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(54) **System for heating the oil vapour flowing through a circuit that is external to a vehicle engine**

(57) A system for heating the oil vapour flowing through a circuit that is external to a vehicle engine is described, said system comprising the use of external pipes (1) covered with another coaxial tube (outer jacket) (4), wherein water coming from the engine cooling system is made to circulate, to produce a heat exchange effect that heats the oil vapour.

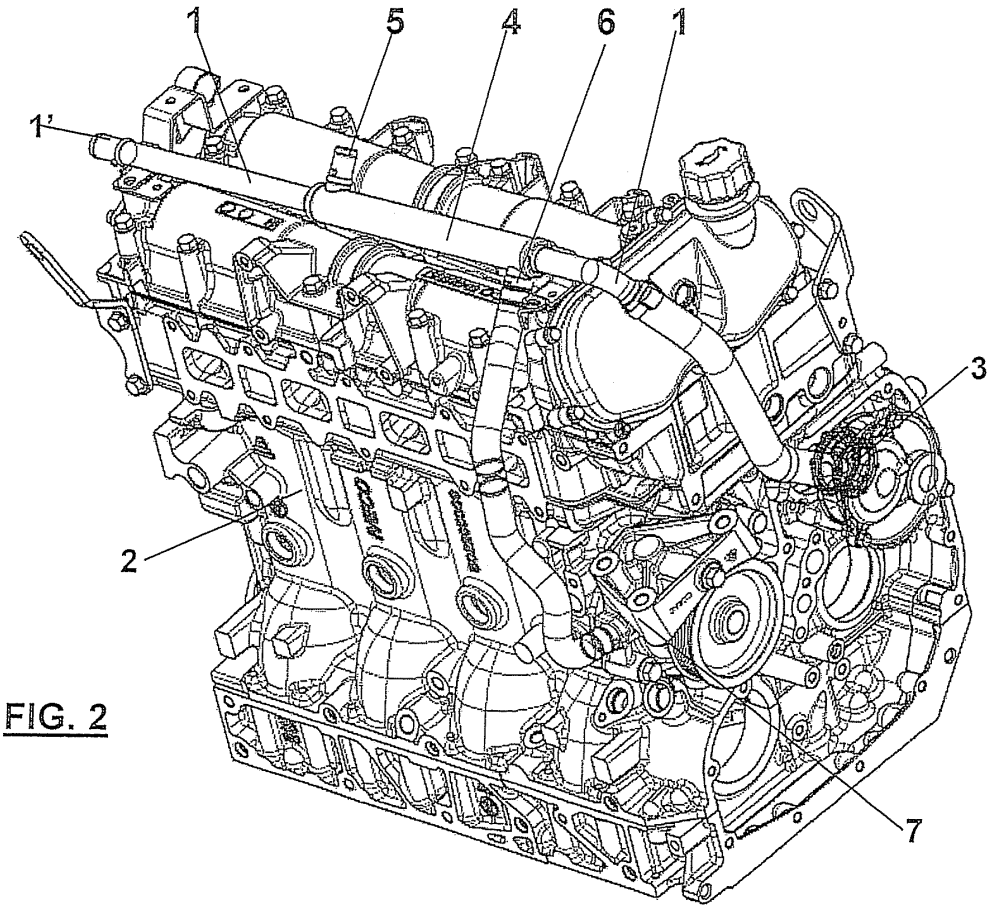

FIG. 2

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Description

[0001] The present invention relates to a system for heating the oil vapour flowing through a circuit that is external to a vehicle engine.

[0002] As is known, oil vapour, or blow-by, is produced inside the engine. The term blow-by refers to the leaking of gas between the piston/rings and barrel of the cylinder caused by the high pressure in the combustion chamber. This vapour ends up inside the crankcase which must be provided with an appropriate breather tube to prevent damage to the engine. This breather tube separates the drops of oil from the vapour, causing the oil to pass back into its circuit. A portion of the oil vapour remains as such.

[0003] In the past this vapour was released into the atmosphere, but nowadays, in order to safeguard the environment, the gas is conveyed through appropriate external pipes, and reintroduced into the air intake circuit of the engine to be burnt in the combustion process.

[0004] When weather conditions reduce the outside temperature to below zero, the oil vapour may stagnate and even freeze inside these external pipes arranged around the engine, especially when the engine has been stopped, and has cooled down, creating obstruction.

[0005] This inconvenience can lead to the development of excess pressure in the engine, which may cause the seals to break and the subsequent loss of oil.

[0006] To overcome this problem, the use of heating resistors arranged on the outside of the pipes is known in the prior art. However, these do not always suffice to ensure the best performance in all operating conditions, especially in very cold climates, leading to excessively long thermal transients. Moreover the heating resistors use a large amount of power, making it necessary to use oversized batteries, and require additional electrical wiring, thus increasing costs of production.

[0007] Therefore the purpose of this invention is to overcome the aforesaid drawbacks and to produce a system for heating the oil vapour flowing through a circuit that is external to a vehicle engine, in which the external pipes are covered with an outer coaxial jacket consisting of a tube made of metal, preferably steel, wherein water coming from the engine cooling system is made to circulate, to produce a heat exchange effect, which heats quickly and sooner than when using heating resistors.

[0008] The water that is used is preferably water discharged from the heating circuit of the driver's cab, before reintroduction into the main engine circuit.

[0009] In particular the object of the present invention is a system for heating the oil vapour flowing through a circuit that is external to a vehicle engine, as described more fully in the claims, which are an integral part of this description.

[0010] Further characteristics and advantages of the invention will be more apparent in the light of the following detailed description of a preferred embodiment thereof illustrated, by way of a non-limiting example, with the aid of the accompanying drawings, wherein:

figures 1a and 1b are two side views of the system for heating oil vapour according to the present invention;

figure 2 is an example of application of the system on an engine;

figure 3 is a graph showing the trend in time of the temperatures at different points of the engine and in different configurations.

[0011] In the drawings the same reference numbers and letters are used to indicate the same components.

[0012] In figures 1 a, 1 b and 2 reference1 indicates a conduit (pipe, duct...) which carries oil vapour coming from the engine 2, in particular from a valve 3 that separates the drops of oil from the blow-by vapour coming from inside the engine, and makes said drops pass back into the main circuit in the engine.

[0013] The remaining part of the vapour that is not converted back into oil is conveyed through the pipe 1 and reintroduced into the air intake circuit of the engine, through the opposite end of the pipe 1', by means of a system that is not illustrated, being of a type known in the prior art, for example by means of a connection to the clean air intake duct of the engine, to be burnt in the combustion process.

[0014] The pipe 1 is covered at least partially by an outer jacket 4, for example consisting of a steel tube, that creates an hollow space closed at the sides around the same pipe, provided with an inlet opening 5 and an outlet opening 6, wherein water coming from the engine cooling system, not illustrated in figure 2, is made to circulate, to produce a heat exchange effect.

[0015] The pipe couplings for connection to the cooling circuit are connected to the openings 5 and 6 in a known way. The water enters through the opening 5 and leaves through the opening 6, returning into the main engine cooling circuit through a point of introduction 7 directly into the engine water pump.

[0016] The water that is used is preferably water discharged from the heating circuit of the driver's cab, normally consisting of a line branching from the main cooling circuit, before returning to the main circuit in the engine.

[0017] The pipes are preferably made of metal (sheet metal or steel), with good heat conductivity and a low cost. The same applies for the outer jackets.

[0018] The length of the outer jacket 4 is defined according to the specific requirements of the engine on which it is used. The same applies for the diameter and length of the pipe 1.

[0019] Experiments have been carried out that certify the considerable improvement obtained using the system according to this invention.

[0020] Tests were performed in a Cold Tunnel according to the provisions of Standard 7.T1135.

- First a test was performed with the metal pipe without any heating device: with an outside temperature of below -20°C the temperature at which the vapour

was introduced into the clean air intake duct for combustion remained below zero continuously for an unlimited time (-6°C with an outside temperature of -21 °C), which is not acceptable;

- Next a test was performed with the metal pipe and heating resistor, using devices known in the prior art: with an outside temperature of below -20°C the temperature at which the vapour was introduced into the clean air intake duct remained below zero continuously for 25 minutes, which may be sufficient for some operating conditions in climates that are not particularly cold, (after 10 minutes a curve of almost zero is postulated with an outside temperature of -17°C / -18°C), but is still not acceptable for cold climates.
- Last of all a test was performed with the metal pipes provided with the system according to the invention: with an outside temperature of below -20°C, the temperature at which the vapour was introduced into the clean air intake duct only remained below zero for 10 minutes. As can be observed in the graph in figure 3, over a period of approximately 50 minutes, the thick continuous line indicates the outside temperature curve (a), almost constant at -20°C; the top dashed line (b) indicates the temperature curve of the oil vapour leaving the engine (valve 3, fig. 2); the dotted line indicates the temperature curve (c) of the water circulating in the chamber 4; the thick dash line indicates the temperature curve (e) of the oil vapour entering the pipe 1; the fine continuous line indicates the temperature curve (d) of the oil vapour discharged at point 1' and thus at the point at which the vapour enters the clean air duct, which, as can be observed, rises to above zero after 10 minutes.

[0021] It will be apparent to the person skilled in the art that other alternative and equivalent embodiments of the invention can be conceived and reduced to practice without departing from the true spirit of the invention.

[0022] For example there may be a plurality of pipes 1 each equipped with its own outer jacket 4 and connected in the same way to the engine and to the cooling circuit.

[0023] The use of the system according to this invention presents some obvious advantages.

[0024] The invention provides advantages in terms of costs, and also energy consumption, since it uses heat that is already available and does not have to be specifically generated, as in the case of heating resistors, allowing the reduction of the battery load. Moreover the system is made more reliable and economical by avoiding the use of heating resistors and the relative wiring.

[0025] By the description set forth above the person skilled in the art is enabled to implement the invention without introducing any further construction details.

Claims

1. System for heating the oil vapour flowing through a circuit that is external to a vehicle engine, comprising:

   - one or more pipes (1) suitable to convey oil vapour coming from the engine (2), and to reintroduce it into the clean air intake circuit of the engine;
   - one or more outer jackets, suitable to create hollow spaces closed at the sides and fitted around said one or more pipes (1), water, coming from an engine cooling circuit, being made to circulate in said hollow spaces, to produce a heat exchange effect suitable to heat said oil vapour.

2. System according to claim 1, **characterized in that** said one or more outer jackets (4) are connected to a heating circuit of the driver's cab of the vehicle, before reintroduction into the engine cooling circuit.

3. System according to claim 1 or 2, **characterized in that** said one or more pipes (1) and said one or more outer jackets (4) are made of metal.

4. Engine of a vehicle, **characterized in that** it is provided with a system for heating the oil vapour flowing through a circuit that is external to the engine according to any of the previous claims.

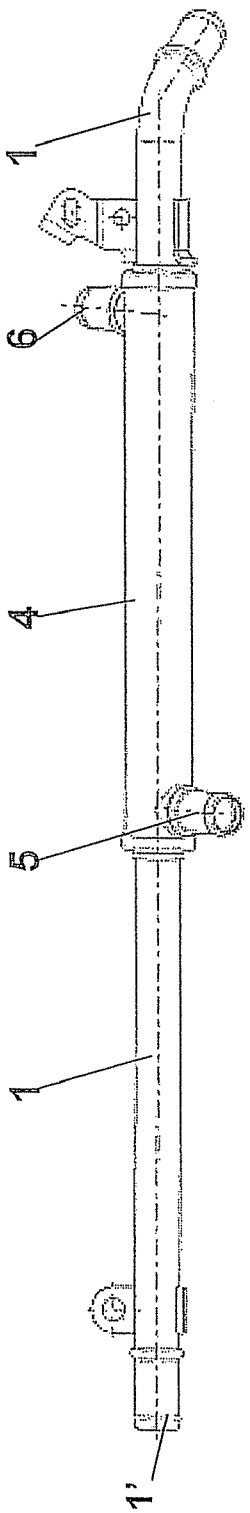


FIG. 1a

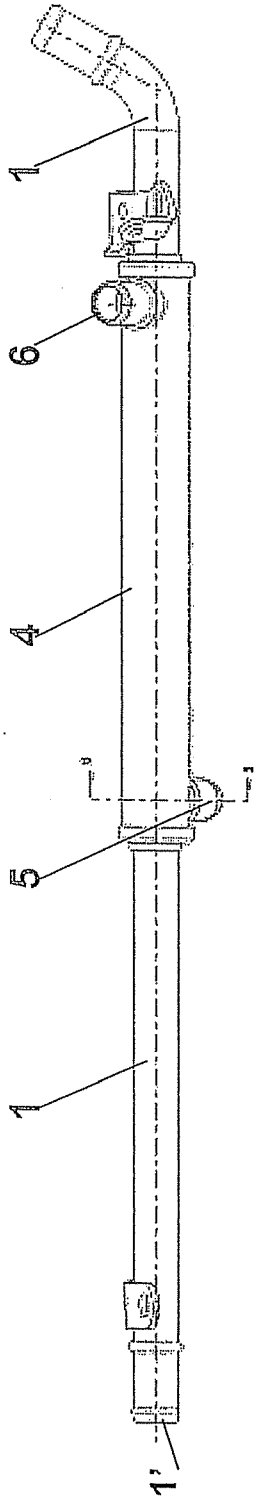


FIG. 1b

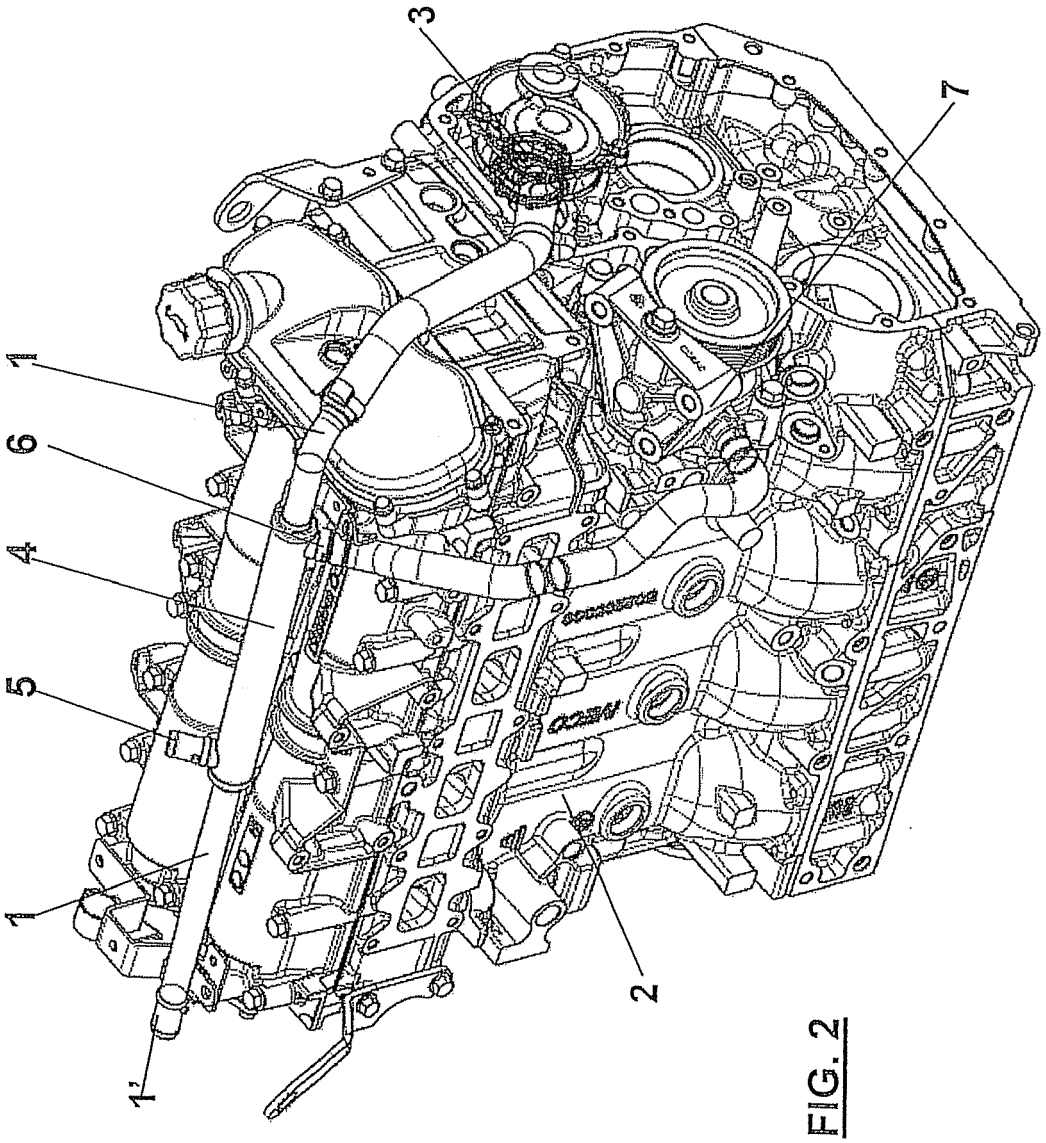
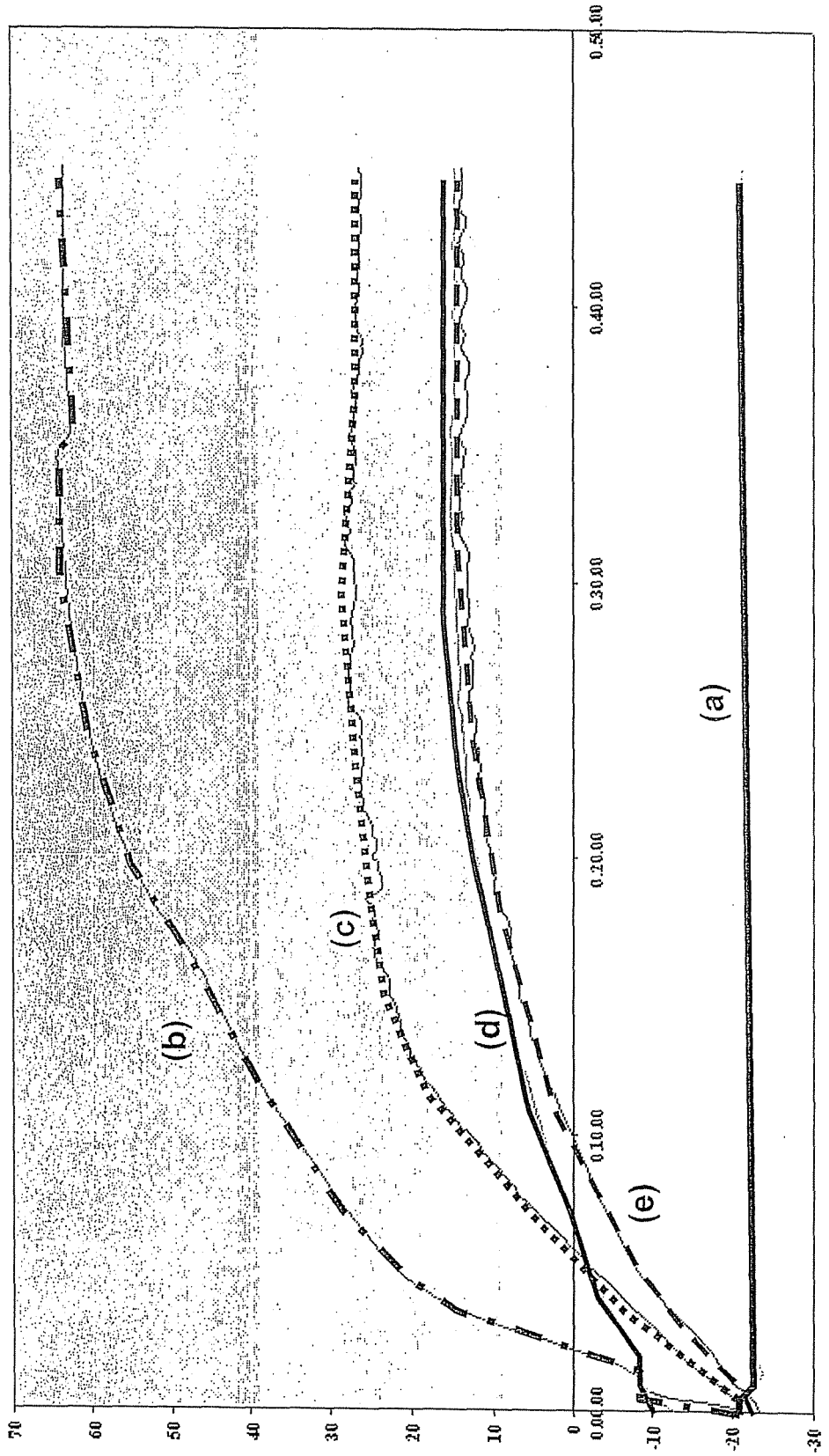


FIG. 2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(a)
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FIG. 3