May 22, 1956 W. J. BABCOCK 2,746,493

TELESCOPED DRIVING CONNECTION FOR POWER TOOLS

Filed Dec. 7, 1954 2 Sheets-Sheet 1

FIG_1

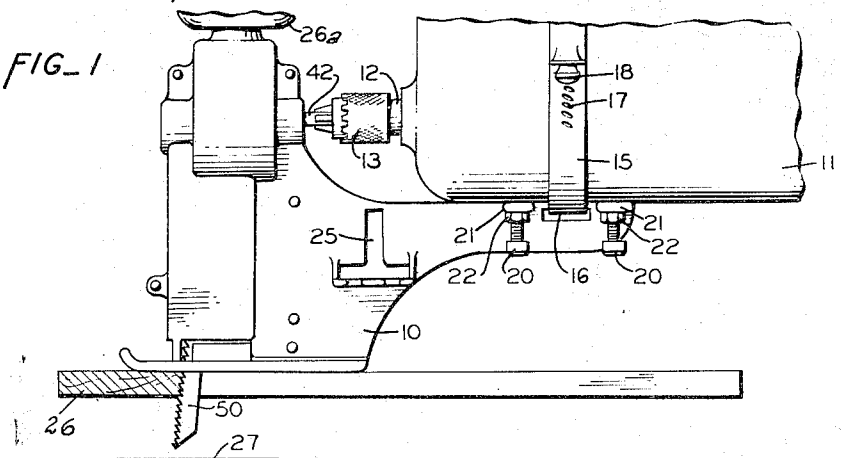


FIG_7

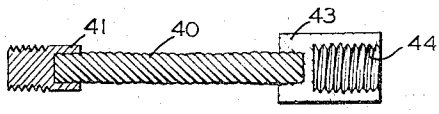


FIG_2

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FIG_3

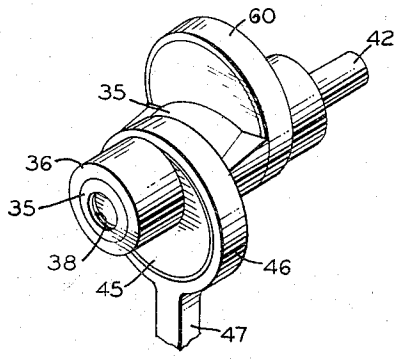


FIG_4

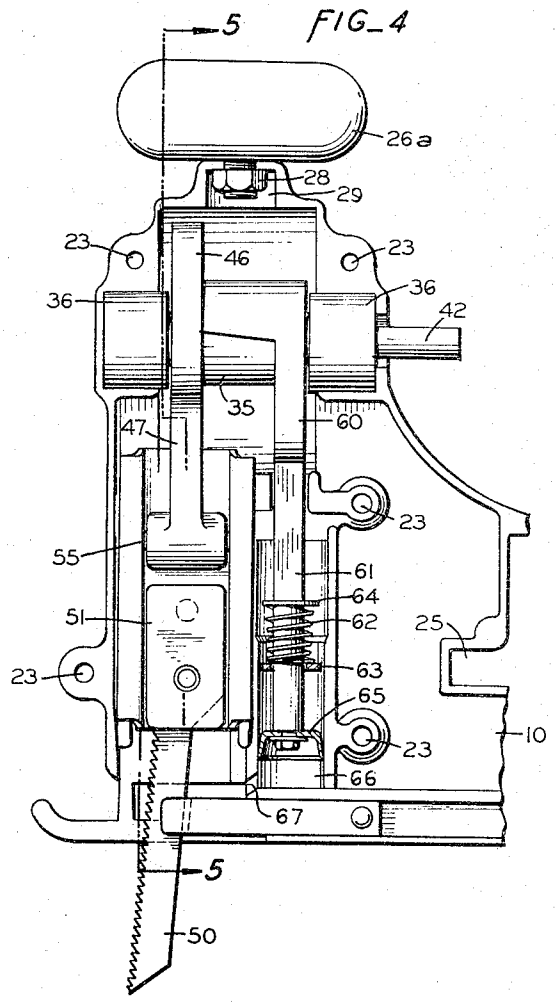


FIG_5

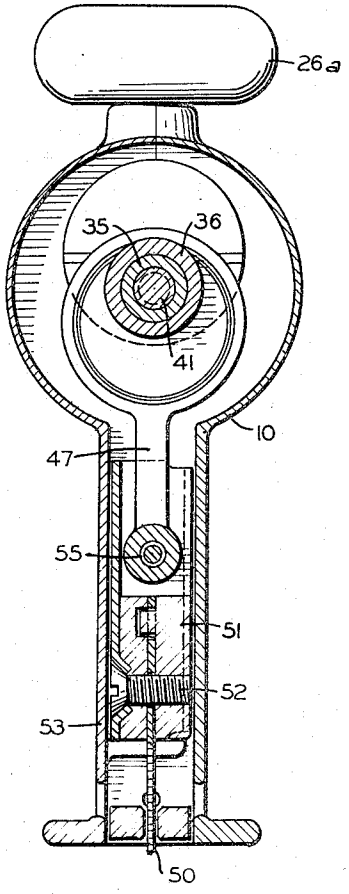
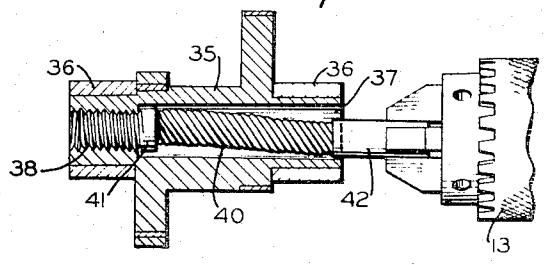


FIG_6



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TELESCOPED DRIVING CONNECTION FOR POWER TOOLS

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2 Claims. (Cl. 143—68)

The present invention relates to power tools, and more particularly to implements adapted to be attached to portable electric motors for operation in a unitary assembly with such motors.

In devices of this class in which a frame is provided whereby the tool may be attached to the body of the driving motor, as distinguished from the type in which the tool is attached only to the shaft of the driving motor, it is essential that some type of flexible driving connection be provided between the driven elements of the tool mounted in such a frame and the driving shaft of the motor, so that extremely precise alignment of the driving shaft of the motor and the driven shaft of the tool will not be indispensable to the successful operation of the device. Conventional types of flexible driving connections have proved unsatisfactory for use in such devices, principally because of the space which they occupy; it being essential in combinations in which the motor and the tool are to be manipulated as a single implement that the arrangement be as compact as possible.

The present invention provides a novel driving connection of the flexible type which is exceedingly compact and for this reason is particularly adapted to be employed in such power tools in an arrangement with the frame of such tools permitting the closest coupling between the chuck or shaft of the driving motor and the tool.

Essentially, the present invention contemplates the telescoping within a rotatable driving element of a power tool of a flexible torque-transmitting shaft. This shaft is made materially smaller in diameter than the tubular recess into which it is telescoped, so that misalignment between the driving shaft of a motor and the rotatable driving element of the tool, either angularly or in a plane at a right angle to the axis of the driving shaft of the motor is compensated for by the flexing of the flexible shaft. Thus when such a flexible driving connection is mounted in bearings in a frame which has means in connection therewith for removably mounting a driving motor having a shaft carrying a chuck, the chuck or shaft may be engaged with an end of the flexible shaft projecting from the recess closely adjacent one end of the rotatable element instead of spaced therefrom by such a distance as would be required for the interposition of a flexible drive connection.

The novel features characteristic of the present invention are defined with particularity in the appended claims. The invention itself, however, together with additional objects and advantages thereof will be best understood from the following description of an embodiment thereof when read in connection with the accompanying drawings in which:

Figure 1 is a view in side elevation of a power saw embodying the present invention, showing the frame of the tool together with the means for removably mounting in operating position thereon a conventional driving motor;

Figure 2 is a view in vertical cross-section of the power tool of Figure 1; certain parts thereof being shown in section and certain others in elevation with parts removed to display the interior construction;

Figure 3 is a detail view in perspective of an element of the tool embodying the novel flexible connection of the present invention;

Figure 4 is a view in elevation of the power tool of the present invention with a portion of the frame removed to display the interior construction;

Figure 5 is a sectional view taken on the line 5—5 of Figure 4, but with the frame members removed from Figure 4 replaced in position; and

Figure 6 is a detail view in section of the telescoped flexible driving connection of the present invention illustrating the manner of its attachment to the chuck of a motor and the manner in which it responds to compensate for misalignment between the motor shaft and the axis of the driven element mounted in the tool.

Figure 7 (sheet 1) is a sectional view of a modified form of the flexible coupling of the present invention.

The novel flexible driving connection of the present invention is illustrated in the accompanying drawings as embodied in a power saw; this being a typical example of a class of tools embodying a frame adapted to be attached to the body of the driving motor and manipulated as a single implement in such attachment to the motor. It will be understood, however, that the invention is not limited in its application to the specific tool disclosed, but is generically applicable to all devices of this general class.

As shown in Figure 1, power tool comprises a frame **10** provided with means for removably mounting in operating position thereon a driving motor **11** having a shaft **12** carrying a conventional chuck **13** by which the shaft **12** of the motor may be releasably engaged with the shaft of any type of device which it is desired to operate by the motor. The means on the frame **10** for removably mounting the driving motor **11** thereon comprises a flexible metal band **15** passing through a slot **16** in the frame **10** and adapted to encircle the body of the motor **11**, being provided with adjusting slots **17** and a clamping screw **18** whereby the diameter of the band **15** may be varied to accommodate motors of different sizes in snugly clamped relationship with the frame **10**. Cooperating with the band **15** to hold the motor **11** firmly in position are adjusting screws **20** each of which is threaded through a boss **21** integral with the frame **10**, this arrangement being such that the screws **20** may be screwed up into firm engagement with the body of the motor **11** and locked in position as by lock nut **22**. Four such screws **20** are provided, two on each side of the frame **10**, and by means of them the body of the motor **11** may, if necessary to effect approximate alignment between the motor shaft **12** and the driven shaft of the tool, be raised slightly above a position in which it actually rests upon the frame **10**.

As best shown in Figures 2 and 4, the frame **10** is made in two mating halves which in the assembly of the tool are adapted to be bolted together by bolts passed through holes **23**. Also provided in the frame **10** is an inverted T-shaped recess **25** through which a correspondingly shaped metal bar is adapted to be passed when it is desired to mount the tool on a bench for use in a stationary position; the bar being clamped in a vise on the bench under such circumstances. However, in ordinary use, the device is manipulated as a unitary implement for purposes such as sawing a board indicated at **26** in Figure 1. In order to facilitate such manipulation of the assembled tool and motor, the tool frame **10** is provided with a wooden knob **26a** secured to the upper portion of the frame by means of a screw **27** engaging a nut **28** seating in a non-circular recess **29** in the frame **10**.

Tool driving means are carried by the frame **10** for

the purpose, in the illustrated embodiment, of reciprocating a saw blade and concurrently reciprocating a piston adapted to expel air from a cylinder adjacent the saw blade to clear sawdust from the work area. This tool driving means comprises a rotatable element **35** mounted in spaced bearings **36** in the frame **10** and having a tubular recess **37** extending coaxially of the axis of rotation thereof. Adjacent its left end, as shown in the drawings, the tubular recess **37** is of reduced diameter and is threaded internally as indicated at **38**. Disposed within the recess **37** is a flexible, torque-transmitting shaft **40** which is of materially smaller diameter than the recess **37** and has at least its major portion disposed within said recess; the purpose of the clearance between the periphery of the flexible shaft **40** and the wall of the recess **37** being to permit deflection of the flexible shaft **40** from the position in which it is shown in Figure 2 to approximately the position in which it is shown in Figure 6 and as an incident to misalignment of the shaft **12** of the motor **11** with the axis of rotation of the rotatable element **35**.

The preferred form of flexible driving shaft **40** illustrated in the accompanying drawings is a spiral wrap of wire enclosing an interior wrap of spiral wire; the interior wrap being spiraled in the opposite direction from the exterior wrap. This form of flexible driving shaft is well known in the art and therefore is not illustrated or described in detail. Other specific forms of flexible driving shafts may be employed in lieu thereof, however.

Secured to one end of the flexible driving shaft **40**, as by spinning or swaging in place thereon, is a ferrule **41** the exterior surface of which is threaded, and this ferrule is in the assembly of the device screwed into the threaded portion **38** of the member **35**; the direction of the threads being such that the rotation of the shaft **12** in the operation of the device will tend to tighten the threaded engagement of the ferrule **41** with the thread **38**. The opposite end of the flexible shaft **40** is provided with a ferrule **42** similarly secured to the flexible shaft **40** and constituting a chuck engageable portion of the flexible shaft extending from the end of the recess **37** adjacent the motor mounting means so as to be adapted to be engaged by the chuck **13** closely adjacent one end of the rotatable element **35** as shown in Figures 1 and 6.

Alternatively, as shown in Figure 7, a tubular member **43** may be substituted for the ferrule **42**, and threaded internally, as at **44**, to receive the threaded end presented by the motor shaft **12** when the chuck **13** has been removed therefrom.

Secured to or formed integrally with the rotatable element **35** is a tool operating means illustrated as an eccentric **45** which is surrounded by a strap **46** provided with a downwardly extending arm **47**; this arrangement being such that upon rotation of the element **35** the downwardly extending arm **47** is rapidly oscillated to drive a saw blade **50** removably secured in a chuck **51** as by a screw **52** accessible through a slot **53** in the frame **10**; the chuck **51** being pivotally connected to the arm **47** at **55**.

Also secured to or formed integrally with the rotatable element **35** is a cam **60** against which a plunger **61** is pressed by a spring **62** compressed between a flange **63** formed on the frame **10** and a collar **64** carried by the plunger **61**. The lower end of the plunger **61** is provided with a leather cup piston **65** which is thus reciprocated within a cylinder **66** upon rotation of the rotatable element **35** to expel air through a passage **67** which directs it toward the work area adjacent the saw blade **50** for the purpose of clearing that area of saw dust.

It will be apparent from the foregoing that the present invention provides an exceedingly compact flexible driving connection for a tool of the class described permitting the mounting of a portable motor with its chuck closely adjacent the element to be driven thereby without impairing the effectiveness of the flexible driving shaft in compensating for either vertical or angular misalignment of the motor shaft and the driven element.

What is claimed is:

1. A power tool comprising a frame, means on said frame for removably mounting in operating position thereon a driving motor having a shaft carrying a chuck; tool driving means carried by said frame including a rotatable element having a tubular recess extending coaxially of the axis of rotation thereof; said element being mounted in spaced bearings in said frame and including tool operating means situated between the spaced bearings, and a flexible, torque-transmitting shaft of materially smaller diameter than said recess having at least its major portion disposed within said recess; the end of said flexible shaft within said element being secured to said element adjacent one end of said recess and the opposite end of said flexible shaft being provided with a chuck-engageable portion extending from the end of said recess adjacent said motor-mounting means, whereby said chuck may be engaged with said chuck-engageable portion of said flexible shaft closely adjacent the end of said rotatable element remote from the end secured to said shaft.

2. A power tool according to claim 1 including a chuck adapted to receive and retain a tool; said chuck being mounted for reciprocation in a path at a right angle to the axis of rotation of said rotatable element and having an operating connection with said tool operating means.

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