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MAGNETIC SOCKET WRENCH

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Fig. 1.

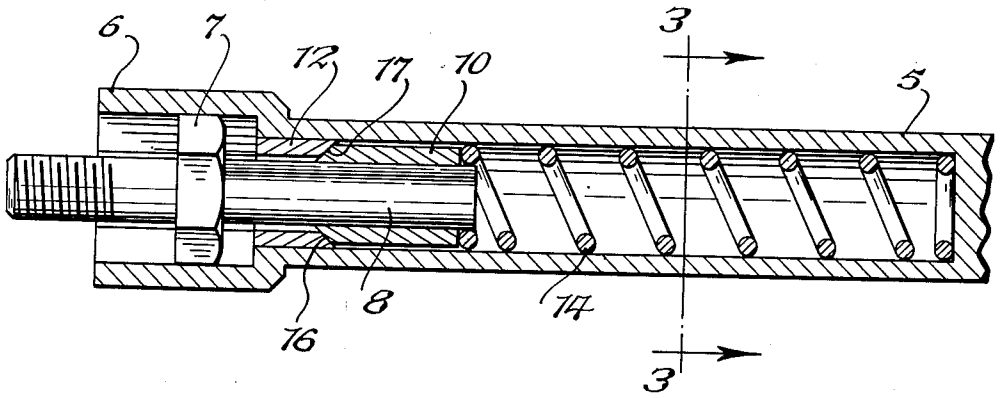


Fig. 2.

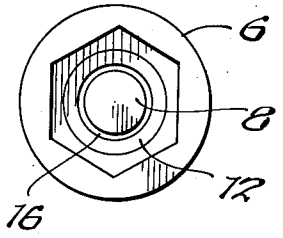


Fig. 3.

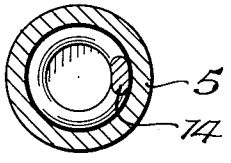
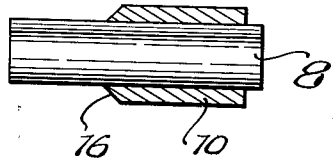


Fig. 4.



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MAGNETIC SOCKET WRENCH

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5 Claims. (Cl. 81—125)

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This invention relates to improvements in magnetic socket wrenches of the type in which a magnet is employed for holding a nut, bolt, screw or other article which is to be rotated.

One of the objects of this invention is to provide a socket wrench of this type with a magnet which is slidably mounted in the shank of the wrench in such a manner that very little pressure of the article being held and rotated is exerted against the magnet.

Another object is to provide a socket wrench of this type in which the magnet is yieldingly held in its outer position to engage the article to be rotated, and in which the magnet may move into the socket against the action of the yielding means as the article which is being rotated advances into the socket.

A further object is to provide a construction of this type in which the magnet is arranged within a non-magnetic sleeve which surrounds a sufficient portion of the magnet to insulate it from the hollow shaft or shank in which it is arranged; also to provide a spring which is constructed to bear against the non-magnetic sleeve of the magnet to urge the magnet into its outer position; also to secure within the bore of the socket wrench a bushing of non-magnetic material which forms a stop to limit the extent to which the magnet will be moved by the spring into its outer position.

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 longitudinal central sectional view of a socket wrench embodying this invention.

Fig. 2 is an end elevation thereof.

Fig. 3 is transverse, sectional elevation thereof, on line 3—3, Fig. 1.

Fig. 4 is an elevation, partly in section, showing the magnet and the sleeve which is secured to the magnet.

In the particular embodiment of this invention illustrated by way of example, 5 represents a portion of a shank of a socket wrench which is preferably, at least in part, of tubular hollow cylindrical form. Only the outer end portion of the shank is shown in the drawing, and it will

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be understood that the other end of the shank may be provided with suitable means for turning the same about its axis, either manually or by means of a power operated mechanism. The outer end of the shank may, if desired, be somewhat enlarged, as shown at 6 and as shown, is formed integrally with the shank 5. This outer end of the shank is provided with an interior surface which may be hexagonal or of other non-circular form and into which an article to be turned, such as a nut or head of a screw 7, may extend so that the article will be rotated when the shank 5 is rotated about its axis.

8 represents a permanent magnet which, in the construction shown, is of the bar type having the opposite poles thereof at the opposite ends of the magnet, or if desired, the outer end of the magnet may be formed and magnetized so that both poles are at this end of the magnet. This magnet may be of any suitable cross sectional shape, for example, circular, as in the construction illustrated, and is slidably arranged within the hollow shank 5 with one end portion thereof extending into the enlargement 6 thereof to hold the nut, screw or other article 7 by magnetic force.

The magnet 8 is partly surrounded by a sleeve 10 of non-magnetic material, such for example as bronze, brass or certain types of stainless steel. The sleeve 10 is rigidly secured to the magnet 8 in any suitable manner, such for example as by means of a driving fit. A considerable portion of the outer end of the magnet extends beyond the sleeve 10 and a lesser portion of the inner end of the magnet extends beyond this sleeve.

Suitable means are provided for limiting the extent to which the magnet and sleeve can move outwardly toward the outer end of the shank, and for this purpose, a bushing 12 is provided which is of non-magnetic material and which is suitably secured to the shank 5 at the inner end of the bore thereof. When this bushing is secured in place, it will be obvious on an inspection of Fig. 1, that the bushing cooperates with the sleeve 10 of the magnet to form a stop to limit the extent to which the sleeve 10 and magnet 8 held thereby may move with reference to the hollow shank 5. The magnet is yieldingly urged into its outer position in any suitable manner, and in the construction shown by way of example, the inner end

of the sleeve 10 is engaged by a coil spring 14, the inner end of which may seat on the inner end of the bore of the hollow sleeve part 5 of the shank, and the outer end of the spring engages the inner end of the sleeve 10 about the magnet 8. The spring is, consequently, confined in correct engagement with the inner end of the sleeve 10 by means of the adjacent end of the magnet which extends slightly beyond the inner end of the sleeve, and therefore, serves to center the spring 14 in reference to the sleeve 10.

The sleeve 10 is provided at the outer end thereof with an outwardly extending, conical face 16, and the bushing 12 is preferably provided with a correspondingly shaped, inner conical surface 17. These two conical surfaces serve to center the sleeve 10 and the magnet 8 with reference to the hollow shank 5, so that the outer end of the magnet will be arranged substantially centrally in the inner, non-circular bore of the enlarged end 6 of the shank.

Since the sleeve 10 and bushing 12 are both made of non-magnetic material, the shank 5 and the extension 6 thereof may be made of magnetic material. Consequently, when the nut, bolt or screw 7 is arranged within the enlargement 6 of the shank, this nut or head will be subjected to the maximum magnetic force and if the magnet has its poles at its opposite ends, the magnetic circuit will extend from the outer end of the magnet through the nut or head 7 to the part 6 and the shank to the other end of the magnet. The spring 14 is preferably made of magnetic material, so that some of the magnetic flux will pass from the shank through the spring adjacent the magnet 8. By providing a magnetic circuit which is substantially free from air gaps, the article is held by the maximum force which the magnet can exert.

In the use of the socket wrench described, the article 7 is inserted into the non-circular bore of the sleeve and is held within this bore by the magnet 8. However, when pressure is applied by the article against the magnet, it will move inwardly into the hollow shank 5 against the action of the spring 14 to any desired extent, so that no material pressure will be exerted against the magnet. Since magnets of the high powered type, such as those of Alnico alloy, are quite brittle, this spring backing of the magnet will prevent damage to the magnet when force is applied to the same by means of the nut or other article. Furthermore, the construction of the wrench is such that if a nut is held in the socket to be applied to a threaded bolt or stud, after the end of the bolt or stud projects beyond the nut, this end may enter into and through the bushing 12, with the result that the magnet 8 will be pushed farther into the hollow shank against the action of the spring 14 without damage to the magnet. When the socket wrench is withdrawn from the nut or other article, the spring will again force the magnet into its outer position, shown in Fig. 1, for cooperation with another article, and the inclined faces 15 and 17 of the sleeve and bushing will tend to center the magnet within the shank 5 and extension 6 thereof. Furthermore, during the movement of the magnet back and forth in the hollow shank 5, the magnet will be held out of contact with the hollow shank, and any wear resulting from the movement of the magnet back and forth into and out of the hollow shank will be taken by the sleeve 10. The sleeve, furthermore, serves to center the magnet in the wrench.

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

It will be understood that various changes in the details 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 socket wrench including a hollow shank made of a material permeable to magnetism and provided at the outer end thereof with an internal non-circular bore for receiving the articles to be rotated by the wrench, a magnet slidable in said shank, a sleeve of non-magnetic material covering only a portion of said magnet and cooperating with said hollow shank to guide the magnet in its movement lengthwise within said shank, a bushing of non-magnetic material through which a non-covered portion of said magnet may pass and which is secured to said shank and cooperates with said sleeve to limit the extent to which said magnet may move outwardly in said shank, and spring means arranged in said hollow shank and urging said magnet into its outer position and permitting said magnet to be moved into said shank.

2. A socket wrench including a hollow shank made of a material permeable to magnetism and provided at the outer end thereof with an internal non-circular bore for receiving the articles to be rotated by the wrench, a magnet slidable in said shank, a sleeve of non-magnetic material extending about a portion of said magnet and cooperating with said hollow shank to guide the magnet in its movement lengthwise within said shank, said magnet extending at its inner end beyond said sleeve, a coil spring in said hollow shank made of material permeable to magnetism and having the outer end thereof engaging said sleeve and extending about the end of the magnet which projects beyond said sleeve, the other end of the spring being seated in said sleeve and forming a part of a magnetic circuit which includes the articles being held by the magnet.

3. A socket wrench including a hollow shank made of a material permeable to magnetism and provided at the outer end thereof with an internal non-circular bore for receiving the articles to be rotated by the wrench, a magnet slidable in said shank, a sleeve of non-magnetic material extending about a portion of said magnet and cooperating with said hollow shank to guide the magnet in its movement lengthwise within said shank, said magnet extending at its inner end beyond said sleeve, a coil spring in said hollow shank made of material permeable to magnetism and having the outer end thereof engaging said sleeve and extending about the end of the magnet which projects beyond said sleeve, the inwardly extending end of the magnet and said sleeve forming an annular seat in which the outer end of said coil spring is seated.

4. A socket wrench including a hollow shank provided at the outer end thereof with an internal non-circular bore for receiving the articles to be rotated by the wrench, a magnet slidable in said shank and having the outer end thereof extending into said non-circular bore when said magnet is in its outer position, resilient means urging said magnet into its outer position and permitting said magnet to move into said hollow shank, a sleeve of non-magnetic material

secured to and covering only that portion of said magnet remote from said outer end thereof, and stop means in the form of a bushing of non-magnetic material secured within said hollow shank, said sleeve cooperating with said bushing to limit the extent to which said magnet may move outwardly in said shank.

5. A socket wrench according to claim 4, in which said bushing and said sleeve are provided with cooperating tapering faces converging toward the axis of the wrench which serve to center the magnet in said hollow shank when said magnet is in its outer position.

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