Title: MEASURING DEVICE, CONTAINER MEANS AND SYSTEM FOR MONITORING AND MANAGING CONTAINER MEANS

Abstract: A measuring device (10) for detecting a filling status of a containing cavity (5) suitable for containing non-homogeneous objects (6) of various nature comprises capacitive means (11, 11a, 14, 15) that is positionable near said containing cavity (5) and configured for detecting a variation in electric capacity caused by the presence of said objects (6) so as to determine said filling status. There is provided container means (1) provided with said measuring device (10); a system is provided comprising said measuring device (10) and a station (3; 19) configured for receiving and processing data provided by said measuring device (10), said system (2) being configured for managing and monitoring said filling status and planning intervention activities on said containing cavity (5). A use of said system (2) for monitoring and managing urban waste is provided.
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— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(1))

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Measuring device, container means and system for monitoring and managing container means

The invention relates to a measuring device, container means and a system for monitoring and managing container means that is suitable for containing various objects in multiple fields of application.

In particular, the measuring device according to the invention enables the filling status and/or the filling level of the container means to be measured in contexts in which the conferred objects are heterogeneous and unpredictable in terms of type, shape and material.

In particular, the container means is suitable for containing non-homogenous objects of different nature, for example unsorted waste, such as urban refuse.

Skips with rather large dimensions are known for collecting urban waste, which are provided with sensors comprising load cells or strain-gauge elements that are suitable for measuring the weight of the refuse contained therein. Such skips are able to send a signal indicating the weight contained therein. This signal can be received by an approaching vehicle designed to empty skips and collect waste.

Containers are further known for collecting waste that are provided with optic barrier sensors, or ultrasound sensors, which are suitable for supplying a signal when the filling level inside the containers reaches a set level. A system is provided for managing containers that provides for the aforesaid signal sent by the containers being received from a suitable station that plans the path of a collecting vehicle in function of the filling status of the various containers located in the urban area.

A drawback of the known containers discussed above is that they are rather complex to construct and entail rather a high cost. Further, maintenance and repair costs for possible damage to the aforesaid containers can be significant. From the economic point of view this makes it
uneconomical to adopt such sensors on containers or at most makes it feasible to apply such sensors onto to containers of large dimensions in order to be able to amortise the cost thereof. Nevertheless, the containers of large dimensions are suitable for being distributed along roads and or/wide spaces but are not suitable for being located in zones such as pavements, parks, etc.

One object of the invention is to improve the measuring devices, the known containers, in particular containers for collecting waste, and the systems for managing the containers.

Another object of the invention is to provide a measuring device that is simple and economical in constructional, management and maintenance terms and is able to report the operating conditions or status of the container means and/or other information rapidly, precisely and efficiently.

The invention can be better understood and implemented with reference to the attached drawing that illustrate some embodiments thereof by way of non-limiting example, in which:

Figure 1 is a functional architecture diagram of container means provided with a measuring device and with a system for monitoring and managing this container means;

Figure 2 is a schematic section view of container means according to the invention;

Figure 3 shows schematically an operating mode of the system;

Figure 4 is another schematic view of operating modes of the system;

Figure 5 is a diagram illustrating various parts of the system including the container means according to the invention;

Figure 6 shows schematically various parts included in the container means;

Figure 7 is a diagram of a movable device included in the system;
Figure 8 is a diagram that shows how data and/or information are managed in the system according to the invention. With reference to Figure 1, there is shown schematically container means 1 provided with a measuring device 10 according to the invention. The measuring device 10, which will be disclosed in detail further on, is used to measure and/or detect a filling status of the container means 1. In other words, the measuring device 10 acts to detect whether the container means 1 is in a total filling condition, or acts to detect possible occlusion at a mouth of the container means 1. Owing to a warning of the measuring device 10, it is possible in this manner to act promptly to empty the container means 1. The measuring device 10 can further be configured also for measuring the progressive filling of the container means 1, or for measuring periodically the filling level of the container means 1, as will be shown in detail by the description. Figure 1 shows schematically the functional architecture of a system 2 for monitoring and managing the container means 1. The system 2 can be used in various applications and/or industrial environments to detect and/or measure the degree of filling of container means 1 when the latter are intended to contain multiple objects that are heterogeneous and unpredictable in terms of type, shape and material. In other words, the container means 1 can receive non-homogenous objects of different nature. In an application that is disclosed below in a non-limiting manner, the container means 1, or containers 1, are suitable for receiving and containing non-homogenous objects of various nature, for example unsorted waste, such as urban waste. In this case, a plurality of containers 1 is provided distributed over an urban area. The system 2 enables the filling status of the container means 1 to be monitored owing to the configuration of the latter that will be disclosed below, and enables waste collection and disposal.
operations to be managed in an optimum manner in an urban area.
The container means 1 is particularly suitable for being located at several points of the urban area, in particular in public gardens, on pavements, squares, etc. The container means 1 can have reduced dimensions so as to enable the positioning thereof on zones of any extent. In this case, the container means 1 is not bulky and does not necessarily require great space, unlike prior-art urban waste skips. The container means 1 is thus particularly suitable for receiving waste of various kinds from pedestrians and/or passers-by in any zone of the city. The container means 1 can have a height comprised between 40 cm and 140 cm, and can have a width and a depth comprised between 20 cm and 80 cm. In particular, the container means can have three different sizes. A first size, specified in Figure 1, provides a width and a depth that are substantially equal to 50 cm, and a height that is substantially equal to 80 cm. A second size provides a width and a depth that are substantially equal to 60 cm, and a height that is substantially equal to 100 cm. A third size provides a width and a depth that are substantially equal to 35 cm, and a height that is substantially equal to 50 cm. Nevertheless, the container means 1 with which to associate the measuring device 10 can have any desired dimension and shape. The various parts that comprise the system 2, in particular the various parts of which the container means 1 is made up have great resistance to atmospheric agents and great mechanical resistance to blows, vibrations and wear. The system 2 is configured for performing functions that according to requested requirements and to the degree of importance that it is desired to assign thereto comprise main functions F1, F2...Fn, which may be of basic importance, and secondary functions f1, f2...,fn, which may be optional and/or desired. The main functions that the system 2 can perform comprise: detecting the occlusion of the mouth of
the container 1, detecting full or empty status of the container 1, temporal indication of the measurement. Further useful functions are: detecting the filling level of the container means 1, detecting a state of blockage or obstruction of the container means 1, localising the container means 1, promptly warning of the exceeding of the filling threshold of the container means 1. Information/data acquired by the system 2 is sent to a departmental station 3 associated with a set territorial fraction of the town. The departmental station 3 comprises a data-gathering and analysis centre, in one embodiment, the departmental station 3 is configured for monitoring a plurality of containers 1 located in several zones of an area, such as an urban area, and further comprises a monitoring and management unit that is able to plan and programme the path of one or more vehicles employed to empty containers 1 and collect the waste contained therein. Several departmental stations 3 can be provided, each having distinct urban territorial competence, and a central station 19 to which all the departmental stations 3 are connected. Obviously, it is possible to have a single departmental station 3, which in this case coincides with the central station 19.

In Figure 2 there is shown the container means 1 according to the invention. The container means 1 comprises a casing 4 that defines a containing cavity 5 that is suitable for receiving objects, such as waste 6. The containing cavity 5 extends along a longitudinal axis A. The casing 4 is shaped so as to be able to house a bag 7 or similar elements that are suitable for receiving the waste 6 that users throw inside the container means 1. The bag 7 enables the container means 1 to be emptied rapidly, for example by an operator 12. The operator 12 extracts the bag 7 full of waste 6 from the container means 1 to transfer the waste to a collecting vehicle 13.
In the embodiment in Figure 2, the waste 6 is introduced into the container means 1 through an opening 8 associated with the casing 4.
The container means 1 comprises a lid element 9, which can be removably connected or can be hinged on the casing 4 and which is used to constrain an upper part of the bag 7 to the container means 1. In particular, the upper part of the bag 7, during use, is locked between the lid element 9 and an upper end zone of the casing 4.
The container means 1 is provided with the measuring device 10, configured for detecting the filling status of the containing cavity 5.
The device 10 is of capacitive type, i.e. it comprises one or more elements of capacitive type, i.e. one or more capacitors 14. The device 10 is provided with at least one pair of metal plates 11, each pair defining a capacitor 14. Each pair of plates 11 comprises a first pair 11a and a second pair 11b, arranged on or in the casing 4, on opposite sides to one another. In particular, the first metal plates 11a and the second metal plates 11b are positioned such as to be on opposite sides to the bag 7. In other words, the bag 7 is interposed between the first metal plates 11a and the second plates 11b. The set of plates 11 associated with the container means 1 defines a capacitor system 15.
The operating principle of the device 10 is based on the variation of the electric capacity of this capacitor system 15, through the effect of the introduction of one or more objects inside the container means 1. In particular, the measuring device 10 detects variations in the value of electric capacity that are due to the introduction of objects, such as waste 6, inside the containing cavity 5.
When the containing cavity 5 is empty, or only the bag 7 is present, the electric capacity has a set value that substantially depends on the dielectric constant of the air.
In this situation, it is possible to measure a capacity value of the capacitor system 15 "empty".
The various materials of which the waste consists that are deposited in the container means 1 are characterised by a dielectric constant that is different from the quality of the air.

By measuring a variation in the capacity of the capacitor system 15, it is possible to detect the presence of the waste.

An object 6 is detected as introducing the object 6 inside the containing cavity 5 determines a variation in the dielectric constant. Detecting an object 6 can also occur through the effect of a variation in the geometry of the equivalent capacity. This occurs if the introduced object is of a conductive material that causes the resulting capacity to increase or decrease.

The measuring device 10 comprises an electronic unit 16 operationally connected to the plates 11, and provided with a local file 23, comprising a local memory 33. A supply source 17 is provided for supplying the electronic unit 16 and the plates 11. The supply source, in particular, comprises a battery 17. The battery 17 may comprise a rechargeable cell. A recharging device may be provided that is included in the container means 1, to recharge the battery 17. The recharging device can comprise a photovoltaic panel that is able to recharge the battery 17 with solar energy. In all cases, the type of power supply chosen is such as to have great resistance to environmental factors, require minimal maintenance, contain costs and simplify the management thereof and is such as to minimise environmental impact.

The device 10, owing to the electronic unit 16, is able to measure periodically and store the quantity of waste contained inside the container means 1. By arranging several capacitors that are suitably positioned on the container means 1 it is possible to define filling "levels" and consequently to provide a discrete filling measurement.
As shown in the embodiment in Figure 2, the device 10 comprises a plurality of first metal plates 11a and of second plates 11b. Owing to this configuration, the device 10 is able to detect in a discrete and progressive manner various filling levels of the containing cavity 5.

The dimension and the position of the plates 11 is chosen in function of the degree of precision and discreteness of the measurement that it is desired to obtain. The greater the number of plates 11 and the less the dimension of the latter, the greater will be the resolution of the measurement and thus the greater will be the number of detectable and monitorable filling "levels". Each metal plate 11 can have a height comprised between 10 and 30 cm, and a width comprised between 30 and 70 cm. In the described embodiment, in particular but not in a limiting manner, each metal plate 11 has a height that is substantially equal to 21 cm, and a width that is substantially equal to 55 cm.

Owing to the measuring device 10 that is thus configured it is possible to obtain an effective and precise filling measurement of the container 1 that is independent of the type and/or geometry and/or materials of which the waste 6 is composed. The measuring device 10 is very reliable in reporting the filling level of the container 1 and prevents false negative signals on container 1 status from being generated.

With a suitable arrangement of several plates 11 and a processing algorithm of the signal/s supplied by the latter it is possible also to conduct shape measurements on the objects 6 introduced into the containing cavity 5.

The measuring device 10 may also operate in continuous mode. This may be useful for counting the number of introductions of objects/waste into the container 1.

The measuring device 10 is also able to detect the occlusion of the containing cavity 5 by bags and other obstructive materials, regardless of whether the filling threshold has been reached. This occlusion measurement could occur through
luminosity sensors, such as phototransistors or photocells suitably placed inside the containing cavity 5. By adding further external sensors it is possible to count the number of persons in transit near the container 1.

The measuring device 10 is further configured to be mounted without problems on known containers that are already used for collecting waste. The measuring device 10 is able to be easily adapted to all known types and sizes of container having different geometrical shapes.

The measuring device 10 according to the invention is very cheap and also very difficult to tamper with and is therefore secure against acts of vandalism. In a first embodiment, the container means 1 is configured for sending data directly to the departmental station 3 and/or to the central station 19 by communication means 24 of GPRS type included in the container means 1. In this case the container means 1 can be configured for transmitting data in real time. This can be provided for the entire area or for set zones of the latter. It may be useful to be able to dispose of data in real time in zones of particular/critical interest. It is possible to set up the container 1 in such a manner that the latter acquires data and information also from other similar containers of the zone and sends all the data to the central station 19 and/or to the departmental station 3. In this case a detailed analysis of a given set of containers 1 is conducted. At the end of this detailed analysis further containers 1 can be selected that are located in other urban zones so as to define a new set of containers 1 to be monitored directly remotely in real time. The container 1 provided with the GPRS module could gather and convey the data of the containers placed near itself inside an area with a high density of containers (for example in which the distance between adjacent containers 1 is less than approximately 100 metres).
In a second embodiment, the system 2, with reference to Figure 3, comprises a movable device 18 configured for exchanging information with the container means 1, in particular for acquiring data from the latter. The movable device 18, which will be disclosed in detail in Figure 7, is provided for the operator 12, and/or can be provided on the collecting vehicle 13. In this last configuration, it is not necessary for the operator 12 to alight from the vehicle 13 to place the movable device 18 in contact with the container means 1. This is very useful for facilitating waste inspection and collection operations. The movable device 18 is configured for remote interaction with the container means 1. The movable device 18 communicates autonomously with the container means 1 when the operator 12 approaches the latter, thus acquiring information/data.

In particular, the data stored in the electronic unit 16 are sent to the movable device 18 to be subsequently transferred to the departmental station 3 and/or to the central operating station 19. In particular, sending the data from the measuring device 10 to the movable device 18 can occur during the operations of replacing the bag 7 by the operator 12.

The container means 1 is identified univocally so as to be able to be discriminated on the basis of set historical analyses that take account of the intensity and the manner with which the container means 1 is used by the users. At the moment of data collection the movable device 18 with which the operator 12 is provided also has to record the geographical position in which it has interacted with the container 1. This enables passive geolocation of all the containers 1, keeping the inventory up to date. The operator 12, at the end of his shift, returns to the departmental station 3 and/or to the central station 19, where he can unload all the data contained in the movable device 18 through a wireless or cable connection.
At the central station 3 the data are stored in a general file 25 in order to be able to create the necessary reports and analyses. At the central station 3 the information/data 26 is processed to define analytical and synthetic representations 22 and is supplemented and correlated with cartographic data supplied by a cartographic database 20. Figure 8 shows a mode with which the various information/data 26 relating to the containers 1 flows into the system 2. The data 26 saved on the movable devices 18 can be sent via Internet to an Internet server 27 where they are entered in the general file 25. In the general file 25 there is data identifying and locating the containers 1, data relating to current readings, and historical data associated with the various containers 1. The information/data 26 is extracted from the general file 25 to be processed and integrated with information taken from the cartographic database 20, as indicated by the step F, so as to generate analytical and synthetic representations 22 that can be displayed graphically via a graphic user interface 28.

The departmental stations 3 and/or the central stations 19, owing to the user interface 28, are able to analyse and display various data, generate reports and documents and carry out or plan various intervention activities 29, for example maintenance activities, and generate alarm signals 30.

With reference to Figure 5 certain parts of the system 2 are disclosed, in particular the container 1 and the movable device 18 are disclosed in greater detail. In particular, in Figure 5 there is shown schematically the supply source 17 and the measuring device 10 comprising the metal plates 11 with which the container 1 and the electronic unit 16 are provided. The electronic unit 16 comprises a first processor 37 for processing data and/or signals by set algorithms. The container 1 further comprises a clock 31 and a temperature sensor 32.
The container 1 is provided with a local memory 33 that stores the information/data 26 that are subsequently sent to the departmental station 3 and/or to the central station 19 or to the movable device 18, with which the operator 12 is provided. The transmission of information/data 26 can take place via a first receiving-transmitting module 35 included in the container 1. The first receiving-transmitting module 35, depending on the transmission configurations that it is desired to obtain as disclosed previously, comprises a GPRS module and/or a short-range wireless module.

The container 1 is provided with a first interface 33 of serial and/or of JTAG type that conducts the diagnoses of various electronic parts of the container 1 rapidly and cheaply and programmes and/or debugs the various components of the electronic unit 16.

Figure 5 shows in greater detail the movable device 18 with which the operator 12 is provided. The movable device 18 comprises a second interface 36 of JTAG and/or serial and/or USB type, by means of which the movable device 18 is connectable to the container 1 and/or to the departmental station 3, and/or to the central station 19. The movable device 18 comprises a second receiving-transmitting module 40, for example of short-range wireless type, by means of which communication 39 occurs between the movable device 18 and the container 1.

The movable device 18 is provided with a second processor 38 for processing, using set algorithms, data and/or signals that are exchanged with the container 1 and/or with the departmental station 3, and/or with the central station 19.

The movable device 18 can be configured for being connected for example to the central station 19, in particular to the general file 25, by a wireless or USB connection so as to establish a communication 41 for exchanging and/or transferring data.
The movable device 18 is further provided with a supply-battery 42 and with a local memory 43 for storing the information/data 26.
The movable device 18 comprises a GPS module 44 by means of which the position of the operator 12 and/or of each container 1 in the urban area is identified. The GPS module 44 is able to detect its own position at the moment of data gathering. In this manner, the GPS module 44 enables the position of the single container 1 at the moment of data collection to be ascertained indirectly.
The movable device 18 is provided with a user interface 45, comprising an acoustic warning horn, for example for the buzzer type, and/or a visual warning lamp, for example of the LED type. At the moment of data collection the movable device 18 further synchronises and/or corrects the clock 31 of the container 1.
With reference to Figure 6, there are shown in greater detail various electric/electronic parts included in the container 1, in particular in the electronic unit 16, some of which have already been disclosed with reference to Figure 5. An electric converter 46 is provided that acts on the electric current dispensed by the battery 17. The electric converter 46 can be configured for receiving a direct current input and for releasing a direct current output at a set voltage value. This value can, for example, be equal to 3.3 volt. The electronic unit 16 is provided with a microprocessor 47 suitable for processing and exchanging signals with other parts that are operationally connected thereto, for example with the local memory 33. A digital capacity meter 48 is provided for measuring the capacity value of the capacitor system 15, defined by the plates 11. A detecting device 49 is provided that is used to detect parameters of the electric current coming from the electric converter 46. The detecting device 49 is connected bidirectionally to the microprocessor 47 to send and/or receive information and/or command signals.
An antenna 50 is provided for sending information/data connected to the first receiving-transmitting module 35, already disclosed previously with reference to Figure 5. The electronic unit 16 is provided with a switch 51 connected operationally to the first receiving-transmitting module 35, to the digital meter 48, to the detecting device 49 and to the microprocessor 47.

The local memory 33, the digital capacity meter 48, the microprocessor 47, the first receiving-transmitting module 35, the antenna 50, the switch 51, the electric converter 46 and the detecting device 49 together define an electronic board 52.

The various parts disclosed above are connected together so as to permit operation in the desired modes. For example, the container 1 that is thus configured is able to store data relating to filling of the containing cavity 5 in given intervals of time that can be suitably set and selected. The container 1 that is thus configured, when it is interrogated by a movable device 18, is activated to send the data stored in the local memory 33. Alternatively and/or additionally, the container 1 can be configured for communicating autonomously with the departmental station 3 and/or with the central station 19, in particular for sending alarm signals relating to the filling status thereof, or for periodically sending various types of information the status or operating condition thereof.

With reference to Figure 7 below, various electric/electronic parts included in the movable device 18, are disclosed in greater detail, some of which have already been disclosed with reference to Figure 5.

The movable device 18 comprises a further electric converter 53 that acts on the electric current dispensed by the supply battery 42. The further electric converter 53 can be configured for receiving a direct current input and for releasing a direct current output at a set voltage value. This value can, for example, be equal to 3.3 volt. The
further electric converter 53 is connected to the user interface 45. A further detecting device 54 is provided that is used to detect parameters of the electric current coming from the further electric converter 53. The further detecting device 54 is connected bidirectionally to the second microprocessor 38 to send and/or receive information and/or command signals. The movable device 18 is provided with a USB port 55 by means of which the movable device 28 can be connected to an apparatus of the departmental station 3 and/or of the central station 19 to enable the information/data 26 to be exchanged. The memory 43, the GPS module 44, the USB port 55, the second receiving-transmitting module 40, to which an antenna 56 is connected, the further detecting device 54, the further electric converter 53, and the user interface 45 are operationally connected to the second processor 38. These parts together define a further electronic board 57. The measuring device 10 disclosed above is highly resistant to environmental factors and atmospheric agents, is reliable, has low consumption and requires no maintenance, or at most requires much reduced maintenance. The system 2 is easy to manage and can be immediately understood by all operators, both those assigned to emptying the container means 1 and those working remotely in the departmental stations 3 and/or in the central station 19. The system 2 enables costs to be reduced because it optimises the waste collection cycle, being particularly advantageous, for example, for municipal administrations. The quality of the containers 1 emptying service is thus also improved, a cleaner town being thus obtained. The solution proposed above for measuring filling status and, in particular, the filling status of container means, can be used not only in the field of managing waste but also in various other industrial applications and/or environments. The solution disclosed above can be adapted to
containers having any desired geometrical shape and dimensions. Variations and/or additions to what have been disclosed above and illustrated in the attached drawings are possible.
CLAIMS

1. Measuring device for detecting a filling status of a containing cavity (5) for containing non-homogenous objects (6) of different nature, characterised in that it comprises capacitive means (11, 11a, 11b, 14, 15) that is positionable near said containing cavity (5) and configured for detecting a variation in electric capacity caused by the presence of said objects (6) so as to determine said filling status.

2. Measuring device according to claim 1, wherein said capacitive means comprises plate means (11, 11a, 11b) that is positionable in peripheral zones of said containing cavity (5), configured for detecting a total filling status or a partial filling status of said containing cavity (5).

3. Measuring device according to claim 1 or 2, wherein said capacitive means comprises first plate means (11a) and second plate means (11b), mutually arranged at opposite ends with respect to said containing cavity (5).

4. Measuring device according to claim 3, wherein said first plate means (11a) and said second plate means (11b) lie on surfaces that laterally bound said containing cavity (5) and which are arranged transversely to a plane defined by an opening (8) through which said objects (6) are introduced into said containing cavity (5).

5. Measuring device according to claim 3 or 4, wherein said first plate means and said second plate means comprise respectively a plurality of first plate elements (11a) and a plurality of second plate elements (11b) positionable in a manner distributed parallel to a longitudinal axis (A) of said containing cavity (5), so as to be able to detect a plurality of progressive filling levels of said containing cavity (5).
6. Measuring device according to claim 5, wherein each of said first plate elements (11a) and of said second plate elements (11b) has a height comprised between 10 and 30 cm, in particular approximately equal to 21 cm, and a width comprised between 30 and 70 cm, in particular approximately equal to 55 cm.

7. Measuring device according to any preceding claim, further comprising an electronic unit (16) provided with a processor (37) for processing data and/or signals and a digital capacity meter (48).

8. Measuring device according to claim 7 and further comprising a local memory (33) for storing information/data (26), supplied in particular by said processor (37).

9. Measuring device according to any preceding claim, further comprising a first receiving-transmitting module (35) for transmitting data.

10. Measuring device according to claim 9, wherein said first receiving-transmitting module (35) comprises a GPRS module or is configured for short-range wireless transmission.

11. Measuring device according to any preceding claim, further comprising a supply source (17) by means of which said measuring device (10) is electrically suppliable.

12. Measuring device according to claim 11, wherein said supply source comprises a battery (17), in particular a battery that is rechargeable by recharging photovoltaic means.

13. Measuring device according to any preceding claim, further comprising an interface (33) of serial and/or of JTAG type.

14. Measuring device according to any preceding claim, further comprising a clock (31) and a temperature sensor (32).
15. Measuring device according to any preceding claim, further comprising luminosity sensor means for detecting an occlusion of said containing cavity (5) - caused, for example, by bags or other bulky objects - independently of whether a filling threshold of said containing cavity (5) has been reached.

16. Measuring device according to claim 15, wherein said luminosity sensor means, which is positionable in said containing cavity (5), is chosen from a group comprising: phototransistor sensors, photocell sensors.

17. Container means comprising a measuring device (10) according to claims 1 to 16 and comprising a casing (4) bounding said containing cavity (5).

18. Container means according to claim 17, and having a height comprised between 40 cm and 140 cm, in particular approximately equal to 80 cm, and a width and a depth comprised between 20 cm and 80 cm, in particular approximately equal to 50 cm.

19. System comprising a measuring device (10) according to any one of claims 1 to 16 and a station (3; 19) configured for receiving and processing data provided by said measuring device (10) so as to monitor said filling status and plan intervention activities on and/or manage, said containing cavity (5).

20. System according to claim 19, and further comprising container means (1) according to claim 17 or 18.

21. System according to claim 19 or 20, wherein said station (3; 19) is configured for receiving data sent by said measuring device (10) via a wireless connection of GPRS type.

22. System according to any one of claims 19 to 21, and further comprising a movable device (18) for acquiring data from said measuring device (10) to transfer the data to said station (3; 19).
23. System according to claim 22, wherein said movable device (18) is configured for being connected to said measuring device (10) via a wireless connection.

24. System according to claim 22 or 23, wherein said movable device (18) is provided with a memory (43) and with a further interface (36) of JTAG and/or serial and/or USB type by means of which said movable device (18) is connectable to said measuring device (10) and/or to said station (3; 19).

25. System according to any one of claims 22 to 24, wherein said movable device (18) comprises a GPS module for geolocating said containing cavity (5).

26. System according to any one of claims 22 to 25, wherein said movable device (18) is provided with acoustic-visual warning means (45).

27. Use of the system according to any one of claims 19 to 26 for monitoring and managing urban waste.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. G01F23/26
ADD. B65F1/06

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

G01F  B65F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>X</td>
<td>CH 557 462 A (TECHNICAIR SA) 31 December 1974 (1974-12-31) column 2, line 3 - line 16; figures 1-3</td>
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<td>Y</td>
<td>DE 25 04 212 A1 (KARLSRUHE AUGSBURG IWEKA) 5 August 1976 (1976-08-05) page 10, paragraph 2; figures 1-3</td>
<td>7-17, 19-27</td>
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<td>X</td>
<td>US 5 465 619 A (SOTACK JOHN D [US] ET AL) 14 November 1995 (1995-11-14) column 5, line 12 - column 15, line 47; figures 1-3 5 8</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

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**Date of the actual completion of the international search**

8 November 2010

**Date of mailing of the international search report**

17/11/2010

**Name and mailing address of the ISA:**

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**Authorized officer**

Rose, Alain
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<td>WO 2008/085060 A1 (MULTISENSE AS [NO]; ELLINGSEN OLAV [NO]; ELLINGSEN BJARTE S [NO]) 17 July 2008 (2008-07-17) page 4, line 16 - page 5, line 18; figures 1-6</td>
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