Sept. 9, 1930. S. MANDL 1,775,402

WRENCH OUTFIT

Filed Jan. 26, 1925 2 Sheets-Sheet 1

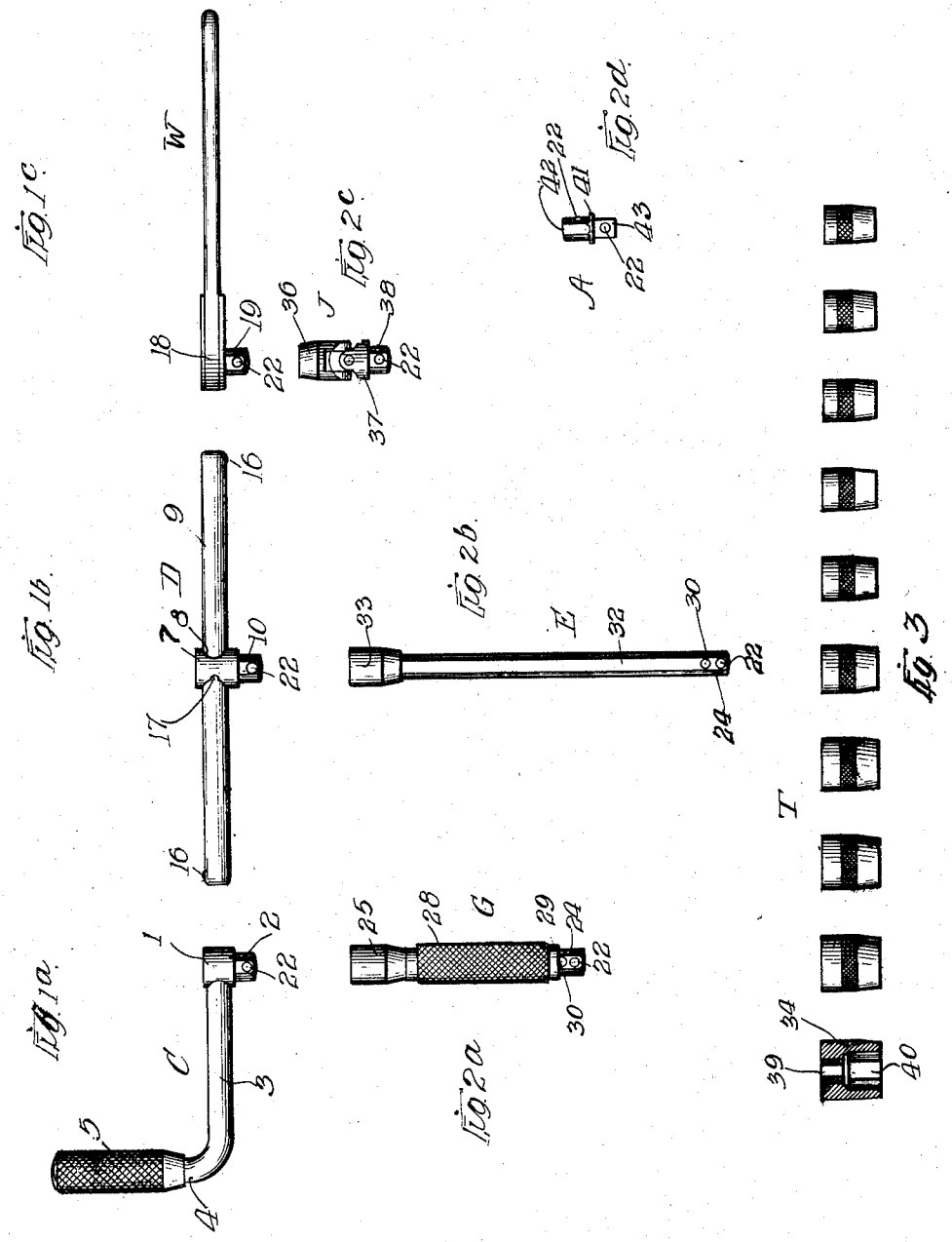

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Fig. 4.

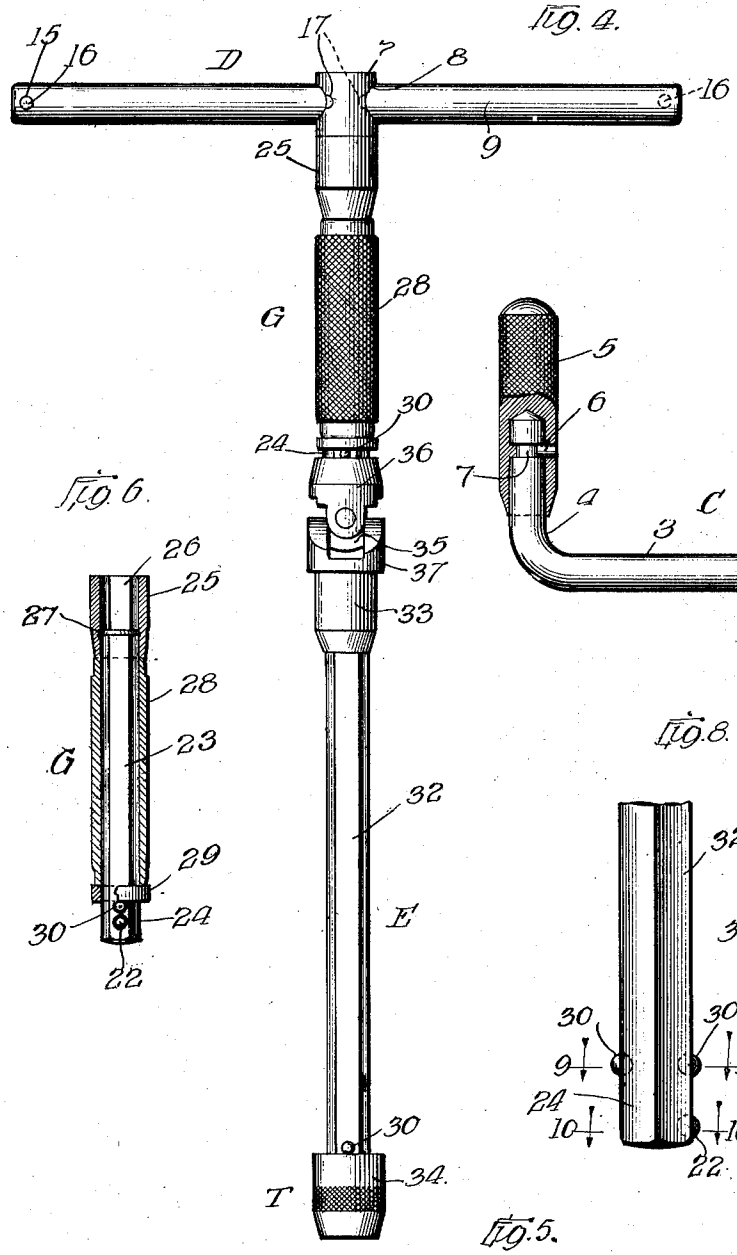
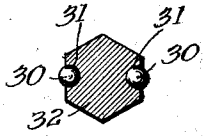


Fig. 7.

Fig. 6.

Fig. 8.

Fig. 9.



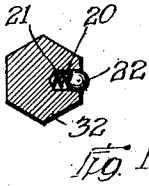
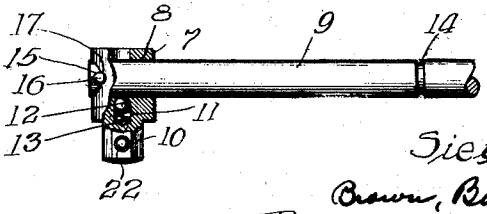


Fig. 10

Fig. 5.



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UNITED STATES PATENT OFFICE

SIEGMUND MANDL, OF MILWAUKEE, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO HUSKY CORPORATION, OF KENOSHA, WISCONSIN, A CORPORATION OF WISCONSIN

WRENCH OUTFIT

Application filed January 26, 1925. Serial No. 4,689.

My invention relates to wrench outfits and the general object is to produce an improved wrench outfit comprising a comparatively small number of units or elements which can be readily selectively and interchangeably connected together in a great many combinations to obtain wrench structures best adapted for the particular work to be accomplished.

More in detail, one of the important objects of the invention is to produce a wrench outfit comprising a number of handles or driving elements, a number of transmitting or extension elements, and a number of tool elements, all constructed and operable to be selectively connected or joined together into a multiplicity of combinations which will make it easy and a pleasure to build just the right wrench structure for the particular work in hand, and a structure which can be efficiently applied and operated where the work is in out of the way or cramped places.

In my improved wrench outfit, I employ plug and socket members for detachably and interchangeably connecting the various elements together, and another important feature of my invention resides in the solidity and strength of the various elements, their connection, and consequently in the built up or combination wrench structure. In accordance with my invention, the body of each transmission element is in the form of a length of solid polygonal bar, one end of which forms a plug, and at the other end of which is a socket, another important feature of my invention residing in the securing of the socket to the bar end without resorting to fusing, brazing, welding, or other special procedure.

Another important object of the invention is to provide simplified and improved means for permitting sockets and plug ends to be readily connected and to retain such connection during operation of a built-up structure and to eliminate all play at the joints.

Another important object of the invention is to provide an improved T handle driving element and for permitting adjustment of the handle to obtain any degree of leverage, and for keeping the handle end from projecting and interfering with proper operation of a built-up structure in tight corners.

Another important object is to provide one of the transmission elements with a swiveled grip which will serve both to guide the structure and hold the tool up to the work while the driving element is being operated.

Other objects, features and advantages of the invention will more fully appear from the following detail description taken in connection with the accompanying drawings on which

Figs. 1^a, 1^b and 1^c are side elevational views of the crank driving element, T handle driving element, and the ratchet driving element, respectively;

Figs. 2^a, 2^b and 2^c are side elevational views, respectively, of the grip transmission element, the extension bar, and the swivel transmission element;

Fig. 2^d is a side elevational view of an adapter element;

Fig. 3 is a side elevational view of a row of nut engaging sockets, the first one being in vertical diametral section;

Fig. 4 is a side elevational view showing a number of the elements coupled together to form a wrench structure;

Fig. 5 is a side elevational view of the T handle driving element with the head member in vertical section;

Fig. 6 is a side elevational view of the grip transmission element showing the socket part and the swivel grip in vertical diametral section;

Fig. 7 is a side elevational view of the crank driving element with the grip partly in section;

Fig. 8 is an enlarged side elevational view of the lower end of a transmission bar showing the retaining and stop balls therein;

Fig. 9 is a sectional view on the plane 9—9 of Fig. 8; and

Fig. 10 is a sectional view on line 10—10 of Fig. 8.

The crank driving element C comprises a hub 1 from which extends the plug end 2 of polygonal cross-section preferably hexagonal. The hub and plug are preferably of a single piece of steel, either drop-forged or

milled. Extending from the hub is the crank lever 3 on whose handle 4 is rotatably mounted the grip 5 which is locked thereto by the engagement of the pin 6 in the peripheral groove 7.

The hub or head 7 of the T driving element D has the transverse diametral passageway 8 (Fig. 5) through which is slidable the bar 9. The head has the hexagonal extension or plug 10. The head has also the radial pocket 11 for the detent ball 12 behind which is the compression spring 13 which forces the ball to project into the passageway 8 of the head and against the bar 9 so as to resist relative movement between the bar and head when the device is in operation. At the center of the bar is the peripheral groove 14 into which the detent ball extends to more securely lock the bar to the head in balanced position, so that the handle may be spun where speedy work is required, as after a nut has been loosened, or is being started toward its seating position. At each end of the bar 9 is a pocket 15 in which is secured a ball 16 to project a distance beyond the bar surface to form a detent abutment. These detent balls are close to the ends of the bar, and in the edges of the head 7 at the ends of its passageway 8 are the recesses 17 for receiving the detent balls in order that the bar ends may be locked well within the head 7 so as not to be in the way when the element is being used in tight places, for example on nuts which are close to other parts or in corners. This will be clear from Figures 1^b and 2^b of the drawings, which are on the same scale and from which it will be noted that the socket members are of greater diameter than head 7. With bar 9 in its extreme position in either direction, the end of the bar is substantially flush with head 7, as illustrated in Figure 7, and is well within the outline of the socket member into which the extension is inserted.

The driving element W of Fig. 1^c has a head 18 and a plug 19, but the plug is connected through ratchet mechanism with the head, as clearly disclosed in my co-pending application, Ser. No. 757,312, filed December 22, 1924. The plugs 2, 10 and 19 of the driving elements are of the same size and cross-sectional shape and each has a pocket 20 in which a compression spring 21 projects a detent ball 22 outwardly, as shown in Fig. 10, so that when a plug is inserted in a socket member the connection will be free from play, although readily separable. The driving elements are thus interchangeable.

The grip unit or element G shown in Fig. 2^a, if used in a combination, is usually connected with a driving element or unit to provide a convenient grip for steadying and guiding a built-up wrench structure so that work can be accomplished more accurately and expeditiously. The body 23 of the grip element is a solid hexagonal bar having the same cross-sectional dimension throughout as the plug of the driving unit. The end 24 of the bar will therefore serve as a plug. Secured to the other end of the bar 23 of the grip element is the socket 25 having the hexagonal bore 26 which securely fits the bar. The socket is forced onto the bar end and the resulting frictional engagement rigidly secures the socket in place. The frictional engagement may be assisted by burring the edge of the bar into depressions 27 formed in the inner side of the socket. The engagement of the hexagonal bar in the hexagonal socket will positively and most securely lock the parts against relative rotational movement and the frictional engagement assisted by the burring will lock the parts against relative longitudinal movement and thus the bar and socket are most intimately rigidly connected together without resorting to brazing, welding, or other heat employing process. The grip sleeve 28 is rotatably mounted on the body 23 of the grip element and is held in place between the socket 25 and an abutment ring 29 whose hexagonal inner sides securely receive the bar and which is held against the abutment members 30 which may be in the form of balls secured in pockets 31 as shown in Fig. 9. Sufficient play is allowed between the grip sleeve and the bar 23 and between the ends of the sleeve and the socket and ring, so that the grip sleeve may freely rotate, or, in other words, so that when the grip is held in the hand the body of the grip element may be readily and freely rotated to transmit the driving force of the driving element applied to the grip element. Like the plugs 2, 10 and 19 of the driving element, the plug end 24 of the grip element has the ball detent 22 rotatable in and projected from the pocket 20 by a spring 21, as shown in Fig. 10.

The extension element E shown in Fig. 2^b and also in Fig. 4, consists of the long solid hexagonal bar 32 having at its one end the socket 33 of the same shape as the socket of the grip element and secured thereto in the same manner. The other end 24 of the bar 32 acts as a plug and has a detent or latch ball 22 positioned the same as the latch ball of the grip element. The plug end 24 has also abutments 30 whose location corresponds to that shown in Fig. 6 in connection with the grip element. The purpose of the abutments 30 is to limit the distance a bar end engages in a socket member. In Fig. 4 one of the tool elements T, in this case nut engaging sockets, is shown applied to the lower end of the bar 32, the engagement being limited by abutment of the tool body 34 against the abutments 30. The abutments 30 of the grip element serve the additional purpose of forming seats for the abutment ring 29, as has already been explained.

The universal coupling or joint element J

comprises the block 35 to which the socket member 36 and plug member 37 are pivoted. The socket member may receive the plugs of the driving elements or the plug ends of the transmission elements, and the plug end 38 of the coupling plug member will fit the socket ends of the transmission or other elements.

The tool elements T shown in Fig. 3, comprise each the cylindrical body 34 provided with the plug receiving hole 39 for receiving the plugs of the driving or transmission elements interchangeably. The tool elements have nut receiving sockets 40 of different sizes, so that with a series of elements an extended range of nut sizes can be accommodated. The tool elements are preferably in the form of drop-forgings or are machined integral from solid bars of special steel which has been heat treated so that the units will not round out or break.

In Fig. 2[a], I show what I call an adapted element A which is utilized when my improved wrench outfit is to be used in connection with wrench or other tool elements having squared plug openings instead of the hexagonal openings 39, shown in Fig. 3. This adapter element comprises the body portion 41 from which extends the hexagonal plug 42 on one side and the square plug 43 on the other. With such adapter, I would use the tool element T whose hexagonal nut socket is the same size as the plug hole 39, and this tool element would be joined to the end of a built-up wrench structure, so that the hexagonal plug 42 of the adapter could be jointed to the tool element with the square plug 43 then projecting to be used for engagement with the tools having square plug openings.

From the foregoing description, it will be apparent that with the various units shown, a great many combinations are possible. It has been demonstrated that several hundred practical combinations can be made with the several parts shown, each combination being especially adapted to the particular work in hand. The driving elements can be applied directly to the nut engaging elements T or any desirable combination of transmitting elements can be interposed. Usually, the grip element G is used with the driving element to serve both to guide the tool and hold it up to the work while the driving element is operated. With the swivel handled crank driving element and the swivel handled grip element, nuts, as for example those holding the tire rim to the wheel, can be very rapidly removed or reapplied.

In Fig. 4 I show the T driving element connected with a nut socket element through a transmission train comprising the grip element G, the universal coupling element J, and the extension element E, and these transmission elements can be interposed in any order desired, depending upon the nature and location of the work to be operated on, and with the universal coupling element connected in, the work can be approached from any angle. The universal joint member is made short so that it will turn at its fullest angle within a small space, and it is narrow so that the wrench structure can be inserted through tight places.

The handle bar 9 of the T driving unit can be slid to any position within the head 7 to give any desired leverage. When the bar is centrally located and locked by the engagement of the friction ball 12 in the notch 14, the bar can be rotated to spin the nut off or to its setting position. When the bar is shifted to either end in the head, it will be doubly locked by the friction ball and the detent balls engaging in the notch 17. In this position there will be practically no overhang of the bar end relative to the head which is a decided advantage when working in tight corners, where an end wrench would ordinarily have to be used. By reason of the abutment balls 30, accurate connection of the various units is always assured and the friction or detent balls 22 will then insure substantial and rigid joints free from any play, and the parts will not fall apart until sufficient pull is applied to overcome the pressure of the friction balls.

All the parts which transmit the driving power to the work being of solid steel with uniform strength throughout, and the parts being securely jointed together, very efficient and heavy work can be accomplished without inconvenience and waste of time.

As modifications, both in construction and arrangement may be made without departing from the spirit of the invention, I do not desire to be limited to the precise structure and arrangement shown.

I claim:—

In a wrench structure, a polygonal bar, a first socket member fixed directly upon one end of said bar, an abutment member mounted upon said bar near but spaced from the opposite end of the bar with the adjacent end of the bar projecting from said abutment member in a direction away from said first socket member for driving engagement with a second socket member, means holding said abutment member against displacement longitudinally of the bar in a direction away from said first socket member and a sleeve mounted upon said bar and rotatable about the corners thereof, said sleeve having endwise abutting cooperation at opposite ends with said first socket member and with said abutment member respectively and held against longitudinal displacement therebetween.

In witness whereof, I hereunto subscribe my name this 20th day of January, 1925.

SIEGMUND MANDL.