(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 822 474 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
19.05.2021 Bulletin 2021/20

(21) Application number: **19220291.9**

(22) Date of filing: **31.12.2019**

(51) Int Cl.:
F02M 27/06 *(2006.01)* ***F02M 29/04*** *(2006.01)*
F02M 29/06 *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **18.11.2019 TW 108215253 U**

(71) Applicant: **Chen, Tung-Sen**
New Taipei City 235 (TW)

(72) Inventor: **Chen, Tung-Sen**
New Taipei City 235 (TW)

(74) Representative: **Bandpay & Greuter**
30, rue Notre-Dame des Victoires
75002 Paris (FR)

(54) AIR REACTIVATOR

(57) An air reactivator includes a plurality of first ribs, a plurality of second ribs, a plurality of diffusion members, and a plurality of air passages. Each of the first ribs has a first top face and a first bottom face and two first inclined faces. Each of the second ribs has a second top face and a second bottom face and two second inclined faces. The diffusion members are defined at connections of the first ribs and the second ribs. Each of the diffusion members has a projection and a third bottom face and a recessed portion. Each of the air passages is defined between the first inclined face, the second inclined face, and the recessed portion. The first ribs, the second ribs, and the diffusion members are made of a mixture of far infrared material and polymer material.

EP 3 822 474 A1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a reactivator and, more particularly, to an air reactivator.

2. Description of the Related Art

[0002] With the development of environmental protection laws and regulations, restriction on the air exhaust of the internal combustion engine used by various vehicles has become increasingly stricter. During the operation of the internal combustion engine, it will mix air and fuel to generate kinetic energy. Without changing the structure of the internal combustion engine, many companies have developed devices that use far-infrared rays and magnetic forces to process the air entering the internal combustion engine to increase the combustion efficiency after the mixture of oil and gas.

[0003] Taiwanese Patent Publication No. M551227 disclosed an "Automotive Intake Optimized Gasket", and Taiwanese Patent Publication No. M305263 disclosed an "Automotive Environmental Protection Horsepower Booster". The above two patents are limited to air holes of different dimensions, such that when the air contacts the blocks, a large amount of turbulent flow is generated at the interface of the air holes, thereby reducing the intake efficiency.

[0004] Taiwanese Patent Publication No. M531984 disclosed an "Air Refinement Device". Although this patent can increase the contact times of the air with the wave plate, the air is divided to flow along the two sides of the wave plate after contacting the wave plate, such that a turbulent flow is produced at the bottom of the wave plate, thereby reducing the intake efficiency.

[0005] Taiwanese Patent Publication No. M358880 disclosed an "Automotive fuel-saving device". The diameter of the through hole is too large, and the passing speed is too fast, such that the far infrared material and the air cannot perform a reactivation. In addition, the air filter of the car allows passage of the air instead of the fuel.

[0006] In the current vacuum braking system, the combustion efficiency of the engine room cannot reach the original design, such that the air density and the vacuum degree of the engine room are lost, which affects the vacuum degree of the intake manifold. In general, the force of the vacuum applied on the braking pump is designed in such a manner that the braking rate of the front wheel braking system and the rear wheel braking system is about 7: 3 or 6: 4. However, the vacuum degree of the intake manifold is not enough or the air pressure is not enough, such that the car head has a better braking effect, and the car tail has a poor braking effect. Thus, when an emergency braking happens, the car head easily sinks forward, the car tail is easily lifted, and easily flicks or swings, and the car easily slips sideward, thereby causing danger to the driver.

BRIEF SUMMARY OF THE INVENTION

[0007] In accordance with the present invention, there is provided an air reactivator comprising a plurality of first ribs, a plurality of second ribs, a plurality of diffusion members, and a plurality of air passages. The air reactivator is mounted on an outside of an internal combustion engine, and is connected to an air flow channel of a fuel intake system. Each of the first ribs has a first top face and a first bottom face. Each of the first ribs has two sides each having a first inclined face. Each of the second ribs has a second top face and a second bottom face. Each of the second ribs has two sides each having a second inclined face. The second ribs are connected with the first ribs respectively. The diffusion members are defined at connections of the first ribs and the second ribs. Each of the diffusion members has a projection and a third bottom face. Each of the diffusion members has a recessed portion formed on an intersection of the first inclined face and the second inclined face. Each of the air passages is defined between the first inclined face, the second inclined face, and the recessed portion. The first ribs, the second ribs, and the diffusion members are made of a mixture of far infrared material and polymer material. When a water molecular cluster of an air with a relative humidity contacts the first ribs, the second ribs, and the diffusion members, the first top face, the second top face, and the projection guides and accelerates the air to pass the air passages rapidly, while the first inclined face, the second inclined face, and the recessed portion produce a diffuse effect and increase a contact area of the far infrared material and the air. After the air contacts the far infrared material, the air is perturbed to form a vortex flow and to increase a contact time of the far infrared material and the air, such that the water molecular cluster of the air produce resonance and is atomized or made smaller by the far infrared material, and a molecular freedom of the air is enhanced. The water molecular cluster of the air has an enhanced oxygen contained area, and has an increased contact area with a fuel, such that the water molecular cluster of the air is mixed with the fuel evenly.

[0008] Preferably, the far infrared material includes, but is not limited to, a composition of magnesium oxide (MgO), silicon dioxide (SiO_2), titanium dioxide (TiO_2), aluminum oxide (Al_2O_3), iron oxide (Fe_2O_3), calcium oxide (CaO), chromium oxide (Cr_2O_3), manganese oxide (MnO), nickel oxide (NiO_2), cobalt oxide (CoO), zirconium oxide or zirconia (ZrO_2), sodium oxide (NaO), and potassium oxide (K_2O), which are mixed, sintered and ground at a weight (or mass) proportion of 2: 3: 2: 1: 1: 1: 2: 2: 3: 3: 1: 1: 2.

[0009] Preferably, the far infrared material has a granularity of 0.01-30 micrometers.

[0010] Preferably, the polymer material includes poly-

ethylene (PE), polypropylene (PP), polyurethane (PU) or Nylon.

[0011] Preferably, the far infrared material has an far-infrared emissivity, more than 80%.

[0012] Preferably, the first ribs, the second ribs, and the diffusion members are formed integrally by plastic injection molding.

[0013] Preferably, the first ribs intersect the second ribs respectively, and the diffusion members are formed on intersections of the first ribs and the second ribs, and connects the first ribs and the second ribs.

[0014] Preferably, the first top face has an area smaller than that of the first bottom face, the second top face has an area smaller than that of the second bottom face, and the projection has an area smaller than that of the third bottom face.

[0015] Preferably, the projection has a height greater than that of the first top face and that of the second top face.

[0016] According to the primary advantage of the present invention, the air reactivator has a simplified structure, has a low cost, and has a high air circulation.

[0017] According to another advantage of the present invention, the water molecular cluster of the air produce resonance and is atomized or made smaller, and the molecular freedom of the air is enhanced.

[0018] According to a further advantage of the present invention, after the water molecular cluster of the air produce resonance and is atomized, the water molecular cluster of the air has an enhanced oxygen contained area, and has an increased contact area with a fuel, such that the air forms a vortex flow and increases a reactivating time, and the water molecular cluster of the air is mixed with the fuel evenly.

[0019] According to a further advantage of the present invention, the water molecular cluster of the air has an enhanced oxygen contained area, to increase the air pressure, such that the air density of the braking pump is increased, to shorten the braking distance, and to enhance the braking safety.

[0020] Further benefits and advantages of the present invention will become apparent after a careful reading of the detailed description with appropriate reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

[0021]

FIG. 1 is a perspective view of an air reactivator in accordance with the preferred embodiment of the present invention.

FIG. 2 is a locally enlarged view of the air reactivator taken along circle A as shown in FIG. 1.

FIG. 3 is a schematic operational view showing the air reactivator which is used for a braking system.

FIG. 4 is a test report showing usage of the air reactivator in accordance with the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Referring to the drawings and initially to FIGS. 1 and 2, an air reactivator in accordance with the preferred embodiment of the present invention comprises a plurality of first ribs 1, a plurality of second ribs 2, a plurality of diffusion members (or spoilers or vortex generators or turbulence generators) 3, and a plurality of air passages (or channels) 4. The air reactivator is mounted on an outside of an internal combustion engine, and is connected to an air flow channel of a fuel intake system. The first ribs 1 are spaced from each other. The second ribs 2 are spaced from each other. The diffusion members 3 are arranged in a matrix. The air passages 4 are arranged in a matrix.

[0023] Each of the first ribs 1 has a first top face 11 and a first bottom face 12. Each of the first ribs 1 has two sides each having a first inclined face 13. Each of the second ribs 2 has a second top face 21 and a second bottom face 22. Each of the second ribs 2 has two sides each having a second inclined face 23. The second ribs 2 are connected with the first ribs 1 respectively. The diffusion members 3 are defined at connections of the first ribs 1 and the second ribs 2. Each of the diffusion members 3 has a projection 31 and a third bottom face 32. Each of the diffusion members 3 has a recessed portion 33 formed on an intersection of the first inclined face 13 and the second inclined face 23. Each of the air passages 4 is defined between the first inclined face 13, the second inclined face 23, and the recessed portion 33. Preferably, the first ribs 1, the second ribs 2, and the diffusion members 3 are made of a mixture of far infrared material and polymer material.

[0024] In practice, when a water molecular cluster of an air with a relative humidity contacts the first ribs 1, the second ribs 2, and the diffusion members 3, the first top face 11, the second top face 21, and the projection 31 guides and accelerates the air to pass the air passages 4 rapidly, while the first inclined face 13, the second inclined face 23, and the recessed portion 33 produce a diffuse effect and increase a contact area of the far infrared material and the air. After the air contacts the far infrared material, the air is perturbed (or disturbed) to form a vortex flow and to increase a contact time of the far infrared material and the air, such that the water molecular cluster of the air produce resonance and is atomized or made smaller by the far infrared material, and a molecular freedom of the air is enhanced. In such a manner, the water molecular cluster of the air has an enhanced oxygen contained area, and has an increased contact area with a fuel, and a brake pressure of a vacuum braking system is increased, such that the water molecular cluster of the air is mixed with the fuel evenly. Thus, the air reactivator helps a complete interior burning of the internal combustion engine, to decrease drain of

the waste gas, to enhance the power of the internal combustion engine, to prevent the carbon from being accumulated in the engine room (or chamber), to enhance the lifetime of the internal combustion engine, and to shorten the braking distance.

[0025] In the preferred embodiment of the present invention, the far infrared material includes, but is not limited to, a composition of magnesium oxide (MgO), silicon dioxide (SiO_2), titanium dioxide (TiO_2), aluminum oxide (Al_2O_3), iron oxide (Fe_2O_3), calcium oxide (CaO), chromium oxide (Cr_2O_3), manganese oxide (MnO), nickel oxide (NiO_2), cobalt oxide (CoO), zirconium oxide or zirconia (ZrO_2), sodium oxide (NaO), and potassium oxide (K_2O), which are mixed, sintered and ground at a weight (or mass) proportion of 2: 3: 2: 1: 1: 1: 2: 2: 3: 3: 1: 1: 2.

[0026] In the preferred embodiment of the present invention, the far infrared material has a granularity of, but not limited to, 0.01-30 micrometers.

[0027] In the preferred embodiment of the present invention, the polymer material includes, but is not limited to, polyethylene (PE), polypropylene (PP), polyurethane (PU) or Nylon.

[0028] In the preferred embodiment of the present invention, the far infrared material has an far-infrared emissivity, more than, but not limited to, 80%.

[0029] In the preferred embodiment of the present invention, the first ribs 1, the second ribs 2, and the diffusion members 3 are formed integrally by plastic injection molding.

[0030] In the preferred embodiment of the present invention, the first ribs 1 intersect the second ribs 2 respectively, and the diffusion members 3 are formed on intersections of the first ribs 1 and the second ribs 2, and connects the first ribs 1 and the second ribs 2.

[0031] In the preferred embodiment of the present invention, the first top face 11 has an area smaller than that of the first bottom face 12, the second top face 21 has an area smaller than that of the second bottom face 22, and the projection 31 has an area smaller than that of the third bottom face 32.

[0032] In the preferred embodiment of the present invention, the projection 31 has a height greater than that of the first top face 11 and that of the second top face 21.

[0033] Referring to FIG. 3 with reference to FIGS. 1 and 2, the air reactivator is mounted on an outside of an engine room A. The air reactivator introduces the atomized water molecular cluster of the air into the engine room A, to increase the combustion efficiency of the engine room A, and to prevent the carbon from being accumulated in the engine room A, thereby increasing the air density and the vacuum degree of the engine room A. Then, the atomized water molecular cluster enters an intake manifold B, to enhance the vacuum degree of a vacuum pump C, and to increase a brake pressure of a braking pump D. The vacuum pump C applies a force on the braking pump D evenly and steadily during the braking process, such that the braking pump D delivers the braking oil to a brake matching unit steadily, such that the braking oil enters and is evenly distributed in a front wheel braking system E and a rear wheel braking system F. Thus, the pressure is applied to the front wheel braking system E and the rear wheel braking system F evenly and steadily according to a determined proportion, such as 7: 3 or 6: 4, so as to achieve a balanced braking, thereby preventing the car head from sinking forward, preventing the car tail from being lifted, preventing the car tail from flicking or swinging, and preventing the car from slipping sideward during an emergency braking. In addition, the braking distance is shortened.

[0034] Referring to FIG. 4, six cars are tested to measure and compare the fuel consumption, the CO (carbon oxide) emission, and the HC (hydrocarbon) emission of the cars before and after mounting the air reactivator. According to the test report, the driving distance (kilometer) per litter is increased, which means the fuel consumption is decreased. In addition, the CO emission is decreased, and the HC emission is also decreased. It is noted that, when the CO emission is zero, it means that the CO emission is smaller than 0.01.

[0035] Although the invention has been explained in relation to its preferred embodiment(s) as mentioned above, it is to be understood that many other possible modifications and variations can be made without departing from the scope of the present invention. It is, therefore, contemplated that the appended claim or claims will cover such modifications and variations that fall within the scope of the invention.

Claims

1. An air reactivator comprising:

a plurality of first ribs, a plurality of second ribs, a plurality of diffusion members, and a plurality of air passages;
wherein:

the air reactivator is mounted on an outside of an internal combustion engine, and is connected to an air flow channel of a fuel intake system;
each of the first ribs has a first top face and a first bottom face;
each of the first ribs has two sides each having a first inclined face;
each of the second ribs has a second top face and a second bottom face;
each of the second ribs has two sides each having a second inclined face;
the second ribs are connected with the first ribs respectively;
the diffusion members are defined at connections of the first ribs and the second ribs;
each of the diffusion members has a projection and a third bottom face;

each of the diffusion members has a recessed portion formed on an intersection of the first inclined face and the second inclined face;
each of the air passages is defined between the first inclined face, the second inclined face, and the recessed portion;
the first ribs, the second ribs, and the diffusion members are made of a mixture of far infrared material and polymer material;
when a water molecular cluster of an air with a relative humidity contacts the first ribs, the second ribs, and the diffusion members, the first top face, the second top face, and the projection guides and accelerates the air to pass the air passages rapidly, while the first inclined face, the second inclined face, and the recessed portion produce a diffuse effect and increase a contact area of the far infrared material and the air;
after the air contacts the far infrared material, the air is perturbed to form a vortex flow and to increase a contact time of the far infrared material and the air, such that the water molecular cluster of the air produce resonance and is atomized or made smaller by the far infrared material, and a molecular freedom of the air is enhanced;
the water molecular cluster of the air has an enhanced oxygen contained area, and has an increased contact area with a fuel, such that the water molecular cluster of the air is mixed with the fuel evenly.

2. The air reactivator of claim 1, wherein the far infrared material includes a composition of magnesium oxide (MgO), silicon dioxide (SiO_2), titanium dioxide (TiO_2), aluminum oxide (Al_2O_3), iron oxide (Fe_2O_3), calcium oxide (CaO), chromium oxide (Cr_2O_3), manganese oxide (MnO), nickel oxide (NiO_2), cobalt oxide (CoO), zirconium oxide or zirconia (ZrO_2), sodium oxide (NaO), and potassium oxide (K_2O), which are mixed, sintered and ground at a weight (or mass) proportion of 2: 3: 2: 1: 1: 1: 2: 2: 3: 3: 1: 1: 2.

3. The air reactivator of claim 1, wherein the far infrared material has a granularity of 0.01-30 micrometers.

4. The air reactivator of claim 1, wherein the polymer material includes polyethylene (PE), polypropylene (PP), polyurethane (PU) or Nylon.

5. The air reactivator of claim 1, wherein the far infrared material has an far-infrared emissivity, more than 80%.

6. The air reactivator of claim 1, wherein the first ribs, the second ribs, and the diffusion members are formed integrally by plastic injection molding.

7. The air reactivator of claim 1, wherein the first ribs intersect the second ribs respectively, and the diffusion members are formed on intersections of the first ribs and the second ribs, and connects the first ribs and the second ribs.

8. The air reactivator of claim 1, wherein the first top face has an area smaller than that of the first bottom face, the second top face has an area smaller than that of the second bottom face, and the projection has an area smaller than that of the third bottom face.

9. The air reactivator of claim 1, wherein the projection has a height greater than that of the first top face and that of the second top face.

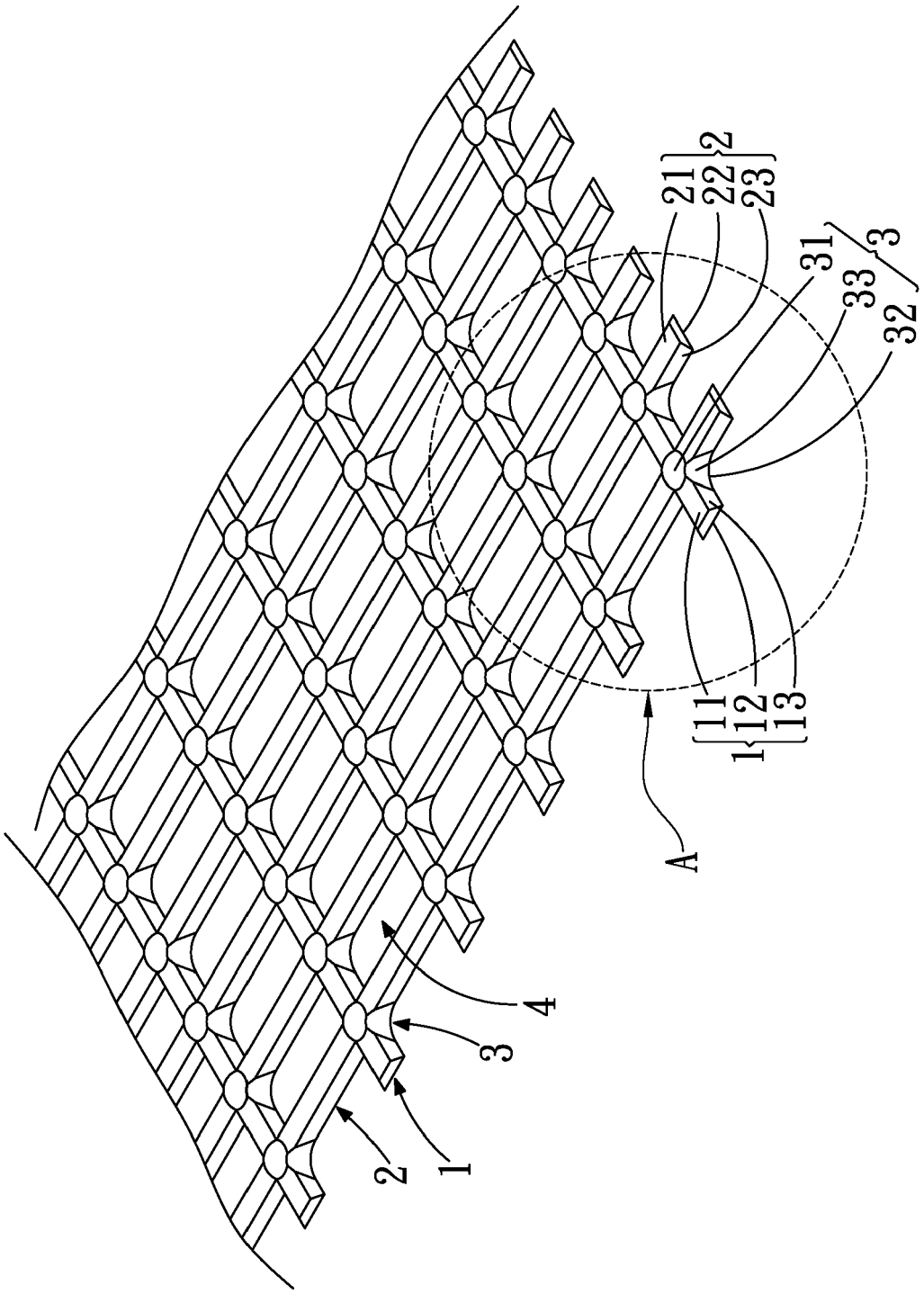

Fig. 1

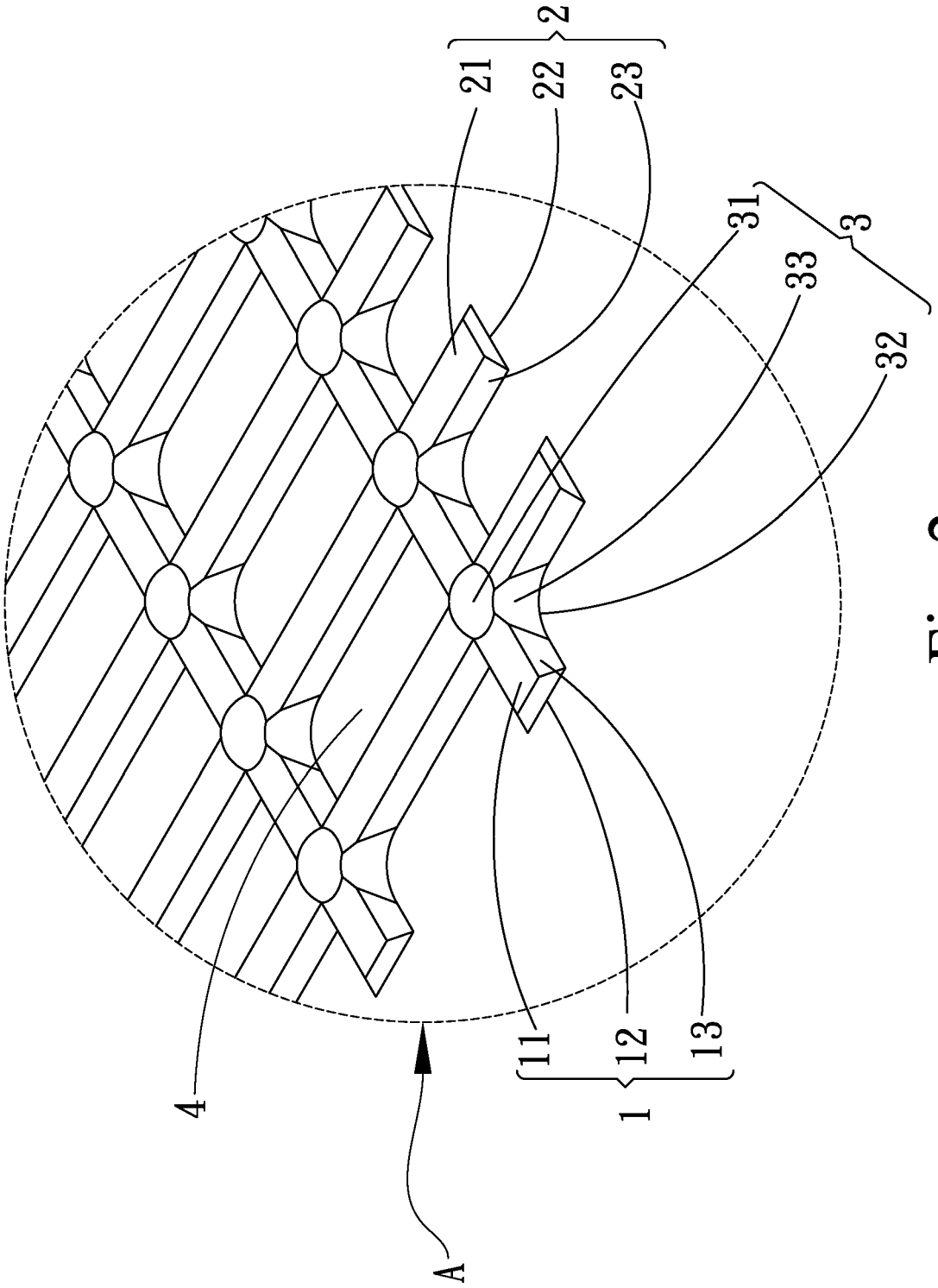

Fig. 2

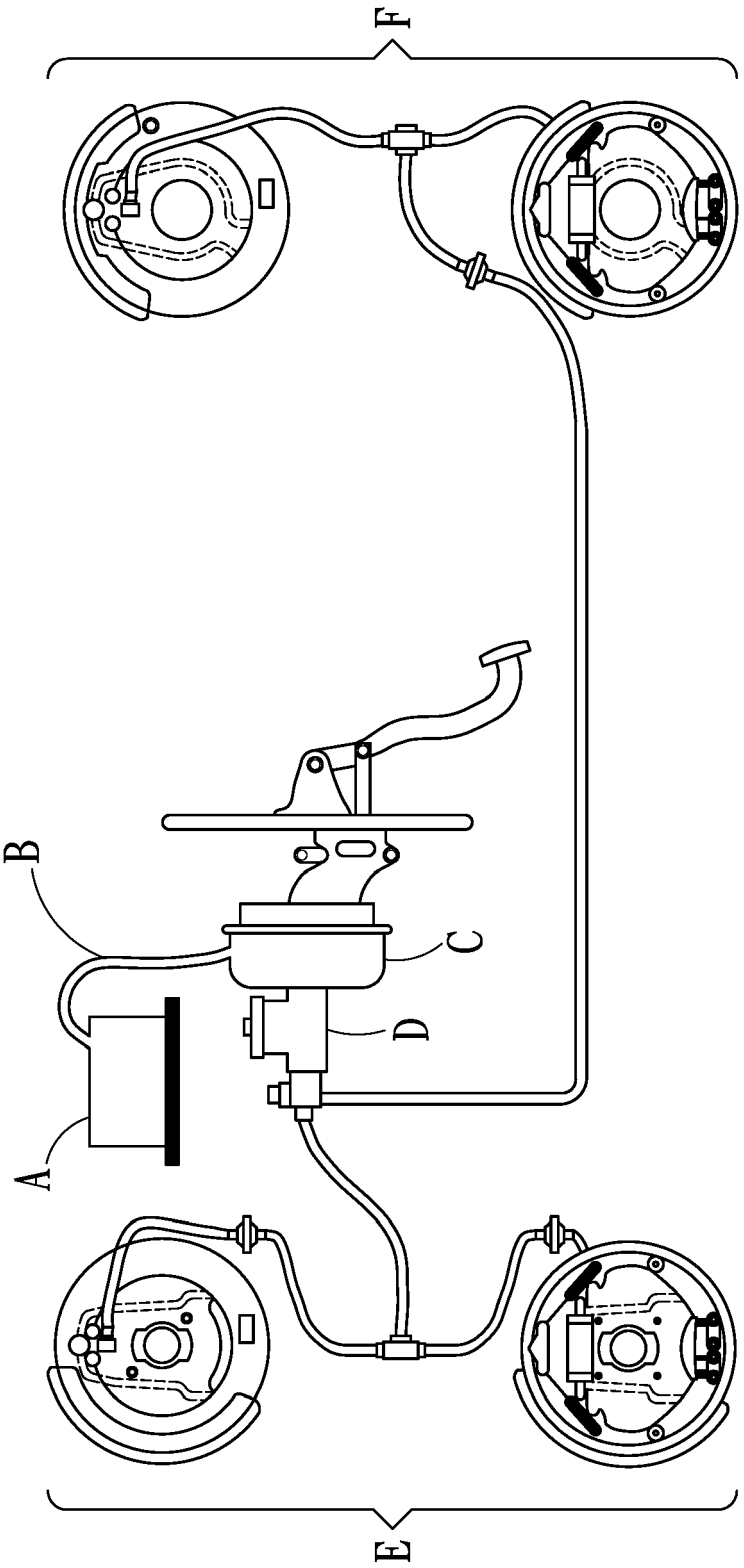

Fig. 3

	before mounting the air reactivator			after mounting the air reactivator		
	fuel consumption (km／L)	H C (ppm)	C O (%)	fuel consumption (km／L)	H C (ppm)	C O (%)
Test Car 1	10	364	0.3	12	101	0.15
Test Car 2	8.2	257	0.2	9.8	121	0.10
Test Car 3	15.9	121	0.3	17.1	96	0
Test Car 4	15.1	129	0.25	16.9	101	0.1
Test Car 5	14.1	131	0.2	16.2	96	0
Test Car 6	12.4	124	0.1	14.2	97	0

Fig. 4

EP 3 822 474 A1

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 19 22 0291

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 6 244 254 B1 (CHEN TUNG-SEN [TW]) 12 June 2001 (2001-06-12) * the whole document *	1-9	INV. F02M27/06 F02M29/04 F02M29/06
Y	US 4 672 940 A (NAKAYAMA HAJIME [JP] ET AL) 16 June 1987 (1987-06-16) * abstract; figures *	1-9	
T	Anonymous: "Far infrared - Wikipedia", , 19 September 2019 (2019-09-19), XP055676250, Retrieved from the Internet: URL:https://en.wikipedia.org/wiki/Far_infrared [retrieved on 2020-03-12]		
A	US 2002/095919 A1 (CHEN D; CHEN T; CHIN T) 25 July 2002 (2002-07-25) * abstract; figures * * paragraph [0013] *	1-9	TECHNICAL FIELDS SEARCHED (IPC)
A,D	TW M 358 880 U (REN JIANG ENTPR CO LTD) 11 June 2009 (2009-06-11) * figures *	1-9	F02M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 March 2020	Torle, Erik

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 22 0291

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-03-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6244254 B1	12-06-2001	NONE	
US 4672940 A	16-06-1987	NONE	
US 2002095919 A1	25-07-2002	US 2002095919 A1	25-07-2002
		US 2003196420 A1	23-10-2003
TW M358880 U	11-06-2009	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- TW M551227 **[0003]**
- TW M305263 **[0003]**
- TW M531984 **[0004]**
- TW M358880 **[0005]**