March 9, 1965 J. A. MOORE 3,172,516

POWER TOOL WITH PREDETERMINED POSITION STOP

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FIG. 1

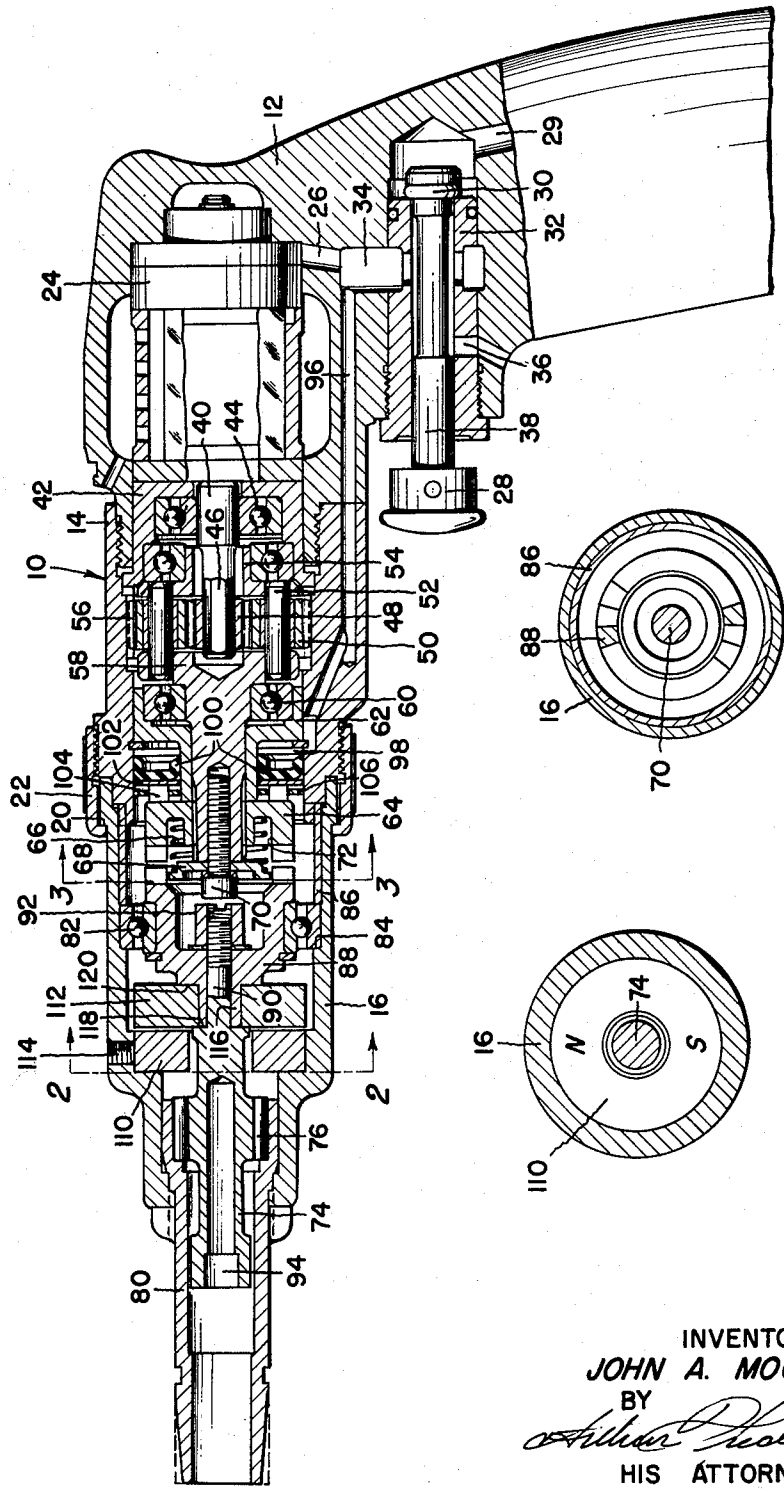

FIG. 3

FIG. 2

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This invention relates to rotary power tools and particularly to a type of such tool that is intended to be operated intermittently.

In using hand held rotary power tools, the work is usually of an intermittent character and calls for engagement successively with different pieces of work. It is often considered convenient if the tool is so constructed that engagement will be possible in a similar position each time it is applied to the work. This is particularly true of such tools as wire wrapping tools in which a wire end is inserted into a suitable piece which contains a hole to engage the end of the wire to be wrapped. It is a great convenience if the operator does not have to search for the hole into which to insert the wire and if he knows that it will be in a certain definite position at the time he is ready to insert the wire.

It is accordingly an object of the invention to provide a tool of this character in which the tool engaging spindle is biased to come to rest in a predetermined position.

It is a further object to produce a tool of this character which is convenient to operate, inexpensive to manufacture and simple to adjust.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention is hereinafter described as applied to a preferred embodiment of wire wrapping tool of which the accompanying drawing includes

FIGURE 1, a longitudinal section of a wire wrapping tool embodying the invention,

FIG. 2 is a transverse section taken along the line 2—2 looking in the direction of the arrows, and

FIG. 3 is a transverse section taken at the line 3—3 looking in the direction of the arrows.

Referring to the drawing, housing 10 of the tool is formed in sections of which the motor casing and handle section 12 is attached by suitable screw threads to a gear housing section 14, in turn connected to the nose portion 16 remote from handle portion 12. Sections 14 and 16 are coupled by means of a coupling member 22 which engages suitable shoulder 20 of nose portion 16 and is threaded onto the front end of section 15.

In the rearmost section 12 is housed, in this instance, a suitable vane type motor 24 which is provided with an air passage 26 controlled by a throttle valve 28 interposed between passages 26 and the air supply passage 29. As indicated in the drawing, the head 30 of throttle valve 28 seats at the end of valve bushing 32 which communicates with a port 34 and exhaust port 36 controlled by the stem portion 38 of throttle valve 28.

The air motor 24 has a drive shaft 40 extending through a bushing 42 supporting the anti-friction bearings 44. Drive shaft 40 has a hexagonal head 46 for connection with a planetary gear reduction assembly which includes a sun gear 48 and planet gears 50 rotatable on pins 52 which are carried by a spider 54 so that gears 50 are in mesh with an internal gear 56 formed in gear casing 14. Spider 54 has a shaft portion 58 suitably journaled in the anti-friction bearings 60 mounted in the stepped bushing 62. Shaft portion 58 carries at its forward splined end the movable half 64 of a clutch normally held in the retracted position by a spring 66 bearing against a retainer member 68 held in place on the end of shaft 58 by a screw 70.

Clutch member 64 is hollow, as indicated at 72, to receive spring 66 and to permit longitudinal motion on shaft 58.

Within the nose portion 16 of the housing 10 is mounted a spindle 74 which is provided with a pair of bearings, the forward pair 76 being of the roller type and carried by a nose tool receptacle 80, the rear anti-friction bearing 82 being mounted in casing nose portion 16 and held in place therein between a shoulder 84 of casing nose portion 16 and a sleeve 86 interposed between the outer race of bearing 82 and casing portion 14. Anti-friction bearing 82 is mounted on the outside of a clutch portion 88 which is complementary to the slidable clutch portion 64. As shown in this instance, clutch portion 88 is mounted on the threaded stem 90 of spindle 74 and held thereon by a suitable nut 92. Clutch portions 88 and 64 are of the crown type and engagement therebetween is therefore positive and unyielding.

Spindle 74 can be adapted for various uses. In this instance, a hexagonal internal aperture 94 is provided for attachment to a suitable wire wrapping fixture (not shown) and which is suitably contained in the nose tool recptacle 80.

Clutch member 64 is actuated pneumatically and for this purpose a port 96 is provided leading from port 34 to a chamber 98 formed between the stepped bushing 62 and gear housing section 14 and in which chamber is disposed an annular piston 100. Piston 100 is cup-shaped in cross section and may be of leather or other suitable material. Piston 100 abuts a washer 102 bearing against a plurality of rollers 104 which project from the back of clutch member 64 and are centralized by a retainer 106. When pressurized fluid, such as air, is introduced into chamber 98, piston 100 is forced to move axially to the left as viewed in FIG. 1 and, by engagement with washer 102, effects axial movement of clutch part 64 into meshing engagement with clutch part 88 so as to transmit rotation of drive shaft 58 to spindle 74.

As indicated above, it is desirable that when spindle 74 comes to rest the spindle should assume a pre-determined position with respect to casing nose portion 16. To this end, there is provided means to bias the spindle to such rotational position which includes a pair of magnets 110 and 112, preferably permanent magnets. Magnet 110 is cylindrical in form and encircles spindle 74 being held stationary in position within casing nose portion 16 by a set screw 114 in close proximity to magnet 110. Permanent magnet 112 is mounted on spindle 74 so as to tightly fit the stem end 116 of clutch member 88 and abut a shoulder 118 formed on spindle 74 and an opposed shoulder 120 on clutch member 88. Nut 92 screwed into the threaded end 90 of spindle 74 holds magnet 112 solidly in position and against rotation with respect to spindle 74. As indicated in FIG. 2, magnet 110 is provided with poles, north and south, diametrically opposite with respect to the axis of spindle 74. Magnet 112 is provided with a magnetic polarity the same as that of magnet 110.

In the operation of the tool rotation of spindle 74 is controlled by operation of throttle valve 28 which is adapted to admit motive fluid to the air motor 24 and, simultaneously, to the chamber 98 for effecting clutching of the two clutch portions 64 and 88. Rotation of spindle 74 results by rotation of shaft 58 through the reduction gearing associated therewith. Upon release of throttle valve 28 to close communication between air supply passage 29 and the motor 24, residual air within the tool is exhausted by way of passage 26 and port 96 about the stem of throttle valve 28 and through the exhaust port

36 to atmosphere. Spring 66 thereupon retracts clutch member 64 to free spindle 74, whereupon magnets 110 and 112 automatically rotate spindle 74 to a position whereat the north and south poles of those magnets are in juxtaposition, which is the predetermined position at which the operator of the tool can count on for applying the tool to the next piece of work.

Thus, by the above construction are accomplished among others the objects hereinbefore referred.

I claim:

1. A rotary power tool comprising a housing, a motor in said housing for providing rotary power, a drive shaft connected to be rotatively driven by said motor, a driven shaft, coupling means including a first coupling member connected for conjoined rotation with said driven shaft and a second coupling member connected for conjoined rotation with said drive shaft, one of said first and second coupling members being axially movable relative to the other coupling member to positively engage said other coupling member for transmitting rotation of the drive shaft to the driven shaft and to disengage said other coupling member for interrupting transmission of rotation from the drive shaft to the driven shaft, and magnetic means cooperatively associated with said driven shaft to arrest the latter in a predetermined angular position upon disengagement of said first and second coupling members and cessation of transmission of rotation from the drive shaft to the driven shaft.

2. A rotary power tool comprising a housing, a motor in said housing, a shaft drivably connected to said motor for rotation, a tool engaging spindle mounted for rotation in said housing, a clutch constructed and arranged for positive rotative engagement in one position with said spindle and said shaft to effect transmission of rotation from the shaft to the spindle and in another position to disengage said spindle from said shaft to cease transmission of rotation from the shaft to the spindle, a stationary magnet fixedly secured within said housing and encircling said spindle, and a second magnet mounted on said spindle for conjoined rotation with

the latter and adjacent to said stationary magnet so that upon disengagement of said spindle and said shaft the mutual magnetic attraction of the stationary magnet and second magnet arrests rotation of the latter and the spindle at a predetermined angular position.

3. A rotary power tool comprising a housing, a motor in the housing for providing rotary power, a shaft drivably connected to said motor for rotation by said motor, a tool engaging spindle, a pair of spaced bearings in said housing for supporting said spindle for rotation, a positive clutch cooperatively associated with said shaft and said spindle for rotatively engaging in one position said spindle with said shaft to effect transmission of rotation from the shaft to the spindle and in another position to disengage said spindle from the shaft to effect cessation of transmission of rotation from the shaft to the spindle, a permanent magnet fixedly secured in said housing between said pair of bearings and encircling said spindle, and a second permanent magnet encircling said spindle adjacent said first mentioned permanent magnet and mounted thereon for conjoined rotation with said spindle and relative rotation to said first mentioned permanent magnet, each of said magnets having angularly spaced like and unlike poles so that upon disengagement of said spindle and said shaft the mutual magnetic force of attraction between the unlike poles of the first mentioned and second permanent magnets arrests rotation of the second permanent magnet and the spindle at a predetermined angular position.

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