

Dec. 11, 1945.

H. W. CRAM ET AL

2,390,515

TOOL FOR SECURING INSERTS IN TAPPED HOLES

Filed June 3, 1944

2 Sheets-Sheet 1

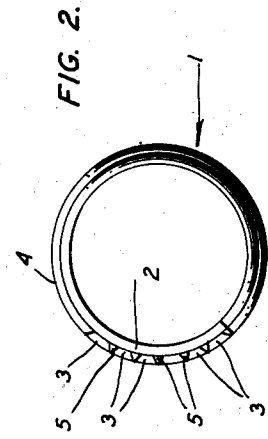


FIG. 2.

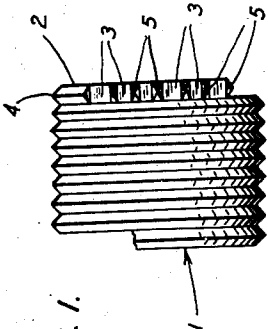


FIG. 1.

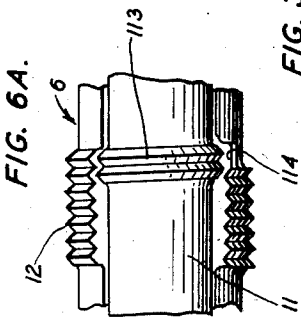


FIG. 6A.

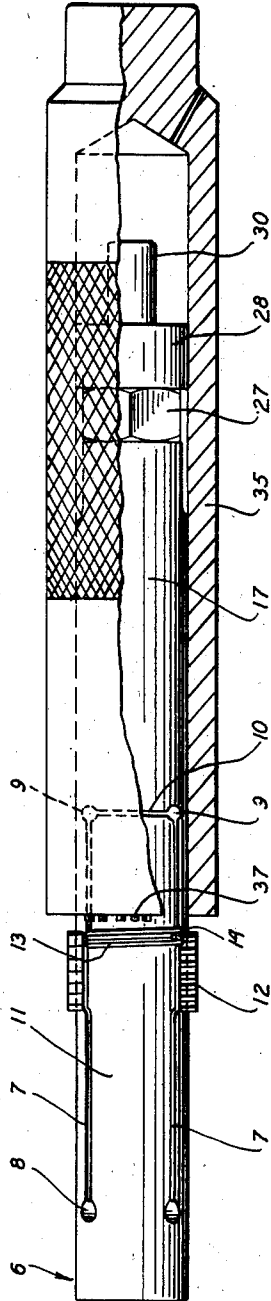


FIG. 3.

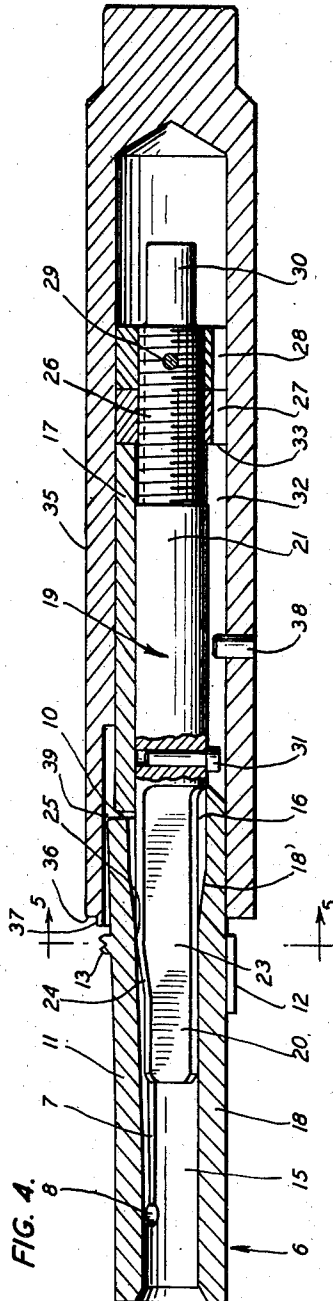


FIG. 4.

INVENTORS.
 HARKNESS W. CRAM
 BY ERWIN ECKENER
 Walter S. Preston

ATTORNEY

Dec. 11, 1945.

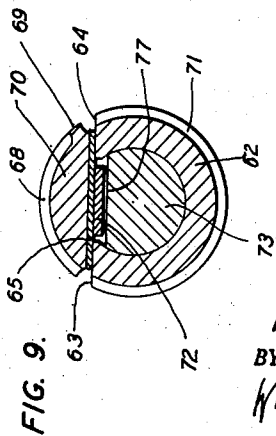
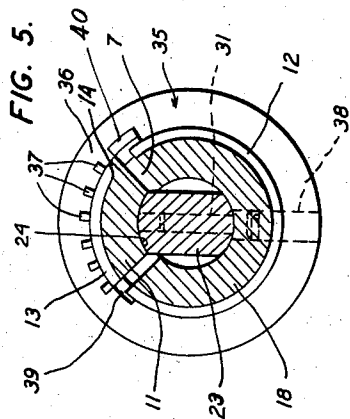
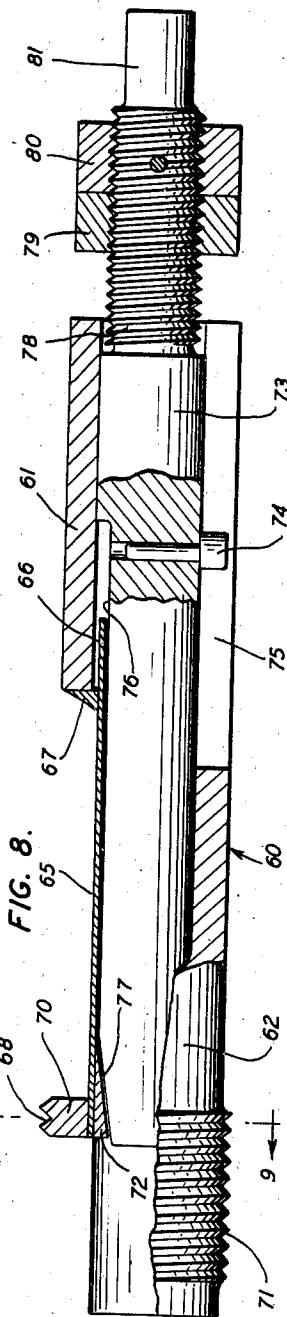
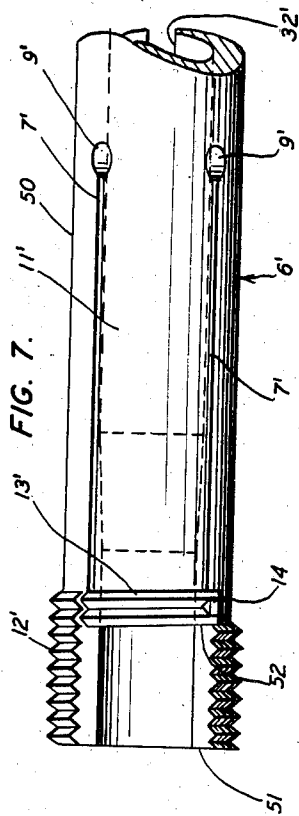
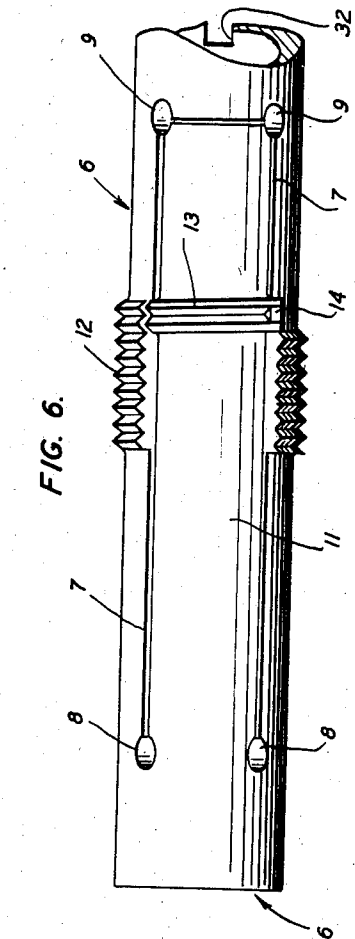
H. W. CRAM ET AL

2,390,515

TOOL FOR SECURING INSERTS IN TAPPED HOLES

Filed June 3, 1944

2 Sheets-Sheet 2



INVENTORS.
HARKNESS W. CRAM
BY ERWIN ECKENER
Walter S. Bylerton
ATTORNEY

UNITED STATES PATENT OFFICE

2,390,515

TOOL FOR SECURING INSERTS IN TAPPED HOLES

Harkness W. Cram, Mount Vernon, and Erwin Eckener, Bronx, N. Y., assignors to Aircraft Screw Products Company, Inc., Long Island City, N. Y., a corporation of New York

Application June 3, 1944, Serial No. 538,590

9 Claims. (Cl. 10—1)

The invention relates to a tool for securing the end of a wire coil in a tapped hole or a boss or nut member into which the coil is inserted as an interiorly threaded lining. The invention contemplates the provision of a tool whereby the coil end preferably shaped for this purpose with a sharp edge or serration of its outer periphery can be forced into the material of the tapped thread groove in which the coil end is located. A coil end thus embedded will be prevented from being backed out of the tapped hole when a stud engaging the coil is turned loose. A further object of the invention is the provision of a tool whereby the coil end can be secured in the boss member and simultaneously widened in order to facilitate the grip of the first convolution of a stud which is to be screwed into the wire coil threading. The invention also aims to combine a tool for the indicated purpose with a staking punch to drive or compress, from the outside, the material of the boss or nut member in the range of the embedded coil end and also in the rear thereof.

The invention mainly consists of a tool comprising a tubular member externally threaded in part, according to the internal threading constituted by a coil for which it is destined, and so slitted as to form a longitudinally extending tongue, provided with a portion of one thread to engage from the inside the coil end to be secured in the boss. The tool also comprises means to spread said tongue outward. The tool according to the invention may be combined with a punch having a front face teathed in an arc substantially corresponding to the width of the tongue, the punch being so guided that the teathed portion is in registry with the tongue.

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

Figs. 1 and 2 are side and front elevations respectively of a portion of a wire coil insert of a form to which the tool can be applied with particular advantage;

Fig. 3 is a side elevation of an embodiment of the tool according to the invention;

Fig. 4 is a longitudinal cross-section thereof;

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

Fig. 6 is a side elevation of a portion of the tool on a larger scale;

Fig. 6a is a side elevation of a modified portion of the tool;

Fig. 7 is a side elevation of another modification;

Fig. 8 is a longitudinal cross-section of another embodiment; and

Fig. 9 is a cross-section along line 9—9 of Fig. 8.

The principle of the invention is applicable to wire coil inserts of any desired cross-section. Hence, the diamond shape shown in Figs. 1 and 2 is selected as an example illustrating one of a variety of conventional forms. However, in order to attain best results by the application of the tool according to the invention, it is advisable to provide an end portion of the coil to be secured in the tapped hole of a boss or nut member with a sharp outer edge, if such is not already by itself part of the cross-section of coil wire. It is also advantageous to serrate the coil end portion in order to provide for a plurality of teeth which may be forced into the material of the boss or nut member after the insertion of the coil. Figs. 1 and 2 show such a coil 1 with an end portion 2 which comprises approximately a quarter convolution and is provided with recesses 3 of the outer edge 4, thereby forming a plurality of teeth 5.

The tool of Figs. 3 to 6, for securing a coil of that type, comprises a tubular body 6 of an outer diameter corresponding to the inner diameter of the coil insert to which the tool is to be applied. The body 6 is provided with two longitudinal slits 7 spaced from each other approximately a quarter of the circumference of the body 6. The slits start at points 8 at a short distance from the one end of the body 6, and extend to points 9 where they are connected by a transverse slit 10. The length of the slits 7 is so selected that a fairly well resilient tongue is formed by the slits. The remaining three-quarter circumference portion of body 6 is provided with an external threading 12 of a length, pitch and diameter according to the internal threading constituted by a coil for which the tool is destined, and which may be of a shape as shown in Figs. 1 and 2. The threading 12 is so located with respect to points 8 and 9 that the tongue portion in registry with the threading 12 can be deflected a sufficient distance by a force acting from the interior of the body in a manner and for a purpose described hereinafter. The tongue is provided with a portion 13 of one thread only which is located in continuation of that end of the threading 12 which is nearest to the transverse slit 10 of the tongue. Now it will be clear that the body 6 can be screwed, starting from the end 2, into a coil 1 until the end portion 2 is located in the thread

portion 13 provided on tongue 11. In order to prevent further insertion of the tool into the coil, the thread 13 may end at an abutment on that side of the tongue where the ultimate end of the combined threading 12 and 13 is located. Such abutment may be provided either as the abutment 14 on the tongue proper (Fig. 6) or on the remainder portion of the body 6 close to the threading 12 as the abutment 114 in registry with the tongue thread 113 in Fig. 6a. The diameter of the inner cylinder portion 15 of the tubular member 6 from which the major portion of the tongue 11 is formed is smaller than the inner cylinder 16 of the other end portion 17 of the body which may be of a somewhat larger outer diameter than the body portion 18 in the range of the tongue 11. The inner cylindrical portions 15 and 16 are connected by a conical portion 18'. Interiorly of body 6 a rod-like driver 19 is movable in axial direction. One end of the driver 19 has an inner end portion 20 fitting the cylinder portion 15 of member 6. A portion 21 remote from the end 20 is also cylindrical, having a diameter according to that of the inner cylindrical body portion 16. Intermediate the portions 20 and 21 there is a portion 23, having an inclined face 24 shaped according to the conical portion 18' of body 6. The cross-section of the portion 23 is such that the driver 19 can be pushed inward, i. e. to the left in Fig. 4, thereby to bear as a wedge against the inner side 25 of the tongue 11, in order to force the tongue outside. The end 26 of the driver 19 opposite its aforementioned end 20 is screw-threaded to receive thereon a nut 27 and a stop collar 28 secured to the driver 19 by a rivet 29 or the like. The rod has also an extension 30 beyond the portion 26. The extension 30 constitutes a head to which the pressure, for instance by a hammer, may be applied in order to push the driver 19 inward against the restraint of the tongue 11. A guide pin 31 is secured to the driver 19 intermediate its ends so as to engage a longitudinal slot or groove 32 provided for this purpose in the wall of the body 6. This arrangement insures that the driver face 24 moves in registry with the tongue 11.

In order to apply the tool to an insert lining of a tapped hole of a boss member, first body 6 is screwed into the insert from the side of the insert portion 2 (Fig. 2) until that end portion abuts against the stop 14 provided on the tongue 11. This can be readily done because the tongue without any restraint from the inside will be in true continuation of the circumference of the body 6. In this position of the body, the driver 19 is inserted with the guide pin 31 in slot 32 and pushed or hammered inward a desired distance. This distance can be adjusted by the setting of the nut 27 which finally comes to bear on the end surface 33 of the body 6. The driver by moving inward wedges outward the tongue 11 which is in engagement with the coil end 2 located in the thread portion 13. Thereby the coil end 2 will be firmly pressed into the tapped thread of the boss member, the outer edge or teeth 5 biting in the material of the latter. Also, the coil end 2 will be widened in relation to the remainder of the coil. Thus, simultaneously the coil end will be secured in the boss, and the insertion of a stud used in a screw connection of the boss facilitated.

In order to remove the tool, nut 27 bearing on the front surface 33 can be turned to relieve the pressure of the wedge face 24 on the tongue, whereupon body 6 may be screwed out of the insert coil.

In order to secure the coil end still stronger in the boss, a cylindrical punch may be combined with the parts heretofore described and in a manner similar to that disclosed in U. S. Patent No. 2,325,508 of July 27, 1943, to Haas and Hawkins. Whereas, however, according to that patent such cylindrical punch is used to swage or stake the entire annular ring zone of the boss member surface surrounding a tapped hole, in the instant of the present application it is preferable that the punch acts only on that portion of the boss which is engaged by the end 2 of the coil. For this purpose, a hollow cylindrical punch 35 is provided which can be slid over body 6 with driver 21 therein as shown in Figs. 3 and 4. The punch has a front face 36 which is provided with axially projecting teeth 37 arranged over an arc corresponding to the width of the tongue 11. In order to insure the correct position of the thread in relation to the tongue, the punch is provided with a guiding pin 38 inwardly projecting and so arranged that it may engage the aforementioned groove 32 of the body 6. Inasmuch as tongue 11 will slightly project in a radial direction from body 6 when the driver 19 is applied, the punch is recessed at 39 in order to provide "or sufficient space for the tongue. If now, after body 6 with driver 19 has been applied to a coil and the edge of the coil end has been embedded in the boss member, driving of the punch against the latter will stake and compress the boss material in the neighborhood of and particularly also between the teeth 5 of the coil if such are provided. One of the teeth of the punch, i. e. tooth 40, is preferably larger than the remainder of the teeth 37 and so located as to indent and compress the boss material immediately in front of the ultimate end of the inserted coil. The embodiment illustrated and described hereinbefore is applicable to a hole in a boss or nut member which is open at both ends so as to permit the tongue-provided end of body 6 to be passed through the hole and that the threading 12 may engage the inner threading constituted by an insert. The modification of Fig. 7 illustrates part of a tool applicable to a coil in a blind hole. The illustration shows merely that portion of the tool which differs from the form shown in the preceding figures. In this modification the tongue-provided end 50 of the tubular body 6' is provided with two parallel slits 7' starting from the end face 51 of the body and extending towards the other end to points 9' so far remote from the face 51 that the resulting tongue 11' is of sufficient resiliency. Also starting from the face 51 the body portion 50 is provided with an external threading 12' similar to the threading 12 described in connection with Figs. 3 to 6. One thread portion 13' with abutment 14' is provided on the tongue in an arrangement similar to the equivalent parts 13 and 14, best shown in Fig. 6. The tongue portion between the threading 13' and the face 51 originally formed by the slitting of the body may be cut off at 52. In all other respects the modified tool may be similar to the first described embodiment, and it will now be clear that the threaded end 12' may be screwed into an insert in a blind tapped hole as far as required, provided that the depth of the hole is not shorter than the length of the threading 12' and 13'.

Figs. 8 and 9 illustrate the tongue-provided tubular body and wedging rod of another modification. No punch is shown in connection with these parts, but it will be clear that the punch 35 of the first described embodiment may be used

in combination with these modified parts. The tubular body 60 according to Figs. 8 and 9 comprises a substantially cylindrical portion 61 and a second portion 62 of a cross-section shaped as a segment of a ring. The size of the segment is larger than 180° and it may be formed by removing, e. g. in a cutting operation, the smaller segment complementing the remaining segment to the original circular circumference of the tube. The two end faces 63 and 64 of the segment in Fig. 9 may be in one plane. However, this is not material from the viewpoint of the invention. Where the two portions 61 and 62 meet, a leaf spring 65 is secured to the body by suitable means. This is done in the illustrated embodiment by providing the portion 61 with a short slot 66 in the plane of the faces 63 and 64, and inserting the leaf spring end in the slot and bonding it at 67 to the body 60 by welding, soldering or similar operation. The spring 65 extends along the portion 62 and may bear on the faces 63 and 64. The outside of the other end of the spring is provided with a portion of a thread 68 and abutment 69 similar to the thread 13 and abutment 14 respectively, first described. Instead of the abutment 69, one arranged like the abutment 114 of Fig. 6a may be provided. Although the body of the spring and the threaded portion may be made of one piece, it is preferable to work the thread 68 into a little block 70 which is secured to the spring, e. g. by soldering or another suitable and conventional method or means. The thread 68 constitutes the continuation of the threading 71 on the portion 62 for the purpose mentioned hereinbefore. The spring 65 is provided on its inside with a wedge face projection 72 which, similarly to the block 70, may be made as a separate piece and secured to the spring. The projection 72 cooperates with the wedging rod 73 which is axially movable in body 60 and guided with pin 74 in the slot 75. The rod has a flat face 76 so as to clear the spring 65 when the rod is shifted in axial direction, and has also, in continuation of said flat face an inclined face 77 for engagement of the projection 72 of the spring. The rear end of the rod is shaped similarly to that of the rod 19, i. e. it is provided with a threading 78 with adjustable nut 79 and stop collar 80, and with an extension 81. The manner of application and the functions of the tool are the same as hereinbefore described with respect to the embodiment of Figs. 3 to 6. The modification of Figs. 8 and 9 is preferable to the former if a softer spring action of the tongue is desired. Also, in the case of the modification it is possible to repair the body 60 if the thread 68 is worn, by exchanging the spring 65 with block 70 or even merely the latter, whereas no easy repair appears to be feasible if the tongues of the other illustrated tools are destroyed for any reason.

It will be apparent to those skilled in the art that many alterations and modifications of the tool described and illustrated by way of example are possible within the spirit and essence of the invention which shall be limited therefore only by the scope of the appended claims.

We claim:

1. A tool for securing a wire coil insert with one of its ends in a tapped hole of a boss or nut member, comprising a tubular body including a first portion of substantially circular cross-section, and a second portion the cross-section of which constitutes a circular ring segment of more than 180°, said second portion being insertable

in a coil for which the tool is destined, and fitting substantially the interior of said coil, said tubular body further including a resilient tongue-like portion in connection with and extending longitudinally from the one end of said first portion adjacent said second portion along at least part of said second portion, and transversely so as to substantially cover the gap between the ends of said segmental cross-section, said tongue having a radially oscillatable free end and including, remote from its connected end, a portion of one external thread of a shape and pitch according to the inner threading constituted by said coil, and a wedge member interiorly of said body and guided therein to engage and force the thread-provided tongue portion outward upon movement of said member relatively to said body.

2. A tool as claimed in claim 1, including an abutment for the coil end when engaging said thread portion of said tongue.

3. A tool for securing a wire coil insert with one of its ends in the tapped hole of a boss or nut member, comprising a tubular body including a first portion of substantially circular cross-section, and a second portion the cross-section of which constitutes a circular ring segment of more than 180°, said second portion being insertable in a coil for which the tool is destined and being provided with an external threading of a diameter and pitch according to the inner threading constituted by said coil, said tubular body further including a resilient tongue-like portion in connection with and extending longitudinally from the one end of said first portion adjacent said second portion along at least part of said second portion, and transversely so as to substantially cover the gap between the ends of said segmental cross-section, said tongue having a radially oscillatable free end and being provided, in the zone of said external threading, with a portion of one thread in continuation of the one end of the threading of said second portion, and a wedge member interiorly of said body and guided therein to engage and force the thread-provided tongue portion outward upon movement of said member relatively to said body.

4. A tool for securing a wire coil insert with an arc of one of its end convolutions by radial pressure in a tapped hole of a boss or nut member, comprising a substantially tubular body provided with two longitudinal slits so as to form therebetween a resilient tongue of a width substantially according to the length of the arc of the coil convolution to be secured in the boss, said tongue having one end in connection with said body and a radially oscillatable free other end and including a portion of one thread of a shape and pitch according to the inner threading constituted by said coil, said body being insertable in said coil and fitting substantially the interior of said coil, and a wedge member interiorly of said body and guided therein to engage and force said tongue outward upon axial movement of said member in relation to said body.

5. A tool for securing a wire coil insert with one of its ends in a tapped hole of a boss or nut member, comprising a substantially tubular body provided with two substantially longitudinal slits starting at a distance from one end of the body and connected at their ends by a transverse slit, so as to form a resilient tongue extending in axial direction of said body, a portion of the remainder of said body intermediate the ends of said slits including an external threading according to the internal threading constituted by

the wire coil insert for which the tool is destined, said tongue including a portion of one thread in continuation of one of the end convolutions of said external threading to receive therein said end portion of said insert when the tool is applied thereto, and a rod-like wedge interiorly of said body and adapted to force said tongue outward upon axial movement of the wedge relatively to said body.

6. A tool for securing a wire coil insert with one of its ends in a tapped hole of a boss or nut member, comprising a substantially tubular body having one end portion of a length approximately according to that of a wire coil for which the tool is destined recessed in a width of approximately one-quarter of the circumference of said body, the remainder of said recessed body portion including an external threading according to the internal threading constituted by said wire coil, said body being provided with two longitudinal slits spaced from each other according to the width of said recess and extending from said recess towards the other body end a length sufficient to form a resilient tongue between said slits, said tongue including a portion of one thread in continuation of the adjacent end of said external threading, and a wedge member interiorly of said body and guided therein to engage and force said tongue outward upon axial movement of said member in relation to said body.

7. A tool for securing a wire coil insert with one of its ends in a tapped hole of a boss or nut member, comprising a substantially tubular body insertable in a coil for which the tool is destined and fitting substantially the interior of said coil, said body being provided with two longitudinal slits so as to form therebetween a resilient tongue, said tongue having one end connected to said body and a radially oscillatable free other end and including, remote from said connected end a portion of one thread of a shape and pitch according to the inner threading constituted by said coil, a wedge member interiorly of said body and guided therein to engage and force said tongue outward upon axial movement of said

member in relation to said body, a removable substantially cylindrical punch of an inner diameter similar to the outer diameter of said body, said punch including staking teeth projecting in axial direction from a portion of its front face which is leading when the punch is applied to the body from the end opposite the tongue, said teathed portion being of a width similar to that of said tongue, and means in connection with said body and said punch to guide the latter in axial direction with said teathed face portion in registry with said tongue.

8. A tool as claimed in claim 7, said teeth including one tooth located laterally of that end of the one thread of said tongue which is opposite the end in continuation of said external threading of said remainder body portion, said tooth being larger than the other teeth.

9. A tool for securing a wire coil insert with one of its ends in a tapped hole of a boss or nut member, comprising a tubular body including a first portion of substantially circular cross-section, and a second portion the cross-section of which constitutes a circular ring segment of more than 180°, said second body portion being insertable in a coil for which the tool is destined, and fitting substantially the interior of said coil, a leaf spring having one end secured to said body close to the end of the second body portion and a radially oscillatable free other end, adjacent said first portion, said spring extending longitudinally along at least part of said second portion and transversely so as to substantially cover the gap between the ends of said segmental cross-section, said spring including, remote from its connected end, a portion of one external thread of a shape and pitch according to the inner threading constituted by said coil for which the tool is destined, and a wedge member interiorly of said body and guided therein to engage and force the thread-provided spring portion outward upon movement of said member relatively to said body.

HARKNESS W. CRAM.
ERWIN ECKENER.