Dec. 11, 1956 E. T. ABLE 2,773,574

RATCHET ADAPTERS FOR SOCKET WRENCHES

Filed March 8, 1954

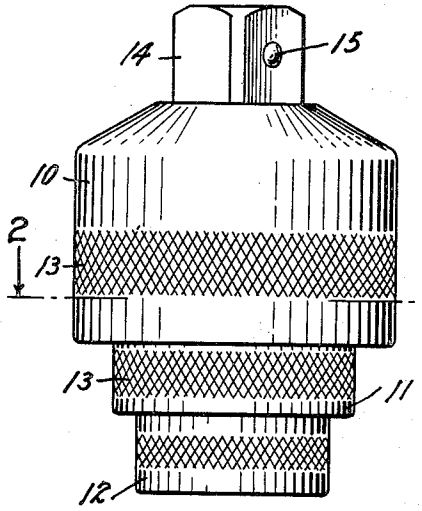


Fig 1

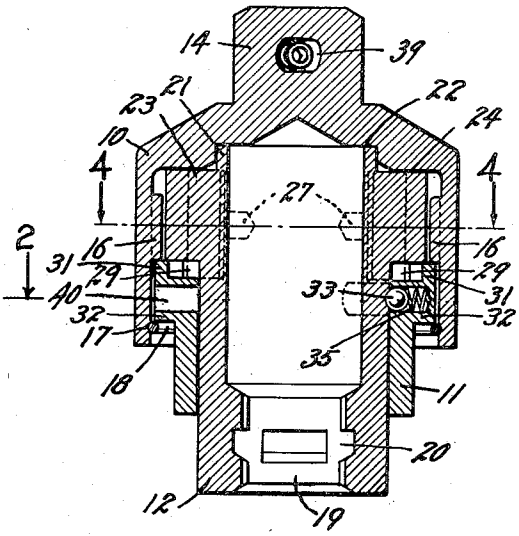


Fig 3

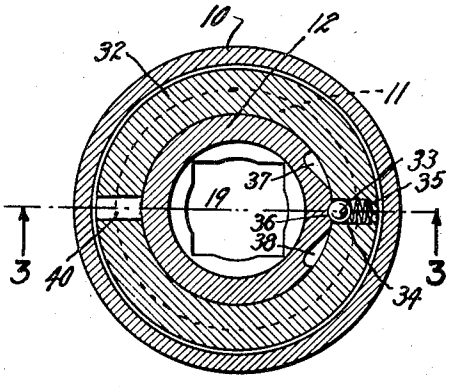


Fig 2

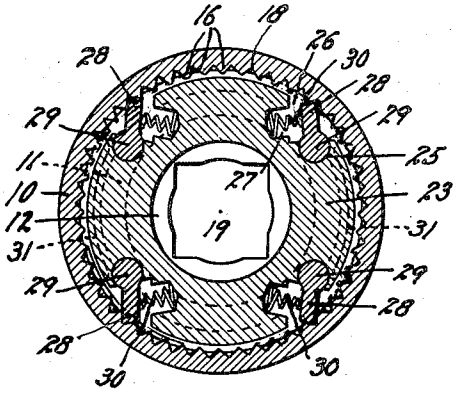


Fig 4

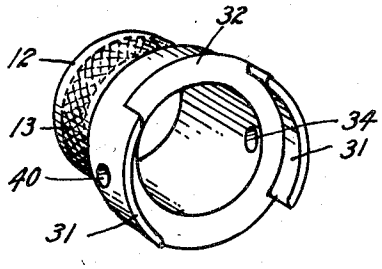


Fig 5

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United States Patent Office 2,773,574 Patented Dec. 11, 1956

2,773,574

RATCHET ADAPTERS FOR SOCKET WRENCHES

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Application March 8, 1954, Serial No. 414,564

6 Claims. (Cl. 192—43.1)

This invention relates to a ratchet adapter for socket wrenches, and has for its principal object the provision of a simple and highly efficient device which can be positioned between a socket wrench and the work-receiving socket thereof to provide either a locked or a right or left ratcheting movement therebetween.

Another object of the invention is to provide a device of this character which can be quickly and easily adjusted to any of three operating positions while in use; which will securely retain itself in the adjusted position; and which, when in the locked position, will present maximum strength to torque strains.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is had to the accompanying drawing which forms a part hereof. Like numerals refer to like parts in all views of the drawing and throughout the description.

In the drawing:

Fig. 1 is a side view of the improved socket wrench adapter;

Fig. 2 is a cross-section therethrough, looking downwardly on the line 2—2, Fig. 1;

Fig. 3 is a longitudinal section therethrough, taken on the line 3—3, Fig. 2;

Fig. 4 is a cross-section, looking downwardly on the line 4—4, Fig. 3; and

Fig. 5 is a detail perspective view of a shifting collar employed in the improved adapter.

The improved socket wrench adapter consists of three principal parts, a housing **10**, a shifting collar **11**, and a socket sleeve **12**. Each of these members is preferably provided with an encircling knurled band **13** to facilitate finger gripping.

The housing **10** has an inverted cup shape having a closed top and an open bottom. A concentric, non-circular, usually square, wrench stud **14** is formed on the closed extremity of the housing, and is provided with the usual click plunger **15** actuated by a spring **39** for retaining the adapter in place in a conventional socket wrench.

The housing **10** is formed with an internal, annular band of ratchet teeth **16**. The ratchet teeth **16** are of the double-acting form, that is, both sides of each tooth are inclined similarly and substantially at right angles to each other. The housing is also provided, adjacent its open extremity, with a ring groove **17** to receive a split steel snap ring **18**.

The sleeve **12** is formed with a non-circular socket **19**, usually square, in its outer extremity to receive the usual stud of a work-receiving socket of a conventional socket wrench. The socket **19** is internally grooved, as indicated at **20**, to receive the click plunger with which the studs of conventional work-receiving sockets are provided. The upper extremity of the socket sleeve **12** is projected

to form a tubular bearing portion **21** which rides in an annular bearing seat **22** formed in the head of the housing **10**.

The socket sleeve **12** is provided with an annular enlargement or rim **23** which is positioned in closely spaced relation to the ratchet teeth **16** and extends upwardly from the latter to bear against a thrust bearing shoulder **24** in the housing **10**. The enlargement or rim **23** has a plurality, preferably four, of longitudinally milled, equally spaced pawl cavities. Each cavity consists of a semi-cylindrical pawl shaft bearing portion **25**, a triangular pawl swinging portion **26**, and a spring socket **27**.

A cylindrical pawl shaft **29** is positioned in the pawl shaft bearing portion **25** of each cavity and a flat, rectangular pawl **28** is formed on and projects radially from each pawl shaft **29** into the pawl swinging portion **26** of each cavity. The free extremity of each of the pawls **28** is constantly urged outwardly into engagement with the ratchet teeth **16** by means of a conical compression spring **30** seated in the spring socket **27** of the cavity. The cavities are so formed that each pawl **28** will extend in a direction tangentially opposite to its two adjacent pawls and opposite pawls will extend in the same tangential direction. Thus, two of the pawls, as shown at the upper left and lower right in Fig. 4 will be "right-handed" and the remaining two "left-handed." The pawls **28** and their pawl shafts **29** have a greater length than the width of the rim **23** so that they extend from the thrust shoulder **24** and project below the rim **23**.

The shifting collar **11** is formed with an enlarged hub-portion **32** on its inner extremity which is positioned within the two arcuate, oppositely-positioned, pawl-shifting flanges **31** are formed on and project upwardly from the hub-portion **32**. Each of the flanges **31** has an arcuate length substantially equal to the distance between adjacent pawl shafts **29** and the flanges are positioned diametrically opposite each other. The projecting portions of the pawls **28** are in the arcuate path of movement of the flanges **31** when the collar **11** is rotated. The flanges **31** bear against the rim **23** of the socket sleeve **12** so as to retain the latter in place in the housing. The shifting collar **11** is retained in place in the housing by means of the snap ring **18** against which the hub-portion **32** bears.

It can be seen that if the shifting collar **11** is in an intermediate position, as shown in Fig. 4, all of the pawls **28** will be in engagement with the ratchet teeth **16** and the sleeve **12** will be locked against rotation in the housing **10** and thus no ratcheting effect can be obtained. If the shifting collar, however, is rotated to the right in Fig. 4, the two flanges **31** will slide between the two right-handed pawls **28** and the ratchet teeth **16** to prevent the pawls from engaging the ratchet teeth. If the housing **10** is now reciprocally rotated relative to the socket sleeve **12**, the latter will be intermittently rotated to the left. If the shifting collar **11** is now moved to the left in Fig. 4, it acts to bring the flanges **31** between the right-hand pawls **28** and the ratchet teeth **16** so that reciprocal rotation of the barrel **10** will intermittently rotate the socket sleeve **12** to the left.

The shifting collar **11** is restrained in either the "right," "left" or "locked" positions by means of a click ball **33** mounted in a diametric ball socket **34** formed in the hub-portion **32** of the collar **11**. The ball **33** is constantly urged against the socket sleeve **12** by means of a suitable compression spring **35**. Three ball-receiving pockets are indented into the socket sleeve **12**, namely, a locking pocket **36**, a right-hand pocket **37**, and a left-hand pocket **38**. A bore **40** in the wall of the hub portion is formed by the drill which is used to drill the ball socket **34**.

As the shifting collar **11** is moved to each of its three positions, the ball **33** will enter the respective pocket corresponding to that position and retain the collar in

its set position. The right and left-hand pockets are formed with relatively straight terminal walls beyond which the ball cannot pass to limit the extreme movements of the shifting collar. The adjacent walls, however, are inclined so that manual rotation of the shifting collar readily forces the ball 33 from the pockets to allow the sleeve to be freely turned to any desired position.

It is desired to call attention to the fact that two of the pawls 28 will always be acting against the ratchet teeth 16 regardless of which direction the housing 10 is rotated and regardless in which of the pockets 36, 37 or 38 the ball 33 is engaged. It is also desired to call attention to the fact that the thrust of each pawl is distributed throughout the entire length of the shaft bearing portions 25 of the cavities in the rim 23 so that all bending or distorting stresses on the pawl shafts are eliminated.

While a specific form of the improvement has been described and illustrated herein, it is to be understood that the same may be varied within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

1. A socket wrench adapter comprising: a cup-shaped housing having a closed and an open extremity; a wrench-receiving stud concentrically projecting from the closed extremity of said housing; an annular series of internal, double-acting ratchet teeth formed in said housing; a tubular socket-receiving sleeve concentrically mounted in said housing and having a protruding extremity extending through the open extremity of said housing; an enlarged annular rim surrounding said sleeve within said housing within said annular series of ratchet teeth; a plurality of swinging pawls mounted in said rim and adapted to engage said ratchet teeth, each of said pawls projecting in a tangential direction opposite to its two adjacent pawls so that they will be alternately right and left handed; resilient means urging said pawls into engagement with said ratchet teeth; a tubular shifting collar surrounding said socket sleeve and forming a supporting bearing for the protruding extremity thereof, said collar extending from the open extremity of said housing about said sleeve; a circular hub portion formed on said collar and bearing against the inner wall of said housing to maintain said collar concentric therein; means retaining said hub portion in said housing; and means on said hub portion adapted when the latter is rotated to pass between certain of said pawls and said housing so as to prevent the latter pawls from engaging said teeth.

2. A socket wrench adapter comprising: a cup-shaped housing having a closed and an open extremity; a wrench-receiving stud concentrically projecting from the closed extremity of said housing; an annular series of internal, double-acting ratchet teeth formed in said housing; a tubular socket-receiving sleeve concentrically mounted in said housing and having a protruding extremity extending through the open extremity of said housing; a enlarged annular rim surrounding said sleeve within said housing within said annular series of ratchet teeth; a plurality of swinging pawls mounted in said rim and adapted to engage said ratchet teeth, each of said pawls projecting in a tangential direction opposite to its two adjacent pawls so that they will be alternately right and left handed; resilient means urging said pawls into engagement with said ratchet teeth; a tubular shifting collar surrounding said socket sleeve and forming a supporting bearing for the protruding extremity thereof, said collar extending from the open extremity of said housing about said sleeve; a circular hub portion formed on said collar and bearing against the inner wall of said housing to maintain said collar concentric therein; means retaining said hub portion in said housing; said pawls projecting longitudinally beyond said ratchet teeth toward the circular hub portion of said shifting collar; and arcuate, spaced-apart, peripheral flanges formed on said hub portion and extending toward the rim of said sleeve adjacent the inner wall of said housing and being circumferentially positioned so that when the latter is rotated by gripping the outwardly extending portion thereof, said flanges will rotate circumferentially to a position between the ratchet teeth and either the left-handed or the right-handed pawls to prevent the pawls of either desired hand from engaging said ratchet teeth.

3. A socket wrench adapter as described in claim 2, said flanges having an arcuate circumferential length slightly less than the distance between adjacent pawls so that when said flanges are in a position intermediate said pawls, the pawls of both hands will be free to simultaneously engage said ratchet teeth.

4. A socket wrench adapter as described in claim 3 and having means for retaining said shifting collar in either the right, left, or intermediate positions.

5. A ratchet adapter for socket wrenches comprising: an inverted, cup-shaped, cylindrical housing having a closed top and an open bottom; a wrench-receiving stud projecting upward from said top; an internal, annular band of double-acting ratchet teeth formed within said housing; a tubular wrench socket sleeve, concentrically positioned within said housing and projecting downwardly from the open bottom of said housing; an enlarged rim formed in said sleeve in spaced-relation to and within said band of teeth; a shifting collar rotatably surrounding said sleeve within said housing and projecting downwardly through the open bottom of the latter and forming a bearing bushing for said sleeve; an enlarged circular hub-portion formed on the upper extremity of said collar within said housing and contacting the inner wall of said housing and acting to maintain said sleeve concentric therein; means partially closing the open bottom of said housing and acting to maintain said hub-portion therein; a pair of oppositely positioned left-hand pawls hingedly mounted in said rim; a pair of oppositely positioned right-hand pawls hingedly mounted in said rim intermediate said left-hand pawls; spring means urging all of said pawls into engagement with said ratchet teeth, said pawls projecting downwardly below said rim towards said hub-portion; and two arcuate, spaced-apart peripheral flanges formed on and projecting upwardly from said hub-portion and acting to space said rim from said hub-portion, each of said flanges being normally positioned between the downwardly projecting extremities of opposite-handed pawls, so that by rotation of said collar, said flanges may be rotated to a position between the ratchet teeth and the pawls of either hand as desired.

6. A ratchet adapter as described in claim 5 having a bearing portion formed on said sleeve above said rim; and a bearing seat formed in said housing rotatably receiving said bearing portion and forming a support for the upper extremity of said sleeve, said housing forming a bearing for said collar and said collar forming a bearing for the lower extremity of said sleeve.

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