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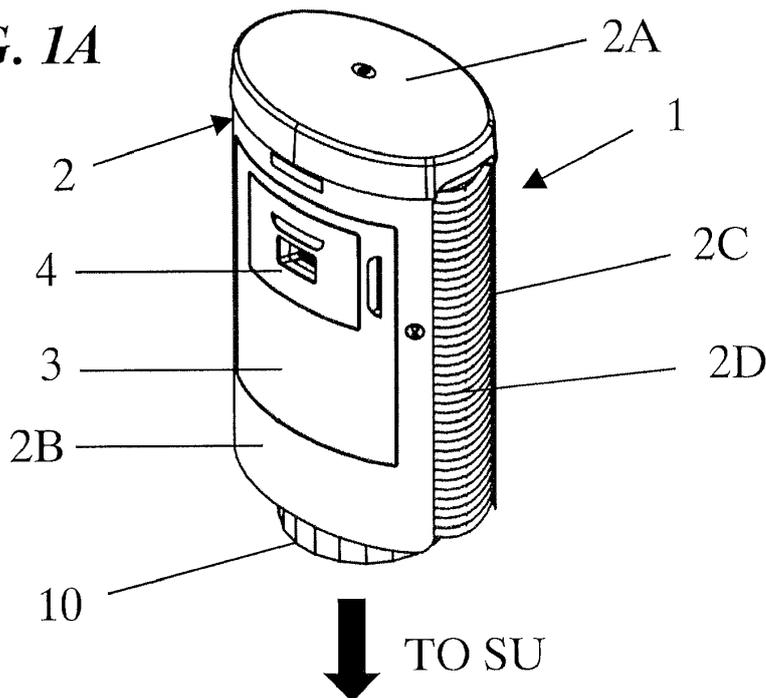
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(54) **WASTE INLET AND OPERATING METHOD**

(57) A waste inlet unit (1) for connection to a vacuum waste collection system (100) and having an outer cover (2) supporting at least one opening waste inlet door (3; 4) for allowing access for a user to an inlet inner volume that connects downwardly to a waste collection system temporary storage utility (SU), further includes a control

valve adjustable between closed and open positions so that the control valve in the closed position blocks objects introduced into the inlet from entering the waste collection system temporary storage utility and in the open condition allows introduced objects to fall into the storage utility. A method for operating such inlets is also provided.

FIG. 1A



Description

TECHNICAL FIELD

[0001] This technology generally concerns waste inlets that are intended for allowing the insertion of waste therein and for communicating with waste collection systems for the purpose of collecting waste therein.

BACKGROUND

[0002] Waste inlets in the form of so called free-standing inlets have for decades been used for the collection of waste, such as residual waste, waste for recycling and organic waste etc. Such free-standing inlets have been used both for installations outside as well as inside buildings and may be combined with any type of temporary storage solution, such as a tank, a container or a section of a transport pipe system of a vacuum waste collection system.

[0003] Among problems encountered in association with such inlets are not least safety issues with regard to users as well as other persons that may fall into especially inlets having large waste inlet doors adapted for commercial use, such as by businesses and institutions, such as shops, restaurants and schools. Although locks of different kinds have been commonly used to block access to the inlets for unauthorized persons, there is still a danger of someone by accident falling into such open large inlets during authorized use. In such a situation there has been a risk that someone falling into the inlet would fall down further into a storage facility.

[0004] Other problems appearing in connection with waste inlets is the individual debiting of authorized users, both commercial and households, for the introduced waste and the limiting of the volume of each waste item that may be introduced in order to not block the system.

SUMMARY

[0005] It is a general object to provide an improved solution to the above discussed problems.

[0006] In particular it is an object to suggest improved waste inlets configured to provide increased user safety and practicality.

[0007] In particular it is another object to suggest improved methods of operating a waste inlet.

[0008] These and other objects are met by the technology as defined by the accompanying claims.

[0009] The technology generally relates to a vacuum waste collection system for transporting waste of various kinds from insertion points to storage facilities.

[0010] In a first aspect of the technology, there is provided inlet units for connection to such a vacuum waste collection system and having an outer cover supporting at least one opening waste inlet door allowing access for users to an inlet inner volume that connects downwardly to a waste collection system temporary storage utility. In

a basic configuration the inlet unit includes a control valve adjustable between closed and open positions. In the closed position the control valve thereby blocks objects introduced into the inlet from entering the waste collection system temporary storage utility and in the open condition it allows introduced objects to fall into the storage utility.

[0011] In accordance with another aspect of the technology there is provided an improved method of operating the inlet unit of the present technology, wherein, in a basic configuration, a user is first verified as being registered to allow access to the inlet unit inner volume. Then the control valve is closed and its closed state is verified. Such verification releases a commercial inlet door lock and the commercial door is opened, whereupon a discharge valve downstream of the waste collection system temporary storage utility is blocked. Then waste is deposited in the inlet and the inlet door is closed. Finally the closed state of the inlet door is verified and upon verification the control valve is opened so that the inlet unit is ready for a new introduction sequence.

[0012] Preferred further developments of the basic idea as well as embodiments thereof are specified in the dependent subclaims.

[0013] Advantages offered by this technology, in addition to those described above, will be readily appreciated upon reading the below detailed description of embodiments of the technology.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The technology and its further objects and advantages will be best understood by reference to the following description taken together with the accompanying drawings, in which:

Fig. 1A is a top perspective view of a first embodiment of a waste inlet according to the present technology;

Fig. 1B is a similar illustration of a second embodiment of a waste inlet according to the present technology, shown with the commercial inlet door in an open position;

Fig. 2 is an exploded view of the first embodiment of the waste inlet of Fig. 1A;

Fig. 3A is a schematical illustration of the control valve of the waste inlet of the technology, in its open condition;

Figs. 3B is a schematical illustration of the control valve of Fig. 3A, in its closed condition;

Figs. 4A-D are detailed illustrations of vital parts of the control valve and its control assembly;

- Fig. 5 is a schematical top view of the control valve in closed position;
- Fig. 6A-B are schematical illustrations of an information display/board; and
- Fig. 7 is a schematic flow diagram of a method of operating the inlet of Fig. 1A.

DETAILED DESCRIPTION

[0015] The present technology will now be explained with reference to exemplifying embodiments of this technology that are illustrated in the accompanying drawing figures 1-7. The illustrated embodiment relates to an application of the proposed technology to inlets configured as combined commercial and household inlets that are designed to be integrated in a vacuum controlled waste collection system. It is emphasized though, that the illustrations are for the sole purpose of describing preferred embodiments of the technology and are not intended to limit the presently proposed technology to details or to any specific field of application thereof. The presently proposed solutions may with only minor adaption be applied to most types of inlet configurations and waste handling and transport systems.

[0016] In the introductory part of the specification reference was made to known types of inlet units and to the problems and disadvantages associated therewith. To overcome the above described disadvantages and problems with the known inlets, the present technology now suggests a novel approach for optimizing inlet unit operation safety. It also suggests improved user friendliness as well as improved user verification and debiting.

[0017] With specific reference to the accompanying drawing figures 1A and 1B there are shown two embodiments of a waste inlet unit 1; 1' configured for installation in and for communication with a vacuum waste collection system (not specifically illustrated). These specific waste inlet units 1, 1' were developed for installation in vacuum waste collection systems where the inlet units are positioned outside of buildings. The first embodiment of the inlet unit 1 (Fig. 1A) is in particular intended for receiving residual waste, whereas the second embodiment of the inlet unit 1' (Fig. 1B) is in particular intended for receiving deposited waste, such as paper, plastic and recycling fractions etc. They may both be installed in connection with just about any type of storage utility SU (not specifically illustrated) and may also be used for installations indoors.

[0018] The inlet unit 1 illustrated in Fig. 1A basically has an outer cover 2 consisting of a top cover 2A, side covers 2B, 2C and two ventilation sections 2D (only one visible in Fig. 1A) for ventilating the inner inlet unit volume V. The cover 2 supports at least one opening waste inlet door 3; 4 for allowing access for a user to the inlet unit inner volume V. In this specific application the inlet unit 1 has what may be called a combo-door, 3, 4, namely

one large door 3 named a commercial door 3 for receiving business/institution waste of larger volume and one household inlet door 4 for receiving household waste of lesser volume. In this particular application waste bags having a volume up to 120 liters may be deposited through the commercial inlet door 3. This commercial door is mainly intended to be used by businesses, such as shops, restaurants etc., and institutions, such as schools. In the large door is supported a smaller household door 4 where smaller waste bags having a volume of up to approximately 30 liters may be deposited.

[0019] The inlet unit 1 and its inner volume V connects downwardly to a waste collection system temporary storage utility SU. This storage utility is not specifically illustrated in the drawings but as indicated by the arrow in Fig. 1A it serves to receive waste that exits the inlet unit 1 inner volume V. The communication between this inner volume V and the waste collection system temporary storage utility SU is controlled by a control valve 5 adjustable between closed CP and open OP positions (see Figs. 3A, 3B, 4A-D and 5). In the closed position CP the control valve 5 blocks objects introduced into the inlet unit 1 from entering the waste collection system temporary storage utility SU and in the open condition OC it allows introduced objects to fall into the storage utility SU.

[0020] The control valve 5 is a flap type valve that may also be named a "beak valve". It has two pivotal flaps 5A, 5B and additionally serves as a volume limiter for objects that may be allowed to exit the inlet unit towards the temporary storage utility SU. In effect, the theoretical maximum size O_{max} of objects that may pass the control valve in its closed condition OC is very small, as will be seen in Fig. 5. The two flaps 5A, 5B in the lower part of the inlet unit are each controlled by a separate compressed air cylinder 7A, 7B, all supported by a valve frame 6. Each flap cylinder 7A, 7B has an integrated brake mechanism and their open and closed positions OP and CP, respectively are illustrated in detail in the above mentioned Figs. 3A, 3B, 4A-D and 5.

[0021] As indicated above, the control valve has two main functions, namely as a safety stop blocking the bottom part of the inlet unit 1 to prevent people falling down into the vacuum waste collection system, and as a volume limiter preventing users from depositing more than 120 liters of waste for each commercial door 3 opening sequence. The commercial door 3 cannot be opened unless the control valve 5 is closed, thereby effectively preventing someone from falling down through the inlet unit 1. Also, for additional safety the discharge valve of the storage utility (none of them shown in the drawings) may not be opened unless the control valve 5 is closed. The control valve 5 is only activated for the large commercial door 3 but not for the smaller household door 4.

[0022] The inlet unit is equipped with a control system including an authorization control that preferably involves a user identification reader 15, such as an RFID-reader. This means that access to the inlet unit 1 is only allowed to registered users having the correct RFID-tag. This ap-

plies both to the commercial 3 and to the household 4 door. Furthermore, the control system includes a registered user register, first and second sensors D1, D2 for each of the two control valve 5 flaps 5A, 5B, indicating an open or closed control valve 5 state, an electrically controlled door lock (not specifically illustrated), and a third sensor indicating an opened or closed commercial inlet door 3. The control system may further include a fourth sensor D4 registering each waste deposit and being connected to a superior user debiting system.

[0023] A method of operating the inlet unit 1 of this technology specifically for a commercial user will now be described with specific reference to Fig. 6. The activation or starting of a waste deposit sequence may in this embodiment be implemented by a user holding his RFID-tag adjacent the RFID-reader 15. In step S the control system checks the authority of the user against a registered user register, and if the user is authorized and registered as a commercial user the brakes of the control valve 5 cylinders 7A, 7B are released and the control valve closes in step S2. In step S3 the system verifies that the control valve 5 has closed. The closed CP control valve 5 position is checked by one sensor D1, D2, preferably an inductive sensor, for each flap 5A, 5B.

[0024] In step S4 the flap cylinder brakes are re-applied and the control system then releases the lock of the commercial door 3 and the user in step S5 manually opens the commercial door 3 when the cylinders 7A, 7B have been re-applied. As mentioned above the discharge valve downstream of the storage utility SU is blocked in step S6 when the commercial door 3 is open. The open state of the commercial door is sensed by the system through the door lock, electrical lock, and a third sensor that detects a lever arm of the commercial door 3. In step S7 the user then deposits his waste and subsequently closes the commercial door 3 in step S8. The door may be fully or partly self-closing.

[0025] In step S9 the system verifies that the commercial door 3 is closed, again through the door lock, electrical lock, and the third sensor. When the closed state of the commercial inlet door 3 has been verified the brakes of the control valve 5 cylinders 7A, 7B are released and the control valve 5 opens in step S10. This causes waste in the inlet unit 1 volume V to fall down into the storage utility SU and the system and inlet unit 1 are ready for the next sequence/user.

[0026] In a further development of the technology invoicing data is sent to a superior user debiting system based on the waste deposit detection made by a fourth sensor D4. Also, one of two optional reference panels 30; 40, Fig. 6A and Fig. 6B, respectively, is positioned above the commercial inlet door 3. The reference panel 30; 40 has three (Fig. 6A) or four (Fig. 6B), LED's. The inlet unit with a reference panel 30 having three LED's has the following function:

- when the insert unit is operational/active all LED's 31-33 are turned off;

- In case an inlet unit is inoperative/non-active the middle LED 32 is lit up in red color and the left and right LED's 32, 33 are lit up in green color, which is a reference to another static address (street address) where users should go to deposit their waste. The user will get a temporary authorization to deposit his waste at the address to which the system refers him;
- Reference is primarily made to a secondary static address, by the left or right LED;
- Should the secondary static address also have been disabled reference is made to a tertiary static address.

[0027] The inlet unit having a reference panel 40 with four LED's 41-44 has the following function:

- The function of the three-LED reference panel but with the following addition:
- The fourth LED is lit up when a user is debited for his deposit, as described above and below.

[0028] Such debiting control based on deposited waste introduced through the household door 4 by a registered household user may likewise be performed, whereby the household door 4 has integrated therein a volume limiter (not specifically indicated) preventing a user from depositing more than approximately 30 liters of waste for each door 4 opening. Like for the commercial users this debiting sequence functions so that the household user holds his RFID-tag close to the RFID reader 15 on the inlet unit 1. The system then checks the authority of the household user and releases a household door 4 lock if the user is authorized and registered as a household user. With the household door 4 lock released the user can manually open the household door 4 and deposits his waste. The user then initiates closing of the household door 4 and just before the waste falls down through the inlet unit 1 to the storage utility SU the door 4 passes a position where a further sensor, inductive sensor, detects that the household door 4 integrated volume limiter is close to a position where the waste falls down. A signal is then sent to the superior user debiting system as a base for user invoicing. A fourth LED 44 on a reference panel 40 is lit to signal to the user that he will be debited for the deposit.

[0029] When the waste has fallen down into the storage utility the user has two options, namely either to continue the door closing movement to close the door 4 that automatically will be locked by the electric lock, or the user stops the closing movement of the door 4 and initiates a new opening sequence, now with the volume limiter empty. At this stage a next waste volume may be deposited and the sequence continues like before.

[0030] In alternative, but not specifically illustrated embodiments of the technology variations of the different illustrated parts of the inlets may be employed without departing from the scope of the technology. Examples of this is the use of a single inlet door for commercial users or alternatively for household users, integration of

inlets into different kinds of waste collection and transport systems and the connection of inlets to different kinds of storage facilities. It shall also be emphasized that although the technology has been described and illustrated with reference to a specific application, it is in no way restricted to such applications.

[0031] The technology has been described in connection with what is presently considered the most practical and preferred embodiments, but it is to be understood that the technology is not limited to the disclosed embodiments. The technology is therefore intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

Claims

1. A waste inlet unit (1; 1') for communication with a vacuum waste collection system and having an outer cover (2) supporting at least one opening waste inlet door (3; 4) for allowing access for a user to an inlet inner volume (V) that connects downwardly to a waste collection system temporary storage utility (SU), **characterized by**:
 - a control valve (5) adjustable between closed (CP) and open (OP) positions;
 - in that the control valve is a flap type valve that consists of two flaps (5A, 5B);
 - by first and second sensors (D1, D2) on each of two control valve (5) flaps (5A, 5B) indicating an open (OP) or closed (CP) valve state;
 - an electrically controlled door lock; and
 - a third sensor indicating an opened or closed inlet door.
 - whereby
 - the control valve in the closed position blocks objects introduced into the inlet from entering the waste collection system temporary storage utility and in the open condition allows introduced objects to fall into the waste collection system temporary storage utility
2. A waste inlet unit (1; 1') according to claim 1, **characterized in that** the control valve (5) consists of two pivotal flaps (5A, 5B) and additionally serves as a volume limiter for objects that may be allowed to exit the waste inlet unit towards the waste collection system temporary storage utility (SU).
3. A waste inlet unit (1; 1') according to claims 1 or 2, **characterized by** having a control system including a user identification reader 15 and a registered user register.
4. A waste inlet unit (1; 1') according to any of claims 1 - 3, **characterized by** a sensor (D4) registering each waste deposit and being connected to a superior user debiting system.
5. A waste inlet unit (1; 1') according to any of claims 1-4, **characterized in that** it includes one commercial inlet door (3) for receiving business/institution waste of larger volume and one household inlet door (4) for receiving household waste of lesser volume.
6. A method of operating a waste inlet unit (1; 1') of any of claims 3-5, **characterized by**:
 - verifying that a user is registered to allow access to the waste inlet unit inner volume (V);
 - closing the control valve (5);
 - verifying closing of the control valve;
 - releasing a commercial inlet door lock;
 - opening commercial inlet door;
 - blocking of discharge valve downstream of the waste collection system temporary storage utility (SU);
 - depositing waste in inlet;
 - closing commercial inlet door;
 - verifying commercial inlet door closed;
 - and opening control valve, whereby
 - the inlet unit is ready for a new introduction sequence.
7. A method according to claims 6, **characterized by** a detection of waste deposits made by an authorized user by means of a fourth sensor (D4) and by sending invoicing data to a superior user debiting system based on said sensor detection.
8. A method according to claims 6 or 7, by an inlet unit (1; 1') having a reference panel (30; 40), **characterized by** indicating on the reference panel (30; 40) an active or inactive state of an inlet unit (1; 1'), and in case of a non-active inlet unit making a reference to another static address (street address) where users should go to deposit their waste.
9. A method according to any of claims 6 to 8, by an inlet unit (1) having a combo-door (3, 4) with a household door (4; 4') integrated in a commercial door (3; 3'), **characterized in that** when a waste deposit has fallen down into the storage utility (SU) the user has two options, namely either to continue the household door closing movement to close the household door (4; 4') that automatically will be locked by the electric lock, or the user stops the closing movement of the door and initiates a new opening sequence, now with a household door integrated volume limiter empty, whereby a next waste volume may be deposited and the sequence continues.

FIG. 1A

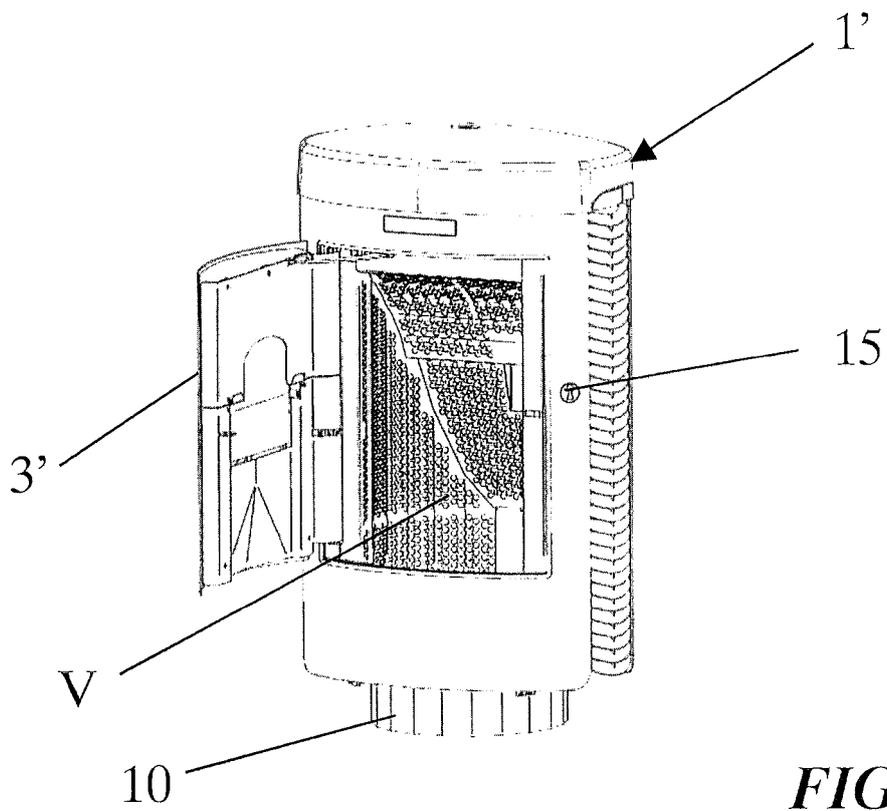
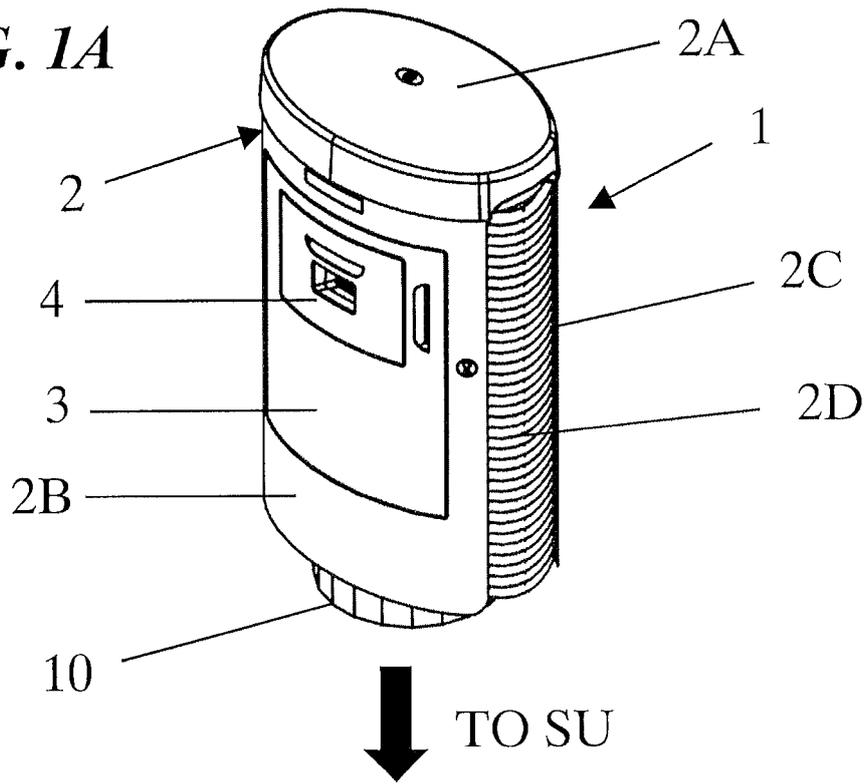


FIG. 1B

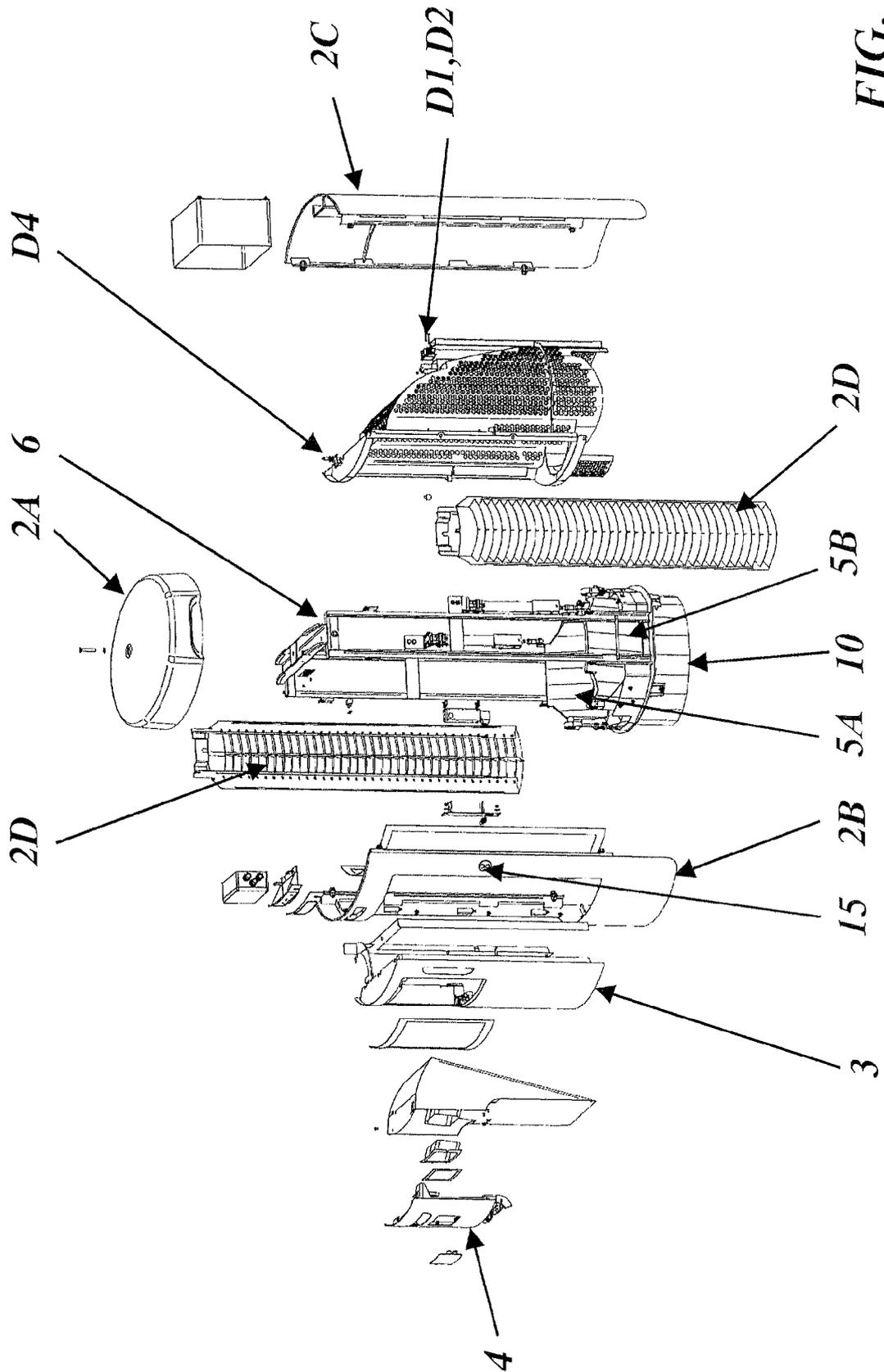


FIG. 2

FIG. 3A
OP

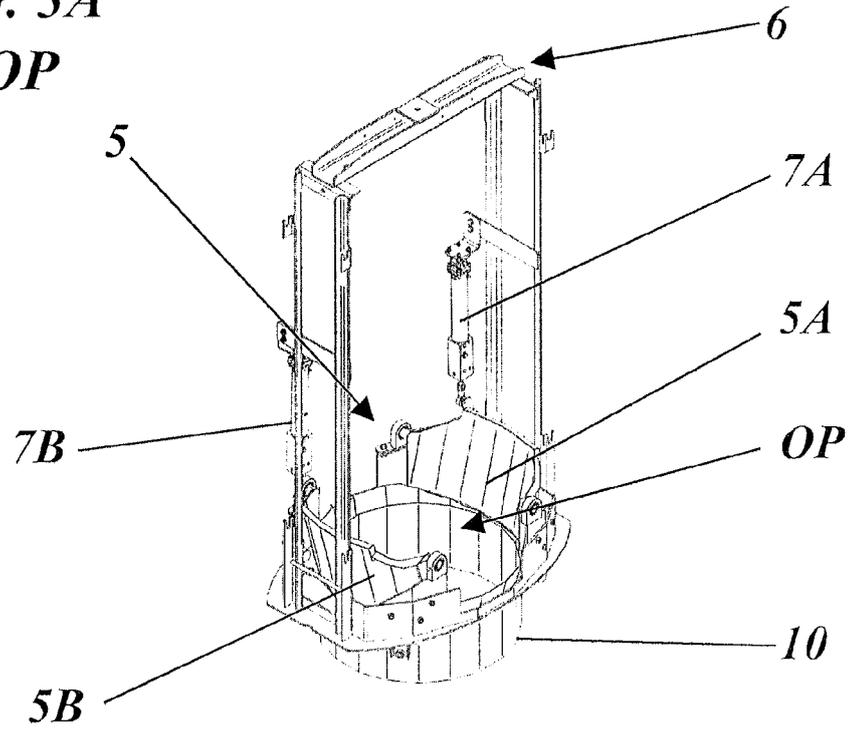
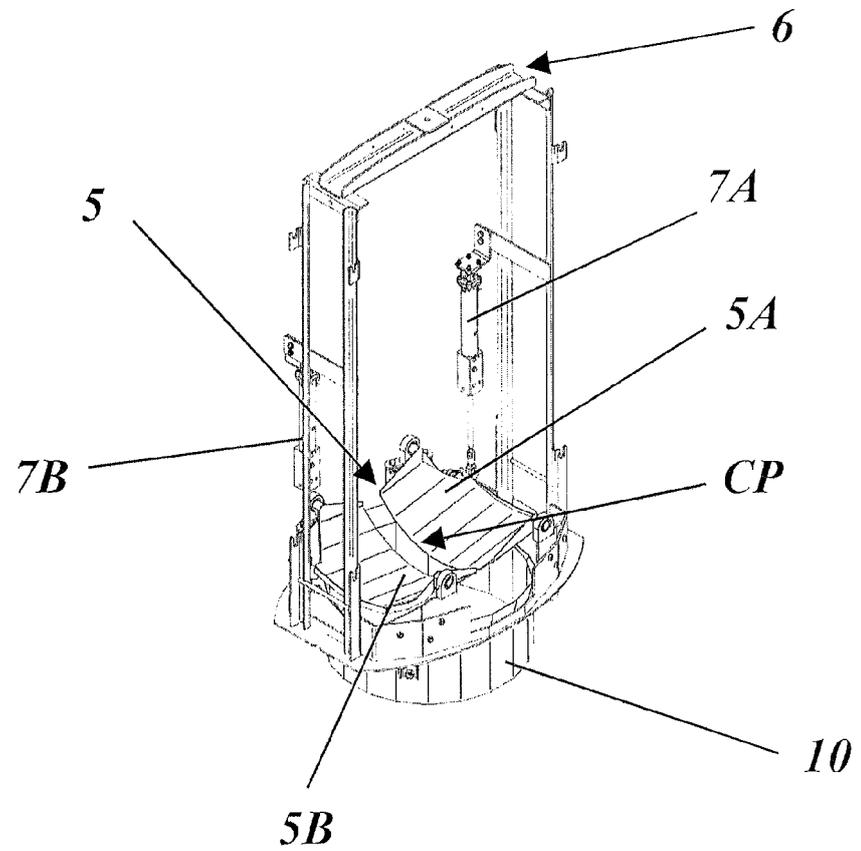


FIG. 3B
CP



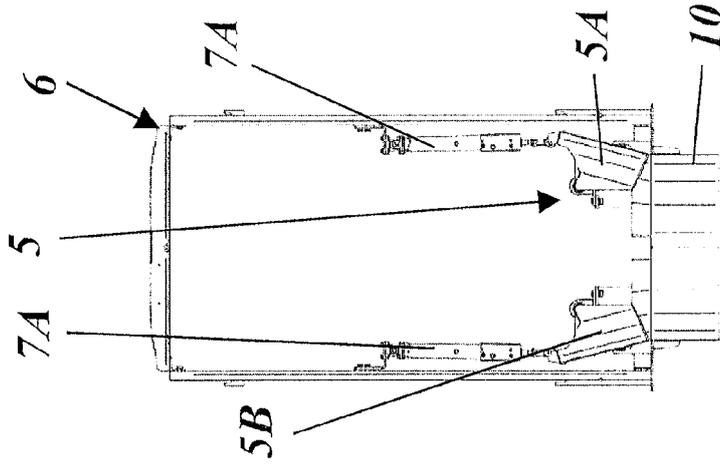


FIG. 4A
OP

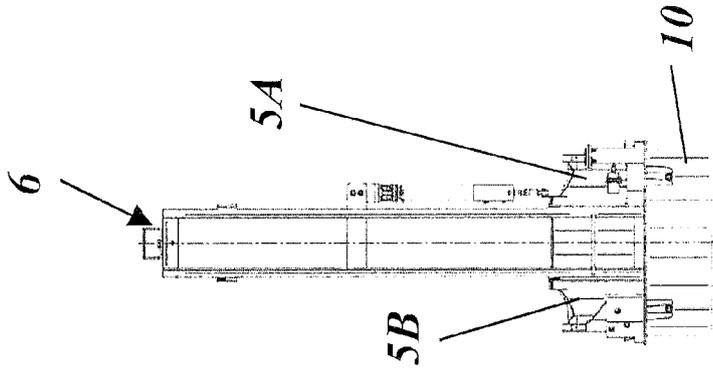


FIG. 4B
OP

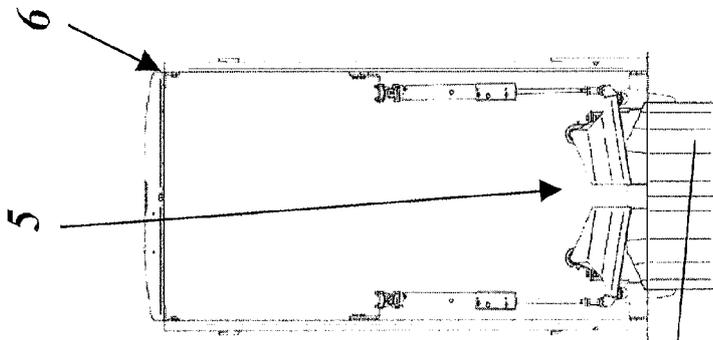


FIG. 4C
CP

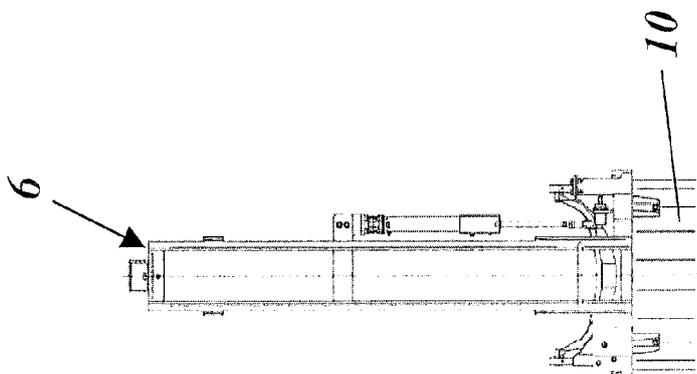


FIG. 4D
CP

FIG. 5

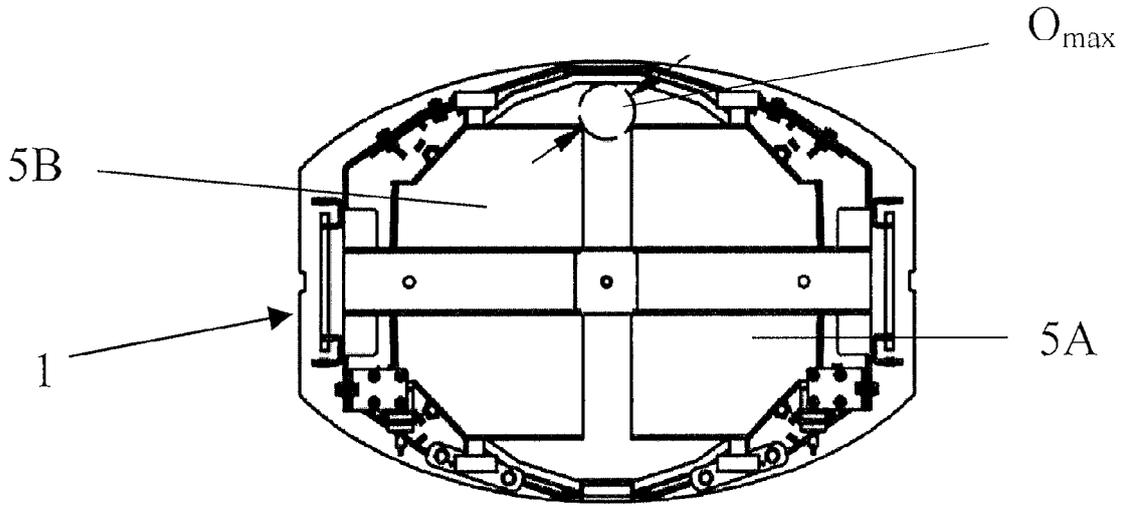


FIG. 6B

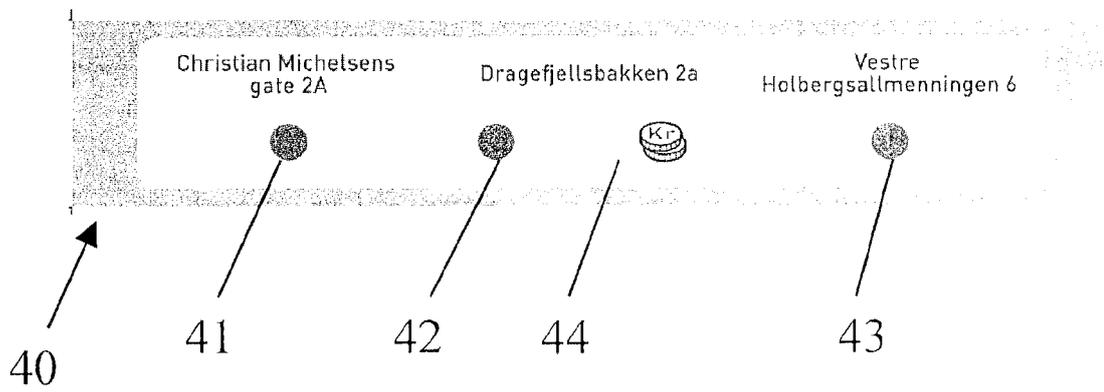
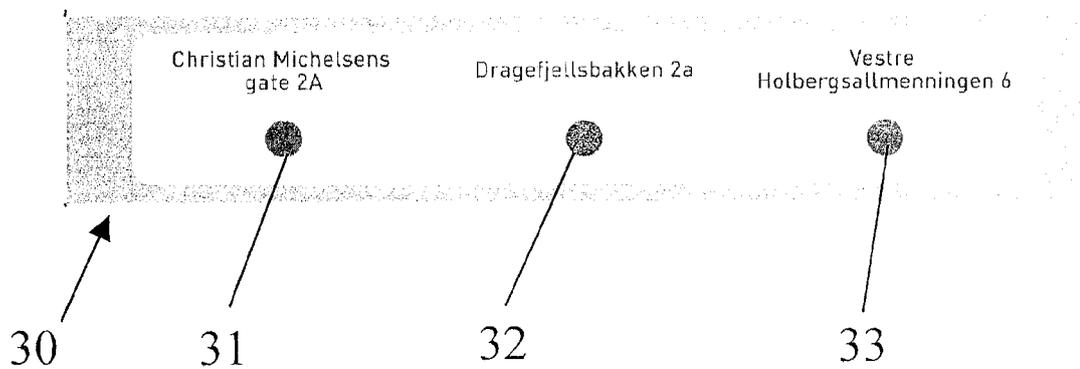


FIG. 6A



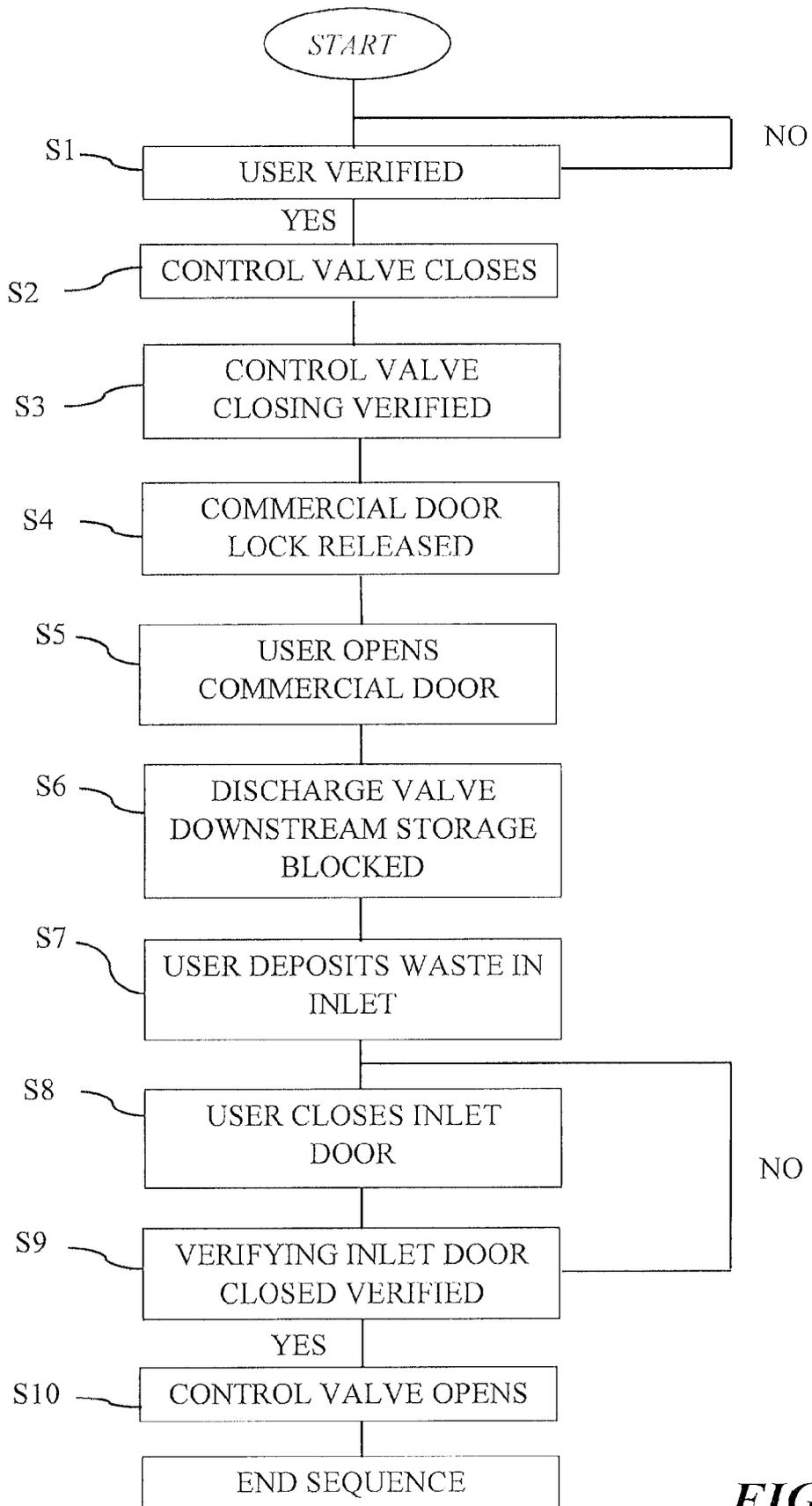


FIG. 7



EUROPEAN SEARCH REPORT

Application Number
EP 16 17 2228

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Place of search The Hague		Date of completion of the search 11 November 2016	Examiner Luepke, Erik
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ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 16 17 2228

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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