March 6, 1934. H. A. UNKE 1,949,923

APPARATUS FOR FORMING LUGS IN THREAD PROTECTORS

Filed Sept. 9, 1930 4 Sheets-Sheet 1

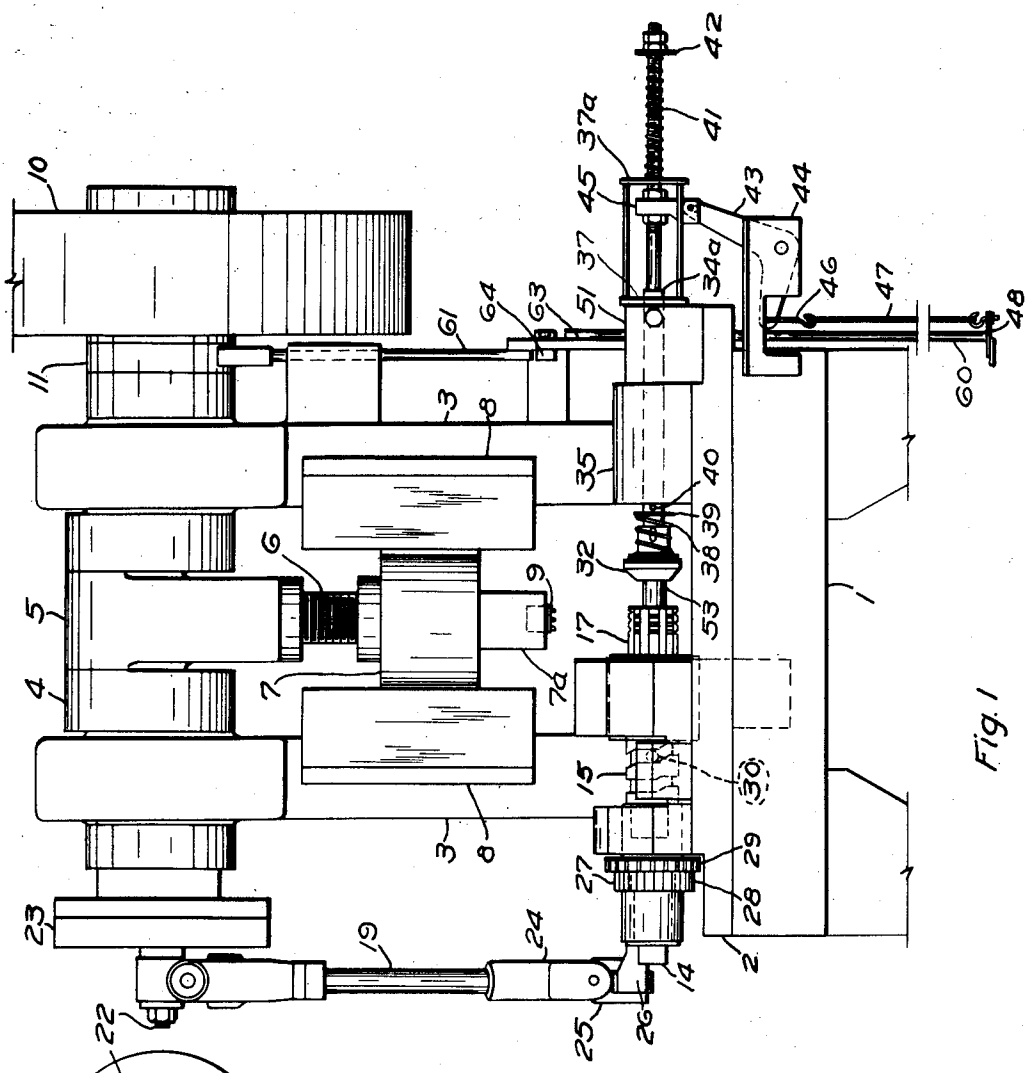


Fig. 1

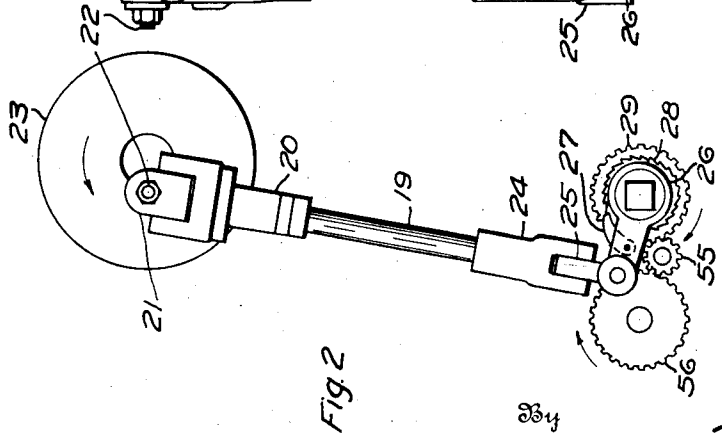


Fig 2

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APPARATUS FOR FORMING LUGS IN THREAD PROTECTORS

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Fig. 3

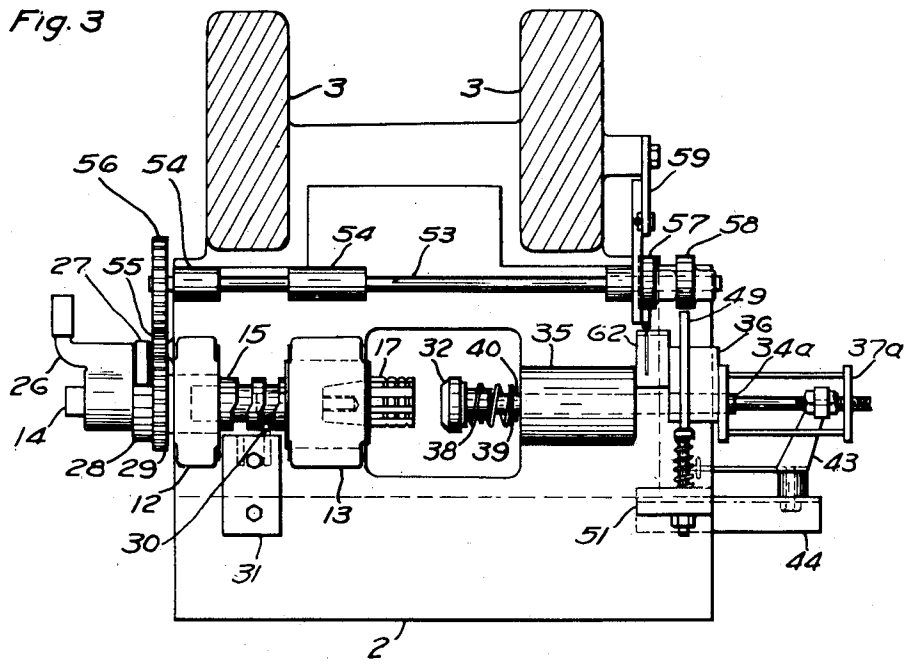
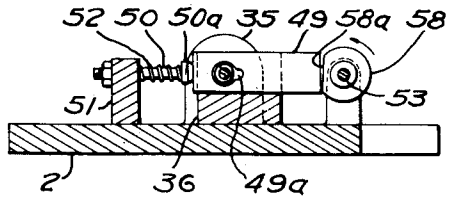


Fig. 5



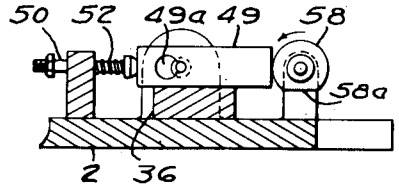
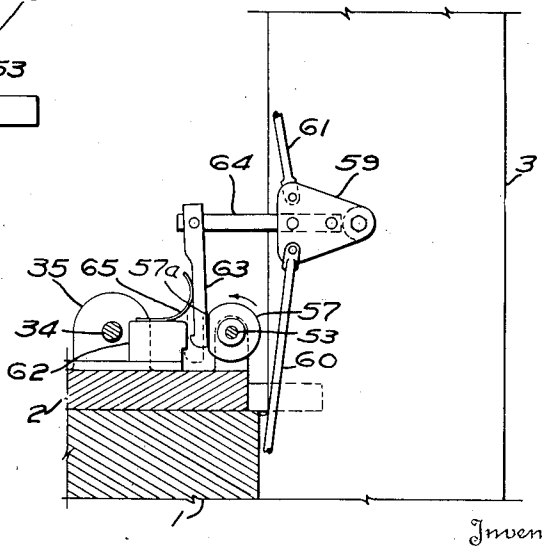


Fig. 6

Fig. 4



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APPARATUS FOR FORMING LUGS IN THREAD PROTECTORS

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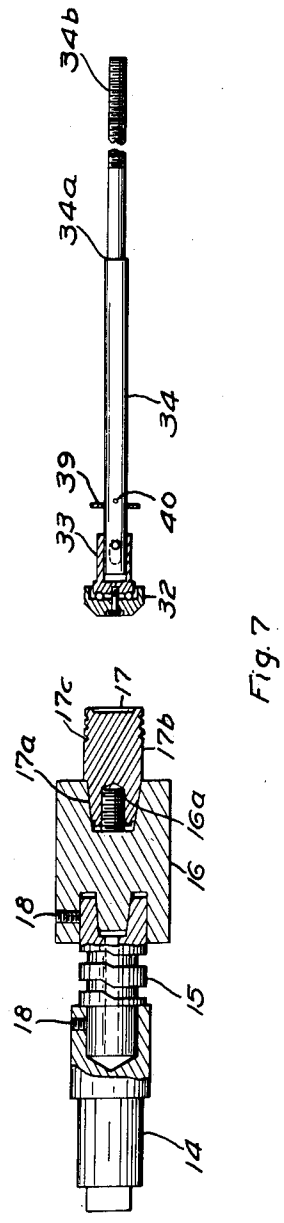


Fig. 7

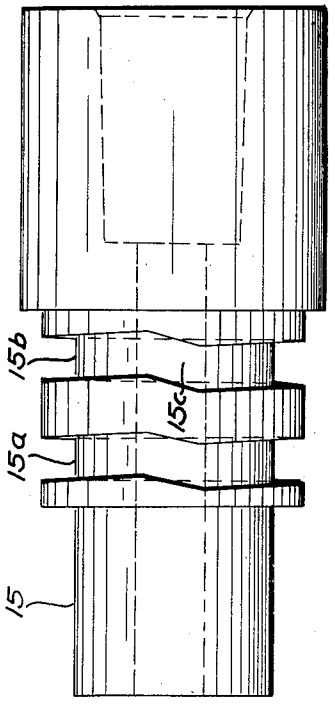


Fig. 8

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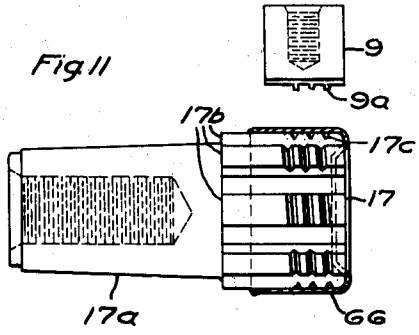
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Fig. 11



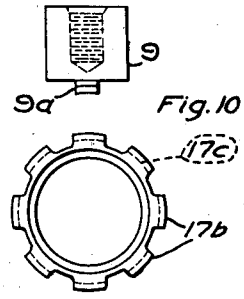


Fig. 10

Fig. 9

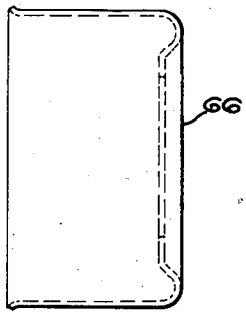


Fig. 12

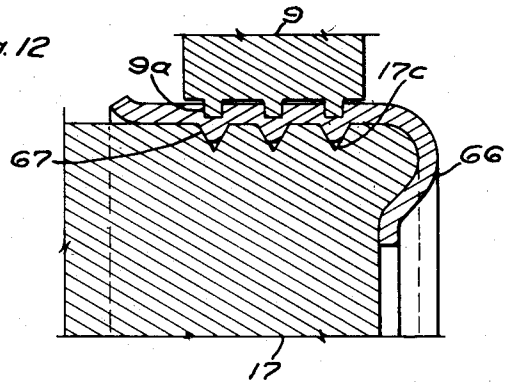


Fig. 13

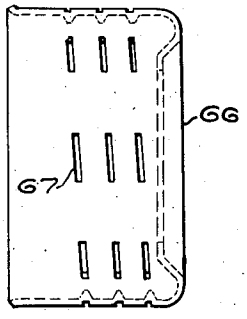
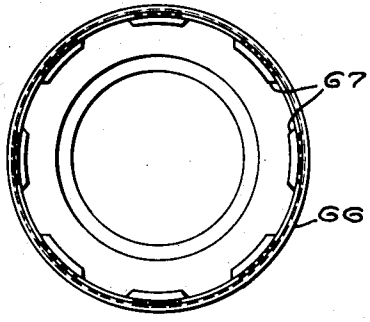


Fig. 14



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1,949,923

UNITED STATES PATENT OFFICE

1,949,923

APPARATUS FOR FORMING LUGS IN THREAD PROTECTORS

Herman A. Unke, Cleveland, Ohio

Application September 9, 1930, Serial No. 480,745

11 Claims. (Cl. 10—153)

This invention relates in general to methods of and apparatus for fabricating sheet metal articles, and has reference more particularly to a novel method of and apparatus for forming lugs on thread protectors, as shown and described in Patent No. 1,776,528, granted to me September 23, 1930.

It is a primary object of the present invention to provide a method of forming lugs on thread protectors, which shall be highly efficient and economical, and which may be readily adapted for large scale production.

Another object of the invention is to provide apparatus for forming lugs on thread protectors, which consists of a minimum number of automatically operated parts, which may be readily replaced when worn.

A further object of the invention is to provide apparatus of the aforesaid nature, which may be quickly and readily adapted for forming lugs of various sizes and helical pitch arrangement on a thread protector, or for forming lugs on thread protectors of various sizes.

In order that the invention may be clearly understood and readily carried into effect, the same will now be described more fully with reference to the accompanying drawings which illustrate, by way of example, apparatus for forming lugs of the type disclosed in the patent aforementioned. In the drawings:

Fig. 1 is a front elevation of the press employed for forming lugs in accordance with the present invention;

Fig. 2 is an end elevation of the lower die rotating mechanism, as viewed from the left side of the press;

Fig. 3 is a plan view of the lower portion of the press;

Fig. 4 is a side elevation of the hold-down mechanism for the press trip rod;

Fig. 5 is a side elevation of the mechanism for operating the pull-back rod lock;

Fig. 6 is a view similar to Fig. 5, but showing the pull-back rod lock bar in locking position;

Fig. 7 is a longitudinal cross-section through the spindle assembly and pull-back rod;

Fig. 8 is a side view of the cam for obtaining longitudinal movement of the cam spindle and lower die;

Fig. 9 is a side elevation of a thread protector, prior to the formation of lugs therein;

Fig. 10 is an end view of the upper and lower lug forming dies;

Fig. 11 is a front view of the lug forming dies, showing in cross-section a thread protector positioned on the lower die prior to formation of lugs therein;

Fig. 12 is an enlarged fragmentary cross-section through the dies and thread protector at the end of the lug forming operation;

Fig. 13 is a side elevation of the completed thread protector, and

Fig. 14 is an end elevation of the completed thread protector, as viewed from the left side of the protector shown in Fig. 13.

Referring more particularly to the drawings, wherein like reference characters designate like parts throughout the several figures, 1 is the base of a press upon which the lower die shoe 2 is supported. The die shoe 2 is provided at its rear portion with upright posts 3, and mounted in suitable bearings in the upper ends of these posts is a crank shaft 4, which carries a crank 5. Adjustably secured to the crank 5 by means of a pitman 6 is a vertically reciprocable ram or head 7, which is confined in its vertical movement by means of guides 8, secured to the posts 3.

Secured to the lower part of the ram 7 is an upper die shoe 7*a* which has secured thereto an upper die 9, having on the lower face thereof spaced slug-displacing elements 9*a*, which serve a purpose to be later described. These slug-displacing elements may be formed with arcuate faces. The press is further provided with the usual flywheel 10 and clutch 11, which may be of the well-known sliding jaw type and need not therefore be here further described.

Mounted in bearings 12 and 13 on the die shoe 2 is a spindle assembly comprising a stub shaft 14, a cam 15, a cam spindle 16 and the lower die 17. As shown in Figs. 7 and 8, the cam 15 has helical grooves 15*a* and 15*b* therein, which may be of different pitches, as for example 11½ and 8 pitch respectively. These grooves serve a purpose to be presently described.

The cam 15 is mounted between and is secured in non-rotatable relation with the stub shaft 14 and cam spindle 16 by means of set screws 18. The lower die 17 has an internally-threaded tapered shank 17*a*, by means of which it is secured to a threaded stud 16*a* on the spindle 16, and from which it may be readily unscrewed when it is desired to replace the die with another die. As shown in Figs. 10, 11 and 12, the lower die is provided with axially extending circumferentially spaced lug-swaging elements 17*b*, each of which has circumferentially extending axially spaced V-shape grooves 17*c* therein, the groove arrangement around the die conforming to the helix of the threads of a pipe and corresponding with the

helical groove 15b in the cam 15. It will be noted that the helical arrangement of the grooves is interrupted at one point to correspond with an offset 15c in the cam groove 15b. This offset marks the end of the lug-forming operations for each thread protector, which will be later described.

For the purpose of causing the lower die 17 to rotate a predetermined amount with each complete revolution of the crank shaft, the following mechanism is provided:

A connecting rod 19 is secured at one end thereof, through a universal joint comprising yoke 20 and connection 21, to a crank pin 22, which is eccentrically mounted on a disk 23, rigidly secured to the crank shaft 4. The rod 19 is adjustably secured at its opposite end, through a universal joint comprising yokes 24 and 25, to an arm 26, which is mounted on and is free to oscillate on the stub shaft 14. A pawl 27 is pivotally secured to the arm 26. Keyed or otherwise secured to each other and to the stub shaft 14 are a ratchet 28 and a drive gear 29. It will be apparent that upon each complete revolution of the crank shaft 4, the pawl 27 will cause the spindle assembly and lower die to rotate a predetermined amount. In the present instance, the die is caused to rotate through an arc equal to the distance between successive lug-swaging elements 17b in order to bring the grooves 17c in each of these elements successively under the slug-displacing elements 9a of the upper die. Owing to the helical arrangement of the grooves 17c, however, it is necessary with each stroke of the pawl 27 to move the lower die longitudinally a distance equal to the pitch distance of the helix between successive lug-swaging elements 17b, and for this purpose, the following mechanism is provided:

A cam roller pin 30, mounted in a block 31, extends into the groove 15b of the cam 15, and causes the spindle assembly to move longitudinally to the extent determined by the pitch of the helical groove 15b. At the end of each complete revolution of the cam 15, the offset 15c causes the cam to return to its initial longitudinal position, and thus repositions the lower die for the lug forming operations on succeeding thread protectors.

For the purpose of preventing slipping between the lower die and the thread protector positioned thereon, a thrust member 32 is provided. This thrust member has a ball-bearing mounting on a sleeve 33, which, in turn, has a pin and slot connection with a pull-back rod 34, as clearly shown in Fig. 7, so that it has a limited axial movement with respect to the pull-back rod.

The pull-back rod is coaxial with the spindle assembly and lower die and is mounted for longitudinal movement in a bearing 35 and a slide block 36, which are secured to the die shoe 2 of the press. A portion of this rod is reduced to provide a shoulder 34a, and the end of the reduced portion is threaded as at 34b. The rod 34 extends through bearing plates 37 and 37a secured as a unit to the slide block 36. A coil spring 38 is mounted on the pull-back rod between the sleeve 33 and a washer 39, which is limited in its rearward movement by a pin 40. This coil spring normally holds the thrust member 32 at its outermost position on the rod. A coil spring 41, mounted on the rear end of the pull-back rod between the plate 37a and a washer 42, normally holds the pull-back rod at its rearmost position, as shown in Figs. 1 and 2.

For the purpose of moving the thrust member 32 towards the lower die 17, against the tension of the coil spring 41, a bell-crank lever 43, pivotally secured at its mid-point to a support 44, is provided. One arm of the lever 43 has a pin and slot connection with a member 45, which, in turn, is rigidly secured to the pull-back rod at a point between the plates 37 and 37a, and the other arm of the lever is secured to a link 46, which is secured by means of a second link 47 to the foot pedal 48 of the press.

Mounted for transverse sliding movement in the slide block 36 is a lock-bar 49, having therein a key-hole slot 49a. The lock bar is normally maintained in its rearmost position, as shown in Fig. 5, by means of a push rod 50, slidably mounted in a bearing 51 and urged rearwardly by a coil spring 52, mounted thereon between the bearing 51 and head 50a of the push rod. The pull-back rod extends through the enlarged portion of the key-hole slot 49a,

A cam shaft 53, mounted in bearings 54 on the die shoe 2 of the press, is adapted to be driven at the same speed as the spindle assembly by means of the gear 29 through the intermediary of a pinion 55, mounted on the die shoe 2, and a gear 56 secured to one end of the cam shaft. Rigidly secured to the opposite end of the cam shaft 53 are spaced apart cams 57 and 58, which are provided with flat portions 57a and 58a respectively. These cams serve a purpose to be presently described.

Mechanism for tripping the press is provided, which includes a member 59, which is pivotally secured to an upright post 3 of the press, a pedal rod 60 pivotally secured at its upper end to the member 59 and at its lower end to the pedal 48, and a press trip rod 61, pivotally secured at its lower end to the member 59 and at its upper end to the clutch 11 of the press.

Means are also provided for holding the clutch engaged for one complete revolution of the spindle assembly. For this purpose, a block 62 is employed, having an overhanging upper portion which in the operation of the press, serves to hold down a latch 63 pivotally secured at its upper end to a bar 64, extending from and rigidly secured to the member 59. A flat spring 65 secured to the block 62 normally urges the latch away from the block, as shown in solid lines in Fig. 4.

Operation

With the various parts of the press in the position shown in Figs. 1 to 5 inclusive, and with the flywheel disengaged from the crank shaft, the operator places a thread protector 66, as shown in Fig. 9, on the lower die 17, the lower die occupying the position shown in Figs. 10 and 11, i. e., with the grooves 17c of one of the lug swaging elements 17b directly under the slug displacing elements 9a of the upper die 9.

The operator then steps on the pedal 48 of the press, and in so doing, causes the pull-back rod 34 to move to the left against the tension of the spring 41, thereby forcing the thrust member 32 against the thread protector and holding it firmly in position on the lower die. The pull-back rod moves to the left until the shoulder 34a thereof just clears or passes the keyhole slot 49a in the lock bar 49.

Downward movement of the pedal 48 retracts the press trip rod 61, and causes the crank shaft to move the upper die downwardly. The downward movement of the upper die is accompanied by a downward movement of the connecting rod

19 and the parts associated therewith, the pawl 27 moving backward over the teeth of the ratchet 28. At the end of the downward stroke of the upper die, the elements 9a thereof displace slugs of approximately square cross-section from the metal of the walls of the thread protector, the displaced slugs entering the grooves 17c in the lower die 17, and being swaged by the walls of these grooves to the V-shape, as shown in Fig. 12. After the lugs 67 are thus formed, the upper die rises to its initial position.

Upward movement of the die is accompanied by an upward movement of the pawl 27, which, through the intermediary of the ratchet 28, rotates the lower die 17 through an arc equal to the distance between successive lug swaging elements 17b, and at the same time, the cam pin 30, through the intermediary of the cam 15, causes the lower die to move longitudinally to the extent determined by the pitch of the helical groove 15b. Rotary movement of the lower die is also accompanied by a corresponding movement of the cam shaft 53 and the cams 57 and 58 associated therewith.

In the retracting movement of the press trip rod 61, the latch 63 moves downward to the position shown in dotted lines in Fig. 4, and the cam 57, in rotating in the direction indicated by the arrow in this figure, holds the latch in engagement with the block 62. The cam 58, in rotating in the direction indicated by the arrow in Fig. 5, forces the lock bar 49 to move against the tension of the spring 52 to the position shown in Fig. 6, wherein the lock bar abuts the shoulder 34b of the pull-back rod and prevents the pull-back rod from returning. With the pull-back rod locked and the press trip rod latched, the operator may remove his foot from the pedal.

The thread protector shown in the present drawings is provided with eight rows of lugs, and eight strokes of the upper die are therefore required to form these rows of lugs. Each time that the thread protector is rotated to its successive positions, the thrust member 32, owing to its ball-bearing mounting, is free to rotate with the thread protector, but is maintained under constant tension against the thread protector by means of the coil spring 38.

After the last stroke of the upper die, i. e., at the beginning of the final upward movement of the upper die, the flat portion 57a of the cam 57 returns to the position shown in Fig. 4, whereupon the spring 65 forces the latch 63 out of engagement with the block 62 and permits the flywheel to be thrown out of engagement with the crank shaft, thus stopping the press. Immediately after the latch 63 is released, the flat portion 58a of the cam 58 returns to the position shown in Fig. 5, whereupon the spring 52 forces the lock bar to the position shown in this figure, thus permitting the pull-back rod to return to its original position, as shown in Fig. 1.

The operator then removes the finished thread protector, as shown in Figs. 13 and 14 from the lower die, places another thread protector on the lower die and again steps on the pedal, repeating the aforesaid cycle of operations.

The cam 15 is shown as having helical grooves of two different pitches. By utilizing a cam pin in connection with the groove 15a, the lugs are arranged in a helical curve having a pitch of 11½, whereas use of the cam pin in connection with the groove 15b results in the lugs being arranged in a helical curve having a pitch of 8. It will be understood, however, that cams having helical grooves of any desired pitch may be substituted for the cam shown.

It will be understood that the lugs may be formed on thread protectors of various diameters by merely substituting dies of the desired size or diameter for those shown, and that the circumferential spacing of the rows of lugs may be varied by adjusting the length of the connecting rod 19 to thereby vary the stroke of the pawl 27.

From the foregoing, it will be apparent that the present method and apparatus fulfills the objects herein set forth.

Without further description, it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be understood that changes in the form, proportion and minor details of construction may be resorted to without departing from the scope of the appended claims.

I claim:

1. Apparatus for forming lugs in a thread protector including an automatically rotatable and axially displaceable die upon which a thread protector is adapted to be positioned, a second die cooperating with said first named die to form lugs in said thread protector and means for preventing slipping between the die and thread protector during the lug forming operations.

2. Apparatus as defined in claim 1, and means for releasing said last named means upon completion of the lug forming operations to permit removal of the finished thread protector.

3. Apparatus for forming lugs in a thread protector including a reciprocating upper die, a lower die adapted to be progressively moved in a helical path to predetermined positions to receive successive strokes from the upper die, means for causing reciprocation of the upper die for a predetermined number of strokes, and means for causing cessation of said reciprocation.

4. Apparatus for forming lugs in a thread protector including an automatically rotatable and axially displaceable die upon which a cup-shaped thread protector is adapted to be positioned having circumferentially-spaced grooves therein, a second die having a slug displacing element thereon, means for rotating said first-named die to bring the grooves therein successively opposite said slug displacing element, and means for moving said second-named die towards said first-named die between successive rotational movements of the latter to cause the slug displacing element to displace a solid slug of metal radially inwardly from the wall of the thread protector and into one of the grooves to be swaged into a thread engaging lug by the walls of said groove.

5. Apparatus for forming lugs in a thread protector including an automatically rotatable and axially displaceable die upon which a cup-shaped thread protector is adapted to be positioned having circumferentially spaced helically arranged grooves therein, a second die having a slug displacing element thereon, means for rotating said first-named die to bring the grooves therein successively opposite said slug displacing element, means for moving said second-named die towards said first-named die between successive rotational movements of the latter to cause the slug displacing element to displace a solid slug of metal radially inwardly from the wall of the thread protector and into one of the grooves to be swaged into a thread engaging lug by the walls of said groove.

6. Apparatus as defined in claim 5, and means

for preventing relative rotation between the thread protector and the first-named die during rotational movements of the latter.

7. Apparatus as defined in claim 5, means for preventing relative rotation between the thread protector and the first-named die during rotational movements of the latter, and means for releasing said last-named means after each complete revolution of the first-named die to permit removal of the finished thread protector.

8. Apparatus as defined in claim 5, and means for moving the first-named die longitudinally after each stroke of the second-named die.

9. In apparatus for forming lugs on a thread protector, a female die upon which a cup-shaped thread protector is adapted to be positioned, means for imparting rotary and axial movement to said die to position the thread protector for the formation thereon of helically arranged lugs, and a thrust member for preventing relative rotation between the thread protector and die during the aforesaid movements.

10. In apparatus of the character described, an automatically reciprocable die, a mandrel arranged in the path of movement of said die and having its axis disposed at right angles to said path of movement, said mandrel being rotatable through predetermined arcs in response to the movement of said die, and means for displacing said mandrel axially with each rotative movement thereof.

11. In apparatus of the character described, an automatically reciprocable die, a mandrel arranged in the path of movement of said die and having its axis disposed at right angles to said path of movement, said mandrel being rotatable through predetermined equal arcs in response to the movement of said die, and means for displacing said mandrel axially with each rotative movement thereof.

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