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(54) Throttle air inlet for a pneumatic tool

(57) A throttle air inlet for a pneumatic tool which includes a swivel air inlet bushing for rotatably attaching the pneumatic tool to a pressurized air supply hose. The air inlet bushing includes a first groove, formed on an exterior surface of the bushing, which rotatably mates with a pin-roll inserted in the handle of the pneumatic tool. This configuration allows the air inlet bushing to rotate about its longitudinal axis within the handle of the pneumatic tool. When the air supply hose is attached to the exterior end of the air inlet bushing, the pneumatic tool can be swiveled independently of the air supply hose.

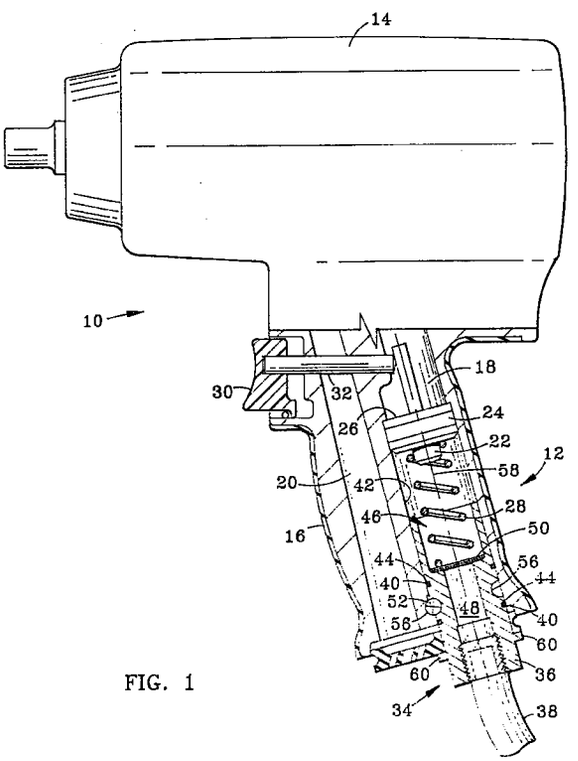

FIG. 1

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Description

Field of the Invention

The present invention relates in general to pneumatic tools and, more particularly, to a throttle air inlet for a pneumatic tool which includes a unique swivel air inlet bushing for rotatably attaching the pneumatic tool to a pressurized air supply hose.

Background of the Invention

As is known in the art, pneumatic tools are commonly actuated using a supply of pressurized air provided through an air supply hose which is releasably connected to the tool using an appropriate air inlet fitting. Typically, the air inlet fitting is threadedly or otherwise fixedly secured within the distal end of the grip or handle portion of the pneumatic tool. The air supply hose is attached to the pneumatic tool by connecting an end portion of the hose to a complementary portion of the air inlet fitting. This type of arrangement is disclosed, for example, in U.S. Patent No. 3,043,2784 to Quackenbush, U.S. Patent No. 3,443,646 to Baker et al., U.S. Patent No. 4,258,799 to Eckman, and U.S. Patent No. 5,544,710 to Groshans et al., incorporated herein by reference.

Currently available pneumatic tools generally suffer from several disadvantages. For example, the air supply hose, which is formed from a stiff, robust material, is usually attached to the air inlet fitting such that it cannot rotate independently of the pneumatic tool. As a result, the section of the air supply hose adjacent the pneumatic tool tends to bind when the pneumatic tool is rotated. This reduces the maneuverability and handling of the pneumatic tool. In addition, the binding of the air supply hose may adversely affect the operation of the pneumatic tool by reducing the available supply of pressurized air.

Pneumatic tools produced by a particular manufacturer incorporate a wide variety of specific components which are designed to optimize the operation of each individual tool. Unfortunately, similar components within different types of pneumatic tools may have substantially different configurations. For example, the air inlet fitting for a pneumatic impact wrench may not be interchangeable with an air inlet fitting for a pneumatic ratchet wrench from the same manufacturer. This causes problems both on the manufacturing side, where considerable time and money is expended in the design and production of each component, and on the consumer side, where a large inventory of disparate replacement parts are required.

Accordingly, it is an object of the present invention to provide a throttle air inlet for a pneumatic tool which includes a swivel air inlet bushing for rotatably attaching the pneumatic tool to an air supply hose, thereby improving the maneuverability and ease of use of the tool.

It is a further object of the present invention to provide an air inlet bushing for a pneumatic tool which substantially eliminates binding of an attached pressurized air supply hose.

It is an additional object of the present invention to provide an air inlet bushing which may be used interchangeably in a wide variety of pneumatic tools.

It is yet another object of the present invention to provide an air inlet bushing for a pneumatic tool which is designed to be easily inserted and removed within the throttle air inlet of the tool to facilitate replacement.

Summary of the Invention

In order to overcome the deficiencies of prior art pneumatic tools, the present invention provides a throttle air inlet for a pneumatic tool which includes a swivel air inlet bushing for rotatably attaching the pneumatic tool to a pressurized air supply hose.

The throttle air inlet of the present invention includes a novel swivel air inlet bushing. The air inlet bushing includes a first groove, formed on an exterior surface of the bushing, which rotatably mates with a pin-roll inserted in the handle of the pneumatic tool. When the air supply hose is threaded into or otherwise suitably attached to the exterior end of the air inlet bushing, the pneumatic tool can be swiveled independently of the air supply hose.

The end of the air inlet bushing disposed within the interior of the air input channel of the pneumatic tool is cup-shaped. A first end of a throttle spring extends into the cup-shaped end of the air inlet bushing. The opposing end of the throttle spring engages and biases a trigger actuated throttle valve assembly toward a closed position in a manner known in the art.

The air inlet bushing further includes at least one exterior groove for receiving an O-ring. The O-rings are used to seal the air inlet bushing against the interior surface of the air input channel. This seal is maintained as the air inlet bushing rotates within the handle of the pneumatic tool.

The air inlet bushing of the present invention is designed to be easily replaced when necessary. To remove the air inlet bushing from the handle of the pneumatic tool, an operator simply removes the pin-roll. The air inlet bushing can then be pulled out of the handle and replaced. The replacement air inlet bushing is secured within the handle by again inserting the pin-roll.

Brief Description of the Drawings

These and other features and advantages of the present invention will become readily apparent upon reading the following detailed description and upon reference to the drawings in which:

FIG. 1 is a partial elevational and partial cross-sec-

tional view of a pneumatic impact wrench incorporating a throttle air inlet in accordance with a preferred embodiment of the present invention;

FIG. 2 is a perspective view of the handle portion of the pneumatic impact wrench of FIG. 1, illustrating the removal of the air inlet bushing;

FIG. 3 is a partial elevational and partial cross-sectional view of a pneumatic ratchet wrench incorporating the air inlet bushing of the present invention; and

FIG. 4 is a perspective view of the air inlet bushing;

Detailed Description of the Invention

Referring now specifically to FIG. 1, there is illustrated a pneumatic impact wrench 10 incorporating a throttle air inlet, generally designated as 12, in accordance with a preferred embodiment of the present invention.

The pneumatic impact wrench 10 includes a body portion 14 for enclosing a conventional air motor assembly (not shown), and a handle portion 16. An air motor assembly is illustrated and described, for example, in the aforementioned U.S. Patent No. 5,544,710. The handle portion 16 includes an air inlet channel 18 and an air exhaust channel 20.

A throttle valve 22 and associated throttle valve seat 24 are biased against a reduced diameter portion 26 of the air inlet channel 18 by a throttle spring 28. The throttle valve 22 is actuated in a known manner using a trigger 30 and a throttle pin-push 32.

A replaceable swivel air inlet bushing 34 is disposed in the lower end of the air inlet channel 18. The air inlet bushing 34 includes a threaded fitting 36 for attachment to an air supply hose 38. The remaining portion of the air inlet bushing 34 is positioned within the air inlet channel 18. The air inlet bushing 34 includes at least one O-ring 40, formed of rubber or other suitable material, for pneumatically sealing the bushing 34 against the inner surface 42 of the air inlet channel 18. Each O-ring 40 is seated in a circumferential groove 44 formed about the periphery of the air inlet bushing 34. The O-rings 40 pneumatically seal the air inlet bushing 34 within the air inlet channel 18 when the bushing 34 is stationary with respect to the pneumatic impact wrench 10, and, as will be described in greater detail below, during rotation of the bushing 34 within the air inlet channel 18.

A first end of the throttle spring 28 encircles the head of the throttle valve 22 and engages the throttle valve seat 24. A second end of the throttle spring 28 extends into a cup-shaped end 46 of the air inlet bushing 34. The throttle spring 28 is maintained in a compressed state to bias the throttle valve seat 24 against the restricted portion 26 of the air inlet channel 18.

A bore 48 extends from the cup-shaped end 46 to the threaded fitting 36 of the air inlet bushing 34 to provide an air passageway between the air supply hose 38 and the air motor (not shown) via the air inlet channel 18. An air screen 50 prevents contaminants from entering the interior of the pneumatic impact wrench 10.

The air inlet bushing 34 is rotatably disposed within the handle portion 16 of the pneumatic impact wrench 10. The rotation of the air inlet bushing 34 is achieved through the use of a pin-roll 52 which is removably inserted through an aperture 54 (see FIG. 2) formed in the handle portion 16 of the pneumatic impact wrench. As shown in FIG. 1, the pin-roll 52, when inserted in the handle portion 16, engages a complementary groove 56 formed around the circumference of the air inlet bushing 34. This arrangement allows the air inlet bushing 34 to freely rotate a full 360 degrees about an axis of rotation 58 within the handle portion 16 of the pneumatic impact wrench 10. Thus, the pneumatic impact wrench 10 may be rotated about the axis 58 independently of an air supply hose 38 coupled to the air inlet bushing 34. The range of rotation of the air inlet bushing 34 can be limited to less than 360 degrees, however, by forming the groove 56 around a portion of the circumference of the bushing 34.

The air inlet bushing 34 is easily replaced when necessary within the handle portion 16 of the pneumatic impact wrench 10. The replacement procedure is illustrated in detail in FIG. 2. A user simply removes the pin-roll 52 from the aperture 54 (directional arrow 62), and pulls the air inlet bushing 34 out of the handle portion 16 (directional arrow 64). A replacement air inlet bushing 34 can then be inserted into the handle portion 16, and rotatably secured therein, by reinserting the pin-roll 52 into the aperture 54. The air inlet bushing 34 further includes a positioning flange 60 for limiting the insertion depth of the bushing 34 within the handle portion 16, to correctly align the aperture 54 with the groove 52.

The air inlet bushing 34 of the present invention is designed to be used interchangeably in the throttle air inlet of a wide variety of pneumatic tools. As described above, for example, the air inlet bushing 34 can be used to rotatably attach an air supply hose 38 to the handle portion 16 of a pneumatic impact wrench 10. An additional example of a pneumatic tool incorporating the air inlet bushing 34 is shown in FIG. 3, wherein the air inlet bushing 34 is used in the throttle air inlet 70 of a pneumatic ratchet wrench 72.

The throttle air inlet 70 of the pneumatic ratchet wrench 72 has substantially the same configuration as the throttle air inlet 12 of the previously described pneumatic impact wrench 10. The trigger assembly, however, comprising a trigger 74 and a throttle pin-push 76, is specifically designed for use with the pneumatic ratchet wrench 72.

The pneumatic ratchet wrench 72 includes a handle portion 78 which encloses the throttle air inlet 70, and a body portion 80 which encloses an air motor (not

shown). The handle portion 78 includes an air inlet channel 82 for passing pressurized air from an attached air inlet hose 38 to the air motor through the air inlet bushing 34.

Once again, the air inlet bushing 34 includes at least one O-ring 40 for pneumatically sealing the bushing 34 against the inner surface 84 of the air inlet channel 82. Each O-ring 40 is disposed within a groove 44 which encircles the air inlet bushing 34. The O-rings 40 seal the air inlet bushing 34 within the air inlet channel 82 when the bushing 34 is stationary with respect to the pneumatic ratchet wrench 72, and during rotation of the bushing 34 within the air inlet channel 82.

The air inlet bushing 34 is rotatably secured within the air inlet channel 82 by the coaction of a removable pin-roll 52 and a groove 56 formed on the surface of the bushing 34. This allows the pneumatic ratchet wrench 72 to be rotated along its longitudinal axis independently of an air inlet hose 38 attached to the air inlet bushing 34. The pin-roll 52 is removably inserted into the groove 56 of the air inlet bushing 34 through an opening (not shown) in the handle portion 78 of the pneumatic ratchet wrench 72. The air inlet bushing 34 can be replaced in a manner similar to that described above with regard to FIG. 2.

A throttle valve arrangement comprising a throttle valve 22 and a throttle valve seat 24 is positioned for operation by a throttle spring 28. A first end of the throttle spring 28 biases the throttle valve assembly against a reduced diameter portion 26 of the air inlet channel 82. The opposing end of the throttle spring 28 is positioned within the cup-shaped end 46 of the air inlet bushing 34. The throttle valve 22 is actuated as known in the art by the trigger 74 and pin-push 76 combination.

A perspective view of the air inlet bushing 34 of the present invention is provided in FIG. 4. This view clearly illustrates the O-ring grooves 44, and the groove 56 which, in conjunction with the pin-roll 52, allow the air inlet bushing 34 to rotate independently of the main body of a pneumatic tool.

The foregoing description of the preferred embodiments of this invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and obviously many modifications and variations are possible in light of the above teaching. Such modifications and variations that may be apparent to a person skilled in the art are intended to be included within the scope of this invention as defined by the accompanying claims.

Claims

1. An apparatus for use with a plurality of different types of pneumatic tools, each pneumatic tool including a throttle air inlet for receiving a supply of pressurized air, comprising:

   a universal air inlet bushing, configured for use with said throttle air inlet, for attaching an air supply hose to any of said plurality of different types of pneumatic tools.

2. The apparatus according to claim 1, wherein said throttle air inlet further includes:

   an assembly for rotatably securing said universal air inlet bushing within said throttle air inlet to allow each of said plurality of different types of pneumatic tools to be rotated independently of an attached air supply hose.

3. The apparatus according to claim 2, wherein said universal air inlet bushing includes a groove, and wherein said securing assembly includes a pin member for engaging said groove to allow rotation of said universal air inlet bushing within said throttle air inlet.

4. The apparatus according to claim 2, wherein said universal air inlet bushing includes at least one circumferential groove, and a sealing element disposed in each groove for pneumatically sealing said universal air inlet bushing within said throttle air inlet.

5. The apparatus according to claim 1, wherein said throttle air inlet includes a throttle valve and a spring for biasing said throttle valve toward a closed position, and wherein said spring includes a first end for engaging said throttle valve, and a second end disposed within a cup-shaped portion of said universal air inlet bushing.

6. The apparatus according to claim 5, wherein said throttle air inlet further includes a trigger unit for selectively actuating said throttle valve.

7. The apparatus according to claim 1, wherein said throttle air inlet further includes:

   an assembly for removably securing said universal air inlet bushing within said throttle air inlet.

8. The apparatus according to claim 7 wherein said universal air inlet bushing includes a groove, and wherein said securing assembly includes a removable pin member for engaging said groove to secure said universal air inlet bushing within each throttle inlet.

9. A throttle air inlet for a pneumatic tool comprising:

   an air inlet bushing; and

an assembly for rotatably securing said air inlet bushing within the throttle air inlet of said pneumatic tool.

10. The throttle air inlet according to claim 9, wherein said air inlet bushing includes a coupling for attaching an air supply hose to said pneumatic tool.

11. The throttle air inlet according to claim 10, wherein said air inlet bushing and an air supply hose attached thereto can be rotated independently of said pneumatic tool.

12. The throttle air inlet according to claim 9, wherein said air inlet bushing includes a groove, and wherein said securing assembly includes a pin member for engaging said groove to allow rotation of said air inlet bushing within the throttle air inlet of said pneumatic tool.

13. The throttle air inlet according to claim 12, wherein said pin member is removable to allow replacement of said air inlet bushing in said pneumatic tool.

14. The throttle air inlet according to claim 9, wherein said air inlet bushing includes at least one circumferential groove, and a sealing element disposed in each groove for pneumatically sealing said air inlet bushing within the throttle air inlet of said pneumatic tool.

15. The throttle air inlet according to claim 9, further including an arrangement for removably securing said air inlet bushing in the throttle air inlet of said pneumatic tool.

16. The throttle air inlet according to claim 9, further including a throttle valve and a spring for biasing said throttle valve toward a closed position, wherein said spring includes a first end for engaging said throttle valve, and a second end disposed within a cup-shaped portion of said air inlet bushing.

17. The throttle air inlet according to claim 16, further including a trigger unit for selectively actuating said throttle valve.

18. An air inlet bushing for a pneumatic tool comprising:

a tubular body; and
a groove on said tubular body for rotatably securing said air inlet bushing within said pneumatic tool.

19. The air inlet bushing according to claim 18, wherein said groove is configured to rotatably engage a pin inserted into said pneumatic tool.

20. The air inlet bushing according to claim 18, further including an arrangement for pneumatically sealing said air inlet bushing within said pneumatic tool.

21. The air inlet bushing according to claim 20, wherein said sealing arrangement comprises a sealing element disposed within a circumferential groove on said tubular body.

22. The air inlet bushing according to claim 18, wherein an end of said tubular body includes a coupling for attaching said air inlet bushing to an air supply hose.

23. The air inlet bushing according to claim 18, wherein an end of said tubular body is cup-shaped.

24. The air inlet bushing according to claim 18, wherein said tubular body includes a flange-type member for limiting an insertion depth of said air inlet bushing within said pneumatic tool.

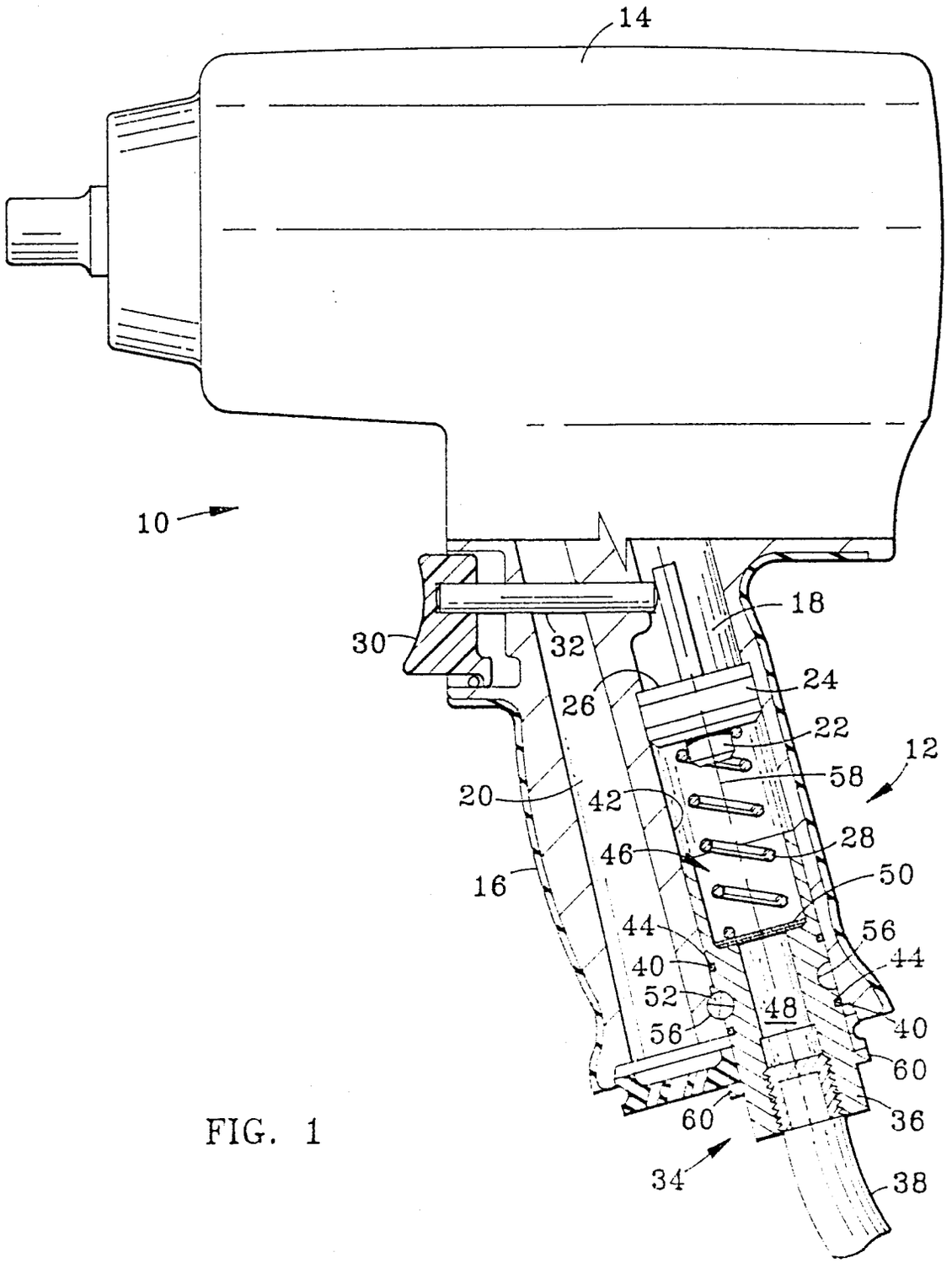
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FIG. 1

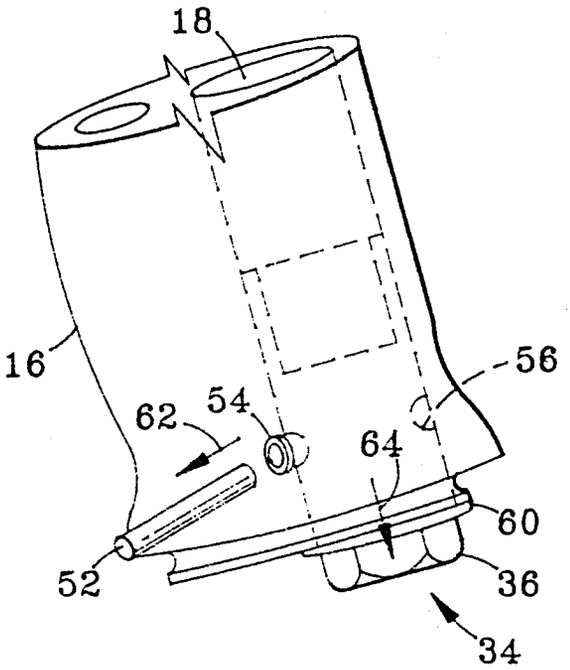
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FIG. 2

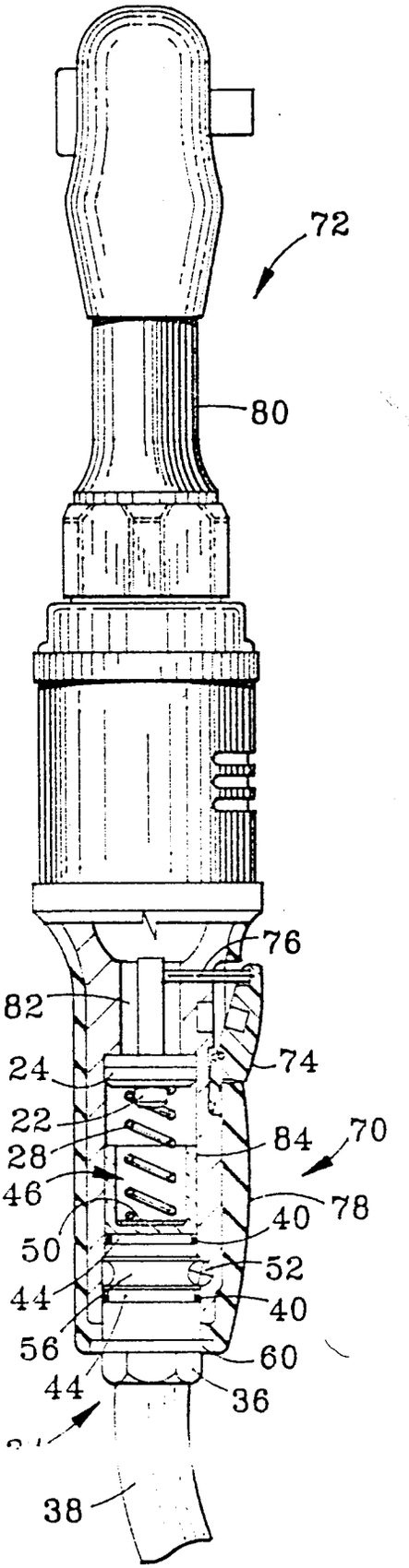
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FIG. 3

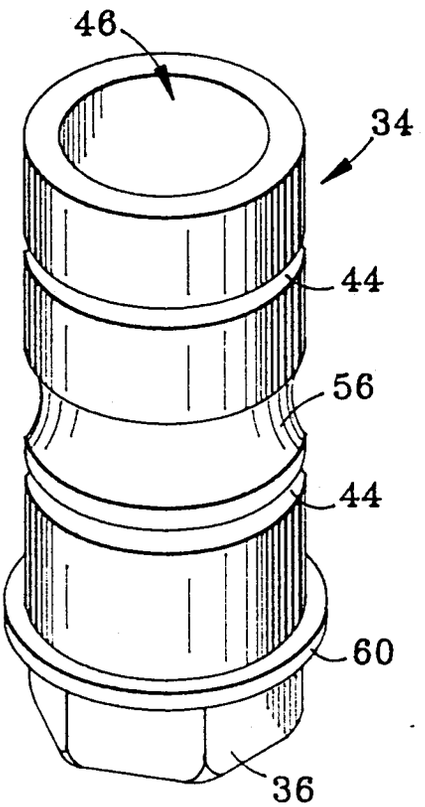

FIG. 4