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(54) Method for detecting a hopper insertion state for a bag-filling packaging machine

(57) A method for detecting a hopper insertion state for a bag-filling packaging machine using photoelectric sensors 7 provided at an item supply step position. The photoelectric sensors 7 detect deformation of the bag mouth that occurs when the hopper 4 is inserted into the bag mouth, and a decision whether the insertion status of the hopper 4 in the bag mouth is good or bad is made based on the detection result of the photoelectric sensors 7. If the tip end of the descending hopper 4 catches the bag mouth or presses the bag mouth and folds it, the bag face is moved away from the detection part 9 (light passage route) of the sensors 7, so that light from the light-emitting part of the sensors 7 reaches a reflecting mirror 6 and reflected, and the reflected light is detected by the light-receiving part of the sensors 7.

FIG. 4(a)

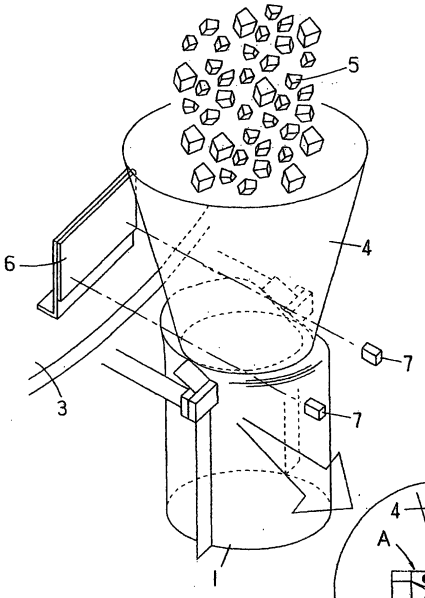
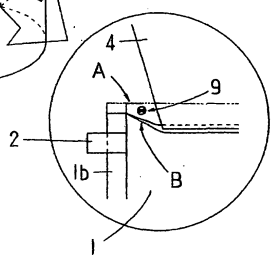


FIG. 4(b)



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a hopper detecting method in a bag-filling packaging machine that opens a bag mouth of a supplied bag, inserts a hopper into the bag mouth, loads the items to be packed into the bag via the hopper, and then withdraws the hopper from the bag mouth after the loading; and more particularly, the present invention relates to a method for detecting whether or not the hopper is inserted into the bag mouth normally.

2. Description of the Related Art

[0002] A bag-filling packaging machine generally opens a bag mouth, inserts a hopper end into the bag mouth, and loads the items to be packed into the bag via the hopper (see Japanese Patent Nos. 2981952, 2745203 and 3582681, Japanese Patent Application Laid-Open (Kokai) No. 2004-67224, and Japanese Patent Application Laid-Open (Kokai) No. 2005-29175).

[0003] Usually, the diameter of the opening of the hopper's insertion end is set to be large, with the maximum limit being so that it can be inserted into the bag mouth, thus allowing the items to be packed to through the hopper reliably and swiftly. Therefore, if the bag mouth is not opened fully or if the opening shape of the bag mouth is deformed from the normal shape, the hopper's insertion opening end catches the edge of the bag mouth end when the hopper is inserted, so that part of the insertion opening end may be exposed outside the bag or be blocked by the folded bag mouth. As a result, various loading errors may occur; in other words, the items to be packed may spill outside the bag, passage of the items to be packed may be interfered with and the items to be packed may not be loaded into the bag, or loading of the items to be packed may not be completed within the predetermined time.

[0004] The conventional way of keeping this sort of problem from occurring is to provide an opening guide device that has a plurality of rod-shaped or plate-shaped opening claws at a predetermined position on a bag-filling packaging machine. The opening claws are inserted inside the opened bag, the opening shape of the bag mouth is kept in a predetermined shape, and then the hopper is inserted into bag mouth (see Japanese Patent No. 2981952). However, there are problems. Providing the opening guide device makes the structure of the bag-filling packaging machine complicated and increases the cost. In addition, the bag-filling steps in the bag-filling packaging machine increases, reducing productivity.

[0005] In addition, in the case of the ordinary rotary-type bag-filling packaging machine disclosed in Japanese Patent No. 2981952, only one hopper is disposed at a predetermined position (in the case of a so-called W-type machine, in which two bags are simultaneously filled, there is one hopper corresponding to each bag, for a total of two hoppers). But in the case of a bag-filling packaging machine in which a plurality of hoppers are provided (corresponding to each gripper pair respectively) on a rotary table, as disclosed in, for example, Japanese Patent Application Laid-Open (Kokai) No. 2004-67224, providing opening guide devices is very difficult in terms of space and structure.

[0006] On the other hand, assuming that loading errors will occur, it is conventional practice to detect items to be packed that are loaded into a bag with a proximity sensors or vibrations sensors, thus determining whether or not a loading error has occurred (see Japanese Patent Application Publication (Kokoku) No. H3-56973 and Japanese Patent No. 3436406). However, if a very small quantity of items to be packed spills outside the bag, making that decision is very difficult.

[0007] Also, though a sensor for detecting items to be packed that fill the interior of a bag is used conventionally (see Japanese Patent No. 2745203), this method cannot detect items to be packed that spill outside the bag, and loading errors are overlooked.

[0008] When items to be packed are loaded into a bag via a hopper in a bag-filling packaging machine, nearly all of the loading errors occur when the insertion end of the hopper is not inserted properly (or correctly) into the bag mouth. To put it another way, if it were possible to detect whether or not the insertion end of the hopper was inserted normally into the bag mouth, then it would be possible to detect the occurrence of loading errors and in addition to prevent the occurrence of loading errors.

BRIEF SUMMARY OF THE INVENTION

[0009] Accordingly, the object of the present invention is to provide a method for detecting whether or not the insertion end of a hopper is inserted into a bag mouth in a normal or correct fashion.

[0010] Generally, when inserting the hopper, if its insertion end catches on the bag mouth edge and is not inserted normally into the bag mouth, the bag mouth is pressed by the insertion opening end of the hopper and deforms (often it is folded inward). Also, if the bag-filling packaging machine is the type that holds both edges of the bag with grippers and supports it with the bag hanging down (a so-called vertical-type packaging machine), the deformed bag mouth partially blocks the insertion opening end of the hopper and interferes with passage of the items to be packed, and items to be packed that remain inside the hopper fall when the hopper is withdrawn from the bag mouth. Therefore, if it were possible to detect deformation of the bag mouth when the hopper is inserted into the bag mouth and/or to detect the items to be packed falling from the hopper when the hopper is withdrawn from the bag mouth, then it is possible to detect whether or not the insertion end of the hopper was normally in-

serted inside the bag mouth. The present invention is based on this knowledge.

[0011] Accordingly, the above object is accomplished by unique steps of the present invention for detecting a hopper insertion state in a bag-filling packaging machine that opens a bag mouth of a supplied bag, inserts a hopper in the bag mouth of the supplied bag, loads the items to be packed into the supplied bag via the hopper, and then withdraws the hopper from the bag mouth; and in the present invention, sensors for detecting deformation of the bag mouth based on the insertion operation of the hopper (bag mouth detecting sensors) are provided in the bag-filling packaging machine; and deformation of the bag mouth during the insertion operation of the hopper is detected by the bag mouth detecting sensors, and whether the hopper insertion state in the bag mouth is good or bad or acceptable or not is determined based on the detection result of the bag mouth detecting sensors.

[0012] This method of the present invention is applicable to the type of bag-filling packaging machine that holds both edges of a supplied bag with grippers and supports it with the bag hanging down while various packaging operations are performed (the so-called vertical-type packaging machine disclosed in, for instance, the above-described Japanese Patent Nos. 2981952, 2745203 and 3436406, Japanese Patent Application Laid-Open (Kokai) No. 2004-67224 and Japanese Patent Application Publication (Kokoku) No. H3-56973) and also to the type of bag-filling packaging machine that holds the bag mouth using grippers, suction cups, etc. with the bag in a prone state while various packaging operations are performed (the so-called lateral-type packaging machine disclosed in, for instance, the above-described Japanese Patent Application Laid-Open (Kokai) No. 2005-29175 and Japanese Patent No. 3582681).

[0013] In the case of vertical-type packaging machines, the method of the present invention is generally applicable to vertical-type packaging machines, such as a rotary table type bag-filling packaging machine in which a plurality of gripper pairs are provided on the periphery of a rotating table that is rotated continuously or intermittently, an endless track type bag-filling packaging machine in which a plurality of gripper pairs are provided on a chain, etc. that moves continuously or intermittently along a ring-shaped track, and in addition to a linear movement type bag-filling packaging machine in which one gripper pair or a plurality thereof undergoes reciprocating motion in a straight line, etc.

[0014] In addition, the method of the present invention is not just applicable to a bag-filling packaging machine in which a bag mouth is sealed and then the bag is discharged to the outside of the machine in a single packaging operation, and it can also be applied to a bag-filling packaging machine in which the bag is discharged to outside the machine without sealing all the bag mouths or without sealing the bag mouth completely (for example, when the bag is sent to a vacuum packaging machine via a transfer device).

[0015] Also, the method for detecting a hopper insertion state of the present invention is applicable only to a vertical-type packaging machine. More specifically, the present invention provides a hopper insertion state detecting method for a bag-filling packaging machine that holds both edges of a supplied bag with grippers and supports the bag hanging down, opens the bag mouth of the supplied bag, inserts a hopper in the bag mouth, loads the items to be packed into the bag via the hopper, and then withdraws the hopper from the bag mouth; and in the present invention, sensors for detecting items to be packed falling from the hopper when the hopper is withdrawn from the bag mouth (falling items detecting sensors) are provided in the bag-filling packaging machine; and the falling items detecting sensors detects items falling from the hopper when the hopper is withdrawn from the bag mouth, and whether the hopper insertion state in the bag mouth is good or bad or acceptable or not is determined based on the detection result of the falling items detecting sensors. This method can be used in conjunction with the previously described method for detecting a hopper insertion state that uses the bag mouth detecting sensors (for detecting deformation of the bag mouth).

[0016] Furthermore, the method of the present inventive is particularly suitable to a bag-filling packaging machine of the type in which a plurality of grippers for holding both the left and right edges (or both side edges) of a bag so that the bag hangs down are disposed at equidistant separation on the periphery of an intermittently rotating table, and a hopper that is raised and lowered at a predetermined timing is disposed on the table to correspond to each respective gripper pair; and various packaging means such as a bag supply device, a bag mouth opening device, an item supply device, a sealing device, etc. are disposed on the periphery of the table, so that various packaging operations such as supplying of a bag, opening of the bag mouth, inserting of the hopper into the bag mouth, loading of the items to be packed into the bag, withdrawing of the hopper from the bag mouth, sealing of the bag mouth, etc. are performed when the table is rotated once.

[0017] If the insertion end opening of the hopper catches on the bag mouth edge when the hopper is inserted into the bag mouth of the supplied bag, the bag mouth of the supplied bag is pressed by the opening end of the hopper and deforms. The present invention detects the presence or absence of this deformation; and based on the detection result of the sensors, a control device determines whether or not the hopper was inserted normally inside the bag mouth. Thus, detection and decision of the hopper insertion state can be done easily.

[0018] In the method of the present invention, if it is determined that the hopper is not inserted into the bag mouth normally, it is possible to stop injecting the items to be packed into the relevant hopper in, for example, the loading step based on the decision result. It is also

possible to halt the operation of the packaging means (for example, a liquid loading device, bag mouth sealing device, device to transfer to a vacuum packaging machine, etc.) at steps following the relevant bag, or to discharge only the relevant bag at a discharge position different from the usual discharge position, or to halt the entire packaging device.

[0019] On the other hand, in a vertical-type packaging machine, when the insertion end opening of the hopper catches on the bag mouth edge when the hopper is inserted into the bag mouth of the supplied bag, the bag mouth is pressed by the hopper's opening end and deformed; and if it deforms inward, the deformed bag mouth partially blocks the insertion opening end of the hopper and interferes with passage of the items to be packed, and the items to be packed remain inside the hopper or cannot pass through it within the expected time, and the items to be packed that remain inside the hopper fall when the hopper is withdrawn from the bag mouth.

[0020] Thus, in another method of the present invention, the presence or absence of items to be packed is detected when they fall from the hopper upon the withdrawal of the hopper from the bag mouth, and a control device determines whether or not the hopper was inserted normally inside the bag mouth based on that detection result. Thus, detection and decision of the hopper insertion state can be done easily.

[0021] In this method too, if it is determined that the hopper is not inserted into the bag mouth normally, it is as described above possible to halt the operation of the packaging means (for example, a liquid loading device, bag mouth sealing device, device to transfer to a vacuum packaging machine, etc.) at steps following the relevant bag or to discharge only the relevant bag at a discharge position different from the usual discharge position or to halt the entire packaging device.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0022]

Figure 1 is a schematic perspective view of the vicinity of the bag mouth opening step position in a bag-filling packaging machine in accordance with the present invention;

Figure 2(a) is a schematic perspective view of the vicinity of the item supply step position and Figure 2 (b) is an enlarged front view thereof;

Figure 3 is a schematic perspective view of the vicinity of the idle step position after the item supply step position;

Figure 4(a) is a schematic perspective view of the vicinity of the item supply step position and Figure 4 (b) is an enlarged front view thereof, showing the deformed configuration of the bag when insertion of the hopper into the bag mouth fails;

Figure 5 is a schematic perspective view of the vicinity of the idle step position after the item supply step position, showing the situation when insertion of the hopper into the bag mouth fails and the items to be packed spill from the lower end of the raised hopper; and

Figure 6 is a schematic perspective view of the vicinity of the item supply step position in another bag-filling packaging machine in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0023] The method for detecting a hopper insertion state in accordance with the present invention will be described below in detail with reference to Figures 1 through 6.

[0024] The bag-filling packaging machine shown in Figure 1 has a plurality (only one pair is shown) of gripper pairs 2, which hold the left and right edges (or both side edges) of a bag 1 so that the bag hangs down. The grippers 2 are disposed at equidistant separation on the periphery of a table 3 that is rotated intermittently (the arrow indicates the rotation direction). A single hopper 4 is provided on the table 3 for each respective pair of grippers 2. The table 3 is, in the course of its one rotation, repeatedly rotated and halted the same number of times as the number of gripper pairs 2, and the hoppers 4 are raised and lowered at a predetermined timing through the operation of a cam rail, cam roller, and slider which are not shown in the drawings.

[0025] Disposed on the periphery of the table 3 are a bag supply device, a printing device, a bag mouth opening device, an item supply device that supplies items to be packed, a sealing device, a cooling sealing device, etc., so that they are provided at positions where the operations of the machine are executed. Each time the table 3 halts, the various operations are carried out, including supplying of a bag to the halted gripper pair 2, printing on the surface of the supplied bag, opening of the bag mouth of the supplied bag, supplying of the items to be packed into the supplied bag, sealing the bag mouth, cooling the seal area, etc. Subsequently, the product bag that contains the items is discharged to the outside of the packaging machine.

[0026] The construction and functions of the bag-filling packaging machine described above are known from, for instance, Japanese Patent Application Laid-Open (Kokai) No. 2004-67224.

[0027] In the bag-filling packaging machine shown in Figure 1, the raising and lowering movement of the hopper 4 begins at a bag mouth opening step position and ends at an appropriate timing after the step of supplying the items to be packed into the supplied bag. The raising and lowering movement of the hopper 4 will be described below in more detail (see Japanese Patent Application Laid-Open (Kokai) No. 2004-67224 in this matter).

(1) The above-described cam rail is disposed in a

ring shape centered on the rotational axis of the table 3. As the table 3 is rotated, the cam roller (fixed to each hopper 4) is rotationally moved along the cam rail, and the hopper 4 is also rotationally moved.

[0028] As the table 3 is rotated, the hopper 4 leaves the printing step position and is rotationally moved toward the bag mouth opening step position. During this interval, the cam rail is disposed at a high position and on a horizontal plane, so that the hopper 4 is rotationally moved on a horizontal plane at its ascended position (which is a position a predetermined distance from the upper end of the bag mouth); and when the table 3 is halted with movement, it is stopped at the bag mouth opening step position.

[0029] At the bag mouth opening step position, the cam rail is positioned so that it sandwiches the slider between the high position and low position, and the cam roller leaves the cam rail at the high position immediately before halting and being transferred to the slider, which is standing by at the same height. This slider is disposed at the bag mouth opening step position, and it has an elevator function for vertically lowering the cam roller from the high position to the low position.

(2) The bag mouth is opened at the bag mouth opening step position; and at the same time (at the timing shown in Figure 1), the slider descends so as to lowers the cam roller, thus allowing the hopper 4 to be lowered to the descended position at the same time, so that the lower end of the hopper 4 is inserted into the bag mouth of the bag 1.

(3) As the table 3 is rotated, the hopper 4 at the bag mouth opening step position is rotationally moved toward the next halt position (the item supply step position where the item to be packed is supplied to the hopper and then into the bag). Simultaneously with the start of rotation of the table 3, the cam roller leaves the slider and is transferred to the cam rail disposed at the low position whose height is as the same as the slider. During this interval, since the cam rail is on a horizontal plane at the low position, the hopper 4 is rotationally moved on the horizontal plane at the descended position and is halted at the item supply step position when the rotation of the table 3 is halted.

[0030] Meanwhile, the slider immediately returned to the original high position after leaving the cam roller and waits for the next cam roller to be transferred thereon.

(4) At the item supply step position, the items to be packed are injected into the hopper 4, and the items pass through the hopper 4 and are loaded into the bag 1. Figure 2(a) shows the positional relationship between the hopper 4 and bag 1 at the item supply step position, and it also shows the state of items to be packed 5 being injected into the hopper 4 from an item supply device.

(5) As the table 3 is rotated, the hopper 4 at the item supply step position is rotationally moved toward the next halt position (an idle step position). The cam rail slants upward from the item supply step position to this idle step position; and at the idle step position, it is positioned at the same high position as the printing step position. Accordingly, the bottom end of the hopper 4 is withdrawn from (or out of) the bag mouth during this rotational movement; and when the hopper 4 is halted at the idle step position, the hoper 4 has arrived at the above-described ascended position. Figure 3 shows the positional relationship between the hopper 4 and bag 1 at this idle step position, and it also shows the state of items to be packed 5 loaded inside the bag 1.

(6) The cam rail is disposed horizontally at the high position from the idle step position to the printing step position. Therefore, the hopper 4 is kept in the ascended position while rotationally moving through this interval.

[0031] In the bag-filling packaging machine shown in Figure 1, a reflecting mirror 6 is provided on the table 3 for each gripper pair 2. The reflecting mirror 6 is disposed parallel to the tangent direction of the round table 3 on a perpendicular plane with respect to the flat surface of the table 3. Also, as shown in Figure 2(a), a pair of reflecting-type photoelectric sensors (bag mouth detecting sensors) 7 are provided at the above-described item supply step position so as to face the reflecting mirror 6 at the outside of the table 3; and as shown in Figure 3, a group of reflecting-type photoelectric sensors (falling items detecting sensors) 8 are provided at the above-described idle step position so as to face the reflecting mirror 6 at the outside of the table 3.

[0032] A detection part 9 (light passage route) of each one of the photoelectric sensors 7 is positioned, as shown in Figure 2(b), so that it is slightly below the upper end 1a of the bag mouth and at the bag face (unsealed face) located between the side seal part 1b of the bag 1 and the hopper 4 when the lower end of the hopper 4 is inserted normally inside the bag mouth of the bag 1. Also, as shown in Figure 4(b), the detection part 9 is set at a position where the bag face is removed from (or out of) the detection part 9, if the lower end of the hopper 4 catches the bag mouth edge of the bag 1 so that the hopper 4 is not inserted normally into the bag mouth and the bag mouth is pressed by the lower end of the hopper 4 and takes an abnormally deformed shape (in Figure 4(b), a part of the bag mouth edge is folded inward). In Figures 2(b) and 4(b), only one of two detection parts 9 which are set so as to be at both shoulder portions of the bag is shown.

[0033] Detection by the photoelectric sensors 7 (light emission by the light-emitting part and detection by the light-receiving part of the photoelectric (bag mouth detecting) sensors 7) occurs for the bag 1 supplied and

stopped at the item supply step position immediately after the table 3 is halted. If the lower end of the hopper 4 is inserted normally into the bag mouth of the bag l as shown in Figure 2(a), the detection parts 9 of the photoelectric sensors 7 are positioned at the bag face of the bag 1 as shown in Figure 2(b); and thus, light emitted by the light-emitting parts of the photoelectric sensors 7 is blocked by the bag face and does not reach the reflecting mirror 6; as a result, no light is reflected by the mirror 6, and no reflected light is detected by the light-receiving part of the sensors 7. This means that the bag mouth of the bag 1 is not abnormally deformed, and this detection result is sent to the control device (not shown in the drawings) of the bag-filling packaging machine. The control device determines that the hopper 4 was inserted into the bag mouth without problems. The detection time (the time from starting detection until the detection ends) is set to be very short.

[0034] On the other hand, if the lower end of the hopper 4 catches on the bag mouth edge of the supplied bag 1 and is not inserted into the bag mouth normally, and the bag mouth is pressed by the lower end of the hopper 4 and abnormally deformed (see the part of the bag mouth irregularly deformed as shown by dashed line in Figure 4(a), and see the normal bag mouth shown by two dotted line A and the irregularly deformed bag mouth shown by solid line B in Figure 4(b)), and the bag face is removed from (or out of) the detection part 9 of one or both of the photoelectric sensors 7 as shown in Figure 4(b), light from one or both of the light-emitting parts of the photoelectric sensors 7 reaches the reflecting mirror 6 and is reflected; as a result, the reflected light is detected by the light-receiving part. This detection result is sent to the control device of the bag-filling packaging machine, and the control device determines that insertion of the hopper 4 into the bag mouth failed.

[0035] Detection parts (light passage routes) of the photoelectric (falling items detecting) sensors 8 that are provided at the idle step position are set at a number of locations in the horizontal direction in the space between the lower end opening of the hopper 4 which is at the ascended position and the upper end of the bag 1 as shown in Figure 3.

[0036] Detection by the photoelectric sensors 8 (light emission by the light-emitting part and detection by the light-receiving part of the photoelectric sensors 8) is done at the above-described idle step position immediately after the rotation of the table 3 is halted. If all of the items to be packed that are injected into the hopper 4 are loaded into the bag 1 while at this idle step position as shown in Figure 3, all of the light emitted from the light-emitting parts of the photoelectric sensors 8 reaches the reflecting mirror 6 without being blocked and is reflected; as a result, the reflected light reaches the light-receiving part of each photoelectric sensors 8 without being blocked, and each light-receiving part continuously detects the reflected light during the appropriately set detection time (which is set to be longer than that of the photoelectric sensors 7). This means that the items to be packed 5 did not fall from the hopper 4; and this detection result is sent to the control device of the bag-filling packaging machine, and the control device determines that the hopper 4 was inserted into the bag mouth normally without problems.

[0037] On the other hand, if the lower end of the hopper 4 catches on the bag mouth edge of the bag 1 as shown in Figure 4(a) and is not inserted normally into the bag mouth and part of the bag mouth of the bag 1 is folded inside, then some of the items to be packed 5 remain inside the hopper 4 until the hopper 4 is completely withdrawn from the bag mouth of the bag 1. As a result, after the hopper 4 is halted at the idle step, the items to be packed 5 may fall into the bag 1 or outside the bag 1 from the bottom end opening of the hopper 4 as shown in Figure 5. In this case, light from the light-emitting part or its reflected light is temporarily blocked by the falling items at one or more than one of the photoelectric sensors 8, so that during that detection time there is a brief moment when one or a plurality of the corresponding light-receiving parts does not detect the reflected light. This means that the items to be packed 5 that remained inside the hopper 4 fell; and this detection result is sent to the control device of the bag-filling packaging machine, and the control device determines that insertion of the hopper 4 into the bag mouth failed.

[0038] In the above-described method for detecting the hopper insertion state, if the control device determines that the hopper 4 was inserted into the bag mouth of the bag 1 normally without problems, the packaging operations by various packaging means (the sealing device, cooling sealing device, etc.) at subsequent steps are performed as programmed; if, however, the control device determines that insertion of the hopper 4 into the bag mouth was improper and failed, then the packaging operations by various packaging means at subsequent steps are halted for the relevant bag 1, as described earlier, or the entire packaging machine is halted; and if the detection result of the photoelectric sensors 7 was failure, then controls such that the items to be packed are not injected into the hopper 4 at the item supply step position, etc. are executed.

[0039] The bag-filling packaging machine described above can be modified as, for example, describe below.

(1) In the described embodiment, the photoelectric sensors 7 for detecting deformation of the bag mouth are provided at the item supply step position. However, they can be disposed at the bag mouth opening step position, so that the presence or absence of deformation of the bag mouth is detected immediately after the hopper 4 arrives at the descended position.

(2) In the foregoing embodiment, the slider is provided at the bag mouth opening step position, and the cam roller is lowered from the high position to the low position while the table 3 is halted (the hopper 4 is lowered from the ascended position to the de-

scended position) and the lower end of the hopper 4 is inserted into the bag mouth immediately after opening. However, it is also possible to make the cam rail continuous without providing a slider and to lower the hopper 4 while rotationally moving from the bag mouth opening step position to the next halt position (the item supply step position), and insert the lower end of the hopper 4 into the bag mouth.

(3) The above embodiment uses photoelectric sensors 7 and 8. However, other types of sensors can be used as long as it is possible such sensors detect deformation of the bag mouth and falling items as described above.

[0040] Figure 6 shows another type of bag-filling packaging machine.

[0041] In the bag-filling packaging machine of Figure 6, a plurality (only one pair is shown in the drawing) of gripper pairs 12, which hold the left and right (or both side) edges of a bag 11 so that the bag hangs down, are provided at equidistant separation on the periphery of a table 13 that is rotated intermittently; and in the course of one rotation, the table 13 repeatedly is rotated and halted the same number of times as the number of gripper pairs 12.

[0042] On the periphery of the table 13, a bag supply device, a printing device, a bag mouth opening device, a hopper 14 and its raising/lowering device, an item supply device that supplies items to be packed, a sealing device, a cooling sealing device, etc. are provided. Each time the table 13 halts, the various steps are carried out including supplying of a bag to the halted gripper pair 12, printing on the bag surface, opening of the bag mouth, inserting of the hopper 14 into the bag mouth of the supplied bag and supplying of the items to be packed into the bag, sealing of the bag mouth, cooling of the seal area, etc. Subsequently, the product bag is discharged to the outside of the packaging machine.

[0043] The bag-filling packaging machine shown in Figure 6 is an ordinary rotary-type bag-filling packaging machine, and its construction and functions are conventionally known.

[0044] In the bag-filling packaging machine shown in Figure 6, the hopper 14 and its raising/lowering device are disposed at the item supply step position together with the item supply device, and the hopper 14 is raised and lowered at this item supply step position as described below.

(1) The bag 11 with its bag mouth opened by the bag mouth opening device at the bag mouth opening step position is halted at the item supply step position due to the intermittent rotation of the table 13. At this time, the hopper 14 is at its ascended position (a position at a predetermined distance from the upper end of the bag mouth) at the item supply step position.

(2) Immediately after the table 13 is halted, the hopper 14 is lowered to the descended position by the raising/lowering device, and the lower end of the hopper 14 is inserted into the bag mouth of the bag 11, and then the items to be packed are injected into the hopper 14 and pass through the hopper 14 so as to be loaded into the bag 11.

(3) The hopper 14 returns is raised to the ascended position, then the table 13 is rotated, so that the loaded bag 11 with the items is moved to the next step position (sealing step position).

[0045] In this bag-filling packaging machine shown in Figure 6, a reflecting mirror 16 is provided on the table 13 for each gripper pair 12. The reflecting mirror 16 is parallel to the tangent direction of the round table 13 on a perpendicular plane with respect to the flat surface of the table 13. In addition, a pair of reflecting-type photoelectric sensors (bag mouth detecting sensors) 17 and a group of reflecting-type photoelectric sensors (falling items detecting sensors) 18 are provided so as to face the reflecting mirror 16 at the outside of the table 13 at the above-described item supply step position.

[0046] The detection part (light passage route) of the photoelectric (bag mouth detecting) sensors 17 is set to be at essentially the same position as the detection part 9 in the bag-filling packaging machine shown in Figures 1 to 5. In other words, the detection part (light passage route) of the photoelectric sensors 17 is set at a position where abnormal deformation of a bag can be detected as required. Also, the detection parts of the photoelectric (falling items detecting) sensors 18 too are essentially the same as the detection parts in the bag-filling packaging machine shown in Figures 1 to 5. In other words, the detection parts of the photoelectric sensors 18 are set at a number of locations in the horizontal direction in the space between the lower end opening of the hopper 14 which is at the ascended position and the upper end of the bag 11.

[0047] Detection by the photoelectric sensors 17 occurs immediately after the hopper 14 reaches its descended position. Also, detection by the photoelectric sensors 18 starts at the moment when the items to be packed have been injected into the hopper 14 by the supply device and raising of the hopper 14 starts and its lower end opening tip passes the position of the detection part of the photoelectric sensors 18. As described previously, the detection time of the photoelectric sensors 17 (time from starting detection until the detection ends) is very brief, but the detection time of the photoelectric sensors 18 is preferably set somewhat longer than that of the photoelectric sensors 17 to take into account the timing of the falling of the items to be packed.

[0048] The photoelectric sensors 17 and 18 have exactly the same function as the photoelectric sensors 7 and 8 described above. Their detection result is sent to the control device of the bag-filling packaging machine, and the control device determines whether the insertion of the hopper 14 into the bag mouth is good or bad (or acceptable or not) on the same standard as that of the

control device for the bag-filling packaging machine explained in Figure 1. The control method too after the decision is the same as that of the control device for the bag-filling packaging machine explained in Figure 1, and further detailed explanation thereof is omitted.

Claims

1. A method for detecting a hopper insertion state for a bag-filling packaging machine that opens a bag mouth of a supplied bag, inserts a hopper into the bag mouth of the supplied bag, loads items to be packed into the bag via said hopper, and then withdraws said hopper from the bag mouth, said method comprising the steps of:

   detecting deformation of the bag mouth during insertion operation of said hopper into the bag mouth by bag mouth detecting sensors provided in said bag-filling packaging machine, and
   determining whether or not a hopper insertion state in the bag mouth is acceptable based on a detection result of said bag mouth detecting sensors.

2. The method for detecting a hopper insertion state according to Claim 1, wherein in said bag-filling packaging machine, both edges of the supplied bag are held by grippers so that the supplied bag is kept hanging down.

3. The method for detecting a hopper insertion state according to Claim 2, further comprising the steps of
   detecting whether or not items to be packed are falling from said hopper when the hopper is withdrawn from the bag mouth by falling items detecting sensors provided in said bag-filling packaging machine, and
   determining whether or not the hopper insertion state in the bag mouth is acceptable based on a detection result of said falling items detecting sensors.

4. A method for detecting a hopper insertion state for a bag-filling packaging machine that:

   holds both edges of a supplied bag by grippers, thus keeping the supplied bag hanging down,
   opens the bag mouth of the supplied bag,
   inserts a hopper into the bag mouth,
   loads items to be packed into the bag via said hopper, and then
   withdraws said hopper from the bag mouth;
   wherein said method comprises the steps of:

   detecting items to be packed falling from the hopper when said hopper is withdrawn from the bag mouth by falling items detecting sensors, and
   determining whether or not the hopper insertion state in the bag mouth is acceptable based on a detection result of said falling items detecting sensors.

5. The method for detecting a hopper insertion state according to any one of Claims 2 through 4, wherein said bag-filling packaging machine comprises:

   an intermittently rotating table,
   a plurality of pairs of grippers for holding both side edges of a bag so that the bag hangs down, said plurality of pairs of grippers being disposed at equidistant separation on a periphery of said intermittently rotating table, and
   a hopper that is raised and lowered at a predetermined timing and is disposed on said table so as to correspond to each respective gripper pair; and wherein
   various packaging means including a bag supply device, a bag mouth opening device, an item supply device, a sealing device are disposed on the periphery of said table; and
   various packaging operations including supplying of a bag, opening of the bag mouth, inserting of the hopper into the bag mouth, loading of the items to be packed in to the bag, withdrawing of the hopper from the bag mouth, sealing of the bag mouth are performed when said table is rotated once.

FIG. 1

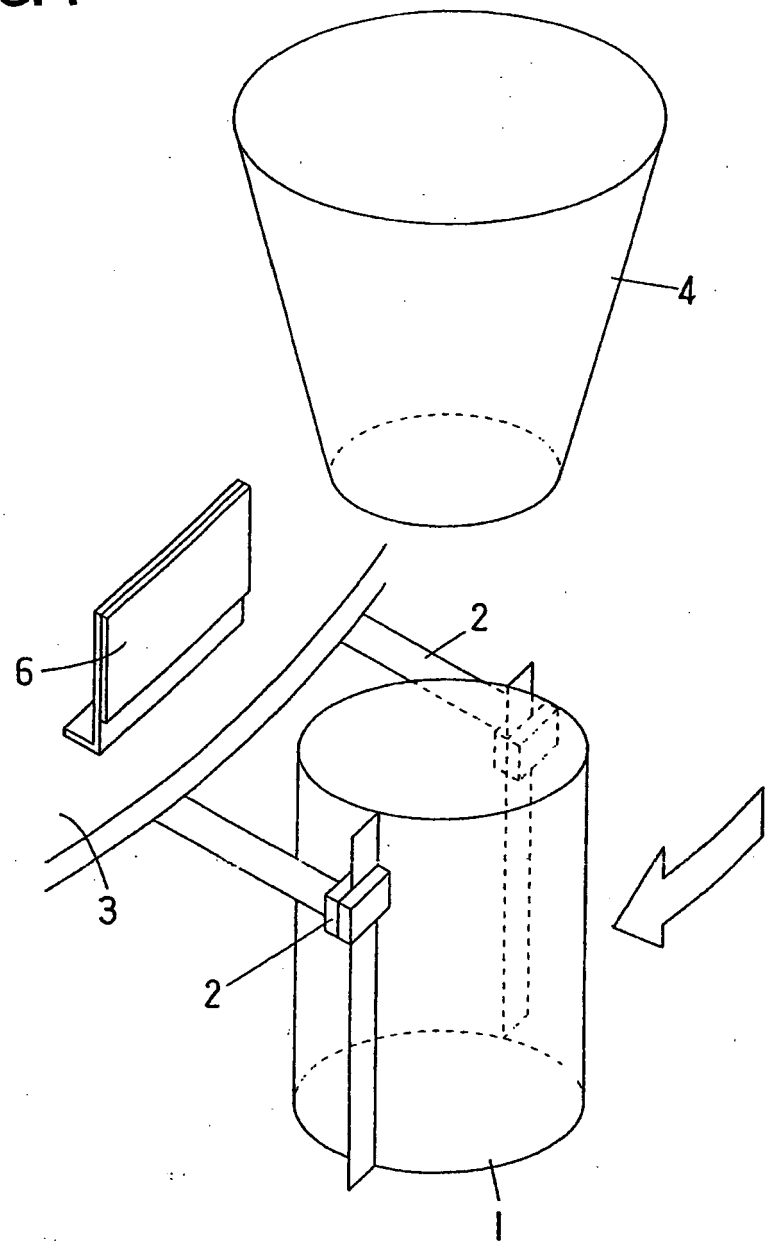


FIG. 2(a)

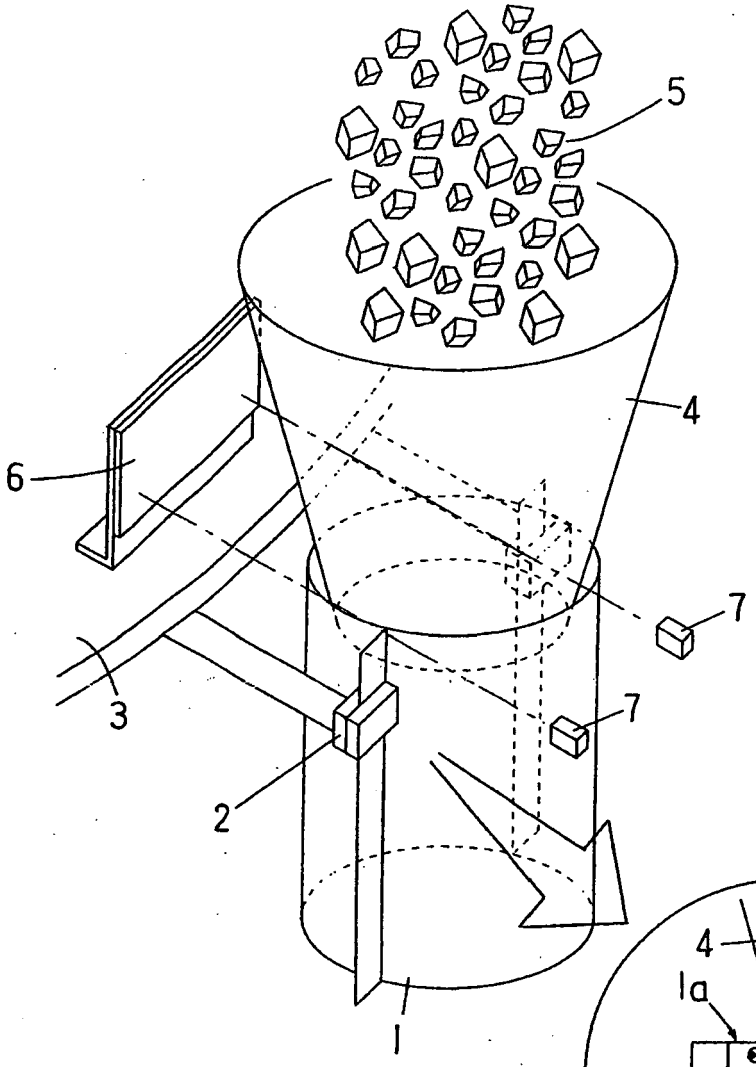


FIG. 2(b)

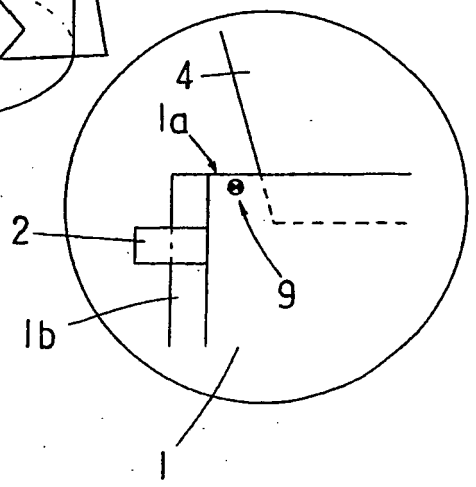


FIG. 3

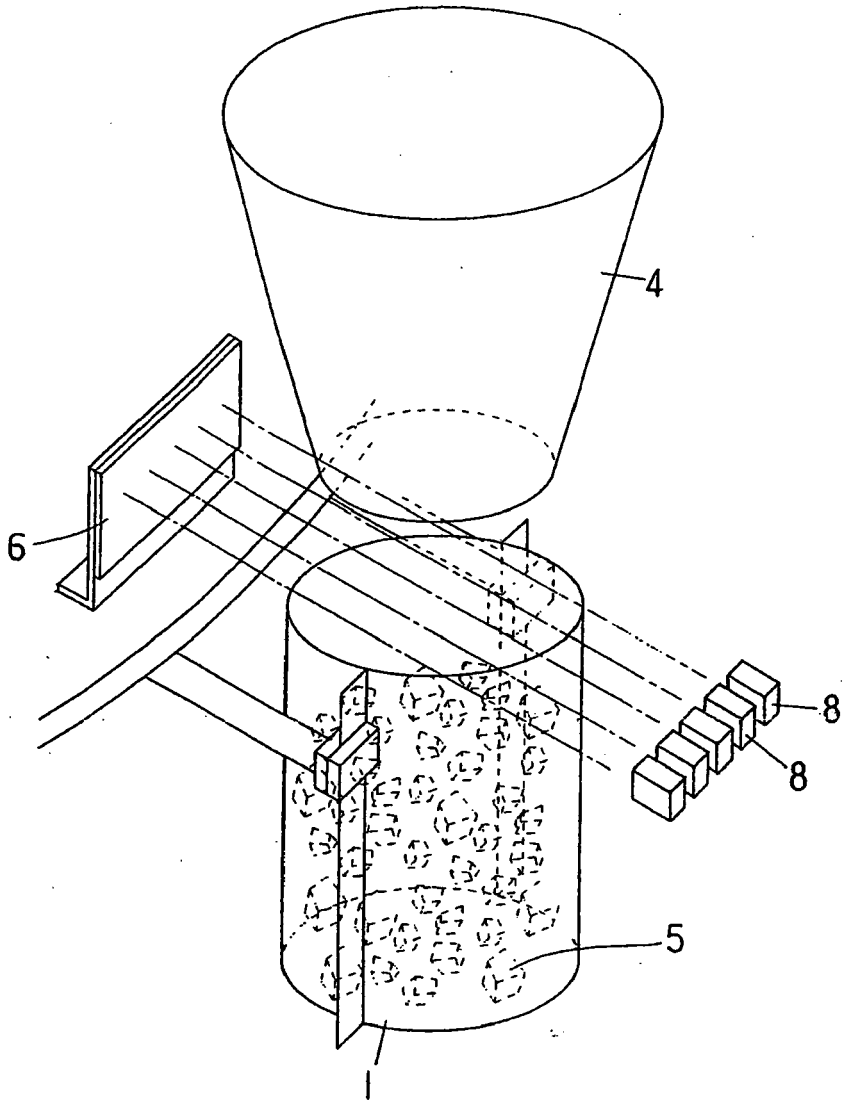


FIG. 4(a)

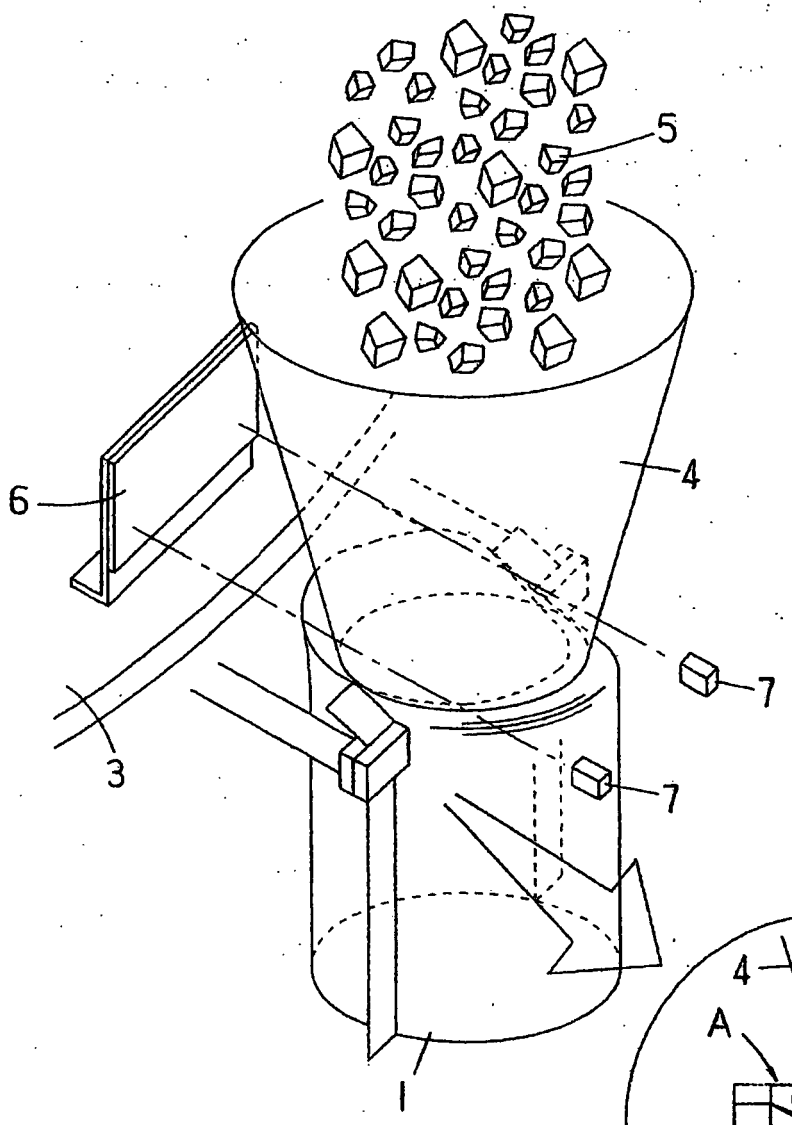


FIG. 4(b)

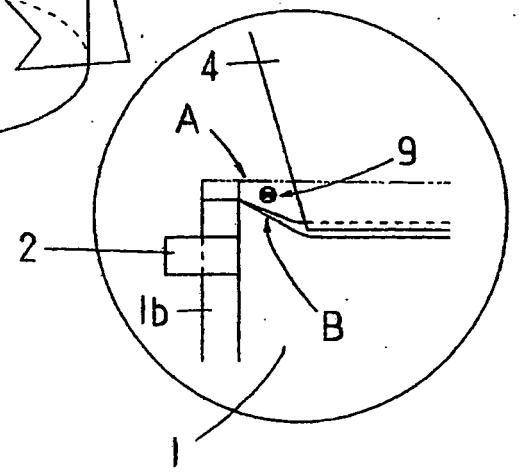


FIG. 5

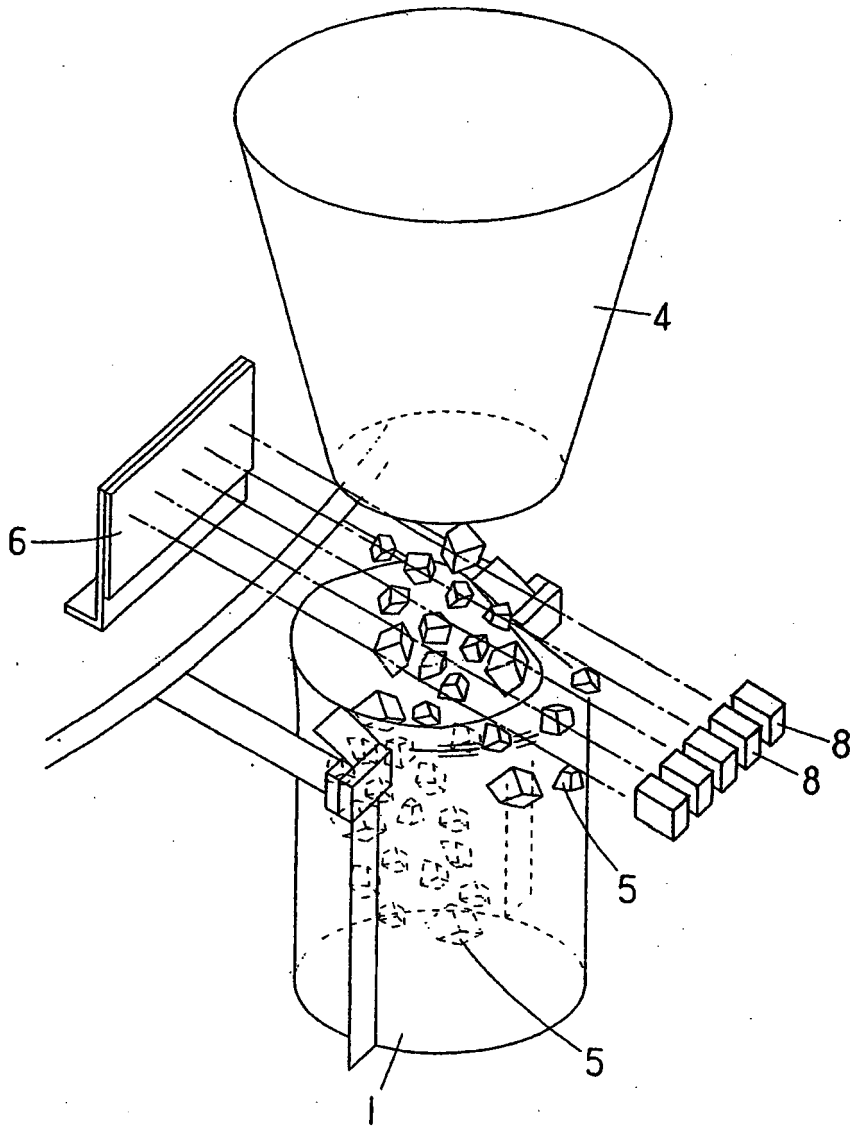
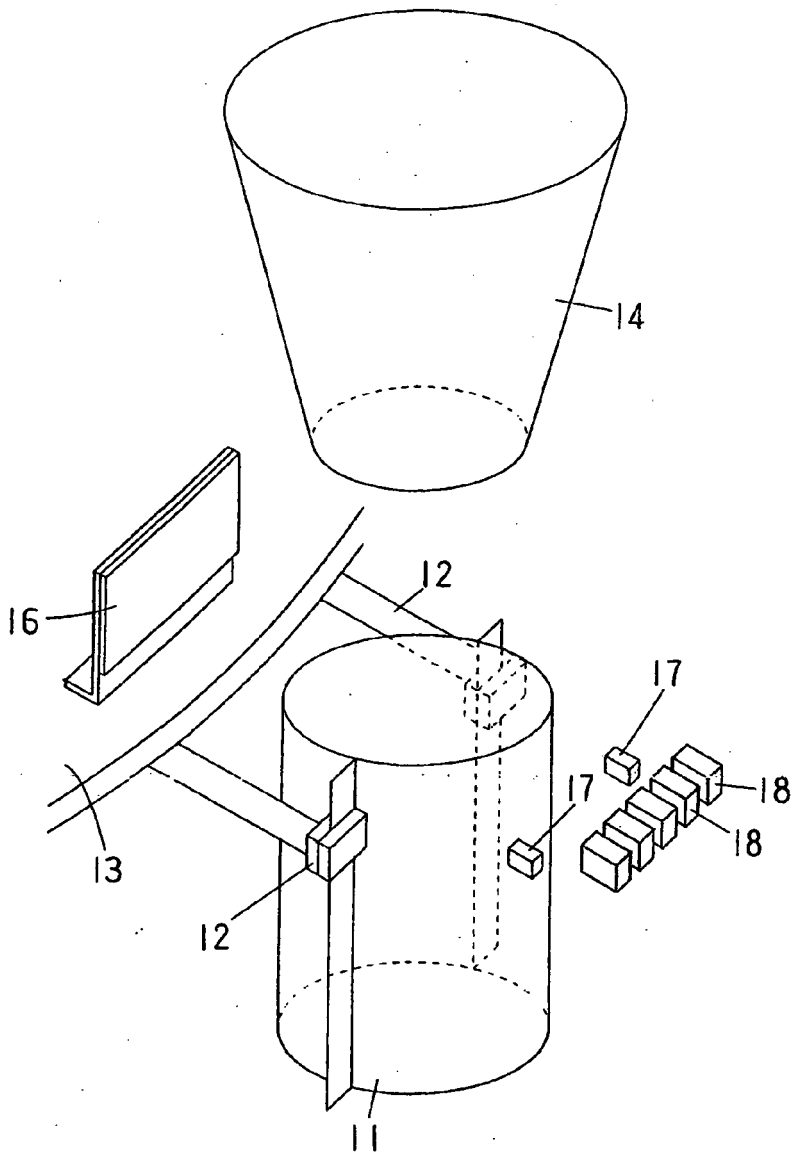


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 06 01 1194

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Place of search	Date of completion of the search	Examiner
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