March 9, 1943. J. A. RONNING 2,313,398

WRENCH-ACTING TOOL

Filed June 29, 1939 3 Sheets-Sheet 1

Fig. 1

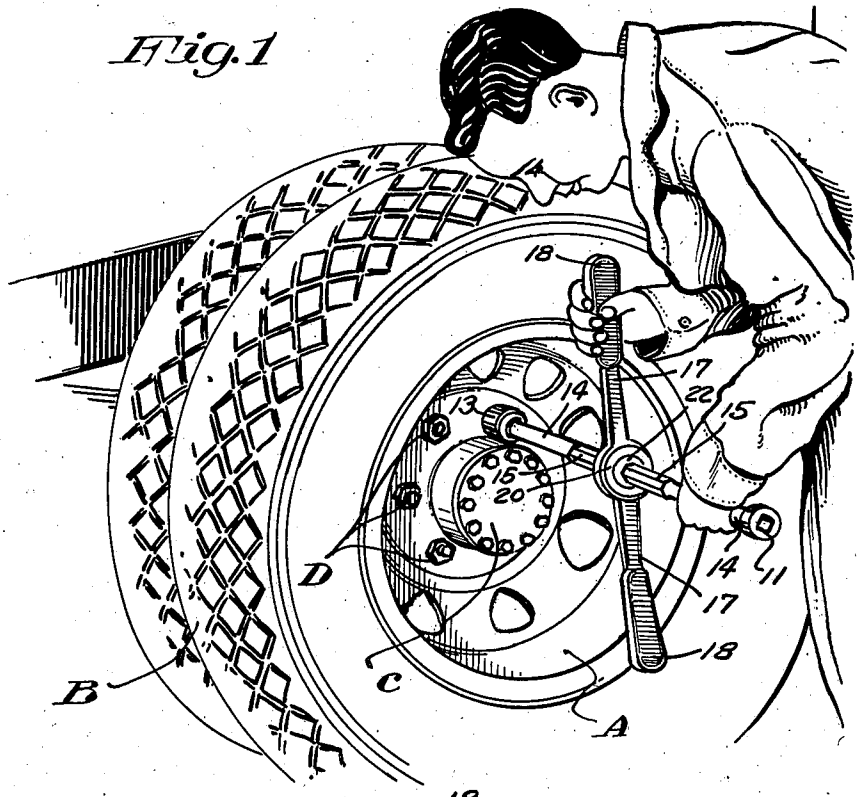
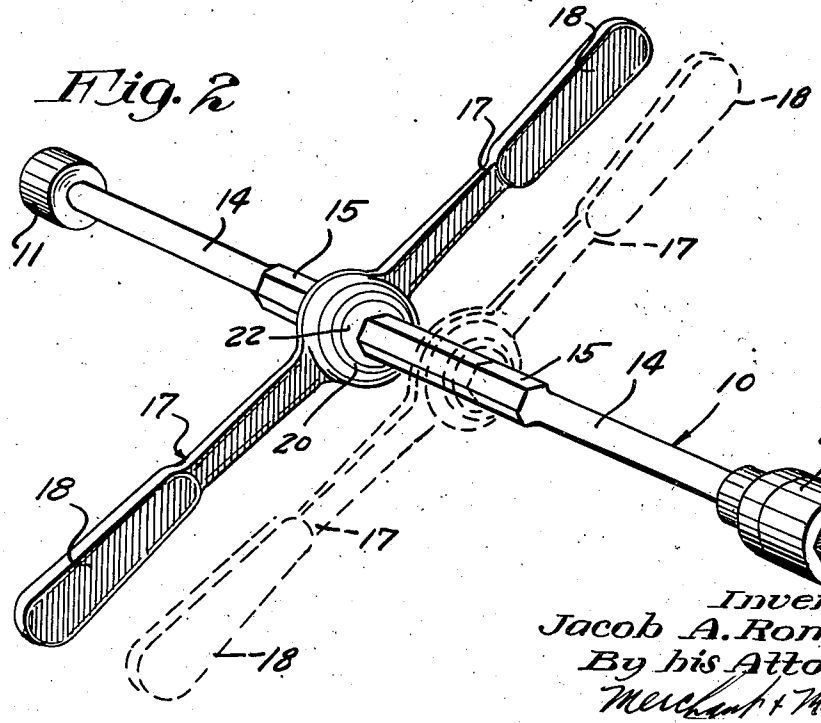


Fig. 2

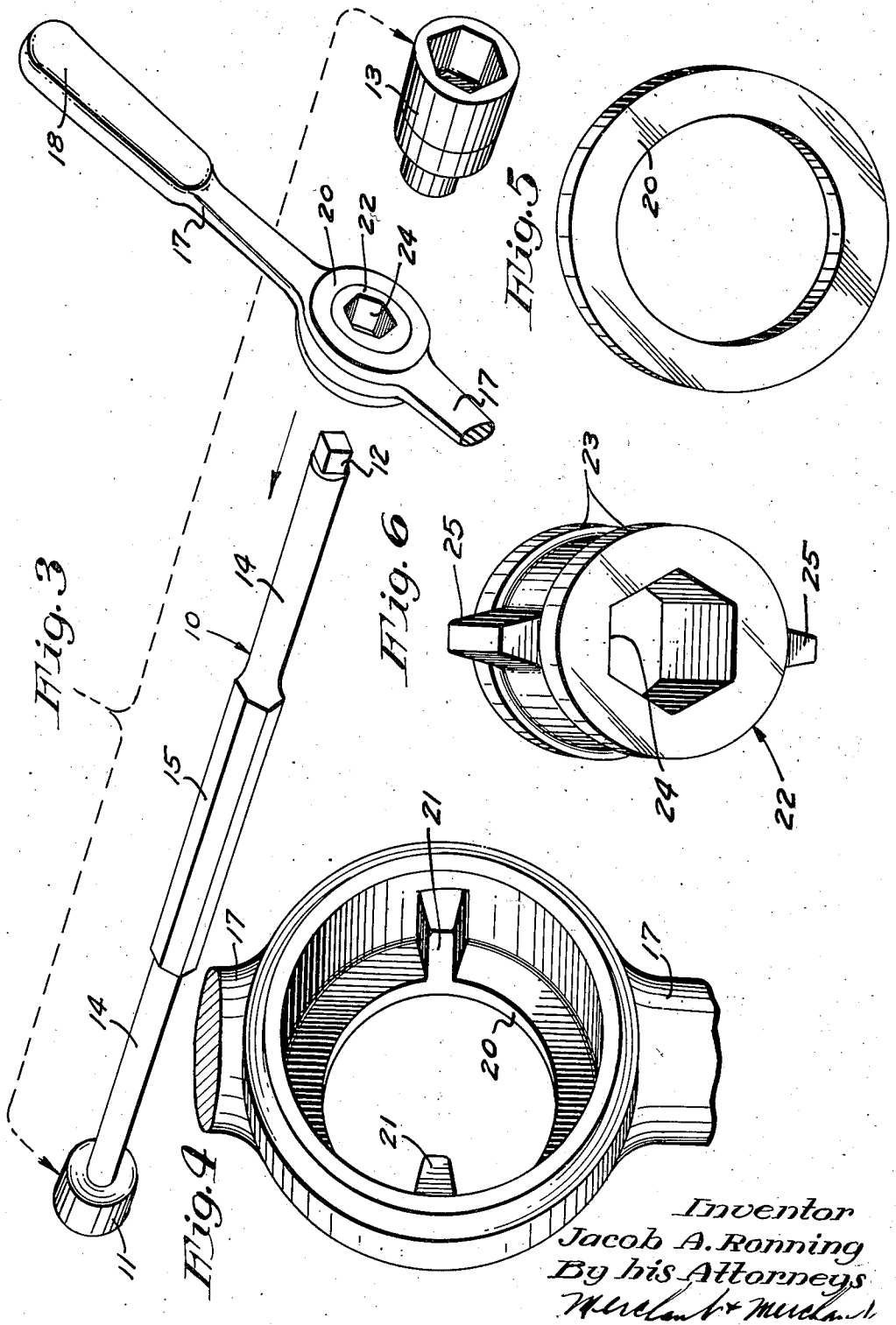


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Filed June 29, 1939 3 Sheets-Sheet 2

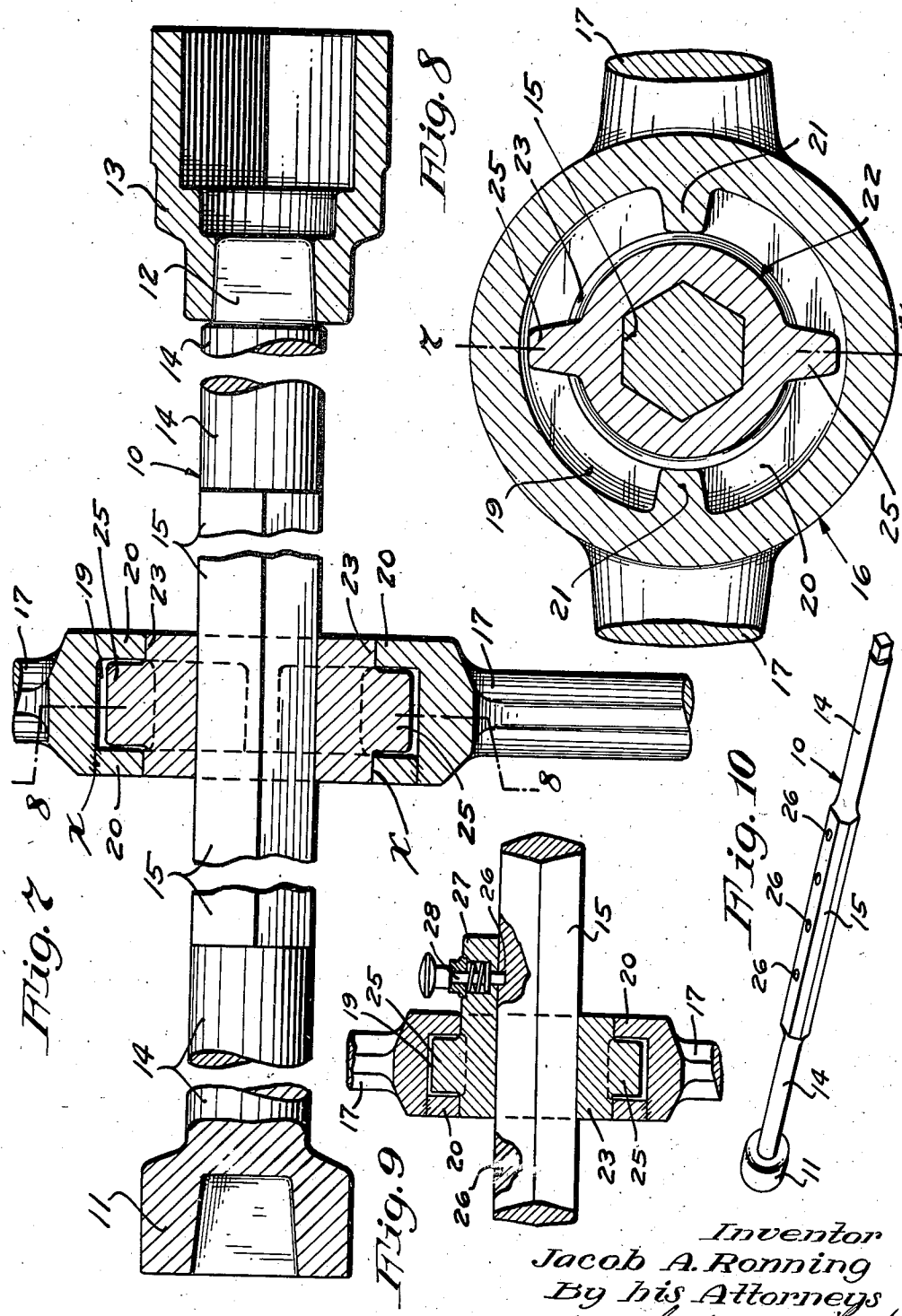


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Filed June 29, 1939 3 Sheets-Sheet 3



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WRENCH-ACTING TOOL

Jacob A. Ronning, Minneapolis, Minn.

Application June 29, 1939, Serial No. 281,887

1 Claim. (Cl. 81—53)

This invention relates to improvements in wrench-acting tools or torque producing devices and is in the nature of an improvement on or modification of the wrench-acting tool structures disclosed and claimed in a co-pending application Serial Number 281,886 filed jointly by myself and Thomas B. Newell of even date herewith, and which application is a continuation of our earlier filed application.

The device herein illustrated like the devices illustrated in the co-pending applications identified comprises a shaft adapted to engage work at one end while its other end is journaled in one of the operator's hands; and having a rotary hammer mounted on the intermediate portion thereof for limited rotary movement, and which hammer is adapted to be rotated by the other of the operator's hands.

Although the devices of our previous applications have proven very successful and have met with wide commercial acceptance, they are sometimes objected to in that the range of different kinds of work which can be accomplished with any given length of shaft is essentially limited to jobs wherein the radially projecting portions of the hammer will clear obstructions within the plane of movement thereof, which is, in these previous devices, a fixed distance from the work engaging end of the shaft since no provision is made for axial extension of the shaft or axial adjustment of the hammer on the shaft.

This invention seeks to and does, in fact, provide a tool in which the above noted disadvantage of our previous structures is overcome; while at the same time retaining most of the important objectives and advantages of the tool of our earlier applications. To this end the shaft of the tool is provided with a cross sectionally angular intermediate portion, preferably of relatively great length with respect to the overall length of the shaft, and the hammer is rotatively mounted on a bearing member which has an angular aperture which is axially slidable on and rotatively interlocks the bearing to the shaft.

In the preferred forms of the device herein illustrated this bearing member is removable from the shaft axially thereof; and also in the preferred embodiments of the invention illustrated, this bearing member is axially interlocked to the hammer so that the hammer and bearing member are axially displaceable as a unit.

The above noted and other important objects and advantages of the invention will be made apparent from the following specification and claims.

In the accompanying drawings like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a perspective view illustrating the invention being used to remove the anchor nuts of a vehicle wheel;

Fig. 2 is a somewhat enlarged perspective view of the tool illustrating two different axially adjusted positions of the hammer on the shaft.

Fig. 3 is a perspective view showing several parts of the tool in segregated axially aligned relation;

Fig. 4 is a fragmentary perspective view of the hub portion of the hammer with one flange thereof removed as before complete assembly;

Fig. 5 is a perspective view of the removed hub flange;

Fig. 6 is a perspective view of the bearing member;

Fig. 7 is a still further enlarged view partly in axial section with some parts on the section line being shown in full, the section being taken on the line 7—7 of Fig. 8;

Fig. 8 is a transverse sectional view taken on the line 8—8 of Fig. 7 but with the hammer hub turned 90° with respect to the position shown in Fig. 7;

Fig. 9 is a fragmentary view correponding to Fig. 7 but illustrating an additional feature preferably employed in the device; and

Fig. 10 shows in perspective the shaft designated as illustrated in Fig. 9.

In Fig. 1 a vehicle wheel is indicated by A, a pair of pneumatic tires mounted on the wheel by B, the wheel hub by C and nut equipped wheel anchoring bolts by D.

The tool shaft indicated as an entirety by 10 is illustrated as being provided at one end with an integrally formed work engaging head 11 in the nature of a nut-receiving socket, and at its other end said shaft is illustrated as being provided with an angular work engaging head 12 which may be used to engage a socket nut or the like but which is shown as being equipped with a removable supplementary work engaging head 13 in the nature of a nut-receiving socket. Whereas the opposite end portions of the shaft 10 inwardly of the work engaging heads are shown as being, and are preferably, cylindrical cross sectionally, the extended intermediate portion of the shaft is cross sectionally angular, preferably hexangular.

By reference to the drawings it will be seen that the minimum diameter portions of the angular intermediate portion of the shaft have a

diameter at least as great or slightly larger than that of the cylindrical portions of the shaft, this being for the purpose of rendering the hammer and its bearing readily removable axially of the shaft. The cylindrical gripping end portions of the shaft 10 are indicated by 14 and the angular intermediate portions thereof is indicated by 15.

The hammer, in its preferred form illustrated, comprises a tubular or annular hub portion indicated as an entirety by 16, and a pair of like diametrically opposed weighted radial arms 17, which arms are relatively heavy throughout and provided adjacent their ends with enlarged hand gripping portions 18. As will be seen by reference to the drawings, the annular hub 16 is formed to afford a radially inwardly opening annular chamber 19 defined at its sides by radially inwardly projecting annular end thrust flanges 20. Preferably formed integrally with the hammer hub and projecting into the annular channel 19 is an oppositely disposed pair of rotary impact abutment lugs 21.

The annular bearing member 22, which has external cylindrical bearing surface sections 23, has an angular axial aperture 24 to slidably but snugly receive the angular intermediate portion 15 of the shaft. The external bearing surfaces 23 of the bearing member are journaled in cooperating bearing surfaces formed by the cylindrical free edges of the flanges 20, and said bearing member is provided with diametrically opposed radially projecting rotary impact abutment lugs 25. These abutment lugs 25 work in the annular channel 19 of the hammer in radially overlapping relation to the abutments 21 so that the opposite circumferentially spaced striking surfaces thereof cooperate with similar striking surfaces on the abutments 21. The abutment lugs 25 are preferably just slightly narrower than the channel 19 so that the opposite axially spaced sides thereof will afford end thrust guide surfaces which will cooperate with the annular end thrust guide surfaces of the flanges 20 to axially interlock the bearing member within the annular hub.

While the tool described is extremely well adapted for use in the extreme tightening up of or the loosening of extremely tight nuts, bolts and the like, it should be understood that it is equally adaptable for performing innumerable other operations requiring a high degree of torque power. One very urgent need for such a wrench-acting tool has been found in the automotive service business for removing anchor nuts from wheels of large vehicles, such as automobiles, trucks, tractors and the like, in which not only is a high degree of torque power necessary to securely anchor the wheels to their hubs, but in which an even much greater amount of power is often necessary to loosen such tightly engaged nuts after they have become corroded or rusted.

This device is used as an ordinary cross wrench insofar as is possible, but to obtain initial tightening pressure and/or initial loosening pressure, the hammer is given a rapid rotation with respect to the shaft to bring the cooperating abutments together, which causes the rotary inertia of the heavy hammer to be abruptly transmitted to the shaft and through the shaft to the nut or bolt. The rotary impact thus produced is sufficient to loosen or tighten nuts or bolts which would otherwise require great auxiliary pressure over and above that which could be produced through application of manual pressure to an arm of corresponding length in a conventional tool not embodying such slack motion construction.

In the use of ordinary cross wrenches or other conventional tools, auxiliary pressure over and above that which can be produced by direct pull or push by an operator on the tool arm is usually provided by means of long extension arms or hammering on the tool itself. Insofar as the operations of the device in the manner illustrated in the drawings is concerned, it operates the same as the device of the above identified prior applications insofar as the actual loosening or tightening of the nuts or the like is concerned, but in the present tool the hammer may be axially adjustably positioned on the shaft, which is very important mainly for the following reasons, to wit: (*a*) In order to obtain maximum efficiency and a minimum of vibration, it is desirable to position the hammer as closely as possible to the work engaged end of the shaft, which, of course, also minimizes the torque strain upon the shaft. (*b*) By reference to Fig. 1 it will be seen that the minimum distance that the hammer can be operated from its work engaging end in this particular job is determined by the depth of the recess of the wheel to the limit providing working clearance for the operator's hands. Whereas in the illustration, the wheel recess permits approximate centering of the hammer on the shaft, it will be obvious that in larger wheels wherein the recess is deeper, either a tool with a longer shaft must be resorted to or the hammer must be axially shifted off center on the shaft. Hence, due to the axial adjustability of the hammer on the shaft, the shaft can be made relatively very short as compared to a device wherein the hammer was not shiftable axially, thus increasing the scope of the work which can be done with a tool shaft of given length.

To remove the shaft and bearing member bodily from the shaft it is necessary only to remove the work engaging head 13 and slide the bearing member axially off of the shaft. With this device, as in the devices of the co-pending applications identified, a single hammer can be used with a variety of shafts each adapted for a different kind or type of work.

By reference to the drawings it will be seen that the axial centers of the rotary impact abutments 21 and 25 are located in the axial center of weight of the hammer, which is important in that in this construction the rotary impact between the hammer and shaft is transmitted with a minimum of vibration, which vibration is not only annoying to the operator but, of course, reduces the overall efficiency of the rotary impact.

Preferably the improved tool illustrated is initially formed in four independent units, to wit: (*a*) the shaft as one unit, (*b*) the hammer together with its annular hub, arm and one of the flanges 20 but exclusive of another of the flanges 20 as another unit, (*c*) one of the flanges 19 as a third unit and (*d*) the bearing member 22 together with its abutments 25 as another integral unit. Where maximum durability is desired, each of these units is preferably formed as an integral drop forged member. When all of these units have been completed, the bearing member 22 is placed in the hub recess 19, after which the separately formed flange 20 is put into place against the exposed ends of the abutments 21 and is welded to the hammer hub as best shown at *x* in Fig. 7 so as to form the same into

an integral unit with the hammer and lock the bearing member in position.

Frequently the tool will be used with the shaft 10 in a vertical position and for such use it is desirable to have means for holding the hammer against vertical sliding movements on the shaft 10. This is accomplished in a very simple way by providing the central portion 15 of the shaft 10 with plunger seats 26 and providing the section 23 with an extended lug 27, and mounted in said lug an inwardly spring pressed lock pin 28, as shown in Figs. 9 and 10.

What I claim is:

In a lost-motion socket wrench having a shaft member adapted for operation with its axis in a substantially horizontal position, said shaft having a socket at one end and a non-circular intermediate portion and a circular handle portion at the other end, an inner hub member slidable onto said shaft from one end thereof and having a non-circular opening adapted to coact with the correspondingly shaped portion of said shaft for rotating the one from the other, impact lug means projecting laterally outwardly from said inner hub member and having oppositely disposed impact surfaces, cylindrical bearing surfaces on said inner hub member on opposite sides of said impact lug means adjacent the base thereof, a cooperating outer hammer-acting hub member having on opposite sides thereof spaced wall-forming flanges projecting radially inwardly therefrom a distance greater than the height of said impact lug means for embracing same therebetween, said flanges having internally formed cylindrical bearing surfaces for rotatably engaging the corresponding cylindrical bearing surfaces of said inner hub, and striking lug means on said outer hub member projecting radially inwardly between the wall-forming flanges thereof and having oppositely disposed striking surfaces engageable with corresponding surfaces of said impact lug means on relative rotation of said inner and outer hub members.

JACOB A. RONNING.