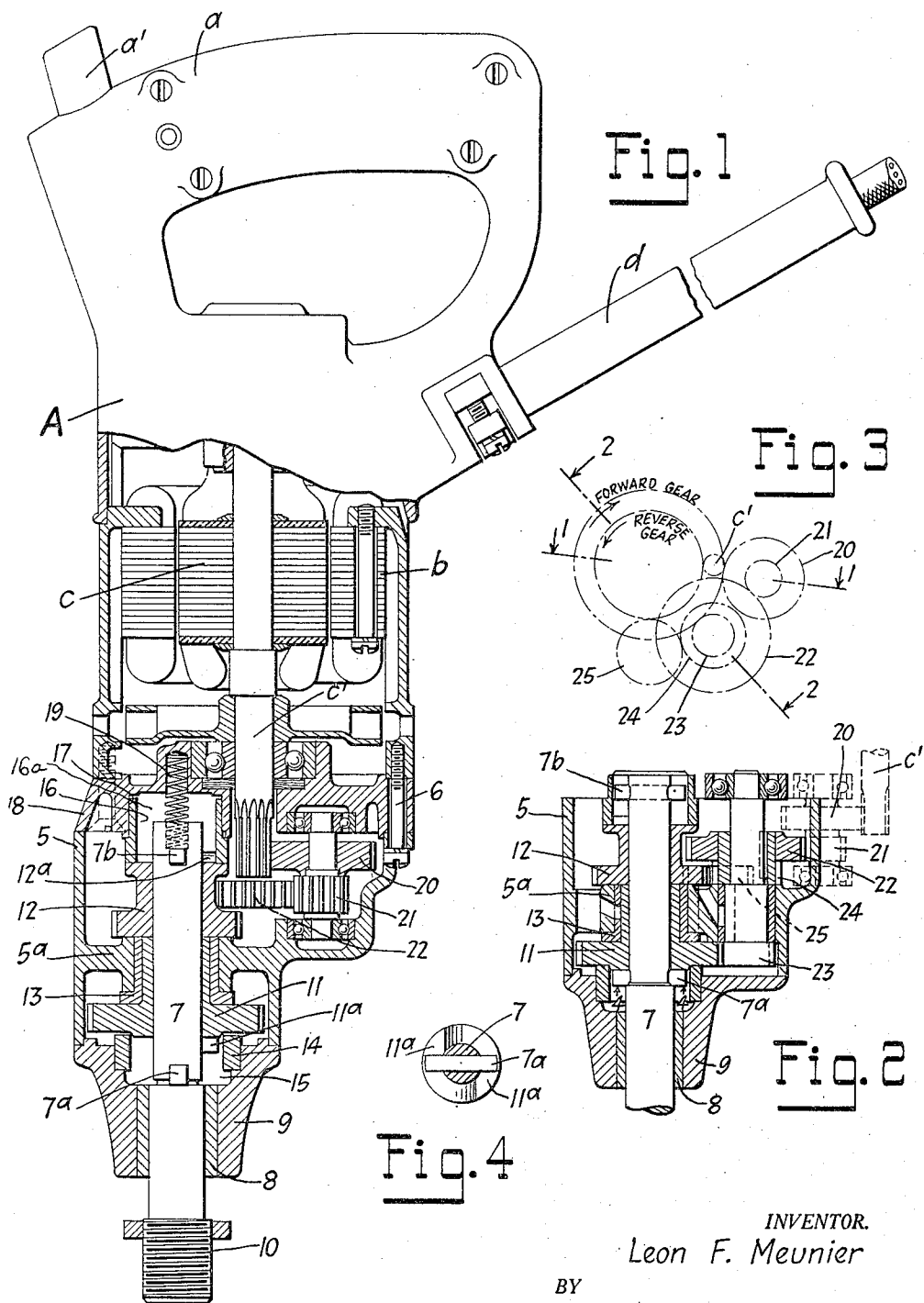


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TRANSMISSION APPARATUS

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TRANSMISSION APPARATUS

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This invention relates to transmission apparatus of the type commonly referred to as chucks for use with tools, especially power driven hand tools, and more particularly to chucks arranged automatically to reverse the rotation of the bit when the latter is withdrawn.

One object of the invention is to provide a chuck of the type described which shall provide ample bearings for the spindle. Another object is to provide a reversible chuck of compact but rugged construction adapted to withstand the strain of continuous use. Other objects will be apparent from the detailed description which follows.

In order to illustrate the invention one concrete embodiment thereof is shown in the accompanying drawings, in which:

Fig. 1 is a side elevational view partly in section of a power driven tool equipped with the reversing chuck, also shown in section substantially on the line 1—1 of Fig. 3;

Fig. 2 is a sectional view of the chuck only, substantially on the line 2—2 of Fig. 3 and indicating diagrammatically the connection with the prime mover;

Fig. 3 is a diagrammatic showing of the arrangement of shafts and gears; and

Fig. 4 is a detailed sectional view substantially on the line 4—4 of Fig. 2.

The embodiment of the invention chosen for the purpose of illustration is shown in Fig. 1 as forming a part of a hand operated power driven tool A. The tool consists of a casing to which is secured an operating handle *a* having a plunger switch *a'* to control the prime mover which in the present instance is an electric motor having a stator *b* and a rotor *c* mounted within the casing, power being supplied to the motor through a suitable cable connection *d*. The armature shaft *c'* of the motor extends beyond the motor casing and into the chuck casing 5 which is secured to the motor casing by any suitable means such as the screw bolts 6. In accordance with the usual practice the projecting end of the armature shaft *c'* is grooved to form a driving pinion.

Within the chuck casing 5 and in substantial parallelism with the armature shaft *c'*

is mounted for rotative and reciprocative movement the tool spindle 7 having a bearing 8 in the end or nose piece 9 of casing 5 and carrying on its projecting end the usual tool or bit chuck 10. As indicated in Figs. 1 and 2 spindle 7 extends well within the chuck casing 5 and has rotatably mounted thereon in abutting relation the forward gear member 11 and the reverse gear member 12. A web or bridging portion 5^a of casing 5 has a central bore receiving a bearing 13 for member 11, which bearing also serves to take the rearward thrust of member 11. Web 5^a and bearing 13 also serve to support the forward thrust of gear member 12. Member 11 is held against movement in a forward direction by a thrust bearing 14 in the form of an annulus seated in a suitable socket in the nose-piece 9. Bearing 14 is spaced from spindle 7 to provide a chamber 15 for clutch teeth 11^a and to act as a keeper for key 7^a. Member 12 is held against movement in a backward direction by a thrust bearing 16 in the form of a shouldered annulus seated in a recess 17 therefor in the transfer plate 18 clamped between the motor casing and the chuck casing 5. Bearing 16 provides a chamber 16^a for clutch jaws 12^a and serves as a keeper for key 7^b. It will thus be apparent that the gear member 11 serves as a bearing for spindle 7.

While gear members 11 and 12 are mounted as indicated for rotative movement but are held against axial movement, spindle 7 is arranged for endwise or axial movement therewithin so as to establish a driving connection with either. To this end gear member 11 is provided with the clutch teeth 11^a (Fig. 4) extending into chamber 15 and arranged to cooperate with the key 7^a mounted in a cross bore in spindle 7. Similarly gear member 12 has the gear teeth 12^a projecting into chamber 16 and arranged to cooperate with the transverse key 7^b in the slotted rear end of spindle 7. A coil spring 19 normally urges the spindle 7 to the limit of its outward or forward reciprocative movement (Fig. 1) and into clutching engagement with reversing gear member 12. In using tool A for tapping or driving opera-

tions pressure of the working tool against the work forces spindle 7 rearwardly against the pressure of spring 19 to the position shown in Fig. 2, thus releasing the spindle from clutching engagement with the reverse gear 12 and clutching the spindle to forward gear 11 through the engagement of key 7^a with clutch teeth 11^a. A pull upon tool A or release of pressure on the tool so as to permit spring 19 to act serves to produce forward or outward movement of spindle 7 relative to casing 5 causing release of the same from forward gear 11 and clutching engagement with reverse gear 12.

The driving connection between armature shaft c' and gear members 11 and 12 will now be described, reference being had particularly to the diagrammatic showing of Fig. 3 and the partial diagrammatic showing of Fig. 2. The pinion end of shaft c' meshes with a gear 20 carrying a pinion 21 which meshes with a gear 22 carrying a pinion 23 meshing with gear member 11. Gear member 22 also carries a second pinion 24 which meshes with the gear 25 which is also in mesh with reverse gear 12. The shafts upon which the gear-pinion members 20-21, 22-23-24 and idler gear 25 are supported are mounted in suitable bearings in casing 5 and transfer plate 18. When the prime mover is in operation, the driving members, gear members 11 and 12, rotate continuously in opposite directions upon the driven member, spindle 7.

From the above it will be apparent that the invention provides a tapping chuck in which the forward and reverse driving gears are rotatably mounted upon the tool spindle in abutting relation, that the chuck casing provides a radial bearing for one of the gear members, that this bearing also serves to take the thrust of both the gear members, and that the general assembly and arrangement of parts including the driving connections to both gear members is such as to provide a compact, rigid and strong reversible transmission.

While but one form of the invention has been herein shown and described it is to be understood that the invention is not limited to the specific details thereof but includes all changes, adaptations and modifications within the scope of the appended claims.

I claim:

1. Transmission apparatus for a small portable or hand tool comprising a casing arranged to be secured to the tool, a spindle rotatable and reciprocable in said casing, two members rotatably mounted on said spindle in abutting relation, said casing providing bearings for said members, means for rotating said members in opposite directions, means for establishing a driving connection between said spindle and either of said members, and resilient means in line with said spindle and

partly telescoping within the latter for yieldingly maintaining the driving connection between said spindle and one of said members.

2. Transmission apparatus for a portable power machine comprising a casing arranged to form a part of the machine, a tool spindle rotatable and reciprocable in said casing, two members rotatably mounted on said spindle, means for rotating said members in opposite directions, and means for establishing a driving connection between said spindle and either of said members, said casing providing a radial and thrust bearing for one of said members, said bearing serving as a thrust bearing for the other of said members.

3. Transmission apparatus for a portable power machine comprising a casing arranged to form a part of said machine, a tool spindle rotatable and reciprocable in said casing, two members rotatably mounted on said spindle in abutting relation, means for rotating said members in opposite directions, bearings for said members retaining the same in fixed position within said casing and providing chambers at the remote ends of said members, means within said chambers operating on axial movement of said spindle to effect a driving connection between said spindle and one or the other of said members, and resilient means normally maintaining said spindle in position to be driven by one of said members.

4. Transmission apparatus for a portable power machine comprising a casing arranged to form a part of said machine, a tool spindle rotatable and reciprocable in said casing, two members rotatably mounted on said spindle, means for rotating said members in opposite directions, said casing providing a radial bearing for one of said members serving also as a thrust bearing for both said members, means providing chambers at the remote ends of said members, and means within said chambers operating on axial movement of said spindle for effecting a driving connection between said spindle and one or the other of said members.

5. Transmission apparatus for a portable power machine comprising a casing arranged to form a part of said machine, a tool spindle rotatable and reciprocable in said casing, two members rotatably mounted on said spindle, means for rotating said members in opposite directions, said casing providing a radial bearing for one of said members serving also as a thrust bearing for both said members, means providing chambers at the remote ends of said members, means within said chambers operating on axial movement of said spindle for effecting a driving connection between said spindle and one or the other of said members, and a spring engaging said spindle yieldingly holding the latter in position to maintain operative driving connection with one of said members.

6. The combination with a portable tool having a prime mover, of transmission apparatus comprising a casing secured to the prime mover, a spindle supported in said casing for rotatable and for limited axial movement, and means whereby axial movement of said spindle in opposite directions will produce rotation of the same in opposite directions comprising driving members rotatably mounted upon said spindle in fixed position within said casing, means for rotating said members in opposite directions, a radial bearing for one of said members supported in an integral portion of the said casing, said members being in abutting relation with each other and with opposite ends of said bearing, clutching means at the remote ends of said members for releasably effecting a driving connection between said spindle and either of said members, and resilient means in line with said spindle and normally acting upon the latter yieldingly to maintain the same in position to make the clutching means for one of said members operable.

7. A transmission device for a portable power machine comprising a casing secured to said machine, a spindle rotatable in said casing, two members rotatably mounted on said spindle in abutting relation, means providing chambers at the remote ends of said members, said spindle being arranged for limited reciprocal movement relative to said members to effect a driving connection between said spindle and one or the other of said members, and a coil spring in one of said chambers acting on the inner end of said spindle yieldingly to hold it at one limit of its reciprocable movement.

Signed by me at Cleveland, Ohio, this 2nd day of February, 1926.

LEON F. MEUNIER.