Dec. 23, 1969 H. S. ACHLER ET AL 3,485,122

SPRING-STRIPPER FOR USE WITH PUNCHES, DIES AND THE LIKE

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FIG. 1.

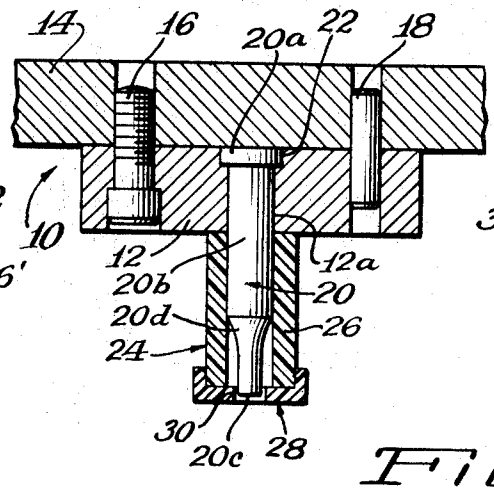


FIG. 5.

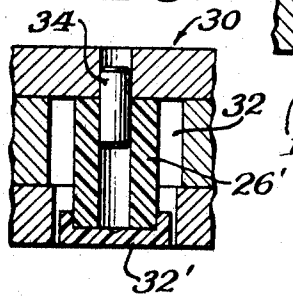


FIG. 6.

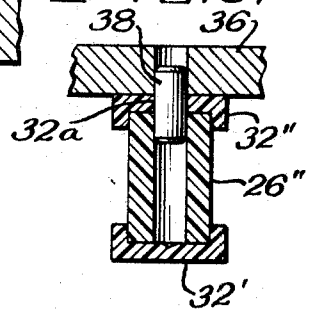


FIG. 2.

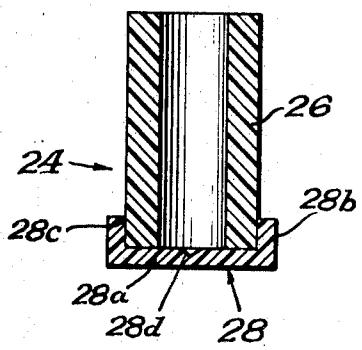


FIG. 4.

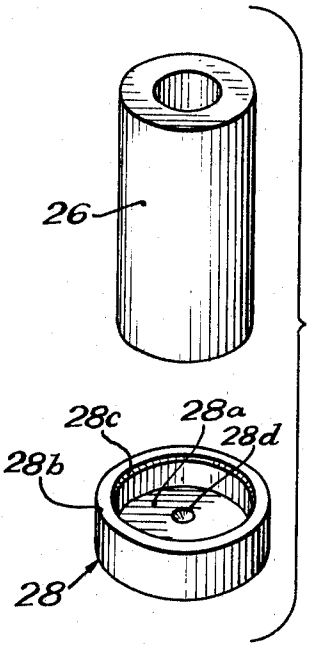
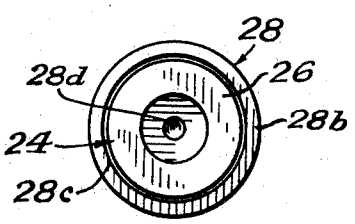


FIG. 3.



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SPRING-STRIPPER FOR USE WITH PUNCHES, DIES AND THE LIKE

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ABSTRACT OF THE DISCLOSURE

An improved spring-stripper is provided by the combination of a cylindrical spring-like sleeve of urethane rubber with durometer-scale hardness in the range of 75–98 Shore A having a stripper-disc cap of urethane rubber with durometer-scale hardness greater than the hardness of the spring-sleeve assembled thereon by a press fit. The hardness of the cap is in the range of 100–130 Shore A and preferably is at least 10 points higher on the Shore A scale than the hardness of the sleeve. The simplicity of a press-fit permits assembling a precise length spring-stripper at the site of usage, since caps may be readily assembled with sleeve-like springs cut to precise length from stock lengths. A bevel provided on the inner peripheral edge of the cap's flange assists in assembly.

BACKGROUND OF THE INVENTION

This invention relates to an improved spring-stripper for use in machine shops and in production operations such as with punches, ejectors and the like.

It has been known to use sleeves of polyurethane as springs in spring-strippers in machine shop and production operations such as with punches, ejectors and the like. In certain prior constructions, a cupped end member of steel or other metal has been secured to an end of the sleeve-spring by upsetting the distal end of the metal flange to cause same to bite into the peripheral wall of the sleeve-spring at a region spaced from the bottom of the cut. Such prior constructions have, among others, the following deficiencies: the metal end member tends to mar the work against which the stripper abuts in stripping; the said attachment of the end member to the sleeve-spring produces non-uniform and undesirable stresses in the sleeve-spring; the construction is relatively expensive and fails to provide flexibility in the production of spring-strippers of desired size and length at the site of usage.

In other prior constructions, punch stripping has been effected by springs formed either of natural rubber or urethane elastomeric materials that have been molded into cylinder or cup-shaped bodies of pre-selected sizes with a pilot hole through the base of the cup. Primary deficiencies of such constructions are: the base of the cup may not be hard enough to effect a proper stripping function; there is an economic limitation on a supplier's ability to provide all sizes of outside diameters, inside diameters and length of springs, and a limitation on the ability to provide for producing desired sizes and lengths of spring-strippers at the site of usage.

SUMMARY OF THE INVENTION

Thus, an object of this invention is to provide an improved spring-stripper that is constructed of a separate urethane spring and urethane stripper-cap of different durometer hardnesses to provide for press fit assembly and retention in assemblage, thereby affording the greatest flexibility possible in selection of different combinations of outer diameter, inner diameter and length of springs and permitting ready production of spring-strippers at the site of usage.

Another object of this invention is to provide an improved spring-stripper that avoids the undesirable features of prior constructions and which is characterized by its simplicity and inexpensiveness of construction.

Further objects and advantages of this invention will become apparent as the following description proceeds and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

A preferred embodiment of the invention is shown in the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 illustrates, partially in cross-section, an assemblage of a typical punch with a spring-stripper that embodies the invention herein;

FIGURE 2 is an enlarged cross-section view of the assembled spring and stripper/shedder-cap embodying the invention herein disclosed;

FIGURE 3 is a top plan view of the device shown in FIGURE 2;

FIGURE 4 is an exploded perspective view of the device of FIGURES 2 and 3, showing a separate spring and stripper/shedder-cap as they appear when separated and prior to assembly;

FIGURE 5 is a view, similar to FIGURE 1, showing an assemblage usable as a shedder; and

FIGURE 6 shows still another variation of assemblage of parts herein disclosed.

Referring now to the drawings, FIG. 1 illustrates one typical environment for the spring-stripper of this invention. As shown in FIG. 1, there is a typical punch installation generally indicated at **10** that includes a front plate **12** and a backup plate **14**, the plates being typically connected together and/or aligned by means of a bolt **16** and/or pin **18**. The front plate **12** is bored as at **12***a* to receive therethrough the shank of a headed punch pin generally indicated at **20**. The punch pin **20** has a head end **20***a*, a shank **20***b*, a punch tip **20***c*, and a faired portion **20***d* which necks down from the shank **20***b* to the cylindrical punch tip **20***c*. The front plate **12** is provided with a counterbore **22** to receive and seat the head **20***a* of the punch pin **20**. Thus far what has been described is well known in the art and forms no part of the invention herein but serves to describe an environment wherein the invention of the spring-stripper is to be used.

The spring-stripper is generally indicated at **24** and includes an elongated sleeve **26** of a synthetic rubber-like material, namely a urethane rubber with a durometer-scale hardness in the range of 75–98 Shore A, that serves as a spring. As a preferred example, the hardness of spring **26** is in the range of 95±3 Shore A. The spring **26** is made of a tough, resilient, high-modulus of urethane rubber that will withstand more than 100,000 cycles of compression. Such a urethane rubber is available from Kaufmann Tool & Engineering Corp., of Chicago, Ill., under its Specification as K–167. It will be understood that the spring **26** may be selected of any length and may be of any selected outer or inner diameter. It is sufficient to note here that the inside diameter of the spring sleeve **26** is so selected in the particular example here disclosed relative to punch pin **20**, that the shank **20***b* has what is known as a wring fit in sleeve **26**, namely that in the absence of forces tending to effect sliding, the sleeve **26** remains positioned on and held by slight friction between shank **20***b* and sleeve **26**, but the fit is such that the sleeve **26** may be slid onto punch **20** to reach the condition of FIG. 1.

The remainder of the spring-stripper of this invention is a cap member **28** which also is formed of a rubber-like material, namely urethane rubber, but here the cap is re-

quired to be very tough and hard and is formed with a durometer-scale hardness of a selected degree greater than the durometer-scale hardness of the sleeve 26. The durometer-scale hardness of the cap may be in the range of 100–130 Shore A, and as a preferred example the hardness is at least 10 points greater than the hardness of sleeve-spring 26 and is in the range of 114–120 Shore A.

The cap 28 in its normal condition prior to assemblage is best seen in FIG. 4, or in assemblage is seen in cross section in FIG. 2. The cap 28 is shaped to provide a flat disc-like portion 28*a* having an integral peripheral flange 28*b* extending transversely of portion 28*a* from one side thereof. The inner dimension of the flange 28*b* is selected so that it is just slightly smaller than the exterior periphery of the sleeve 26. This arrangement is such that sleeve 26 and cap 28 may be assembled only by a press fit of the parts.

The end of the annular flange 28*b* that is distal from the disc portion 28*a* of the cap 28 has a continuous peripheral chamfer or bevel 28*c* defined on the inner edge. The bevel 28*c* assists in centering the sleeve 26 with the peripheral flange 28*b*, and assists in the effecting of a press fit assemblage between the sleeve 26 and the cap 28.

It will be seen that both the sleeve 26 and the cap 28 are formed of urethane rubber, with the cap being provided with a hardness greater than the hardness of the sleeve in an amount of at least 10 points on the Shore A durometer scale. While the bevel 28*c* is preferably continuous along the inner periphery of the flange 28*b*, it will be appreciated that the bevel 28*c* may be in the form of segmental lengths toward achieving the same effect.

The cap 28 is provided on the spring side of the disc portion 28*a* thereof, which faces in the direction that the flange 28*b* extends from the disc 28*a*, with a countersink notch or centering recess 28*d* that is located centrally of the annular flange 28*b*. Preferably the recess has an included apex angle of about 118°. The recess 28*d* serves as a guide for a drill bit in drilling out a hole such as 30 as seen in FIG. 1 through which the punch tip 20*c* may protrude as in a punching operation.

The simplicity and utility of the device is apparent from the foregoing description. The sleeve-spring 26 may be cut and/or formed to any desired length and size from an elongated rod or tube of urethane rubber stock of the required durometer hardness. After the desired length of sleeve-spring 26 is available, it may be used as a spring, or if intended for use as a stripper or shedder then caps may be provided at the outermost end, or at both ends, if desired. Assemblage is by a simple press fit effected in a vise, or by means of an arbor press or upon first stroke of the ram, or punch as seen in FIG. 1. The press fit is such, and the nature of the urethane rubber is such, that the press fit causes the cap 28 to squeeze the inserted end of spring 26 and develop retention pressure in the resilient material so as to securely mounted on and held by the sleeve 26.

The cap 28 as is may serve as a shedder, or if intended as a stripper it may be drilled, pierced or machined to provide a central aperture 30 that conforms to the contour of the punch. While in the example shown in FIGURE 1 the punch tip is cylindrical, an aperture 30 of any other contour is intended to be disclosed herein. The spring 26 is usually provided slightly longer than final intended usage, such as 1/16 inch longer to compensate for permanent set which may occur during the first few press strokes, depending upon the percentage of deflection designed for. In preferred usage, the disc 28*a* of cap 28 is provided with a flat smooth outer face and the urethane is reinforced and molded, or cast, with randomly disposed glass fibers substantially uniformly distributed within the urethane rubber of the cap.

The spring-stripper of FIG. 2 is then assembled onto the shank 20*d* of a punch, and the friction developed between the sleeve 26 and the shank 20*b* is sufficient to hold the parts assembled as seen in FIG. 1. The nature of the urethane rubber material is such that once press fit into position as seen in FIG. 2, the sleeve 26 tightly holds the cap 28 and the parts will not separate under the ordinary pressure developed by use of the punch 20. The cap 28, since it is formed of urethane rubber, operates as a stripper plate in FIGURE 1, or as a shedder as hereinafter described in FIGURE 5, and at the same time avoids any marring of the surface of the material against which the cap 28 is pressed.

The spring-stripper 24 herein disclosed will: provide for its size unusually high pressures because of the spring modulus of the material of spring 26; permit close center distances because of the strength of the materials; provide positive stripping action; reduce and damp punch vibration; provide for simple and quick installation without set screws or stripper bolts; prevent marring of the work against which the caps 28 abut; and prevent shrapnellizing (flying into pieces) as occurs with competitive devices that fracture under load, thereby protecting both dies and workers.

In FIGURE 5 there is shown another assemblage using the same parts, namely a spring-sleeve and cap assembled for use as a shedder. The environment includes frame means generally indicated at 30 arranged to define a recess 32. A pin 34 carried by frame means 30 projects into recess 32 and carries an elongated spring-sleeve 26′ whose lower end has press fit thereon an imperforate cap 32′ which serves as a shedder.

In FIGURE 6, still another assemblage is shown. The environment includes frame plate 36 carrying pin 38. The assemblage has an elongated spring-sleeve 26″ with an imperforate cap 32′ press fit on its lower end and a top cap 32″ press fit on the sleeve's upper end. The top cap 32″ is bored at 32*a* for receiving therethrough the pin 38.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. An improved spring-stripper consisting of an elongated sleeve of synthetic rubber-like material, and a cap of rubber-like material defining a disc-like transverse portion and an annular flange, the cap being assembled on one end of said elongated sleeve by a press-fit between said sleeve and said annular flange, the sleeve and cap both being formed of urethane rubber, with the cap provided with a hardness greater than the hardness of the sleeve in an amount of at least 10 points on the Shore A durometer scale.

2. A device as in claim 1 wherein the sleeve has a right-circular exterior periphery, and the flange on the cap has a right circular internal periphery that is slightly smaller than the exterior periphery of the sleeve for engaging and slightly compressing an end portion of the right-circular exterior periphery of the sleeve so as to retain the cap on the sleeve.

3. A device as in claim 2 wherein the end of the annular flange distal from said transverse wall portion has a bevel defined on the inner edge to assist in centering the sleeve before effecting a press-fit between said sleeve and cap.

4. A device as in claim 1 wherein the hardness of the sleeve is in the range of 75–98 Shore A on the durometer scale.

5. A device as in claim 1 wherein the hardness of the cap is in the range of 100–130 Shore A on the durometer scale.

6. A device as in claim 1 wherein the hardness of the sleeve is in the range of 95±3 Shore A on the durometer scale and wherein the hardness of the cap is in the range of 114–120 Shore A on the durometer scale.

7. A device as in claim 1 wherein the sleeve is provided with a cap press fit on each end.

8. An improved stripper cap for use with an elongated, cylindrical spring sleeve of synthetic rubber-like material, said improved stripper cap providing a disc-like transverse wall portion integral with an annular flange extending

perpendicularly from said transverse wall portion, the interior periphery of said annular flange being slightly smaller than the exterior periphery of an end portion of the cylindrical sleeve, so that the cap must be press fit onto an end portion of the sleeve to assemble the stripper cap with a sleeve, said stripper cap being formed of urethane rubber having a hardness of at least 10 points Shore A on the durometer scale greater than the hardness of the sleeve.

9. A device as in claim **8** wherein the hardness of the cap is in the range of 100–130 Shore A on the durometer scale.

10. A device as in claim **8** including a centering recess

defined on said disc-like transverse wall located precisely centrally of said annular flange.

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