out portion **28** of the shank **16**. The portion **28** defines a radially opening groove of appreciable axial width and the relative movement between the sleeve **11** and the shank **16** is limited by abutment of the pin **27**

with the radial side margins of the groove 28. Consequently, the sleeve 11 and shank 16 may move relative to one another in directions with or against the spring 23 to an extent as limited by contact between the pin 27 and a radially directed side margin of the groove 28. The spring 23 is received within the bore 27 in a compressed state so as to constantly urge the sleeve 11 and the collar 24 away from one another into the positions shown in Figs. 1 and 2.

The operation of the tool 10 is best illustrated in Figs. 4 and 5 wherein a known type of terminal screw 29 is illustrated as being provided with a flat annular head 30 provided with a transverse, upwardly opening kerf 31 within which the end of the bit 18 is received to rotate the screw. The head 30 has integrally formed therewith a threaded screw shank 32 which is threadedly received in a terminal supporting base 33. The tool 10 is used to simultaneously wrap a bared free end 34 of an electrical conducting wire 35 provided with an insulating wrapping 36 about the shank 32 of the screw 29 while advancing the screw 29 into clamping engagement with the wrapped wire end 34.

In order to bring this about, the opened end of the sleeve 11 carrying the wire-wrapping lug 12 is received about the head 30 of the screw 29 and the annular shoulder 20 is brought into abutting engagement with the top annular edge surface of the head 30. This initial step, as a result of the positioning of the shoulder 20 outwardly of the end of the bit 18 under the compressive action of the spring 23 as shown in Fig. 2, results in automatic centering of the bit 18 relative to the central portion of the head 30. Downwardly directed pressure and rotating torque is applied to the free end of the shank 16 outwardly of the collar 24 by any suitable means and the end of the bit 18 is moved into the kerf 31.

Due to the spring-mounting of the sleeve 11, the same rides freely in engagement with the top surface of the head 30 of the screw 29 and functions independently of the downwardly directed pressure applied to the shank 16. Upon rotation of the shank 16 in a direction to advance the screw 29 toward the surface 33, the sleeve 11 also rotates by reason of its interconnection with the shank 16 through the pin 27 and the lug 12 engages a portion of the free end 34 of the wire 35. Continued rotation wraps or turns the free end 34 of the wire 35 about the shank 32 of the screw 29 at the same time that the bit 18 rotates the screw 29 and threadedly advances the same toward the supporting surface 33. The substantially complete enveloping of the screw head 30 by the bore 19 of the sleeve 11 maintains continuous centering action between the tool 10 and the screw 29 to eliminate the possibility of the bit 18 moving sidewise out of operative association with the head 30. Depending on the length of the bared end, one complete revolution of the tool 10 wraps the free end 34 of the wire 35 about the shank 32 of the screw 29 to form a complete and tight encircling loop capable of being tightly clamped by continued advancement of the screw 29.

Upon the completion of the first revolution, the lug 12 will contact the main portion of the wire 35 inwardly of the free end 34 thereof and in order to continue the advancing of the screw 29 the lug 12 must move over and past the main portion of the wire 35. As particularly shown in Fig. 5, the wire 35 acts on the lug 12 to cam the sleeve 11 against the biasing action of the spring 23 in an upwardly direction to move the sleeve 11 independently of the shank 16 toward the pin 25. This independent upward movement of the sleeve 11 may continue until the pin 27 carried thereby abuts the opposite radially directed side margin of the groove 28 in the shank 16 depending on the diameter of the wire 35. The width of the groove 28 is adequate to allow the sleeve 11 to move upwardly relative to the shank 16 to an extent that the lug 12 rides over the top surface of the wire 35 and thus allows continued uninterrupted rotational movement of the shank 16 in advancing the screw 29 toward the supporting surface 33. Once the lug 12 has cleared the wire 35, the biasing action of the spring 23 moves the sleeve 11 in a downward direction to its original positioning relative to the shank 16 as illustrated in Fig. 4. Upon each of the subsequent revolutions the same sequence of operation occurs and the lug 12 is continuously cammed by the wire 35 over the same to an extent that continued rotational operation of the bit 18 is completely uninhibited and uninterrupted.

As will be noted from the foregoing description, the one-piece shank 16 and bit 18 forming the screw driver portion of the tool 10 has direct and continuous bearing on the head 30 of the screw 29 at all times while the screw is being threadedly advanced into its wire-clamping position. The direct bearing is also present while the free end of the wire 35 is being wrapped around the shank 32 of the screw 29. Still further, the wire-wrapping and screw-advancing operations are simultaneously performed without one interfering with efficient functioning of the other. The annular shoulder 20 rests on the top surface of the screw head 30 at all times except when the lug 12 passes over the wire 35. During this latter functioning the end of the sleeve 11 is maintained in centered relation with respect to the screw 29 by reason of the bore 19 having sufficient axial length to prevent complete clearance occurring between the same and the head 30. Consequently, the bit 18 is prevented from slipping off the head 30 while the screw 29 is being turned to the desired extent as well as while the wire is being wrapped about the shank 32. The tool is designed to wrap the wire during the first complete revolution of the same and subsequent revolutions result in a clutch or slipping action of the sleeve 11 relative to the main portion of the wrapped wire while the sleeve continues to act as a screw finder and centering means to allow uninterrupted advancement of the screw by the bit 18.

The arrangement and manner in which the screw driver portion and wire-wrapping portion of the tool 10 cooperatively function with one another allows the bit 18 to be designed for use with any type of screw head, such as hexagon, slotted or recessed heads. The free end of the shaft 16 to which the downward pressure and rotational torque are applied is adapted for association with any type of torque application means. A handle portion may be applied to the free end of the shank 16 or the same may be adapted for use with ratchet, Yankee or plunger speed, electric high speed or automatic air drivers.

The sleeve 11 and its associated wire looping lug 12 locks the wire around the shank of the screw in such a manner that the wire stays on the screw even though the screw is removed from the workpiece or supporting base 33. By utilization of a free and independently functioning wire-wrapping sleeve 11 of the type described it is unnecessary to take the standard precautions of predetermining the thread and gauge limit of the screw so as not to overdrive or double the wire under the head of the same. The particular cooperation occurring between the wire-wrapping sleeve 11 and the screw driver portion formed from the shank 16 and bit 18 readily adapts the tool 10 for use in many different types of terminal screw arrangements.

Obviously many modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. A combination tool for use in turning a wire end about a terminal screw while advancing the latter into wire-clamping position, said tool including a shank carrying a screw-turning bit at an end thereof, a sleeve received about said shank attached for rotation therewith during full use of said tool and having an axially extend-

ing wire-turning lug carried by an end thereof in association with said bit, resilient compression means having portions associated with said sleeve and said shank to permit axial relative sliding movement therebetween, said compression means acting to urge said sleeve forwardly of said bit to cover the same and with sufficient force to effect turning of the free end of a wire about said terminal screw, and stop means carried by said sleeve and cooperating with said shank to limit movement of said sleeve forwardly of said bit, said sleeve being arranged to initially center said bit relative to a head of a screw and maintain the centered relation during full use of said tool, said lug including a surface which is cam actuatable by the main portion of a wire following the end turning of the same to move over said main portion by further compression of said resilient means during continued advancing of said screw to effect a rearward movement of the sleeve upon each reveolution of said tool.

2. A combination tool for use in turning a wire end about a terminal screw while advancing the latter into wire-clamping position, said tool including a shank carrying a screw-turning bit at an end thereof, a sleeve received about said shank attached for rotation therewith during full use of said tool and having an axially extending wire-turning lug carried by an end thereof in association with said bit, resilient compression means having portions associated with said sleeve and said shank to permit axial relative sliding movement therebetween, said compression means acting to urge said sleeve forwardly of said bit to cover the same, and with sufficient force

to effect turning of the free end of a wire about said terminal screw and stop means carried by said sleeve and cooperating with said shank to limit movement of said sleeve forwardly of said bit, the end portion of said sleeve carrying said lug being provided with an internally carried annular shoulder spaced inwardly from the end thereof and said lug, said shoulder adapted for resting engagement with the top surface of a head of a screw during the turning of the same by said bit and the wire-turning functioning of said lug to initially position and subsequently maintain said bit in centered relation with said head, said lug including a surface which is cam actuatable by the main portion of a wire following the end turning of the same to move over said main portion by further compression of said resilient means during continued advancing of said screw to effect a rearward movement if the sleeve upon each revolution of said tool while maintaining said centered relation.

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