Aug. 27, 1968 E. S. MEIER 3,398,588

RECIPROCATING HAND TOOL ATTACHMENT FOR HAND-DRILLS

Filed March 30, 1967 2 Sheets-Sheet 1

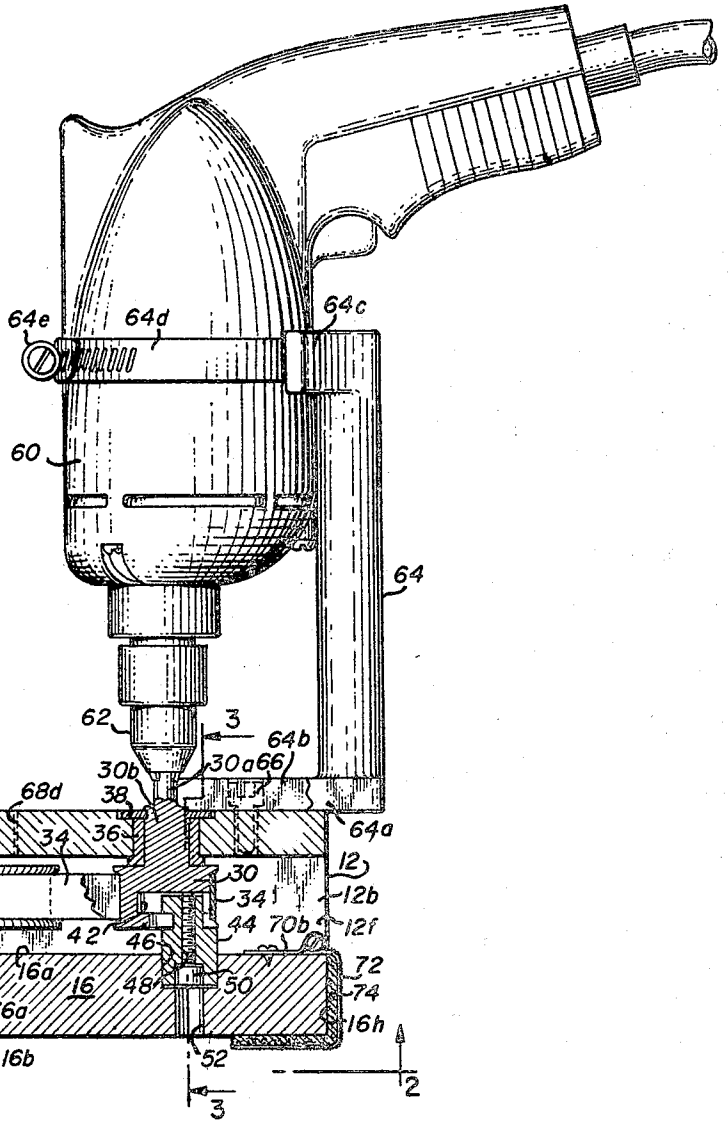


Fig_1

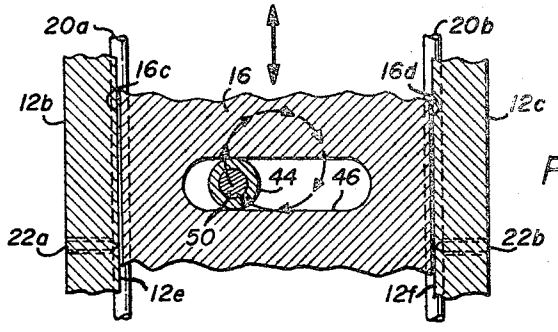


Fig_6

INVENTOR
EMIL S. MEIER

BY Harvey J. Loobeer

ATTORNEY

Aug. 27, 1968 E. S. MEIER 3,398,588

RECIPROCATING HAND TOOL ATTACHMENT FOR HAND-DRILLS

Filed March 30, 1967 2 Sheets-Sheet 2

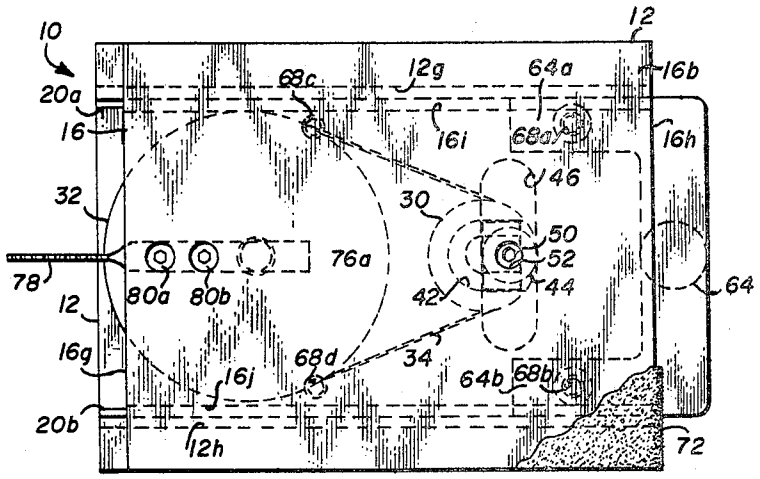


Fig_2

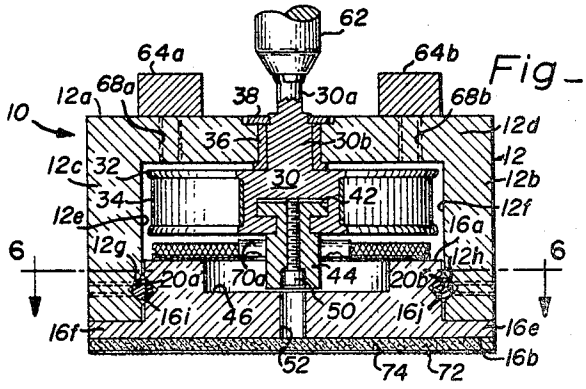


Fig_3

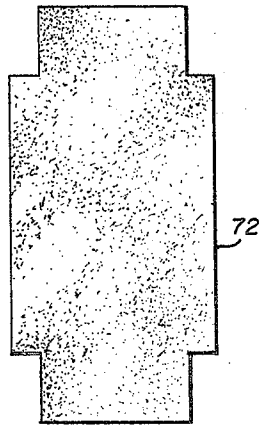


Fig_4

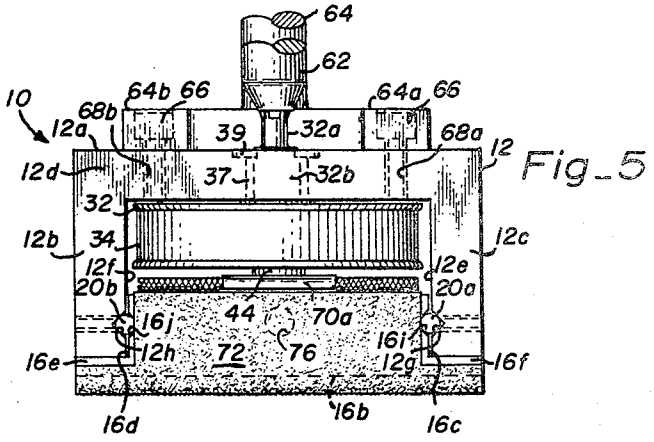


Fig_5

INVENTOR
EMIL S. MEIER

BY Harvey S. Lambert

ATTORNEY

United States Patent Office 3,398,588 Patented Aug. 27, 1968

3,398,588

RECIPROCATING HAND TOOL ATTACHMENT FOR HAND-DRILLS

Emil S. Meier, Mountain View, Calif.
(1573 Peacock Ave., Sunnyvale, Calif. 94086)

Filed Mar. 30, 1967, Ser. No. 626,995
10 Claims. (Cl. 74—50)

ABSTRACT OF THE DISCLOSURE

A hand-drill attachment for converting rotary motion into reciprocating motion in which a reciprocating slide member is actuated by an adjustable eccentric cam which is directly and positively coupled to one drive shaft engageable to the hand-drill shaft and indirectly and through a friction means coupled to another drive shaft engageable to the hand-drill shaft. The reciprocating slide member includes clip-on means for holding sandpaper and a fastening means for holding saw blades, hammers or the like. A handle means supports the hand-drill on the attachment and provides means for conveniently handling the combination.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to an attachment for power tools and for converting rotary motion to reciprocating motion and, more particularly, to a reciprocating hand tool attachment for hand-drills.

Description of the prior art

Many types of reciprocating hand tool attachments for hand-drills are known today as evidenced by the disclosures of U.S. Letters Patent 2,307,174, 1,951,170, 2,282,728 and 2,713,271, to name only a few. Each of these prior art hand-drill attachments has been found wanting in one or more respects which include such factors as the absence of any means to adjust the length of the reciprocating stroke, the absence of any means to change the reciprocating speed, and the absence of any means to change from a direct connection such as a gear train to an indirect connection with a friction drive, or vice versa. Further, combining the hand-drill with the attachment produced a structure which was found wanting from the point of view of ruggedness and convenience in handling the same for applying the reciprocating tool to a workpiece.

It is therefore a primary object of this invention to provide a reciprocating hand tool attachment for hand-drills which overcomes each of the aforementioned deficiencies.

It is another object of this invention to provide an attachment for a hand-drill which is powered by the rotating hand-drill shaft and which effectively drives reciprocatingly operable hand tools.

It is still another object of this invention to provide an attachment for hand-drills for reciprocating a slide member to which reciprocatingly operable tools may be attached, and which is capable of being operated in at least two different reciprocating speed modes.

It is a further object of this invention to provide an attachment of the type described having one direct or positive coupled drive, and one indirect or friction coupled drive.

It is still a further object of this invention to provide an attachment of the type described which includes means to securely support the hand-drill on the attachment and which also allows the resultant combination to be conveniently handled by an operator.

It is a still further object of this invention to provide an attachment of the type described which includes provisions for reciprocating the slide member in at least two different reciprocating speed modes, and for continuous adjustability of the length of the reciprocating stroke over wide limits.

It is also an object of this invention to provide an attachment for a hand-drill which may be quickly and easily attached to the hand-drill, and which includes a reciprocating slide member having means for securely holding reciprocally operable hand tools such as saws, files, hammers, sandpaper and the like, and which may be operated at more than one speed and at any desired length of stroke, and which includes a friction coupling for one speed to prevent damage to the hand-drill when the reciprocating tool locks to the workpiece or, in the alternative, to prevent damage to the workpiece under such circumstances.

SUMMARY OF THE INVENTION

Briefly, in the preferred embodiment of this invention, a housing is provided to which the hand-drill may be fastened by a handle means which also serves as a convenient handle by which the combination of the attachment and the hand-drill may be handheld. The housing slidably supports a slide member to which the various reciprocally operable tools may be attached. The housing also includes two rotatably mounted pulleys which are operatively connected by a friction belt and which have control shafts projecting out of the housing for engagement with the chuck of the hand-drill. One of the pulleys carries a cam whose eccentricity is adjustable and which engages a slot in the slide member to reciprocate the same in a direction of motion which is perpendicular to the pulley axis. By connecting the hand-drill to the cam carrying pulley, a direct drive is provided, and by connecting the other pulley to the hand-drill a friction drive is provided. By making the pulleys of different diameters, a different reciprocating speed is provided in accordance as to whether the hand-drill is connected to the larger or the smaller pulley, and by varying the eccentricity of the cam the length of the reciprocating stroke is varied.

Further objects and advantages of the present invention will become apparent to those skilled in the art to which the invention pertains as the ensuing-description proceeds.

The features of novelty that are considered characteristic of this invention are set forth with particularity in the appended claims. The organization and method of operation of the invention itself will best be understood from the following description when read in connection with the accompanying drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a view of the hand-drill attachment of this invention in cross section and the handle means and hand-drill in elevation;

FIGURE 2 is a view taken along line 2—2 of FIGURE 1;

FIGURE 3 is a view taken along line 3—3 of FIGURE 1;

FIGURE 4 is a reduced plan view of a suitably shaped piece of sandpaper which may be utilized in connection with practicing the present invention;

FIGURE 5 is a view taken along line 5—5 of FIGURE 1; and

FIGURE 6 is a view taken along line 6—6 of FIGURE 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, in which like reference characters designate like parts, there is shown a hand-drill attachment **10** including housing **12** having a substantially horizontally disposed upper surface **12***a* and a slide member **16** horizontally slidably carried by the housing. Housing **12** has a generally inverted U-shaped cross section comprising two downwardly disposed side plates **12***b* and **12***c* and a top plate **12***d* integrally joining the side plates. The facing inner surfaces of side plates **12***c* and **12***d* are identified as surfaces **12***e* and **12***f*.

Slide member **16** is of generally rectangular cross section having an upper surface **16***a*, a lower surface **16***b* and a pair of side surfaces **16***c* and **16***d* as best seen in FIGURE 6. The lower corners of slide member **16** further include a pair of horizontal and outwardly extending lips **16***e* and **16***f* which respectively overlap the end surfaces of side plates **12***b* and **12***c* for sliding contact. Similarly, surfaces **12***e* and **16***c*, and surfaces **12***f* and **16***d*, are in sliding contact, respectively.

There are further provided oppositely aligned V-shaped longitudinal grooves **12***g* and **16***i* in slidingly disposed surfaces **12***e* and **16***c*, and oppositely aligned V-shaped longitudinal grooves **12***h* and **16***j* in slidingly disposed surfaces **12***f* and **16***d* which respectively form substantially rectangular channels. Nylon bearing rods **20***a* and **20***b* are respectively inserted into the rectangular channels, and form a retaining bearing allowing slide **16** to slide within housing **12** in a direction parallel to its direction of elongation. Nylon bearing rods **20***a* and **20***b* may be retained against motion with respect to housing **12** by retaining screws **22***a* and **22***b* which are disposed in corresponding threaded openings in side plates **12***a* and **12***b*, respectively, and are provided with a pointed leading edge to engage the nylon bearing rods.

Inside the rectangular space within housing **12** are a first pulley **30** and a second pulley **32** whose peripheral surfaces are shaped to accommodate a belt **34** which passes operatively over both pulleys. Pulley **30** has a central drive shaft **30***a* which is integrally connected to pulley **30** through a bearing hub **30***b*. Hub **30***b* is rotatably journalled within a bearing sleeve **36** press fitted into top plate **12***d* and a retainer ring **38** may be slipped over the end of hub **30***b* to retain pulley **30** against axial displacement.

Similarly, pulley **32** has a central drive shaft **32***a* which is integrally connected to pulley **32** through a bearing hub **32***b*. Hub **32***b* is rotatably journalled with a bearing sleeve **37** press fitted into top plate **12***d*, and a retainer ring **39** may be slipped over the end of hub **32***b* to retain pulley **32** against axial displacement.

Pulley **30** is further provided with a horizontally extending T-shaped slot **42** which extends part way through the pulley. A cam means **44**, having its upper end portion of also a T-shaped configuration to engage slot **42**, is carried by pulley **30** to extend downwardly and is positioned eccentrically with respect to the pulley axis. The lower end portion of cam **44** is of generally cylindrical shape to engage an elongated slot **46** which extends part way into slide **16** having a direction of extension which is perpendicular to the direction of sliding motion. In other words, the direction of extension of slot **46** is perpendicular to the direction of extension of V-shaped channels **16***i* and **16***j*.

The structure so far described is a means for converting rotary motion applied to one of the two drive shafts **30***a* and **32***a* into reciprocating motion of slide **16**. When rotary motion is applied to drive shaft **30***a*, a direct coupling to slide member **16** is provided, and when applied to drive shaft **32***a*, a frictional element in the form of friction belt **34** is interposed therebetween in the coupling to slide member **16**. If the diameter of pulley **32** is selected to be larger than pulley **30** as shown, it is readily seen that a friction coupling is provided for

operation in the fast reciprocating mode. This is as it should be since for sawing and filing operations, which are generally conducted at a slow reciprocating speed, a direct and positive coupling is desirable, and for sanding and hammering operations, which are generally conducted at a fast reciprocating speed, an indirect friction coupling is desirable.

It is further seen from the arrangement so far described that the "throw" or length of the stroke is a function of the eccentricity of cam **44** with respect to the axis of pulley **30**. For greater utility of the attachment of this invention, cam **44** is provided with continuously variable means in the form of a threaded bore **48** and a thrust and clamping screw **50** disposed therein by which the position of cam **44** may be adjusted. To provide access means for clamping screw **50**, an access opening **52** is provided in slide **16** whereby a tool, such as an Allen wrench, may be inserted into the head of clamping screw **50** to loosen the same to change the degree of eccentricity of cam **44**. Clamp screw **50**, when tightened, clamps against the facing portion of key slot **42** to firmly secure cam **44** to pulley **30**.

Referring now particularly to FIGURE 1, there is also shown a conventional hand-drill **60** having a conventional Jacobs chuck **62** for engaging either one of drive shafts **30***a* or **32***a*. Since the direction of reciprocating motion of slide **16** of this invention is at right angles to the axis of the rotating hand drill spindle, handle means **64** is provided whereby an operator can conveniently grasp the combination formed by hand-drill **60** and attachment **10** for operating the reciprocating tool. Handle means **64**, as best seen in FIGURE 2, includes a lower portion comprising a pair of legs **64***a* and **64***b* adapted to engage upper surface **12***a* to which the legs may be fastened by fastening means such as screws **66** which engage corresponding threaded openings **68***a*, **68***b* or **68***c* and **68***d* in top plate **12***d*. Openings **68***a* and **68***b* are positioned for chuck alignment with drive shaft **30***a* and openings **68***c* and **68***d* are positioned for alignment with drive shaft **32***a*. Even though screws **66** are shown of the Allen head type, it is to be understood that other means of fastening legs **64***a* and **64***b* to housing **12**, including quick connect and disconnect means, may be employed. Handle means **64** further includes an upper portion comprising a hand-drill engagement means in the form of a spacer member **64***c* whose inner surface conforms to the outer surface of hand-drill **60** and having connected thereto the ends of a band **64***d* which may be tightened around the body of hand-drill **60** by a conventional band tightening means **64***e*. It should be noted at this point that handle means **64** not only provides a convenient operator's grip, but also a means whereby a secure combination between handle-drill **60** and attachment **10** is effected. More particularly, handle means **64** is clamped to hand-drill **60** and includes means which are disposed and dimensioned to effect a proper coupling alignment of the hand-drill chuck with a selected pulley shaft. Further, hand means **64** is easily engaged and disengaged by loosening screws **66** for the purpose of shifting hand-drill **60** from drive shaft **32***a* to drive shaft **30***a* and vice versa when a change of reciprocating speed is desired. Instead of utilizing two pulleys, it is readily understood that three or more pulleys may be advantageously employed in case additional speeds are desired. These additional pulleys may be gear connected or belt connected to the primary pulley **30**.

Slide **16** is provided with various means to engage reciprocally operable tools. A pair of clamps **70***a* and **70***b* are fastened to opposite ends of surface **16***a* to provide a means to hold a piece of sandpaper **72** (such as shown in FIGURE 4) in place along the bottom surface of slide **16**. For best operation, an elastic material such as foam rubber **74** may be interposed between lower slide surface **16***b* and sandpaper **72**. A horizontally extending bore **76** passing through end surface **16***g* of

slide **16** is dimensioned for engaging reciprocating tools such as illustrated saw **78** or some other tool such as a file or a hammer. These tools may be securely fastened to slide member **16** by means of fastening screws **80***a* and **80***b* in corresponding threaded openings extending through slide surface **16***b*. Some tools, such as a hammer (of the general form employed in pneumatic hammers), need only be securely held in place during the working (forward) stroke and require only a small retention force during the backward stroke. For such applications, the tool may be placed into contact with end face **76***a* which will take the full force of the impact during the working stroke, and a ball **82**, spring loaded in opening **76** by a spring **83**, may be used to engage a spherical recess in the shaft of the hammer to hold the same in place during the return stroke.

There has been described hereinabove an attachment for a hand-drill for driving reciprocating tools in at least two selected reciprocating speeds. The attachment of this invention makes it possible to utilize a direct drive for slower reciprocal motion and a friction drive for faster reciprocatory motion and for those applications where a friction drive is more suitable. Further, means are provided for continuously adjusting the length of the stroke of the reciprocating motion to suit the particular application. Finally, handle means are provided for securely fastening the attachment to the hand-drill and for providing, at the same time, a convenient handle means for an operator by which the combination may be held for operation.

While the above detailed description has shown, described and pointed out the fundamental novel features of the invention as applied to various embodiments, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. An attachment for hand-drills for driving reciprocatory tools comprising:

a housing having a substantially horizontally extending upper surface and including a first and second handle connection means;

first and second pulleys rotatably mounted within said housing and having vertically disposed central drive shafts extending through said housing for projection above said upper surface, said first pulley including a downwardly extending cam means mounted eccentrically with respect to the axis of its drive shaft;

a friction belt operatively connecting said first and second pulleys;

handle means including first fastening means for engaging one of said handle connection means and second fastening means for engaging the hand-drill, said handle means being dimensioned such that when engaging said first handle connection means the chuck of the hand-drill is in axial coupling alignment with the central drive shaft of said first pulley and when engaging said second handle connection means is in axial coupling alignment with the central drive shaft of said second pulley; and

a slide member horizontally slidably supported by said housing and including cam follower means engaging said cam means and tool engagement means for attaching a reciprocatory tool thereto.

2. An attachment in accordance with claim **1** further including means associated with said first pulley and said cam means for adjusting the eccentricity of said cam means.

3. An attachment in accordance with claim **1** in which said cam follower means comprises an elongated slot in said slide member having a direction elongation substantially perpendicular to the direction of motion of said slide member.

4. An attachment in accordance with claim **1** in which said handle means includes a hand grip for hand holding the hand-drill and attachment combination.

5. An attachment in accordance with claim **2** in which said housing includes a pair of spaced end facing vertical side surfaces and in which said slide member includes a pair of side surfaces immediately adjacent the side surfaces of said housing, each of said side surfaces including an elongated groove which are disposed such that the groove is immediately adjacent side surfaces to form a channel.

6. An attachment in accordance with claim **5** further including an elongated bearing rod disposed in each of said channels.

7. An attachment in accordance with claim **2** in which said slide member includes a pair of clips disposed exteriorly of its lower horizontal surface for holding sandpaper means in operative position.

8. An attachment in accordance with claim **2** in which said slide member includes a horizontal bore in its end face for holding the handle portion of a reciprocally operable tool.

9. An attachment in accordance with claim **8** in which a fastening means is associated with said bore to secure the tool handle portion to said slide member.

10. An attachment in accordance with claim **9** in which said fastening means comprises a spring loaded ball.

References Cited

UNITED STATES PATENTS

1,898,956	2/1933	Harvie	144—35.1
2,911,843	11/1959	Mitchell	74—665

FRED C. MATTERN, JR., *Primary Examiner.*

W. S. RATLIFF, *Assistant Examiner.*