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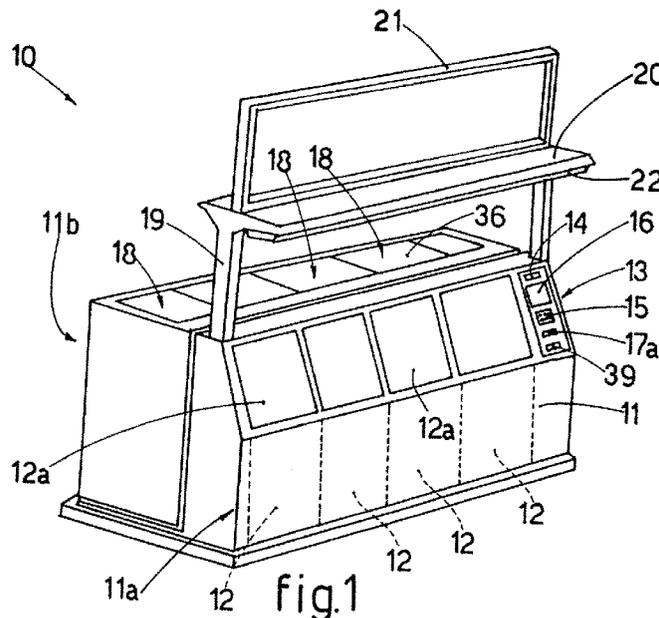
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(54) **Container for automated differentiated waste collection**

(57) Automated container for differentiated waste collection, used to collect and temporarily store waste (23) of differing composition, type, shape and size, comprising a plurality of compartments (12) differentiated at least according to the type of waste (23), wherein each compartment (12) is defined by a respective basket (24) to temporarily contain the waste (23), associated with a door (12a) which can be opened on command. A user interface panel (13) comprises at least recognising means (17) for recognising the user and input means (15) to input data associated to the waste (23) to intro-

duce into the basket (24). Actuating means (29) are provided to selectively open the specific door (12a) on the basis of the recognition of the user by the recognising means (17) and of its selection at least of the specific type of waste (23) to introduce into the basket (24). Transfer means (23, 35) are provided to transfer the waste (23) from one selected basket (24) to a corresponding removable container (18) communicating therewith, and a control unit (40) is provided for controlling the panel (13), the actuating means (29) and the transfer means (23, 35) e for managing and processing the data of any individual waste loading operations.



Description

FIELD OF THE INVENTION

5 **[0001]** This invention concerns an automated container for differentiated waste collection as set forth in the main claim.

[0002] To be more exact, the invention concerns a specialised container equipped with a plurality of containing sections specific for the type of waste, means to recognise the user, means to weigh the waste unloaded, means to press and/or reduce the volume of the waste unloaded and means to record the completed unloading operation, the data
10 possibly being sent to a central control unit and a ticket of confirmation possibly being issued.

BACKGROUND OF THE INVENTION

15 **[0003]** In the state of the art, there are ever increasing problems caused by the production of solid urban waste, particularly in the more economically and technologically advanced countries, and in the cities with the highest densities of population.

[0004] The problems of waste disposal have for years induced the local administrations and competent authorities to look for solutions, but these are not very functional and have not involved the public very much and so they have shown themselves to be only partially successful and have not indicated an effective way to solve the problem.

20 **[0005]** The attempt to start procedures of differentiated waste collection, using for example specific containers for glass, paper, special waste such as batteries, medicines, etc., has supplied only a partial solution. This is due to the difficulty the user has in the first place to find the location of a plurality of containers spread over the territory, and then due to the time and attention required to separate the waste at source according to type and then to unload the waste in different places.

25 **[0006]** There is an almost total lack of domestic containers suitable to contain differentiated waste; this often leads the user to forget the problem and to not pay due attention in separating the waste. Furthermore, due to the lack of economic incentives which might involve the public directly, and on the contrary, the levying of specific taxes for waste disposal, users often pass all responsibility to those bodies which are involved in the activity of collecting and disposing of waste.

30 **[0007]** All this leads to a situation which, given the present rate of growth in the volume of waste produced, risks becoming more and more uncontrollable and unmanageable.

[0008] The present applicant has examined the problem in all the aspects mentioned above and has proposed a solution, as set forth in this invention, which is intended to solve at least in part the shortcomings of the state of the art and to obtain further advantages as will be explained hereafter.

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SUMMARY OF THE INVENTION

[0009] The invention is set forth in the main claim, while the dependent claims describe variants of the idea of the main embodiment.

40 **[0010]** The purpose of the invention is to provide an automated container for the differentiated collection of waste wherein the waste is separated by the user according to type, inside a single structure, from the beginning.

[0011] In this way, the user is not obliged to separate the waste when the waste is collected at home, and then look for a plurality of containers spread over the territory where he/she can unload the waste, but can separate the waste when it is unloaded into a single container.

45 **[0012]** The automated container according to the invention comprises a plurality of containing sections or compartments, associated with doors which can be opened on command, each of which is dedicated to a specific type of waste.

[0013] The automated container also comprises interface means to recognise the user and allow him/her to select the desired operation, and means to record the completed operation with the possible issue to the user of a ticket or receipt.

50 **[0014]** According to a variant, the container also comprises means to send the data of the operation to a central control unit, connected in a network to a plurality of containers for the unified management of the waste collection service.

[0015] According to the invention, each section or compartment of the container comprises automatic weighing means which are activated every time the user unloads waste.

55 **[0016]** The sections or compartments also cooperate with pressing and/or volume-reducing means by means of which the mass of waste is compressed and compacted inside the container itself; the advantages of this are that the container needs to be emptied less frequently, less space is needed for transport, less space is taken up at the dumps, and there is less pollution.

[0017] The invention gives a plurality of advantages in operational and management terms.

[0018] The automatic recording of the waste according to type and quantity allows the competent authorities to learn, substantially in real time, the quantity of waste disposed of and possibly to make statistics with temporal and/or geographical parameters, for example according to season, town districts, etc.

[0019] This also allows continuous up-dating and facilitates management programming.

[0020] With the container according to the invention, each user actively participates in the differentiated collection; moreover, the personalised record of the quantities and types of waste unloaded allows a system of economic incentives to be created which can involve the user and encourage him/her to separate the waste more efficiently.

[0021] The plants are managed and controlled continuously, with the result that immediate, specific interventions can be carried out in the event of breakdowns or problems of any kind, with the location and type of the problem already being known.

[0022] According to a variant, the containers are equipped with advertising spaces which personalise them, embellish their aesthetic appearance and allow the costs to be at least partly amortised.

[0023] According to a further variant, the containers are aesthetically characterised by drawings or images which, apart from reducing the environmental impact, can be used to make the public more aware of the problem of the differentiated collection of waste and more involved at every level.

[0024] Further variants include possible roofs, canopies or similar, to shelter users during the unloading operations, night-time illumination, signalling means, automatic means to clean the sections or compartments and so on.

[0025] According to a further variant, the container comprises a system with solar panels associated with batteries which supply all the electric appliances.

[0026] The automated containers according to the invention, according to their size, can be used at the side of the roads to serve a street or a block, a condominium, a school, a company, etc.

[0027] According to a variant, the containers are equipped with safety systems such as photocell sensors, proximity sensors, sensors associated with the individual compartments to recognise incompatible objects, etc.

[0028] According to a further variant, the weighing means and/or the pressing means are governed by control means which stop the unloading cycle, transfer, or pressing etc., if the weight of the waste unloaded by the user exceeds a pre-determined maximum value.

[0029] According to a further variant, the container, either individually or in groups, cooperates with visual monitoring systems, for example with a camera, connected to a control centre in order to prevent and intervene in the event of incorrect use or acts of vandalism, etc.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The attached figures are given as a non-restrictive example and show some preferential embodiments of the invention as follows:

- Fig. 1 is a three-dimensional view of the container according to the invention;
- Fig. 2 is a side view of the container shown in fig. 1;
- Fig. 3 shows the container during the step where the waste is unloaded;
- Fig. 4 shows the step where the compartment is closed and the waste is weighed;
- Fig. 5 shows the step where the waste is loaded into the compacting container;
- Figs. 6a, 6b and 6c show in sequence three operating steps of the unit to collect and discharge waste of the container according to the invention;
- Fig. 7 shows the detail of the section or compartment containing the waste;
- Fig. 8 shows the detail of the waste-unloading arm;
- Fig. 9 shows a variant of fig. 1;
- Fig. 10 shows a variant of the compacting and volume-reducing system;
- Fig. 11 shows a detail of fig. 10; and
- Fig. 12 shows a block diagram of the control group of the container according to the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0031] An automated container 10 (fig.1) for differentiated waste collection according to the present invention comprises a box-like structure 11 having a front side 11a and a rear side 11b.

[0032] On the front side 11a, a plurality of compartments 12, in this case four, is provided, having each one a basket 24 and a door 12a through which the waste 23 can be discharged according to their type. An interface panel 13 is disposed on the front side 11a of the container 10, laterally with respect to the compartments 12, and comprises at least a keyboard 15 for inputting data and possibly to formulate requests or information, a display 16 to read instructions

or commands to follows, a slot 17a associated with a card reader 17 (fig.12) to recognise the user, and a transponder unit 14 able to recognise the user when the latter, provided with a corresponding recognition device, known per se, is in the proximity of the container 10.

[0033] The panel 13 further comprises, at its inner part, a control unit 40 having a processor unit 41 connected to the transponder unit 14, the keyboard 15, the display 16 and the card reader 17.

[0034] The control unit 40 is able to control and manage all functions of the container 10 and comprises a unit 42 by means of which it can transmit, via cable or radio, the data collected and processed by the processor unit 41 to a remote control unit, not represented on the drawing.

[0035] The panel 13 further comprises means 39 able to issue tickets or receipts confirming the completed operation or other possible information, for example on the cost of the operation just completed or a statement of the operations already made in a determined period of time.

[0036] On the rear side 11b, the automated container 10 has a plurality of corresponding removable containers 18 for waste storage, each associated with one compartment 12. Each removable container 18 can be provided with means to detect the level of waste stored therein and signalling means, either acoustic or visual, to signal when it is full.

[0037] The box-like structure 11 also comprises uprights 19 supporting a roof 20 to protect and shelter the user, on which there is mounted a panel 21 defining a space for advertising signs.

[0038] There is also a lighting element 22 mounted on the roof 20.

[0039] Fig. 2 shows the automated container 10 in the inactive position.

[0040] In order to load waste, the user must first insert its personal card into the slot 17a, and possibly key-in a code on the keyboard 15, or it shall cause the transponder unit 14 to recognise it.

[0041] When the user has been identified by the control unit 40 associated with the automated container 10, or by the remote central control unit to which the control unit 40 is connected, the user is authorised to proceed.

[0042] By means of the keyboard 15, possibly on the command of instructions which appear sequentially on the display 16, the user can select the functions it wishes to carry out, for example indicating the type of waste it intends to load into the container 10. According to this command, only the door 12a of the compartment 12 corresponding to that type of waste 23 will open, and the other doors 12a, associated with the relative baskets 24, will remain closed. The opening of each door 12a, and the rotation of each basket 24, is actuated by an actuator 29 controlled by the control unit 40.

[0043] Each basket 24 includes respective security means 43 such as proximity sensors or photo cell sensors which, for example, stop the movement of the door 12a and of the basket 24 in the event that they detect the presence of parts of the user's body or objects interfering with the movement; each basket 24.

[0044] Sensors 37 (figs. 6a, 6b, 6c) are also provided to detect the presence of waste 23 incompatible with the type of the relative compartment 12. If this should happen, the sensors 37 stop the functioning of the automated container 10 until the incompatible waste 23 has been removed.

[0045] Fig. 3 shows the step wherein the user loads the waste 23.

[0046] When the waste has been loaded and the end of the operation has been confirmed, for example by the user keying a predetermined key of the keyboard 15 (fig. 4), the door 12 closes and the waste 23 is accumulated in the specific compartment 12.

[0047] During this step, the waste 23 is weighed by appropriate weighing means 44, for example of electronic type, disposed on the bottom of each basket 24 and the weight is recorded and transmitted to the control unit 40 and/or to the remote central control unit.

[0048] When the weighing operation has been confirmed, the means which transfer the waste 23 from the basket 24 to the removable container 18 are automatically activated; here, the waste 23 is pressed and reduced in volume.

[0049] In this case, the transfer means comprise one or more arms 25, rotating around a shaft 26. The arms 25 rotate from an inactive position 25a to a working position 25b, remove the waste 23 from the relative basket 24 and discharge it into the removable container 18 (figs. 4 and 5), where it is compacted and pressed.

[0050] When this operation is terminated, the arms 25 return to their inactive position 25a.

[0051] The arms 25, shown in detail in fig. 8, have an insert 27 at their end which functions as a scraper sliding to cooperate with the bottom of the basket 24.

[0052] The insert 27 is made advantageously in wear-resistant rubber and also functions as a seal, in cooperation with the sealing element 28 present along the rear edge of the basket 24 (figs. 6a and 7) so that when the user unloads the waste 23, there is no leakage of liquids, particles, dust or other dirt.

[0053] When the waste has been unloaded into the removable container 18, and the pressing and compacting operation is terminated, an operations-over signal is emitted, either visually or acoustically, and the relative data is transmitted to the control unit 40 so that a receipt may possibly be issued by the unit 39 to the user.

[0054] The data of the operation is processed by processor unit 41 and transmitted to the remote central control unit. Both the control unit 40 and the remote central control unit are able to calculate the amount related to the operation just completed so that bills or similar can be issued and the relative taxes paid. Additionally, statistics can be formulated

relating to how the collection is progressing, subdivided, for example, according to time and/or geography.

[0055] In the event of breakdowns or anomalies, the control unit 40 transmits a signal to the remote central control unit, so that the container 10 may be immediately identified, thus facilitating and accelerating the operation of maintenance or replacement.

5 [0056] Figs. 6a, 6h and 6c show in detail how the basket 24 and the arms 25 work in the various operating stages.

[0057] In fig. 6a, the basket 24 is in its inactive position with the door 12 closed.

[0058] On the front edge of the door 12 there is a water-tight seal 31 which prevents the leakage of material and odours from the basket 24 in the closed position.

10 [0059] When the automated container 10 is activated following the request from the user, the basket 24 is opened by the actuator 29, which moves to the extended position (fig. 6b), as the arms 25 are still in an inactive position.

[0060] The actuator 29 is advantageously of the hydraulic type and is attached to the basket 24, in this case, by means of a bracket 30.

[0061] When the user has finished unloading, the waste 23 is weighed and the basket 24 closes again, returning the door 12 to the closed position; then the unloading and pressing cycle is started.

15 [0062] In the event that the weight of the waste 23 exceeds a limit value compatible with the structure of the basket 24, the hydraulic actuator 29 cannot be activated, thus preventing any incidents.

[0063] In this case, the arm 25 begins to rotate around the torque shaft 26 and, cooperating with the bottom 33 and the side walls 34 (see fig. 7) of the basket 24 and with the upper conveyor wall 32, it transfers the waste 23 to the removable container 18 where the waste 23 is compacted (fig. 6c).

20 [0064] When this transfer is terminated, the arm 25 returns to the inactive position shown in fig. 6a.

[0065] The pressing arms 25 are also associated with safety means which, if a pressure value is monitored which is higher than a pre-determined maximum value, stop the arms 25 from functioning and return them to the inactive position 25a until the problem has been removed.

25 [0066] Each compartment 12 is provided with washing means 45, for example spray means, and possibly disinfectant means for washing and disinfecting the baskets 24..

[0067] Fig. 9 shows a variant of the automated container 10 used to collect particularly voluminous waste and/or devised for a greater and prolonged autonomous functioning.

[0068] The variant shown in figs. 10 and 11 concerns the use of a transfer and compacting system which, instead of a rotary arm 25, uses a rotary screw 35.

30 [0069] This solution is particularly efficacious in the case of automated containers 10 of the type shown in fig. 9 for voluminous waste, or also in the case of frequent discharge of waste which is difficult to treat, such as paper, wood, mattresses, foliage or similar.

35 [0070] The rotary screw 35 substantially functions in the same way as described above: it is activated when the basket 24 is closed after waste 23 has been loaded, in order to transfer the discharged waste 23 into the removable container 18 for storage and compacting.

[0071] In this case, as shown in fig. 1, the automated container 10 is equipped with a system of solar panels 36, associated with inner batteries which are not shown here, which allow the automated container 10 to be supplied independently from external power supplies and therefore guarantee an autonomous energy supply.

40 [0072] The automated container 10, either individually or in groups, is associated (fig. 9) with a viewing system, for example a cctv video camera 38 connected to a control centre, in order to monitor its functioning and to prevent acts of vandalism and/or incorrect use.

[0073] It is obvious that to the automated container 10 here above described any modifications and addition of parts may be possible, within the scope of the present invention.

45 [0074] For example, the user data can be transmitted to the panel 13 by a portable wireless keyboard; and the card reader 17 may be of the type able to read and update any magnetic or microchip card, of known type, which can allow the user to directly perform any kind of payment related to the effected operation.

Claims

50 1. Automated container for differentiated waste collection, used to collect and temporarily store waste (23) of differing composition, type, shape and size, characterised in that it comprises:

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- a plurality of compartments (12) differentiated at least according to the type of waste (23), each of said compartments (12) being defined by a respective basket (24) to temporarily contain the waste (23), associated with a door (12a) which can be opened on command;
 - user interfacing means (13) comprising at least recognising means (17) for recognising the user and input means (15) to input data associated to the waste (23) to introduce into the basket (24);

- actuating means (29) to selectively open the specific door (12a) on the basis of the recognition of the user by said recognising means (17) and of its selection at least of the specific type of waste (23) to introduce into the basket (24);
 - transfer means (23, 35) to transfer said waste (23) from one selected of said baskets (24) to a corresponding removable container (18) communicating therewith;
 - a control unit (40) for controlling said interfacing means (13), said actuating means (29) and said transfer means (23, 35) e for managing and processing the data of any individual waste loading operations.
2. Container as in Claim 1, characterised in that each one of said baskets (24) includes its own weighing means (44) to weigh the waste (23) loaded for every cycle.
 3. Container as in Claim 1 or 2, characterised in that each one of said baskets (24) includes washing and/or disinfectant means (45).
 4. Container as in any claim hereinbefore, characterised in that said transfer means (25, 35) also function as means to press and compact the waste (23) loaded into said removable container (18).
 5. Container as in any claim hereinbefore, characterised in that said transfer means (25, 35) cooperates with means to detect the pressure of the compacting operation governed by a threshold value of maximum pressure.
 6. Container as in any claim hereinbefore, characterised in that said transfer means comprises at least an arm (25) rotating around a shaft (26) from a first inactive position (25a) and a second active position (25b) cooperating with the bottom (33) of the corresponding basket (24) to transfer the waste (23) to the corresponding removable container (18).
 7. Container as in Claim 6, characterised in that said arm (25) includes a scraper element (27) at its end, made of wear-resistant material.
 8. Container as in Claim 7, characterised in that said scraper element (27) has a sealing function in cooperation with sealing means (28) associated with the inner edge of the corresponding basket (24).
 9. Container as in any claim from 1 to 5 inclusive, characterised in that said transfer means comprises rotary screw means (35).
 10. Container as in any claim hereinbefore, characterised in that each one of said baskets (24) includes water-tight means (31) on its outer edge.
 11. Container as in any claim hereinbefore, characterised in that each of said baskets (24) includes means (37) to recognise incompatible waste (23).
 12. Container as in any claim hereinbefore, characterised in that it further comprises safety means (43) with photocell sensors and/or proximity sensors.
 13. Container as in any claim hereinbefore, characterised in that said interfacing means (13) comprises a display (16) to display selections, instructions or commands.
 14. Container as in any claim hereinbefore, characterised in that said interfacing means (13) comprises means (39) to issue a ticket or receipt.
 15. Container as in any claim hereinbefore, characterised in that said interfacing means (13) comprises acoustic and/or visual means to signal the end of the operation.
 16. Container as in any claim hereinbefore, characterised in that said control unit (40) is connected to a remote central control unit for the unified management of the waste collection service.
 17. Container as in any claim hereinbefore, characterised in that said control unit (40) comprises means to process and issue bills and/or to define statistics based at least on geographical and/or temporal parameters.

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18. Container as in any claim hereinbefore, characterised in that it further comprises means (21) to define advertising spaces or signs.

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19. Container as in any claim hereinbefore, characterised in that it further comprises lighting means (22).

20. Container as in any claim hereinbefore, characterised in that it further comprises means (20) to protect or shelter the user.

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21. Container as in any claim hereinbefore, characterised in that it further comprises electric supply means with solar panels (36).

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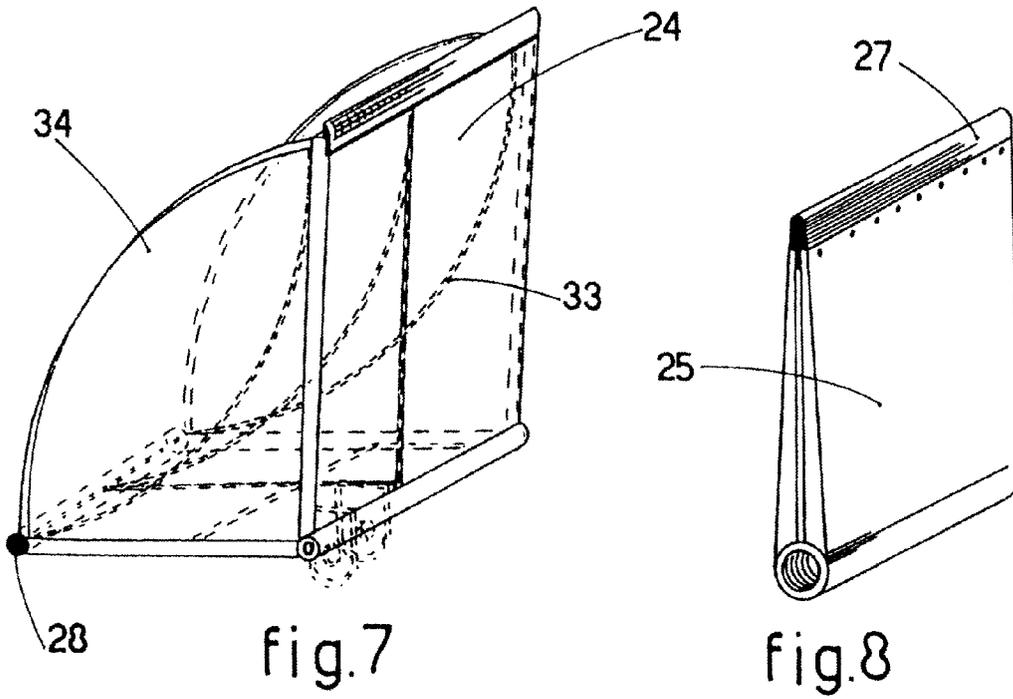
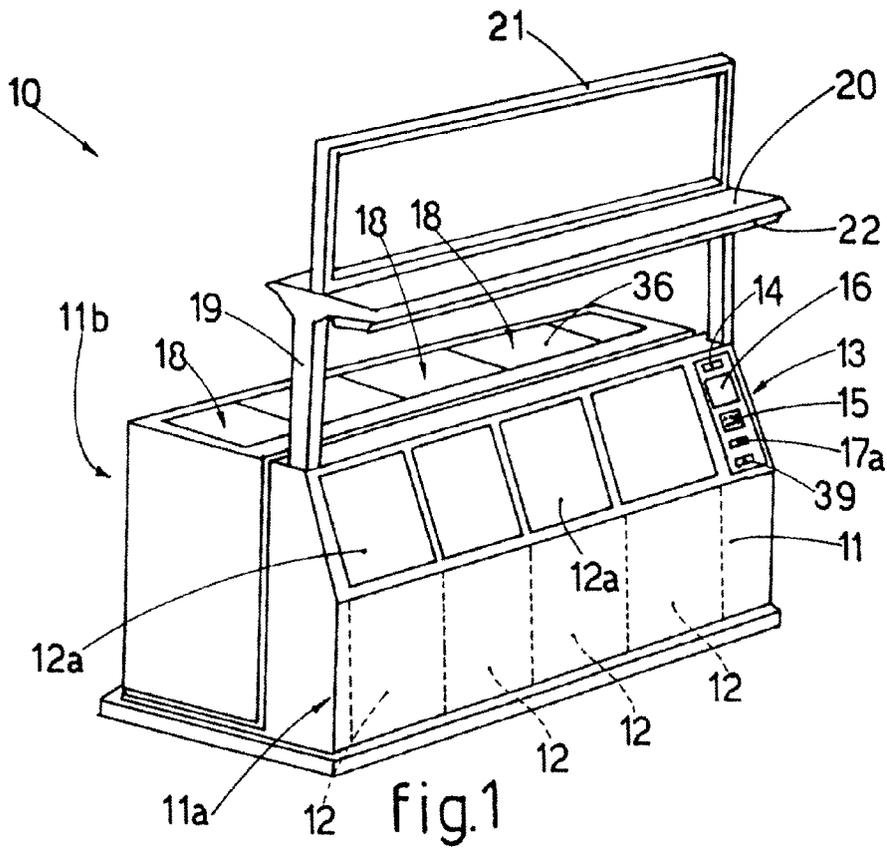
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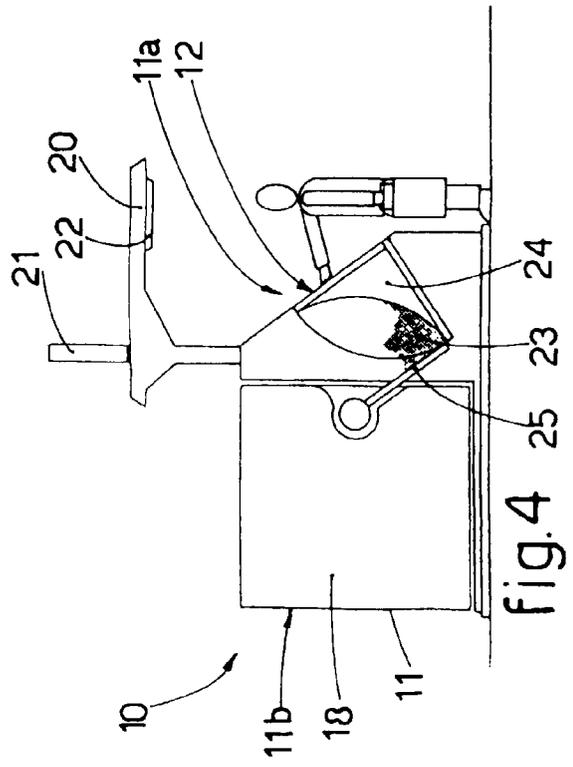
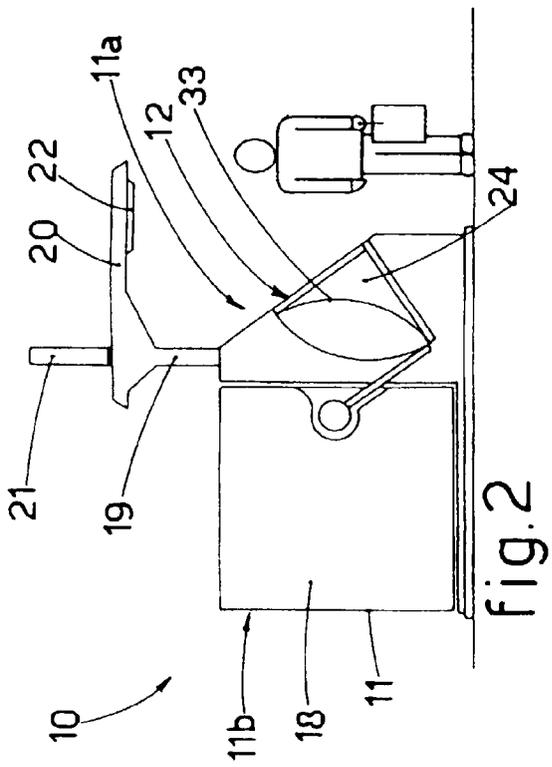
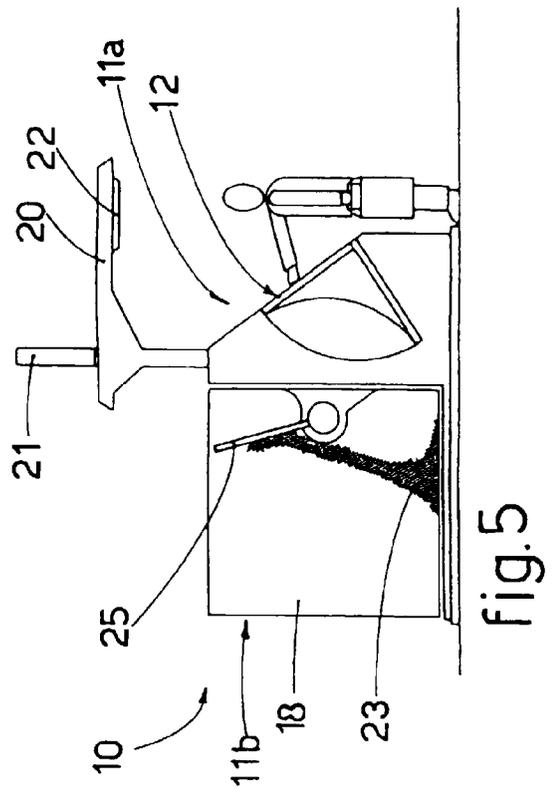
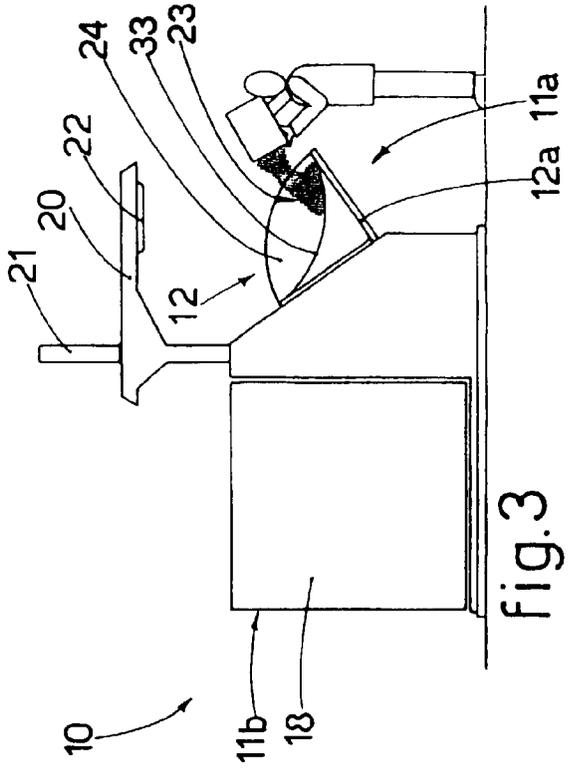
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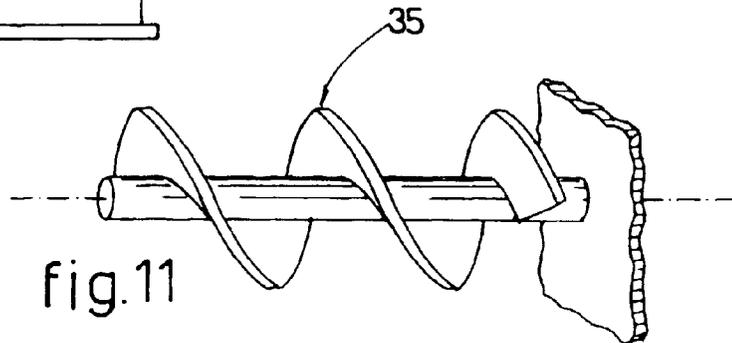
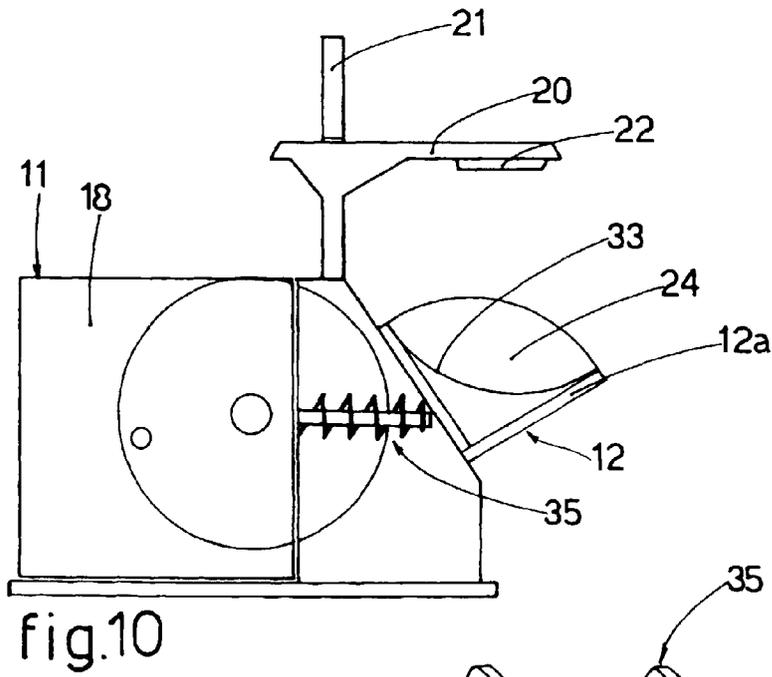
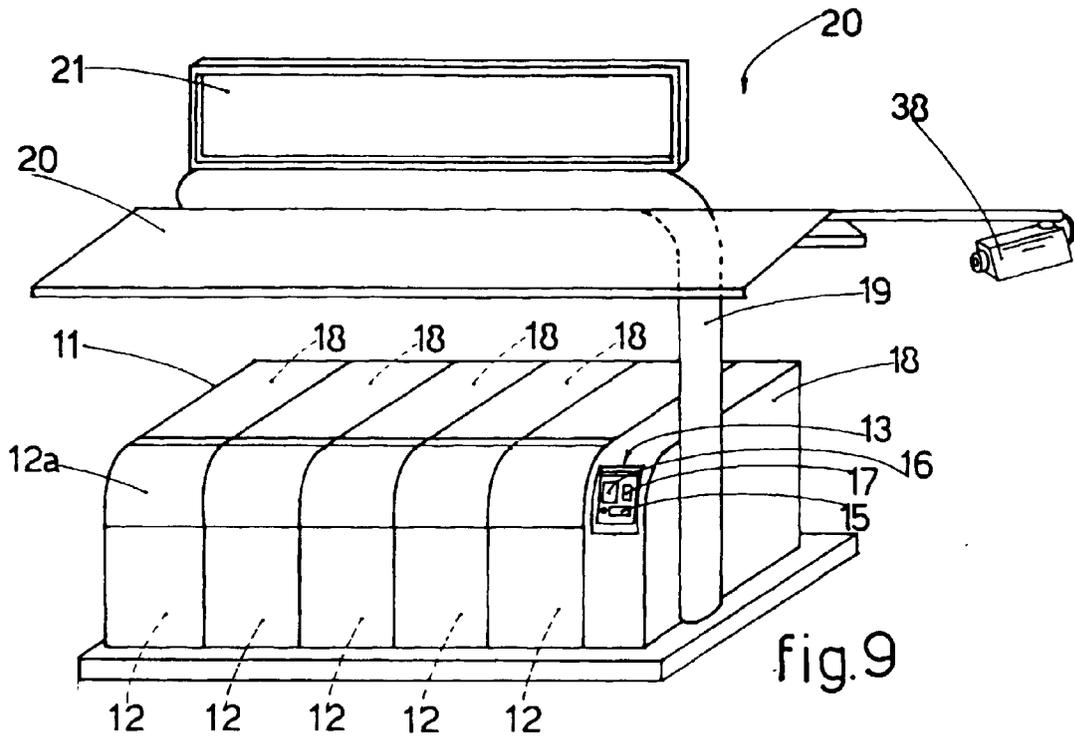
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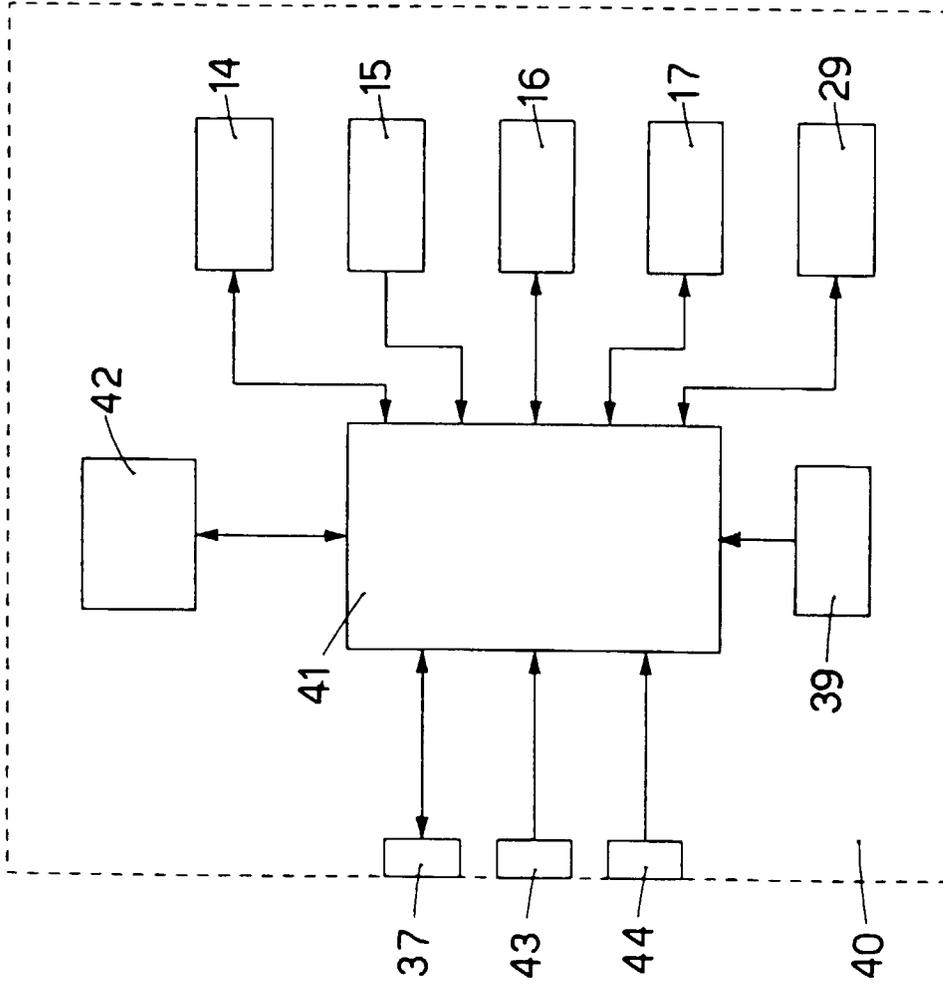


fig.12



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 98 11 5891

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ANNEX TO THE EUROPEAN SEARCH REPORT
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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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