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(54) **HOPPER STRUCTURE, METHOD OF CONTROLLING THE EMPTYING OF SUCH A HOPPER STRUCTURE, AND A WASTE CHUTE HAVING SUCH A HOPPER STRUCTURE**

BEHÄLTERKONSTRUKTION, VERFAHREN ZUR STEUERUNG DER ENTLEERUNG SOLCH EINER
BEHÄLTERKONSTRUKTION UND ABFALLRUTSCHE MIT SOLCH EINER
BEHÄLTERKONSTRUKTION

STRUCTURE DE TREMIE, PROCEDE PERMETTANT DE COMMANDER LE VIDAGE D'UNE TELLE
STRUCTURE DE TREMIE, ET VIDE-ORDURES POSSEDANT UNE TELLE STRUCTURE DE
TREMIE

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Description

TECHNICAL FIELD

[0001] The present invention generally relates to the feeding of material into a receiving body. More specifically, the invention relates to a hopper structure for feeding fixed maximum volumes of a material, said hopper being pivoted between an outwardly open loading position and an outwardly closed discharge position.

BACKGROUND

[0002] For many years pivotal hopper units have been generally employed for receiving volumes of material, such as ashes and waste, for subsequent discharge into a receiving body in the form of a waste container, a refuse chute etc. The traditional feed hopper unit is pivotally supported in a frame, has parallel side walls and converging front and rear walls extended between and connected to the side walls. The front and rear walls converge downwardly to form a tapered receptacle into which a fixed maximum volume of material can be loaded.

[0003] An example of such a prior art hopper structure is disclosed in U.S. Patent No. 1.733.801 that specifically concerns a hopper door for loading refuse or waste into an incinerator. This prior art hopper door has front and rear partition walls that between them form an angle of as much as approximately 90°. Even with such a relatively large receptacle the front wall of the hopper door will have to be pivoted a considerable distance into the receiving body in order to secure proper discharge of the loaded material from the hopper. Furthermore, in order to maintain an acceptably short path of operation between the hopper loading and discharge positions, the infeed opening of the hopper is very restricted in the loading position, corresponding to less than half of the full receptacle opening.

[0004] It is evident that this discussed prior art suffers from several undesirable design limitations that make it virtually impossible to obtain a structure having the desired functionality. A main drawback of this general design is that it requires a compromise between several desirable aspects, namely the desire to provide an infeed apparatus that: allows only the infeed of a maximum volume of material; permits only the introduction of items smaller than specified dimensions; presents a generous infeed opening; has an acceptably short path of movement between the infeed and discharge positions, and; provides for secure discharge of the complete hopper load.

SUMMARY OF THE INVENTION

[0005] The invention eliminates the above discussed problems and shortcomings of the prior art.

[0006] A basic object of the invention is to provide comfortable operation and compact design of an infeed ap-

paratus while simultaneously controlling the volume and dimensions of material and items, respectively, that may be introduced into a receiving body through said apparatus.

5 [0007] A specific object of the invention is to provide an improved hopper unit permitting comfortable loading and discharge of material and at the same time permitting only the introduction of a fixed maximum volume of material and/or of items being smaller than specified, pre-

10 [0008] Another object of the invention is to provide such a hopper unit that occupies only a restricted amount of space in a receiving body.

[0009] Briefly, the invention concerns a hopper unit having a hopper structure comprising one wall being moveable between closed and open conditions. Movement of said wall is functionally connected, through a transmission, to the movement of the hopper structure between loading and discharge positions. One advantage of such a design is that it allows for a controlled, comparably limited path of movement between loading and discharge positions of the hopper structure, while still providing a fixed maximum hopper loading volume and a secure emptying of the hopper load.

25 [0010] In an embodiment of the invention the movement of the hopper structure is transmitted to the moveable wall through a cam follower that is attached to said wall and that is received in a fixed cam groove. This provides a practical and reliable transmission comprising a minimum of moveable parts and requiring little space.

30 [0011] By extending a main portion of the cam groove at a fixed radius from a horizontal pivot axis of the hopper structure and extending a minor portion thereof in a direction away from said pivot axis, at an increasing radial distance therefrom, the opening movement of the moveable wall will be performed during the final portion of the hopper structure movement towards its discharge position. Such a design will at least greatly reduce the possibility of introducing longer items past the hopper and into the receiving body.

35 [0012] A further object of the invention is to provide an improved method of controlling the discharge from a hopper unit having a fixed volume hopper structure, so that a very comfortable and compact hopper operation is achieved, in the sense that a comparatively short path of movement and a small space is required for said operation.

40 [0013] In accordance with the invention, this object is achieved by pivoting a wall of the hopper structure between closed and open conditions and by controlling the movement of said wall in dependence upon the pivoting of the hopper structure. In this manner, it is possible to control the hopper structure so that it remains in its fixed volume condition during at least a major portion of its movement from its open loading position to a closed position where no further loading is possible. At a desired position of the hopper, normally shortly before reaching its closed position, a slight further pivoting thereof acti-

vates and/or controls the opening of the moveable wall and thereby a secure discharge of the loaded material. Thus, employing the invention it is possible to minimize the required pivoting movement of the hopper, and to still inhibit excessive loading of the hopper and to achieve a secure discharge of the loaded material.

[0014] Yet another object of the invention is to provide an improved waste chute of a waste collection system, where a waste inlet structure allows only the insertion of predetermined maximum volumes of waste into the chute in each operation, inhibits the insertion of items exceeding predetermined dimensions and requires minimum space within the chute during its entire operation.

[0015] In accordance with the invention, this object is achieved by positioning a hopper unit as suggested by the invention in an inlet opening or each inlet opening of the chute.

[0016] These and further objects of the invention are met by the invention as defined in the appended patent claims.

[0017] Advantages offered by the present invention, in addition to those described above, will be readily appreciated upon reading the below detailed description of embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The invention, together with further objects and advantages thereof, may best be understood by referring to the following description taken together with the accompanying drawings, in which:

- Fig. 1 is a front perspective view of an embodiment of the hopper unit according to the invention installed in a schematically illustrated waste chute;
- Fig. 2 is a side view of the hopper unit of fig. 1, likewise installed in the schematically illustrated waste chute;
- Fig. 3A is a side view of the hopper structure of the hopper unit of figs. 1 and 2;
- Fig. 3B is a rear perspective view of the hopper structure of fig. 3A;
- Fig. 4A is a side view of the hopper unit of figs. 1 and 2 in a loading position;
- Fig. 4B is a side view of the hopper unit entering a hopper rear wall activating position;
- Fig. 4C is a side view of the hopper unit in a discharge position; and
- Fig. 5 illustrates an alternative embodiment of the cam groove of the transmission in a view cor-

responding to that of fig. 3A.

DETAILED DESCRIPTION OF EMBODIMENTS

[0019] Figs. 1 and 2 illustrate a hopper unit 2 according to the invention in an application where it is installed in a very schematically depicted receiving body in the shape of a waste chute 1. The waste chute 1 is part of a waste collection system that is not illustrated or described in any further detail. The waste chute 1 has a waste inlet opening 1A into which the hopper unit 2 is fitted, and said chute may for instance be an isolated ground floor waste chute of a vacuum collection system. Although only the single inlet opening 1A is shown in the drawings, it should be noted that the chute 1 may also be a section of a waste chute of a multi-story building, containing several inlets provided at different levels.

[0020] The hopper unit 2 consists of a support structure 4 that in this embodiment is a separate frame 4 that is inserted into the inlet opening 1A and that is attached to the chute 1. The frame 4 has a front plate 4A that is preferably bolted to the exterior of a chute wall, surrounding the opening 1A. At a rear surface of the front plate 4A, facing the interior of the chute 1 in the installed condition, a hopper guide structure is provided, consisting of two spaced parallel guide walls 4B that extend into the chute 1. A cover plate 4C upwardly closes off the space between said guide walls 4B, and serves mainly to stabilize the guide structure. To a certain extent said cover plate in certain applications also protects the hopper unit from items or material falling from a higher level of the chute, such as in the above mentioned waste chute of a multi-story building.

[0021] A hopper structure 3 is pivotally supported in the support structure 4, for pivoting around a first horizontal axis H1. Specifically, in the illustrated embodiment, the hopper structure is pivotally supported on a pivot pin 12 that is journaled in brackets 13 attached to the rear of the front plate 4A. The hopper structure 3 comprises a front wall 5 having a handle portion 5A for convenient manual operation of the hopper, as will be described below. Furthermore, two generally sector-shaped, spaced and mutually parallel side walls 6, 7 are attached to the front wall 5, to be received between the two guide walls 4B of the support structure frame 4, each extending adjacent the respective one of the two guide walls 4B. A rear or bottom wall 8 of the hopper structure 3 is pivotally journaled in the side walls 6, 7, adjacent rear portions 6A (only one illustrated in the drawings) thereof being most distant from the front wall 5. Specifically, adjacent one end portion 8A thereof the rear wall 8 is pivotally supported on a pivot pin 11 carried by the side walls 6, 7 at said rear portions 6A thereof. Thus, as will be described further below the rear wall 8 is pivoted between open OC (see figs. 3B and 4C) and closed CC (see fig. 3A) conditions around a second horizontal axis H2.

[0022] The pivoting of the rear wall 8 of the hopper

structure 3 between its closed and open conditions CC and OC, respectively, around the second horizontal axis H2 is controlled in dependence upon a pivoting of the entire hopper structure 3 between later described loading and discharge positions LP and DP, respectively (see figs. 4A and 4C). Specifically the pivoting of the rear hopper wall 8 is controlled by means of a transmission 9, 10 functionally connecting said rear wall 8 to the hopper structure 3 to transmit the pivoting movement of the hopper structure 3 to the rear wall for controlled movement thereof between its closed and open conditions CC and OC, respectively. In the illustrated embodiment the transmission comprises a cam follower 9 attached to the rear wall 8 at a position spaced from the pivot pin 11 and thereby from the second horizontal pivot axis H2. Here, the cam follower 9 is a pin extending across the full width of the rear wall 8 and protruding from the sides of the rear wall 8 and into an associated cam groove 10 extended in each of the two guide walls 4B of the support structure frame 4. Only one cam groove 10 is visible in the drawings, but it should be obvious that the two cam grooves 10 in the two guide walls 4B are identical both with regard to their positions in the guide walls 4B and to their extension. Thus, each end of the follower 9 is received in its associated cam groove 10 in the support structure 4 that is fixed relative to the chute 1.

[0023] The cam groove 10 has a main portion 10A extending rearwardly from a position approximately adjacent the rear side of the support structure front plate 4A. The main groove portion 10A is extended at a fixed radius from the first horizontal pivot axis H1. In a rear portion 4D of the guide wall 4B, the cam groove main portion 10A passes into a minor opening portion 10B of the cam groove 10. Compared to the main portion 10A the minor portion 10B has an inverted curvature and a much smaller radius. In other words, the minor groove portion 10B is extended away from the first horizontal pivot axis H1 at an increasing radial distance therefrom.

[0024] Upon movement of the hopper structure 3 from its loading position LP towards its discharge position DP the follower 9 will initially travel in the groove main portion 10A. During this phase, the rear wall 8 is maintained in its closed condition CC due to the distance between the pivoting axis H2 of the rear wall 8 and the follower 9. However, further movement of the hopper structure 3 in the same direction will eventually make the cam follower 9 enter the minor opening portion 10B of the groove 10, allowing the follower 9 to move away from the first pivot axis H1 and thereby allowing the rear wall 8 to swing down to its open condition OC. This operation of the hopper unit 2 will be described further below.

[0025] In the illustrated embodiment, the pivot pin 11 for pivotally supporting the rear wall 8 is extended so that it is likewise received in the two grooves 10, thereby generally stabilizing the pivoting of the hopper structure 3. One or both of the end positions of the pivotal movement of the hopper structure 3 may preferably be determined by the engagement of the pivot pin 11 and/or the cam

follower 9 with ends of the cam groove 10, but may alternatively be determined by additional, not illustrated stops. These options will specifically be considered for embodiments lacking the below described damper.

[0026] One end of a damper means 20 is pivotally connected to said extended pivot pin 11 and its opposite end is pivotally connected to a bracket 14 attached to the rear side of the front plate 4A of the support structure 4. The purpose of the damper 20 is to provide damping of the pivoting movement of the hopper structure towards its loading and discharge positions LP and DP, respectively. In particular, it is desirable that the damper 20 provide progressively increased damping towards said end positions. Such a design will prevent injuries to hands or arms of a person operating the hopper and will also eliminate the risk that hard impacts are produced in the end positions of the hopper structure, caused by a too forceful operation of the hopper structure 3, and will therefore assist in reducing the load on the entire hopper unit 2. Preferably, the desired progressive damping is obtained by means of a viscous damper 20. Although only one damper means is illustrated in the drawings, it should be pointed out that for reasons of stability it is preferred to provide one damper means adjacent each guide wall 4B.

[0027] Fig. 1 illustrates a restriction plate 15 being extended between upper edges 6B, 7B of the hopper side walls 6, 7 at a position immediately adjacent the hopper front wall 5. The restriction plate 15 is extended along a limited part of the upper edges 6B, 7B of the side walls 6, 7, and said limited part is substantially equal to the part of said upper edges being positioned outside the support structure 4 as the cam follower 9 enters the minor opening portion 10B of the cam groove 10. The extent to which the hopper structure 3 is still open at the time when the rear wall 8 starts to open depends upon the position of the transition of the main groove portion 10A into the minor opening portion 10B of the groove. Said position does in turn depend upon the chosen design for said opening portion 10B and may be varied for different applications, as will be discussed below.

[0028] The purpose of the restriction plate 15 is to prevent the insertion of longer items into the chute 1, past the opening rear wall 8 during the final pivoting movement of the hopper structure 3 towards its discharge position DP in which the hopper front wall 5 is positioned so that a rear surface thereof is approximately flush with the outer chute wall. Otherwise, such long items might get stuck in the chute and block the passage therethrough. The illustrated design of the cam groove 10, having a smooth transition between the main and minor groove portions 10A and 10B, respectively, and having a minor groove portion of comparatively large radius, in combination with the provision of the restriction plate 15 will allow for a calm and smooth opening of even a heavily loaded rear wall 8 during the final portion of the hopper closing movement. Still, the introduction of excessively dimensioned items into the receiving body will be effectively inhibited in all operative positions of the hopper 3.

[0029] The operation of the inventive hopper unit 2 will now be described with specific reference to figs 4A-4C. In a loading position LP, as is illustrated in figs. 1, 2 and 4A, the front, side and rear walls, 5, 6, 7 and 8, respectively, of the hopper structure 3 form a receptacle into which a fixed maximum volume of material, such as waste or refuse in the present application, may be inserted. By virtue of the large upper opening of the receptacle that is only restricted by the narrow restriction plate 15 of this embodiment, waste in the form of refuse bags 30 may be conveniently inserted into the hopper structure 3 from straight above. The fixed volume and dimensions of the receptacle inhibits the insertion of too large volumes of waste 30 as well as oversized items, both of which might otherwise cause blockage of the chute 1.

[0030] When the hopper 3 has been loaded, the handle 5A is gripped and the hopper is pivoted into the chute 1 around the first horizontal axis H1. During the first portion of said pivoting, as long as the cam follower 9 remains in the main groove portion 10A, the rear hopper wall 8 remains fully closed. The hopper unit 3 then enters its activating position AP (see fig. 4B) as soon as the cam follower 9 reaches the transition between said main and minor groove portions 10A and 10B, respectively. From this position, the pivoting of the rear wall 8 between its closed and open conditions CC and OC, respectively, is controlled by the further pivoting of the hopper structure 3 around axis H1 and by the shape of the minor groove portion 10B. In the illustrated embodiment, the shape of the minor groove portion 10B provides a smooth opening of the rear wall 8, where the full opening movement thereof is directly controlled by the final pivoting of the hopper 3 around axis H1.

[0031] During said pivoting of the hopper 3 from its loading position LP towards the discharge position DP (see fig. 3) the movement is progressively damped by the damper 20. Such damping of the movement will prevent injuries to hands or arms in the event that the upper end of the hopper front wall 5 or the restriction plate 15 is gripped rather than the handle 5A. Damage to the hopper unit will likewise be avoided since a too forceful closing of the hopper will be excluded, even in case the hopper unit is installed in a chute 1 of a vacuum operated waste collection system and the vacuum is applied in the chute when a hopper is in its loading position LP or in any intermediate position. The damper preferably provides progressive damping action in both directions.

[0032] Fig. 4C illustrates the hopper unit 2 in the discharge position DP where the hopper structure 3 has been pivoted to a fully closed position CP and the rear wall 8 is in its fully open condition OC so that the waste 30 will be securely discharged therefrom and into the chute 1. In this open condition OC of the rear wall 8 the entire bottom of the receptacle is open, providing a continuously widening discharge passage that favors said discharge and eliminates the risk of blockage. The next time the hopper 3 shall be loaded, the handle 5A is gripped and the hopper 3 is pivoted back to the loading

position LP around the axis H1. During the initial pivoting in this direction, the rear wall 8 is likewise pivoted to its closed condition CC by the described interaction between the cam follower 9 and the minor groove portion 10B.

[0033] In the illustrated embodiment that is specifically intended for a waste chute application, the total pivoting of the hopper structure 3 is about 60-70° around the axis H1. In such an application it is advantageous if the hopper is balanced so that it remains in a set position during the first 10-15° of pivoting from the loading position LP, and is then, upon further pivoting, given a self-closing function, even when unloaded, by proper positioning of counterweights (not illustrated).

[0034] The shape of the minor opening portion 10B of the groove 10 and thereby the length of the pivoting movement of the hopper 3 that is required for actually opening the hopper rear wall 8, depends to a large extent upon the desired characteristics of the opening and closing of the rear wall 8. Fig. 5 illustrates a modified embodiment of the invention, where the support structure 104, and specifically its guide walls 104B, have been slightly re-designed to accommodate a modified groove 110. Specifically, the main groove portion 110A has been extended in order to maintain the hopper rear wall 8 in its closed position until shortly before the hopper front wall 5 engages the front plate 104A of the support structure 104. The minor closing groove portion 110B as well as the transition between the main and major groove portions have also been modified to provide a steep short radius transition between the main and minor groove portions 110A and 110B, respectively, to produce a quicker, later opening of the rear wall. This produces a rapid opening of the rear wall 8 at the very end of the pivoting of the hopper 3 towards its discharge position DP.

[0035] However, such a design will in most cases necessitate the use of means for damping the opening movement of the rear wall 8, in order to avoid harmful impacts caused by a rapid opening of the rear wall. Additional forces may also be required when the rear wall 8 shall be closed during the initial hopper movement from the discharge position DP. In such an embodiment the hopper unit would therefore in most cases also have to be supplemented with an actuator (not illustrated) assisting in returning the hopper structure 3 to its loading position LP by initiating the closing movement of the rear wall 8. Thus, the invention covers all practically possible shapes and designs of the guide groove and its main and minor portions.

[0036] In a further alternative embodiment, not specifically illustrated, it is also possible to provide the guide groove in one or both of the hopper side walls and to provide a cam follower on the inner side of one or both guide walls of the support structure. In such a case the groove would be inverted, having the opening groove portion positioned closer to the hopper front wall.

[0037] In all of the illustrated and described embodiments of the invention, the hopper structure has been

supported in a separate frame attached to the receiving body. It should be emphasized though, that the invention likewise covers embodiments, not specifically illustrated, wherein said hopper-supporting frame is an integral part of the receiving body. Furthermore, it should be pointed out that the invention covers also transmission grooves provided in either or both guide walls of the frame and cooperating with a corresponding single-sided or double-sided cam follower.

[0038] It will be understood by those skilled in the art that various modifications and changes may be made to the present invention without departure from the scope thereof, which is defined by the appended claims.

Claims

1. A hopper unit (2) for loading material into a receiving body (1), comprising a hopper structure (3) having walls (5, 6, 7, 8) forming a fixed volume receptacle in a loading position (LP) of the hopper structure, and a support structure (4; 104) pivotally supporting the hopper structure for pivoting between the loading position and a discharge position (DP) around a first horizontal axis (H1), **characterized in that** one wall (8) of the hopper structure is pivotally connected to fixed hopper walls (6, 7), for movement around a second horizontal axis (H2) between a closed and an open condition (CC and OC, respectively) and by a transmission (9, 10; 110) functionally connecting the pivotal wall to the pivoting movement of the hopper structure (3) between the loading and discharge positions (LP and DP, respectively) to thereby transmit said hopper structure movement to the rear wall for controlled movement thereof between its closed and open conditions (CC and OC, respectively).
2. A hopper unit (2) according to claim 1, **characterized in that** the hopper structure (3) has a front wall (5), spaced side walls (6, 7) and a pivotal rear wall (8), **in that** the support structure (4; 104) is stationary, **in that** the rear wall (8) is pivotally connected adjacent one end (8A) thereof to the side walls (6, 7), for movement around the second horizontal axis (H2) and **in that** the transmission (9, 10; 110) physically connects the rear wall (8) to the support structure (4; 104).
3. A hopper unit (2) according to claim 2, **characterized in that** the transmission comprises at least one cam follower (9) attached to the rear wall (8) at a position spaced from the second horizontal pivot axis (H2) and at least one cam groove (10; 110) in the support structure (4; 104), receiving said at least one cam follower (9).
4. A hopper unit (2) according to claim 3, **characterized in that** a main portion (10A; 110A) of the cam groove (10; 110) is extended at a fixed radius from the first horizontal pivot axis (H1) and **in that** a minor opening portion (10B; 110B) of the cam groove is extended away from the first horizontal pivot axis (H1) at an increasing radial distance therefrom.
5. A hopper unit (2) according to any of claims 2-4, **characterized by** a restriction plate (15) being extended between upper edges (6B, 7B) of the hopper side walls (6, 7) at a position immediately adjacent the hopper front wall (5).
6. A hopper unit (2) according to claim 5, **characterized in that** the restriction plate (15) is extended along a limited part of the upper edges (6B, 7B) of the side walls (6, 7), said limited part being substantially equal to the part of said upper edges being positioned outside the support structure (4; 104) as the cam follower (9) enters the opening portion (10B; 110B) of the cam groove (10; 110).
7. A hopper unit (2) according to any of claims 1-6, **characterized by** a damper means (20) being extended between the support structure (4; 104) and the hopper structure (3) for providing progressive damping of said pivoting movement of the latter towards its loading and/or discharge positions (LP and DP, respectively).
8. A hopper unit (2) according to claim 7, **characterized in that** the damper means is a viscous damper (20) extended between the support structure (4; 104) and a pivot pin (11) for supporting the rear wall (8) for pivoting around said second horizontal axis (H2).
9. A method of controlling the emptying of a hopper unit (2) that is employed for loading material into a receiving body (1) and that comprises a hopper structure (3) having walls (5, 6, 7, 8) forming a fixed volume receptacle in a loading position (LP) of the hopper structure, and a support structure (4) for pivotally supporting the hopper structure for pivoting between the loading position and a discharge position (DP) around a first horizontal axis (H1), **characterized by** pivoting one wall (8) of the hopper structure around a second horizontal axis (H2) between a closed and an open condition (CC and OC, respectively) and by controlling the movement of the pivotal wall in dependence upon the pivoting of the hopper structure (3) between the loading and discharge positions (LP and DP, respectively).
10. A method according to claim 9, **characterized by** controlling the movement of the pivotal wall (8) around the second horizontal axis (H2) during its full movement between the closed and open conditions (CC and OC, respectively).

11. A method according to claim 9 or 10, **characterized by** progressively damping the movement of the hopper structure (3) towards its loading and/or discharge positions (LP and DP, respectively).

12. A waste chute (1) having at least one inlet opening (1A), a hopper unit (2) for loading material into the chute being provided in the or each inlet opening, said hopper unit comprising a support structure (4) being fixed relative to the chute and a hopper structure (3) being pivotally supported in the support structure for pivoting around a first horizontal axis (H1) between a loading position (LP) and a discharge position (DP) and having walls (5, 6, 7, 8) forming a fixed volume receptacle in the loading position, **characterized in that** one wall (8) of the hopper structure is pivotally connected to fixed hopper walls (6, 7), for movement around a second horizontal axis (H2) between a closed condition (CC) wherein it completes the fixed volume receptacle and an open condition (OC) wherein it opens the receptacle for discharge of the volume of material into the chute and by a transmission (9, 10) functionally connecting the pivotal wall to the pivoting movement of the hopper structure (3) between the loading and discharge positions (LP and DP, respectively) to thereby transmit said hopper structure movement to the rear wall for controlled movement thereof between its closed and open conditions.

13. A waste chute (1) according to claim 12, **characterized in that** the hopper structure (3) has a front wall (5), spaced side walls (6, 7) and a pivotal rear wall (8), **in that** the support structure (4; 104) is fixed to the chute 1, **in that** the rear wall (8) is pivotally connected adjacent one end (8A) thereof to the side walls (6, 7), for movement around the second horizontal axis (H2) and **in that** the transmission (9, 10; 110) physically connects the rear wall (8) to the stationary support structure (4; 104).

14. A waste chute (1) according to claim 12 or 13, **characterized in that** the support structure (4) is a separate frame attached to the chute (1).

15. A waste chute (1) according to claim 12 or 13, **characterized in that** the support structure (4) is an integral part of the chute (1).

Patentansprüche

1. Fülltrichtereinheit (2) zum Laden von Material in einen Auffangkörper (1), umfassend eine Fülltrichteranordnung (3) mit Wänden (5, 6, 7, 8), welche in einer Ladeposition (LP) der Fülltrichteranordnung eine Aufnahme mit festem Volumen bilden, und eine die Fülltrichteranordnung schwenkbar tragende

Stützenanordnung (4; 104) zum Schwenken um eine erste horizontale Achse (H1) zwischen der Ladeposition und einer Entladeposition (DP), **dadurch gekennzeichnet, dass** eine Wand (8) der Fülltrichteranordnung schwenkbar mit feststehenden Fülltrichtervorwänden (6, 7) zur Bewegung um eine zweite horizontale Achse (H2) zwischen einem geschlossenen und einem offenen Zustand (CC bzw. OC) verbunden ist und dass ein die schwenkbare Wand mit der Schwenkbewegung der Fülltrichteranordnung (3) zwischen der Lade- und Entladeposition (LP bzw. DP) funktionsmäßig verbindendes Getriebe (9, 10; 110) vorgesehen ist, um **dadurch** die Fülltrichteranordnungsbewegung auf die Rückwand zu übertragen, zur kontrollierten Bewegung dieser zwischen ihren geschlossenen und offenen Zuständen (CC bzw. OC).

2. Fülltrichtereinheit (2) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Fülltrichteranordnung (3) eine Vorderwand (5), beabstandete Seitenwände (6, 7) und eine schwenkbare Rückwand (8) aufweist, dass die Stützenanordnung (4; 104) feststehend ist, dass die Rückwand (8) zur Bewegung um die zweite horizontale Achse (H2) angrenzenden an einem Ende (8A) dieser mit den Seitenwänden (6, 7) schwenkbar verbunden ist und dass das Getriebe (9, 10; 110) die Rückwand (8) mit der Stützenanordnung (4; 104) körperlich verbindet.

3. Fülltrichtereinheit (2) nach Anspruch 2, **dadurch gekennzeichnet, dass** das Getriebe zumindest einen an der Rückwand (8) in einer Position beabstandet zu der zweiten horizontalen Schwenkachse (H2) befestigten Nockenstößel (9) umfasst und zumindest eine den zumindest einen Nockenstößel (9) aufnehmende Nockenkurve (10; 110) in der Stützenanordnung (4; 104).

4. Fülltrichtereinheit (2) nach Anspruch 3, **dadurch gekennzeichnet, dass** sich ein Hauptabschnitt (10A; 110A) der Nockenkurve (10; 110) in einem feststehenden Radius von der ersten horizontalen Schwenkachse (H1) erstreckt und dass sich ein kleinerer Mündungsabschnitt (10B; 110B) der Nockenkurve weg von der ersten horizontalen Schwenkachse (H1) mit einem steigenden radialen Abstand zu dieser erstreckt.

5. Fülltrichtereinheit (2) nach einem der Ansprüche 2 - 4, **dadurch gekennzeichnet, dass** sich zwischen oberen Rändern (6B, 7B) der Fülltrichterseitenwände (6, 7) in einer unmittelbar an die Fülltrichtervorderwand (5) angrenzenden Position eine Begrenzungsplatte (15) erstreckt.

6. Fülltrichtereinheit (2) nach Anspruch 5, **dadurch gekennzeichnet, dass** sich die Begrenzungsplatte

- (15) entlang eines begrenzten Teils der oberen Ränder (6B, 7B) der Seitenwände (6, 7) erstreckt, wobei der begrenzte Teil im Wesentlichen dem Teil der oberen Ränder entspricht, der sich außerhalb der Stützordnung (4; 104) befindet, wenn der Nockenstößel (9) in den Mündungsabschnitt (10B; 110B) der Nockenkurve (10; 110) tritt.
7. Fülltrichtereinheit (2) nach einem der Ansprüche 1 - 6, **dadurch gekennzeichnet, dass** sich ein Dämpfungsmittel (20) zwischen der Stützordnung (4; 104) und der Fülltrichteranordnung (3) erstreckt, um progressives Dämpfen der Schwenkbewegung der letzteren in Richtung ihrer Lade- und/oder Entladeposition (LP bzw. DP) zu bieten.
8. Fülltrichtereinheit (2) nach Anspruch 7, **dadurch gekennzeichnet, dass** das Dämpfungsmittel ein Viskosedämpfer (20) ist, der sich zur Abstützung der Rückwand (8) beim Schwenken um die zweite horizontale Achse (H2) zwischen der Stützordnung (4; 104) und einem Schwenkzapfen (11) erstreckt.
9. Verfahren zur Steuerung der Entleerung solch einer Fülltrichtereinheit (2), die verwendet wird, um Material in einen Auffangkörper (1) zu laden, und die eine Fülltrichteranordnung (3) mit Wänden (5, 6, 7, 8) umfasst, die in einer Ladeposition (LP) der Fülltrichteranordnung eine Aufnahme mit festem Volumen bilden, und eine die Fülltrichteranordnung schwenkbar tragende Stützordnung (4) zum Schwenken um eine erste horizontale Achse (H1) zwischen der Ladeposition und einer Entladeposition (DP), **dadurch gekennzeichnet, dass** eine Wand (8) der Fülltrichteranordnung um eine zweite horizontale Achse (H2) zwischen einem geschlossenen und einem offenen Zustand (CC bzw. OC) geschwenkt wird und dass die Bewegung der schwenkbaren Wand gesteuert wird in Abhängigkeit des Schwenkens der Fülltrichteranordnung (3) zwischen den Lade- und Entladepositionen (LP bzw. DP).
10. Verfahren nach Anspruch 9, **dadurch gekennzeichnet, dass** die Bewegung der schwenkbaren Wand (8) um die zweite horizontale Achse (H2) während ihrer vollen Bewegung zwischen den geschlossenen und offenen Zuständen (CC bzw. OC) gesteuert wird.
11. Verfahren nach Anspruch 9 oder 10, **dadurch gekennzeichnet, dass** die Bewegung der Fülltrichteranordnung (3) in Richtung ihrer Lade- und/oder Entladepositionen (LP bzw. DP) progressiv gedämpft wird.
12. Abfallschacht (1) mit zumindest einer Einlassöffnung (1A), einer in der oder jeder Einlassöffnung vorgesehenen Fülltrichtereinheit (2) zum Laden von Material in den Schacht, wobei die Fülltrichtereinheit eine relativ zum Schacht fixierte Stützordnung (4) umfasst und eine in der Stützordnung schwenkbar gelagerte Fülltrichteranordnung (3), zum Schwenken um eine erste horizontale Achse (H1) zwischen einer Ladeposition (LP) und einer Entladeposition (DP), und mit Wänden (5, 6, 7, 8), welche in der Ladeposition eine Aufnahme mit festem Volumen bilden, **dadurch gekennzeichnet, dass** eine Wand (8) der Fülltrichteranordnung schwenkbar mit feststehenden Fülltrichterwänden (6, 7) verbunden ist, zur Bewegung um eine zweite horizontale Achse (H2) zwischen einem geschlossenen Zustand (CC), in welchem sie die Aufnahme mit festem Volumen vervollständigt, und einem offenen Zustand (OC), in welchem sie die Aufnahme zum Entleeren des Schüttvolumens des Materials in den Schacht öffnet, und dass ein Getriebe (9, 10) die schwenkbare Wand funktional mit der Schwenkbewegung der Fülltrichteranordnung (3) zwischen den Lade- und Entladepositionen (LP bzw. DP) verbindet, um **dadurch** die Bewegung der Fülltrichteranordnung auf die Rückwand zur kontrollierten Bewegung dieser zwischen ihren geschlossenen und offenen Zuständen zu übertragen.
13. Abfallschacht (1) nach Anspruch 12, **dadurch gekennzeichnet, dass** die Fülltrichteranordnung (3) eine Vorderwand (5), beabstandete Seitenwände (6, 7) und eine schwenkbare Rückwand (8) aufweist, dass die Stützordnung (4; 104) an dem Schacht (1) befestigt ist, dass die Rückwand (8) zur Bewegung um die zweite horizontale Achse (H2) angrenzend an einem Ende (8A) dieser mit den Seitenwänden (6, 7) schwenkbar verbunden ist und dass das Getriebe (9, 10; 110) die Rückwand (8) mit der Stützordnung (4; 104) körperlich verbindet.
14. Abfallschacht (1) nach Anspruch 12 oder 13, **dadurch gekennzeichnet, dass** die Stützordnung (4) ein separater an den Schacht (1) befestigter Rahmen ist.
15. Abfallschacht (1) nach Anspruch 12 oder 13, **dadurch gekennzeichnet, dass** die Stützordnung (4) ein integraler Bestandteil des Schachts (1) ist.

Revendications

1. Unité formant trémie (2) destinée à charger un matériau dans un corps de réception (1), comprenant une structure (3) de trémie ayant des parois (5, 6, 7, 8) qui forment un récipient à volume fixe dans une position de chargement (LP) de la structure de trémie, et une structure de support (4, 104) destinée à supporter de manière pivotante la structure de trémie pour pivoter entre la position de chargement et une

- position de déchargement (DP) autour d'un premier axe horizontal (H1), **caractérisée en ce qu'**une paroi (8) de la structure de trémie est raccordée de façon pivotante à des parois (6, 7) de trémie fixes, pour effectuer un mouvement autour d'un second axe horizontal (H2) entre un état fermé et un état ouvert (respectivement CC et OC) et au moyen d'une transmission (9, 10 ; 110) raccordant de manière fonctionnelle la paroi pivotante au mouvement pivotant de la structure (3) de trémie entre les positions de chargement et de déchargement (respectivement LP et DP) pour transmettre de ce fait ledit mouvement de la structure de trémie à la paroi arrière afin de commander son mouvement entre ses états fermé et ouvert (respectivement CC et OC).
2. Unité formant trémie (2) selon la revendication 1, **caractérisée en ce que** la structure (3) de trémie comporte une paroi avant (5), des parois latérales écartées (6, 7) et une paroi arrière pivotante (8), et **en ce que** la structure de support (4 ; 104) est stationnaire, **en ce que** la paroi arrière (8) est raccordée de manière pivotante aux parois latérales (6, 7) de façon adjacente à une extrémité (8A) de celle-ci, pour effectuer un mouvement autour du second axe horizontal (H2) et **en ce que** la transmission (9, 10 ; 110) raccorde physiquement la paroi arrière (8) à la structure (4 ; 104) de support.
 3. Unité formant trémie (2) selon la revendication 2, **caractérisée en ce que** la transmission comprend au moins un galet (9) de came fixé à la paroi arrière (8) au niveau d'une position écartée du second axe de pivotement horizontal (H2) et au moins une rainure (10 ; 110) de came dans la structure (4 ; 104) de support qui reçoit ledit au moins un galet (9) de came.
 4. Unité formant trémie (2) selon la revendication 3, **caractérisée en ce qu'**une partie principale (10A ; 110A) de la rainure (10 ; 110) de came s'étend sur un rayon fixe depuis le premier axe de pivotement horizontal (H1) et **en ce qu'**une portion d'ouverture mineure (10B ; 110B) de la rainure de came s'étend à distance du premier axe de pivotement horizontal (H1) sur une distance radiale croissante depuis celui-ci.
 5. Unité formant trémie (2) selon l'une quelconque des revendications 2 à 4, **caractérisée en ce qu'**elle comprend une plaque de restriction (15) qui s'étend entre des bords supérieurs (6B, 7B) des parois latérales (6, 7) de trémie au niveau d'une position immédiatement adjacente par rapport à la paroi avant (5) de trémie.
 6. Unité formant trémie (2) selon la revendication 5, **caractérisée en ce que** la plaque de restriction (15)
- s'étend le long d'une partie limitée des bords supérieurs (6B, 7B) des parois latérales (6, 7), ladite partie limitée étant sensiblement égale à la partie desdits bords supérieurs qui est positionnée à l'extérieur de la structure (4 ; 104) de support lorsque le galet (9) de came entre dans la portion d'ouverture (10B ; 110B) de la rainure (10 ; 110) de came.
7. Unité formant trémie (2) selon l'une quelconque des revendications 1 à 6, **caractérisée en ce qu'**elle comprend un moyen d'amortissement (20) qui s'étend entre la structure (4 ; 104) de support et la structure (3) de trémie pour mettre à disposition un amortissement progressif dudit mouvement de pivotement de cette dernière vers ses positions de chargement et/ou de déchargement (respectivement LP et DP).
 8. Unité formant trémie (2) selon la revendication 7, **caractérisée en ce que** le moyen d'amortissement est un amortisseur visqueux (20) qui s'étend entre la structure (4 ; 104) de support et une goupille (11) de pivot destinée à supporter la paroi arrière (8) afin de pivoter autour dudit second axe horizontal (H2).
 9. Procédé destiné à commander la vidange d'une unité formant trémie (2) qui est employé pour charger un matériau dans un corps de réception (1) et qui comprend une structure (3) de trémie ayant des parois (5, 6, 7, 8) qui forment un récipient à volume fixe dans une position de chargement (LP) de la structure de trémie, et une structure (4) de support destinée à supporter de manière pivotante la structure de trémie pour pivoter entre la position de chargement et une position de déchargement (DP) autour d'un premier axe horizontal (H1), **caractérisé en ce qu'**il comprend les étapes consistant à faire pivoter une paroi (8) de la structure de trémie autour d'un second axe horizontal (H2) entre un état fermé et un état ouvert (respectivement CC et OC) et commander le mouvement de la paroi pivotante en fonction du pivotement de la structure (3) de trémie entre les positions de chargement et de déchargement (respectivement LP et DP).
 10. Procédé selon la revendication 9, **caractérisé en ce qu'**il comprend l'étape consistant à commander le mouvement de la paroi pivotante (8) autour du second axe horizontal (H2) pendant son mouvement complet entre les états fermés et ouverts (respectivement CC et OC).
 11. Procédé selon la revendication 9 ou 10, **caractérisé en ce qu'**il comprend l'étape consistant à amortir progressivement le mouvement de la structure (3) de trémie vers ses positions de chargement et/ou de déchargement (respectivement LP et DP).

12. Vide-ordures (1) ayant au moins une ouverture (1A) d'entrée, une unité formant trémie (2) destinée à charger un matériau dans le vide-ordures étant prévue dans la ou chaque ouverture d'entrée, ladite unité formant trémie comprenant une structure (4) de support fixée relativement au vide-ordures et une structure (3) de trémie supportée de manière pivotante dans la structure de support pour pivoter autour d'un premier axe horizontal (H1) entre une position de chargement (LP) et une position de déchargement (DP) et ayant des parois (5, 6, 7, 8) qui forment un récipient à volume fixe dans la position de chargement, **caractérisé en ce qu'une** paroi (8) de la structure de trémie est raccordée de manière pivotante à des parois (6, 7) de trémie fixes, pour effectuer un mouvement autour d'un second axe horizontal (H2) entre un état fermé (CC) dans lequel elle complète le récipient à volume fixe et un état ouvert (OC) dans lequel elle ouvre le récipient pour décharger le volume de matériau dans le vide-ordures et au moyen d'une transmission (9, 10) raccordant de manière fonctionnelle la paroi pivotante au mouvement pivotant de la structure (3) de trémie entre des positions de chargement et de déchargement (respectivement LP et DP), pour transmettre de ce fait le mouvement de ladite structure de trémie à la paroi arrière pour commander son mouvement entre ses états fermé et ouvert.
13. Vide-ordures (1) selon la revendication 12, **caractérisé en ce que** la structure (3) de trémie comporte une paroi avant (5), des parois latérales écartées (6, 7), et une paroi arrière pivotante (8), **en ce que** la structure (4, 104) de support est fixée au vide-ordures (1), **en ce que** la paroi arrière (8) est raccordée de manière pivotante aux parois latérales (6, 7) de façon adjacente à une extrémité (8A) de celle-ci, pour effectuer un mouvement autour du second axe horizontal (H2) et **en ce que** la transmission (9, 10 ; 110) raccorde physiquement la paroi arrière (8) à la structure (4 ; 104) de support stationnaire.
14. Vide-ordures (1) selon la revendication 12 ou 13, **caractérisé en ce que** la structure (4) de support est un cadre séparé fixé au vide-ordures (1).
15. Vide-ordures (1) selon la revendication 12 ou 13, **caractérisé en ce que** la structure (4) de support est une partie solidaire du vide-ordures (1).

FIG. 1

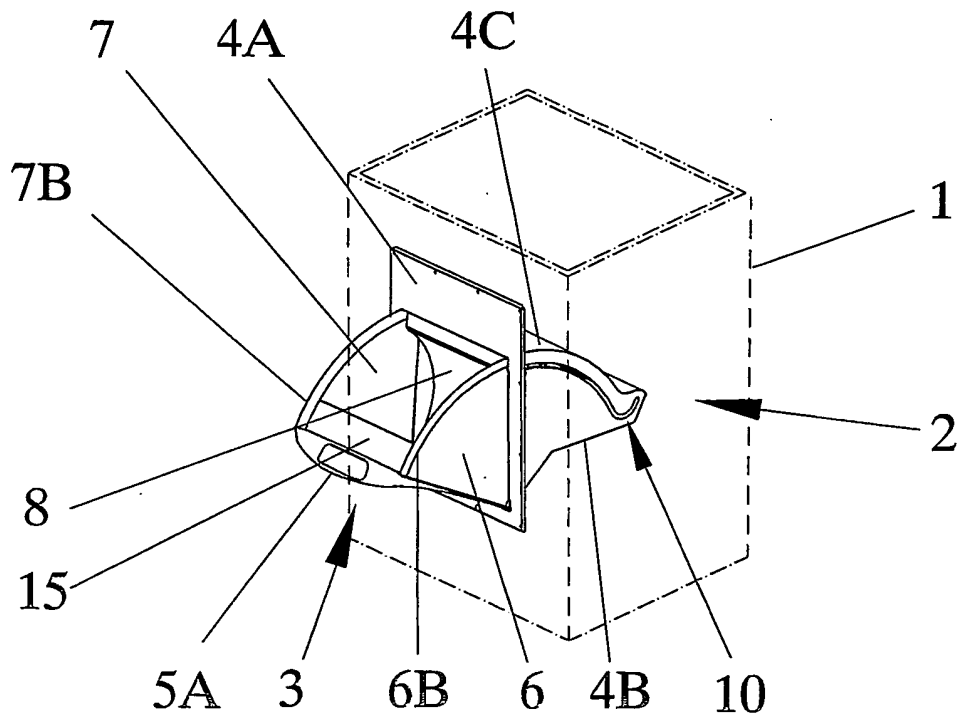


FIG. 2

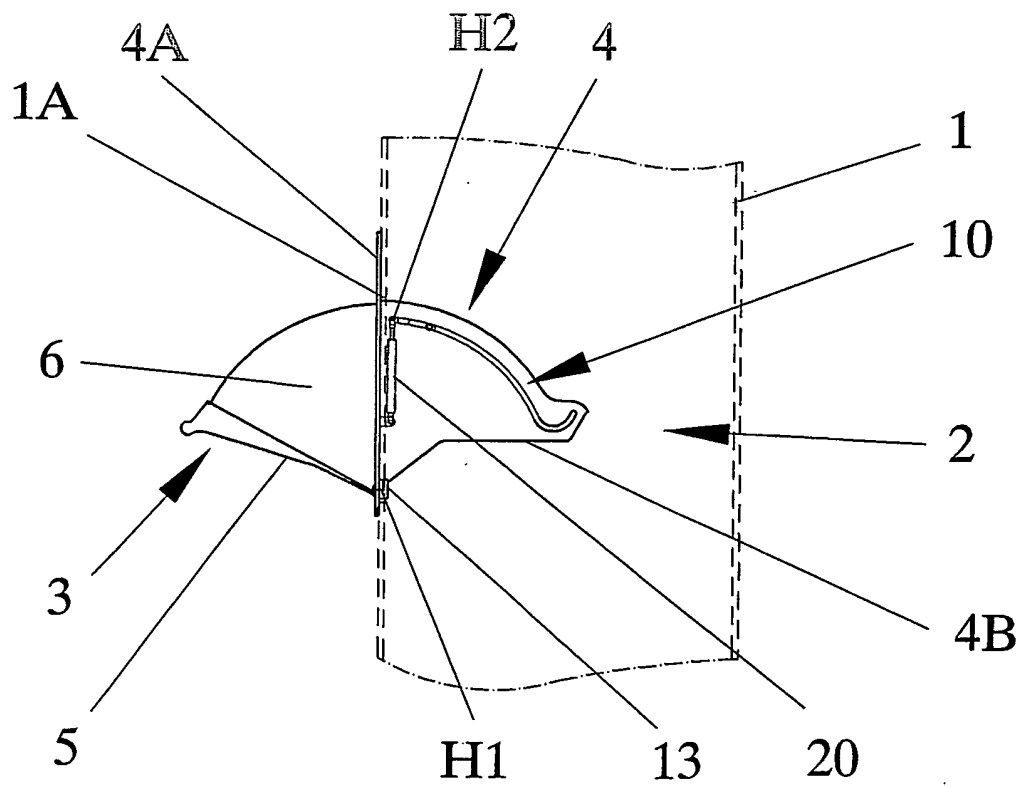


FIG. 3A

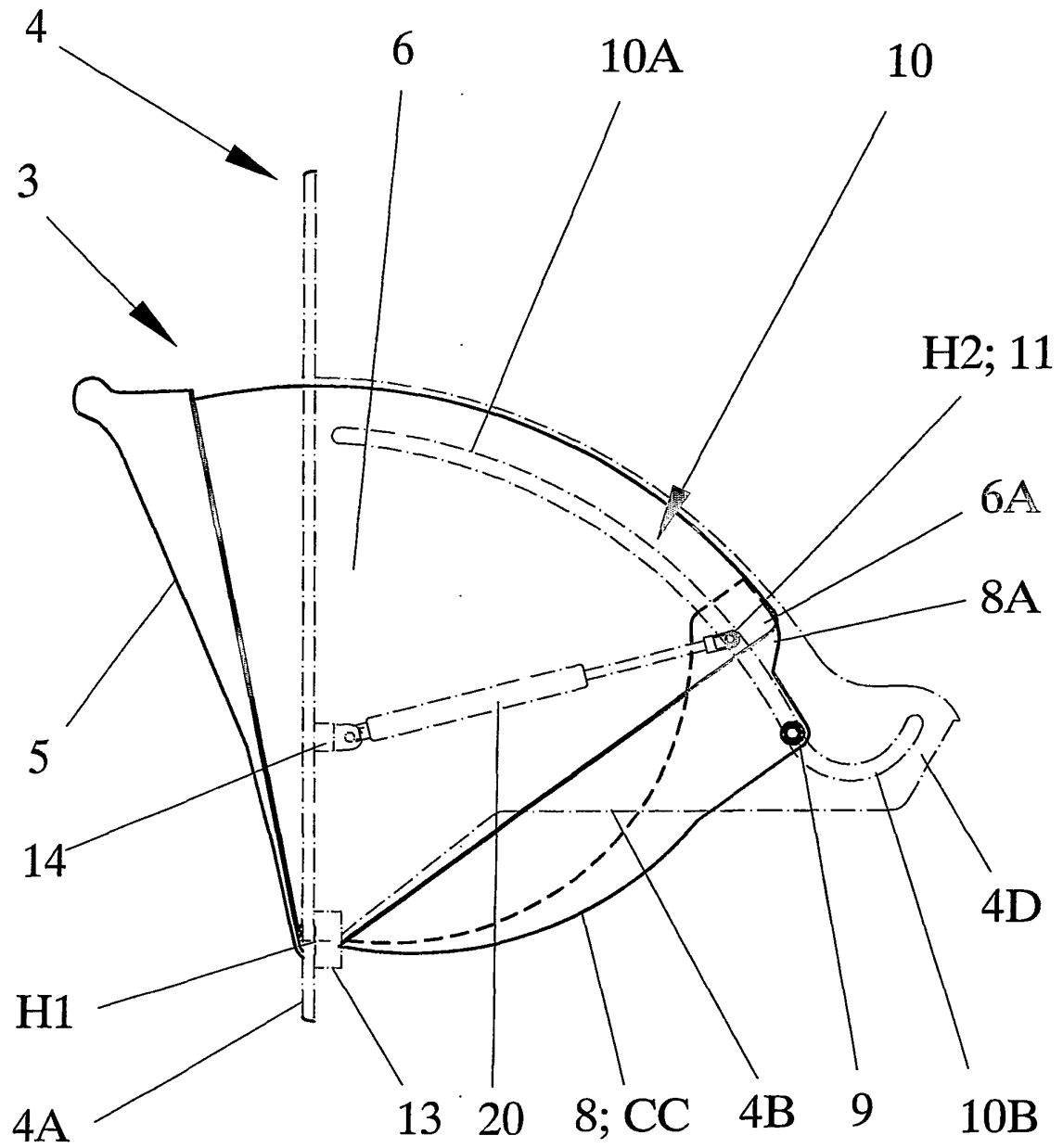
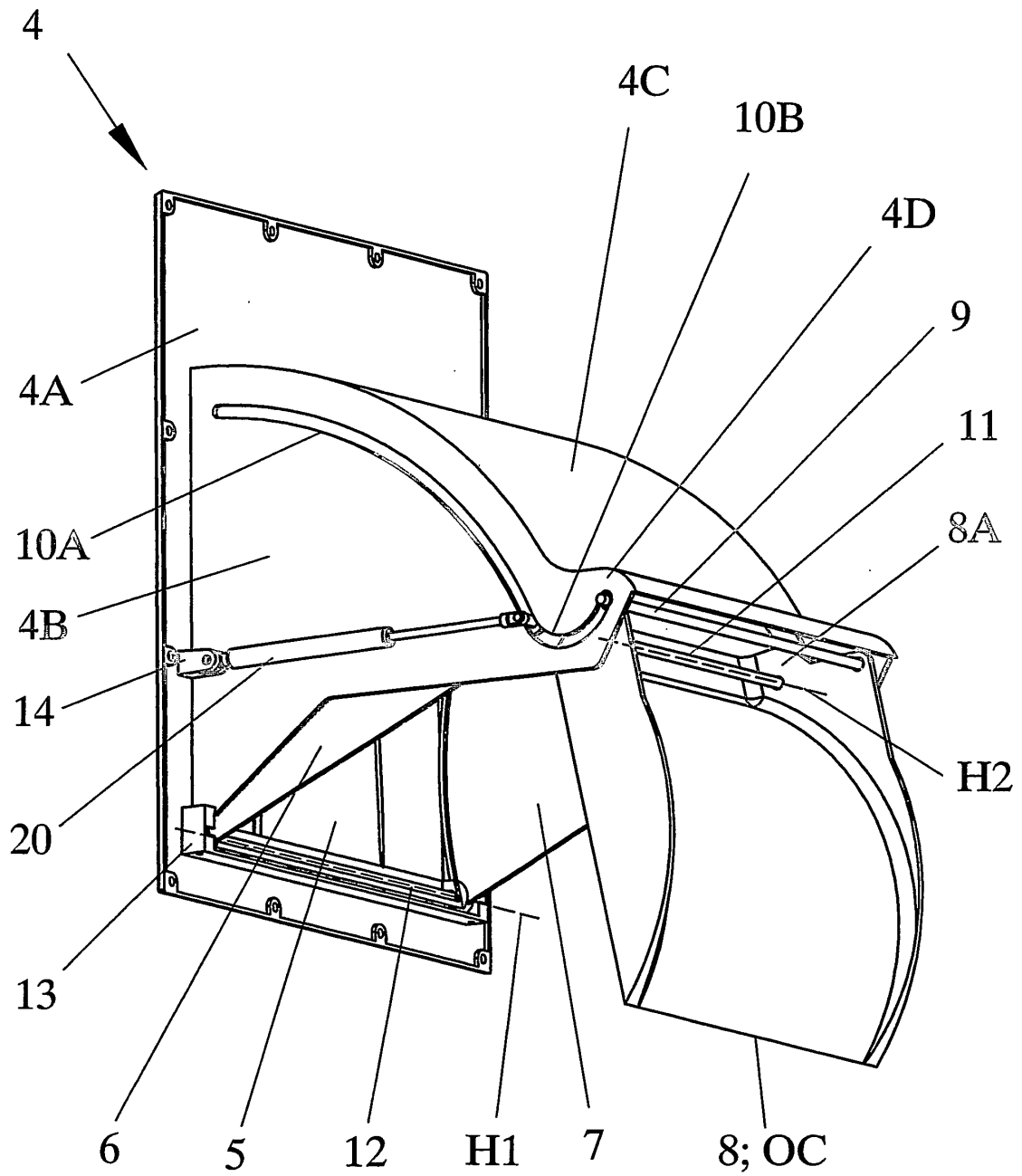


FIG. 3B



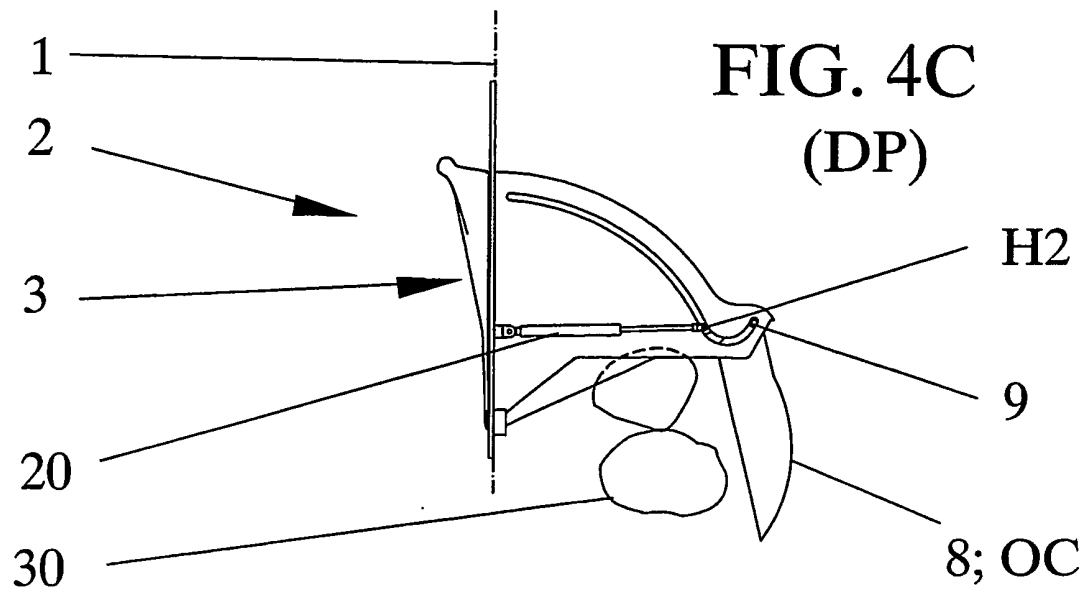
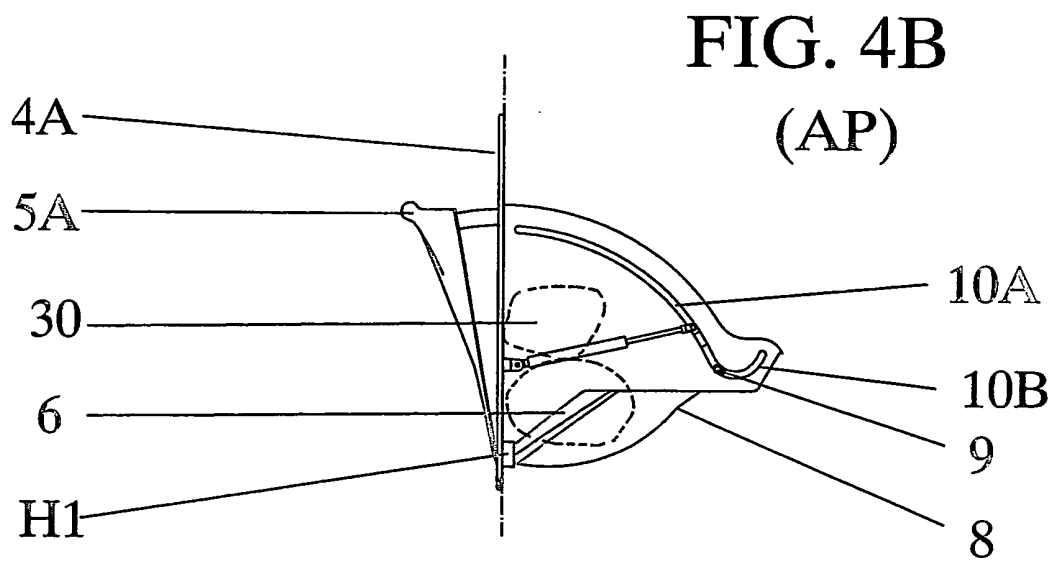
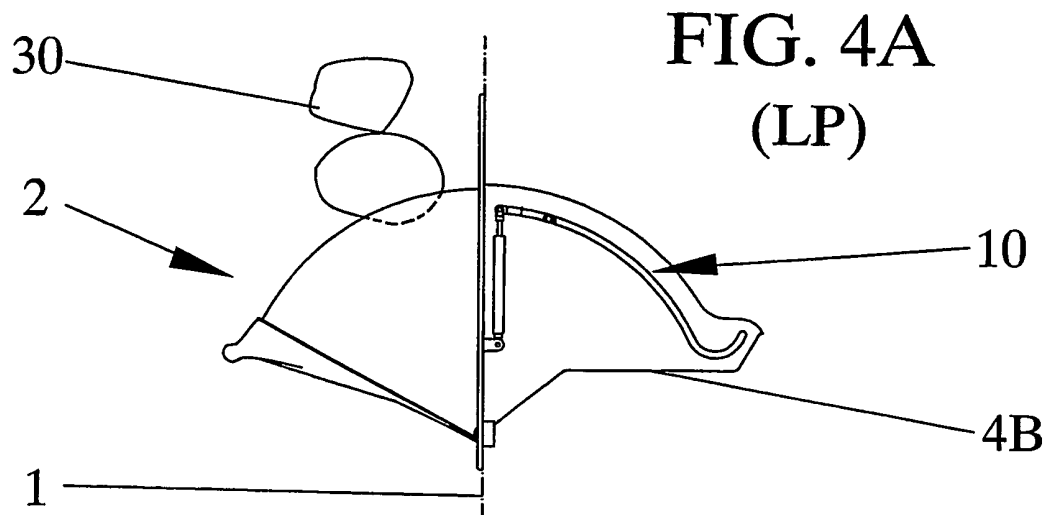


FIG. 5

