

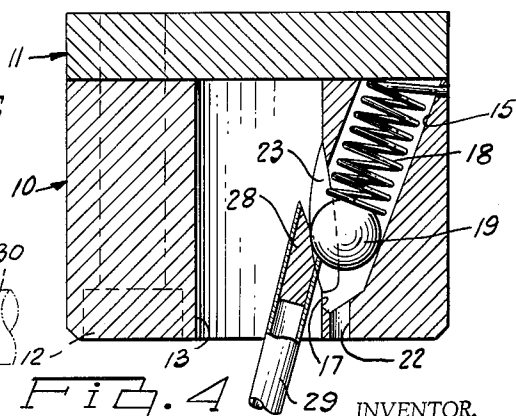
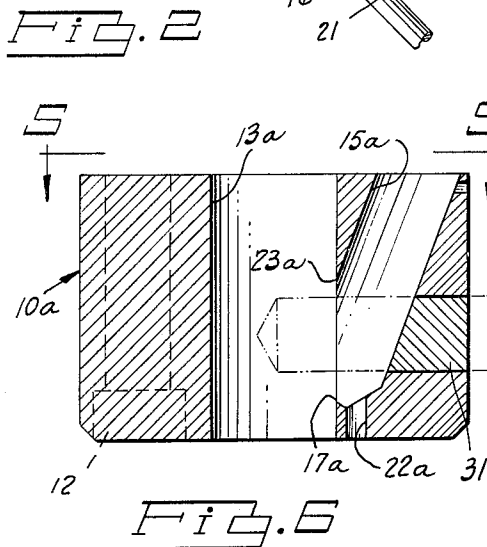
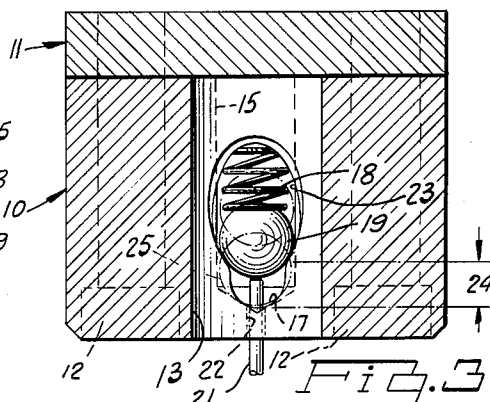
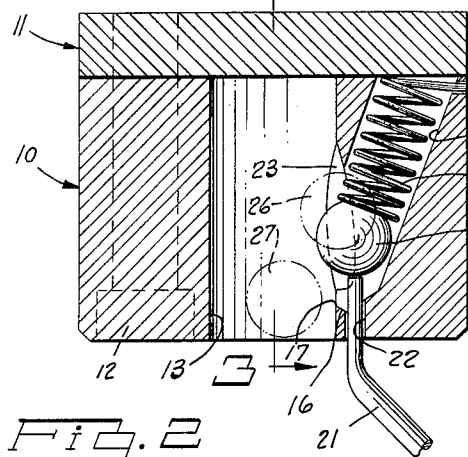
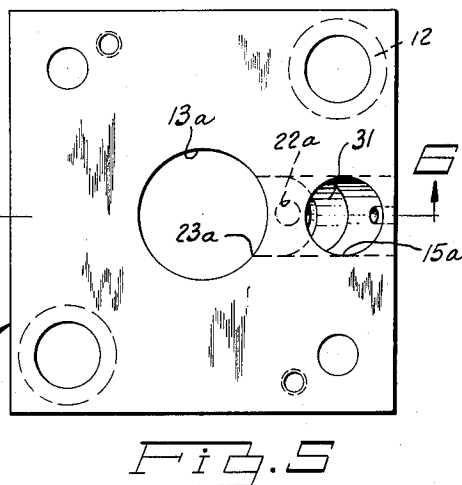
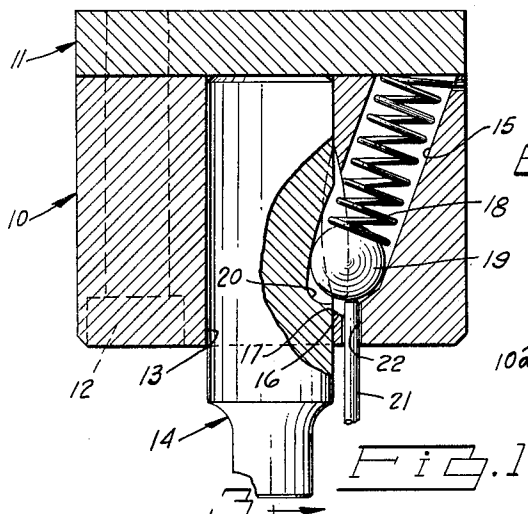
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3,245,694

REMOVABLE BALL RETAINER BLOCK

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3,245,694
REMOVABLE BALL RETAINER BLOCK
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1 Claim. (Cl. 279—30)

This invention relates generally to the construction of punching and forming tools adapted for use upon punch presses and the like, and more particularly to a novel and improved tool retainer construction which is provided with a spring-loaded ball lock means for retaining a first member, as a punch, in a second member, as a punch retainer.

The present invention may be embodied in various constructions of interchangeable dies, punches and the like which are provided with spring-loaded ball lock means, as for example, the metal punching tool construction shown in United States Patent No. 2,662,773.

Spring-loaded ball locking means are widely used in the metal punching and forming tool field for releasably retaining two tool members together to permit quick and easy assembly and disassembly of the tools. It is a common occurrence in this particular field to have conditions occur in the operation of punching tools and the like which result in damage to the ball in the spring-loaded ball locking means. For example, due to tool accidents the ball may be scored and also provided with flat spots. When such damage to the ball occurs, it must be removed and replaced with a new ball and this replacement operation is a costly and time consuming task. In order to remove the ball it is necessary to dismantle, in many instances, an entire punch retainer block assembly and other structure, as the stripper plate structure, and this operation is a lengthy and costly operation. In view of the foregoing, it is an important object of the present invention to provide a novel and improved construction for metal forming and punching tools and the like wherein a spring-loaded ball locking means is provided with a structural arrangement whereby the locking ball may be quickly and easily removed from the tool construction for quick and easy replacement of the same.

It is another object of the present invention to provide a novel and improved punching and forming tool retainer construction which includes means for removing the locking ball from a spring-loaded ball locking means without dismantling the retainer construction when it is desired to replace a damaged locking ball.

It is still another object of the present invention to provide a novel and improved retainer construction for punching and forming tools which is simple and compact in construction, economical of manufacture, and efficient in operation.

It is a further object of the present invention to provide a novel and improved punching and forming tool retainer construction which is provided with a spring-loaded ball lock means in a first elongated bore, said bore being adapted to intersect a tool mounting bore in the retainer construction, and said first named bore being enlarged at the point of intersection with the tool mounting bore to permit the locking ball in said ball locking means to be removed from the first named bore into the tool mounting bore for replacing said ball.

Other objects, features and advantages of this invention will be apparent from the following detailed description, appended claim, and the accompanying drawing.

In the drawing:

FIG. 1 is an elevational section view of a metal punching tool retainer construction made in accordance with the principles of the present invention;

FIG. 2 is an elevational section view, similar to FIG. 1, and showing the punch removed and the spring-loaded

ball locking means moved to a position to permit removal of the ball;

FIG. 3 is an elevational section view of the structure illustrated in FIG. 2, taken along the line 3—3 thereof and looking in the direction of the arrows;

FIG. 4 is an elevational section view, similar to FIG. 2, and showing a new locking ball being inserted into the spring-loaded ball locking means bore;

FIG. 5 is a top plan view of a retainer block, taken along the line 5—5 of FIG. 6; and

FIG. 6 is an elevational section view of the structure illustrated in FIG. 5, taken along the line 6—6 thereof.

Referring now to the drawing and in particular to FIGS. 1 and 2, the reference numeral 10 generally designates a tool retainer block which is provided with the usual backing plate, generally indicated by the numeral 11, and which is adapted to be secured to the head of a press or the like (not shown). The backing plate 11 is adapted to be secured to the punch retainer block 10 by any suitable means, as by means of a plurality of suitable screws indicated by the numeral 12. The punch retainer block 10 is provided with a cylindrical tool socket or bore 13 which is adapted to have seated therein a conventional punch generally indicated by the numeral 14.

As shown in FIGS. 1 and 2, the retainer block 10 is provided with the bore or hole 15 which is angularly disposed relative to the bore or tool hole 13 and which extends inwardly and downwardly into the retainer block 10 and terminates at the point indicated by the numeral 16. As best seen in FIG. 3, the lower or inner end of the hole 16 intersects with the tool hole 13 as indicated by the numeral 17.

Operatively mounted in the hole 15 is the helical compression spring 18 which abuts the backing plate 11 at one end of the spring. The other end of the spring 18 is adapted to engage the locking ball 19 and normally bias the same downwardly to the bottom of the hole 15 against the lower end surface 16 thereof.

As shown in FIG. 1, the punch 14 is provided with a pocket 20 which is substantially the form of a half tear drop when viewed in elevation, and which is adapted to receive the locking ball 19 to releasably lock the punch 14 in the hole 13. In the prior art spring-loaded locking ball constructions the ball 19 projects outwardly from the hole 15 into the hole 13 through the opening 17. The ball 19 extends into the hole 13 a sufficient distance to be engaged in the pocket 20 in the punch 14 so as to lock the punch 14 in the hole 13, yet prevent the ball 19 from being ejected into the hole 13 by the spring 18. In order to remove the punch 14 it is the common practice to insert a tool as 21 into the hole 22 in the retainer block 10 and to engage the ball 19 and push it upwardly so as to move it out of the pocket 20 and permit withdrawal or removal of the punch 14 from the hole 13. It will be seen that in the prior art constructions in order to replace the ball 19 it is necessary to disassemble the retainer block 10 from the backing plate 11 in order to remove the spring 18 and ball 19 from the hole 15.

In accordance with the principles of the present invention the opening 17 at the intersection of the holes 15 and 13 is enlarged at a point above the lower end of the intersection hole 17 so as to permit removal of the ball 19 through the enlarged hole indicated by the numeral 23 through the tool mounting hole 13. As shown in FIG. 3, the intersection hole 17 between the holes 15 and 13 has been enlarged starting at a point upwardly from the lower end of the hole 17 by a distance indicated by the numeral 24. The numeral 25 in FIG. 3 indicates the lowermost position of the ball 19 when the spring 18 has moved the ball 19 downwardly to the bottom of the hole 15 into a releasable locking engagement with the pocket 20 in the punch 14. When the ball 19 is in the position indicated

by the numeral 25 in FIG. 3, it is operative to extend outwardly through the reduced lower portion of the hole 17 and perform its locking operation without danger of being ejected or moved into the hole 13 as, for example, when the punch 14 has been removed from the hole 13.

It will be seen that when the tool 21 is inserted into the hole 22, as shown in FIG. 2, to move the ball 19 upwardly and out of the pocket 20 in the punch 14, that the punch 14 can be released and pulled out of the hole 13. As the punch 14 is removed from the hole 13 the ball 19 is guided downwardly by the trailing edge of the punch into the position indicated by the numeral 25 in FIG. 3, and the retainer block is in a condition to receive another punch or other tool 14. If the ball 19 is damaged and it is necessary to replace the same, the retainer block 10 does not have to be removed from the backing plate 11, but it is merely necessary to insert the tool 21 into the hole 22 and move the ball 19 upwardly as shown in FIG. 2. When the ball 19 has been moved upwardly into the enlarged portion 23 of the intersecting hole between the holes 15 and 13, the ball 19 will be moved sidewardly into the tool mounting hole 13 as indicated by the dotted position 26 in FIG. 2. The ball 19 will then be moved downwardly and out of the hole 13 through a succession of positions, one of which is indicated by the numeral 27 in FIG. 2, and thence out of the hole 13. The spring 18 assists in ejecting the ball 19 through the hole 23 when the ball 19 has been moved upwardly into the hole portion 23.

In order to replace the ball 19 it is merely necessary to use some holding tool as, for example, the magnet 28 shown in FIG. 4. The magnet 28 is mounted in a suitable handle 29 and a new ball 19 may be inserted into the hole 15 through the opening 23, as indicated in FIG. 4. After the ball has been inserted through the opening 23 into the hole 15 the magnet 28 is moved downwardly and the ball 19 will move down into the bottom of the hole 15 and will be seated opposite the reduced intersecting portion of the hole 17 and retained in place and ready for insertion of the tool 14.

It will be seen from FIGS. 1 and 2 that the ejection operation of the ball 19 through the enlarged intersection hole 23 is assisted by the fact that the tool 21 engages the ball 19 at a position slightly off-center opposite to the ejection hole 23 whereby the ball 19 is forced or biased to the left as viewed in FIG. 1 into the enlarged hole 23, and when it is elevated into the enlarged intersection hole 23 the spring 18 ejects the ball 19 into the hole 13.

FIGS. 5 and 6 show a modified method for making the enlarged hole 23. In the first embodiment the enlarged hole 23 which forms the enlarged intersection between the holes 15 and 13 is formed by a suitable boring tool being moved into the hole 13 and directed upwardly into the hole 17 so as to enlarge the same. FIGS. 5 and 6 illustrate how the hole 17a can be enlarged as indicated by the numeral 23a by means of a suitable tool 30 shown in dotted lines in FIG. 6. The tool 30 would be used to drill a hole at right angles to the tool mounting hole 13a so as to provide an enlarged opening 23a to communicate the hole 15a with the hole 13a to provide a passage for the ball 19 between these holes. This drilling operation

would obviously have to be performed before the retainer block was hardened. The hole formed by the drill 30 would also be closed by a suitable plug 31. FIGS. 5 and 6 illustrate that the ball ejection hole 23 which communicates the hole 13 with the hole 15 may be formed in any suitable manner and by any suitable means.

It will be understood that the invention may be incorporated in other tool constructions than that shown in the figures. The invention has been illustrated in a punch retainer construction. However, it will be understood that it may be incorporated in any tool construction wherein spring-loaded ball locking means are employed, as for example, in a punch retainer and reducer construction, in a die button and die button retainer construction, and other tool mounting constructions.

Experience has shown that the present invention eliminates the need for disassembling a complete tool construction when it is mounted on a punch press or the like, and when there is a need for replacing the locking ball in a spring-loaded locking ball means. The invention thus provides substantial savings in down time and labor required for dismantling the prior art tool constructions which employ the prior art spring-loaded ball locking means.

While it will be apparent that the preferred embodiments of the invention herein disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claim.

What I claim is:

In a tool construction, the combination comprising: a retainer block; a tool socket having an open end formed in said retainer block; a hole formed in said retainer block; a spring-loaded locking ball positioned in said hole; said socket communicating with said hole by means of an opening having an inner portion and an outer portion with the outer portion adjacent the open end of the tool socket; said opening being disposed adjacent one end of said hole to permit a portion of said ball to project into said socket for locking engagement with a tool positioned in said socket; and said communicating opening being of a first size at the outer portion thereof adjacent said open end of the tool socket which permits said ball to project there-through into locking engagement with a tool positioned in said socket and of a second enlarged size at the inner portion thereof to permit said ball to be moved from said hole into said socket.

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