April 30, 1940. H. BAER ET AL 2,199,328

ENGINE STARTING APPARATUS

Original Filed Aug. 1, 1935

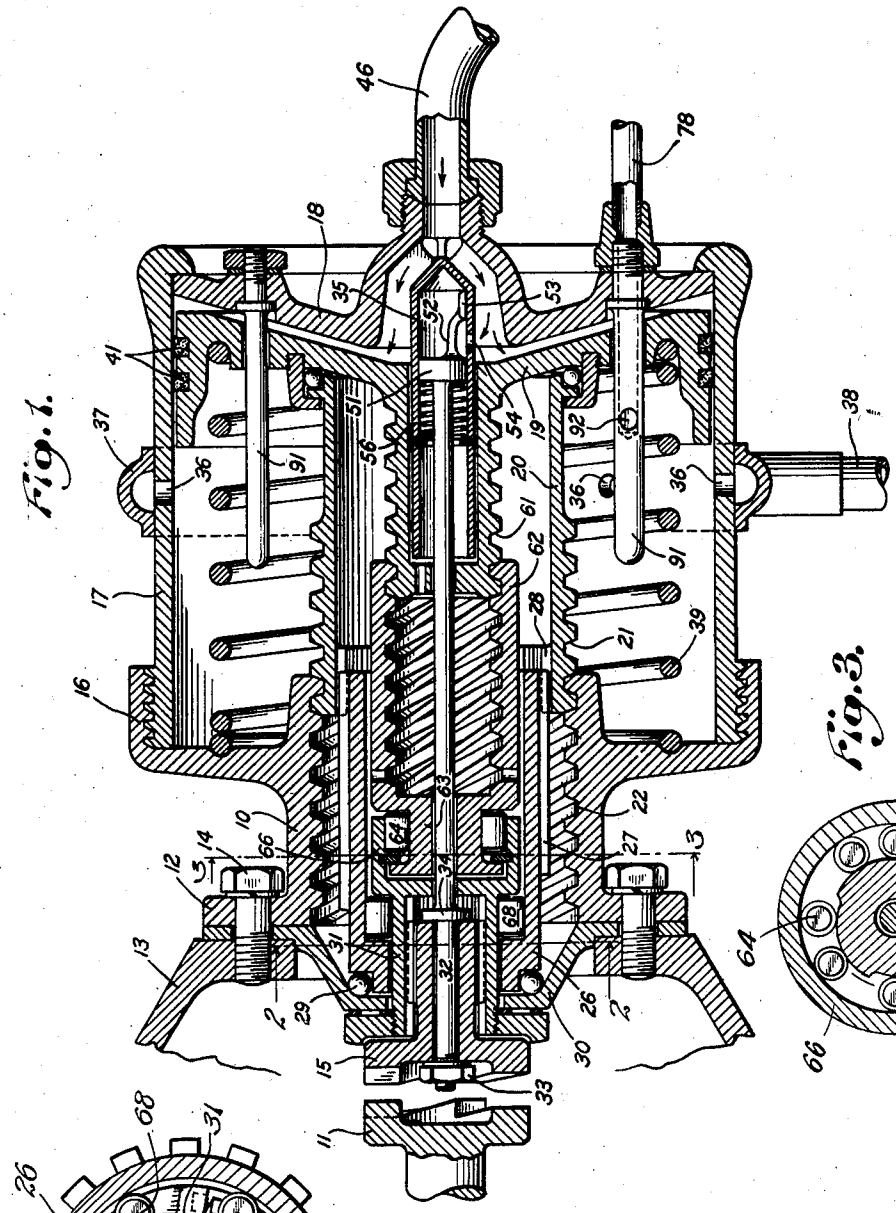


Fig. 1.

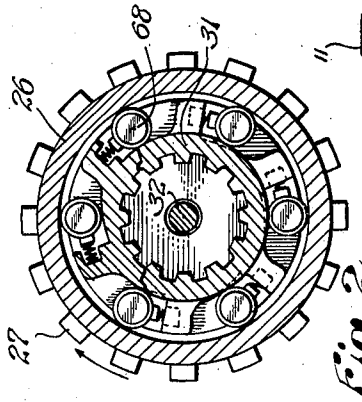


Fig. 2.

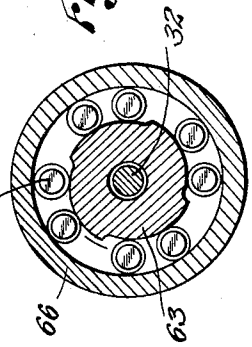


Fig. 3.

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ENGINE STARTING APPARATUS

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Original application August 1, 1935, Serial No. 34,286, now Patent No. 2,154,555, dated April 18, 1939. Divided and this application February 12, 1937, Serial No. 125,496

2 Claims. (Cl. 121—37)

This invention relates to engine starters, and particularly to those of the type having an engine engaging member which is movable to engaging position to impart initial rotary movement to the engine crankshaft, and subsequently retracted, or "demeshed" when the cranking effort is discontinued.

An object of the invention is to provide means for holding the engine engaging member in engine engaging position until the engaged engine member has attained a speed greater than that of the engine engaging member, such holding being effected by a novel method of operation which includes the step of utilizing energy derived from the same source as that which supplies the cranking force.

When the source of energy is a fluid under pressure, as in the embodiment illustrated in the accompanying drawing, the holding means for the engine engaging member preferably takes the form of a mesh controlling piston movable in response to application of the fluid pressure, and having pressure trapping means associated therewith to hold the piston (and hence the engine engaging member) in the effective position until the engaged element of the engine runs ahead of i. e., "over-runs"—the engine member of the starter.

In the illustrated embodiment the starter is shown as of the type including a piston (distinct from the mesh controlling piston above described) reciprocable within a fluid receiving chamber, the motion of the piston being converted into rotation of the engine engaging member by suitable translating mechanism; but it is to be understood that the drawing is for the purpose of illustration only and is not to be construed as a limitation of the scope of the invention, reference being had for this purpose to the appended claims.

In the drawing:

Fig. 1 is a longitudinal sectional view of a device embodying the invention;

Fig. 2 is a transverse sectional view along line 2—2 of Fig. 1; and

Fig. 3 is a transverse sectional view along line 3—3 of Fig. 1.

With reference to the drawing, and more particularly to Fig. 1, the piston and engine starting gear unit comprises a body member 10 having a flange 12 by which it is secured to the engine crankcase 13 as by bolts 14, the flange being conveniently of a size standardized for aircraft engine starters. The engine crankshaft, or other drive shaft (not shown) is provided with an engine jaw 11 engageable by the starter jaw 15 as will be later more fully described.

Screw threaded in a quickly detachable manner to an annular flange 16 integral with the body 10 is a cylinder 17 having a closed head 18, and slidably fitted within the cylinder is a piston comprising the head 19 secured to the rotatable cylindrical piston body 20, the piston body 20 and the main starter body 10 being provided with cooperating helical grooves 21 and 22. A sleeve 26 is internally drivably connected with the piston body 20 by splines 27 and 28 which permit the axial travel of the piston body relative to the sleeve, but restrain these two parts to unitary rotation. An anti-friction thrust bearing 29 is preferably interposed between the end of the sleeve 26 and a nose piece 30.

The starter jaw 15 is splined for limited axial travel within a second sleeve 31 and is normally retained in the position shown by a central rod 32 which is connected to the jaw 15 as by the nut 33 and shoulder 34.

This rod has a piston fit within the bore of a sleeve 35 which is integral with the cylinder head 18, the head 51 of the rod being exposed to the gas pressure within the cylinder 17. Trailing from the head 51 is a tail piece 52 having a portion 53 constituting a slide valve adapted to close the port 54 in cylinder 18 when the piston moves forward to a sufficient extent to mesh the parts 15 and 11, such forward movement being yieldedly opposed by the spring 56. As shown the cylinder 35 is received within the bore of the externally threaded extension 61 formed centrally of the piston head 19 and engageable with a correspondingly internally threaded sleeve 62 terminating in a portion 63 of reduced diameter constituting the inner race of an overrunning clutch 64, the outer race being constituted by the extending socket 66 of an internally splined sleeve 31 previously described. This sleeve 31 constitutes the inner race of a second overrunning clutch 68, the outer race of which is constituted by the previously described sleeve 26.

Exhaust ports 36 are uncovered by the piston at the left-hand end of its stroke and an exhaust ring 37 preferably collects the discharge so that it may be led away to any desired point by a suitable pipe 38. A spring 39 normally maintains the piston at the right-hand end of its travel as shown, and the piston is preferably equipped with a pair of piston rings 41. The cylinder head 18 is provided with a pipe 46 which may be connected to the breech of a cartridge firing mechanism, as in Fig. 3 of our Patent No. 2,154,555

granted April 18, 1939, or to a pressure chamber, as in Fig. 2 of said patent.

In order to hold the piston head 19 against rotation, a plurality of rods 91 are caused to extend through apertures in the piston head, the outer end of the rod being fixedly secured in the stationary head 18. One of these rods 91 is apertured as indicated at 92 and is also longitudinally bored to permit passage of fluid into the pipe 78 from the space to the right of the piston head 19 when the latter has advanced to the left to a sufficient extent to uncover the said port 92.

This application is a division of application Serial No. 34,286, filed August 1, 1935, which has matured into Patent No. 2,154,555, issued April 18, 1939.

What is claimed is:

1. In a device of the class described the combination with an engaging member, of actuating means including a reciprocable part operative in one position to hold said engine engaging member disengaged from the engine, and in another position to hold said engine engaging member engaged with the engine, a fluid receiving chamber and means for supplying pressure fluid to said chamber to move said reciprocable part from said first-named position to said second position, and means for holding said reciprocable part in said second position even after the exhaust of pressure fluid from said chamber, said last-named means including a second chamber into which a part of the pressure fluid enters after passing through said first-named chamber, and means movable with said reciprocable part to trap said fluid in said second chamber.

2. In a device of the class described the combination with an engaging member, of actuating means including a reciprocable part operative in one position to hold said engine engaging member disengaged from the engine, and in another position to hold said engine engaging member engaged with the engine, a fluid receiving chamber, means for supplying pressure fluid to said chamber to move said reciprocable part from said first-named position to said second position, means for holding said reciprocable part in said second position even after the exhaust of pressure fluid from said chamber, said last-named means including a second chamber into which a part of the pressure fluid enters after passing through said first-named chamber, means movable with said reciprocable part to trap said fluid in said second chamber, and engine operated means engageable with said engine engaging member to return said reciprocable part to its initial position and, by the same action, release the fluid trapped in said second chamber.

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