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(72) Inventor; and
(71) Applicant : **TOMPEA, Petru** [RO/RO]; 30 Sincai Street, Drobeta Turnu Severin, R-220094 Mehedinti (RO).

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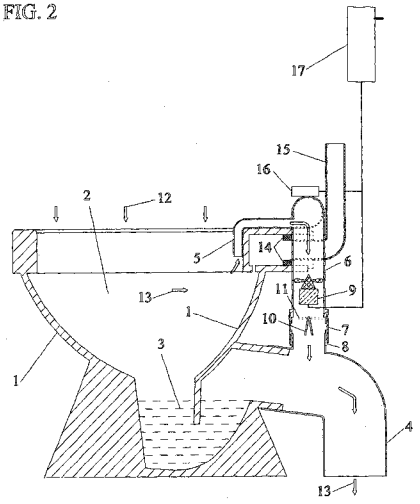
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(54) **Title**: TOILET VENTILATION SYSTEM

FIG. 2



(57) **Abstract**: The toilet ventilation system (1) schematically rendered in fig. 2 sucks in smells and bacteria in suspension (13) directly from the toilet cavity (2) through the suction port (5) (mounted under the toilet lid) and the elbow pipe (6), by means of the 24 V mini fan (9), (mounted on the elbow pipe) and they are evacuated via the normally closed one-way valve (10) (mounted on the elbow pipe after the mini fan), the connecting elbows (7) and (8) into the sewerage connecting pipe of the toilet (4). When a person sits on the toilet, the proximity sensor (16) (mounted in the surrounding area of the toilet lid) signals the supply and control unit (17) (supply from the 220V socket), which turns on the mini fan on a low power. When the person stands up, by means of the sensor, the control unit switches the mini fan on high power maintaining it in operation for a pre-established (adjustable) time. The throttle valve opens only when the mini fan is on, then it closes automatically so as not to let the sewerage gases enter the toilet. In a simpler model, you may replace the 24V mini fan by a 220V one and the proximity sensor and the supply and control unit by an on-off switch and a speed variator.

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DESCRIPTION OF INVENTION

TOILET VENTILATION SYSTEM

The invention aims at solving the discomfort and health issues due to the smells and bacteria in suspension coming from faeces which spread through bathrooms and lavatories after using the toilet.

At present, the ventilation of bathrooms and lavatories is preponderantly made by opening a window (where there is one), by fans mounted into walls or natural draft fans through ventilation pipes. The big inconvenient of these ventilation methods is that smells and bacteria first spread inside bathrooms and lavatories and then they must be eliminated outside, a thing that is quite uncomfortable for the person using the toilet and the persons who enter the bathroom afterwards.

Following these drawbacks, over the years different devices have been designed to extract smells directly from the toilet through the water pipe which flushes the toilet by eliminating them via pipes into the air or the sewerage. Some devices are mounted in the water tanks, others in walls being equipped with complicated water-based valves which switch from water to air thus stopping ventilation when the toilet is being flushed which makes smells spread through the room from that moment until the toilet is completely flushed (the problem is solved only partially) as presented in Vicent's US5361422(A) or Shahar's US6173453(B1). Others are complex and expensive systems and aspiration is again made through the water pipe and the blocking of penetration of sewerage gases into the bathroom relies on water, too, as we may see in WO2009061684A1. In these cases, if the toilet is emptied of water, for various reasons, the sewerage gases (which may also contain methane) go onto the room. These systems also need relatively high ventilation powers to open the water-based valves which may disturb a lot the person sitting on the toilet due to the strong air currents which may form because of the small suction surface. There are also ventilation systems that are not equipped with a barrier against the penetration of the sewerage gases into the room via the sewerage system, as it is Dong Wang's GB2467512A.

The objective of this invention is to eliminate all disadvantages currently existing by designing a ventilation system that may totally eliminate the smells and bacteria coming from faeces when using the toilet, and prevent the dangerous gases enter from sewerage into the

toilet even when there is no water or the power is cut, in other words a simple, safe, cheap and adaptable system to the existing sanitary installations which may not prove uncomfortable while using it.

The solution presented consists in the suction of dangerous smells and bacteria (in suspension) coming from faeces directly from the toilet by means a mini fan and discharging them via the one-way valve to the sewerage connection, fig.1 and fig.2. Suction port (5) is mounted under the rim of the toilet lid directly in cavity (2) of toilet (1). This fits tightly after the form of the toilet bowl so that after letting down the toilet lid it may no longer be seen and it is fixed to the toilet bowl together with its lid. The bad smelling air (13) is suctioned by the mini fan (9), with a 24V engine supplied by the power supply and control unit (17) from a 220V socket and discharged through the one-way valve (10) to the toilet connection (4) on the sewerage pipe. The mini fan is mounted on the elbow pipe (6) and it has two speeds corresponding to two power modes. There are also simpler models where the 24V mini fan and the proximity sensor are replaced by others of 220V, or the sensor is replaced by a simple on-off switch. In these cases, the supply of the mini fan is made by a speed variator. At the end of the elbow pipe they mount a throttle valve which opens (position (10)) under the pressure created by the mini fan upon start-up, and closes (position 11) when the fan stops, under the action of the inbuilt elastics. This valve prevents the inflowing of the sewerage gases via the toilet into the bathroom. The valve may be replaced with an electromagnetic valve normally closed which opens only during the operation of the mini fan. Elbows (7) and (8) make the connection between the mini fan pipe and the sewerage coupling. In the area of the toilet lid a proximity or presence sensor (16) is mounted which sends electrical signals to the supply and control unit and the latter controls the operation of the mini fan.

When a person sits on the toilet, the proximity sensor signals the supply and control unit which turns on the mini fan with a low power capable to create a small fresh air inflow (12) towards the toilet bowl (knowing that in this phase the suction surface is small); thus the air current is very weak almost imperceptible, so as not to disturb the person on the toilet. At the same time, the one-way valve opens allowing the evacuation of the infested air to the sewerage coupling. The infested air cannot enter again in the toilet through the sewerage system due to the buffer water volume (3) which always lies at the bottom of the toilet. When the person stands up, the proximity sensor signals the supply and control unit which switches the mini fan on an increased speed in order to evacuate a higher gas volume

following the increase of the suction surface (after the person has risen) and the influence of the water volume entering the toilet bowl cavity (to evacuate faeces and flush the toilet). By means of a timer, the supply and control unit maintains, for a pre-established (adjustable) time, the operation of the mini fan with high power to flush the toilet and evacuate water from it, and then it turns off the mini fan followed by the closing of the one-way valve. For the bathroom which do not have windows or ventilation systems, the operation time may be adjusted so as to ensure the elimination of vapors from the room as well.

The main advantages are: suction is made directly from the toilet bowl cavity through the suction port thus allowing ventilation to operate during the flushing and evacuation of faeces, when smells and bacteria are still given off, because the suction circuit is independent from the water circuit, as compared to the system where suction is made via the water pipe; the mini fan has two suction powers, a low one when the person is sitting on the toilet by creating a very small air inflow for ventilation purposes (the suction surface is small) without disturbing the person on the toilet, and a high one, when the person stands up, in order to provide a ventilation adequate to the new conditions, when the suction surface increases, and the flushing water enters the toilet to evacuate the faeces. The previous systems have a steady ventilation power, if it has been adjusted not to disturb the person sitting on the toilet (due to the air current formed), when the person stands up and the suction surface increases these systems cannot ensure the collection of all smells: if the fan has a high power while ventilating it may become uncomfortable during use; in the previous systems when the toilet is flushed, ventilation stops, whereas our system the fan goes on operating with higher power to eliminate all smells; the system is equipped with a normally closed valve (throttle valve) or a normally closed electromagnetic valve which does not depend on the presence of water or electricity providing full safety against gas inflow (which may also contain methane) through the toilet into the bathroom even when there is no water or electricity, whereas in similar current systems, if there is no water, the sewerage gases enter the room; by the increase of the operation time on high power the vapors in the bathrooms that do not have windows or other ventilation systems may be evacuated as well; reduced power consumption due to the reduced operation time and low installed power (the average consumption of the mini fan is 12 w) and heating saving in winter time since it is no longer necessary to open the windows for ventilation; it is simple, reliable, safe and easy to maintain, it may be manufactured at low costs and it is adequate for large repetitive manufacturing; the system may be adapted to the current types of toilets and it may be easily mounted: the toilet lid is disassembled, fig.1, the

discharge opening (5) is placed, the lid is put back in place and fixed with the same screws, you change the hose assembly of the toilet to the sewerage pipe with one with a branch pipe (4), you mount the elbow pipe (6) inside which there is the mini fan and the one-way valve, then you couple elbows (7) and (8) to the sewerage coupling and you finally position the proximity sensor (16) and connect the supply and control unit (17) to the 220V socket. As you may see the mounting takes only a couple of minutes and you do not need any specialized knowledge.

We present below an example of our invention, according to fig. 1 and 2.

- fig.1, isometric view of the toilet on which the ventilation system is mounted;

- fig.2, explanatory drawing.

You mount the suction port (5) under the toilet lid which is connected to the sewerage coupling (4) by the elbow pipe (6) and elbows (7) and (8). The 24V mini fan (7) and the one-way valve (10) are mounted inside the elbow pipe (6) (fig.2). The system also contains the proximity sensor (16) mounted in the area surrounding the toilet lid and the supply and control unit (17) which is plugged to a 220V socket. The components of the connection line are sliding; they may rotate and be mounted on left or right in order to adapt to different types of toilets.

Another simpler, cheaper and less automatic variant consists in replacing the 24V mini fan with a 220V fan supplied by a speed variator to the 220V socket (the supply and control unit disappears) and the proximity sensor by an on-off switch.

CLAIMS

1. Toilet ventilation system which sucks in smells from the toilet cavity and evacuates them in the sewerage pipe; it contains a 24V mini fan (9) with two power stages (controlled by the proximity sensor (16) and the supply and control unit (17)), mounted in the suction and discharge pipe made up of the suction port (5), piping (6), connecting pipes (7) and (8), which suck in the smells and bacteria from cavity (2) of the toilet and evacuates them through the one-way valve (10) in the sewerage connecting pipe (4).

2. Ventilation system according to claim 1 characterized by the fact that the mini fan operates on a low power when a person is sitting on the toilet and on high power when the person stands up stopping after a pre-established (adjustable) time.

3. Ventilation system according to claim 1 characterized by the fact that it may be integrated in the toilet bowl, with a two-stage drive solenoid controlled by the proximity sensor and the steady power mini fan.

4. Ventilation system according to claim 1 characterized by the fact that it may be manufactured as a 220V mini fan and the proximity sensor and the supply and control unit may be replaced by an on-off switch and a speed variator.

AMENDED CLAIMS
received by the International Bureau on 27 May 2014 (27.04.2014)

1. Ventilation system toilet, which sucks in smells from the toilet cavity and evacuates them in the sewerage pipe; characterized in that when a person is seated on the toilet, is open the one-way valve and mini fan starts at low power because the suction surface is small (it is covered by person on the toilet) and that the air flow does not cause discomfort to the person on the toilet. When the person stand up, mini fan automatically switches to full power operation, necessary to ensure optimum suction odors, due to increased much suction surface following the lifting of the person on the toilet and ingress of water, which vents feces in the toilet cavity, then automatically stops the mini fan and close the one-way valve.

2. Ventilation system according to claim 1, characterized by it contains a 24V mini fan (9) with two power stages (controlled by the proximity sensor (16) and the supply and control unit (17)), mounted in the suction and discharge pipe made up of the suction port (5), piping (6), connecting pipes (7) and (8), which suck in the smells and bacteria from cavity (2) of the toilet and evacuates them through the one-way valve (10) in the sewerage connecting pipe (4).

3. Ventilation system according to claim 1, characterized by the ventilation system can be programmed to operate at maximum power a predetermined time after the evacuation of feces, making and room ventilation.

4. Ventilation system according to claim 1, characterized by it can be produced and delivered in kit form, which can be easily mounted to all existing toilets today.

5. Ventilation system according to claim 1, characterized by the fact that it may be integrated in the toilet bowl.

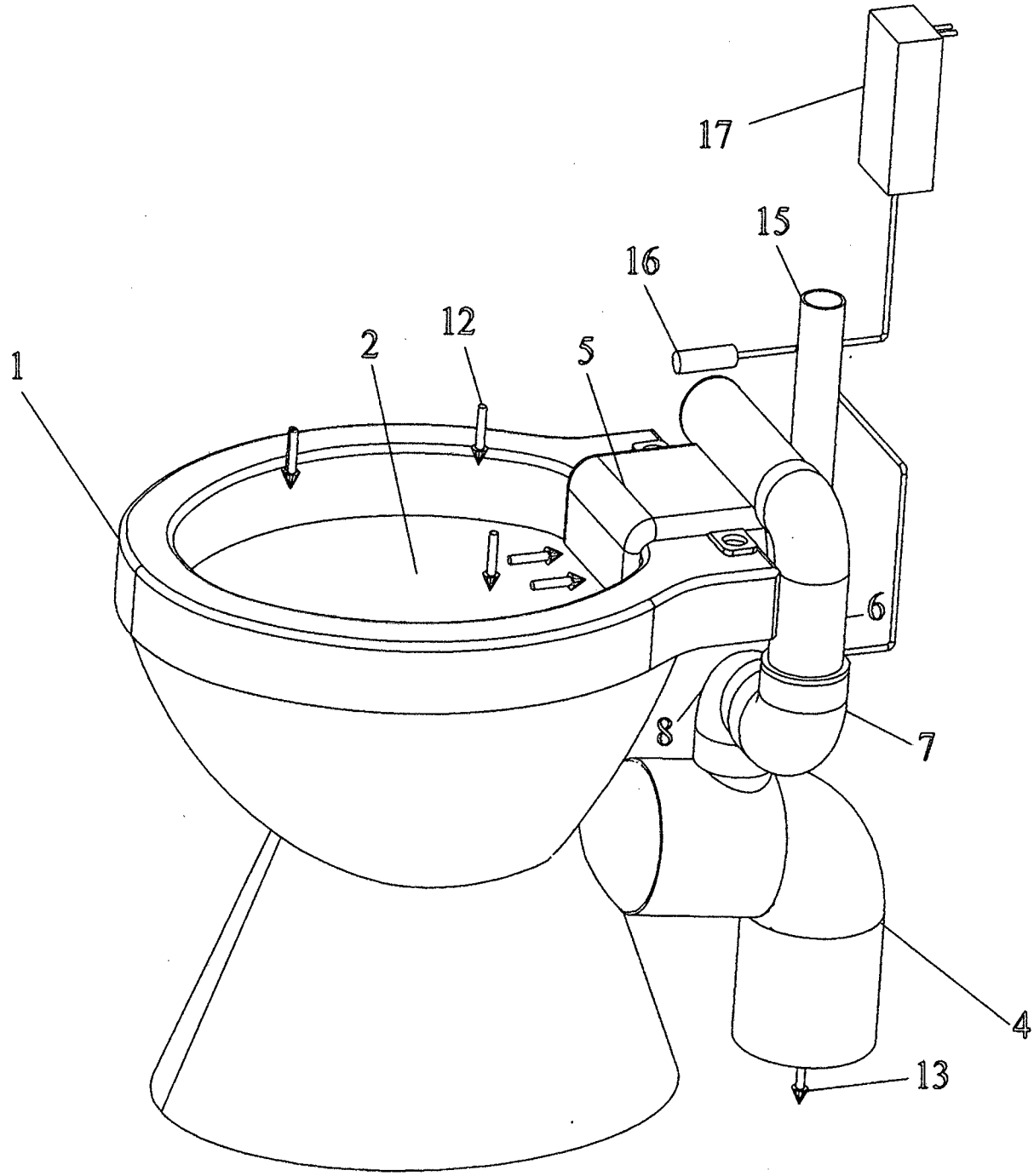


FIG. 1

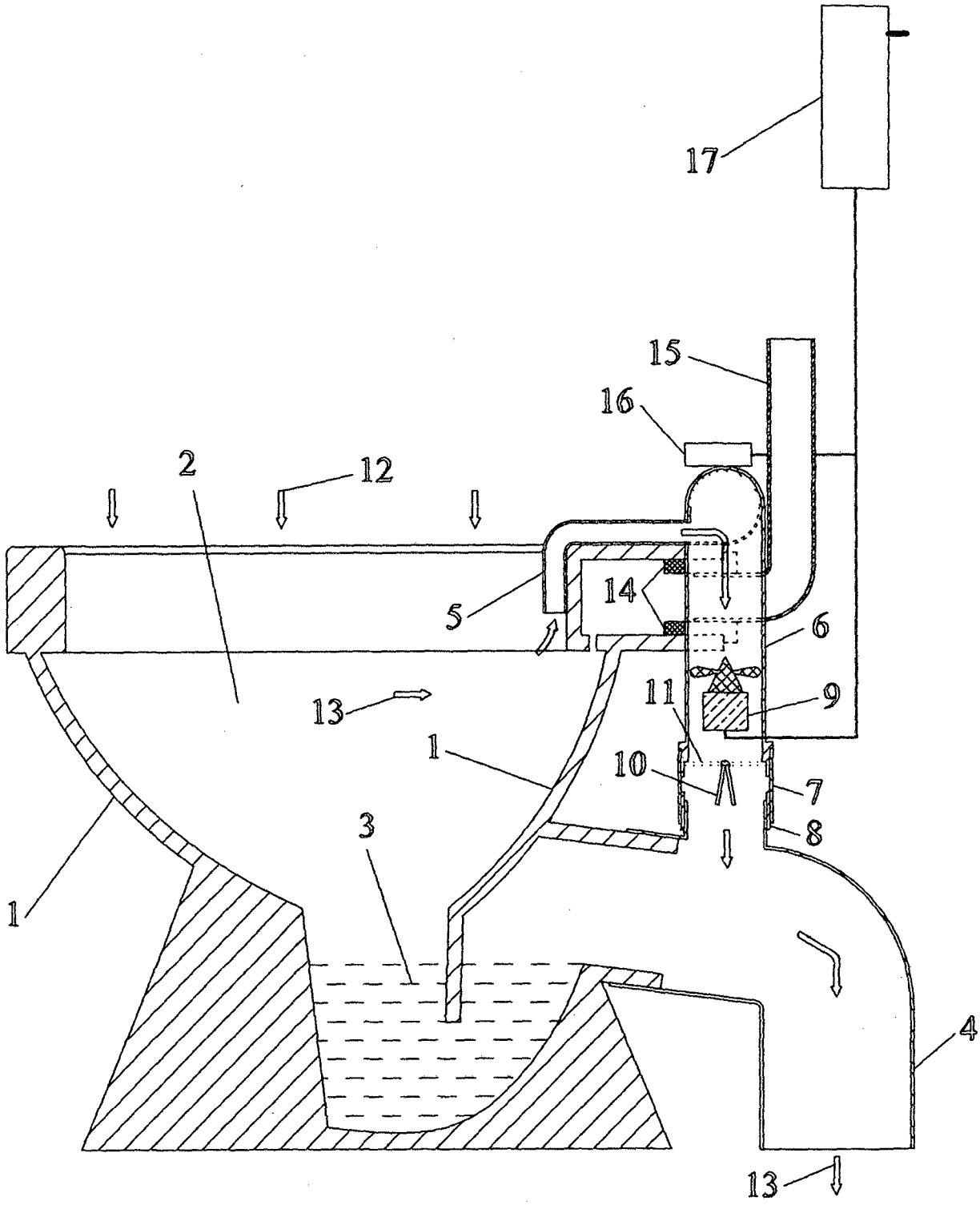


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/RO 2014/000001

A. CLASSIFICATION OF SUBJECT MATTER

E03D 9/04 *(2006.01)*
E03D 9/052 *(2006.01)*
F24F 7/06 *(2006.01)*

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)

A47K 17/00, E03D 5/00, 5/10, 9/00, 9/04, 9/05, 9/052, 11/00, F24F 7/00, 7/007, 7/06

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)

Espacenet, PatSearch (RUPTO internal), RUPAT, DWPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2005/0028255 A1 (TIAN Z. MA et al.) 10.02.2005, abstract, paragraphs [0010], [0011], [0017]-[0021], [0023]-[0026], [0030], [0032], fig. 1-4	1-4
Y	US 3896509 A (DANALD STIPP et al.) 29.07.1975, abstract, col. 1, lines 1-18, col. 2, lines 38-44, col. 3, lines 26-58, fig. 1-6	1-4
Y	GB 2323610 A (ROGER EDWARD FLAHERTY) 30.09.1998, p. 7, lines 9-28, p. 8, 9, lines 1-15, abstract, fig. 1-4	2, 3
Y	CN 202214795 U (HAITAO WU) 09.05.2012, abstract	4
Y	GB 2467512 A (WANG CHANG DONG) 04.08.2010, abstract, p. 1, 5 paragraph from bottom, p. 2, 4 paragraph from the top, fig. 4	4

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/ FIPS Russia, 123995, Moscow, G-59, GSP-5, Berezhkovskaya nab., 30-1 Facsimile No. +7 (499) 243-33-37	Authorized officer V. Parfenov Telephone No. 8(495)531-64-81

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/RO 2014/000001

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 102004014310 A1 (TIBOR VUJEVIC) 13.10.2005	1-4
A	WO 2003/106775 A2 (PARENTI, ARMANDO) 24.12.2003	1-4
A	UA 29638 U (HADOMSKYI VIACHESLAV YURIIOVYCH) 25.01.2008	1-4