HEAT EXCHANGER WITH INTEGRAL PUMP

Inventor: Jens Schneemann, Wolfenbuttel (DE)

Correspondence Address:
BAKER & BOTTS
30 ROCKEFELLER PLAZA
NEW YORK, NY 10112

Appl. No.: 09/834,010
Filed: Apr. 12, 2001

FOREIGN APPLICATION PRIORITY DATA
Apr. 12, 2000 (DE)..............100 18 0469

PUBLIC CLASSIFICATION
Int. Cl. 7 .....................B63H 21/10
U.S. Cl. ........................440/88

ABSTRACT
A heat exchanger has a housing with a housing cover, in fluid connection with a pump. The pump is arranged integrated into the housing cover. Advantageously, the pump is designed as an impeller pump and the heat exchanger is functionally connected with a drive engine of a watercraft.
HEAT EXCHANGER WITH INTEGRAL PUMP

BACKGROUND OF THE INVENTION

[0001] The invention relates to a heat exchanger with a housing having a housing cover and which is operatively connected with a pump.

[0002] Heat exchangers of this kind disadvantageously are relatively complex in design with respect to connection with a pump, and consequently a relatively large structural volume may be required. Further, the connection between the heat exchanger and pump may be difficult to install and maintain, particularly when installed below deck in a watercraft.

[0003] It is an object of the invention to provide a heat exchanger which is compact, structurally simple in design, and easy to install and maintain.

SUMMARY OF THE INVENTION

[0004] To accomplish this object, a heat exchanger is provided with an improvement wherein the pump is arranged integral into the housing cover of the heat exchanger. An integrated arrangement of the pump in the housing cover advantageously makes it possible to design the heat exchanger and pump assembly as a compact structural unit. At the same time, the pump integrated into the housing cover can be functionally connected with the heat exchanger in a manner favorable for installation and maintenance. With a smaller volume for the heat exchanger/pump assembly, there is a reduction in the number of structural units, particularly with regard to the structural design and connection to the pump. The pump has no separate pump housing to be functionally connected with the heat exchanger, but is completely or at least partially integrated into the cover of the housing of the heat exchanger. The housing cover of the heat exchanger thus has a double function, namely the function of a cover of the heat exchanger as well as the function of a pump housing. Since the housing cover is separable from the heat exchanger, the possibility of flexible preassembly of the pump in the housing cover is provided. In addition, a pump integrated into the housing cover permits weight-saving structural design of the heat exchanger/pump assembly. This integration eliminates complicated hose or other connections between the heat exchanger and the pump.

[0005] The pump advantageously is designed as an impeller pump, that is, a vane-type or propeller pump. Since such an impeller pump usually has a relatively large structural volume, its integration into the housing cover of the heat exchanger is advantageous, in particular with regard to reduction of the total installation volume, number of structural parts and the weight of the parts.

[0006] The heat exchanger installed in a watercraft advantageously is functionally connected with a drive engine of the watercraft. A heat exchanger with a pump integrated into the housing cover is suitable for effective and reliable cooling of a drive engine in marine use. Because of the reduction in structural parts, particularly with regard to the connection between the heat exchanger and the pump, failure rates of the heat exchanger system, for example defective hoses, may be reduced.

[0007] According to a preferred watercraft installation, the pump draws cooling water from the body of water surrounding the watercraft. The surrounding water is therefore utilized as cooling medium for the heat exchanger, for cooling the drive engine connected with the heat exchanger. Consequently, the drive engine of a watercraft may be cooled in a particularly simple, reliable and effective fashion by means of compact heat exchanger/pump assembly using the surrounding water.

[0008] Advantageously, a pump chamber, an inlet opening and an outlet opening of the pump are integrated into the housing cover. In this way the cooling fluid goes directly into the housing cover and thus into the heat exchanger, so that effective cooling of a drive engine functionally connected with the heat exchanger is made possible.

[0009] The heat exchanger preferably is designed as the main heat exchanger for an engine, but may also be used as a compressor air cooler or as a motor-oil cooler. Because of the compact design of the heat exchanger/pump assembly, it may be used in a versatile manner for cooling a variety of components.

[0010] The housing cover advantageously is designed in two parts, where a first housing cover part defines a pump chamber accommodating an impeller and a second housing cover part is designed as a bearing housing for a pump shaft. Such a two-part arrangement of the housing cover advantageously makes it possible to ensure accessibility to the integrated pump for easy installation and maintenance, without necessarily having to remove the entire housing cover. Removal of the second housing cover from the first housing cover part makes the pump accessible from outside in relatively rapid and simple fashion.

[0011] According to a preferred embodiment, the pump is arranged in a structural unit separable from the heat exchanger, consisting of a bearing housing, an impeller, a pump shaft and a belt pulley. This structural unit of the pump, separable from the heat exchanger, advantageously is used in a two-part design of the housing cover. Removal of the bearing housing part allows the pump unit to be separated from the heat exchanger for easy assembly and maintenance. This is especially advantageous, since flexible preassembly of this structural unit is possible and, in addition, rapid and trouble-free replacement of individual structural unit of the pump is possible.

[0012] Additional advantageous developments of the invention follow from the description of an example, explained in detail below with the aid of the associated drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1, shows a side view of a heat exchanger according to the invention with a pump integrated into the housing cover.

[0014] FIG. 2, a bottom view of the heat exchanger of FIG. 1.

[0015] FIG. 3, a plan inside view of a housing cover removed from the heat exchanger of FIG. 1.

DESCRIPTION OF THE INVENTION

[0016] FIGS. 1 and 2, illustrate an embodiment of the heat exchanger 10 which is provided with a housing 12 and a housing cover 11. A pump is arranged integrated into
housing cover 11. The housing cover 11 is fabricated in two parts, a first housing cover part 29 and a second housing cover part 30, separable from the cover part 29. The first housing cover part 29 has an inlet opening 14, designed as a connecting piece, through which cooling fluid enters in the direction of arrow 15 drawn by the pump 13 into the heat exchanger and is conveyed according to arrows 19 first into a pump chamber 20 in the housing cover 11 and then flowing through the heat exchanger 10. The second housing cover part 30 is designed as a bearing housing 21 for a pump shaft 28 of the pump 13. The pump shaft 28 carries a belt pulley 22 at its outer end, which may be driven, for example, by connection to an engine shaft. The second housing cover part 30 is separably fastened by means of a plurality of fastening members 27, which may be bolts threaded into the first housing cover part 29.

[0017] FIG. 3, shows a plan view of the interior of housing cover 11, removed from the heat exchanger 10 (see FIGS. 1 and 2). An impeller 26 of the pump 13, which is driven by pump shaft 28 about an axis of rotation 25 for producing a rotary motion according to arrow 31, is arranged in the housing cover 11. The rotating impeller 26 sucks a cooling fluid in the direction of arrow 15 through the inlet opening 14, into the housing cover 11 and conveys the same according to the arrows 16, 17, 18, 19 into the pumping chamber 20, which is likewise located in the housing cover 11. From the pumping chamber 20 the cooling fluid flows through the heat exchanger 10 (see also FIGS. 1 and 2) and is therefore used as cooling medium for cooling primary fluid, for example, from a drive engine. The housing cover 11 has a plurality of fastening members 24 which may be bolts by which housing cover 11 with the integrated pump 13 is mounted to the associated housing 12 of the heat exchanger 10. In addition, the fastening members 27 provide for separate connection of the second housing cover part 30 to the first housing cover part 29 and are shown schematically in FIG. 3.

[0018] When the fastening members 27 are disconnected, the bearing housing 21, together with the impeller 26, the pump shaft 28 and the belt pulley 22, may be removed from the heat exchanger 10 and/or from the first housing cover part 29.

[0019] The heat exchanger 10 may be used as a main heat exchanger of an engine such as a watercraft engine. It may also be used as a compressor air cooler or as a motor-oil cooler. The pump 13 may be designed as a cooling water-impeller pump and used together with the heat exchanger 10 for cooling a drive engine of a watercraft. In such marine use, the pump 13 draws the water surrounding the watercraft for use as cooling fluid in heat exchanger 10. The impeller 26 is preferably made of synthetic material, such as rubber, neoprene, nitrile or the like.

[0020] The heat exchanger 10 with the pump 13 integrated into the housing cover 11 advantageously is designed to be especially compact and easy to assemble and maintain, the impeller 26 of the pump 13, for example, is accessible from outside in simple and rapid fashion by simple unscrewing of the bolts 27 and/or 24 respectively.

[0021] While there has been described what is believed to be the preferred embodiment of the present invention, those skilled in the art will recognize that other and further changes and modifications may be made thereto without departing from the spirit of the invention, and it is intended to claim all such changes and modifications as fall within the true scope of the invention.

I claim:
1. In a heat exchanger having a housing with internal passages and a housing cover, the improvement wherein said housing cover includes a pump for circulating fluid through said heat exchanger.
2. The improvement specified in claim 1 wherein said pump is an impeller pump.
3. The improvement specified in claim 1 wherein said housing cover includes a pump chamber, an inlet opening and an outlet of the pump.
4. The improvement specified in claim 1 wherein said housing cover has a first housing cover part defining a pump chamber for accommodating an impeller and a second housing cover part having a bearing housing for a pump shaft.
5. The improvement specified in claim 4 wherein said second housing cover part is arranged to be separable from said heat exchanger as a structural unit and includes said bearing housing, an impeller, a pump shaft and a pulley.
6. A watercraft having a drive engine and a heat exchanger arranged to cool said drive engine, wherein said heat exchanger includes a housing having internal passages and a housing cover, wherein the housing cover includes a pump for circulating water through said heat exchanger, and wherein said heat exchanger is connected to cause said pump to circulate water surrounding said watercraft through said heat exchanger.

* * * * *