FLEXIBLE EXTENSION OR SHANK FOR TOOLS

Hobert B. Jones, 829 Kenmore Blvd., Akron, Ohio
Filed Apr. 29, 1959, Ser. No. 809,686
1 Claim. (Cl. 81—177)

This invention relates to a flexible extension or shank for tools, and, more particularly, is concerned with the provision of tools or the provision of extensions for socket wrench sets and the like to facilitate the application of the tools to, and the use of tools in hard-to-get places.

A complete set of socket wrench tools today includes a wide variety of handles, extensions, sockets, wrenches, and the like all of which are interchangeably interfitting so that a wide variety of operations can be performed upon nuts, bolts, and so forth, in many difficult, hard-to-get-to positions. However, in spite of the flexibility of commercially available equipment there are still certain angles, attitudes, and locations where known tool equipment cannot function efficiently, or at all, and especially is this true in modern automobiles wherein space for working on the engine or other parts of the car is extremely limited or awkwardly positioned.

It has been practiced heretofore, for example in U.S. Patent No. 1,316,398 to provide a tool having a link chain forming a shank between a handle and a wrench head, the shank being capable of bending in one plane to aid in getting the tool into hard to reach operating positions. However, tools of the type shown in the indicated patent have not proven acceptable commercially and it is believed due to the fact that the links of the chain are so free and floppy in the plane in which they have bending movement that control of the tool is difficult and annoying.

It is the general object of the present invention to avoid and overcome the foregoing and other difficulties of and objections to known tools of the type described by the provision of relatively simple, inexpensive and practical flexible extensions or shanks for tools of the type described and which will facilitate and aid a mechanic and machinist in performing machine work otherwise particularly annoying or difficult to perform.

Another object of the invention is to provide a flexible shank between the handle and the head of the tool, or a flexible extension adapted to be removably secured at one end to a handle and at the other end to a tool and wherein a pivoted link chain is utilized bendable in one plane only, the chain being associated with resilient means normally tending to hold it straight, and/or frictionally resisting kinking movement of the chain links.

The foregoing objects of the invention, and other objects which will become apparent as the description proceeds, are achieved by the provision of in a tool of a shank portion including a pivoted link chain freely bendable in one plane only, and resilient means associated with the chain tending to hold it straight and resiliently opposing its bending movement in its bendable plane. The resilient means preferably takes the form of an oil resistant, resilient plastic cover molded or otherwise formed around the chain when it is straight.

For a better understanding of the invention reference should be had to the accompanying drawings wherein:

FIG. 1 is a side elevation, partially broken away, of a flexible extension incorporating the principles of the invention;

FIG. 2 is a fragmentary view of an embodiment of the invention in which a handle is permanently secured to a flexible shank;

FIG. 3 is a fragmentary side elevation of a straight handle adapted to be removably secured in the socket end of the extension of FIG. 1;

FIG. 4 is a fragmentary side elevation of a ratchet handle adapted to be secured in the socket portion of FIG. 1;

FIG. 5 is a fragmentary side elevation of a rotary type handle adapted to be removably secured in the socket portion of FIG. 1;

FIG. 6 is a side elevation of a socket adapted to be removably secured to the plug end of the extension of FIG. 1;

FIG. 7 is a perspective view of an open-ended wrench having a socket portion adapted to be removably secured to the plug of the extension of FIG. 1;

FIG. 8 is a perspective view of a closed-end wrench having a socket portion adapted to be removably secured into the plug of the extension of FIG. 1;

FIG. 9 is a fragmentary perspective view of a wrench permanently secured to the end of a flexible shank and forming another embodiment of the invention;

FIG. 10 is a cross-sectional view taken on line 10—10 of FIG. 1; and

FIG. 11 is like FIG. 9 but shows another embodiment of the invention.

In the drawings, the numeral 10 indicates generally a pivoted link chain freely bendable in one plane and having little or no bending movement in any other plane. Secured to one end of the chain is a socket member 12 adapted to removably receive in a socket recess 14 the polygonal plug of any one of a plurality of handles, for example such as shown in FIGS. 3, 4 and 5.

The handle of FIG. 3 includes a polygonal plug 16 including a spring detent 18 adapted to be removably received in the socket opening 14 of the socket 12.

FIG. 4 shows a ratchet type handle including ratchet mechanism 20, a handle 22, and a polygonal plug 24 including a spring detent 26 adapted to be removably received in the socket opening 14 of the socket 12.

FIG. 5 includes a handle portion 28 rotatably receiving a rotary brace 30 which terminates in a polygonal plug 32 having a spring detent 34, and with the plug 32 removably fitting in the socket opening 14 of the socket 12.

The other end of the chain 10 has secured thereto a polygonal plug 36 having a spring detent 38, the plug 36 being adapted to removably fit in any of a plurality of tools, for example those shown in FIGS. 6 to 8.

In FIG. 6 is shown a socket 40 having an opening 42 adapted to fit a certain size nut or bolt head, the other end of the socket having an opening 44 adapted to removably receive the polygonal plug 36.

FIG. 7 shows an open end wrench 46 having a socket opening 48 adapted to removably receive the polygonal plug 36. The socket opening 48 being adapted to receive the plug 36 and the spring detent 38 so that the flat plane of the wrench 46 is parallel to the pivots in the chain 10, as seen, for example in FIG. 9.

In FIG. 8 is illustrated a closed end wrench 50 having a socket opening 52 adapted to removably receive the polygonal plug 36, again so that the flat plane of the wrench is parallel to the pivots in the chain. Thus, torque can be applied through the chain to rotate the flat wrench in its own plane.

The embodiment of the invention illustrated in FIG. 10 illustrates a construction in which an open end wrench 54, or other suitable tool, is permanently secured to a pivoted link chain 56 which is covered with a suitable plastic cover 58, as hereinafter more fully described.

In the embodiment of the invention illustrated in FIG. 12 a handle 60 is permanently secured to a pivoted link chain 62, the chain being covered with a suitable plastic 64, as hereinafter more fully described.
The chain 10 is covered with a suitable oil-resistant, resilient plastic 66 which is molded to and around the chain 10. The plastic 66 is formed on the chain by a dipping operation, or by a metal molding operation to provide a very intimate and surrounding cover for the chain, this being done with the chain 10 straight. Suitable materials include neoprene, some of the new polyvinyl chloride plastisols, and the like, with the plastic cover 66 functioning to hold the chain 10 normally straight, but with the cover 66 yielding resiliently to allow bending of the chain in its bendable plane. FIG. 10 illustrates a typical cross section of the chain 10 with the body 66 of plastic molded to and surrounding the chain. The invention particularly contemplates that the plastic 66 be molded to or adhered to the chain, with or without the use of bonding adhesives, metal plating on the chain to improve the bond, or the like. However, at least some of the advantages of the invention are achieved if the covering body 66 of plastic merely fully surrounds and supports the chain without being completely vulcanized thereto.

The plastics 58 and 64 of the forms of the invention shown in FIGS. 9 and 2, respectively, are like the plastic 66 and are formed on the chains in similar fashion. The embodiment of the invention shown in FIG. 11 illustrates a polygonal plug 36a secured to the end of a chain 10a and having a plastic cover 66a. The plug 36a has an outside dimension of, for example, ½ inch to fit any ½ inch socket or tool, and an inside dimension of opening 70 of, for example ¾ inch to fit any ¾ inch plug. Thus providing plugs 36a of the indicated type at both ends of chain 10a makes a very convenient attachment and adapter capable of using ½ inch or ¾ inch handles, and tools.

While in accord with the patent statutes, certain best known embodiments of the invention have been illustrated and described, it is to be understood that the invention is not limited thereto or thereby, but that its scope is defined in the appended claim.

What is claimed is:
The combination in a tool of a pivoted link chain having all of the pivots parallel to each other so that the chain can bend in one plane only, an oil resistant, resilient plastic cover molded over and to the chain when it is straight, said cover tending to always return the chain to a straight shape and resiliently opposing its bending movement in its bendable plane, a polygonal post secured to one end of the chain, a spring detent in the post, a socket, a flat wrench secured to the socket, said socket being adapted to fit the post and the spring detent so that the plane of the flat wrench is held parallel to the pivots in the chain, a socket secured to the other end of the chain, and a handle adapted to be removably received in the last-named socket.

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