Jan. 6, 1953 F. G. CLARK 2,624,223

MAGNETIC DRIVING IMPLEMENT

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Fig. 1.

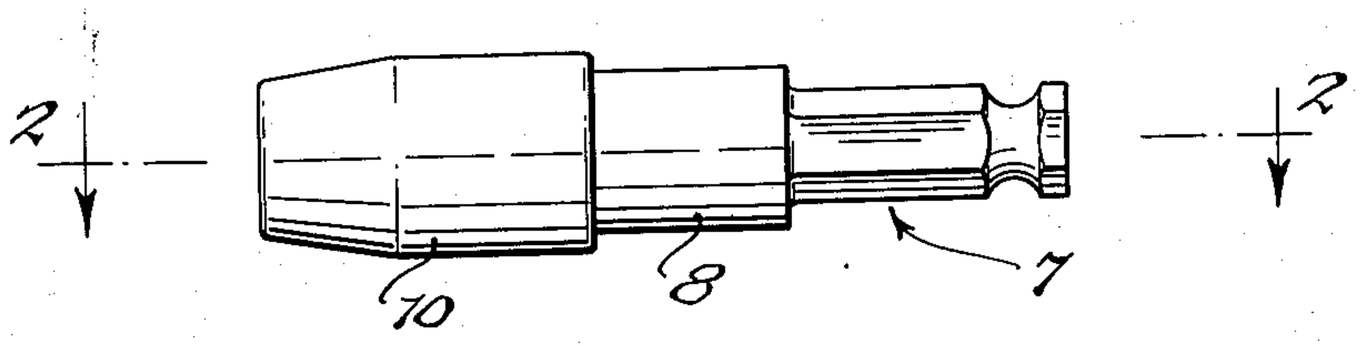
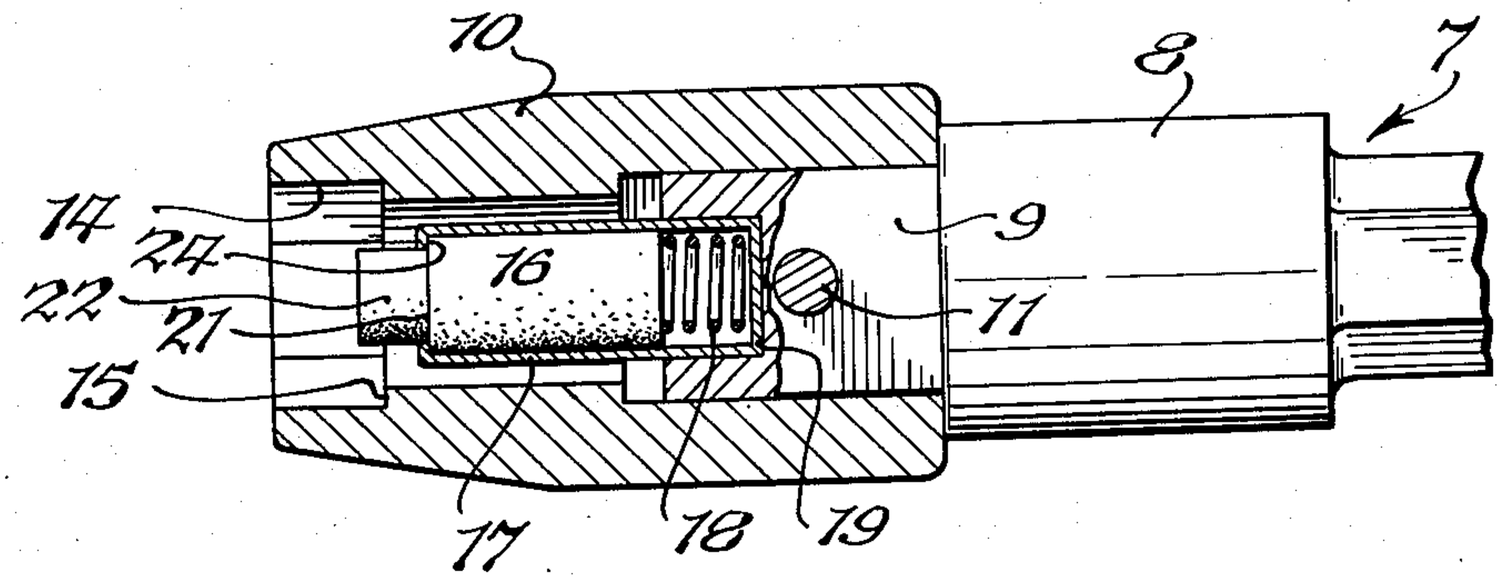


Fig. 2.



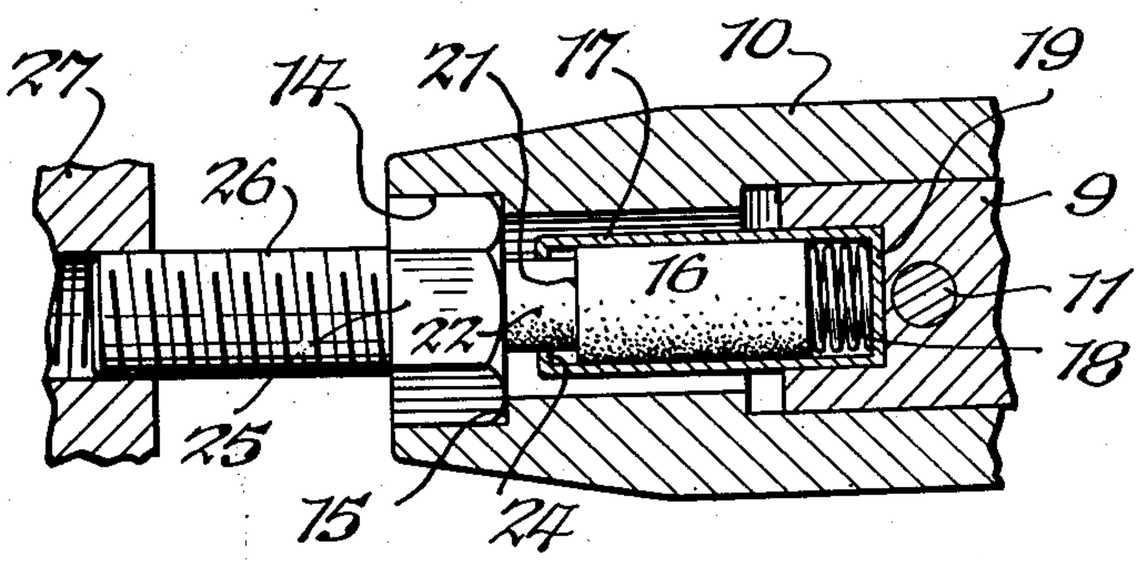


Fig. 3.

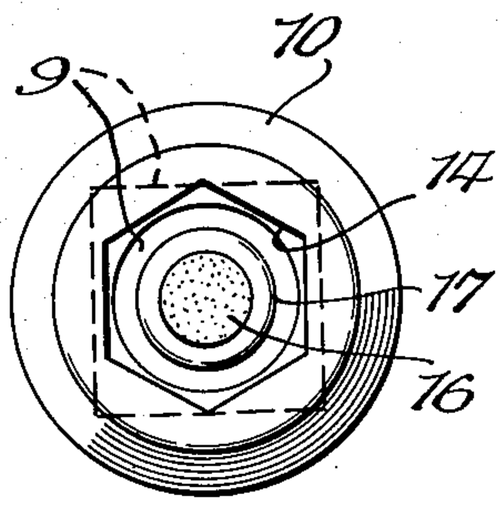


Fig. 4.

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MAGNETIC DRIVING IMPLEMENT

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4 Claims. (Cl. 81—125)

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This invention relates to improvements in driving implements for rotating and driving fastenings, such as nuts, bolts, screws, or the like, which implements are provided with a magnet for supporting a fastening in operative position on the implement while the fastening is being positioned for driving.

Magnets of the type which are preferably used on implements of this nature are generally made of an alloy which when magnetized are capable of exerting a strong magnetic force, and alloys of this type are usually brittle and subject to breakage when subjected to shocks, impacts, strains or heavy pressures.

It is, therefore, one of the objects of this invention to provide an implement of this type having a magnet movably mounted thereon to protect the magnet against damage and breakage.

Another object of this invention is to provide a driving implement of this type in which the magnet is yieldingly mounted on the implement in position to engage a fastening and in which the magnet may be retracted into the implement by the fastening when pressure is applied to the fastening, to prevent damage to the magnet.

Still another object of this invention is to provide an implement of this type having a hollow socket removably mounted thereon, and in which the magnet is yieldingly mounted on the shank of the implement and extends into any socket that may be mounted on the implement, into position to engage a fastening when placed into the open end of the socket.

Other objects and advantages will be apparent from the following description of one embodiment of the invention and the novel features will be particularly pointed out hereinafter in connection with the appended claims.

In the accompanying drawings:

Fig. 1 is a side view of a fastening driving implement embodying this invention.

Fig. 2 is a fragmentary central sectional view thereof, on an enlarged scale, on line 2—2, Fig. 1.

Fig. 3 is a fragmentary section thereof, showing the magnet in retarded position and operating on a fastening.

Fig. 4 is an end view of the implement.

The implement includes a shank 7 of any suitable or desired construction. The shank shown is of the type commonly used in connection with power driven screw drivers, the shank having the inner end portion thereof of hexagonal or noncircular cross section for forming a driving connection with the power actuated screw driver or similar tool. It will be understood, however, that this shank may be of other suitable or desired construction, and may, for example, be a part of a hand driven implement for imparting rotation to a fastening. The shank shown also includes a substantially cylindrical portion 8 which terminates at its outer end in a projecting stud 9 which, in the construction shown, is of square cross section, but it may be of any other noncircular cross section so as to form a driving connection with a hollow or cylindrical socket member 10, which may be mounted thereon in any suitable or desired manner. In the construction shown for this purpose, the projecting part 9 of the shank and the socket member 10 are provided with transverse registering holes through which a pin 11 may be inserted for securing the socket member on the shank of the implement. The pin 11 may be permanently secured in place for permanently mounting the socket member on the end of the shank, or if desired, the pin 11 may be removably mounted in any usual or suitable manner, so that the socket member may be removed and replaced by a socket member formed to operate on a fastening of a different size or shape. The socket member 10 may be of any usual or suitable construction, such for example as has heretofore been commonly employed in connection with driving implements, and the socket member is of hollow or tubular form and provided at the outer end thereof with a recessed part or socket 14 of suitable cross section to cooperate with a fastening for driving the same. The socket member is also provided at the inner end of the recess 14 with a shoulder 15 against which a fastening may abut to limit the extent to which the fastening may enter the socket or recess of the socket member. These recesses may vary in size, depth and shape so as to cooperate with fastenings of different types.

16 represents a magnet for holding a fastening in the recess 14 of the socket member. This magnet may be of any suitable or desired type. Preferably it is made of an alloy, such as Alnico or a similar alloy which is capable of exerting a strong magnetic force. It is desirable to mount a magnet of this type on the driving tool in such manner that it may cooperate with all socket members that may be mounted on the shank, regardless of the depth of the recess or socket formed therein. In order to accomplish this without damage to the magnet, I have movably mounted the magnet on the shank so that the outer end of the magnet may extend into the recess or socket of the socket member to engage a fastening inserted into the recess, and may

move out of the recess or socket when pressure or impacts are applied to the fastening. This movable mounting may be of any suitable or desired form, and in the construction illustrated by way of example, the magnet 16 is mounted to slide lengthwise in a shell 17 which is made of a non-magnetic material. The magnet in the preferred form of my invention, is urged outwardly with reference to the shell by any suitable means, such for example as a coil spring 18 which is interposed between the inner end of the magnet and the adjacent end wall 19 of the shell.

The shell 17 is mounted on the end of the projecting portion 9 of the shank in such manner as to extend into any socket member which may be mounted on the shank. Any suitable means for mounting the shell on this portion of the shank may be provided, and in the construction illustrated by way of example, a hole is drilled in the outer end of the portion 9 of the shank and the shell may be secured in this hole in any suitable manner, for example, by pressing the same into the hole. The hole is preferably coaxial with the shank so that the shell and magnet extend outwardly from the end of the shank and will be arranged approximately centrally in any socket member which may be secured to the shank.

In order to limit the extent to which the magnet may move outwardly with reference to the shell, stop means are provided on the shell and magnet to limit the outward movement of the magnet by the spring 18. In the particular construction illustrated in the drawings, these stop means include a shoulder 21 formed on the magnet 16, this shoulder being formed by providing the magnet with an outer end portion 22 of reduced diameter, and the shell is provided with an inwardly extending flange 24 with which the shoulder 21 of the magnet may engage when the magnet is urged into its outer position by the spring 18. The stop means are so arranged on the shell and magnet that the outer end of the magnet extends to some extent into the recess 14 into which a fastening may be inserted.

In the operation of the implement described, a fastening member, such as a screw or bolt 26, Fig. 3, which is to be driven into an internally threaded member 27, is first positioned so that the head 25 thereof extends into the recess 14 of the socket member 10. Consequently, the magnet 16 will engage the head of the bolt or screw and hold the same within the recess of the socket member. The threaded part of the fastening member may then be inserted into the internally threaded aperture in a part 27 while held by magnetic force on the shank of the implement. After the fastening has been positioned in operative relation to the threaded hole in the workpiece 27, pressure is usually applied to the implement while the same is being rotated for driving the fastening device into its desired position. When such pressure is applied, the fastening device will move the magnet 16 farther into its shell 17, for example, into the position shown in Fig. 3, while the edge portions of the fastening engage the annular shoulder 15 in the socket member. This shoulder, consequently, prevents farther pressure from being exerted on the magnet, the pressure being exerted against the shoulder 15. When the fastening device has been secured in place and the implement is removed out of engagement with the head of the fastening, the spring 18 will urge the magnet 16 into its outer position to engage another fastening. If no spring is employed, the magnet may be dropped by gravity

into the position shown in Fig. 2, or may be drawn into this position by magnetic attraction when a fastening is placed into the socket or recess of the socket member. The implement may, of course, be equally well used in a similar manner to apply a nut to a bolt or stud.

Since the magnet and its shell 17 are permanently secured to the outer end of the shank of the driving implement, it will be obvious that this magnet will cooperate with socket members of different sizes and shapes which may be applied to the end of the shank of the implement. Since the magnet 16 is yieldingly mounted on the shank of the driving implement, it will readily cooperate with recesses 14 in the socket member to varying depths for cooperation with fastenings of different sizes. It is customary to form the sockets or recesses 14 in the socket members of different depths and the magnet 16 is so mounted on the shank of the implement that it will extend to a very slight extent into a shallow recess and to a greater extent into a recess cut deeper in the socket member. The magnet, therefore, will cooperate with socket members of many different sizes and shapes, and furthermore, when socket members are worn out, they can be replaced by new ones which will then cooperate with the same magnet. Consequently, many sockets can be used to destruction with my improved driving implement while the magnet remains undamaged on the shank.

It will be understood that various changes in the details, materials, and arrangements of parts which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention, as expressed in the appended claims.

The term "non-magnetic" is herein used in the practical sense to designate materials of very low magnetic permeability.

I claim as my invention:

1. A magnetic tool for driving fastenings, including a shank portion which may be rotated for driving the fastenings, a hollow socket member secured at one end to said shank for rotation thereby and having the other end thereof provided with a non-circular recess to receive and apply torque to a fastening, a magnet for cooperation with a fastening to hold the same by magnetic force in said socket member, and a supporting member of substantially non-magnetic material fixedly mounted on said shank and arranged within said socket member and terminating in spaced relation to said recess to support said magnet for limited movement lengthwise of said socket member, an end of said magnet extending beyond said supporting member into said recess into position to hold a fastening by magnetic force in operative position within said socket member, regardless of the position of the fastening with relation to said recess.

2. A magnetic tool according to claim 1, in which said supporting member comprises a shell of substantially non-magnetic material in which the magnet is freely slidable and which is secured to said shank and in which a spring is provided within said shell to normally urge said magnet outwardly with reference to said shell for holding a fastening on said recess in all positions of said magnet.

3. A magnetic tool for driving fastenings, including a shank portion which may be rotated for driving the fastenings, a hollow socket member secured at one end to said shank and having

the other end thereof provided with a non-circular recess to receive a fastening and impart torque thereto, a magnet for cooperation with a fastening in said socket member, and a shell of non-magnetic material having one end thereof secured to said shank and the other end of which terminates in spaced relation to said recess, said magnet being mounted to slide lengthwise of said socket member and having the outer end thereof normally extending beyond the other end of said shell into said recess of said socket member, said shell having an inwardly extending flange on the outer end thereof and said magnet having a shoulder which engages said flange to limit the extent to which said magnet may move outwardly relatively to said socket member, said magnet having an outer portion of reduced diameter which extends beyond said shoulder into said recess of said socket to engage a fastening, and yielding means urging said magnet outwardly with reference to said shell.

4. A magnetic tool according to claim 3, in which said socket member is removably mounted

on said shank for replacement by other socket members for cooperation with said shank and said magnet.

FREDERICK G. CLARK.

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