Jan. 17, 1961 R. HAPPE 2,968,187

PORTABLE BELT-DRIVEN TOOLS WITH DETACHABLE MOTORS

Filed Sept. 10, 1957 2 Sheets-Sheet 1

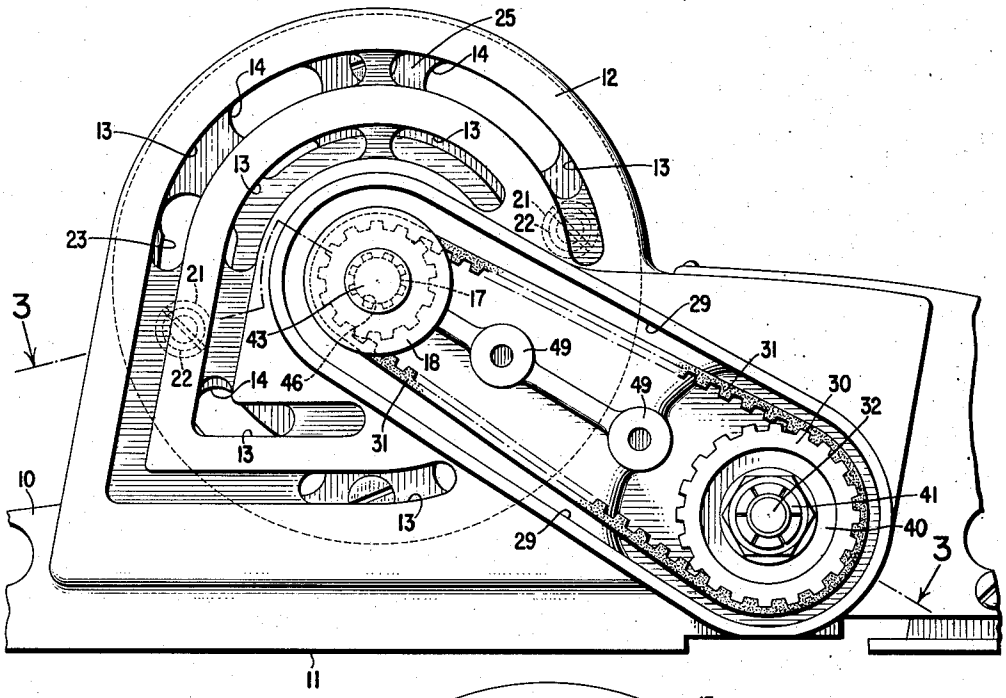


Fig. 1

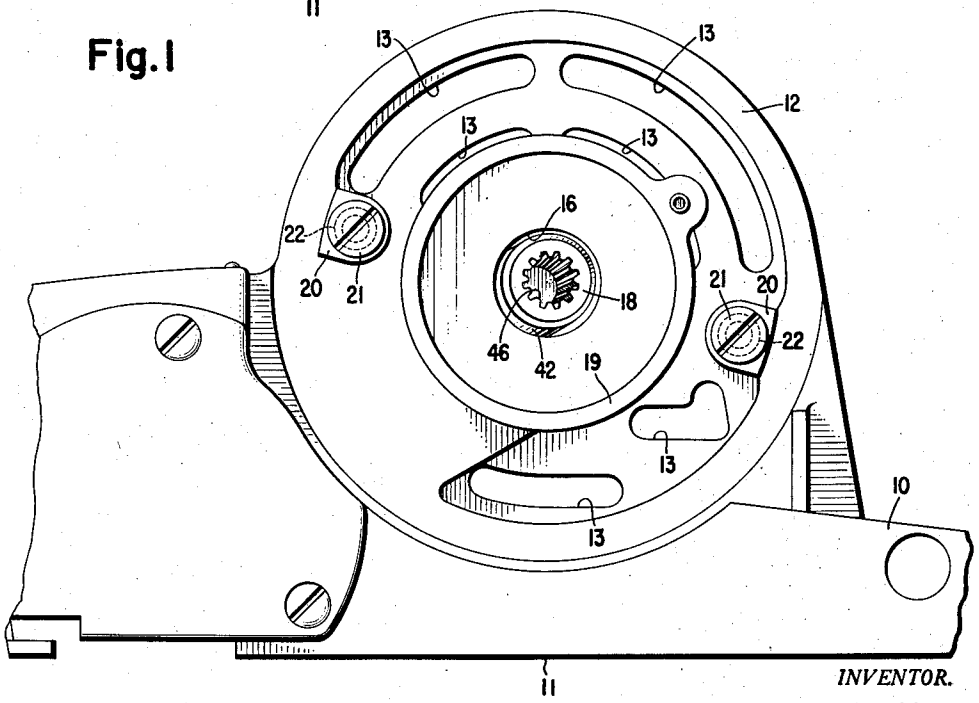


Fig. 2

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PORTABLE BELT-DRIVEN TOOLS WITH DETACHABLE MOTORS

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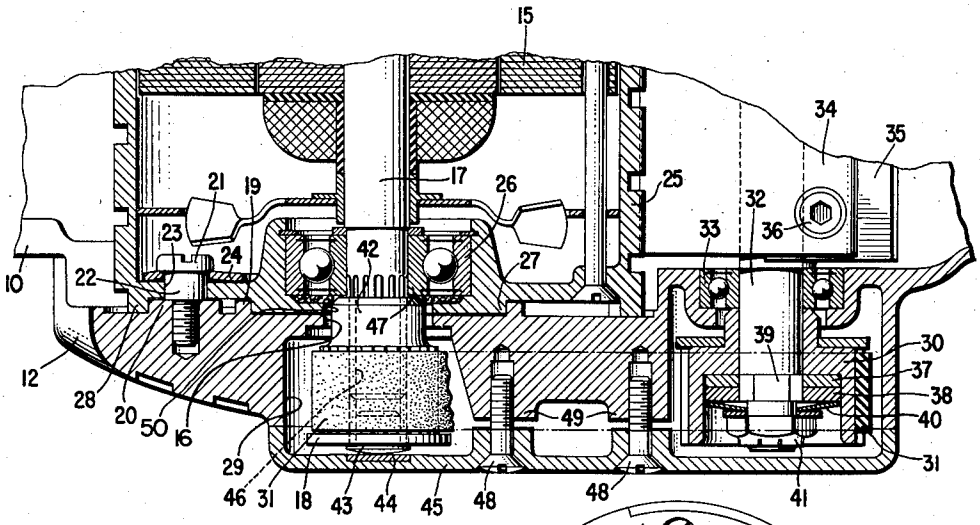


Fig.3

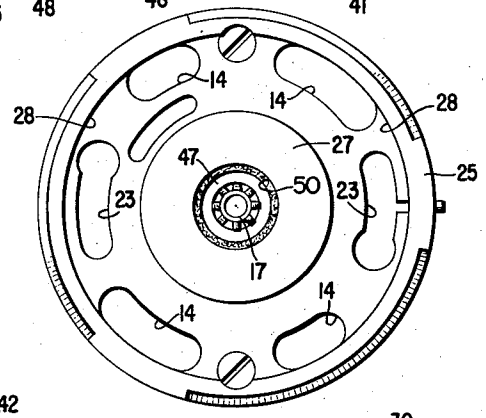


Fig.5

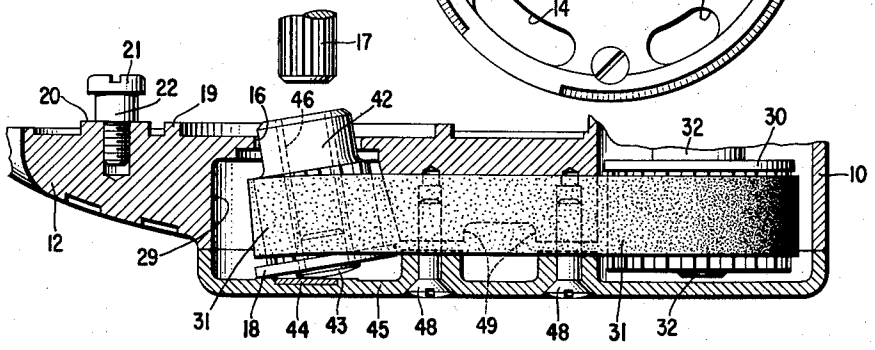


Fig.4

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PORTABLE BELT-DRIVEN TOOLS WITH DETACHABLE MOTORS

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9 Claims. (Cl. 74—216.5)

This invention relates to a portable belt-driven tool, powered by an electric motor and more particularly to means for effecting quick and easy attachment and detachment of said motor to and from the tool body so that the motor may be used to power other tools as desired.

The tool chosen to illustrate the invention is a planer and it is proposed to use a toothed or cog belt drive with the motor shaft positioned parallel to the cutter shaft and transverse to the tool body since good handling balance can be secured by this arrangement. Further it is considered desirable to keep the motor pulley engaged by the belt at all times and captive in the tool body when the motor is detached therefrom. At the same time the axis of the motor pulley must be substantially free to assume the position of the motor rotor axis when the motor is attached.

It is a primary object of this invention, therefore, to provide means for making quick and easy power transmitting connection between a motor shaft and a belt-driving pulley carried by a portable tool body.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations and arrangements of parts hereinafter set forth and illustrated in the accompanying drawings of a preferred embodiment of the invention, from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

In the drawings, Figure 1 is a side elevation view of part of a portable planer having a belt cover-plate removed and showing one embodiment of the invention.

Figure 2 is a side elevation view taken from the side opposite to that shown in Fig. 1 and having the motor removed.

Figure 3 is a transverse sectional view, partly in plan, taken substantially on line 3—3 of Fig. 1.

Figure 4 is a view substantially the same as Fig. 3 except with the motor removed.

Figure 5 is an elevation view of the shaft end of the motor.

Referring now to Fig. 1, a portion of a planer tool body is shown comprising a horizontally extending base portion 10 having a work-contacting surface 11 and a vertically extending motor-supporting flange 12 preferably formed integrally with the base portion 10. The flange 12 is formed with circumferential openings 13 for discharge of ventilating air from exhaust ports 14 of a motor 15 secured to said flange 12 and with a central opening 16 for receiving a motor shaft 17 and a motor pulley 18 as seen best in Fig. 3.

The inside face of the motor-supporting flange 12 is formed with a central annular locating boss 19 and two outer diametrically spaced bosses 20 each having threaded therein a headed screw 21 having a shoulder portion 22 for establishing an accurate fitting dimension for engaging bayonet slots 23 of the motor 15 and detent springs 24 as shown in Fig. 3.

The motor 15, which is the same as that shown in the copending U.S. patent application Serial No. 594,207, filed June 27, 1956, now United States Patent No. 2,842,173, is formed with a casing 25 carrying a bearing 26 in which is journaled the rotor shaft 17. The casing 25 is formed on its end face with an inner cylindrical raised portion 27 for engaging within the annular locating boss 19 and an outer annular rib 28 for engaging the spaced bosses 20 as shown best in Fig. 5. These locating means provide accurate positioning of the motor axis relatively to the tool body on which it is mounted.

The outside face of the motor-supporting flange 12 is formed with a recess 29 which extends downward into the base portion 10 to provide a housing for the driving motor pulley 18, a driven pulley 30 and a toothed belt 31 connecting said pulleys as seen best in Fig. 1. A removable cover plate 45 fits over the recess 29 and is secured in position by screws 48 threaded into bosses 49 formed in the flange 12, as seen in Fig. 3.

The driven pulley 30 is mounted on a shaft 32 journaled in a bearing 33 carried by the base member 10. The shaft 32 drives a conventional cutter arbor 34 to which is secured insertable cutter blades 35 by means of set-screws 36 as shown in Fig. 3. The pulley 30 transmits limited torque to the cutter shaft 32 through a slip-clutch comprising a friction disc 37 free on the shaft 32, a driving disc 38 fitted to a flat 39 formed on the shaft 32, a spring washer 40 and a nut 41.

The driving or motor pulley 18 is formed with a reduced neck portion 42 which fits loosely within the aperture 16 in the motor supporting flange 12. A thrust button 43, preferably made of nylon, is secured in one end of the motor pulley 18 and is adapted to bear if necessary against a steel plate 44 inserted in the inner surface of the cover plate 45 to maintain the reduced portion 42 of the pulley within the flange aperture 16 to hold the pulley 18 in belt-engaged captive condition in the tool body when the motor is detached as seen in Fig. 4.

The motor pulley 18 is formed with internal teeth 46 which engage the splined portion of the motor shaft 17 for torque transmission. During insertion of the motor shaft 17 into the pulley 18, the button 43 is pushed against the plate insert 44 and thus provides a minimum frictional contact so that the pulley 18 goes from the canted position of Fig. 4 to the shaft-engaged position of Fig. 3 with little or no restraint. The opening 50 in the motor casing 25 for the shaft 17 is sufficiently large to enable the reduced neck portion 42 of the pulley 18 to contact the inner race 47 of the motor bearing 26 and furnishes one limit for the axial movement of the pulley 18 on the shaft 17.

When the motor 15 is attached to the planer body 10 as in Fig. 3, the relation of the parts is such that the pulley 18 is strictly limited in its allowed axial movement for good belt alignment and normally runs with slight clearances between the button 43 and the plate insert 44 and between the reduced portion 42 and the inner race 47 of the motor bearing 26. If, however, either clearance should be reduced to zero, no adverse effects would result because no frictional forces can be set up between the pulley 18 and the inner race 47, and the button 43 and the steel plate 44 form good bearing surfaces for minimum wear.

It will be understood that the act of attaching the motor to the tool body involves a sliding of the shaft 17 axially within the pulley 18, a registration of the locating surfaces and of the headed screws 21 with the large ends of the bayonet slots 23 and a final twisting of the motor about the rotor shaft axis to a positive stop position in which the screws 21 are seated fully against the ends of the bayonet slots 23. The torque reaction under load is such as to keep the screws forced against the ends

of the bayonet slots so as to avoid accidental detachment of the motor from the tool body.

From the foregoing description it will be apparent that there has been provided a simple inexpensive structure whereby a detachable electric motor may be readily secured to a belt-driven portable tool and in which a torque transmitting connection is quickly made between the motor shaft and a normally unsupported pulley held loosely captive in the tool body without the use of set screws or similar fastening means.

By "loosely captive" as used in the specification and claims is meant free to move within limits in any direction.

Having thus described the nature of the invention, what I claim herein is:

1. In a belt-driven portable tool having a body portion, an electric motor detachably secured to the body portion, a shaft for the motor, a belt-engaged normally unsupported motor pulley loosely captive in the body portion in belt-engaged condition and formed with an internal bore having a configuration for receiving the motor shaft in driving connection by relative axial movement of shaft and pulley, and means for limiting the axial movement of said pulley on said shaft relatively to the body portion effective responsively to the securement of said motor to said body portion.

2. In a belt-driven portable tool having a motor-supporting flange formed with an apertured portion, an electric motor having a splined shaft, means for detachably securing the motor ot one side of the flange, a belt-engaged motor pulley slidingly engageable with said splined shaft and formed with a reduced neck portion with fits loosely within said apertured portion of the flange from the side of the flange opposite from the motor, a cover plate for retaining the pulley loosely captive in the flange aperture, and cooperating means located on the pulley and on the cover plate for reducing the frictional wear between them.

3. In a belt-driven portable tool having a body portion, an electric motor detachably secured to the body portion, a shaft for the motor, a belt-engaged pulley for engaging the shaft and held loosely captive in the body portion, said pulley having a reduced portion at one end, a motor end-belt supporting a ball-bearing for the shaft and having an aperture concentric with and surrounding said motor shaft for permitting entry of the reduced portion of the pulley so that it may contact the inner race of said ball-bearing, and cover means secured to said body portion for urging said pulley into close positional relation with the inner race when the motor is secured to the body portion.

4. In a belt-driven portable tool, a tool body, a cutter journaled in said tool body, a first pulley mounted for rotation with said cutter, a second pulley loosely captive in said tool body, a belt connecting said pulleys, an electric motor detachably secured to said tool body, and a shaft for said motor drivingly engageable with said second pulley upon securement of the motor in the tool body.

5. Apparatus according to claim 4 in which the captive pulley is formed with a reduced diameter portion which is loosely held within an apertured portion of the tool body.

6. In a belt-driven portable tool, a motor mounting flange formed with an apertured portion, an electric motor detachably secured to the flange with the shaft passing through the apertured portion, a belt-engaged motor pulley formed with a portion of a reduced diameter, means for retaining the reduced portion loosely captive within the apertured portion to hold the pulley in belt-engaged condition and in position to receive the motor shaft in driving engagement when the motor is secured to the mounting flange.

7. In a belt-driven portable tool, a tool body, a first pulley mounted to rotate about an axis fixed with respect to the tool body, a second pulley loosely captive in said tool body and restrained in belt-engaged condition for limited bodily movement, a belt connecting the pulleys, an electric motor detachably secured to the tool body and drivingly engageable with said second pulley to establish an axis of rotation for said second pulley which is fixed relative to said tool body when the motor is secured to the tool body.

8. In a belt-driven portable tool, a tool body, a belt-driven pulley journaled in said tool body, a belt-driving pulley held loosely captive in said tool body in belt-engaged condition but normally free for limited bodily movement, a belt connecting said pulleys, an electric motor, a bearing for said motor, a shaft journaled in said bearing, means for detachably securing the motor to the tool body with the shaft in driving engagement with the belt-driving pulley whereby the belt-driving pulley is effectively journaled in said motor bearing.

9. In a belt-driven portable tool, a vertically positioned motor mounting flange having an apertured portion on one side of said flange, a motor mounted on said flange, a shaft journaled in said motor and adapted to extend horizontally through said apertured portion, a belt-engaged pulley held loosely captive in said apertured portion on the side opposite the motor and formed with a bore for receiving the motor shaft in driving engagement by an axial sliding movement of the shaft and means for thereafter locking said motor to said flange by a twisting movement of the motor about the shaft axis.

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