April 9, 1968 R. K. WILLIS 3,376,940

POWERED HAND HAMMER

Filed May 10, 1966

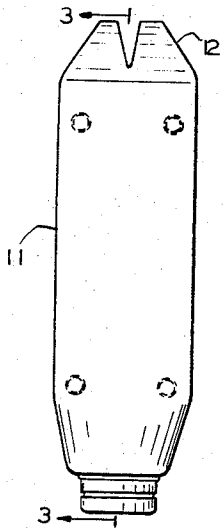


Fig. 2

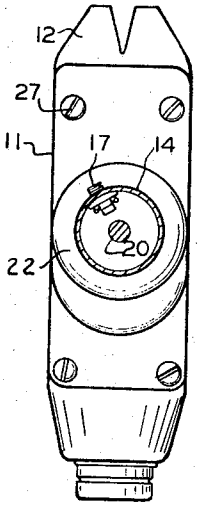


Fig. 4

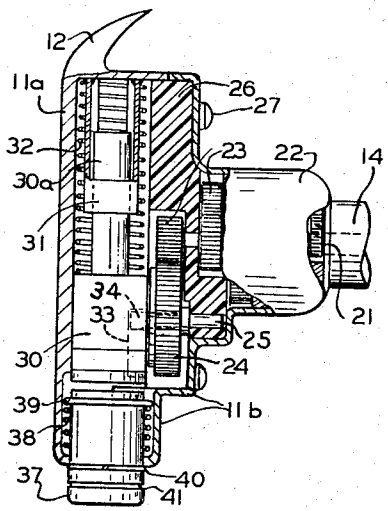


Fig. 3

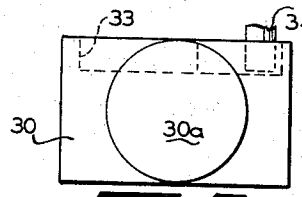


Fig. 7

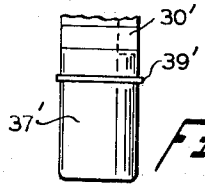


Fig. 9

Fig. 1

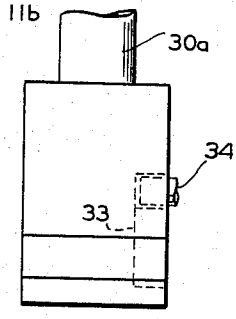


Fig. 6

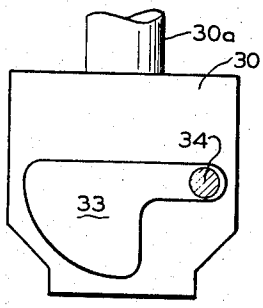


Fig. 5

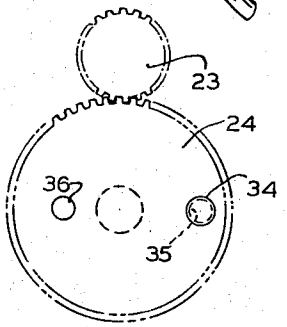


Fig. 8

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POWERED HAND HAMMER

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This invention relates generally to tools and more particularly to an electrically powered hammer.

Electrically powered hand hammers have been heretofore suggested for work in hard-to-get-at places but none have been successful because those in which a reciprocating head moves at right angles to the handle, the most effective type for reaching into awkward places, have never been completely self-contained. Those in which a motor is provided in the hammer itself have been too large and extend vertically from the working end too far to be effective when working in constricted places where an ordinary hand hammer cannot be swung.

The principal object of the present invention is to provide a hand hammer with a reciprocating plunger head moving in reverse directions normal to the handle, the plunger being driven by motor means contained in the handle.

Another important object is to provide means for reciproating the plunger in alternate work and return strokes in which the plunger is free to rebound independent of the remainder of the hammer after its work stroke.

A further object is to provide a hammer having a generally conventional configuration with a reciprocating motor-driven plunger in the head, the motor being mounted within the handle and its speed being regulatable by a switch mounted on the handle.

Other objects and advantages will become apparent from the following description in conjunction with the accompanying drawing, in which:

FIGURE 1 is a side elevational view of a hammer according to the invention;

FIGURE 2 is a left end view thereof;

FIGURE 3 is a fragmentary sectional view on the line 3—3 of FIGURE 2;

FIGURE 4 is a sectional view on the line 4—4 of FIGURE 1;

FIGURE 5 is a fragmentary enlarged rear elevational view of the plunger as viewed from the right in FIGURE 1 and showing a portion of the drive pin engaged therewith;

FIGURES 6 and 7 are fragmentary enlarged side elevational and top plan views, respectively, of the parts shown in FIGURE 5;

FIGURE 8 is an enlarged front elevational view of the plunger drive mechanism as viewed from the left in FIGURE 3; and

FIGURE 9 is a fragmentary side elevational view of a modified form of plunger on the same scale as FIGURE 3.

In FIGURE 1 the hammer **10** comprises a head housing **11**, provided with nail-pulling claws **12**, and a handle **13** including a grip portion **14** secured to the housing **11** and an enlarged hollow free end portion **15** housing an electric motor **16** shown diagrammatically. A shut-off switch **17** for motor **16** is shown mounted on the grip portion **14** of the handle and a speed control switch **18** of the silicon rectifier type is shown mounted on the free end of handle **13**. A flexible cord **19** extends from the free end of the handle for connecting motor **16** to a source of electric current and is connected in conventional manner through switches **18** and **17** to the motor. The source of electric current may be a conventional electric outlet or a battery pack carried by the operator.

The motor shaft **20** of motor **16** is elongated and extends the length of the handle, terminating within housing

11 and having a gear **21** fixed to its forward end. As best seen in FIGURE 3, gear **21** is housed in the rear portion **22** of housing **11** and is the first gear of a train of reduction gearing partially shown at **23–24** journalled in any convenient manner within housing portion **22**. The driven or final gear **24** of the train is shown journalled on a stub shaft **25** fixed on a journal member **26** secured within the housing **11**. Journal member **26** is shown as made of nylon plastic but may alternatively be of metal.

Housing **11** is made in two parts **11***a* and **11***b* secured together by the bolts or screws **27** which also secure journal member **26** within the housing. Portion **22** of the housing is shown as integral with the part **11***b*.

Forward of the gear **24** a plunger **30** is journalled for longitudinal reciprocating motion in the housing **11**. The upper portion **30***a* is cylindrical and may slide up and down in a sleeve **31** secured to the top of housing **11**. The lower portion of plunger **30** is widened as shown and has a flat face slideable against the flat forward face of the gear **24**. Plunger **30** is also journalled for its reciprocating movement by the portion **11***a* of the housing and by the journal member **26**.

Around the sleeve **31**, a coil spring **32** bearing on the shoulder between the upper and lower portions of the plunger, biases the plunger downward as viewed in FIGURE 3.

The flat rear face of plunger **30** has a groove **33** thereacross, as best seen in FIGURE 5. Into the groove **33** a cog or drive pin **34** projects from the gear **24**. The pin **34** may be shouldered, as shown in FIGURE 8, and secured in an appropriate hole **35** in gear **24** which is eccentric with respect to the center of rotation of the gear. Other holes such as that shown at **36** at a different radial distance from the center of rotation of the gear may be provided so that pin **34** may be removed from one hole and transferred to another.

Groove **33** is substantially of a width equal to the diameter of pin **34** about half way across the plunger. The groove is widened downward as shown for the remainder of the distance across the plunger.

Below the plunger **30**, a separate reciprocating head or work member **37** is journalled coaxially with the plunger between the parts **11***a* and **11***b* of the housing. The head **37** is biased upward by the spring **38** bearing on collar **39** on the head so as to normally be in the path of the plunger **30**, spring **38** being weaker than spring **32**.

The head **37** is limited in its upward movement by a snap ring **40** seated in an appropriate groove around the portion of the head which protrudes from the end of housing **11**. Another groove **41** may be provided for ring **40** to allow further upward movement of the head when pin **34** is placed in the hole **36** in gear **24**.

In operation, hammer **10** is of conventional shape and may be used without training by anyone familiar with a conventional hand hammer. The hammer may be used in the conventional way without turning on the motor for starting a nail, for example. After the nail is started, motor **16** may be turned on by movement of the switch **17** and its speed regulated by turning the switch **18**. Motor shaft **20** turns the drive or first gear **21** of the train of gears, the final gear **24** being driven at a considerably reduced rate.

The drive pin **34** is carried in a rotary path and on its down or work stroke is engaged in the narrow portion of groove **33**. On the return stroke pin **34** engages the top of groove **33** for returning plunger **30** to its upper or withdrawn position. During the return stroke pin **34** is in the wider portion of groove **33** so that plunger **30** is free to rebound independent of the remainder of hammer **10** after it has completed its work stroke.

During the work stroke, when pin **34** is substantially half way in its downward movement, the lower end of

plunger **30** meets the head member **37** and drives it downward compressing the spring **38**. When head **37** is placed on a nail, for example, the force of the blow of plunger **30** striking head **37** drives the nail into the wood in which it has been started, the plunger slowing in its downward movement as it approaches its lowermost position.

If the nail does not penetrate into the wood far enough to absorb the blow of the lowering plunger the hammer will recoil. Upon the completion of the work stroke of plunger **30**, however, pin **34** reaches the wider portion of groove **33** and the plunger is free to recoil independently of the remainder of the hammer, pin **34** occupying a position in the lower portion of the groove as the plunger recoils upward. Thus rebound of the hammer is minimized and the head **37** tends to stay in contact with the nail head as the operator presses down on the hammer.

On the return stroke, pin **34** rises in the groove **33** until it reaches the top of the groove. As the pin continues to rise it thereafter carries plunger **30** upward compressing the spring **32** to add to the downward force of plunger **30** in its next work stroke.

Means are provided for changing the length of the stroke of plunger **30**, for lighter work, for example. Screws **27** are removed and the two parts **11***a* and **11***b* of the housing are separated. This exposes the forward face of gear **24** and the drive pin **34** can be removed in any convenient manner from the hole **35** and placed in the alternate hole **36**.

Snap ring **40** is then removed and placed in the alternate groove **41**. Housing **11** is then reassembled and the parts secured by replacing screws **27**. This adjustment requires partial disassembly but, unless the hammer is to be used for a considerable length of time for the lighter work, a somewhat similar effect can be obtained simply by slowing the motor by turning switch **18**.

It will be apparent that the head **37** may be made integral with the plunger **30** so as to be carried with the plunger to the top of its return stroke and return spring **38** and snap ring **40** may be omitted. A modified form of plunger **30**^{1} is shown fragmentarily in FIGURE 9. Plunger **30**^{1} is the same as plunger **30** shown in FIGURES 2, 5, 6 and 7 except that plunger **30**^{1} has an integral work head **37**^{1} at its lower end similar in shape to head **37**, the portion **37**^{1} being adapted to extend from lower end of housing **11** at least during the final portion of its work stroke.

As will be apparent to those familiar with the art, the invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The embodiments disclosed therefore are to be considered in all respects as illustrative, rather than restrictive, the scope of the invention being indicated by the appended claims.

What is claimed is:

1. An electric power hammer comprising: an elongated head housing; a hollow handle extending laterally from the side of the housing, the handle having a forward end secured to the housing, an enlarged free end, and a reduced grip portion between the forward and free ends; an electric motor secured within the free end, the motor shaft extending through the grip portion into the housing; a motor shut-off switch mounted on the grip portion; a speed control switch for the motor mounted at the free end of the handle adjacent the motor; a reduction gear train having a plurality of gears including a first gear and a final gear journalled within the housing, the first gear of the train being secured to the forward end of the motor shaft and the final gear having an eccentrically mounted drive pin projecting forward from its face; and a plunger journalled in the housing for receiprocating longitudinal movement therein adjacent the face of the final gear, the plunger having a slot thereacross adapted to receive the drive pin, whereby each rotation of the final gear drives the plunger in a work stroke in one direction and then returns the plunger in the opposite direction.

2. The power hammer as defined in claim **1** wherein the plunger is spring-biased in the direction of its work stroke and the width of the portion of the plunger slot containing the drive pin during the work stroke is substantially equal to the diameter of the drive pin and the remainder of the plunger slot has a width greater than the pin diameter whereby the plunger may rebound independent of the housing after the work stroke of the plunger.

3. The power hammer as defined in claim **2** wherein the plunger has a work portion extending outside the housing for at least a portion of its work stroke.

4. The power hammer as defined in claim **2** having a head member journalled coaxially with the plunger in the housing for limited reciprocating longitudinal movement and normally projecting from one end of the housing, the head member being normally disposed in the path of the plunger in its work stroke and spring biased to a position in which it is struck by the plunger substantially midway in its work stroke.

5. A power hammer comprising: an elongated head housing; a plunger journalled in the housing for longitudinal reciprocating movement therein and spring-biased in the direction from a withdrawn to an extended position; a tool head member journalled coaxially with the plunger for limited longitudinal reciprocating movement in the housing and having a portion normally projecting from one end of the housing, said member being spring biased toward a normal position so as to be struck by the plunger when it moves substantially half way from its withdrawn to its extended position and being movable against the bias of its spring when struck by the plunger; the plunger having a transverse flat surface having a groove thereacross; a rotating element journalled in the housing and having a face abutting the plunger flat surface; a drive pin eccentrically mounted on the element and projecting from its face into the plunger groove; a hollow handle projecting laterally from the head housing; and means in the handle for rotating said element; that portion of the groove carrying the pin during the movement of the plunger from its withdrawn to its extended position being of a width substantially equal to the diameter of the pin and the remaining portion of the groove being wider for allowing the plunger to rebound independent of the housing during the return of the plunger to its withdrawn position.

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