Dec. 12, 1950 H. H. TALBOYS ET AL 2,533,975

HAMMER

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Fig. 1

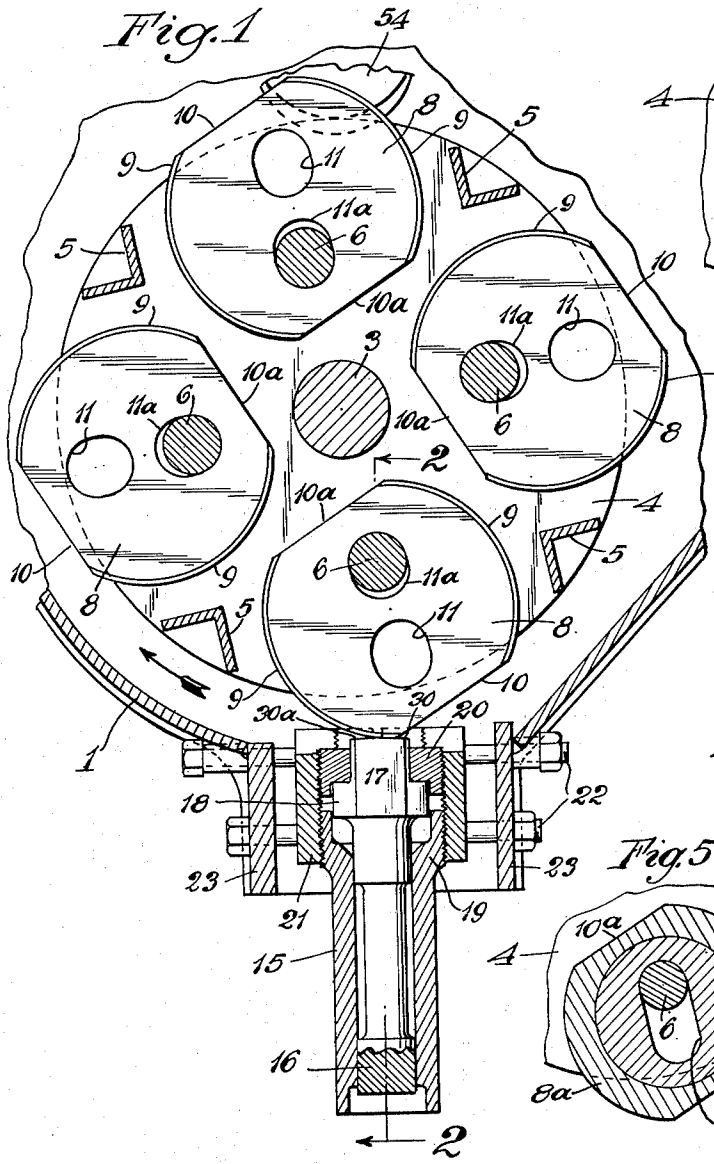


Fig. 4

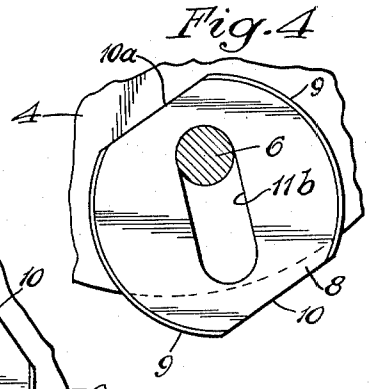


Fig. 2

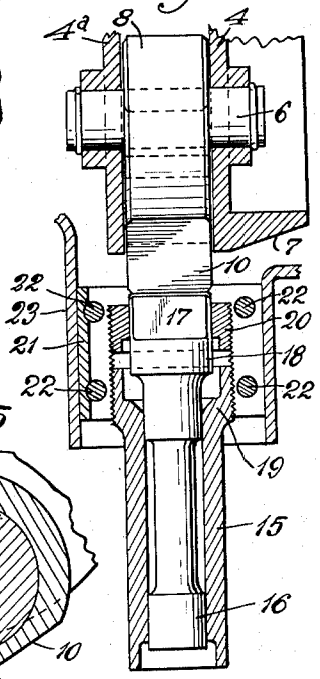
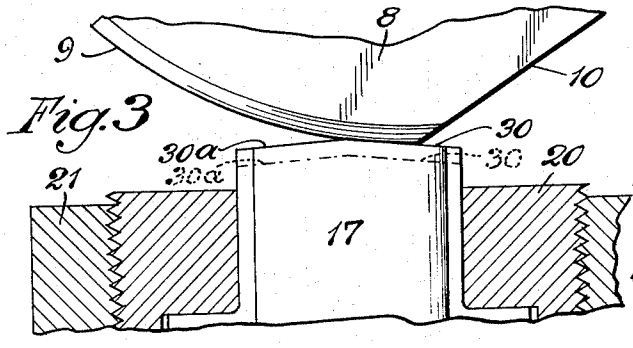


Fig. 5

Fig. 3



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Fig. 6

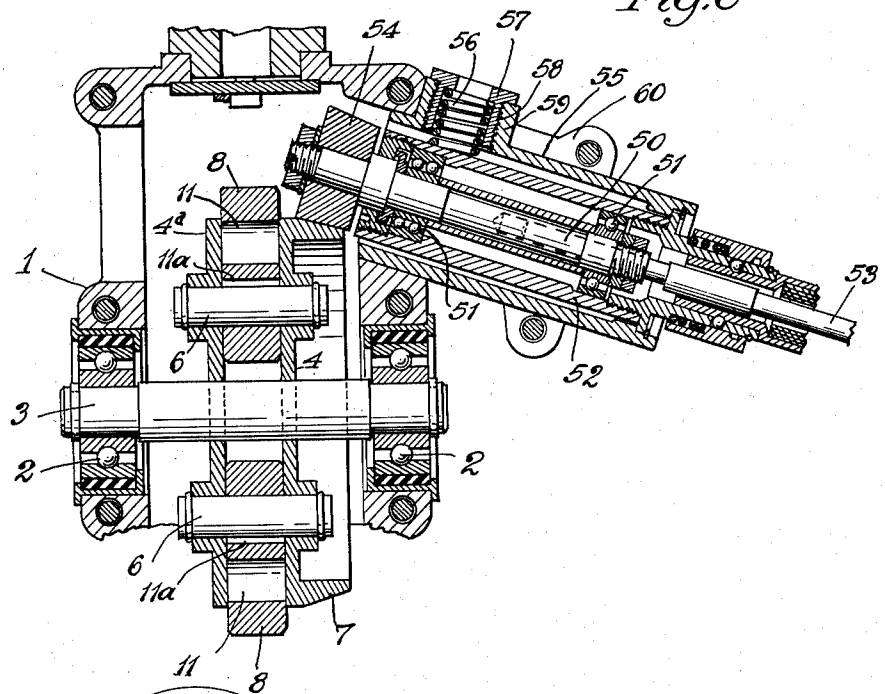
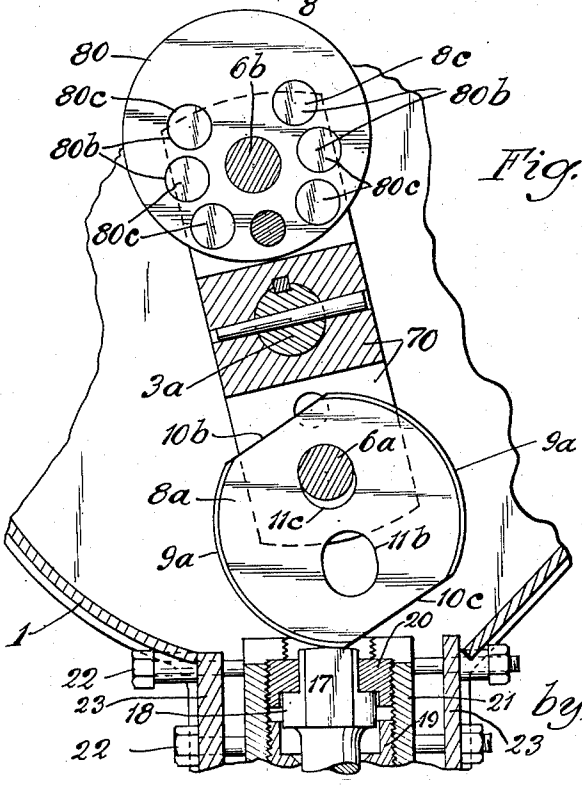


Fig. 7



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HAMMER

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Application April 15, 1946, Serial No. 662,173

5 Claims. (Cl. 125—33)

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Our invention relates to an improvement in hammers or impact delivery means.

One purpose is to provide an improved power hammer.

Another purpose is to provide an improved power hammer and anvil assembly.

Another purpose is to provide an improved hammer element for use with power hammers.

Another purpose is to provide an improved anvil element for use with power hammers.

Other purposes will appear from time to time in the course of the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawings, wherein:

Figure 1 is a section on a plane perpendicular to the axis of rotation of the hammer assembly;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is an enlarged view of the opposed parts of the hammer element and anvil;

Figure 4 is an elevation of a variant hammer element;

Figure 5 is a section of a variant hammer element;

Figure 6 is a vertical section illustrating the driving connection for the hammer assembly illustrated in Figures 1 and 2; and

Figure 7 is a section similar to Figure 1 illustrating a variant form of the device.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring to the drawings 1 generally indicates any suitable housing or frame in which a hammer rotor assembly is rotatably mounted, for example in roller or ball bearings 2. 3 indicates a shaft, the ends of which are rotatably in the bearings 2. Mounted on it is a rotor or cage which may include a pair of spaced discs 4, 4a, separated by suitable spacing elements 5 and carrying a plurality of bearing pins 6. 7 is any suitable beveled friction drive member which may be formed as an extension from the disc 4, or may be otherwise formed. Rotatably mounted on the shaft 6 are individual hammer elements 8. Each such element is in the form of a disc having a generally cylindrical impacting face 9 cut away or flattened, preferably at two diametrically opposed points as at 10, 10a. Each disc 8 is provided with a slot or slots through which the shaft 6 passes. In the form of Figure 1, we illustrate a plurality of slots or slightly elongated apertures 11, 11a. In the form of Figures 4 and 5 we illustrate a single elongated slot, 11b in Figure 4 and 11c in Figure 5. It will be understood that as the hammer assembly rotates, the hammer elements 8 move centrifugally outwardly as far as the slots 11a, 11b or 11c permit. They are also free to rotate about the pins 6. They are so positioned that, when the rotor rotates, in the direction of the arrows in Figure 1, the arcuate surface adjacent and in advance of the cutaway portion 10, constitutes an impacting surface effective to engage the below described anvil, which is offset somewhat from the axis of the rotor.

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15 generally indicates a guiding sleeve in which is slidably positioned a hammer element or blow delivering member shown as including the hammer head 16 and the anvil structure 17. The anvil is laterally enlarged as at 18, the enlarged portion being received in the upper enlargement 19 of the sleeve 15 and the opposed adjustable nut 20. The members 19 and 20 are mounted for relative adjustment within the screw threaded split sleeve 21. The sleeve 21 is held by bolts 22 in any suitable lower extension 23 of the housing 1. It will be noted that the anvil 17 extends upwardly through the nut 20 and opposes an inclined face 30 to the hammer element 8. The parts are shown on an enlarged scale in Figure 3 and it will be observed that the toe or end of the arcuate impacting surface 9 engages the inclined surface 30 of the anvil. It will be understood that the anvil 17 may be reversed to present the opposite inclined surface 30a to the hammer elements. Also, the individual hammer elements 8 may be reversed on the pins 6. There is thus a double provision for wear, which extends the life of the opposed wearing parts.

Any suitable means may be employed for rotating the hammer assembly. As a matter of convenience however, and as a form of practical drive, we illustrate in Figure 6, a driving assembly including a shaft 50 mounted in any suitable bearings 51 within a housing 52. The shaft 50 may be rotated for example by a flexible shaft 53 extending to any suitable motor not herein shown.

The shaft carries at its outer end the frictional disc 54 which is opposed to the frictional driven member 7. The housing 52 is mounted within a housing 55 and is spring thrust, as by the coil spring 56 to maintain compression between the members 7 and 54. The thrust of the spring 56 may be adjusted or controlled by any suitable takeup member or spring abutment 57, screw threaded as at 58 in relation to the adjusting sleeve 59 which extends outwardly from and forms part of the outer housing 55. The outer housing may be removably secured to a split sleeve 60 which may be integral with the main housing 1.

It will be realized that whereas we have described and illustrated a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of our invention. We therefore wish our description and drawings to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting us to our precise showing.

For example either a single slot may be employed in the hammer elements, as shown in Figures 4 and 5, or separate or interrupted slots may be employed, as shown in Figure 1. The impact members 8 may be unitary, as shown for example in Figures 1 and 4, or they may be formed with a separate outer removable wear taking member 8a as shown in Figure 5.

With references to Figure 7, we illustrate a form of hammer in which in the place of the form of rotor 4 shown in Figure 1, we illustrate a crossbar 70 mounted on the shaft 3a, said cross bar having cross pins 6a, 6b adjacent opposite ends thereof. On the pins 6a we illustrate a hammer member 8a with opposite arcuate hammer surfaces 9a and opposite flattened or cut away portions 10b, 10c. The hammer as shown is provided with two apertures each somewhat elongated as at 11b, 11c. The anvil structure including the anvil 17 is the same as shown in Figure 1. At the opposite end of the cross bar of the rotor, we illustrate a counterweight 80 which is fixed against rotation, and which is so formed and positioned as to avoid any contact with the anvil. It may be adjusted as to weight for example by employing apertures 80b which may have weights or fillers 80c inserted therein to a desired total weight.

The use and operation of the invention are as follows:

We provide an efficient rotary hammer member particularly adapted for use with power driven hammer assemblies. The rotation of the rotor is effective to maintain the individual hammer elements 8 or 8a in their outermost position. With the particular elements herein shown flattened as at 10 and 10a, and with the flattened parts related, as shown in the drawings, to the center about which the hammer elements rotate, and to the slots 11, 11a, 11b and 11c, the hammer elements engage the anvil at the "toe" of the hammer element, or at a terminal portion of the arcuate face of the hammer located just in advance of the lead end of one of the cutaway portions 10 or 10a. The hammer structure is preferably constantly rotated at high speed. As soon as the anvil 17 enters the path of movement of the hammer element it is subject to a rapid succession of sharp shocks or impacts, the timing of the impacts being determined by the rate of rotation of the hammer structure.

Assuming that the anvil 17 is in a predetermined position, holding the working end 16 against whatever member or material is to be impacted, the rotary hammer assembly is so positioned as to cause the path of the outer portions of the hammer elements 8 to intersect with the impact receiving face 30 or 30a of the anvil. As long as the rotary hammer structure is in the proper position to cause a contact of the elements 8 with the anvil 17, the succession of impacts will take place. As each hammer element 8 strikes the anvil it recedes upwardly slightly from the anvil and tends to rotate slightly about one of the pins 6. Thus a rotary and bodily inward movement of the hammer elements are both essential. However, owing to the cutaway portions 10, the contact between the hammer elements 8 and the anvil is instantaneous and immediately broken off. The slotting of the hammer gives in effect a slight yielding release, which reduces wear, and permits each hammer to give somewhat as it passes across the surface of the anvil. The hammer can recede somewhat toward the center of rotation of the hammer structure, and it can also rotate somewhat about the pin 6. There is thus both radial and rotary relief. However, even though the hammer structure is constantly rotated, a predetermined relative movement of separation of the anvil and the center of rotation of the rotor is effective to terminate the series of impacts. In practice it is important to have the hammer assembly of substantial weight. The hammer blow against the anvil 17 tends slightly to raise the entire assembly, which then drops slightly by the time the next hammer is ready to strike the anvil. The rotation of the hammer structure maintains an absolute balance as long as the hammer does not contact the anvil. There is therefore no continuous nerve shattering vibration, such as results from the usual power hammer. However, when the parts are in contact, the effect of the contact of the hammer elements on the anvil is to tend to lift the hammer assembly, the force being absorbed by the weight of the hammer assembly, which rises upon contact, and falls again in time with the rapid contact which follows.

The hammer herein shown may be applied to a wide variety of uses. It may be employed in connection with tampers or cement breakers. It is ideally adapted to driving spikes or nails, for example in railroad use. If made somewhat larger it may be employed as a pile driver.

Wherever in the form of Figure 1 we illustrate four hammers, it will be understood that more or less than four may be applied, for example it may be advantageous to remove two opposite hammers, leaving two diametrically opposed hammers in position. This can be done without any change in the structure. The form of Figure 7 may also be advantageously employed with two hammers but we illustrate it as having one hammer and one counterweight.

With reference to the operation of both forms herein shown and regardless of the number of hammers employed, all hammers are arranged in diametrically opposed pairs. Where a counterweight is used, a counterweight and hammer are arranged in a diametrically opposed pair. When the anvil 17 is not contacted, the rotating element is thus in balance. When the bottom hammer is lifted or knocked toward the center of rotation due to contact with the anvil the centrifugal pull of the upwardly moving hammer is negated, and for the time being does not affect the rotor. This permits the oppositely disposed hammer or counterweight to pull the entire assembly upward.

It is highly important that the hammers have the cut away portions shown at 10, 10a, 10b or 10c. In effect the center of the shaft 3 is somewhat in advance of the axis of the anvil 17 when the impact takes place. The impact in the form of a somewhat glancing blow with a substantial downward component is on the toe or last inch or inch and a quarter of the surface 9 as shown in Figure 3. The slope 30 may be made as steep as for example an angle of five degrees. In effect there is a camming action. The anvil is driven downwardly, and the hammer as a whole is jerked upwardly by the above discussed tem-

porary interruption of the centrifugal pull on the rotor of the impacting hammer. This in connection with the cut away 10 withdraws the hammer from alignment with or subsequent immediate contact by the anvil 17, and the anvil can rise or rebound after the stroke without recontacting the hammer. By the time the hammer makes another circuit it is in position to strike another blow and as before completing a circuit, resumed its balancing centrifugal pull on the device.

In practice, in some sizes of hammer, we find it highly advantageous to employ a single hammer and counterweight as shown in Figure 7, with a single hammering contact for each rotation of the shaft 3. The hammer strikes a blow and gets out of the way and at the speeds of rotation employed, the number of impacts per minute is ample to obtain the desired effect.

Whereas we illustrate a friction drive for the hammer, it will be understood that any other suitable driving means may be employed, the details of the drive not forming part of the present invention.

We claim:

1. In a power hammer assembly, a hammer housing, a hammer rotor mounted in said housing for rotation about an axis predetermined in relation to the housing, a hammer loosely pivoted to the rotor for oscillation about a pivot eccentric to the axis of the rotor, said hammer having a generally arcuate impacting surface, the pivotal connection of the hammer with the rotor being substantially eccentric in relation to the impacting surface of the hammer whereby, in response to centrifugal force the center of mass of the hammer, when the rotor is rotated, is located substantially radially outwardly beyond the pivotal connection between hammer and rotor, a guiding sleeve secured to said housing, and extending outwardly from the path of the hammer, an anvil movably mounted in said guiding sleeve, means for limiting said anvil to an excursion of predetermined length toward and away from the path of the hammer, said anvil having a surface which lies, when the anvil is at its closest approach to the path of the hammer, in position to receive a glancing blow from that part of the hammer most remote

from the axis of rotation of the rotor, said hammer being loosely pivoted on the rotor and being thereby adapted both to swing and to recede against centrifugal force, in response to the glancing impact of the hammer against the anvil.

2. The structure of claim 1 characterized by and including a plurality of hammers mounted for rotary oscillation on said hammer rotor.

3. The structure of claim 1 characterized by and including an eccentric pivot pin on the rotor, the hammer being apertured to receive the pivot pin, the hammer aperture through which the pivot pin passes being of greater length than the diameter of the pin.

4. The structure of claim 1 characterized by and including an anvil having a generally plane surface bevel slightly inclined to the path taken by the outer portion of the hammer in the course of its rotary movement toward the anvil.

5. The structure of claim 1 characterized by and including a reversible hammer having opposite surface bevels, each of which is slightly inclined to the path taken by the outer portion of the hammer in the course of its rotary movement toward the anvil, said bevels converging on an intermediate portion of the hammer engaging surface of the anvil.

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