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RETAINER

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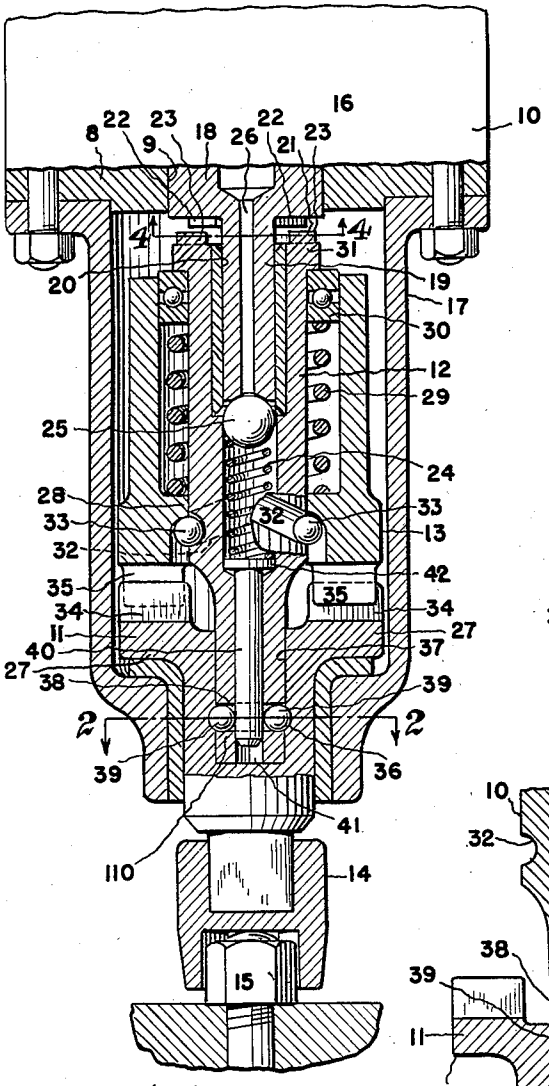


FIG.-1.

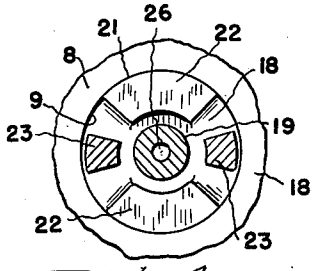


FIG.-4.

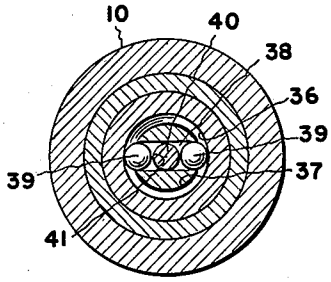


FIG.-2.

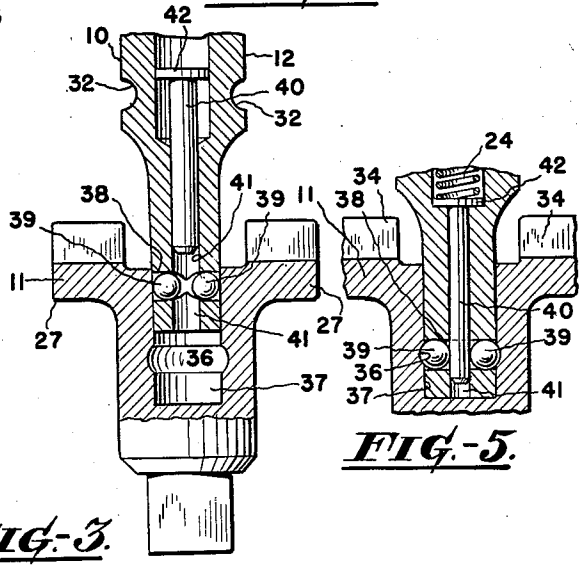


FIG.-3.

FIG.-5.

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RETAINER

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4 Claims. (Cl. 287—119)

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This invention relates to retainers and more particularly to such a device used as means for retaining the anvil on the spindle of wrenches of the type in which the spindle moves longitudinally with respect to the motor for engagement and disengagement therewith. Experience has shown that in wrenches of the type referred to and particularly impact wrenches, the anvil must be engaged against longitudinal movement with respect to the spindle in order to prevent partial disengagement of the anvil and hammer jaws and otherwise prevent erratic operation of the wrench. It is, accordingly, one object of this invention to secure the anvil to the spindle of an impact wrench against such motion in a relatively simple but efficient manner.

Heretofore, such means, in general, comprised some type of pin inserted in a slot in the anvil and having one end extending into an annular groove formed around the spindle and having the other end flush with the outer periphery of the anvil and held in position by the bearing material in which the anvil rotated. Such an arrangement entailed several disadvantages as for example, the inner end of the pin would become peened over during the operation of the wrench thereby making it difficult to remove the pin and, further, the outer end of the pin had a tendency to wear a groove in the bearing material for the anvil. It is, therefore, a further object of our invention to eliminate any possibility of wear between the retaining means and the members which they serve to engage—namely, the spindle to the anvil.

Another object of this invention is to provide a securing means which may be readily removed from its engaging position.

Other objects of this invention will be obvious from the following description and associated drawing in which:

Figure 1 is a vertical elevation, partly in section, of an impact wrench embodying the present invention,

Fig. 2 is a transverse view taken through Figure 1 along the line 2—2 looking in the direction of the arrows and shows the construction of the means for securing the anvil to the spindle of the wrench,

Fig. 3 is a vertical elevation, partly in section, showing the securing means in a disengaged position,

Fig. 4 is a transverse view taken through Figure 1 along the line 4—4 looking in the direction of the arrows, of the clutch arrangement whereby power is transmitted from the motor to the spindle of the wrench, and

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Fig. 5 shows an alternate construction of the means for securing the anvil to the spindle.

Referring to the drawing, 10 indicates, in general, an impact wrench embodying a preferred form of the means for securing the anvil 11 to the spindle 12. Impact wrenches of the type to which this invention appertains are generally utilized under circumstances where a plurality of nuts are tightened in rapid succession and it is, therefore, adapted to be moved from one nut to the next without shutting off its motor. In this manner, the socket can be removed from the nut and adapted to the following nut, or any other member it may be utilized to rotate, without the loss of time entailed in allowing the motor to stop between tightening operations. Accordingly, the driving motor (not shown) for the wrench runs continuously and is engaged and disengaged to the rotating member or spindle 12 on which is mounted the hammer element 13 for intermittently rotating the anvil 11 which, in turn, rotates the socket 14 engaging the nut 15.

Such engagement and disengagement of the spindle to the motor by longitudinal movement of the spindle 12 with respect to the motor is imparted by the operator of the tool in the operation of tightening or loosening the nut. That is, after the socket 14 has been adapted to the nut 15, or is otherwise held against endwise movement, any longitudinal movement of the motor thereafter in the direction of its work will serve to engage the spindle to the motor and any longitudinal movement away from its work as is required in order to remove the socket 14 from the nut 15, will serve to disengage the spindle from the motor. It is due to this relative movement of the spindle with respect to the motor that the need arises for a means for retaining the anvil against movement with respect to the spindle. The wrench 10 is, accordingly, provided with the unique retaining means, designated, in general, by 110, that prevents longitudinal movement and permits rotary movement between the members which it engages.

More specifically, the impact wrench 10 comprises a motor housing 16 to which is bolted a casing 17 into which projects a spindle or arbor 18 through a perforation 9 in the plate 8 which forms a closure for the back end of the casing 17. The spindle 18 is rotated by the motor through a gear train (not shown) and has a reduced extension 19 arranged telescopically in

a central bore 20 of the spindle 12. The bore 20 is at least equal in depth to the length of the reduced extension 19 in order to permit engagement of a clutch arrangement, designated in general by 21, on the adjacent ends of the spindles 12 and 18.

The clutch arrangement 21 is best seen in Figure 4 and comprises a pair of jaws 22 mounted 180 degrees apart on the forward end of spindle 18 which cooperate with another set of jaws, also 180 degrees apart, mounted on the rearward end of the spindle 12. It will be noted that the jaws 23 are of somewhat less width than the jaws 22 in order to permit easy and sure engagement of the clutch. In the arrangement shown, the clutch members 22 and 23 are constantly urged into the disengaged position by means of a spring 24 interposed between the bottom of the bore 20 and the lower or free end of the extension 19. Inasmuch as relative rotation occurs between the spindle 12 and the spindle 18, the free end of the extension 19 is recessed to receive a ball 25 interposed between the spring and the spindle to minimize the friction therebetween. Lubrication of the ball is facilitated by means of a passage 26 in the spindle through which a lubricant may be passed from the gear case (not shown).

Loosely encircling the spindle 12 is the tubular shaped hammer element 13 having an internal flange 28 at the lower or forward portion thereof on which seats a spring 29, the other end of which bears against a thrust bearing 30 mounted on the rearward end of the spindle 12 and held against rearward movement by flange 31 on the spindle 12. The width of the members defining the races for the bearing 30 are so designed as to maintain a sliding fit between the periphery of the bearing 30 and the hammer element 13. With this construction and arrangement, the bearing 30 serves the additional purpose of guiding the hammer element 13.

Immediately forward of the flange 28 are the forward ends of the races 32 which spiral rearwardly in the periphery of the spindle 12. Balls 33 are supplied for the races 32 which are of greater diameter than the depth of the races 32 and, therefore, protrude into the path of the flange 28. With this arrangement, whenever the resistance to rotation of the anvil 11 exceeds some predetermined value, as when the nut 15 is seated, the speed of rotation of the anvil will slow down whereas the motor speed tends to remain relatively constant. This causes the spindle 12 to rotate relative to the anvil 11 and the hammer 13 engaged thereby. Inasmuch as the balls 33 are held against rotational and longitudinal movement relative to the hammer 13 by the flange 28, the relative rotation between these elements drives the balls 33 back along the races 32 moving the hammer longitudinally relative to the spindle 12. Such movement of the hammer compresses the spring 29 and disengages the jaws 34 and 35.

At this time the balls 33 are at or near the rearward end of the races 32, hence, when the jaws 34 and 35 are disengaged, the spring 29 will expand driving the hammer forwardly, and the balls riding forward in the races 32 will impart forward rotational movement to the hammer relative to the spindle 12 and anvil 11. Of course, the hammer is also rotated by the spindle 12. As the balls 33 near the forward ends of the races 32 the jaws 35 are moved into alignment with the jaws 34 so that the hammer 13 strikes a blow on the anvil 11.

In order to permit the wrench to work equally well in either direction, as for loosening the nut 15, the races 32 are V-shaped with the point of the V located immediately forward of the flange. Thus, when the rotation of the motor is reversed, rotation of the spindle 12 relative to the hammer 13 will cause the balls to ride backwardly along the other leg of the V to disengage the hammer in the manner previously described.

The anvil 11 which serves to transmit the rotary movement of the hammer 13 to the nut 15 or other member to be rotated is arranged telescopically on the forward end portion of the spindle 12 and journaled in the forward end of the casing 17. A replaceable bearing material is interposed between the anvil 11 and the casing 17 which serves to eliminate the wear between the casing and the body portion of the anvil and the forward edge of the wings 27 spaced 180 degrees apart on the rearward end of the anvil. Mounted on and extending rearwardly of the wings 27 are jaws 34 that engage a similar set of jaws 35 formed on the forward end of the hammer 13 for transmitting the blow energy of the hammer 13 to the anvil.

It is readily apparent that during the operation of the wrench, due to the violent vibratory action of the hammer 13 with respect to the spindle 12, the spindle 12 will tend to move longitudinally relative to the anvil 11 resulting in partial disengagement of the jaws 34 and 35. In order to obviate this disadvantage, means is provided which engages the spindle to the anvil to prevent longitudinal movement therebetween and thereby assuring the proper mating relation between the jaws 34 and 35 at all times.

In the preferred form shown, this means comprises an annular groove 36 in the periphery of the bore 37 encircling the spindle 12. The depth of the bore 37 is such that when the end of the spindle 12 rests on the bottom of the bore 37 and the hammer is in its lowermost position, the jaws 34 and 35 are positioned to engage fully. When the spindle 12 is in this position, the cavities or transverse passage 38 provided in the spindle 12 aligns with the groove 36 and anti-friction members, such as the balls 39, are provided in the passage 38 which extend into the groove 36 to prevent longitudinal movement of the anvil 11 with respect to the spindle 12 but which permits unrestricted rotary movement therebetween. In order to attain positive engagement between the anvil 11 and the spindle 12, a means is provided for urging the balls 39 into the groove 36 which, in the form of the invention shown, comprises a pin 40 inserted in a bore 41 co-extensive with, but of smaller diameter than, the central bore 20 in the spindle 12. A head 42 is provided in the rearward end of the pin 40 which limits forward movement of the pin and rearward movement of the pin is restricted by the spring 24 which rests thereon.

Thus, it may be seen by the proper choice of the size of the balls 39, i. e., having a diameter substantially equal to the depth of the groove 36 plus the thickness of the wall defining the cavities 38, the balls 39 will be forced into position to engage the anvil 11 to the spindle 12 whenever the pin 40 is interposed between the balls 39.

With this arrangement, in order to disengage the spindle 12 from the anvil 11, it is merely necessary to retract the pin 40 and thereby release the balls to recede into the cavities or passage 38 to free the spindle to be withdrawn from the anvil. In order to prevent the balls 39 from

receding too far into the cavities 38 and subsequently falling into the bore 41, or otherwise making it difficult to adapt the hammer to the spindle, the inner ends of the cavities are reduced somewhat (see Figure 3) so as to limit the inward movement of the balls 39, or in the alternate construction shown in Figure 5 a bore 41 is formed of less diameter than the balls 39.

It is now obvious to those skilled in the art that the present invention provides a simple and effective means whereby an anvil may be engaged to and disengaged from the spindle of an impact wrench, and the like, and which will permit relatively uninhibited rotary movement therebetween. It will be noted, further, that the arrangement shown eliminates the need for any transverse passages in the anvil 11 with their attendant weakening effect on a member subject to high strain, as an impact.

While we have shown and described specific forms of our invention, it is to be understood that various changes and modifications may be made without departing from the spirit of the invention as set forth in the appended claims.

We claim:

1. A retainer comprising, two relatively rotating members, one slidably mounted within the other, the outer of said members having a groove therein, the inner member having a cavity therein opposite the groove, an anti-friction member in the cavity and of greater width than the depth of the cavity, said inner member having a bore therein intersecting the cavity and of less width than the width of said antifriction member, and means within the bore for holding said anti-friction member in the groove to prevent longitudinal movement between said relatively rotating members.

2. In an impact wrench of the type having a longitudinally acting clutch for the motor, a spindle adapted to be engaged to the motor by the clutch, an anvil slidably mounted on an end of the spindle, the anvil having a groove therein encircling the spindle, the spindle having a cavity therein opposite said groove, a ball in the cavity extending into said groove and being retractable into the cavity, said spindle having a passage therein in communication with the cavity, a pin having a loose fit in said passage for holding the ball in said groove, and a spring in said passage for holding the pin in the passage and for disengaging said clutch.

3. A retainer for a pair of telescopically arranged members, the outer member having a groove therein, the inner member having a longitudinal bore therein and a cavity communicating with said bore and groove, an antifriction member positioned in said cavity and extending into said groove, a rod extending slidably into the bore for moving said antifriction members into the groove, and means on the inner member to prevent said antifriction member from passing through said bore when the rod is withdrawn therefrom.

4. A retainer for a pair of telescopically arranged members, the outer member having a groove therein, the inner member having therein a longitudinal bore and a cavity communicating with said bore and groove, an antifriction member positioned in said cavity and extending into said groove, a rod extending slidably into the bore for moving said antifriction members into the groove, said rod being of substantially uniform diameter throughout that portion of its length extending into said bore, and means on the inner member to prevent said antifriction member from passing through said bore when the rod is withdrawn therefrom.

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