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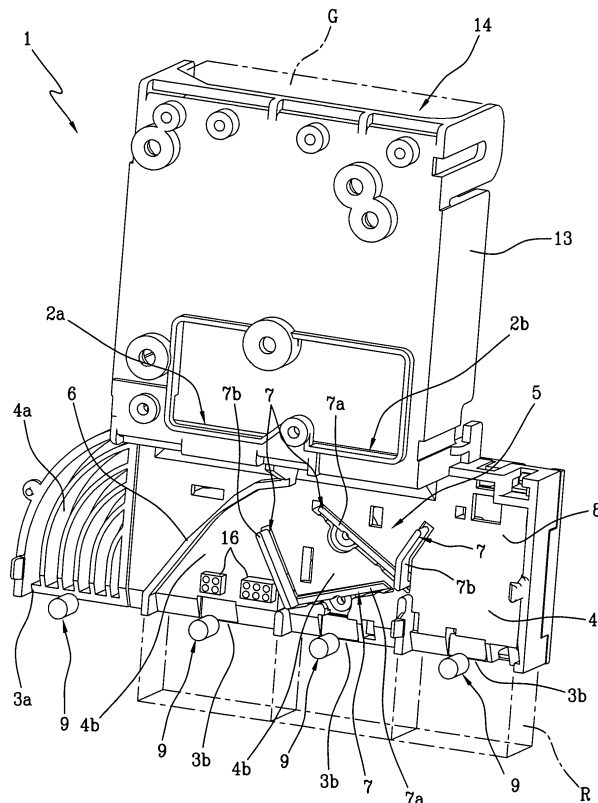
(54) **Device for sorting coins**

(57) A device for sorting coins that have been already recognised comprises at least one inlet section (2a, 2b) adapted to receive a coin of which an identification parameter is known, at least two outlet sections (3a, 3b) and sorting means (5) adapted to define at least two coin-

sorting paths (4a, 4b) between said inlet section (2a, 2b) and outlet sections (3a, 3b), in a selective manner depending on the identification parameter.

At least at one outlet section (3a, 3b), the sorting device (1) comprises at least one passage detector (9) suitable for checking transit of the coin.

FIG 2



Description

[0001] The present invention relates to a device for sorting coins.

[0002] In particular, the invention is to be employed in sorting coins that have been already recognised based on an identification parameter such as value, size, weight or component material.

[0003] Use of this type of device is particularly advantageous in coin dispensers, such as gambling machines, parking meters, moneychangers, drink or food dispensers or in general in devices capable of emitting or paying out coins in the form of change or wins, for example.

[0004] It is known that in these apparatus there is the presence of a device capable of validating the coins, commonly referred to as "token machine", i.e. capable of recognising whether the coin inserted by the user through an inlet slot is valid. Similar devices are also able to recognise the coin value based on an identification parameter such as the diameter, shape, weight or type of material of which the coin is made.

[0005] In other words, based on the identification parameters, the machine associates the inserted coin with a given value.

[0006] Some types of machines are not designed for emitting money to the user. Therefore, once the coin has been inserted and recognised by the "token machine", it runs along a channel conveying the coin to a collection container where coins of any value are stored in an indiscriminate manner or, should the coin be judged as non valid, it will take a reject path to be returned to the user.

[0007] Other types of machines, such as videogames present in bars or in playrooms, or machines for carrying out payments, such as those present in motorway toll-booths or parking meters, or also machines for buying assets of various kinds such as dispensers of travel tickets, drinks, snacks, newspapers, or yet coin-operated public telephones or moneychanging devices, involve return of an exact amount of money in the form of coins.

[0008] All money introduced by the user therefore is not always collected in an indiscriminate manner into a single container, but it is arranged in respective collecting containers based on its value, so that the machine can directly draw money out of these containers to pay out the possible change or win.

[0009] These collecting containers can be periodically supplied manually by an operator, or supplied in an automatic manner by the "token machine" placed upstream of the collecting containers, through a sorting device.

[0010] For facing up to the small capacity of the collecting containers, in the machines presently in operation or carrying out distribution, there is a tendency to install a sorting device automatically supplying the individual collecting containers, downstream of the "token machine".

[0011] In other words, once the coin inserted by the user has been recognised by the "token machine", it is sent to a coin-sorting device placed between the "token

machine" and the collecting containers.

[0012] The sorting device generally has two inlet sections, one for the accepted coins and one for the coins to be rejected, and three or more outlet sections, of which one is dedicated to return of the coins that are not accepted and the others are intended for collecting the coins in suitable collecting containers, based on their value. In addition between the inlet and outlet sorting means is interposed that, based on the command received by the "token machine", is such arranged as to define a precise path along which the coin must run to reach the correct outlet and therefore the exact collecting container.

[0013] This sorting means can take different configurations; it can be chutes defining channels, against which the coin rebounds until it reaches the correct outlet section and is gathered with the other coins having the same value.

[0014] Disadvantageously, mechanical errors occur with some frequency, due for example to a wrong positioning of the chutes and a too violent rebound of a coin against the channel walls, so that it is directed to the wrong collecting container and a correct sorting of the coin is inhibited.

[0015] This error can be disadvantageous both for the user and the installation operator.

[0016] In fact obviously, if due to a wrong sorting of the coins, coins having a higher value are dispensed instead of small-denomination coins, and if such a mistake takes place frequently, the machine operator will suffer pecuniary losses, also taking into account the fact that generally such a malfunction is not signalled either by the machine or by the user. On the other hand, when coins of lower value are dispensed instead of coins of high value, losses will be suffered by the user.

[0017] Under this situation, the technical task underlying the present invention is to propose a device for sorting coins capable of obviating the above mentioned drawbacks.

[0018] Within the scope of this technical task, the main aim of the present invention is to make available a device for sorting coins which has a high reliability in sorting.

[0019] Another aim of the invention is to make available a device for sorting coins which is capable of signalling possible sorting errors, and therefore enabling an efficient control on the correct conveyance of the coins.

[0020] It is finally a further aim of the invention to provide a device for sorting coins capable of controlling possible malfunctions of the device itself, so as to prevent the operator or user from being subjected to even minimum pecuniary losses.

[0021] The technical task mentioned and the aims specified are substantially achieved by a device for sorting coins, characterised in that it comprises the technical features of one or more of the appended claims.

[0022] Description of a preferred embodiment of a device for sorting coins is now given hereinafter by way of nonlimiting example, in accordance with the accompanying drawings, in which:

- Fig. 1 is a perspective exploded view of a device for sorting coins in accordance with the invention, in a preferred embodiment thereof;
- Fig. 2 is a perspective front view of a device for sorting coins in accordance with the invention, with some parts removed for better understanding of others;
- Fig. 3 is a perspective rear view of a device for sorting coins in accordance with the invention, with some parts removed for better understanding of others.

[0023] A device for sorting coins in accordance with the invention is identified with reference numeral 1 in the accompanying figures.

[0024] The sorting device 1 comprises at least one inlet section 2a; 2b, suitable for receiving an already recognised coin, i.e. of which an identification parameter is known which is determined upstream of the whole travel covered by the coin, by a device of known type and commonly referred to as "token machine" G, which is capable of validating and discriminating the coins. In other words, this device is able to recognise whether the coin is valid and consequently to identify the respective value based on an identification parameter such as the diameter, shape, weight or type of material of which the coin is made.

[0025] The sorting device 1 further comprises at least two outlet sections 3a, 3b of which preferably at least one is a reject section 3a directly communicating with the outside through a channel of fixed geometry 4a for return of the non-accepted coins.

[0026] Alternative configurations, not shown, contemplate a sorting device comprising a single inlet section and a plurality of outlet sections, none of which is a reject section. This device is also devoid of the channel of fixed geometry through which the coins that are believed to be non-valid by the "token machine" are returned to the user. In fact, in this case the non-accepted coins are conveyed to the outside through a duct directly connected to the "token machine" without therefore passing through the sorting device.

[0027] In the preferred configuration herein shown, at least two inlet sections 2a and 2b and four outlet sections 3a and 3b are instead present.

[0028] In particular, a first inlet section 2b is intended for admission into the sorting device 1 of the validated coins to be sorted, while the second inlet section 2a is used for introduction into the sorting device of the coins to be rejected and to be returned to the user.

[0029] On the contrary the outlet sections comprise a reject section 3a receiving through the fixed channel 4a, the coins to be rejected that have been selected by the "token machine" G and sent therefrom to inlet 2a, and directly sending them to the outside thereby allowing return to the user of the non-accepted coins.

[0030] The other outlet sections 3b each communicate, through respective sorting channels 4b defined by sorting means 5, with a coin-collecting container R or collecting magazine, each dedicated to one type of coin

alone.

[0031] Said sorting means 5 is interposed between the inlet sections 2b and the outlet sections 3b and defines the path that the coin must follow, in a selective manner depending on the identification parameter. In particular, the sorting means 5 comprises a plurality of movable bodies adapted to take at least one first and one second operating position to define different sorting paths 4a; 4b. Said movable bodies comprise rotating elements or slidable partitions or swinging walls, for example.

[0032] In the preferred configuration shown in the accompanying drawings, the sorting means 5 comprises a fixed wall 6 separating the reject channel 4a from the sorting channels 4b, and a plurality of movable bodies each consisting of two partitions 7; the movable bodies are selectively shiftable between at least a first and a second operating positions so as to define said sorting paths 4b. These bodies 7 therefore are positioned between the second inlet section 2b and the outlet sections 3b communicating with the coin-collecting containers R or coin-collecting magazines.

[0033] In detail, in the first operating position of the movable body the first one of the two partitions 7 is at a backward location and fully buried in a bottom wall 8 so that it does not interfere with the path of the coin passing through the sorting device, thereby enabling passage thereof; conversely, the second one 7b of the two partitions 7 defines an abutment surface emerging in cantilevered fashion from the bottom wall 8 so as to intercept and deviate the coin passing therethrough.

[0034] In the second operating position the movable bodies are translated by suitable actuating means 11 so that the first one 7a of the two partitions 7 emerges in cantilevered fashion from the bottom wall 8 thereby intercepting and deviating the coin along its path; conversely, the second one 7b of the two partitions 7 further emerges from the bottom wall 8 from which it moves away, thereby defining a passage between the bottom wall itself and the partition. Therefore in this configuration the coin can cross the passage without being intercepted by the second partition 7b.

[0035] By adopting the two movable bodies of the above described type, the validated coins entering section 2b can be addressed to three different outlets 3b.

[0036] In the configuration seen in Fig. 2 (first operating position of both movable bodies) the coin will be addressed to the central collecting magazine.

[0037] Should the movable body be brought to its second operating position, the coin would be intercepted by the first partition 7a of the upper movable body and addressed to the magazine mostly on the right.

[0038] On the contrary, should the lower movable body alone be moved from the configuration seen in Fig. 2 to the second operating position the coin would be intercepted by the first partition 7a of the lower movable body and deviated towards the first magazine on the left.

[0039] Therefore, the combination of partitions 7a, 7b that are alternately activated and deactivated, and con-

sequently the particular sorting path that is identified, depend on the outlet section towards which the coin must be addressed.

[0040] The sorting device 1 also has a plurality of passage detectors 9 adapted to control passage of the coin at each outlet section 3a and 3b, or at least at the only outlet sections 3b for coin collection.

[0041] The passage detectors 9 can comprise optical target sensors or reflection sensors, provided with compensation (via software, for example) of the variations introduced by possible dirt present therein; alternatively Hall-effect sensors can be provided.

[0042] Yet alternatively, the passage detectors 9 may also comprise sensors of the capacitive type.

[0043] Generally, the passage detectors 9 will have the only function of signalling transit of the coin since in this step no recognition of the latter is required.

[0044] Also present is a management unit 10 co-operating with the coin-recognising device G and adapted both to drive the sorting means 5 through the actuating means 11, and to receive information from the passage detectors 9.

[0045] The actuating means 11 by way of example comprises solenoids or electric motors designed to move the movable bodies between the two above described operating positions.

[0046] In the preferred configuration herein shown, this actuating means 11 consists of solenoids piloted by the management unit 10 depending on an addressing signal that the management unit 10 receives as an input by the coin-recognising device G. Following this addressing signal, solenoids 11 selectively move partitions 7 defining the correct sorting path 4b that the coin must take for being addressed to the desired outlet section 3b.

[0047] Following passage of the coin through an outlet section 3b, the passage detector 9 positioned at this outlet emits a control signal (occurred passage) that is sent to the management unit 10. The management unit 10 verifies such a signal and controls its correspondence with the expected signal (correct addressing of the coin).

[0048] As viewed from Fig. 1, the management unit 10 is applied onto a support 12 and is connected through connectors 16 both to the coin-recognising device G from which it will receive at least information concerning recognition of the coin for correct addressing of same, and to other control units of the machinery incorporating the "token machine" and sorting device.

[0049] The management unit 10 is also able to monitor the sorting device 1 with a programmed check and to detect possible malfunctions, in particular through verification of the correct operation of the actuating means 11.

[0050] To this aim, the management unit will be able to carry out current measurement in the solenoid windings detecting possible short-circuits, circuit breaks and/or incomplete or missed mechanical stroke of the actuator of the solenoid (i.e. malfunctions).

[0051] The sorting device 1 further comprises a supporting frame 13 including a seat 14 designed to house

the coin-recognising device G. At an intermediate region of the supporting frame 13, located under the seat 14, there is a partition 15 in which the inlet sections 2a and 2b of the sorting device 1 are formed and through which the coin-recognising device G is brought into direct communication with the sorting device 1.

[0052] All that is mounted within a machine capable of dispensing coins.

[0053] The user introduces a coin into the machine, which coin is recognised by the coin-recognising device or "token machine" G. If the coin is believed to be non-valid, it is addressed to the inlet section 2a and directly to the reject outlet 3a. If on the contrary the coin is valid, the coin-recognising device G sends an addressing signal to the management unit 10 for activation of the actuating means 11, i.e. the solenoids. The latter are selectively activated and consequently move the sorting means 5 depending on the identification parameter, thereby generating the correct arrangement of partitions 7a, 7b delimiting the correct sorting path 4b, capable of connecting the second inlet section 2b with the desired outlet 3b.

[0054] The present invention achieves the intended purposes.

[0055] If the coin passes through the correct outlet, the management unit 10 receives the control signal from the passage detector 9 corresponding to the outlet established by the coin-recognising device G, checking correct addressing of the coin.

[0056] If on the contrary, a mechanical error has occurred, the management unit 10 receives the control signal from the wrong passage detector 9, i.e. the one placed at an outlet through which no passage of coin was expected; as a consequence of this, the management unit 10 signals the occurred error to a unit designed for that function. Signalling of mistakes in sorting enables an efficient control on the correct addressing of the coins.

[0057] The machine's arrangement following reception of the signal of error depends on the design choices and is beyond the protection field of the present invention.

[0058] The passage detectors 9 also have the function to inform the management unit 10 about the occurred transit of the coin through the outlet section, so as to be sure that the coin has completed its path from the coin-recognising device G to the sorting device. This information guarantees that the coin did not stop at some point inside the machine and that therefore the whole path is clear and ready for passage of another coin. In addition, the passage detectors 9 are also able to supply the management unit 10 with the information concerning the instant at which the coin comes out of the sorting device, so as to optimise and close the operating cycle of the sorting device 1. Detection of the instant at which the coin is ready for coming out of the sorting device enables the operating cycle of the solenoids to be fed back, closing it typically in advance relative to the timed command used in the machines currently on the market. This feature allows an improvement of the whole transit time in

the coin-recognising device.

[0059] Checking carried out by the management unit in a programmed and automatic manner prevents the machinery from going on running in the presence of possible malfunctions.

Claims

1. A device for sorting coins that have been already identified comprising at least one inlet section (2a; 2b) adapted to receive a coin of which an identification parameter is known, at least two outlet sections (3a; 3b), sorting means (5) suitable for defining at least two coin-sorting paths (4a, 4b) between said inlet section (2a; 2b) and outlet sections (3a; 3b), in a selective manner depending on the identification parameter, **characterised in that** at least at one outlet section (3a, 3b) it comprises at least one passage detector (9) suitable for checking transit of the coin.
2. A device as claimed in claim 1, **characterised in that** between said inlet section (2a; 2b) and outlet sections (3a; 3b) no device is present which is suitable for recognition of the coins passing through said sorting unit (1).
3. A device as claimed in claim 2, **characterised in that** it comprises a management unit (10) for management of the sorting means (5) in order to define the sorting paths (4a; 4b); said passage detectors (9) being interlocked with said management unit (10) to signal transit of the coin.
4. A device as claimed in claim 3, **characterised in that** it comprises actuating means (11) to move said sorting means (5); the management unit (10) operating said actuating means (11) depending on the identification parameter, so as to select a given coin-sorting path (4b).
5. A device as claimed in claim 4, **characterised in that** said management unit (10) receives an addressing signal as an input which is a function of the identification parameter of the coin, the actuating means (11) being activated by the management unit (10) to define the sorting path (4b) and address the coin to the desired outlet section (3b) determined by said addressing signal, the passage detector (9) emitting a control signal corresponding to the outlet section (3b) passed through by the coin, the management unit (10) verifying the correct addressing of the coin through said control signal.
6. A device as claimed in claim 2 or 5, **characterised in that** said management unit (10) is suitable for checking malfunctions present in the device (1) for sorting coins, preferably for checking correct operation of the actuating means (11).
7. A device as claimed in one of the preceding claims, **characterised in that** said sorting means (5) is movable bodies adapted to take at least one first and one second operating positions for defining different sorting paths (4a, 4b).
8. A device as claimed in claim 7, **characterised in that** said movable bodies comprise at least two slidable partitions (7); in a first operating position of the movable body, the first slidable partition enables passage of the coin and the second one inhibits passage of the coin, while in a second operating position of the movable body the first slidable partition inhibits passage of the coin and the second one enables passage of the coin.
9. A device as claimed in one of the preceding claims, **characterised in that** it comprises at least two inlet sections (2a, 2b) and at least three outlet sections (3a, 3b), said inlet sections (2a, 2b) comprising a first inlet (2a) suitable for reception of the coins to be rejected and a second inlet suitable for reception of the coins that, being already recognised based on the identification parameter, are to be sorted, said outlet sections (3a, 3b) comprising a first outlet (3a) adapted to be passed through by the coins to be rejected and directly in connection with the first inlet (2a) through a reject path (4a) of a preferably fixed geometry, and at least two outlets (3b), each adapted to be passed through by a given type of coin that has been already selected based on the identification parameter; said sorting means (5) being active between said second inlet (2a) and said at least two outlets (3b) for identification of the sorting paths (4b).
10. A device as claimed in anyone of the preceding claims, **characterised in that** it comprises a supporting frame (13) including a seat (14) designed to house a device (G) suitable for recognition of the coins and a partition (15), located under said seat (14) and defining the inlet sections (2a, 2b) of the sorting device (1), and through which the coin-recognising device (G) is in direct communication with the sorting paths (4a, 4b).
11. A device as claimed in anyone of the preceding claims, **characterised in that** the passage detector (9) is a sensor, an optical sensor of the target or reflection type for example, each of the outlets (3b) adapted to be passed through by a valid coin that has been already recognised being provided with a respective passage detector (9).

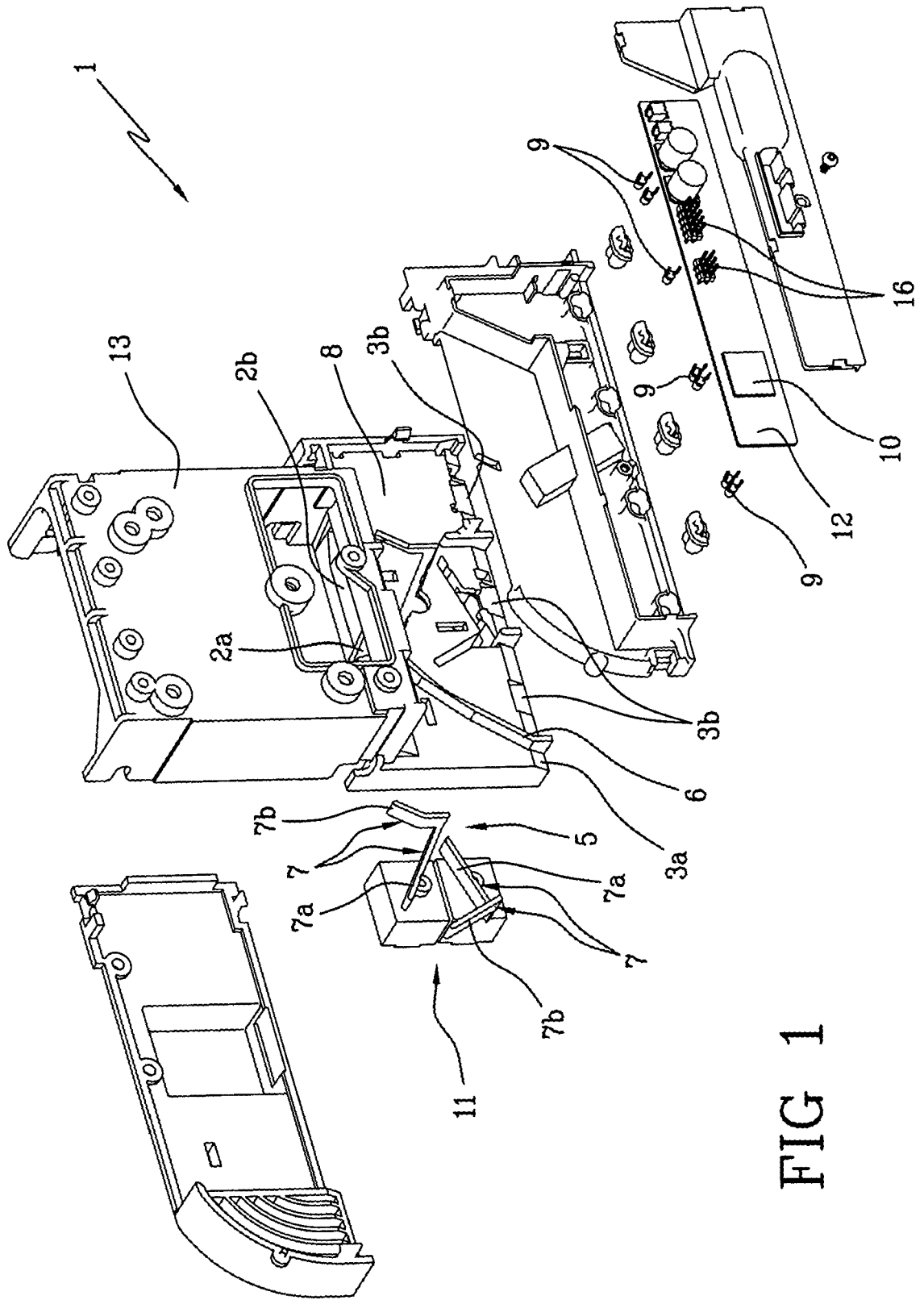


FIG 1

FIG 2

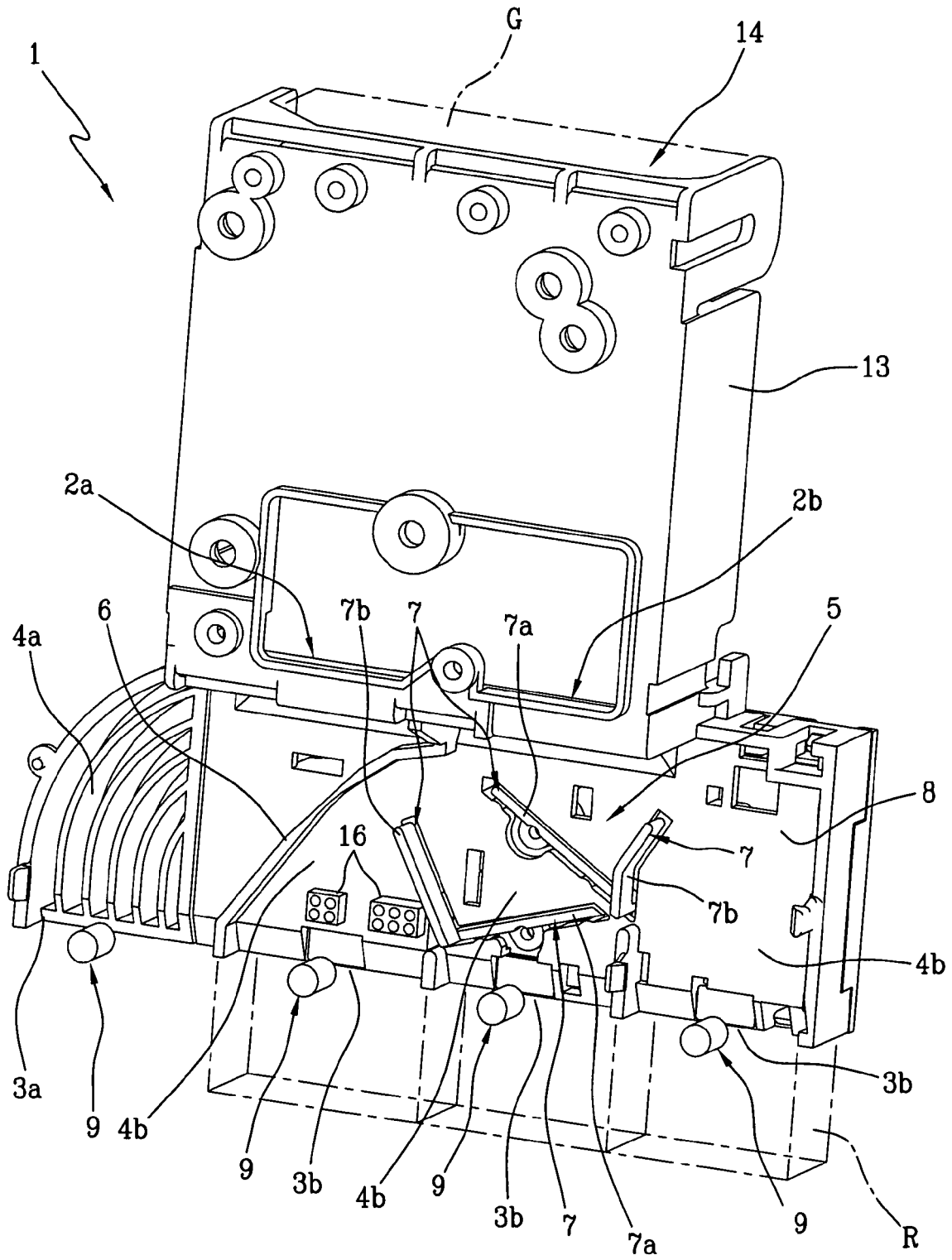
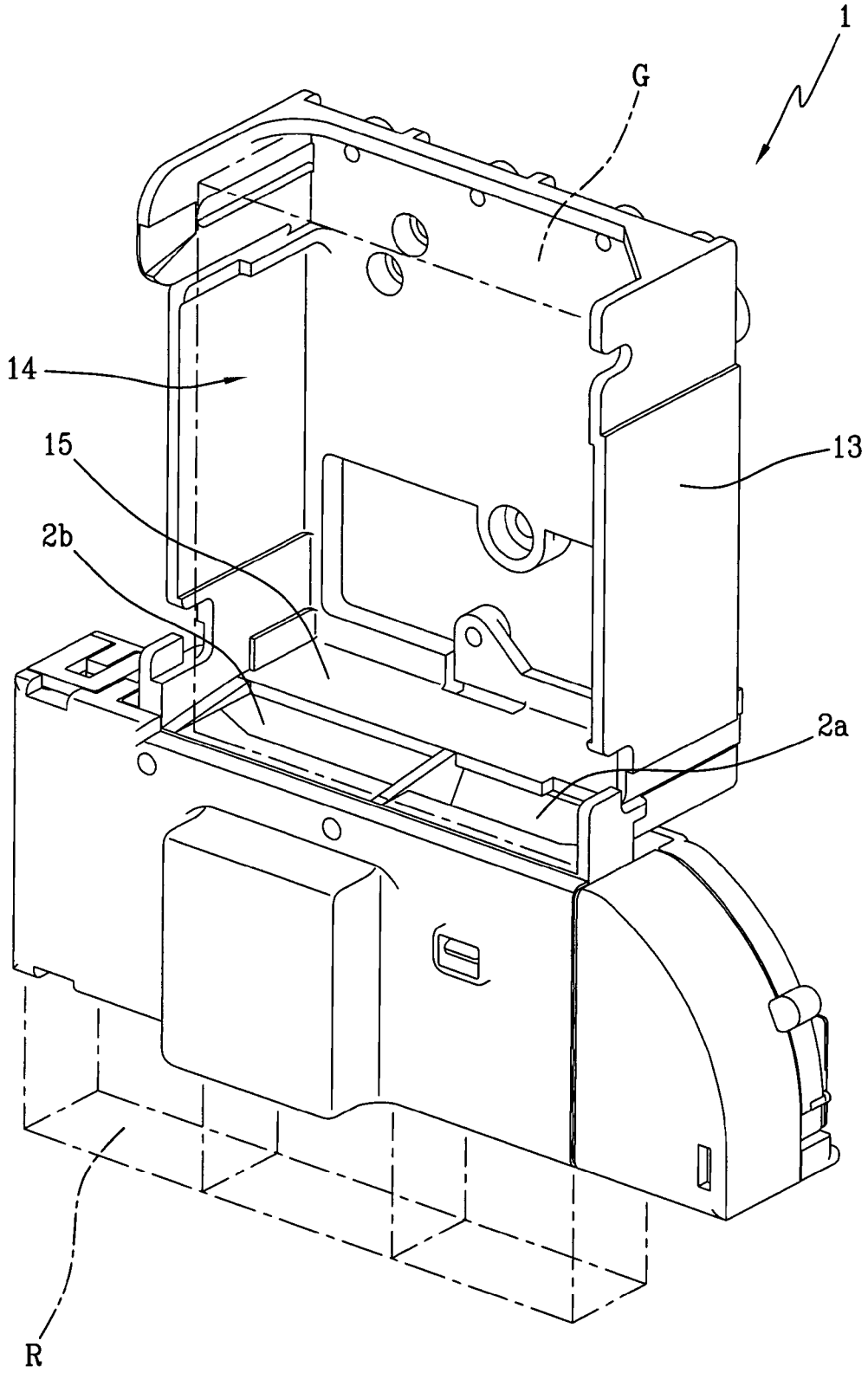


FIG 3



ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 07 42 5135

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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17-08-2007

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