

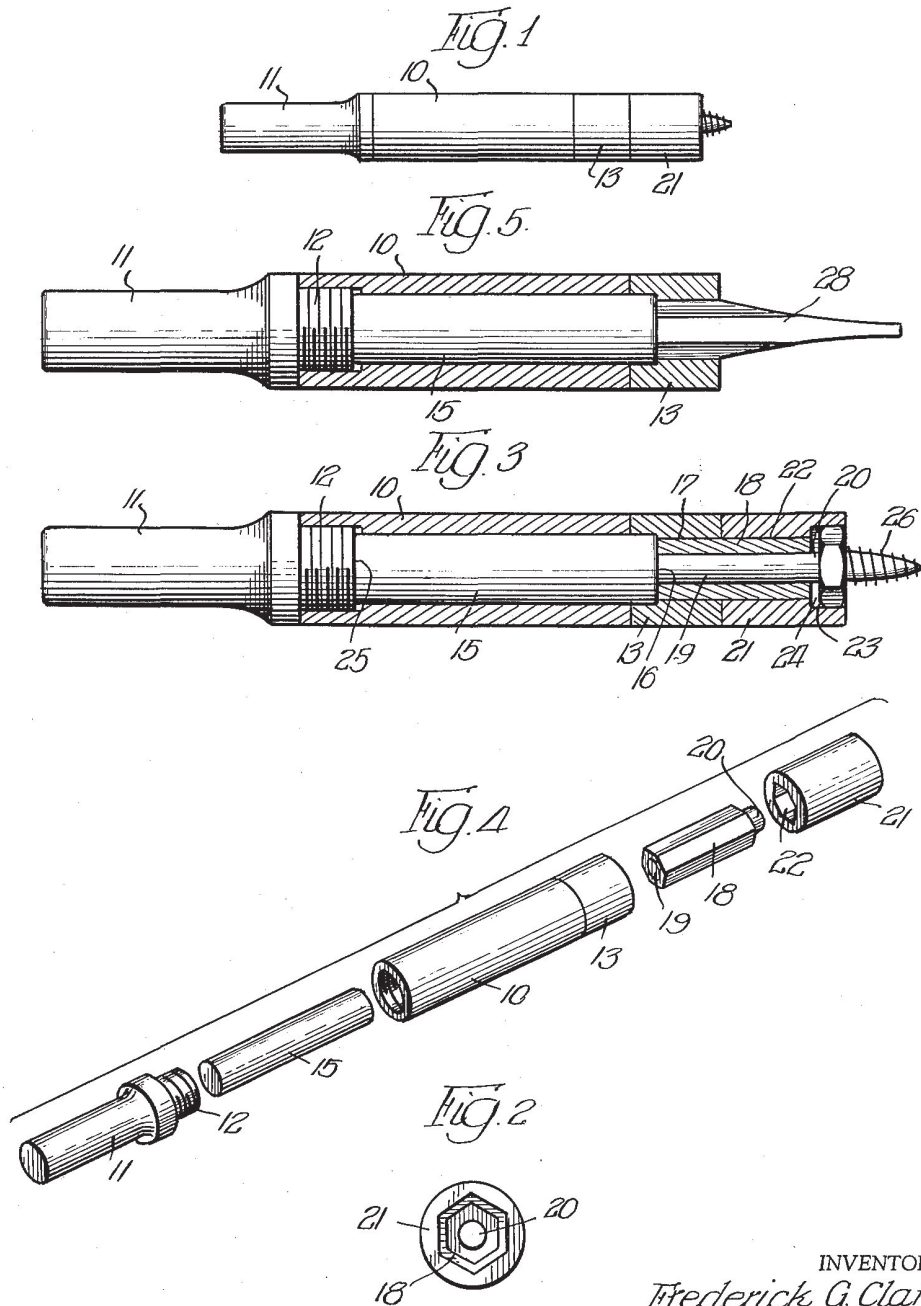
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MAGNETIC TOOL HOLDER

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1

3,007,504

MAGNETIC TOOL HOLDER

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This invention relates to magnetic tools, and more particularly to tools adapted to magnetically hold and drive a multiplicity of different types of screws or the like.

In United States Letters Patent No. 2,550,775, there is disclosed and claimed a magnetic screw driver capable of use with a plurality of different screw driving bits. For instance, the patented tool referred to can be supplied interchangeably with bits of the cross-slot, "Phillips," or other types, all of which are capable of being magnetically held in driving position and of imparting magnetic force to the tip of the bit for holding the particular screw employed in working relationship thereon.

Whereas the tool of said patent has been extensively used and has been highly successful in practice, there has developed a desire and a need for greater universality in the types of screws and the like that can be processed by a single tool. For instance, it is highly desirable to be able to drive screws having hexagonal or other multi-sided heads, or in other words, to provide a tool which will accommodate driving means in the nature of socket wrenches and the like. It is further desirable for such tools to be capable of accommodating the regular screw bits of the types now employed by the tool construction of said Letters Patent No. 2,550,775, as well as socket and other driving devices. Finally, the tool that is sought must accommodate socket ends and the like over a wide range of sizes including those that are larger in diameter than the diameter of the shank, or of the diameter of screw bits previously employed, and yet be capable, for all sizes, of exerting a magnetic holding force on the screw employed therewith in the same manner that the bits of said prior patent exert a magnetic holding force on the "Phillips," cross-slotted, or other screws.

It may be pointed out that the magnetic force employed in tools of this kind are such that it is not possible to accomplish the objectives here expressed by merely providing a plurality of suitably shaped socket members having hexagonal or like shanks and selectively inserting them in the tool illustrated in said patent in place of the screw driver bit illustrated as employed therewith. This simple method of approach is not possible for the reason that most sockets that require a head extending outwardly beyond the shank will set up magnetic lines of force which will defeat the objective of holding the screw or the like in the socket. In fact, the lines of force will extend rearwardly of the tool from the nearest corners of the socket extension, with the result that the magnetic holding action for the screw will be defeated. Tests have shown that when such constructions are employed, the screw is actually repelled from the socket rather than held therein.

The applicant has now discovered a new construction of tool of the type referred to, which is capable of providing interchangeability for all types and characters of bits or sockets, irrespective of whether or not the end thereof that extends outwardly is larger in diameter than the diameter of the shank.

It is an object of this invention to provide a new and improved magnetic tool adapted to receive, interchangeably, a plurality of tool endings such as bits, sockets, and the like, but which is capable of driving screws and similar fasteners while the same are magnetically held in contact with the tool.

These and other objects not specifically enumerated

2

will readily appear to one skilled in the art as the following description proceeds.

This invention proceeds upon the discovery that the construction of tool illustrated in said Letters Patent No. 2,550,775 can be modified by replacing a limited portion of the outer end of the nonmagnetic sleeve encasing the magnet with magnetic material, and that when this is done, the magnetic portion so supplied constitutes a magnetic member capable of holding a tool extension or ending of a type adapted to accommodate polygonal headed screws or the like.

It has been discovered that in order to realize the advantages herein referred to, it is necessary to restrict the length of the encasement of the magnet in the magnetic portion of the sleeve or casing in relation to the length of the encasement of the magnet in the non-magnetic portion of the sleeve or casing in order to preserve that degree of magnetism in the bit or other tool ending required for the work to be done. Accordingly, by selecting a magnet of proper length and adjusting its position in relation to the nonmagnetic and magnetic portions of the sleeve or casing in such manner that one half or more of the length of the magnet is encased in the non-magnetic portion of the casing, a new and useful result is accomplished in that a large number of different tool ends can be selectively employed, as hereinafter described, and the magnetic force imparted to the end of the tool for holding a screw or the like can be selected to accommodate the needs of any particular use.

By making the end portion of the sleeve of magnetic material, tool ends, such as socket wrenches and similarly shaped devices, can be applied thereto and provided with sufficient diameter to accommodate various sizes of polygonal and similar tools, while at the same time maintaining a sufficient magnetic force on the end of the tool to magnetically hold the screws and the like in working association therewith.

A further advantage is realized from this invention in that the magnetic portion of the sleeve or casing which holds and drives the bit or equivalent tool can be hardened to a greater hardness than any applicable non-magnetic material with the result that the magnetic tool holder has greater strength and durability.

One particular form of this invention which has been found to serve satisfactorily is illustrated in the accompanying drawing, in which:

FIGURE 1 is a side view of the magnetic tool holder embodying the invention.

FIGURE 2 is an end view of the magnetic tool holder shown in FIGURE 1.

FIGURE 3 is a side view partially in section of the magnetic tool holder shown in FIGURE 1.

FIGURE 4 is an exploded view showing the parts in their relative positions before assembly.

FIGURE 5 represents a modified form of the magnetic tool holder embodying the invention.

Referring now to the drawings, there is shown a shell portion generally denoted by the numeral 10. The shell portion should be made from relatively magnetically non-permeable material such as copper, brass, or austenitic stainless steel. Secured to one end of the shell 10 is the shank portion 11 by any suitable means. The shank portion 11 is of such a shape that it may be drivingly held by the driving means such as some suitable type of an electric or pneumatic motor.

A hollow cylindrical member 13 is permanently secured to the other end of the shell 10 by some suitable means such as brazing or welding and as will be seen later on, forms a work piece holder receiving end. The cylindrical member 13 is made from a magnetically permeable material such as a nonaustenitic steel.

A bar magnet 15 of substantially the same length as

3

shell 10 is assembled therein. As best shown in FIGURE 3, the bar magnet abuts at one end on the shank 11 and terminates at the other end near the joint between the shell 10 and the cylindrical member 13. The magnet 15 will at least extend to the joint and will generally extend part way into the cylindrical member 13 as will be seen later on. The magnet 15 may in some instances terminate short of the joint but should be sufficiently close so that the cylindrical portion 13 due to the magnetic field becomes magnetized.

In the preferred embodiment the bore 17 of the cylindrical portion 13 is of a noncircular cross section such as a hexagonal configuration which is particularly adapted for this use. A second shell member 18 of substantially the same size and cross sectional shape as that of the bore 17 is slidably received therein. The shell 18 is made of a magnetically nonpermeable material. A magnetically permeable member 19 is secured within the shell 18 and is adapted at the end 16 to abut the magnet 15. The other end of the magnetically permeable member 19 extends beyond the end of the shell 18 to form the extended portion 20.

Abutting the other end of the cylindrical portion 13 is the workpiece holder 21. The workpiece holder 21 is provided with the bore 22 which slidably receives the shell 18. The bore 22 is of a noncircular cross section substantially of the same cross section as that of the shell 18, so that the workpiece holder 21 is prevented from rotating with respect to the cylindrical portion 13. The workpiece holder 21 is made of a magnetically permeable material such as a nonaustenitic ferrous alloy. It can now be seen that the workpiece holder is held to the cylindrical portion 13 by the magnetic forces transmitted therethrough.

The workpiece holder 21 is provided with the noncircular chamber 23 which receives the screw 26 which is to be driven as will be seen later on. However, it is apparent that the workpiece holder 21 may be adapted to receive either nuts or polygonally headed screws in a large variety of sizes. As is best shown in FIGURE 3, the extended portion of the magnetically permeable member 19 is substantially coplanar with the shoulder 24 of the workpiece holder 21. Thus, when the workpiece is placed in the chamber 23, it is in touching relationship with the extended portion 20. By this arrangement the magnetic forces which are transmitted through the magnetically permeable member 19 from the magnet 15 are utilized to hold the workpiece in driving position.

When the magnetically permeable member 19 is in abutting relationship with the bar magnet 15, it can be seen that the magnetic poles are the end 25 of the bar magnet 15 and the extended portion 20 of the magnetically permeable member 19. As shown in the drawing substantially more than half of the magnet is confined within magnetically nonpermeable material. In this manner the amount of leakage of the magnetic flux is minimized so that substantially all of the flux is directed to the workpiece in the chamber 23. If more than half of the magnet is adjacent to magnetically permeable material, then the magnetic circuit would be completed so that the magnetic force directed to the workpiece holder would be substantially diminished.

As was mentioned previously, the magnetic tool holder is readily adaptable for driving slotted screws, as shown in FIGURE 5. In this instance the workpiece holder 21 and the shell 18 are removed from the assembly shown in FIGURE 3. In place of the shell 18 the shank 29 of a work piece holder such as the screw driver 28 is inserted into the cylindrical member 13. The screw driver 28 is constructed of a magnetically permeable material so that it is magnetically held to the magnet 15. At the same time the magnetic forces are transmitted to the tip of the screw driver 28 so that the screw will be held thereto.

From the foregoing description it can readily be seen

4

that the workpiece holder 21 may be easily removed from its assembled position and a workpiece holder having a different size or shape chamber 23 substituted therefor. In this manner the magnetic toolholder embodying the invention is readily adaptable to relatively small production operations in which it is necessary to drive a large variety with regard to size and shape of screws, nuts, etc.

Moreover, the workpiece holder may be fabricated from a magnetically permeable material such as a non-austenitic ferrous alloy. Such materials are readily hardenable so that they have excellent wear resisting properties. Thus the useful life of the workpiece holder is considerably greater than that heretofore possible so that a considerable economy in maintenance can be realized.

It is apparent that certain modifications may be made within the scope of the claims without departing from the spirit of the invention.

It is to be understood that in the preferred form of the invention the bit or other tool member placed in the work piece holder receiving end is actually in physical contact with the end of the bar magnet but that in other but satisfactory forms the bit or other tool may be slightly spaced from the end of the bar magnet, provided only that the spacing is not so great as to destroy the desired effect of the magnet upon the bit or other tool. Accordingly the term "engagement" as used in the appended claims should be construed to mean actual physical engagement between these parts or a near physical engagement which provides only a spacing insufficient to destroy the magnetic holding action on the bit or other member.

I claim:

1. A magnetic tool holder comprising a shell having a first tubular portion of magnetic material forming a work piece holder receiving end and a second tubular portion of non-magnetic material forming a drive end, said first and second tubular portions being secured together in a substantially coaxial abutting relationship, said second tubular portion adapted to cooperate with means for driving the tool holder, said work piece holder receiving end including a bore of non-circular cross-section, a bar magnet having more than half of its length disposed within the non-magnetic portion of the shell, and a screw driver of magnetic material having a non-circular shank removably mounted within said work piece holder receiving end and in engagement with said magnet.

2. A magnetic tool holder comprising a shell having a first portion of magnetic material having a through bore forming a work piece holder receiving end and a second portion of non-magnetic material forming a tubular drive end, said first and second portions being secured together in a substantially coaxial abutting relationship, and a bar magnet having more than half of its length disposed within the non-magnetic portion of the shell, at least a part of said through bore of said first portion having a non-circular cross section adapted to receive a work piece member and to magnetically hold and to drive the same when said member has at least a part thereof of magnetic material, in engagement with said bar magnet.

3. A magnetic tool holder comprising a shell having a first portion of magnetic material having a through bore forming a work piece holder receiving end and a second portion of non-magnetic material forming a tubular drive end, said first and second portions being secured together in a substantially coaxial abutting relationship and a bar magnet having more than half of its length disposed within the non-magnetic portion of the shell, at least a part of said through bore of said first portion having a non-circular cross section and a driven member having a non-circular shank removably mounted within said work piece holder receiving end and having at least a magnetic portion in engagement with said bar magnet.

4. A magnetic tool holder of the construction defined in claim 3, further characterized in that the non-circular shank comprises an outer shell of non-magnetic material

3,007,504

5

and a core of magnetic material, the core having exposed ends with its inner end in engagement with said bar magnet when the non-circular shank is mounted in said bore.

5. A magnetic tool holder of the construction defined in claim 4, further characterized in that a work piece receiving member having a non-circular bore is mounted on said non-circular shank so as to be driven thereby and held in abutting coaxial engagement with said first tubular portion.

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2,677,294
2,714,829
2,718,806
2,838,082

10

References Cited in the file of this patent

UNITED STATES PATENTS

2,550,775 Clark ----- May 1, 1951

6

Clark ----- May 4, 1954
Clark ----- Aug. 9, 1955
Clark ----- Sept. 27, 1955
Lange ----- June 10, 1958

FOREIGN PATENTS

Germany ----- Sept. 13, 1921
Canada ----- June 22, 1952