

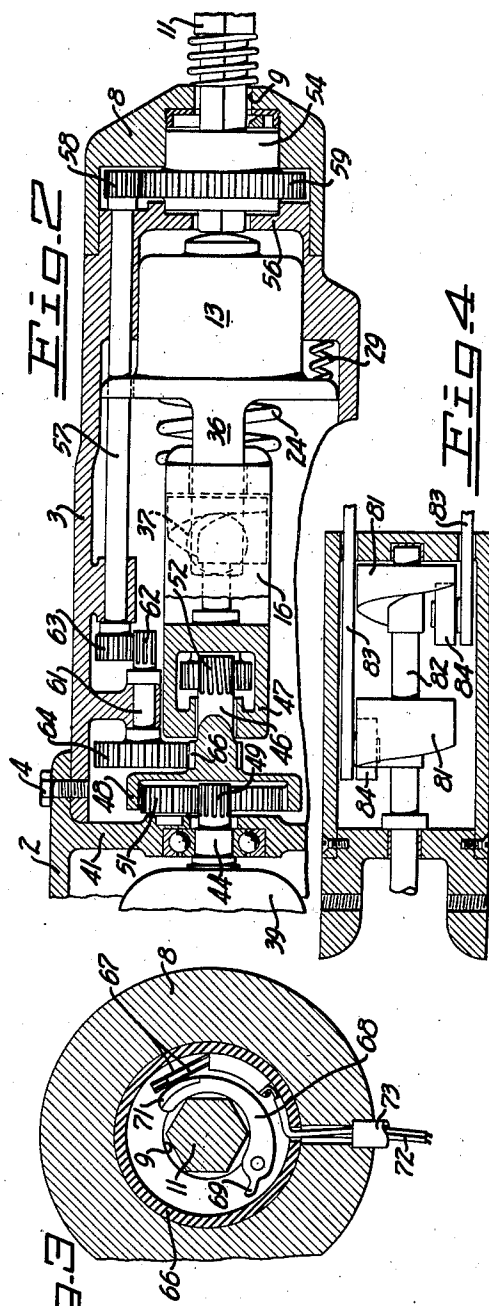
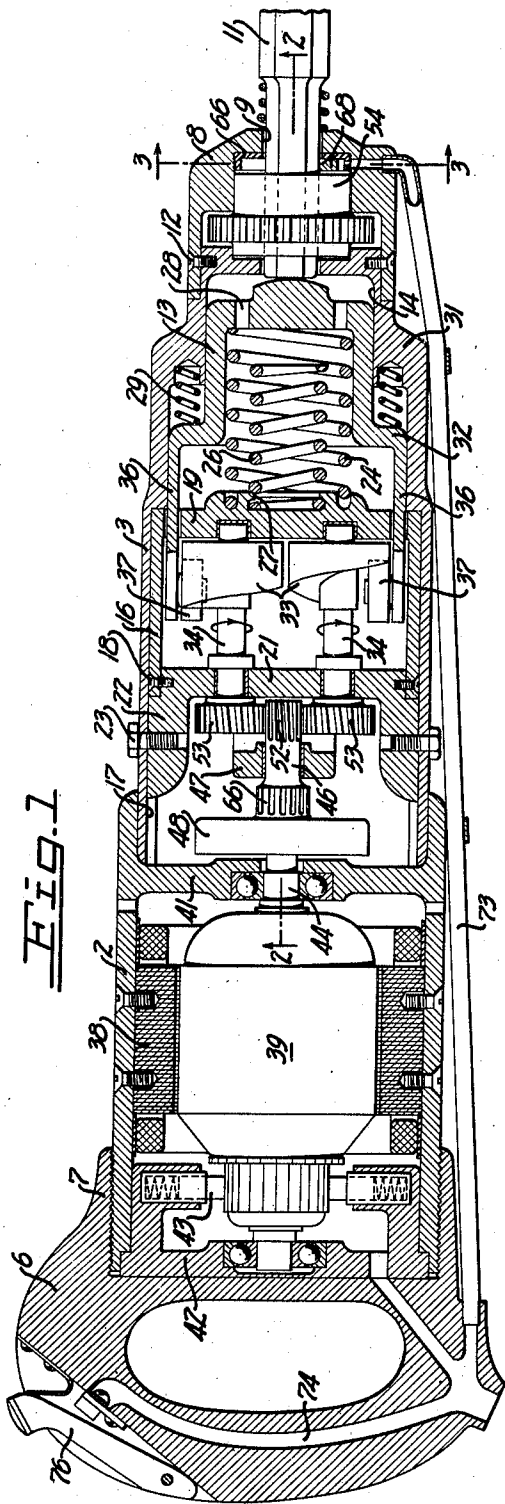
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POWER HAMMER

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## POWER HAMMER

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8 Claims. (Cl. 255—42)

My invention relates to power hammers and more particularly to a hammer having a spring pressed striking head.

It is among the objects of my invention to provide a hammer embodying a striking head actuated by a spring that is intermittently stressed by means of a cam.

Another object of my invention is to provide an arrangement of cams for retracting the striking head to stress the driving spring, without causing the head to bind or causing uneven or undue wearing of the head against adjacent parts.

Another object is the provision in a motor driven hammer of the character described, of driving means for equalizing the lateral thrust on the striking head.

Among other objects of my invention are the provision of improved arrangement of springs for driving the striking head; improved means for rotating the tool held by the hammer; and safety devices to prevent operation of the hammer unless a tool is in the hammer.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of my invention. It is to be understood that I do not limit myself to this disclosure of species of my invention, as I may adopt variant embodiments thereof within the scope of the claims.

Referring to the drawing:

Figure 1 is a longitudinal sectional view of the power hammer embodying my invention; and

Figure 2 is a similar view of the lower portions of the hammer, taken in a plane indicated by the line 2—2 of Figure 1.

Figure 3 is a transverse sectional view taken in plane indicated by the line 3—3 of Figure 1, and shows the safety switch.

Figure 4 is a fragmentary sectional view showing a modified form of cam arrangement.

In terms of broad inclusion, the power hammer embodying my invention comprises a reciprocable striking head and a spring for driving the head. A plurality of cams are provided for retracting the head to compress the spring, and the cams are arranged to apply substantially equal lifting forces on opposite sides of the head, so that the head is retracted evenly and without binding or causing uneven or undue wear. An electric motor is preferably provided for driving the cams, and a safety switch is preferably provided so that the motor may be energized only when a drill or other tool is present in the hammer. Improved means are further provided for rotating a drill held by the hammer. An im-

proved arrangement of springs is also provided for driving the striking head.

In greater detail, and referring particularly to Figures 1 and 2 of the drawing, the power hammer embodying my invention comprises a sectional housing including a rear cylindrical section 2 and a forward tubular extension 3 fitted in the rear section and secured by a screw 4. A suitable handle 6 is mounted on the rear end of the housing, and is preferably provided with a sleeve portion 7 threaded on the end of section 2. The forward end of housing section 3 is preferably reduced to give the desired pointed nose for convenience in handling the hammer. A demountable cup-shaped tip 8 having an opening 9 for receiving a drill or tool 11 is preferably provided, and is secured to the housing by suitable screws 12.

Means are provided in the housing for striking the drill 11. For this purpose a cup-shaped striking head 13 is slidably mounted for reciprocation in a bore 14 provided in the forward end of the housing section 3. A backing for the striking head is provided by a narrow rectangular bracket 16 extending across the width of the housing and insertably mounted in grooves 17 formed in the side walls of the housing. The bracket is formed in two pieces held together by screws 18 for convenience in assembly; the inner piece of the bracket having a cross partition 19 adjacent the striking head 13, and the outer piece of the bracket having a cross partition 21 carrying lugs 22 for receiving fastening screws 23.

Spring means are provided for driving the striking head against the drill 11. Preferably a pair of coaxial springs 24 and 26 are provided, the outer spring being seated in the cup provided by the head and compressed between the head and the partition 19 of the bracket. The inner spring 26 is preferably shorter than the outer spring and is held by a groove 27 in the bracket partition 19, so that the free end of the spring is spaced from the striking head in the extended position of the latter. This arrangement is superior to a single heavier spring, because both springs are effective at the beginning of the stroke, giving the same initial thrust as a heavier spring; while the single lighter spring with its reduced static inertia is free to give added velocity at the end of the stroke. A greater striking impact is therefore provided.

As shown in Figure 1, the forward end of the striking head 13 is provided with vents 28 to allow free air passage through the head. Shock springs 29 are preferably provided, and are com-

pressed between a shoulder 31 on the housing and a rim flange 32 provided on the striking head. The shock springs tend to smooth out the action of the mechanism by helping to initiate a return movement.

Means are provided for retracting the head 13 to stress the springs 24 and 25. This is accomplished by a pair of helical cams 33 arranged side by side in the bracket 16, and fixed on a pair of substantially parallel cam shafts 34 journaled in the bracket partitions 19 and 21. Operable connection between the cams and striking head is made by a pair of arms 35 extending rearwardly from opposite sides of the head and projecting through the partition 19 of the bracket 16, so that the bracket also functions as a guide for the reciprocating head. The rear ends of the arms 35 each carry a follower roller 37 positioned to ride on the cams 33.

The cams 33 are rotated in the same direction, but due to the setting of the followers 37 at relatively opposite sides of the cams as shown in Figure 1, undesirable lateral stresses on the head 13 are avoided. The followers 37 ride up on the inclined faces of the cams to retract the head 13, until the followers ride off the cam faces; at which time the head is released and driven forwardly by the springs 24 and 25. An important feature of the cam arrangement is that equal lifting forces are applied on opposite sides of the striking head, so that the latter is drawn back uniformly and evenly to prevent binding or uneven and undue wearing of the sliding parts.

Means are provided for rotating the cam shafts 35 in the same direction to drive the cams. The prime mover for this purpose is preferably an electric motor comprising a field 38 mounted directly in the housing section 2, so that the latter forms the housing of the motor. This integral construction in a hammer of the character described is especially important, because it makes a separate motor housing unnecessary and therefore reduces the weight and bulkiness of the unit. The armature 39 of the motor is journaled at one end in a partition 41 formed across the forward end of the housing section 2, and is journaled at the opposite end in a plate 42 clamped between the housing section and handle 6. This latter plate also carries the brushes 43 for the motor.

A driving connection between the motor shaft 44 and cam shafts is provided by an intermediate shaft 45 journaled in a yoke 47 formed on the bracket partition 21. As best shown in Figure 2, one end of the intermediate shaft 45 carries an internal gear 48, which is connected to pinion 49 on the motor shaft 44 through an idler pinion 51 journaled on the housing partition 41. The other end of the intermediate shaft 45 is provided with a helical pinion 52 meshing with helical gears 53 mounted on the ends of the cam shafts 34. This drive arrangement operates to rotate the cams in the same direction, and also provides a reduction gearing between the motor and cams. The particular reduction used is of course determined by the speed of the motor to be used and the number of driving impulses desired of the striking head.

Means are also preferably provided for rotating the drill 11 during the operation of the hammer. For this purpose a rotor 54 is journaled between the end of the housing section 3 and tip 8. This rotor is provided with a hexagonal opening for slidably receiving the hexagonally shaped end of an ordinary drill, so that when the rotor

is rotated the drill is also turned. The drill extends freely through the holding rotor 54, and projects through a hole in the end partition 56 of the housing, so as to be engaged by the striking head 13. As shown in Figure 2, a side shaft 57 is journaled in the housing and extends forwardly alongside the striking head. This shaft carries a pinion 58 on its forward end, meshing with teeth 59 formed on the periphery of the drill holding rotor 54.

The rear end of the side shaft 57 is drivably connected to the intermediate shaft 45 by a short shaft 61 journaled in the housing and having a pinion 62 at one end meshed with a gear 63 on the side shaft. A gear 64 on the other end of the short shaft 61 meshes with a pinion 66 on the intermediate shaft. By this driving arrangement the rotor 54 is rotated simultaneously with the cams 33, so that the drill is turned whenever the striking head operates.

Safety means are also preferably provided for preventing operation of the striking head when a drill is not present in the hammer, since operation of the head without the tool in place would cause damage to the hammer. As shown in Figures 1 and 3, an insulating cup 66 is threaded in the tip 8 ahead of the rotor 54. This cup provides a mounting for a pair of normally open spring switch elements 67, and a pivoted actuating arm 68. The latter is of arcuate shape to extend over part of the opening 9, so that when a drill is inserted the arm is shifted out to press the switch elements together. A stop 69 on the arm limits the inward movement of the arm, and the outward pushing of the arm by the drill may be further assisted by beveling the inner edge of the arm. An important feature of this switch construction is that the curved arm 68 engages more than one of the hexagonal edges of the drill. This prevents chattering of the switch arm when the drill rotates. An insulating segment 71 on the arm 68 prevents contact with the drill.

Suitable leads 72 are carried from the handle 6 in an external duct 73 to the switch elements 67, so that the latter may be interposed in the motor connections. In this way, the motor cannot be energized unless a drill is inserted in the hammer. Suitable passages 74 are provided in the handle 6 for the remaining connections, and an operating switch 75 is also preferably provided in the handle for the convenience of the operator.

A modified form of construction embodying my invention is shown in Figure 4. In this case, the cams 81 are mounted coaxially on a single cam shaft 82; which latter may conveniently comprise a continuation of the intermediate shaft 45 of the structure shown in Figure 1. In this tandem arrangement one of the follower arms 83 is longer than the other, but otherwise the structure is similar to that shown in Figure 1. The desired result of applying equal pulling forces on opposite sides of the striking head is also obtained with this cam arrangement. So also is the elimination of undesired side thrusts. This is accomplished by the arrangement of the followers 84 on relatively opposite sides of the cams.

I claim:

1. A power hammer comprising a housing having a shoulder therein, a bracket assembled in said housing and having an end resting against said shoulder, means for fastening the bracket in assembled position, a reciprocable head in the housing, a spring for driving the head, a plurality

of coaxial cams journaled wholly in the bracket and independently of the housing for retracting the head to stress the spring, and means for driving the cams.

5 2. A power hammer comprising a housing, a striking head mounted for reciprocation in the housing, a bracket in the housing, a compression spring for driving the head and interposed between it and the bracket, a cam shaft journaled on the bracket, a cam on the shaft, a follower on the head and riding on the cam for retracting the head to compress the spring, a gear on the cam shaft, an intermediate shaft journaled on the bracket, a pinion on the intermediate shaft and meshed with the cam shaft gear, an internal gear on the intermediate shaft, a motor having its shaft axially aligned with the intermediate shaft, a pinion on the motor shaft, and an idler gear between the motor shaft pinion and the internal gear.

30 3. A power hammer comprising a housing, a striking head mounted for reciprocation in the housing, a two-part bracket in the housing, means for securing the bracket parts together independently of the housing, means for fastening the bracket to the housing, a compression spring for driving the head and interposed between it and the bracket, a cam shaft journaled on the bracket, a plurality of cams on the shaft, followers on the head and riding on the cams for retracting the head to compress the spring, and means for driving the cam shaft.

40 4. A power hammer comprising a tubular housing, a striking head reciprocally mounted in the forward end of the housing, a two-part cam bracket mounted in the housing behind said head, means for securing the bracket parts together independently of the housing, means for fastening the bracket to the housing, a thrust spring interposed between the head and bracket, a pair of coaxial cams journaled in the bracket, arms projecting rearwardly from opposite sides of said head, followers on the arms and riding on said cams, and means for driving the cams.

45 5. A power hammer comprising a tubular housing, a striking head reciprocally mounted in the forward end of the housing, a two-part cam bracket slidably mounted for assembly in the housing behind said head, means for securing the bracket parts together independent of the housing, means for fastening the bracket to the housing in assembled position, a cam journaled in the

bracket and arranged between the parts thereof, an arm projecting rearwardly from said head, a follower on the arm and riding on the cam, and means for driving the cam.

6. A power hammer comprising a tubular housing having longitudinal grooves therein terminating adjacent the intermediate portions of the housing to provide shoulders, a striking head reciprocally mounted in the forward end of the housing, a cam bracket slidably mounted for assembly in said grooves and having its forward end resting on said shoulders, means for fastening the bracket to the housing in assembled position, a cam journaled wholly in the bracket and independent of the housing, an arm projecting rearwardly from said head, a follower on the arm and riding on the cam, and means for driving the cam.

7. A power hammer comprising a tubular housing having longitudinal grooves therein terminating adjacent the intermediate portions of the housing to provide shoulders, a striking head reciprocally mounted in the forward end of the housing, a rotor journaled in the housing forwardly of the striking head for holding a tool, an elongated two-section cam bracket having a width less than the internal diameter of the housing to provide a space alongside the bracket, said bracket being slidably mounted for assembly in said grooves and having its forward end resting on said shoulders, means for fastening the bracket sections together independently of the housing, means for fastening the bracket to the housing in said assembled position, a cam shaft journaled in the bracket, one end of the shaft being journaled in one section of the bracket and the other end being journaled in the other section, a cam on the shaft, a follower on the head and riding on the cam, a second shaft extending forwardly in the space alongside the bracket for turning the tool holding rotor, and means for rotating said shafts.

8. A power hammer comprising a housing having a shoulder therein, a cam bracket assembled in said housing and having an end resting against said shoulder, means for fastening the bracket in assembled position, a cam journaled wholly in the bracket and independent of the housing, a striking head in the housing, a follower connected with the head and riding on said cam, and means for driving the cam.

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