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F. G. CLARK
MAGNETIC SCREW DRIVER

2,550,775

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Fig. 1.

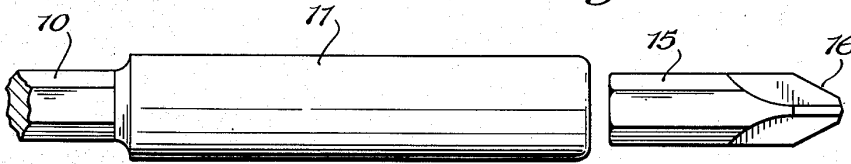


Fig. 2.

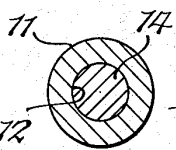
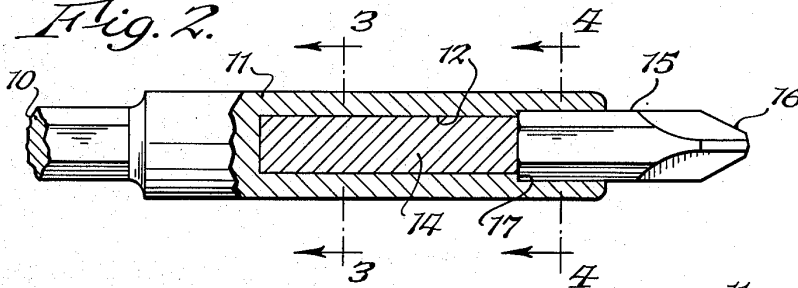


Fig. 3.

Fig. 4.

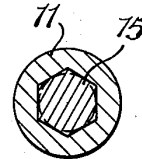


Fig. 5.

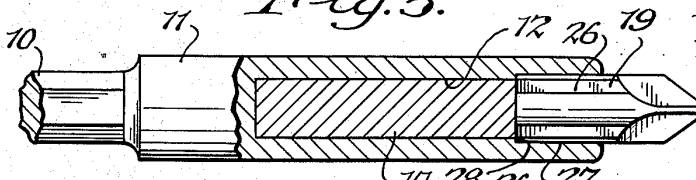


Fig. 6.



Fig. 8.

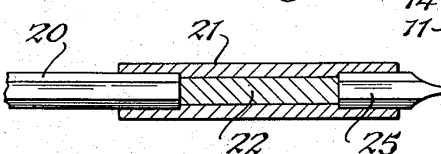


Fig. 7.



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MAGNETIC SCREW DRIVER

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5 Claims. (Cl. 145—50)

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This invention relates to improvements in magnetic tools of the type in which the workpiece such as a screw, or the like, to be driven is held by magnetic force to facilitate the placing of the workpiece into position to be driven.

One of the objects of this invention is to provide a magnetic tool of this type, which is so constructed that the driving implement or bit can be readily attached to or removed from the tool. Another object is to provide a tool of this type in which a removable driving implement or bit is held in operative relation to the tool by means of a magnet which also magnetizes the implement so that the workpiece becomes attached by magnetic force to the end of the bit. A further object is to provide a tool of this type with a shank having at the end thereof a bit holder of non-magnetic material within which a magnet may be arranged, the outer end of the bit holder being formed to receive the driving implement which is held in place on the tool by the force of the magnet and which driving implement becomes magnetized to hold the workpiece which is to be driven.

Another object is to provide a tool of this type with a magnet which is so arranged as to serve the two-fold purpose of holding the driving implement on the tool and of magnetizing the driving implement to hold a workpiece on the same. It is also an object of this invention to provide a tool of this type with a removable bit holder containing a magnet, and in which the magnet serves the purpose of holding the bit holder on the shank of the tool, of holding the driving implement or bit in the bit holder, and of magnetizing the driving implement or bit so that the same will hold a workpiece thereon.

A further object of this invention is to provide a tool of this type with a bit holder in which a magnet is embedded and which is provided with a stop shoulder against which a bit abuts when in close proximity to the magnet to prevent transmission of impacts on the bit from being transmitted directly to said magnet. Another object is to provide a bit of improved construction for cooperation with a tool of this type.

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 fragmentary longitudinal view of a tool embodying this invention and having a

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driving implement arranged in position to be inserted into the bit holder of the tool.

Fig. 2 is a similar view thereof, partly in section, showing the driving implement in operative relation to the tool.

Figs. 3 and 4 are respectively transverse sectional views thereof, on lines 3—3 and 4—4, Fig. 2.

Fig. 5 is a longitudinal view, partly in section, similar to Fig. 2, but showing a driving implement or bit of different type mounted on the tool.

Fig. 6 is an end view thereof.

Fig. 7 is a fragmentary longitudinal sectional view of the tool shown in Fig. 5 and provided with a bit of modified construction.

Fig. 8 is a longitudinal view, partly in section showing a tool of modified construction.

In the particular embodiment of the invention illustrated in Figs. 1 to 7, 10 represents a shank of a screwdriver or similar tool, only a portion of which is shown in the drawing. This shank may be provided with a handle for rotating the same manually or may be a part of a power driven screwdriver or the like. 11 represents a bit holder which is suitably connected with the shank 10 in any suitable manner, and which is made of a non-magnetic material, such as non-ferrous metals or certain types of stainless steel. If the shank 10 is also made of the same non-magnetic material, then the bit holder 11 and the shank may be formed in one piece. If the shank 10 is made of a magnetic material, then the bit holder 11 may be suitably secured thereto in any desired manner.

The bit holder is provided with a bore 12 of any suitable type formed to receive a bar magnet 14 which may be suitably held within the bore 12 in any suitable manner, either by means of a drive fit of the magnet within the bore, or by soldering, brazing, or the like. The magnet is so arranged within the bit holder that the outer end of the magnet will be spaced within the bit holder at a distance from the outer end thereof. The bore 12 may be circular or non-circular in cross section, and in the particular construction shown, the portion of the bore in which the magnet 14 is arranged is circular, and the bore at the outer end of the bit holder is non-circular to cooperate with a corresponding non-circular shape of a driving implement or bit, such as the bit 15. In the particular construction illustrated in Figs. 1 to 4, the shank portion of the bit is of hexagonal cross section, and consequently, the outer end portion of the bore in

the bit holder is also hexagonal. In Figs. 5 to 7, the shank portion of the bit is of approximately cross-shaped cross section, and consequently the portion of the bore into which the shank portion of the bit fits is of corresponding cross section. Any other connection may be provided between the driving implement or bit and the bit holder to prevent relative rotation of these two parts. The outer end 16 of the driving implement or bit may be of any suitable or desired shape to fit the workpiece which is to be driven by rotation of the shank 10. The driving implement or bit is made of the usual steel employed for the screwdriver bits and the like, and is, consequently, magnetic.

As a result of the construction described and of the use of a bar magnet within the bit holder with poles at opposite ends thereof, the magnet holds the bit within the bit holder in the position shown in Fig. 2, and the magnetism passes through the bit to the work-engaging end 16 thereof so that a screw, or similar workpiece will be held on the end of the bit. The magnet, consequently, serves the two-fold purpose of holding the driving implement or bit in the bit holder and of holding the workpiece on the end of the bit or driving implement.

The construction described has the advantage that the usual spring pressed clips, pins, balls, or other holding devices for securing a bit or driving implement in a bit holder may be dispensed with, since the magnet serves the purpose of holding the bit in the bit holder. Furthermore, the driving implement can easily be removed from the bit holder by simply pulling on the same sufficiently to overcome the magnetic force, and the bit or driving implement can be replaced with equal facility by merely inserting the shank end of the implement into the bit holder. The construction described has the further advantage that the driving implements or bits can be very easily manufactured to cooperate with a tool of the type described, since the body portion of the bit need not be provided with an aperture or recess to cooperate with a detent for holding the bit in the bit holder. This is an important feature, particularly with tools which are given severe use in shops or factories; and in which the life of a bit is quite short. Consequently, a relatively short bit can be used so that the expense of replacing of worn-out bits is relatively low.

The bits or driving implements shown in Figs. 1 and 2 are in the form of Phillips head screwdrivers, but it will be obvious that the outer ends of the bits may be of any desired shape to cooperate with screws or bolts of different types. When my improved tool is to be used in connection with slotted or recessed head screws, a very short bit or driving implement 18, shown in Fig. 7, may be used, in which case, the outer end of the non-magnetic bit holder 11 may serve to engage the head of the screw to accurately align the same while the work engaging end of the screwdriver bit 18 is seated in the slot or recess of the screw.

Since permanent magnets lose some of their magnetism when subjected to blows, shocks or impacts, I have provided means for preventing such shocks or blows on the bits from being transmitted to the magnet. For this purpose, the magnet itself and the bore in the bit holder into which it fits are made of less diameter than the maximum diameter of the non-circular bore into which the bit fits, thus forming a shoulder

17, Fig. 2, at the inner end of that portion of the bore of the bit holder into which the bit fits. The magnet is of such length that it will not extend outwardly beyond the shoulder 17. Consequently, any blows or impacts on the bit will react against the shoulder 17 of the bit holder and not against the magnet, thus avoiding loss of magnetism due to such blows. This shoulder also takes the endwise pressure exerted on the shank 10 of the tool against the work, which is desirable, since high power magnets, such as are preferably used on these tools, are somewhat fragile. Preferably the shoulder 17 extends outwardly to a slight extent beyond the outer end of the magnet so that the inner end of the bit does not contact with the magnet. The small air gap thus formed between the end of the magnet and the inner end of the bit does not appreciably reduce the magnetic force exerted on the bit, or on the screw held on the end of the bit.

In Figs. 5 to 7, I have shown a bit in which the shank 19 is of approximately cross-shaped cross section, and in which the bit holder has the portion of the bore thereof which receives the bit of corresponding internal cross section. A bit of this cross section offers improved resistance to the turning of the bit and the bit holder relatively to each other, as will be readily seen by inspection of Fig. 6. By means of this construction, approximately right-angled longitudinal slots or grooves 26 are formed in the sides of the shank and correspondingly shaped keys or longitudinal projections are formed in the bit holder to enter the recesses of the shank of the bit holder. This key and slot construction is capable of transmitting greater torque from the bit holder to the bit. In the construction shown in Figs. 5 to 7, the inner end of the bit lies in a plane substantially perpendicular to the longitudinal axis of the bit, and this bit has the further advantage that the outer unslotted or peripheral portions 27 of the shank of the bit, which are of substantially cylindrical outer contour, form extended seats against the annular shoulder 28, Fig. 5, within the bit holder, thus providing a more extended bearing on this shoulder by the inner end of the bit to further avoid the transmitting of shocks, blows or pressure from the bit to the magnet.

In the particular construction shown in Fig. 8, a shank 20 is employed with which a removable bit holder 21 cooperates and in which the magnet, in addition to the purposes served by it in the construction shown in Figs. 1 to 5, serves the further purpose of holding the bit holder 21 on the shank 20 of the tool. This is accomplished by making the bit holder 21 of non-magnetic material and providing a magnet 22 within the bit holder, the magnet being shorter than the bit holder and terminating at both ends in spaced relation to the ends of the bit holder. The end portions of the bore of the bit holder are non-circular, one end being formed to receive the shank 20, which is also non-circular in cross section, and the other end being formed to cooperate with a driving implement or bit 25. The magnet 22 employed in this construction must also be a bar type magnet with the opposite poles thereof located at its opposite ends. Consequently, one end of this magnet will hold the shank 20 by magnetic attraction, and thus hold the bit holder on the shank of the tool, and the other end of the magnet acts on the driving implement

or bit and holds it within the bit holder. The magnet also magnetizes the driving implement so that screws, nuts, or other workpieces may be held by the bit. If the shank 21 is made of the same cross section as the driving implement, it is, of course, also possible to reverse the bit holder 21, since either end of the bit holder will then cooperate with either the shank or driving implement.

The construction shown in Fig. 8 has the advantage that a number of different bit holders may be provided to cooperate with the shank 20. The end of the bit holder which cooperates with the driving implement may be made of various sizes and shapes so as to cooperate with driving implements or bits of different sizes and types. In this construction, as well as in the others herein described, the bit holders are preferably made of a non-magnetic material, so that the maximum amount of magnetic force will be available at the end of the driving implement to hold the workpiece. The magnetic force at the outer end of the driving implement is, of course, considerably less than at the end thereof adjacent to or contacting the magnet. Consequently, after the workpiece has been driven into its final position and the tool is removed from the workpiece, the magnetic attraction between the workpiece and the driving implement will not be sufficient to pull the driving implement out of the bit holder. By making the bit holder of non-magnetic material, so that no liner or non-magnetic sleeve need be provided about the magnet, the outside diameter of the bit holder can be small so that the tool may be used in places where very little room is available for driving a screw.

The construction described has the further advantage that the bit or driving implements used in connection with the magnetic tool may be made of a good grade of tool steel, such as is preferably employed for bits or driving implements of this type.

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.

I claim as my invention:

1. A magnetic tool comprising a shank by means of which the tool may be rotated, an elongated bit holder of non-magnetic material on said shank, said bit holder having an axial bore, a bar type magnet secured in said bore, the outer end of said magnet terminating in spaced relation to the outer end of said bore, the bore in said bit holder beyond said magnet being non-circular in cross section, and a driving implement of magnetic material having a non-circular portion formed to seat in said non-circular outer end portion of said bore and held in place in said bit holder by said magnet, the portion of the bore in which the magnet is secured being of circular cross section, said portion of non-circular cross section having parts of larger diameter than said portion of circular cross section to form a shoulder against which said driving implement abuts when held in said bit holder by said magnet.

2. A magnetic tool comprising a shank made of magnetic material and of non-circular cross section and by means of which the tool may be rotated, a bit holder of non-magnetic material having a longitudinal bore therein, a bar magnet se-

cured in said bore of said bit holder with the ends thereof terminating in spaced relation to the ends of said bit holder, one end of said bore being of cross section corresponding to the cross section of said shank to receive the end portion of said shank and to form a driving connection between said shank and said bit holder, whereby the bit holder is held in operative relation to said shank by means of said magnet, the other end of said bit holder having a non-circular bore for receiving a non-circular member of magnetic material to which rotation may be imparted by rotation of said bit holder and which is held in place in said bit holder by said magnet.

3. A bit holder for use with a shank and bit, said bit holder being of non-magnetic material and having a longitudinal bore, the middle portion of said bore being of smaller diameter than the end portions thereof to form shoulders at the ends of said middle portion of said bore, a bar magnet having poles at opposite ends thereof and secured in said middle portion of said bore, one end of said bore being non-circular in cross section to slidably receive a shank of corresponding cross section for imparting rotation to said bit holder and the other end of said bore being non-circular in cross section to slidably receive a bit of corresponding cross section for imparting rotation from said bit holder to said bit, whereby said bit holder is held by magnetic attraction on said shank, and said bit is held on said bit holder by magnetic attraction, said shoulders transmitting end thrust of said shank through said bit holder to said bit without subjecting said magnet to strains.

4. A magnetic tool comprising a shank by means of which the tool may be rotated, an elongated bit holder of non-magnetic material on the end of said shank and having a longitudinal bore which is of non-circular cross section at one end thereof, a bar magnet with the poles at opposite ends thereof arranged entirely within said bore and having the outer end thereof spaced inwardly from said one end of said bit holder and secured to said bit holder, a driving implement of magnetic material having means on the outer end thereof formed to engage a workpiece and a shank of non-circular cross section on the other end thereof formed to slidably and non-rotatably fit into the non-circular end of the bore in said bit holder and adjacent to the magnet, whereby the driving implement will be yieldingly held in said bit holder by the force of said magnet.

5. A magnetic tool comprising a shank by means of which the tool may be rotated, an elongated bit holder of non-magnetic material on the end of said shank and having a longitudinal bore which is of non-circular cross section at one end thereof, a bar magnet with the poles at opposite ends thereof arranged entirely within said bore and having the outer end thereof spaced inwardly from said one end of said bit holder and secured to said bit holder, said end of non-circular cross section constituting a socket terminating at said magnet to receive a shank of similar cross sectional shape of a bit of magnetic material to enable said bit to be rotated by said bit holder, whereby said magnet magnetizes said bit when the shank thereof is in said socket to enable the bit to support workpieces at the outer end thereof by magnetic force.

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