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

(11) **EP 2 514 973 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
24.10.2012 Bulletin 2012/43

(21) Application number: **09808937.8**

(22) Date of filing: **17.12.2009**

(51) Int Cl.:
F04B 43/02 *(2006.01)*

(86) International application number:
PCT/ES2009/070603

(87) International publication number:
WO 2011/073464 (23.06.2011 Gazette 2011/25)

(84) Designated Contracting States:
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 SE SI SK SM TR

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(54) VACUUM, PRESSURE OR LIQUID PUMP

(57) It comprises driving means (2), with shaft (5), connected to an eccentric (8), at least two membranes that block a similar number of apertures (4) in a box (1), characterised in that it comprises: connecting rod 6, the centre of which houses a single bearing (9) for each eccentric (8), through which referred shaft (5) passes, and at least two actuators (7) that join membranes (3) to connecting rod (6), with said actuators (7) articulated to connecting rod (6).

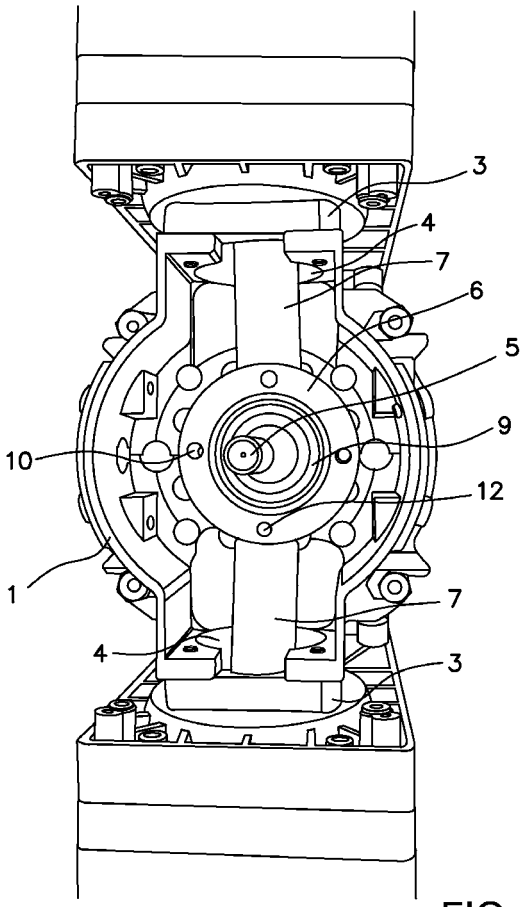

FIG. 4

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Description

[0001] Vacuum, pressure or liquid pump, of the type that comprises driving means with a shaft connected to an eccentric, at least two membranes that block a similar number of apertures in a box, characterised in that it comprises: a connecting rod, in whose centre houses a single bearing for each eccentric through which the referred shaft passes and at least two actuators that join the membranes to the connecting rod, being said actuators articulating with the connecting rod.

BACKGROUND OF THE INVENTION

[0002] The use of pumps is known in the state of the art, with one or two heads, one on each side of the motor, or even two on the same side (opposite with traditional connecting rods and a similar number of bearings). If more extraction capacity is required additional, heads can be added, or they can be over-dimensioned, which involves the use of as many connecting rods, bearings and membranes as required heads, increasing sizes and motor powers.

[0003] Thus, Spanish utility model 0244030 "A DEPRESSION OR VACUUM MEMBRANE PUMP" is known from 1979, in the name of PIERBURG BMBH & CO.KG, which refers to a depression or vacuum membrane pump, especially for conditioning automobile elements, such as servo brakes, the membrane of which is operated from a main shaft via a connecting rod and the chamber that is next to the head is sealed against the atmosphere, the chamber is connecting with the atmosphere by means of at least one valve that allows access the air and prevents the air exit from chamber to the atmosphere. In a similar fashion another valve performs the same process to expulse the air.

DISCLOSURE OF THE INVENTION

[0004] This application is framed within the sector of vacuum, pressure and liquid pumps.

[0005] With this invention, the inventor intends to operate with a single connecting rod, more heads, in other words, using a single connecting rod, be able to place as many actuators with membranes as permitted the connecting rod size, so that, to larger size of the connecting rod, greater number of actuators can be operate. This results in economic savings for both the manufacturer and the end buyer.

[0006] This means that the need for independent regulation of force centring and work loads is eliminated. Currently, each head incorporated into the pump requires a different load point along the shaft for each one. This invention uses a single bearing for each eccentric on which point all forces are balanced and stabilised. This is because only one connecting rod is required independently of the number of heads.

[0007] Thus, greater performances are obtained with less space because a smaller pump can provide identical or even better results than larger pumps. Similarly, this means that this smaller size leads to significant space and weight savings.

[0008] In this way, the present pump can operate a determined number of membranes with the same connecting rod and all forces caused by the heads and membranes are centred with respect to each other at the same working point. When an expulsion force is generated, another intake force is produced at the opposite point, with these being equal at all cycle points.

[0009] One objective of this invention is a vacuum, pressure or liquid pump, of the type comprising driving means with a shaft connected to an eccentric, at least two membranes that block a similar number of apertures in a box, characterised in that it comprises: a connecting rod, the centre of which houses a single bearing for each eccentric through which the referred shaft passes and at least two actuators that join the membranes to the connecting rod, with said actuators articulating with the connecting rod.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] In order to facilitate the description, this report is accompanied by four sheets of drawings that represent a practical exemplary embodiment, which is given as an example that does not limit the scope of this invention.

- Figure 1 is a general view of the invention, in which the membranes and heads have been eliminated.
- Figure 2 is a close-up without the box, membranes and heads.
- Figure 3 is a close-up of an actuator, a part that is connected by means of a hinge joint to the connecting rod.
- Figure 4 is a side view of the invention applied to an end product.

SPECIFIC EXEMPLARY EMBODIMENT OF THIS INVENTION

[0011] Thus, Figure 1 illustrates a box 1, driving means or motor 2, apertures in the box 4, which houses the membranes and heads, a shaft 5, an eccentric 8, a connecting rod 6, actuators 7 and the connecting rod pass-through orifices 10 (at the actuator 7 positions).

[0012] Figure 2 shows driving means 2, connecting rod 6, eccentric 8, shaft 5, connecting rod pass-through orifices 10 and actuators 7.

[0013] Figure 3 illustrates the actuator 7 that is joined to the connecting rod via the actuator pass-through orifice 11, with a pin to form a hinge joint.

[0014] Lastly, Figure 4 represents box 1, heads 3, box apertures 4, connecting rod 6, actuators 7, shaft 5, connecting rod pass-through orifices 10, pins 12 that form hinges joints and a bearing 9 housing the eccentric.

[0015] Thus, in a specific exemplary embodiment, the

product is basically configured as follows: it comprises a box 1, driving means 2, with shaft 5 connected to eccentric 8, two membranes (as many as necessary, three, four, six, despite the fact that, although there are two in this embodiment, they cannot be seen because they are housed inside), which block the orifices in box 4 of cited box 1.

[0016] Regarding actuators 7 and the membranes, it is possible to configure as many as desired, starting with two by taking into account the positions of actuators 7 so that they compensate the forces as well as possible. For example, with three actuators 7, each one could be positioned at 120°-, which would then largely balance the forces. Five actuators would be positioned every 72°- and so on according to the desired number. The idea is to divide the circumference by the desired number of actuators 7.

[0017] Unlike known pumps, this invention includes a single bearing 9 for each eccentric 8.

[0018] It also comprises connecting rod 6, the centre of which houses a single bearing 9, through which the referred shaft 5 passes and at least two actuators 7 that connect the membranes housed inside heads 3 to connecting rod 6, with said actuators 7 articulating with connecting rod 6 by, for example, pins.

[0019] When motor 2 is switched on, it turns shaft 5 which, by means of eccentric 8 produces a similar movement of connecting rod 6.

[0020] Actuators 7 are articulated to connecting rod 6 by joints that employ pins 12 in this embodiment to form hinge joints.

[0021] Moreover, in this invention the connecting rods 6 partially house actuators 7 just as shown in figures 1, 3 and 4. In this embodiment, connecting rod 6 articulates by means of a first pass-through orifice 10 through which actuator 7 passes, facing it via pin 12 (Figure 4), which passes through actuator 7, leaving both pass-through orifices 10 and 11 aligned (Figures 1, 2 and 4).

[0022] This enables actuators 7 to continue pushing the membranes housed inside head 3 so that they continue to block and unblock the respective entrances and exits inside head 3. Even when the eccentric movement is produced, the connecting rod forces that the movement on the membrane is linear because actuator 7 articulation on connecting rod 6 allows any membranes position to be recovered while these maintain their respective positions over apertures 4.

[0023] In fact, connecting rod 6 becomes the connection between actuator 7 and bearing 9 and eccentric 8, thus permitting the membranes to work and adapt to any position as forced by the eccentric.

[0024] This invention patent describes a new vacuum, pressure or liquid pump. The exemplary embodiments descried here do not limit this invention, which can have various applications and/or adaptations within the scope of the following claims.

Claims

1. A vacuum, pressure or liquid pump, of the type comprising driving means (2), with shaft (5), connected to an eccentric (8), at least two membranes that block a similar number of apertures (4) in a box (1), **characterised in that** it comprises:

   - Connecting rod (6), the centre of which houses a single bearing (9) for each eccentric (8), through which referred shaft (5) passes, and
   - At least two actuators (7) that join membranes (3) to connecting rod (6), with said actuators (7) articulated to connecting rod (6).

2. A pump, in accordance with claim 1 **characterised in that** connecting rod (6) partially houses actuators (7) and articulates with the same by means of a first pass-through orifice (10), through which connecting rod (6) passes, facing a second pass-through orifice (11), through which actuator (7) passes, so that both pass-through orifices (10, 11) are joined by a pin (12).

3. A pump, in accordance with claim 1 **characterised in that** actuators (7) are articulated in an equidistant manner from each other to the connecting rod (6).

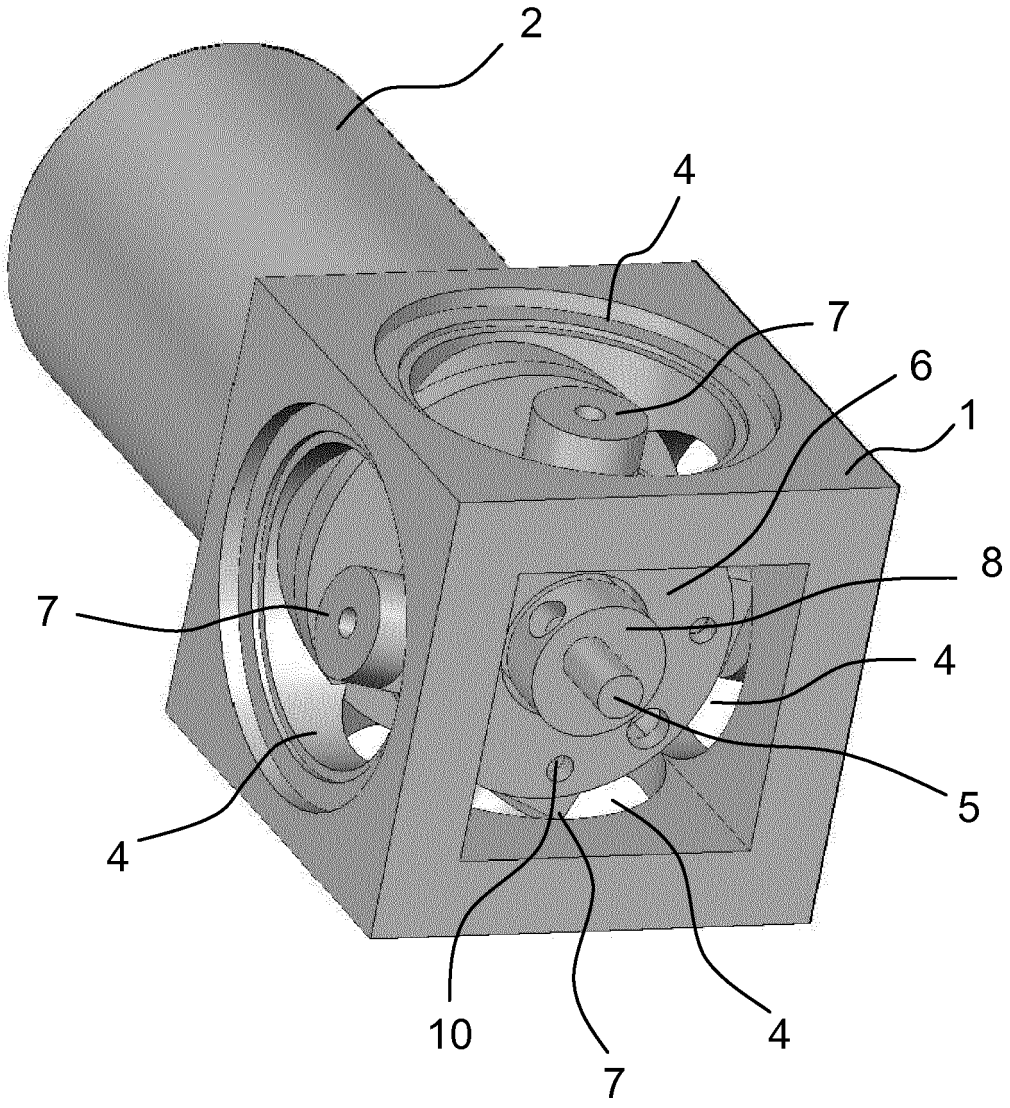


FIG. 1

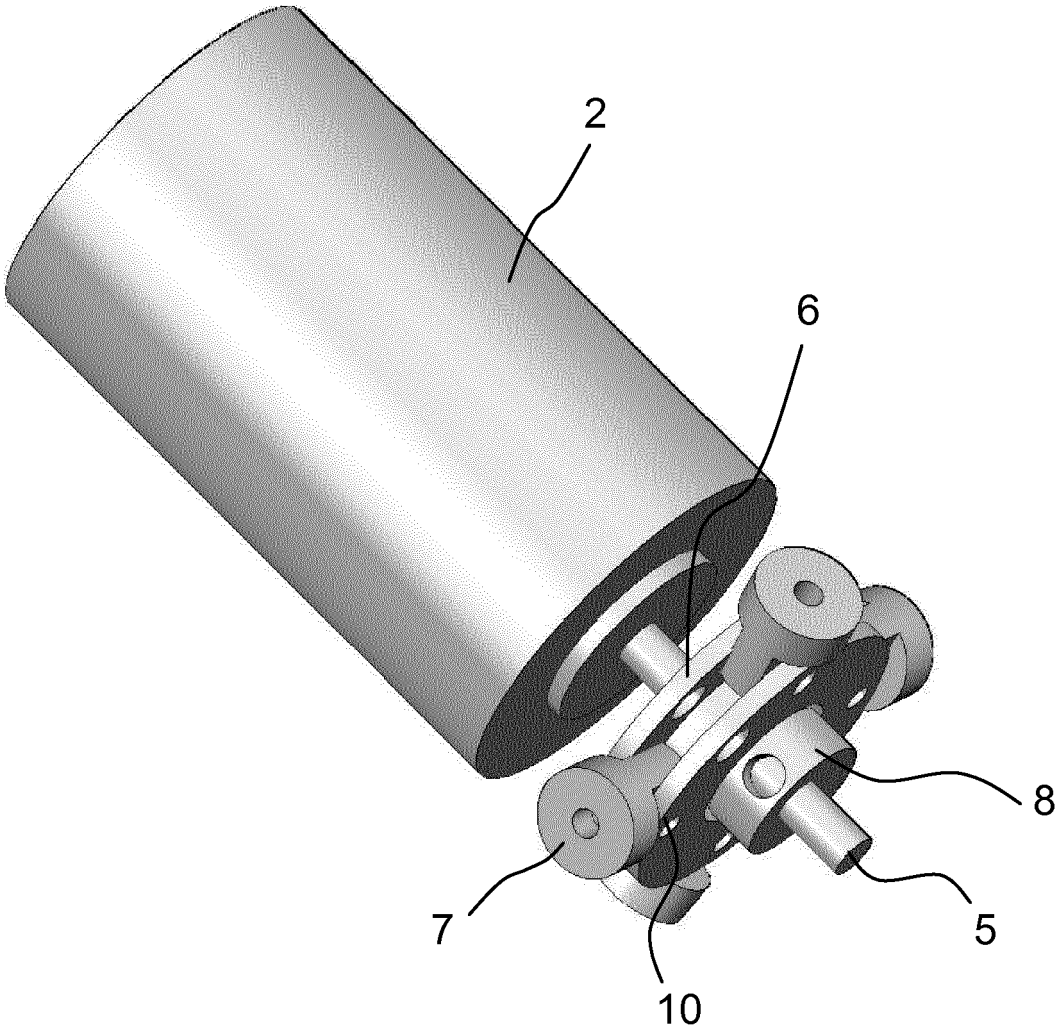
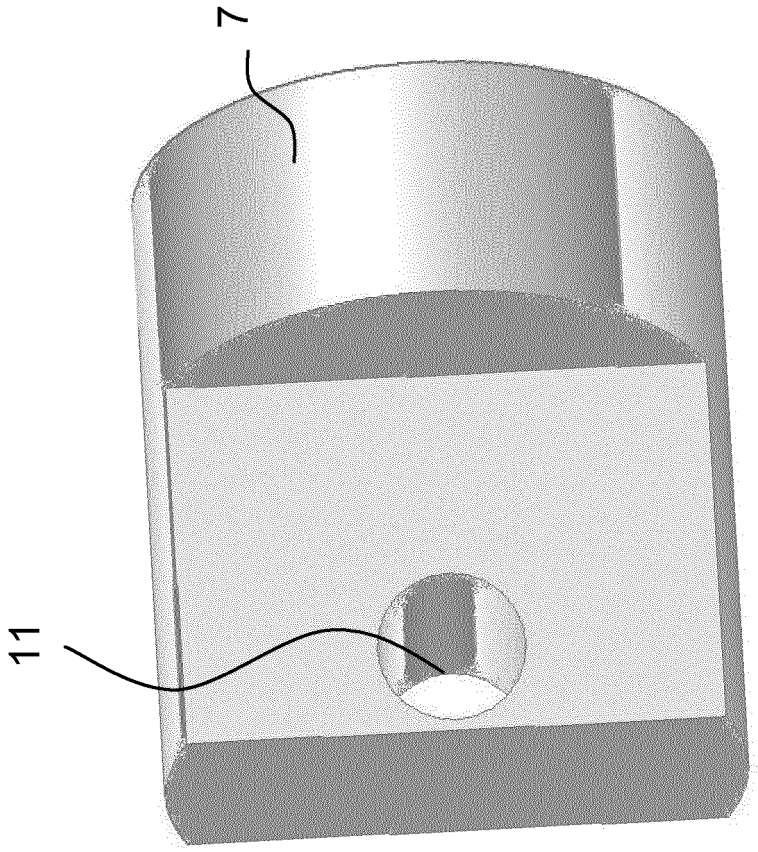


FIG. 2

FIG. 3



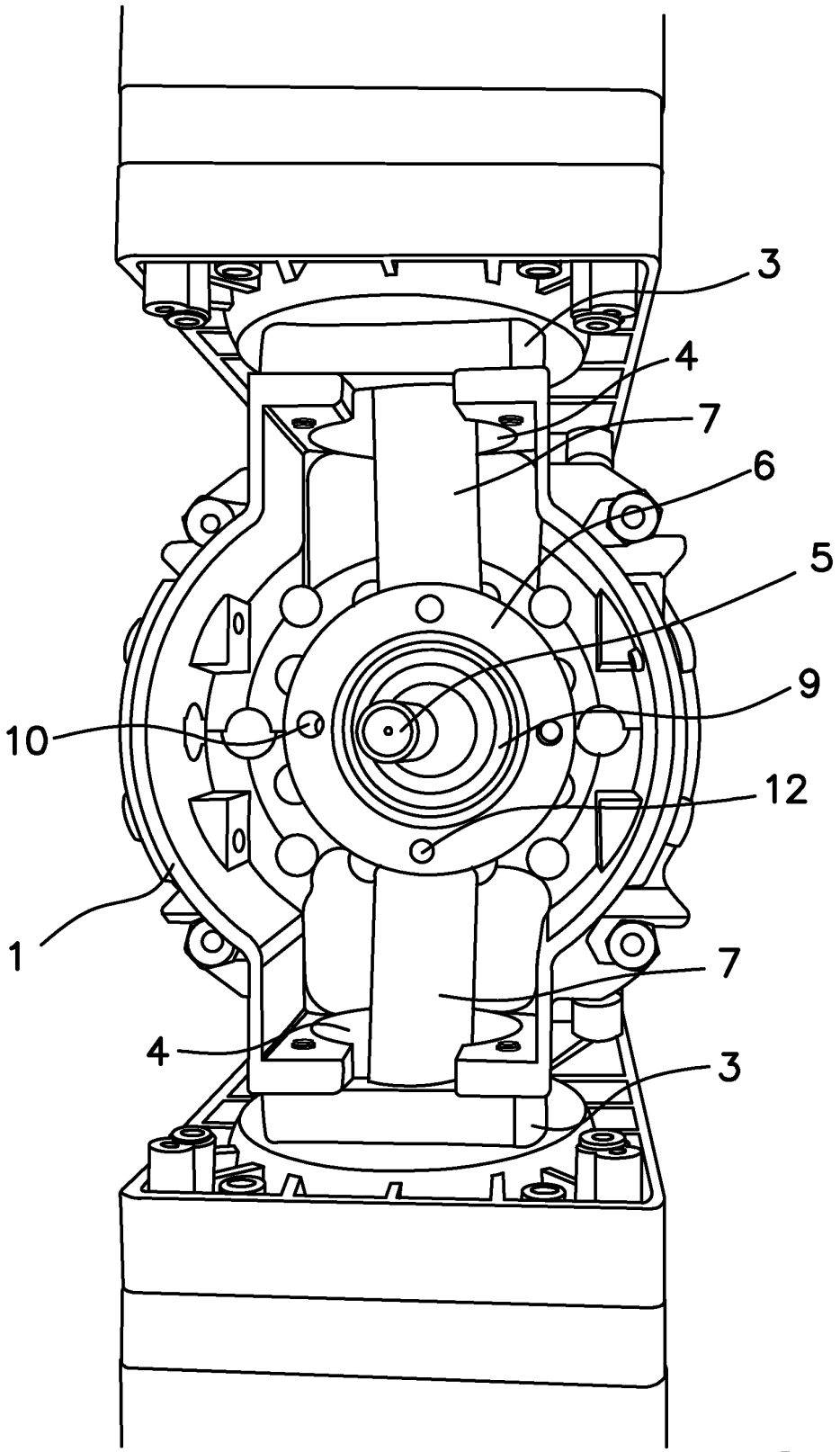


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/ES2009/070603

A. CLASSIFICATION OF SUBJECT MATTER
INV. F04B43/02
ADD.

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)
F04B

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 049 347 A5 (COZIC ALBERT) 26 March 1971 (1971-03-26) page 3, line 10 - page 3, line 15; figures 3,5,6,7	1-3
X	US 4 931 000 A (FLEMING JR WILLIAM T [US]) 5 June 1990 (1990-06-05) * abstract; figures 1,2	1-3
X	US 4 963 075 A (ALBERTSON PHILIP E [US] ET AL) 16 October 1990 (1990-10-16) * abstract; figures 1,4	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"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

"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.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 September 2010	27/09/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Pinna, Stefano

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/ES2009/070603

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2049347 A5	26-03-1971	NONE	
US 4931000 A	05-06-1990	NONE	
US 4963075 A	16-10-1990	NONE	

Form PCT/ISA/210 (patent family annex) (April 2005)