March 22, 1955 P. SHUMAN 2,704,475

LEVER OPERATED BOX WRENCH WITH RATCHET HEAD

Filed Feb. 7, 1950

2 Sheets-Sheet 1

Fig. 1.

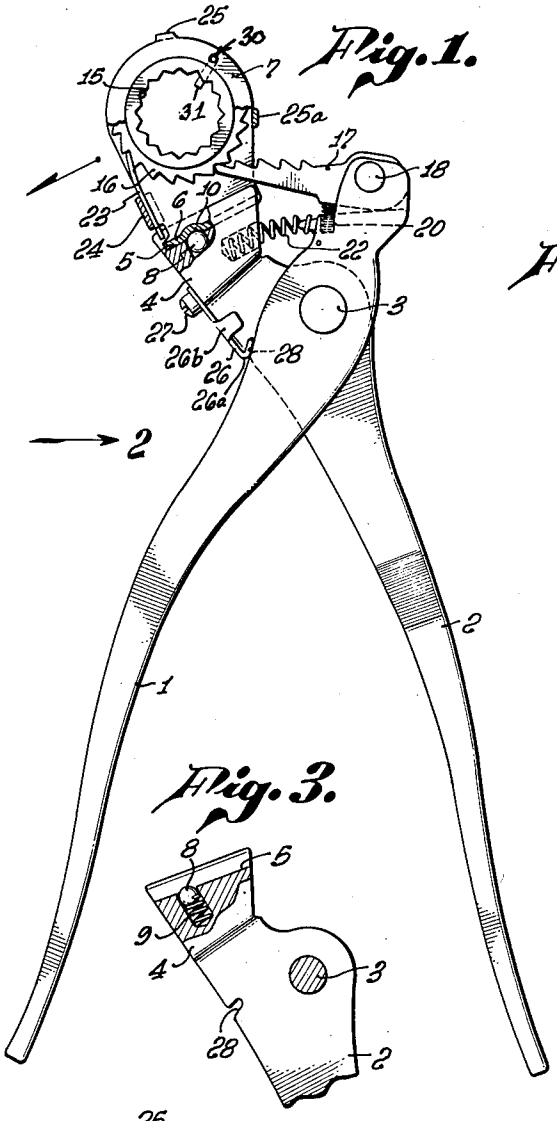


Fig. 2.

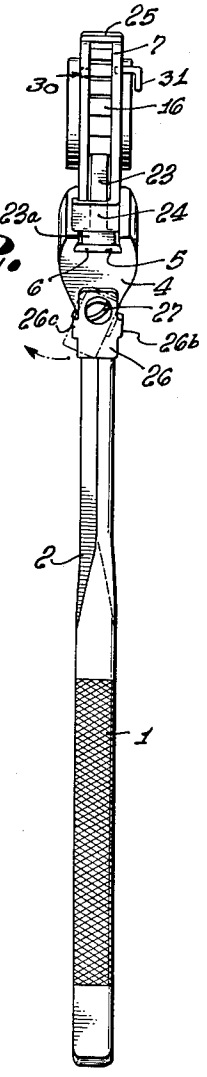


Fig. 3.

Fig. 4.

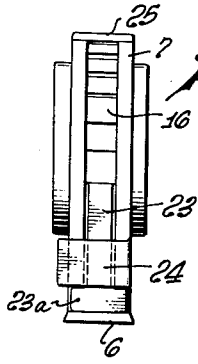
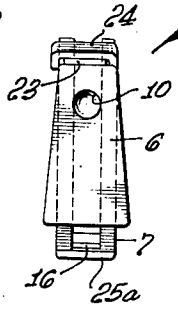


Fig. 5.



INVENTOR.
PAUL SHUMAN,
BY
ATTORNEY.

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Fig. 6.

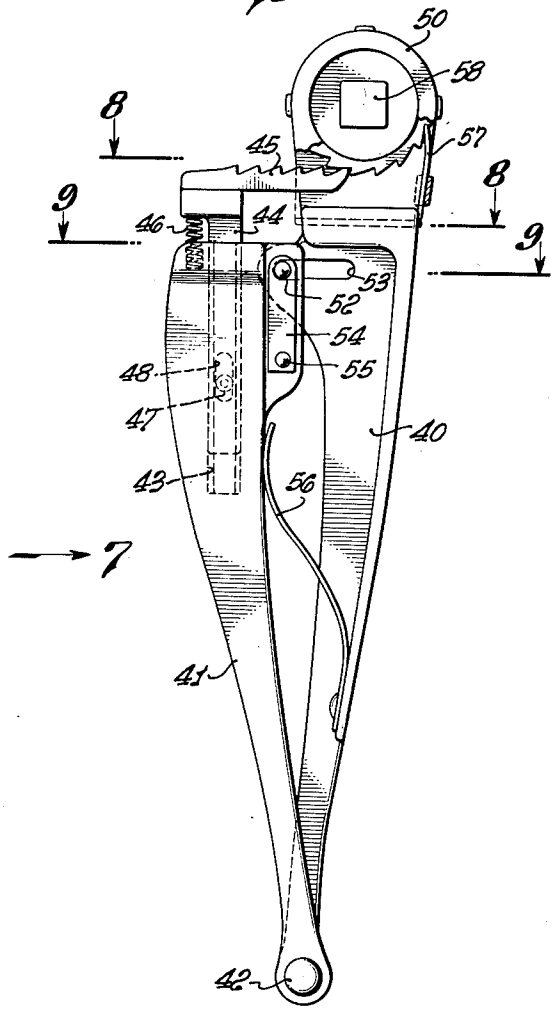


Fig. 7.

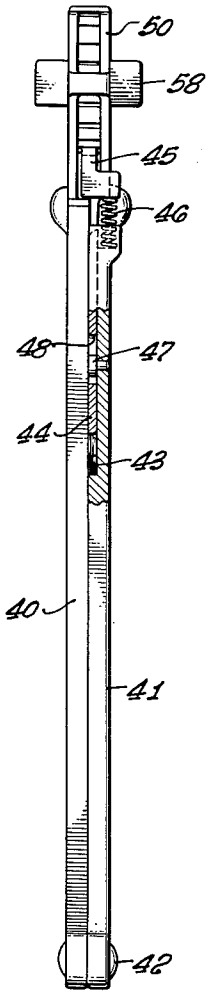


Fig. 8.

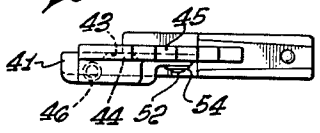
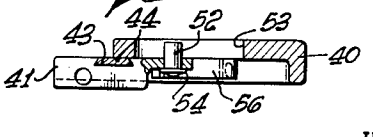


Fig. 9.



INVENTOR.
PAUL SHUMAN,
BY
O'Martin
ATTORNEY.

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LEVER OPERATED BOX WRENCH WITH RATCHET HEAD

Paul Shuman, Los Angeles, Calif.

Application February 7, 1950, Serial No. 142,850

5 Claims. (Cl. 81—61)

This invention relates to box or socket wrenches and particularly a ratchet operated wrench of this type.

It is the general object of the invention to provide a wrench of the type referred to which is convenient to operate. It is a further object of the invention to provide a wrench which is fitted with a detachable box or socket member to the end that the wrench may be quickly and easily adjusted to suit work of various sizes. These and other objects of the invention, together with the many advantageous features thereof, will be better understood upon perusal of the following detailed description and by referring to the accompanying drawings, of which:

Fig. 1 is a side view of a wrench embodying the invention;

Fig. 2 is a substantially corresponding edge view of the wrench;

Fig. 3 is a fragmentary view of one of the jaw members of the wrench with a portion thereof broken away for the sake of clearness;

Fig. 4 illustrates, on a larger scale, the socket head of the device as it appears when removed from the wrench;

Fig. 5 is a bottom view of the socket head;

Fig. 6 is a side view of a somewhat modified form of the wrench;

Fig. 7 is an edge view of this modified construction;

Fig. 8 is an end view of the device of Fig. 6 as viewed in the direction of the arrow **8** and with the head of the wrench removed therefrom; and

Fig. 9 is a sectional end view of the device taken substantially on line **9—9**, of Fig. 6.

Referring in the first instance to Fig. 1, it is noticed that the wrench in some respects resembles an ordinary pair of pliers in that it includes levers **1**, **2**, which are pivotally connected at **3**. The lever **2** is shown extending beyond the pivotal point to terminate at the top in an enlargement **4** having in the ends thereof a groove **5** of a size to receive therein a wedge-shape base plate **6** forming part of a socket member **7**. The latter is hereinafter, for convenience of description, mostly referred to as a head of the wrench. The groove **5** and the member **6** are shown correspondingly tapered in order that, when the head is advanced into the groove in the direction of the arrow of Fig. 1, it may become firmly anchored in the groove. In addition, it is found advantageous to place within a recess sunk into the bottom of the groove a ball **8** which by a spring **9** is held partly projected into the groove, substantially as indicated in Fig. 3. The bottom of the base **6** is recessed, as best shown at **10** in Fig. 5, to receive the projecting portion of this ball when the head is placed in position on the wrench, thereby to lock the head securely in position thereon. An annular socket member **15** is mounted for rotation within the head and it is on its outer periphery fitted with ratchet teeth **16** for engagement by a pawl **17** of the lever **1** of the wrench. The pawl is pivotally mounted on the end of the lever, as indicated at **18** and it is yieldingly maintained in the projected position shown in Fig. 1 by a compression spring **20**.

To operate the wrench, it is merely required to grip the levers **1**, **2** and to draw these levers together, thereby to cause the pawl to advance the teeth of the socket member thereby to rotate this member in clockwise direction. While an ordinary pawl might function satisfactorily in the type of device herein described, I prefer to cut a series of teeth in the working surface of the pawl for successive contact with the teeth of the socket member

as this member is rotated. An advantage of this construction is that at least two teeth of the pawl are in engagement with the teeth of the socket member during the operation of the wrench. Upon completion of each rotation of the member, the parts are returned to their initial position by a spring **22**. In addition, it is necessary to provide means for preventing return movement of the socket member by the pawl while the wrench is returned to its initial position at the end of each operation. Such means is, for the sake of simplicity, shown to consist of a short detent **23** of resilient material the broader foot **23a** of which is resting on the base of the head and the detent is held pressed against the ratchet teeth by a cross-brace **24** of the head, see Fig. 4. Additional cross-braces **25** and **25a** are added more securely to maintain the side members of the head in properly spaced relation to each other.

It was above stated that the spring **22** is provided for returning the levers of the wrench to the initial position of Fig. 1. The levers are maintained in this position by means of a detent **26** which is pivotally secured to the upper end of the lever **2**, as indicated at **27**, and the lower end of the detent is bent to form a stop **26a** limiting outward movement of this lever relative to the lever **1**. While in this position, the pawl **17** will remain in engagement with the teeth of the socket member and the wrench may be operated without danger of the pawl slipping out of engagement therewith. The inwardly directed lip **26a** will, when the detent is swung in clockwise direction, as indicated in dotted outline of Fig. 2, enter a recess **28** in the side of the lever **2**, see Fig. 3, at the same time to pass beyond the inner edge of the lever **2**, thereby to permit the spring **22** to swing this lever into fully open position and so to afford room for removal of the socket head from the wrench. This movement of the detent is limited by a lip **26b** of the detent engaging the inner surface of the lever **2**. A second lip **26c** is projected from the opposite side edge of the detent to limit movement thereof in counter-clockwise direction thereby correctly to align the lower stop portion **26a** with the edge of the lever **1**.

In the modified form illustrated in Figs. 6 and 7 the head **50** may remain substantially as above described but the levers are in this case shown pivotally joined at **42**. A dovetailed groove **43** is sunk into the inner surface of the lever **41** of a size to receive therein the shank **44** of a ratchet pawl **45**. The shank of the pawl is slidably fitted into this groove and it is, by a light spring **46**, held yieldingly projected to maintain the pawl in engagement with the teeth of the head **50**. A pin **47**, of the lever **41**, projects into an elongated perforation **48** of the shank **44** for the purpose of limiting outward movement of the pawl in the lever.

It is seen from this description that, when the levers of the wrench are manually gripped, pressure may be applied by the hand gripping the wrench to swing the levers on their pivot **42** to cause the teeth of the pawl to advance the teeth of the head, thereby to rotate the latter. As in the above described structure, means should be provided for limiting return movement of the pawl and such means may take the form of a pin **52** of the lever **41** riding in an elongated perforation **53** of the lever **40**. This pin is shown projecting from the free end of a spring member **54**, which latter is riveted in position on the lever **41**, as indicated at **55**. When it is desired to withdraw the head **50** for replacement by a different head, it is merely required slightly to withdraw the free upper end of the spring member **54**, thereby to cause the pin **52** to recede from the opening **53**. The levers will then be liberated for additional spreading movement to provide clearance for withdrawal of the pawl from the head. A spring **56** is shown mounted on the lever **40** in position to apply pressure against the lever **41** normally to maintain the pawl in the operative position of Fig. 6 and to urge further outward movement when the lever **41** is released upon withdrawal of the pin **52**.

While I have, in Fig. 1, shown the head of the wrench fitted with a rotatable socket member, it is noted that a different type of rotatable member **58**, such as commonly employed in wrenches, is applied to the head **50** of the

Fig. 6 and I wish it understood that either type of rotating member may be used in connection with the two wrenches as may be any other type of work engaging member which may be found adaptable for use on the wrenches. Return rotation of the member **58** is checked by a resilient plate **57**, which may be identical with the element **23** of Figs. 1 and 2 and will function in like manner. It is to be understood that the various devices hereinbefore described are merely illustrative of simple means of accomplishing the results for which the invention is designed and that modifications, within the scope of the claims hereto appended, may be embodied to the end that a well balanced, conveniently operated wrench may be produced.

In addition, it may be found advantageous to place a stop member in the rim of the head to prevent the work placed therein from dropping through the head while being carried by the wrench to some place of attachment difficult to reach. Illustrative of such device, I have at **30**, in Figs. 1 and 2, shown the rim of the head transversely perforated to receive an element **31** which may be seated therein, from either side, to form a stop for the work placed within the head.

I claim:

1. A wrench comprising two pivotally interconnected levers, a head detachably mountable in the end of one of the levers adjacent the end of the other lever, a work engaging member seated for rotation in the head, said member being fitted on its outer periphery with ratchet teeth, a pawl mounted on the adjacent end of the other lever for engagement with thet ratchet teeth to rotate the member within the head when the levers are manually drawn toward each other, resilient means urging the levers apart, a stop member limiting separating movement of the levers to retain the pawl in engagement with the teeth of the member, and an element on said stop member for moving the latter to release the levers for further movement to withdraw the pawl from the teeth.

2. A wrench comprising two pivotally interconnected levers, means urging the levers apart, a stop member limiting opening movement of the levers, one lever having in one end thereof a groove parallel with the direction of movement of the lever on its pivot, a head detachably seatable in said groove, a work engaging member seated for rotation within the head and provided on its periphery with ratchet teeth, a pawl mounted on the adjacent end of the other lever for engagement with said teeth to rotate the member within the head upon manual compression of the levers, and an element on the stop member for moving the latter to release the levers for further opening movement thereby completely to withdraw the pawl to afford room for withdrawal of the head from the groove of the lever.

3. A wrench comprising two pivotally interconnected levers, means urging the levers apart, stop means limiting opening movement of the levers, one lever having in one end thereof a groove parallel with the direction of movement of the lever on its pivot, a head detachably seatable in said groove, a work engaging member seated for rotation within the head and provided on its periphery with

ratchet teeth, a pawl mounted on the adjacent end of the other lever for engagement with said teeth to rotate the member within the head upon manual compression of the levers, an element on the stop member for moving the latter to release the levers for further opening movement thereby completely to withdraw the pawl to afford room for withdrawal of the head from the groove of the lever, and means urging the pawl into engagement with the ratchet teeth.

4. A wrench comprising two pivotally interconnected levers, means urging the levers apart, stop means limiting opening movement of the levers, one lever having in one end thereof a groove parallel with the direction of movement of the lever on its pivot, a head detachably seatable in said groove, means locking the head in position within the groove, a work engaging member seated for rotation within the head and provided on its periphery with ratchet teeth, a pawl pivotally mounted on the adjacent end of the other lever for engagement with said teeth to rotate the member within the head upon manual compression of the levers, the stop member being shiftable to release the levers for further opening movement thereby completely to withdraw the pawl to afford room for withdrawal of the head from the groove of the lever, and means urging the pawl into engagement with the ratchet teeth.

5. A wrench comprising two pivotally interconnected levers, means urging the levers apart, a stop on one lever engaging the other lever to limit opening movement of the levers, a head detachably mountable on the end of one of the levers, a work engaging member rotatably fixed within said head and provided on its peripheral surface with ratchet teeth, a pawl mounted on the adjacent end of the other lever, said pawl having thereon a plurality of teeth engaging the ratchet teeth of the head to rotate the latter in response to manual complession of the levers, means yieldingly maintaining the teeth of the pawl in engagement with the ratchet teeth, and a resilient element on the head checking return rotation of the member, the stop being manually movable to release the levers for further separating movement to withdraw the pawl from the member and so to provide space for removal of the head from the lever.

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