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(54) **AUTOMATED BIN FOR COLLECTING AND EMPTYING WASTE, AND COLLECTING AND EMPTYING WASTE SYSTEM THEREOF**

(57) The present invention comprises an automated bin (1) for collecting and emptying waste, comprising a container (10) having an opening (100) for waste entering, at least one sensor (S1,...,Sn), connected to said container (10), for detecting at least one filling parameter of said container (10), a logic control unit (U), operationally connected to said at least one sensor (S1,...,Sn), power supply means (15), connected to said at least one sensor (S1,...,Sn) and to said logic control unit (U), for providing power to said at least one sensor (S1,...,Sn) and to said logic control unit (U), transmitting means (17), connected to said logic control unit (U), wherein said

transmitting means (17) can be connected, by means of a telematic communication network (T), to a central unit (CU), wherein said logic control unit (U) is configured for reading said at least one filling parameter, verifying if said at least one filling parameter is greater than a respective threshold to determine if said container (10) needs to be emptied, and transmitting, by means of said transmitting means (17), a signal for emptying said container (10) to said central unit (CU).

The present invention relates also to a system (2) for collecting and emptying waste.

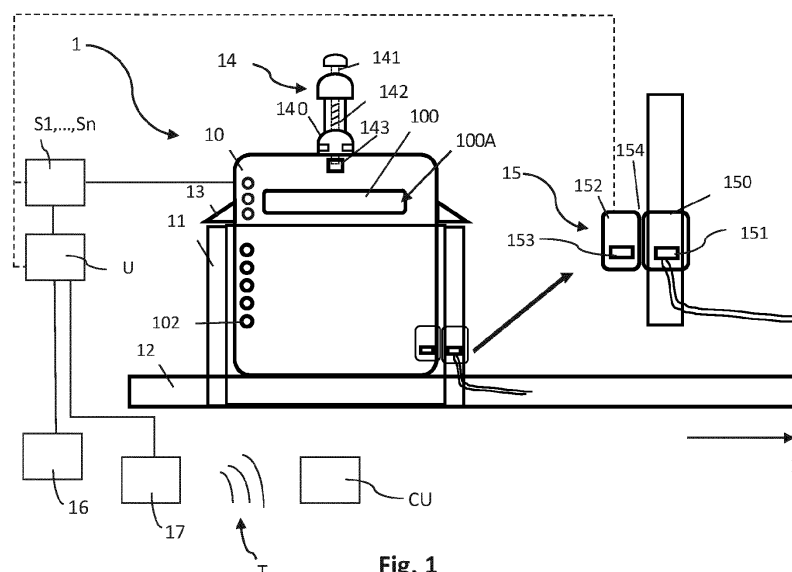


Fig. 1

Description

[0001] The present invention relates to an automated bin for collecting and emptying waste.

[0002] The present invention also relates to a system for collecting and emptying waste.

Field of the invention

[0003] More specifically, the invention relates to an automated bin of the aforesaid type, designed and made in particular to optimise the steps of collecting and emptying waste such as, for example, municipal waste.

[0004] In the following the description will relate to the management of municipal waste such as, for example, domestic, vegetable and similar solid waste, but it is clear that the same should not be considered limited to this specific use.

Prior art

[0005] As is known, there are currently several systems and methodologies for managing the entire waste process, from its production to its final destination.

[0006] In particular, the current waste management systems provide an optimisation of the collection, transport, treatment (recycling or disposal), up to the reuse of waste materials, so as to reduce the effects of the same waste on the environment and human health.

[0007] Such known solutions typically provide one or more bins arranged side by side, outside the roadway, so as not to cause an obstacle or danger to circulation.

[0008] However, one drawback of such known solutions is that they do not provide any monitoring system of the weight of the waste inside the same bins to allow a rapid emptying of the same bin when the latter is full.

[0009] Furthermore, the known solutions provide a periodic emptying of each bin regardless of the respective waste filling level. This can negatively affect the waste management cycle, preventing users from using the bin and increasing the pollution of the area around the bin.

[0010] Lastly, a further drawback of such known solutions is that they provide manual movements for opening or closing the bin, for example by means of buttons and levers, with consequent hygienic problems for users.

Aim of the invention

[0011] In the light of the foregoing, therefore, it is the aim of the present invention to provide an automated bin for collecting and emptying waste which allows to automate the waste management, improving the efficiency of the waste collecting and emptying steps.

[0012] A further aim of the invention is to provide an automated bin for collecting and emptying waste which allows to monitor the weight of the waste inside the bin and measure the filling level of the bin, subsequently communicating the filling data of the bin to one or more

telematic devices and/or telematic systems.

[0013] Another aim of the invention is to provide an automated bin for collecting and emptying waste which allows to reduce the environmental pollution caused by slurry, gases, toxic substances and non-biodegradable waste materials, improving the health safety of users.

[0014] A further aim of the invention is to provide an automated bin for collecting and emptying waste which allows to optimise the use of energy resources.

[0015] Another aim of the invention is to provide an automated bin for collecting and emptying waste which is of high reliability, of relatively simple construction, and at competitive costs if compared to the prior art.

Object of the invention

[0016] Therefore, a specific object of the present invention is an automated bin for collecting and emptying waste, comprising a container having an opening for waste entering, at least one sensor, connected to said container, for detecting at least one filling parameter of said container, a logic control unit, operationally connected to said at least one sensor, power supply means, connected to said at least one sensor and to said logic control unit, for providing power to said at least one sensor and to said logic control unit, transmitting means, connected to said logic control unit, wherein said transmitting means can be connected, by means of a telematic communication network, to a central unit, wherein said logic control unit is configured for reading said at least one filling parameter, verifying if said at least one filling parameter is greater than a respective threshold to determine if said container needs to be emptied, and transmitting, by means of said transmitting means, a signal for emptying said container to said central unit.

[0017] Advantageously, according to the present invention, said at least one sensor can comprise a weight sensor for weighing the waste inserted in said container and/or a position sensor for detecting the filling level of said container.

[0018] Still according to the present invention, said position sensor can comprise a plurality of first LEDs and a plurality of second LEDs, wherein each first LED is arranged on an inner wall of said container and a respective second LED is arranged on a further inner wall of said container, opposite to said inner wall, so that each first LED is capable of emitting a light radiation towards said respective second LED and said respective second LED is capable of detecting the filling level of said container on the basis of the light radiation received from said first LED.

[0019] Conveniently according to the present invention, said weight sensor can comprise a weighing unit arranged inside said container.

[0020] Still according to the present invention, said weighing unit can comprise a first plane, a second plane arranged parallel to said first plane, a plurality of springs arranged between said first plane and said second plane,

a rack having one end fixed to said first plane, a gear-wheel connected to said rack, and an encoder connected to said gearwheel and to said logic control unit, wherein said first plane is coupled to said second plane by means of said plurality of springs and movable with respect to said second plane along a vertical direction, so that, when a weight force is exerted on said first plane, the latter moves towards said second plane along said vertical direction causing a displacement of said rack and of said gearwheel proportional to said weight force and readable by said encoder.

[0021] Still according to the present invention, said automated bin can comprise a slide having one end connected to said opening and a further end connected to said first plane of said weighing unit.

[0022] Advantageously according to the present invention, said automated bin can comprise a housing structure for housing said container.

[0023] Conveniently according to the present invention, said power supply means can comprise at least one transformer, wherein said at least one transformer comprises a first support coupled to said housing structure, a first coil wound on said first support, and a first terminal connected to said first coil and to a power supply network, and a second support coupled to said container, a second coil wound on said second support, and a second terminal connected to said second coil, so as to generate a magnetic flux between said first coil and said second coil when a supply voltage is applied, by means of said first terminal, to said first coil.

[0024] Still according to the present invention, said power supply means can comprise at least one first electric contact arranged on said container, at least one second electric contact arranged on said housing structure, wherein said at least one first electric contact contacts said at least one second electric contact, wherein said at least one first electric contact comprises a first support and a first spring connected to said first support, and wherein said at least one second electric contact comprises a second support and a second spring connected to said second support.

[0025] A further object of the present invention is a system for collecting and emptying waste comprising at least one first automated bin for collecting and emptying waste, at least one second automated bin for collecting and emptying waste, wherein said power supply means of said at least one first automated bin also supply said at least one second automated bin.

[0026] Still according to the invention, said system can comprise a power supply column connected to said at least one first automated bin and to said at least one second automated bin, and said power supply means are arranged inside said supply column.

Brief description of the figures

[0027] The present invention will now be described, in an illustrative but nonlimiting manner, according to pre-

ferred embodiments thereof, with particular reference to the figures of the attached drawings, wherein:

figure 1 shows, in front view, an embodiment of an automated bin for collecting and emptying waste, according to the present invention;

figure 2 shows, in schematic view, an embodiment of power supply means of the automated bin for collecting and emptying waste of figure 1;

figure 3 shows a circuit diagram of a further embodiment of the power supply means of figure 2;

figure 4 shows, in schematic view, an embodiment of a primary circuit of the circuit diagram of figure 3;

figure 5 shows, in schematic view and in detail, a coupling between two portions of the power supply means of figure 2;

figure 6A shows, in schematic view, another embodiment of the power supply means of figure 2;

figure 6B shows, in schematic view, a further embodiment of the power supply means of figure 2;

figure 7A shows, in side view, a first embodiment of a waste weighing unit coupled to a slide, according to the present invention;

figure 7B shows, in perspective view and in detail, the waste weighing unit of figure 7A;

figure 7C shows, in schematic view, a detail of the weighing unit of figure 7A;

figure 8 shows, in schematic view, a second embodiment of the slide of figure 7A;

figure 9 shows, in schematic view, a communication between a group of sensors and a logic control unit, according to the present invention;

figure 10A shows, in side view, a plurality of first LEDs and a plurality of second LEDs arranged inside the bin of figure 1, according to the present invention;

figure 10B shows, in top view, the first LEDs and the second LEDs of figure 10A;

figure 11A shows, in schematic view, a communication between first LEDs, second LEDs and the logic control unit;

figure 11B shows, in detail, a first LED and a second LED, according to the circuit of figure 11A;

figure 11C shows, in detail, a circuit diagram of a transmission interface of the circuit of figure 11A;

figure 12 shows, in schematic view, a communication between memory means and the logic control unit, according to the present invention;

figure 13A shows, in schematic view, a communication between a motorisation group of the bin of figure 1 and the logic control unit, according to the present invention;

figure 13B shows a circuit diagram of the controls for the motorisation group of figure 13A;

figure 14 shows, in schematic view, an embodiment of an actuator group, according to the present invention;

figure 15A shows, in schematic view, a first embodiment of a system for collecting and emptying waste,

according to the present invention;

figure 15B shows, in schematic view, a second embodiment of the system for collecting and emptying waste of figure 15A;

figure 16 shows, in schematic view, an embodiment of a movement group of the automated bin of figure 1; figure 17A shows a front view of a third embodiment of the system of figure 15A;

figure 17B shows, in top view, the system of figure 17A; and

figure 17C shows, in schematic view, a communication between a supply column of the system of figure 15A and a central unit.

[0028] In the various figures, similar parts will be indicated with the same numerical references.

Detailed description

[0029] With reference to figure 1, the automated bin for collecting and emptying waste, indicated globally by reference number 1, comprises a container or collector 10, at least one sensor S1,..., Sn, connected to said container 10, for detecting at least one filling parameter of said container 10, a logic control unit U, operationally connected to said at least one sensor S1,..., Sn, power supply means 15, connected to said at least one sensor S1,...,Sn and to said logic control unit U, for providing power to said at least one sensor S1,...,Sn and to said logic control unit U and to said transmitting means 17, connected to said logic control unit U, wherein said transmitting means 17 can be connected, by means of a telematic communication network T, to a central unit CU.

Structure of the automated bin

[0030] In the present embodiment said container 10 of said bin 1 has the shape of a parallelepiped.

[0031] However, the shape of said container 10 can be different from that described, without thereby departing from the scope of protection of the present invention. By way of example, said container 10 can have a cylindrical shape. Furthermore, the capacity of the container 10 can be between 660 and 2,400 litres, with the most widespread use of 1,100L. The total load supported by such a container 10 can be between 300 and 800 kg.

[0032] In an embodiment, the container 10 has a height between 1.20 and 1.50 m, with openings or inlet mouths 100, having cut-resistant gaskets, with the dimensions: 133x36, or 2 circular mouths 100 of 45x26 or 2x30, or hopper front 109x26, according to the required dimensions, different for the type of waste material. The maximum volume, and therefore the maximum weight to be loaded, will be proportional to the type of compactor for the collection, and to the system attachments.

[0033] In particular, the container 10 with its covers 100A can have a seal to water, insects and other fauna, so as to avoid bad odours. Furthermore, the upper outer

surface of the container 10 can be tilted or rounded to prevent waste from being stably rested on the same surface.

[0034] In more detail, the covers 100A can be provided with movement means (not shown in the figures) for being moved automatically. In such a case, the movement means are connected to the power supply means 15 and can comprise position sensors for detecting the approach of a user or his hands near the inlet mouths 100. For safety reasons, the closure of the bin 1 is performed with slow-moving shock absorbers.

[0035] The covers 100A can be double hinged doors, inner and outer, controlled with geared motorisations and shock absorbers, complete with response sensors to the commands received, such as for example a microswitch, for the definition of the position.

[0036] Furthermore, the automated bin 1 comprises a collection member 14 to allow the container 10 to be collected from a vehicle such as, for example, a compactor or the like (not shown in the figures).

[0037] In particular, the collection member 14 in turn comprises a hook or mushroom 140 to allow the compactor to hook the container 10, a rod with head 141, a return spring 142 and a microswitch 143, which assist in the collection function of the container 10.

[0038] The mushroom 140 is shaped for being able to be hooked by the collection arm of the compactor with a suitable mechanical part complementary to the mushroom 140, governed by the same compactor.

[0039] In particular, the collection arm of the compactor is capable of acting on the rod 141, which, in turn, drives said microswitch 143.

[0040] The microswitch 143 then communicates with the logic control unit U, which controls the opening of one or more doors preferably arranged at the base of said container 10 for unloading the waste.

[0041] In the collection step, the bin 1 is isolated from the power supply (in fact, the container 10 is separated from the housing structure 11). Therefore, the energy required for such drives can be provided, for example, by a buffer battery.

[0042] As mentioned, the bin 1 comprises a logic control unit U. Such a logic control unit U can be arranged on an electronic board having all the terminals dedicated to the actuation or data reading services, coming from the devices used in the automation functions.

[0043] Said logic control unit U can comprise a microprocessor.

[0044] Furthermore, one or more further microprocessors, connected to the logic control unit, can be arranged on said electronic board to cooperate with said logic control unit.

[0045] In other words, a main microprocessor and one or more secondary microprocessors can be positioned on the same electronic board.

[0046] In particular, in an embodiment, the electronic board, on which the logic control unit U is positioned, and other devices are arranged in the upper part of the con-

tainer 10 of the "under roof" type so as not to hinder the devices used, which will be described below. Furthermore, a fan (not shown in the figures) connected to such an electronic board is responsible for limiting the temperature in the circuits.

[0047] Furthermore, in the case of wet waste, the bin 1 can comprise a metal "hat" or of other suitable material, arranged a few centimetres from the upper part of the container 10. In particular, said container 10 is open above at the centre, and below at the edge, so as to create a chimney effect of the air heated by the sun and reduce the fermentation effect.

[0048] The effect is linked to the heat inside the container 10.

[0049] As can be seen from figure 1, then, in the embodiment described, said automated bin 1 comprises a base 12, on which a housing or enclosure structure 11 is supported and mechanically connected, capable of at least partially containing said container 10.

[0050] Such a housing structure 11 is fixed to the base 12. Furthermore, the housing structure 11 can comprise a side opening to facilitate the emptying of the container 10 which can occur in the usual manners.

[0051] The housing structure 11 can then accommodate, as an alternative to the container 10, manual and pedal buttons for opening the inlet mouths 100A, for the user.

[0052] As will be better described in the following, said base 12 allows to house several automated bins 1, and can easily be serialized.

[0053] In the present embodiment, said base 12 has a longitudinal extension along a direction X and a thickness of about 10-25 cm. However, the shape and dimensions of said base 12 can be different from that described, without thereby departing from the scope of protection of the present invention.

[0054] In the embodiment described, the housing structure 11 is 1/3 to 2/3 the height of the container 10, so that incorrectly deposited waste does not prevent the repositioning of the container 10 in the correct position, of the housing structure 11.

[0055] In fact, the height of the housing structure 11 between 1/3 and 2/3 of the height of the container 10 allows to prevent the incorrectly deposited waste such as, for example, waste deposited outside the container 10, from affecting the insertion of the same container 10 inside the housing structure 11.

[0056] The housing structure 11 also has the function of a heat shield since it is insulated.

[0057] In addition, in the present embodiment, the automated bin 1 comprises signalling devices 102 such as, for example, signalling LEDs arranged on said container 10, preferably in the upper part of said container 10.

[0058] Such signalling LEDs are capable of providing data and/or information on the filling, operation, efficiency/inefficiency, maintenance and alarms related to the state of the automated bin 1.

[0059] However, in other embodiments, the type and

position of said signalling devices 102 can be different from that described. For example, the signalling LEDs 102 can be positioned on the housing structure 11. Such signalling LEDs 102 can also be used as night lights.

[0060] In addition, receivers can be provided for voice commands, instructions and voice signals. The allocation of the devices will be on the container 10 or on the housing structure 11, according to models or needs.

[0061] Furthermore, said automated bin 1 comprises electromechanical devices such as, for example, hand or foot buttons, RFID readers (transponders), electronic key readers, body approach sensors or hand sensors, and further indicators (not shown in the figures).

[0062] In an embodiment, said housing structure 11 can be fixed and of such a height as to avoid obstruction in the manoeuvres for the removal of any waste on the ground.

[0063] N buttons, sensors, screen and control devices can be arranged on the housing structure 11 and the container 10.

[0064] Alternatively, the bin 1 can be designed to be partially or totally underground.

[0065] The base 12 can be stable and anti-slip, to provide the bin 1 with a power of the order of kW, in wireless mode.

[0066] In addition, the composition of the bin, even multi-material, will have adequate structure for assembly, transport, inspections, ordinary, extraordinary maintenance and cleaning.

[0067] The choice of materials must evaluate and verify the actions of acids, moulds, etc. with particular attention to cleaning with short periodicity. Compatibility will also be maintained for bins 1 on the ground, in basements and underground.

Power supply means

[0068] As mentioned, the power supply means 15 are capable of providing power to said automated bin 1.

[0069] With particular reference to figure 2, in an embodiment of the present invention, said power supply means 15 comprise a transformer 15. Therefore, the transfer of power occurs wirelessly, by means of induction from a transformer.

[0070] However, in other embodiments, the number of said transformers can be different from that described.

[0071] Said transformer 15 comprises two iron supports or sheets 150, 152, of the "E" type, which are usually closed for the magnetic flux with an "I"-shaped sheet. In the present embodiment, however, such supports 150, 152 are closed on the opposite "E"-shaped sheet 152, 150.

[0072] In particular, the first support 150 supports the primary winding or first coil 155 and the second support 152 supports the secondary winding or second coil 156. The primary winding 155 is arranged on an inner wall of the housing structure 11 while the secondary winding 156 is arranged on a wall of the container 10 facing said

inner wall.

[0073] The two supports 150, 152 facing and opposite each other in axis, allow the magnetic circulation of the flux generated by the primary winding 155 and concatenated to the secondary winding 156, allowing the energy transfer.

[0074] The energy transferred will in turn be a function of the distance or air gap 154 between the two supports 150, 152. Sometimes the air gap 154 is deliberately increased to have better resistance to the magnetic flux and avoid saturation. Consequently, however, the primary-secondary coupling worsens and the dispersed fluxes with reactive powers increase. The best way is to instead increase the section of the central core of the iron to which the Primary and Secondary are wound, in order to reduce the flux density per unit area. This allows to distance from saturation.

[0075] By applying to the primary winding 155, with the first terminal or first clamp 151, the expected voltage at 50Hz, to the second terminal or second clamp 153 of the secondary winding 156, the voltage necessary to operate on the electromechanical and electronic equipment of the bin 1 is obtained.

[0076] The dimensions of the transformer and the section of the windings depend on the amount of electric current required. The voltage level will still be below the limits of human safety.

[0077] The power supply means 15 can be connected, in addition to the logic control unit U, also to chargers, to motor means, such as for example jacks or actuators, electronic boards and electronic sensors, electronic controls, indicators, display devices, etc.

[0078] Naturally, in an embodiment, said power supply means comprise a plurality of transformers 15, according to the needs of the bin 1.

[0079] However, the solution just described, with the use of ferrosilicon, is not particularly advantageous since the losses are high and the yield is poor. For example, with a 1mm air gap, the yield is less than 60%.

[0080] In the light of the foregoing, the most suitable solution for the purpose of the present invention is carried out.

[0081] In particular, a greater yield is obtained using working frequencies of 30-60kHz, since at these working frequencies, the losses due to the dispersed flux are reduced. There will be a strong reduction in the size of the devices, keeping the power at a certain level, with a good yield.

[0082] In this case, the ferrosilicon sheet cannot be used due to the considerable losses, but a sheet must be used, for example, in the same profile but in MnZn ferrite, with high permeability, high saturation, low power losses. Such material is extremely useful for various electronic applications. Thereby a safe, repeatable and inexpensive approach is obtained.

[0083] Figure 3 shows the circuit diagram C of such a type of transformer, in which the working frequency is 40kHz.

[0084] The primary circuit C1 comprises a generator G, which provides voltages V_{gA} and V_{gB} offset from each other and the power stages PotA and PotB working alternately. The division of double ferromagnetism is observed.

[0085] The secondary circuit C2 comprises a rectification circuit C20 for rectifying a voltage and obtaining an output voltage +Vu. Said rectification circuit can be a rectifier with linear stabilisation or a rectifier with switching stabilisation, according to needs. The output voltage +Vu will be that necessary for the user. From said output voltage +Vu it will be possible to obtain a plurality of voltages +Vu1, +Vu2...+Vun, each necessary for a respective device, through respective switching devices.

[0086] In the embodiment described, the rectification circuit is a rectifier with linear stabilisation indicated with the reference "stab" and the switching devices are indicated with the reference "switching".

[0087] Figure 4 shows the primary circuit C1 comprising two transistors Tr1 and Tr2 which alternately conduct with a signal from a generator, for example a 50kHz square-wave generator.

[0088] In particular, the locking and damping coils Bl_1 and Bl_2 are depicted in the circuit, and the capacitors which reduce the signal harmonics are $C_1 = 50nF$ 100V, $C_2 = 330nF$ 160V, $C_3 = 50nF$ 100V, making the fronts less steep and protecting the transistors Tr1 and Tr2.

[0089] Therefore, the switching losses are almost zero. The capacitor C_2 actively participates in the resonance. Such a circuit is similar to the Royer circuit, which, however, is self-oscillating, and therefore does not require any generator.

[0090] Thereby, however, there is easy operating and implementing linearity as the generation step will be delegated to the logic control unit U or to a further microprocessor (connected thereto) and the frequency is thus easily determined and stable.

[0091] Transistors of different types can easily conduct high currents, even of the order of tens of Ampere. For example, the two transistors can also be very robust, of the non-exclusive type, 2SD1047 from STMicroelectronics with 200V voltage and repetitive current 12A and peak current 20A. The circuit depicted is essentially a resonant DC-DC converter.

[0092] The two supports 150, 152, can comprise male/female mechanical couplings, or any automatic alignment electromagnets to minimise the air gap 154 and ensure a precise alignment of the axes.

[0093] Figure 5 shows a first portion or female part 150A mechanically integral with the first support 150, and a second portion or male part 152A mechanically integral with the second support 152. A possible electromagnet will bring such portions 150A, 152A closer together. The axis setting will thereby be very precise.

[0094] A further energy transfer system provides the presence of electric contacts arranged on the winding structure 11 and on the container 10, preferably in the lowermost peripheral part, taking into account moving

parts of the container 10.

[0095] As can be seen from figure 6A, the container 10 comprises first electric contacts or inner electric contacts 10A and the winding structure 11 comprises second electric contacts or outer electric contacts 11A, which contact said first electric contacts 10A.

[0096] More specifically, each first electric contact 10A comprises a first support 100A and a first spring or first sliding spring 101A connected to said first support 100A.

[0097] Similarly, each second electric contact 11A comprises a second support 110A and a second spring or second sliding spring 111A connected to said second support 110A.

[0098] With reference to figure 6B, in the case of compression spring-type electric contacts 10A, 11A, the structure is similar to the previous one.

[0099] In other embodiments, the electric contacts 10A, 11A can be different from the sliding or crushing spring electric contacts. Furthermore, the number of contacts will also be a function of needs so as to divide the current therebetween with less relative problems. By way of example, it is always necessary to restore the ground contact, in order to ensure safety, especially for the significant metal masses involved.

[0100] Furthermore, the electromechanical devices with high absorption in each bin 1 and all the other electronic devices will not be active simultaneously, but according to a programmed plan of use, in order to optimise energy resources.

Sensors

Weight sensor

[0101] The sensors S1,...,Sn shown in figure 1 can comprise a weight sensor for weighing the waste inserted in said container 10.

[0102] In particular, in an embodiment, said weight sensor can be a weighing unit 18, shown in figures 7A-7C.

[0103] As can be seen from figure 7A, said weighing unit 18 is arranged inside said container 10 and comprises a first plane 180 and a second plane 181 arranged parallel to said first plane 180.

[0104] Furthermore, said weighing unit 18 comprises a plurality of springs 182 arranged between said first plane 180 and said second plane 181, a rack 183 having one end fixed to said first plane 180, a gearwheel 184 connected to said rack 183.

[0105] The first plane 180 is coupled to said second plane 181 by said plurality of springs 182 and movable with respect to said second plane 181 along a vertical direction indicated with the reference letter Y. In particular, sliding pins (not shown in the figures) can be used to allow the sliding of the first plane 180. Such sliding pins can be made of material suitable for sliding, for example Teflon, or can be comprised in a bearing system.

[0106] The weighing unit 18 further comprises an encoder 185 connected to said gearwheel 184, to said logic

control unit U. In particular, as can be seen from figures 7B and 7C, said encoder 185 is integral with the plane 181 by means of a bracket St.

[0107] Therefore, when a weight force is exerted on said first plane 180, the latter moves towards said second plane 181 along said vertical direction Y, inducing a displacement of said rack 183 and of said gearwheel 184 proportional to said weight force P_e and readable by said encoder 185.

[0108] In fact, a pressure force, for example, weight force P_e , will change the distance D_d between the two planes 180, 181, inducing a displacement of the rack 183.

[0109] Such a displacement will induce a rotation of the gearwheel 184 connected thereto, in turn integral with an encoder 185.

[0110] The movement will allow the encoder 185 to provide the information Cel to be sent to the logic control unit U for its interpretation.

[0111] The weighing unit 18 further comprises a motor M1, preferably a stepper motor, drivable by the logic control unit U.

[0112] Following the opening of the inlet mouth 100, the first plane 180 is kept in a stable horizontal position for a short time, for example, of the order of the second or more, to allow the weighing unit 18 to stabilise, providing the encoder 185 with the data which can also be averaged, between some significant values.

[0113] If the distance D_d between said first plane 180 and said second plane 181 is a variation, for example, by 20mm, with a maximum load of 20kg, for 2 kg there is a displacement of the first plane 180 by 2mm and so on.

[0114] Such a displacement involves a further displacement of the rack 183, integral with the first plane 180, which in turn induces, by means of a rotation of the gearwheel 184, a rotation of the encoder 185, which provides the data to the logic control unit U. Such a logic control unit U governs the entire process:

- opening of the inlet mouth 100 and the underlying safety door (not shown in the figures);
- horizontal rest positioning of the first plane 180 by means of the motor M1;
- signal reading times of the encoder 185;
- release of said first plane 180 in a new position, inclined with respect to the original position, rotating M1 so as to release the waste into the container 10; and
- horizontal repositioning of the first plane 180 by means of the motor M1.

[0115] The information datum sent to the logic control unit U, is subsequently processed and, when possible, shown to the user.

[0116] The global weighing will be the sum of the individual weighings, but only in principle, due to the large amount of errors which can be accumulated in series. This will instead be done with the due precision, in the load by the compactors.

[0117] As can be seen from figures 7A and 8, the inlet mouth 100 is connected to a slide 103 to favour the sliding of the waste inside the container 10.

[0118] To avoid any impediments in the sliding of the waste caused by an increase of the friction forces, for example, in the case of wet bags, presence of glues or the like, the slide 103 is provided connected to a further motor M2 capable of generating a vibrational motion for a safe detachment of the waste from the wall of the slide 103.

[0119] In an embodiment, said slide 103 has a free end and another end connected to the inlet mouth 100, in particular, being hinged thereto by means of the hinge 104.

[0120] The motor M2 can be a misaligned lever motor. The drive will be controlled by the logic control unit U which governs the entire cycle.

[0121] In particular, when in use, the logic control unit U drives M2 for the vibration of the slide 103, so that the waste with weight P_e deposits on the first plane 180.

[0122] For a very short mechanism stabilisation time, the waste is kept on the first plane 180.

[0123] As mentioned, once the rotation of the encoder 185 is achieved by means of the gearwheel 184 and the rack 183, such rotation is proportional to the weight.

[0124] The evaluation of the weight by the logic control unit U can occur by averaging several acquired values.

[0125] The weight is then managed by the software. The logic control unit U controls the release of the first plane 180 in the new operational position, allowing the sliding of the waste.

[0126] The mouths 100 remain closed, the first plane 180 will return to the original position, i.e., in a horizontal position, and the other electromechanical activities will resume their course. The entire cycle can start again.

[0127] Figure 9 shows the sensors $S_1, \dots, S_n$, whose data are read by an interface board CC2 connected to the logic control unit U. Such a logic control unit U receives such data and sends the commands $C_{m1}, \dots, C_{mn}$.

Position sensor

[0128] Figures 10A, 10B show the presence of a plurality of position sensors Lt, Lr arranged inside the container 10 for detecting the level of waste filling in the container 10.

[0129] As will be explained further below, such a measurement can then be transmitted to the central unit CU for the management of the compactor lorries.

[0130] Ultrasonic sensors are typically used. However, the use of such sensors is not effective for the disordered type of waste present inside the container 10.

[0131] In the embodiment described, the position sensor comprises a plurality of first LEDs or transmitter LEDs Lt and a plurality of second LEDs or receiver LEDs Lr.

[0132] In particular, each first LED Lt is arranged on an inner wall of said container 10 and a respective second LED Lr is arranged on a further inner wall of said container

10, opposite to said inner wall.

[0133] Thereby, each first LED Lt is capable of emitting a light radiation towards said respective second LED Lr and said respective second LED Lr is capable of detecting the filling level of said container 10 on the basis of the light radiation received from said first LED Lt.

[0134] More specifically, there is a horizontal network of transmitter-receiver pairs in an adequate number, for example 2 or more per side, arranged at desired heights inside said container 10.

[0135] In height, the LED-sensor networks could be $1/4, 1/2, 3/4, 4/4$, the set of transmitter LEDs Lt will be fed with pulses and the receivers Lr will detect and control the reception.

[0136] The process is repeated over time and the set of data analysed by the logic control unit U allow to analytically know the filling level of the container 10 over time, i.e., the volume of its content.

[0137] After the analysis, the data are periodically transmitted to the central unit CU.

[0138] Figure 11A shows the tuples of pairs Lt-Lr necessary for the process, governed, by means of an interface board Cin, by the logic control unit U. The logic control unit U, by means of an interface Lt, is responsible for the transmission of data, for example, in Bluetooth. By way of example, within the interface board Cin, the n-th coupling scheme with pulse stimulus is indicated.

[0139] The logic control unit U is configured to send the information related to the filling level of the container 10 (obtained by the pairs of LEDs Lt Lr) and the voltages V_{outn} through a UART indicated with Tx Rx to a Bluetooth module (for example an RN4870 board).

[0140] Figure 11B shows a detail of a pair of LEDs comprising a transmitter LED Lt and a receiver LED Lr, of the infrared phototransistor type.

[0141] There is a basic circuit for each pair of LEDs Lt, Lr in the interface board Cin. The LED Lt is fed by electric current pulses so that it is not disturbed by the light present in the system, and to achieve high precision.

[0142] The LED working in infrared from about 700 to 800 nm, with narrow angle and high pulsed current, with a period of a few ms, sends radiation to the base of the phototransistor which transforms it into current in the collector. The load R will create the voltage drop proportional to the current and therefore the voltage V_{out} of the on-off type, which contains the information to be used.

[0143] This voltage V_{out} communicated to the logic control unit U will be the subject of the multiple pair data set processing, of the different planes. The interruption of the rays due to the residues will allow to know the filling, thus the level and volume thereof.

[0144] The overall processing and detailed analysis will eliminate the filling limit zones for example for a few rays interrupted by a single item of waste. This is to define the global filling level, to be used in the transmission with Lt, towards the Bluetooth receiver of the column, with sending in predetermined times to the data centre. This relates to the filled container 10 datum.

[0145] Instead, in a more refined manner, the partial filling datum will be transmitted at defined times for the construction of the time-filling chart or table.

[0146] In figure 11C, a Bluetooth circuit is shown, for example of the RN4870 type, already mentioned, Bluetooth module V5.0 2.48GHz 10mA, with integrated antenna, governed directly by the logic control unit U, with a UART.

Temperature sensor

[0147] In addition, one or more temperature sensors, for example of the PTC or NTC type or other, can be located at respective points of the bin 1. In particular, the temperature values detected by each temperature sensor are acquired by the logic control unit U by means of suitable interfaces and said temperature values will be managed by dedicated software.

[0148] For example, such temperature sensors can detect the maximum and minimum value of the temperature of the waste inside the container 10, which can be used as parameters indicative of the conservation state of the same waste in order to verify the need for emptying the container 10.

[0149] The temperature values can be sent to the central unit CU for the centralised management of the bins 1 to be emptied. The ambient temperature value can also be displayed on special displays.

Geolocation device

[0150] Each bin 1 can comprise one or more geolocation devices or GPS modules.

[0151] In particular, such GPS modules are capable of providing time, date, latitude, longitude and height and recording the data for a long time. Such data can be sent to the central unit CU, for mapping and programming the emptying of the container 10.

[0152] The knowledge of GPS data will be useful for the overall management of the bins, even in large urban centres and for centralised control, also at national level.

[0153] In other embodiments, it is possible to provide further GPS devices, which, for example, are interfaced at least to the logic control unit U, allowing the management thereof.

[0154] In particular, the positioning of the bins can be digitised with GPS modules such as, for example, a module capable of providing time, date, latitude, longitude and height with recording of the data every 15 seconds and stored for 16 hours.

[0155] Other devices similar to the GPS modules can be interfaced to the logic control unit U or to one or more other microprocessors to manage the data received from said devices. These data can be sent to the central unit CU, for the required mapping. The knowledge of GPS data can be very useful to the central unit CU, to follow the entire life cycle of the bin 1, its allocation and consequent remote management, with continuous surveil-

lance.

Memory means

5 [0156] Said bin 1 then comprises memory means 16. Such memory means 16, connected to said logic control unit U, allow to store a predetermined threshold for each filling parameter.

10 [0157] In particular, said memory means 16 allow the storage of a large amount of data such as, for example, elements referable to users, for the management of reports related to refunds, transit memory of the technical data to be transmitted outside of real time, such as filling of the bins or maintenance elements.

15 [0158] In an embodiment, said memory means 16 are arranged in an accessible part of the bin 1 suitably reserved, accessible by management personnel.

20 [0159] As shown in figure 12, a reader of multiple memories SD, for example SD1 and SD2, is allocated inside the container 10, easily accessible by authorised personnel.

[0160] In the present embodiment, said reader is the interface reader or board Cin.

25 [0161] The memory SD is read by the interface board Cin and connected to the logic control unit U, which, with an adequate video interface Cvid, will provide all the information requested by the video screens Sch.

Movement means

30 [0162] The movement means or motors M1,...,Mn allow opening the inner and outer doors 100, closing the waste unloading doors as well as the movement of the weighing unit 18.

35 [0163] Such drives will never be simultaneous for reasons of safety and efficiency in terms of use of energy resources.

40 [0164] In particular, as shown in figures 13A, 13B, the motor drives will be responsible for the logic control unit U with the established commands cM1, cM2,... cMn of the I/O, according to the established management protocols, using the power interface board C3.

45 [0165] Working in direct current, the control switches can be in addition to mechanical, or solid-state, relays with typical transistor circuits. The transistors can reach remarkable currents, even those mentioned above, for example 2SD1047. In this example, Q1 will be a complementary PNP. Q2 NPN will also be of adequate power.

Actuators

50 [0166] With reference to figure 14, with regard to the actuators and/or jacks A1,...,An, respectively pneumatic, linear, electrical, hydraulic, rotating the first and hydraulic, mechanical, electrical, screw, the second, the operating principle is completely similar to that of the movement means M1,...,Mn.

[0167] They differ from each other by Vac and Vdc and

by the value of the voltage and current. By way of non-exhaustive example, for the direct we indicate 24V 6A Finder relays 34.81.7.024.9024 and for the alternating power 25A Crydom D2425, but also 10A, 50A, etc.. These latter Modules Mod in the drawing, work in output for zero-crossing voltages from 24 to 280Vrms.

[0168] The control voltage ranges from 3 to 32 VDC and the control current ranges from 7 to 12mA. For these voltage and current values, it is necessary to have an interface so that the logic control unit U is capable of managing such voltage and current values. For example, with transistors that close one control pole to ground while the other is at the supply voltage.

[0169] In the example of figure 14, the value of the voltage +V and the resistance R2, determine the current necessary to control the Mod. The power terminals of An are indicated with 1 and 2.

Supply column

[0170] With reference to figures 15A ,15B, a system for collecting and emptying waste is shown, indicated globally with the reference number 2, comprising an automated bin 1 for collecting and emptying waste and a supply column or pole or tower 20 connected to said first automated bin 1. Therefore, the power supply means 15 are arranged inside the supply column 20 and connected to the bin 1.

[0171] In the first embodiment of figure 15A, the supply column 20 has a fixed ground base, which becomes thinner in the upper part. The latter ends with a cap covering the lighting elements of the area I_{II} and comprises a camera Tel for the technical control of the area devices.

[0172] The power from the supply column 20 arrives at the base 12 by means of a standard, very low voltage connection.

[0173] The supply column 20 has the function similar to those of the car charging type.

[0174] In particular, there is a wired energy connection from the supply column 20 to the housing structure 11, while between the housing structure 11 and the container 10 there is a wireless connection, with a "transformer" type, in which a first half of the transformer (comprising a primary winding) is on the housing structure 11 and a second half of the transformer (comprising a secondary winding) is on the container 10, with a minimisation of the possible air gap. Power of the order of kW can be used.

[0175] The supply column 20 can be provided with one or more technical and protective video surveillance cameras of the area, and courtesy lights, and, similar to the container 10, said supply column 20 can also have a contactless card reader, hand and foot actuation buttons, level indicators, displays, recognition systems, etc.

[0176] The supply means 15 are connected to the supply network (not shown in the figures) and to the base 12. The connection between said supply column 20 and said bin 1 can be underground or protected.

[0177] Furthermore, the supply column 20 can be provided with one or more solar panels to assist in the supply of energy. The bin 1 can also use a solar panel for the aims already described.

[0178] If the supply column 20 is not present, and the activities of the bin 1 can only be supported by the solar panel system, also reducing or rarefying the chosen functions over time, all the activities provided for the supply column 20 can be transferred directly to the bin.

[0179] Furthermore, the supply column 20 can contain the connectivity elements to the internet for the connection to the central unit CU, and to the bins 1 in Bluetooth, for the data exchange of all the programmed functions, as already indicated.

[0180] There is a less equipped version of the supply column 20 in the embodiment shown in figure 15B.

[0181] The data transmission mode from the bin 1 to the supply column 20 and from the latter to the central unit CU and vice versa, can make use of the circuitry of figure 11C and the related software, for all the necessary technical matters.

User buttons

[0182] Figure 16 shows the buttons necessary for the management of the bin 1. They can be allocated on the bin 1 itself, on the housing structure 11 or on the supply column 20 or even distributed therebetween.

[0183] These are available to users and necessary for opening the inlet mouths 100 with hands and feet, to request information, to repeat commands, to request listening to information, etc.

[0184] Furthermore, in an alternative, the circuit shown in figure 16 can comprise one or more further microprocessors, each of which is connected to the logic control unit U.

[0185] Figure 16 shows the buttons or keys generically named PUn which are directly connected to the I/O Pins of the logic control unit U. The connection occurs with the connector MPu of the logic control unit U.

[0186] An alphanumeric keypad can also be provided with a smaller number of letters and numbers with respect to the number of letters and numbers of a keypad of a known type (for example, the alphanumeric keypad can comprise three letters and three numbers), if necessary it will be connected to the logic control unit U for reading the codes assigned to users, instead of or at the same time as RFID and/or electronic keys.

Fans

[0187] In addition, the bin 1 can comprise one or more fans, each of which is positioned in a respective point of the bin 1, for example to cool a respective electric or electronic circuit.

[0188] Each fan is controlled by the logic control unit U by means of a respective electric switch. Said electric switch can be a relay, in particular a solid-state relay.

Connectivity

[0189] To connect the various devices or parts of the electronic circuits to each other, according to needs, it is possible to use a Bluetooth connection (for example an RN4870 board) or a WiFi connection or one or more RS485 communication protocols or one or more MBus communication protocols, if the peripheral devices are not provided with supply means.

[0190] The MBus protocol allows to use two electric wires of any type, even if not intertwined. Unlike the RS485 communication protocol, the consumption of electric current will be practically negligible since the consumption of electric current is distributed over time. Small and constant recharges of the devices occur during the pulses of the transceiver.

Connection through RS485 communication protocol

[0191] The use of the RS485 communication protocol allows to place several devices which use the same communication protocol on the same bus, so as to allow the communication between said devices.

WiFi connection

[0192] Direct WiFi connectivity can be obtained by using, as a non-exclusive example, the WiFi Module ESP8266EX SPI 4MB Flash UART/Antenna, provided with an antenna in the circuit, interfaced with the logic control unit U.

[0193] Such connectivity will also be useful in the event of a Bluetooth connection failure. Furthermore, such connectivity will be used to connect with smartphones, tablets, etc. Some applications can allow the thorough management of the bin 1 by the user, for their part, such as access logs, all the data collected, the weight and quality and quantity of waste conferred where it was possible to collect such data, schedules, possible credit, etc. This can also occur using Bluetooth.

[0194] This type of interface can also be used by service personnel for verification and maintenance, reading all the data (log) of the last days of operation and entering update data.

System for collecting and emptying waste

[0195] Figures 17A, 17B show the system 2 comprising a plurality of bins 1, as well as a base 12 and a supply column 20 for said plurality of bins 1.

[0196] Each bin 1 is provided with a respective Bluetooth module RNn therein, for example an RN4870 board, which can communicate with a Bluetooth module Rnc of the supply column 20. Furthermore, the supply column 20 is provided with a further logic control unit configured to receive the data processed and transmitted by each logic control unit U of each bin 1.

[0197] Figures 17A, 17B also show further Bluetooth

modules RNn', which can be contained in the housing structure 11 of a respective bin 1. In such a case, the Bluetooth modules RNn of each bin 1 will be interfaced to a respective further Bluetooth module RNn' of a respective housing structure 11. Said further Bluetooth modules RNn' will exchange data with the Bluetooth module Rnc of the supply column 20.

[0198] Such further Bluetooth modules RNn' allow to improve the data exchange between the supply column 20 and each bin 1_{1,..., 1n}, even at considerable distances.

[0199] Furthermore, given that the devices are not in the open free field, but are adequately contained in the bins 1 and in the housing structures 11, a wired system can be used, created between the supply column 20 and the housing structures 11 by means of RS485 communication protocols.

[0200] It will be the task of the supply column 20 to exchange data, for example through an internet connection, with the central unit CU, which governs the entire system 2. By way of example, such communication can occur with the current WiFi 802.11ac standard.

[0201] As can be seen from figure 17C, a router with a SIM which allows connection to the internet can be inserted in each supply column 20.

[0202] The central unit CU communicates with the plurality of SIM routers in the supply columns 20 to receive and communicate data by means of the internet and/or a telephone data network.

[0203] In particular, the UMTS (Universal Mobile Telecommunications System) module, present in the router, stores the data detected by the bins 1 connected thereto, and periodically sends them to the central unit CU.

[0204] Said data, stored by said plurality of supply columns 20 are related, for example, to the previously described operation and to the remote diagnostics of the efficiency of the mechanisms of the smart bins.

[0205] The positioning of the supply columns 20 can also be an air quality monitoring point.

Cleaning

[0206] With regard to the ordinary maintenance of the bins 1, they must be washed promptly, at a fixed, periodic, regular, close frequency.

[0207] In particular, washing the bins 1 involves the use of special machinery. The washing should also contain sanitation. The activity can only be done by special machines, sometimes it is actually done in the same arranged compactors.

Advantages

[0208] A first advantage of the optimised bin according to the present invention is that of allowing an automation of all its functions, such as, for example, collecting waste and transmitting data, with the use of the latter as a guide to the collection cycle, with the consequent simplification, efficiency and optimisation of waste management.

[0209] Another advantage of the optimised bin according to the present invention is that of allowing a measurement of the filling level of each bin, and, therefore, transmitting the filling data to a central unit, so as to optimise the respective waste disposal cycles, for example, by sending one or more compactor lorries.

[0210] A further advantage of the optimised bin according to the present invention is that of ensuring an improvement in the cleanliness, decorum and hygiene of the area surrounding the bin.

[0211] Another advantage of the optimised bin according to the present invention is that of allowing a transfer of energy to the bin, for example in wireless mode, automating its functions of collecting and/or emptying waste. Thereby, the bin self-regulates the collecting or emptying of waste following the reception of one or more control signals from electric/electronic circuits.

[0212] The present invention has been described, in an illustrative but nonlimiting manner, according to preferred embodiments thereof, but it is to be understood that variations and/or modifications may be made by those skilled in the art without thereby exiting from the relative scope of protection, as defined by the attached claims.

Claims

1. Automated bin (1) for collecting and emptying waste, comprising

a container (10) having an opening (100) for waste entering,
at least one sensor (S1,...,Sn), connected to said container (10), for detecting at least one filling parameter of said container (10),
a logic control unit (U), operationally connected to said at least one sensor (S1,...,Sn),
power supply means (15), connected to said at least one sensor (S1,...,Sn) and to said logic control unit (U), for providing power to said at least one sensor (S1,...,Sn) and to said logic control unit (U),
transmitting means (17), connected to said logic control unit (U), wherein said transmitting means (17) can be connected, by means of a telematic communication network (T), to a central unit (CU),
wherein said logic control unit (U) is configured for

reading said at least one filling parameter,
verifying if said at least one filling parameter is greater than a respective threshold to determine if said container (10) needs to be emptied, and
transmitting, by means of said transmitting means (17), a signal for emptying said con-

tainer (10) to said central unit (C).

2. Automated bin (1) according to the preceding claim, wherein said at least one sensor (S1,...,Sn) comprises a weight sensor for weighing the waste inserted in said container (10) and/or a position sensor for detecting the filling level of said container (10).

3. Automated bin (1) according to the preceding claim, wherein

said position sensor comprises a plurality of first LEDs (Lt) and a plurality of second LEDs (Lr), and
wherein
each first LED (Lt) is arranged on an inner wall of said container (10) and a respective second LED (Lr) is arranged on a further inner wall of said container (10), opposite to said inner wall, so that each first LED (Lt) is capable of emitting a light radiation towards said respective second LED (Lr) and said respective second LED (Lr) is capable of detecting the filling level of said container (10) on the basis of the light radiation received from said first LEDs (Lt).

4. Automated bin (1) according to any one of claims 2 or 3, wherein said weight sensor comprises a weighing unit (18) arranged inside said container (10).

5. Automated bin (1) according to the preceding claim, wherein

said weighing unit (18) comprises:

a first plane (180),
a second plane (181) arranged parallel to said first plane (180),
a plurality of springs (182) arranged between said first plane (180) and said second plane (181),
a rack (183) having one end fixed to said first plane (180),
a gearwheel (184) connected to said rack (183), and
an encoder (185) connected to said gearwheel (184) and to said logic control unit (U),
wherein

said first plane (180) is coupled to said second plane (181) by means of said plurality of springs (182) and movable with respect to said second plane (181) along a vertical direction (Y), so that, when a weight force is exerted on said first plane (180), the latter moves towards said second plane (181) along said vertical direction (Y) causing a displacement of said rack (183) and of said gearwheel (184) proportional to said

weight force and readable by said encoder (185).

6. Automated bin (1) according to the preceding claim, wherein said automated bin (1) comprises a slide (13) having one end connected to said opening (100) and a further end connected to said first plane (180) of said weighing unit (18). 5
7. Automated bin (1) according to any one of the preceding claims, wherein said automated bin (1) comprises a housing structure (11) for housing said container (10). 10
8. Automated bin (1) according to claim 7, wherein said power supply means (15) comprise at least one transformer (15), wherein said at least one transformer (15) comprises: 15

a first support (150) coupled to said housing structure (11), 20

a first coil (155) wound on said first support (150), and

a first terminal (151) connected to said first coil (155) and to a power supply network, and 25

a second support (152) coupled to said container (10),

a second coil (156) wound on said second support (152), and

a second terminal (153) connected to said second coil (156), 30

so as to generate a magnetic flux between said first coil (151) and said second coil (153) when a supply voltage is applied, by means of said first terminal (155), to said first coil (155). 35

9. Automated bin (1) according to claim 7, wherein said power supply means (15) comprise: 40
- at least one first electrical contact (10A) arranged on said container (10),
- at least one second electric contact (11A) arranged on said housing structure (11),
- wherein said first electric contact (10A) contacts said at least one second electric contact (11A), wherein said at least one first electric contact (10A) comprises a first support (100A) and a first spring (101A) connected to said first support (100A), and 45
- wherein said at least one second electric contact (11A) comprises a second support (110A) and a second spring (111A) connected to said second support (110A). 50

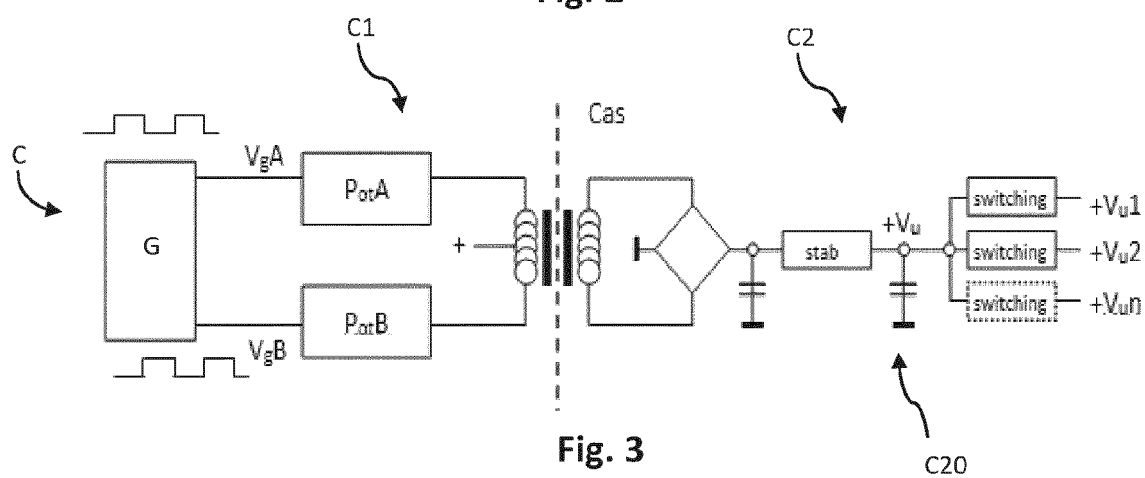
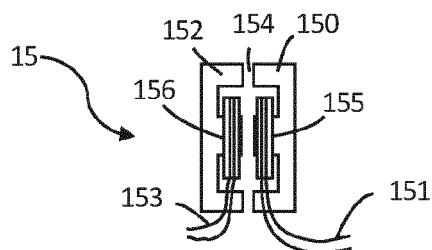
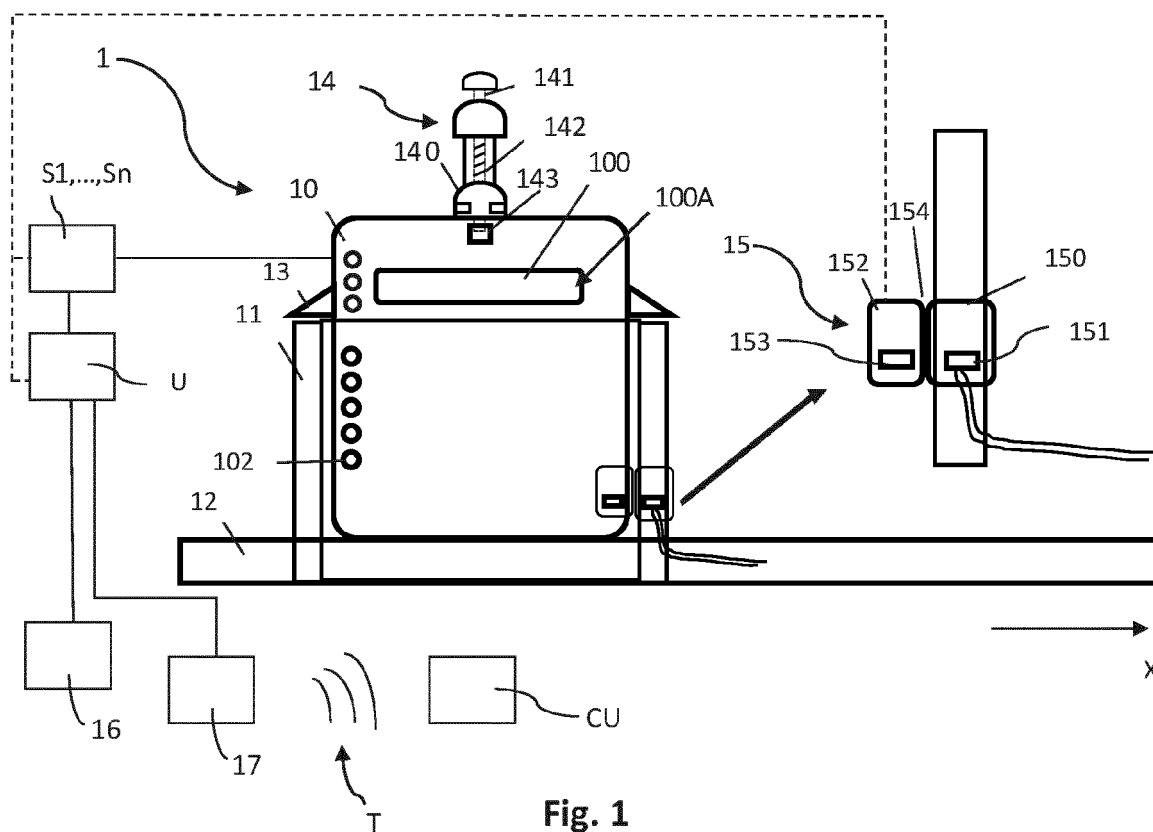
10. System (2) for collecting and emptying waste, comprising: 55

at least one first automated bin (1) for collecting and emptying waste according to any one of claims 1-9,

at least one second automated bin (1) for collecting and emptying waste according to any one of claims 1-9,

wherein said power supply means (15) of said at least one first automated bin (1) supply also said at least one second automated bin (1).

11. System (2) according to the preceding claim, wherein said system (2) comprises a supply column (20) connected to said at least one first automated bin (1) and to said at least one second automated bin (1), and wherein said power supply means (15) are arranged inside said supply column (20).



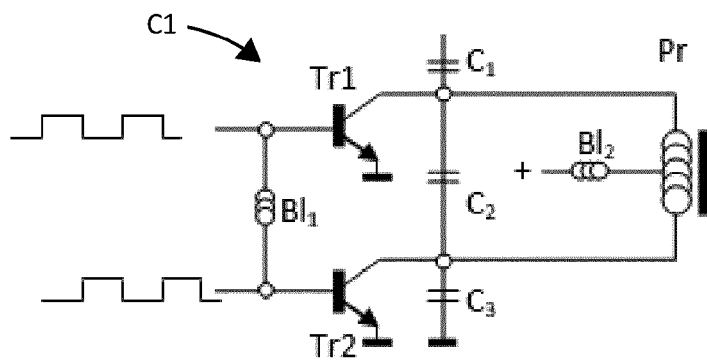


Fig. 4

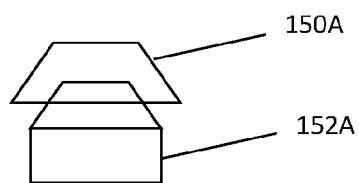


Fig. 5

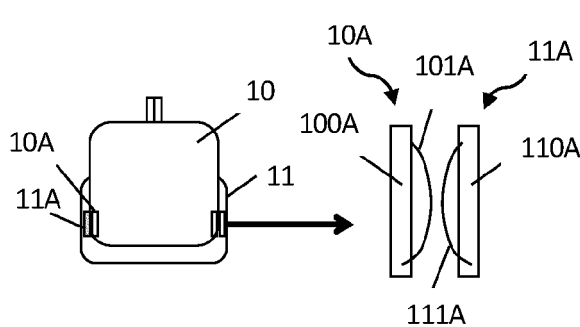


Fig. 6A

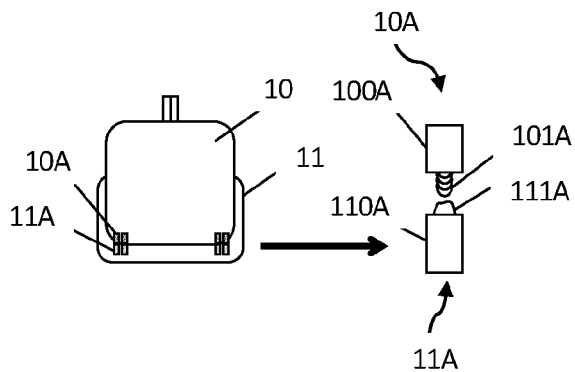


Fig. 6B

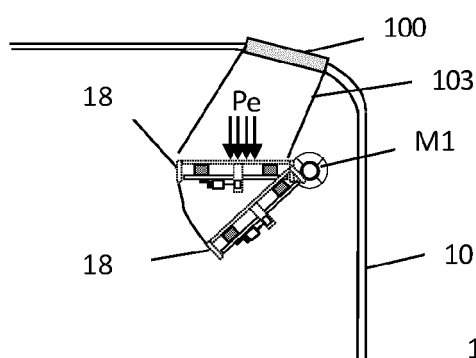


Fig. 7A

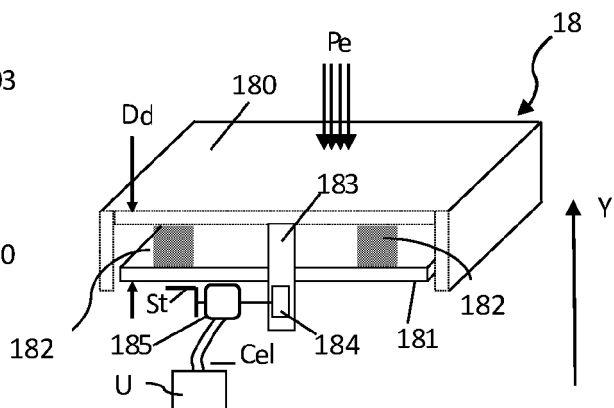


Fig. 7B

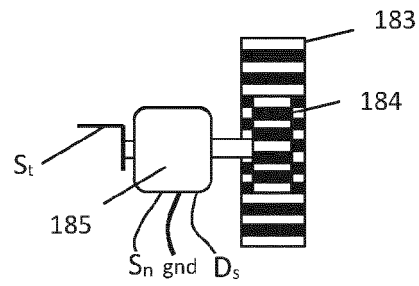


Fig. 7C

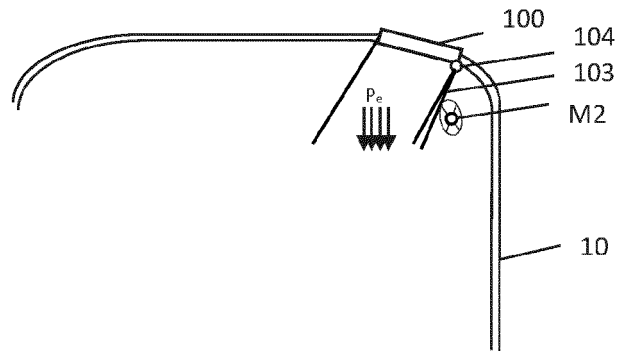


Fig. 8

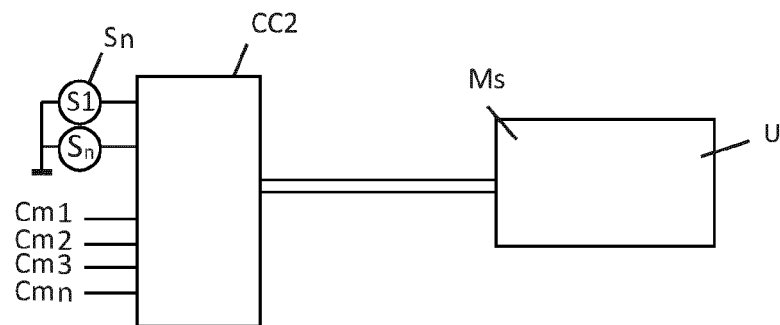


Fig. 9

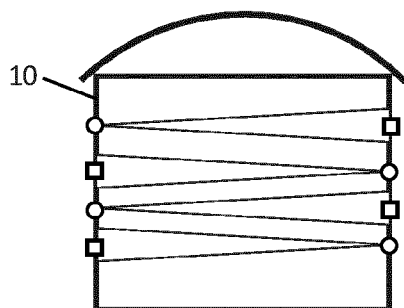


Fig. 10A

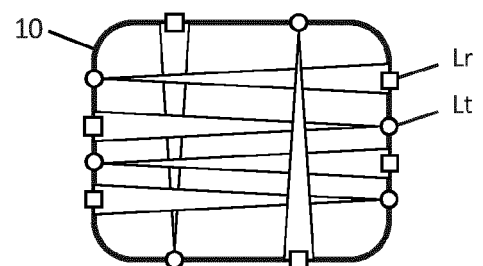


Fig. 10B

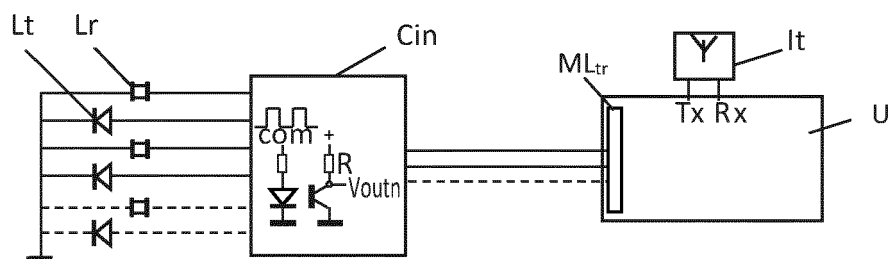


Fig. 11A

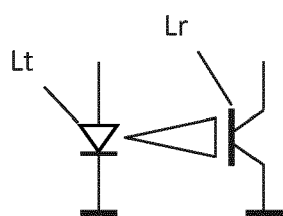


Fig. 11B

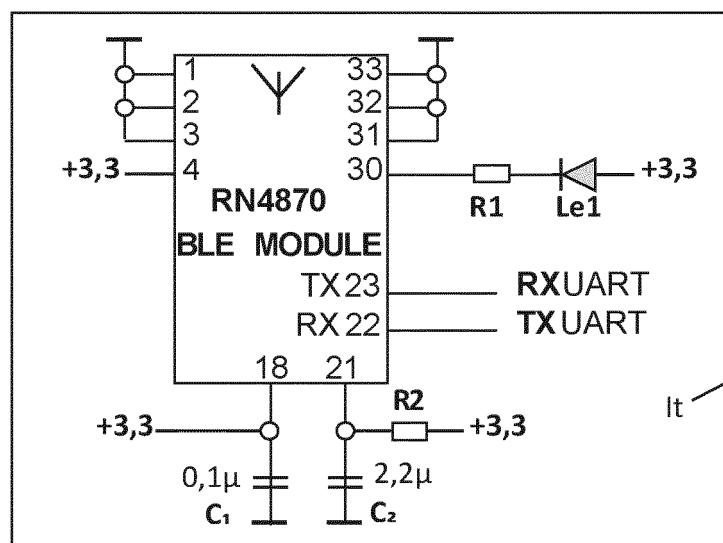


Fig. 11C

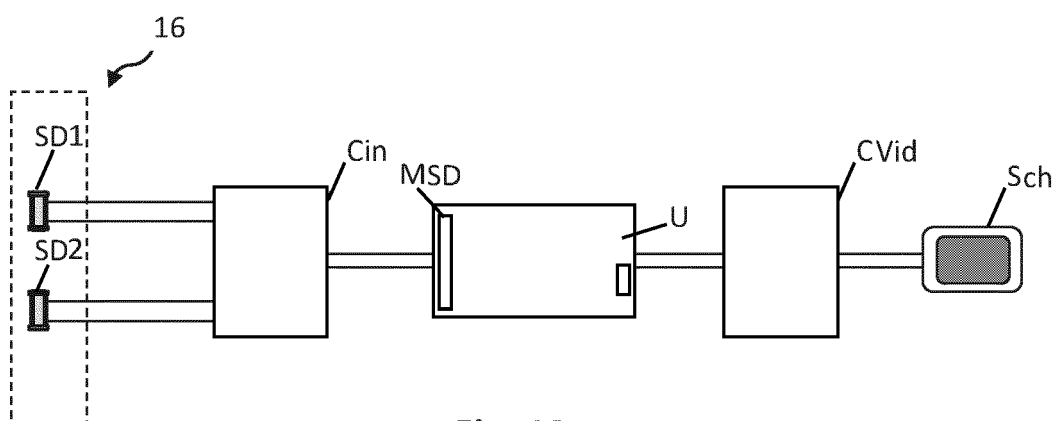


Fig. 12

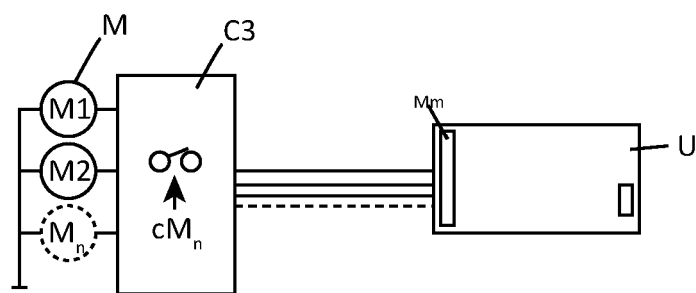


Fig. 13A

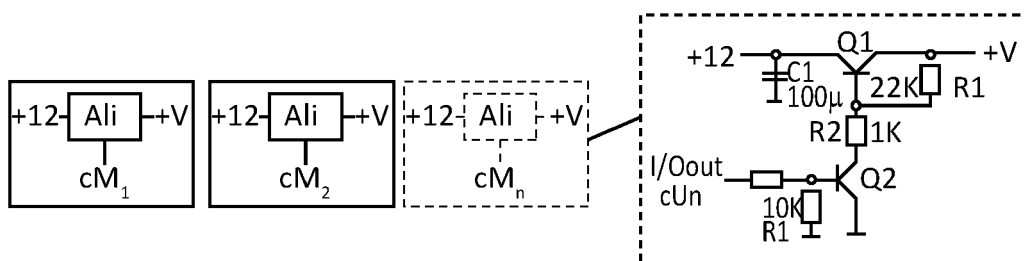


Fig. 13B

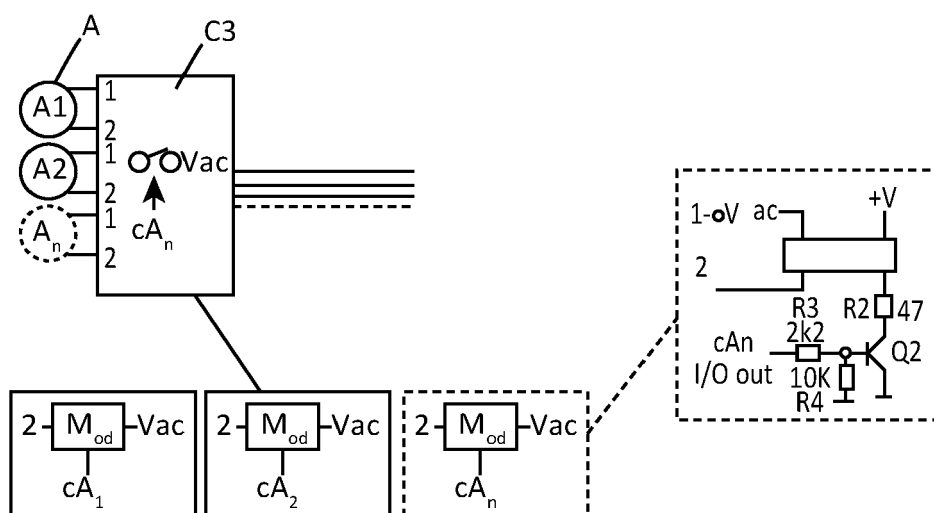


Fig. 14

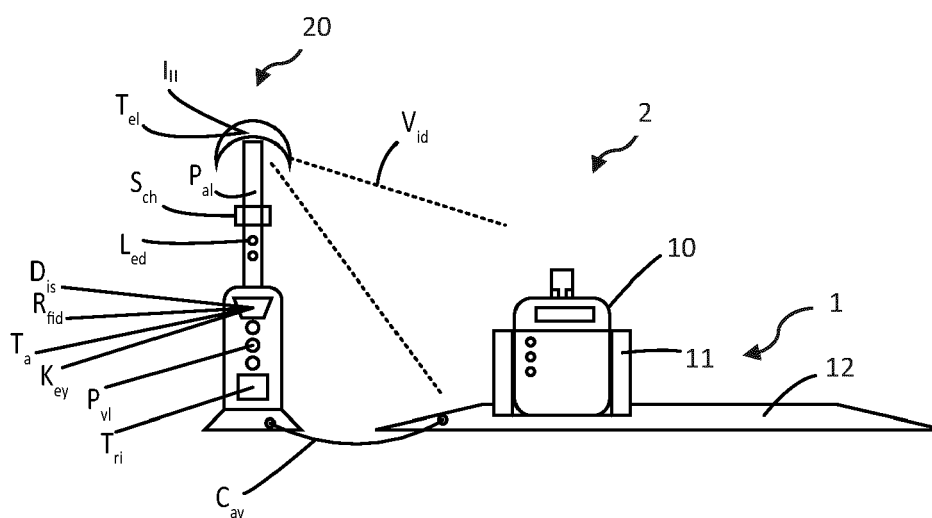


Fig. 15A

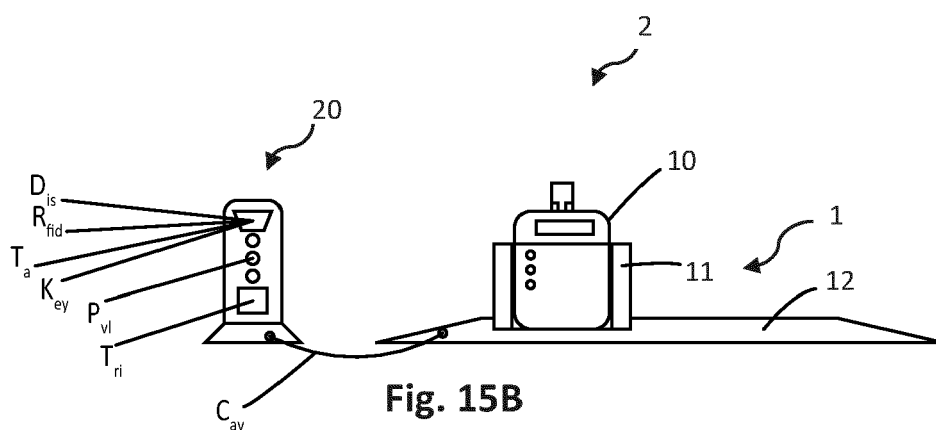


Fig. 15B

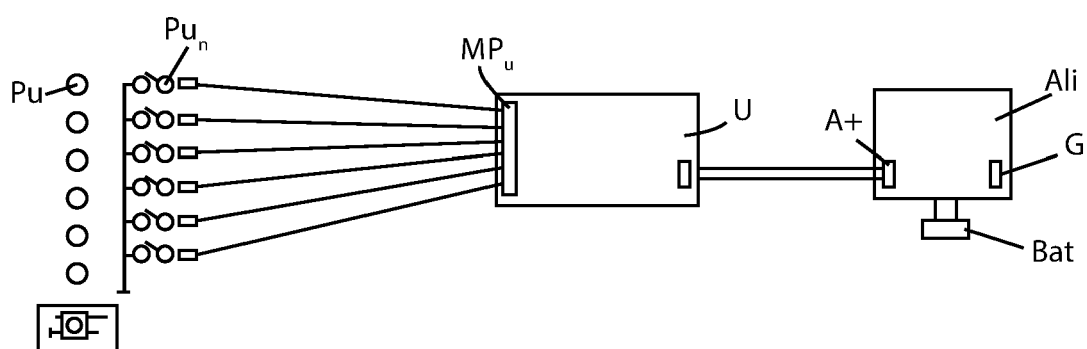


Fig. 16

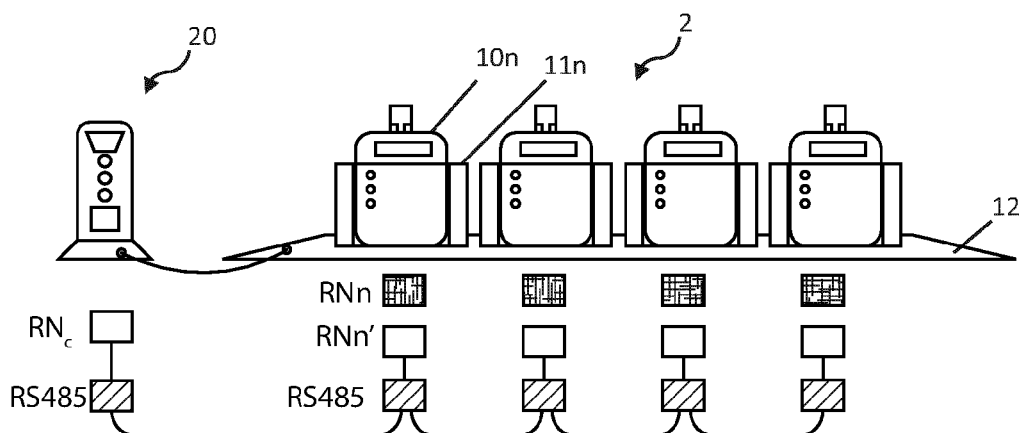


Fig. 17A

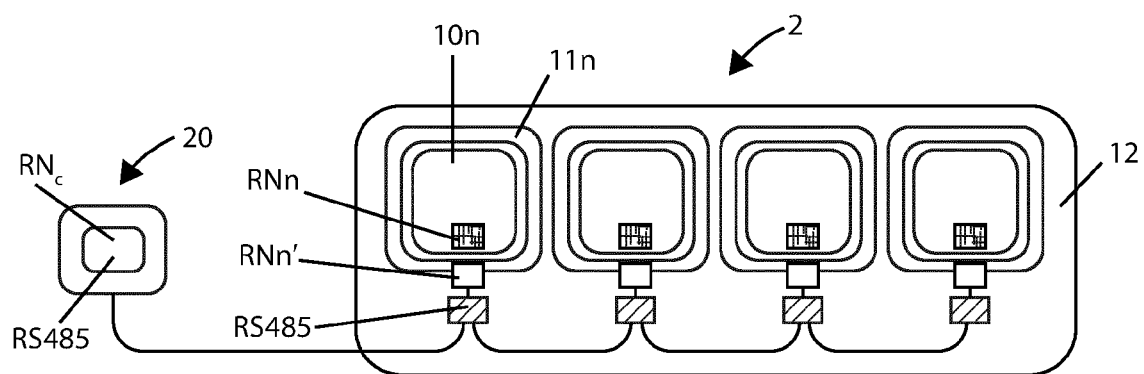


Fig. 17B

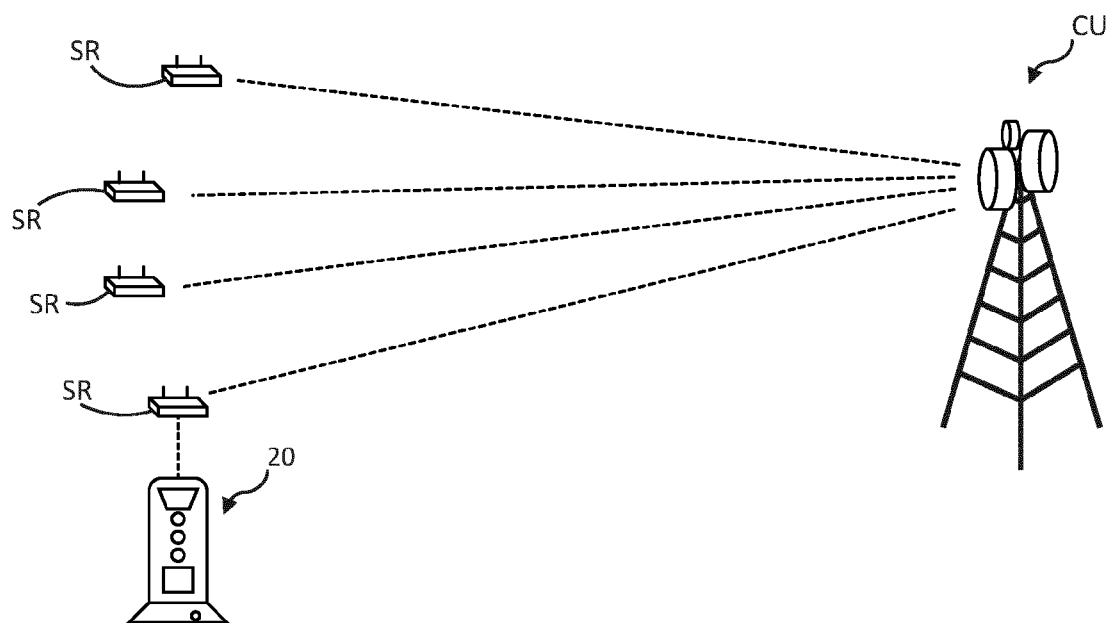


Fig. 17C



EUROPEAN SEARCH REPORT

Application Number

EP 22 18 3753

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2016/115400 A1 (GOODWILL IND OF SAN FRANCISCO SAN MATEO AND MARIN COUNTIES [US]) 21 July 2016 (2016-07-21)	1-4, 7	INV. B65F1/14
A	* paragraphs [0070], [0073], [0074], [0076], [0080], [0089]; figures 10, 15B *	5, 6, 8-11	
X	US 2018/039959 A1 (RODONI PHILIP [US]) 8 February 2018 (2018-02-08) * paragraphs [0014], [0015], [0016], [0020]; figures 1, 2 *	1, 2, 4, 7, 10, 11	
A	FR 2 763 051 A1 (POTET JEAN MICHEL [FR]) 13 November 1998 (1998-11-13) * page 7, line 1 - line 21 *	5	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65F

The present search report has been drawn up for all claims

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EPO FORM 1503 03:82 (P04C01)

Place of search

The Hague

Date of completion of the search

2 December 2022

Examiner

Wartenhorst, Frank

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
 Y : particularly relevant if combined with another document of the same category
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 D : document cited in the application
 L : document cited for other reasons

& : member of the same patent family, corresponding document

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ON EUROPEAN PATENT APPLICATION NO.**

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5 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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02-12-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2016115400 A1	21-07-2016	NONE	
US 2018039959 A1	08-02-2018	CA 3033492 A1	15-02-2018
		US 2018039959 A1	08-02-2018
		WO 2018031332 A1	15-02-2018
FR 2763051 A1	13-11-1998	NONE	