RECPROCATING HAND TOOL ATTACHMENT FOR HAND-DRILLS

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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 12a and a slide member 16 horizontally slidable carried by the housing. Housing 12 has a generally inverted U-shaped cross section comprising two downwardly disposed side plates 12c and 12d and a top plate 12d integrally joining the side plates. The facing inner surfaces of side plates 12c and 12d are identified as surfaces 12e and 12f.

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

There are further provided oppositely aligned V-shaped longitudinal grooves 12g and 16i in slidingly disposed surfaces 12e and 16c, and oppositely aligned V-shaped longitudinal grooves 12h and 16j in slidingly disposed surfaces 12f and 16d, which respectively form substantially rectangular channels. Nylon bearing rods 20a and 20b 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 20a and 20b may be retained against motion with respect to housing 12 by retaining screws 22a and 22b which are disposed in corresponding threaded openings in side plates 12a and 12b, 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 gear surfaces are shaped to accommodate a belt 34 which passes operatively over both pulleys. Pulley 30 has a central drive shaft 30a which is integrally connected to pulley 30 through a bearing hub 30b. Hub 30b is rotatably journaled within a bearing sleeve 30c press fitted into top plate 12d and a retaining ring 38 may be slipped over the end of hub 30b to retain pulley 30 against axial displacement.

Similarly, pulley 32 has a central drive shaft 32a which is integrally connected to pulley 32 through a bearing hub 32b. Hub 32b is rotatably journaled within a bearing sleeve 32c press fitted into top plate 12d and a retaining ring 39 may be slipped over the end of hub 32b 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 16f and 16g.

Thus far described is a means for converting rotary motion applied to one of the two drive shafts 30a and 32a into reciprocating motion of slide 16. When rotary motion is applied to drive shaft 30a, a direct coupling to slide member 16 is provided, and when applied to drive shaft 32a, 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. Clamps, screw 50, when tightened, clamps against the facing portion of key slot 40 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 30a or 32a. Since the 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 64a and 64b adapted to engage upper surface 12a to which the legs may be fastened by fastening means such as screws 66 which engage corresponding threaded openings 68a, 68b, and 68c and 68d in top plate 12d. Openings 68a and 68b are positioned for chuck alignment with drive shaft 32a and openings 68c and 68d are positioned for alignment with drive shaft 32a. Even though screws 66 are shown of the Allen head type, it is to be understood that other means of fastening legs 64a and 64b 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 64e whose inner surface conforms to the outer surface of hand-drill 60 and having connected thereto the ends of a band 64f which may be tightened around the body of hand-drill 60, thus providing a further tightening means 64e. 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 connection between hand-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 32a to drive shaft 30a 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 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 80a and 80b in corresponding threaded openings extending through slide surface 16d. 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 re- tension force during the backward stroke. For such applications, the tool may be placed into contact with end face 76a 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 heretofore 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

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