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(54) A method and installation for fire fighting in connection with a combustion engine

(57) A fire fighting method in connection with a combustion engine apparatus (1) comprising at least one combustion engine unit (2) with its combustion chamber and a source (3) of fluid, comprising water, in co-operation with the combustion engine apparatus, a pressure booster device (4) for said fluid and a nozzle arrangement (5) for leading said fluid to the combustion engine unit (2). In the method, during a normal mode of operation of the combustion engine apparatus the fluid from the source (3) is elevated from the pressure level of the source to a higher pressure and fed by means of said nozzle arrangement (5) to the combustion engine unit (2). The fluid is rationed and timed in a manner which affects the operation of the engine in a desired way. By virtue of a pre-determined event said fluid is led outside (2") the combustion chamber of the combustion engine unit. The invention also relates to an installation for fire fighting in connection with a combustion engine apparatus (1), which comprises at least a flow channel arrangement (5') combining a pressure booster device (4) and a nozzle arrangement (5), and in which a fluid joint arrangement (8) is provided in the flow channel arrangement (5'). A fire fighting arrangement (9) is provided for leading the fluid to a space (2") outside the combustion chamber (2') of the combustion engine unit.

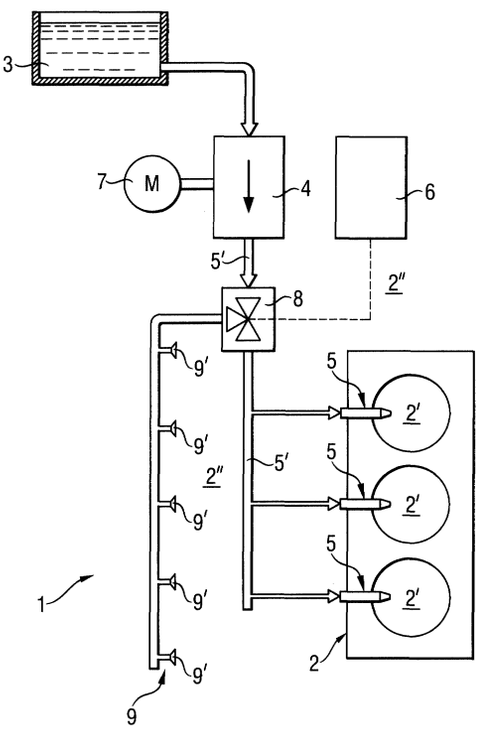

Fig. 1

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Description

[0001] The present invention relates to a method according the preamble of claim 1 and to an installation according to the preamble of claim 8.

[0002] In this specification, the expression "large combustion engine" means an engine of the kind exemplified by main or auxiliary engines of ships or power plants for the production of heat and/or electricity.

[0003] During the operation of combustion engines a risk of fire always exists, for example due to the fuel systems of the engines and their relatively high temperature. For example, depending on the application, the fuel used may be very easily ignitable gas or less easily ignitable heavy fuel oil.

[0004] Different kinds of fire extinguishers and extinguishing systems for fighting file are commonly known, by means of which it is possible to bring to the burning object different kinds of substances having an effect on this burning. WO 98/58705 shows such a system, which comprises separate devices, is space consuming and causes additional costs.

[0005] Also in connection with combustion engines it is known to use different kinds of integral file extinguishers, by means of which it is possible to introduce fire retarding or fire preventing substances into the vicinity of the combustion engine. Many agents, like CO_2 or Halon, have injurious effects for example for humans. Thus the fire extinction may not be commenced immediately after the alarm, but first it must be ensured that the engine space has been evacuated of people. Also it must be ensured that all doors, ventilating channels, fire closures and the like have been closed and that all combustion engines have been shut down and blowers turned off. This may take as long as 30 minutes. Especially in ship engine applications a problem arose from the fact that typically fire fighting systems have been provided with one extinguisher charge. Therefore one must always ensure that the system will not be launched without making sure that all required precautions are made i.e. that the charge will be utilised properly.

[0006] Fire fighting devices are as such very necessary security devices, but these kind of separate systems increase inter alia both investment costs and service costs.

[0007] JP 9135917 addresses fire extinguishing in a combustion engine by describing a fire extinguishing arrangement for a vehicle engine. It suggests using cooling liquid from a closed cooling system circuit of the engine for extinguishing a possible fire. In this kind of arrangement there is, however, a very limited amount of cooling liquid for use as extinguishing liquid. Also, this requires a totally separate extinguishing system, which only uses the cooling liquid of the engine as a source of extinguishing liquid. Cooling liquid also typically contains substances which are not optimal for fire extinguishing purpose. Additionally, in this kind of method the possibility of keeping the engine running is lost, even if it otherwise would be possible. For example in marine applications this means loss of steerability of the vessel.

[0008] It is an object of the invention to provide a new method and installation for fire fighting in connection with a combustion engine apparatus, in which the shortcomings of the known prior art have been minimised. It is also an object of the present invention to provide a method and installation for fire fighting in connection with a large combustion engine apparatus, by means of which fire fighting may be realised in a very advantageous manner. Specifically it is an object of the present invention to provide a method and apparatus for fire fighting, which may be fitted also to ship engine applications.

[0009] The method and installation objects of the invention are achieved substantially as defined in claims 1 and 8 respectively. Preferred or optional features of the invention are defined in the other claims. The invention relates to fire fighting in connection with a combustion engine apparatus, which comprises at least one combustion engine unit and a source of fluid, comprising water, in co-operation with the combustion engine unit, a pressure booster device for said fluid and a nozzle arrangement for leading said fluid to the combustion engine unit. In the method according to the invention during a normal mode of operation of the combustion engine apparatus the fluid from the source is elevated from the pressure level of the source to higher pressure and is fed by means of said nozzle arrangement to a combustion chamber of the combustion engine unit and the fluid is rationed and timed in a manner which affects the operation of the engine in a desired way, and by virtue of a pre-determined event said fluid is led outside the combustion chamber of the combustion engine unit.

[0010] According to the invention in the normal mode of operation it is possible to supply the fluid, comprising water, to the combustion chamber of the engine either directly or for example to inject it into the combustion air, along with which it is brought into the combustion chamber. It is important that the fluid can be rationed in the desired manner into the combustion engine. In the normal mode of operation, by introducing the fluid, comprising water, it is possible to affect e.g. emissions of the engine so as to decrease them. According to the invention, by virtue of a pre-determined event said fluid is led outside the combustion chamber of the combustion engine apparatus, and specifically in the case of a fire, the fluid fed in the normal mode of operation to the combustion chamber is led outside the combustion chamber of the combustion engine apparatus for extinguishing the fire.

[0011] An installation for fire fighting according to the invention in connection with a combustion engine apparatus comprises at least a combustion engine unit and a source of fluid, comprising water, in co-operation with the combustion engine apparatus, a pressure booster device for said fluid and a nozzle arrangement for leading said fluid to the combustion engine unit and for af-

fecting the operation of the engine in a desired way, as well as a flow channel arrangement, which combines said pressure booster device and the nozzle arrangement. The installation comprises a fluid joint arrangement provided in the flow channel arrangement and a fire fighting arrangement for enabling leading of the fluid by means of the fire fighting arrangement to a space outside the combustion chamber of the combustion engine unit.

[0012] The combustion engine installation may further comprise a fire alarm arrangement or the like. The method for fire fighting in connection with a combustion engine apparatus may include a step of stopping the supply of said fluid into the combustion chamber of said combustion engine unit and immediately starting supply of said fluid outside the combustion engine unit by virtue of a signal given by the fire alarm arrangement or the like. The fire alarm arrangement or the like advantageously comprises at least a capability for manual launch, but desirably comprises both automatic and manual launch capabilities.

[0013] By virtue of a pre-determined event said fluid normally fed into the combustion chamber will thus be led specifically for fire extinguishing purposes, and preferably introduced to locations which are selected taken into account the extinguishing of possible fires. Typically this kind of location may comprise a space surrounding the combustion engine unit and possibly separate box structures in connection with engine. If so, the fire fighting arrangement may comprise a fire fighting pipe system to which several extinguishing nozzles have been arranged. The nozzles are provided for spraying the fluid to the space surrounding the engine. The specific locations will be determined in more detail according to need.

[0014] Several advantages can be obtained by means of the invention. In the solution according to the invention it is possible to utilise a pre-existing water injection system or a water injection system to be installed for decreasing emissions of engine, whereas the solution will be advantageous in the point of view of both its costs and space requirements. However, simultaneously an efficient fire extinguishing ability will be maintained. Because according to the invention the fire extinguishing will mainly take place by water, the extinguishing may be started even if there would be humans in the vicinity of the engine. On the other hand according to the invention, while the engine is running there is always water available in pressurised state in vicinity of the engine ready to be used for fire fighting. The solution according to the invention may be realised by using commercially available components, which are selected to be suitable for respective case.

[0015] The invention will now be described, by way of example only, with reference to the accompanying drawing in which Figure 1 shows schematically a combustion engine apparatus according to the invention.

[0016] The combustion engine apparatus 1 in the figure comprises a combustion engine unit 2, which is preferably a large piston engine, and a source 3 of fluid, comprising water, in co-operation therewith. The source 3 may for example comprise a water supply system or separate water tank. In order to elevate the pressure of the fluid, comprising water, the arrangement comprises a pressure booster device 4, such as a pump. In addition to this, the arrangement may be provided with fluid filtering devices according to need, which are not shown in the figure. The apparatus also comprises a nozzle arrangement 5 for leading said fluid to the combustion chamber 2' of the combustion engine unit 2. In the method according to the invention, during a normal mode of operation of the combustion engine apparatus the fluid from the source 3 is elevated from the pressure level of the source to higher pressure and is fed by means of said nozzle arrangement 5 to the combustion chamber of the combustion engine unit 2. The amount of fluid is rationed and the injection is timed in a manner which reduces the emissions from the engine.

[0017] Combustion engine apparatus 1 further comprises a fire alarm arrangement 6 or the like, which emits a signal causing the supply of said fluid into the combustion chamber 2' of said combustion engine unit to be stopped, and causing the immediate commencement of supply of said fluid outside the combustion chamber 2' of the combustion engine unit, to a space 2" surrounding the combustion engine unit. The fluid may be led to suitable locations, such as outer surfaces of the engine, air space surrounding the engine and also inside any box structure in connection with the engine. The locations may be selected to be suitable for the respective case.

[0018] The fire alarm arrangement 6 or the like is provided in co-operation with a fluid joint arrangement 8 arranged in a flow channel arrangement 5'. The fluid joint arrangement 8 preferably comprises a valve arrangement by means of which the flow of said fluid is selectably guideable either to the nozzle arrangement 5 for guiding the fluid in to the combustion chamber 2' of the combustion engine, or to a fire fighting arrangement 9, which enables the leading of said fluid to the space 2"outside the combustion chamber 2' of the combustion engine apparatus. The fluid joint arrangement 8 may for example be a three-way valve or the like along with an actuator, known as such, whereas the fire alarm arrangement 6 or the like has been adapted to control said actuator.

[0019] The signal from the fire alarm arrangement of the like may be automatically generated by the fire alarm arrangement of the like or it may be manually originated based on e.g. visual observation of smoke. The fire alarm arrangement or the like thus advantageously comprises separate, suitably located fire detectors, under control of which the alarm may be set.

[0020] The combustion engine apparatus 1 further comprises an auxiliary operating arrangement 7 being substantially independent from the combustion engine apparatus 1 for maintaining the supply of said fluid, com-

prising water. This kind of auxiliary operating arrangement preferably comprises a backup electricity supply for the pressure booster device 4 from an emergency generator. This is turned on if the actual voltage of the normal mains supply (not shown in the figure) decreases below a pre-determined level.

[0021] The flow channel arrangement 5' in the combustion engine apparatus connects said pressure booster device 4 and the nozzle arrangement 5. A separate fluid joint arrangement 8 has been arranged in the flow channel arrangement, which enables the leading of fluid to the space 2" outside the combustion chamber 2' of the combustion engine apparatus. The installation comprises a fire fighting arrangement 9 in connection with the fluid joint arrangement 8,which fire fighting arrangement 9 further comprises a fire fighting pipe system and several fire fighting nozzles 9' arranged for spraying said fluid, comprising water, into the space surrounding the engine.

[0022] Preferably downstream of said pressure booster device for fluid, comprising water, there is arranged a fluid supply channel in connection with the combustion engine, from which channel the fluid may be conducted to the combustion chamber of each cylinder of a combustion engine, preferably a large combustion engine, through independently controlled injectors of an injector arrangement.

[0023] The figure shows the injector arrangement extending directly to the combustion chamber, but the term "combustion chamber" as used in this specification also includes such parts of the engine by means of which substances participating in the combustion are conducted to the actual combustion chamber, in addition to the actual combustion chamber; and the introduction of fluid could take place in these parts. Thus, the fluid may be brought into the combustion air at a suitable stage. Additionally, the figure shows a piston engine of an application, but it is clear that the invention may also be applied in connection with other types of combustion engines. Hence it is clear that the technical solutions presented above are only exemplary, and the invention is not limited to the embodiments shown but several modifications of the invention are reasonable within the scope of the attached claims.

Claims

1. A method in connection with a combustion engine apparatus (1), which comprises at least one combustion engine unit (2) with its combustion chamber and a source (3) of fluid, comprising water, in co-operation with the combustion engine apparatus, a pressure booster device (4) for said fluid and a nozzle arrangement (5) for leading said fluid to the combustion engine unit (2), in which method, during a normal mode of operation of the combustion engine apparatus, the fluid from the source (3) is elevated from the pressure level of the source to a higher pressure and is fed by means of said nozzle arrangement (5) to the combustion engine unit (2) and the fluid is rationed and timed in a manner which affects the operation of the engine in a desired way, **characterised in that** by virtue of a pre-determined event said fluid is led outside (2") the combustion chamber of the combustion engine unit.

2. A method according to claim 1, wherein the combustion engine apparatus comprises a fire alarm arrangement (6) or the like, **characterised in that** by virtue of a signal emitted by the fire alarm arrangement or the like the supply of said fluid into the combustion chamber (2') of said combustion engine unit is stopped.

3. A method according to claim 1, **characterised in that** that by virtue of a pre-determined event said fluid is led to a space (2") surrounding the combustion engine unit.

4. A method according to claim 1 or 2, **characterised in that** the supply of the fluid, comprising water, is maintained by means of an auxiliary operating arrangement (7) being substantially independent from the combustion engine apparatus.

5. A method according to claim 2, **characterised in that** in case of a fire the fire alarm arrangement or the like triggers the alarm signal automatically under the control of separate fire sensors.

6. A method according to claim 2, **characterised in that** the fire alarm arrangement or the like triggers the alarm signal by virtue of a manual action such as a manual fire alarm launch.

7. A method according to claim 1, **characterised in that** during the normal mode of operation of the combustion engine apparatus (1) water is injected by means of a nozzle arrangement (5) into a combustion chamber of the combustion engine unit (2) and water is rationed and timed in a manner decreasing emissions.

8. An installation for fire fighting in connection with a combustion engine apparatus (1), which comprises at least a combustion engine unit (2) and a source (3) of fluid, comprising water, in co-operation with the combustion engine apparatus, a pressure booster device (4) for said fluid and a nozzle arrangement (5) for leading said fluid to the combustion engine unit (2) and for affecting the operation of the engine in a desired way, as well as a flow channel arrangement (5'), which connects said pressure booster device (4) and the nozzle arrangement (5), **characterised in that** the installation

comprises a fluid joint arrangement (8) provided in the flow channel arrangement (5') and a fire fighting arrangement (9) for leading the fluid by means of the fire fighting arrangement (9) to a space (2") outside the combustion chamber (2') of the combustion engine unit.

9. An installation according to claim 8, **characterised in that** the installation additionally comprises a fire alarm arrangement or the like (6), which arrangement has been adapted in co-operation with said fluid joint arrangement (8) provided in the flow channel arrangement (5').

10. An installation according to claim 8 or 9, **characterised in that** the fluid joint arrangement (8) comprises a valve arrangement, by means of which the flow of said fluid is selectably guideable either to the nozzle arrangement (5) for guiding the fluid in to the combustion chamber (2') of the combustion engine or to the fire fighting arrangement (9), which enables the leading of said fluid to the space (2") outside the combustion chamber (2') of the combustion engine apparatus.

11. An installation according to any one of claims 8-10, **characterised in that** the combustion engine apparatus comprises an auxiliary operating arrangement (7) being substantially independent from the combustion engine apparatus for maintaining the supply of said fluid, comprising water.

12. Installation according to any of claim 8-11, **characterised in that** the fire fighting arrangement (9) comprises a fire fighting pipe system, which contains several fire fighting nozzles (9') arranged for spraying said fluid, comprising water, to the space surrounding the engine.

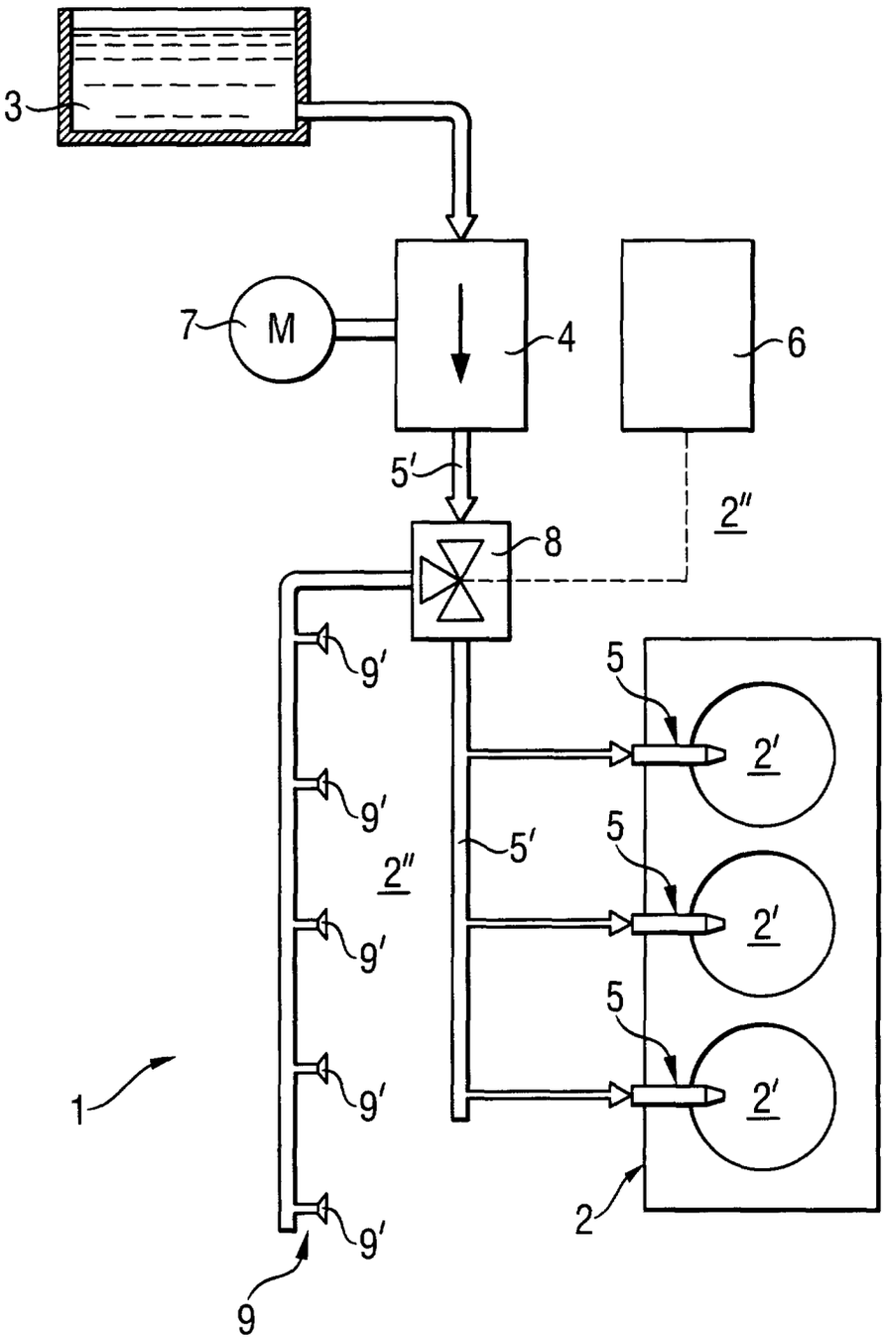

Fig. 1