Jan. 9, 1951 W. VIETS 2,537,175

RATCHET TYPE SOCKET WRENCH

Filed July 6, 1946

FIG. 1.

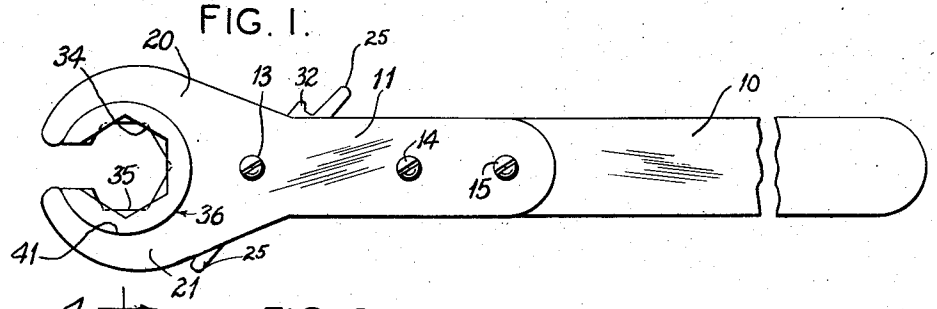


FIG. 2.

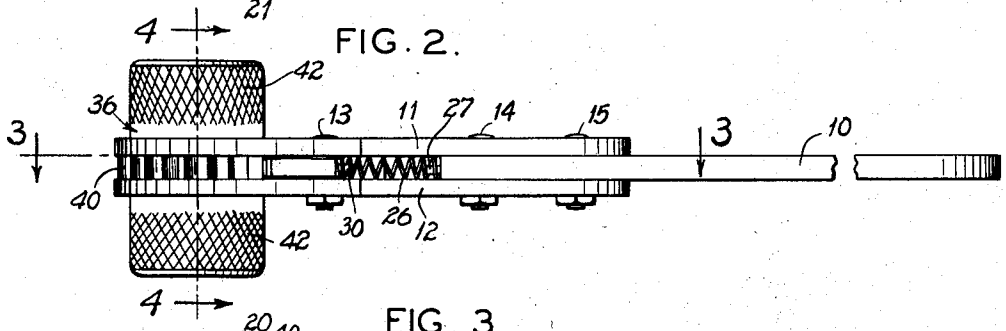


FIG. 3.

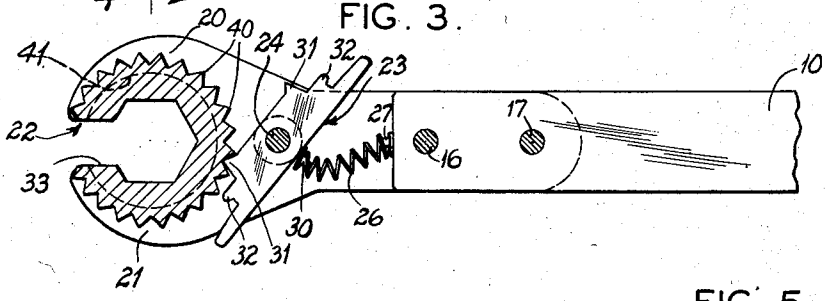


FIG. 4.

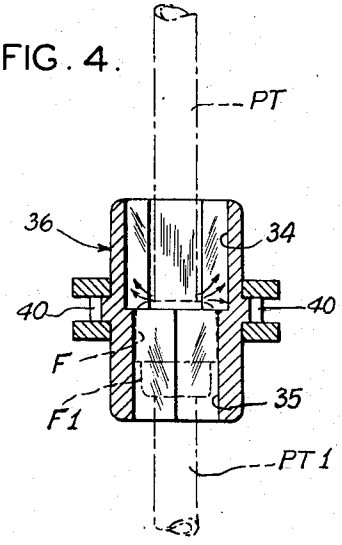
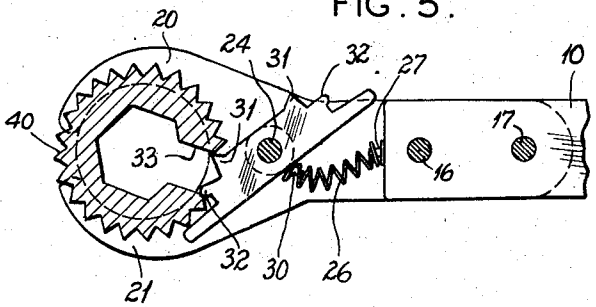


FIG. 5.



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Patented Jan. 9, 1951 2,537,175

UNITED STATES PATENT OFFICE

2,537,175

RATCHET TYPE SOCKET WRENCH

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Application July 6, 1946, Serial No. 681,687

2 Claims. (Cl. 81—63)

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This invention relates to improvements in ratchet wrenches, and more particularly to a side-open socket wrench assembly which is particularly, but not exclusively, adapted to use on threaded fittings, for example, the hexagon connections employed with high pressure tubing, as in refrigerant and like systems.

There have heretofore been known and utilized socket wrenches of ratchet type, in which both the wrench head and socket element are of side open type, enabling application of the wrench assembly laterally onto a threaded fitting or nut, or alternately, lateral application of the assembly to a rod, tube or the like. As far as is known, wrenches of the type referred to are all subject to a defect or disadvantage, in that, when under ratchet operation, the pawl encounters the side recess in the socket, it may enter such recess and preclude further actuation of the fitting, at least without resetting the wrench thereon. Also noted as a series shortcoming is the fact that, in conventional tools of the type noted, it has heretofore been impossible to actuate the socket element through a full turn without resetting the wrench. It is accordingly a major objective of the present improvements to obviate the noted inadequacies of existing ratchet wrench structures, and to enable, in a side-applicable wrench assembly, substantially a full revolution of the nut-engaging structure and to render possible such actuation by minor, angular movements of the lever or handle portion of the tool.

A further and important objective is realized in a wrench structure of the type referred to, and such that, when used with fluid pressure connections, the socket will serve as a shield to protect the operator against liquids or gases emitted under pressure from a loosened connection.

An additional important objective is realized in a ratchet wrench of socket type in which the socket element is extended substantially beyond its ratchet portion, and is particularly conformed in such extended part to facilitate actuation of the socket by rotation within the wrench head, while axially positioned by the latter, all in a manner greatly to aid the starting application of a threaded connection such as a nut, or polygonal fittings generally.

A general object of the present improvements is realized in a tool of the character referred to characterized by improved ease of pawl shift, better balance of the assembly, improved facilities for substitution of socket elements in the wrench head, and an improved design throughout the assembly.

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A noteworthy objective identified with the socket structure per se, is realized in an improved construction of double socket element such as to effect considerable economies of production and advantages in use. The sockets are formed as by broaching, with their nut-engaging portions mutually out of register. This formation results in an abutment for each socket, limiting the depth of application of the socket over a nut or fitting received by the companion socket.

The foregoing and numerous other objects will appear from the following detailed decription of a presently preferred embodiment of the invention, as illustrated by the accompanying drawings, in which

Fig. 1 is a plan view of a ratchet socket wrench assembly, as presently improved;

Fig. 2 is a side or edge elevation of the assembly of Fig. 1;

Fig. 3 is a top or plan view, with certain parts shown in section, the sectional portions being taken along line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken longitudinally of a double socket element, particularly as viewed along line 4—4 of Fig. 2, and showing in dotted lines a high-pressure fluid connection of a nature particularly exemplifying certain functions of the improved socket; and

Fig. 5 is a view similar to Fig. 3, but showing the socket rotated relative to the wrench head, slightly beyond a half revolution, to illustrate the relation between the pawl and the side aperture of the socket structure.

Referring now by characters of reference to the drawings, the wrench structure of the present invention includes a handle 10 which may consist of an element of a flat metal stock, such as a suitable mild steel, or if desired, of tool steel or the like. The wrench head may be regarded as comprised of two spaced parallel plates, 11 and 12, assembled to each other and to the handle 10 as by a suitable plurality (shown as three) of fastening elements 13, 14 and 15. The plates and handle may be permanently united as by riveting although it is preferred, in order to facilitate interchange and substitution of sockets, to utilize machine screws or bolts in assembly, these being exemplified by the kerfed head screw elements shown, and provided with nuts engaging the opposite plate, suitable screw apertures such as 16 and 17 being provided in the component elements.

The two plates 11 and 12 are extended to form spaced component parts of an open end wrench,

the jaws of which are indicated at 20 and 21, with an end opening 22 therebetween.

A pawl generally indicated at 23 is preferably of symmetrical form, provided with a central pivot aperture 24 through which extends the pin or screw 13 as a pawl pivot. The length of the pawl 23 in each direction from the pivot is such that in either limit of its movement, as hereafter described, an extension or finger piece projects laterally beyond the head and is provided with ends 25 enabling ease of pawl shift as by the forefinger of the hand grasping the wrench handle. A spring 26 abuts the end face of the handle 10, and is retained by a positioning pin 27 at this end, and a similar positioning pin 33 just opposite the pivoted zone of the pawl. The length and loading of spring 26 are such that a toggle relation exists, imparting maximum compression to the spring when the pawl is in a centered or transverse position. Thus as the pawl is shifted by forward movement of either end, such movement will be completed by the spring until the pawl movement is limited by its engagement with the ratchet of the socket member, hereinafter described.

The pawl teeth are shown as four in number, two on each side of the pawl axis. An operative structure may consist of only two such pawl teeth, each of which, indicated at 31, will function selectively according to throw of the pawl, the extension of the pawl endwise beyond each tooth 31 rendering it impossible for the pawl to enter the socket proper through the side opening thereof. Better results are, however, attained by the addition of a further tooth 32 on each side, by reason of which it will appear that, even though the recess of the socket fall opposite the pawl, the two teeth currently presented toward the socket, will always be in position to engage the socket recess, or by a minor movement of the handle may be brought to a position so that one thereof may engage one of the ratchet teeth (hereinafter described) on the socket structure. Furthermore, the design of pawl and relation of its teeth to the ratchet teeth, and to the width of side opening of the socket, are such that in spite of the interruption of the band of ratchet teeth, the socket may be displaced by small angular step-by-step movements of the wrench head through a full circle of relative movement of the head and socket. Stated somewhat differently, the pawl, in either of its extreme positions will operatively and structurally bridge the gap or side opening in the socket. In most cases, when the side recess of the socket comes opposite the pawl, one of the plurality, shown as two, of the pawl teeth will engage a ratchet tooth, either on one side or the other of the socket recess. In the occasional condition when neither of the adjacent pawl teeth will engage, only a minor angular handle movement is necessary to cause resumption of pawl-and-ratchet actuation of the socket.

Referring now more particularly to the socket construction per se, this is in the form of an elongate tubular element, say of tool steel or other wear-resisting metal or alloy, shown in Figs. 2 and 4 as a double socket element of much more than usual length. When utilized for lateral application over a rod or tube, the socket structure is provided with a full length longitudinal recess 33. This is desirably of a width at least equal to that of the end opening 22 in the wrench head, and should be of a width to enable the wrench to be easily laterally applied, for example over the length of pressure tubing PT which, for illustration, is assumed to be end-flared for connection to a rotatable internally threaded fitting F. The latter is secured in fluid tight relation to a male threaded fitting FI, the latter being sweated to a connected length of tubing PTI. Connections of this type are prevalent in the refrigeration industry.

It is preferred that each of the sockets 34 and 35 of the socket element, generally indicated at 36, be formed, for example, by broaching, and be mutually angularly displaced or out of register to the maximum possible extent. In this manner, as will appear from Fig. 4, each socket formation provides an internal abutment for a fitting F received in the other socket, a construction presenting considerable production economies over the formation of a separate internal annular collar or abutment. The double socket structure 36 is provided with a projecting interrupted band of ratchet teeth 40 which, in assembly, is received between and coacts in journalling relation with a cylindrical aperture 41 in each of the jaws of the wrench head. It will be noted from Fig. 4 that the extent of protuberance of the band of teeth is such as to assure a fixed axial position of the socket in the head, and at the same time to permit free rotation of the socket in a cylindrical aperture 41 of each of the jaws except, of course, as the socket and wrench are rotated together due to the action of the pawl.

It is preferred as a special convenience in manually starting to thread up the fitting, to provide the sockets 34 and 35 with a greater than usual axial extension such that each end thereof projects laterally beyond the ratchet portion, with a specially conformed outer surface. The type of such surface is optional, but it should at least be roughened as exemplified by the milling indicated at 42.

One feature of the presently illustrated wrench is particularly useful when employed as an aid in manual starting of a nut or fitting, although of value also under all conditions of usage of the tool, namely, an improved balance. Repeated experiments have shown that best balance is obtained when the parts are so proportioned that a center of gravity falls in a zone of the order of one third the distance from the free extremity of the wrench head to the opposite end of the wrench, being the full extremity of the handle.

The manner and advantages of usage of the improved wrench assembly are believed to have been rendered fully apparent from the foregoing description, but it is briefly noted that for application as in refrigeration work, the openings 22 and 33 are brought into coincidence, the wrench applied endwise toward, thence by preference laterally over the length of tubing PT. The chosen socket of the assembly 36 is then moved axially over the fitting F until the latter bottoms in the socket. Assuming it be desired to thread up the fitting, the pawl is moved to the position shown by Fig. 3, and with the handle 10 at a right angle to the tubing, the socket is manually actuated through portions 42, first utilizing the wrench only as a positioning agency. Upon further resistance by the fitting F, the wrench is oscillated in the usual manner so as to effect a step-by-step partial rotation of the socket, hence of the fitting. From Fig. 5 it will appear that after a half turn or so of the fitting at least certain of the pawl teeth will encounter the gap in the socket. However, due to the number and spacing of teeth there will still be enabled an engagement of a next ratchet tooth, in prac-

tically all cases by at least one of the operative pawl teeth, thus virtually eliminating the operative hiatus which would always exist with but a single operative pawl tooth. In the event of an occasional failure of full operative bridge of the socket gap by the pawl teeth, only a very small angular movement, of much less arcuate extent than the socket gap, will quickly restore the pawl and ratchet teeth to operative relation.

Assuming now unthreading actuation of the fitting be desired the pawl is thrown to an opposite operative position, and the fitting backed off from tightened relation. Occasionally, in emergency work, such fluid lines will remain under some pressure. The present preference in length of the socket structure is such that each socket is preferably of an order at least twice the actual length of the stardard fitting or nut to be engaged thereby. Thus the socket serves as a shield protecting the eyes, face and person of the operator, and even if a pressure fluid be released it will be constrained to flow along the tubing rather than outwardly therefrom, by the shielding effect of the elongate socket structure.

It will now have appeared that the tool as described will serve fully to attain the several objects enumerated, as well as other advantages implied from the foregoing description. Although, for completeness, the description has disclosed a preferred embodiment in detail, no limitation is thereby intended, because of the numerous variants possible within the intended scope of the claims hereto appended.

I claim as my invention:

1. In a socket wrench assembly, a wrench head and a handle connected therewith, a socket journaled in the head and having a side opening and ratchet teeth thereon, an elongated pawl extending transversely of the head substantially between the socket and the handle, means pivotally mounting the pawl on the head substantially midway of the length of the pawl, teeth on each end portion of the pawl in position for at least one of said teeth to engage the ratchet teeth and said teeth on each end portion of the pawl being in position to enter the side opening of the socket upon rotation of the socket to bring said opening into alignment with the teeth on one end of said pawl, and a handle on each outer end portion of the pawl projecting therefrom outwardly from the pawl teeth in position to bear against a side of the ratchet teeth and to limit entry of the pawl teeth into the side opening of the socket, one of said handles on each end of the pawl projecting externally of the head in each position of the pawl for moving the pawl selectively to different positions.

2. In a socket wrench assembly, a wrench head and a handle connected therewith, a socket journaled in the head and having a side opening and ratchet teeth thereon, an elongated pawl extending transversely of the head substantially between the socket and the handle, means pivotally mounting the pawl on the head substantially midway of the length of the pawl, teeth on each end portion of the pawl in position for at least one of said teeth to engage the ratchet teeth and said teeth on each end portion of the pawl being in position to enter the side opening of the socket upon rotation of the socket into alignment therewith, and a handle on each outer end portion of the pawl projecting therefrom outwardly from the pawl teeth in position to bear against a side of the ratchet teeth and to limit entry of the pawl teeth into the side opening of the socket, said handle on the pawl projecting externally of the head in one position of the pawl for moving the pawl selectively to different positions, the pawl teeth being arranged on the pawl in position to engage the ratchet teeth of the socket relatively close to the longitudinal plane through the wrench handle and through the axis of the socket, and a coiled spring bearing at one end against an end of the handle and at the opposite end thereof against a side of the pawl substantially at the axis thereof in position to provide yieldable snap action on the pawl.

WALTER VIETS.

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