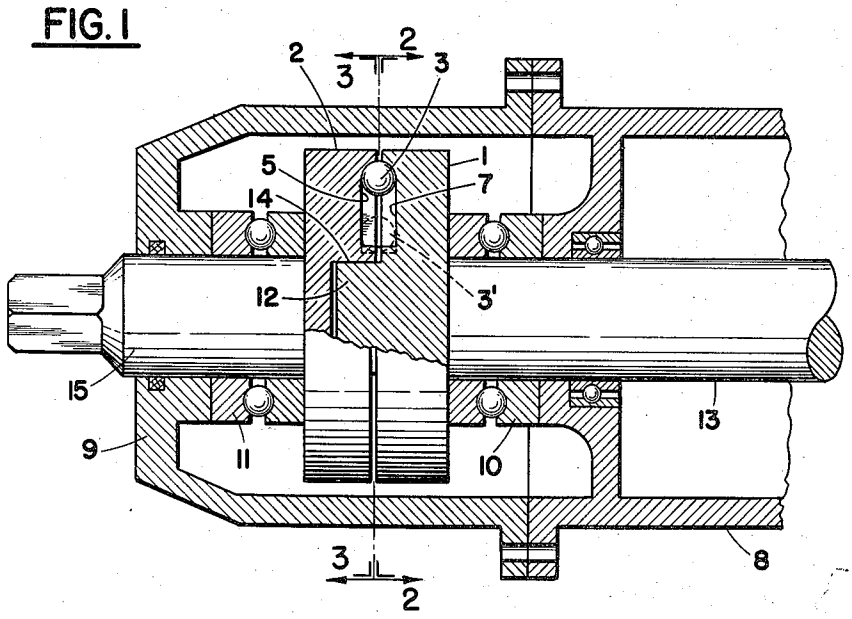
April 30, 1946. C. W. PORTER 2,399,251

IMPACT WRENCH

Original Filed Dec. 2, 1942

FIG. 1



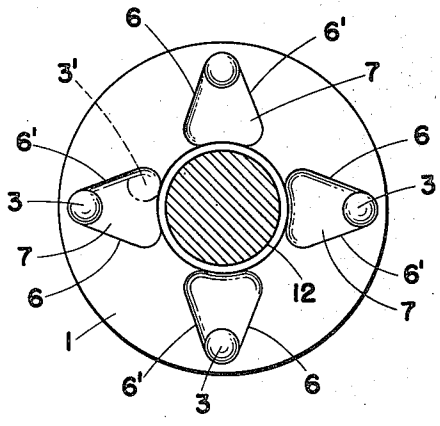


FIG. 2

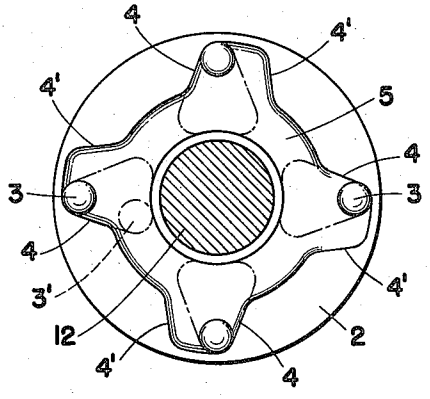


FIG. 3

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IMPACT WRENCH

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Original application December 2, 1942, Serial No. 467,659. Divided and this application September 21, 1944, Serial No. 555,159

3 Claims. (Cl. 192—30.5)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention herein disclosed is a means for increasing the speed and personal safety and reducing manual fatigue of the operator in driving nuts, or other rotarily wedged parts into place or loosening them therefrom after they have been tightened.

The main object of the invention is to adapt the use of power means for supplying both intermittent impulses and smooth rotary motion as needed so that they may be applied to a wrench in a most practical manner.

A further object is to increase the speed and reduce the hazards of the present methods of tightening or loosening bolts, nuts, etc., and to provide in the same tool a means for turning nuts etc., at a high rate of speed when they are loose enough to permit it, together with means for changing over from direct rotary connection in the power tool for driving the nut, to imparting intermittent impulses thereto, and vice versa, said means being operative automatically upon increase in resisting torque due to tightening of the nut or decrease in the resisting torque due to loosening thereof, respectively, the changeover being effected at a torque value in accordance with the speed of the power motor, said means further automatically increasing the energy supplied per impulse during intermittent operation as well as increasing the number of impulses upon increase in speed of rotation of the power motor.

This application is a division of application Ser. No. 467,659 filed December 2, 1942. The parent application discloses three preferred forms of my invention illustrated by twelve figures in the accompanying drawing. Figs. 10, 11 and 12 thereof illustrate the modification which is the subject of the present application. This invention is illustrated in the present application by three figures, 1, 2 and 3, corresponding to the original Figures 10, 11 and 12 in the parent application.

Fig. 1 being an elevation of the assembly of this form of the wrench illustrating a square ended projection for application to a socket of the same size and cut away to show the principal parts of this form of the invention,

Fig. 2 is an end view of the impacter or driver 1 taken at the section line 2—2 in the direction of the arrows shown in Fig. 1,

Fig. 3 is an end view of the torque block 2 taken at the section line 3—3 in the direction of the arrows shown in Fig. 1.

It is my aim to provide an impact wrench attachable to a source of power (electric or compressed air) and so operable therefrom that this wrench may through its component parts, be used to impart blows or impacts to a nut in such a way as to turn or rotate the nut for tightening or loosening purposes.

It is further my aim to combine in this same tool, means for simple high-speed spinning of nuts on or off bolts, whenever the nut fits loose enough to permit such operation.

The advantages of this wrench over other tools for this purpose are its compactness, simplicity, effectiveness, efficiency, safety, smoothness of operation, speed and lack of fatigue with which my wrench can be operated.

Similar aims and advantages are derived from this form as from those in the other two arrangements shown in Figs. 1 to 9 in parent application, with the further result that since the wedging edges diverge radially inwardly of the drive shaft, the centrifugal force acting on the balls will directly act against the tendency of the balls to be squeezed out of their driving position and will thus have a greater effect on increasing the driving impulses on the work being turned with an increase in speed of operation of the motor.

Referring to this arrangement on the drawing, Figs. 1 to 3, 2 is a cylindrical torque block having a projection with a square end adaptable for insertion into a square socket portion of any one of a set of socket wrenches or the like. This end however may be made to suit any requirements. 1 is a cylindrical impacter or ball driver for driving the balls 3, 3 etc. by means of the edges 6, 6' etc. of the pockets 7, 7 etc., against the edges 4, 4' etc. of pockets 5 in the adjacent face of the torque block 1, the depth of each pocket being slightly less than the radius of the balls. Upon reversal of direction of operation of the motor, the balls are squeezed between the opposite edges 6, 6' etc., of the impacter 1 and 4, 4' etc. of the torque block 2, each ball always remaining in the same pocket 7 of the impacter, but being adaptable to work in any one of the outwardly extending portions of the common pocket 5 of the torque block.

When all the balls are squeezed inwardly the impacter turns relative to the torque block until the balls are thrown outwardly by centrifugal force into the succeeding outwardly projecting portions in the pocket 5.

The two members 1 and 2 are mounted for rotation in aligned bearings in the casing sections 8 and 9 between which and these members are fitted thrust bearings 10 and 11 respectively to keep the end faces of the members 1 and 2 closely adjacent. To assist in maintaining the parts in

alignment a cylindrical projection 12 on the end face of the impacter 1 concentric with the drive shaft 13, fits into a bore 14 in the end face of the torque block 2 concentrically aligned with the shaft portion 15 of the torque block.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. In a reversible variable speed power tool for turning, tightening and loosening parts, a casing, a driving member and a driven member rotatably and concentrically mounted therein, adjacent faces on said members having complementary pockets for simultaneously retaining balls therein and having circumferentially opposed edges for wedging the balls toward portions of the pockets which permit relative rotation between the members, the last named portions of the pockets being radially inward of the portions where the opposing edges pass each other upon relative rotation of said members and the pockets in one member being individual to each of the balls working therein and the other member having a common annular pocket concentrically disposed in said member extending through a 360° arc and having a number of outwardly extending portions, the individual pockets and the outwardly extending portions of the common pocket being equally spaced circumferentially around their respective members.

2. In a reversible variable speed power tool for turning, tightening and loosening parts, a casing, a driving member and a driven member rotatably and concentrically mounted therein, adjacent faces on said members having complementary pockets for simultaneously retaining balls therein and having circumferentially opposed edges for wedging the balls toward portions of the pockets which permit relative rotation between the members, the last named portions of the pockets being radially inward of the portions where the opposing edges pass each other upon relative rotation of said members and the pockets in the driving member being individual to each of the balls working therein and the driven member having a common annular pocket concentrically disposed in said member and extending through a 360° arc around said member at its inner portion but having a number of outwardly extending portions, the individual pockets and the outwardly extending portions of the common pocket being equally spaced circumferentially around their respective members.

3. In a reversible variable speed power tool for turning, tightening and loosening parts, a casing, a driving member and a driven member rotatably and concentrically mounted therein, adjacent faces on said members having complementary pockets for simultaneously retaining balls therein and having circumferentially opposed edges for wedging the balls toward portions of the pockets which permit relative rotation between the members, the last named portions of the pockets being radially inward of the portions where the opposing edges pass each other upon relative rotation of said members and the pockets in the driving members being individual to each of the balls working therein and the driven member having a common annular pocket concentrically disposed in said member extending through a 360° arc around said member and having a number of outwardly extending portions equal to the number of the individual pockets in the other member, the individual pockets and the outwardly extending portions of the common annular pocket being equally spaced circumferentially around their respective members and all having edges symmetrically arranged with respect to a common radius in each pocket or portion for operation in either direction of drive to furnish impulses to the driven member in proportion to the speed of the driving member and the resulting centrifugal forces imparted to the balls due to their being rotated by the edges of their respective individual pockets in the driving member.

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