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(54) **METHOD FOR HEATING COOLING LIQUID TO START PREHEATING AND HEATING SYSTEM**

(57) A method for heating cooling liquid to start preheating comprising: step 1, supply cooling liquid, which cooling liquid is filled in a circulating water pipe (12); step 2, supply fuel and ignite the fuel to heat the cooling liquid in the circulating water pipe; step 3, connect the circulating water pipe to an engine (1), and the cooling liquid is made to circulate in the circulating water pipe in order to continuously heat the engine; step 4, the exhaust gas generated by fuel combustion is collected and guided to the bottom of the engine for heating same; and step 5, judge the temperature of the engine, and stop burning fuel when the temperature of the engine reaches a threshold value. The method features a low temperature start and a high temperature cut-off with a higher level of safety. Also disclosed is a system of heating cooling liquid to start preheating.

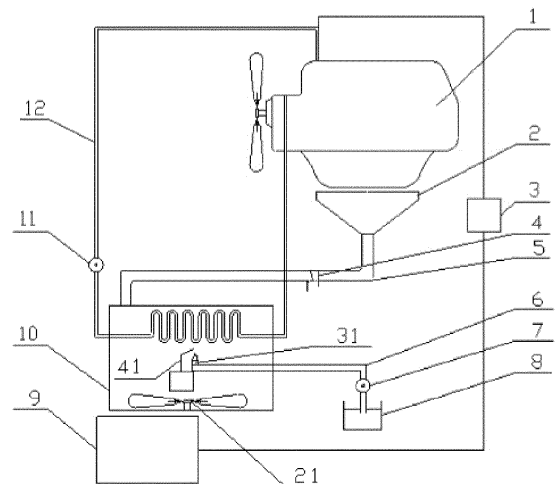


FIG 1

Description**CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] The present application claims the priority of the Chinese application number 201110341120.4, filed on November 2, 2011, the disclosure of which is herewith incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present invention relates to a method for fuel preheating and the preheating system thereof, more specifically, to a method for heating cooling liquid to start preheating and the heating system thereof.

BACKGROUND OF THE INVENTION

[0003] The excavator fuel needs to be preheated for solving the issue that when the excavator started the diesel fuel (fuel) can't beat the fire, especially in the North China, it is the normal phenomenon.

[0004] In the past, the resistance wire heating inlet form is employed by the common excavator fuel preheating systems via the hot air to heat the diesel fuel and the fuel, so as to ensure the normal initiate of the excavator. However, in the northern cold region of China, the temperature even reaches to the minus 30 ° C, heating the inlet air can't guarantee the normal initiate of the excavator, which makes excavator can't work properly, bring great puzzle to customers and service engineers.

[0005] In the prior art, in order to preheat the fuel in the low temperature, some companies have provided some solutions. The fundamental of the fuel preheating system is: by heating the fuel tank, fuel pipes, filters and other low pressure fuel, to remove the phenomenon of the diesel fuel frozen with the wax. For example, the Chinese utility model patent application no. CN200720039751 has disclosed a preheating device which comprises a relay, a reset switch and a fuse combination, however, there are many electric control equipments in the excavator, the security of many preheating systems can't be contented, if it is on fire due to the breakdown, serious consequences will happen.

[0006] Accordingly, a new design method is provided. The preheating method and the heating system are particular important for which can decrease the fault rate, heat effective, protect the environment.

SUMMARY OF THE INVENTION

[0007] The present invention aims to solve the above mentioned problems, a new heating system is designed by the heating system so as to heat the cooling liquid and to remove the phenomenon of the diesel fuel frozen with the wax, and to use the exhaust hot flow of the heating system to achieve the function of heating fuel.

[0008] This invention has disclosed a method for heat-

ing cooling liquid to start preheating, wherein it comprises:

Step 1, providing the cooling liquid which is filled in a circulating water pipe;

Step 2, providing fuel and igniting the fuel in order to heat the cooling liquid in the circulating water pipe; Step 3, connecting the circulating water pipe to an engine, and making the cooling liquid circulate in the circulating water pipe in order to continuously heat the engine;

Step 4, collecting the exhaust gas generated by fuel combustion, and guiding the exhaust gas to the bottom of the engine for heating the engine;

Step 5, judging the temperature of the engine and stopping burning fuel when the temperature of the engine reaches a threshold value.

[0009] According to the above methods, wherein Step 2 further comprises:

Step21, developing the fuel into high pressure fuel mist by the high pressure spray at first;

Step22, mixing the high pressure fuel mist with air; Step23, igniting the mixture of the high pressure fuel mist and the air.

[0010] The above methods, wherein step 4 further comprises:

Step41, draining the smoke generated by the initial heating at first.

[0011] The above methods, wherein step 5 further comprises:

Step51, achieving the current temperature of the engine;

Step52, comparing the current temperature of the engine with the threshold value, if the engine temperature is higher than the threshold value, then Step 53 is executed;

Step53, sending a signal to stop the fuel burning.

[0012] According to another aspect of the present invention, it also discloses a system of heating cooling liquid to start preheating, wherein it comprises:

A circulating pipe with cooling liquid, which is connected to a pump for driving the cooling liquid circulation to flow;

A heater covered with the circulating water pipe, which has a fuel pipe for absorbing the fuel from the fuel tank, the fuel is filled into the heater from the fuel pipe, and the fuel is ignited by an ignition; an internal pipe channel of the heater is connected to the circulating water pipe, the heat is absorbed by the cooling liquid circulation;

an exhaust pipe is also provided to the heater, the exhaust pipe is connected to the below vertical portion of the engine, the opening of the exhaust pipe towards the vertical position;

a temperature sensor which detects the engine temperature and connects a control device to control the heater air-inlet device switch, the heater air-inlet device is used to provide air for the heater.

[0013] According to the above heating system, wherein a pump is provided to the fuel inlet for absorbing the fuel from the fuel tank, a nozzle is provided to the fuel outlet for mixing high pressure fuel mist with air. According to the above heating system, wherein the exhaust pipe end is connected to comprises guiding cover with upright opening of which opening area is greater than the engine base, the exhaust pipe is provided with an air door for discharging the smog from the initial heating.

[0014] According to the above heating system, wherein the heater air-inlet device comprises a motor which drives an fan located in the in heater for absorbing the outside air into the heater.

[0015] According to the above heating system, wherein the heater covered with the circulating water pipe is provided with a heat exchanger interlayer, which is on the circulating water pipe, heat conductive slices is provided inside the interlayer, the heat conductive slices are evenly attached to the surface of the circulating water pipe.

[0016] The present invention heats diesel fuel and fuel by the heater, the principle of the heater is the fuel pump driven by the motor, the inlet fuel is sent from the fuel pipe to the nozzle, the inlet fuel is ejected by the nozzle depends on the pressure function, the ejected high pressure fuel mist mixes with the air absorbed by the air fan in the combustor and ignited by the ignition electrode, in the combustor after sufficient combustion, fuel gas flows through heat conductive slices of the heat exchanger interlayer, by heating heat conductive slices to convey most of the heat to the cooling fluid in the heat exchanger interlayer

the heating system is used to heat the cooling fluid at first, and using the pump to make the heated cooling fluid circulate in the internal of the engine, so as to achieve the heat of the engine fuel; Secondly, using the hot air generated by heater fuel combustion, guiding it to the bottom of the engine by the exhaust pipes, so as to achieve the function of heating the fuel.

[0017] The advantages of the present invention are:

- 1) the system adopts full automatic control injection liquid heater, it opens and shuts down without smog pollution, and with more stable combustion , higher efficiency, emissions are more environmental protection, and it has a low temperature initiation, high temperature and stop function, it has the higher security;
- 2) the preheating effect is better when the diesel

fuel and fuel is heated at the same time;

3) the diesel fuel is employed as the fuel of the engine which make it easier and reliable;

4) a wide temperature range is employed to improve the stability of the excavator initiation;

BRIEF DESCRIPTIONS OF THE DRAWINGS

[0018]

Figure 1 is a schematic diagram of a system of heating cooling liquid to start preheating.

Figure 2 is a schematic diagram of a process of heating cooling liquid to start preheating.

DESCRIPTIONS OF THE PREFERRED EMBODIMENT

[0019] The present invention will be further illustrated in combination with the following Figures and embodiments. However it should not be deemed as limitation of the present invention.

[0020] As referred in Figures 1 and 2, the present invention discloses a system of heating cooling liquid to start preheating and the schematic diagram of the process of heating cooling liquid to start preheating to illustrate the method of heating cooling liquid to start preheating. In figure 2, S 1 represents the abbreviation of the step 1, which is used to express step 1, other steps are expressed in S similarly The present invention comprises the following steps:

Step 1, providing the cooling liquid which is filled in a circulating water pipe 12, the use of the cooling liquid can convey the heat efficiently, Simultaneously, reducing the possibility of the fire caused by the fault in similar present technology, so as to improve the security significantly by utilizing the cooling liquid; Step 2, providing the fuel and igniting the fuel to heat the cooling liquid in the circulating water pipe 12; heating cooling fluid by burning fuel is a method for rapid heating, for the convenience of collecting materials, diesel fuel can be selected;

Step 3, connecting the circulating water pipe 12 to an engine 1, and making the cooling liquid circulate in the circulating water pipe 12 in order to continuously heat the engine 1; keeping transfer the heated cooling fluid to the circulating water pipe of the engine 1, transfer the heat to the engine 1 through the heat transfers to increase the temperature of the engine 1; Step 4, collecting the exhaust gas generated by fuel combustion, and guiding the exhaust gas to the bottom of the engine 1 for heating the engine 1; this is because the exhaust gas generated in step 2 has the high problem, it can be recycled for heating the engine 1 and avoiding the waste of energy; Step 5, judging the temperature of the engine 1 and stopping burning the fuel when the temperature of

the engine 1 reaches a threshold value. The present invention aims to achieve preheating initiation, therefore, when the engine 1 temperature reaches a pre-set target temperature must stop heating.

[0021] In a particular embodiment, igniting the fuel in Step 2 further comprises the following several specific implementation processes:

Step 21, developing the fuel into high pressure fuel mist by the high pressure spray, and making it easy to be ignited;

Step 22, mixing the high pressure fuel mist with air, this step can be achieved by providing a enclosed space, making the high pressure fuel mist mix with air in the enclosed space;

Step 23, igniting the mixture of the high pressure fuel mist and the air, so that it just have the burning need oxygen, meet the conditions of fuel combustion wherein Step 4 further comprises:

Step 41, draining the smoke generated by the initial heating at first.

[0022] While it can avoid the smoke accessing to the engine 1 directly by guide the smoke to another place.

[0023] Wherein Step 5 further comprises:

Step 51, achieving the current temperature of the engine; in a particular embodiment, this step can be initiated from heating, continues until the whole heating process terminated;

Step 52, comparing the current temperature of the engine with the threshold value, if the engine temperature is higher than the threshold value, then Step 53 is executed to send a signal to stop the fuel burning;

[0024] As referred in Figures 1, the schematic diagram of the system of heating cooling liquid to start preheating comprises:

A circulating pipe 12 with cooling liquid, which is connected to a pump 11 for driving the cooling liquid circulation to flow;

A heater 10 covered with the circulating water pipe 12, which has a fuel pipe 6 for absorbing the fuel from the fuel tank 8, the fuel is filled into the heater 10 from the fuel pipe 6, and the fuel is ignited by an ignition;

The engine 1 connects to the circulating water pipe 12, absorbing the heat by the cooling liquid circulation;

An exhaust pipe 5 is also provided to the heater 10, the exhaust pipe is connected to the below vertical position of the engine 1, the opening of the exhaust pipe 5 towards the vertical position, in the process of fuel combustion, exhaust flows

through the exhaust pipe 5 to the below position of the engine 1, because the exhaust has a certain temperature, it can be recycled for heating the engine 1; the temperature sensor 3 which connects to a control device used to detect the temperature of the engine 1 (not shown in figure 1), controller receives the sign of the temperature sensor 3 by a signal receiver, the controller has a differential comparator, if the signals received by temperature sensor 3 is higher than a preset value, then the controller will control the heater air-inlet device to close the switch, the heater air-inlet device used to provide air for the heater 10, providing sufficient oxygen for combustion, when do not need to heat, you just need to close the heater air-inlet device, it will stop burning because of the lack of oxygen, so you stop heating.

[0025] In the figure 1, a pump 7 is provided to the fuel 6 inlet for absorbing the fuel from the fuel tank 8, a nozzle 31 is provided to the fuel 6 outlet for mixing high pressure fuel mist with air.

[0026] It can make the fuel combust more sufficiently, specifically, an ignition is provided near the nozzle 31 used to ignite,

In one preferred embodiment, the exhaust pipe 5 end is connected to comprises a guiding cover 2 with upright opening of which opening area is greater than the engine 1 base, thus exhaust can cover the bottom of the engine 1 well, it benefits to heat the engine 1 rapidly and decreases the unwanted consumption of the heat; the exhaust pipe 5 is provided with an air door 4 for discharging the smog from the initial heating; a valve is provided to the air door 4 used to achieve the conversion of the exhaust.

[0027] In the figure 1, heater 10 air-inlet device comprises a motor 9 which drives an fan 21 located in the heater 10 for absorbing the outside air into the heater 10.

[0028] In a specific embodiment, the heater 10 covered with the circulating water pipe 12 is provided with a heat exchanger interlayer, which is on the circulating water pipe 12, heat conductive slices is provided inside the interlayer, the heat conductive slices are attached to the surface of the circulating water pipe 12 uniformly, this can increase the heating efficiency maximized, making the present invention has broad prospects. While the present disclosure has been described in connection with certain exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims, and equivalents thereof.

Claims

1. A method for heating cooling liquid to start preheating, wherein it comprises:

- Step 1, providing the cooling liquid which is filled in a circulating water pipe;
- Step 2, providing fuel and igniting the fuel in order to heat the cooling liquid in the circulating water pipe;
- Step 3, connecting the circulating water pipe to an engine, and making the cooling liquid circulate in the circulating water pipe in order to continuously heat the engine;
- Step 4, collecting the exhaust gas generated by fuel combustion, and guiding the exhaust gas to the bottom of the engine for heating the engine;
- Step 5, judging the temperature of the engine and stopping burning fuel when the temperature of the engine reaches a threshold value.
2. A method as disclosed in Claim 1, wherein step 2 further comprises:
- Step21, developing the fuel into high pressure fuel mist by the high pressure spray at first;
- Step22, mixing the high pressure fuel mist with air;
- Step23, igniting the mixture of the high pressure fuel mist and the air.
3. A method as disclosed in Claim 1, wherein step 4 further comprises:
- Step41, Draining the smoke generated by the initial heating at first.
4. A method as disclosed in Claim 1 and 3, wherein Step 5 further comprises:
- Step51, achieving the current temperature of the engine;
- Step52, comparing the current temperature of the engine with the threshold value, if the engine temperature is higher than the threshold value, then Step 53 is executed;
- Step53, Sending a signal to stop the fuel burning.
5. A system for heating cooling liquid to start preheating as disclosed in Claim 1 to 4, wherein it comprises:
- A circulating pipe with cooling liquid, which is connected to a pump for driving the cooling liquid circulation to flow;
- A heater covered with the circulating water pipe, which has a fuel pipe for absorbing the fuel from the fuel tank, the fuel is filled into the heater from the fuel pipe, and the fuel is ignited by an ignition;
- an internal pipe channel of the heater is connected to the circulating water pipe, the heat is absorbed by the cooling liquid circulation;
- an exhaust pipe is also provided to the heater, the exhaust pipe is connected to the below vertical portion of the engine, the opening of the exhaust pipe towards the vertical position;
- a temperature sensor which detects the engine temperature and connects a control device to control the heater air-inlet device switch, the heater air-inlet device is used to provide air for the heater.
6. The heating system as disclosed in Claim 5, wherein a pump is provided to the fuel inlet for absorbing the fuel from the fuel tank, a nozzle is provided to the fuel outlet for mixing high pressure fuel mist with air.
7. The heating system as disclosed in Claim 5, wherein the exhaust pipe end is connected to comprise a guiding cover with upright opening of which opening area is greater than the engine base, the exhaust pipe is provided with an air door for discharging the smog from the initial heating.
8. The heating system as disclosed in Claim 5, wherein the heater air-inlet device comprises a motor which drives a fan located in the in heater for absorbing the outside air into the heater.
9. The heating system as disclosed in Claims 5 to 8, wherein the heater covered with the circulating water pipe is provided with a heat exchanger interlayer, which is on the circulating water pipe, heat conductive slices is provided inside the interlayer, the heat conductive slices are evenly attached to the surface of the circulating water pipe.

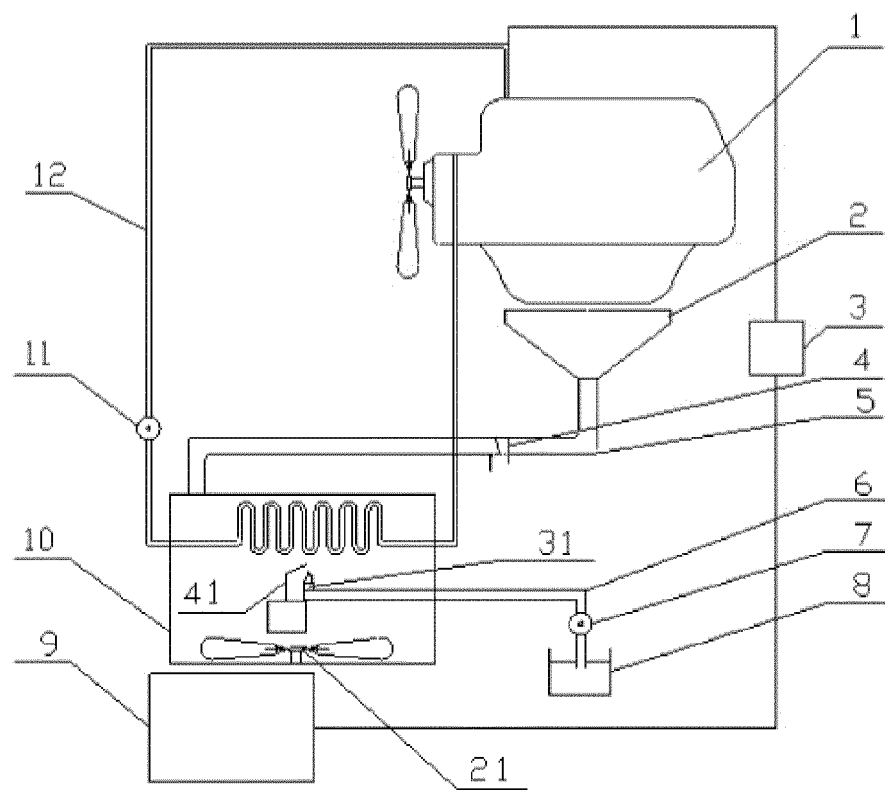


FIG 1

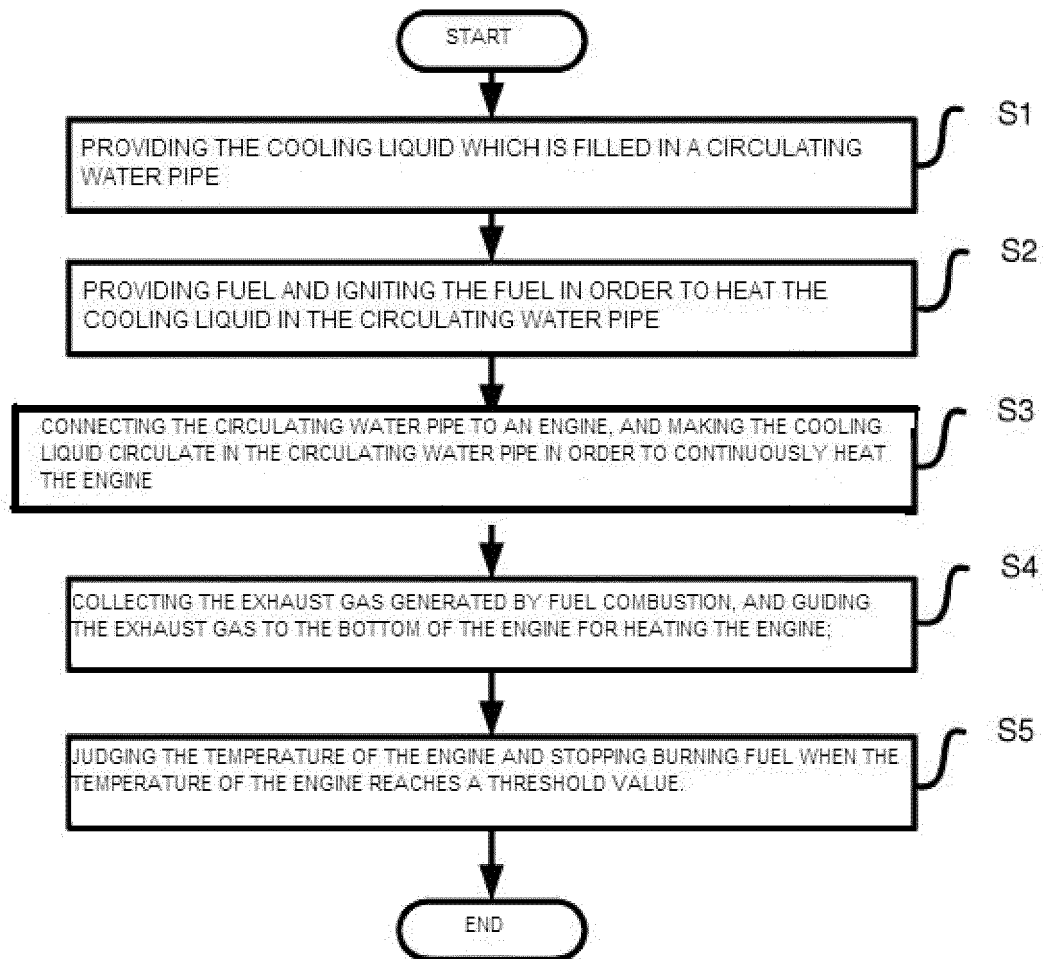


FIG 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2012/074371

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: F02N, F01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC,WPI,CNPAT,CNKI: coolant, cooling, start, heat+, preheat+, combustion, fuel, smoke, exhaust

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 201326498 Y (SANYI VEHICLE MFG LTD) 14 Oct. 2009 (14.10.2009) description, pages 1-6 and figures 1-4	1-9
A	CN 201521387 U (TELLHOW SCI TECH CO LTD) 07 Jul. 2010 (07.07.2010) the whole document	1-9
A	CN 2453147 Y (TIAN, Xinying) 10 Oct. 2001 (10.10.2001) the whole document	1-9
A	CN 2625596 Y (SANY HEAVY IND CO LTD)14 Jul. 2004 (14.07.2004) the whole document	1-9

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
20 Jul.2012 (20.07.2012)Date of mailing of the international search report
09 Aug.2012 (09.08.2012)Name and mailing address of the ISA
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2012/074371

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5003941 A (Roy R. Jeffrey, Jr. et al) 02 Apr. 1991 (02.04.1991) the whole document	1-9

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2012/074371

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 201326498 Y	14.10.2009	None	
CN 201521387 U	07.07.2010	None	
CN 2453147 Y	10.10.2001	None	
CN 2625596 Y	14.07.2004	None	
US 5003941 A	02.04.1991	None	

Form PCT/ISA /210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2012/074371

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A. CLASSIFICATION OF SUBJECT MATTER

F02N 19/10 (2010.01) i
F01M 5/02 (2006.01) i

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201110341120 [0001]
- CN 200720039751 [0005]