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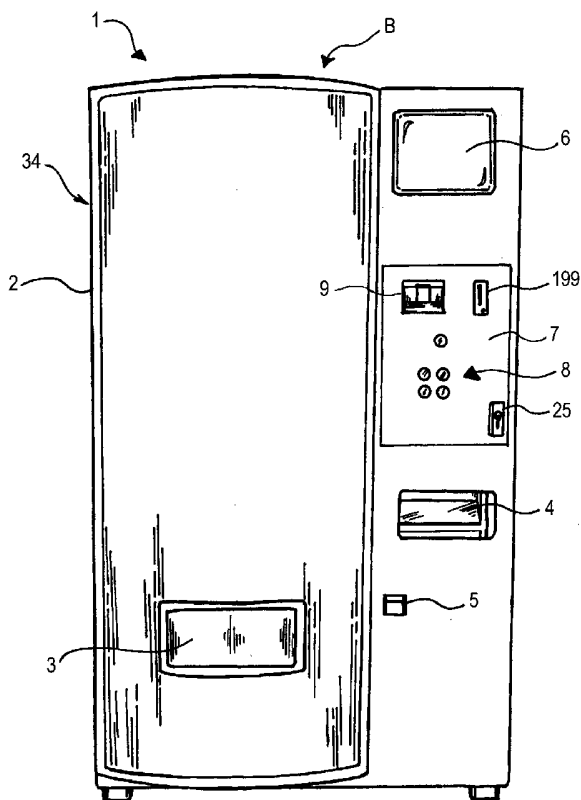
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(54) Title: APPARATUS FOR DISTRIBUTING PACKAGED FOOD PRODUCTS



(57) Abstract: An apparatus for distributing food products packaged in containers (51) comprises storage units (88) for storing stacks (61) of said containers (51), supporting means (64) associated with each storage unit (88) for supporting a respective stack (61), extracting means (80; 89) arranged for extracting containers (51) from a bottom zone of each stack (61), the storage units (88) are mounted on carousel means (13) arranged for moving said storage units (88) towards or away from said extracting means (89).

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Apparatus for distributing packaged food

The invention relates to an apparatus for distributing packaged food products.

Machines are known that are arranged for distributing food products, packaged in sealed containers substantially with the shape of a cylindrical or parallelepipedon tray, comprising a refrigerating unit intended for containing the containers and conserving the food products contained therein at low temperature, a heating unit, comprising an oven, generally a microwave oven, in which the food products are heated before being dispensed into a transfer unit, that conveys the containers between the refrigerating unit and the oven. These machines furthermore contain a selection unit, in which a user can select a desired food product, and a removal opening through which the user can remove the selected food product already heated.

In the refrigerating unit the containers are arranged in a plurality of stacks, each stack of said plurality of stacks comprising food products of the same variety. The transfer unit comprises for each stack an extracting device that enables a container to be extracted from the bottom of the stack and be placed on a resting plane arranged below the stack. The extracting device is provided with an upper supporting device and with a lower supporting device, controlled to move in relation to one another according to a predefined sequence owing to a cam mechanism, so that the bottom container of the stack is transferred from the upper supporting device to a plate of the lower supporting device and from the latter to the resting plane. The lower supporting device comprises a lever mechanism that enables the plate to be tilted so that the container can slide from the plate to the rest surface.

The transferring unit furthermore comprises a pushing device arranged to push the container from the rest plane inside the oven.

A drawback of machines of the known type is that the extracting device comprises rather a complex cam mechanism that requires a great degree of precision both during manufacturing and assembly of the mechanism.

- 5 As the stacks are arranged next to one another, a cam mechanism must also be provided for each stack, thus increasing the complexity of machines of the known type not only from the constructional point of view but also from the point of view of maintenance and production of spare parts.
- 10 Furthermore, the extracting device also comprises a lever mechanism, which is also rather complex, that can easily get locked in positions that prevent operation of the extracting device.

- Another drawback of machines of the known type is that the
- 15 extracting device is designed to extract containers having definite dimensions and cannot be used for containers having dimensions other than the design dimensions.

- A further drawback is that the low temperature present in the refrigerating unit may impair the operation of the
- 20 mechanical and electronic members of the pushing device.

- Another drawback is that a container extracted from a stack is tilted so that it can run from the plate of the lower supporting device to the base plane; in this way, the food product contained in the container accumulates in an
- 25 internal zone of the container so that the container is unbalanced or even overturns. Furthermore, the aesthetic appeal of the food product is compromised when the container is removed by the user from the removal opening.

- In known machines, the oven is provided with a door that,
- 30 driven by a motor, runs parallel to a wall in which a space is obtained that connects the heating unit and the refrigerating unit.

- The door closes the aforementioned space to separate the heating unit from the refrigerating unit, when the oven is
- 35 operating. This door does not effectively isolate the heating unit from the refrigerating unit. In fact, the door,

by running parallel to the wall of the space, slides on seals that are generally associated with a peripheral edge of the space, pulling them in the direction of motion of the door and causes the seals to break after a short operating
5 period of the machine.

Thus part of the microwaves produced by the oven is lost through gaps that form between the space and the door. As a result, the oven has reduced heating efficiency with significant loss of energy.

10 An object of the invention is to improve the distributing machines of packaged food products.

Another object is to make distributing machines of packaged food products provided with a transferring unit that is constructionally simple.

15 A further object is to produce machines that distribute packaged food products in containers, which may be loaded with containers the dimensions of which belong to a relatively wide range.

Another object is to produce distributing machines of
20 packaged food products in containers in which a transferring unit is provided that moves the containers without their being tilted.

Still another object is to obtain distributing machines of packaged food products that enable the consumption of energy
25 for heating food products to be limited.

In a first aspect of the invention, an apparatus is provided for distributing food products packaged in containers, comprising storage units for storing stacks of said containers, supporting means associated with each storage
30 unit for supporting a respective stack, extracting means arranged for extracting containers from a bottom zone of each stack, characterised in that said storage units are mounted on carousel means arranged for moving said storage units towards or away from said extracting means.

35 Owing to this aspect of the invention, it is possible to provide extracting means associated with carousel means and

not with each storage unit, with consequent simplification of the extraction apparatus.

In a second aspect of the invention, an apparatus is provided for distributing food products packaged in containers, comprising storage units for storing stacks of said containers, supporting means associated with each storage unit for supporting a respective stack, extracting means arranged for extracting containers from a bottom zone of each stack, characterised in that said supporting means is movable in a direction substantially contained on a plane that is transverse to said storage units.

Owing to this second aspect, it is possible to make an apparatus for distributing packaged food products that is particularly simple.

In an embodiment, said supporting means is guided in said direction by wedge means.

Owing to the wedge means, it is possible to extract a container from a bottom zone of the stack in a very simple manner, so that this container is not tilted in any way.

In an embodiment, the supporting means comprises distance adjusting means that enables the distance to be adjusted that separates distinct supporting elements that form the supporting means, so that the supporting means can supportingly receive containers belonging to a range comprising types of containers having differently formed perimeter edges.

In a third aspect of the invention, an apparatus is provided for distributing food products packaged in containers, comprising storage units for storing stacks of said containers, supporting means associated with each storage unit for supporting a respective stack, extracting means arranged for extracting containers from a bottom zone of each stack, heating means arranged for heating said food products, characterised in that said extracting means comprises lifting means, movable between a removal position

near said supporting means and an inlet position near an inlet opening of said heating means.

In a fourth aspect of the invention, an apparatus is provided for distributing food products packaged in containers, comprising storage units for storing stacks of
5 said containers, said storage units being provided in refrigerating means arranged for conserving said food products, heating means arranged for heating said food products, said heating means being provided with an inlet
10 opening connecting said refrigerating means and said heating means, closing means arranged for interacting with said inlet opening for separating said refrigerating means from said heating means, characterised in that said closing means is movable in a direction substantially parallel to said
15 inlet opening and a further direction substantially transverse to said inlet opening.

Owing to this aspect of the invention, it is possible to prevent seals that are possibly associated with an edge of the aforementioned opening from being cut by the closing
20 means.

Furthermore, the closing means thus enables the refrigerating means and the heating means to be separated effectively.

The invention may be better understood and implemented with reference to the attached drawings, that illustrate some
25 embodiments thereof by way of non-limitative example, in which:

Figure 1 is a schematic frontal view of a distributing apparatus of meals in a closed configuration;

30 Figure 2 is a schematic view taken along a horizontal plane of the apparatus in Figure 1 in a closed configuration;

Figure 3 is a perspective and schematic frontal view of the apparatus in Figure 1 in an open configuration;

Figure 4 is a fragmentary perspective view of parts of a
35 refrigerating unit provided in the apparatus in Figure 1;

Figure 5 is partially sectioned and fragmentary frontal view of supporting means provided in the apparatus in Figure 1 and arranged in a supporting configuration for supporting containers containing the meals to be distributed;

5 Figure 6 is an enlarged detail of the supporting means illustrated in Figure 5;

Figure 7 is a view like the one in Figure 5, illustrating the supporting means in an extraction configuration of a container;

10 Figure 8 is a fragmentary perspective view of a detail of the supporting means and of a part of a lifting device provided in the apparatus;

Figure 9 is a view like the one in Figure 8, illustrating the supporting means in an extraction configuration and the
15 lifting device in a raised configuration;

Figure 10 is a fragmentary perspective view of a detail of the lifting device in a lowered configuration;

Figure 11 is a fragmentary perspective view of the lifting device;

20 Figure 12 is a perspective view of closing means of a heating unit with which the apparatus in Figure 1 is provided, the heating unit being shown in an open position;

Figure 13 is a view like the one in Figure 12, illustrating the heating unit in a closed position;

25 Figure 14 is a perspective view of pushing means provided in the apparatus in Figure 1;

Figure 15 is a view like the one in Figure 14, illustrating parts of the pushing means;

Figure 16 is a frontal view of the pushing means.

30 With reference to Figure 1, an apparatus 1 is shown for distributing packaged food products, in particular meals. As will be disclosed in greater detail below, the foodstuffs that constitute the meals are contained in containers, in particular sealed containers, for example shaped as trays,
35 that are conserved in a refrigerated environment obtained

inside the apparatus and are heated before being distributed to a user.

The apparatus 1 comprises a casing 34 delimited at the front by a hatch 2 that is movable between an open configuration A, shown in Figure 3, in which it is possible to access the inside of the casing 34, and a closed configuration B, shown in Figure 1 in which the inside of the casing is isolated from the external environment.

The hatch 2 comprises a first opening 3 arranged for dispensing a set of cutlery 38, for example contained in a bag, and a second opening 4 that enables the meal that is ready to be consumed to be extracted from the casing 34. The hatch 2 comprises a screen 6 in which information is displayed on the types of meals that are selectable and on the cost of the latter. The hatch 2 is furthermore provided with a unit 7 comprising a lock 25 arranged to prevent access to the inside of the casing 34 by unauthorised persons, a plurality of pushbuttons 8 that enable the desired meal to be selected, a slit 9 provided with an anti-vandalism lock that is not shown, that permits the introduction inside of a suitable receiving unit of the money that is necessary for purchasing the meal and a recess 199 arranged to house a reader of an electronic key device by means of which it is possible to purchase the aforementioned meal.

A slit 5 is furthermore provided placed near the second opening 4 through which coins are dispensed if the money inserted by the user exceeds the cost of the selected meal. As shown in Figure 2, the casing 34 comprises walls 16 that delimit an internal zone 40, with a substantially parallelepipedon shape, in which a refrigerating unit 11 and a heating unit 12 are provided that are separated by a wall 17 arranged on a substantially vertical plane. The refrigerating unit 11 is maintained at a temperature noticeably below 0 °C, for example at approximately -18/-20 °C, and comprises a carousel 13 arranged for supporting and

distributing containers 51 containing the meals. The containers 51, being stackable one on top of the other, are arranged in the carousel 13 so as to form stacks 61 of containers. The containers 51 of each stack 61 contain meals
5 of the same type.

The heating unit 12 comprises an oven 14, for example a microwave oven, arranged for defrosting and heating the meals conserved in the refrigerating unit 11. The heating unit 12 and the refrigerating unit 11 are made to
10 communicate by a door 15, associated with an opening 52 obtained in the wall 17 that is movable between an open position E and a closed position F through the action of a driving device, as will be disclosed in detail with reference to Figures 12 and 13.

15 A dispensing device 18 of sets of cutlery 38 is associated with the hatch 2.

The apparatus 1 furthermore comprises a first pusher 53 arranged below the carousel 13 for pushing a container 51 extracted from the carousel 13 inside the oven 14, and a
20 second pusher 54 arranged for pushing the heated meal from the oven 14 to the second opening 4.

The apparatus 1 furthermore comprises a command and control unit, which is not shown, that runs the distributing operations of the apparatus 1.

25 As shown in Figure 3, the refrigerating unit 11 is isolated from the dispensing device 18 through a further hatch 55. The carousel 13 is arranged in an upper zone of the refrigerating unit 11 and a refrigerating exchanger 56 is arranged in a lower zone of the refrigerating unit 11 below
30 the carousel 13.

The carousel 13 comprises an upper plate 57 and a lower plate 58 fixed together by means of pairs of bars 59 associated with pairs of plates 60. Each pair of bars 59 and the corresponding pair of plates 60 are arranged so as to
35 delimit a substantially parallelepipedon-shaped region, so as to form a hollow column 88 that extends between the lower

plate 58 and the upper plate 57. In particular, the carousel 13 comprises four columns 88, each column 88 being intended for being occupied by a respective stack 61 of containers 51. Below the carousel 13 there is provided a base plane 109 that comprises a further opening 110 (Figure 8) for enabling the passage of extracting means, in particular of a lifting device 89 arranged for transferring a container removed from the stack 61 to a zone near the heating unit 12.

The Figure 4 shows a detail of the carousel 13. The lower plate 58 of the carousel is rotatably supported by a central shaft 62 rotated by a motor that is not shown. The lower plate 58 comprises a hole 63 for each column 88, said hole 63 being substantially rectangular in shape the same as that of a plan shape of the containers 51 and having greater dimensions than those of the plan shape of the containers 51, so that the hole 63 can be traversed by the respective stack 61. The bars of each pair of bars 59 are associated with lesser sides 63a of the hole 63, whilst the plates of each pair of plates 60 are associated with greater sides 63b of the hole 63.

The apparatus 1 comprises for each stack 61 supporting means 64 associated below with the lower plate 58 and release means 80 associated with each column 88 that enables a container 51 to be freed from the supporting means 64, in particular the container 51 placed at the bottom of the stack 61.

With reference to Figures 5 and 6, the supporting means 64 comprises a pair of rods 65 arranged below the hole 63 and associated with the greater sides 63b of the hole 63. The containers 51 comprise an edge 67 that projects laterally from an opening zone of the container 51 and externally to it, substantially to a support base 68 of the container 51. The pair of rods 65 is arranged so as to interact with opposite sides 66 of the edge 67 for supporting the container 51.

The supporting means 64 furthermore comprises a pair of distinct supporting elements 69 arranged below the hole 63, each supporting element 69 being associated with a lesser side 63a of the hole 63. Each supporting element 69 is provided with a hollow body 70, by means of which the supporting element 69 is fixed to the lower plate 58, in a central zone of the corresponding lesser side 63a of the hole 63 and below it, and with projecting elements 71 that project from the hollow body 70 from opposite sides of the hollow body 70 and on which rest ends of each rod of the pair of rods 65. At each end of each rod 65 a protrusion 72 is provided, having a cross section with a substantially rectangular shape and comprising a face 73 by means of which the end of the rod 65 rests on the corresponding projecting element 71. In particular, the projecting element 71 is provided with a housing 74 in which the protrusion 72 is housed. The protrusion 72 is traversed by a threaded hole 87 having an axis substantially parallel to the longitudinal extent direction of the housing 74. A threaded shank 76 extends between end walls 75 of the housing 74 and couples with the threaded hole 87, so that the protrusion 72 is interposed between the end walls 75.

The position of the protrusion 72 - and therefore of the rod 65 associated therewith - with relation to the housing 74, is thus adjustable by tightening the threaded shank 76 in a first rotation direction or in a second rotation direction opposite the first. In fact, by rotating the threaded shank 76, the protrusion 72 moves inside the housing 74 in a first movement direction, in accordance with the first rotation direction or in a second movement direction, opposite the first, in accordance with the second rotation direction.

By adjusting the position of the protrusion 72 of each rod of the pair of rods 65, it is possible to adapt the supporting means 64 to support containers 51 having dimensions belonging to a certain interval. In particular, the containers distributed by the apparatus 1 can be chosen

from a relatively large range of containers that differ by a respective width.

Figure 5 shows the release means 80 in a supporting configuration H, in which supporting means 64 supports the stack 61.

In Figure 7, the release means 80 is in an extraction configuration L, in which the supporting means 64 does not support the stack 61 and delivers it to the lifting device 89 provided in the apparatus 1.

The projecting elements 71, and therefore also the rods of the pair of rods 65, are movable substantially parallel to the lower plate 58 in a first direction G1, in which the rods 65 are moved away from one another, so that the release means 80 moves from the supporting configuration H to the extraction configuration L. The projecting elements 71, and therefore also the rods of the pair of rods 65, are furthermore movable in a second direction G2, opposite direction G1, in which the rods 65 are moved to one another, so that release means 80 moves from the extraction configuration L to the supporting configuration H.

Each projecting element 71 is partially received and fixed, by means of removable connecting members, in a first cavity 95 obtained in an upper end region of a member 77, which is partially housed in the hollow body 70 and is slidable inside the hollow body 70. The member 77 is provided, in a lower end region thereof, with a second cavity 79 in which a wheel 78 is arranged that is rotatably supported by a pivot 81 fixed to the member 77. The wheel 78 faces a central region of the hollow body 70 comprising a first space 82 obtained in a lower wall 90 of the hollow body 70. Facing the first space 82 a second space 83 is provided obtained in an upper wall 91 of the hollow body 70 and a third space 84, connected to the second space 83, is obtained in the lower plate 58. In the hollow body 70 two members 77 are thus provided that are arranged symmetrically to the central region of the hollow body 70.

Each member 77 comprises in the lower region thereof a third cavity 97 that is open below that extends substantially parallel to the first cavity 95 and in which an elastic member is housed, in particular a spring 96. The spring 96 is interposed between a side wall 99 of the third cavity and an "L"-shaped plate 98, which on one side of the "L" is received in the third cavity 97 and on a further side of the "L" is fixed outside the lower wall 90 of the hollow body 70.

10 In the supporting configuration H (Figure 7), the plate 98 is near a further side wall 100 of the third cavity and the spring 96 is substantially in an extended configuration. In the extraction configuration L, the plate 98 is further from the further side wall 100 and the spring 96 is substantially
15 in a compressed configuration.

The release means 80 comprises a driving element 85 arranged for driving the member 77 to slide in the hollow body 70. The driving element 85 comprises a stem 86, that is slidable inside the second space 83 and the third space 84 and is
20 provided with a head 112 that, by interacting with the lower plate 58, prevents the driving element 85 from dropping through gravity as it emerges from the hollow body 70. The driving element 85 also comprises a body 93 provided with a tapered portion 92 to which the stem 86 is centrally fixed.
25 The tapered portion 92 comprises two driving surfaces 94 symmetrically tilted with respect to the stem 86, so as to confer on the driving element 85 a wedge shape.

The driving surfaces 94 are arranged so as to interact through contact with a respective wheel 78.

30 In the supporting configuration H, the wheels 78 are in contact with the driving surfaces 94 in a zone of the tapered portion 92 that is nearer the stem 86. In this configuration, the head 112 of the stem 86 rests on the lower plate 58 and the tapered portion 92 is for a greater
35 part outside the hollow body 70.

As shown in Figure 7, in the extraction configuration L, the wheels 78 are in contact with the driving surfaces 94 in a zone of the tapered portion 92 further from the stem 86 and nearer the body 93. In this configuration, the tapered portion 92 is substantially arranged inside the hollow body 70 and the stem 86 is for a greater part outside the hollow body 70.

The driving element 85 is provided below with an actuating surface 101 arranged for interacting with a lifting plane 102 connected to the lifting device 89.

With reference to Figure 11, the lifting device 89 comprises a motor 104 supported by a support 103 with the shape of an upturned "U", arranged below the carousel 13, this support 103 being mounted, through parts thereof that define the legs of the "U", on a base portion 105 of the casing 34. The motor 104, interposed between the parts that define the legs of the "U", controls a nut 107, mounted by means of a suitable support, on the portion that connects together the parts that define the legs of the "U", to rotate coupled with a worm screw 108. The worm screw 108 has an end 106 connected to the lifting plane 102. Through the rotation of the nut 107 within the support thereof, the worm screw can move in a substantially vertical direction indicated by the arrows S, in accordance with the rotation direction of the motor 104, between a lowered position M, shown in Figure 10, in which the lifting plane 102 is further from the column 88 and a raised position N, shown in Figures 7 and 9, in which the lifting plane 102 is nearer the column 88. The lifting device 89 furthermore has a rest position O, shown in Figure 8 in which the lifting plane 102 and the base plane 109 are on the same plane.

With reference to Figure 8, before a meal has been selected by a user, the lifting device 89 is arranged in the rest position O and the release means 80 is in the supporting configuration H. In this configuration, the actuating surface 101 is at a distance P from the lifting plane 102.

When the user selects the meal, the carousel 13 is rotated until the column 88 inside which the stack 61 comprising the chosen meal is housed is positioned above the lifting plane 102 at the further opening 102. Subsequently, as shown in
5 Figure 9, the motor 104 of the lifting device 89 rotates the lifting plane 102 to rise until the lifting plane 102, by interacting with the actuating surface 101, lifts the driving element 85 with a certain force that is directed substantially vertically. The force acting on the driving
10 element 85 is transferred, owing to the tilt of the driving surfaces 94, to the members 77 through the wheels 78. In fact, a component of this force drives the members 77 to slide in the first direction G1. The members 77 move towards the outside of the hollow body 70 and each spring 96 is
15 compressed because when the member 77 moves in the first direction G1, the side wall 99 is moved to the further wall 100. The rods 65 are thus moved away from one another and are thus moved away from the edge 67 of the container 51. The container 51 placed at the bottom of the stack 61 is no
20 longer supported by the supporting means 64, but by the lifting plane 102 that in the meantime is placed in contact with the support base 68 of the container 51 placed at the bottom of the stack 61 before the supporting means 64 has released the container 51. The lifting plane 102, by
25 continuing to rise, then reaches the raised position N. The stack 61 that is initially supported by the supporting means 64 is then transferred to the lifting device 89. The release means 80 thus reaches the extraction configuration L.
A sensor 111 indicates the presence of a container 51 on the
30 lifting plane 102 in the raised position N and commands the motor 104 to stop and invert rotation direction.
From this moment, the lifting device 89 starts to descend to move from the raised position N to the lowered position M, illustrated in Figure 10. Whilst the lifting plane 102 is
35 lowered, the stack 61 that is supported by it and also the driving element 85 move with it; through the effect of

gravity, the actuating surface 101 remains in contact with the lifting plane 102 until the moment at which the head 112 of the driving element 85 reaches the lower plate 58. Each wheel 78 runs along the respective driving surface 94, to
5 move from a zone of the tapered portion 92 nearer the body 93 to a zone of the tapered portion 92 nearer the stem 86, and each member 77 is driven to slide in the second direction G2 pushed by a reaction of the spring 96, previously compressed when the rods 65 have been moved away.

10 The member 77 is externally provided with an arrest appendage 113 that by cooperating with an end edge 114 of the hollow body 70 stops the member 77 in a position in which the release means 80 has again taken on the supporting configuration H.

15 The rods 65 are thus moved to one another until they interact with a container 51 immediately above the container 51 resting on the lifting plane 102. In the meantime, the container 51 resting on the lifting plane 102 is moved away from the stack 61 by the lifting plane 102 and the stack 61
20 is thus again supported by the supporting means 64.

With reference to Figure 10, when the lifting device 89 is in the lowered position M, the container 51 extracted from the stack 61 is arranged opposite an inlet space 115 of the oven 14, said inlet space 115 being provided at the opening
25 52.

With reference to Figure 11, the lifting device 89 comprises guiding means arranged for guiding the lifting device 89 during the motion thereof between the raised position N and the lowered position M. The guiding means comprises a
30 guiding plate 117 fixed to a side 116 of the lifting plane 102 near the oven 14 and extending from the lifting plane 102 to the base portion 105 substantially orthogonally to the lifting plane 102. The guiding plate 117 comprises two side panels 118 that extend from further sides 119a and 119b
35 of the lifting plane 102 to the base portion 105. The further sides 119a and 119b are adjacent to the side 116 and

opposite one another with respect to the side 116. On the further sides 119a and 119b cuts 120 are obtained arranged for being at least partially occupied by small wheels 121 engaged in running in guiding bars 122. The small wheels 121 are rotatably supported on an elongated element 123 (Figures 12 and 13) mounted on the guiding plate 117 on a face thereof facing the oven 14.

In Figures 12 and 13 there is illustrated the door 15 of the oven 14. The door 15 is provided with a frame 124 comprising a bottom panel 125, in which the inlet space 115 is obtained in an upper zone thereof and two uprights 126 adjacent to the bottom panel 125 and arranged on opposite sides with respect to the bottom panel 125. The door 15 comprises, furthermore, a closing element 127 that extends between the uprights 126, the closing element 127 being interposed between the uprights 126 and having a substantially parallelepipedon shape. The closing element 127 is movable between an open position E, in which it is possible to access the oven 14 from a region external thereto through the inlet space 115 and a closed position F, in which the closing element 127 occupies the inlet space 115 preventing access to the oven 14 from a region external thereto.

The closing element 127 is driven by a connecting rod-crank mechanism 128, mounted on the bottom panel 125 below the inlet space 115. The connecting rod-crank mechanism 128 comprises a crank 129 rotated by a further motor 130 and a connecting rod 131 hinged at an end thereof to the crank 129 and at a further end thereof to a connecting member 132. The connecting member 132 is fixed to a central portion of a surface 133 of the closing element 127.

The door 15 comprises further guiding means 135, arranged for guiding the closing element 127 when driven by the further motor 130. The further guiding means 135 comprises distinct protruding elements 136, fixed to opposite side surfaces 134a and 134b of the closing element 127, arranged for being received in recesses 137 obtained on the uprights

126. The side surfaces 134a and 134b of the closing element 127 are adjacent to the surface 133 and substantially orthogonal thereto.

The recesses 137 comprise a fashioned profile and define a route for the distinct protruding elements 136 when the closing element 127 is driven between the open position E and the closed position F.

This fashioned profile comprises a first part 138 that is substantially parallel to the extent direction of the uprights 126. When the protruding element 136 interacts with the first part 138, the closing element 127 is guided to move along a trajectory substantially parallel to the bottom panel 125.

The fashioned profile furthermore comprises a second part 139 that defines a curved trajectory, in particular a circumference arc. When the protruding element 136 interacts with the second part 139, the closing element 127 is guided to move to the bottom panel 125, or to move from the bottom panel 125, according to whether the protruding element 136 runs along the second part 139, with reference to Figures 12 and 13, respectively from left to right or from right to left.

Owing to the further guiding means 135, the closing element 127 does not move to the inlet space 115 by sliding on edges thereof, but approaches the inlet space 115 frontally. This enables the possibility to be significantly limited that seals on the edges of the inlet space 115 can be deformed or cut by the closing element 127.

The further guiding means 135 further ensures that the oven 14 can be effectively isolated from the refrigerating unit and that there is no dispersion of the microwaves generated by the oven.

In an embodiment which is not shown, the second part 139 comprises substantially straight lines and defines a trajectory that is tilted with respect to the first part 138.

When the lifting device 89 is in the rest position O, the door 15 is in the closed position F.

Still with reference to Figures 10 and 11, before the lifting device 89 reaches the lowered position M, the
5 further motor 130 drives the connecting rod-crank 128 mechanism, so that when the lowered position M is reached, the closing element 127 has already freed the inlet space 115. This enables the time to be significantly reduced that is taken by the apparatus 1 to distribute the meal.

10 The container 51 extracted from the stack 61 corresponding to the selected meal is pushed inside the oven 14 through the inlet space 115 by the first pusher 53. The first pusher 53 is arranged below the base plane 109, inside the refrigerating unit 11 at a distance from the base portion
15 105 substantially corresponding to the distance between the container 51, supported by the lifting device 89 in the lowered position M, and the base portion 105.

With reference to Figures 14 to 16, the first pusher 53 comprises an arm 140 provided with a pushing member 141
20 arranged for pushing the container 51 from the lifting plane 102 inside the oven 14. The arm 140 is movable with reciprocating movement in a direction indicated by the arrows Q between an advanced position, in which the arm 140 is in contact with the container 51, and a retracted
25 position, in which the arm 140 is further from the container 51 to be pushed.

The arm 140 is driven owing to a chain-drive mechanism 147, comprising a chain 146, closed in a loop, in which a drive gear wheel, which is not shown, driven by a still further
30 motor 144 and a driven gear wheel 143 engage. The chain-drive mechanism 147 is enclosed in a guard 151 surrounding the entire mechanism.

The arm 140 is supported on a support panel 142 that comprises a first portion 148 outside the guard 151 and to
35 which the arm 140 is connected, a second portion 149, received inside the guard 151 and a third portion 150, that

extends inside the guard 151 substantially on the same plane as the first portion 148.

The second portion 149 projects from the first portion 148 and from the third portion 150 so as to form a "C"-shaped
5 step in the concave portion of the "C" there being housed the drive gear wheel when the arm 140 is in the retracted position.

A peg 152 protrudes from the chain 146 and is inserted in a slot 153 provided in a central region of the second portion
10 149. The peg 152, by interacting with the slot 153, drags the support panel 142 and thus enables the arm 140 to be driven.

In the third portion 150 and in the first portion 148, in an internal zone of the guard 151, wheels 154 are provided, in
15 particular two wheels 154 in the third portion 150 and two wheels in the first portion 148, that by running along internal walls that are not shown of the guard 151 enable the arm 140 to be guided during the reciprocating movement.
Once the first pusher 53 has inserted the container 51 into
20 the oven 14, it returns to the retracted position and remains there until a further meal is selected.

In the oven 14 the food product contained in the container 51 is cooked or merely heated and is moved from the second
pusher 54 to the second opening 4, from which it can be
25 removed.

The invention furthermore relates to an apparatus for distributing packaged food products with which a cutlery dispensing device is associated.

Machines are known that are arranged for conserving meals at
30 low temperature and for distributing these meals after heating them that comprise a unit for distributing meals and a further unit for dispensing cutlery.

In particular, the unit for distributing meals comprises a conserving refrigerating unit, a transferring unit, a
35 heating unit, a selection unit and an opening for removing a

meal. The unit for dispensing the cutlery comprises a device for expelling the cutlery contained therein.

The machines disclosed above operate in the following manner: a user chooses through the selection unit the
5 desired meal and inserts the quantity of money required to purchase it into a money insertion unit.

The meal, which is kept at a low temperature in the conservation refrigerating unit, is then conveyed from the transferring unit to the heating unit to be taken to the
10 consumption temperature.

The user, through the removal opening, can then remove the selected meal and, through a further opening in the cutlery dispensing unit, can remove the cutlery necessary for consuming it.

15 In the machines disclosed above, the unit for the distribution of the meals and unit for dispensing the cutlery are independent of one another and are installed so as to be next to one another.

In known machines, these units are made with panel
20 structures.

The machines disclosed above require premises to be available that are sufficiently spacious for housing them because of the considerable spaces necessary for housing the two distinct structural elements that constitute them, i.e.
25 the unit for distributing meals and the cutlery dispensing unit.

The machines disclosed above furthermore require considerable time and significant cost to be installed, inasmuch as both the unit for distributing the meals and the
30 unit for distributing the cutlery have to be mounted.

The machines disclosed above are thus easily damageable inasmuch as they are made with panel structures. In particular, these machines can be tampered fairly easily by malicious persons.

35 An object of the invention is to improve the distributing machines of packaged food products.

Another object is to make distributing machines of packaged food products that are rather compact.

A further object is to make distributing machines of packaged food products that are rapid and cheap to install.

5 Still another object is to obtain distributing machines of packaged food products that are hardly damageable or are virtually tamperproof.

According to the invention an apparatus is provided for distributing packaged food products, comprising a frame
10 provided with casing means provided with hatch means for regulating access to an internal zone of said casing means, characterised in that it furthermore comprises dispensing means of sets of cutlery associated with said hatch means.

Owing to the invention, it is possible to make an apparatus
15 for distributing packaged food products that is particularly compact. In fact this apparatus comprises a device for dispensing cutlery incorporated in a hatch of the apparatus that enables a considerable reduction of overall dimensions to be obtained.

20 Owing to the invention it is possible to install a single apparatus that distributes both the packaged food products and the sets of cutlery, thus reducing the time and costs required for installation.

Furthermore, owing to the invention it is possible to make
25 an apparatus comprising a body consisting of a single structure rather than a plurality of distinct units as occurs in known machines. The apparatus according to the invention is thus particularly resistant to damage and tampering.

30 The invention can be better understood and implemented with reference to the attached drawings that illustrate an embodiment thereof by way of non-limitative example, in which:

Figure 17 is a schematic frontal view of a distributing
35 apparatus of meals;

Figure 18 is a schematic section taken along a horizontal plane showing hatch means of the apparatus in Figure 17 in a closed configuration;

Figure 19 is a section like the one in Figure 18 showing the hatch means in an open configuration;

Figure 20 is a perspective frontal view of the apparatus in Figure 17 that shows the hatch means in the open configuration;

Figure 21 is a schematic section taken along a vertical plane of dispensing means of cutlery.

With reference to Figure 17 an apparatus 1 for distributing packaged food products, in particular meals, is shown. As will be disclosed in greater detail below, the food that constitutes the meals is contained in receptacles, for example shaped as trays, that are conserved in a refrigerated environment obtained inside the apparatus and are heated before being distributed to a user.

The apparatus 201 comprises a casing 234 delimited at the front by a hatch 2 that is movable between an open configuration A1, shown in Figures 19 and 20, in which it is possible to access the inside of the casing 234, and a closed configuration B, shown in Figures 17 and 19 in which the inside of the casing 234 is isolated from the external environment.

The hatch 202 comprises a first opening 203 arranged for dispensing a set of cutlery 238, for example contained in a bag, and a second opening 204 that enables the meal that is ready to be consumed to be extracted from the casing 234. The hatch 202 comprises a screen 206 in which information is viewable relating to the types of meals that are selectable and the cost of the latter. The hatch 202 is furthermore provided with a unit 207 comprising a lock 225 arranged for preventing access to the inside of the casing 234 by unauthorised persons, a plurality of pushbuttons 208 that enable the desired meal to be selected, a slit 209 provided with an anti-vandalism device that is not shown that enables

a suitable unit to be introduced inside for receiving the money necessary for the purchase of the meal, and a recess 299 arranged for housing a reader of an electronic key device by means of which it is possible to purchase the
5 aforementioned meal.

A slit 205 is furthermore provided placed near the second opening 204 through which coins are dispensed if the money inserted by the user exceeds the cost of the selected meal. As shown in Figure 19, the casing 234 comprises walls 216
10 that delimit an internal zone 240, with a substantially parallelepipedon shape, in which a refrigerating unit 211 and a heating unit 212 are provided separated by a wall 217 arranged on a substantially vertical plane. The refrigerating unit 211 is maintained at a temperature
15 noticeably below 0 °C, for example at approximately -18/-20 °C, and comprises a carousel 213 arranged for supporting and distributing the containers containing the meals.

The heating unit 212 comprises an oven 214, for example a microwave oven, arranged for defrosting and heating the
20 meals conserved in the refrigerating unit 211. The heating unit 212 and the refrigerating unit 211 are made to communicate by a door 215, associated with an opening obtained in the wall 217 that is movable between an open position and a closed position through the action of a
25 driving device that is not shown.

A dispensing device 218 of sets of cutlery 238 that is associated with the hatch 202 comprises a first dispensing unit 220 and a second dispensing unit 221 that contain and dispense the sets of cutlery 238.

30 The hatch 202 is internally provided with a cavity 250 having a depth S_1 greater than a transverse dimension d of the first dispensing unit 220 and of the second dispensing unit 221, so that the first dispensing unit 220 and the second dispensing unit 221 are receivable inside the cavity
35 250 as will be disclosed in greater detail below.

As shown in Figure 19, the first dispensing unit 220 and the second dispensing unit 221 are associated with the hatch 202 through hinges 223, so as to be movable between a dispensing configuration C1, shown in Figures 18 and 20, in which the sets of cutlery are expelled from the first dispensing unit 220 or from the second dispensing unit 221, and a loading configuration D1, shown in Figure 19, in which an operator can load the first dispensing unit 220 and the second dispensing unit 221 with the sets of cutlery 238.

In the dispensing configuration C1 the first dispensing unit 220 and the second dispensing unit 221 are received inside the cavity 250, whereas in the loading configuration D1 the first dispensing unit 220 and the second dispensing unit 221 project from the hatch 202 for promoting the introduction of the sets of cutlery 238 by a person in charge of supervising the apparatus 201.

The first dispensing unit 220 and the second dispensing unit 221 are provided with locking devices 224, for example of magnetic type, that keep these units in the dispensing configuration C1.

The first dispensing unit 220 and the second dispensing unit 221, are each provided with a box frame 230 delimited by a first side wall 235 and by a second side wall 236 facing one another and interconnected by a third side wall 237.

The hinges 223 are positioned on a corner defined at the intersection between the first side wall 235 and the third side wall 237.

The box frame 230 is delimited above by a base wall that is not shown.

The box frame 230 comprises an opening 231 opposite the aforementioned base wall through which, in use, the sets of cutlery 238 are dispensed, as will be disclosed in greater detail below.

The box frame 230 furthermore comprises a further opening 239, opposite the third side wall 237, through which an operator can load a plurality of sets of cutlery 238 into

the first dispensing unit 220 and into the second dispensing unit 221.

With each box frame 230 a motor shaft 226 is provided that is arranged near the opening 231, which motor shaft 226 is
5 rotated by an electric motor, and a driven shaft 227, arranged near the aforementioned base wall.

The aforementioned electric motor rotates the motor shaft 226 by steps.

The motor shaft 226 and the driven shaft 227 are connected
10 together by a chain 228 with which a plurality of conveying elements 229 are associated, the chain 228 comprising a first part 241 and a second part 242 arranged substantially parallel to the first side wall 235, to the second side wall 236 and the third side wall 237. In other words, the first
15 part 241 and the second part 242 extend substantially vertically.

The chain 228 furthermore comprises a third part 243 that winds partially around a wheel 246 that is connected to the driven shaft 227 and a fourth part 244 that partially winds
20 around a further wheel 245 connected to the motor shaft 226. The conveying elements 229 are substantially "L"-shaped and comprise a first portion 247 fixed to the chain 228 and a second portion 248 that projects from the chain 228.

The conveying elements 229 cooperate together and with the
25 first side wall 235, the second side wall 236, the third side wall 237 and the base wall to define a plurality of receptacles 249 that contain the sets of cutlery 238 that are supported and moved by the second portions 248.

The second portions 248 of the conveying elements 229 that
30 at a given instant of a work cycle of the apparatus 201 are associated with the first part 241 and with the second part 242 define supporting planes arranged substantially horizontally.

In operation, when the chain 228 associated with one of the
35 dispensing units, for example with the first dispensing unit 220, is driven by the motor shaft 226 for a stroke of preset

extent, a conveying element 229, for example the conveying element 229 nearest the opening 231, unloads the set of cutlery 238 associated therewith and directs it to a conveying chute 232 that transfers the set of cutlery 238 to the first opening 203, from which it can be removed by a user.

In other words, when the chain 228 winds around the further wheel 245, the second portions 248 define supporting planes tilted in relation to a horizontal plane, causing the expulsion of a set of cutlery 238 from the respective conveying element 229.

Between the opening 231 and the chute 232 there is positioned a detecting device 233 arranged for defining the presence of the set of cutlery 238.

In particular, the set of cutlery 238, by falling through the force of gravity from the conveying element 229 on which it was resting, interacts with the detecting device 233.

If although a chain 228 shift has occurred, the detecting device 233 does not detect any set of cutlery 238, a signal is emitted that drives the chain 228 associated with the second dispensing unit 21.

The invention furthermore relates to methods for the control of a thermal conditioning apparatus.

Machines are known for the distribution of heated food products, for example packaged foods, comprising a unit refrigerated for the low-temperature conservation of the food products and a heating unit in which a portion of the food products is heated before being dispensed to a user.

The heating units may comprise ovens supplied with electric power, in particular microwave ovens.

The ovens are provided with command and control units in which, for each type of food product that can be dispensed, a corresponding heating time is memorised.

In the case of microwave ovens, the aforementioned heating time may comprise periods during which the microwave generating devices are supplied with intervals of one or

more rest periods, during which these microwave generators are kept inactive. This enables the heating conditions to be improved. Some food products, in fact, can be burnt if they are subjected to continuous radiation for prolonged periods.

5 A drawback of the aforementioned machines is the incorrect heating of the food product preselected by the user.

In particular, the food product may have been overheated and therefore be burnt, or vice versa the food product may have been heated too little, thus being still partially frozen.

10 As the aforementioned heating time depends on the supply voltage of the heating unit if the supply voltage is subjected to variations from a nominal value, the total amount of heat supplied by the heating unit to the food product during the heating time mentioned above may undergo
15 corresponding variations that may be very significant.

In particular, if during operation of these machines a diminution of the value of the supply voltage with respect to the aforementioned nominal value occurs, which happens fairly frequently, for example due to oscillations linked to
20 the load on an electric power distribution main, the heating unit provides the food product with an amount of heat that is less than what is theoretically envisaged.

This means that the food product may be undercooked, be insufficiently hot or even be still partially frozen.

25 On the other hand, if during operation of the machines an increase in the value of the supply voltage with respect to the aforementioned nominal value occurs, the heating unit provides the food product with an amount of heat that is greater than what is theoretically provided.

30 This means that the food product may be overcooked or even burnt.

In known machines, furthermore, the heating time associated with any type of food product that can be dispensed, is established on the basis of a theoretical value of current
35 absorbed by part the heating components of the heating unit.

As the heating components of the heating unit may have an actual current absorption value that is different from the theoretical current absorption value, the food product may not be correctly heated.

5 In particular, when the apparatus comprises a microwave oven, if the actual value of the current absorbed by microwave-generating devices (for example magnetrons and electromechanical transforming devices associated therewith) is less than the theoretical current absorption value, the
10 effective amount of electric power that is transformed into electromagnetic wave - and consequently the heat supplied to the food product - is less than a nominal amount necessary for obtaining the desired degree of heating.

On the other hand, if the actual current absorption value is
15 greater than the theoretical current absorption value, the food product is subjected to excessive heating.

An object of the invention is to improve the methods for the control of the heat conditioning apparatuses of food products.

20 A further object is to provide a method for controlling heat-conditioning apparatuses of food products so that these food products have a desired degree of heating, or of cooking, when they are dispensed.

A still further object is to provide a method for setting an
25 operating cycle time of a heat-conditioning apparatus for food products.

In a first aspect of the invention, a method is provided for the control of a heat-conditioning apparatus for food products, comprising providing a conditioning time of a food
30 product, characterised in that it furthermore comprises periodically updating said conditioning time during operation of said apparatus.

In a second aspect of the invention, a method is provided for the control of a heat-conditioning apparatus for food
35 products, comprising acquiring a nominal conditioning time of a food product, characterised in that it furthermore

comprises detecting an actual value of an electric parameter indicating a quantity of energy with which said apparatus is supplied, comparing said actual value with a nominal value of said electric parameter, fixing an actual conditioning time that depends on the outcome of said comparing.

Owing to these aspects of the invention, it is possible to obtain a method for controlling a heat-conditioning apparatus for food products, that if necessary enables the actual conditioning time of the apparatus to be modified on the basis of a parameter indicating current operating modes. In this way, the apparatuses controlled with the methods according to the aforementioned aspects of the invention are much more flexible than the known apparatuses in which the conditioning time associated with a particular type of food product is fixed at the moment of manufacture of the apparatuses and cannot be subsequently modified.

As the actual conditioning time of the apparatuses can be controlled during a work cycle of the apparatuses, a food product is obtained that has a desired degree of heating.

In a third aspect of the invention, a method is provided for the control of a thermal conditioning apparatus, comprising acquiring a reference time of a conditioning cycle of a food product, characterised in that it furthermore comprises detecting an actual value of an electric parameter indicating the quantity of electric energy absorbed by said apparatus, comparing said actual value with a reference value of said electric parameter, fixing a conditioning time that depends on the outcome of said comparing.

Owing to this aspect of the invention, it is possible to obtain an apparatus in which a conditioning time associated with a food product depends, for example, on the actual value of the current absorbed by heating elements of the apparatus and is not simply calculated on the basis of nominal absorbed current values supplied by the manufacturer of the heating elements.

In particular, each apparatus has, for each type of food product that has to be thermally treated, a particular conditioning time calculated by taking account of the actual values of absorbed current with respect to the heating elements with which it is equipped.

The invention can be better understood and implemented with reference to the attached drawings, that illustrate some embodiments thereof by way of non-limitative example, in which:

Figure 22 shows a flow diagram relating to a method for controlling a heat-conditioning apparatus for food products; Figure 23 shows a further flow diagram relating to a method for setting a cycle time of a heat-conditioning apparatus for food products.

A list of the references is shown below that are used in the attached flow diagrams:

V_E : actual power voltage value (variable);

V_N : nominal power voltage value (constant);

T_N : nominal heating time (constant);

T_E : actual heating time (variable);

T_T : theoretical heating time (constant);

A_E : actual absorbed current value (variable);

A_{MIN} : minimum acceptable absorbed current value (constant);

A_{MAX} : maximum acceptable absorbed current value (constant);

A_{RIF} : reference absorbed current value (constant).

With reference to Figure 22, there is shown a flow diagram relating to a method for controlling a heating apparatus.

The method can be applied for providing a food product with a preset amount of heat before the food product is consumed by a user.

The heating apparatus can dispense a plurality of food products with each of which a calculated nominal heating time T_N is associated, the aforementioned amount of heat being known, on the basis of a nominal power voltage value V_N , for example equal to 220 V, with which heating elements of the apparatus are supplied.

In order to keep the aforementioned amount of heat constant, also in the presence of undesired variations in the voltage actually dispensed, setting an actual heating time T_E using the methods indicated below is provided for.

- 5 The method according to the invention provides for detecting an actual voltage value V_E with which the apparatus is supplied and subsequently comparing this value with the nominal voltage value V_N .

As shown in the right-hand portion of the flow diagram, if
10 from the above comparison it emerges that the actual voltage value V_E is substantially the same as the nominal voltage value V_N , setting the actual heating time T_E the same as the nominal heating time T_N is provided for.

In this case, in fact, it is not necessary to deviate from
15 the nominal heating time T_N , no variations in supply voltage having occurred.

If the actual voltage value V_E is different from the nominal voltage value of V_N , calculating the actual heating time T_E on the basis of the nominal heating time T_N and of the
20 difference between the actual voltage value V_E and the nominal voltage value V_N is provided for.

The actual heating time T_E moves further from the nominal heating time T_N the greater the difference between the actual voltage value V_E and the nominal voltage value V_N .

- 25 In particular, the actual heating time T_E can be calculated as a percentage of the nominal heating time T_N .

In particular, if the actual voltage value V_E is less than the nominal voltage value V_N , the actual heating time T_E is greater than the nominal heating time T_N .

- 30 On the other hand, if the actual voltage value V_E is greater than the nominal voltage value V_N , the actual heating time T_E is less than the nominal heating time T_N .

The phases of the method disclosed above, i.e. the recording of the actual voltage value V_E , the comparison between the
35 actual voltage value V_E and the nominal voltage value V_N and

the determination of the actual heating time T_E are repeated cyclically over the course of a work cycle of the apparatus. In this way, the actual heating time T_E is updated periodically during the aforementioned work cycle.

5 It is therefore possible to obtain a food product that has optimal consumption conditions inasmuch as the actual heating time T_E to which the food product is subjected is selected on the basis of the actual electric power supply conditions of the heating elements.

10 With reference to Figure 22, a flow diagram relating to a method for setting a cycle time of a heating apparatus of food products is shown.

The method can be applied to obtain the nominal heating time T_N to which reference has been made above, this nominal
15 heating time T_N depending on the amount of heat that has to be transmitted to a food product.

As disclosed above, the heating apparatus can dispense a plurality of food products with each of which a theoretical heating time T_T is associated that is calculated on the
20 basis of a reference absorbed current value A_{RIF} determined on the basis of the nominal values of current absorbed by the heating elements of the apparatus, as supplied by the manufacturers of the heating elements.

In order to keep the aforementioned amount of heat constant
25 even in the presence of actual current absorption values that are different from the reference absorbed current value A_{RIF} , owing to tolerable differences in the performance of the heating elements, determining the nominal heating time T_N according to the methods indicated below is provided for.

30 The method provides for detecting an actual absorbed current value A_E and subsequently checking whether this actual absorbed current value A_E belongs to an interval defined by a minimum acceptable absorbed current value A_{MIN} and a maximum acceptable absorbed current value A_{MAX} .

35 If the actual absorbed current value A_E does not belong to the aforementioned interval a signal is generated that

indicates that the apparatus does not meet suitability requirements and that it is necessary to replace the heating elements.

If on the other hand the actual absorbed current value A_E belongs to the aforementioned interval, this actual absorbed current value A_E is compared with the reference absorbed current value A_{RIF} .

If the actual absorbed current value A_E is substantially the same as the reference absorbed current value A_{RIF} , setting the nominal heating time T_N the same as the theoretical heating time T_T is provided for.

On the other hand, if actual absorbed current value A_E is different from the reference absorbed current value A_{RIF} , calculating the nominal heating time T_N on the basis of the theoretical heating time T_T and of the difference between the actual absorbed current value A_E and the reference absorbed current value A_{RIF} is provided for.

The more the nominal heating time T_N differs from the value of the theoretical heating time T_T the greater is the difference between the actual absorbed current value A_E and the reference absorbed current value A_{RIF} .

The nominal heating time T_N can be calculated as a percentage of the theoretical heating time T_T .

In particular, if the apparatus is equipped with a microwave oven provided with magnetrons and respective electromechanical transforming devices it is observed that if the actual absorbed current value A_E is greater than the reference absorbed current value A_{RIF} , the nominal heating time T_N is less than the theoretical heating time T_T .

This is because the actual quantity of electric power transformed into electromagnetic power is greater than an amount of electric power calculated on the basis of the theoretical heating time T_T .

On the other hand, if the actual absorbed current value A_E is less than the reference absorbed current value A_{RIF} , the

nominal heating time T_N is greater than the theoretical heating time T_T .

The method thus enables nominal heating times to be identified for each apparatus, each of which is associated
5 with a respective food product, that depends on the actual absorbed current value of the heating elements with which the apparatus is equipped.

The invention furthermore relates to a microwave oven for defrosting and heating precooked foodstuffs.

10 In the modern human diet, for reasons of convenience, rapidity and hygienic safety the use of precooked and frozen foods that are ready to be heated and served at table within a very short time is becoming increasingly common.

These foods are prepared by specialised companies of the
15 industry in controlled sanitary hygienic conditions, and from the qualitative point of view, they often reach excellent values.

Freezing enables these foods to be conserved, without resorting to preservatives, for a long period without
20 harming the organoleptic properties and qualitative shelf life.

The foodstuffs are packaged in containers in cardboard for foodstuffs the inside of which is coated with a film of plastic materials that prevents the leakage of the liquids
25 that accompany the food (juices, sauces, etc.). The containers are packaged, often in a controlled atmosphere, and are sealed with a special cover that ensures the hygienic and sanitary conditions and the preservability of the contents.

30 Very many foods are commercially available (first courses of pasta or rice, second courses of meat and fish), side dishes of vegetables, potatoes, etc.

The problem arises when the food contained in the tray has to be taken to serving temperature within a short time
35 inasmuch as it takes a long time for food extracted from the

freezer to reach ambient temperature naturally and then become heated in the traditional manner.

In this way the rapidity is lost that is one of the factors that have enabled this type of foodstuff to become
5 established.

Heating the tray with the contents thereof in a traditional oven is not possible because the cardboard of which it consists does not withstand high temperatures and furthermore acts as a thermal insulator.

10 Microwave heating is in theory the ideal system but in practice has limitations.

It is known that microwaves transfer energy to the materials without contact taking place inasmuch as the electromagnetic waves constituting the microwaves agitate the polar
15 molecules present in the materials, causing localised heating that transfers to the rest of the substance.

The efficacy of the energy transfer by microwaves is defined in function of the distance between the surface of the means to be heated and the depth (penetration) at which the energy
20 associated with the microwave is halved. This value is conventionally defined by the formula: $D \text{ (cm)} = \frac{1}{2} E_{MO}$

The shorter this distance is the greater is the transfer of energy from the microwaves to the means to be heated.

Table 1 shows the $D = \frac{1}{2} E_{MO}$ values of some substances.

25

Microwave penetration values in some substances

Material	Temperature °C	Penetration ($D = \frac{1}{2} E_{MO}$ in cm)
Water	25	1.4
Water	95	5.7
Ice	-12	1100
Bread	25	2 ... 5
Unpeeled potato	25	0.9
Peeled potato	25	0.8

Carrot	25	1
Meat	25	0.9 ... 1.2
Paper cardboard	25	20 ... 60
Wood	25	8 ... 350
rubber	25	15 ... 350
Glass	25	35
Porcelain	25	56
PVC	20	210
Epoxy resin (Araldite CN-501)	25	4100
Teflon	25	9200
Quartz	25	16000

Regardless of the polarity features of the substances, the microwaves, owing to the mechanism with which they transfer energy, are very effective when they have to heat liquid substances where the molecules are near and mobile so that they reciprocally transfer movement and heat. Microwaves are not very effective, except for some cases, in transferring energy to solid substances, even if they are polar, because the molecules are immobilised and transfer very little energy to neighbouring molecules. They are even less effective in transferring energy to the gaseous substance because the molecules are very distant from one another.

Ice, for example, absorbs the microwaves to a very limited extent as $D = \frac{1}{2} EMO = \text{cm } 1.100$ whereas liquid water is an excellent absorber, as $D = \frac{1}{2} EMO = \text{cm } 1.4$ at 20°C .

As a result, thawing of foods in which initially only ice is present in practice requires a long time and leads to poor results from the point of view of the quality of the final product.

In practice, there is a marked temperature gradient that brings the external part of the food to high temperatures whereas the internal part of the food remains frozen or cold. This phenomenon is due to the fact that the peripheral parts of the block of food, regardless of the presence of

the microwaves, are the first to defrost through heat exchange with the environment and are therefore the parts that capture most of the energy of the microwaves.

The object of the present patent is an oven for rapid
5 defrosting and uniform heating to serving temperature of pre-packaged frozen foods.

The particular feature of this oven consists of the fact that combined microwave-traditional thermal heating is implemented.

10 Traditional thermal heating is achieved by means of solid bodies of various shape that are placed in direct contact with the bottom of the container of the frozen food. These solid bodies consist of materials that are excellent captors of microwaves that are capable of effectively converting the
15 energy associated with the microwaves into heat and in this way the food placed at the bottom of the tray starts to defrost and change into a liquid state. The susceptors are in turn housed in a solid support consisting of a material that is transparent to the microwaves that also acts as a support
20 plane of the tray containing the frozen food. At this point the microwaves act effectively on this layer of liquid, heating it and causing a chain mechanism that leads to the rapid defrosting of the food and to the subsequent heating thereof to serving temperature.

25 The reciprocal position of container-number of heaters-shape of heaters is the object of this patent as the position, the shape and the surface of the heaters influence the path of the microwaves and concentrate them homogenously in the part of the oven occupied by the food to be heated.

30 The concentration of the microwaves in this aforementioned zone enables the following phases to take place that are schematised below:

Disclosure of the initial situation (see Fig. 24):

The microwaves emitted by the antenna 325 follow different
35 paths. A part acts directly or through reflection on the heaters 329 (dotted arrows 327) that capture them and heat

them, starting to transfer the heat to the bottom of the container 302A.

Other microwaves (arrows 328 with a dashed line) traverse undisturbed both the container 302A and the frozen food 302 inasmuch as the $D = \frac{1}{2} E_{MO}$ of these materials is very high. Others, finally, after traversing the container 302A and the food 302, act on the heaters 329 from above, heating them greatly. The heaters 319 transmit the heat to the frozen food 302 in the tray 320A, which starts to defrost, forming a thin layer of microwave-receiving liquid 310.

Disclosure of the evolving heating.

The microwaves travel the same paths with respect to the initial situation, with the difference that they now also encounter a layer of liquid 310 in a phase of continuous growth to which they effectively transfer energy, heating it. The result is rapid heating of the food 302 that becomes uniform if the EM field associated with the microwaves is uniform in the zone of space occupied by the tray 302A containing the food 302.

In this patent solid materials that effectively absorb the microwaves, strongly heating them, are used as heaters 329 or, as defined in the technical literature, as susceptors. These solid state materials, in addition to being good conductors of heat, have $D = \frac{1}{2} E_{MO}$ values that are particularly low. Many natural or synthetic materials exist that have these features but not all can be used in microwave ovens intended for heating foods inasmuch as the chemical composition thereof includes toxic harmful heavy metals such as nickel, chrome and copper. The materials in this type of oven that are usable as susceptors are on the other hand graphite, coal, magnetite, silicon carbide, many types of glass and ceramics and the Ceram, a vitroceramic material that is used to make cooking hotplates with electric and gas heating. The function of these susceptors in the microwave oven that is the object of this invention is to capture part of the energy of the microwaves and to become greatly heated.

In order to obtain the greatest effectiveness in the transfer of heat from the susceptors to the tray of frozen food, good contact is achieved so as to obtain controlled defrosting of a layer of food and the formation of a thin layer of liquid water on which the microwaves act effectively. Heat transfer by conduction and by convection to the neighbouring layers also occurs, which defrost, causing a chain mechanism that leads to rapid and uniform defrosting.

These susceptors rest on slabs 306 consisting of materials that are transparent to microwaves and also in this case not all materials, due to their chemical composition, are suitable for this purpose. The suitable ones are, on the other hand, polyethylene, polypropylene, polytetrafluorethylene (Teflon), the epoxy resins and inorganic materials such as calcite-based marble, chalk, quartz and the ceramic fibre used as a thermal insulator in laboratory microwave ovens.

The materials making up the susceptors, the shape and arrangement thereof within the oven 301 are the object of this patent as it has been surprisingly found that it is possible to defrost and heat food uniformly in a very short time. This phenomenon is due to the homogenisation of the field of the microwaves in the zone in which the container is present with the food produced by the arrangement, shape and surface of the susceptors. This homogenous arrangement of the EM field generated by the microwaves was surprisingly ascertained by heating numerous containers of frozen food, noting that it is sufficient to insert a quantity of susceptors the surface of which covers 8% to 15% of the surface of the horizontal plane of the oven 301 to obtain, although at differing times, defrosting and heating of the foods in a uniform manner.

The indication of the points at which the temperatures were measured that were reached by the food after heating in the microwave oven that is the object of this patent have been

set out in Table A and summarised in each example shown using Table B.

Table A

Indication of the points at which the temperatures were
5 measured that were reached by the food after heating in the
microwave oven that is the object of this patent.

Tray containing the food seen from above.

10

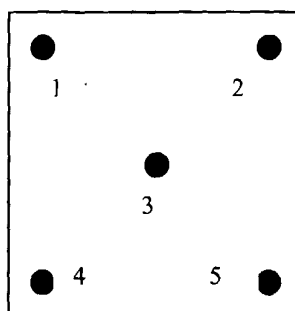


Table A Distribution of the temperature reached by the food after heating in the oven that is the object of this patent.			
Food to be defrosted:	Temperature reached by the food after ... seconds		
Distribution of susceptors:	Point 1		Point 2
Type of susceptor:		Point 3	
Supporting material:	Point 4		Point 5

Some embodiments of the invention are illustrated here below.

Example 1 (Figure 26A, 26B, 26C)

In an oven for defrosting and heating precooked foods having the following dimensions: width 250 mm, height 125 mm, depth
5 310 mm, surface of the horizontal plane 77500 mm², 8
susceptors in Ceram were inserted that were 4 mm thick, the
other dimensions thereof being 20 mm and 60 mm. The surface
of the single susceptor was therefore 1200 mm² and the
surface covered by the susceptors was 12.38% of the total of
10 the horizontal plane. The representation of the position of
the Ceram inside the oven is shown in Figure 26.

The Ceram plates were placed in cavities obtained in a
vitroceramic slab, a material that is permeable to
microwaves, and were fixed with refractory cement so that
15 they are at the same level as the plane of the slab, thus
ensuring intimate contact with the bottom of the container of
the food. The vitroceramic slab had the same horizontal
dimensions as the oven. The position of the plates was
selected so that it corresponded to the position of the
20 bottom of the container of the food in the heating phase.

With this configuration of the susceptors inside the oven,
it was possible, starting from three types of food frozen at
-20°C, to obtain defrosting and heating with a distribution
of the temperatures as shown in Figures 26A-26C that refer
25 respectively to a heating time of 105, 150, and 90 seconds.

Example 2

In an oven for defrosting and heating precooked foods having the following dimensions: width 250 mm, height 125 mm, depth
30 310 mm, surface of the horizontal plane 77500 mm², 10
susceptors in Ceram were inserted that were 4 mm thick, the
other two dimensions thereof being 20 mm and 60 mm. The
surface of the individual susceptor was therefore 1200 mm²
and the surface covered by the susceptors was 15.48% of the
total surface on the horizontal plane.

35 The representation of the position of the Ceram inside the
oven is shown in Figure 27.

The Ceram plates were placed on suitable recesses obtained in a vitroceramic slab, material permeable to microwaves, and fixed with refractory cement, so that they were at the same level as the plane of the slab, thus ensuring intimate contact with the bottom of the food container. The vitroceramic slab had the same horizontal dimensions as the oven. The position of the plates was chosen so that it corresponded to the position of the bottom of the container of the food being heated. With this configuration of the susceptors inside the oven, it was possible, starting with foods frozen to -20°C , to obtain the defrosting and heating thereof with distribution of the final temperatures, as shown in Figures 27A-27C, that refers respectively to temperatures measured after 105, 150 and 90 seconds of heating.

Example 3

As example 1, with the difference that susceptors made of silicon carbon were used so as to achieve a "star" formation. The surface covered by the susceptors represents 8.8 % of the horizontal plane of the oven. The supporting plane was made of epoxy resin, susceptors were isolated from the resin by interposing a layer of ceramic fibre and fixed with refractory cement.

The representation of the position of Ceram inside the oven is shown in Figure 28.

With this configuration of the susceptors inside the oven, it was possible, starting with foods frozen to -20°C , to obtain the defrosting and heating thereof with a distribution of the final temperatures, as shown in Figures 28A-28C which refer respectively to 105, 150 and 90 seconds of heating.

Example 4

As example 1, with the difference that susceptors made of silicon carbon have been used so as to form an "irregular chequered pattern" arrangement. The surface covered by the susceptors represents a 10.8% cover of the horizontal plane

of the oven. The supporting plane was made of white Carrara marble and the susceptors were fixed with refractory cement. The representation of the position of the Ceram inside the oven is shown in Figure 29.

5 With this configuration of the susceptors inside the oven, it was possible, starting with foods frozen to -20°C , to obtain the defrosting and heating thereof with distribution of the final temperatures, as shown in Figures 29A-29C, which refer respectively to 105, 105 and 90 seconds of heating.

10 Example 5

As example 1, with the difference that susceptors made of magnetite were used so as to achieve a "close chequered" arrangement. The surface covered by the susceptors represents 12.9 % of the horizontal plane of the oven. The supporting
15 plane was made of white Carrara marble and the susceptors were fixed with refractory cement.

The representation of the position of the susceptors in magnetite inside the oven is shown in Figure 30.

20 With this configuration of susceptors inside the oven, it was possible, starting with foods frozen to -20°C , to obtain the defrosting and heating thereof with distribution of the final temperatures, as shown in Figure 30A-30C which refer respectively to 105, 105 and 90 seconds of heating.

Example 6

25 As example 1, with the difference that susceptors made of Ceram were used so as to make a "wide chequered arrangement". The surface covered by the susceptors represents 8.25 % of the horizontal plane of the oven. The supporting plane was made of polypropylene and the susceptors were insulated from
30 the plane in plastic material with a layer of ceramic fibre and were fixed with refractory cement.

The representation of the position of the Ceram inside the oven is shown in Figure 31.

35 With this configuration of the susceptors inside the oven, it was possible, starting with foods frozen to -20°C , to obtain the thawing and heating thereof with distribution of

the final temperatures, as shown in Figures 31A-31C which refer respectively to 105, 150 and 90 seconds of heating.

CLAIMS

1. Apparatus for distributing food products packaged in containers (51), comprising storage units (88) for storing stacks (61) of said containers (51), supporting means (64) associated with each storage unit (88) for supporting a respective stack (61), extracting means (80; 89) arranged for extracting containers (51) from a bottom zone of each stack (61), characterised in that said storage units (88) are mounted on carousel means (13) arranged for moving said storage units (88) towards or away from said extracting means (89).
2. Apparatus according to claim 1, wherein said carousel means (13) is rotatable around an axis substantially parallel to a longitudinal extent direction of said storage units (88).
3. Apparatus according to claim 2, wherein said storage units (88) are arranged around said axis.
4. Apparatus according to any preceding claim, wherein said carousel means comprises base plate means (58) provided with hole means (63), suitable for being traversed by a respective stack (61), each hole of said hole means (63) being associated with a respective storage unit (88).
5. Apparatus according to claim 4, wherein said supporting means (64) is associated with said hole means (63).
6. Apparatus according to any preceding claim, wherein said supporting means (64) is movable in a direction (G1, G2) substantially contained on a plane that is transverse to said storage units (88).
7. Apparatus for distributing food products packaged in containers (51), comprising storage units (88) for storing stacks (61) of said containers (51), supporting means (64) associated with each storage unit (88) for supporting a respective stack (61), extracting means (80; 89) arranged for extracting containers (51) from a bottom zone of each stack (61), characterised in that said supporting means (64) is movable in a direction

- (G1, G2) substantially contained on a plane that is transverse to said storage units (88).
8. Apparatus according to claim 6, or 7, wherein said supporting means (64) comprises supporting means (65) arranged for supporting an edge portion (67) of said containers (51).
9. Apparatus according to claim 8, wherein said supporting means comprises distance adjusting means (72, 74, 75, 76) suitable for adjusting the position of said supporting means (65) with respect to one another.
10. Apparatus according to claim 8, or 9, wherein said supporting means (65) is arranged on a plane that is transverse to a longitudinal extent direction of said storage units (88).
11. Apparatus according to any one of claims 8 to 10, wherein said supporting means (64) comprises driving means (80) arranged for moving said supporting means towards and/or away from one another (65).
12. Apparatus according to claim 11, wherein said driving means (80) comprises first driving surface means (94) that is movable in a first direction (S) that is substantially transverse to said transverse plane.
13. Apparatus according to claim 12, wherein said driving means (80) furthermore comprises second driving surface means (78) that is movable in a second direction (G1, G2) substantially parallel to said direction.
14. Apparatus according to claim 13, wherein said first direction (S) and said second direction (G1, G2) are substantially orthogonal to one another.
15. Apparatus according to any one of claims 12 to 14, wherein said first driving surface means (94) cooperates through contact with said second driving surface means (78), and vice versa.
16. Apparatus according to claim 15, wherein said driving means (80) furthermore comprises elastic means (96)

- arranged for pressing said second driving surface means (78) against said first driving surface means (94).
17. Apparatus according to any one of claims 13 to 16, wherein said second driving surface means comprises rolling means (78).
18. Apparatus according to claim 17, wherein said rolling means (78) is rotatably supported on a sliding member (77), obliged to run in said second direction (G1, G2).
19. Apparatus according to claim 18, wherein said sliding member (77) comprises projecting means (71) that protrudes from said sliding member (77) and is associated with said supporting means (65).
20. Apparatus according to claim 18, or 19, wherein said sliding member (77) is at least partially received in a hollow body (70) of said supporting means (64).
21. Apparatus according to any one of claims 12 to 20, wherein said first driving surface means comprises a tilted surface (94) tilted with respect to said first direction (S).
22. Apparatus according to claim 21, wherein said tilted surface (94) is obtained in wedge means (70).
23. Apparatus according to claim 22 when claim 21 is appended to claim 20, wherein said wedge means (85) is at least partially received in said hollow body (70).
24. Apparatus according to any one of claims 11 to 23, wherein said driving means (80) is drivable by said extracting means (89).
25. Apparatus according to claim 24, wherein said extracting means (89) comprises pushing surface means (102) arranged for cooperating through contact with actuating surface means (101) provided in said driving means (80) so as to drive said driving means (80).
26. Apparatus according to claim 25, when claim 24 is appended to claim 22 or 23, wherein said actuating surface means (101) is obtained in a part of said wedge means (85).

27. Apparatus according to any preceding claim, and furthermore comprising heating means (12) arranged for heating said food products, said heating means (12) being provided with an inlet opening (115).
- 5 28. Apparatus according to claim 27, wherein said extracting means comprises lifting means (89), movable between a removal position (L) near said supporting means (64) and an inlet position (M) near said inlet opening (115).
29. Apparatus according to claim 28 when claim 27 is
10 appended to claim 25, or 26, wherein said pushing surface means (102) is provided in said lifting means (89).
30. Apparatus according to claim 29, wherein said pushing
15 surface means (102) is such as to cooperate with said actuating surface means (101) when said lifting means (89) is in said removal position (L).
31. Apparatus for distributing food products packaged in
20 containers (51), comprising storage units (88) for storing stacks (61) of said containers (51), supporting means (64) associated with each storage unit (88) for supporting a respective stack (61), extracting means (59) arranged for extracting containers (51) from a bottom zone of each stack (61), heating means (12) arranged for heating said food products, characterised
25 in that said extracting means comprises lifting means (89) movable between a removal position (L) near said supporting means (64) and an inlet position (M) near an inlet opening (115) of said heating means (12).
32. Apparatus according to any one of claims 28 to 31,
30 wherein said lifting means (89) comprises a lifting plane (102) arranged for supportingly receiving said stack (61) in said removal position (L) from said supporting means (64).
33. Apparatus according to claim 32, wherein said lifting
35 plane (102) is arranged for supportingly receiving a

container (51) extracted from said bottom zone in said inlet position (M).

34. Apparatus according to any one of claims 28 to 33, and furthermore comprising pushing means (53) arranged for moving said containers (51) from said lifting means (89) to said heating means (12) through said inlet opening (115).
35. Apparatus according to claim 34, wherein said pushing means (53) is movable between a retracted position wherein said pushing means is further from said inlet opening (115), and an advanced position wherein said pushing means (53) is nearer said inlet opening (115).
36. Apparatus according to claim 34, or 35, wherein said pushing means (53) comprises a chain-drive mechanism (147) arranged for driving said pushing means (53).
37. Apparatus according to any preceding claim, and furthermore comprising refrigerating means (11) arranged for conserving said food products.
38. Apparatus according to claim 37, wherein said storage units (88) are provided in said refrigerating means (11).
39. Apparatus according to claim 37 or 38 when claim 37 is appended to any one of claims 27 to 36, wherein said inlet opening (115) connects said refrigerating means (11) and said heating means (12).
40. Apparatus according to claim 39, and furthermore comprising closing means (127) arranged for interacting with said inlet opening (115) for separating said refrigerating means (11) from said heating means (12).
41. Apparatus according to claim 40, wherein said closing means (127) is movable in a direction substantially parallel to said inlet opening (115) and a further direction substantially transverse to said inlet opening (115).
42. Apparatus for distributing food products packaged in containers (51), comprising storage units (88) for

- storing stacks (61) of said containers (51), said storage units (88) being provided in refrigerating means (11) arranged for conserving said food products, heating means arranged for heating said food products, said heating means (12) being provided with an inlet opening (115) connecting said refrigerating means (11) and said heating means (12), closing means (127) arranged for interacting with said inlet opening (115) for separating said refrigerating means (11) from said heating means (12), characterised in that said closing means (127) is movable in a direction substantially parallel to said inlet opening (115) and a further direction substantially transverse to said inlet opening (115).
43. Apparatus according to claim 41, or 42, and furthermore comprising guiding profile means (137) arranged for guiding said closing means in said direction and in said further direction.
44. Apparatus according to claim 43, wherein said guiding profile means (137) comprises a first portion (138) and a second portion (139) that are connected to one another.
45. Apparatus according to claim 44, wherein said first portion (138) is formed by substantially straight lines.
46. Apparatus according to claim 44, or 45, wherein said second portion (139) is formed by substantially straight lines.
47. Apparatus according to claim 46, wherein said second portion (139) is tilted with relation to said first portion (138).
48. Apparatus according to claim 44, or 45, wherein said second portion (139) is formed by substantially curved lines.
49. Apparatus according to any one of claims 43 to 48, wherein said guiding profile means (137) is obtained in frame means (124) at least partially surrounding said closing means (127).

50. Apparatus according to any one of claims 43 to 49, wherein said closing means (127) is provided with protruding means (136) intended for slidably cooperating in said guiding profile means (137).
- 5 51. Apparatus according to any one of claims 1 to 6 and/or according to any one of claims 7 to 30 and/or according to any one of claims 31 to 41 and/or according to any one of claims 42 to 50.
- 10 52. Apparatus for distributing packaged food products, comprising a frame provided with casing means (234) provided with hatch means (202) for regulating access to an internal zone of said casing means (234), characterised in that it furthermore comprises dispensing means (218) of sets of cutlery (238)
- 15 associated with said hatch means (202).
53. Apparatus according to claim 52, wherein said hatch means (202) is internally provided with cavity means (250) having a depth (S1) greater than a transverse dimension (d1) of said dispensing means (218).
- 20 54. Apparatus according to claim 52, or 53, wherein said dispensing means (218) is associated with said hatch means (202) through connecting means (223) formed so that said dispensing means (218) is movable between a dispensing configuration (C1), in which said dispensing means (218) distributes said sets of cutlery (238), and
- 25 a loading configuration (D1), wherein said dispensing means (218) receives said sets of cutlery (238).
55. Apparatus according to claim 54, wherein in said dispensing configuration (C1) said dispensing means (218) is received inside said hatch means (202).
- 30 56. Apparatus according to claim 54, or 55, wherein in said loading configuration (D1) said dispensing means (218) projects from said hatch means (202) for promoting the introduction of said sets of cutlery (238).

57. Apparatus according to any one of claims 54 to 56, wherein said connecting means comprises hinge means (223).
58. Apparatus according to any one of claims 54 to 57,
5 wherein with said dispensing means (218) there is associated locking means (224) shaped in such a way as to maintain said dispensing means (218) in said dispensing configuration (C1).
59. Apparatus according to claim 58, wherein said locking
10 means comprises magnetic locking means (224).
60. Apparatus according to any one of claims 52 to 59, and furthermore comprising transporting means (229) arranged for supporting and conveying said sets of cutlery (238).
61. Apparatus according to claim 60, wherein said
15 transporting means (229) is movable so as to release said sets of cutlery (238) directing them to outlet slit means (203) obtained in said hatch means (202).
62. Apparatus according to claim 61, and furthermore comprising detecting means (233) arranged for detecting
20 said sets of cutlery (238) during the transfer of said sets of cutlery (238) between said transporting means (229) and said outlet slit means (203).
63. Apparatus according to claim 61, or 62, and furthermore comprising conveying means (232) arranged for receiving
25 said sets of cutlery (238) from said transporting means (229) and directing them to said outlet slit means (203).
64. Apparatus according to claim 53, wherein said conveying means comprises chute means (232).
- 30 65. Apparatus according to any one of claims 60 to 64, and furthermore comprising flexible driving means (228) arranged for driving said transporting means (229).
66. Apparatus according to any one of claims 60 to 65,
35 wherein said transporting means comprises a plurality of transporting elements (229).

67. Apparatus according to claim 66, as appended to claim 55, wherein said transporting elements (229) are fixed to said flexible driving means (228).
68. Apparatus according to claim 66 as appended to claim 65,
5 or according to claim 67, wherein said transporting elements (228) comprise a first portion (247) connected to said flexible driving means (229) and a second portion (248) projecting from said flexible driving means (229).
- 10 69. Apparatus according to claim 68, wherein said second portion (248) extends transversely with respect to said flexible driving means (229).
70. Apparatus according to any one of claims 66 to 69,
15 wherein said transporting elements (229) are separated from one another by a distance such that between two adjacent transporting elements (229) a space (249) is defined that is arranged for receiving a corresponding set of cutlery (238).
71. Apparatus according to claim 65, or according to any one
20 of claims 66 to 70 as appended to claim 55, wherein said flexible driving means comprises flexible driving means (228) closed in a loop and rotatable by motor means (226).
72. Apparatus according to claim 71, wherein said flexible
25 driving means (228) closed in a loop is partially wound on rolling means (245) arranged near a zone at which said sets of cutlery (238) are expelled from said transporting means (229).
73. Apparatus according to claim 72, and furthermore
30 comprising further rolling means (243) on which said flexible driving means (228) is partially wound so that, in use, said flexible driving means (228) comprises a first part (241) and a second part (242) arranged substantially vertically.
- 35 74. Apparatus according to any one of claims 60 to 73, wherein said dispensing means (218) comprises box frame

means (230) inside which there is housed said transporting means (229).

75. Apparatus according to claim 74, wherein said box frame means (230) comprises dispensing opening means (231) through which said sets of cutlery (238) are expelled from said box frame means (230).
76. Apparatus according to claim 75, wherein said box frame means (230) is formed so that said dispensing opening means (231) is arranged, in use, below said transporting means (229).
77. Apparatus according to any one of claims 74 to 76, wherein said box frame means (230) comprises loading opening means (239) through which said sets of cutlery (238) are introduced into said box frame means (230).
78. Apparatus according to claim 77, wherein said loading opening means (239) faces said transporting means (229).
79. Apparatus according to claim 77, or 78, wherein said box frame means (230), comprises first side wall means (235) and second side wall means (236) facing one another and connected by third side wall means (237), said loading opening (239) being opposite said third side wall means (237).
80. Apparatus according to claim 75, or 76, or according to any one of claims 77 to 79 as appended to claim 75, or 76, wherein said box frame means (239) furthermore comprises base wall means, said dispensing opening (231) being opposite said base wall means.
81. Apparatus according to any one of claims 52 to 80, wherein said dispensing means (218) comprises first dispensing means (220) and second dispensing means (221).
82. Apparatus according to claim 81, wherein said first dispensing means (220) and said second dispensing means (221) are rotatably supported at opposite ends of said hatch means (202).

83. Apparatus according to any one of claims 52 to 82, and furthermore comprising a refrigerating unit (211) arranged for receiving and conserving said packaged food products.
- 5 84. Apparatus according to any one of claims 52 to 83, and furthermore comprising a heating unit (212) arranged for heating said packaged food products before said packaged food products are dispensed.
- 10 85. Apparatus according to claim 84 as appended to claim 83, wherein said refrigerating unit (211) and said heating unit (212) are separated by wall means (217).
86. Apparatus according to claim 85, and furthermore comprising door means (215) associated with passage means obtained in said wall means (217).
- 15 87. Method for controlling a heat-conditioning apparatus for food products, comprising providing a conditioning time (T_E) of a food product, characterised in that it furthermore comprises periodically updating said conditioning time (T_E) during operation of said apparatus.
- 20 88. Method according to claim 86, wherein said updating is repeated at set intervals of time.
89. Method according to claim 88, wherein said intervals of time are constant.
- 25 90. Method according to any one of claims 87 to 89, and furthermore comprising detecting an actual value (V_E) of an electrical parameter that is indicative of a quantity of energy with which said apparatus is supplied.
91. Method according to claim 90, and furthermore comprising
- 30 comparing said actual value (V_E) with a nominal value (V_N) of said electric parameter.
92. Method according to claim 91, wherein said updating depends on the outcome of said comparing.
93. Method according to claim 92, wherein, if said actual
- 35 value (V_E) is substantially the same as said nominal value (V_N), said updating comprises setting said

conditioning time (T_E) the same as a nominal conditioning time (T_N) depending on said nominal value (V_N).

- 5 94. Method according to claim 92, wherein, if said actual value (V_E) is different from said nominal value (V_N), said updating comprises calculating said conditioning time (T_E) on the basis of a nominal conditioning time (T_N) depending on said nominal value (V_N) and the difference between said actual value (V_E) and said nominal value (V_N).
- 10 95. Method according to claim 94, wherein said calculating comprises obtaining said conditioning time (T_E) as a percentage of said nominal time (T_N).
- 15 96. Method according to any one of claims 90 to 95, wherein said electric parameter comprises a supply voltage of said apparatus.
97. Programme that comprises a code for implementing the method according to claims 87 to 96 when the programme is run in a computer system.
- 20 98. Support that is readable by a computer and that has a programme defined in claim 97.
99. Method for controlling a heat-conditioning apparatus for food products, comprising acquiring a nominal conditioning time (T_N) of a food product, characterised in that it furthermore comprises detecting an actual value (V_E) of an electric parameter indicating a quantity of energy with which said apparatus is supplied, comparing said actual value (V_E) with a nominal value (V_N) of said electric parameter, fixing an actual conditioning time (T_E) that depends on the outcome of said comparing.
- 25 30 35 100. Method according to claim 99, wherein, if said actual value (V_E) is substantially the same as said nominal value (V_N), said fixing comprises setting said actual conditioning time (T_E) the same as said nominal conditioning time (T_N).

101. Method according to claim 99, wherein if said actual value (V_E) is different from said nominal value (V_N), said fixing comprises calculating said actual conditioning time (T_E) on the basis of said nominal conditioning time (T_N) and of the difference between said actual value (V_E) and said nominal value (V_N).
102. Method according to claim 101, wherein said calculating comprises obtaining said actual conditioning time (T_E) as a percentage of said nominal conditioning time (T_N).
103. Method according to any one of claims 99 to 102, wherein said fixing comprises periodically updating said actual conditioning time (T_E) during operation of said apparatus.
104. Method according to claim 103, wherein said updating is repeated at set intervals of time.
105. Method according to claim 104, wherein said intervals of time are constant.
106. Method according to any one of claims 99 to 105, wherein said electric parameter comprises a supply voltage of said apparatus.
107. Program that comprises a code for implementing the method according to claims 99 to 106 when the programme is run in a computer system.
108. Support that is readable by a computer and that carries a programme defined in claim 107.
109. Method for controlling a thermal conditioning apparatus, comprising acquiring a reference time (T_T) of a conditioning cycle of a food product, characterised in that it furthermore comprises detecting an actual value (A_E) of an electric parameter indicating the quantity of electric energy absorbed by said apparatus, comparing said actual value (A_E) with a reference value (A_{RIF}) of said electric parameter, fixing a conditioning time (T_N) that depends on the outcome of said comparing.
110. Method according to claim 109, wherein, if said actual value (A_E) is substantially the same as said reference

value (A_{RIF}), said fixing comprises setting said conditioning time (T_N) the same as said reference time (T_T).

- 5 111. Method according to claim 109, wherein, if said actual value (A_E) is different from said reference value (A_{RIF}), said fixing comprises calculating said conditioning time (T_N) on the basis of said reference time (T_T) and of the difference between said actual value (A_E) and said reference value (A_{RIF}).
- 10 112. Method according to claim 111, wherein said calculating comprises obtaining said conditioning time (T_N) as a percentage of said reference time (T_T).
113. Method according to any one of claims 109 to 112, and furthermore comprising furthermore acquiring a minimum
15 limit value (A_{MIN}) and a maximum limit value (A_{MAX}) of said parameter.
114. Method according to claim 113, wherein, before said comparing, it is provided for checking if said actual
20 value (A_E) falls between said minimum limit value (A_{MIN}) and said maximum limit value (A_{MAX}).
115. Method according to claim 114, wherein, if said actual value (A_E) falls between said minimum limit value (A_{MIN}) and said maximum limit value (A_{MAX}), allowing said checking is provided for.
- 25 116. Method according to claim 114, wherein, if said actual value (A_E) does not fall between said minimum limit value (A_{MIN}) and said maximum limit value (A_{MAX}), preventing said checking is provided for.
117. Method according to claim 116, wherein with said
30 preventing generating an unsuitability signal of said apparatus is provided for.
118. Method according to any one of claims 109 to 117, wherein said electric parameter comprises a current absorbed by thermal conditioning elements of said
35 apparatus.

119. Programme that comprises a code for implementing the method according to claims 109 to 118 when the programme is run in a computer system.
120. Support that is readable by a computer and that has a programme defined in claim 119.
121. Apparatus for processing food products (302), comprising a chamber (304) for receiving internally said food products (302), provided internally with susceptor means (309) suitable for interacting with microwaves (308) for producing thermal energy to be transferred to said food products (302), said susceptor means being formed by distinct elements (309), mounted on a support (306) for the food products (302).
122. Apparatus according to claim 121, wherein said distinct elements (309) have a thickness that is not less than about 1 mm.
123. Apparatus according to claim 122, wherein said distinct elements (309) have a dimension and a further dimension, parallel to a rest surface of said support (306), of the same order of magnitude as said thickness.
124. Apparatus according to claim 122 or 123, or 3, wherein said elements (9) on said support (6) occupy an area comprised between approximately 5% and approximately 20% of a plan section of said chamber.
125. Apparatus according to claim 124, wherein said area is comprised between approximately 8% and approximately 15% of said plan section.
126. Apparatus according to claim 123 or according to claim 124 when appended to claim 123, or according to claim 125, when claim 124 is appended to claim 123, wherein said dimension is approximately 20 mm.
127. Apparatus according to claim 123, or according to claim 124 when appended to claim 123, or according to claim 125, when claim 124 is appended to claim 123, or according to claim 126, wherein said further dimension is approximately 60 mm.

128. Apparatus according to claim 122 or 123, or claim 124 or 125, when claim 124 is appended to claim 122 or 123, or according to claim 126 or 127, wherein said thickness is approximately 4 mm.
- 5 129. Apparatus according to any one of claims 121 to 128, wherein said elements (9) comprise a first element and a second element aligned in a first direction.
130. Apparatus according to claim 129, wherein said elements (9) comprise a third element and a fourth element
10 aligned in a second direction transverse to said first direction.
131. Apparatus according to claim 130, wherein said second direction intersects said first direction in a zone interposed between said first element and said second
15 element.
132. Apparatus according to claim 130 or 131, wherein said second direction is perpendicular to said first direction.
133. Apparatus according to any one of claims 130 to 132,
20 wherein said second direction is equidistant from said first element and from said second element.
134. Apparatus according to any one of claims 130 to 133, wherein said third element and said fourth element are arranged on opposite sides with respect to said first
25 direction.
135. Apparatus according to any one of claims 130 to 134, wherein said third element and said fourth element are equidistant from said first direction.
136. Apparatus according to any one of claims 130 to 135
30 wherein said elements (9) comprise a fifth element and a sixth element aligned in a third direction that is transverse to said first direction and to said second direction.
137. Apparatus according to claim 136, wherein said fifth
35 element and said sixth element are arranged on opposite

sides from one another with respect to said first direction and to said second direction.

138. Apparatus according to claim 136 or 137, wherein said fifth element and said sixth element are equidistant from said first direction and from said second direction.

139. Apparatus according to any one of claims 136 to 138, wherein said elements (9) comprise a seventh element and an eighth element aligned in a fourth direction that is transverse to said third direction.

140. Apparatus according to claim 139, wherein said seventh element and said eighth element are arranged on opposite sides with respect to said third direction.

141. Apparatus according to claim 139 or 140, wherein said seventh element and said eighth element are equidistant from said first direction and from said second direction.

142. Apparatus according to any one of claims 121 to 128, wherein said elements are arranged so as to define a first row of elements and a second row of elements.

143. Apparatus according to claim 122, wherein said first row of elements and said second row of elements are substantially parallel to one another.

144. Apparatus according to claim 122 or 123, wherein said first row of elements comprises a plurality of elements that are parallel to one another.

145. Apparatus according to claim 124, wherein adjacent elements of said plurality of elements are separated by the same distance.

146. Apparatus according to any one of claims 142 to 145, wherein said second row of elements comprises a further plurality of elements that are parallel to one another.

147. Apparatus according to claim 146, wherein adjacent elements of said further plurality of elements are separated by the same distance.

148. Apparatus according to claim 146 when appended to claim 144 or 145, or according to claim 147, when claim 146 is appended to claim 144 or 145, wherein elements of said plurality of elements are separated by a first distance from corresponding elements of said further plurality of elements near ends of said first row of elements and of said second row of elements.
149. Apparatus according to any one of claims 146 to 148, when claim 146 is appended to claim 144 or 145, wherein further elements of said plurality of elements are separated by a second distance from corresponding further elements of said further plurality of elements, near a central portion of said first row of elements and of said second row of elements.
150. Apparatus according to claim 149 as appended to claim 148, wherein said second distance is greater than said first distance.
151. Apparatus according to claim 146, when appended to claim 144 or 145, or according to any one of claims 147 to 150, when claim 146 is appended to claim 144 or 145, wherein said plurality of elements and said further plurality of elements each comprises five elements.
152. Apparatus according to any one of claims 121 to 151, wherein said elements are obtained from a material selected from a group comprising: Ceram, ferrites, graphite, coal, silicon carbide, ceramic materials and glass materials.
153. Apparatus according to any one of claims 121 to 152, wherein said support comprises a slab (6).
154. Apparatus according to claim 153, wherein said slab (6) is obtained from a material selected from a group comprising: ceramic-fibre materials, ceramic materials, glass materials.
155. Apparatus according to claim 153, or 154, wherein said slab is 250 mm wide and 310 mm deep.

156. Apparatus according to any one of claims 153 to 155, wherein said slab is provided with a plurality of seats, each of which is arranged to house a respective element (9).
- 5 157. Apparatus according to claim 156, wherein each element (9) is fixed to a respective seat by means of refractory cement.

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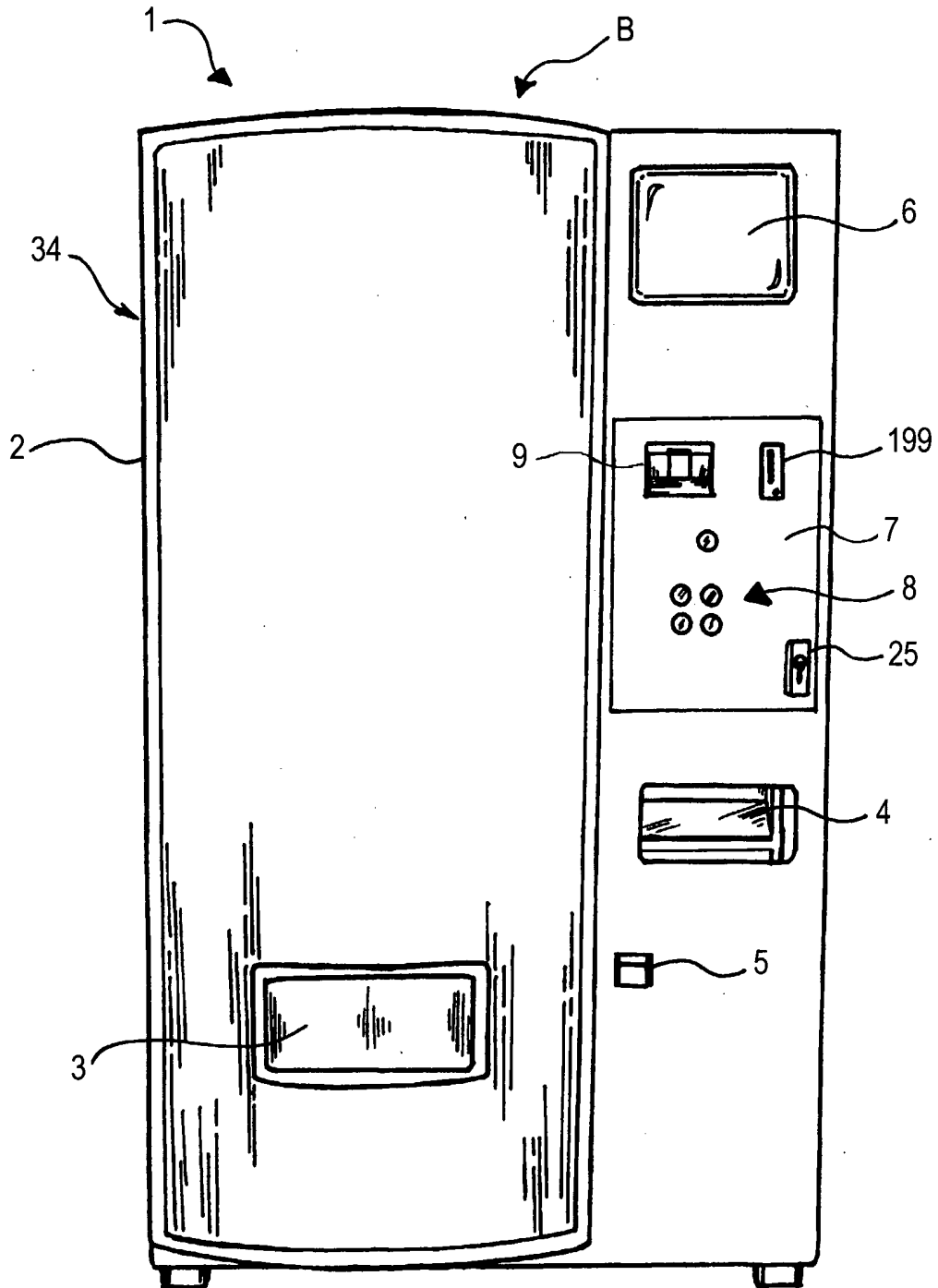


Fig. 1

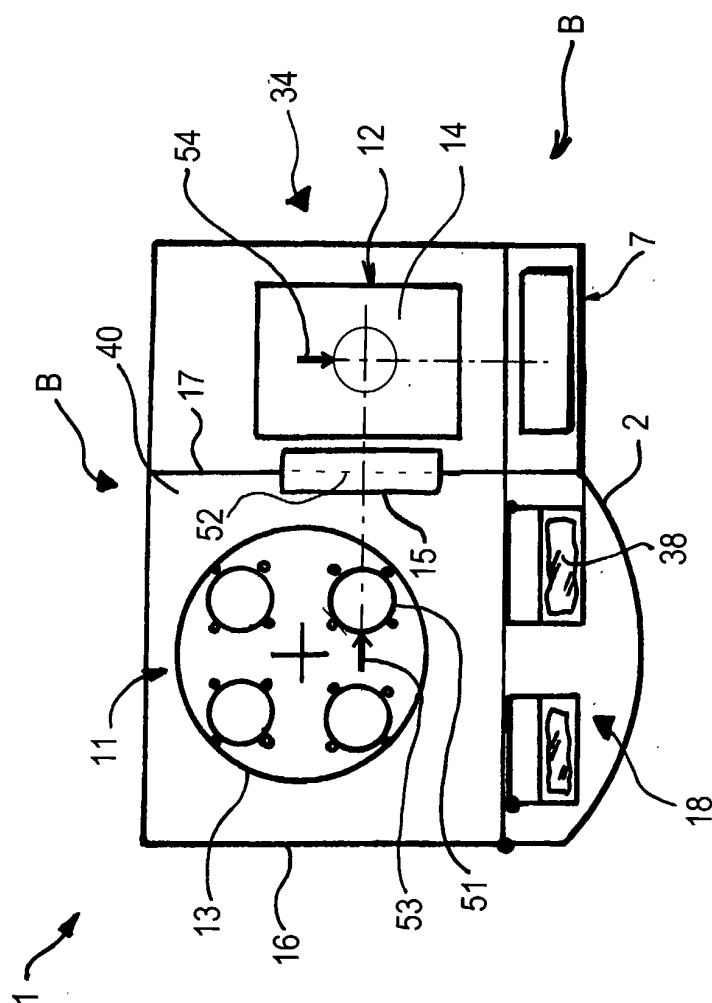


Fig. 2

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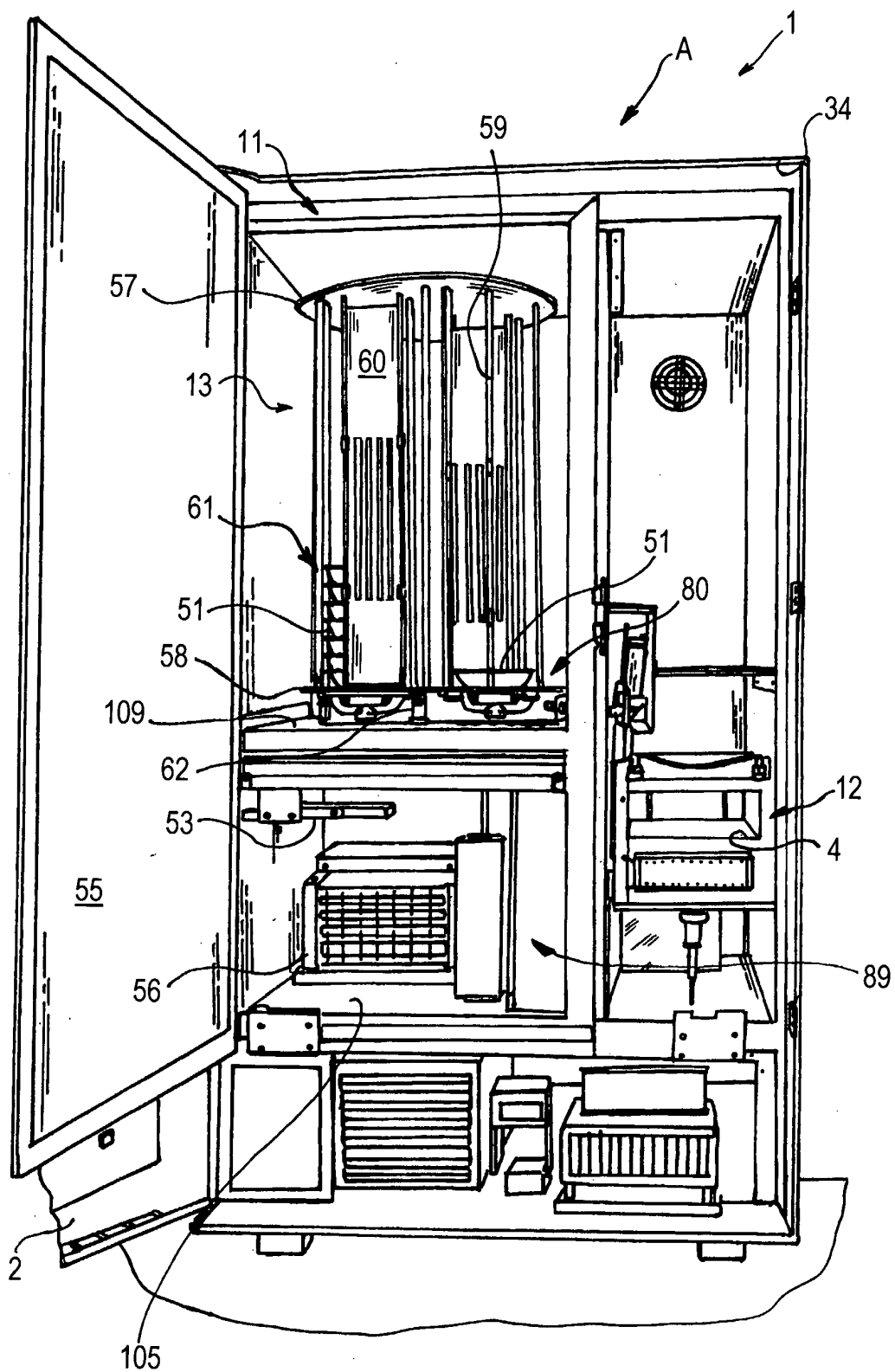


Fig. 3

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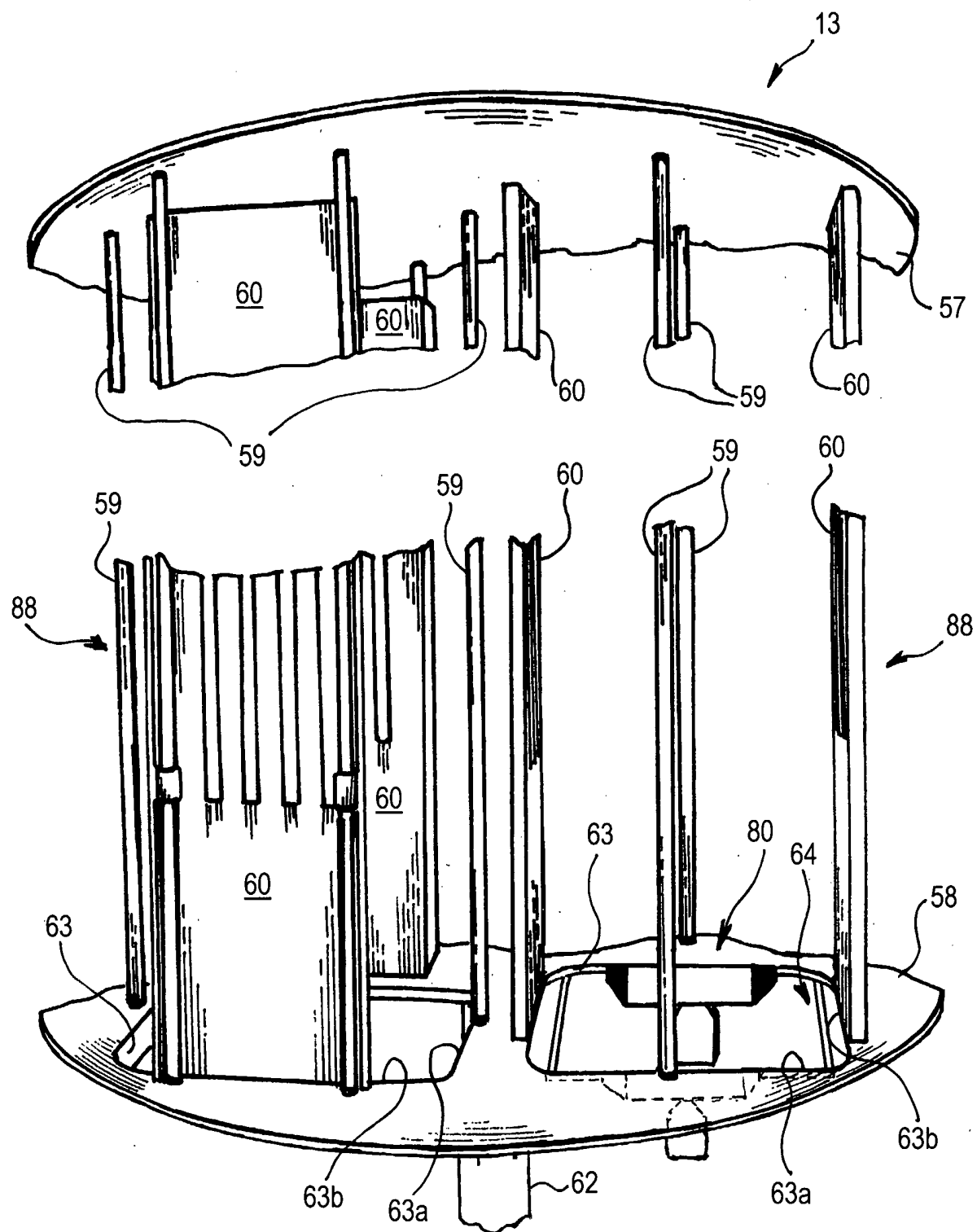


Fig. 4

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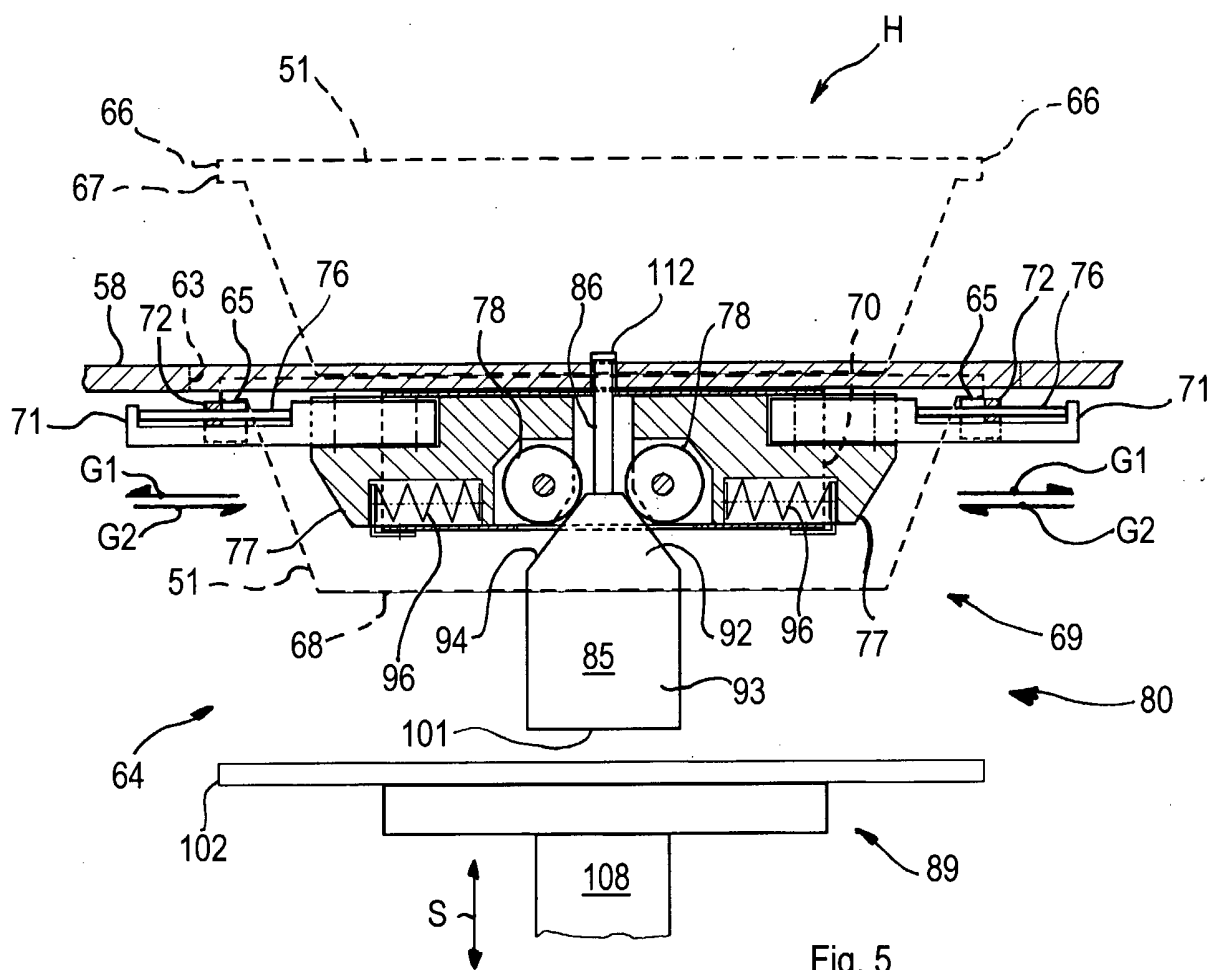


Fig. 5

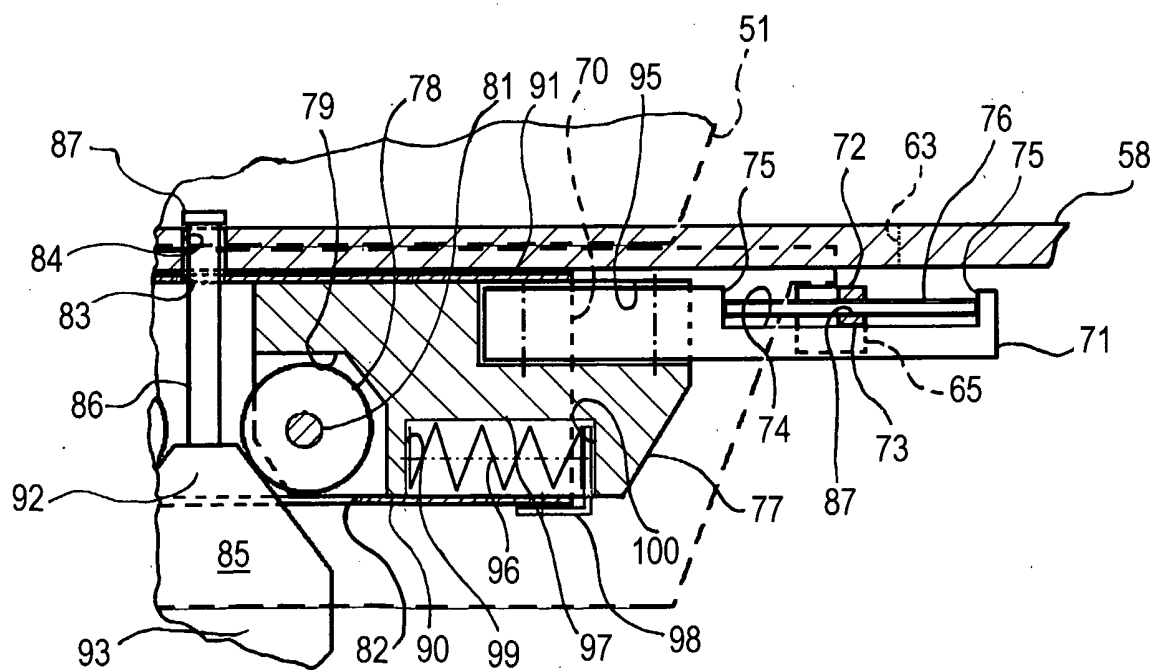


Fig. 6

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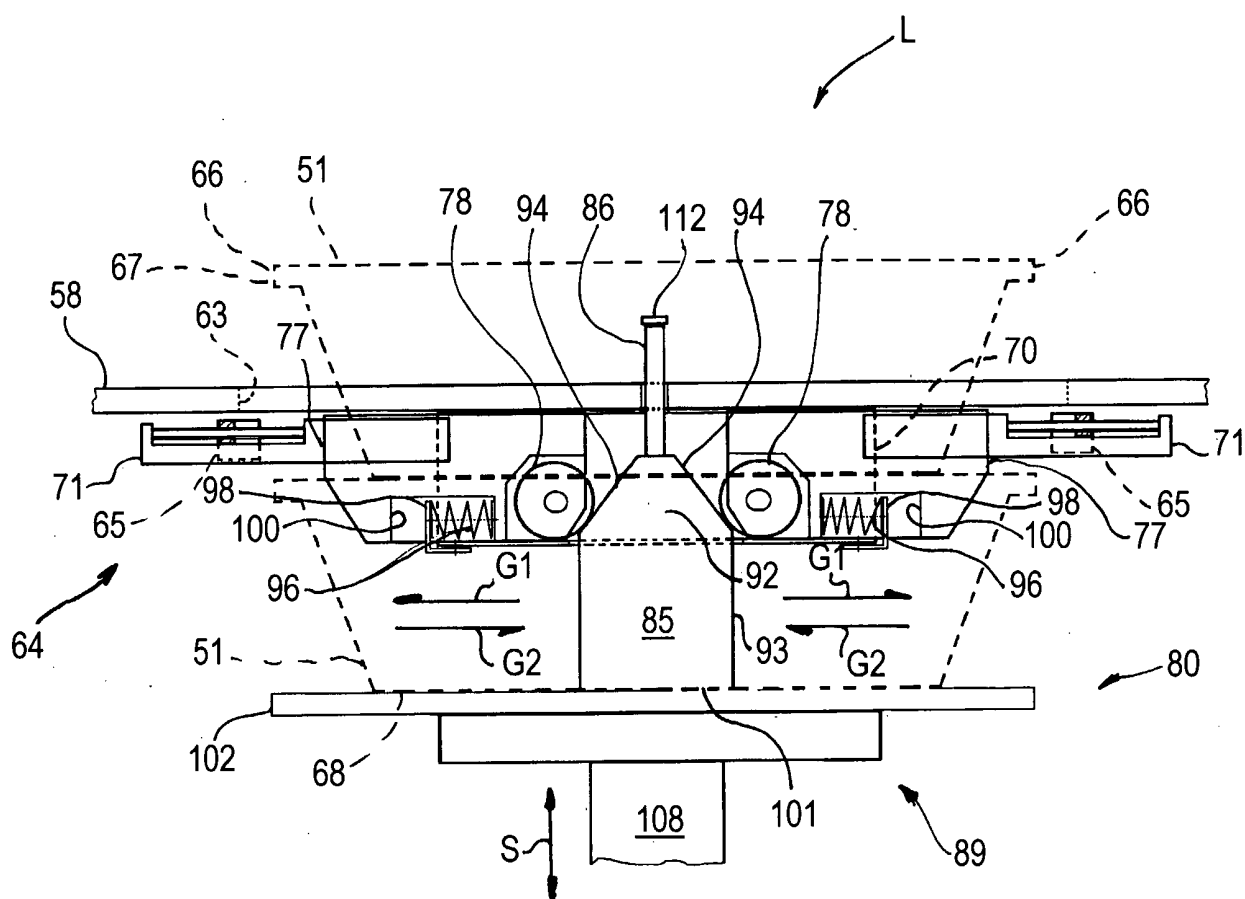


Fig. 7

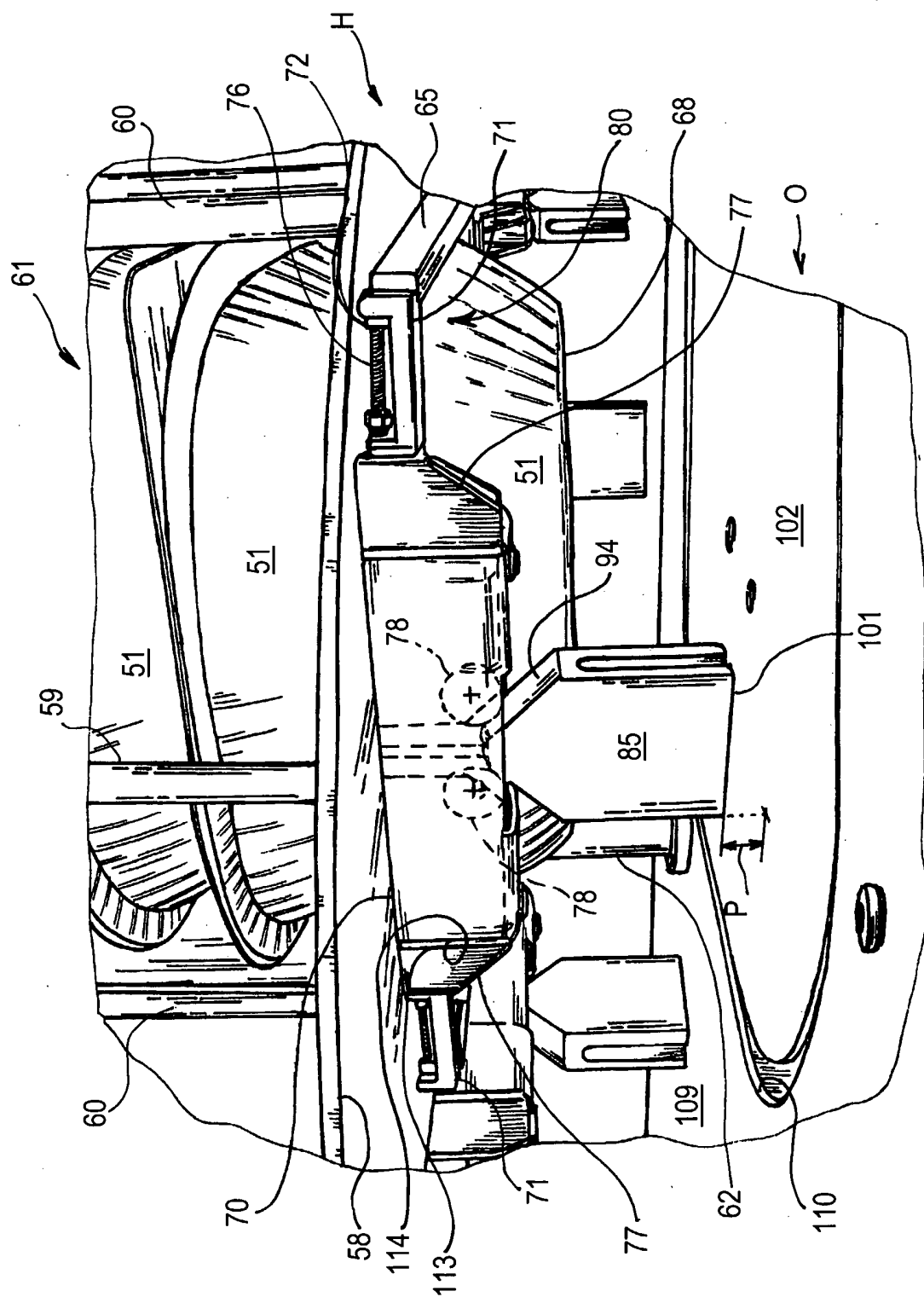


Fig. 8

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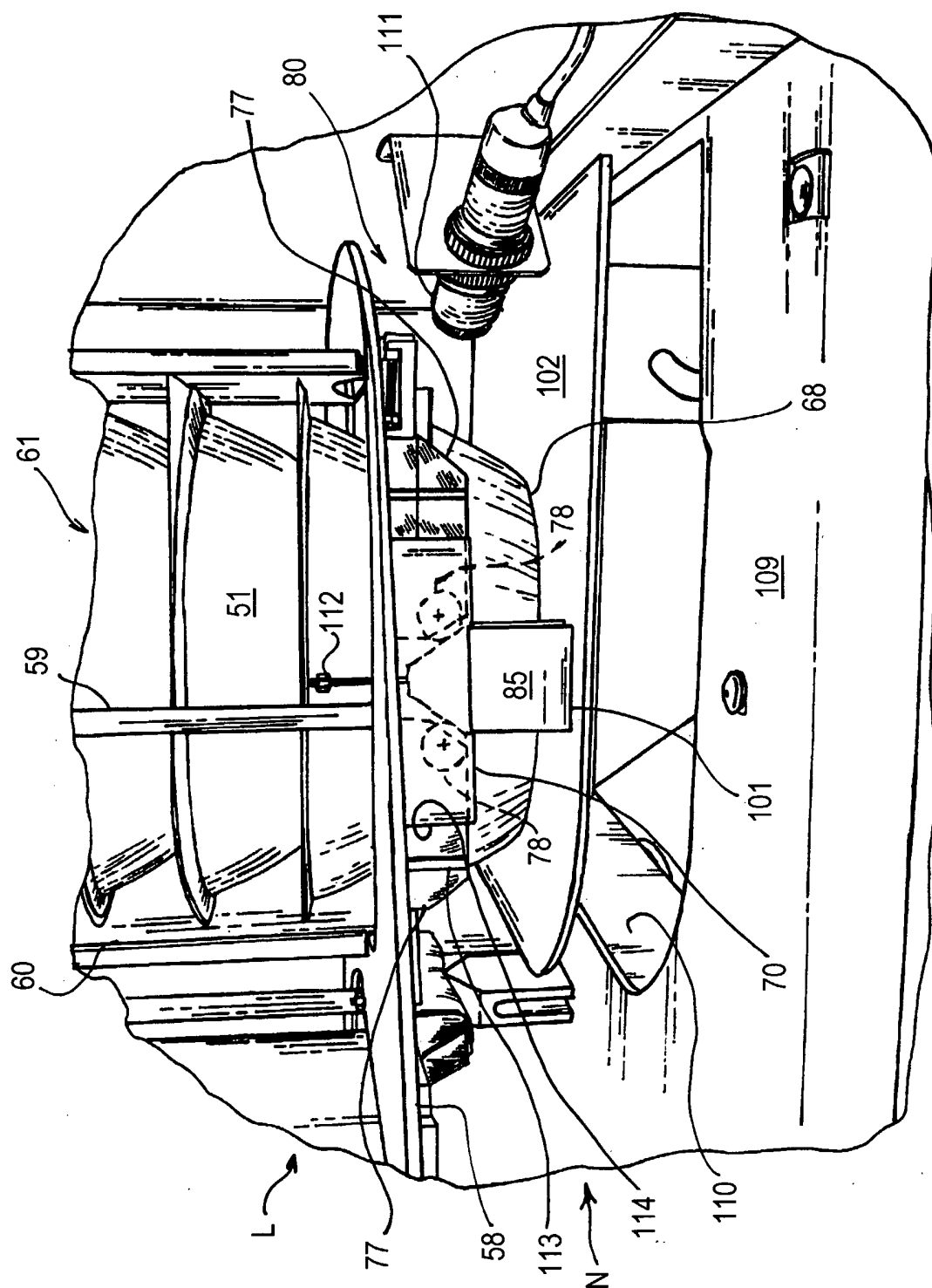


Fig. 9

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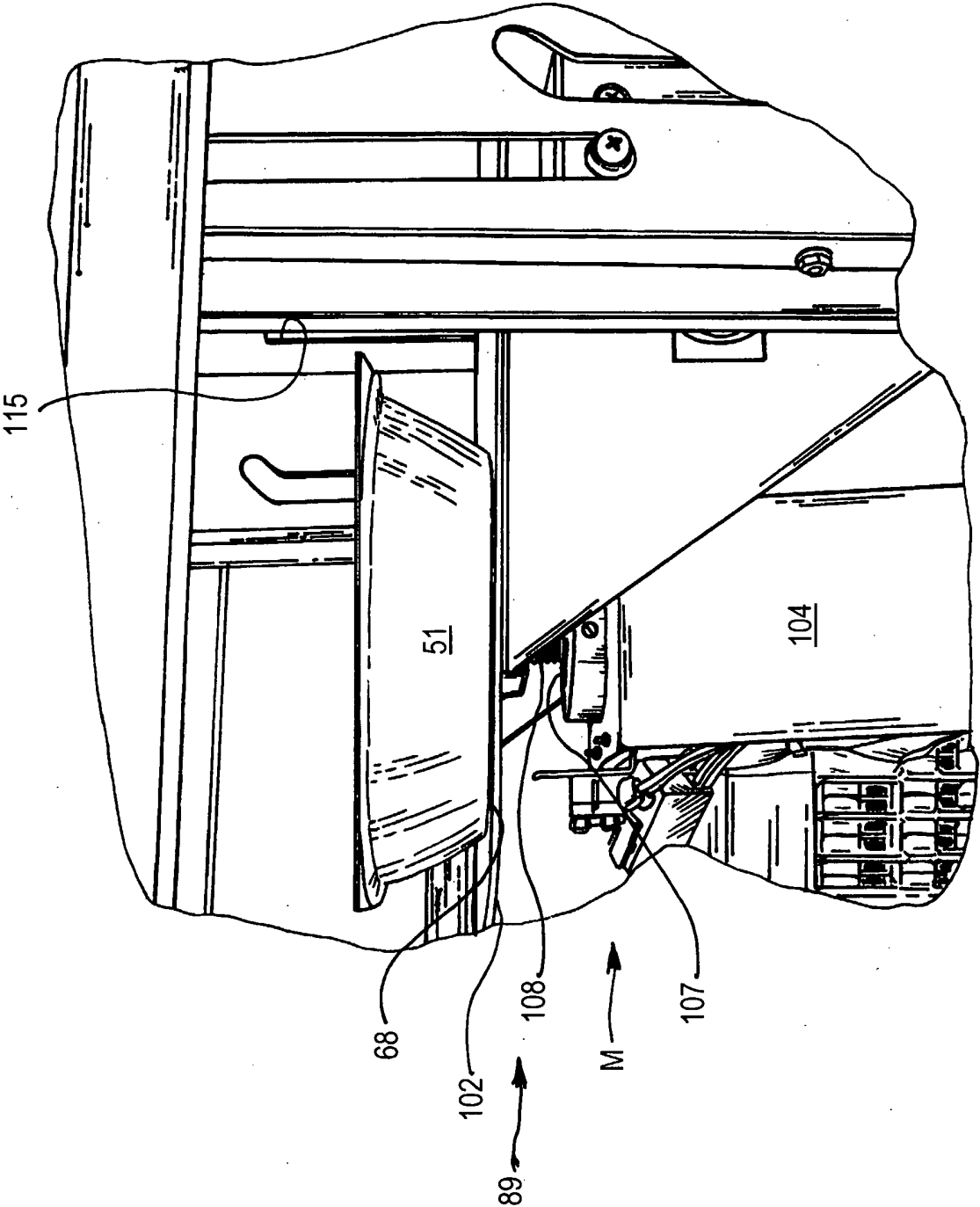


Fig. 10

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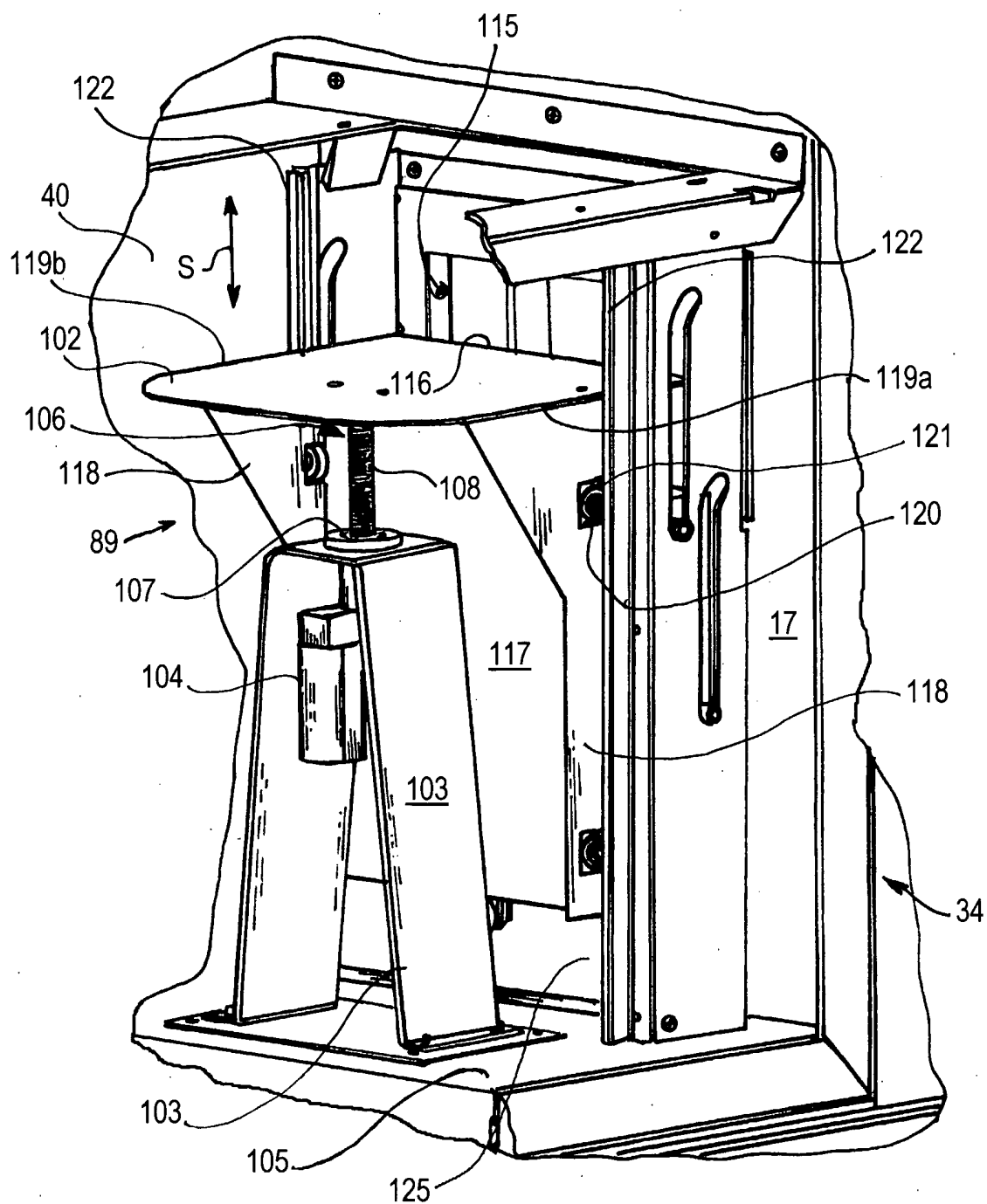


Fig. 11

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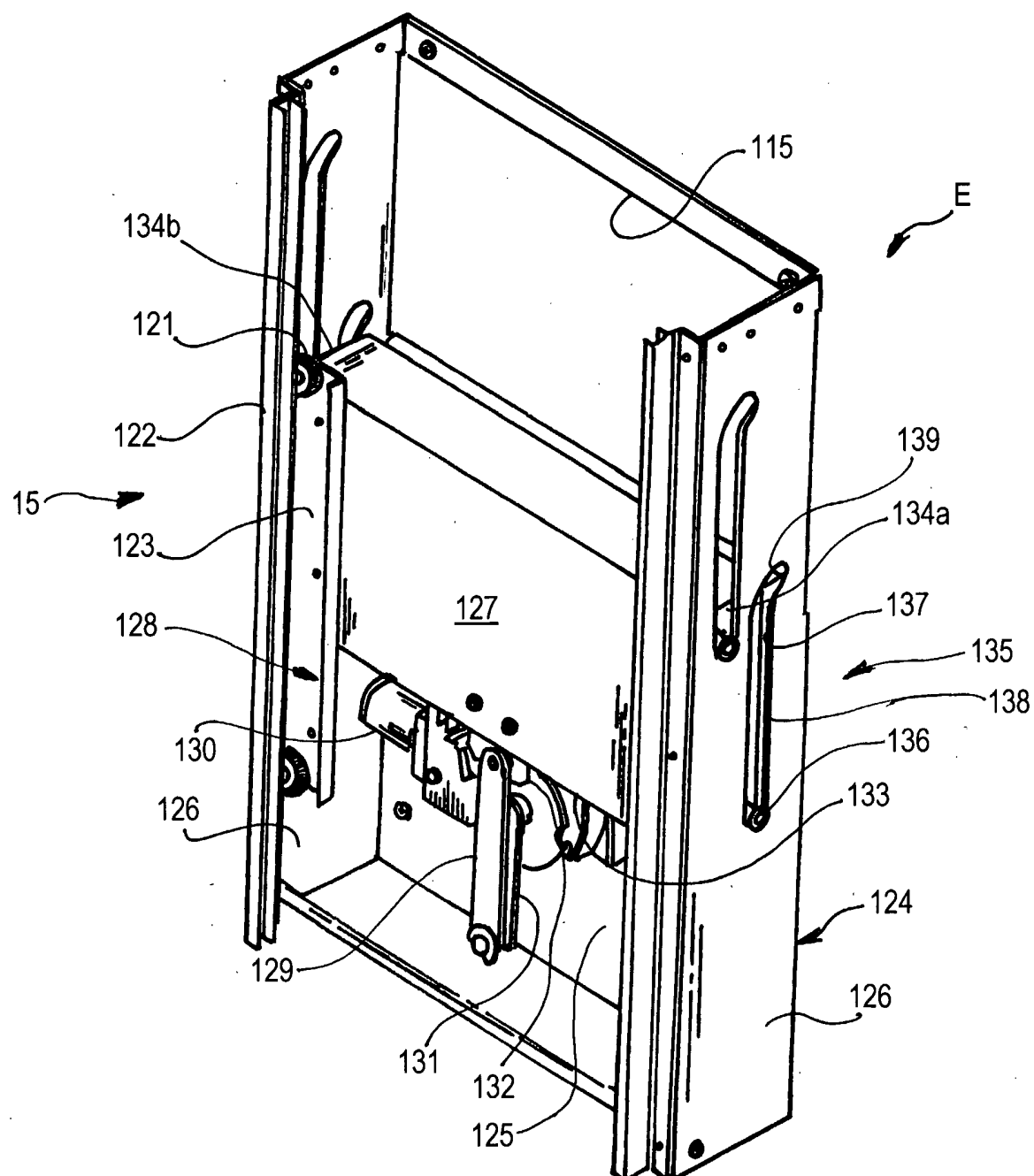


Fig. 12

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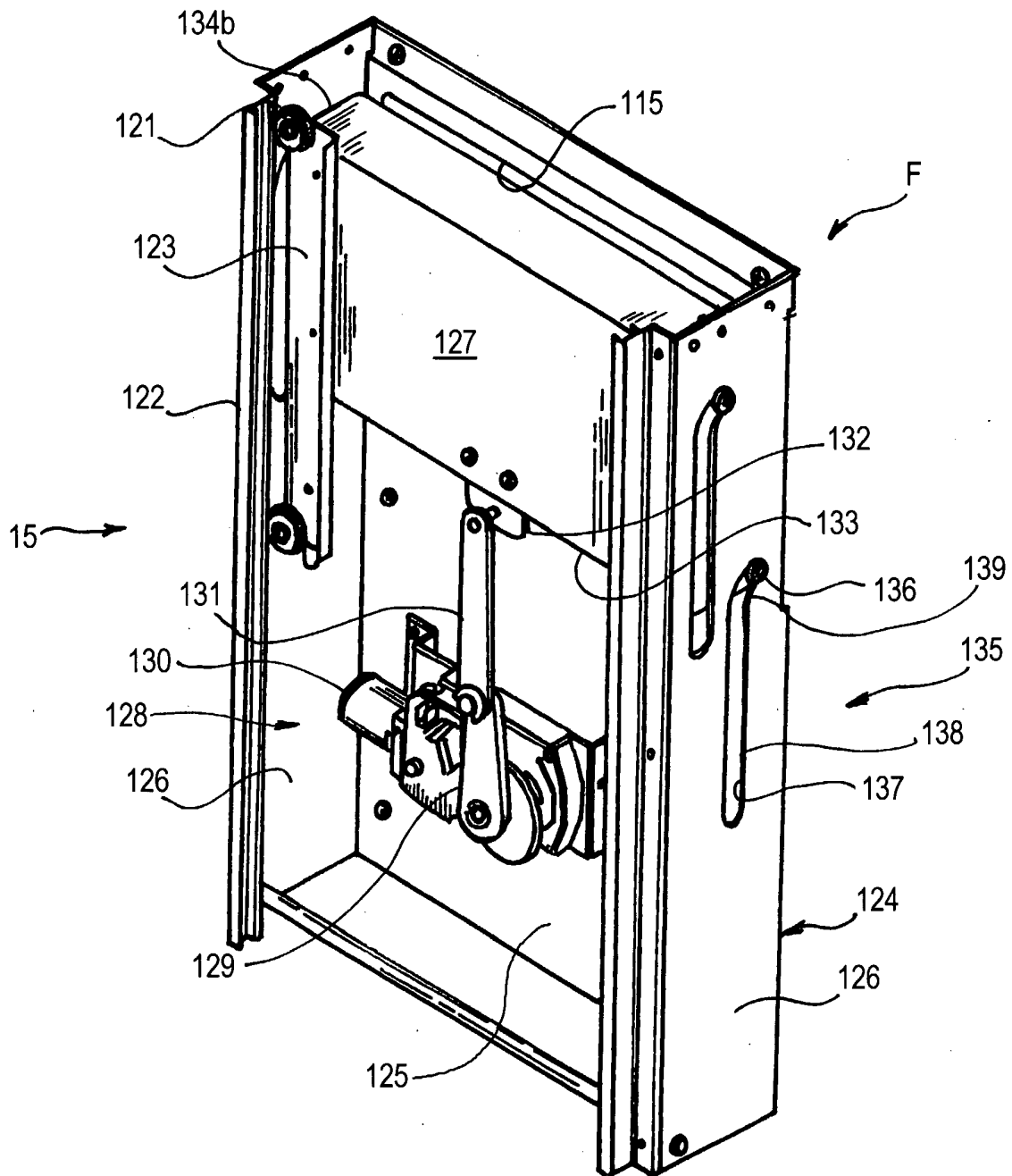


Fig. 13

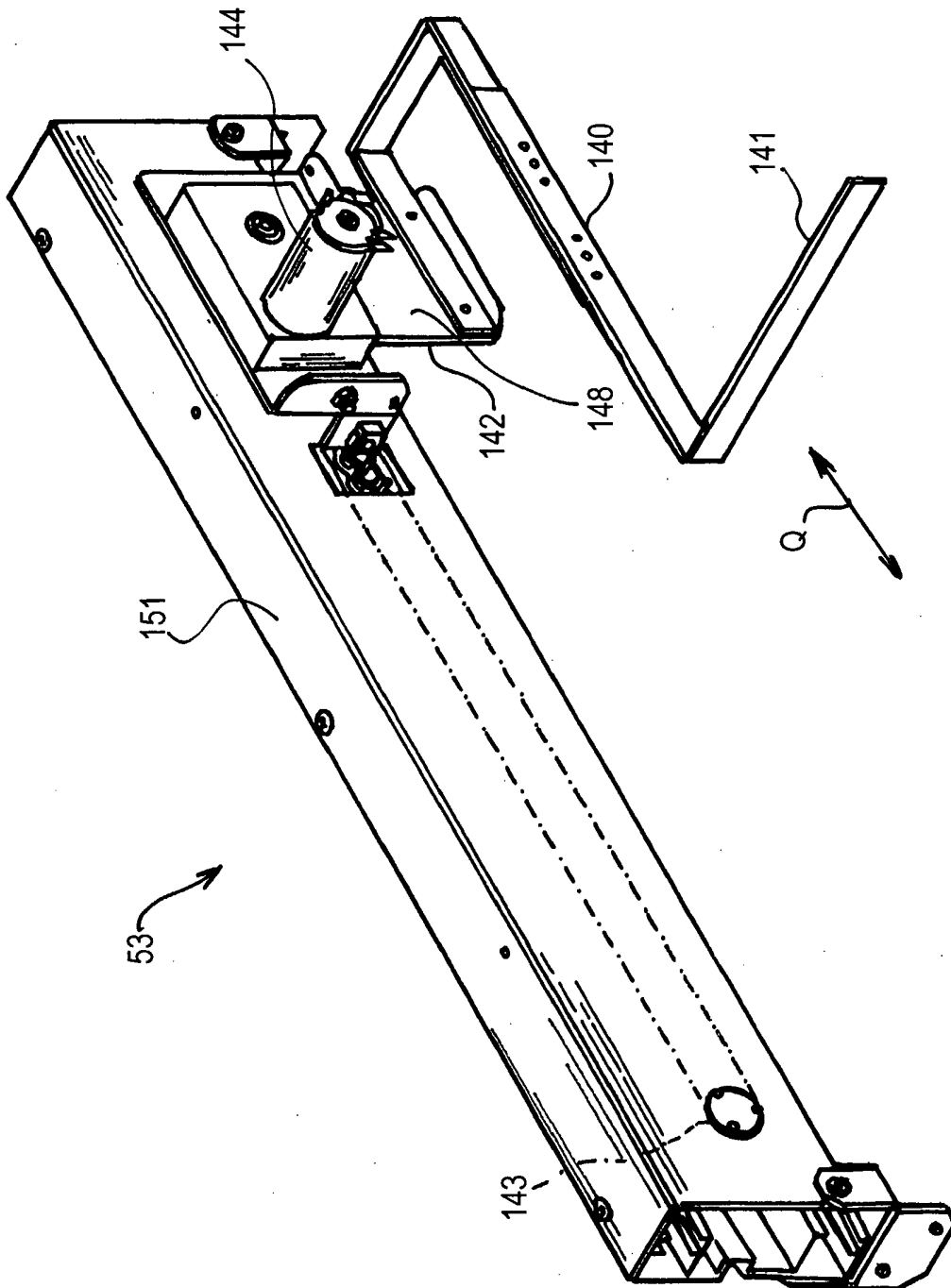
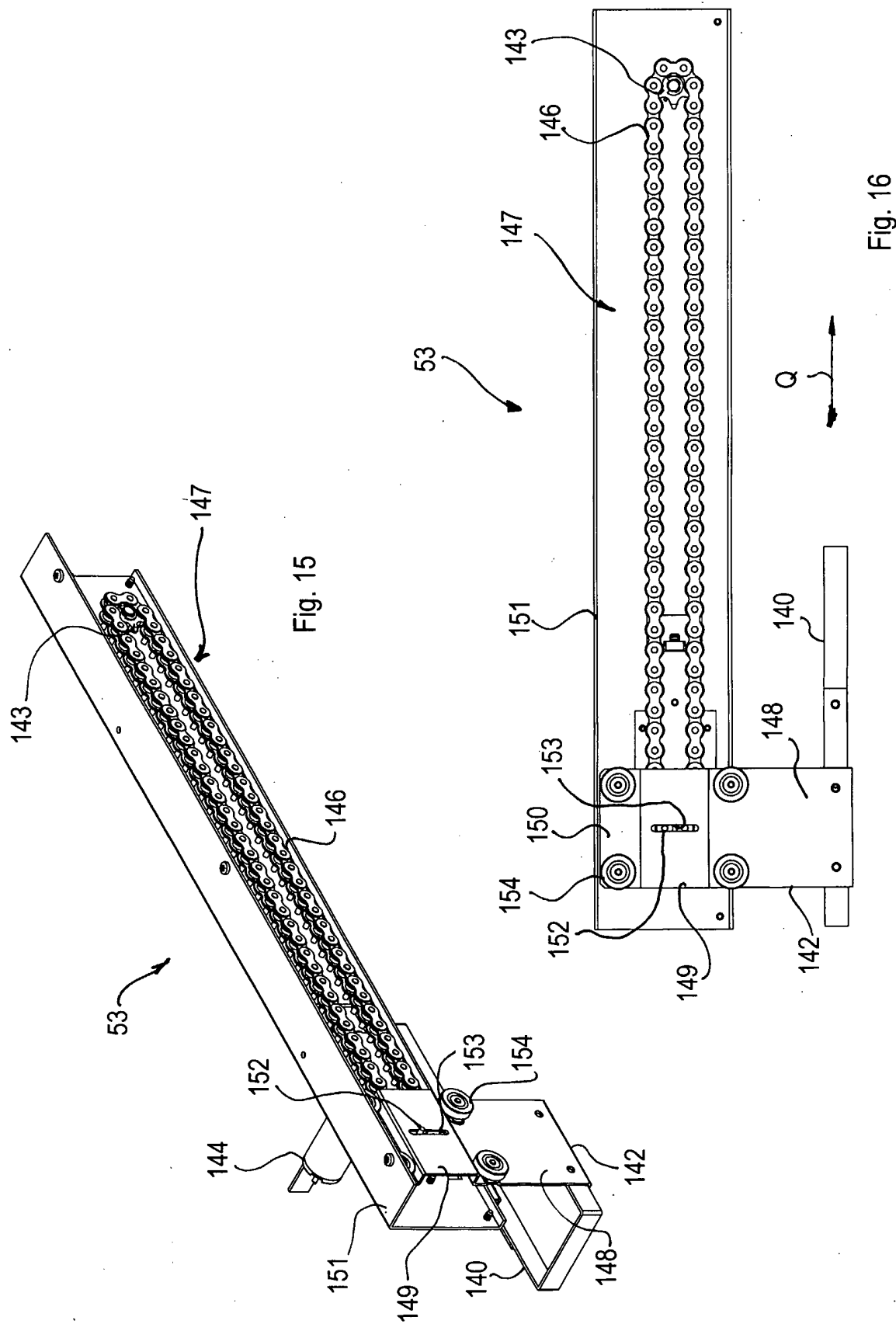


Fig. 14



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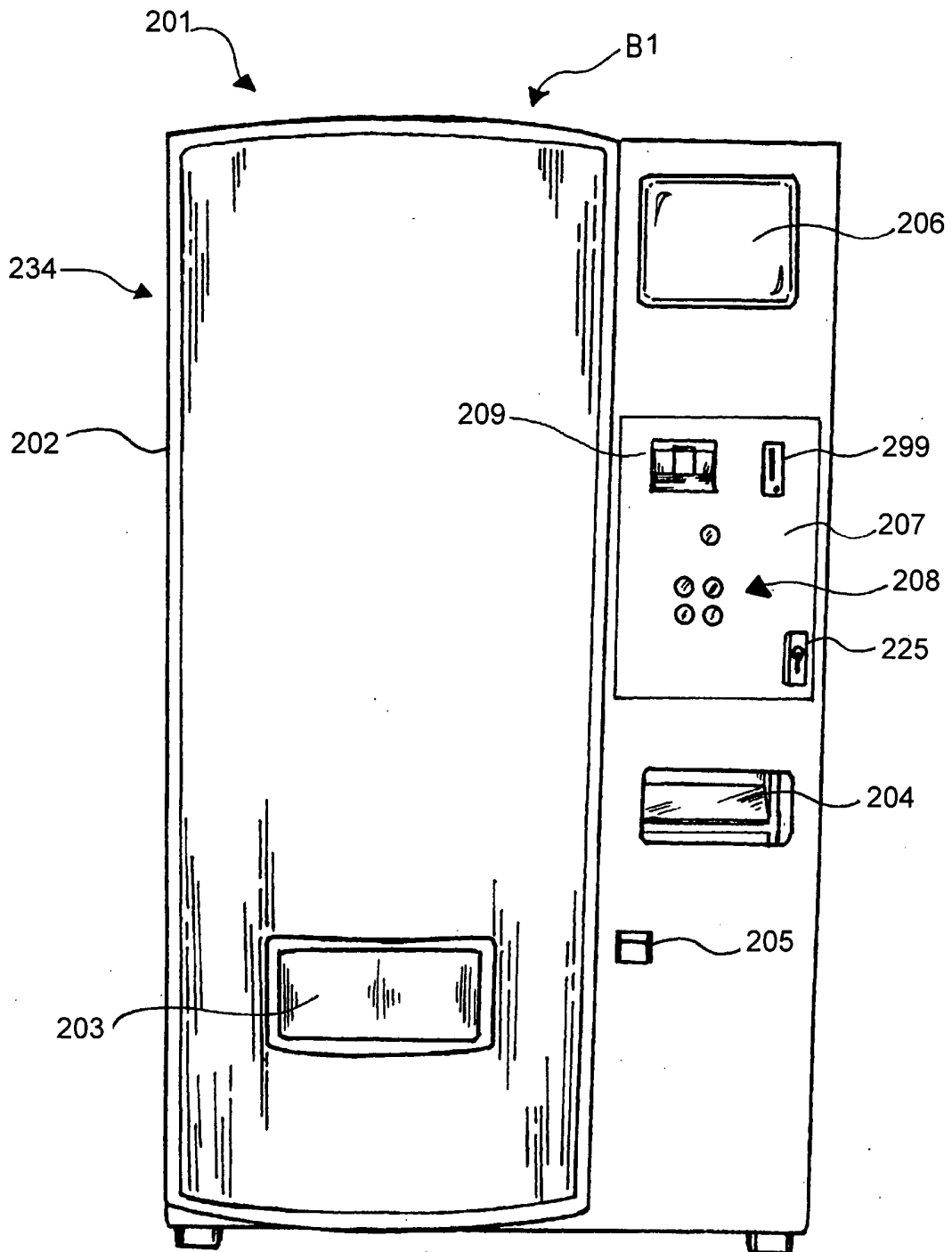
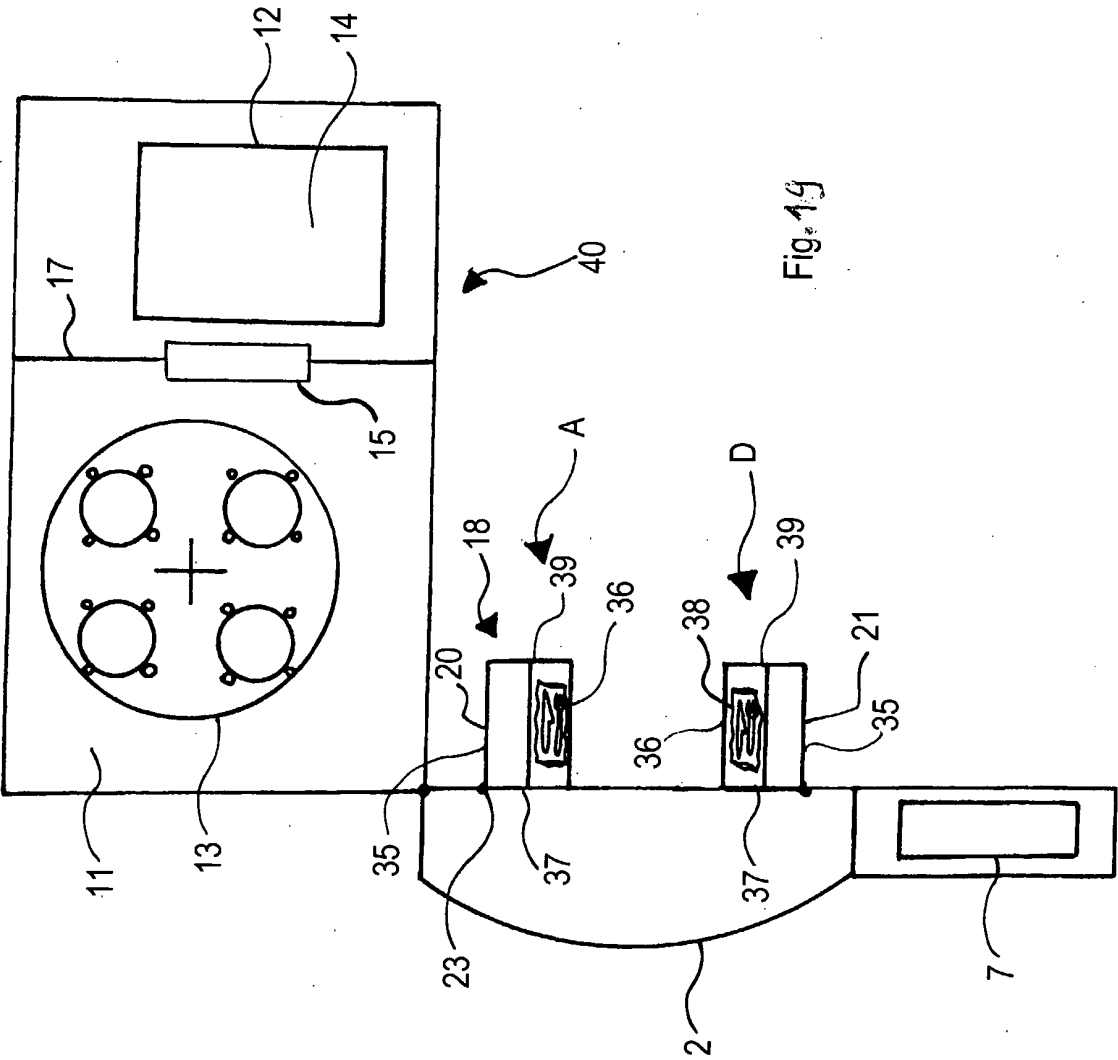


Fig. 17



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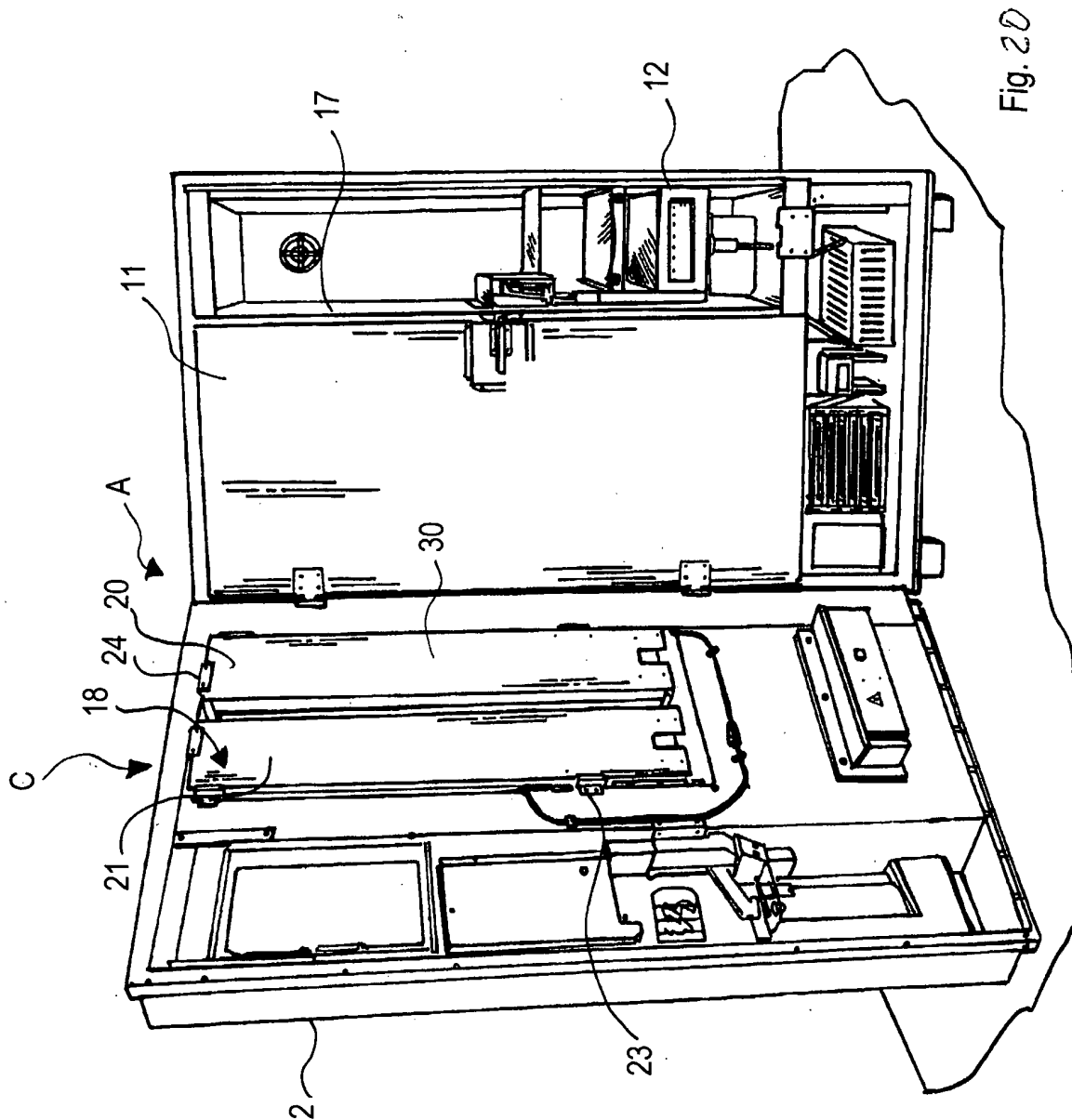


Fig. 20

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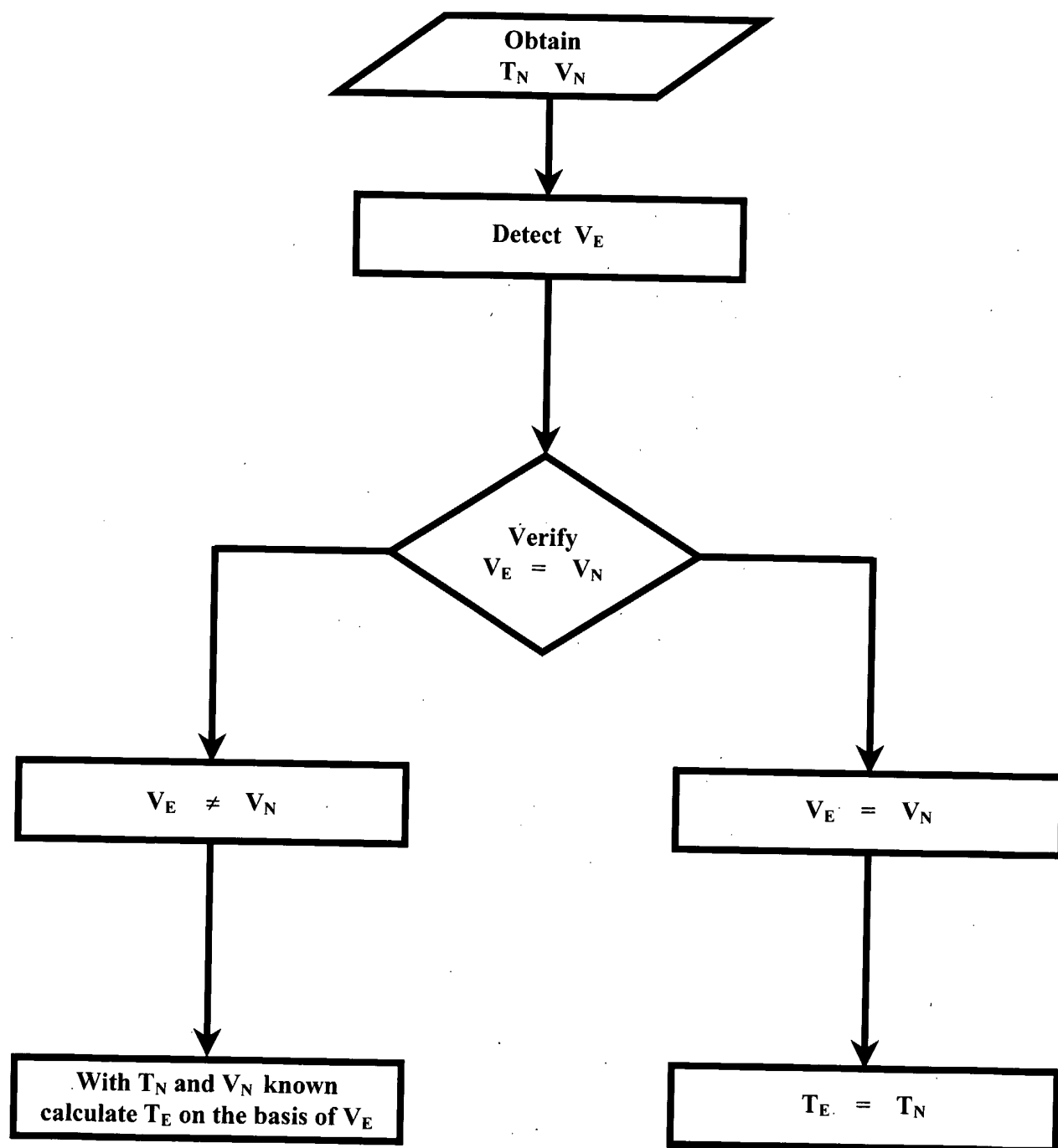


Fig. 22

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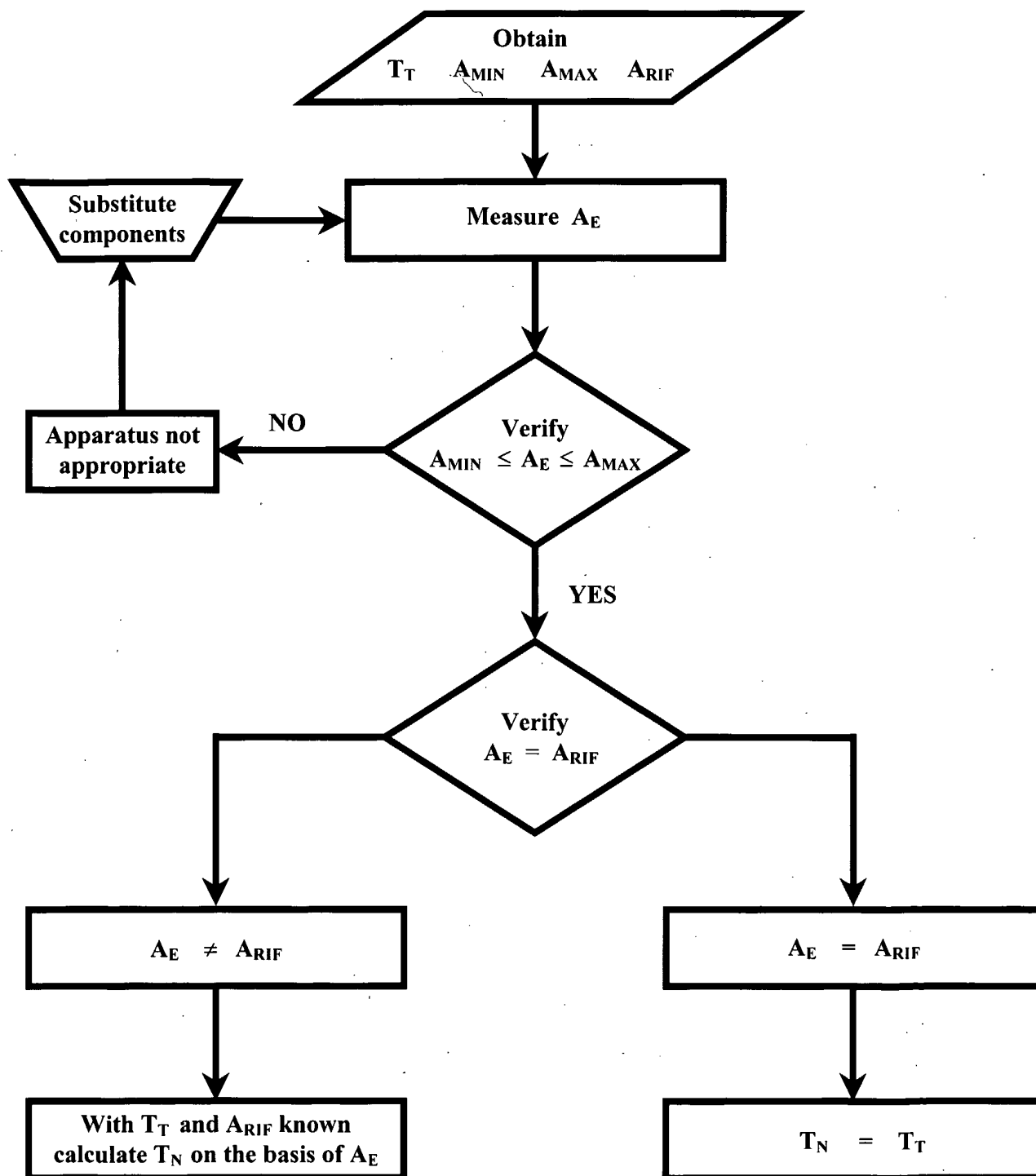
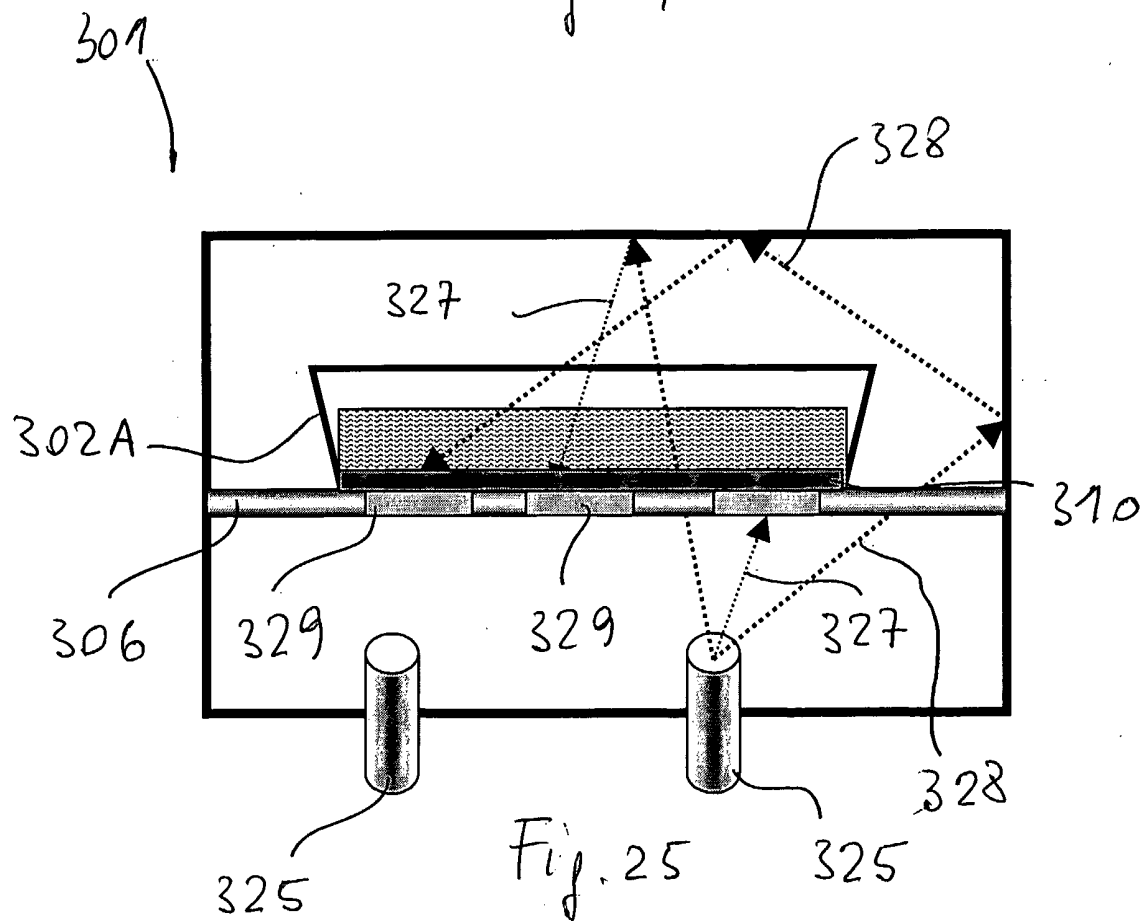
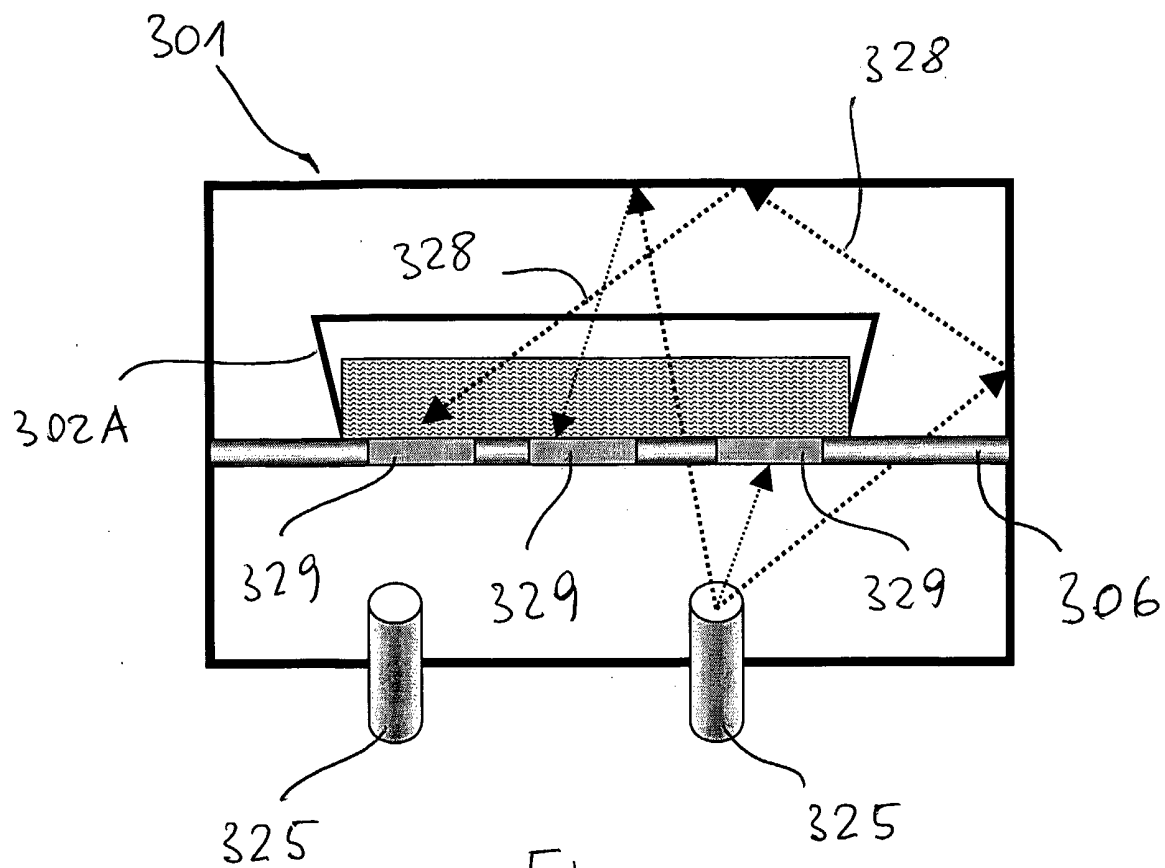
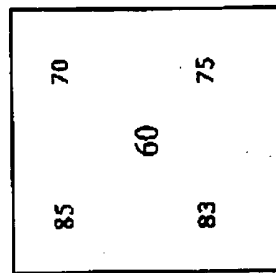
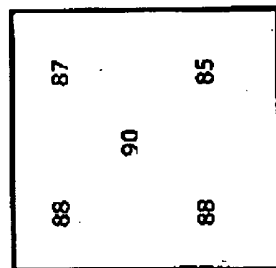
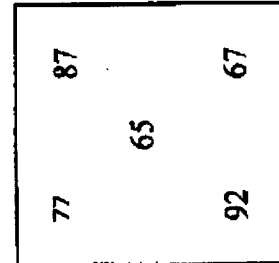
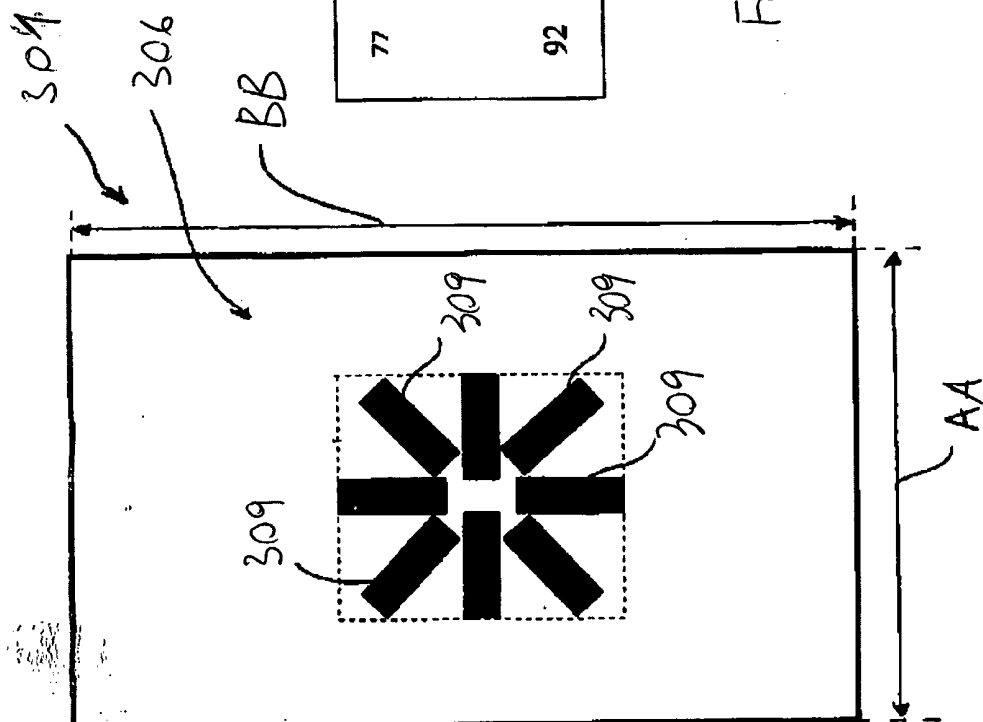
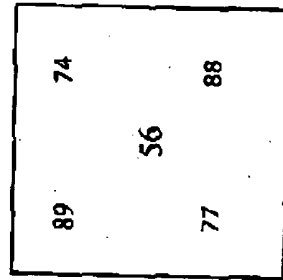
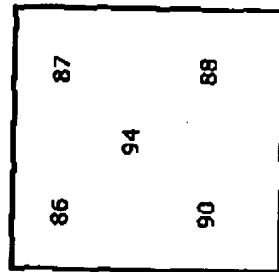
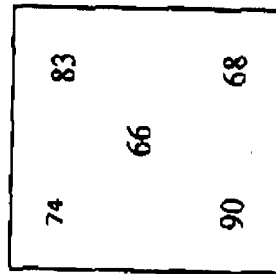
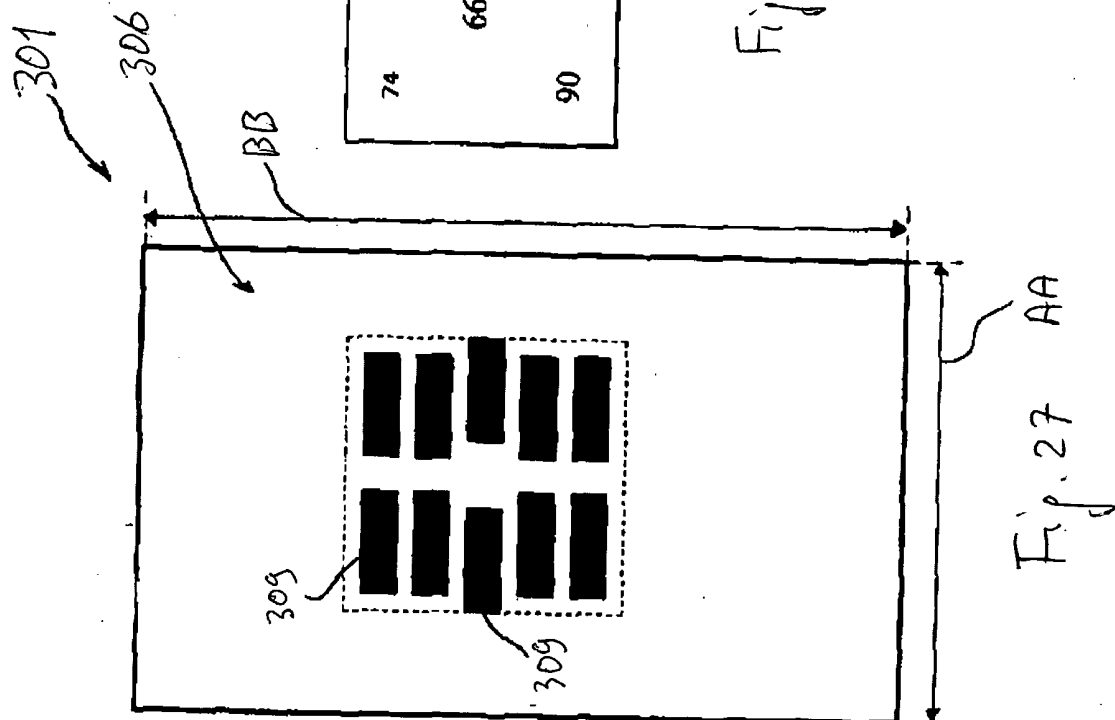
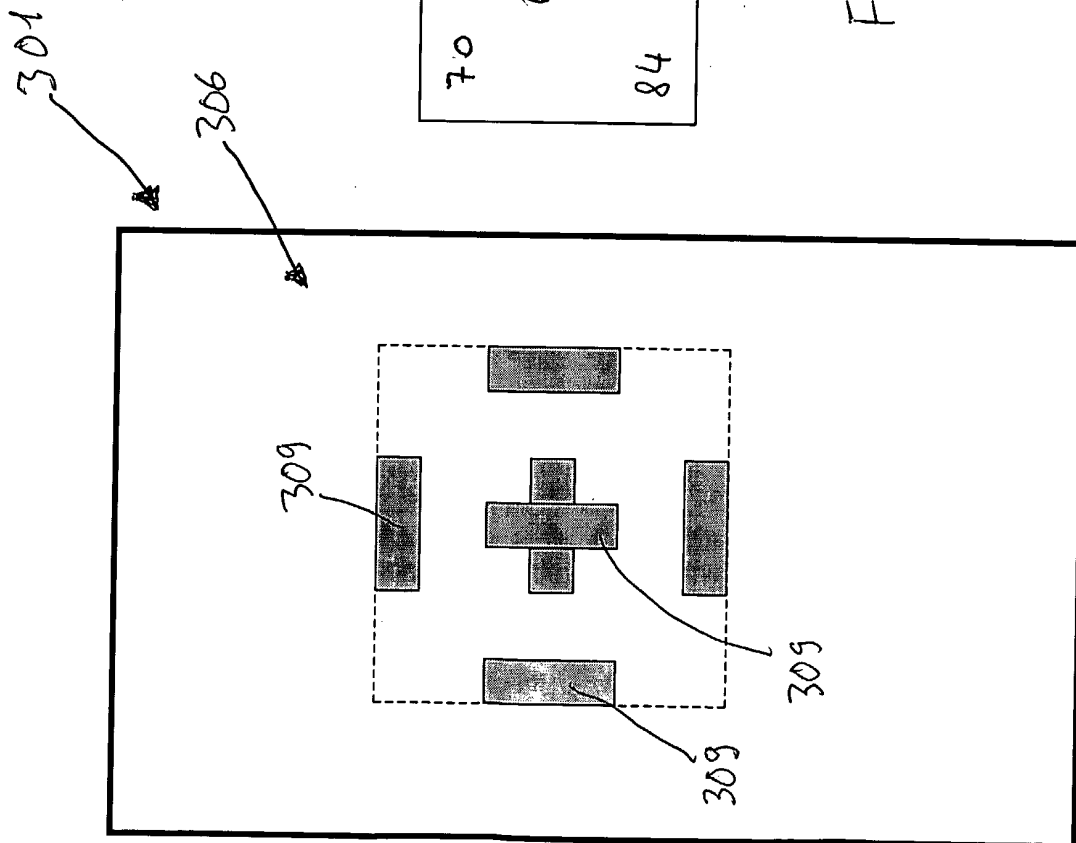


Fig. 23









70	72
84	66
64	

Fig. 28A

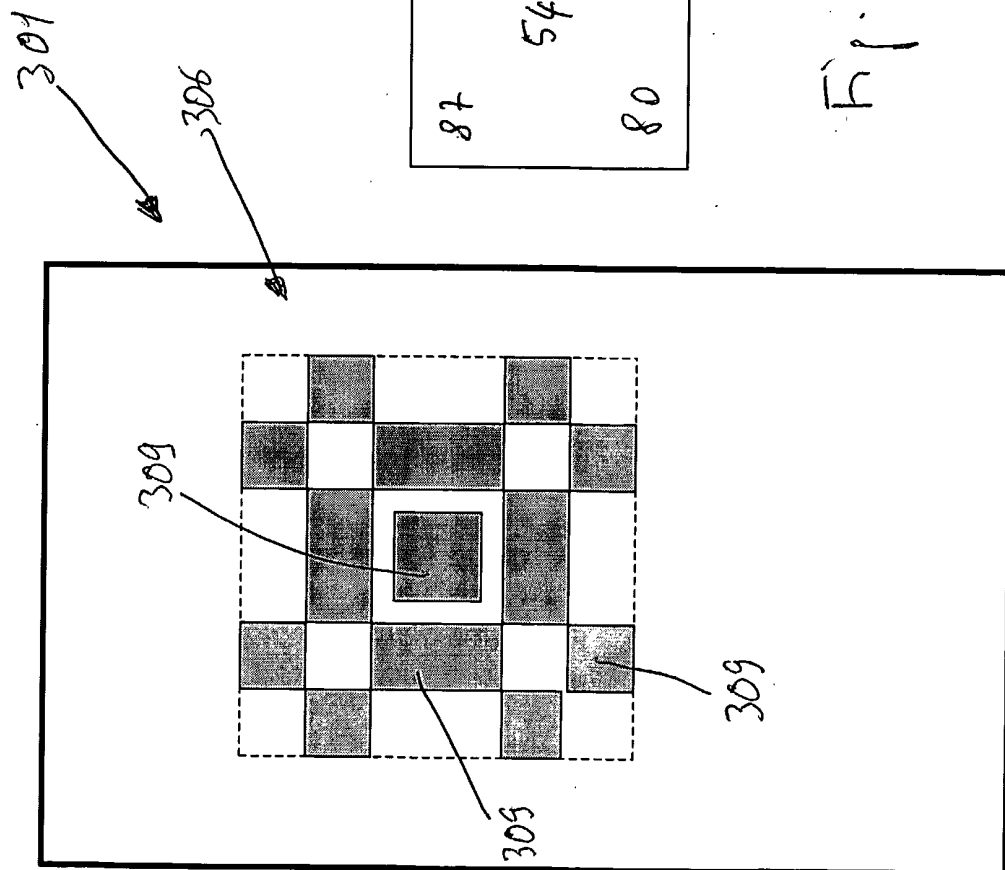
80	80
68	86
66	

Fig. 28B

85	70
76	66
60	

Fig. 28C

Fig. 28



87	66	
	54	
80	77	

Fig. 29A

83	67	
	66	
84	85	

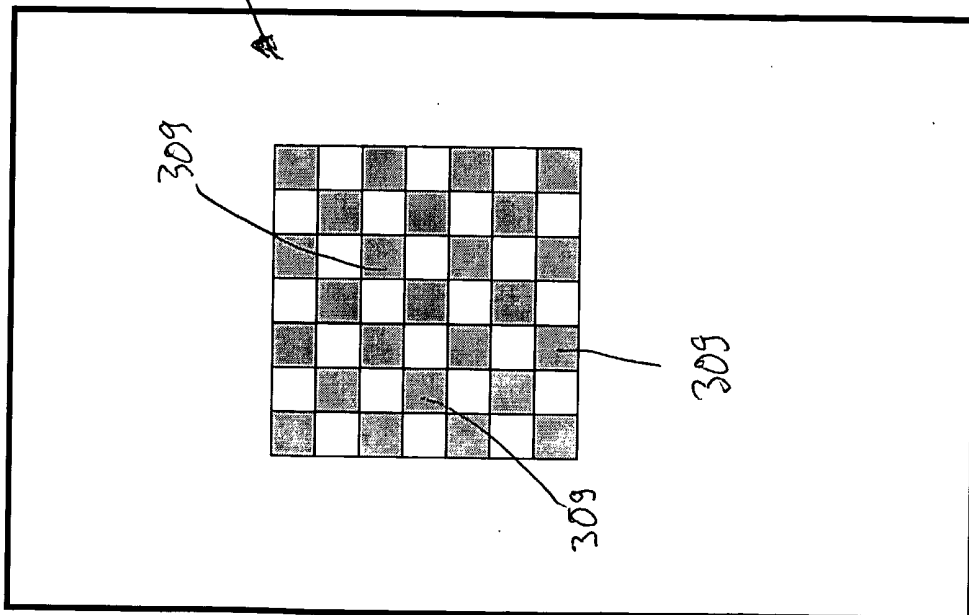
Fig. 29B

75	70	
	60	
79	62	

Fig. 29C

301

306



75	82
	68
82	70

Fig. 30A

81	77
	67
83	69

Fig 30B

80	74
	63
73	75

Fig. 30C

Fig. 30

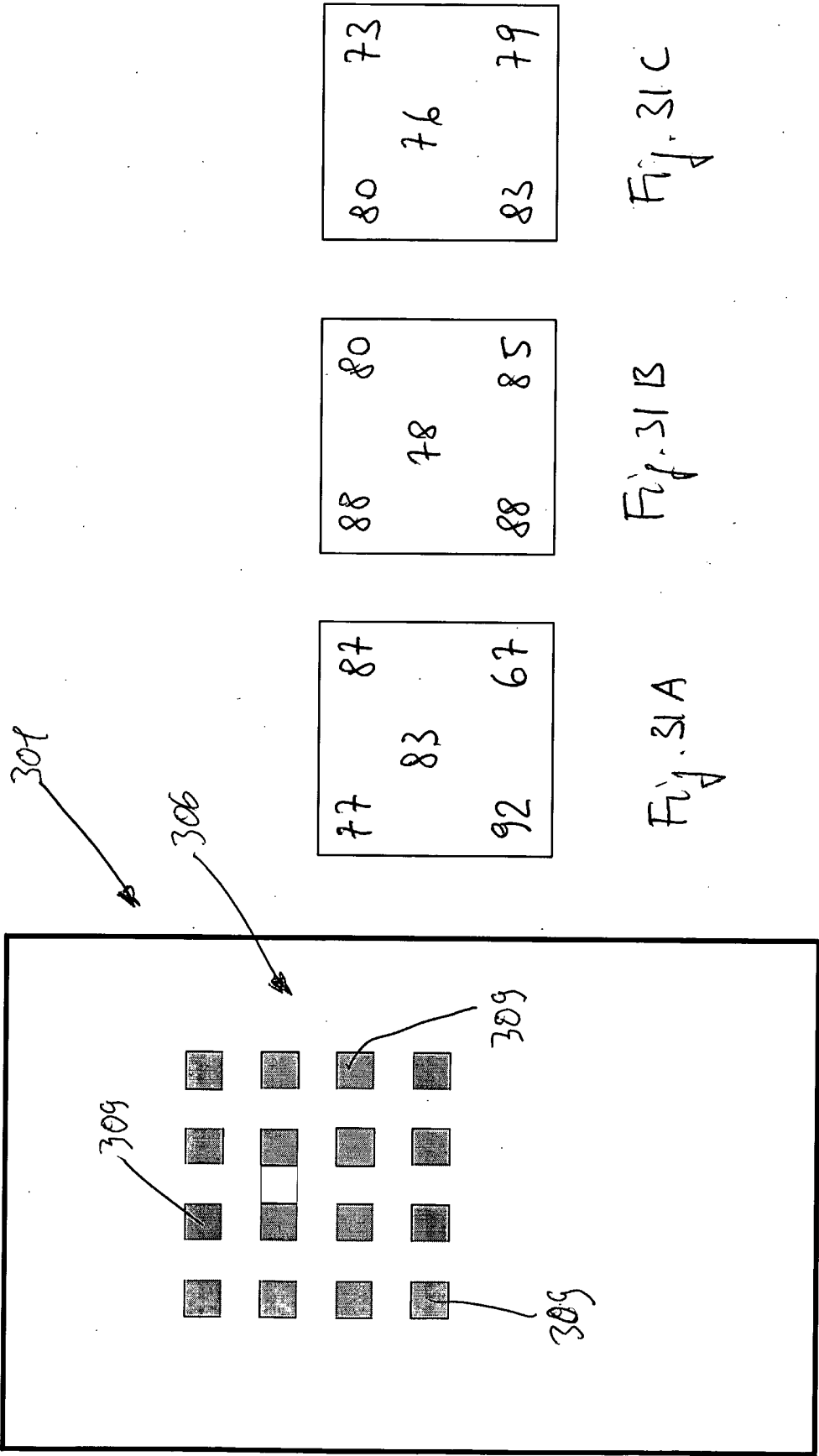


Fig. 31