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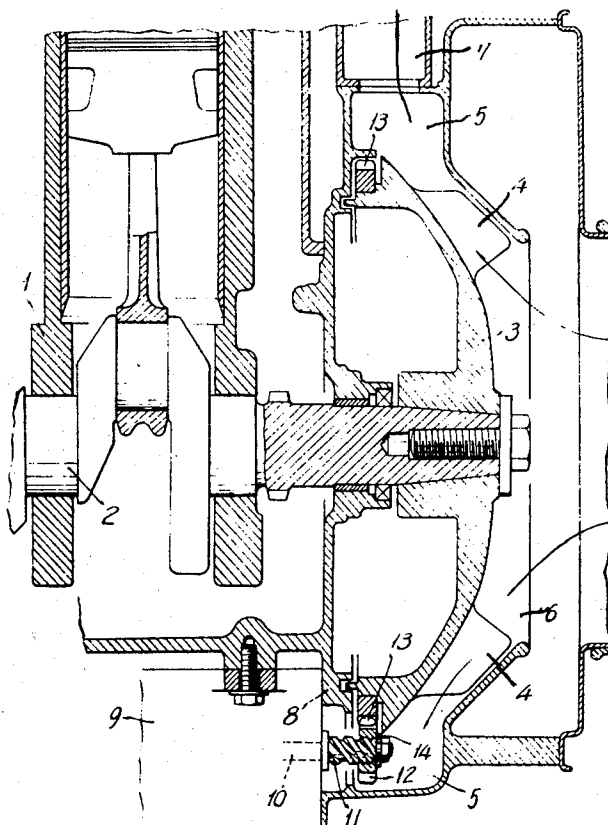
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[54] **IMPELLER-CONNECTED ENGINE STARTING APPARATUS**
4 Claims, 1 Drawing Fig.

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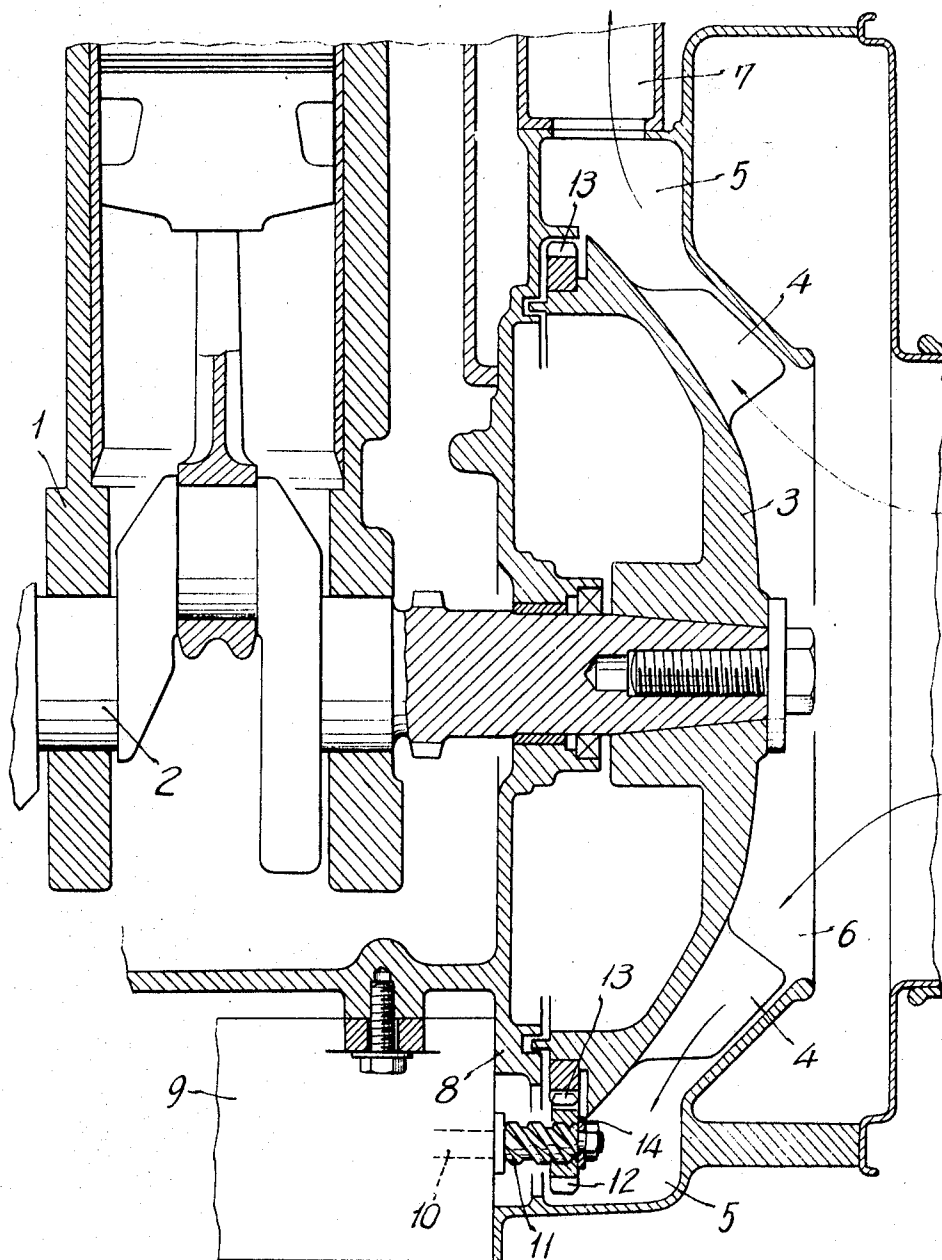
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ABSTRACT: An impeller is connected with a crankshaft of an engine and is positioned in a chamber for the conveyance of air, the impeller being formed with a gear. A starter motor drives a threaded shaft on which a pinion is mounted for travel between a first position in engagement with the gear on the impeller and a second position out of engagement with this gear. When the starter motor is actuated the pinion travels to its first position and the crankshaft is driven through the impeller, whereas after the engine has started the pinion is driven to its second position.



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IMPELLER-CONNECTED ENGINE STARTING APPARATUS

BRIEF SUMMARY OF THE INVENTION

This invention relates to apparatus for the starting of internal combustion engines.

An object of the invention is to provide starting apparatus which utilizes an impeller connected to the engine crankshaft and serving for conveying clean air either for engine cooling purposes or for supply of air to the passenger compartment. As a consequence the starting apparatus is placed in a clean environment which prolongs its proper operation. Also the construction is simplified as will be shown later.

According to the invention, a gear is rigidly formed on the impeller and a starter motor is coupled to the gear on the impeller via means during engine starting and is decoupled after the engine has started and has reached a speed of rotation greater than the motor.

Said means comprises a pinion which travels on a threaded shaft driven by the starter motor between a first position in engagement with the gear on the impeller and a second position out of engagement with said gear.

BRIEF DESCRIPTION OF THE DRAWING

The sole FIGURE of the drawing is a longitudinal cross section taken through the apparatus according to the invention.

DETAILED DESCRIPTION

Referring to the drawing, numeral 1 denotes an engine cylinder block, and numeral 2 denotes a crankshaft of the engine. An impeller 3 is fixed to one end of crankshaft 2 and numeral 4 denotes the blades of the impeller. The impeller rotates in an impeller chamber 5 surrounding the impeller 3. Numeral 6 denotes a suction opening in the front surface of chamber 5 and number 7 denotes an air conduit pipe for supplying the air under the action of blades 4 to the engine, the passenger compartment or the like. Numeral 8 denotes the rear wall surface of the impeller chamber 5. The construction described to this point is conventional.

A starter motor 9 for engine starting is attached to the outside of the rear wall surface 8, and a screw 11 at the end of a spindle 10 projects into the interior of the impeller chamber 5, and a movable pinion 12 is loosely mounted in threaded engagement on the screw 11. The impeller 3 has, rearwardly of the blade 4, a large diameter starting gear 13 fixed thereto, and the movable pinion 12 is detachably engageable therewith.

When the engine is stopped, the movable pinion 12 is in an inoperative position at the left of the illustrated position so as to be separated from the starting gear 13. To start the engine, the starter motor 9 is started to rotate the screw 11. The movable pinion 12 is then brought, owing to its own inertia, in relative rotation to the screw 11 to move to the right, and is then stopped in its rightward movement by striking against a stopper 14 after meshing with the starting gear 13, whereby

the starting gear 13 is rotated and the engine is started. After the engine is started, the movable pinion 12 is in turn rotated by the starting gear 13 so as to be at a higher speed than the screw 11, whereby the pinion 12 is moved to the left and is separated from the starting gear 13 to return to its original inoperative position.

Thus, in accordance with this invention, the engine cooling impeller 3 is attached to the starting gear 13 so as to be utilized as a starting mechanism, so that there is brought about the advantage that the construction can be simplified. As the freshest air possible is to be used for engine cooling, the impeller housing is such that mud, dust or the like is prevented from entry therein. According to this invention, the starting parts, e.g. gears and the like are provided within the impeller chamber 5 as such, so that there is the advantage that these parts are in a clean environment and remain reliable in operation and are high in durability. Additionally, the pressure at that portion behind the blade 4 in the impeller chamber 5 is higher than atmospheric pressure, so that even if there is a small gap between the starter motor 9 and the rear wall surface 8, contaminated external dirty air will not enter the impeller chamber 5, but rather the air within the impeller chamber 5 leaks slightly to the outside through such gap. Accordingly, it is advantageous that the starter motor 9 is not required to be affixed in airtight relation to the rear wall surface 8 and thus the attaching of the starter motor 9 can be simplified.

What I claim is:

1. In an air-cooled engine having a crankshaft; an impeller connected to said crankshaft and adapted to convey cooling air thereto; a chamber; said impeller being rotatably mounted in said chamber, said chamber having a front air inlet portion and a rear air outlet portion providing a region of generally increased atmospheric pressure during rotation of said impeller; an engine starting apparatus comprising a starter motor; gear means on said impeller; and means coupling said starter motor and gear means for driving the impeller from the motor when the engine is being started and for decoupling the impeller and motor after the engine has started and the impeller rotates at a speed greater than the motor, said gear means and said coupling means being positioned in said chamber in the region of increased atmospheric pressure so as to prevent contamination thereof when subjected to passage of cooling air through said chamber.

2. An engine as claimed in claim 1 wherein said means for coupling said starter motor and gear means comprises a threaded shaft driven by said motor, and a pinion in threaded engagement with said shaft and displaceable therealong between a first position in engagement with said gear and a second position out of engagement with said gear.

3. An engine as claimed in claim 1 wherein said starter motor is attached to said engine adjacent the air outlet end portion of said impeller chamber.

4. An engine as claimed in claim 2 comprising stop means mounted on said shaft for limiting displacement of the pinion when the pinion reaches its impeller driving position.

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