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(54) **INTERNAL COMBUSTION ENGINE WITH CARTRIDGE STYLE WATER PUMP ASSEMBLY**

(56) **References Cited**

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(57) **ABSTRACT**

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An internal combustion engine includes a cylinder block having a cylinder head connected to an upper end thereof. A front end of the cylinder block has a coolant introduction passage. A timing chain provided at the front end is engaged to a camshaft sprocket associated with the cylinder head. A timing chain cover is mounted to and spaced forward of the cylinder block front end. A water pump assembly includes a pump housing and an impeller assembly. The pump housing is directly secured to the cylinder block and interposed between the timing chain cover and the front end of the cylinder block. The pump housing has a pump chamber in fluid communication with the coolant introduction passage. The impeller assembly is removably mounted in the pump chamber without removal of the timing chain cover. An end of an impeller drive shaft extends forward of the timing chain cover.

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See application file for complete search history.

20 Claims, 6 Drawing Sheets

