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(54) Title: AUTOMATIC DISPENSER

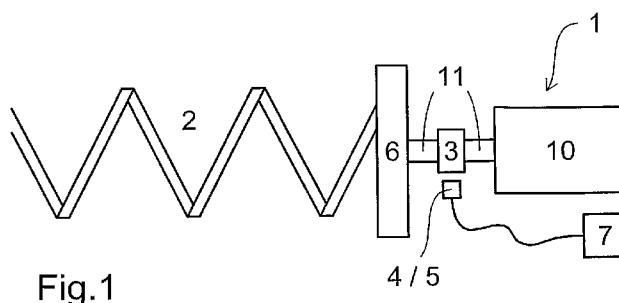


Fig. 1

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(57) Abstract: The present invention relates to an automatic dispenser equipped with an ejection assembly; the assembly comprises at least a geared motor (1), an ejection device (2) fitted to the output shaft (11) of the geared motor (1), and detection means (3,5) adapted to detect the movement of the ejection device (2); the detection means (3,5) comprise at least one magnet (32,33) associated with the output shaft (11) of the geared motor (1), and at least one magnetic sensor (5) positioned in a manner such as to detect when the magnet (32,33) passes through a predetermined region (51A); the ejection assembly further comprises an overcurrent protection device (8) connected electrically upstream of the geared motor (1).

TITLE**AUTOMATIC DISPENSER****DESCRIPTION**

The present invention relates to a automatic dispenser.

5 A typical application of the present invention is the field of articles automatic dispensers that are commonly called “vending machines” are used for dispensing, upon payment, various types of products, in particular foods and beverages. The present description will refer in particular to the field of articles dispensers, even though the present invention is not limited to such an application.

10 Articles automatic dispensers equipped with an articles ejection assembly are currently available on the market; said assembly comprises at least a “geared motor” (i.e. a unit incorporating an electric motor and a motion reduction mechanism), a metal spiral fitted to the output shaft of the geared motor, a cylindrical element fitted to the output shaft of the geared motor, and a microswitch arranged close to the cylindrical element.

15 The articles to be dispensed are inserted between the coils of the metal spiral and generally consist of bottles or packaged snacks; as the spiral makes one full revolution, all products advance axially by a distance corresponding to the spiral pitch, and the article which arrives at the free end of the spiral thus becomes ready to be dispensed, for example, by letting it fall by gravity into a collection cavity.

20 An ejection device like the one described above is shown schematically in Fig.1, wherein 1 is the geared motor (10 being the external housing thereof), 11 is the output shaft thereof having an axis of rotation 11A, 2 is the spiral, 3 is the cylindrical element, and 4 is the microswitch (40 being the external housing thereof); the cylindrical element 3 and the microswitch 4 are shown in more detail
25 in Fig.2 and Fig.3 in two different reciprocal positions.

As can be seen in Fig.2 and Fig.3, the cylindrical element 3 has a radial recess 31; the microswitch 4 is arranged close to the cylindrical element 3 in a manner such

that, when the shaft 11 of the geared motor 1 is rotating, the actuator 41 of the microswitch 4 is pressed and released cyclically by the cylindrical element 3; the microswitch 4 is held pressed (Fig.3) for almost one full revolution and is then released (Fig.2) for a short time; by detecting the opening and closing actions of the microswitch 4 it is possible to control the geared motor 1 and obtain the delivery of one article at a time.

This microswitch-based electromechanical solution has been used in “vending machines” for a long time.

A first drawback of such a solution is that the microswitch may bounce back to some extent when abruptly pressed and released, thus causing wrong detections of the rotation of the geared motor and therefore of the advance of the articles, hence leading to article delivery problems.

These problems are generally overcome by using special high-quality microswitches and/or by making the pressing/releasing action less abrupt; in spite of these corrective steps, problems may still arise which require a call to the “vending machine” service technician.

A second drawback of such a solution is that the ejection assembly sometimes gets stalled or braked due to an anomalous positioning of the articles to be delivered; such anomalous positioning may occur when the articles are being loaded into the dispenser or, more often, during the operation of the dispenser, in particular during the actuation of the ejection assembly; this causes article delivery problems as well as damage to the electric motor of the geared motor, which is stalled or braked just when power is being supplied to it – this anomalous condition of the electric motor may cause even worse material and personal damage.

These problems can be prevented by checking that the article is delivered correctly every time the ejection assembly is actuated, e.g. through a sensor detecting that the article has fallen or is present in the collection cavity; if delivery has not taken place, the dispense stops, awaiting an intervention by a service technician.

However, if the ejection assembly is not stalled, but is only braked, the fault will not be detected and risks of damage will result.

It is the general object of the present invention to provide a solution which is alternative to the prior art and which overcomes the above-mentioned drawbacks, in particular as far as a regular and reliable articles delivery is concerned.

5 These and other objects are achieved through the automatic dispenser having the features set out in the appended claims, which are intended as an integral part of the present description.

The present invention is based on the innovative concept of detecting the mechanic operation of the ejection device through a magnetic sensor and the electric operation of the ejection device through an overcurrent protection device.

10 In particular, the present invention advantageously employs at least one magnet (preferably two or three magnets) mechanically associated with the output shaft of the geared motor, and a Hall effect sensor as well as a PPTC [Polymeric Positive Temperature Coefficient, i.e. a particular type of PTC] connected electrically upstream of the geared motor.

15 As an alternative to the Hall effect sensor (but less advantageously), a different type of magnetic proximity sensor may be used: for instance, a Reed contact sensor or an inductive sensor.

As an alternative to the PPTC (but less advantageously), a different type of overcurrent protection device may be used: for example, a fuse (electric fuse,
20 thermal fuse, ...) or a magnetic switch (magnetothermal switch, relay, ...) or a thermal switch (with a bimetallic foil) or a traditional PTC.

With this solution, the detection of the movement of the ejection device becomes simple, accurate and reliable; it follows that the automatic dispenser can determine accurately and reliably if an article, for example, has been delivered correctly in a
25 manner substantially independent of the weight and size of the article itself, while preparing itself accurately and reliably for the next delivery operation as well.

Furthermore, with this solution the automatic dispenser can determine if the electric motor of the geared motor of the ejection assembly is operating in proper conditions, and therefore if delivery can continue regularly.

A first important advantage offered by the present invention is that it does not require the presence of long, complex and awkward wirings inside the vending machine.

5 A second important advantage offered by the present invention is that, should anomalous electric conditions arise, the operation of the ejection device will be automatically stopped electrically; also, when a PPTC (which is a resettable device) is used, the operation of the ejection device can be restored simply by switching off and on the power to the ejection assembly (in particular to the geared motor) without having to replace any component.

10 A third important advantage offered by the present invention is that the overcurrent protection device provides protection against anomalous electric conditions due not only to the electric motor of the geared motor getting stalled or braked, but also to any anomalous absorption of electric current (e.g. short circuits).

15 The present invention applies to articles dispensers, in particular for foods and/or beverages, as well as to doses dispensers, in particular for powder material (e.g. powder coffee) or granulated material (e.g. granulated coffee or combustible pellets).

20 The present invention, and in particular the technical features and advantages thereof, will become more apparent from the following description referring to the annexed drawings, wherein:

Fig.1 shows a much simplified mechanic diagram of an article ejection assembly according to the present invention; this is a general diagram which is applicable, to a large extent, to prior-art assemblies as well as to assemblies according to the
25 present invention,

Fig.2 shows a cylindrical element and a microswitch according to the prior art, in a first reciprocal position,

Fig.3 shows a cylindrical element and a microswitch according to the prior art, in a second reciprocal position,

30 Fig.4 shows a cylindrical element and a magnetic sensor according to an embodiment of the present invention, in a first reciprocal position,

Fig.5 shows a cylindrical element and a magnetic sensor according to an embodiment of the present invention, in a second reciprocal position,

Fig.6 shows a cylindrical element and a magnetic sensor according to an embodiment of the present invention, in a third reciprocal position,

- 5 Fig.7 shows a cylindrical element and a magnetic sensor according to an embodiment of the present invention, in a fourth reciprocal position, and
Fig.8 is a simplified mechanic/electric diagram of an embodiment of the present invention.

Said description and said drawings are explanatory only and non-limiting;
10 additionally, they are schematic and simplified.

The present invention will now be described with reference to Fig.1 as well as to Fig.4, Fig.5, Fig.6, Fig.7 and Fig.8.

The automatic dispenser according to the present invention is equipped with an ejection assembly; said assembly comprises at least:

- 15 - a geared motor (1 in Fig.1),
- an ejection device (2 in Fig.1) fitted either directly or indirectly to the output shaft (11 in Fig.1) of the geared motor (1 in Fig.1),
- detection means (3 and 5 combined together in Fig.1) adapted to detect the movement of the ejection device (2 in Fig.1);
20 the detection means comprise:
- at least one magnet (32 and/or 33 in Fig.4, Fig.5, Fig.6 and Fig.7) associated with the output shaft (11 in Fig.1) of the geared motor (1 in Fig.1),
- at least one magnetic sensor (5 in Fig.1) positioned in a manner such as to detect when said at least one magnet (32 and/or 33 in Fig.4, Fig.5, Fig.6 and Fig.7)
25 passes through a predetermined region (51A in Fig.1),
- an overcurrent protection device (8 in Fig.8) connected electrically upstream of said geared motor (1 in Fig.8).

According to this solution, the detection of the movement of the ejection device is simple, accurate and reliable; it follows that the automatic dispenser can determine
30 accurately and reliably if an article has been delivered correctly in a manner substantially independent of the weight and size of the article itself, while

preparing itself accurately and reliably for the next delivery operation as well. An important advantage offered by the present invention is that it does not require the presence of long, complex and awkward wirings inside the vending machine.

Furthermore, with this solution the automatic dispenser can determine if the electric motor of the geared motor of the ejection assembly is operating in proper conditions, and therefore if delivery can continue regularly. An important advantage offered by the present invention is that, should anomalous electric conditions arise, the operation of the ejection device will be automatically stopped electrically; also, another important advantage of the present invention is that the overcurrent protection device provides protection against anomalous electric conditions due not only to the electric motor of the geared motor getting stalled or braked, but also to any anomalous absorption of electric current (e.g. short circuits).

The overcurrent protection device is preferably a PPTC; as a matter of fact, said component increases very much its resistance quickly when a current above a predetermined threshold flows through it, and then such high resistance is maintained until power is cut off; the thermal inertia of the PPTC is sufficient to prevent any short current peaks from cutting off the power supply to the geared motor, in the absence of any dangerous conditions.

In the example of Fig.1, the ejection device is a metal spiral 2 fitted to the output shaft 11 of the geared motor 1 through a flange 6.

In the example of Fig.1, the magnetic sensor 5 is connected electrically to an electronic control unit 7 adapted to, among other things, control the rotation of the geared motor 1 and cause the articles to be delivered.

In the example of Fig.1, the magnetic sensor 5 comprises a small electronic board 50 and a Hall effect sensor 51 fitted to the board 50 (as can be seen only in Fig.4, Fig.5, Fig.6 and Fig.7); the sensor 51 has a detection region 51A within which the sensor 51 can detect a magnetic field.

In the example of Fig.1, two magnets 32 and 33 are associated with the output shaft 11 of the geared motor 1 (as can be seen only in Fig.4, Fig.5, Fig.6 and Fig.7); the magnets 32 and 33 are arranged in a manner such as to pass through the detection region 51A of the sensor 51 when the geared motor 1 is rotating. In Fig.4 no magnet is within the detection region 51A of the sensor 51; in Fig.5 the magnet 32 is within the detection region 51A of the sensor 51; in Fig.6 no magnet is within the detection region 51A of the sensor 51; in Fig.7 the magnet 33 is within the detection region 51A of the sensor 51.

In the example of Fig.1, the two magnets 32 and 33 are located at such a distance as to form an angle between 30° and 90° with the axis 11A of the shaft 11 (as can be seen only in Fig.4, Fig.5, Fig.6 and Fig.7); in particular, said angle is approximately 45° .

In the example of Fig.1, as well as in Fig.4, Fig.5, Fig.6, Fig.7 and Fig.8, the geared motor 1 is adapted to rotate in both directions and to reverse its direction of rotation; as a consequence, this also applies to the shaft 11 and to the device 2; it should be noted that the direction of rotation associated with the normal operation of the ejection assembly is indicated in Fig.4, Fig.5, Fig.6 and Fig.7.

Said possibility of reversing the direction of rotation is very useful should any articles become trapped in the ejection device; in fact, if the dispenser detects a jam while rotation in the normal working direction is taking place in the ejection assembly, the dispenser can reverse the direction of rotation of the geared motor.

Advantageously, the reversal of the direction of rotation lasts for a short time and can be controlled by using the two magnets 32 and 33; in fact, between two successive detections of the magnet 32 or magnet 33 by the sensor 51 the shaft 11 and the device 2 make one revolution, whereas between the detection of the magnet 32 and the detection of the magnet 33 the shaft 11 and the device 2 make only a small portion of a revolution, in particular about one eighth of a revolution.

The article ejection assembly according to the illustrated example may operate as follows. The dispenser receives a request for an article by a user and causes the articles ejection device 2 to make one full revolution by means of the geared

motor 1; the rotation of the geared motor 1 takes place in the time interval between two successive detections of the magnet 32; if the dispenser realizes that the article has not been delivered, it will reverse the direction of rotation of the geared motor 1 for a time interval between the detection of the magnet 32 and the detection of the magnet 33, and then it will reverse the direction of rotation of the geared motor 1 again for a time interval between the detection of the magnet 33 and the detection of the magnet 32; such a sequence of two consecutive reversals may even be repeated several times; it may also be provided that, if the article is still not delivered after three repetitions, for example, the dispenser will generate a visual and/or audible error signal.

The dispenser can be made to operate as described above under the control of the electronic control unit 7, in particular thanks to a program of a microcontroller internal to the unit 7.

A third magnet associated with the output shaft 11 of the geared motor 1 may additionally be employed, arranged in such a position as to pass through the detection region 51A when the geared motor 1 is rotating; in this case, the third magnet is located at such a distance from one of said two magnets 32 and 33 as to form an angle of approximately 180° with the axis 11A of said shaft 11; thus the unit 7 can detect half-turn rotations of the shaft 11 and of the device 2.

In the example of Fig.1 there is a cylindrical element 3, which may alternatively be a prismatic one, fitted either directly or indirectly to the output shaft 11 of the geared motor 1; the magnets 32 and 33 are secured onto or within said element 3; this fixing may be realized through only or also the use of glue.

As aforementioned, the present invention is also applicable to doses dispensers, in particular for powder material (e.g. powder coffee) or granulated material (e.g. granulated coffee or combustible pellets).

A doses ejection assembly suitable for this application may be, for example, similar to the one shown in Fig.1, provided that the spiral is replaced with a screw; the (rotary) screw is used for creating and ejecting the doses.

In this case as well, there may be jamming problems (e.g. jammed pellets or coffee grains) and/or problems of incorrect or irregular dose ejection (e.g. due to powder of the material to be delivered getting compacted/cemented in the screw).

5 The diagram of Fig.8 shows the geared motor 1 and an electric drive circuitry 71 connected electrically to each other by means of at least two electric conductors C1 and C2; the geared motor thus receives the electric power it needs to operate from the circuitry 71 through the conductors C1 and C2.

The circuitry 71 is arranged at a first end E1 of the conductors C1 and C2, and belongs to the electronic control unit 7.

10 The geared motor 1 (which comprises a direct current electric motor) is arranged at a second end E2 of the conductors C1 and C2, together with the magnetic sensor 51 (which is a Hall effect sensor) and an overcurrent protection device 8 (which is a PPTC); the output signal of the sensor 51 then arrives at the unit 7 (this is not shown in Fig.8).

15 At the second end E2 there is also a circuitry 9 for supplying power to the geared motor 1 and to the sensor 51; in particular, the circuitry 9 comprises a sub-circuitry 91 for supplying power to the geared motor 1 and a sub-circuitry 92 for supplying power to the sensor 51; the sub-circuitry 91 may comprise, for example, a diode (connected along the conductor C1) or a diode bridge, and possibly a
20 capacitor (connected across the conductors C1 and C2); the sub-circuitry 92 may comprise, for example, a series connection of a resistor and a Zener diode whose intermediate tap is used for supplying power to the sensor 51.

With reference to the example of Fig.8, at the end E2 the device 8 is placed first across the conductors C1 and C2, followed by the circuitry 9 and the geared motor 1.

25 It is also conceivable that the operation of the PPTC is detected by the dispenser (e.g. by its electronic control unit) and that the dispenser itself generates a visual and/or audible error signal.

The geared motor 1 is a unit incorporating an electric motor and a motion reduction mechanism; according to the preferred embodiment of the present

invention, the geared motor comprises a direct current electric motor, which is small and inexpensive; as an alternative to the direct current motor (but less advantageously), a synchronous motor, an asynchronous motor or a brushless motor may be used instead.

- 5 The component combination of the example shown in Fig.8 (PPTC, Hall effect sensor, direct current electric motor) and the spatial grouping of said components (forming a single electromechanical component) represents an optimal solution especially for (without being limited to) applications in the field of vending machines; in fact, this is a functionally complete, effective and low-cost solution.
- 10 Furthermore, the simultaneous presence in the dispenser of an overcurrent protection device and of the possibility of reversing the direction of rotation of the geared motor is very useful for solving at best any problems related to the operation of the ejection assembly of the dispenser.

CLAIMS

1. Automatic dispenser equipped with an ejection assembly, wherein said ejection assembly comprises at least:

- a geared motor (1),

5 - an ejection device (2) fitted to the output shaft (11) of said geared motor (1),

- detection means (3,5) adapted to detect the movement of said ejection device (2), characterized in that said detection means (3,5) comprise:

- at least one magnet (32,33) associated with the output shaft (11) of said geared motor (1),

10 - at least one magnetic sensor (5) positioned in a manner such as to detect when said at least one magnet (32,33) passes through a predetermined region (51A); and further characterized in that said ejection assembly additionally comprises:
- an overcurrent protection device (8) connected electrically upstream of said geared motor (1).

15 2. Dispenser according to claim 1, characterized by comprising two magnets (32,33) associated with the output shaft (11) of said geared motor (1), said magnets (32,33) being positioned in a manner such as to pass through said predetermined region (51A) when said geared motor (1) is rotating.

3. Dispenser according to claim 2, wherein said two magnets (32,33) are
20 located at such a distance as to form an angle between 30° and 90° with the axis (11A) of said shaft (11).

4. Dispenser according to claim 3, characterized by comprising a third magnet associated with the output shaft of said geared motor, said third magnet being positioned in a manner such as to pass through said predetermined region when
25 said geared motor is rotating, and wherein said third magnet is located at such a distance from one of said two magnets (32,33) as to form an angle of approximately 180° with the axis (11A) of said shaft (11).

5. Dispenser according to claim 2 or 3 or 4, wherein said geared motor (1) is adapted to rotate in both directions and to reverse its direction of rotation.

6. Dispenser according to any of the preceding claims, wherein said magnetic sensor is a magnetic proximity sensor and comprises a Hall effect sensor or a Reed contact sensor or an inductive sensor.

7. Dispenser according to any of the preceding claims, wherein said
5 overcurrent protection device comprises a fuse or a magnetic switch or a thermal switch or a PTC.

8. Dispenser according to any of the preceding claims, wherein said overcurrent protection device is a resettable one.

9. Dispenser according to claims 6 and 8, wherein said magnetic sensor
10 comprises a Hall effect sensor and said overcurrent protection device comprises a PPTC.

10. Dispenser according to any of the preceding claims, wherein said geared motor (1) comprises a direct current electric motor.

11. Dispenser according to any of the preceding claims, characterized by
15 comprising:
- an electric drive circuitry (71) for driving said geared motor (1),
- at least two electric conductors (C1, C2) connected to said electric drive circuitry (71) at a first end (E1) and to said geared motor (1) at a second end (E2);
wherein said magnetic sensor (51) and said overcurrent protection device (8) are
20 arranged at said second end (E2).

12. Dispenser according to claim 11, characterized by comprising a power supply circuitry (9) arranged at said second end (E2) for supplying power to said geared motor (1) and/or to said magnetic sensor (51), and wherein said overcurrent protection device (8) is connected electrically upstream of said power supply
25 circuitry (9).

13. Dispenser according to any of the preceding claims, characterized by comprising a cylindrical or prismatic element (3) fitted to the output shaft (11) of said geared motor (1), wherein said at least one magnet (32,33) is secured onto or within said cylindrical or prismatic element (3).

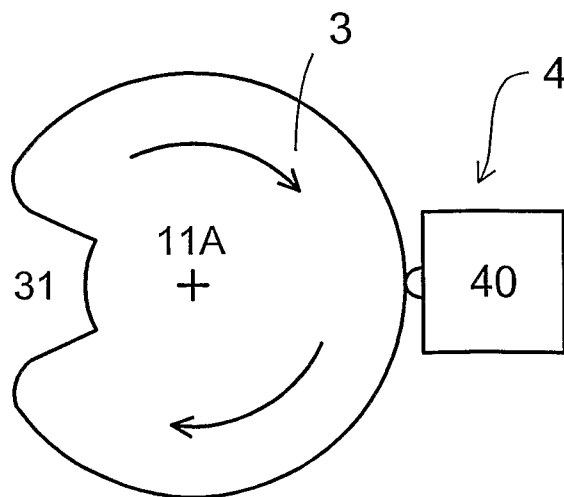
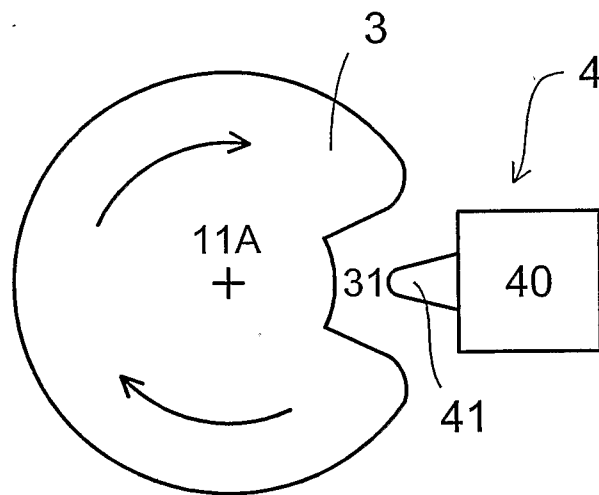
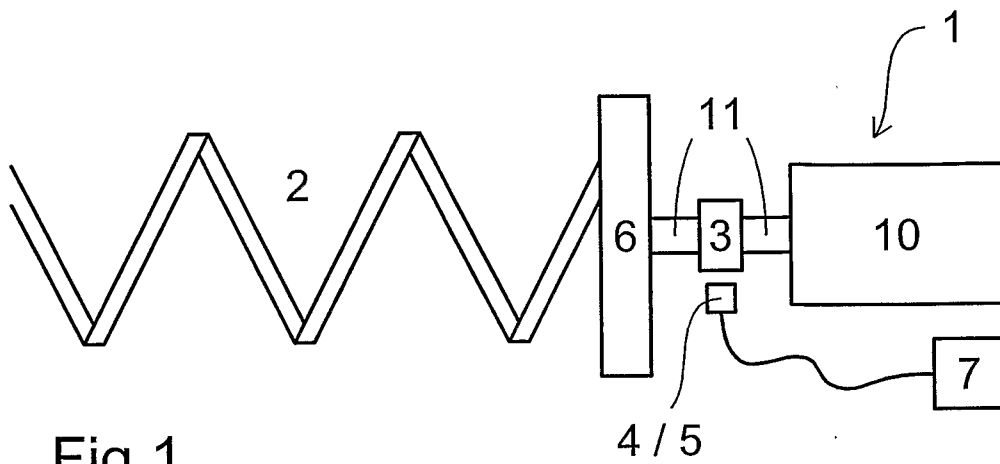
14. Dispenser according to any of the preceding claims, wherein said ejection device (2) is either a spiral or a screw.

15. Dispenser according to any of the preceding claims from 1 to 14,
characterized by being an articles dispenser, in particular a dispenser adapted to
5 dispense foods and/or beverages.

16. Dispenser according to any of the preceding claims from 1 to 14,
characterized by being a doses dispenser, in particular a dispenser adapted to
dispense powder or granulated material.

* * * * *

1 / 3



2 / 3

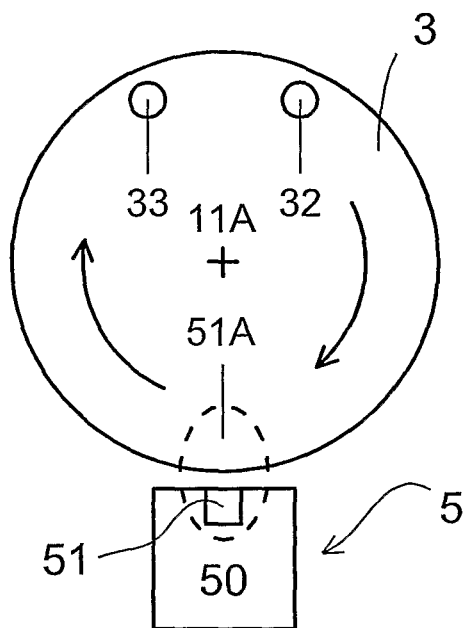


Fig.4

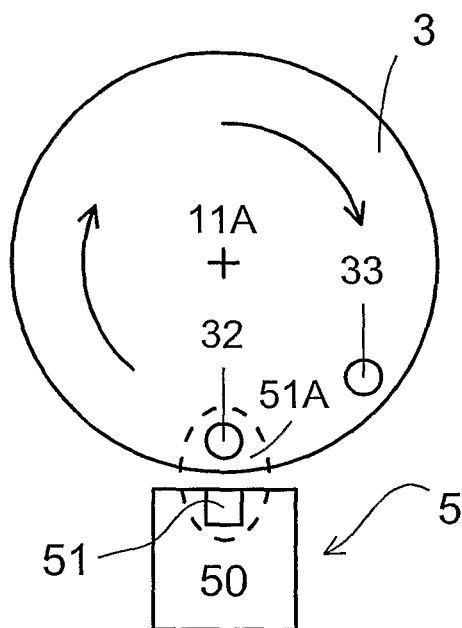


Fig.5

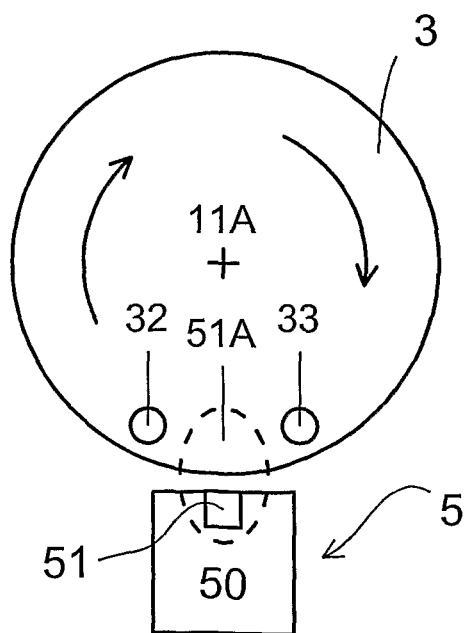


Fig.6

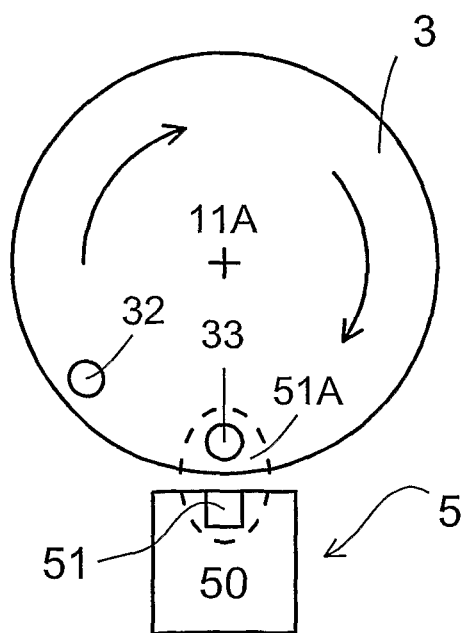


Fig.7

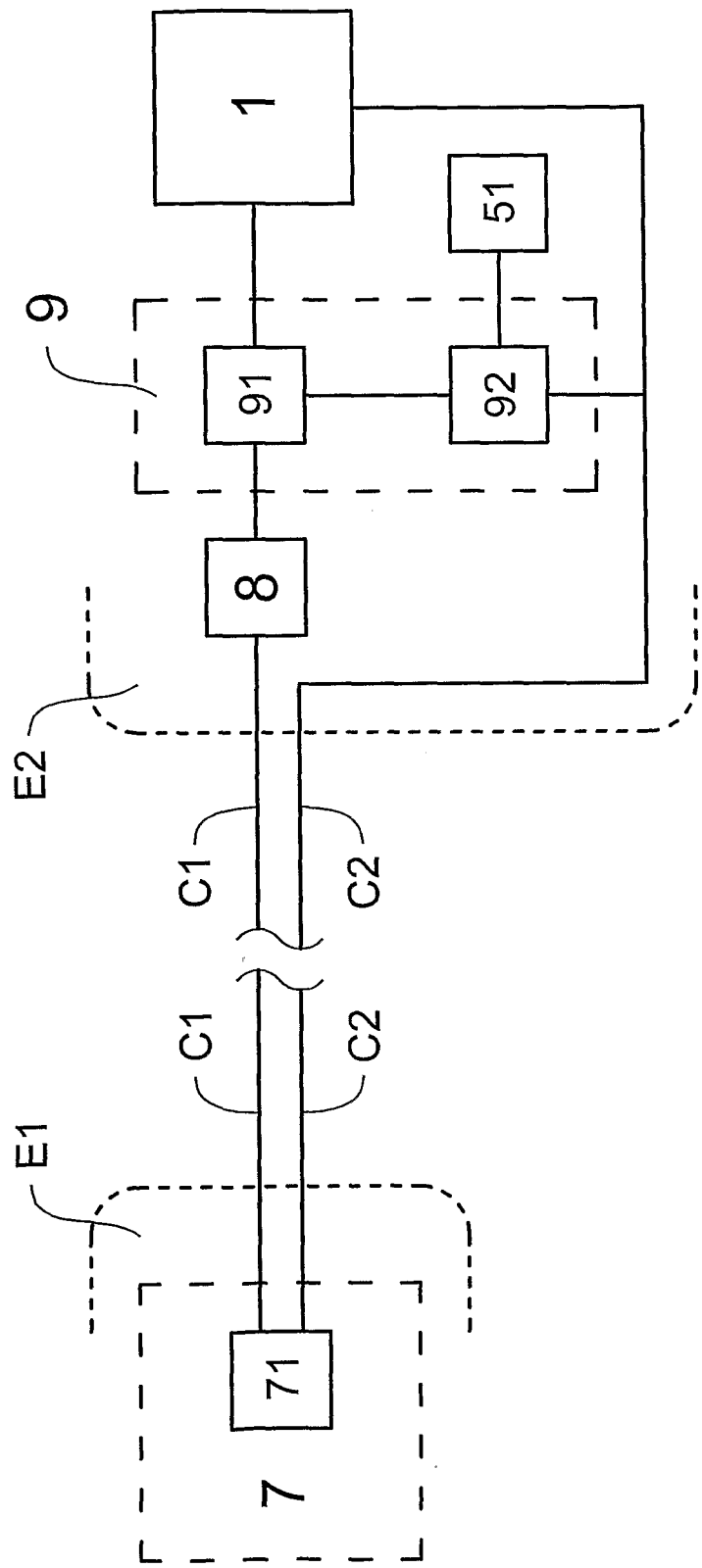


Fig.8

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2008/003571

A. CLASSIFICATION OF SUBJECT MATTER

INV. G07F11/00

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)
G07F

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 256 921 A (PRUIS HARRY [US] ET AL) 26 October 1993 (1993-10-26) abstract column 1, line 38 - line 68 column 2, line 28 - column 3, line 31 figures 1-3	1-16
A	US 2004/104239 A1 (BLACK TALBERT JAMES [US] ET AL BLACK JR TALBERT JAMES [US] ET AL) 3 June 2004 (2004-06-03) abstract paragraphs [0003], [0009], [0015] - [0018], [0028] - [0033], [0036], [0038], [0039]; figures 1-5 ----- -/--	1-16

☒ 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

2 April 2009

Date of mailing of the international search report

14/04/2009

Name and mailing address of the ISA/

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Kling, Jonas

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2008/003571

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 2003/011330 A1 (MACHALEK KEVIN J [US] ET AL MACHALEK KEVIN J [US] ET AL) 16 January 2003 (2003-01-16) the whole document -----	1-16
Y	JP 07 249159 A (KUBOTA KK) 26 September 1995 (1995-09-26) the whole document -----	1-16
A	JP 02 212997 A (SHIBAURA ENG WORKS LTD) 24 August 1990 (1990-08-24) the whole document -----	1-16
A	US 2007/235468 A1 (LIVA ROBERT [US]) 11 October 2007 (2007-10-11) the whole document -----	1-16

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2008/003571

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5256921	A	26-10-1993	NONE	
US 2004104239	A1	03-06-2004	US 2009037019 A1	05-02-2009
US 2003011330	A1	16-01-2003	NONE	
JP 7249159	A	26-09-1995	NONE	
JP 2212997	A	24-08-1990	JP 2750440 B2	13-05-1998
US 2007235468	A1	11-10-2007	NONE	