Feb. 26, 1952 J. O. FORSTER 2,586,805

INSERTING TOOL FOR TANGLESS COILS

Filed March 2, 1949 2 SHEETS—SHEET 1

FIG. 1.

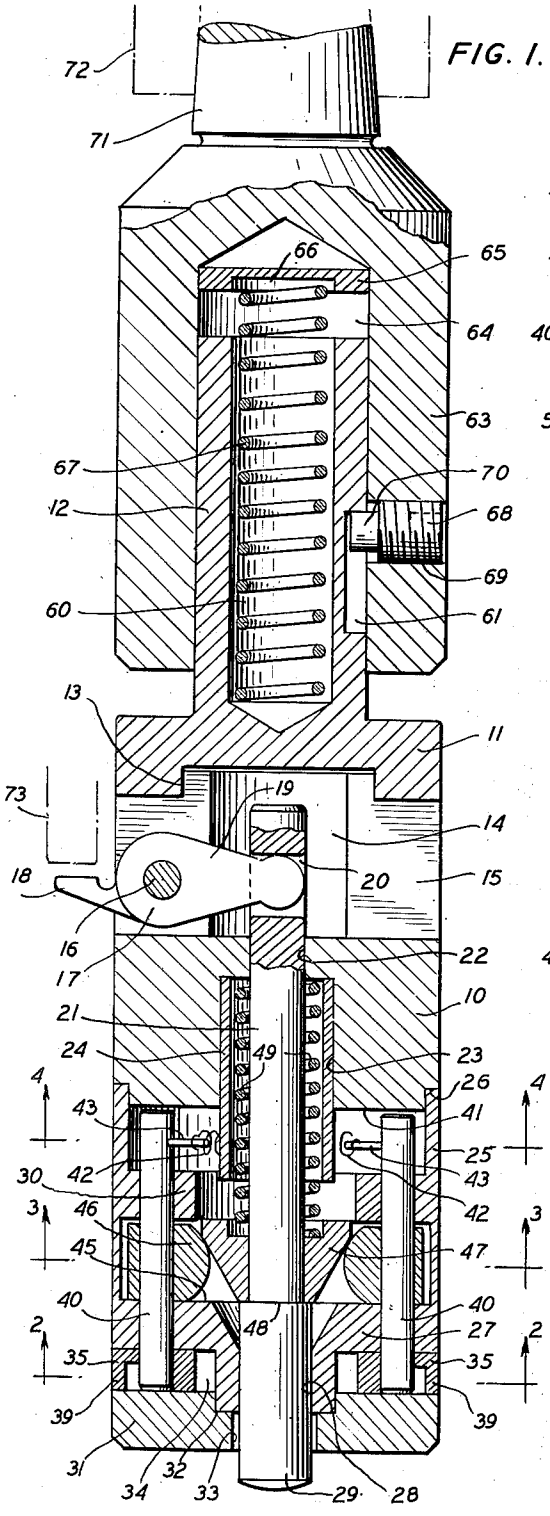


FIG. 2.

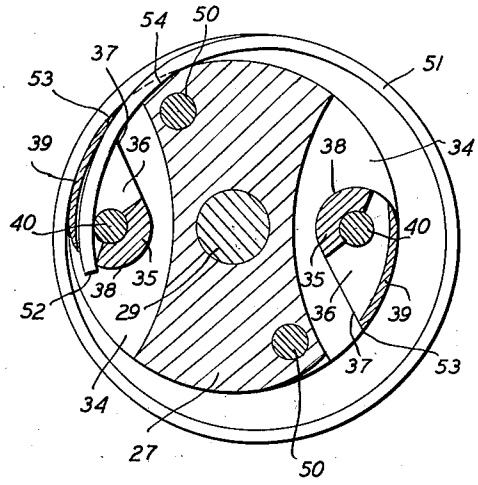
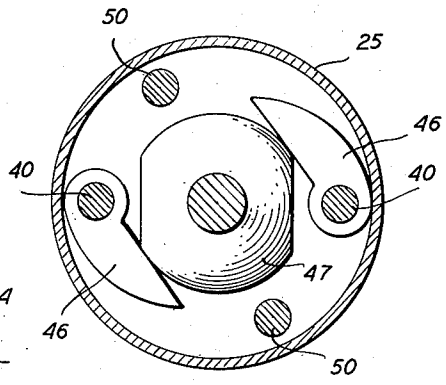


FIG. 3.



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FIG. 4.

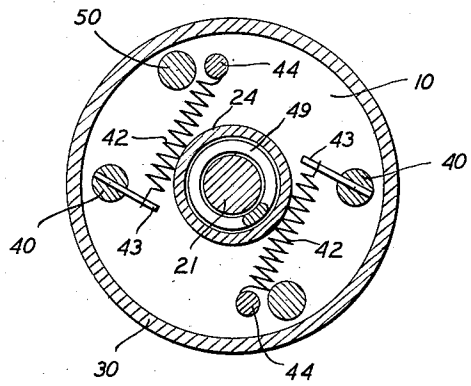
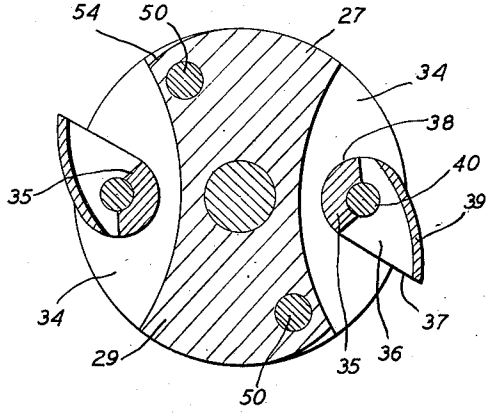


FIG. 5



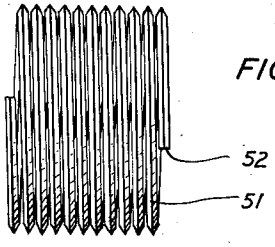
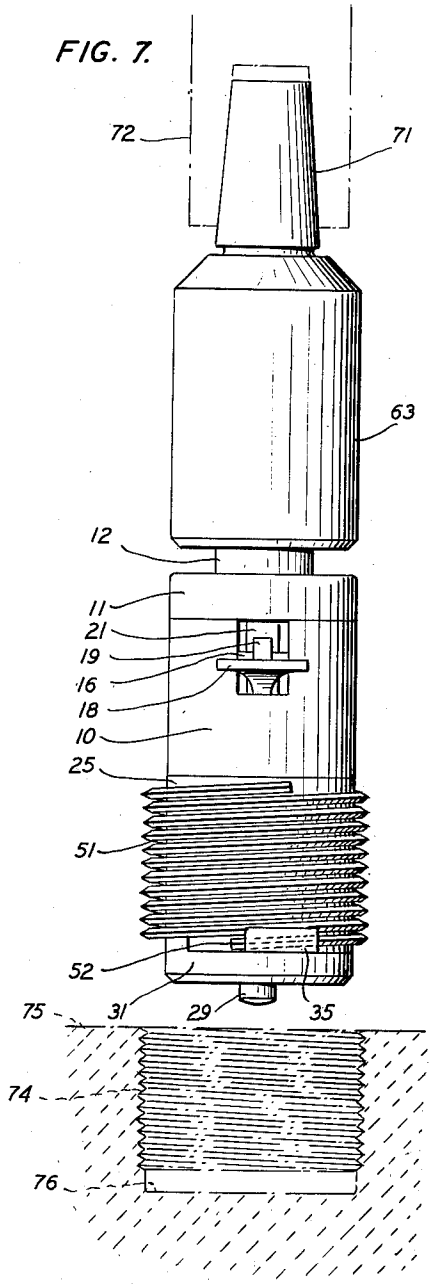


FIG. 6.

FIG. 7.



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Patented Feb. 26, 1952

2,586,805

UNITED STATES PATENT OFFICE

2,586,805

INSERTING TOOL FOR TANGLESS COILS

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Application March 2, 1949, Serial No. 79,260

9 Claims. (Cl. 10—1)

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The present invention relates to a tool for inserting thread-forming wire coils in tapped holes. In making screw connections, the tapped holes of boss or nut members are frequently lined with inserts of coiled wire in order to provide, for engagement with bolts or studs, an interior threading having qualities which the material of the boss or nut member is lacking. For instance, if a hard steel bolt or stud is to be secured in an aluminum boss, the wire insert of proper material will protect the soft aluminum against damages resulting from a repeated screwing in and out of the bolt. Usually, such inserts have springy properties and are coiled with an original diameter larger than that of the boss thread they are intended to reinforce. For that reason, special tools are necessary for inserting such wire coils. The conventional tools for that purpose require that at least one end convolution of each insert is specifically shaped in order to render such tools applicable. This is a severe drawback as in the production of inserts, the specific formation of the end convolutions calls for operations which are additional to the coiling of the wire and increase labor and production costs considerably. Certain types of the conventional inserting tools even require additional operations after the insertion of a coil in order to remove an end needed for rendering the tool applicable but obstructing the passage of a member intended to be screwed into the insert; in many cases of use of such tanged coils, the tang has to be removed after the insertion.

The present invention aims to provide a tool which can be introduced into a cylindrical tangless coil from the one coil end, and can be caused to grip the other coil end so as to hold it firmly and, if necessary, to apply a torque thereto as it is required in the case of a screw thread insert.

The tool according to the invention essentially comprises a cylindrical member of a diameter somewhat smaller than the inner diameter of the coil for which it is destined, and at least one element connected to that member so as to be oscillatable with respect thereto to project from or be withdrawn within the periphery of said member whereby the end of a coil can be gripped between said element and said member.

In the preferred form of the tool, resilient means are provided tending to urge said element in the projected position, and other means to withdraw it against the restraint of said resilient means.

Another object of the invention aims to provide a tool of the mentioned type with means adapting it for power operation.

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The invention also aims to provide an attachment for use with a power-driven shaft and a tool of the class of screw drivers to which the afore-mentioned tool broadly belongs, for the purpose of preventing the screw member from injuring the threading into which it is to be driven.

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

Fig. 1 is a longitudinal cross-section of a tool according to the invention;

Figs. 2, 3 and 4 are cross-sections along lines 2—2; 3—3 and 4—4, respectively, of Fig. 1;

Fig. 5 is a cross-section similar to Fig. 2, with the gripping elements in projected position;

Fig. 6 illustrates a coil of the type to which the tool may be applied, and

Fig. 7 is an elevation, on a smaller scale, of the tool in engagement with such coil.

Referring now to the drawing, a cylindrical shank 10 is provided with an upper extension piece 11 including an end portion 12 of reduced diameter for the purpose of applying a torque to the shank. The shank and the extension are axially alined by means as indicated at 13. The shank has an axial hole 14 in its upper portion with a diametrically extending slot 15. On the one side of the hole 14 a pin 16 crossing the slot 15 is secured in the shank. On pin 16, a lever 17 is pivoted one arm 18 of which projects outwardly whereas the other arm 19 extends into the hole 14 and engages a slot 20 in the upper portion of a rod 21. This rod is axially guided in a reduced continuation 22 of hole 14 which is widened at 23 in the lower portion of the shank 10 so as to receive therein a tubular member 24 projecting downwardly. A piece 25 of the same diameter as the shank is held in axial alinement with the latter by suitable means as for instance seating on a shoulder 26 of the shank. Piece 25 substantially forms a hollow cylinder with a bottom 27 having an axial bore 28 in which the mentioned pin 21 is axially guided with its lower end 29 of somewhat increased diameter. Intermediate its upper end and its bottom, piece 25 is provided with an inner flange 30. An end piece 31 is attached to the bottom 27, seated on it at 32 and having an axial bore 33, through which the end 29 of pin 21 projects. The lower surface of the bottom 27 is recessed so as to form at least one gap 34 of a shape apparent from Fig. 2 between the bottom 27 and the end piece 31, in which gap a gripping element 35 is lodged. Al-

though one is sufficient, there are two such gaps 34 and elements 35 shown in the illustrated embodiment for a reason to be explained hereinafter, but there may be even more than two if so desired. Each gripping element, as best seen in Fig. 2, is approximately pear-shaped, i. e. it has a rounded portion from which there extends a portion having converging sides. The element has in its lower surface a recess 36 which extends, curved and tapering, from the one 37 of the converging sides to the rounded portion 38 so that there is only a thin wall 39 standing on the other one of the converging sides. That wall is curved substantially according to the periphery of the mentioned cylindrical parts 25 and 11 of the tool. Each element 35 is secured to a pivot pin 40 which is journaled in the bottom 27 and flange 30 of the piece 25 so that the element can swing outward in the position of Fig. 5 and inward in the position of Fig. 2. Thus, it will be clear, that each element 35 can be defined as a hook projectable from and retractable within the circumference of the tool body. Each pin 40 projects upward into the space between the flange 30 of piece 25 and the lower face 41 of the shank 10 where a tension spring 42 is attached with its one end to a secondary pin 43 radially projecting from pin 40, and with its other end to another pin 44 projecting upwards from the flange 30 as best seen in Fig. 4. The arrangement is such that the spring tends to turn the pin 40 so as to urge the element 35 in its outward position of Fig. 5. In the space between the flange 30 and the upper face 45 of the bottom 27 of piece 25, a radial finger 46 extending in a direction opposite to that of the associated element 35 is secured to each pin 40 so as to cooperate, substantially in the manner of a cam device, with a conical piece 47 which is mounted on rod 21 and bears against the shoulder 48 formed by the lower end 29 of that rod. A compression spring 49 surrounding the rod for its major portion interiorly of the tubular member 24, is inserted between the conical piece 47 and shank 10. This spring urges the piece 47 together with rod 21 downward, whereby the finger or fingers 46 are urged outwardly to turn the element or elements 35 inward against the restraint of the small springs 42. The shank 10, piece 25 and the end piece 31 are held together and in proper relative position by bolts 50 appearing in cross-section in Figs. 2 to 4.

The tool as far as described hereinbefore, is applicable in the following manner: While all parts are in the position of Fig. 1, that means while the gripping elements 35 are retracted, an insert coil of the type illustrated in Fig. 6 is pushed from below on the tool until its lower end convolution is above the gripping elements 35. The coil wire may be of any desired cross-section which in the illustrated example is selected as substantially diamond shaped. While the coil is so held in relation to the tool, lever arm 18 will be depressed thereby lifting rod 21 together with the cone 47 against the restraint of spring 49. The lifting of the cone frees the fingers 46 so that the springs 42 in Fig. 4 can turn the pins 40 to swing the fingers inward and the gripping elements 35 outwards into the position of Fig. 5. By lowering the insert coil and turning it relatively to the tool, the lower coil end 52 can be passed through the channel 36, from its wider end, of one of the gripping elements 35. It is advisable to provide the tool with more than one gripping element in order to shorten the maximum angle the coil will have to be turned in order so to engage such element. It will also be

understood, that, for oppositely coiled inserts, gripping elements of mirror image shape are to be used in order to permit the coil end to enter the wider end of the channel 36. Similarly, in that event, the arrangement of the fingers 46 must be a mirror image of that shown and the springs 42 must be arranged so as to turn the pins 40 in the opposite direction. When the end 52 of the coil convolution engaging the channel 36 slightly projects from the narrow end of the latter, lever arm 18 will be released, whereupon spring 49 urges the cone 47 downward which will spread the fingers 46 so that the gripping elements are turned inward. Thereby, as shown in Figs. 2 and 7, the gripping element with the coil convolution will clamp the latter between three points, viz. the pointed end 53 of the element, the pin 40 which projects into the channel 36, and a point or short face portion 54 rounded off the bottom part 27. The insert coil 51 so held may then be inserted in a tapped hole such as 74 in Fig. 7, to be lined by screwing it in with the aid of the tool. When the end 29 towards the end of the screwing operation engages a stop which may either be the bottom 76 of a blind hole or a stop otherwise provided if it is a through-going hole, the rod 21 will be pushed upward in relation to the further advancing tool thereby releasing the grip of the element 35 on the coil end which due to the continued turning of the tool will slip out of the channel 36, whereupon the tool can be removed.

The tool just described may be either operated by hand or by power. Now, I have found that frequently the threading of a tapped hole is damaged, if an externally threaded element, be it a stud or bolt or an insert coil the outer portions of which constitute an outer threading, is to be driven into the hole by means of a shaft which is moved simultaneously in an axial and peripheral direction as e. g. by the shaft of a tapping or screw driving machine. Unless extreme care is taken to insure that the leading convolution end of the screw member and the end of the thread groove of the tapped member are exactly in registry when the one member starts to engage the other one, the one of harder material will cut into the softer and destroy its thread.

In order to avoid such happening I provide, according to my invention, an attachment to the tool end to which the axial and peripheral movement of the power drive is to be transmitted. This attachment comprises means for positive rotation of the tool and other means for the axial drive thereof, including a lost motion connection operative against the restraint of a spring, wherein the lost motion connection is effective over a distance of approximately the pitch of the combined axial and peripheral advancement of the driving shaft to which the attachment is to be connected, and wherein the spring force is less than would be necessary to cause a cutting effect of the above-mentioned kind.

For this purpose, the afore-mentioned upper extension 12 of the shank 10 is provided with an axial bore 60, and with a longitudinal groove 61 on its outside. A socket 63 has an axial bore 64 to receive therein, fittingly, the extension 12. A disc 65 bears on the bottom of bore 64. The disc is recessed at 66 and accommodates in that recess the one end of a compression spring 67 the other end of which bears on the bottom of the bore 60 housing the major length of the spring. A screw 68 is screwed into a radially tapped hole 69 of the socket and projects inwardly with its end 70 which constitutes a key in engagement

with the groove 61 thereby forming a lost motion connection between the extension 12 and socket 63 and also connecting these members for common rotation. The upper end 71 of the socket 63 is so shaped that it can be rigidly but releasably secured to the shaft of a suitable machine as e. g. a drill press or tapping machine. For this purpose, the upper end 71 is shown as a slender cone in the illustrated embodiment.

In order to apply a power drive to the tool with the attachment just described, the conical end 71 will be inserted into the end of an accordingly shaped driving shaft 72 indicated in dash and dot lines. While the parts are in the position of Fig. 1, a wire coil may be pushed on the shank from below until the lower convolution has cleared the gripping elements 35. Thereupon the lever 17 may be operated as hereinbefore described. However, it is preferable to provide a stationary abutment 73 which will depress the lever arm 18 when the shaft 72 with the tool is lifted, and release arm 18 when the shaft is lowered. If the tool rotates during the engagement of the lever arm and the abutment, the latter may be shaped as a ring co-axial with the tool. In all other respects, the gripping and clamping of the coil end takes place as stated above. The shaft with the tool and the gripped coil may be lowered while turning in order to insert the latter in an interiorly threaded bore such as 74 of boss member 75 in Fig. 7. When, then, the lower portion of the tool enters the hole 74 and the lowermost coil convolution engages the top surface of the boss 75, the coil end, in most instances, will not be exactly in registry with the groove entrance of the tapped hole. While, now, the shaft 72 continues to rotate and descend, shank 10 with the coil thereon will also be rotated. However, owing to the lost motion connection 61, 70 the shank will not be pressed down with a force stronger than required to overcome the restraint of the spring 67. In consequence, the coil can be turned without axial movement until its end can enter the threading of the hole 74. In all other respects, the inserting operation is similar to that explained above.

Although I have described my invention in connection with wire coil inserts for tapped holes, it will be clear that it can be applied, with equal advantage, to any kind of wire coil, for instance, a cylindrical spring in order to contract or expand it by turning the one end thereof in relation to the other.

Furthermore, although I have described and shown only one embodiment of my invention it will be apparent to those skilled in the art that many alterations and modifications thereof are possible without departure from the spirit and essence of my invention which for that reason shall not be limited but by the scope of the appended claims.

I claim:

1. A tool for inserting cylindrical wire coils in tapped holes comprising a cylindrical body including means to apply a torque thereto, said body being provided with a first recess in its periphery, an element reciprocably mounted to said body within said first recess so as to be projectable from and retractable within the periphery of said body, said element including an outer rim bordering a second recess of said element so that when said element is projected there is an entrance into said second recess between said outer rim and the periphery of said body for an end convolution of a coil into which the tool has been inserted, and means interiorly of said body

and in engagement with said element to reciprocate the latter, thereby to clamp said convolution having entered said second recess between said rim and said body when said element is at least partly retracted.

2. A tool for inserting cylindrical wire coils in tapped holes, comprising a cylindrical body including means to apply a torque thereto, said body being provided with a recess in its periphery, an element reciprocably mounted to said body within said recess and including a portion having a substantially hook-like cross-section and being projectable from and retractable within the periphery of said body, said element being adapted to engage with said hook-like cross-section an end convolution of a wire coil into which said tool has been inserted and to clamp it against said body, and means interiorly of said body and in engagement with said element to reciprocate the latter.

3. A tool as claimed in claim 2, said element being a flat piece substantially pear-shaped and pivoted in said recess with its pointed portion projectable from and retractable within said body periphery, said piece being recessed on one of its flat surfaces so as to form a channel extending taperingly from one of the sides close to the pointed end of the element to the other side close to the rounded portion thereof.

4. A tool as claimed in claim 2 further comprising a pivot pin in said recess parallel to the body axis, said element being turnable about the axis of said pivot pin for the projection and retraction of its hook-like portion.

5. A tool as claimed in claim 2 further comprising a spring connected to said element and said body and tending to urge said element into projected position, resilient means operatively connected to said element so as to urge said element into retracted position against the restraint of said spring, and operative means in connection with said resilient means to shift the latter into an inoperative position.

6. A tool as claimed in claim 2 further comprising a pivot in said body across said recess, said element being reciprocable about the axis of said pivot, a first spring connected to said element and said body and tending to turn said element into projected position, a cam device connected to said element interiorly of said body and including a driving part, a driven part and a second spring, said driven part being connected to said element, said second spring being connected to said driving part so as to urge it in one direction thereby to cause said driven part to turn said element into retracted position against the restraint of said first spring, and operative means in connection with said driving part to shift the latter in the opposite direction against the restraint of said second spring.

7. A tool as claimed in claim 5 wherein said driven part of the cam device is an arm connected to said element and projecting radially in respect to said pivot axis, and said driving part is a cone-shaped piece movable axially in respect to the axis of said body.

8. A tool for inserting cylindrical wire coils in tapped holes comprising a cylindrical body including means at one of its ends to apply a torque thereto and being provided with a recess in its periphery, an element reciprocably mounted to said body within said recess and including a portion having a substantially hook-like cross-section and being projectable from and retractable within the periphery of said body, said element being adapted to engage with said hook-

like cross-section an end convolution of a wire coil into which said tool has been inserted and to clamp it against said body, a first spring connected to said element and said body tending to project said hook-like portion, means in operative connection with said element interiorly of said body and including a second spring tending to retract said hook-like portion, and a rod-like member axially shiftable with respect to said body and projecting from the other end thereof, said member being connected to said means so as to inactivate the latter by compression of said second spring when the projecting portion of said member is shifted inwards.

9. A tool as claimed in claim 8 further comprising a lever pivoted in said body and having

one arm in engagement with said rod-like member and its other arm projecting laterally from said body, so as to shift said member when said other arm is operated.

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