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2,453,840

INSERT COIL SETTING TOOL

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6 Claims. (Cl. 10-1)

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The invention relates to a tool for setting wire coils as linings in tapped holes, and more particularly to a tool as described for instance in U. S. Patent No. 2,316,231. A tool of the type here under consideration mainly comprises a tubular member having an interiorly threaded forward end portion and a coil-receiving chamber in the rear thereof, and a rod-like member axially shiftable and rotatable in the tubular member. One end of the rod is shaped so as to grip, from the interior the forward end of a wire coil charged into the receiving chamber, and by rotating and simultaneously shifting the rod forward the coil screwed through the narrower threading of the tubular member can be contracted, and inserted in a tapped hole as it leaves the forward end of the tool threading.

However, such a conventional tool has certain drawbacks. On the one hand, a torque is set up between the two tool members owing to the contraction of the resilient wire coil during the application of the tool. This torque tends to reverse the rotation of the rod member in relation to the tube member. The well known tool prevents an actual reversing of the rod by means of a braking device acting between the two members. In consequence, the torque which must be applied to contract the coil is approximately at least twice as great as that required when the coil is contracted without any braking effect. On the other hand, it is practically impossible or at least very difficult to insert the contracted coil in a tapped hole to a depth predetermined within tolerances because no stop or indication limits the axial movement of the rod in relation to the tubular member, and the braking effect prevents any feeling for the moment when the coil leaves that member.

The invention aims to avoid the mentioned drawbacks and to improve the tool so as to render it useful for setting insert coils with great exactness to a desired depth in tapped holes. The invention essentially consists in the provision of a ratchet and detent device active between the two tool members so as to prevent rotation of the rod in a direction opposite for contracting a coil. The invention also consists of means for limiting the distance the forward rod end can be projected from the tubular member.

Further objects and details of the invention will be apparent from the description given hereinafter and the accompanying drawing illustrating embodiments thereof by way of example. In the drawing:

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Fig. 1 is a side elevation of a tool according to the invention, in retracted position of the rod.

Fig. 2 is a side elevation, partly in section of the same tool turned 90° and with the rod in projected position.

Fig. 3 is a rear end view thereof.

Fig. 4 is a side elevation of another embodiment.

Fig. 5 is a cross-section along line 5-5 of Fig. 4.

Fig. 6 is a cross-section along line 6-6 of Fig. 5, on a larger scale.

Fig. 7 shows a portion of Fig. 5 on a larger scale with the tool in a position ready to contract a coil and to insert it into tapped hole of a boss; and

Fig. 8 is a front view of the driver end.

Referring now to the drawing, the embodiment illustrated in Figs. 1 to 3 comprises the tubular member 1 provided, in the forward end portion 2, with an internal threading 3 of a pitch and maximum diameter according to those to which a wire coil is to be contracted by the tool prior to the insertion of the coil into a tapped hole. Portion 2 may be recessed as shown at 4 in order to render observation of the coil during its contraction possible. Rearwardly of portion 2 a laterally open chamber 5 is formed by the removal of part of the wall of the tubular member, so that a coil may be charged into it. The major portion 6 of member 1 may be externally knurled and has an axial bore 7 of a diameter smaller than that of the chamber 4 and of the inner diameter of the threading 3. A rod-like member or driver 8 is rotatable and axially shiftable interiorly of member 1. Its forward end is so shaped as to grip, from the inside, the forward end of a coil charged into chamber 5. In the illustrated embodiments it is assumed that the coils have a diametrical tang for this purpose. A coil 11 of such type with a tang 12 is shown in Fig. 2 in its final position, i. e. inserted in the tapped hole 13 of a boss or similar part 14. Accordingly the driver end 9 is provided with a slot 10 into which the said tang may engage when the driver after the insertion of a coil in chamber 5 is axially shifted forward from its retracted position shown in Fig. 1. This is more fully described in the afore-mentioned Patent No. 2,316,231. Another form of the coil end will also require a different form of the driver end. Examples of such co-ordinate other forms are illustrated in U. S. Patent No. 2,363,789 and allowed application Ser. No. 555,469 respectively. The rearward end of the driver is provided with means such as for instance a cross bar 15 in order to move the driver

either by hand or by a prime mover in relation to the member 1 which can be held at its knurled portion.

Now in order to prevent rotary backing of the driver without interfering with its movability in an axial direction and also without increasing the torque required in order to screw a coil through the threading 3 of the tool, a ratchet and detent device is provided which is so arranged that the driver is normally locked against rotation relatively to the tubular member in a direction opposite to that for contracting the coil. For this purpose, member 1 has a slot 16 axially extending from the rear end face 17 thereof. On both sides of the slot recesses 18 and 19 respectively are provided so that a pivot pin 20 can be passed through the material constituting the slot flanks, at some distance from the end face 17. There is also a depression 21 between the recesses 18 and 19 for a purpose to be explained hereinafter. A detent 22 is located in the slot 16 and pivoted on pin 20. The forward end of the detent is formed as a tooth with an inclined face 23 and a leaf spring 24 secured to member 1 by screws 25 presses the tooth end of the detent inward upon the driver 3. The rearward detent end is tapered at 26 so that it can be pressed downward to lift the detent tooth against the restraint of spring 24, the aforementioned depression 21 allowing sufficient space for a finger thus to turn the detent about its pivot. Under the action of spring 24, the detent is in engagement with a portion 27 of the driver which is circumferentially toothed. The teeth are preferably very narrow, and they are of such length in axial direction that the detent stays in engagement therewith regardless of the position of the driver between the ultimate limits between which the driver has to be axially shifted when the tool is in use.

While the ratchet and detent device prevents undesired rotation of the driver in relation to the tubular member, other means are provided in order to limit axial shifting of the driver in at least one direction. For this purpose another portion 28 in the rear of portion 27 is externally threaded and one or two nuts 29 are screwed on the threading of portion 28. Thus, the nuts will serve as an abutment in co-operation with the end face 17 of member 1. It will be clear that by adjusting the position of the nuts 29 the distance will be selectively limited which the forward end 9 of the driver can be projected from member 1, and that thereby also the depth can be set to which a coil 11 can be inserted in the tapped hole 13.

The described tool is useful to set coils in the desired manner. However, it requires careful handling, inasmuch as the driver can be forced, during the setting operation, in an axial direction relatively to the coil rather than to advance only as the coil is advanced in the threading 3 or in the threading of the boss. If this happens, the tang may be bent forward and thus the driver shifted forward in relation to the coil. In consequence, the coil will be set to a depth less than that for which the abutment is adjusted. With coils having their forward ends shaped to be gripped in another manner, for instance, hook shaped as mentioned hereinbefore, an axial shift of the driver in relation to the coil during the setting operation would disengage the tool. Such happening is avoided in the tool illustrated in Figs. 4 to 7 and which now will be described.

In this tool, the tubular member, in general denoted by 31 is composed of several pieces. This

has been done in order to facilitate the production and also to apply certain improvements which will be apparent from the description. The member 31 comprises the sleeve part 32 which has a circumferential inner recess 33 of its forward end. Into the recess 33, a piece 34 is fitted and secured by suitable means (not shown). It is interiorly threaded at 35 and may be hardened while the sleeve may consist of more easily workable material. In the rear of the so formed prewinder, shell 32 is laterally recessed at 36 so as to constitute in the recessed portion a charging chamber according to the chamber 5 of the first described embodiment. The rearward portion 37 of the shell is of larger outer and inner diameters than the forward portion. Where the two portions meet a bushing 38 is inserted to serve as a guide for the driver which will be described hereinafter. Also into portion 37, a tube 39 is fitted the forward end of which is externally screw-threaded at 40. Tube 39 is secured in its position within the shell 32 by a set screw 41 and provided with a window 42 and if so desired, also with an opening 43 in the wall opposite that window. Tube 39 will be hereinafter denoted as the outer tube in order to distinguish it from other tubular members of the tool. Interiorly of the outer tube, an intermediate tube 44 is non-rotatable but axially shiftable. For this purpose, it is provided with grooves 45 length-wise extending in its outer surface. Set screws 46 in the wall of the outer tube serve to guide the intermediate tube when the latter is shifted, and to secure it in an adjusted position relatively to the outer tube. The outer wall of the tube 44 is provided with a longitudinally arranged scale 47 which can be observed through the window 42 and read with reference to a marker 48 on the window rim. By fingering the tube 44 through the window 42 and opening 43, it can be shifted when the screws 46 are loosened, although normally its movement will be caused differently as will be explained hereinafter. At least a portion of the tube 44 is provided with an inner threading 49 into which the outer threading 50 of an inner tube 51 engages. This tube has, at its rearward end, a flange 52 the forward face 53 of which can abut against the rearward face 54 of the tube 44 whereas the rearward face can abut against a washer 55 inserted into the rear end of the outer tube 39 and held in position by a nut 56 screwed on the threading 40. A driver rod 57 which may be arranged for hand or power operation, is passed through nut 56, the inner tube 51 and bushing 38. The driver rod 55 is provided with one groove 58 of a length substantially according to the length of the sleeve chamber 36, and a second groove 59 which may be of considerably greater length. A pin 60 penetrating and secured to the flange 52 of the inner tube engages in groove 58, and a small ratchet wheel 61 axially held by washer 55 and the bottom face 62 of nut 56 is in spline connection with the driver 57 so that the latter can shift axially in relation to the ratchet wheel but rotate together with it. A spring-biased detent or pawl 63, located in a recess 64 of the nut and pivoted thereto by a pin 65 is normally in engagement with the ratchet wheel, and, from the viewpoint of the present invention it is of importance that the threadings 35 and 49 are of the same pitch and that the teeth of the ratchet are so formed as to prevent, when engaged by the detent, the driver from rotating in the direction opposite to that for screwing a coil through the threading 35. The detent, however, has an arm 66 whereby

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it can be disengaged when the arm is pressed down. The forward end 67 of the driver is formed according to the coil end to be gripped, i. e. in the present embodiment where it is assumed that the coil 11 has a tang 12 for such purpose, the driver end is provided with a slot 68 the one end 69 of which, however, is closed so that engagement can take place in only one relative position of driver and tang.

In order to apply the tool first the set screws 46 are loosened and the driver is retracted as far as possible. This position is reached when simultaneously pin 60 of the inner tube is at the forward end of the driver groove 58, the rear end of flange 52 abuts against the washer 55 and the forward driver end is withdrawn from the charging chamber. While the driver is in such axial position, it will now be rotated until the scale 47 and marker 48 indicate that the intermediate or stop tube 44 is set for the desired depth to which a coil is to be inserted. This position of tube 44 defines the adjusted distance of the faces 53 and 54 which is equal to the desired depth to which the coil is to be inserted in the tapped hole of the boss plus the length of the threading 35 in axial direction. Depending whether for this purpose tube 44 has to be shifted forward or backward the detent 63 must be disengaged or may stay engaged. Tube 44 will be secured in the desired position by tightening the set screws 46. Now, a coil may be charged into the charging chamber so as to bear upon the prewinder piece 34, and the driver may be shifted forward without rotation until pin 60 is at the rearward end of groove 58. The length of the groove 58 is such that in the so projected position the coil tang can engage the driver slot 68 without any stress. If the tang is not in registry while the driver is projected, the coil rather than the driver is to be turned. Now, the driver will be rotated to screw the coil through the threading 35 until one or two coil convolutions project forward of the piece 34. If the tool had already been placed on top of the boss in registry with the tapped hole the projecting convolutions will have entered the boss threading. Otherwise, the projecting coil convolutions will now be screwed into the tapped hole by turning the whole tool without a change of the driver position in relation to the other tool parts, until the front face of the tool bears against the boss. Then the driver may be further rotated while shell 32 is held stationary, until the driver comes to a stop which occurs when face 53 abuts against face 54 and the coil has reached the desired depth. In order to make the tool ready to drive another coil the driver rod is to be turned as far as it will go in the opposite direction while the detent is held disengaged and also shifted in axial direction to withdraw the forward driver end from the charging chamber.

It will be apparent to those skilled in the art that many modifications and alterations of the structure illustrated and described are possible without departure from the essence and spirit of my invention which for this reason, shall not be limited but by the appended claims.

I claim:

1. A tool for setting an insert coil in the

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threading of a tapped hole comprising a tubular member with an interior threading at one of its ends and a coil-receiving chamber in the rear of said threading, a rod-like member movable in said tubular member and having an end shaped to grip, from the inside, a coil charged into said chamber and to screw it through said threading, two interengaging screw threaded elements between said members, one of said elements being non-rotatable in relation to one of said members, and the other element being non-rotatable in relation to the other one of said members, the threadings of said elements having a pitch equal to that of said threading of said tubular member, and means in engagement with one of said screw means and said rod-like member so as to permit a limited axial shift of the latter in relation to the former.

2. A tool as claimed in claim 1, said end of said rod-like member embodying means to prevent the rod-like member from gripping a coil in a relative position other than a sole predetermined one.

3. A tool as claimed in claim 1, said end of said rod-like member being diametrically slotted so as to be adapted to grip a tang-provided coil, and the one end of said slot being closed.

4. In a tool of the type described the combination of an outer, an intermediate and an inner tubular member in telescopic arrangement, said intermediate member being non-rotatable but axially shiftable in relation to said outer member and in screw-threaded engagement with said inner tubular member, releasable means to secure said intermediate member to said outer member in an adjusted position, a rod-like member interiorly of said inner tubular member and non-rotatable but axially shiftable in relation to the latter a limited distance, abutment faces on said outer and said inner tubular members and, respectively, co-ordinated abutment faces on said inner member so as to limit axial movement of said inner member in both axial directions.

5. A tool as claimed in claim 4, further comprising a scale on said intermediate tube and a window in said outer tube so as to permit reading of the position of the intermediate tube in relation to said outer tube.

6. A tool as claimed in claim 4 further comprising a ratchet wheel splined to said rod-like member, a detent pivoted to said outer member and normally in engagement with said wheel so as to prevent rotation of said rod-like member in one direction, and means to disengage said detent.

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REFERENCES CITED

The following references are of record in the file of this patent:

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