United States Patent

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[15] **3,675,838**

[45] **July 11, 1972**

[54] MUZZLE BUSHING ASSEMBLY FOR POWER-ACTUATED FASTENING TOOLS

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[22] Filed: **March 8, 1971**

[21] Appl. No.: **121,635**

[52] **U.S. Cl.** **227/8,** 227/10

[51] **Int. Cl.** **B25c 1/14**

[58] **Field of Search** 227/8, 9, 10, 11

[56] **References Cited**

UNITED STATES PATENTS

2,925,603	2/1960	Pfaff et al.	227/8
3,468,466	9/1969	Wackrow	227/10
3,534,895	10/1970	Henning	227/10
3,575,332	4/1971	Brunelle	227/10

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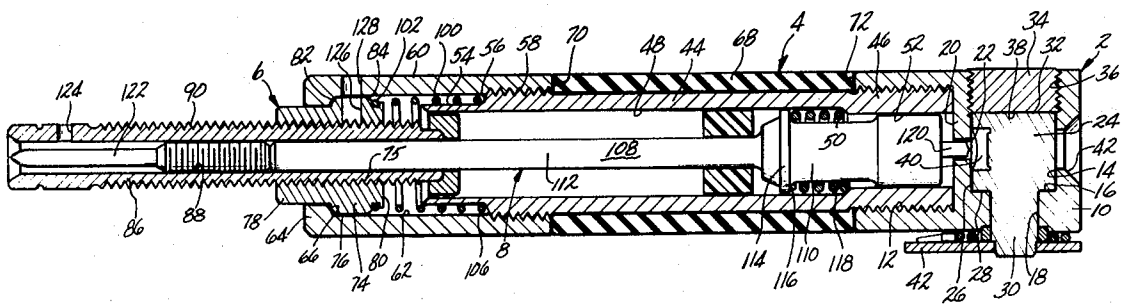
[57] **ABSTRACT**

An adjustable muzzle bushing assembly for a powder-actuated tool having means to prevent the muzzle bushing thereof from accidentally moving out of adjustment. The assembly includes a collet with a threaded bore which receives an externally threaded muzzle bushing. A longitudinal portion of the external surface of the muzzle bushing is reduced and the collet has a portion of its external surface reduced to form a flat surface intersecting its bore. A spring has a portion coiled about the collet and a straight portion in engagement with the flat surface and the muzzle bushing to act as a detent when the spring is in engagement with the flat surface of the muzzle bushing.

7 Claims, 4 Drawing Figures



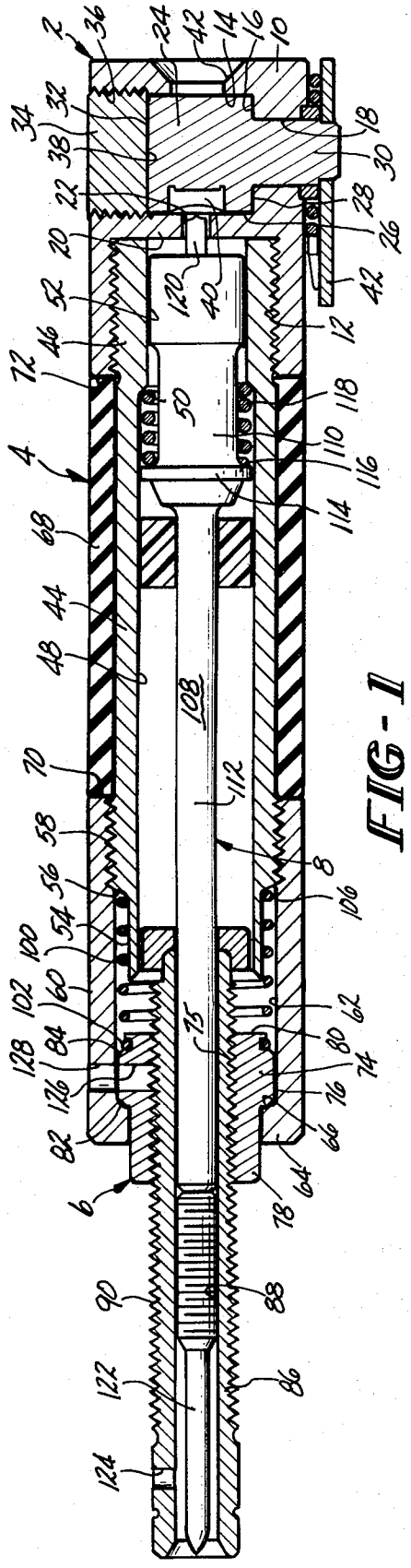


FIG-1

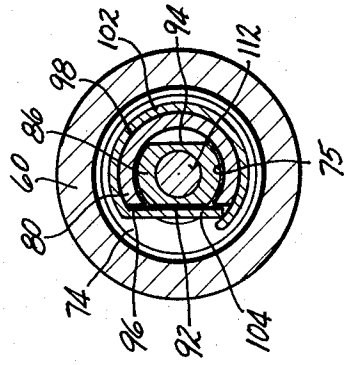


FIG-3

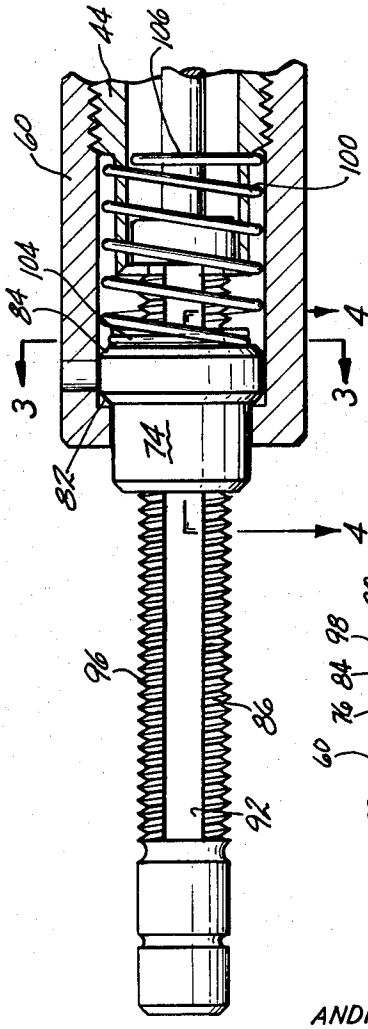


FIG-2

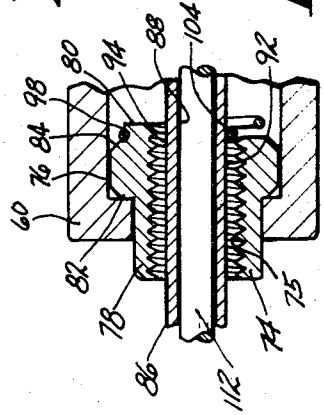


FIG-4

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MUZZLE BUSHING ASSEMBLY FOR POWER-ACTUATED FASTENING TOOLS

This invention relates generally to powder-actuated fastening tools. More particularly, the invention relates to such tools having an improved muzzle bushing assembly.

There are certain powder-actuated fastening tools on the market which are fired by moving the body of the tool toward the work surface. These tools are so designed that the fastener will hold the piston member stationary when the body of the tool moves to cause ignition of the powder charge. These tools are usually equipped with an adjustable muzzle bushing for holding the fastener. The muzzle bushing usually comprises a member threaded into a nut so that the muzzle bushing can be rotated to cause increased or decreased extension of the muzzle bushing from the end of the body of the tool.

The purpose of providing the adjustable feature is so fasteners of varying lengths can be used with the same tool. However, it has been found that in some cases, due to vibration and other forces, a muzzle bushing will tend to come out of adjustment with the possible result that either the fastener will not be properly guided or the powder charge will not be ignited.

In view of the above, it is an object of the present invention to provide a powder-actuated fastening tool having an improved muzzle bushing assembly.

More particularly, it is an object of the present invention to provide a fastening tool having a muzzle bushing assembly which helps to insure proper adjustment of the muzzle bushing.

More specifically, another object of the present invention is the provision of a muzzle bushing assembly for a powder-actuated tool wherein a muzzle bushing which adjusts by threading will be retained in its proper adjusted position.

These and other objects and advantages of the present invention will become more apparent by reference to the following description of a preferred embodiment of the invention and to the accompanying drawings in which:

FIG. 1 is a cross sectional view of a tool incorporating the improved muzzle bushing assembly of the present invention;

FIG. 2 is an enlarged partial sectional view of the forward or muzzle end of the tool of FIG. 1;

FIG. 3 is a transverse sectional view taken along the lines 3—3 of FIG. 2; and

FIG. 4 is a sectional view taken in the direction of lines 4—4 in FIG. 2.

An example of the tool in which the improved muzzle bushing assembly of the present invention may be used is shown in FIG. 1. Generally, the tool comprises a housing assembly 2, a barrel assembly 4 attached to the housing assembly 2, the improved muzzle bushing assembly 6 operably connected to the barrel assembly 4 for relative movement therewith, and a piston assembly 8 mounted within the barrel assembly 4 for relative movement therewith.

The housing assembly 2 includes a block-like housing member 10 the forward end of which is provided with an internally threaded counterbore 12. A second counterbore 14 is provided having an axis extending in a direction perpendicular to the axis of the tool. The counterbore 14 extends a portion of the way through the housing member 10 to a shoulder 16 with a reduced bore 18 extending the remainder of the way. The forwardmost surface of the counterbore 14 is spaced rearwardly from the bottom of the counterbore 12 to provide a breech face 20. The breech face 20 is provided with a port 22 having an axis coincident with the axis of the barrel assembly 4.

A powder charge receiving drum 24 is rotatably mounted within the counterbore 14 and reduced bore 18 in the housing member 10. The drum 24 is provided with a first cylindrical outer surface 26 which is in tight, but rotatable engagement with the surface of the counterbore 14, a bottom shoulder 28 which engages the shoulder 16 formed by the counterbore 14, and a reduced, cylindrical portion 30 having a surface in engagement with the reduced bore 18. The end of the reduced, cylindrical portion 30 projects beyond the outer edge of the housing.

The top surface 32 of the powder charge receiving drum 24 is flat. A plug 34 having a flat bottom surface 38 and external threads is threaded into the threaded upper portion 36 of the counterbore so that its bottom surface 38 is in contact with the top surface 32 of the drum 24 to confine the drum 24 between the plug 34 and the shoulder 16 formed by the counter-bore 14, thereby preventing lateral movement. The cylindrical surface 26 of the drum 24 is provided with a powder charge receiving chamber 40. In the particular tool shown, the powder charge receiving chamber 40 is of the type adapted to receive a pellet of caseless ammunition. When the tool is in the firing position as shown in FIG. 1, the powder charge receiving chamber 40 is in alignment with the port 22 in the breech face 20. A handle 42 is attached to the drum 24 to rotate the drum 24 180° into its loading position wherein the powder charge receiving chamber 40 is in communication with a loading port 42 in the rearward face of the housing 2.

The barrel assembly 4 includes a barrel member 44 having an externally threaded rearward end 46 which is threadedly secured within the threaded counterbore 12 in the housing 2. The main cylindrical bore 48 of the barrel member 44 extends from the forward end thereof to a tapered shoulder 50 which tapers inwardly and rearwardly until it meets with a reduced, cylindrical bore 52 which extends to the rearward end of the barrel member 44. The outer surface 54 of the barrel member 44 is reduced adjacent its forward end to form a shoulder 56. The outer surface 58 immediately rearward of the shoulder 56 is externally threaded and is connected to an internally threaded cap member 60. The cap member 60 has a generally cylindrical internal surface 62 with its forward end having an internal stop shoulder 66. A grip 68 of rubber, plastic or other suitable material, surrounds the barrel member 44 and extends from the rearward face 70 of the cap member 60 to the forward face 72 of the housing member 10.

The improved muzzle bushing assembly 6 includes a collet 74 mounted within the cap member 60 and having an internally threaded bore 75. The collet 74 includes an outwardly extending flange 76 intermediate its ends providing the collet 74 with a reduced forward portion 78 and a reduced rearward portion 80. The flange 76 provides the collet 74 with a forward abutment surface 82 and a rearward surface 84. A muzzle bushing 86 having a bore 88 extending therethrough is externally threaded through its length except for a small portion adjacent the forward and rearward ends thereof. The threads 90 on the muzzle bushing 86 are interrupted by two reduced diametrically opposed areas extending throughout the length of the threads 90 to provide two opposed longitudinally extending flat surfaces 92 and 94 on the outside surface. The muzzle bushing 86 is threadedly received within the threaded bore 75 of the collet 74.

The reduced rearward portion 80 of the collet 74 has a portion of its side wall cut away as shown in FIGS. 3 and 4 to form a flat planar portion 96 which interrupts the bore 75 so that the flat planar portion 96 will be substantially coplanar with one of the flat areas 92 and 94 on the muzzle bushing 86 when those components are in the position shown in FIG. 3. The rearward reduced portion 80 is also provided with a circumferentially extending groove 98. A compression spring 100, having its forwardmost coil 102 reduced and its forward end portion formed into a straight section 104, is snapped into the groove 98 on the collet 74 with the straight section 104 of the spring laying against the flat portion 96 as shown in FIG. 3. The other end 106 of the spring 100 abuts against the shoulder 56 on the barrel member 44. The spring 100 acts in torsion to prevent accidental turning of the muzzle bushing 86 relative to collet 74 as will be described in more detail below, as well as acts to bias the collet into a position wherein its forwardmost abutment surface 82 abuts the stop shoulder 66 of the cap member 60.

The piston assembly 8 includes a piston member 108 having a head portion 110 mounted within the barrel member 44 and

a reduced ram portion **112** extending forwardly into the muzzle bushing **86**. The piston head **110** includes an outwardly extending flange **114** to provide a shoulder **116** against which one end of a coil spring **118** abuts. The other end of the coil spring **118** abuts the shoulder **50** in the barrel member **44**. Projecting axially from the rearwardmost end of the piston member **108** is a firing pin projection **120**. The spring **118** serves to insure that the firing pin projection **120** of the piston member **108** will not project into the powder charge receiving chamber **40** after the tool is being fired.

Prior to the firing operation, the operator should adjust the muzzle bushing for the particular length fastener to be used. To do this, the handle **42** is rotated so as to move the powder charge receiving chamber **40** out of alignment with the port **22** and the firing pin projection **120**. A fastener **122** is then inserted in the forward end of the muzzle bushing **86** and pushed rearwardly until it engages the piston member **108**. The muzzle bushing **86** is then rotated in the proper direction with respect to the collet **74** so that the muzzle bushing **86** will be moved axially to a point where it is substantially flush with the tip of the fastener **122**. The straight section **104** of the spring **100** applies pressure through torsion to the flat areas **92** or **94** on the muzzle bushing **86**. The spring **100** has sufficient give so that the threads **90** of the muzzle bushing **86** will cam the straight section **104** off one flat area onto the other one upon 180° rotation when desired. However, when the muzzle bushing **86** is properly adjusted, the straight section **104** of the spring **100** will be in engagement with a flat area **92** or **94** of the muzzle bushing **86** and due to torsion, apply a sufficient force to the flat area so that the muzzle bushing **86** will be prevented from accidentally turning and thereby becoming improperly adjusted. To aid in rotating the muzzle bushing **86** for adjustment purposes, the forward end of the muzzle bushing **86** is provided with a transverse bore **124**. The collet **74** has a transverse bore **126** which is adapted to align with a transverse bore **128** in the cap member **60**. A fastener may be inserted into the bores **126** and **128** to hold the collet **74** stationary while a fastener may be inserted into the bore **124** in the muzzle bushing **86** whereby additional leverage may be obtained to rotate the muzzle bushing **86** relative to the collet **74**.

With a powder charge in the powder charge receiving chamber **40**, and the chamber **40** in line with the port **22**, the tool may be fired by placing the forward end of the muzzle bushing **86** against the work surface and applying a sharp blow to the rearward end of the housing member **10** by a suitable instrument such as a hammer or the like. The housing assembly **2** and barrel assembly **4** will move forward relative to the muzzle bushing assembly **6** and piston assembly **8** so that the firing pin projection **120** will project into the powder charge receiving chamber **40** and cause the ignition of the powder charge. The spring **100**, being under compression, will return the collet **74** forward until it abuts the shoulder **66** of the cap member **60** after the tool is fired.

What is claimed is:

1. An adjustable muzzle bushing assembly for use in a powder-actuated tool, said assembly comprising a collet member having a threaded bore therethrough, a muzzle bushing having a bore therethrough and an externally threaded surface throughout at least a portion of its length and being threadedly received in the bore of the collet member, the external surface of said muzzle bushing having at least one longitudinally extending reduced portion interrupting said threads, said collet member having a portion of its external surface reduced to form a flat surface extending parallel to the axis of its bore and intersecting said bore, a spring having a portion circumferentially coiled about a portion of the external surface of said collet member and a straight portion in engagement with said flat surface of said collet member and said muzzle bushing.

2. The muzzle bushing assembly of claim **1** wherein there are two diametrically opposed reduced flat surfaces on the external surface of said muzzle bushing interrupting said threads.

3. The muzzle bushing of claim **1** wherein said collet member includes an outwardly extending flange and a reduced rearward portion, said reduced rearward portion having a portion of its external surface reduced to form the flat surface extending parallel to the axis of its bore and intersecting said bore, a circumferentially extending groove in the remainder of the reduced section, said spring having its coiled portion received within said groove.

4. In a powder-actuated tool, barrel means, a muzzle bushing assembly connected to said barrel means and having a portion extending from the forward end thereof, said muzzle bushing assembly having relative axial movement with respect to said barrel means, stop means for limiting forward movement of said muzzle bushing assembly with respect to said barrel means, said muzzle bushing assembly comprising a collet member having a threaded bore therethrough and an externally threaded surface throughout at least a portion of its length and being threadedly received in the bore of said collet member, the external surface of said muzzle bushing having at least one longitudinally extending reduced portion interrupting said threads, said collet member having a portion of its external surface reduced to form a flat surface extending parallel to the axis of its bore and intersecting said bore, a spring having a portion circumferentially coiled about a portion of the external surface of said collet member and a straight end portion in engagement with said said flat surface and said muzzle bushing.

5. In the powder-actuated tool of claim **4**, said muzzle bushing having two diametrically opposed reduced flat surfaces interrupting said threads.

6. In the powder-actuated tool of claim **4**, said barrel means having a shoulder therein spaced rearwardly from said collet member, said collet member including an outwardly extending flange and a reduced rearward portion having the flat surface therein, said spring having its portion coiled about said reduced portion and its straight portion engaging the flat surface in the reduced portion of the collet member, said spring being a coil spring with its other end in engagement with said shoulder in said barrel means to provide the means biasing said barrel assembly.

7. In a powder-actuated tool, a housing; barrel means attached to said housing; a muzzle bushing assembly operably connected to said barrel means and having a portion extending from the forward muzzle end thereof, said muzzle bushing assembly having relative axial movement with respect to said barrel; stop means for limiting forward movement of said muzzle bushing assembly with respect to said barrel means; said muzzle bushing assembly including a collet member mounted within said barrel means, said collet member having a threaded bore therethrough, a muzzle bushing having a bore therethrough and having at least a portion of its length threaded and threadedly received within the bore of said collet member, the external surface of said muzzle bushing having at least one longitudinally extending reduced portion interrupting said threads, said collet member having a portion of its surface reduced to form a flat surface extending parallel to the axis of its bore and intersecting its bore, a coil spring having a portion of a coil looped about a portion of the circumference of said coil and a straight portion in engagement with said flat surface and in engagement with said muzzle bushing; piston means having a driving portion extending into said muzzle bushing; a powder charge receiving chamber; a firing pin; one of said powder charge receiving chamber being moveable with said piston means and the other being stationary with respect to said housing during the firing of said tool.

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