

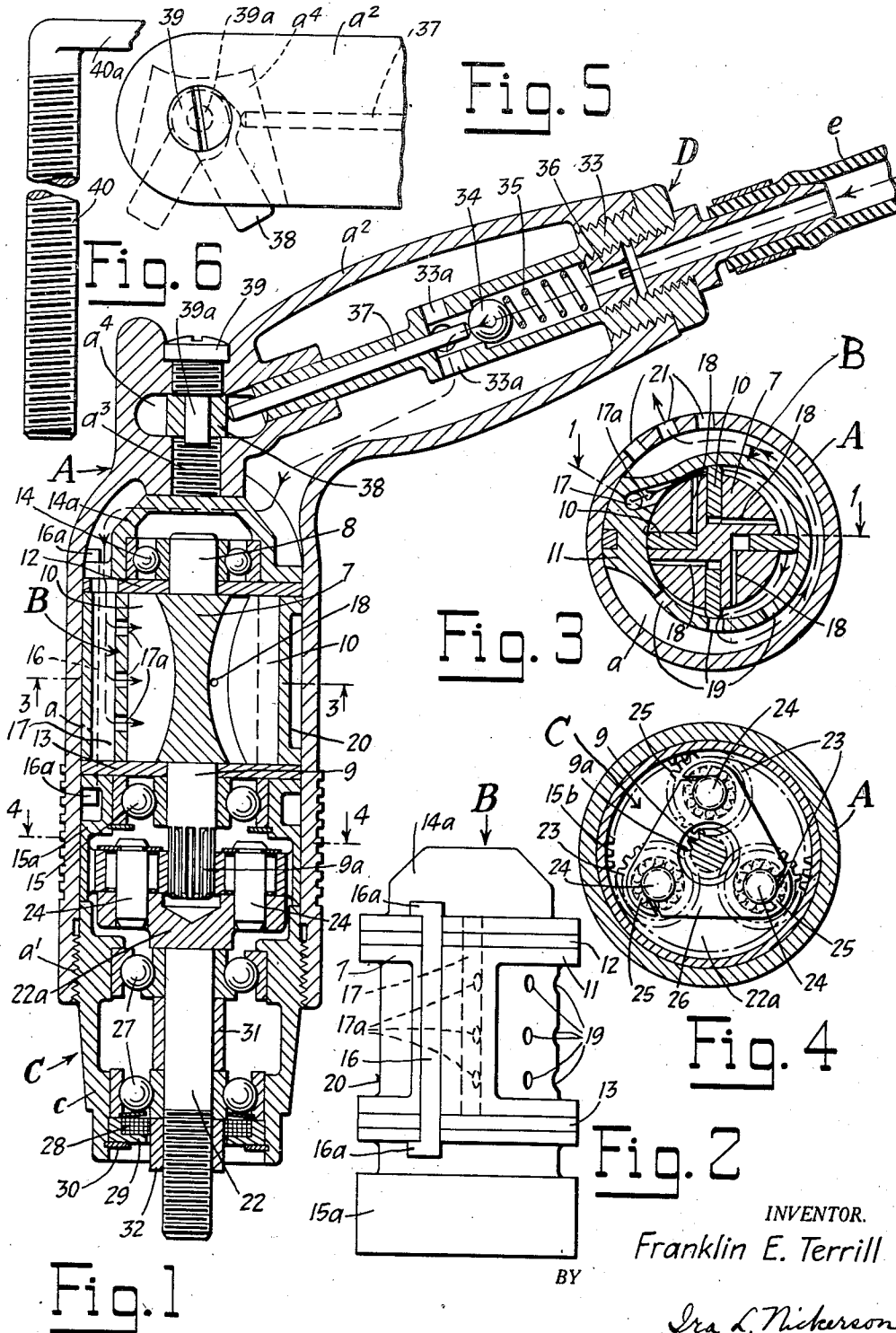
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FLUID PRESSURE TOOL

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FLUID PRESSURE TOOL

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5 Claims. (Cl. 121—34)

This invention relates to fluid pressure tools especially those of the portable or hand-supported type. More specifically it relates to tools utilizing a rotary motor as the prime mover.

One object of the invention is to produce a fluid pressure tool characterized by extreme simplicity, lightness, and compactness. Another object is to effect economies in production and assembly. Another object is to provide a tool in which the operative parts are rigidly maintained in alignment and have the required strength for sustaining hard usage. Another object is to facilitate repair and replacement of parts. Still another object is to confine all torque reaction to the motor itself. Other objects will be apparent from the detailed description which follows.

In the tool of the present invention a casing provides a chamber slidably receiving, preferably with a press fit, a rotary motor assembly. A transmission assembly extends into the chamber and is utilized to maintain the motor assembly in place. The transmission assembly includes reduction gearing and parts of the two assemblies co-act so that all torque reaction of the motor is sustained by the motor itself. By preference the casing has an extension providing a handle or grip portion, the handle providing a conduit for the motive fluid and receiving a control assembly which includes a throttle valve. The supporting arrangement for the manually operable control member for the throttle valve is arranged to provide for conveniently forcing the motor assembly out of the casing when repairs or replacements are necessary.

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

Fig. 1 is a longitudinal vertical sectional view showing certain parts in elevation, the section through the motor cylinder being substantially on the broken line 1—1 of Fig. 3;

Fig. 2 is a top plan view of the motor assembly prior to or after removal from the motor casing;

Figs. 3 and 4 are transverse sectional views substantially on the lines 3—3 and 4—4 respectively of Fig. 1;

Fig. 5 is a fragmentary end elevational view of the handle end of the motor casing; and

Fig. 6 is a side elevational view of an ejecting member for the motor assembly.

The embodiment of the invention chosen for the purpose of illustration comprises in its essentials a tool casing A, a motor assembly indicated generally at B, a transmission assembly indicat-

ed generally at C, and a throttle control assembly indicated generally at D. The three assemblies B, C and D combine with casing A to make a very simple, strong, and compact tool. The casing A is hollow and preferably of light metal such as aluminum or aluminum alloy. It provides a cylindrical chamber *a* of uniform size and considerable extent, the open end of which is internally screw threaded as indicated at *a'*. Chamber *a* receives motor assembly B and at least a portion of transmission assembly C, threads *a'* cooperating with similar threads on the housing of the transmission assembly to secure the latter to the casing to close its open end and to maintain the motor assembly in place. Casing A has an extension *a²*, also hollow, and preferably at an angle to chamber *a* to provide a handle or grip portion for the tool. Handle *a²* forms a conduit for pressure fluid provided by a supply pipe *e* and receives therewithin the control assembly D. Casing A, adjacent handle extension *a²*, has a bore *a³* of restricted size preferably internally screw threaded and preferably in axial alignment with chamber *a*, also a transversely extending recess or slot *a⁴* intersecting bore *a³*. The purpose of the bore and slot will be set forth presently.

The motor assembly B, shown in elevation in Fig. 2, and in vertical and transverse section in Figs. 1 and 3 respectively, comprises a rotor having shaft ends or trunnions 8 and 9 and a plurality of piston blades or vanes 10, in the present instance four in number, slidably mounted in radiating slots in rotor 7. Rotor 7 is rotatably mounted within a cylinder 11 having perforated plates 12 and 13 at either end thereof to form cylinder heads. Rotor shaft ends 8 and 9 project through cylinder heads 12 and 13 and are supported by ball bearings 14 and 15 mounted in bearing supports or cages 14a and 15a respectively. Each of the bearing supports 14a and 15a, of the cylinder heads 12 and 13, and of cylinder 11 is slotted as indicated in Fig. 2, the slots being arranged for disposition in alignment to receive a key member 16 having both ends bent or hooked at 16a to engage portions of bearing supports 14a and 15a thereby to lock the motor parts in assembled relation and in a definitely fixed angular relation to one another. A passage or bore 17 through the flange portion of inner bearing support 14a through cylinder head 12 and longitudinally through the wall of cylinder 11 conducts motive fluid from handle *a²* for distribution by ports 17a within the rotor chamber of cylinder 11 (Figs. 1, 2 and 3). The motive fluid

so admitted has access beneath piston blades or vanes 10 by passages 18 (Figs. 1 and 3) to force and hold the blades or vanes outwardly against the cylinder wall so that the pressure fluid admitted by ports 17a is operative within the crescent shaped space provided by the off-set disposition of rotor 7 within cylinder 11 to rotate rotor 7, the exhaust pressure fluid escaping through angularly spaced series of ports 19 to an exhaust chamber 20 provided between cylinder 11 and casing A, thence through ports 21 in casing A to atmosphere.

Rotor 7 transmits its power to a spindle 22 supported in transmission assembly C through the medium of shaft extension 9 which has teeth 9a on the lower end thereof to form a pinion. Pinion teeth 9a mesh with idler gears 23, three in number, mounted on pins 24 rigidly supported in a head 22a on spindle 22. Idler gears 23 rotate on roller bearings 25 and are in mesh with internal gear teeth 15b on the lower bearing support 15a of the motor assembly as well as in mesh with pinion teeth 9a on rotor shaft 9. Thus the torque reaction of spindle 22 is sustained by the motor assembly B. A spring type retainer washer 26, triangular in shape (Fig. 4) and having a central opening to receive rotor shaft 9, is sprung over the three idler gear pins 24 into grooves in the latter to maintain idler gears 23 and their bearings in place. Spindle 22 is supported in transmission housing c by axially spaced ball bearings 27. Adjacent the lower bearing is a felt packing 28 held in place by a recessed washer 29 which in turn is engaged by a split spring retaining ring 30 expanded into an internal groove in transmission housing c. A collar 31 on spindle 22 spaces bearings 27, and a nut 32 is provided to tighten the inner ball races to prevent them from turning on the spindle and to transmit the tool thrust from the spindles through the ball bearings to the motor casing.

The throttle control assembly comprises a valve cage member 33 projecting into handle extension a² and in screw threaded contact with the latter. Member 33 supports in its central bore a throttle valve 34 of the ball type yieldingly urged to its seat by a conical coil spring 35 seated against a perforated thrust nut 36. A push rod 37 is utilized to force the throttle valve 34 from its seat and to permit motive fluid from supply conduit e to escape through ports 33a to the interior of the handle whence it passes through passage 17 to the motor. The slot a⁴ in casing A, previously referred to, is utilized for mounting for limited movement a manual control lever 38 of the cam type. This lever is pivoted on a pivot extension 39a traversing slot a⁴ which extension forms a part of screw 39 threadedly engaging the interior of bore a³. Figure 5 shows in full lines the position of control lever 38 when admitting motive fluid to run the motor and in broken outline its position when throttle valve 34 is in closed position. Bore a³ is also utilized for ejecting motor assembly B from casing A when repairs or replacements are necessary. To this end screw 39 and lever 38 are removed. A suitable tool is then inserted through bore a³ to engage motor bearing support 14a and by the application of force to the tool the motor assembly B will be ejected. In Fig. 6 a screw bolt 40 is shown for this purpose having threads to cooperate with the threads in bore a³ and having a suitable handle 40a for rotating the ejecting member.

From the above it will be apparent that the

present invention provides an exceptionally compact power tool which is quickly assembled through the mounting of motor, transmission, and control assemblies in a single casing, that the parts fit closely together to give a short overall length and are rigidly held in alignment, that the motor assembly which engages the casing with a press fit may occupy a variety of angular positions within the latter provided only that exhaust ports 21 therein are not covered, that the inter-engagement of the transmission with the motor assembly causes the motor to sustain the torque reactions of the spindle, and that the reduced bore in line with the motor chamber of the tool casing provides means for carrying out the dual function of normally supporting the manual control means for the pressure fluid and of ejecting the motor when repairs or replacements are needed.

While the invention has been herein disclosed in what are now considered to be preferred forms, it is to be understood that the invention is not limited to the specific details thereof but covers all changes, modifications, and adaptations within the scope of the appended claims.

I claim as my invention:

1. In a fluid pressure portable tool, a hollow casing providing a cylindrical chamber of substantial length open at one end and with a reduced open bore at the other end, said chamber being arranged to receive therein the motor and transmission mechanism through said open end, and control mechanism for the pressure fluid having an operating member, said reduced bore being provided for the double purpose of providing means for ejection of the motor and transmission mechanism and for supporting said operating member.

2. In a fluid pressure portable or hand tool, a hollow casing providing a cylindrical chamber of substantial length open at one end, a rotary motor assembly insertable into said chamber through said open end, a transmission assembly closing said open end to maintain said motor assembly in place, said casing having an angular extension remote from said open end to form a handle, said handle providing a conduit for the pressure fluid, a control assembly mounted in said handle extension including a throttle valve and a plunger for actuating said throttle valve, said casing and handle having a bore in line with said chamber and a transverse slot or recess intersecting said bore, a pivot member secured in said bore and extending across said slot, a manually operated control member for said plunger in said slot and mounted on said pivot member, said bore being adapted on removal of said members for the insertion of means for forcing said motor out of said chamber.

3. In a fluid pressure tool, a casing providing an open-ended chamber, a rotary motor assembly for insertion into said chamber as a unit comprising a cylinder, a rotor therein having aligned projecting shaft ends or trunnions, cylinder heads for said cylinder having bores for said shaft ends, bearing supports for said shaft ends adjacent said heads, said cylinder, heads and supports providing aligned slots, and a key member disposed in said slots and having bent or hooked ends engaging said supports to maintain said motor parts in assembled relation and in fixed angular relation.

4. In combination, in a fluid pressure tool, a casing, a rotary motor insertable as a unit within said casing comprising a cylinder, cylinder heads,

and bearing supports for a rotor having shaft ends or trunnions, said cylinder, cylinder heads and supports having recesses or slots in the peripheral portions thereof, a single retainer member for maintaining said motor parts in fixed and assembled relation in the form of a key seated in said recesses and having transversely extending portions at the ends thereof engaging said supports, and means in abutting engagement with one of said bearing supports for maintaining said motor unit in said casing.

5. In a fluid pressure tool, a casing, a rotary motor assembly for insertion as a unit into said

casing, said assembly comprising a cylinder, a rotor therein having a shaft projecting therebeyond, end members for said cylinder, one of which provides a bearing for said shaft, said cylinder and said members having aligned recesses or slots in the peripheral portions thereof, and a single retainer member in the form of a key seated in said recesses and with enlarged integral ends engaging said end members to maintain said motor parts in assembled relation and in a fixed angular relation.

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15	90
20	95
25	100
30	105
35	110
40	115
45	120
50	125
55	130
60	135
65	140
70	145
75	150