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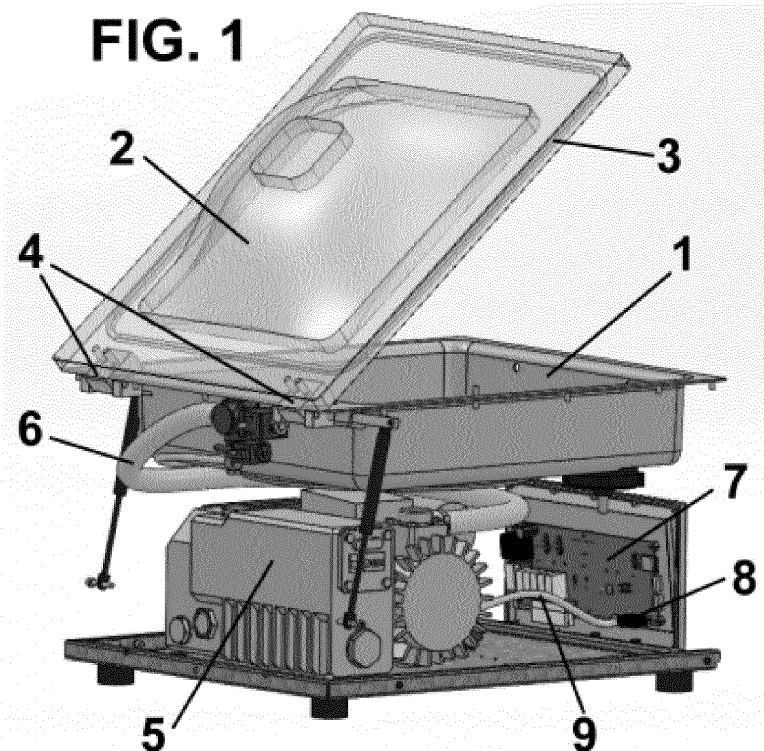
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(54) **DETECTION SYSTEM AND DETECTION METHOD FOR DETECTING THE ACTUATION OF A LID IN A VACUUM PACKAGING MACHINE**

(57) The invention relates to a detection system for detecting the actuation of a lid (2) in vacuum packing machines, the vacuum packing machine comprising a vat (1) which is closed by means of a lid (2), said lid (2) comprising a sealing gasket (3), wherein the detection system comprises a vacuum sensor (8) connected with the vat (1), which detects a pressure value in the vat (1),

such that it is determined that the lid (2) is closed depending on said pressure value detected by the vacuum sensor (8).

The main advantage of the present invention is a reduction in costs, greater ease of assembly and a higher reliability as movable parts are eliminated.



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Description

[0001] The present invention relates to a detection system and method for detecting the actuation of a lid in vacuum packing machines which can be applied to tabletop or free-standing vacuum packing machines.

Background of the invention

[0002] Vacuum packing machines basically consist of a vacuum pump (where the suction capacity of the pump is different depending on the model), a hood where the vacuum is generated, a sealing system, solenoid valves and an electronic or electromechanical control system.

[0003] To vacuum pack a food by means of one of these packers, the food is introduced in a bag, which in turn is introduced in the hood of the packer. The packer then extracts air from the hood by means of a vacuum pump until reaching the level desired by the user.

[0004] Once the air is extracted, the bag is sealed and atmospheric pressure is restored in the chamber. Since the bag containing the food is sealed before restoring atmospheric pressure, it stays at the pressure desired by the user.

[0005] Said machines usually have different models depending on the size of the food to be packed, the productivity to be obtained, or simply depending on the space where the packer is to be located, which results in the development of different machines that are larger in size (type of element to be packed) or different pumps with different suction flow rate values (depending on productivity and size).

[0006] To start a packing cycle, the user must close the lid of the packer, and when the packer detects that the lid is lowered, it switches on the vacuum pump, suctioning out the air in the enclosure. It is therefore understood that a vacuum cycle starts when the lid is closed.

[0007] In the current state of the art, a switch is used to detect the state of the lid. This switch can be visible in the upper portion, between a vat and the lid, or invisible, actuated by the hinge. This switch is connected to the control electronics of the packer which, upon receiving the signal that it has actuated, switches on the vacuum pump.

[0008] Vacuum packers also comprise a vacuum sensor of the control electronics, the vat and the pump, which are pneumatically connected. The vacuum sensor can thereby detect changes in pressure in the vat due to the actuation of the pump. This allows the control electronics to determine the end of the vacuum cycle.

[0009] It is evident that the need to incorporate a switch for detecting the state of the lid increases the cost of the vacuum packing machine.

[0010] Therefore, an objective of the present invention is to provide a detection system and method for detecting a lid in a vacuum packing machine that does not use a switch, resulting in the cost of the packing machine being lower than conventional packing machines using a

switch.

Description of the invention

[0011] The mentioned drawbacks are solved with the detection system and method for detecting the actuation of a lid of the invention, while presenting other advantages described below.

[0012] According to a first aspect, the present invention relates to a detection system for detecting the actuation of a lid in vacuum packing machines, the vacuum packing machine comprising a vat which is closed by means of a lid, said lid comprising a sealing gasket, wherein the detection system comprises a vacuum sensor connected with the vat, which detects a pressure value in the vat, such that it is determined that the lid is closed depending on said pressure value detected by the vacuum sensor.

[0013] Advantageously, said vacuum sensor is connected to control electronics.

[0014] Furthermore, said vacuum sensor is connected with the vat preferably by means of a connection tube.

[0015] The detection system according to the present invention also preferably comprises a vacuum pump connected to said vat, for example, by means of a suction tube.

[0016] According to a preferred embodiment, said lid is assembled in said vat in an articulated manner by means of one or more hinges.

[0017] A second aspect of the present invention relates to a detection method for detecting the actuation of a lid in vacuum packing machines, the vacuum packing machine comprising a vat which is closed by means of a lid, said lid comprising a sealing gasket, the method comprising the following steps:

- constantly monitoring the pressure inside said vat;
- detecting if the pressure inside the vat has increased in a first predetermined time period;
- if an increase in pressure inside the vat is detected, switching on a vacuum pump for a second predetermined time period;
- detecting if the pressure inside the vat has decreased after switching on the vacuum pump; and
- if a decrease in pressure inside the vat has been detected, determining that the lid is closed.

[0018] Advantageously, in the event that a decrease in pressure inside the vat is not detected after said second predetermined time period, the vacuum pump is switched off.

[0019] According to a preferred embodiment, said first predetermined time period is comprised between 0 and 1 second, and the second predetermined time period is comprised between 0 and 10 seconds.

[0020] Furthermore, according to said preferred embodiment, it is determined that there is an increase in pressure if said increase is comprised between 0 and 10 kPa, and it is determined that there is a decrease in pres-

sure if said decrease is comprised between 0 and 100 kPa.

[0021] With respect to switch-based lid detection systems, the main advantage of the present invention is a reduction in costs, greater ease of assembly and a higher reliability as movable parts are eliminated in the apparatus.

Brief description of the drawings

[0022] To better understand what has been set forth, several drawings are attached in which a practical embodiment is schematically depicted merely by way of non-limiting example.

Figure 1 is a perspective view of a vacuum packing machine incorporating the detection system for detecting the actuation of a lid according to the present invention;

Figure 2 is a block diagram of the steps of the detection method for detecting the actuation of a lid according to the present invention;

Figure 3 is a diagram showing a correct detection process, wherein it is detected that the lid is closed; and

Figure 4 is a diagram showing an incorrect detection process, wherein it is detected that the lid is open.

Description of a preferred embodiment

[0023] The present invention relates to a vacuum packing machine comprising a detection system for detecting the actuation of the lid without the use of a switch. According to the present invention, the vacuum sensor of the actual packing machine is used to detect that the user has closed the lid, and the vacuum cycle can thus start.

[0024] In a preferred embodiment shown in Figure 1, the vacuum packing machine comprises:

- a vat 1, where the food to be vacuum packed is placed,
- a lid 2 provided with sealing gasket 3 and attached to the vat 1 by means of one or more hinges 4,
- a vacuum pump 5 connected to the vat 1 by means of a first suction tube 6,
- control electronics 7 provided with a vacuum sensor 8, and
- a connection tube 9 connecting the vat 1 with the vacuum sensor 8.

[0025] The vacuum packing machine further comprises a chassis, casing, solenoid valves, sealing bar, transformer, etc., which, while necessary for the remaining functions of the packing machine, are conventional and not part of the present invention. Therefore, for the sake of simplicity, these additional elements of the packing machine will not be described in detail.

[0026] As shown in Figure 2, the control electronics 7

constantly monitors the value of the vacuum sensor 8.

[0027] When the user closes the lid 2, because of the sealing of the sealing gasket 3 with the vat 1, a slight and rapid rise in the pressure value in the vat 1 takes place.

5 [0028] Since it is attached to the vacuum sensor 8 by means of the connection tube 9, the vacuum sensor 8 can detect this slight and sudden increase in pressure.

[0029] If this increase is within a certain interval of time T' and amplitude A' , the control electronics switches on the vacuum pump 5 for a time T .

10 [0030] Since the vacuum pump 5 is connected to the vat 1 by means of the suction tube 6, if the lid 2 is suitably closed, at the end of this time T the vacuum sensor 8 should detect a decrease in pressure of amplitude A in the vat 1.

15 [0031] If this drop in pressure has not occurred, it would mean that the lid 2 has not been suitably closed, and the control electronics 7 switches off the vacuum pump 5 and returns to the initial point of the detection algorithm.

20 [0032] Figure 3 shows a correct detection process, in which an increase in pressure A' in an interval T' , followed by a decrease in pressure A in an interval T , is detected.

[0033] Figure 4 thereby shows a failed detection process, in which an increase in pressure A' in an interval T' is detected. It can be seen that at the end of time T , the pressure has not dropped below the amplitude A , so the pump is stopped and the original pressure is restored.

[0034] According to a preferred embodiment:

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- $0 < T' < 1 \text{ s}$
 - $0 < A' < 10 \text{ kPa}$
 - $0 < T < 10 \text{ s}$
 - $0 < A < 100 \text{ kPa}$

35 [0035] As indicated above, with respect to switch-based lid detection systems, the main advantage of the present invention is a reduction in costs, greater ease of assembly and a higher reliability as movable parts are eliminated in the apparatus.

40 [0036] Despite having made reference to a specific embodiment of the invention, it is evident to one skilled in the art that the described system and method are susceptible to a number of variations and modifications, and all the mentioned details mentioned can be replaced with other technically equivalent details without departing from the scope of protection defined by the attached claims.

50 Claims

1. A detection system for detecting the actuation of a lid (2) in vacuum packing machines, the vacuum packing machine comprising a vat (1) which is closed by means of a lid (2), said lid (2) comprising a sealing gasket (3), **characterised in that** the detection system comprises a vacuum sensor (8) connected with the vat (1), which detects a pressure value in the vat

- (1), such that it is determined that the lid (2) is closed depending on said pressure value detected by the vacuum sensor (8).
2. The detection system according to claim 1, wherein said vacuum sensor (8) is connected to control electronics (7).
 3. The detection system according to claim 1, wherein said vacuum sensor (8) is connected with the vat (1) by means of a connection tube (9).
 4. The detection system according to claim 1, also comprising a vacuum pump (5) connected to said vat (1).
 5. The detection system according to claim 4, wherein the vacuum pump (5) is connected to said vat (1) by means of a suction tube (6).
 6. The detection system according to claim 1, wherein said lid (2) is assembled in said vat (1) in an articulated manner by means of one or more hinges (4).
 7. A detection method for detecting the actuation of a lid (2) in vacuum packing machines, the vacuum packing machine comprising a vat (1) which is closed by means of a lid (2), said lid (2) comprising a sealing gasket (3), **characterised in that** it comprises the following steps:
 - constantly monitoring the pressure inside said vat (1);
 - detecting if the pressure inside the vat (1) has increased in a first predetermined time period;
 - if an increase in pressure inside the vat (1) is detected, switching on a vacuum pump (5) for a second predetermined time period;
 - detecting if the pressure inside the vat (1) has decreased after switching on the vacuum pump (5); and
 - if a sufficient decrease in pressure inside the vat (1) has been detected, determining that the lid (2) is closed.
 8. The detection method according to claim 7, wherein in the event that a sufficient decrease in pressure inside the vat (1) is not detected after said second predetermined time period, the vacuum pump (5) is switched off.
 9. The detection method according to claim 7, wherein said first predetermined time period is comprised between 0 and 1 second.
 10. The detection method according to claim 7 or 8, wherein the second predetermined time period is comprised between 0 and 10 seconds.
 11. The detection method according to claim 7, wherein it is determined that there is an increase in pressure if said increase is comprised between 0 and 10 kPa.
 12. The detection method according to claim 7, wherein it is determined that there is a decrease in pressure if said decrease is comprised between 0 and 100 kPa.

FIG. 1

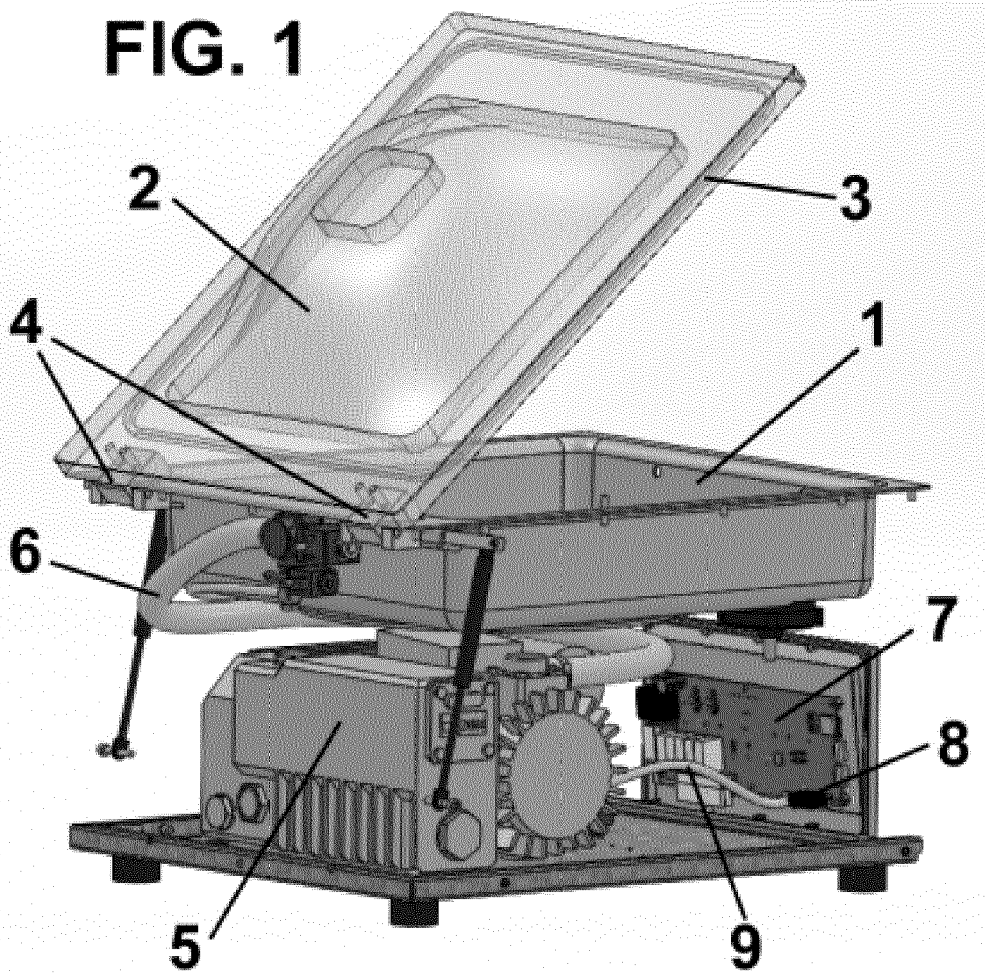
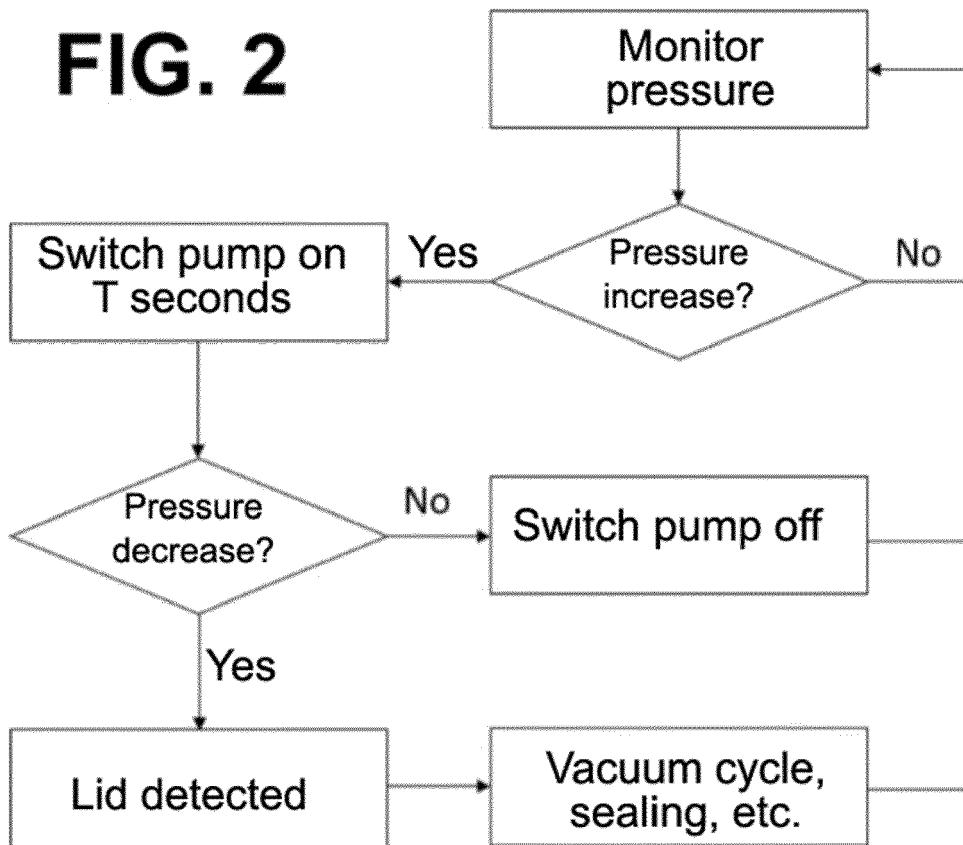
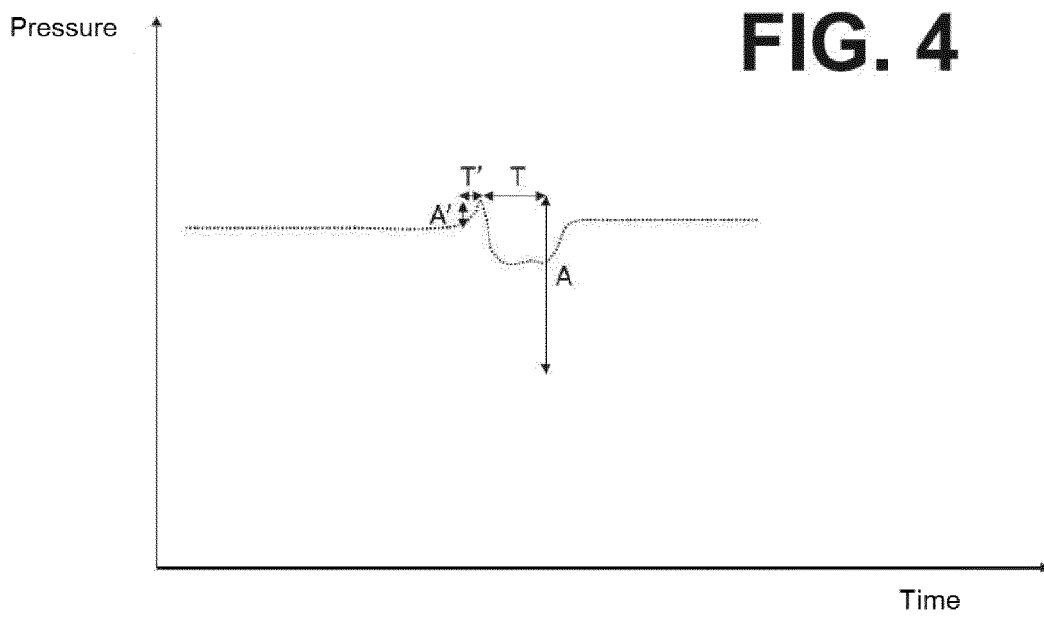
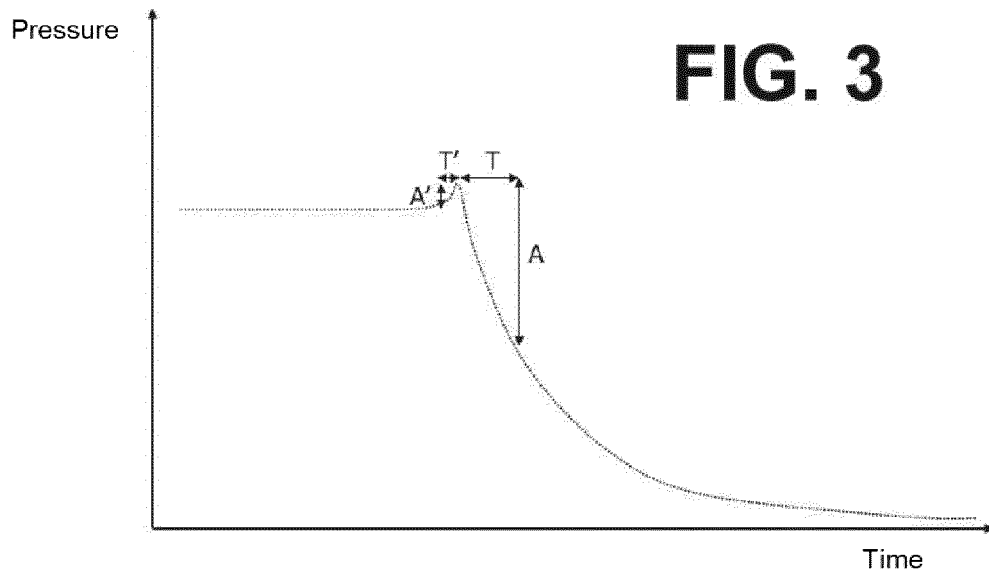


FIG. 2







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