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K. C. BUGG

2,492,840

HAMMER

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2 Sheets-Sheet 1

Fig. 1

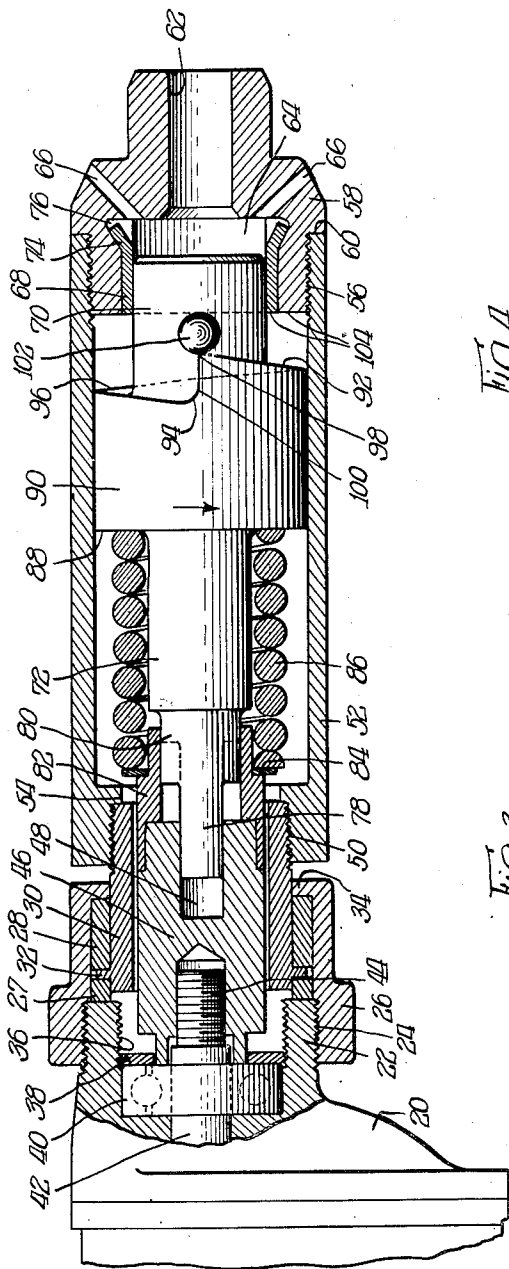


Fig. 4

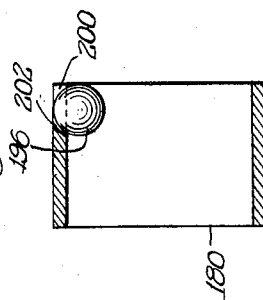
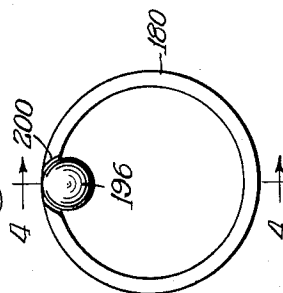


Fig. 3



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HAMMER

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4 Claims. (Cl. 125—33)

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This invention pertains to percussion tools and, more particularly, to power actuated hammers.

An object of the invention is to provide a power driven hammer utilizing a spring as energizing means, which is loaded and released in a predetermined cycle to cause a blow to be delivered.

Another object of the invention is to provide a power driven hammer wherein substantially no blow is delivered against the operator.

Another object of the invention is to provide a power driven hammer wherein a shaft is rotated and reciprocated by actuating and power storing means which rotate with the shaft to greatly reduce the friction in the device whereby heat and wear is greatly reduced.

Another object is to provide a percussion tool wherein the operating members thereof may be assembled readily from one end of the tool and thereafter positively held in working relation, one with respect to the other, by a single member completing the casing assembly, which member is readily and quickly secured to the casing.

Another object is to provide a percussion tool wherein a cam is provided as actuating means for storing energy for delivering blows, wherein the cam is integral with the operating shaft and hammer and anvil.

Another object is to provide a power driven tool wherein there is a substantially constant delivery of force and wherein rotary power means drives the device to deliver a reciprocating movement.

Another object is to provide a tool wherein the blows are only had in a delivery direction, thus reducing shock to the operator, and permitting the use of a lighter tool as recoil mechanism is eliminated.

Another object is to provide a percussion tool which has mechanism adaptable for a large range of sizes, as where an engraving or dentist's tool is used, or where the use is for masonry, caulking, riveting, etc.

Another object is to provide a percussion tool wherein the actuating means includes a cam and ball, the cam being so constructed and arranged that the ball follows the cam.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings, which illustrate embodiments

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of the device and wherein like reference characters are used to designate like parts—

Figure 1 is a fragmentary, sectional elevation of one form of percussion tool embodying the invention;

Figure 2 is a fragmentary, sectional elevation of a modified form of percussion tool embodying the invention;

Figure 3 is a plan view of one form of sleeve adapted for use with the percussion tool illustrated in Figure 2 and showing the ball in its relative position with respect to the sleeve;

Figure 4 is a longitudinal sectional elevation of the sleeve illustrated in Figure 3, the same being taken substantially in the plane as indicated by the line 4—4 of Figure 3;

Figure 5 is a top plan view of a modified form of sleeve adapted for use with the tool illustrated in Figure 2; and

Figure 6 is a sectional elevation taken substantially in the plane as indicated by the line 6—6 of Figure 5.

Referring first of all, more particularly, to the form of tool illustrated in Figure 1, the tool comprises operating means such as indicated by the motor casing 20 which houses a motor adapted to be operated by the usual trigger and is provided with the conventional grip (not shown). It is, of course, understood that the operating means may be remote from the tool, in which case the tool is driven by a flexible shaft. This driving means, obviously may be used with the form of construction illustrated in Figure 2.

The motor casing is provided with the flange 22 externally threaded as at 24 for the reception of complementary threads of the nut or retaining sleeve 26, the nut 26 being provided with the spaced resilient means or packing 27 and 28 disposed between the nut and the sleeve 30, the sleeve 30 having a radial flange 32 thereon disposed between the packing, the packing 28 being retained by the end flange 34 of the nut. The packing 27 is disposed between the flange 32 and the end of the threaded flange 22 of the motor casing 20.

The flange 22 is also internally threaded as at 36 for the reception of a retaining ring 38 which is adapted to retain the antifricition bearings 40 of the motor drive shaft 42. The motor drive shaft 42 is threadably connected as at 44 to the coupling member or block 46 which is adapted to be rotated by the shaft 42 and is provided with the slot or female coupling portion 48.

The sleeve 30 is threaded as at 50 for the complementary threads on the rear end of the casing

52, a limiting shoulder 54 being provided on the casing 52 engaging the end of the sleeve 39. The forward end of the casing 52 is threaded as at 56 for the reception of complementary threads on the nose 58, said nose being provided with the limiting shoulder 60 adapted to engage the end of casing 52. The nose is provided with the axial tool end passage 62 through which an end of a work tool is adapted to be extended, the passage 62 communicating with an enlarged axial passage or recess 64, exhaust passages 66 extending through the nose to the enlarged recess 64. A bearing 68 is disposed in the recess 64 and receives the striking anvil portion 70 of the shaft 72, the bearing being conveniently secured as by the flange 74 interlocking in subrecess 76.

The shaft 72 is provided with the male coupling member 78 slidably received in the slot 48 whereby reciprocation of the shaft is permitted with respect to the coupling member 46 but rotation therebetween is prevented. The shaft 72 has a portion 80 slidably mounted in the sleeve 82 which is fixedly mounted to the coupling member 46 and is provided with the spring seat 84 for the spring 86. The other end of the spring 86 seats on the seat 88 of the hammer member 90, the hammer member being substantially cylindrical and adapted to rotate and reciprocate in the casing 52.

The hammer member 90 is provided with the cam 92, said cam being provided with the starting portion or entrance 94, the helical or sloping portion 96 terminating at the exit or crest 98, said crest being connected by the precipice 100 to the entrance portion. The precipice is preferably in a plane which is axially disposed and is of greater length than the diameter of the ball 102. An antifriction member such as the ball 102 is adapted to move over the cam and also move over the race 104 provided on the nose 58 and bearing 68, which race is in a plane normal to the axis of the shaft.

It will thus be seen that rotation of the motor shaft 42 causes rotation of the coupling 46 and shaft 72. Rotation of the shaft 72, as in the direction of the arrow shown in Figure 1, causes relative movement between the cam 92 and the ball 102. Rotation of the cam thus has the effect of causing the ball to move, for example, from the starting point 94 to the exit 98. The ball 102 moving over the race 104, which is normal to the axis of the shaft, causes compression of the spring 86 and when the ball falls down the precipice to the starting point the anvil 70 is moved quickly by the spring to engage the tool end which has been protruded through the passage 62 into recess 64. Thus a blow is directed to the tool end. The ball 102, being of less diameter than the depth of the precipice, does not take any blow.

Referring now to the modification illustrated in Figure 2, the tool comprises operating means such as a motor (not shown) indicated by the motor casing 106 which motor is adapted to be operated by the usual trigger, the casing being provided with a suitable grip (not shown).

The motor casing is provided with the flange 108 externally threaded as at 110 for the reception of complementary threads of the nut or retaining sleeve 112, the nut 112 being provided with the spaced resilient packing 114 and 116 disposed between the nut and sleeve 118. Sleeve 118 is provided with the radial flange 120 disposed between the packing members, the packing 116 being retained by the end flange 122 of the nut 112 and the flange 120, and the packing 114

being retained by flange 120 and the end of the flange 108.

The flange 108 is also internally threaded as at 124 for the reception of the retaining ring 126 which is adapted to retain the antifriction bearings 128 of the motor drive shaft 130. The motor drive shaft is threadably connected as at 132 to the coupling member or block 134 which is adapted to be rotated with the shaft 130 and is provided with a slot or female coupling portion 136.

The sleeve 118 is threaded as at 138 for the reception of complementary threads on the rear end of the casing 140, a limiting shoulder or wall 142 being provided on the casing 140 engaging the end of the sleeve 118 and providing a spring seat, antifriction bearing seat, or thrust shoulder, the wall 142 being provided with the shaft bearing 144. The forward end of the casing 140 is threaded as at 146 for the reception of complementary threads on the nose 148, said nose being provided with the limiting shoulder 150 adapted to engage the end of the casing 140. The nose is provided with the axial tool end passage 152 through which an end of a work tool is adapted to be extended. The passage 152 communicates with an enlarged axial passage or recess 154, exhaust passages 156 extending through the nose to the enlarged recess 154. A bearing 158 is disposed in the recess 154 and receives the bearing end or anvil portion 160 of the shaft 162, the bearing being conveniently secured as by the flange 164 interlocking in subrecess 166.

The shaft 162 is provided with the male coupling member 168 slidably received in the slot 136 whereby reciprocation of the shaft is permitted with respect to the coupling member 134 but rotation therebetween is prevented. Antifriction bearing 170 is seated on the wall 142 and a spring seat 172 is provided thereon for one end of the spring 174.

The other end of the spring 174 seats on the seat 176 of the hammer member 178, the hammer member being substantially cylindrical and adapted to rotate and reciprocate in the floating sleeve 180 disposed between the hammer member and the casing. The sleeve is free to rotate within the casing but is restrained from longitudinal movement at one end by the shoulder 182 on the casing 140 and on the other end by the ball race 184 provided on the nose 156 and bearing 158, the race 184 being in a plane normal to the axis of the shaft.

The hammer member 178 is provided with the cam 186, said cam being provided with a starting portion or entrance 188, the helical or sloping portion 190 terminating at the exit or crest 192, said crest being connected by the precipice 194 to the entrance portion. The precipice preferably is in a plane which is axially disposed and is of greater length than the diameter of the ball 196. An antifriction member such as the ball 196 is adapted to move over the cam and also move over the race 184 and in the construction shown, the cam is so shaped as to provide an arcuate portion 198 which partially embraces the ball, preventing the ball from being projected diagonally from the precipice and also gives more than a point contact between the hammer and ball. The sleeve 180 and race 184 may also be made arcuate if so desired.

In order to further insure the ball following the cam and precipice, the sleeve 180 (Figures 3 and 4) is provided with the arcuate notched portion 200 which may locally slot the sleeve as at 202. Sleeve 204 (Figures 5 and 6) may be used such

as shown in Patent No. 2,323,375, Kenly C. Bugg, granted July 6, 1943, which sleeve is provided with a longitudinal arcuate slot 206 disposed for the length of the sleeve but not slotting the wall.

In operation of this hammer, rotation of the motor shaft causes rotation of the shaft 162 in the direction of the arrow whereby, in effect, the ball and cam move relatively to each other until the ball falls down the precipice. During this cycle, the sleeve moves with the ball with a rotary movement around the axis of the shaft, and the spring 174 is compressed and suddenly released when the ball falls down the precipice, thereby permitting the anvil 160 to deliver a blow to the tool end which protrudes into the recess 154.

It is, of course, understood that no sleeve may be used in the construction shown in Figure 2, though the operation is more positive with the sleeve, and also a sleeve may be used in the construction shown in Figure 1, and also the cam of the construction shown in Figure 1 may be formed with an arcuate portion as shown in Figure 2.

It is to be understood that this application is not to be limited by the exact embodiments of the device shown, which are merely by way of illustration and not limitation as various and other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

I claim:

1. In a percussion tool for striking the end of a work tool associated therewith, the combination of a casing, a closure for one end of said casing having a bearing recess in said casing and having a passage extending from said recess through the outer end of said closure through which said end of said work tool may be extended into said recess, said closure within said casing having a race for an antifriction member disposed adjacent said recess and in a plane normal to the axis of the casing, a rotatable shaft mounted for reciprocation in said casing having a substantially cylindrical anvil portion integral therewith adjacent one end and reciprocally and rotatably mounted in a bearing provided in said recess, the axes of said shaft, said casing, said recess and said passage coinciding, the end of said anvil portion within the recess strikingly engaging the end of the work tool extended into said recess, said shaft having a hammer portion integral with said shaft and anvil portion, said shaft, hammer and anvil portions rotating and reciprocating as a unit, said hammer portion adjacent said anvil portion having a cam facing said race, said cam having an entrance and an inclined, substantially helical portion terminating in an exit, said exit and entrance being connected by a precipice disposed in a direction axially of said shaft, a floating, spherical, anti-friction member disposed between said cam and race, the diameter of said anti-friction member being less than the length of said precipice, resilient means between said casing and hammer portion engaging the side of the hammer portion opposite to the cam, urging said shaft, hammer and anvil portions toward the closure to cause the anvil portion to strike the end of the work tool extended through said passage, operating means for rotating said shaft, and a coupling between said operating means and shaft permitting reciprocating movement of the shaft with respect to the operating means without shock to the operating means during striking of the work tool.

2. In a percussion tool for striking the end

of a work tool associated therewith, the combination of a casing, a closure for one end of said casing having a bearing recess in said casing and having a passage extending from said recess through the outer end of said closure through which said end of said work tool may be extended into said recess, said closure within said casing having a race for an antifriction member disposed adjacent said recess and in a plane normal to the axis of the casing, a rotatable shaft mounted for reciprocation in said casing having a substantially cylindrical anvil portion integral therewith adjacent one end and reciprocally and rotatably mounted in a bearing provided in said recess, the axes of said shaft, said casing, said recess and said passage coinciding, the end of said anvil portion within the recess strikingly engaging the end of the work tool extended into said recess, said shaft having a hammer portion integral with said shaft and anvil portion, said shaft, hammer and anvil portions rotating and reciprocating as a unit, said hammer portion adjacent said anvil portion having a cam facing said race, said cam having an entrance and an inclined substantially helical portion terminating in an exit, said exit and entrance being connected by a precipice disposed in a direction axially of said shaft, a floating, spherical, anti-friction member disposed between said cam and race, the diameter of said anti-friction member being less than the length of said precipice, operating means for rotating said shaft, a coupling between said operating means and shaft permitting reciprocating movement of the shaft with respect to the operating means without shock to the operating means during striking of the work tool, said coupling having a seat fixed thereto and rotatable with said shaft and said last named seat, and resilient means between said last named seat and hammer portion having one end engaging said last named seat and the other end engaging the side of the hammer portion opposite to the cam, urging said shaft, hammer and anvil portions toward the closure to cause the anvil portion to strike the end of the work tool extended through said passage.

3. In a percussion tool for striking the end of a work tool, the combination of a casing, a closure for one end of said casing having a bearing recess in said casing and having a passage extending from said recess through the outer end of said closure through which said end of said work tool may be extended into said recess, said closure within said casing having a race for an anti-friction member disposed adjacent said recess and in a plane normal to the axis of the casing, a rotatable shaft mounted for reciprocation in said casing having a substantially cylindrical anvil portion integral therewith adjacent one end and reciprocally and rotatably mounted in a bearing provided in said recess, the axes of said shaft, said casing, said recess and said passage coinciding, the end of said anvil portion within the recess strikingly engaging the end of the work tool extended into said recess, said shaft having a hammer portion integral with said shaft and anvil portion, said shaft, hammer and anvil portions rotating and reciprocating as a unit, said hammer portion adjacent said anvil portion having a cam facing said race, said cam having an entrance and an inclined substantially helical portion terminating in an exit, said exit and entrance being connected by a precipice disposed in a direction

axially of said shaft, a floating, spherical, anti-friction member disposed between said cam and race, the diameter of said anti-friction member being less than the length of said precipice, operating means for rotating said shaft, and a coupling between said operating means and shaft permitting reciprocating movement of the shaft with respect to the operating means without shock to the operating means during striking of the work tool, an anti-friction bearing mounted in said casing providing a spring seat rotatable in said casing, and a spring having one end engaging said last named spring seat and the other end engaging the side of the hammer portion opposite to the cam, urging said shaft, hammer and anvil portions toward the closure to cause the anvil portion to strike the end of the work tool extended through said passage.

40 In a percussion tool for striking the end of a work tool, the combination of a casing, a closure for one end of said casing having a bearing recess in said casing and having a passage extending from said recess through the outer end of said closure through which said end of said work tool may be extended into said recess, said closure within said casing having a race for an anti-friction member disposed adjacent said recess and in a plane normal to the axis of the casing, a rotatable shaft mounted for reciprocation in said casing having a substantially cylindrical anvil portion integral therewith adjacent one end and reciprocally and rotatably mounted in a bearing provided in said recess, the axes of said shaft, said casing, said recess and said passage coinciding, the end of said anvil portion within the recess strikingly engaging the end of the work tool extended into said recess, said shaft having a hammer portion integral with said shaft and anvil portion, said shaft, hammer and anvil portions rotating and reciprocating as a unit, said hammer portion adjacent said anvil portion having a cam facing said race, said cam having an

entrance and an inclined substantially helical portion terminating in an exit, said exit and entrance being connected by a precipice disposed in a direction axially of said shaft, said hammer and anvil portions adjacent said cam having recess of a shape to receive a spherical anti-friction member and permit its travel over said cam, a floating, spherical, anti-friction member disposed between said cam and race, and in said recess, the diameter of said anti-friction member being less than the length of said precipice, a sleeve disposed in a recess in said casing between said race and a shoulder in said casing defining said last named race, locating said sleeve against substantial movement axially of the casing, said sleeve being rotatable with respect to said casing and hammer portion and having a slot for freely receiving said anti-friction member, operating means for rotating said shaft, and a coupling between said operating means and shaft permitting reciprocating movement of the shaft with respect to the operating means without shock to the operating means during striking of the work tool, a spring seat in said casing fixed against movement axially of said casing but rotatable with respect thereto, and a spring having one end engaging said last named spring seat and the other end engaging the side of the hammer portion opposite to the cam, urging said shaft, hammer and anvil portions toward the closure to cause the anvil portion to strike the end of the work tool extended through said passage.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,270,929	Bugg	Jan. 27, 1942
2,323,375	Bugg	July 6, 1943