COOLING SYSTEM FOR LIQUIDS USED IN MACHINE TOOLS AND SIMILAR APPLIANCES

Maxime Louis Jentet, Chaton, Seine-et-Oise, France, assignor to Societe Anonyme des Usines Chanson, Aisnière, France, a company of France

Filed June 24, 1963, Ser. No. 289,916

Claims priority, application France, July 2, 1962, 902,702, Patent 1,358,889

3 Claims. (Cl. 165—106)

The present invention relates to a device for cooling and checking temperature, more particularly of oils used for lubrication or the control of hydraulic devices, in particular in machine-tools.

This device makes it especially possible to maintain liquids, for example, lubricating oils or other liquids at substantially constant temperatures or comprised between narrow temperature tolerances, which, in certain machines, is very important.

As is well known, for retaining the effectiveness of oils, it is essential to maintain their heating within given temperature limits, which are often very narrow.

In accordance with the invention, for cooling and checking the temperature of oils or other liquids, certain parts of the liquid, a cooling circuit is put into thermal connection with a coolant in liquid phase, contained in a scaled casing connected to a circuit of which at least a part forms a heat exchanging element for the condensation of vapours coming from the scaled casing.

The invention also applies to a device characterized in that it comprises a scaled systemic unit into which contains a charge of coolant, and at least, a coil connected to an oil cooling circuit and in contact with the fluid, said scaled casing communicating with at least two tubes joined by a heat exchanger element forming a condenser.

Various other characteristics of the invention will moreover be revealed by the detailed description which follows.

A form of embodiment of the purpose of the invention is shown, by way of non-restrictive example, in the attached drawing.

FIG. 1 is a diagrammatical elevation of a device according to the invention.

FIGURE 2 is an elevation of an alternative.

According to the invention, the oil is pumped into a coil placed in a casing defining a scaled system which contains a coolant having a relatively low vapourisation temperature, which may be that known under the name of R12 or R22.

This scaled system is not, however, completely full of coolant in liquid phase, so that the heat given off by the coil causes the vapourisation of said coolant fluid, whose latent vapourisation heat is thus used for cooling the oil. The part of the vapourised coolant is then brought into contact with a heat exchanging element intended to ensure its cooling, and hence, its condensation, so that a vapourisation effect is produced in said scaled system similar to that set up in the circuit of a refrigeration appliance.

According to the drawing, the casing 1 is partly introduced into the oil tank 2 which also contains a pump 3, geared, for example, actuated by the motor 4. The oil level, denoted by the reference numeral 20, is controlled in such manner that it appreciably rises above the top part of the casing.

In the example of embodiment shown, the device provides for the simultaneous cooling of three oil circuits, the casing 1 contains three coils or other independent heat exchangers 6, 6a, connecting the pump and three pressure regulators 7, 7a, 7b, which are provided to adjust suitably the oil pressure in the different circuits. A collector tube 9 is provided for the return of the oil from the circuits to the tank 2.

The casing 1 is also provided with an outlet 10, enabling the casing to be emptied of air, then filled with coolant fluid. The position of this outlet is chosen so that it enables the exact level of the coolant fluid in liquid phase to be known, denoted by the reference 11 and which is determined so as to cover the coils.

A tube 12, communicating with the inside of the sealed casing 1 above the level 11 of the coolant fluid, leads to the upper part of a heat exchanger 13 forming a condenser whose outlet is connected by a tube 14 to the lower part of the sealed casing 1.

The condenser can be of any current type. That of the drawing, according to a construction found to be advantageous, comprises two collector receptacles 15, 15a placed with their symmetry axes in the same vertical plane and communicating by a bundle of metal tubes 17, provided with cooling fins 16 or other heat dissipators.

As shown, the condenser is preferably placed in a sheath 18 forming a common body with the housing of a fan 19, to be cooled by a discharge of sucked-in air.

Although not shown, it is obvious that it is also possible to use a condenser cooled by a circulation of water or other liquid.

The change of state resulting from the heating up of the coolant liquid in liquid phase, obviously has the effect of displacing the resulting vapour up the tube 12 towards the condenser, and condensation of the vapours is then produced in the condenser 13 located above the level 11 whereby a liquid column is produced in the condenser, the weight of which causes a rapid and permanent circulation of the coolant throughout the sealed casing.

The heat transmission of the oil to the coolant fluid takes place mainly through the coils within the casing 1, but also by that part of the surface of the casing which is in contact with the oil. This arrangement thus has the advantage of causing the continuation of cooling of the oil even when the pump 3 is stopped, the vapourisation and condensation of the coolant fluid continuing until a thermal equilibrium is obtained.

The drawing shows that it is possible to maintain the temperature of the coolant fluid appreciably constant and to this end, a valve 21 is provided, for example, on the tube 14, this valve being controlled from a thermostatic element of which 22 denotes the probe or other sensitive component arranged to be in thermal contact with the coolant.

An alternative shown in FIG. 2 applies to the case where a single device must act for simultaneously cooling several liquids, for example, in the case of a machine-tool requiring different oils or liquids for lubrication, for the control of hydraulic devices and for the cooling of tools.

The tank 2 is then divided into a number of fluid-tight chambers 2a, 2b, 2c equal to the number of liquids to be cooled, by vertical partitions 23, which are traversed by the casing 1. Consequently, to each of these chambers there corresponds a part of the surface of the casing 1. Moreover, each chamber contains a pump acting for the delivery of the respective liquid, through its coil, to utilization points. The arrangement of coils 6 inside the casing 1 is independent of the position of the chamber pertaining thereto.

The invention is not restricted to the examples of embodiment, shown and described in detail, for various modifications can be applied to it without going outside of its scope. In particular, the surface of the casing 1 can be provided with cooling fins 24 or other elements intended to speed up the heat exchange.

I claim:

1. A cooling system for the cooling of liquids in machine tools and similar appliances comprising a tank for
the liquid to be cooled, a closed casing at least partly located inside said tank and partly filled with coolant fluid in liquid state, a heat exchanger located at a level above said casing to work as a condenser and means connected in fluid communication between the top of said tank and said condenser, said heat exchanger further having means connecting in fluid communication its lower end to said casing at the bottom thereof whereby circulation of coolant is established from said condenser to said casing and from said casing to said condenser, at least one heat exchanger coil located in said casing and in fluid communication with said tank, a pump between the inlet of said coil and said tank, said tank being supplied with heated liquid whereby said liquid is circulated from said tank to said coil in thermal contact with said coolant in liquid state contained in said casing thus causing vaporisation of coolant in said casing and circulation in said heat exchanger working as condenser.

2. Cooling system as set forth in claim 1, further comprising at least one partition in said tank, said partition being connected to said casing by fluid tight connection whereby at least two compartments are provided in said tank for containing liquids having different characteristics, and a plurality of coils located inside said casing equal in number to the number of compartments provided in said tank, each of said coils being connected to an independent pump whereby several independent cooling circuits for liquids having differentiated characteristics may be operated selectively.

3. A cooling system as set forth in claim 1, further comprising a blowing system associated with said heat exchanger working as condenser.

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ROBERT A. O'LEARY, Primary Examiner.
CHARLES SUKALO, Examiner.