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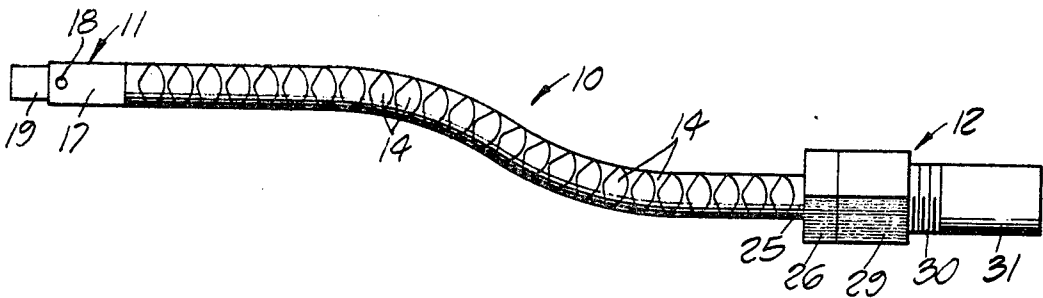
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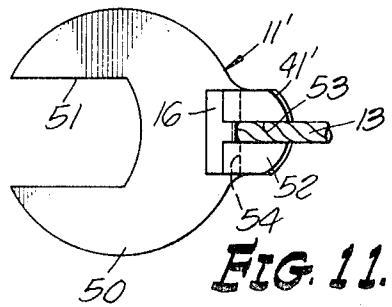
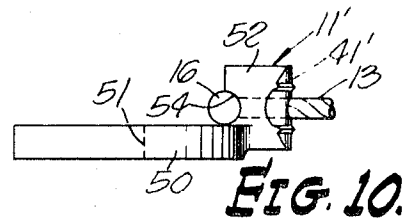
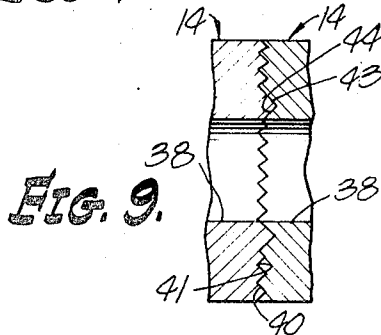
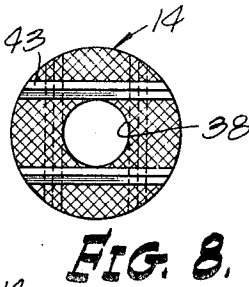
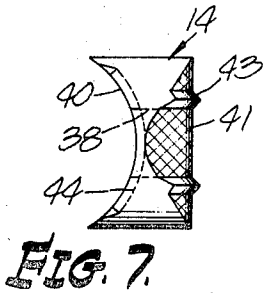
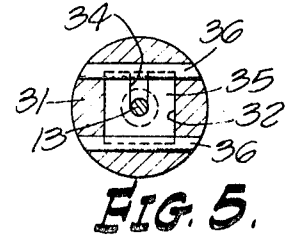
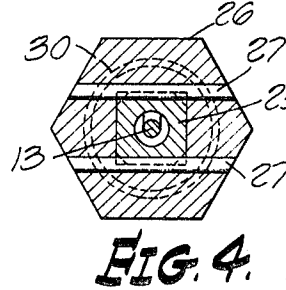
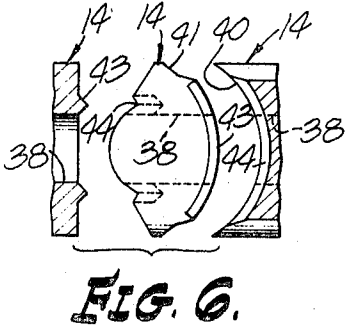
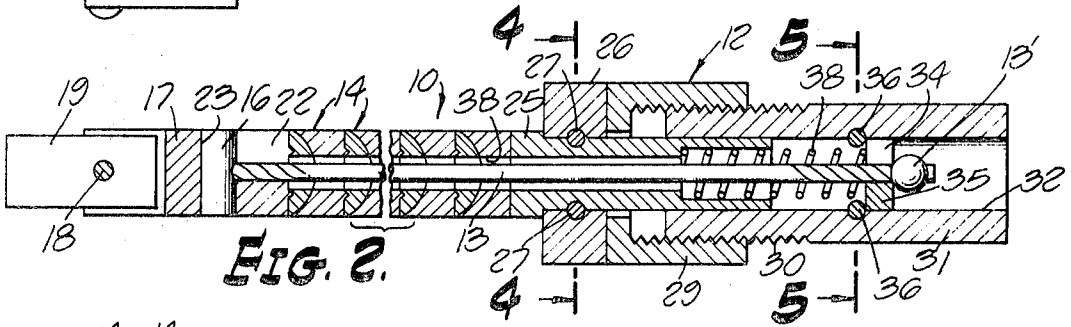
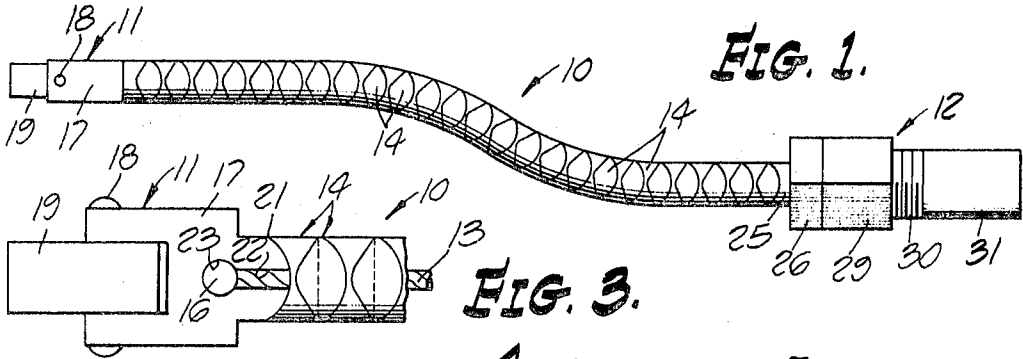
[54] **ADJUSTABLE TOOL HANDLE**
14 Claims, 11 Drawing Figs.

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177-2, 177-8

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ABSTRACT: A tool handle readily adjustable in many different configurations utilizing a multiplicity of similar components assembled along a cable and each having oppositely arched ends rigidly clampable in different positions by tensioning the cable. The arched ends have interesting protruberances and depressions held resiliently nested by spring means while the cable is relaxed and permitting individual pairs of components to be forcibly shifted to a different adjusted position without risk of displacing the adjusted position of other components. Since the arched ends lie in different planes, the handle may be curved in more than one direction.





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ADJUSTABLE TOOL HANDLE

This invention relates to rigid tool handles, and more particularly to a handle made of a multiplicity of components clampable in many different adjusted configurations to permit its use in constricted areas.

The construction of complicated mechanisms in very compact form presents serious servicing problems owing to the tortuous passages often available for wrenching operations. To meet these problems designers have made various proposals heretofore for tool handles capable of being adjusted to different configurations. However, the designs heretofore offered leave much to be desired and are woefully inadequate to meet the operating needs often encountered by mechanics and repairmen.

Among these shortcomings are the serious and time consuming difficulties encountered in shifting and clamping the handle parts in a new configuration and, in particular, the very limited degree and variation in the available adjustability. For example, adjustable tool handles heretofore proposed using a number of small segments held assembled along a flexible cable or the like are easily released from locked condition whereupon each is free to rotate relative to one another. It is then a time consuming and vexatious chore to attempt reseating the components individually and in succession while holding them in position until a desired new arrangement has been achieved. If it is then found that one or more of the components is not in proper position, the operation must be repeated substantially in toto until a new trial configuration has been assembled.

These and other serious shortcomings of prior adjustable tool handles are avoided by the present invention utilizing a large number of identical short length tubular members in combination with a flexible tension member and suitable terminal fittings.

The opposite ends of each component are arched in opposite directions with each end being rotatable to any of a large number of possible operating positions. Each of the arched ends is provided with a multiplicity of small protuberances mateable with a like number of complemental depressions in the adjacent component. By this expedient the components to either end of a given component can be adjusted through a large number of positions but in different planes with the result that the handle as a whole can be adjusted to and clamped in either a simple or a quite complex configuration depending upon the need in a particular environment.

The flexible cable preferably used in holding the components clamped rigidly in a selected configuration includes spring means normally tending to maintain the cable lightly tensioned even when adjusted to a relaxed condition. This spring tension is adequate to retain the parts resiliently inter-nested yet permits any pair of parts to be disengaged and shifted to a new nested position and immediately held reseated by the spring without risk of these or other components becoming disengaged. Accordingly, components of different portions of the handle can be individually adjusted in succession and the handle then checked for suitability of use in a particular operating environment without risk of losing the trial adjustment and without need for forcibly tensioning the cable. If found satisfactory, the parts are readily locked in their new position, but if a further adjustment is necessary this is readily achieved and temporarily retained by the spring means while being handled and checked in the particular working area.

The invention also includes improved tensioning means for holding the parts rigidly assembled as well as means for quickly attaching and detaching wrenching components to the terminal fittings.

Accordingly, it is a primary object of the present invention to provide an improved highly versatile and readily adjustable tool handle for use with wrenching and the like tool components.

Another object of the invention is the provision of an adjustable tool handle utilizing a multiplicity of similar components having oppositely arched ends formed with complementary protuberances and depressions interesting in any of

a wide variety of different adjusted positions and including means for rigidly clamping the parts in any desired configuration.

Another object of the invention is the provision of an adjustable tool handle utilizing a flexible tensioning cable in combination with spring means and interfitted tubular members and wherein the spring is effective to hold the parts resiliently in different adjusted positions during a trial and error adjusting operation.

These and other more specific objects will appear upon reading the following specification and claims and upon considering in connection therewith the attached drawing to which they relate.

Referring now to the drawing in which a preferred embodiment of the invention is illustrated:

FIG. 1 is a side view of a preferred embodiment of the invention in one of its many adjusted configurations;

FIG. 2 is a fragmentary longitudinal cross-sectional view on an enlarged scale showing constructional details;

FIG. 3 is a fragmentary top plan view of the left-hand end of FIG. 2;

FIG. 4 is a cross-sectional view taken along line 4-4 on FIG. 2;

FIG. 5 is a cross-sectional view taken along line 5-5 on FIG. 2;

FIG. 6 is an enlarged exploded view showing one of the handle components and fragmentary cross-sectional views of the similar components to either end thereof;

FIG. 7 is a side view of the center component in FIG. 6 as viewed from the top side thereof;

FIG. 8 is an end view of FIG. 7;

FIG. 9 is a fragmentary cross-sectional view on an enlarged scale showing two of the components fully inter-nested;

FIG. 10 is a fragmentary side elevational view of a terminal fitting adapted to be assembled to the left hand end of the cable in lieu of the universal joint terminal fitting shown in FIGS. 1-3; and

FIG. 11 is a top plan view of FIG. 10.

Referring initially and more particularly to FIGS. 1-3, there is shown a typical embodiment of the invention adjustable tool handle, designated generally 10, equipped at its opposite ends with terminal fittings 11, 12. Extending loosely centrally through the main body of the handle is a long flexible tension member 13 such as a twisted wire cable. This cable is threaded through a multiplicity of identical specially formed tubular components 14.

As best appears from FIGS. 2 and 3, cable 13 is provided with a permanently attached cylindrical crosshead 16 at one end and with a ball 13' at its opposite end, each adapted to be detachably assembled to a component of a respective terminal assembly 11 and 12. As herein shown by way of example, terminal assembly 11 comprises a U-joint formed by yoke member 17 pivotally connected by pivot pin 18 to a male connector member 19 of square cross section. Shank 21 of yoke 17 has a deep slot 22 opening through one face of the shank and merging at its end with a cylindrical bore 23 having a close sliding fit with cable crosshead 16. It will therefore be recognized that the cable and its crosshead can be assembled to and detached from yoke 17 by axial movement of crosshead 16 along bore 23 while the adjacent portion of cable 13 is in registry with slot 22.

Terminal fitting 12 at the other end of the tool handle includes a forward tubular member 25 having a noncircular exterior surface held suitably assembled to a hexagonal nut 26 as by pins 27. Bearing loosely against the outer end of nut 26 is a second hexagonal nut 29 having its internal threads mating with the external threads 30 of a female socket member 31. A bore 32 of square cross section extends centrally through member 31 with its inner end having a loose sliding fit with the square right hand end of member 25. As herein shown, bore 32 is sized to have a snug sliding fit with a complementally shaped male member of another tool fitting, such as member 19 of terminal fitting 11.

As is clearly shown in FIG. 2, the right hand end of cable 13 is held detachably assembled to terminal fitting 12 by having its ball 17 and the adjacent portion of the cable assembled within a radial slot 34 of a square washer 35 extending crosswise of bore 32 and bottoming against cross pins 36. Interposed between the inner face of washer 35 and the outer end of member 25 is a compression spring 38. This spring is effective to maintain cable 13 under suitable tension while adjusting the configuration of the main body of the handle. For this purpose, the spring is effective to slide washer 35 outwardly along bore 32 whenever members 29 and 31 are loosened to relax the tension on cable 13, the parts functioning in a manner which will be explained more fully presently.

The identical tubular components 14 of the handle body preferably have the configuration best illustrated in FIGS. 6 and 7. Each includes a short tubular body having a central bore 38 of a diameter substantially greater than that of cable 13. This permits wide-latitude angular adjustment of elements 14 relative to the axis of the cable.

The opposite ends of components 14 are arched in opposite directions and their generally cylindrical surfaces have the same radius. The longitudinal axes of these cylindrical surfaces extend crosswise of one another such as at an angle of 90°. The arched surface 40 may be referred to as a concave arch whereas surface 41 may be described as a convex arch.

The arched surfaces 40 and 41 are preferably provided one with a multiplicity of low height protuberances and the other with a corresponding number of mating depressions positioned to intermesh with one another in the manner shown in FIG. 9 when adjacent components 14 are adjusted to any of a large number of different angular relationships. Preferably this adjustment is restricted to a plane normal to the axis of the mating cylindrical surfaces by means of mating tongues and grooves 43, 44, grooves 43 being formed crosswise of arched surfaces 41 and grooves 44 being similarly located across the concave arch 40 of the adjacent component. Although the tongues and grooves are herein shown as V-shaped in cross section it will be understood that they may be of other shape if desired, including, in particular, rectangular. Owing to the substantially greater axial height of the tongues and grooves than the similar dimension of protuberances and depressions, the latter may be separated sufficiently to permit adjustment without disengaging the associated set of tongues and grooves.

It will be understood that the ends of each of the terminal fittings 11, 12 opposite the adjacent one of the tubular components 14 preferably has an arched configuration complementary to an interlocking and mating with the end of the terminal fitting.

Referring to FIGS. 10 and 11, there is shown a typical alternate terminal fitting 11' usable in lieu of fitting 11. Fitting 11' comprises a simple open ended wrench head 50 provided on the side thereof opposite the nut engaging slot 51 with a mounting shank 52. This shank has a deep slot 53 terminating at one end with a semicylindrical recess 54 sized to seat crosshead 16 of cable 13. The transversely arched outer end 41' of shank 52 will be understood as having the same features as arched end 41 of tubular components 14 and is adapted to intermesh with surface 40 of one of these components in a large number of different adjusted positions.

The manner in which the described tool handle is adjusted in any one of many different configurations will be quite apparent from the foregoing description of its structural details. If it is desired to adjust the handle to a different position than that shown in FIG. 1, the user applies a wrench to the periphery of nut 29 and seats the male end of another wrench into the outer end of bore 32 of nut member 31. These wrenches are then employed to rotate nuts 29, 31 together thereby relaxing the tension on cable 13.

Many users prefer to slacken the cable only sufficiently to permit facile adjustment of a single pair of components 14 at any one time. As will be evident from a consideration of FIG. 2, spring 38 acts to push washer 35 outwardly along bore 32 thereby resiliently maintaining the multiplicity of components

14 fully intermeshed. Accordingly, the previous relative positions of these components are maintained until the user grasps the exteriors of an adjacent pair and pulls them apart while simultaneously rotating their mating surfaces to a desired different adjusted position. As soon as he relaxes his grasp of the elements, spring 38 acts to keep all components intermeshed.

The user proceeds in the manner just described to make as many adjustments along the length of the handle as required to adapt the tool for use in a given operating environment. The tool may be checked repeatedly for the suitability of the new adjustment for use in a given location without the risk of losing the adjustment or need for tensioning the cable until such time the proper handle configuration has been achieved. Thereupon, wrenches are reapplied to nuts 29, 31 and used to rotate these nuts apart until the cable is fully retensioned to lock components 14 rigidly against relative movement.

It will be readily apparent from the foregoing that more than one of the described adjustable tool handles may be connected in series to provide a longer handle merely by socketing the male end of one handle in the female socket of a second handle. Likewise, terminal fitting 11 may be replaced by or connected to any of a large variety of tool heads, that illustrated in FIGS. 10 and 11 being illustrative.

While the particular adjustable tool handle herein shown and disclosed in detail is fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiment of the invention.

I claim:

1. A tool handle readily adjustable and clampable in any of many different positions, said tool handle comprising a plurality of generally similar short tubular components having oppositely arched ends shaped to nest one within an adjacent one of said components and adapted to pivot relative to one another in a plane common to their respective longitudinal axes, flexible tensioning means extending through said tubular components and including means at the opposite ends thereof operable in one position to clamp said tubular components immovably in a desired adjusted position and operable in a second relaxed position thereof to leave said tubular components free for relative pivotal adjustment.

2. A tool handle as defined in claim 1 characterized in that the curvatures of the oppositely arched ends of said tubular components lie in different planes intersecting one another along the longitudinal axis of each tubular component.

3. A tool handle as defined in claim 2 characterized in that said intersecting planes lie generally normal to one another.

4. A tool handle as defined in claim 1 characterized in that the ends of adjacent tubular components include complementally shaped tongue and groove means lying in a plane parallel to the axis of a given tubular component and normal to the plane of a given arched end and permitting a pair of nested components to pivot in the plane of said arched ends while preventing lateral shifting of said nested components axially of their arched ends.

5. A tool handle as defined in claim 1 characterized in that the intermeshing ends of adjacent tubular components are provided with a multiplicity of complementally shaped protuberances and depressions spaced to interfit in any of a plurality of different positions.

6. A tool handle as defined in claim 4 characterized in that the intermeshing ends of adjacent tubular components are formed with a multiplicity of complementally shaped protuberances and depressions spaced to seat selectively in a plurality of different interlocked positions.

7. A tool handle as defined in claim 6 characterized in that said arched ends are generally cylindrical with their axes lying at an angle to one another in different parallel planes.

8. A tool handle as defined in claim 1 characterized in that the terminal means at the opposite ends of said tensioning means includes respective male and female connector means of noncircular contour adapted to have telescopic assembly with the complementally shaped shank of cooperating tool means.

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9. A tool handle as defined in claim 1 characterized in that one of said terminal means includes means for readily and detachably securing a wrenching tool means thereto, and a surface portion of said wrenching tool means being shaped to interlock with the arched end of the adjacent one of said tubular components when the latter are clamped in a desired adjusted configuration.

10. A tool handle as defined in claim 9 characterized in that wrenching tool means includes a slotted boss sized to seat therein a short length of said tensioning means, and one end of said tensioning means having a crosshead fixed crosswise thereof adapted to seat in a depression formed in said wrenching tool means and extending crosswise of the adjacent end of said slot.

11. A tool handle as defined in claim 1 characterized in that one of said terminal means includes a pair of tubular members held adjustably assembled by mating threads and cooperating

to relax and tension said tensioning means depending upon the direction of relative adjustment of said threaded tubular members.

12. A tool handle as defined in claim 11 characterized in the provision of spring means operatively interposed between said tensioning means and one of said terminal means effective to hold said tubular components resiliently engaged when said tensioning means is relaxed but permitting any adjacent pair of components to be adjusted to a different position while forcibly held disengaged.

13. A tool handle as defined in claim 1 characterized in that said tensioning means comprises a high strength cable having a ball fixed to one end thereof.

14. A tool handle as defined in claim 13 characterized in that said cable has a crosshead fixed to the end thereof remote from said ball.

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