Oct. 18, 1955 R. M. BROWN 2,720,804

MAGNETIC TOOL HAVING YIELDABLY SLIDABLE HOLLOW MAGNET

Filed Sept. 13, 1952

FIG. 1

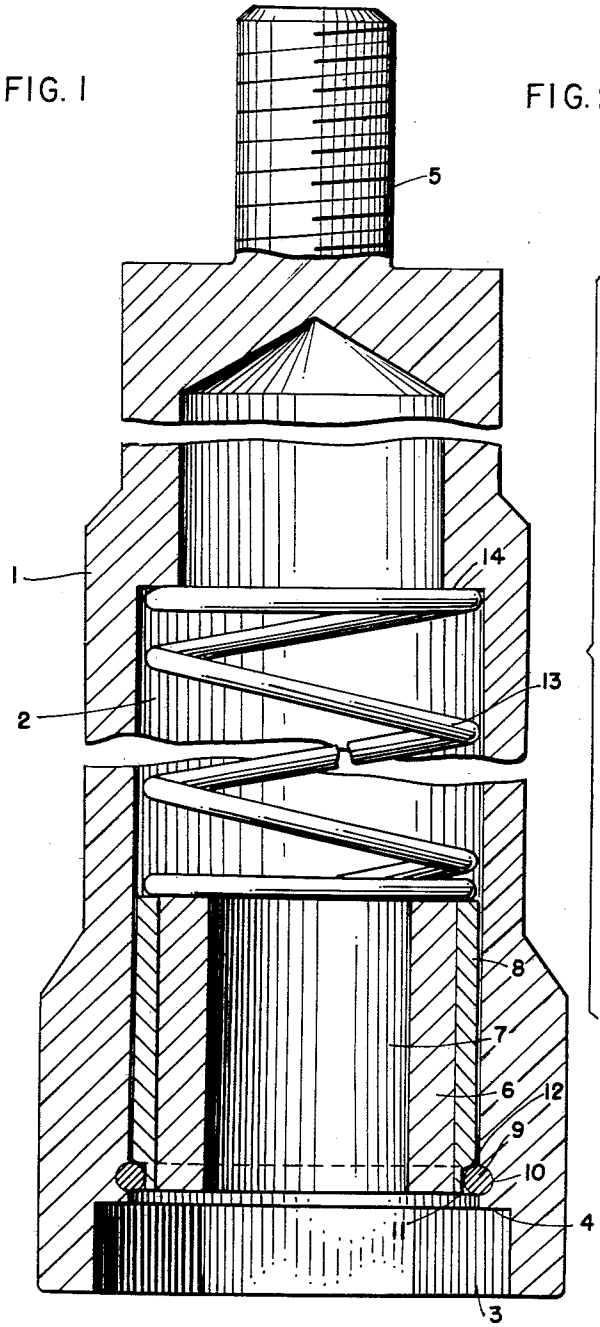


FIG. 2

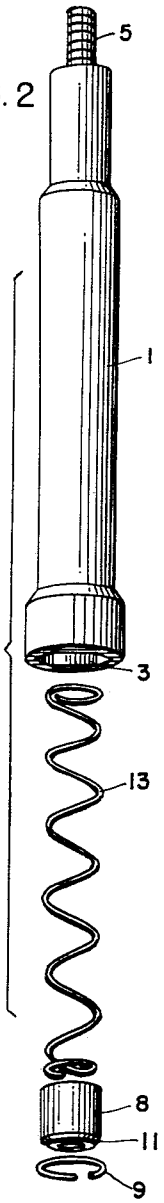
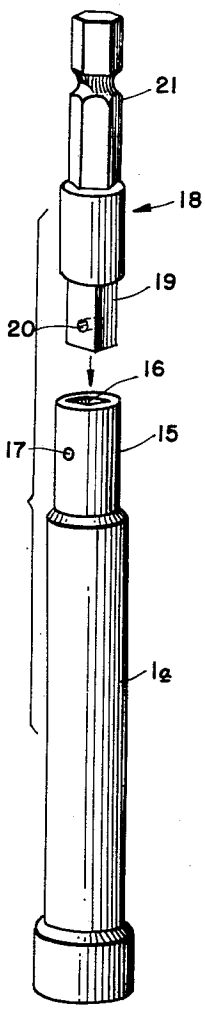


FIG. 3



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2,720,804

Patented Oct. 18, 1955

2,720,804

MAGNETIC TOOL HAVING YIELDABLY SLIDABLE HOLLOW MAGNET

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Application September 13, 1952, Serial No. 309,499

6 Claims. (Cl. 81—125)

This invention relates in general to magnetic tools of the general type which utilize magnetic force for holding a member or workpiece such as screws, bolts, nuts, and the like, in place thereon to facilitate the placing of the member in a position to be driven.

Heretofore magnetic tools have been designed for application to a particular type of workpiece or member to be driven; for example, in my co-pending application Serial No. 49,547 filed September 16, 1948, now Patent No. 2,630,036, I have illustrated a type of magnetic tool utilizing a permanent bar magnet within the bore of a holder which is capable of sliding movement therein and which is particularly adapted to hold screws or bolts so that when force is applied in the application of the screw, the magnet will recede within the bore. The device of said application is also applicable for use in applying nuts to a threaded shaft where the threads begin at a distance from the end of the shaft in which case the shaft may extend a distance within the bore by forcing the magnet inwardly.

In the patent to Clark No. 2,550,775 a magnetic tool is disclosed wherein a permanent magnet is rigidly secured within the bore of a holder and an elongated socket is provided to receive a bit or driving implement such as a screwdriver.

While the device of the present invention may also be used to hold any desired implement, workpiece, or member adapted to be drvien by rotating the holder, it has particular application in connection with threaded shafts where the threads begin at a distance from the end of the shaft and especially where the threaded portion may be of larger diameter than the shaft itself. An example of such shafts is the volume control shafts contained in radio and television receiving sets.

It is customary in assembling such apparatus to use a power driven tool having a chuck to which the shank of the magnetic tool may be affixed. It will be understood, however, that the present invention is adapted for use with manually operated tools as well as with power driven tools. While the present invention is designed with a specific purpose in mind, it will be understood that the novelty resides in the construction of the magnetic tool itself rather than the particular use to which it may be put.

With the foregoing considerations in mind, it is, therefore, a principal object of the present invention to provide an improved magnetic tool structure capable of magnetically retaining a member thereon to facilitate application of the member to a cooperating part and to drive the member into final set position.

A specific object of the invention is to provide a magnetic tool having a bore in the holder thereof and a socket at one end wherein a permanent magnet having a central opening therethrough is removably retained within the bore by a removable retaining means therein and which may be yieldably held in position to permit movement thereof within the bore.

A still further object of the invention is to provide

a magnetic tool wherein a holder has a bore therein with a socket at one end and wherein a permanent magnet having a central opening therethrough is provided with a non-magnetic sleeve for the purpose of increasing the air gap and reducing any magnetic attraction which there might be to the wall of the holder.

Still another and specific object of the invention is to provide in a magnetic tool cooperating retaining means between the magnet and the bore within the holder so that the magnet may be removed, if desired, but may be retained within the bore for use.

Other objects and advantages of the invention will become apparent upon reading the following description taken in conjunction with the accompanying drawing in which:

Fig. 1 is an enlarged longitudinal sectional view through a magnetic tool embodying the present invention;

Fig. 2 is an exploded view in perspective illustrating the various parts of the tool prior to assembly; and

Fig. 3 is an exploded view in perspective of the tool illustrating a modified form of shank which may be applied thereto.

Referring now more particularly to the drawing and especially to Figs. 1 and 2, the body of the holder itself is indicated by the numeral 1 and this holder is provided with a longitudinal bore 2 extending substantially throughout the length thereof. The outer end of the bore is enlarged as shown at 3 thereby providing a socket portion to receive and hold a member of magnetic material. As stated hereinabove in the broad application of the invention, the particular member received by the socket 3 is immaterial. It may be a nut, screw, bolt, or driving implement such as a bit.

A shoulder 4 is provided between the bore 2 and the bottom of the socket 3 against which the magnetic member received by the socket may abut to prevent undue inwardly movement thereof. The socket 3 may be any suitable depth and diameter to suit the particular member which it is adapted to receive. The socket 3, however, must be of non-circular cross section so that a driving force may be applied to the member when the holder 1 is rotated. In the particular illustration of the drawing, the socket 3 is shown as being hexagonal although the particular cross sectional shape is immaterial as long as it is non-circular.

The opposite end of the holder 1 may be provided either with a shank which is integral therewith or may be so constructed as to have a shank applied thereto, the shank being used for application to a driving tool whether it be manual or power operated. In the drawing, Figs. 1 and 2 illustrate a type of shank indicated by the numeral 5 which is formed integral with the holder 1 and constitutes merely a threaded extension which may be threadedly engaged with a threaded opening in a power or manually operated driving tool (not shown). When thus assembled with the tool the holder 1 is caused to rotate and thereby apply the nut, bolt, or other member to its final set position.

The permanent magnet of the present invention is indicated by the numeral 6 and has a centrally disposed longitudinal opening or bore 7 extending therethrough. The holder 1 may be formed of either non-magnetic material or a material which has a low magnetism retentivity. If the material of the holder is such as to tend to have a magnetic attraction for the magnet 6, it is then preferable to surround the magnet with a non-magnetic sleeve 8. The sleeve 8, being formed of non-magnetic material, increases the air gap and reduces any magnetic attraction which there might be to the wall of the holder. This construction also provides for an easier sliding movement of the magnet within the bore.

Suitable means are provided for retaining the magnet

6 within the bore and against removal thereof from the bore through the socket end when in normal use. If the bore of the holder extends completely therethrough so that the magnet can be assembled therewith by inserting through the opposite end, then the retaining means for preventing removal of the magnet through the socket end may be made permanent. If, however, as in the present illustration, the assembly of the magnet with the holder must be by inserting the magnet through the socket end of the bore, then it is necessary to have a retaining means for the magnet of a removable nature. For purposes of illustration the preferred form of such a removable retaining means is shown in Fig. 1 as including a snap retaining ring 9 adapted to be positioned within an annular groove 10 within the bore 2 and adjacent the socket end thereof. The depth of the annular groove 10 and the width of the ring 9 are such that when the ring 9 is located within the annular groove a portion of it extends into the bore 2.

The sleeve 8 is provided on its outer end with an annular recess 11 extending from the outer end thereof inwardly and which is formed by cutting away a portion of the sleeve at said outer end. The radial depth of the recess 11 is equal to or greater than the width of that portion of the ring 9 which projects into the bore 2. The axial depth of the recess 11 is preferably somewhat greater than the thickness of the ring 9 so that the annular shoulder 12 may bear outwardly against the inwardly projecting portion of the ring 9 thereby retaining the sleeve 8 and the magnet 6 against removal from the holder.

The axial depth of the recess 11 from the outer end thereof to the shoulder 12 may vary within wide limits provided said axial depth is sufficiently great to permit the magnet 6 to be positioned sufficiently close to the bottom of the socket 3 to hold a magnetic member within the socket by magnetic attraction whether or not said member comes in direct contact with the magnet 6. In Fig. 1 the magnet 6 is shown as being spaced inwardly a short distance from the bottom of the socket 3 so that any magnetic member such as a nut may be received within the socket and yet be held by magnetic attraction.

A suitable form of yieldable means is located within the bore 2 to normally urge the magnet 6 and sleeve 8 outwardly against the retaining ring 9 but which will also permit the magnet to recede within the bore upon occasion. In the embodiment illustrated herein, such yieldable member has been shown as a coiled compression spring 13 which bears at one end against the inner end of the magnet and at its other end against suitable stop means such as the annular shoulder 14 within the bore.

The foregoing construction is particularly suitable for assembly when one end of the holder 1 is closed or does not otherwise have an opening through which the magnet can be inserted. Fig. 2 illustrates the various parts of tool and the manner in which they may be assembled. In assembling the various parts of the tool shown in Figs. 1 and 2 the spring 13 is first inserted within the bore 2 of the holder 1. The magnetic assembly including the magnet 6 and its sleeve 8 is then placed within the bore through the socket end thereof and against the outer end of spring 13. The snap ring 9 is then inserted within the bore to a position where it will snap open and will become lodged in the annular groove 10.

The tool is then completely assembled and ready for use. The shank 5 may be threaded or otherwise mounted onto a tool which is either manually or power operated and the nuts or other suitable useful item may then be placed in the socket 3 and held therein against the shoulder 4 by the magnetic attraction by the magnet 6.

Although the device embodying the present invention is not limited to use with any particular implement or member, such as screws, nuts, and bolts, it has been designed for use especially for the application of nuts to shafts where the threads of the shaft begin at a distance from the end thereof. In such application the nut is received within the recesses 3 and is held there by the magnetic force of the magnet 6. When it is to be applied to the shaft the unthreaded part of the shaft will extend through the central opening 7 of the magnet 6. If the threaded portion of the shaft has a diameter smaller than the central opening 7, then the magnet may not be caused to recede within the bore in which case the magnet will at all times remain in its outermost position to exert its magnetic force upon the nut. If, however, the threaded portion of the shaft is of a larger diameter than the remainder of the shaft and is larger than the central opening 7 through the magnet, then the magnet may be forced to recede within the bore as the nut is progressively applied thereto and against the force of the spring 13.

When the application of the nut or other member has been completed and the tool removed therefrom, the force of the spring 13 will return the magnet to its outermost position as shown in Fig. 1. If for any reason it becomes necessary to replace the spring or the magnet, it is a simple matter to force the magnet inwardly a short distance sufficient so that the outer end thereof will clear the ring 9 whereupon the ring may be removed and the remaining parts including the magnet and spring may be disassembled.

Fig. 3 illustrates a modified form of shank which could be applied to the device embodying the present invention although it forms no part of the invention itself. In Fig. 3 the holder 1*a* is constructed internally as shown in Fig. 1 but the end thereof opposite to the socket end indicated at 15 has a non-circular opening 16 extending axially therethrough for a predetermined distance. The end 15 also has a small opening 17 extending radially through the wall thereof and communicating with the interior of the opening 16. The shank generally indicated at 18 has one end 19 thereof of the same cross sectional shape as the opening 16 and is adapted to be inserted therein. The end 19 of the shank also has a small spring loaded plunger or pin 20 normally extending outwardly therefrom a short distance which may be depressed a sufficient distance to enable the end 19 to be inserted within the opening 16. The pin 20 is caused to come into alignment with the opening 17 after insertion of the shank and to move outwardly into the opening 17 to lock the shank to the holder 1*a*. The outer end 21 of the shank 18 is shaped to be received by a conventional chuck on a hand or power operated tool whereupon the device of the present invention may be used in the same manner as described above.

From the foregoing description it will be evident that a novel structure of magnetic tool has been designed for use particularly in connection with the application of nuts to threaded shafts where the threads begin at a distance from the end of the shaft. As stated above, however, the invention resides in the novel construction rather than in any use to which the tool may be put and regardless of the type or usefulness of the member or implement which may be inserted within the socket and held in place by the magnet.

Changes may be made in the form, construction and arrangement of parts from those disclosed herein without in any way departing from the spirit of the invention or sacrificing any of the attendant advantages thereof, provided, however, that such changes fall within the scope of the claims appended hereto.

The invention is hereby claimed as follows:

1. A magnetic tool comprising an elongated holder adapted to be rotated, said holder having a longitudinal bore which is of non-circular cross-section at one end thereof, a permanent magnet having a central opening therethrough and mounted for sliding movement within said bore with the outer end thereof spaced inwardly from said one end of said holder, said end of non-circular cross section having a shoulder at the inner end thereof and constituting a socket to receive a member of magnetic

material having a cross sectional shape similar to that of said socket, said member when in said socket being held therein by said magnet and abutting against said shoulder, and removable retaining means within said bore cooperating with said magnet to retain said magnet against movement outwardly through said socket.

2. A magnetic tool comprising an elongated holder adapted to be rotated, said holder having a longitudinal bore which is of non-circular cross-section at one end thereof, a permanent magnet having a central opening therethrough and mounted for sliding movement within said bore with the outer end thereof spaced inwardly from said one end of said holder, said end of non-circular cross section having a shoulder at the inner end thereof and constituting a socket to receive a member of magnetic material having a cross sectional shape similar to that of said socket, said member when in said socket being held therein by said magnet and abutting against said shoulder, an annular recess in said bore spaced inwardly from the outer end thereof, a retaining ring in said recess having a portion thereof projecting inwardly into said bore, and a shoulder on said magnet normally bearing against the projecting portion of said retaining ring, whereby said magnet is prevented from movement outwardly through said socket.

3. A magnetic tool comprising an elongated holder adapted to be rotated, said holder having a longitudinal bore which is of non-circular cross-section at one end thereof, a permanent magnet having a central opening therethrough and mounted for sliding movement within said bore with the outer end thereof spaced inwardly from said one end of said holder, said end of non-circular cross section having a shoulder at the inner end thereof and constituting a socket to receive a member of magnetic material having a cross sectional shape similar to that of said socket, said member when in said socket being held therein by said magnet and abutting against said shoulder, and removable retaining means within said bore cooperating with said magnet to retain said magnet against movement outwardly through said socket, and yieldable means within said bore normally urging said magnet against said removable retaining means.

4. A magnetic tool comprising an elongated holder adapted to be rotated, said holder having a longitudinal bore which is of non-circular cross-section at one end thereof, a permanent magnet having a central opening therethrough and mounted for sliding movement within said bore with the outer end thereof spaced inwardly from said one end of said holder, said end of non-circular cross section having a shoulder at the inner end thereof and constituting a socket to receive a member of magnetic material having a cross sectional shape similar to that of said socket, said member when in said socket being held therein by said magnet and abutting against said shoulder, an annular recess in said bore spaced inwardly

from the outer end thereof, a flexibly retaining ring in said recess having a portion thereof projecting inwardly into said bore, and a shoulder on said magnet normally bearing against the projecting portion of said retaining ring, whereby said magnet is prevented from movement outwardly through said socket, and yieldable means within said bore normally urging the shoulder on said magnet against said retaining ring.

5. A magnetic tool comprising an elongated holder adapted to be rotated, said holder having a longitudinal bore which is of non-circular cross section at one end thereof, a permanent magnet having a central opening therethrough and mounted for sliding movement within said bore with the outer end thereof spaced inwardly from said one end of said holder, a sleeve of non-magnetic material on said magnet, said end of non-circular cross section having a shoulder at the inner end thereof and constituting a socket to receive a member of magnetic material having a cross sectional shape similar to that of said socket, said member when in said socket being held therein by said magnet and abutting against said shoulder, and removable flexible stop means retaining said magnet against movement outwardly through said socket, and yieldable means within said bore normally urging said magnet and sleeve against said stop means.

6. A magnetic tool comprising an elongated holder adapted to be rotated, said holder having a longitudinal bore which is of non-circular cross section at one end thereof, a permanent magnet having a central opening therethrough and mounted for sliding movement within said bore with the outer end thereof spaced inwardly from said one end of said holder, a sleeve of non-magnetic material on said magnet, said end of non-circular cross section having a shoulder at the inner end thereof and constituting a socket to receive a member of magnetic material having a cross sectional shape similar to that of said socket, said member when in said socket being held therein by said magnet and abutting against said shoulder, an annular recess in said bore spaced inwardly from the outer end thereof, a flexible retaining ring in said recess having a portion thereof projecting inwardly into said bore, a shoulder on said sleeve adapted to bear against the inwardly projecting portion of said ring for retaining said magnet against movement outwardly through said socket, and yieldable means within said bore normally urging said magnet and the shoulder on said sleeve against the inwardly projecting portion of said ring.

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