

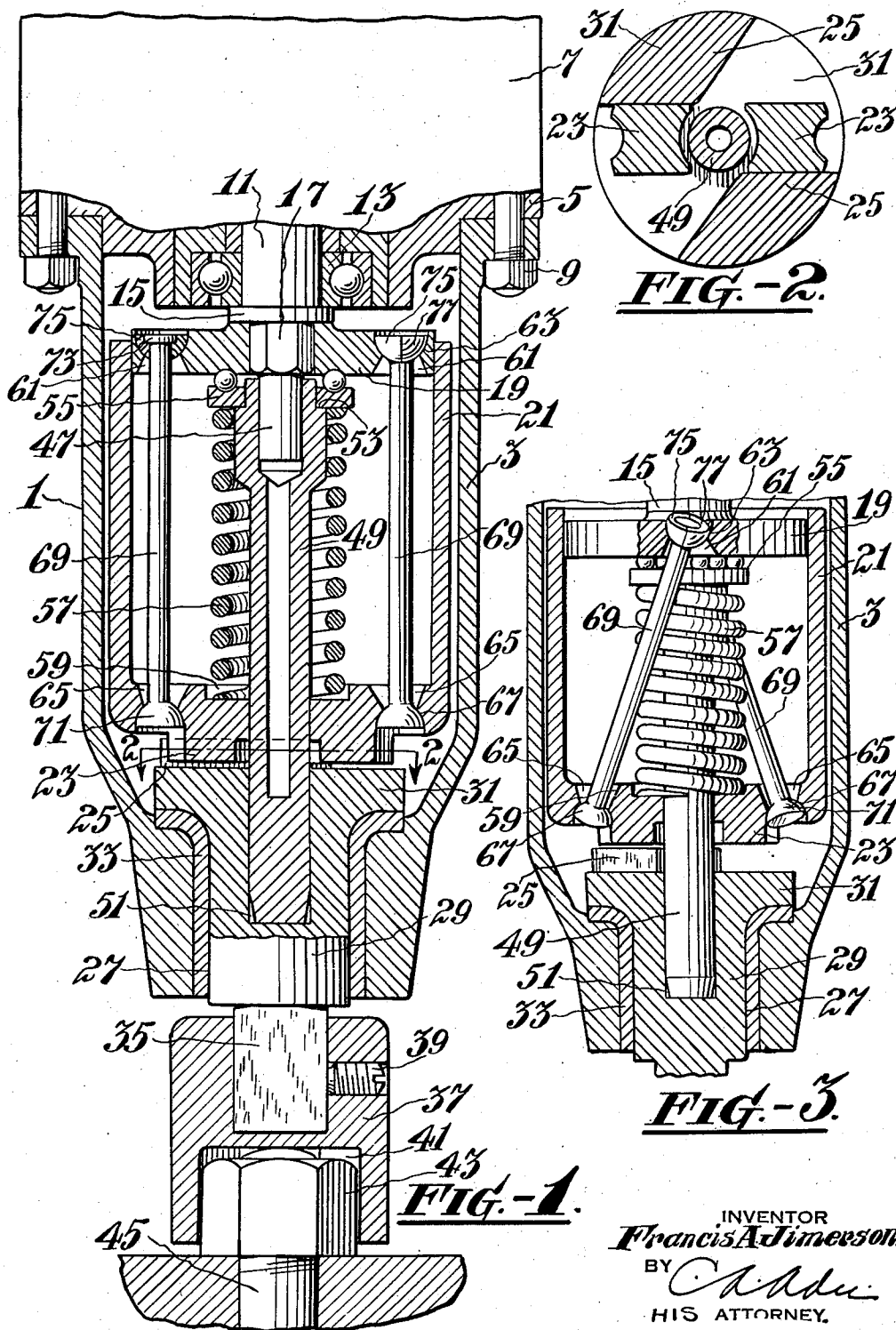
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IMPACT TOOL

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IMPACT TOOL

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The present invention relates to rotary impact devices, but more particularly to a rotary impact tool of the type wherein the device rotates the work until the work sets up a resistance torque greater than the rotating driving torque, and then delivers a series of impacts to overcome the resistance torque of the work. Such devices are ordinarily provided with an anvil member adapted to engage the work and a hammer member through which the driving force of the prime mover is transmitted to the anvil.

A connecting means between the prime mover and the hammer is provided which, when the resistance torque becomes greater than the driving torque, absorbs and stores the energy supplied by the prime mover as long as the work resistance is great enough to prevent movement of the anvil by the hammer, or until the hammer becomes disengaged from the anvil. As soon as the hammer has disengaged the anvil, the stored energy is imparted to the hammer in order to bring the hammer into re-engagement with the anvil with an impact. The energy is used to impart an angular velocity to the hammer in order that the hammer effect may be secured as it strikes the anvil.

Several forms of energy storing driving connections between the prime mover and the hammer have been proposed, but they have been attended with a great many disadvantages. A great many of these driving connections involve the use of cams, gears, rollers, etc., and have a very complicated structure.

It is, therefore, an object of this invention to provide a driving connection which is simple and does not involve the use of cams, gears or other complicated structures.

It is a further object of this invention to provide a driving connection which will impart a positive angular velocity to the driving hammer.

A still further object is to provide a simple driving connection which is an efficient energy storing means, easily constructed, rugged and not requiring frequent and expensive repairs.

These and further objects will be apparent from the following description of which the drawing is a part.

Similar reference numerals in the drawing, refer to similar parts.

Figure 1 is a sectional elevation view of a device constructed in accordance with the present invention.

Figure 2 is a section taken along line 2—2 of Figure 1, and

Figure 3 is a view of a portion of the device

of Figure 1 illustrating the position of the parts in operating position.

With respect to Figure 1 the rotary impact device is generally indicated by 1. It consists of a casing 3 which is secured to the plate 5 of the motor or prime mover 7 by means of the bolts 9. This motor may be an air motor or any other suitably controlled reversible motor. The shaft 11 of the motor extends through the plate 5 and rotates in the bearing 13. The shaft 11 has a flange 15 which contacts the bearing 13 and prevents longitudinal movement of the shaft 11 towards the prime mover. A hexagonal portion 17 forms part of the shaft 11 and is situated next to the flange 15. This portion 17 may be formed in any other manner so long as it will prevent the rotation of the rotary driving head 19 with respect to the shaft 11.

Surrounding the head 19 is a cup-shaped hammer member 21 which extends into the casing. On its lower face the hammer 21 is provided with clutch teeth 23. These clutch teeth 23 are adapted to engage with corresponding clutch teeth 25 mounted on the upper face of the anvil member 27. The clutch teeth 23 and 25 comprise a disengageable locking means between the hammer member and anvil member. The anvil 27 consists of a cylindrical portion 29 and a flange portion 31. The flange and the cylindrical portion bear on a bearing 33 situated within an opening at the bottom of the casing 3.

Extending from the cylindrical portion 29 is a shank 35 to which a wrench 38 is secured by any suitable means such as the set screw 39. The wrench 37 is merely shown for the purpose of illustration and accordingly other types of tools may be used in its stead. The wrench 37 has a socket 41 adapted to co-act with the nut 43 and is adapted to secure it to the bolt 45.

When the prime mover 7 is rotated, the hammer 21 should preferably be kept in axial alignment with the shaft 11. For this purpose an extension 47 on the shaft 11 is recessed in a guide rod 49. The guide rod extends through a central opening in the bottom wall of the hammer member into a bored-out well 51 in the anvil 27. This guide rod has a free running fit within the anvil and also permits free rotation of the extension 47 on the shaft 11.

On the upper portion of the guide rod is a shoulder 53. A thrust bearing 55 rests between the shoulder 53 and the head 19, and permits relative rotation between the head 19 and the guide rod 49. In order to maintain the hammer clutch teeth 23 normally in engagement with the

anvil clutch teeth 25, a spring 57 is placed between the thrust bearing 5 and a cup 59 in the bottom wall of the hammer.

The head 19 is provided with diametrically opposite apertures 61 which communicate with sockets or spherical seats 63. The bottom wall of the hammer is provided with similar apertures 65 and corresponding sockets 67. The apertures 61 are so disposed in the head 19 that each aperture will be in vertical alignment with a corresponding aperture 65 in the hammer member when the device is in the position shown in Figure 1. It is then possible to pass a member which will not stretch and may be rigid such as a rod 69 through each corresponding pair of apertures. In the present instance only two pairs of corresponding apertures are shown, but it is apparent that a greater number may be employed.

The rods 69 each have a ball member 71 at one end and a cylindrical head 73 at the other end. The rods need not be provided with a ball member, but may have a cylindrical head at each end. The cylindrical head 73, being smaller in diameter than the apertures, can be passed through the apertures when the device is being assembled. Thus the head 73 may be passed through the aperture 65 and then the aperture 61, bringing the ball member 71 to rest in the socket 67 as shown, or it may be passed through the aperture 61 first, thereby seating the ball member in the socket 63. After the ball member 71 is seated in the socket 67 the spring 57 between the head 19 and the hammer member 21 may be compressed so that the cylindrical head 73 will extend above the head 19. While the cylindrical head is above the sockets 63, cooperating ball seat members 75 and 77, may be placed in the sockets 63. These members are so designed that the cylindrical head 73 will fit in and rest on them and they will prevent the passage of the cylindrical heads through the apertures 61. Since the ball members are of greater diameter than the apertures, the rods will be held between the head and the hammer and serve to connect these two members.

The operation of the device will now be described. When the prime mover rotates, the head 19 will also be rotated by the hexagonal portion 17 of the shaft 11 since it cooperates therewith. Assuming that the torque resistance of the work is less than the torque furnished by the prime mover, the hammer 21 will then be rotated by the rods 69 and will be in the position indicated in Figure 1. However, as soon as the torque resistance of the work increases to a point where it exceeds the torque furnished by the prime mover, the hammer will be unable to move the anvil. However, since the head will continue to rotate with the prime mover it is readily apparent that the rods 69 will be displaced to the position illustrated in Figure 3.

As these rods 69 are displaced from a vertical position to an angular position they will tend to raise the hammer 21 away from the anvil 27. As the angularity of the rods increases, the hammer will be raised further and further, until the hammer clutch teeth 23 have become wholly separated from the anvil clutch teeth 25. When this has occurred the hammer teeth 23 will rotate with the prime mover over the upper surfaces of the anvil clutch teeth 25 until the openings between the anvil clutch teeth are reached. As soon as the openings are reached, the hammer will be free to return to its former position

in engagement with the clutch teeth under the influence of the compressed spring 57.

As the spring 57 forces the hammer 21 into engagement with the anvil 27 the rods 61 will again tend to assume a vertical position. Consequently, during the time of re-engagement the hammer will be given an additional angular velocity over that imparted by the prime mover and, as a result, the hammer clutch teeth 23 will strike the anvil clutch teeth 25 with a sharp blow thereby driving the work. It is obvious that the hammer is capable of striking any number of such blows and as long as the operator desires to operate the driving motor.

I claim:

1. In a tool of the character described, a rotary driving head, a hammer spaced from said head, an anvil member, coacting clutch members on said hammer and anvil members, rigid means pivotally mounted on the head and hammer connecting the head and hammer adapted to enable the clutch members to disengage and the hammer to remain stationary during rotation of the head, and a spring normally tending to separate said head and said hammer and to normally maintain said clutch members in engagement.

2. In a tool of the character described, a rotary head, a hammer member, an anvil member, co-acting clutch means on said hammer and anvil members, rods pivotally mounted on and connecting the head and hammer member to enable the head to drive the hammer member and adapted to enable the clutch means to disengage and the hammer member to remain stationary during rotation of the head, and a spring to normally resist relative rotation between said head and hammer member and to maintain the clutch means in engagement.

3. In a tool of the character described, a rotary driving head, an anvil member, a hammer member, co-acting separate clutch members on the hammer and anvil members, a spring to normally maintain the clutch member interlocked with the anvil clutch member, and rigid means pivotal with respect to and connecting the head and hammer members and adapted to enable the clutch members to disengage and the hammer member to remain stationary during rotation of the head.

4. In a tool of the character described, a rotary head, an anvil member, a hammer member, co-acting clutch members on the hammer and anvil members, means to normally maintain the clutch members in interlocking engagement and thereby maintain the hammer and anvil members in engagement, and a plurality of rods pivotal with respect to and connecting the head and hammer member to enable the head to drive the hammer member and adapted to enable the clutch members to disengage and the hammer member to remain stationary during the rotation of the head.

5. In a tool of the character described, a rotary head, an anvil member, a hammer member, co-acting clutch members on the hammer and anvil, a spring to normally maintain the clutch members in engagement and thereby maintain the hammer member interlocked with the anvil member, a plurality of sockets disposed on and communicating with apertures in the head and hammer members, a plurality of rods extending through said apertures, ball members cooperating with the rods and sockets to maintain the rods in said apertures and adapted to enable the clutch members to disen-

gage and the hammer member to remain stationary during rotation of the head.

5 6. In a tool of the character described, a rotary head, an anvil member having teeth thereon, a hammer member having co-acting teeth adapted to engage the teeth on the anvil member, a spring to normally maintain the said teeth in engagement, a plurality of sockets disposed and communicating with apertures in the head
10 and hammer, a plurality of pivotal rods extending through said apertures to pivotally connect said head and said hammer member to enable the head to drive the hammer member and adapted to enable the teeth to disengage and the
15 hammer member to remain stationary during rotation of the head.

20 7. In a tool of the character described, a rotary head, an anvil member, a hammer member, clutch means on the anvil and hammer members, means to normally maintain the clutch means in engagement, seats disposed on and in communication with apertures in the head and hammer member, means separate from the first said means extending through said apertures to

connect the head and hammer member, and seating means for said seats cooperating with said separate means to maintain the separate means in the apertures and adapted to enable the clutch means to disengage and the hammer member to remain stationary during rotation of the head. 5

8. In a tool of the character described, a rotary head having apertures therethrough, an anvil member, a hammer member having apertures therethrough, co-acting clutch means on the anvil and hammer members, means to normally maintain the clutch means in engagement, means separate from the last said means extending through the apertures in the head and hammer member, and means cooperating with the head, hammer member and the separate means to maintain the separate means in said apertures and adapted to enable the clutch means to disengage and the hammer member
15 to remain stationary during rotation of the head. 20

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