Oct. 25, 1966 F. H. BICKFORD 3,280,921

ELECTRIC HAMMER

Filed Jan. 7, 1964 2 Sheets-Sheet 1

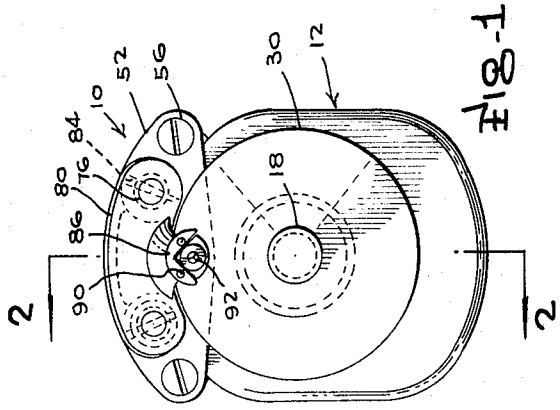

FIG-1

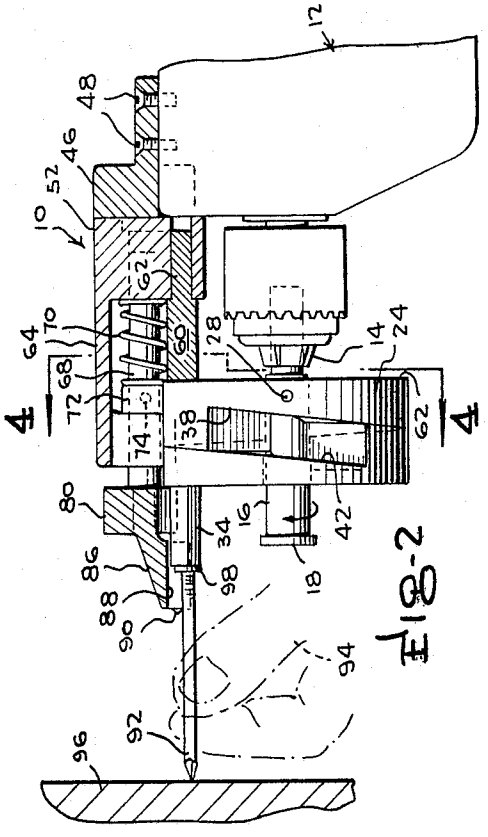

FIG-2

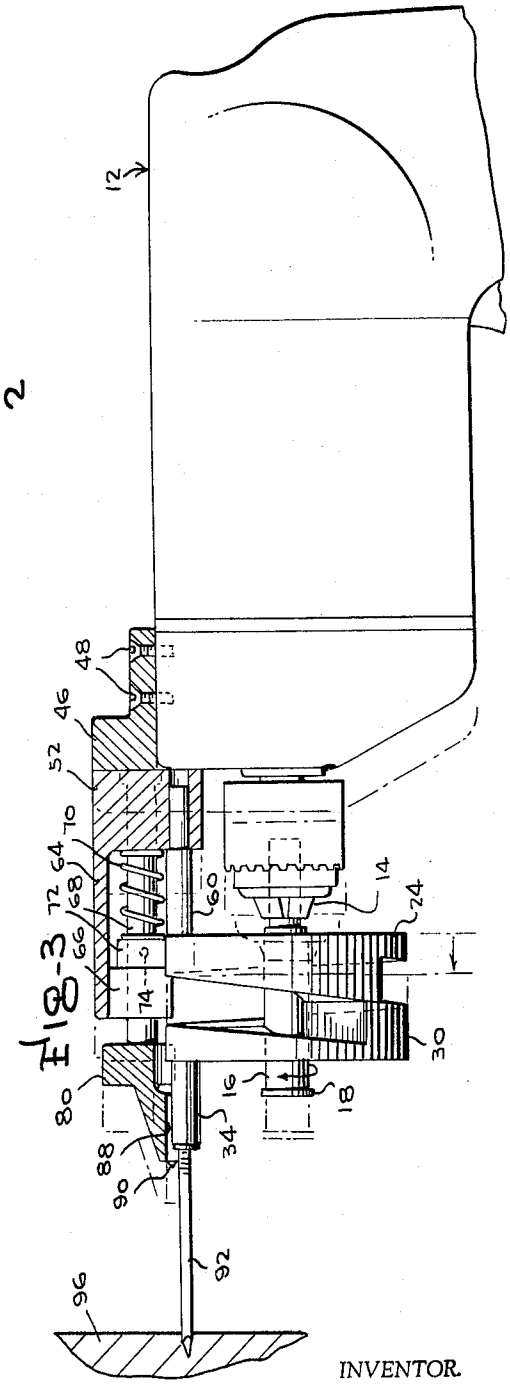

FIG-3

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ELECTRIC HAMMER

Filed Jan. 7, 1964 2 Sheets-Sheet 2

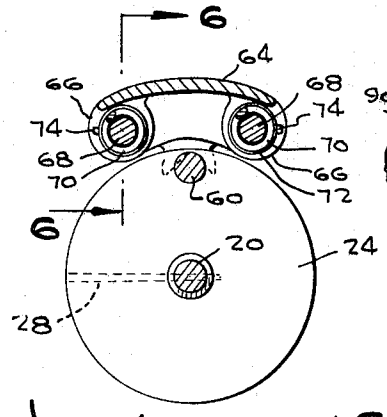

FIG-4

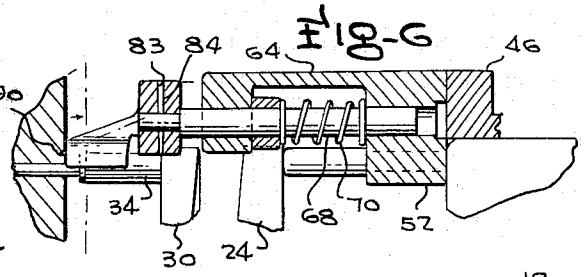

FIG-6

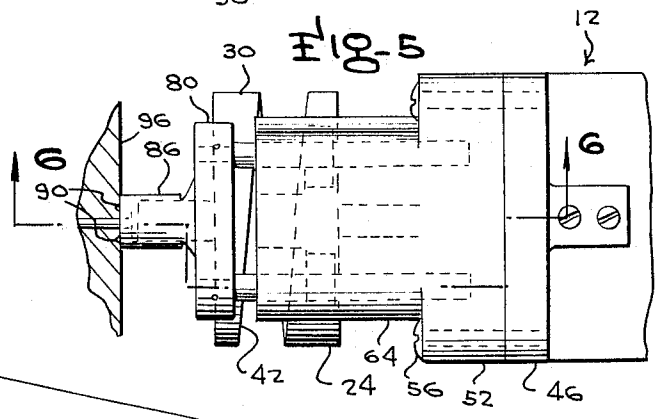

FIG-5

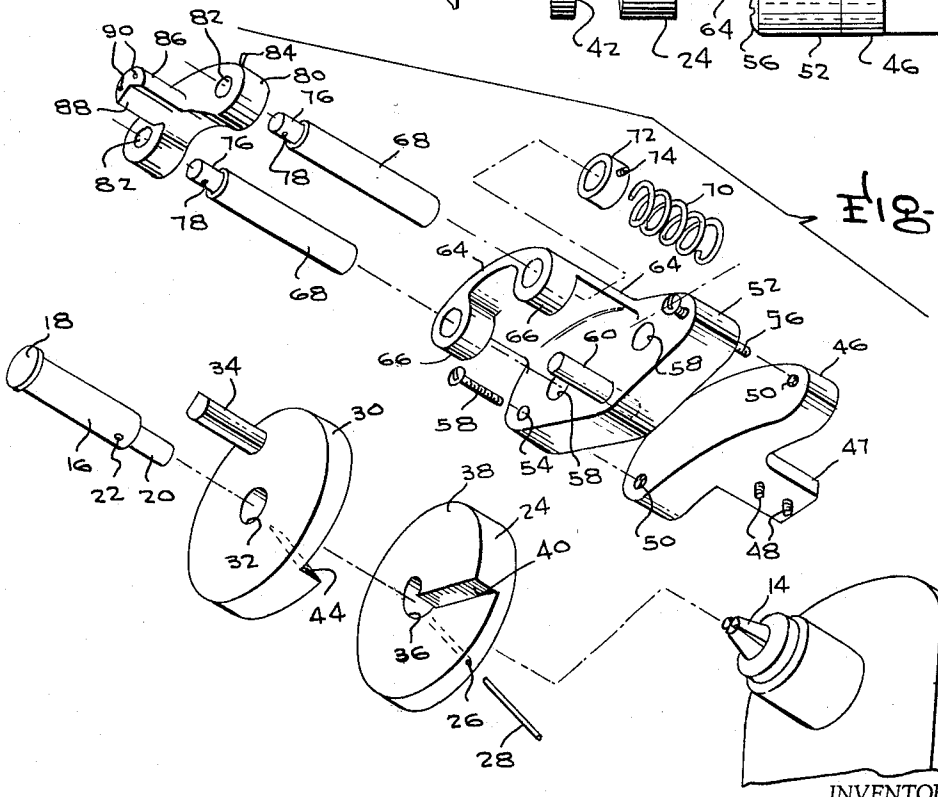

FIG-7

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3,280,921

ELECTRIC HAMMER

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Filed Jan. 7, 1964, Ser. No. 336,298
1 Claim. (Cl. 173—123)

This invention relates to the general field of manually-operated tools and, more specifically, the invention pertains to percussion tools.

One of the primary objects of this invention is to provide an attachment for an electrically driven power drill to convert the drill into a percussion tool or hammer.

A further object of this invention is to provide an attachment for an electric drill to convert the drill into a percussion tool and wherein the attachment includes means for converting the rotary motion of the drill into a reciprocating movement in such a manner as to define a definite impact during each stroke so that the tool may be effectively employed for the driving of nails or in carrying out other related operations.

A still further object of this invention is to provide an attachment for converting the conventional electric drill into a percussion tool, the attachment being so designed as to permit easy connection with a drill and without materially altering the latter.

Still another object of this invention is to provide a percussion attachment for an electric hand drill, the attachment being non-complex in construction and assembly, inexpensive to manufacture and maintain, and which is durable in use.

Other and further objects and advantages of the instant invention will become more evident from a consideration of the following specification when read in conjunction with the annexed drawings, in which:

FIGURE 1 is a front elevational view of the attachment mounted on an electric hand drill;

FIGURE 2 is a detail cross-sectional view, partly in elevation, FIGURE 2 showing the component elements of the attachment when in their respective inoperative positions, FIGURE 2 being taken substantially on the vertical plane of line 2—2 of FIGURE 1, looking in the direction of the arrows;

FIGURE 3 is a detail cross-sectional view showing the component elements of the attachment moved to their respective operative positions in the operation of pounding a nail;

FIGURE 4 is a cross-sectional view of the attachment, FIGURE 4 being taken substantially on the vertical line 4—4 of FIGURE 2, looking in the direction of the arrows;

FIGURE 5 is a top plan view of the attachment showing the same as having substantially driven a nail;

FIGURE 6 is a detail fragmentary cross-sectional view, FIGURE 6 being taken substantially on the horizontal plane of line 6—6 of FIGURE 5, looking in the direction of the arrows; and

FIGURE 7 is an exploded perspective view of the attachment.

Referring now specifically to the drawings, reference numeral 10 designates, in general, a percussion tool attachment for an electric drill constructed in accordance with the teachings of this invention. The tool 10 is seen as being connected with a conventional electric hand drill 12 having the usual rotary chuck 14 at the forward end thereof.

Reference numeral 16 designates an elongated shaft having an enlarged cylindrical head 18 at one end thereof, and its other end is reduced as at 20 and is adapted to be clamped within the jaws of the chuck 14 in the usual manner. As is clearly seen in FIGURE 7, the shaft 16 is provided with a radially extending lock pin-receiving hole 22 to serve a function to be described.

Mounted on the shaft 16 is a first cam 24, the cam 24 having a radially extending passage formed therein, the passage 26 extending inwardly from the outer periphery of the cam 24. Reference numeral 28 denotes an elongated locking pin which is adapted for insertion in the passage 26 and into the lock pin-receiving hole 22 whereby the cam 24 is secured on the shaft 16 for rotation therewith.

As is seen in the drawings, a second cam 30 is mounted on the shaft 16, but this second cam 30 is not connected with the shaft 16, the shaft 16 being free to rotate in the opening 32 centrally located in the cam 30. Projecting laterally from the front face of the cam 30 is an elongated substantially cylindrical rod 34, the function of the latter becoming more apparent as this specification proceeds.

The first cam 24 is centrally apertured, as at 36, and is provided with a helicoidal face 38 consisting of substantially a single convolution. The face 38 merges with a shoulder 40, the shoulder 40 extending radially away from the shaft 16, and is substantially rectangular in configuration.

The cam 30 has a complementing helicoidal face 42 and shoulder 44, the face 42 again consisting of a single convolution and the shoulder 44 extending radially from the shaft 16 and being substantially rectangular in configuration. As is seen in the several figures of the drawings, the faces 38, 42 are disposed in confronting relationship relative to one another.

Reference numeral 46 indicates a support member shaped to conform to the upper end of the housing 12. In this instance, the support member 46 is seen to be arcuately shaped and includes a laterally projecting flange 47 which overlies the housng 12 of the electric hand drill. The flange 47 is connected to the housing 12 as by screws 48 or by other conventional means. As is seen in FIGURE 7, the support member 46 is provided with a pair of internally threaded openings 50 at each end thereof.

Reference numeral 52 designates a polygonal block having essentially an oval-shaped configuration. As is clearly seen in FIGURE 7, the block 52 is provided with a pair of openings 54 extending transversely therethrough adjacent each end thereof. The openings 54 receive therethrough the screws 56 which threadedly engage in the threaded openings 50 to firmly secure the block 52 to the support member 46. The block 52, intermediate the openings 54, is provided with a pair of transversely extending passages 58 which open to the opposed sides thereof. Reference numeral 60 denotes an elongated substantially cylindrical bearing post having a reduced end 62 fixedly secured by conventional means within the block 52. As is clearly seen in FIGURE 2, the outer end of the bearing post 60 is adapted to engage the outer face of the driving cam 24.

Projecting forwardly of the block 52 is a substantially arcuate shell 64, the outer end of the shell 64 terminating in a pair of depending, substantially hollow, cylindrical bosses 66. Reference numeral 68 designates a pair of elongated substantially cylindrical slide posts which are adapted to extend through, respectively, each of the hollow cylindrical bosses 66 and are radially restrained within the passages 58. Surrounding each of the cylindrical slide posts 68 between the block 52 and the bosses 66 is a helicoidal spring 70. Also mounted on each of the cylindrical slide posts 68 is a collar 72 fixedly secured thereon as by means of a set screw 74 (see FIGURE 7). As is seen in FIGURES 2 and 3, each of the helicoidal springs 70 has one end thereof abutting against the block 52, while the respective other ends abut against the collar 72.

Each of the slide posts 68 is reduced in diameter at their respective outer ends, as is designated at 76, and each of

the reduced ends **76** is formed with a diametrically extending bore **78**.

Reference numeral **80** denotes an arcuately shaped end block through which extend a pair of transverse openings **82**, the openings **82** being adapted to receive therein the reduced ends **76** of the slide posts **68**. Each end of the arcuate end block is provided with a tapered bore **83** to receive a tapered pin **84** which also extends through the bores **78** (see FIGURES 6 and 7).

Integral with and projecting forwardly of the end block **80** is an elongated substantially cylindrical guide **86**, the guide **86** being undercut at **88** to form a downwardly facing inverted V-shaped groove **88**. The outer end of the guide **86** has a pair of tines **90** projecting longitudinally therefrom. As is seen in the drawings, the rod **34** is adapted to be received within the V-shaped groove **88** and serves as abutment means therefor in order to prevent rotation of the second cam **30** on the shaft **16**.

In operation, and referring to FIGURES 2 and 3, in particular, a nail **92** is shown as being held between the thumb and index finger **94** of the user. In these figures the nail **92** is shown as being prepared for driving into a wall or other structure designated by reference numeral **96**.

In FIGURE 2 the confronting cam faces **38**, **42** are shown in their respective closed positions, that is, the shoulders **40**, **44** are disposed, one behind the other. The head **98** of the nail **92** is shown as being engaged by the outer end of the rod **34**. Now, as the drill **12** is energized, the shaft **16** will begin its rotation in the direction of the arrows shown in FIGURE 2. Rotation of the shaft **16** causes the cam **24** to rotate and as this rotation takes place, the cam face **38** moves away from the cam face **42** which is held stationary. It is to be understood that as the hand drill **12** is operated, pressure is exerted by the operator in the direction of the longitudinal axes of the rod **34** and nail **92**. As the shaft **16** continues its rotation, the cam **24** will ride on the cam face **42** effecting separation of the cams **24**, **30**, remembering that the operator is continually exerting a force in a forward direction. It will, therefore, be obvious that as the cam **24** completes one full revolution, the shoulders **40**, **44**, representing the highest portion of the cams will pass one another, and due to the aforementioned force exerted by the operator, the two shoulders **40**, **44** will become substantially coplanar and the two cams **24**, **30** become suddenly joined to take their positions as shown in FIGURE 2, the collision of the cam face **38** with the cam face **42** due to the force exerted by the operator giving rise to a sudden and relatively heavy jolt which is, in turn, transmitted to the rod **34**, and this force is applied through the head **98** to the nail **92**, thereby tending to drive the same longitudinally. The length of time required for pounding a driven nail depends, of course, upon the size of the nail, the contour of the cams **24**, **30** and the speed of the shaft **16**.

It may be pointed out at this time that the inverted V-shaped groove **88** serves as a guide for the nail head **98**, whereby the rod **34** is properly aligned with the longitudinal axis of the nail **92**.

As the nail **92** approaches its finished position, the forward end of the guide **86** approaches the wall **96** so as to cause penetration of the tines **90** therein. This immobilizes the guide **80**, and the continued exercise of force in the longitudinal direction of the rod **34** will cause the shell **64** to move toward the guide **80**, and the spring **70** becomes depressed. The compression of the spring **70**

and the movement of the shell **64** continues until the nail **92** is driven to its finished position.

As soon as the nail **92** has been fully driven, the electric hand drill is de-energized and the force exerted upon the same is relieved. This causes, of course, stoppage of the rotation of the shaft **16** and consequently, of the cam **24**. As the force on the hand drill **12** is relieved, the tines **90** of the guide **80** are removed from the wall **96** and, of course, the guide **80** returns to its original position under the influence of the springs **70**.

Having described and illustrated one embodiment of this invention, it will be understood that the same is offered merely by way of example, and that the scope of this invention is to be limited only by the appended claim.

What is claimed is:

An attachment for converting an electric hand drill having a casing and an electrically-driven rotatable chuck to an electrically-driven impaction tool, said attachment comprising a shaft having an end thereof detachably connected with said chuck for rotation therewith, a pair of cylindrical cams mounted on said shaft, said cams having confronting contacting complementing cam surfaces, each of said cams having a confronting helical cam surface extending for substantially one convolution, each of said cam surfaces having its respective high side terminating in a radially-extending shoulder connecting at right angles with its respective low side, means connecting one of said cams fixedly with said shaft for rotation therewith, the other of said cams being loosely mounted on said shaft, a block detachably connected with said casing, an arcuately-shaped shell projecting laterally from a side of said block and across said chuck, said shell at its outer end having a pair of depending substantially hollow cylindrical bosses, said block having a pair of passages extending transversely therethrough, said passages and said bosses being aligned, one with the other, an elongated substantially cylindrical shaft mounted within each pair of aligned passages and hollow bosses, a collar fixedly secured on each of its respective bosses and block, a helicoidal spring surrounding each of said shafts, respectively, said helicoidal springs being interposed between their immediately-adjacent collars and said block, said last-named shafts each having an end projecting beyond said bosses, respectively, an arcuate block fixedly secured to said outer ends of said last-named shafts, said block having a guide projecting therefrom, said guide including an inverted substantially V-shaped groove adapted to receive said rod for reciprocation longitudinally thereof, said guide being engageable with said rod to hold said other cam against rotation, said guide having a plurality of tines projecting longitudinally thereof for engagement with the material in which said workpiece is being driven, and means constantly urging said cams together as said shaft and its said one cam is rotated to provide an intermittent impaction force on said workpiece.

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