May 30, 1950 J. R. McCREARY 2,509,361

STARTER

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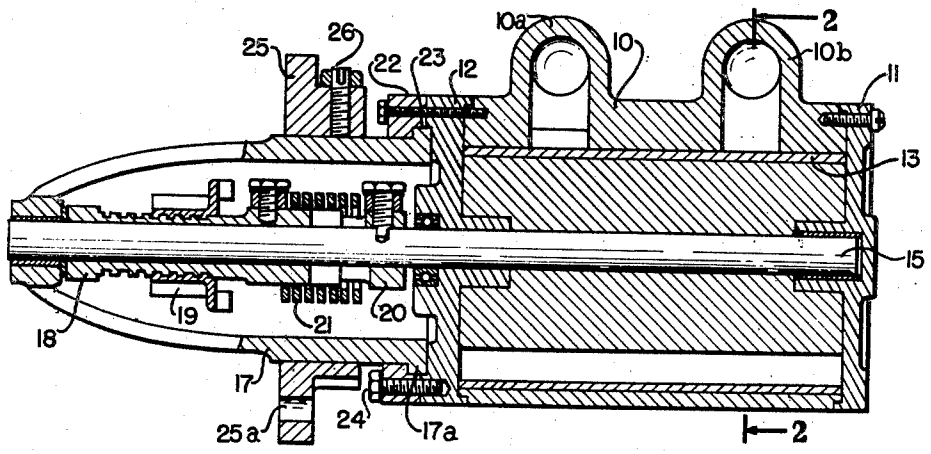

FIG. 1

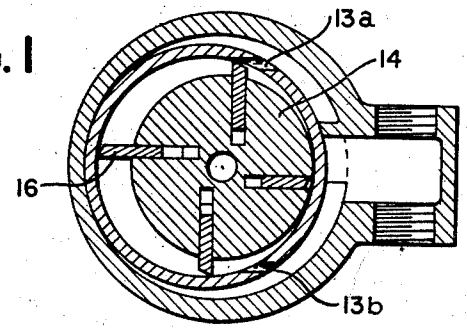

FIG. 2

FIG. 3

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STARTER

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5 Claims. (Cl. 123—179)

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This invention relates to improvements in turbine type starters for engines and refers more particularly to the structure of the rotor casing and drive connection housing which facilitates installation of the starter.

The device has to do with starters for heavy engines such as Diesel engines wherein a gas or air driven turbine or rotor supplies the driving power for the starter. To drive the turbine compressed air may be used, or where gas under pressure is at hand, such as in oil field operations, this gas may be utilized.

In known starters of this type the casing for the rotor and the housing for the drive connection are either integral or are adapted to be anchored relative to one another in only a single position. Inasmuch as the starters may be used in connection with various styles and makes of engines difficulty is often encountered in installing the starters. Usually an elaborate set of pipe connections must be resorted to in order to connect the power fluid inlet and outlet connections with the corresponding connections of the rotor casing. These pipe connections are expensive, time consuming and cumbersome. Often, in certain installations, the engine mounting is such that only a confined space is available for the starter in which case the problem is more serious.

An object of this invention is to provide a turbine type starter which may be readily installed.

Another object is to provide a turbine type starter wherein the rotor casing and drive connection housing may be independently rotated in installation.

A further object is to provide a gas turbine starter having a rotatably adjustable connection between the rotor casing and drive connection housing.

Still another object is to provide an engine starter in which the drive connection housing may be rotated to any selected position relative to the engine in installation.

A still further object is to provide an engine starter in which the drive connection housing may be rotated to any selected position relative to the engine and the rotor casing in installation.

Other and further objects will be apparent from the following description.

In the accompanying drawings which form a part of the instant specification and are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views,

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Fig. 1 is a sectional side elevation of a starter embodying this invention;

Fig. 2 is a view taken along the line 2—2 in Fig. 1 in the direction of the arrows and rotated 90 degrees in a clockwise direction; and

Fig. 3 is a side elevational view partially in section of a modified starter having a reduction gear assembly between the rotor and engine drive connection with part of the rotor broken away.

Referring to the drawings and more particularly to the modification shown in Figs. 1 and 2, the numeral 10 designates a cylinder which constitutes a part of the rotor casing. Plates 11 and 12 bolted to opposite ends of cylinder 10 complete the casing. Cylinder 10 has two fittings 10*a* and 10*b* to receive the connections with the power fluid inlet and exhaust pipes respectively.

Mounted eccentrically within cylinder 10 is a liner or cylinder 13 having ports 13*a* and 13*b* through which the power fluid passes. The rotor 14 is mounted on a shaft 15 extending axially of the casing and journaled in the plates 11 and 12. Radially extending vanes 16 are slidably mounted in radial grooves in the rotor. These blades 16 are urged against the eccentric liner by centrifugal force. Impingement of the power fluid against the vanes or blades serves to actuate the starter.

Extending from plate 12 of the rotor casing is the drive connection housing 17. The housing partially encases the drive connection comprising a sleeve 18 mounted for rotation on the extended end of shaft 15, gear 19 threaded to sleeve 18, ring 20 keyed to shaft 15, and a resilient connection between sleeve 18 and ring 20. The resilient connection includes a spring 21 mounted between stops carried by sleeve 18 and ring 20.

A rotatably adjustable joint is provided between the drive connection housing and casing. This joint is accomplished by means of an element 22 having an internal flange. Element 22 has a central aperture which rotatably receives housing 17. Housing 17 has an outturned flange 17*a* which is received by an annular groove 23 between end plate 12 and element 22. Bolts 24 secure element 22 to plate 12 and when loosened provide independent rotation of either housing 17 or casing 10.

In the modification shown, groove 23 is formed by machined portions in both element 22 and plate 12. However, it is to be understood that the groove could be formed by providing a countersunk portion of sufficient depth in only one

of the elements. However, it is preferred that groove 23 be formed in such fashion that tightening of bolts 24 causes the housing flange to be snugly held between the elements anchoring the housing against movement relative to the rotor casing.

In order to secure the starter to an engine a flange member 25 is provided on the housing. The flange member has a central aperture for rotatably receiving the housing and a concentric series of apertures 25a to facilitate bolting of the flange to the engine. The mounting of the flange on the housing is such that either may be rotated independently of the other to selected positions. Set screw 26 is provided to secure the flange to the housing after proper adjustment has been made.

It is believed that the operation of this invention is obvious from the foregoing description. The starter may be assembled with housing 17 rotatably secured to the rotor casing. The nose of housing 17 is inserted within the engine opening, not shown in the drawings, and the flange 25 is secured to the engine. In this condition the rotor casing may be rotated independently of housing 17 or the engine or if preferred, the bolts 24 may be tightened and the rotor casing and drive connection housing may be rotated as a unit within flange 25. In any event, the rotor casing is rotated into a selected position in which the power fluid connections, not shown in the drawings, may be most readily secured to fittings 10a and 10b, respectively. These fittings, as shown in Fig. 2, have an opening through protruding ears of cylinder 10 whereby the connections may be fitted to either end and the unused end plugged.

When the power fluid connections have been made set screw 26 and bolts 24, or either of them as the case may be, are tightened to complete the installation.

In the modification shown in Fig. 3, the rotor casing cylinder 30 and engine drive connection housing are similar to those shown in Figs. 1 and 2. However, the rotor casing and housing 17 are out of axial alignment to accommodate reduction gears between the end of shaft 31 extending from the rotor casing and the complementary end of shaft 32 on which the drive connection sleeve and ring are mounted. These gears comprise the pinion 33 keyed to shaft 31 and gear 34 keyed to shaft 32 and meshing with the pinion.

End plate 35 is adapted to receive the transmission housing 36 which is secured thereto by bolts 37. A plurality of bolts 37 are used and housing 36 may be fastened to plate 35 in a plurality of positions. Plate 35 may have separate bolts securing it to cylinder 30. Housing 36 has a face portion 36a similar to the face of plate 12 and adapted to receive housing 17 in a similar fashion with the rotatably adjustable joint therebetween. Flange 25 is mounted on housing 17. This mounting as in Figs. 1 and 2 permits relative rotation therebetween until the set screw 26 is tightened.

The operation of this modification is similar to that of the device shown in Figs. 1 and 2. The transmission housing may be adjusted and fastened to the rotor casing in a selected position. The rotatably adjustable joint is provided between the transmission housing and housing 17 which permits relative rotation therebetween. Housing 17 may be fastened to flange 25 in any selected position. Thus, in installing the starter in an engine, the starter is placed in a position to facilitate connection of its inlet and outlet ports 10a and 10b with the power fluid connections.

It will be seen that the objects of this invention have been accomplished. The arrangement is such that the rotor casing in installation may be placed in a selected position to facilitate connection of the device with power fluid fittings. There has been provided a turbine type starter which, with the necessary pipe fittings, will occupy a minimum of space when installed. The construction is such that the rotor casing and drive connection housing may be rotated independently in installation.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having described my invention, I claim:

1. In a gas driven starter for an engine having a casing with a rotor journaled therein and a housing with an engine drive connection mounted therein, an adjustable connection between the casing and housing providing a plurality of installation positions therebetween, a flange member rotatably mounted on the housing and adapted to be secured to the engine and means for anchoring the flange member to the housing whereby installation of the starter is facilitated.

2. A device as in claim 1 wherein the casing and housing are out of axial alignment.

3. In a gas driven starter for an engine having a casing with a rotor journaled therein and a housing with an engine drive connection mounted therein, an element removably mounted on the casing to form an internal annular groove therebetween, an outturned flange on the housing extending into said groove, means to secure the flange in the groove against relative movement in a selected position and a flange member releasably securable to the housing in a selected position relative to the longitudinal axis of the housing and said flange mountable on the engine.

4. In a gas turbine type starter for an engine having a casing with a rotor journaled therein, a housing with an engine drive connection mounted therein, a transmission gear housing between the casing and drive connection housing, meshing gears therein operably connecting the rotor and drive mechanism, the mountings of the casing and drive connection housing on the transmission housing providing for independent rotation of the casing and transmission housing about the longitudinal axis of the drive connection housing and means for securing the housing in a selected position along its longitudinal axis to the engine whereby installation of the starter is facilitated.

5. In a starter for an internal combustion engine, a motor including a casing, a drive connection for the motor and housed within the casing adapted to operably engage a fly wheel of an internal combustion engine, said casing having a part adapted to extend through an engine housing, said casing part having an opening to provide for engagement of the drive connection with an engine fly wheel, and a flange member releasably securable to the casing part

at a selected rotational and axial position thereon whereby mounting of the starter upon the engine is facilitated.

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