

March 16, 1954

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2,672,170

ELECTRICALLY DRIVEN SPEED REDUCING POWER UNIT

Filed May 19, 1950

3 Sheets-Sheet 1

Fig. 1.

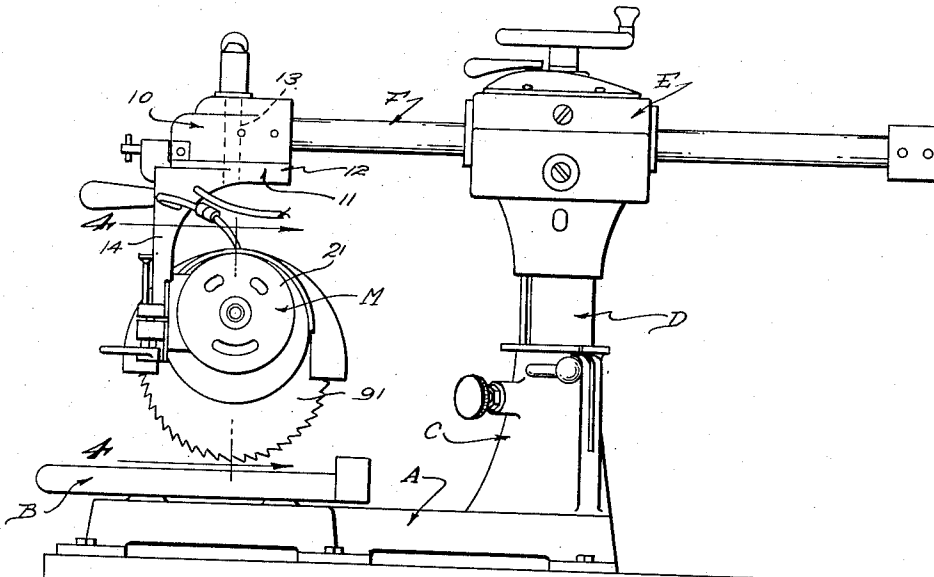


Fig. 2.

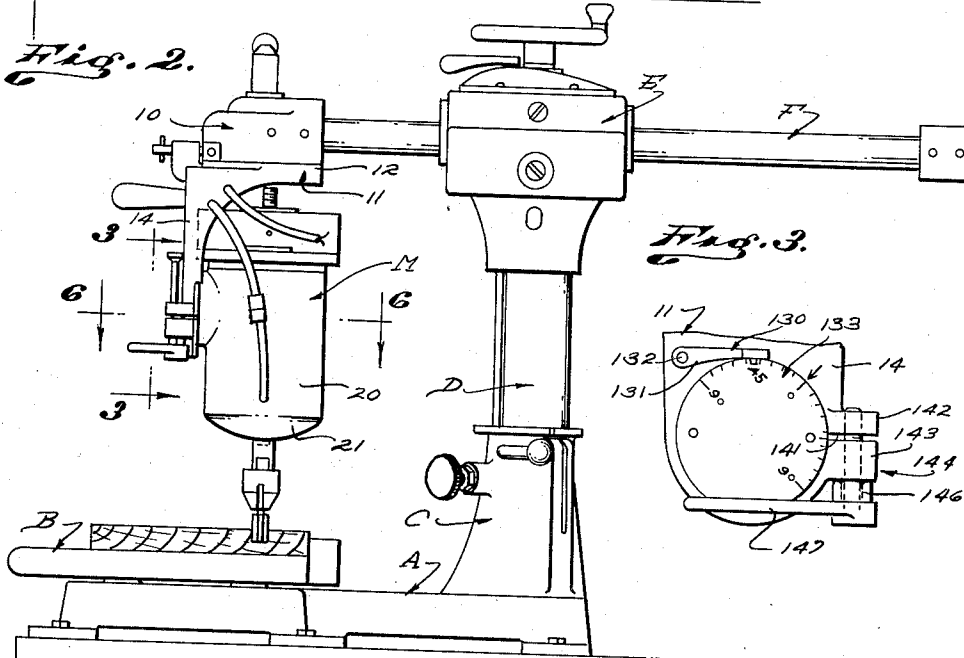
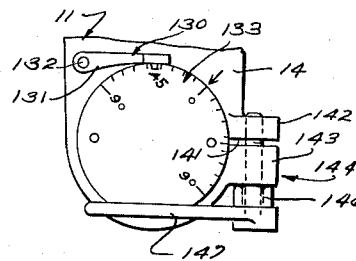


Fig. 3.



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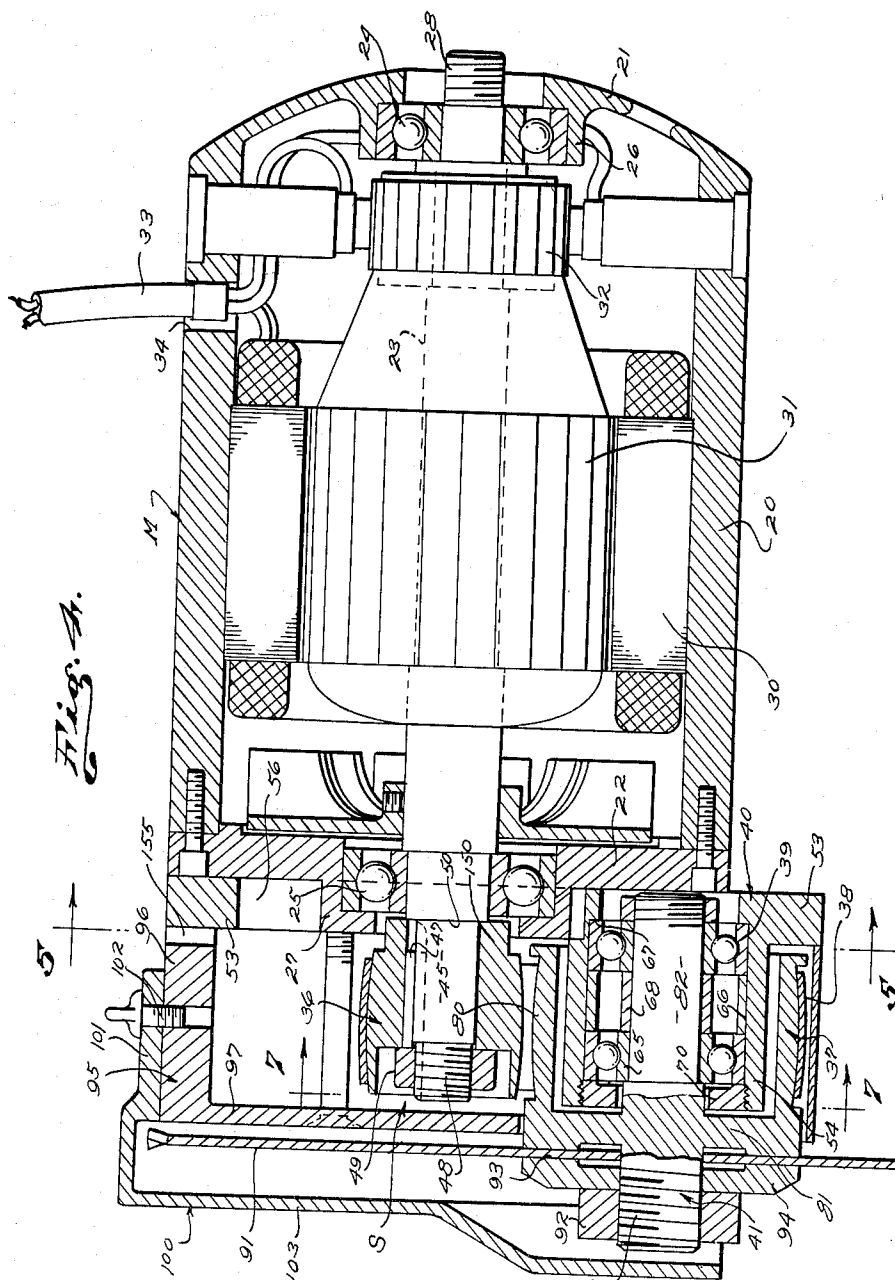


Fig. 4.

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3 Sheets-Sheet 3

Fig. 5.

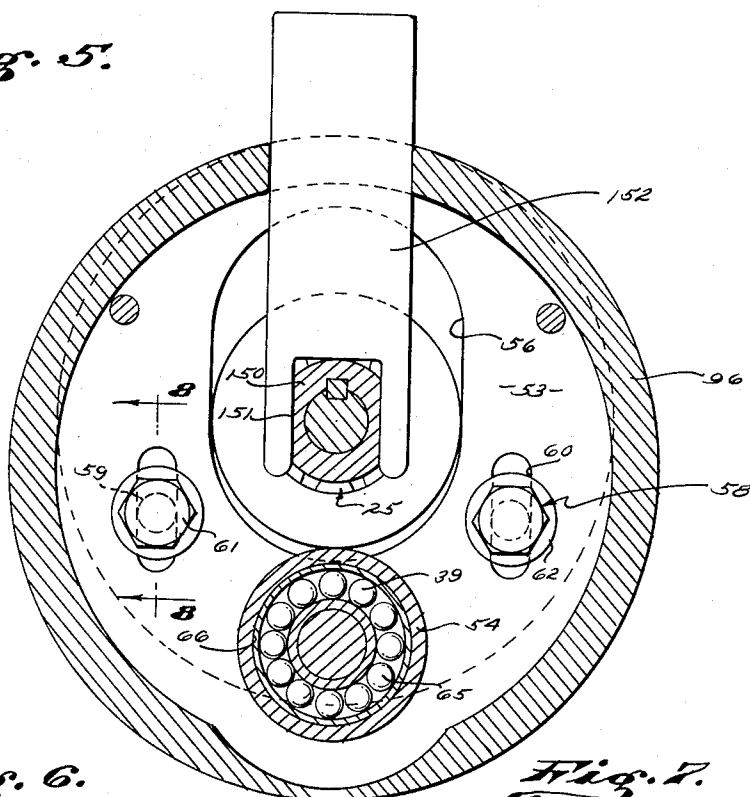


Fig. 6.

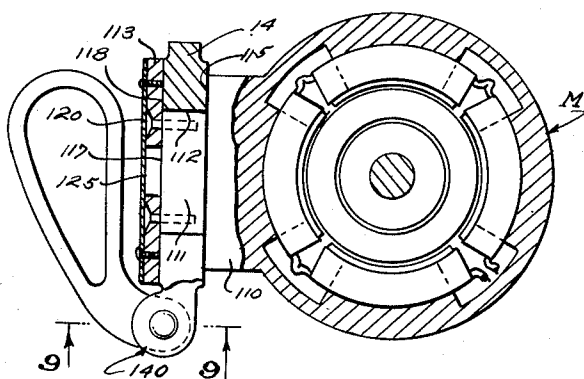


Fig. 7.

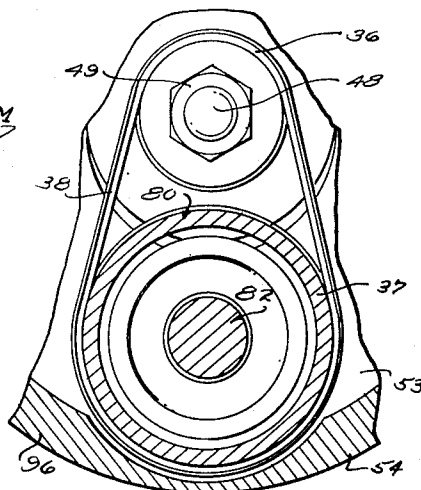


Fig. 8.

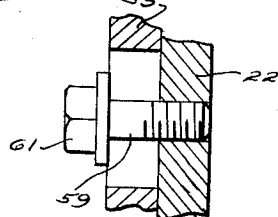
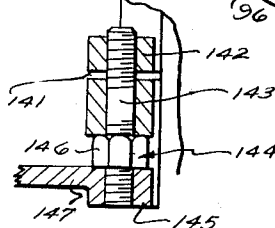


Fig. 9.



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ELECTRICALLY DRIVEN SPEED REDUCING
POWER UNIT

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Application May 19, 1950, Serial No. 162,943

1 Claim. (Cl. 143—33)

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This invention has to do with a power unit and it is a general object of the invention to provide a structure or unit particularly useful in wood working machinery or the like.

There are various machines in which elements such as tools are operated by electric motors. For example in the wood working industry various operations are performed by machines with motor driven cutters and for different operations the cutters are operated at different speeds, thus ordinarily requiring different machines for different operations.

It is a general object of this invention to provide a practical improved power unit or motor applicable to a wood working machine such, for example, as a machine wherein a tool driving motor is carried on an arm through a mounting which enables the motor to be arranged in various manners with reference to a work carrier.

Another object of this invention is to provide a unit of the general character referred to having a shaft projecting from one end of the structure operating at one speed while a second shaft projects from the other end of the structure and operates at a materially different speed. In a typical application of the invention the first mentioned shaft may be a part of the motor shaft operating at motor speed, whereas the second shaft is operated through a speed reducing mechanism and operates at a substantially reduced speed.

Another object of this invention is to provide a power unit of the general character referred to wherein speed reduction is gained through a belt drive and the drive is such as to involve but few simple dependable parts arranged in a simple compact formation.

It is another object of this invention to provide a drive unit of the general character referred to in which the belt drive of the speed reducing mechanism is readily adjustable to set the belt in the desired manner.

A further object of the invention is to provide a drive unit of the general character referred to including a suitable housing encasing the principal working parts and which may serve as a support for a tool guard, if desired.

It is a further object of the invention to provide a power unit of the general character referred to and a mounting means therefor whereby the power unit is variable as to position, for instance, shiftable end for end as circumstances may require.

The mechanism embodying the present invention is particularly practical as applied to a wood

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working machine wherein there is a work support or carrier and a horizontally disposed reciprocating arm overlying the work support and carrying the power unit through a mounting which enables the unit to be moved bodily about a vertical axis. The arm may be supported by a carrier which is supported by a post mounted to rotate and reciprocate as circumstances require. The power unit embodying the present invention is preferably carried by a flange of a bracket depending from the arm so that it is beneath the forward end portion of the arm and overlies the work carrier.

The power unit preferably involves an electric motor with a case with an outer end having an inwardly projecting boss carrying a bearing and an inner end with an outwardly projecting boss carrying a bearing. A motor shaft is supported in the bearings and has a threaded tool carrying end projecting from the first mentioned bearing and has an extension of substantial length projecting from the second bearing. The speed reducing mechanism provided by the invention involves a drive pulley fixed on the extension of the motor shaft and a driven pulley carried by suitable bearing means supported by a carrier secured to the end of the motor case from which the shaft extension projects. A tool carrier is provided on the driven pulley and a belt operates over or between the pulleys. A housing preferably encases the pulleys and the belt and a guard may be carried by the housing to shield a cutter operated by the driven pulley. The carrier supporting the driven pulley is adjustable relative to the motor case so the driven pulley can be adjusted relative to the drive pulley to properly set the pulleys relative to the belt.

Mounting means supports the power unit from the depending flange of the bracket carried by the arm of the machine and is such that the motor can be rotated about a horizontal axis to any desired position as circumstances may require. The mounting preferably involves a boss on the motor case with a reduced extension rotatably carried in an opening in the flange which depends from the arm. A retainer, preferably a disc-shaped plate, holds the boss extension in the bore provided in the flange. Releasable stop means is provided to hold the power unit mounting in various rotative positions and a lock means is provided for setting the power unit against shifting or movement relative to its supporting flange.

The various objects and features of my invention will be fully understood from the follow-

ing detailed description of a typical preferred form and application of the invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a side elevation of a typical wood 5 working machine embodying the present invention showing the machine with the power unit operating a cutter in the form of a disc saw and with the parts positioned for typical use of the saw. Fig. 2 is a view similar to Fig. 1 showing the power unit operating a router type cutter and 10 with the parts of the machine positioned suitable for operation of this type of tool. Fig. 3 is an enlarged view of a portion of the mechanism shown in Fig. 2, being a view taken as indicated by line 3—3 on Fig. 2. Fig. 4 is an enlarged longitudinal sectional view of the power unit, being a view taken as indicated by line 4—4 on Fig. 1. Fig. 5 is a vertical sectional view taken as indicated by line 5—5 on Fig. 4. Fig. 6 is a plan section taken as indicated by line 6—6 on Fig. 2. Fig. 7 is a sectional view taken as indicated by line 7—7 on Fig. 4. Fig. 8 is a detailed sectional view taken as indicated by line 8—8 on Fig. 5, and 25 Fig. 9 is a detailed sectional view taken as indicated by line 9—9 on Fig. 6.

The power unit provided by the present invention and the mounting means provided for such unit can be applied to or incorporated in various machines and in machines intended for various purposes or classes of work. The present invention is particularly useful and practical as applied to wood working machinery and in this disclosure it will be referred to as applied to a common type of wood working machine in which it can be used 30 to advantage.

The machine illustrated in the drawings involves, generally, a rigid horizontally disposed base A having a work support or carrier B 40 mounted on its forward portion. A guide C projects upwardly from the rear portion of the base and carries a post D. The post is rotatable in the guide and can be reciprocated therein and it carries a head E at its upper end. The head 45 supports a horizontally disposed arm F so the arm can be reciprocated. The arm is provided at its forward end with a mounting for the structure provided by the present invention and in the particular case illustrated this mounting involves a block 10 fixed on the arm and an L-shaped bracket 11 secured to the block 10 and depending therefrom. The bracket has a top horizontal flange 12 secured to the under side of the block 10 by a vertical coupling pin 13 and has a depending vertical flange 14 that extends downwardly from one edge of the flange 12. The general mechanism thus far referred to is more fully described and is the subject of my copending application entitled "Wood Working Machine With Motor Driven Tool and Shiftable Work Carrier," 50 Serial No. 162,945, filed on even date herewith, now abandoned.

The power unit provided by the present invention and shown generally in Fig. 4 of the drawings involves an electric motor M and a speed reducing mechanism S. 55

The motor M may, in practice, be of any suitable form or type and for purposes of example I have illustrated a typical motor involving a cylindrical case 20 closed at its outer end by an end 21 and at its inner end by an end 22. A central motor shaft 23 is supported in the case by means of suitable bearings 24 and 25 carried by the ends 21 and 22, respectively. In the preferred arrangement the bearing 24 is carried in an inwardly projecting boss 26 on the end 21 while the bearing 25 is carried in an outwardly projecting boss 27 on the end 22. The bearings are shown as antifriction bearings of typical construction and, in accordance with the invention the motor shaft 23 has an end 28 projecting beyond the bearing 24 so that it is exposed to carry a suitable tool desired to be operated by the motor. In the particular case illustrated the projecting end 28 of the motor shaft is suitably threaded so that any standard tool or connecting part can be readily attached thereto.

As above pointed out the present invention is in no way concerned with the details of the motor. However, for purpose of example the motor is shown as including a field element 30 carried in the case 20 and a rotor 31 on the shaft 23 and within the field. A suitable commutator 32 is provided on the shaft and a power carrying cable 33 enters the motor through a suitable opening 34 provided in the case.

The speed reducing mechanism S provided by the present invention is preferably mounted on or joined to the motor M as a rigid or permanent part thereof so that the motor and mechanism S form a compact unit. In the particular form of the invention illustrated the speed reducing mechanism S involves, generally, a drive pulley 36 operated by a motor M, a driven pulley 37 operated from the pulley 36 by a belt 38, suitable bearing means 39 supporting the driven pulley, a carrier 40 supporting the bearing means, and a tool holder or mounting 41 for carrying a tool so that it is driven by or mounted on the driven pulley. 35

The drive pulley 36 is preferably operated directly by the motor shaft 23 in which case the motor shaft is provided with an extension 45 of substantial length projecting beyond the bearing 25 carried in the boss 27. In the particular case illustrated in the drawings the pulley 36 is considerably smaller in diameter than the driven pulley 37 and it is carried directly on the shaft extension 45 to which element it is fixed by means of a key 47. The shaft extension 45 has a threaded end portion 48 carrying a nut 49 which serves to retain the pulley 36 of the extension 45. As shown in the drawings the motor shaft may have a shoulder 50 against which the pulley 46 is held by means of the nut 49. 50

The carrier 40 for the bearing means 39 which supports the driven pulley is shown as involving a plate 53 arranged against the outer side of the end 22 of the motor M and a boss 54 projecting from the plate 53 to carry the bearing means 39. The plate 53 is shown as being of substantial extent so that it, in effect, covers the entire outer side of the end 22 in which case it is provided with an opening 56 passing or accommodating the boss 27 that carries bearing 25. Suitable fastening means 58 secures the plate 53 to the end 22 of the motor so the plate can be suitably shifted relative to the motor. In the preferred form of the invention the means 58 involves clamp screws 59 engaged through parallel slots 60 in the plate 53 and threaded into the end 22 of the motor (see Fig. 5). Heads 61 on the clamp screws 59 engage the outer side of the plate 53 through washers 62 so that when the screws 59 are tightened the plate 53 is clamped against the end 22 of the motor. The slots 60 in the plate 53 are parallel and extend in the direction that the driven pulley is removed or offset from the motor shaft thus allowing the plate 53 to be shifted or adjusted relative to 75

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the motor to vary the position of the driven pulley relative to the drive pulley which is on the motor shaft.

The boss 54 provided on plate 53 is shown as an integral extension or projection occurring on the plate and in the particular case illustrated the bearing means 39 involves spaced anti-friction bearings 65 arranged within the boss 54. The boss is shown as provided with a bore 66 terminating in a shoulder 67. The bearings 65 are held apart by suitable spacers 68 and the assembly formed by the bearings and the spacers is held against the shoulder 67 by a clamp nut 70 threaded in the outer end of the bore 66.

The driven pulley 37 which is substantially larger in diameter than the drive pulley 36 has a drum-shaped belt carrying portion 80 surrounding the boss 54 within which the bearing means is carried. The pulley 37 has an end plate 81 fixed to one end of the drum 80 and located immediately beyond the outer end of the boss 54. A spindle 82 is carried by the plate 81 concentric with the drum 80 and extends into the bearings 65 carried in the boss 54. Through this construction the belt carrying drum 80 surrounding the boss 54 is effectively supported by the bearings located within the boss.

From the foregoing description and from examination of Fig. 4 of the drawings it will be observed that the pulleys 36 and 37 are in line with the driven pulley laterally offset from the drive pulley. The belt 38 effects the desired drive from the drive pulley to the driven pulley and may be a simple, flexible belt engaged over or around the pulleys in the manner clearly illustrated in Figs. 4 and 7 of the drawings. It will be understood from the foregoing description how the carrier 40 which supports the driven pulley through the construction just described can be adjusted to vary the tension on the belt so that the mechanism operates in the desired manner.

The means 41 provided to carry a suitable tool so that it is operated by the driven pulley may, in practice, vary, depending upon the type or character of tool to be operated. In the case illustrated this means is shown as an extension or projection 90 on the outer side of the plate and located concentrically with the spindle 82. The projection 90 is such as to receive a suitable tool, say, for instance, a saw 91, and it is threaded so that a retainer or nut 92 can be engaged on it to clamp the tool in place. In the case illustrated the outer side of plate 81 is provided with a tool receiving shoulder 93 and an annular tool clamp 94 is carried on the projection 90 to oppose the shoulder 93 and to be operated by the nut 92 so that the tool 91 is clamped tight against the shoulder 93. The particular tool 91 illustrated in the drawings is a rotary or disc-type saw, being a tool of a type that can be advantageously operated at a speed considerably less than that at which the motor shaft 23 operates.

In carrying out the present invention it is preferred to provide a housing 95 to encase the principal working parts. In the drawings the housing 95 is shown as involving an annular shell 96 corresponding in diameter with the plate 53 and having one end engaged with the peripheral portion of the plate so the shell surrounds or encases the belt drive mechanism hereinabove described. An end plate 97 is carried by the other end of the shell 96 to enclose the belt drive as shown in Fig. 4 of the drawings. Where a tool such as a disc saw is employed it may be desired to provide a

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guard 100. In the case illustrated the guard is shown carried by the housing 95 and has a rim 101 which is engaged around the shell 96 of the housing and is secured thereto by suitable screw fasteners 102. A side plate 103 is carried by the rim 101 and overlies a substantial portion of the saw 91. It will be understood that in practice the side plate can be shaped and proportioned to suitably protect the saw, leaving only the desired working parts exposed.

The mounting means provided by the present invention supports the unit formed by the motor and speed reducing mechanism from the depending flange 14 of bracket 11. In its preferred form the mounting means involves a boss 110 (Fig. 8) on one side of the motor case 20, a round extension 111 on the boss rotatable in a bore 112 in the flange 14, and a retainer 113 holding the extension 111 in the bore. In the case illustrated in the drawings the boss 110 is of substantial size and is formed integrally with the motor case while the extension 111 is smaller than the boss leaving a shoulder portion 115 on the boss to bear against the inner side of the flange 14. The extension 111 is turned or round so that it rotates freely in the bore 112 and it extends through the bore so that its outer end 117 is flush with the outer face or side 118 of the flange 14. The retainer 113 is a round or disc-shaped plate that may be suitably secured to the outer end 117 of the extension 111 as by suitable fasteners 120. The plate or retainer 113 is considerably larger in diameter than the extension 111 so that it projects beyond the extension and overlies the outer face 118 of flange 14. It is preferred that the retainer 113 be round and it is secured to the extension 111 so that it is concentric therewith. In the case illustrated a suitable centering projection 125 is provided on the extension 111 to center the retainer 113 on the extension.

With the construction just described it will be apparent how the unit formed by the motor and speed reducing mechanism is rotatably mounted on the flange 14 so that it is freely rotatable about the axis of the extension 111. The mounting is such that the unit formed by the motor and mechanism S can be rotated through 360°.

Releasable stop means 130 serves to hold the mounting just described in predetermined positions. As shown in Fig. 3 of the drawings, the means 130 may involve a stop dog 131 mounted on the flange 14 by means of a pivot pin 132. The dog cooperatively engages one or more peripheral notches 133 in the retainer 113. When the dog 131 is engaged with a notch in the retainer the structure is held against rotation or operation, whereas, when the dog is lifted or released the mounting is free to operate allowing the motor to turn to any desired position.

Lock means 140 serves to set or lock the mounting of the unit in any desired position. The particular lock means illustrated in the drawings is shown in Figs. 6 and 9 of the drawings. The flange 14 is provided with a cut or opening 141 extending to the bore 112 and lugs 142 project from the flange at opposite sides of the opening 141. A clamp screw 143 is threaded to one of the lugs and carries a head 144 that bears against the other lug. The head is shown as an adjustable structure made up of a part 145 threaded on the screw 143 and a lock nut 146 threaded on the screw and locked against the part 145. The part 145 is provided with a suitable operating handle 147. Through the construction just described the part 145 and the nut 146 can be so set or adjusted

to the screw 143 as to bring the handle 147 in the desired position when the means 140 is set locking the short extension 111 against rotation in bore 112.

The present invention provides for holding the parts against operation or rotation to facilitate operation of nuts or the like on the parts 28 and 90. In the form of the invention illustrated the drive pulley 36 has an end portion 150 (Figs. 4 and 5) forming a wrench receiving part. The extension 150 is shown as having flat sides 151 for the reception of a simple wrench 152. The housing is provided with an opening to admit a wrench to the part 150. The shell 96 of the housing is shown provided with an opening 155 located so that the wrench 152 can be inserted to engage the part 150, as shown in Fig. 5 of the drawings. When the wrench 152 is engaged as shown in Fig. 5 nuts or like parts can be threaded to or removed from the threaded parts 28 and 90 without the threaded parts rotating.

From the foregoing description it will be apparent that the invention provides a unit with two rotating tool carrying parts, namely the parts 28 and 90, which parts rotate at different speeds. The driven pulley being substantially larger than the drive pulley the tool carrying part 90 rotates considerably slower than the motor shaft 23 and therefore the part 28 of shaft 23. With this variation in speed of operation of the parts 28 and 90 the user is able to operate tools such as routing tools, carving tools, or the like, requiring high speed operation, by means of the shaft part 28, whereas saws or the like can be advantageously operated by the part 90. By reason of the mounting means mounting the tool operating unit on the support or flange 14 the tool driving unit can be turned or positioned in any desired manner as circumstances may require. The drawings show two typical positions into which the unit can be arranged, Fig. 1 showing a position suitable for operation of a saw which may be applied to part 90, while Fig. 2 shows a router or routing tool applied to the shaft part 28.

Having described only a typical preferred form and application of my invention, I do not wish to be restricted or limited to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claim.

Having described my invention, I claim:

A tool driving unit of the character described including, an electric motor having an elongate case and a shaft with an end portion projecting from and accessible at one end of the case adapted to receive a tool and an extension projecting from the other end of the case, a plate slidably mounted against the outer side of said other end having an elongated opening through which said extension projects, and a speed reducing mechanism including a drive pulley fixed on the shaft extension, a driven pulley rotatably mounted on said plate, said driven pulley being larger than said drive pulley and having a hollow belt receiving portion, a belt on said pulleys tensioned by slidably moving said plate in a plane perpendicular to the axis of said shaft extension, means for locking said plate in slidably adjusted position, wrench receiving means on said drive pulley, means on the driven pulley at one end thereof and adapted to carry a tool, a housing completely enclosing the belt and pulleys leaving the means on the driven pulley exposed, said housing having an access opening aligned with said wrench receiving means so that a wrench passed through said opening to engage said wrench receiving means will prevent rotation of said drive pulley and, correspondingly, said driven pulley, and enable the placing or removing of a tool on said means at one end of said driven pulley.

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