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(54) Vending machine with microwave oven

(57) The present invention concerns a vending machine comprising a microwave oven (10) provided with an opening (13) for products, a framework (2) provided with a stocking volume (4) for dispensable products, a drawing portion (8) for drawing a selected product, the microwave oven (10) being arranged at the drawing portion (8) and being rotatable around a rotational axis (X) between a product charging position, a cooking position in which said opening (13) is closed by a door (18) and a discharging position. A sensor (35), which is designed for detecting the presence of sparks, is foreseen, said sensor being constrained to the door (18) for closing the oven and that faces the oven when it is in the cooking position.

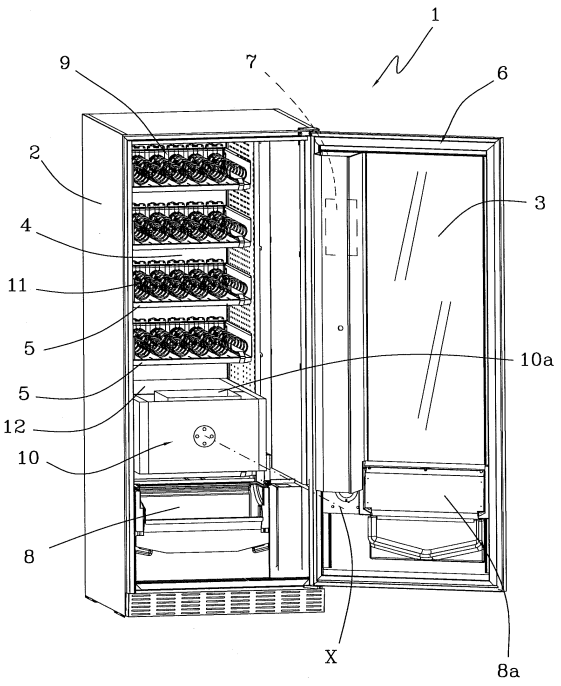

FIG 1

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Description

Technical field

[0001] The present invention refers to a vending machine provided with a microwave oven.

Prior art

[0002] At the state of the art, it is known to sell individually packed products, for example in vending machines. Some vending machines, like for example that described in WO 2008/141746, are provided with a microwave oven for cooking the sold products.

[0003] Special care must be taken when using vending machines provided with microwave ovens, since, as it is known, when cooking packed food products in which the packaging comprises a thin layer of aluminium, the aluminium of the packet, which is poorly conductive, tends to heat up and can become detached from the rest of the packet creating fragments of aluminium that can create sparks which could set fire to the rest of the packet.

[0004] In order to avoid the drawback described above, vending machines provided with microwave ovens are never supplied with packed food products in aluminium packaging (i.e. comprising a thin layer of aluminium).

[0005] In view of the state of the art described, the purpose of the present invention is to propose a vending machine that is provided with a microwave oven that can at least partially solve the drawbacks mentioned above and factually decreases the risk of accidents due to the presence of sparks in the cooking chamber.

[0006] Moreover, the present invention makes it possible to obtain advantages in terms of production simplicity, greater strength, greater compactness and/or greater versatility.

[0007] A further advantage of the present invention consists of keeping the cooking chamber of the microwave oven cleaner since the sparks, even in the case in which they do not start a flame, can incinerate small portions of the packet of the product, which can remain inside the heating chamber (worsening the performance of the microwave oven) or inside the volume from which the user draws the product (with a consequent perception of greater filthiness of the microwave oven).

Summary of the invention

[0008] In accordance with the present invention, such a purpose is achieved with a vending machine that is provided with a microwave oven according to the characteristics of one or more of the attached claims.

Brief description of the drawings

[0009] The characteristics and the advantages of the present invention shall become clearer from the following detailed description of one embodiment, given as an example and not for limiting purposes with reference to the attached drawings, in which:

- figure 1 shows a schematic perspective view of a vending machine provided with a microwave oven in accordance with the present invention,
- figure 2 shows a schematic perspective view of the microwave oven of figure 1, in a first operative position,
- figure 3 shows a schematic front view of the microwave oven of figure 1, in a second operative position,
- figure 4 shows a schematic front view of the microwave oven of figure 1, in a third operative position,
- figure 5 shows a schematic front view of the microwave oven of figure 1, in a fourth operative position,
- figure 6 shows a schematic side view of the oven of figure 1 with some parts removed so as to better highlight others,
- figure 7 shows a schematic perspective view of the oven of figure 1 with some parts removed so as to better highlight others.

Detailed description of the invention

[0010] Even if not explicitly stated, the single characteristics described with reference to the specific embodiments should be considered optional and/or interchangeable with other characteristics, described with reference to other embodiments.

[0011] Similarly, possible expressions like "according to the present invention" or "in accordance with the present invention" only have the meaning of "that is covered by the field defined by at least one of the claims initially filed or granted".

[0012] With reference to figure 1, reference numeral 1 indicates a vending machine provided with a microwave oven 10 in accordance with the present invention.

[0013] The vending machine 1 comprises a framework 2 with a transparent panel 3, for example made from glass or polymer material, so as to allow a user to visualise the products that can be dispensed by the vending machine. The transparent panel 3 can be mounted in a front wall 6 that is hinged to the framework 2 (in figure 1 the front wall 6 has been represented in the open position).

[0014] The products to be dispensed are generally contained in a stocking volume 4 delimited by the framework 2.

[0015] The vending machine 1 preferably has, on the front wall 6, a selection interface 7 (schematised with a broken line in figure 1), such as a keypad, intended to select one of the products contained in the stocking portion 4. Inside the framework 2 there is a drawing portion

8, which is provided with a drawing opening 8a that is foreseen for drawing the selected product. The drawing portion 8 is located below the stocking portion 4.

[0016] By drawing portion we mean a volume, which is inside the vending machine 1 but that can be reached from outside through the drawing opening 8a, foreseen for receiving the product after it has been dispensed from its seat and so as to allow the user to extract the purchased product from the vending machine 1.

[0017] The products to be dispensed are arranged on trays 5 that are housed inside the framework 2, one on top of the other, and that can be seen through the transparent panel 3.

[0018] The trays 5 are generally provided with means 9 for dispensing the products, which are suitable for moving the products 4 from their seat on the tray 5 to the drawing volume.

[0019] The dispensing means 9 can for example comprise a motor (not visible in the figures), which is coupled with one or two spirals 11, the coils of which, together with the trays 5, define a plurality of seats for housing the products.

[0020] Each column of seats is thus actuated by a single motor that determines the rotation of the spiral or of the two spirals, so that the seats advance towards the front wall 6.

[0021] Only one product is generally arranged in each seat, so that the forward movement of the seats towards the front wall 6 brings the front product to not be supported by the tray 5 and to fall towards the drawing portion.

[0022] A microwave oven 10 is positioned at the drawing portion 8 of the vending machine 1 to heat/cook the products dispensed from the trays 5 before they are drawn through the drawing opening 8a. At the top of the oven 10 it is foreseen for there to be a loading hopper 10a for collecting the products coming from the stocking area 4. The loading hopper 10a releases the products into the oven 10.

[0023] It is worth noting that the products dispensed from the trays 5 may or may not be provided with packaging. For example, in the case of pastries, pizza and the like, these can be dispensed inside their packaging or without packaging. In the first case, since these are products which must be heated or cooked inside a microwave oven 10, the packaging must be made in a material that is suitable for being used in microwave ovens and, optionally, provided with valves for discharging steam.

[0024] The microwave oven 10 is thus arranged so as to receive products dispensed from the trays 5 and to heat/cook them so as to make them available to the user through the drawing opening 8a.

[0025] In the present invention, we shall refer to the term "cooking" with it being understood that the microwave oven 10 can be used also for heating products dispensed from the trays 5.

[0026] The microwave oven 10 comprises a support framework 12 and a cooking chamber 20 that is suitable for rotating, with respect to the support framework 12, around a rotational axis X (figures 1 and 2). The rotational axis X is substantially perpendicular to the plane defined by the front wall 6 of the vending machine 1 (when such a wall is closed).

[0027] The oven 10 can rotate around the axis X between a charging position (figure 2), a cooking position (figures 3 and 5) and a discharging position (figure 4). In particular, in the charging position, the oven 10 has an opening 13 facing the stocking volume 4 and in the discharging position, the oven has the opening 13 facing the drawing portion 8.

[0028] According to one embodiment, the support framework 12 represents a portion of the framework 2 of the vending machine 1.

[0029] Alternatively, the support framework 12 can be an element that is separate and fixed to the framework 2 of the vending machine 1.

[0030] The cooking chamber 20 is suitable for rotating from the charging position to the cooking position so as to cook a product received from the trays 5 in the charging position and from the cooking position to the discharging position for discharging the product cooked in the cooking position towards the drawing opening 8a.

[0031] Actuation members 14 are foreseen for setting in rotation the cooking chamber 20 around the rotational axis X.

[0032] According to one embodiment, the actuation members 14 comprise an electric motor 15 that is suitable for transmitting the rotation movement to a gear wheel 16 that is fixedly attached to the cooking chamber 20 through a mechanical transmission 17 (figure 6).

[0033] The cooking chamber 20 comprises a bottom wall 21 and one or more side walls, which are wholly indicated with reference numeral 22, which extend from the bottom wall 21 to the opening 13.

[0034] In the example shown in the figures, the cooking chamber 20 is substantially shaped like a truncated pyramid with four side walls 22.

[0035] It should be noted that in the cooking position of the oven 10, the bottom wall 21 is substantially parallel to the rotational axis X and is substantially perpendicular to the front wall 6 (when closed).

[0036] The charging and discharging opening 13 is delimited by a peripheral portion of the cooking chamber 20 that, in the example, is defined by terminal portions of the four side walls 22.

[0037] A microwave generator 40 (schematically shown in figure 6) is foreseen to generate and introduce the microwaves into the cooking chamber 20 through a microwave inlet opening, preferably made in a side wall 22 of the cooking chamber 20. Typically, the microwave generator 40 generates a flow of microwaves that are normally at the frequency of 2.45 GHz, or rather having a wavelength of 12.24 cm, with a power of between 800W and 1000W.

[0038] According to one embodiment, the microwave generator 40 is connected to the microwave inlet opening

through a waveguide (not illustrated) that is coupled with the outlet of the microwave generator 40 and with the microwave inlet opening. The waveguide is coaxial with respect to the rotational axis X of the oven.

[0039] A closing door 18 is intended to close the opening 13 of the cooking chamber 20 when it is in the cooking position.

[0040] As can be noted from the figures, in the charging position, the cooking chamber 20 is open at the top so as to receive the product to be dispensed. In the cooking position, the opening 13 of the cooking chamber 20 is positioned laterally and is closed by means of the closing door 18, whereas in the discharging position, the cooking chamber 20 is open at the bottom so as to discharge the product to be dispensed.

[0041] In order to cook with the microwave, the cooking chamber 20 and the closing door 18 are made from a material that reflects the microwaves, for example metal material.

[0042] The closing door 18 is mobile between a stand-by position (figure 3) in which it is moved away from the opening 13 when the oven is in the cooking position and an active position (figure 5) in which it contacts and closes the opening 13 when the oven is in the closing position.

[0043] In such a way, the oven has the possibility of rotating between its operative positions without interfering with the closing door 18.

[0044] As illustrated in the attached figures, the door 18 is mobile along an approaching direction A (see figure 3 substantially perpendicular to the rotational axis X and substantially parallel to the front wall 6. In other words, the door 18 can move towards or away from the bottom wall 21 of the cooking chamber 20 when this is in the cooking position.

[0045] In the preferred embodiment of the invention, the oven 10, at the opening 13, is substantially arched and is substantially shaped as a cylinder sector, as illustrated in figure 2. In such a way, the bulk necessary to make the oven rotate between the charging, cooking and discharging operative positions, is minimised. Also the door 18 is substantially arched and is substantially shaped as a cylinder sector for being countershaped with respect to the opening 13.

[0046] In order to allow the movement of the door 18, it is foreseen for there to be members 19 for moving the door 18 (figures 6 and 7). The moving members 19 comprise a pusher 23 that acts on the door 18 in a substantially barycentric position thereof. Preferably, such a pusher 23 comprises a shaft 24 on which an eccentric 25 is keyed (figure 7). The shaft 24 is set in rotation by an electric motor 26. The shaft 24 projects along a direction D that is substantially parallel to the rotational axis X of the oven 10. The eccentric 25 acts on a plate 27 that is fixedly attached to the door 18, preferably inside a slot 27a that is formed in the mentioned plate 27 (figure 7). The plate 27 substantially projects perpendicular with respect to the door 18 and is arranged on a surface thereof facing the opposite side with respect to the opening 13 of the cooking chamber 20. The rotation of the eccentric 25 determines the translation of the plate 27 and thus the door 18. It should be noted that the translation direction of the plate 27 coincides with the direction in which the door 18 approaches the opening 13 of the oven 10 (when the latter is in the cooking position).

[0047] The moving members 19 moreover comprise guiding members 28 that are active on ends of the door 18 so as to slidingly guide it during its movement (figure 5).

[0048] Preferably, the guiding members 28 comprise slots 29 formed on walls 30 that are fixedly attached to the door 18. There are preferably two of such walls 30 and they project perpendicular with respect to the door 18 on the opposite side with respect to the opening 13 of the oven 10 (when the latter is in the cooking position) . On every wall 30 there are two respective slots 29 that are formed, each of which is arranged at opposite ends of the walls 30. The two walls 30 are preferably located at opposite ends of the door 18. Inside each slot 29 at least one active, preferably two active pawls 31, which are fixedly attached to the framework 12 of the oven 10. Such pawls can be rotatably constrained to the framework 12 so as to be able to rotate with respect to the slots 29. The rotational axes of the pawls 31 are parallel to the rotational axis X of the oven 10. The pawls 31 can slide inside the slots along a direction that is substantially parallel to the approaching direction of the door to the opening 13 of the oven 10. Moreover, the pawls 31, inside the slots 29, are mounted with a clearance that is transversal with respect to the slots themselves. In other words, the portions of pawls that are engaged with the slots have smaller dimensions than the transversal dimensions of the slots. In such a way, the walls 30, and thus the door 18, can carry out movements (even if limited) in a direction that is transversal with respect to the approaching direction, so as to compensate for possible errors of alignment with the opening 13. This ensures that the opening 13 is closed perfectly even if there is a non perfect alignment between the door 18 and the opening 13.

[0049] The perfect closure of the door 18 on the opening 13 is indicated by sensor members 32. Such sensor members 32 comprise at least one microswitch 33 (figure 5) that is fixedly attached to the door 18 and is activated by a protuberance 34 (figure 3) present on the opening 13. When the door 18 closes the opening 13, the protuberance 34 intercepts the microswitch 33 indicating that the door 18 has been closed perfectly. In the preferred embodiment of the invention, there are four microswitches 33, and just as many protuberances 34 and they are arranged in the vicinity of the guiding members 28.

[0050] At least one sensor 35 is associated to the microwave oven 10, said sensor being able to detect sparks, for example, it is capable of detecting sparks that form inside the cooking chamber 20. The sensor 35 (further sensors 35 possibly being identical), can be for example an optical detector, a photodiode, a transistor or a CCD (for example a telecamera). The sensor 35 is op-

eratively constrained to the door 18 and operatively faces the cooking chamber 20 when this is in the cooking position. By "operatively" constrained and facing, we mean that the sensor 35 interacts with the door 18 and faces the cooking chamber 20, both directly, that is to say physically, and indirectly, that is to say only from a functional point of view. In other words, the sensor 35 can face the cooking chamber 20 physically or through an optical fibre.

[0051] In the preferred embodiment of the invention, the sensor 35 (figure 7) is physically arranged on the closing door 18 in a portion thereof facing the stocking volume 4 and facing inside the cooking chamber when this is in the cooking position.

[0052] In particular, the sensor 35 is located in a portion of the closing door that is distal from the side wall 22 of the cooking chamber 20 intended to support the product to be cooked or heated when the cooking chamber 20 is in the cooking position. In such a way, it is difficult for possible material, coming out from the package, containing the products being cooked, to be able to dirty the sensor 35 and jeopardise its functionality.

[0053] Preferably, the sensor 35 is located in vicinity of a portion of the door 18 located in vicinity of a side wall 22 of the oven, in particular in vicinity of the guiding members 32 of the door 18. The sensor 35 projects, with respect to the axis D of the shaft 24 of the moving members 19, in the direction facing towards the stocking space 4. In other words, the sensor 35 is positioned on the door 18 in an area that is substantially as distal as possible (compatibly with the space necessary for the correct positioning of the sensor itself) from the surface of the cooking chamber 20 intended to support the product during the heating and/or cooking thereof.

[0054] As illustrated in figure 7, the sensor 35 is housed inside a seat 36 that is formed in the door 18. In particular, the seat 36 projects on the door 18 on a surface thereof that is opposite the surface facing the opening 13 of the oven 10. The seat 36 is suitable for housing and keeping the sensor 35 in position and for facing it towards the opening 13.

[0055] Since the performance of a sensor 35 of the optoelectronic type (like for example a CCD or a photodiode) can be affected by microwaves, the arrangement of such a sensor 35, in accordance with what has been described above and the relative connection to the cooking chamber 20 through optical fibre, makes it possible to reduce or nullify the influence that the microwave generator 40 has on the performance of the sensor 35, increasing the level of safety of the microwave oven 10.

[0056] The sensor 35 is advantageously a threshold sensor, i.e. a sensor that detects variations in brightness. This makes it possible to have greater precision with respect to sensors that detect the absolute quantity of light.

[0057] The signal of the sensor 35 is used directly to block the microwave generator 40 of the microwave oven 10. This solution is safer than that in which the sensor 35 is connected to driving and control means that would then act on the microwave generator 40.

[0058] The microwave generator 40 can thus be connected both to driving and control means, used also to cause the powering on or off thereof during normal cooking operations, and to the sensor 35, which directly manages the emergency powering off of the microwave generator 40 if there is a spark in the cooking chamber 20.

[0059] Advantageously, the sensor 35 is also connected to driving and control means, and sends them the same signal for indicating the presence of sparks in the cooking chamber 20.

[0060] Once this signal has been received by the sensor 35, the driving and control means can carry out the powering off of the microwave generator 40, independently from the signal that the microwave generator 40 received directly from the sensor 35, for yet greater safety.

[0061] The driving and control means can also eject the product from the microwave oven 10, preferably after having powered off the microwave generator 40, so that the product can be extracted from the vending machine 1.

[0062] As can be seen, the system proposed contributes to increasing the safety of cooking with a microwave oven, which may or may not be in a supervised area.

[0063] Of course, with the purpose of satisfying contingent and specific requirements, a man skilled in the art can carry out numerous modifications and variants to the configurations described above.

[0064] For example, it is clear that the present system can be easily adapted both to microwave ovens 10 in which the product rotates with respect to the microwave generator 40, and to microwave ovens 10 in which it is the microwave field generated by the microwave generator 40 that rotates.

Claims

1. Vending machine comprising a microwave oven (10) provided with a cooking chamber (20) and with an opening (13) for products from the cooking chamber (20) to enter and exit, a framework (2) provided with a stocking volume (4) for dispensable products, a selecting interface (7) for selecting at least a product contained in the stocking volume (4), a drawing portion (8) for drawing a selected product, said microwave oven (10) being arranged at the drawing portion (8) for heating/cooking the selected products before they are drawn by the drawing portion (8), said oven (10) being rotatable around a rotational axis (X) between a product charging position in which said opening (13) faces the stocking volume (4), a cooking position in which said opening (13) is closed by a door (18) and a discharging position in which said opening (13) faces the drawing portion (8); **characterised in that** it comprises a sensor (35) designed for detecting the presence of sparks into said cooking chamber (20), said sensor (35) being operatively constrained to said door (18) for closing the

oven for operatively facing said cooking chamber (20) when the oven (10) is in the cooking position.

2. Vending machine according to claim 1, wherein said sensor (35) is arranged on said closing door (18) in a portion thereof facing towards the stocking area (4).

3. Vending machine according to any one of the previous claims, wherein said closing door (18) is movable between a stand-by position in which it is moved away from said opening (13) when the oven is in the cooking position and an active position in which it contacts and closes said opening (13) when the oven is in the closing position.

4. Vending machine according to claim 3, wherein said rotational axis (X) of said oven (10) is substantially perpendicular to a front wall (6) of the vending machine; said door (18) being movable along an approaching direction (A) substantially perpendicular to the rotational axis (X) and substantially parallel to said front wall (6).

5. Vending machine according to claim 4, wherein said cooking chamber (20) of the oven has a bottom wall (21) and side walls (22); said bottom wall (21) being substantially parallel to said rotational axis (X) and substantially perpendicular to said front wall (6) said sensor (35) being located in a portion of said closing door (18) distal from the side wall (22) intended to support the product to be cooked or heated when the cooking chamber (20) is in the cooking position.

6. Vending machine according to claim 5, wherein said sensor (35) is arranged in the vicinity of a portion of the door (18) arranged in the vicinity of a side wall (22) of the oven facing towards the stocking volume (4) when the oven (10) is in the cooking position, said sensor (35) being facing in said cooking chamber (20), when the oven is in the cooking position, either directly or through optical fibre connection.

7. Vending machine according to any one of claims from 3 to 6, wherein said oven (10) at said opening (13) is substantially arched and is substantially shaped as a cylinder sector; said door (18) being substantially arched and being substantially shaped as a cylinder sector for being countershaped with respect to said opening (13).

8. Vending machine according to claim 7, comprising moving members (19) of said door (18) for moving it between the stand-by position and the active position.

9. Vending machine according to claim 8, wherein said moving members (19) comprise a pusher (23) acting on said door (18) in a substantially barycentric position thereof and guiding members (28) acting on ends of the door (18) for slidably guiding said door (18) during the movement thereof.

10. Vending machine according to claim 9, wherein said guiding members (28) allow said door (18) to move transversally to a direction (A) where the door (18) approaches the opening (13) for allowing said door (18) to perfectly align to said opening (13).

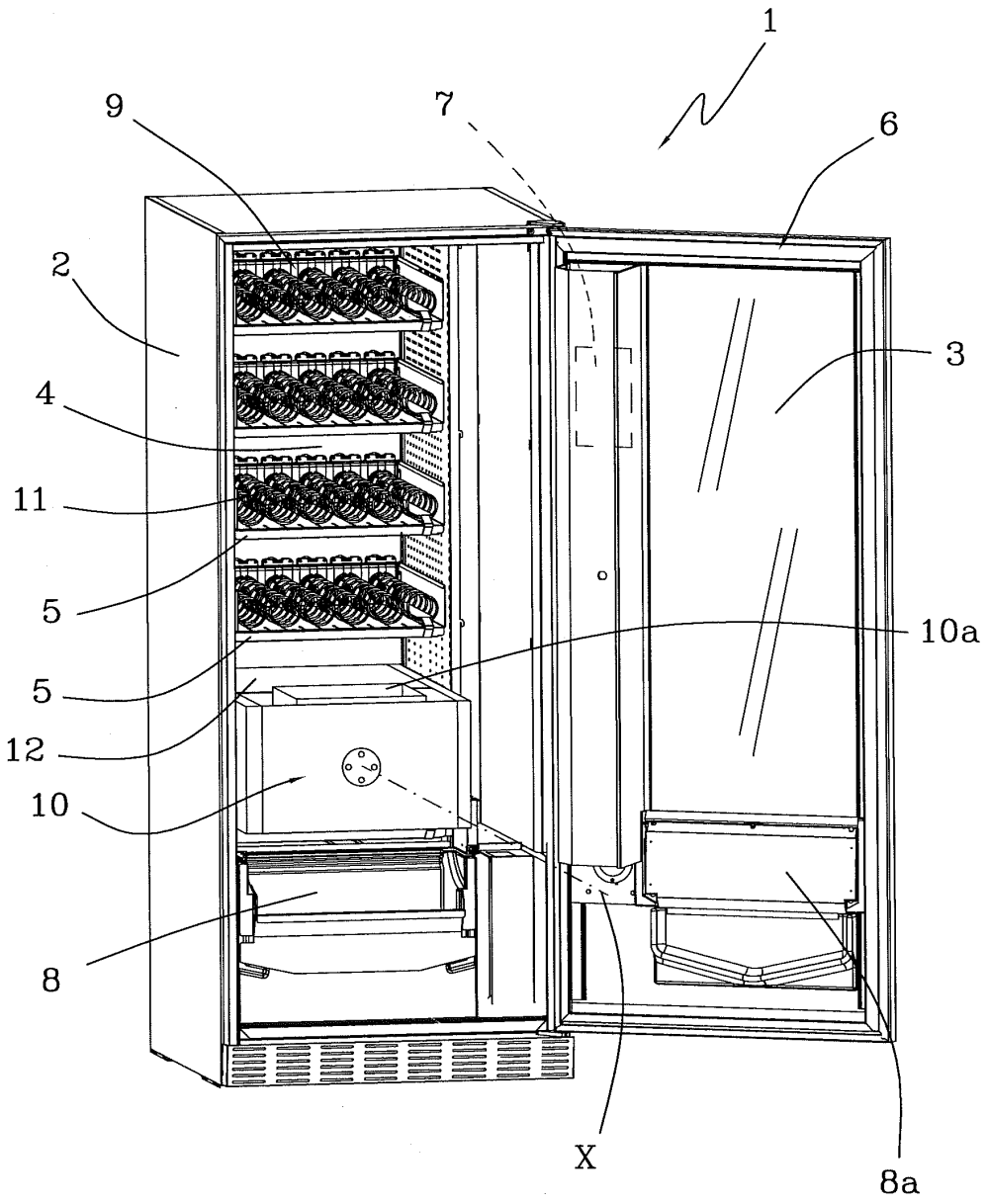


FIG 1

FIG 2

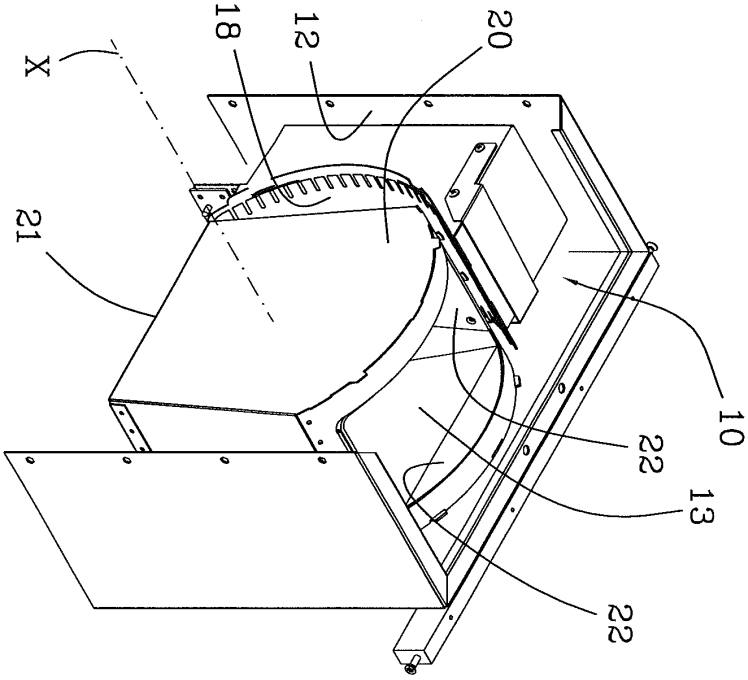


FIG 3

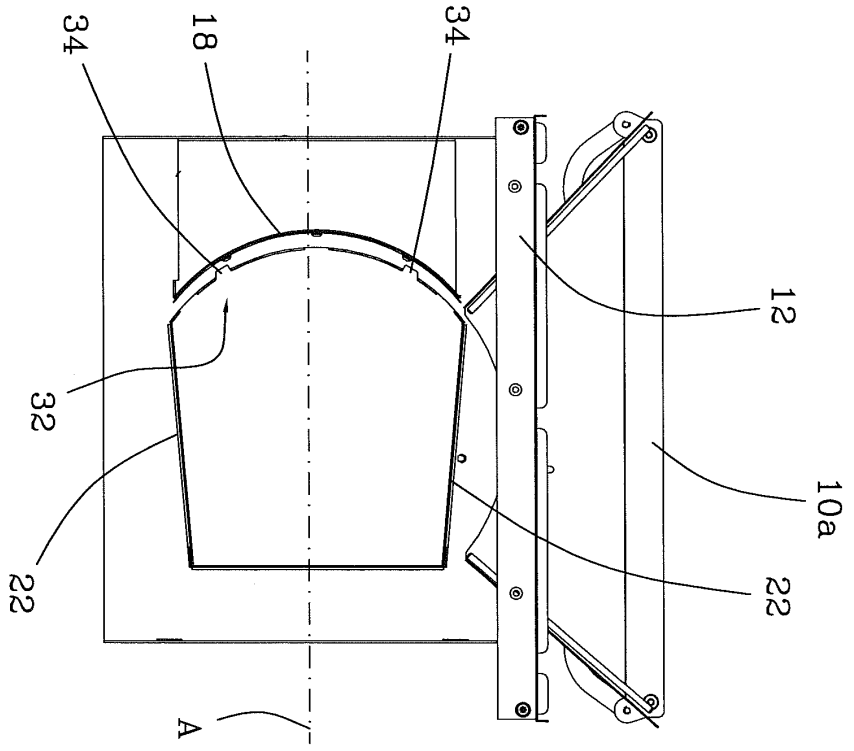


FIG 6

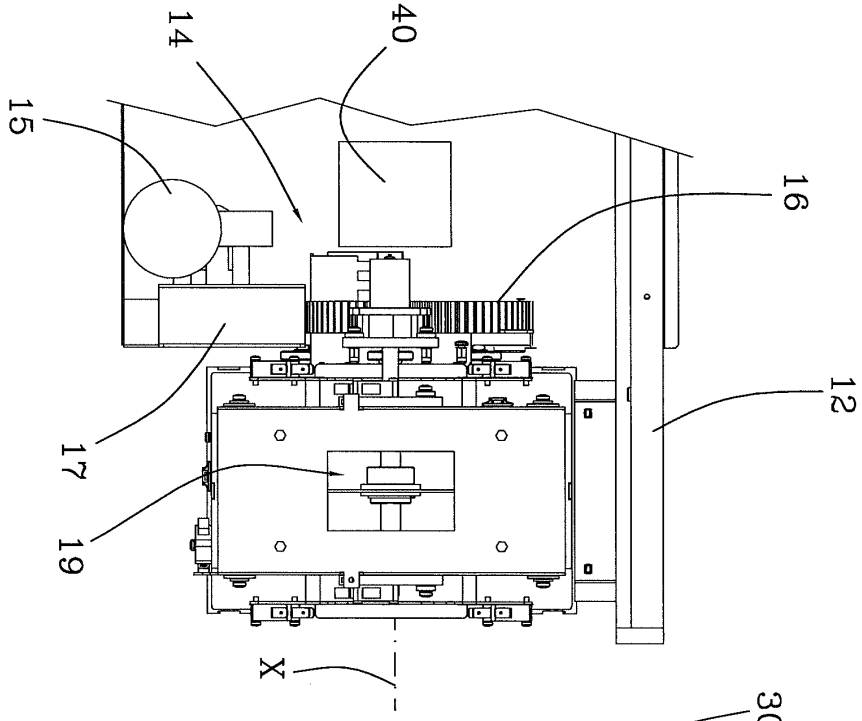


FIG 5

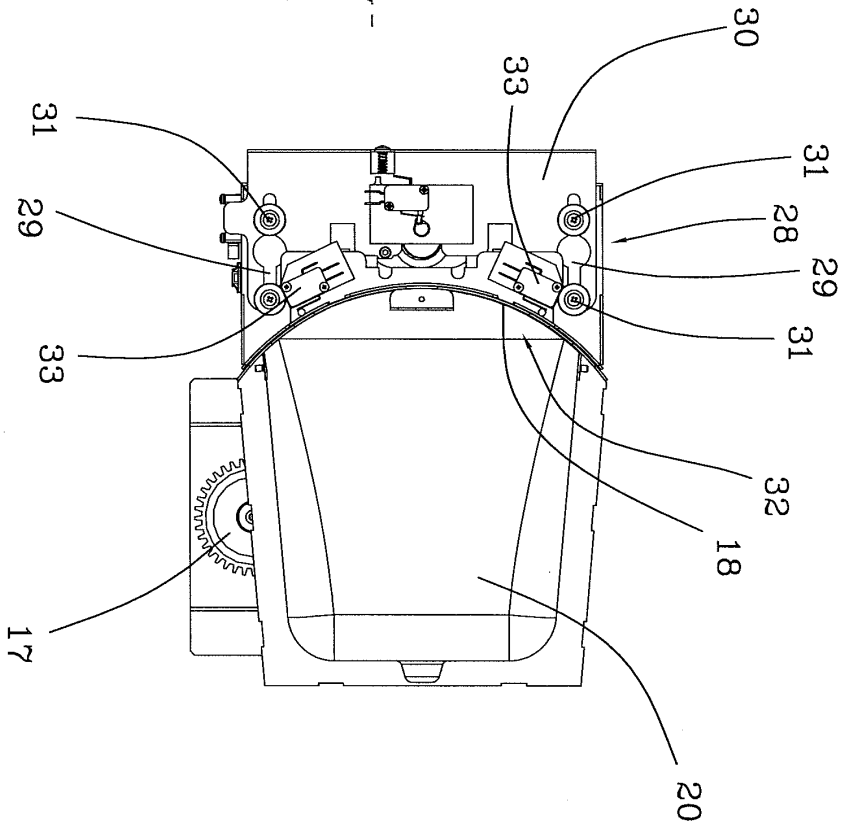


FIG 4

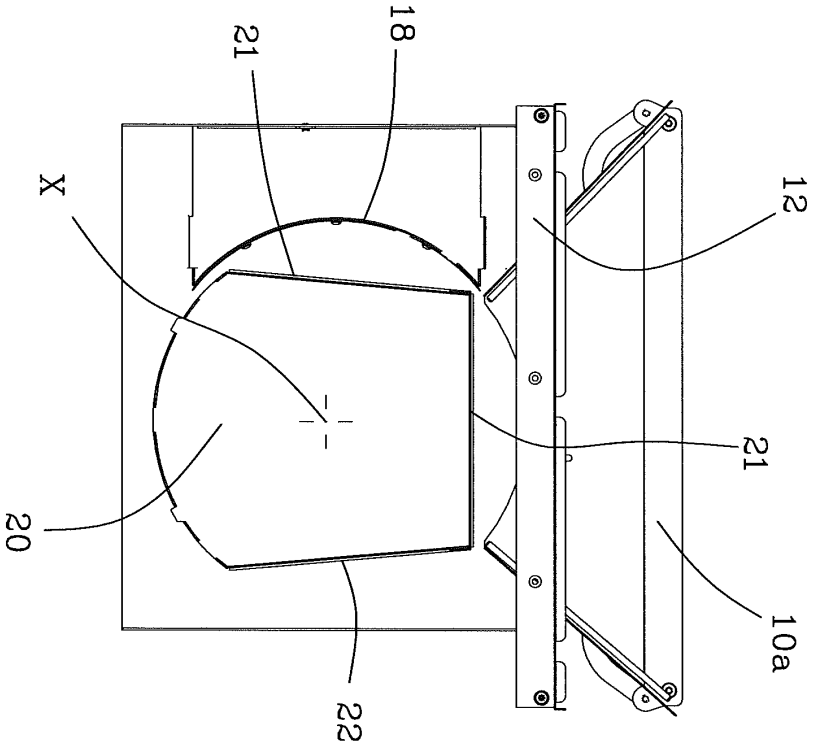
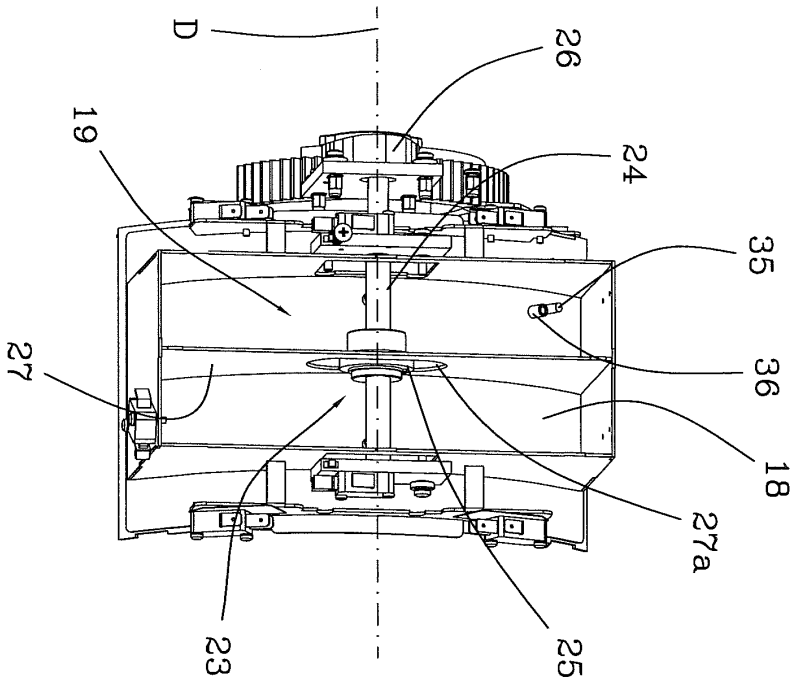


FIG 7



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EUROPEAN SEARCH REPORT

Application Number
EP 13 16 0915

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 June 2013	Fyhr, Jonas

CATEGORY OF CITED DOCUMENTS

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

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