

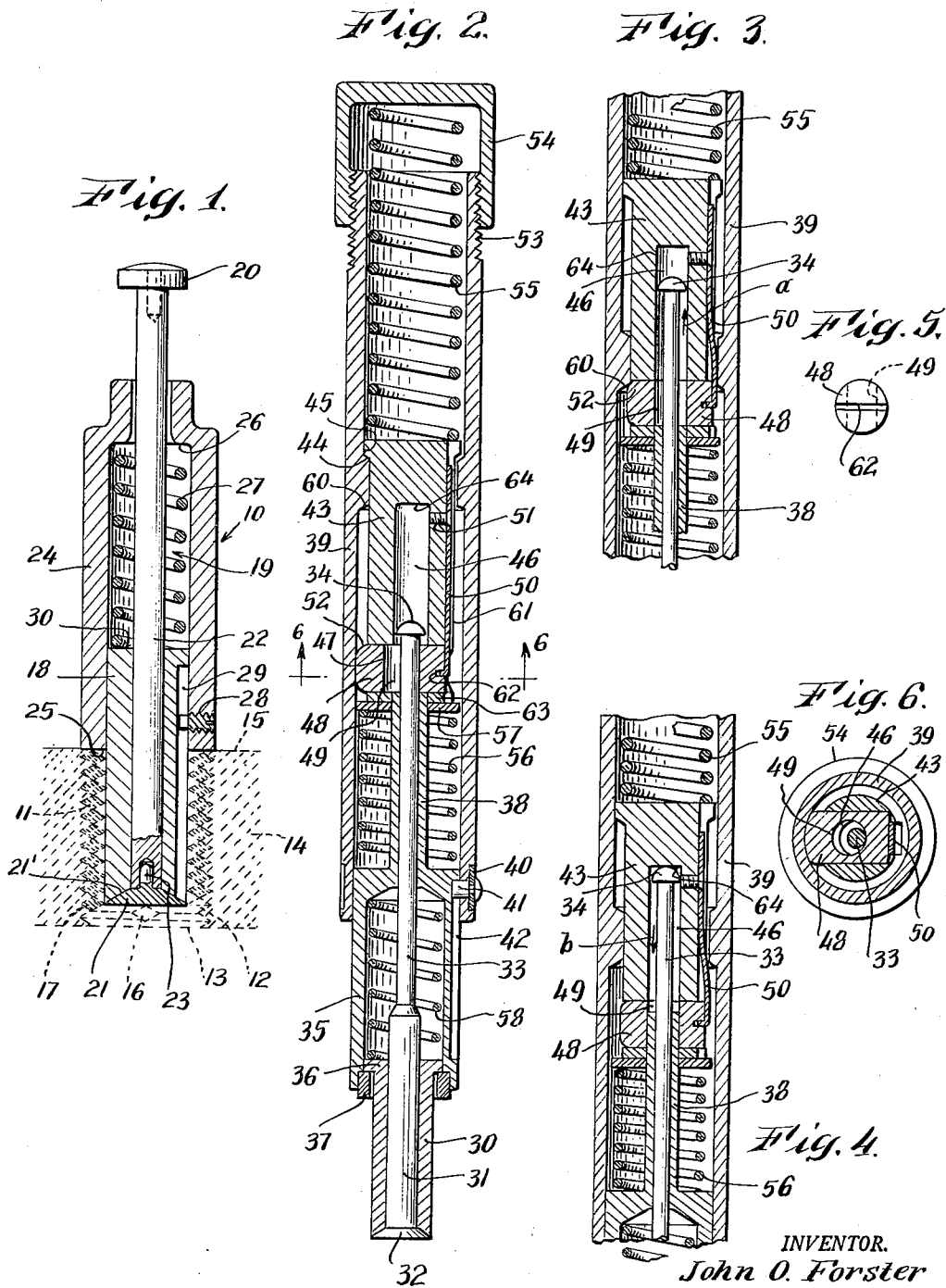
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AXIAL IMPACT TYPE TANG BREAK-OFF TOOL

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AXIAL IMPACT TYPE TANG BREAK-OFF
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The present invention relates to a tool for breaking off the tang of a wire coil insert for a screw-connection. Wire coil screw thread inserts are usually provided with a diametrical tang required as a grip for a tool for screwing the insert into a tapped hole. In many instances, particularly if a through-going hole is lined with such a wire coil the tang must be removed after the insertion as otherwise it would interfere with a bolt or screw engaging the insert.

In order to facilitate the breaking of the tang, a notch is conventionally provided in the wire near the point where the tang joins the adjacent coil convolution. However, when an axial force is exerted on the tang from the inside of the coil to break it off, it frequently happens that the adjacent convolution is deformed and bent out of its seat in the thread groove which it lines.

Therefore it is an object of the present invention to provide a tool for breaking-off the tang, which includes means to prevent a deformation of the coil convolutions.

It also happens that a force applied to break off the tang is either too weak causing merely a bend or it is too strong which may cause other unforeseen damage.

The invention further aims, therefore, to provide a tool of the mentioned type in which a predetermined or adjustable force can be applied to the tang in order to break it off.

The invention essentially consists of a pilot sleeve of an outer diameter similar to the inner diameter of the coil into which it may be inserted, and a punch guided in the sleeve and engaging the tang, so that the latter will be broken off when the punch is hit with a hammer, while the sleeve prevents the coil convolutions from being bent out of their seat in the tapped threading lined with the coil.

The invention also consists of a tool of the mentioned type in combination with a hammer which under a spring pressure will strike the punch with a predetermined or adjustable force.

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,

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

Fig. 2 is a longitudinal cross-section of another embodiment including a hammer to strike the punch,

Figs. 3 and 4 are longitudinal cross-sections of parts of Fig. 2 in different positions,

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Fig. 5 is an end elevation of a part of the tool of Fig. 2, and

Fig. 6 is a cross-section along line 6—6 of Fig. 2.

Referring now to Fig. 1, the tool in general denoted by 10 is shown inserted in a wire coil 11 which lines the tapped threading 12 of a hole 13 in a member 14. The coil has been inserted from the surface 15 and its diametrically directed tang 16 constitutes the continuation of the adjacent end convolution 17. The tool 10 comprises a pilot sleeve 18 having an outer diameter similar to that means very slightly smaller than the inner diameter of the coil 11 for which it is destined. This outer diameter is preferably so selected that the pilot sleeve can be easily inserted but with only little clearance between it and the convolutions of the coil. A punch 19 fitting the interior of the pilot sleeve projects therefrom with its head 20 and is substantially longer than the sleeve. Preferably, the punch 19 has a foot portion 21 either integral with the punch shank 22 or produced as a separate piece and inserted into the shank end as shown at 23. If such foot 21 is provided it should have a diameter similar to the outer diameter of the sleeve. Furthermore it is advisable to make the foot frusto-conical so as to fit an inner taper of the pilot sleeve as clearly shown at 21' in order to insure that the pilot sleeve engages, from the interior all the coil convolutions up to the tang. However, it is also possible to do without the foot portion 21, meaning that the end of the punch is of a diameter similar to that of the shank 22. Such structure is less recommendable because it may happen that the slim punch end bends the tang sideways and bypasses rather than break it off.

Now in order to break off the tang 16 the sleeve 18 with the punch 19 will be introduced into the coil 11 until the foot 21 bears on the tang and the sleeve end bears on the foot. In this position of the coil, the coil convolutions are firmly held within the grooves of the tapped threading and cannot yield to a force tending to bend them towards the axis of the hole 13. If, then, the punch head 20 is hit by a hammer with the required force the tang can be broken off without injury to the coil convolutions.

Now, I have found that the tang may be bent when the sleeve is introduced into the coil with too much pressure, before the punch is hit with a hammer, and, that in such an event the tang does not readily break off. In order to avoid such happening, I provide another sleeve 24 in

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which the pilot sleeve 18 is telescopically shiftable so as to project a variable length from the end face 25 of the sleeve 24. Near the opposite end of sleeve 24 an inner shoulder 26 is provided between which and the pilot sleeve a compression spring 27 is located. The head end 20 of the punch projects a distance from that opposite end of sleeve 24. Means engaging both sleeves prevent their separation. For that purpose, a pin or screw 28 is secured in the wall of sleeve 24 and engages in a longitudinal groove 29 of sleeve 18, which groove terminates at a short distance from the inner end face 30 of said sleeve. Now it will be clear that upon introduction of the tool in a coil 11, spring 27 will be compressed with the tang is reached, until finally the end face 25 of sleeve 24 bears on the surface 15. As the spring 27 can be selected sufficiently soft no excessive pressure can be exerted on the tang by the sleeve 18 or the punch foot 21 projecting therefrom before the punch is hit.

Insert coils of the kind here under consideration generally are of a very hard and, to an extent, even brittle material which breaks more readily under a short, brisk blow than under a more slowly acting pressure. However, owing to the strength of the material the hammer stroke must not be too light nor too strong. In that respect faulty operation can be avoided by the combination of a tool of the type just described with a hammer mechanism striking the punch with the desired strength and briskness. Such a combined tool is illustrated in Figs. 2 to 5. This tool comprises a pilot sleeve 30 with a punch 31 guided therein. The punch has a foot 32, and an elongated shank 33 ending in a head 34. The pilot sleeve 30 is telescopically shiftable in a second sleeve 35, and prevented from separating therefrom by its flange-like rim 36 which can abut against a ring 37 secured in the adjacent end of the sleeve 35. The latter has a tubular extension 38 which also guides the punch shank 33, and is telescopically shiftable in an outer sleeve 39. A split spring ring 40 with a radially inward projecting pin 41 is embedded in the wall of the sleeve 39, and the pin engages a longitudinal groove 42 in the wall of the sleeve 35, thereby preventing separation of sleeve 35 from sleeve 39. Within the latter a cylindrical hammer 43 is axially shiftable. Movement of the hammer towards the side of the other sleeves is limited by an inner shoulder 44 of sleeve 39 against which a flange-like rim 45 of the hammer can abut. The hammer has a blind axial bore 46 through the major part of its length and open towards the sleeve 35. The diameter of the bore is equal to the outer diameter of the tubular extension 38 of sleeve 35. Near the open end of the bore 46 the hammer is provided with a diametrical bore 47 into which a detent member 48 slidably fits. The detent which is somewhat shorter than the inner diameter of sleeve 39, has a bore 49 in the lengthwise direction of the sleeves. The diameter of bore 49 is equal to that of the bore 46 of the hammer. A leaf spring 50 is secured to the hammer at 51 in a groove 61 thereof and engages the detent in a slot 62 clearly shown in Fig. 5, thus preventing the detent from turning and tending to urge the detent in the direction of its rounded head 52. At a distance from the head 52, in the position of Fig. 2, there is a second inner shoulder 60 provided in sleeve 39 which is so inclined that it will urge the detent against the restraint of spring 50 when, by a

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shift of the hammer, the head 52 engages that shoulder. The open end of the sleeve 39 is provided with a threading 53 engaged by a screw cap 54, and a compression spring 55 is arranged between that cap and the hammer and can be pre-tensioned as desired by turning the cap in relation to the sleeve 39. Another compression spring 56 is located between sleeve 35 and a washer 57 bearing against the hammer, and a third compression spring 58 is provided interiorly of sleeve 35 and bears against the pilot sleeve 30 in a manner similar to the spring 27 in Fig. 1. Spring 56 is much more flexible than spring 55 but somewhat stronger than spring 58.

When the tool is not in use the parts are in the position of Fig. 2. In that position the hammer is pushed by spring 55 with its flange 45 against shoulder 44, and the sleeves 35 and 30 are projected as far as possible under the action of the springs 56 and 58 respectively. The head 34 with the adjacent portion of shank 33 projects through the bore 49 of the detent a short distance into the bore 46 of the hammer. As the detent 48 under the pressure of its spring 50 is in such a position that its bore 49 is eccentric with respect to the axes of the sleeves, the end of the tubular extension 38 bears against the detent 48. In the illustrated embodiment, the extension engages the continuation of the bore 46 in the adjacent very short end portion 63 of the hammer. This aids in ensuring co-axial alignment of the parts. However, other arrangements are conceivable wherein there is no such end portion 63, as it is merely essential that in the position of Fig. 2 the extension 38 can not enter the bores 49 and 46.

By gripping sleeve 39 while the parts are in the position of Fig. 2, the tool may be inserted with its pilot sleeve 30 into a coil such as the coil 11 in Fig. 1. When the tang of the coil resists further advancement of the pilot sleeve and the foot 32 of the punch, spring 58 will be compressed until the end ring 37 of sleeve 35 bears on the surface 15 of the member with the coil-provided hole. Thereby, the punch head 34 is moved further into the hammer bore 46 a distance equal to that the pilot sleeve is moved into sleeve 35. A resulting relative position of punch head and hammer is shown in Fig. 3. It is to be noted that the length of bore 46 should be sufficient to allow for a certain clearance between the punch head 34 and the bottom 64 of the bore 46 even if sleeve 30 is shifted its maximum distance into sleeve 35. Such clearance should exist under all conditions prior to the release of the hammer. Continued pushing of sleeve 39 in the direction of the other sleeves will cause a shift of the hammer towards the cap 54 owing to the tubular extension 38 pressing against the detent 48. Thereby spring 55 will be tensioned.

It will be clear that during such shift the hammer and the punch will not change their relative position, nor will spring 56 be compressed.

When the hammer 43 in its movement relative to sleeve 39 in the direction of arrow *a* reaches the position of Fig. 3 and the head 52 of the detent engages the inclined shoulder 60, the detent will be shifted so that the bores 46 and 49 register and the tubular extension 38 can enter the bore 49 and continue into the bore 46. Thereby the pressure against the hammer 43 is suddenly removed so that the hammer will be pushed by spring 55 in the direction of arrow *b* of Fig. 4 and hit the punch head 34 with the

bottom 64 of its bore 46. As the stroke of the hammer depends on the spring 55 a desired impact can be attained by a suitable selection of the spring characteristics, and by an adjustment of the cap 54. In the operation of the hammer, spring 56 has a certain cushioning effect which is to be taken into consideration in the dimensioning of spring 55.

When the tang has been broken off, the tool can be removed from the coil, whereupon spring 58 will project the pilot sleeve with its flange 36 to bear on ring 37, and spring 56 will urge sleeve 35 into its end position. Thereby the extension 38 will be withdrawn from the bore 49 of the detent 48 which under the action of spring 50 will return to its eccentric-position, so that all parts take again the position of Fig. 2.

It will be apparent to those skilled in the art that many alterations and modifications of the structure shown and described are possible without departure from the essence and spirit 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 breaking off the tang of a screw thread wire coil, comprising a first sleeve having an inner shoulder near one of its ends, a pilot sleeve telescopically shiftable in said first sleeve so as to project from the other end of said first sleeve, said pilot sleeve having an outer diameter slightly smaller than the inner diameter of the coil for which the tool is designed, a compression spring between said shoulder and said pilot sleeve, interengaging means in connection with both said sleeves to prevent projection of said pilot sleeve beyond a predetermined length from said first sleeve and a punch projecting from said first mentioned end of said first sleeve and being projectable from the opposite end of said pilot sleeve, said punch being guided in said pilot sleeve, and freely shiftable within limits in axial direction with respect to both said sleeves.

2. A tool as claimed in claim 1, said punch having a length greater than the combined length of said first sleeve and the projectable portion of said pilot sleeve, and including a frusto-conical foot substantially fitting an inner taper of the free end of said pilot sleeve.

3. A tool as claimed in claim 1, wherein said punch is retractable into said pilot sleeve at least so far that its end face is flush with that end face of said pilot sleeve which is remote from said first sleeve.

4. A tool for breaking off the tang of a screw thread wire coil, comprising a first sleeve having an inner shoulder, a pilot sleeve telescopically shiftable in said first sleeve and having an outer diameter slightly smaller than the inner diameter of the coil for which the tool is designed, a compression spring between said shoulder and said pilot sleeve, interengaging means in connection with both said sleeves to prevent projection of said pilot sleeve beyond a predetermined length from said first sleeve, a punch guided in said first sleeve, an outer sleeve in which said first sleeve is telescopically shiftable so as to be projectable together with said pilot sleeve from one end of said outer sleeve, a hammer shiftable within said outer sleeve and adapted to strike said punch, a second compression spring between said hammer and the other end of said outer sleeve, a lost motion connection including a detent between said first sleeve and said hammer whereby said hammer will be shifted against the restraint of said second spring when said

first sleeve is pushed inward with respect to said outer sleeve, and means to release said detent when said second spring is tensioned, thereby causing said hammer to move under the action of said second spring relatively to said first sleeve and to strike said punch.

5. A tool as claimed in claim 4, wherein said lost motion connection includes a tubular extension of said first sleeve from which the head of the punch projects, said hammer being provided with an axial blind bore into which said tubular extension and said punch head can enter, and said detent when in detaining position being adapted to bar the entrance of said projection into said bore, and when released to open said entrance.

6. A tool as claimed in claim 4, further comprising a third compression spring more flexible than said second but stronger than said first spring, said third spring being arranged between said first sleeve and said hammer.

7. A tool as claimed in claim 4, further comprising a screw member in connection with said other end of said outer sleeve, and co-axial therewith, said second spring bearing against said screw member.

8. A tool for breaking off the tang of a screw thread wire coil, comprising a first sleeve having an inner shoulder, a pilot sleeve telescopically shiftable in said first sleeve and having an outer diameter slightly smaller than the inner diameter of the coil for which the tool is designed, a compression spring between said shoulder and said pilot sleeve, interengaging means in connection with both said sleeves to prevent projection of said pilot sleeve beyond a predetermined length from said first sleeve, a punch guided in said first sleeve, an outer sleeve in which said first sleeve is telescopically shiftable so as to be projectable together with said pilot sleeve from the one end of said outer sleeve, a hammer axially shiftable in said outer sleeve, a second compression spring between the other end of said outer sleeve and said hammers, said hammers being provided with a blind axial bore in the end confronting said first sleeve, said first sleeve including an axial tubular extension from which the head of said punch projects and which is adapted to enter said bore, a detent member, a third spring biasing said detent which to be guided in said hammer for movement transverse thereto and barring the entrance into the bore, said outer sleeve and said detent including abutment faces to shift said detent into a position in which said entrance is open when said second spring is tensioned, and a fourth compression spring more flexible than said second and stronger than said first spring between said hammer and said first sleeve.

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