Sept. 19, 1944. T. M. CONE 2,358,445

ENGINE STARTER AND ACTUATING MECHANISM THEREFOR

Filed April 5, 1943 2 Sheets-Sheet 1

FIG. 1.

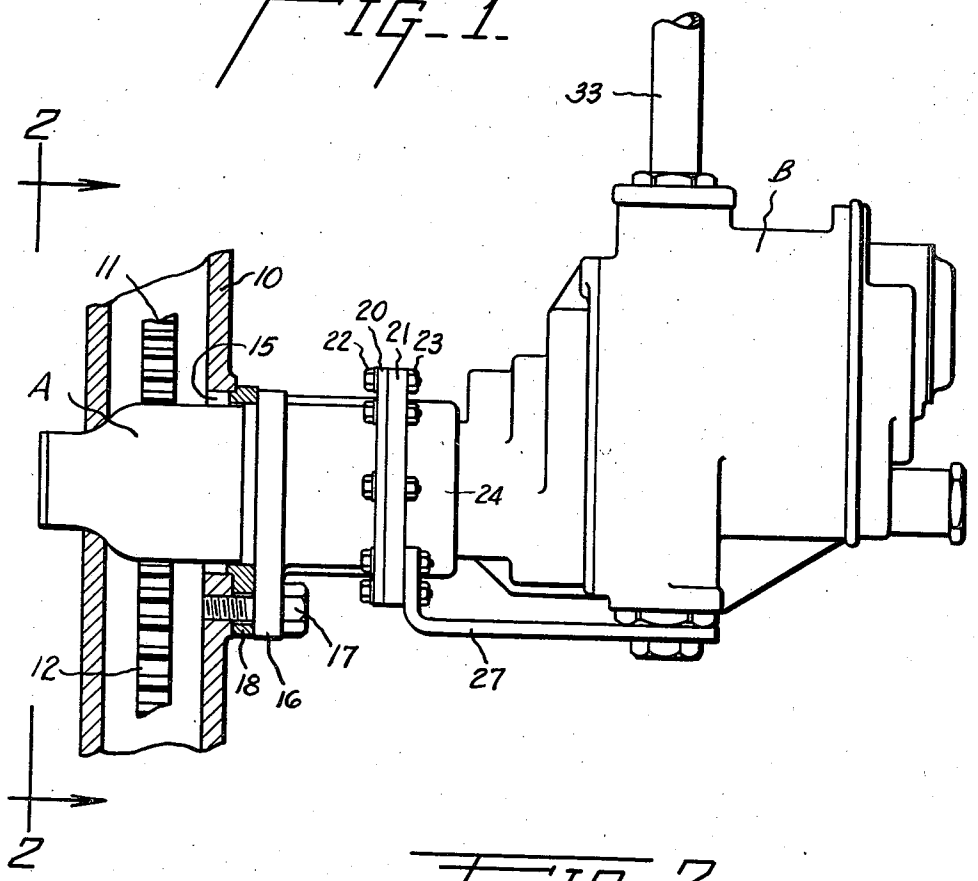
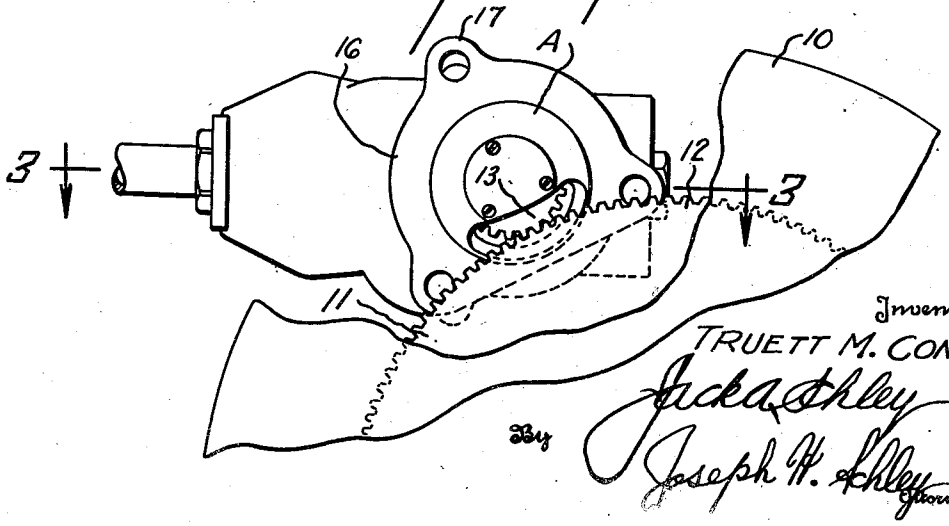


FIG. 2.



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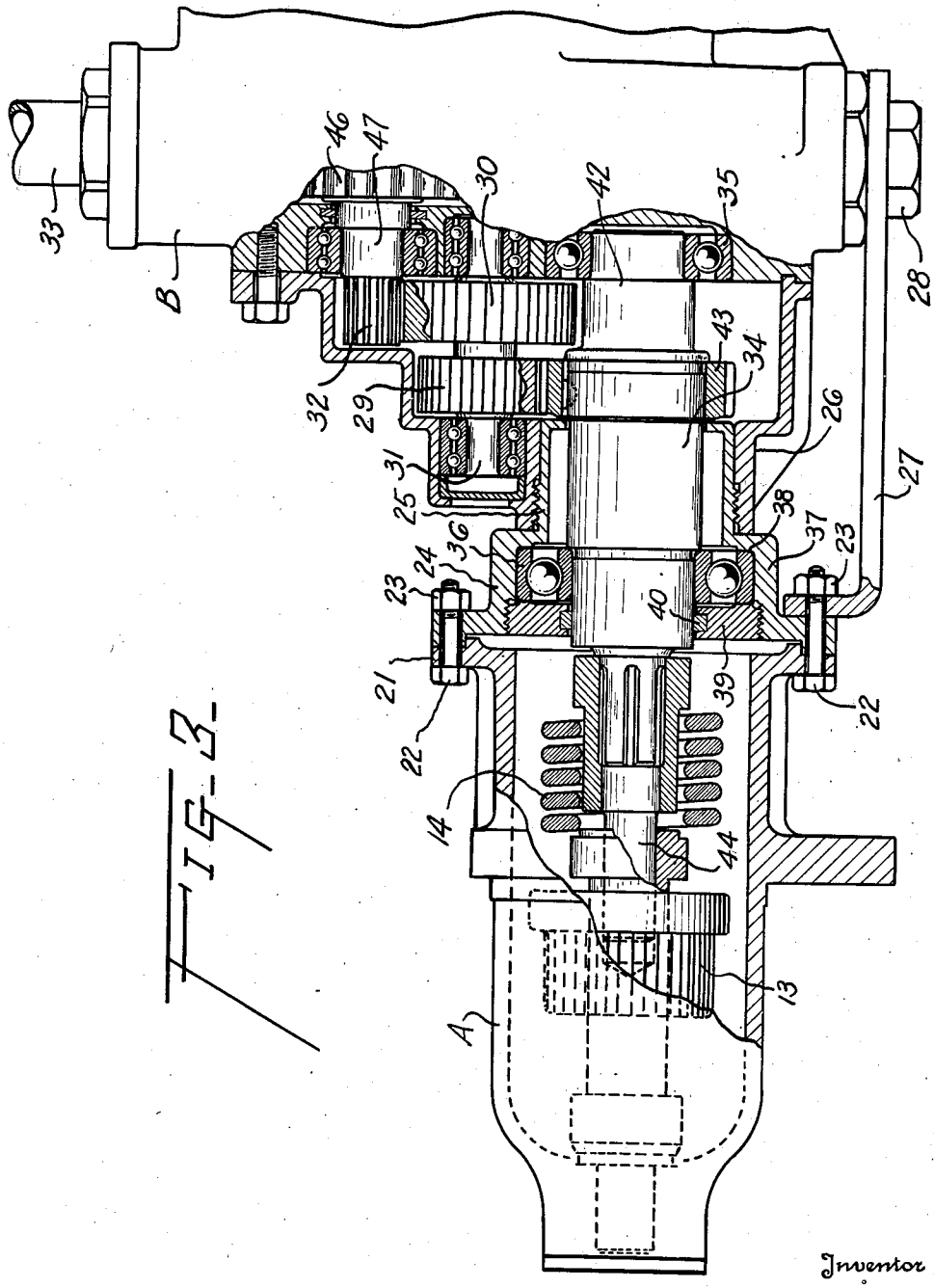

FIG. 3.

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ENGINE STARTER AND ACTUATING MECHANISM THEREFOR

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Application April 5, 1943, Serial No. 481,788

1 Claim. (Cl. 123—179)

This invention relates to new and useful improvements in engine starters and actuating mechanisms therefor.

One object of the invention is to provide an improved starter for an engine having actuating mechanism which may be actuated by portable means so as to obviate the necessity of a power source at the location of the engine.

An important object of the invention is to provide an improved fluid impelled or pressure-actuated drive mechanism for operating the starter of an engine which mechanism is adapted to be actuated by any available source of pressure, such as, an air compressor or a pressure fluid line, whereby the starting of a plurality of engines may be accomplished by employing a single power source so as to eliminate individual power starting means for each engine.

Another object of the invention is to provide an improved actuating mechanism for an engine starter which is adapted to be substituted for the conventional electric motor or mechanical-operating means and which includes an air or fluid impelled motor having its shaft releasably connected with the starter, whereby said starter may be actuated by the motor upon the supplying of suitable fluid of sufficient pressure to said motor.

A further object of the invention is to provide an improved starter actuating mechanism, of the character described, which is of compact rugged and inexpensive construction, is readily mountable upon an engine, and which may be operated by any available source of pressure, thereby being adaptable for use at many installations where conventional power is unobtainable.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, wherein an example of the invention is shown, and wherein:

Figure 1 is a side elevation of an actuating mechanism, constructed in accordance with the invention, and shown connected to the starter of an engine,

Figure 2 is an end elevation, partly broken away, showing the usual connection between the starter and the flywheel of the engine, and

Figure 3 is an enlarged view, partly in section and partly in elevation, of the actuating mechanism and starter.

In the drawings, the numeral 10 designates the housing of an engine within which a conventional flywheel 11 is mounted. Serrations or gear teeth 12 are formed on the periphery of the flywheel and are adapted to constantly mesh with the teeth of a starter pinion 13. As is clearly shown in Figure 3, the starter A includes the usual "Bendix" or similar drive 14 for rotating the pinion 13 and has its housing extending through an opening 15 formed in the wall 10 adjacent the periphery of the flywheel 11. An external, radial flange 16 is formed on the intermediate portion of the housing and has a plurality of lugs or ears 17 made integral therewith for receiving stud bolts 17' which engage in the wall 10 to support said housing. If desired, a suitable spacer ring 18 may be interposed between the wall 10 and the flange 16.

An air-actuated or fluid impelled motor B, having a pressure fluid inlet port, is connected to the outer end of the assembly A by complementary annular flanges 20 and 21 formed on said outer end and the motor. Suitable bolts 22 and nuts 23 fasten the flanges 20 and 21 together. The flange 21 forms a part of an adapter or collar 24 which has its inner end portion reduced in diameter and externally screw-threaded as shown at 25 for engagement within an annular boss 26 made integral with the housing of the motor B. An angular, torque arm 27, having one end connected to the motor housing by a stud bolt 38 and its other end to the radial flanges 20 and 21 by several of the bolts 22, is provided for reinforcing the connection between said motor housing and the assembly A. The motor B is of conventional construction and includes the usual gear train having reduction gears 29 and 30 which are keyed upon a suitable stub shaft 31 journaled in the housing of said motor. The gear 30 is of greater diameter than the gear 29 and is in constant mesh with a reduced pinion 32 formed on the outer end of the shaft 46 of an impeller or rotor 47 for driving said gear 29. A line or pipe 33 is adapted to be connected in the inlet port for supplying air, or other fluid under pressure, to the rotor or impeller of the motor B from any suitable source, such as an air compressor (not shown). Manifestly, the air or other fluid under pressure will drive the impeller or rotor 47 and its shaft 46 so as to rotate the gears 29 and 30 due to the meshing of the latter gear with the pinion 32.

A spindle or shaft 34 extends axially through the collar 24 and boss 26 and has its inner end journaled within the motor housing by a suitable ball bearing 35. For supporting the outer end of the spindle 34, an additional ball bearing 36

is mounted in the bore of the collar 24 which is enlarged and offset radially outwardly as shown at 37 relative to the reduced screw-threaded portion 25 of said collar to provide an annular shoulder 38. A retaining ring 39 is screw-threaded within the outer end of the bore 37 for clamping the ball bearing 36 against the shoulder 38. If desired, a packing ring 40, of any suitable material, may be interposed between the spindle and the retaining ring 39. The outer portion of the spindle which is journaled within the bearing 36 is reduced in diameter so as to provide a radial shoulder 41 which engages said bearing so as to prevent outward displacement of said spindle. A similar shoulder 42 is formed adjacent the inner end of the spindle by reducing the diameter of said inner end, whereby inward displacement of said spindle is prevented by the shoulder 42 engaging the bearing 35.

An annular gear 43, of greater diameter than the reduction gear 29 and having its teeth in constant mesh with the teeth of said reduction gear, is splined or otherwise keyed to the inner end portion of the spindle so that rotation of the reduction gear will impart rotation to said spindle. The outer end of the spindle projects beyond the collar 24 and is formed with a stub shaft 44 which engages within the "Bendix" drive 14 of the starter A. A plurality of splines 45 are formed on the inner end portion of the shaft 44 for establishing a driving connection between the spindle 34 and the "Bendix" drive 14. The drive 14 is actuated in the usual manner through its connection with the splines 45 of the shaft 44 which in turn is rotated due to the driving connection between the spindle 34 and the stub shaft 31 of the motor B. Thus, the pinion 13 of the starter A is rotated to drive the flywheel 11 upon actuation of the "Bendix" drive by the motor.

From the foregoing, it is manifest that whenever it is desired to actuate the drive of the starter assembly so as to start the engine (not shown), it is only necessary to connect the line 33 or other suitable pressure conduit to the port 19 of the motor B. Upon the introduction of air or other fluid under pressure into the motor, the impeller or rotor 47 thereof will be driven to rotate its shaft 46 and pinion 32. Rotation of the pinion 32 will drive the gear 30 which movement will be transmitted to the spindle 34 through the stub shaft 31 and gears 29 and 43. Since the shaft 34 and its splines 45 form a part of the spindle, it is readily apparent that rotation of said spindle will be imparted to the pinion 13 and flywheel 11 through the drive 14. Thus, actuation of the motor B will result in actuation of the starter so as to rotate the flywheel 11 to start the engine. As soon as the engine is started, the flow of air or other fluid under pressure being supplied to the motor B is shut off and the line 33 may, if desired, be removed from the inlet port.

It has been assumed that an air compressor (not shown), preferably portable, will be the most convenient source of pressure for actuating the motor. Obviously, if the source of pressure is portable or available to a plurality of engines, no other source of power would be required. By equipping the starter of an engine with a fluid impelled actuating mechanism as set forth herein, it is manifest that there is no necessity for electrical or mechanical sources of power. Thus, the use of individual starting means, including batteries, for each engine is rendered unnecessary. The air motor B is relatively inexpensive, of rugged, simple construction and may be connected to any engine starter having a "Bendix" or similar drive associated therewith.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claim, without departing from the spirit of the invention.

I claim:

In the type of engine starter having flywheel actuating elements and a housing enclosing the elements, the improvement which includes, a fluid impeller, a gear train transmission constantly connected with the impeller, a housing surrounding said impeller and transmission, a shaft in constant connection with said transmission and releasably connected to the actuating elements of the starter, an adapter surrounding the intermediate portion of the shaft fastened to the starter housing and the impeller housing for connecting the same, and means separate from the adapter extending from said impeller housing to said starter housing and connected thereto for reinforcing the impeller housing.

TRUETT M. CONE.