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Canadian Intellectual Property Office

CA 2801830 C 2018/11/27

(11)(21) **2 801 830**

(12) **BREVET CANADIEN**
CANADIAN PATENT

(13) **C**

(22) **Date de dépôt/Filing Date:** 2013/01/14

(41) **Mise à la disp. pub./Open to Public Insp.:** 2014/07/14

(45) **Date de délivrance/Issue Date:** 2018/11/27

(51) **Cl.Int./Int.Cl.** ***B25B 23/12*** (2006.01)

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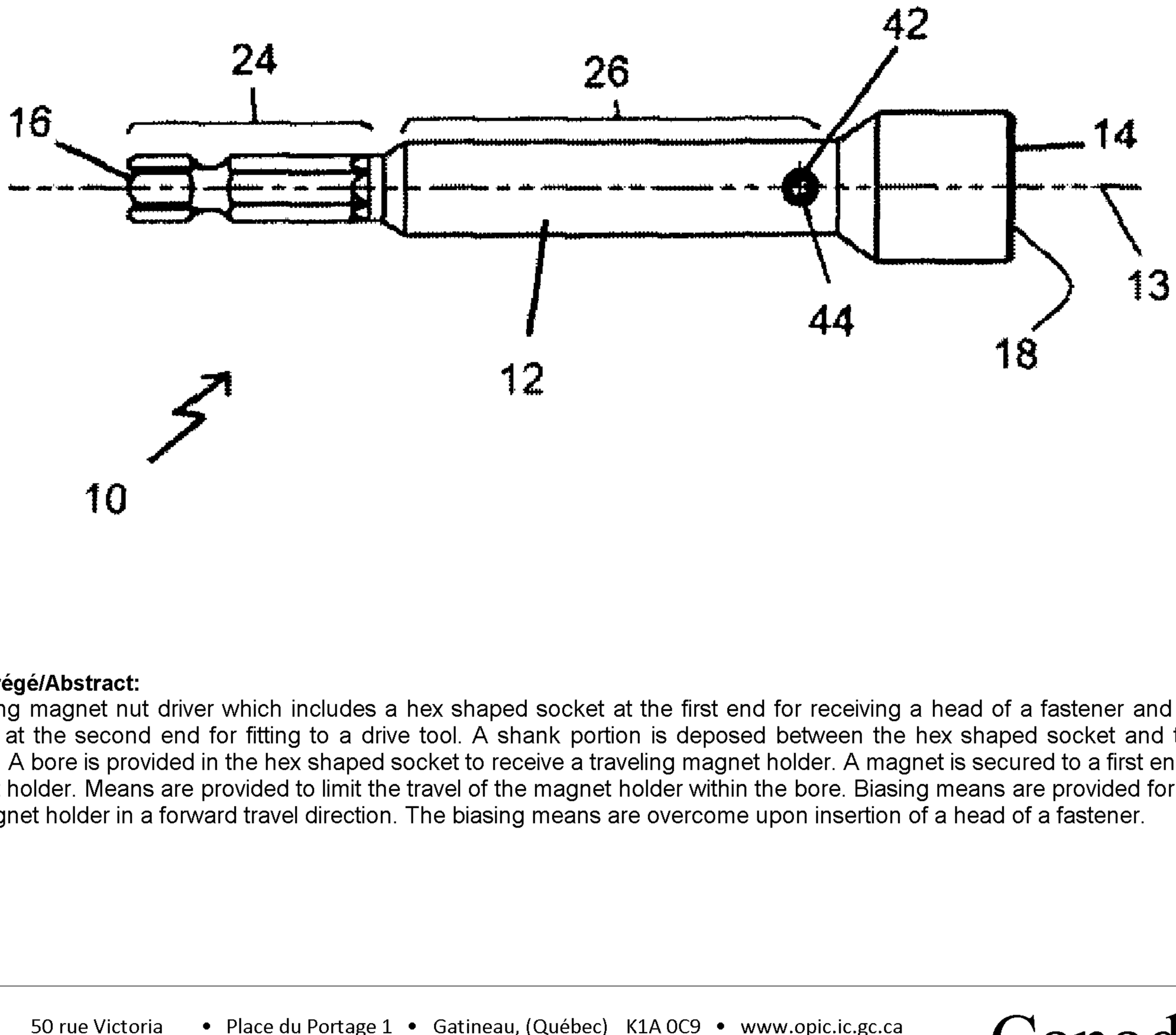
(54) **Titre : TOURNE-ECROU MAGNETIQUE FLOTTANT**
(54) **Title: FLOATING MAGNET NUT DRIVER**



(57) **Abrégé/Abstract:**
A floating magnet nut driver which includes a hex shaped socket at the first end for receiving a head of a fastener and an end section at the second end for fitting to a drive tool. A shank portion is deposed between the hex shaped socket and the end section. A bore is provided in the hex shaped socket to receive a traveling magnet holder. A magnet is secured to a first end of the magnet holder. Means are provided to limit the travel of the magnet holder within the bore. Biasing means are provided for biasing the magnet holder in a forward travel direction. The biasing means are overcome upon insertion of a head of a fastener.

ABSTRACT OF THE DISCLOSURE

A floating magnet nut driver which includes a hex shaped socket at the first end for receiving a head of a fastener and an end section at the second end for fitting to a drive tool. A shank portion is deposed between the hex shaped socket and the end section. A bore is provided in the hex shaped socket to receive a traveling magnet holder. A magnet is secured to a first end of the magnet holder. Means are provided to limit the travel of the magnet holder within the bore. Biasing means are provided for biasing the magnet holder in a forward travel direction. The biasing means are overcome upon insertion of a head of a fastener.

TITLE

[001] FLOATING MAGNET NUT DRIVER

FIELD

[002] The present invention relates to magnetic nut drivers for driving headed fasteners.

BACKGROUND

[003] Nut drivers or nut setters are used for driving headed fasteners such as metal screws. Magnetic nut drivers use a magnet to hold the fastener in position during use. Increasingly, the magnetic nut drivers being used in conjunction with impact drivers. Impact drivers however, can have a fastening torque of up to 1.283 in/lbs. with some of that torque and high rpm being transferred to the magnet during use. The magnets are fragile and can chip and fragment easily. If the headed fastener is not properly held in the nut driver, then the problem of chipping and fragmenting can be exacerbated. As a result magnetic nut drivers tend to have a very short life, particularly when used with impact drivers.

[004] To operate properly and reduce the risk of chipping or fragmenting, the magnet needs to be at a specific distance relative to the top of the nut driver. If the magnet is positioned too far from the top of the nut driver, the magnetic force will not be strong enough to hold the fastener in place. A loosely held fastener will move around in the socket and may damage the magnet, or may become disengaged from the socket altogether. Conversely, if the magnet positioned too close to the top of the nut driver, the screw will have a poor fit. If there is a poor fit, then the torque and high rpm is absorbed by the magnet rather than the hex socket, which can result in fracturing and chipping of the magnet.

[005] Fasteners that are designed to work with nut drivers are generally produced to predetermined industry standards. In large volumes of production, small unintentional variations in head height can occur. Additionally, there are non-standard fasteners in the market that are intentionally designed with differing head heights. Present magnetic nut drivers are not able to accommodate fasteners with varying head heights, and as a result magnets frequently become damaged during use with non-standard fasteners.

[006] What is required is magnetic nut driver with a magnet that will accommodate fasteners with a variety of head heights to maintain the right distance without compromising the magnet.

SUMMARY

[007] There is provided a floating magnet nut driver which includes a hex shaped socket at the first end for receiving a head of a fastener and an end section at the second end for fitting to a drive tool. A shank portion is disposed between the hex shaped socket and the end section. A bore is provided in the hex shaped socket to receive a traveling magnet holder. A magnet is secured to a first end of the magnet holder. Means are provided to limit the travel of the magnet holder within the bore. Biasing means are provided for biasing the magnet holder in a forward travel direction. The biasing means are overcome upon insertion of a head of a fastener.

[008] Another aspect of the invention includes having a spring as the biasing means.

[009] A further aspect of the invention includes having a stop shoulder on the entrance to the bore to prevent a fastener from being inserted too far.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] These and other features will become more apparent from the following description in which reference is made to the appended drawings, the drawings are for the purpose of illustration only and are not intended to be in any way limiting, wherein:

FIG. 1 is side elevation view of the floating magnet nut driver of the present invention.

FIG. 2 is first end elevation view of the floating magnet nut driver illustrated in FIG 1.

FIG. 3 is second end elevation view of the floating magnet nut driver illustrated in FIG 1.

FIG 4 is an exploded perspective view of the floating magnet nut driver.

FIG 5 is side elevation view, in section, of the floating magnet nut driver.

FIG 6 is side elevation view, in section, of the floating magnet nut driver with a standard head fastener.

FIG 7 is side elevation view, in section, of the floating magnet nut driver with a irregular sized head fastener.

DETAILED DESCRIPTION

[0011] A floating magnet nut driver will now be described with reference to **FIG 1** through FIG **7**.

Structure and Relationship of Parts:

[0012] Referring to **FIG 1**, there is illustrated a floating magnet nut driver generally referenced by numeral 10. The floating magnet nut driver 10 has an elongate body 12 with an axis 13, a first end 14 and a second end 16. Referring to **FIG 3**, a hex shaped socket 18 is provided at the first end 14 for receiving a head 20 of a fastener 22 illustrated in **FIG 6**. Referring again to **FIG 2**, an end section 24 is provided at the second end 16 for fitting to a drive tool (not illustrated). Referring to **FIG 4**, a shank portion 26 is deposed between the hex shaped socket 18 and the end section 24. Referring to **FIG 2**, in the illustrated embodiment 10, the first end 14 is illustrated as being a ¼ " hex shank but it could be of other sizes and shapes. Likewise, the second end 16 shown as having a hex shape, however it will be appreciate that other shapes could be used to correspond with the drive tool being used.

[0013] Referring to **FIG 3**, a blind bore 28 is provided in the hex shaped socket 18 that extends axially into the shank portion 26 as illustrated in **FIG 5**. Referring again to **FIG 5**, a magnet holder 30 is received the bore 28 for travel within the bore 28. The magnet holder 30 has a tubular body 32 dimensioned to fit with and travel within the blind bore 28. Tubular body 32 has a first end 34, a second end 36 and an axial slot 38 that traverses through the body 32. Referring to **FIG 5**, a magnet 40 is received in a magnet seat 41 provided at the first end 34 of the magnet holder 30.

[0014] Referring to **FIG 4** and **FIG 5**, a pin 42 extends through apertures 44 on opposed sides a sidewall 46 of body 12, and into the bore 28 and through the axial slot 38 in magnet holder 30 to limit the travel of the magnet holder 30 within the bore 28. Referring to **FIG 1**, apertures 44 are located approximate 24 mm from the first end 14 of the body 12. Referring again to **FIG 4** and **FIG 5**, a compression spring 48 is provided in the blind bore 28 to bias against the second end 36 of the magnet holder 30 so as to cause the magnet holder 30 to travel in a forward direction toward the first end 14 of the body 12. In the illustrated embodiment 10, the compression spring 48 is not secured to the magnet holder 30. The forward movement of the magnet holder 30 is limited by the forward travel of the pin 42 within the length of the axial slot 38.

[0015] Referring to **FIG 6** and **FIG 7**, the biasing force of the spring 48 is overcome upon insertion of the head 20 of the fastener 22 into the hex shaped socket 18. As the head 20 of fastener 22 is inserted into the hex shaped socket 18, the magnetic force of the magnet 40 holds the head 20 in position. If the head 20 is of a greater height, then it must be inserted more deeply into the socket 18. Accordingly, the force of inserting the head 20 of the fastener 22 into the socket 18 overcomes the biasing force of the spring 48, and the magnet holder 40 moves backward into the bore 28 to accommodate the increased head height of the head 20. The backward movement of the magnet holder 30 is limited by the backward travel of the pin 42 within the axial slot 38. The axial slot 38 in the illustrated embodiment 10 will permit the magnet holder 30 to travel approximately 6 mm forward, and 8 mm backward,

Operation

[0016] The use and operation of the floating magnet nut driver 10 will now be described with reference to **FIGS 1** through **7**. Referring to **FIG 1**, to use floating magnet driver 10, end section 24 that is provided at the second end 16 is fitted to a drive tool (not illustrated). Referring to **FIG 6**, a selected standard fastener 22 with a head 20 is inserted into the hex shaped socket 18 so that the magnetic force of the magnet 40 holds the head 20 and fastener 22 in position. The head 20 can be inserted up to a radial flange portion 50 that surround the head 20. Flange portion 50 should be at or flush with the first end 14 of the body 12 for proper positioning.

[0017] Referring to **FIG 6**, because of the magnet holder's 30 ability to travel within the bore 28, the magnet holder 30 can accommodate heads 20 of varying head heights. The spring 48 biases the magnet holder 30 in a forward direction to ensure that the magnet 40 is in contact with and holds onto the head 20 of a selected fastener 22. The pin 42 which extends through the aperture 44 in the sidewall 46 of body 12 and through the axial slot 38 in magnet holder 30 serves to limit the forward travel of the magnet holder 30 and magnet 40. The flanged portion 50 on the fastener 22 prevents the fastener 22 from entering too deeply into the hex socket 18. Once the magnet 40 has connected with the head 20 of the fastener 22, the magnetic force of the magnet 40 will maintain that connection.

[0018] If the fastener 22 is of a non-standard variety with a head 20 of a greater height as illustrated in **FIG 7**, then magnet 40 will pull the fastener 22 into the hex socket18 up until the flange portion 50 abuts or is flush with the end 14 of the hex socket 18. The spring 48 will compress to accommodate the head 20 and maintain the magnet 40 in contact with the head 20 to hold the fastener 22 in position during use.

[0019] Once the head 20 is properly positioned within the socket 18 with the flange portion 50 at or flush with the first end 14 of the body 12 and the magnet 40 securely holding the fastener 22 by magnetic force within the socket, the drive tool (not illustrated) can be activated.

[0020] If the fastener 22 is removed from the socket 18, then biasing spring 48 will bias against the second end 36 of the magnet holder 30 to cause the magnet holder 30 to travel in forward again toward the first end 14 of the body 12.

[0021] One of benefits of the floating magnet nut driver 10 is that it can be used for a longer period of time without the need to clean the magnet of a build-up of metal shavings on the magnet 40. The floating magnet nut driver 10 reduces or eliminates the occurrence of chipped and fragmentation magnets caused by impact drivers being used with fasteners 22 having heads 20 of irregular heights.

Variations

[0022] It will be appreciated that while the illustrated embodiment shows the pin 42 extending through the apertures 44 in the sidewall 46 of bore 28 and through the axial slot 38 in magnet holder 30 to limit the travel of the magnet holder 30 and magnet 40, the pin 42 could be integral to the body 32 of the magnet holder 30 and extend through axial slots extending through the sidewall 46 of the body 12 instead. The effect would also be to limit travel of the magnet holder 30 within the bore 28.

[0023] **FIG 5,** a stop shoulder 52 could be provided in the hex socket 18 at an entrance 54 to the bore 28 to prevent a fastener 22 illustrated in **FIG 6** from being inserted too far.

[0024] It will also be appreciated that the floating magnet nut driver 10 can be of variety of sizes and dimensions depending on the application. While a hex socket 18 is illustrated, it is conceivable that other shapes and sizes of sockets could also be used effectively.

[0025] *In this patent document, the word "comprising" is used in its non-limiting sense to* mean that items following the word are included, but items not specifically mentioned are not excluded. A reference to an element by the indefinite article "a" does not exclude the possibility that more than one of the element is present, unless the context clearly requires that there be one and only one of the elements.

[0026] The following claims are to be understood to include what is specifically illustrated and described above, what is conceptually equivalent, and what can be obviously substituted. Those skilled in the art will appreciate that various adaptations and modifications of the described embodiments can be configured without departing from the scope of the claims. The illustrated embodiments have been set forth only as examples and should not be taken as limiting the invention. It is to be understood that, within the scope of the following claims, the invention may be practiced other than as specifically illustrated and described.

What is Claimed is:

1. A floating magnet nut driver comprising:

a body elongated in an axial direction, the body having a first end defining a socket for receiving a head of a fastener and a second end for fitting to a drive tool;

a bore, the bore opening into the socket and extending axially into the elongated body;

first and second opposing apertures defined by and extending through sidewalls of the body and opening into the bore;

a magnet holder received for forward and backward axial direction travel within the bore, the magnet holder defining a slot extending through the magnet holder in a direction orthogonal to the axial direction;

a magnet attached to the first end of the magnet holder;

a securing member extending through the first and second apertures and through the slot to thereby limit the travel of the magnet holder within the bore in the forward and backward axial directions;

biasing means provided at the second end of the magnet holder to bias the magnet holder in the forward axial direction within the bore toward the first end of the body; and

wherein the biasing means are overcome by insertion of the head of the fastener into the socket.

2. The floating magnet nut driver of claim 1 wherein the socket is a hex shaped socket.

3. The floating magnet nut driver of claim 1 wherein the biasing means is a spring.

4. The floating magnet nut driver of claim 1 wherein a stop shoulder is provided at an entrance to the bore.

5. The floating magnet nut driver of claim 1 wherein the securing member is a pin.

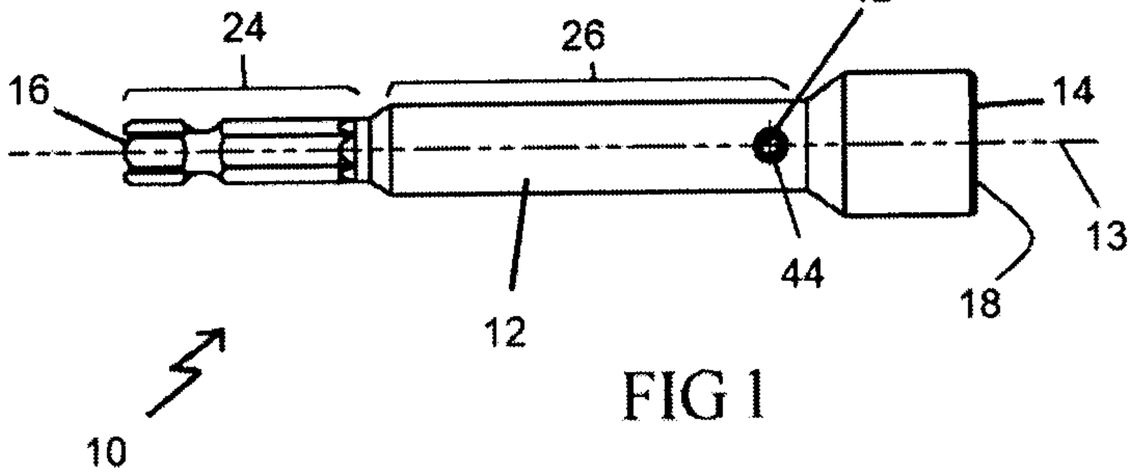


FIG 1

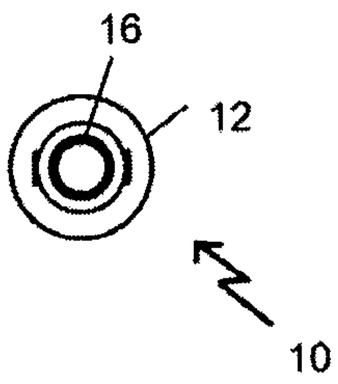


FIG 2

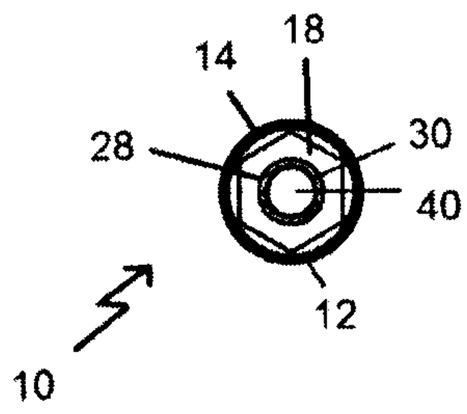


FIG 3

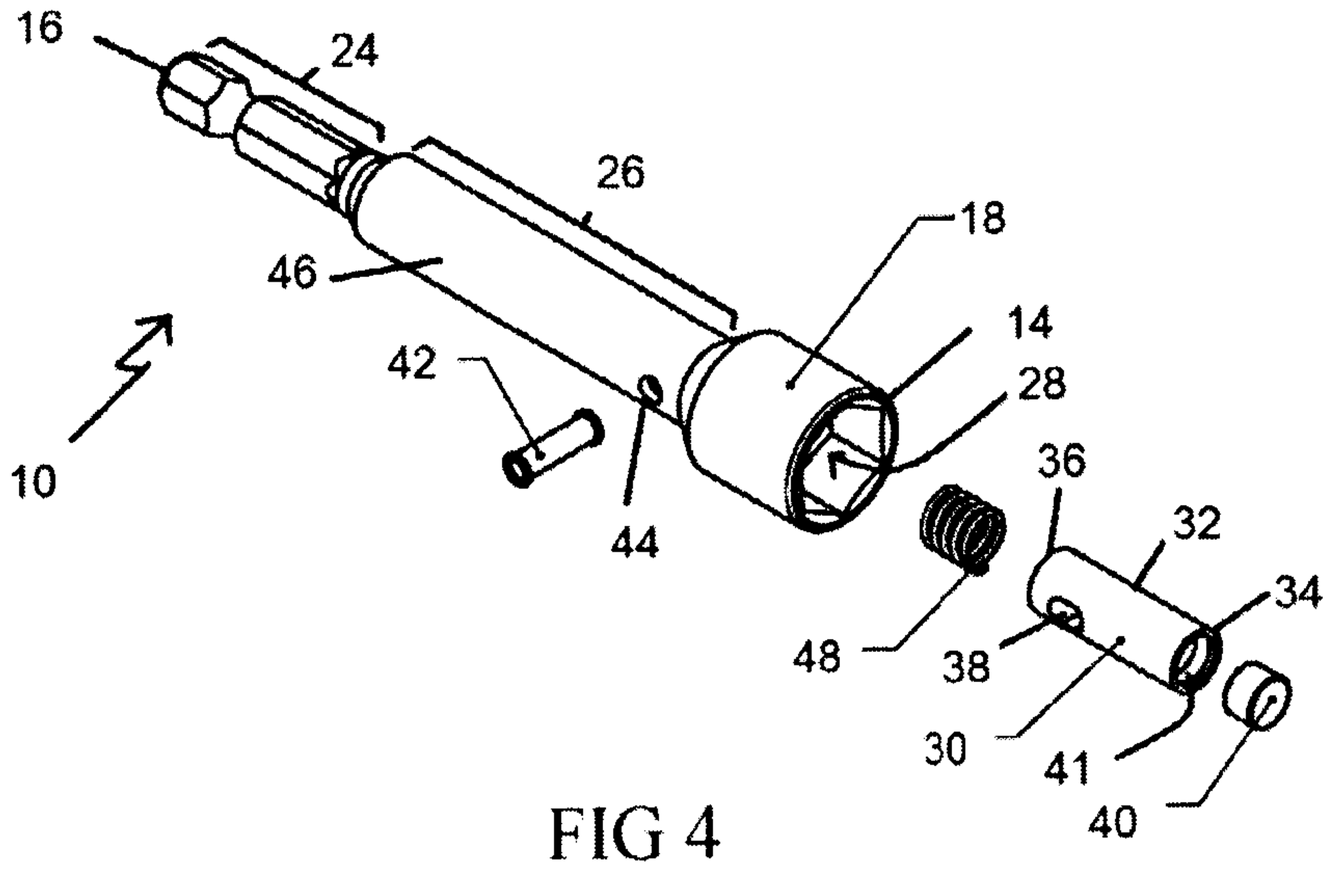

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FIG 4

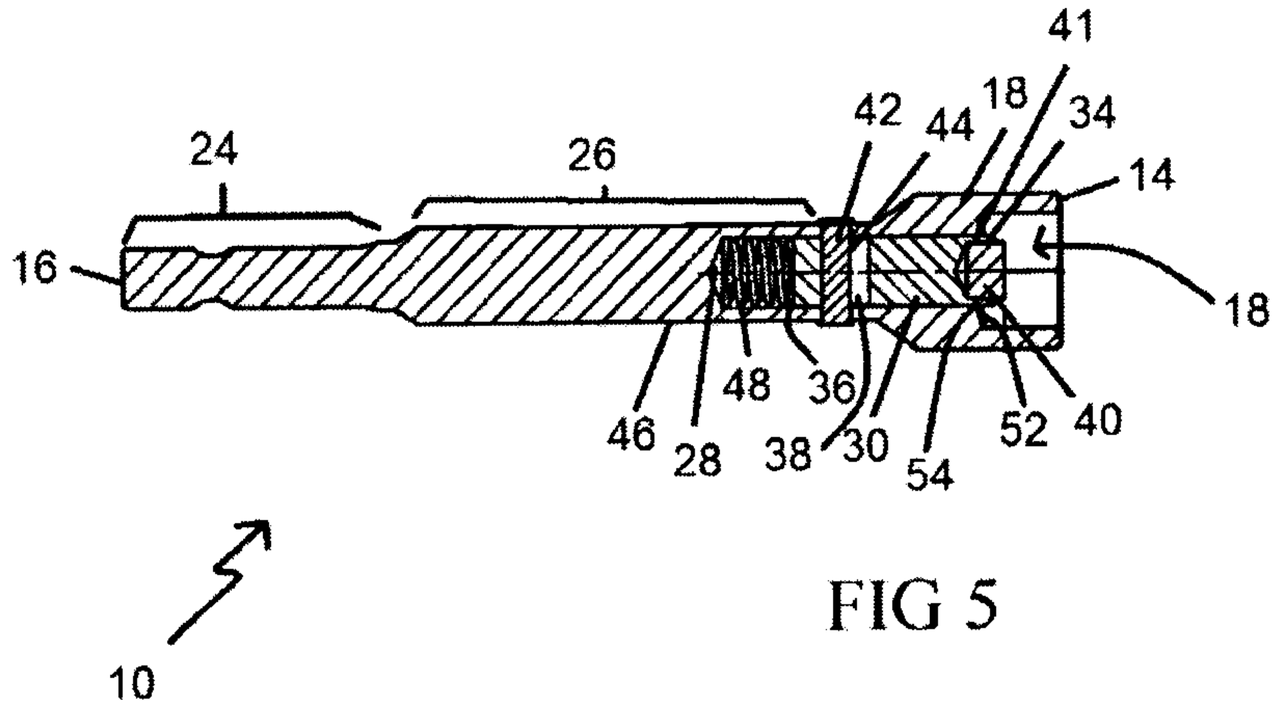
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FIG 5

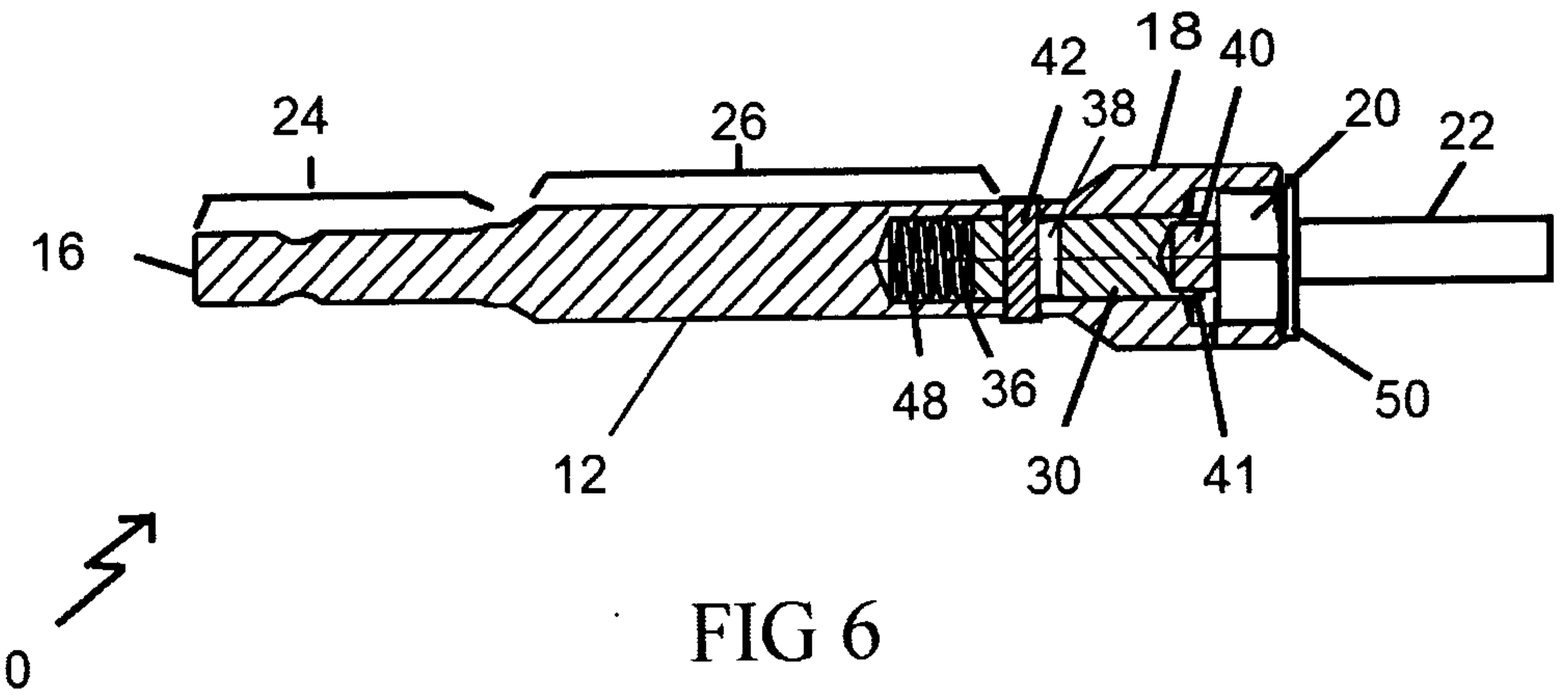
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FIG 6

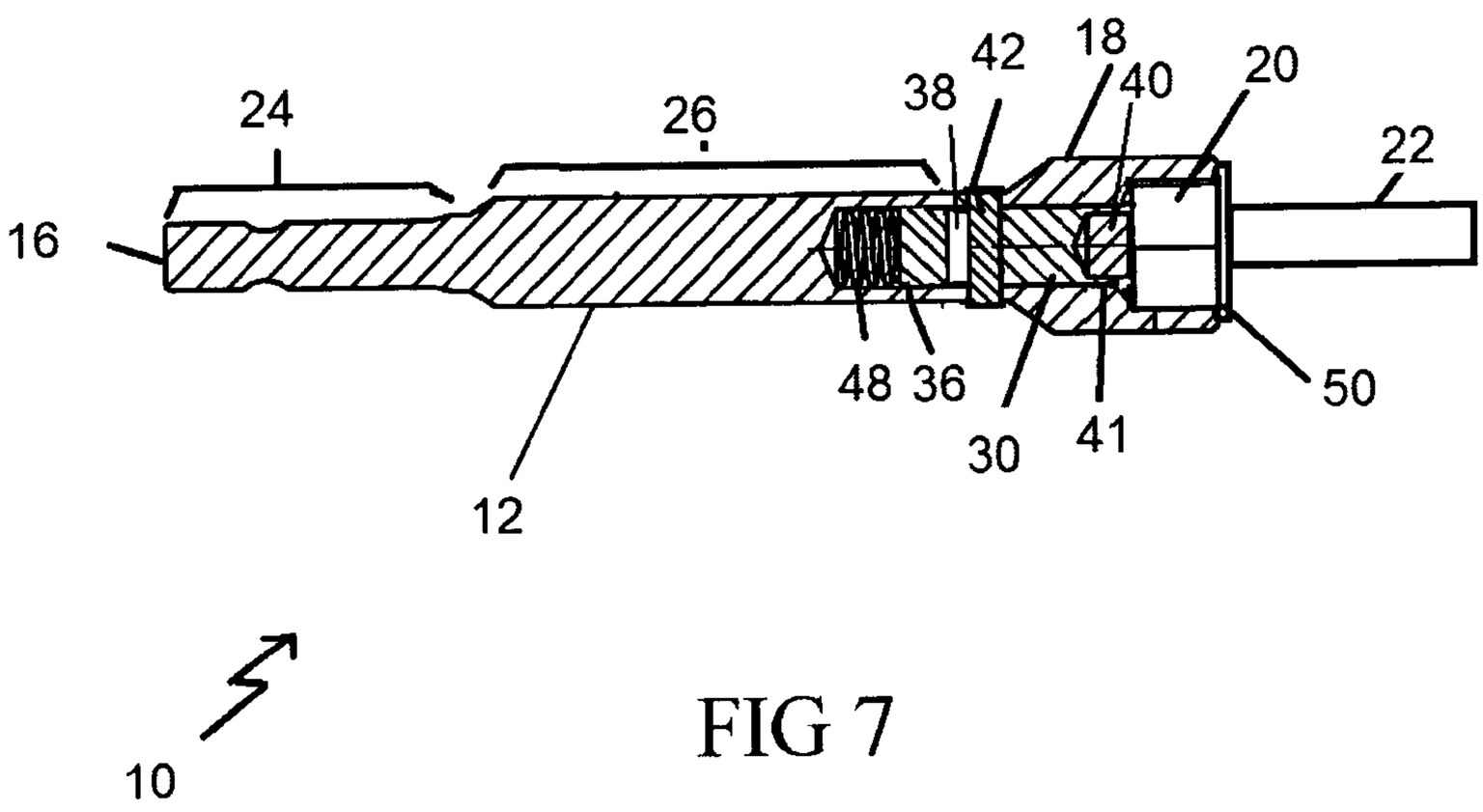
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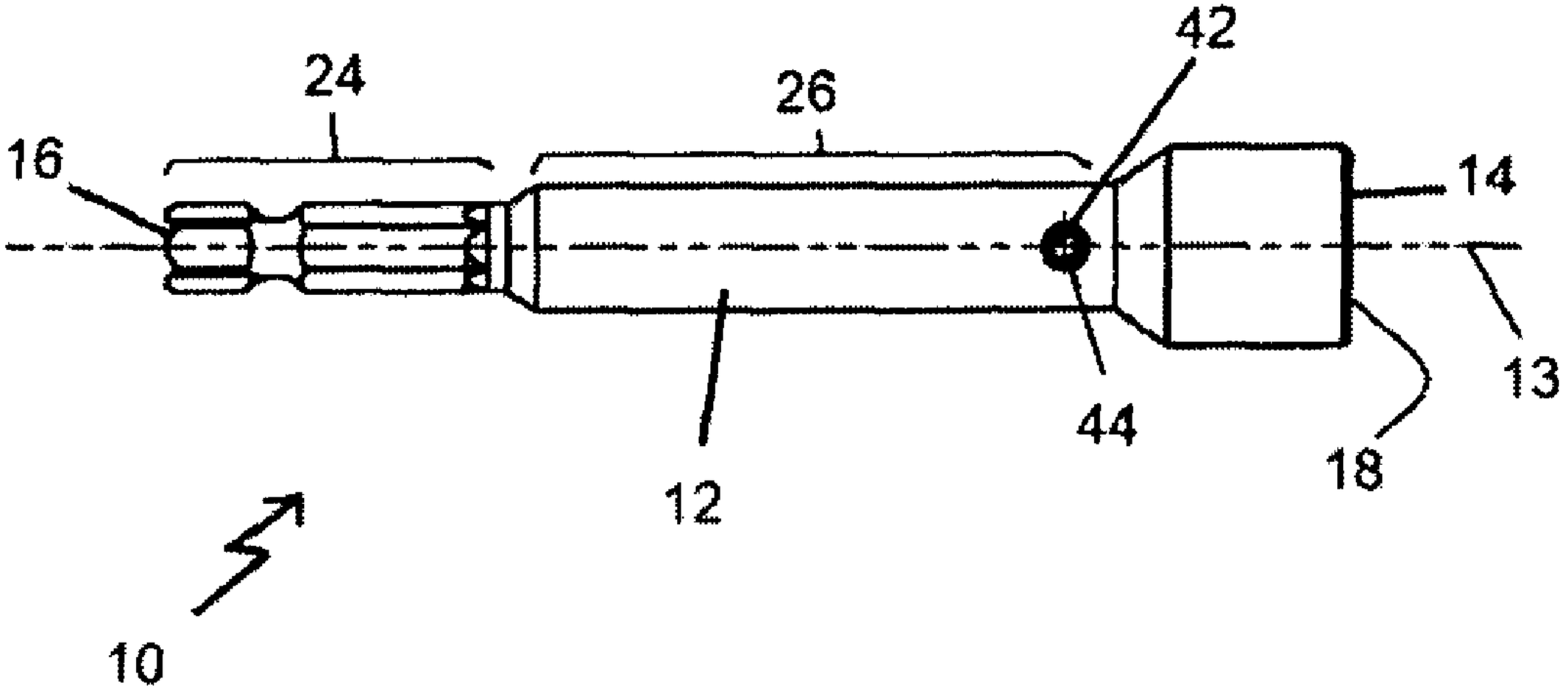
FIG 7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