June 1, 1954 L. E. KRAFFT 2,679,778

FLEXIBLE ROTARY TOOL

Filed April 2, 1953

Fig. 2

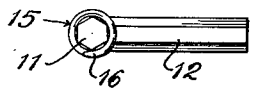


Fig. 1

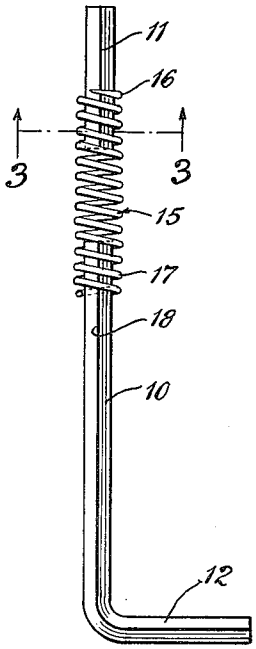


Fig. 3

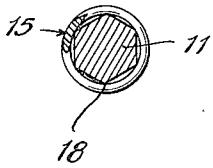


Fig. 4

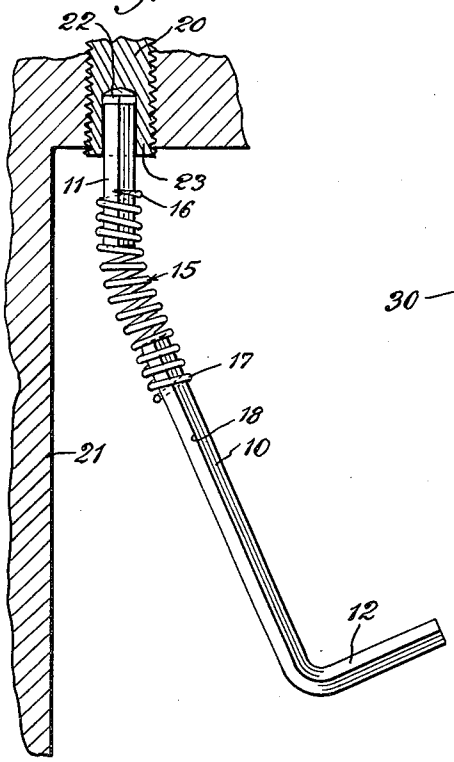
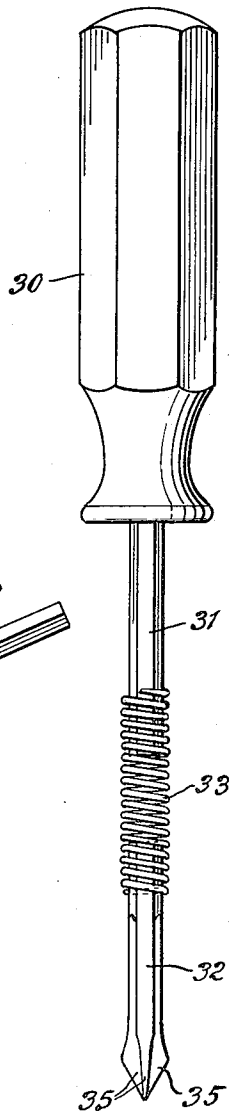


Fig. 5



Inventor
Lewis E. Krafft
By W. Bartlett Jones,
Attorney

Patented June 1, 1954

2,679,778

UNITED STATES PATENT OFFICE

2,679,778

FLEXIBLE ROTARY TOOL

Lewis E. Krafft, Hanover Township, Cook County, Ill., assignor to Aetna Manufacturing Company, Bensenville, Ill., a corporation of Illinois

Application April 2, 1953, Serial No. 346,433

3 Claims. (Cl. 81—71)

1

The present invention relates to flexible rotary tools, and in particular to a structure rendering such tools flexible.

Numerous tools such as drills, screw drivers and socket wrenches are frequently needed in tight places where the location of the work makes ordinary inflexible tools difficult or impossible to handle. It is known that such tools may be rendered flexible in various ways, and the present invention is directed to a simple structure for that purpose.

It is a general object of the present invention to join two shank portions of a rotary tool by means of a flexible coiled spring.

It is a particular object of the invention to pinch the shank within the spring by a forced fit.

It is still another object of the invention to provide either a shank or spring strand or both of such cross section that the tightness of the fit between them is assured.

Various other and ancillary objects and advantages of the invention will become apparent from the following description and explanation of the presently preferred forms of the invention shown in the accompanying drawing, in which:

Fig. 1 represents a bar wrench of conventional right-angular form embodying the invention.

Fig. 2 is a plan view of the wrench as seen in Fig. 1.

Fig. 3 is a cross section of the wrench shown in Fig. 1 and is taken on line 3—3 thereof.

Fig. 4 shows one manner of using the wrench of Fig. 1.

Fig. 5 represents any other type of rotary tool, specifically a screw driver with a Philips head.

For the present invention, any tool which is used in a rotary manner, either a bar wrench, a screw driver, or a drill, has its main straight shank divided into two portions which are normally endwise separated. In accordance with the present invention, a flexible coil spring is employed to connect the separated shank portions. The shank portions and the spring are so designed and related to each other that the shank may be force-fitted into the end of the spring to give a sufficiently tight union for the uses of the particular tool. Of course, these uses may vary over a wide range, but the normal and practical uses thereof are contemplated as the principal goal.

Although either one or both of the two separated shank portions may be round in cross section, it is preferred that each portion has a polygonal cross section, thereby to provide corner

2

lines running generally lengthwise of the shank into which the coils of the spring may forcibly engage. Where a polygonal cross section is employed, it may be triangular, quadrilateral, or many-sided, with or without regularity in design. A regular polygonal form of bar is represented in Fig. 1 by the material conventionally used when a cut end thereof fits a socket in a member to be turned. This has a regular hexagonal cross section, and the corner lines of the shank are straight lines. However, if desired, a twist may be introduced without in any way departing from the utility of the polygonal cross section for the present invention.

In Fig. 1 a common bar wrench with a hexagonal cross section is cut into two portions 10 and 11, the longer section 10 having the usual right angular extension 12 thereof as a structure useful as a handle when the opposite end is the working end. With the shank portions 10 and 11 endwise separated, they are connected by a coil spring 15, one end 16 of which has a forced fit with the shank portion 11, the other end 17 having a forced fit with the shank portion 10. The shank portions are forced into the spring thereby slightly to expand the coils. They may be forced in axially, or screwed into place, the preferred manner depending upon which metal is the harder. The normal tendency of the coils to contract causes the coils to grip the shank and make contact therewith at the corner lines one of which is designated 18.

The strand of which the spring 15 is made is preferably circular spring wire whereby the area of contact of the coils at the corner lines 18 is limited and thereby the gripping force between the coil and shank is greater per unit of area. The contact of the corner lines 18 with the round of the wire to a slight degree upsets the metal of one part or the other forming contact areas tending to lock the union against twisting.

Fig. 4 illustrates a corner in which a socket head screw 20 is mounted, in which screw the wrench of Fig. 1 is inserted for rotary use at the illustrated angle. In Fig. 4 the designated wall 21 is so located that a standard inflexible socket wrench, such as that in Fig. 1 without the spring, could not be turned through a complete revolution. By means of the flexible connection the screw 20 may be readily turned by the wrench of Fig. 1 through several complete revolutions.

The wall 23 surrounding the socket 22 in screw 20 may be considered as a sort of jig holding the wrench section 11 in its axial position for

rotation. Thus, the invention may be applied to produce flexible drills when there is provided a suitable jig or its equivalent to hold the working end of the tool, namely a drill, in axial alinement for its drilling operation.

Fig. 5 represents another form of tool embodying the invention, namely a screw driver having a conventional handle **30**, a straight shank **31** inserted in the handle, a Philips head **32** endwise separated from the shank **31**, and a connecting spring **33**. The two shank portions **31** and **32** of the screw driver are hexagonal, which is conventional for many forms of such tools with a Philips head. The Philips head for a screw driver is preferred over a single blade screw driver, because the Philips head has in effect the four quadrant blades **35** which in use of the illustrated tool in a flexed position hold the head in the Philips slot of the screw being worked. A single blade screw driver tends to slide out of its slot at certain positions in its operation, as may be well understood. However, it is not intended that a single blade screw driver head is inoperable in connection with a flexible shank, because this type of flexible tool is well known, although otherwise constructed.

The present invention is not to be considered as limited to or by the embodiments above illustrated and described, and numerous variations and applications may be made without departing from the invention as expressed in the appended claims.

I claim:

1. A rotary tool comprising two endwise separated straight shank portions each polygonal in cross section, and a coiled spring connecting said portions, one shank portion having at its free end handle-means extending laterally therefrom to facilitate rotatary manipulation of said shank portion, the other shank portion having at its free end a working structure adapted to engage an element to be turned thereby as a result of rotary movement imparted to said shank portion through said spring, the other ends of each shank portion being housed within an end portion of the spring, said end portions of the spring being slightly expanded by a forced fit whereby engagement of the spring and each shank is limited to the corner lines of the polygonal shank.

2. A rotary tool comprising two endwise separated straight shank portions each polygonal in cross section, and a coiled spring of wire which is round in cross section connecting said portions, one shank portion having at its free end handle-means extending laterally therefrom to facilitate rotary manipulation of said shank portion, the other shank portion having at its free end a working structure adapted to engage an element to be turned thereby as a result of rotary movement imparted to said shank portion through said spring, the other ends of each shank portion being housed within an end portion of the spring, said end portions of the spring being slightly expanded by a forced fit whereby engagement of the spring and each shank is limited to the corner lines of the polygonal shank.

3. A flexible bar wrench for hexagonal sockets comprising two endwise separated hexagonal shank portions, one being a straight portion and the other having a right-angle bend therein, and a coiled spring connecting said portions, the end of each shank portion being housed within an end portion of the spring, said end portions of the spring being slightly expanded by a forced fit whereby engagement of the spring and the shank is limited to the six corner lines of the hexagonal shank.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
211,918	Lombard	Feb. 4, 1879
519,354	Sheppard	May 8, 1894
1,187,497	Canfield	June 20, 1916
2,372,930	Bovee	Apr. 3, 1945

FOREIGN PATENTS

Number	Country	Date
637,927	Great Britain	May 31, 1950
1,010,858	France	Mar. 26, 1952