(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 494 179 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
05.01.2005 Bulletin 2005/01

(51) Int Cl.[7]: **G07F 5/24**

(21) Application number: **04380134.9**

(22) Date of filing: **29.06.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

(30) Priority: **30.06.2003 ES 200301519**

(71) Applicant: **Azkoyen Medios de Pago, S.A.**
31350 Peralta (Navarra) (ES)

(72) Inventors:
- **Castany Valeri, Javier**
  31350 Peralta (Navarra) (ES)
- **Serraller Sanchez, Francisco**
  31350 Peralta (Navarra) (ES)
- **Sanz de Galdeano, Luis Santos**
  31350 Peralta (Navarra) (ES)
- **Valencia Zoroza, Jesus Luis**
  31350 Peralta (Navarra) (ES)

(74) Representative: **Carvajal y Urquijo, Isabel et al**
Clarke, Modet & Co.,
C/ Goya No. 11
28001 Madrid (ES)

(54) Change giver

(57) A change giver for automatic vending machines including a coin selector (10) situated above a coin sorter (20), which in turn is situated above four change tubes (30), which tubes are substantially arranged in single file, an extraction system (40) for extracting the coins stored in the change tubes and a casing (50); which sorter comprises first and second blades (P1, P2) hinged by an essentially horizontal shaft; a platform situated below the second blade (P2); a central support situated between a front and a rear support of the sorter, where said platform is conformed; a third blade (P3) hinged by an essentially vertical shaft, this third blade (P3) being situated to one side of said first and second blades in the forward movement direction of the coin, and a fourth linearly movable blade (P4) traversing the central support.

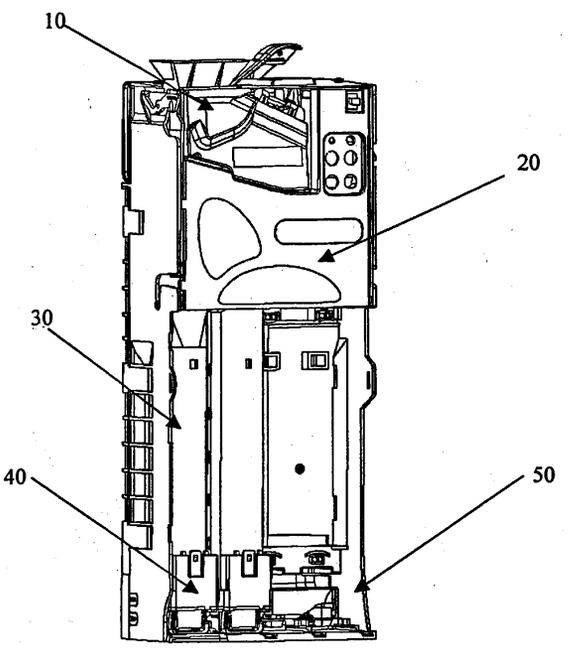

Figura 1

EP 1 494 179 A2

Description

Field of the Invention

[0001] The present invention relates to a change giver of the type used in machines, the operation of which is carried out by means of introducing one or more coins of sufficient value to obtain the requested product or service.

Background of the Invention

[0002] The function of a change giver within this type of automatic vending machines is to carry out the entire sales process, i.e. the recognition of all the programmed coins, their appraisal and classification of, for example, four types of them, for their subsequent use as returned change.

[0003] In some cases, these change givers also enable, for example, using suitable reading devices, the acceptance of different bills, as well as bank or pre-payment cards.

[0004] The change giver usually includes the following main components:

- coin selector,
- sorter,
- change tubes,
- coin extraction system,
- casing, and
- electronic control.

[0005] The function of the selector is to validate and appraise the different coins introduced. To that end the selector has the information corresponding to the features of the coins to be accepted and compares them with those of the introduced coins. The parameters or features of the coin which the selector usually measures are: sound of the coin when striking against, for example, a metal part, size of the coin and electrical and magnetic features of the material or materials making up the coin.

[0006] For its part, the function of the sorter is to divert the coins towards the change tube corresponding to their value, or towards the vault or towards the return chute, always according to the value of the coin, the filled condition of the tubes or of other external conditions imposed by the vending machine.

[0007] The coin extractor system allows for the individual and unitary extraction of the coins stored in the change tubes, which are what store the coins which will be used as coins for change.

Description of the Invention

[0008] The invention relates to a change giver according to claim 1; preferred embodiments of the change giver are defined in the dependent claims.

[0009] The change giver for automatic vending machines of the invention includes a coin selector, situated above a coin sorter, which in turn is situated above four change tubes, which tubes are substantially arranged in single file, an extraction system for extracting the coins stored in the change tubes and a casing; said sorter comprises:

a first and second blade hinged by an essentially horizontal shaft, which can be actuated by respective first and second electromagnets, the first blade situated above the second blade,
a front and a support,
a platform situated below the second blade and tilted with regard to the horizontal towards the inside of the sorter, such that when the first and second blades are actuated by their corresponding electromagnets, a coin entering in the sorter falls on said platform and rolls towards the lower portion of said platform.

[0010] The sorter furthermore comprises:

a central support situated between the front and the rear support of the sorter, where said platform is conformed,
a third blade hinged by an essentially vertical shaft, which can be actuated by a third electromagnet, this third blade being situated to one side of said first and second blades in the forward movement direction of the coin, and
the lower portion of which is constituted of a span of rolling track extending towards the front portion of the sorter on a tilted plane and towards the rear portion on a substantially horizontal plane, said span of rolling track being situated under the second blade, such that a coin which has rolled on said platform falls onto said lower portion of the third blade, in its span of front or rear rolling track, according to whether or not the third electromagnet is

actuated, and

a fourth linearly shiftable blade traversing the central support and which can be actuated by a fourth electromagnet, having an L shape, the upper branch of which is substantially vertical and the lower branch of which is tilted, this lower branch constituting a section of rolling track for the coin, both branches extending towards the front and rear portion of the sorter and respective grooves, such that the coin will be led towards a different one of the four change tubes according to whether or not the blade is actuated by its corresponding electromagnet.

[0011] Preferably, the substantially vertical upper branch of the fourth blade is slightly curved, being a concave curve on which the coin stops in its forward movement through the change giver, the change giver being in its assembly position.

[0012] One, several or all of the electromagnets preferably include an extra injection of plastic part on its movable portion, which carries out the function of anti-remanence. The change giver preferably includes electromagnet actuation control means; more preferably, said actuation control means consist of feeding the electromagnets by means of a short pulse train.

[0013] The sorter preferably includes coin passage detection means, including an optical system of the emitter-receiver type measuring the reflection in the coin, in which the emitter is fed by means of pulses and the reflected signal is measured by means of the receiver both in the instances of time in which the emitter is active and during those in which it remains inactive, calculating the difference between the two states and providing a coin detection signal when the difference exceeds a determined threshold.

Brief Description of the Drawings

[0014] A series of drawings helping to better understand the invention and which are expressly related to an embodiment of said invention, presented as a non-limiting example thereof, will be very briefly described below.

Figure 1 shows a frontal view of some of the main components of a preferred embodiment of the change giver of the present invention.

Figure 2a shows a perspective view of some of the parts of the selector + sorter assembly.

Figure 2b shows a view similar to that of Figure 2a, but in which the front of the sort has been removed for greater clarity.

Figure 2c shows the lower portion of the sorter, the outlets to tubes A, B, C and D, to the vault and to recovery are detailed.

Figure 3 shows the portion of the sorter in which the "acceptance-rejection" blade and its corresponding electromagnet are located.

Figure 4 shows another portion of the sorter, with the vault blades, the plane change blade and the linear shifting blade.

Figure 5 shows the plane change blade in a first position, which opens a path for the coins sorted in tubes A and C.

Figure 6 shows the plane change blade in a second position, which opens a path for the coins sorted in tubes D and B.

Figure 7 shows another portion of the sorter, where the shifting blade is located.

Figure 7a shows an internal detail of the sorter in which the tilt of the rolling ramp is seen, and in which another possible shape of the shifting blade is shown.

Figure 8 shows a detail of the joining of the change tubes to the extraction system.

Figures 9 and 10 show a detail of the anchoring of the modules making up the extraction system to the casing of the change giver.

Figure 11 shows a detail of the handle provided on the rear portion of each extraction module.

Figure 12a shows the upper cover of the sorter assembly.

Figure 12b shows the decorative cover of the coin sorter.

Figure 13 shows the cylindrically shaped sliding ramp provided for collecting and guiding the coins to the exterior from the front portion of the extraction system.

Figure 14 shows the section of rolling ramp for the extraction of coins from tube D.

Figure 15 shows the connector of the extraction system to the control card.

Figures 16 and 17 show an embodiment of the stop defining the thickness of the coins, which is inserted in the change tubes.

Figures 18 and 19 show the casing of the change giver of the invention, with its special design and ribs.

Figures 20, 21 and 22 show details of the casing and the different elements forming part of it.

Figure 23 shows other details of the casing, such as the special design of the transverse guides, their grooves and openings provided thereon.

Figure 24 shows another detail of the casing, where the "path" the casing leaves so that the cable bundle forms a loop is shown.
Figure 25 shows the decorative access cover to the change tubes.

Description of a Preferred Embodiment

[0015] Figure 1 shows the main components of the change giver, arranged according to a preferred embodiment of the present invention:

- coin selector 10,
- sorter 20,
- coin storage and return, made up of change tubes 30 and an extraction system 40,
- casing 50, and
- electronic control.

Coin Selector:

[0016] The selector 10 used in the present change giver is similar to that disclosed in Spanish patent application number 200101875, filed by Azkoyen Medios de Pago, S.A. on 9 August, 2001, and related to a "coin selector". Therefore, the selector 10 is made up of independent modules which can be mechanically, electrically and/or optically coupled to one another and/or on a frame. The selector 10 includes a sensor module, including a path in which a coin 100 has a series of sensors capable of detecting the value and validity of the coins. The manner in which the selector 10 incorporated in the change giver of the invention selects a coin while it passes through the path is disclosed in the following patent applications: Spanish patent application number 200301040, filed by Azkoyen Medios de Pago, S.A. on 7 May, 2003; European patent application EP 03380018.6, filed by Azkoyen Medios de Pago, S.A. on 31 January, 2003; European patent application EP 02380182.2, filed by Azkoyen Medios de Pago, S.A. on 22 August, 2002; European patent application number EP 02380207.7, filed by Azkoyen Medios de Pago, S.A. on 7 October, 2002; European patent application number EP 02380143.4, filed by Azkoyen Medios de Pago, S.A. on 2 July, 2002. The selector measures different features of the progressing coin related to its dimensions, elasticity and electromagnetic features of the alloy or alloys making up the coin. In an immediately subsequent phase, the selector elaborates a series of parameters related to the measurements previously made and compares them with those stored in its internal memory, which correspond to the programmed valid coins. The progressing coin will thus be identified with a certain denomination or, on the contrary, will be recognized as not valid. In any case, the progressing coin will pass towards the sorter to be accepted or rejected, and in the event it is accepted, it will be directed towards the vault or towards one of the change tubes.

Sorter:

[0017] The sorter is an electromechanical module situated immediately after the selector, according to the forward movement path of the coin, which has the function of diverting the progressing coin from an inlet opening corresponding with the outlet of the selector, towards different outlet openings or chutes, according to the result of the analysis carried out by the selector and of the filled conditions of the tubes or of other conditions external to the change giver, such as time inhibitions of certain types of coins for example.

[0018] The preferred embodiment of the sorter 20 is shown in Figures 2 to 7. In its path, the coin is encountered with a first acceptance or rejection bifurcation defined by the blade P1 and by a second one defined by the blade P2, to direct the coin towards the vault or towards the tubes. The recovery is directed towards the front portion, such that on one hand, a better outlet of the rejected coins is provided, and on the other, more space is provided for the coins going to the vault.

[0019] Thus, as shown in Figure 2a, the general support 21 supports the assembly formed by the selector 10 and sorter 20; the front 22 of the sorter is designed to adapt the outlet of the unaccepted coins to the rejection path.

[0020] In Figure 2b, the front 22 of the sorter has been disassembled in order to more clearly observe the interior of the sorter, with its different blades arranged for changing the path of the coins towards the different outlet openings.

[0021] Figure 2c shows the lower portion of the sorter, and the outlets from the sorter to the four change tubes (A), (B), (C) and (D), to the vault (H) and to recovery (R) are detailed.

[0022] By default, and if no operation is carried out in the sorter, all the coins are directed towards the return or rejection path.

[0023] Once the coin exits the selector and is considered acceptable, the electromagnet B1 is actuated, as shown in Figure 3. This electromagnet B1 is responsible for actuating the "acceptance-rejection" blade P1, causing a linear

shifting (shown by the arrow F1) in the part 24, which is converted into a rotation (shown by the arrow F2) in the horizontal lower shaft of the blade P1. If the coin should not be accepted, the blade P1 remains in its standstill position, and the coin runs to the return through a rolling ramp provided on the lower portion of the front 22 of the sorter.

[0024] When the coin has been accepted (electromagnet B1 actuated), in the event that the electromagnet B2 (which is responsible for moving the "vault" blade P2) is not actuated, the coin goes directly to the vault; on the contrary, if the electromagnet B2 is actuated, the coin falls onto a small platform 26 situated below the blade P2 and slightly tilted (15° with regard to the horizontal), on which it rolls towards the tube sorting area (see Figure 4). The vault blade P2 is situated under (in the coin advance direction with the change giver in its assembly position) the blade P1.

[0025] Figure 4 also shows the central support 25 on which the plane change blade P3 is assembled.

[0026] The sorting of the tubes is achieved as a result of a plane change system, which is carried out by means of the "plane change" blade P3. This vertical shaft blade is assembled on the central support 25, such that it intercepts the path of the coin. The blade P3 is situated under the platform 26 and to one side thereof, in the coin rolling direction.

[0027] The coin is diverted to the front or rear portion of the sorter by means of the "plane change" blade P3 (actuated by electromagnet B3). By actuating the electromagnet B3, a linear shifting (shown by the arrow F3 of Figures 5 and 6) of the part 24' occurs, causing a rotation (shown by the arrow F4 of Figures 5 and 6) in the vertical shaft of the blade P3. The blade P3 has a rolling track on its lower portion extending towards the front portion, on a tilted plane, and towards the back portion, on a substantially horizontal plane, of the sorter. In the case shown in Figure 5, the blade P3 is positioned towards the front portion of the sorter, thus opening the path for the coins to go through the rolling track extending towards the rear portion, towards the tubes A or C.

[0028] Figure 6 shows a view similar to that of Figure 5, but in this case the blade P3 is positioned towards the rear portion of the sorter, thus opening the path for the coins to go through the rolling track extending towards the front portion, directing them to the tubes D or B.

[0029] Lastly, as shown in Figure 7, the sorter also includes the linear shifting blade P4 (actuated by B4), which is situated under the plane change blade and which consists of an L-shaped blade, the branches of which extend towards the rear and front portion of the sorter, a section of coin rolling track constituting the lower branch of the L; two grooves have been made in respective branches of the L, such that according to whether or not the blade P4 is actuated by its corresponding electromagnet B4, the coin will follow one path or another. Thus, for example, in the event that the electromagnet B3 is deactivated, if the blade P4 is actuated, the coin will fall through the groove provided on the lower branch (towards tube C), or if not, it will roll through the section of rolling track and then fall through the groove provided on the vertical branch (towards tube A). Similarly, if the electromagnet B3 is actuated, whether or not the blade P4 is actuated, the coin will roll through the section of rolling track and will traverse the groove of the vertical branch (towards tube B), or it will strike against the vertical branch of the blade P4 which will re-guide it towards tube D.

[0030] Placing blade P4 under blade P3 achieves that the path of the coin is minimum, and it likewise achieves reducing height due to the short path necessary for the coin to reach tube D.

[0031] One design aspect taken into account consists of the fact that the rolling ramps inside the sorter must have at least 15° tilt in the lower level so that the coin cannot stop at any point. A ramp of this type, for example, is situated at the rear portion of the front of the sorter, and also on the platform 26 of the central support (Figure 7a), where the plane change blade P3 is assembled.

[0032] Another design aspect taken into account in the sorter of the invention consists of the fact that the width of the chutes ranges between 4 and 5 mm to facilitate a proper flow of the coins. The return area has a width of 9 mm in order to thus be able to simultaneously expel up to three coins.

[0033] According to that described above in the sorter of the invention, the sorting of coins is carried out according to the table shown below, in which the outlet openings of the sorter are related to the actuation of the different electromagnets.

Electromagnet B1	Electromagnet B2	Electromagnet B3	Electromagnet B4	COIN
OFF				**Rejection**
ON	*OFF*			**Vault**
ON	*ON*	*OFF*	*OFF*	**Tube C**
ON	*ON*	*OFF*	*ON*	**Tube A**
ON	*ON*	*ON*	*ON*	**Tube B**
ON	*ON*	*ON*	*OFF*	**Tube D**

[0034] In the electromagnets used for actuating the movable blades, the anti-remanence metal stop in the front portion of the movable metal part has been removed, replacing it with an extra injection of plastic, such that it forms a

stop in the plastic rather than doing so on the metal part, thus eliminating remanence problems. Another improvement introduced by the electromagnets used consists of the optimum design of the cones which are machined in the fixed and movable cores, thus achieving a better performance and therefore a lower power consumption.

[0035] Control of the electromagnets has also been optimized. To that end, a control is carried out by means of a variable duration pulse train, decreasing the working cycle when the electromagnet has carried out its stroke, rather than a long impulse, significantly reducing the value of the intensity necessary for actuating the electromagnet. This favorably affects the total consumption of the change giver and therefore in the sizing of other elements, such as the power supply source.

[0036] The detection of the passage of the coins from the outlets of the sorter towards the tubes and the filling thereof is carried out by means of an optical system made up of photodiode pairs, such as an infrared emitter and phototransistor, such as a detector of the light reflected by the coin in the detection area. The coin reflection detection system has also been optimized to achieve high reliability, even in unfavorable conditions, as is the case of dirty coins or coins of a high ambient illumination. To that end, rather than using the detector only at the electrical levels corresponding to the cutoff or saturation, the entire dynamic margin is used, being connected to an analog-digital converter. Furthermore, rather than continuously feeding the emitter, it is fed at higher intensity pulses than if it were continuously fed, but if a reduced working cycle is maintained, the mean consumption significantly decreases. With the configuration described, the detection area is illuminated with short duration pulses and the signal provided by the detector both when the emitter is actuated and when it remains at rest is measured. The electronic control system based on a microcontroller will calculate the difference between the signals obtained with and without actuation of the emitter. Thus, signals occurring in "common mode", such as the external illumination and other types of noises, are eliminated. Low reflectivity coins are also detected, given that the system thus constructed makes very little noise and, and therefore small value detection thresholds can be established.

[0037] As shown in Figure 12a, the upper cover 27 of the sorter + selector assembly is collapsible, which improves access thereof. The front cover 28 of the sorter shown in Figure 12b is likewise modular and easily removable, such that different versions can be assembled, according to the desired final product; this front cover includes the visualization, communication and control elements. Thus, for example, in this case, the cover includes a membrane keyboard with five keys 280 (four keys for programming the tubes and one key for accessing the program), and with a single light indicator, typically a light emitting diode (LED) 281 which reports the functional state of the change giver; and also a small alphanumerical screen or display 283 with two lines of sixteen characters each, through which the state of the change giver is reported at all times, and it allows changing easily and safely the internal parameters of the change giver. The introduction of a predetermined program, through the connector 282 situated on this front cover 28, is also allowed for by means of a suitable programming tool or personal computer.

Storage and Return of Coins:

[0038] The extraction system 40 used in the present change giver is that disclosed in Spanish patent application number 200203012, filed by Azkoyen Medios de Pago, S.A. on 26 December, 2002 and relating to a "coin payout mechanism". This extraction system is modular, and there will therefore be one extraction module for each change tube, each module being independent and interchangeable. The extraction of the coins for each tube is carried out by means of a mechanism which, every time it is actuated, extracts and gives the coin at all times occupying the lower position in the change tube. Essentially, each extraction mechanism is constituted of two coplanar discs rotating in opposite directions which are situated just below the coin containing tube, the rotating shaft of said discs being parallel to the shaft of the tube. Each of these discs bears a pin of a height exceeding the separation between the disc and change tube. When the discs rotate, the pins thereof define circular paths which are secant with the projection of the containing tube. These pins shift in their paths without interfering with the wall of the tube, to which end said wall may have notches to enable the passage of the pins, or the pins may be retractable, shifting in a downward direction when crossing the wall of the tube. The shifting of the pins according to their circular path occurs between an inoperative position in which they are situated outside of the outline of the change tube, and an extraction position, in which they are situated within the outline of the change tube, resting on and pushing against the edge of the coin occupying the lower position in the containing tube to move it towards the exterior of said tube, through a notch the tube will have after the lower edge of its wall. The pins are situated and assembled such that every time only one of them acts against the edge of the coins and without there being a collision between said pins and the wall of the containing tube.

[0039] The actuation of the previously described extraction system is carried out by means of a continuous current gear motor, but with an arrangement which allows for optimizing the required space and therefore including the amount of coins available for change. In this manner, European patent application EP 903,702 A2 discloses a device of utility in the extraction of coins in which the shafts of the motor, gear motor and coin container, are coaxially arranged such that the total space taken up by the extractor mechanism is reduced. The gear motor used is of the planetary type. Unlike all of this, in the proposed device, disclosed in detail in Spanish patent application ES200203012, the motor is

arranged with the shaft perpendicular to that of the extractor discs and therefore to that of the shaft of the change tube. Rather than using a planetary reduction gear, a worm gear is used. The gear motor assembly thus defined is more compact and uses the vertical and horizontal space better than other arrangements proposed in the mentioned document EP 903702 A2 and in other documents such as: US 4,687,089, US 5,011,456 and US 3,783,885. As a result, this implies that the change return system of the invention is especially useful in the proposed change giver, providing greater capacity in the storage of coins and therefore improving its change return autonomy.

[0040] In a novel manner, the control of each of these motors is carried out by means of PWM (Pulse Wave Modulation), regulating the extraction speed of the coin according to the coin load existing in the change tube. To achieve the operating feature, an optical detector connected with the position of the extraction pins is assembled on the extraction module, and a connection to an inlet of the analog-digital converter of the microcontroller is arranged to measure the voltage in terminals of the motor of the extractor module at all times. By measuring the voltage generated by the motor in the absence of a power supply, the rotating speed of the motor can be known. On the other hand, the power delivered to the motor can be modified by controlling the working cycle (ratio between the connection time and disconnection time of the motor) by means of PWM, and thus controlling the revolutions in the motor, off-setting the effect of the coin load.

[0041] This extractor system allows fast anchoring of the change tubes, facilitating assembly and removal thereof; the anchoring can be carried out for each extraction module, as shown in Figure 8, by means of a dovetailed grooving and tonguing joint 31, 31' finished off with a clip 32. Therefore, each change tube 30 will have a dovetail joint 31 solidly fixed thereto, which fits with another one 31' of the upper part of the extraction system 40.

[0042] On the other hand, Figures 9 and 10 show a manner of anchoring each module of the extraction system to the casing of the change giver. This anchoring consists of a multiple retainer 41 fixed to the lower base of the casing, for example by means of screws; this multiple retainer consists of a system of guides 42 plus clips 43; the clips slightly bend, and one the introduction of the extraction module has concluded, each clip returns to its standstill position, preventing the movement of the extraction system in the direction contrary to its insertion. These clips are removable to facilitate the possible changing of the module in the event of a breakdown. As shown in Figure 11 and given that the different modules are placed against each other, a rotating handle 44 has been provided on the lower and outer part of each extraction module, facilitating the disassembly eliminating the risk of causing breakdowns during handling.

[0043] As shown in Figures 9, 10 and 13, the outlet of the coins from the extraction system towards the exterior is carried out through a sliding ramp 45 having a cylindrical shape. As a result of this design, it is achieved that the coin turns over and reaches the outlet opening in a short period of time and without risks of blockages.

[0044] One of the novelty features of the extraction system 40 (see Figure 14) is a section of rolling ramp 46 which has been provided in alignment with the change tube D. The placement of this tube D, also called fourth tube, is determined by the geometry offered by the different existing standards. For the extraction of the coins from the tube D to the exterior, it is necessary to collect the coin and orient it towards the sliding ramp 45 common to the other tubes. By means of the this section of ramp 46, which has been provided in alignment with the tube D, the coins of this tube in the first place are extracted by sliding (as occurs with the coins of the other tubes), and then they roll along this section of ramp to the outlet of the sliding ramp.

[0045] A fast anchoring of the extraction system to the control card has been carried out through a connector 47 without the need of wires (see Figure 15).

[0046] The control of the secure minimum change level in the tubes is carried out by means of a reflexive-type optical system, of the same type and functionality as the one used for detection of the passage of the coins from the sorter to the different tubes. In this case, the reflection caused by the column of coins in the corresponding tube is analyzed. Just as in the previously mentioned application, the manner of working makes the detector be highly immune to high levels of illumination or different states of aging of the coins, therefore being able to detect with certainty the minimum level of coins required to carry out a secure change.

[0047] The change tubes have a funnel shape in their upper part, which aids in the collection of coins from the sorter.

[0048] As shown in Figures 16 and 17, demarcating stops 48 of the thickness of the outlet coins have been provided, which will depend on the type of coins which can be stored in each change tube. Each demarcating stop 48 consists of a part with a front flap 481, anchoring the part to the change tube 30 by the bending of a clip 482. By varying the dimensions of the flap, the passage of coins of different thicknesses is achieved through the space remaining between said part and the support base of the coins. The stop is introduced in a housing of the change tube 30 provided for that purpose, this housing being in a direction perpendicular to the shaft of the tube. Thus the same change tube can be used for different coins.

[0049] Since the base of the extraction system is smooth, it is not necessary to provide one or several security coins in the tubes to be able to correctly carry out the coin extraction sequence; i.e., the auto-load system provides no problems of a coin remaining in the vertical position.

Casing:

[0050] The casing has as important functions:

- maintaining the different modules making up the system in fixed and precise positions,
- protecting the different modules against the entry of liquids,
- facilitating the anchoring of said equipment and
- guiding of the coins in any part of their path.

[0051] As shown in Figures 18 and 19, one of the main novelty features of the plastic casing of this change giver is that it includes numerous ribs 51 on its sides (transverse ribs), central portion (in grids) and lower portion (diamond-shaped- see Figure 19) to provide rigidity thereto.

[0052] As shown in Figures 20, 21, and 22, the casing 50 likewise has a casing-sorter anchoring which is released by means of a movable angular retainer 52 of a metal support part 53 (see Figure 21), supporting the anchoring of the change giver to the vending machine, and a retractable telescopic handle 54 facilitating its transport (see Figures 21 and 22).

[0053] As previously indicated, the casing has on its lower portion a multiple retainer 41 guiding and then clipping the extraction system and the corresponding tubes.

[0054] By means of its special design, the casing houses the sliding ramp 45 of the coins from the extractor system to the exterior: by means of this cylindrical design, the coin is turned over, passing it from a horizontal outlet to a vertical outlet for better channeling thereof. This special design furthermore serves as an anti-theft design.

[0055] The casing also has a special design (see Figure 23) for evacuating possible liquid entering in the change giver, such that the electronic part is leak-tight, preventing liquid from being introduced in the control boards and causing breakdowns. To that end, the casing has a series of transverse guides 55 with outer grooves 56 and a series of cylindrical openings 57 on the side portion of the casing 50, such that the water (and dust) is redirected, for example, towards the channel of the vault.

[0056] Another one of the special features of the design of the casing is that it allows making a loop with the bundle of cables, following the path indicated by the arrow Fc (see Figure 24), to prevent disconnections or breakage of cables from occurring when the bundle is pulled on; it furthermore includes an embedded fastening which, in addition to serving as a complete fastening of the bundle of cables, serves as an anti-water (leak-tight) system.

[0057] The configuration of the assembly of the casing has a special molding for the purpose of providing it with mechanical rigidity and making it leak-tight; it is not a simple "U" as are the known designs.

[0058] Lastly, as shown in Figure 25, the casing is provided with a decorative cover 59 to access the tubes, with an opening system 590 by means of a spring.

Electronic Control

[0059] In a manner similar to the very physical conception of the change giver in blocks, the electronics are distributed in blocks, these being:

- selector module
- sorter,
- extraction system, and
- control module.

[0060] It is an open system, with the possibility of expansion, for example, to auditing cards.

[0061] The electronics of the change giver is designed such that it has the ability of connection in vending machines having both the Executive, MDB ICP 2.0 protocol, as well as BDV.

[0062] Furthermore, the change giver can be reprogrammed through an external programming tool; this function is carried out by means of an RS-232 outlet, which allows:

- updating the software of any module;
- modifying the configuration of the change giver, which can entail changing the configuration of the other modules of the change giver, including the selector module, through the control module;
- remote adjustments of different parameters of the selector.

[0063] The electronics of the change giver are based on low consumption technology. This is achieved through the control card, which has control functions over the feeding of the other modules, such that it has the ability to disconnect

itself if its activity is not necessary in a determined period of time. The idea of reducing consumption as much as possible, as previously explained, has been taken into account in the control of the electromagnets of the sorter, extraction motors and optical detectors. The change giver has a complete accounting control: number and types of coins, number and types of sales, events,...; it allows for internally storing events so that subsequently, if the user so desires, he or she can have access to the details of these events.

[0064] The change giver also has the ability to inform the user at all times of its functional state by means of light indicators, for example LED diodes situated in the sorter and/or by means of the display.

[0065] The operating program of the change giver is carried out such that:

- the return is optimized to return the coins in the least amount of time possible, being able to return coins from different tubes simultaneously.

  Power consumption is also optimized, controlling the start-up of the extractor motors by introducing a small delay in the start-ups of the different motors, rather than actuating them simultaneously. This feature does not imply a noticeable penalization in the total return time, while it does imply an important reduction in the consumed intensity peak. The same idea is applied to the control of the electromagnets of the sorter when it is necessary to actuate two or more units.
- the acceptance is optimized so that the acceptance speed is maximum, for example, sending one coin to tubes and the other one to the vault.

Claims

1. A change giver for automatic vending machines, including a coin selector (10) situated above a coin sorter (20), which in turn is situated above four change tubes (30), which tubes are substantially arranged in single file, an extraction system (40) for extracting the coins stored in the change tubes and a casing (50),

which sorter comprises

first and second blades (P1, P2) hinged by an essentially horizontal shaft, which can be actuated by respective first and second electromagnets (B1, B2), the first blade situated above the second blade,

a front (22) and a support (21),

a platform (26) situated below the second blade (P2) and tilted with regard to the horizontal towards the inside of the sorter, such that when the first and second blades are actuated by their corresponding electromagnets, a coin entering in the sorter falls on said platform and rolls towards the lower portion of said platform,

characterized in that said sorter comprises,

a central support situated between the front and the rear support of the sorter, where said platform (26) is conformed,

a third blade (P3) hinged by an essentially vertical shaft which can be actuated by a third electromagnet (B3), this third blade (P3) being situated to one side of said first and second blades in the forward movement direction of the coin, and the lower portion of which is constituted of a span of rolling track extending towards the front portion of the sorter on a tilted plane and towards the rear portion on a substantially horizontal plane, said span of rolling track being situated below the second blade (P2), such that a coin which has rolled on said platform (26) falls onto said lower portion of the third blade, on its span of front or rear rolling track, according to whether or not the third electromagnet (B3) is actuated,

a fourth linearly movable blade (P4) traversing the central support and which can be actuated by a fourth electromagnet (B4), having an L shape, the upper branch of which is substantially vertical and the lower branch of which is tilted, this lower branch constituting a section of rolling track for the coin, both branches extending towards the front and rear portion of the sorter and respective grooves, such that the coin will be led to a different one of the four change tubes according to whether or not the blade (P4) is actuated by its corresponding electromagnet (B4).

2. A change giver according to claim 1, **characterized in that** one, several or all of the electromagnets (B1-B4) include a portion of extra injection of plastic on their movable portion, which carries out the function of anti-remanence.

3. A change giver according to one of the previous claims, **characterized in that** it includes electromagnet actuation control means.

4. A change giver according to claim 3, **characterized in that** said actuation control means consist of feeding the electromagnets by means of a short pulse train.

5. A change giver according to any of the previous claims, **characterized in that** said sorter includes coin passage detection means including an optical system of the emitter-receiver type measuring the reflection in the coin, wherein the emitter is fed by means of pulses and the reflected signal is measured by means of the receiver both in the instants of time in which the emitter is active and in those times in which it remains inactive, calculating the difference between the two states and providing a coin detection signal when the difference exceeds a determined threshold.

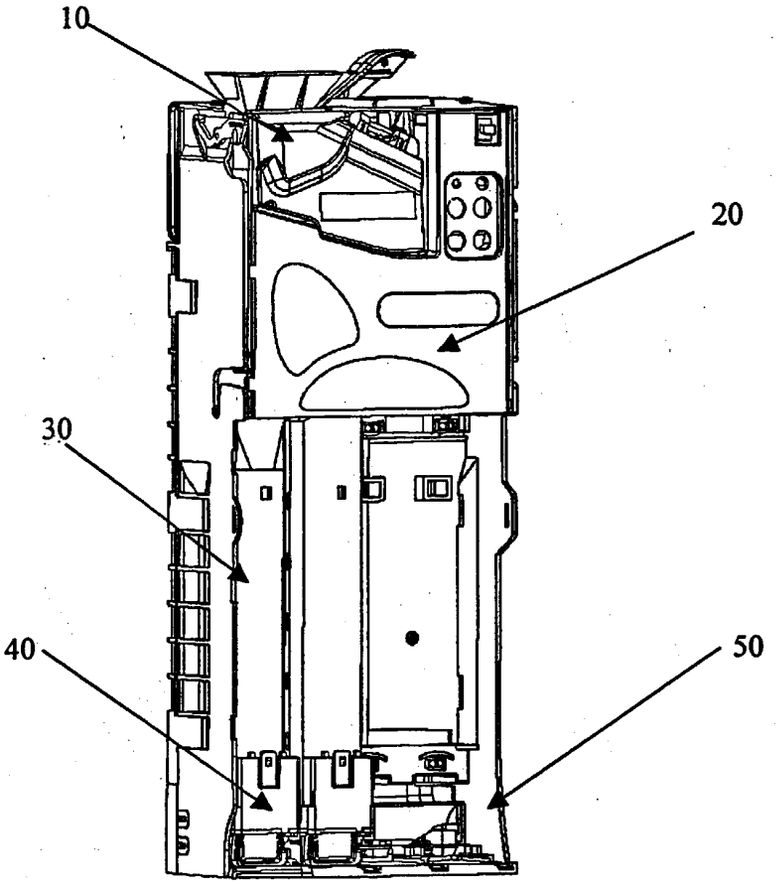

Figura 1

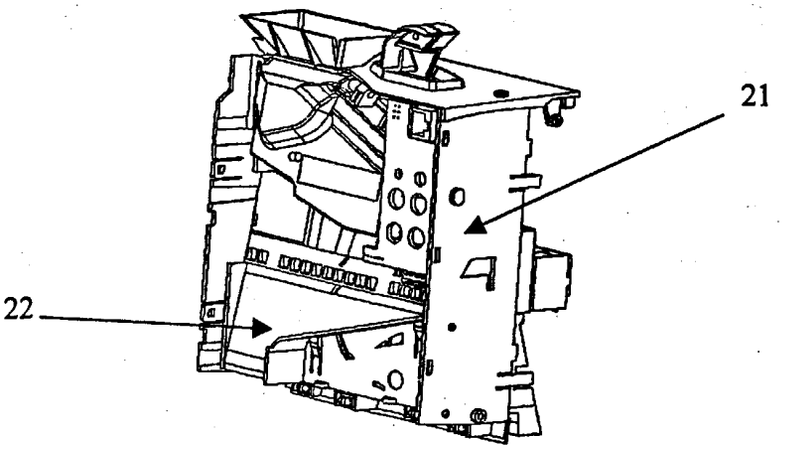

Figura 2a

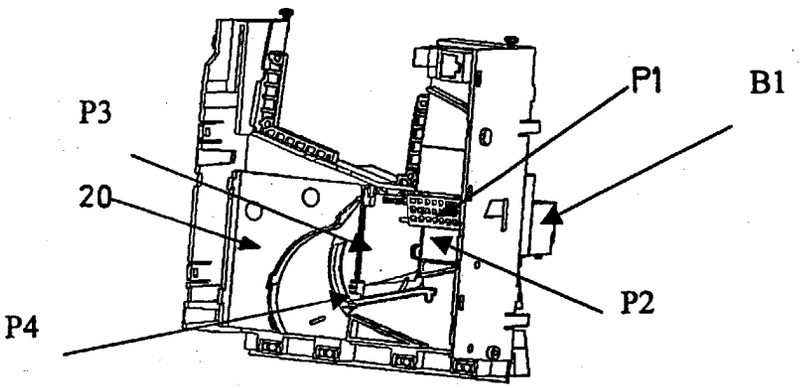

Figura 2b

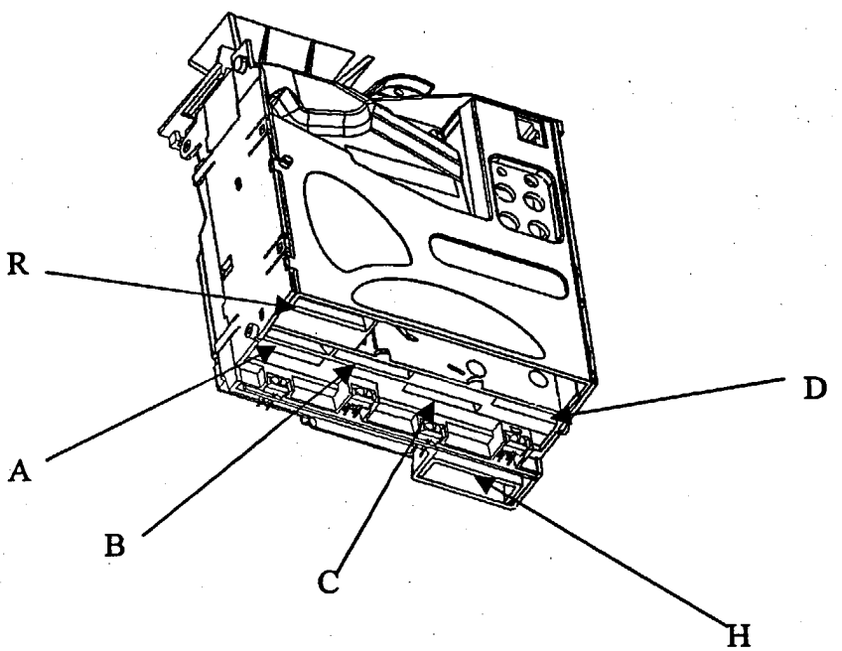

Figura 2c

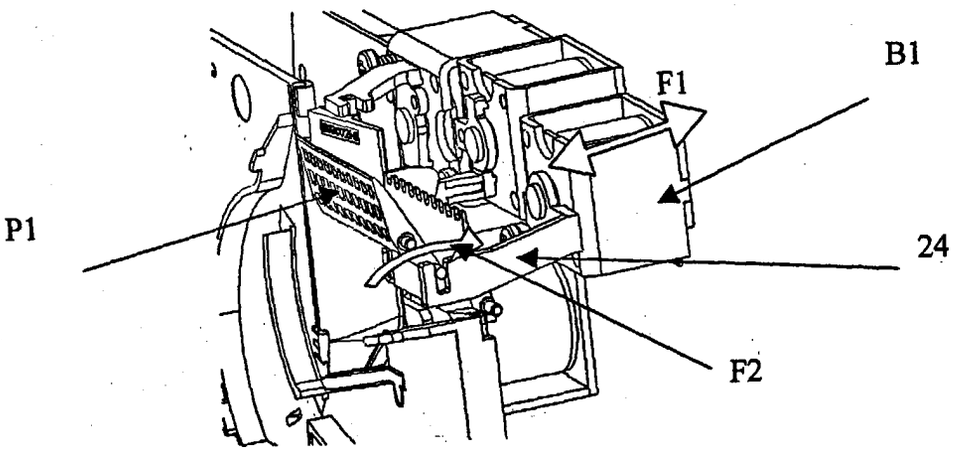

Figura 3

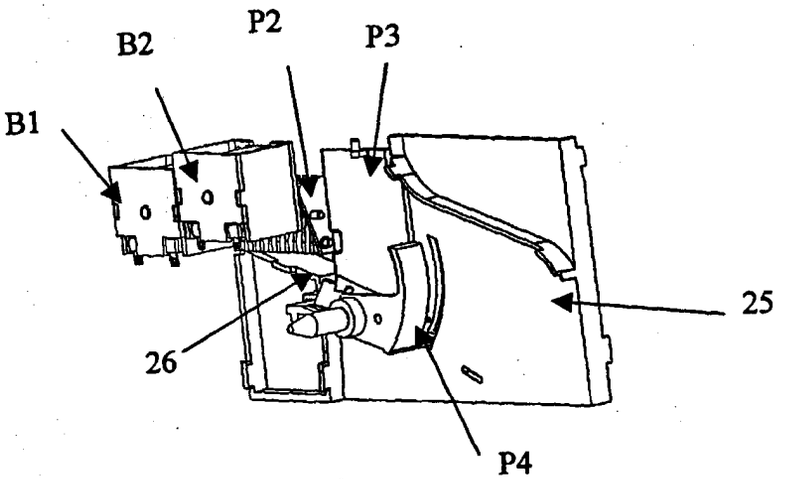

Figura 4

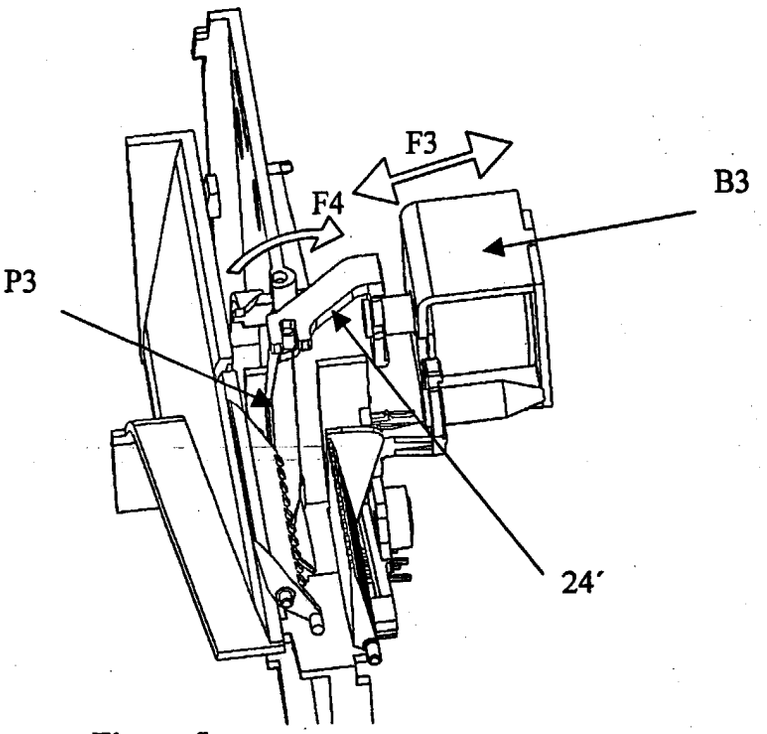

Figura 5

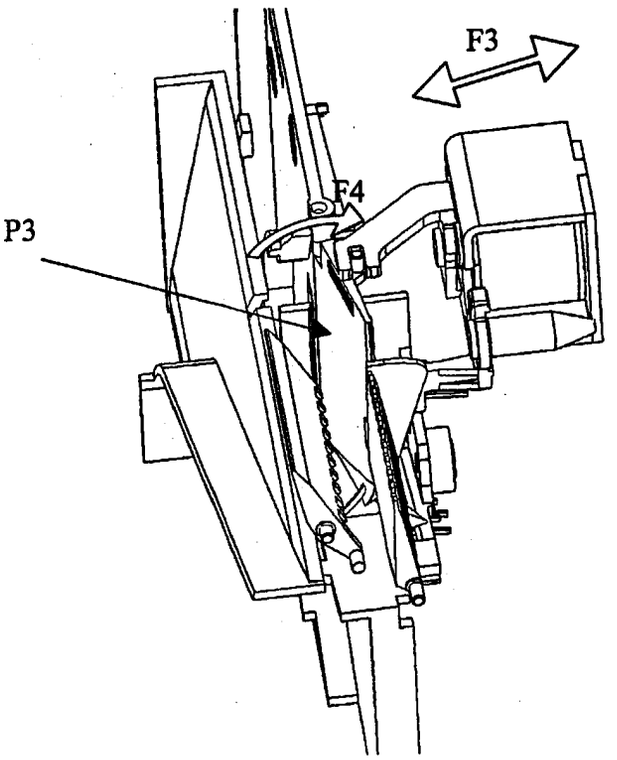

Figura 6

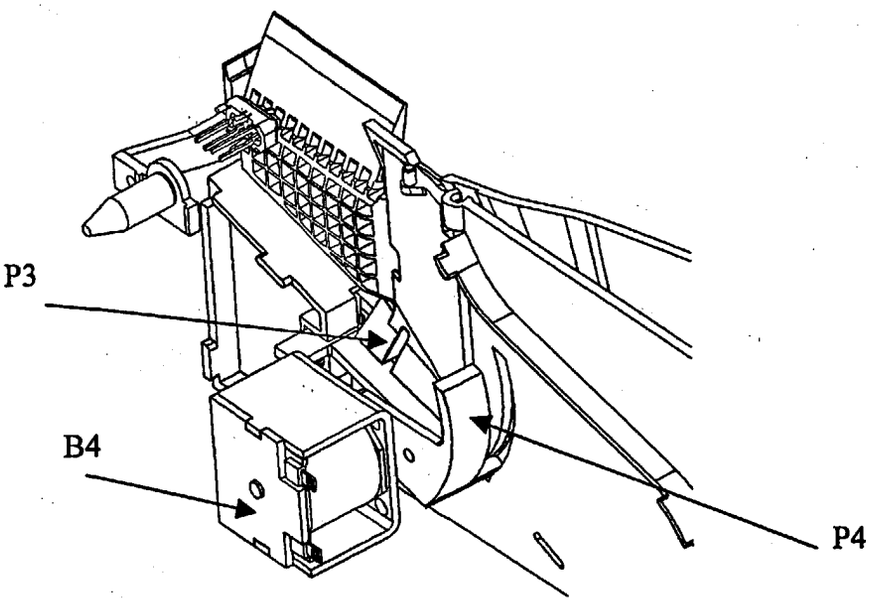

Figura 7

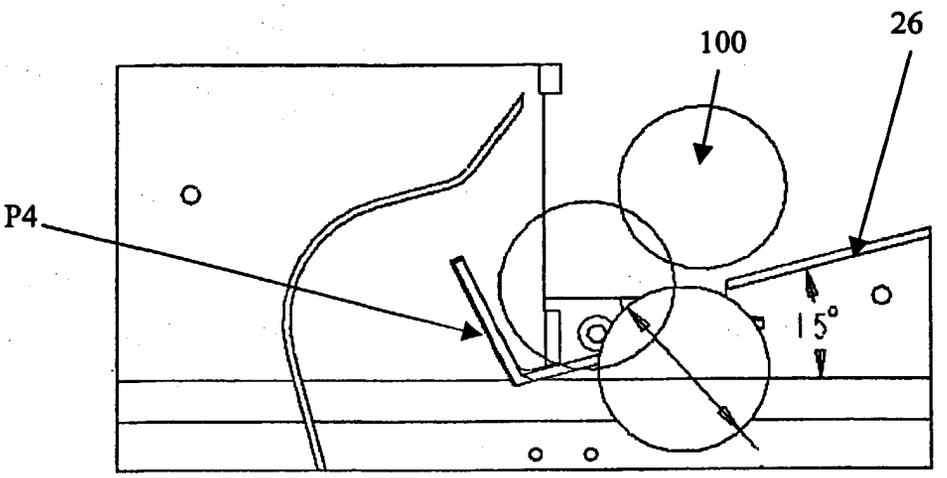

Figura 7a

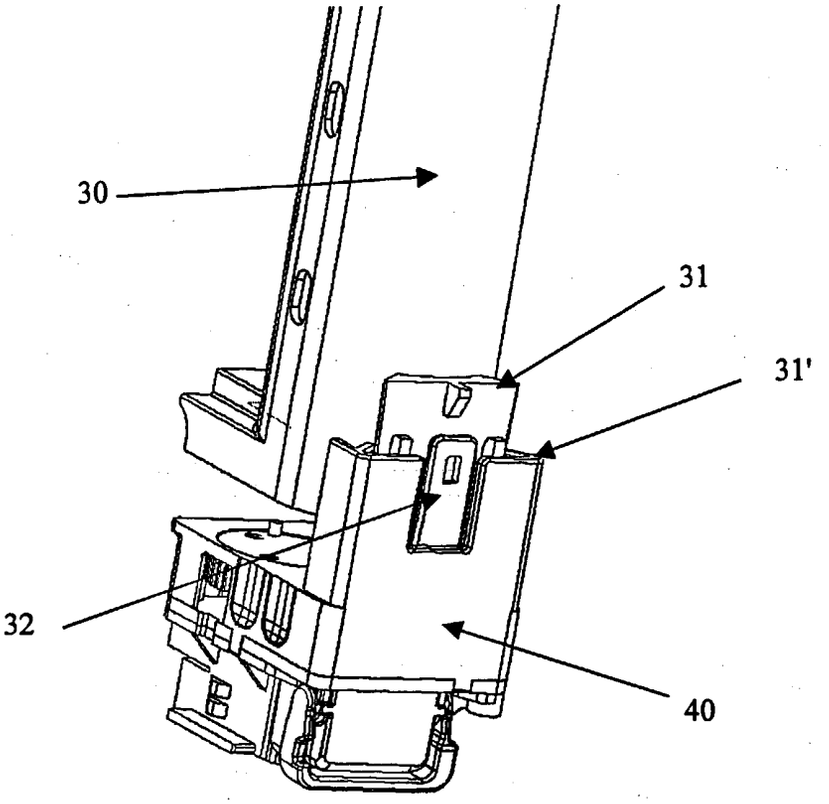

Figura 8

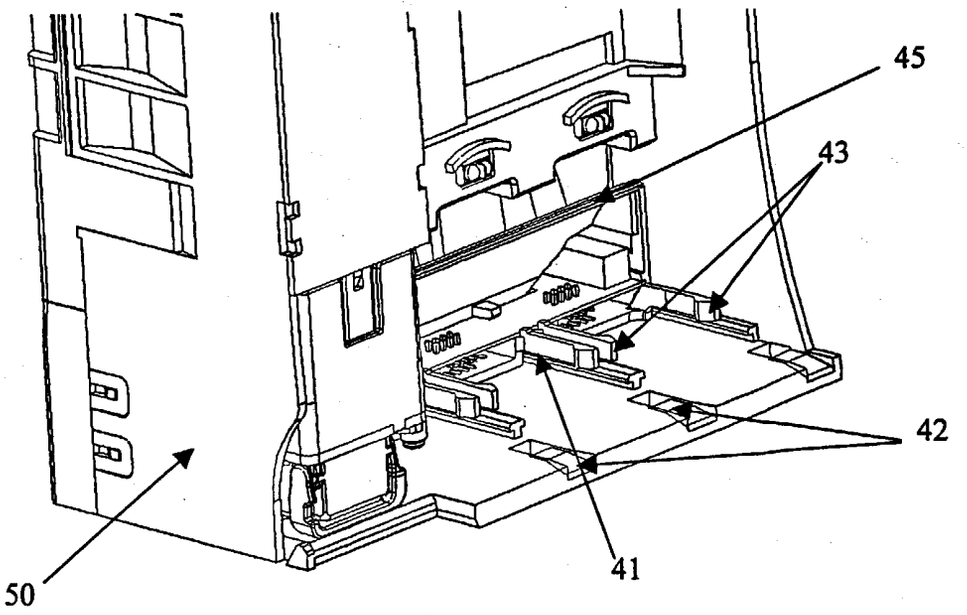

Figura 9

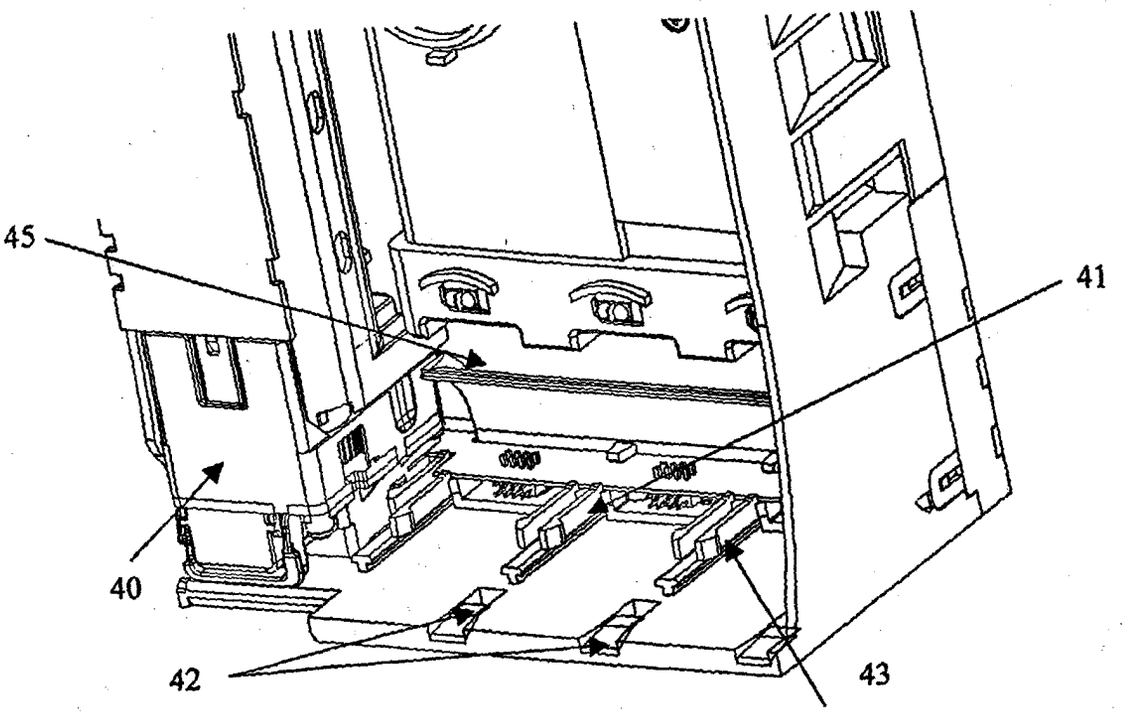

Figura 10

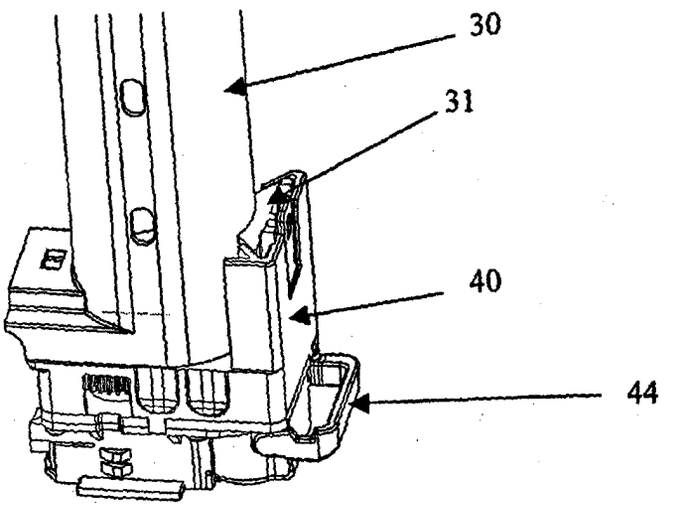

Figura 11

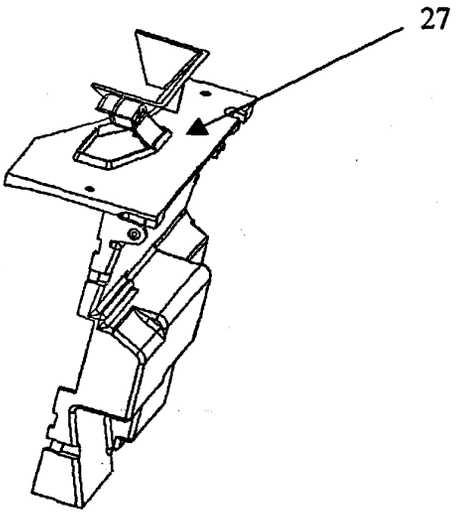

Figura 12a

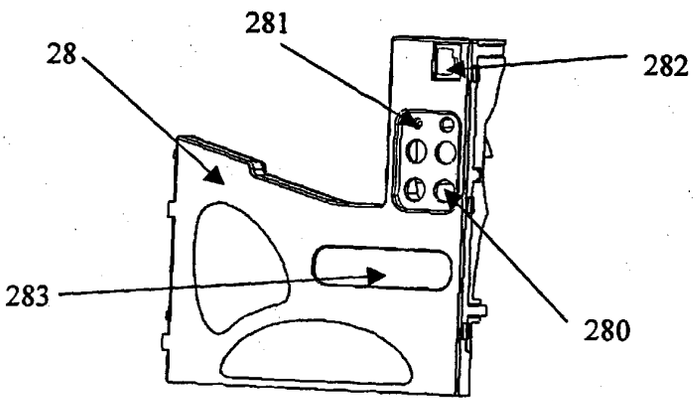

Figura 12b

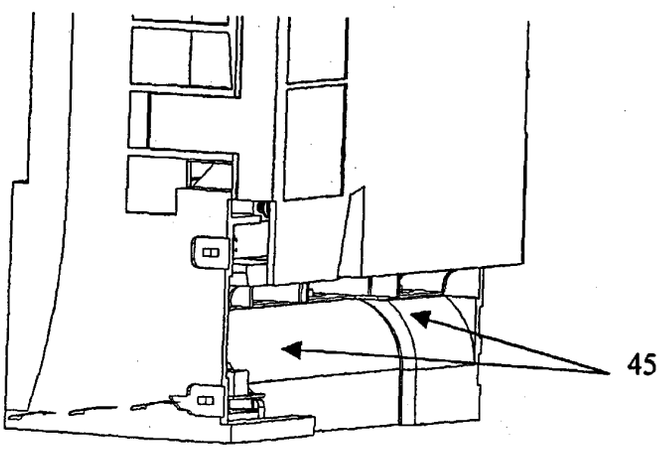

Figura 13

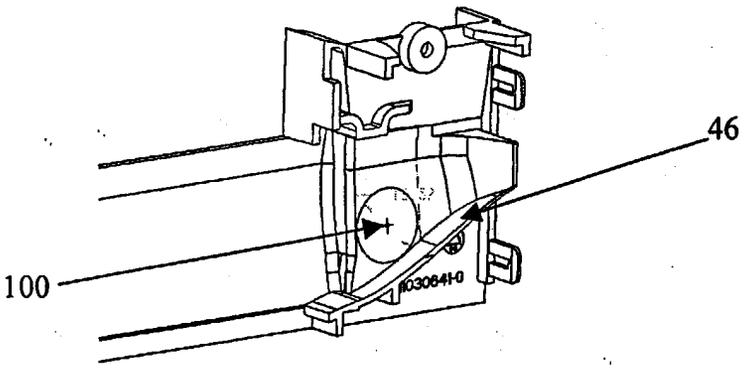

Figura 14

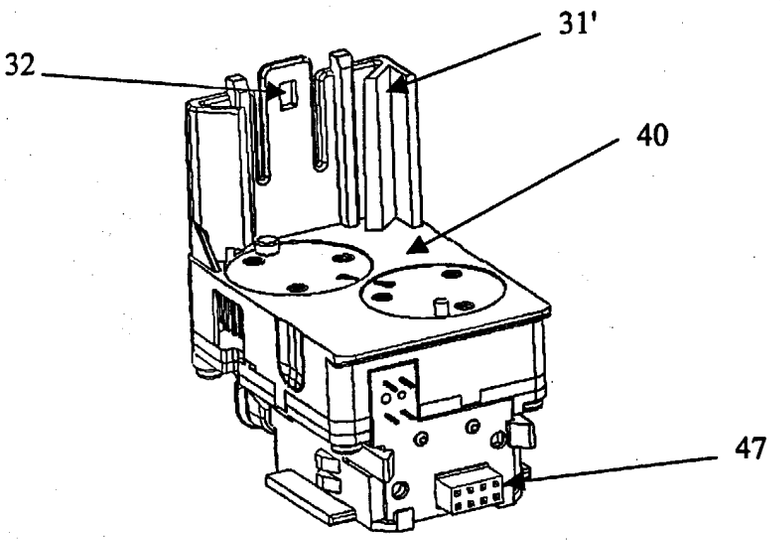

Figura 15

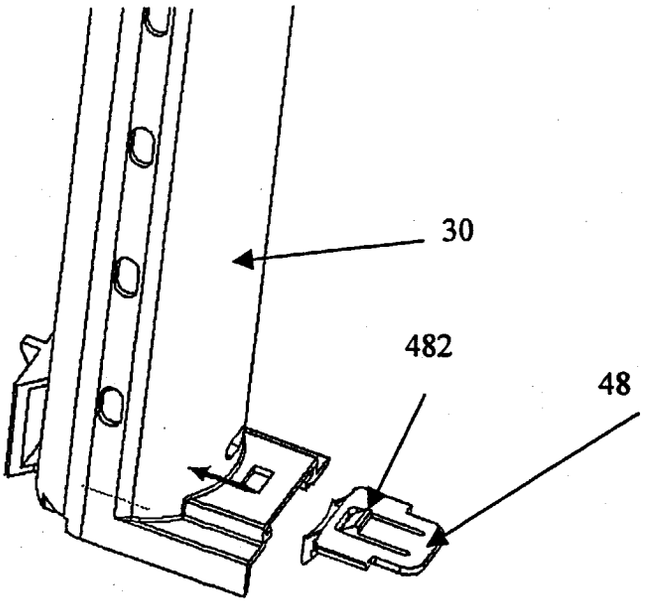

Figura 16

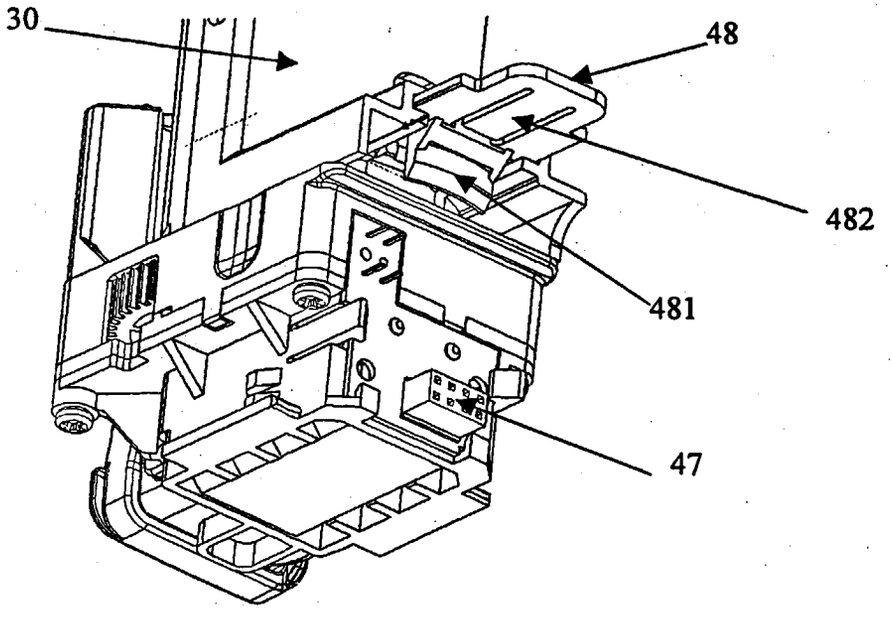

Figura 17

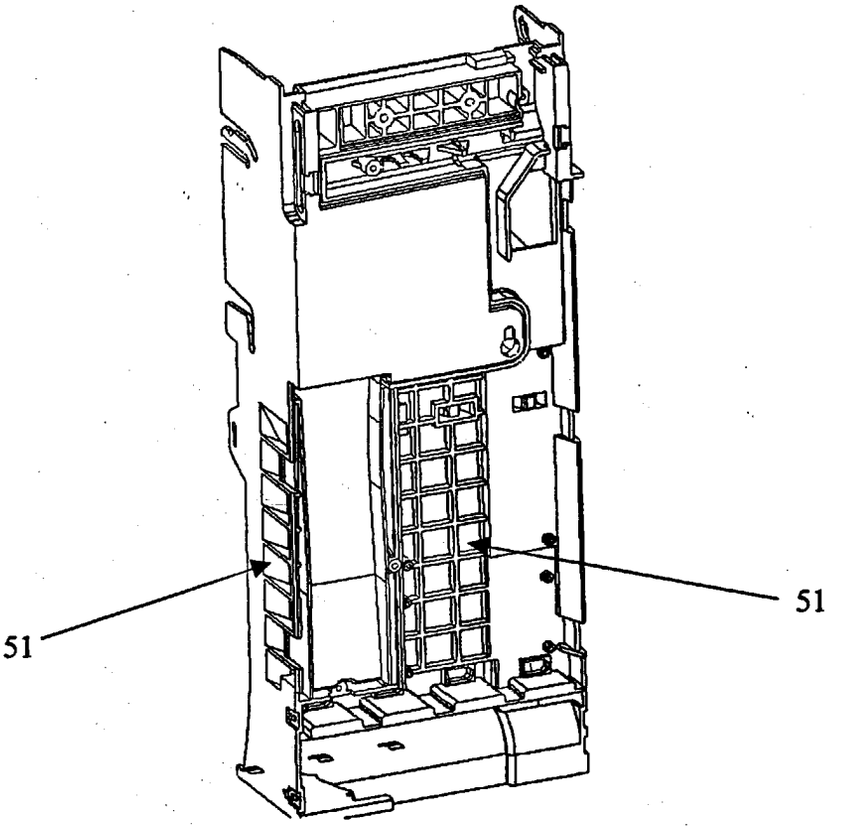

Figura 18

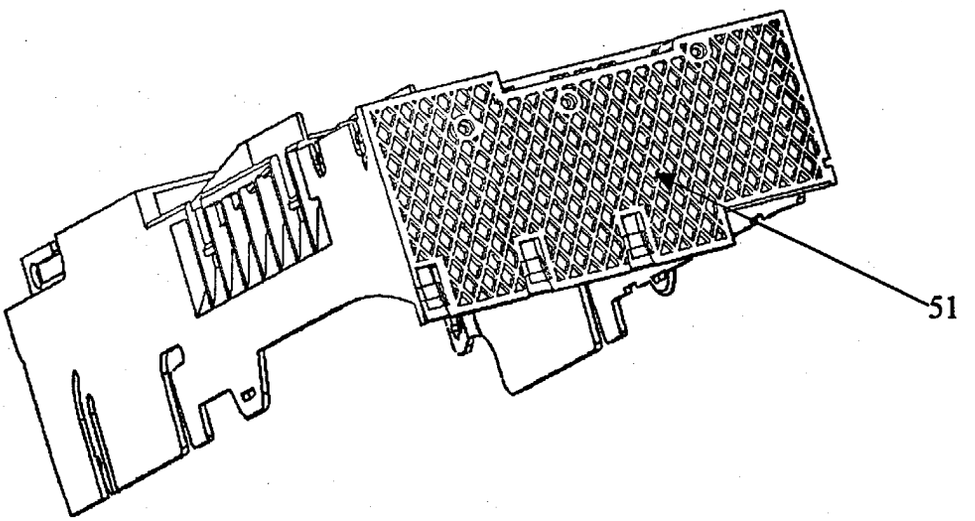

Figura 19

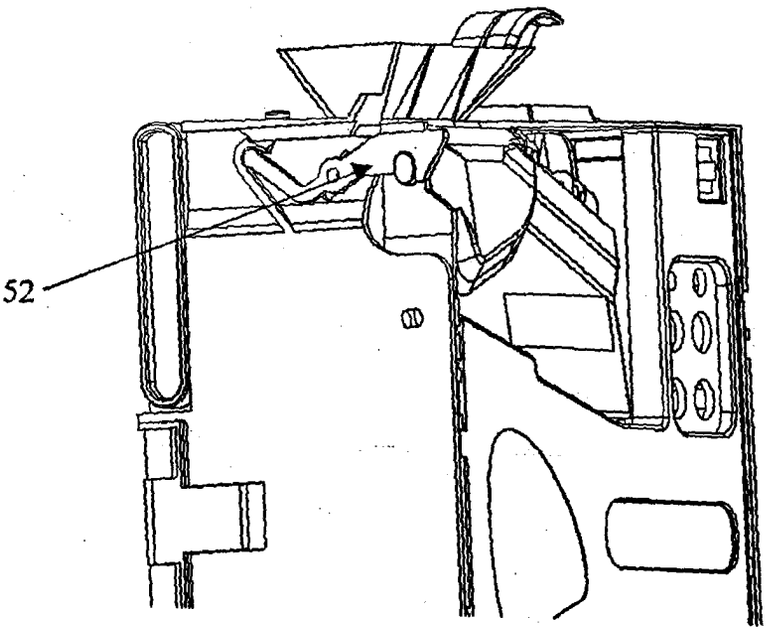

Figura 20

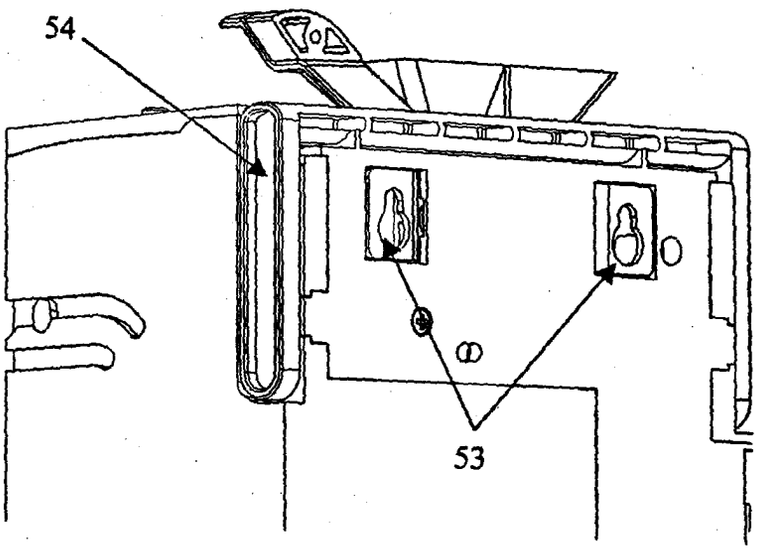

Figura 21

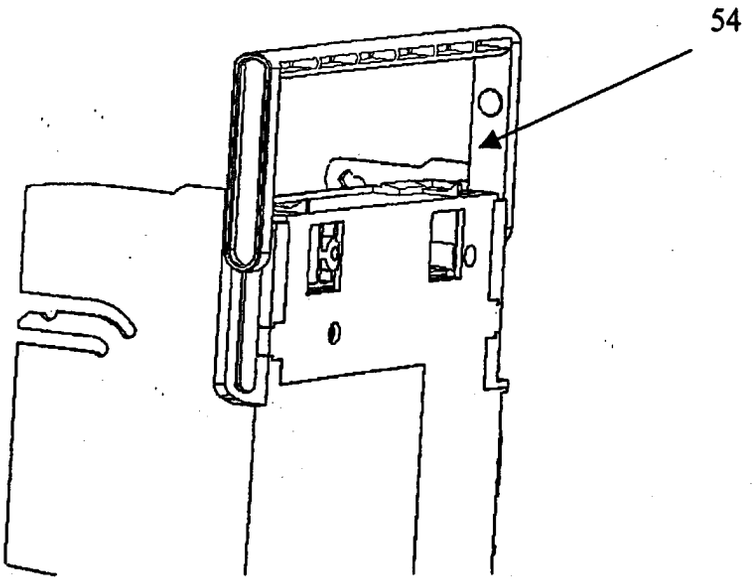

Figura 22

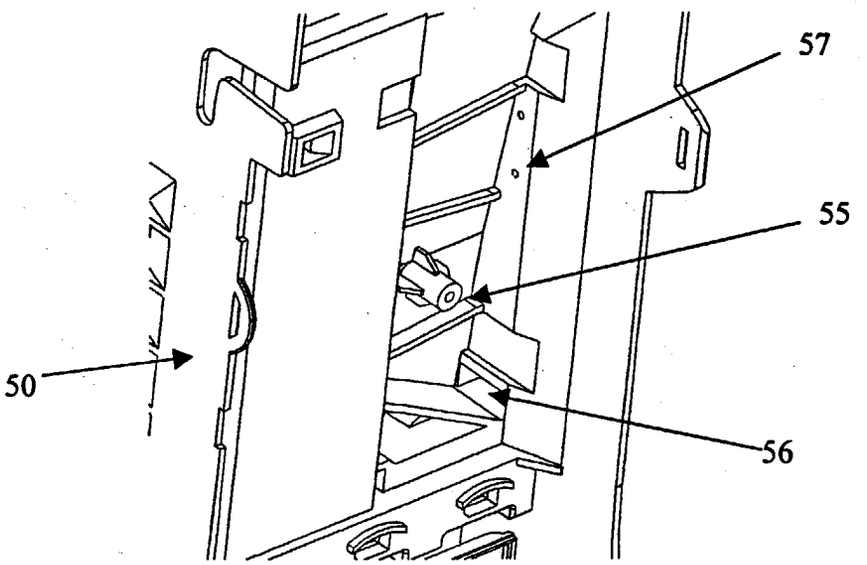

Figura 23

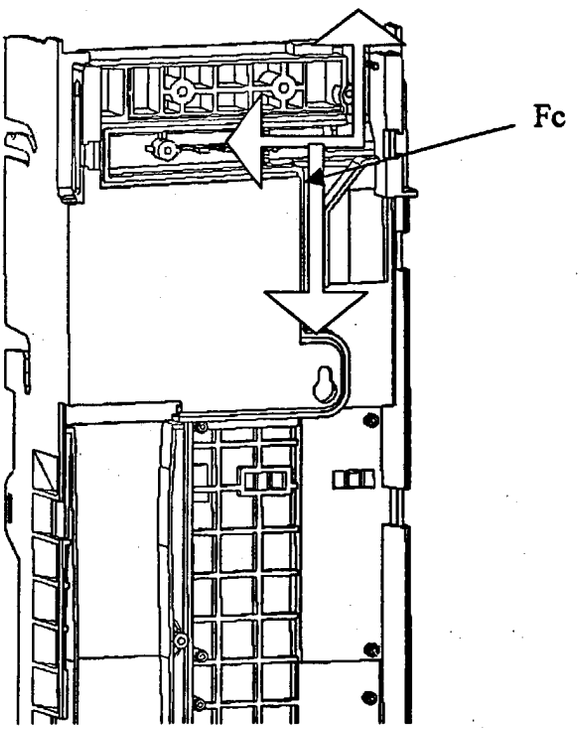

Figura 24

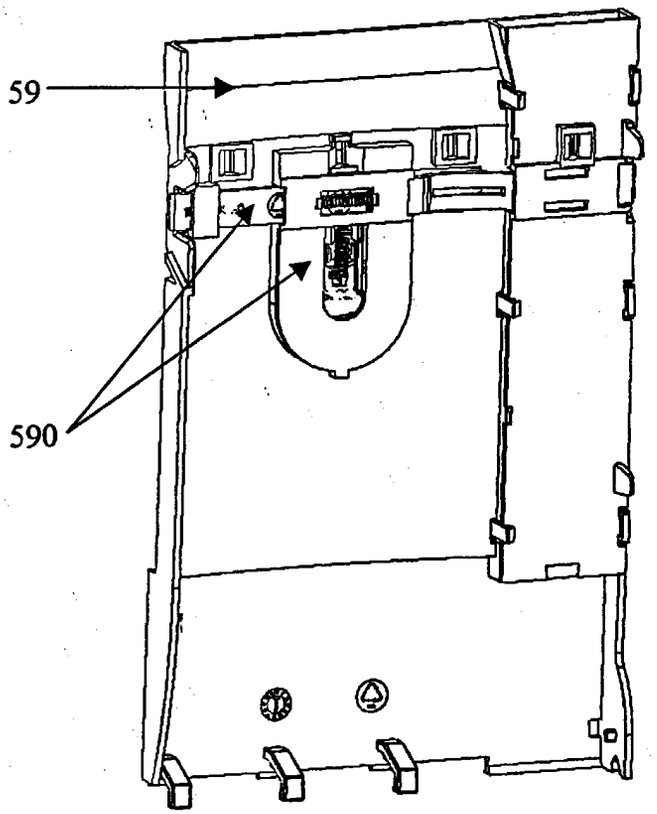

Figura 25