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(54) GUIDE FLAP SYSTEM FOR A REFUSE COLLECTION VEHICLE

(57) Guide flap system (100) for a refuse collection vehicle (1), comprising:
- a guide flap (101) moveable along a trajectory from a lowered position to a predetermined raised position,
- a sensor (121) configured to sense a predetermined sensing position of the guide flap relative to the trajectory and to generate a sensor signal (121 a) representative for the guide flap being at the predetermined sensing position, and
- a processor unit (122) configured to receive the sensor signal, and generating a processor signal in dependence of the received sensor signal.

The guide flap system is configured to determine according to a predetermined criterion whether the guide flap has followed at least part of the trajectory. The processor unit is configured to generate said processor signal if: the guide flap is arranged in the predetermined raised position, and the predetermined criterion has been met during moving of the guide flap along the trajectory into the predetermined raised position.

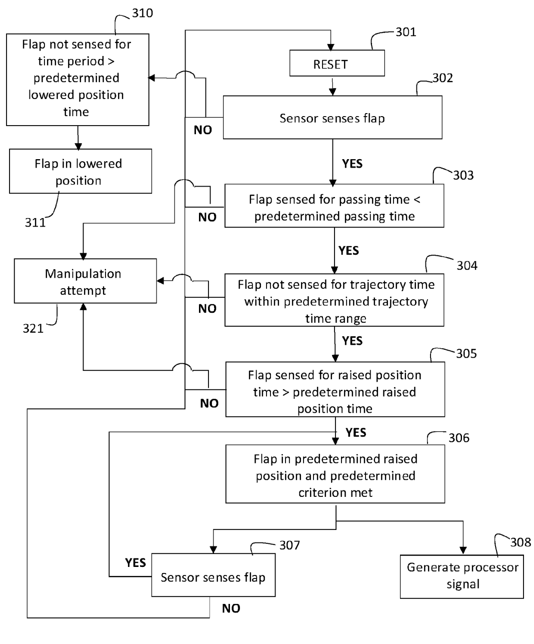

Fig. 6

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Description

[0001] The present application relates to the field of refuse collection vehicles, in particular to a guide flap system for a refuse collection vehicle.

[0002] Refuse collection vehicles are used to pick up refuse, which is usually put outside on the street to be picked up by operators operating the refuse collection vehicle. The refuse collection vehicle may comprise a collection body in which the refuse is collected. Usually at the rear end of the refuse collection vehicle, the refuse can be deposited into a tailgate via an opening. The tailgate may e.g. comprise a hopper.

[0003] The refuse can be deposited outside in different ways, e.g. as loose refuse, bulk refuse, in a refuse bag or in a refuse bin, wherein the refuse bin can have various sizes including the size that is sometimes referred to as a refuse container. In case of loose refuse or refuse bags, an operator usually deposits the refuse manually into the refuse collection vehicle, e.g. into a hopper. In case of a refuse bin, an operator usually arranges the refuse bin on a lifting system. The lifting system tilts the refuse bin such that the refuse is emptied into the refuse collection vehicle, e.g. into hopper.

[0004] A compaction system is provided for pressing the refuse together and guiding the refuse from the hopper to the collection body. An inherent danger of such compaction system is that the hands of an operator may get injured by the compaction system, or even worse.

[0005] It is known to provide a guide flap in a raised position. The guide flap protects the operator by ensuring that the opening towards the compaction system is too high for the operator to accidently get his hands in. However, when the operator is required to deposit refuse bags or loose refuse into the refuse collection vehicle, it not desirable that the opening is that high for ergonomic reasons. This is solved by allowing the guide flap to be lowered to a lowered position, such that the opening is lower and it is easier for the operator to deposit the refuse in the refuse collection vehicle.

[0006] To make sure that the operator is not injured by the compaction system when the guide flap is in the lowered position, said compaction system can e.g. only be operated in a manual operation mode when the guide flap is in the lowered position. A sensor may e.g. be provided for detecting whether the guide flap is in the lowered position or in the raised position.

[0007] It has been found, however, that in practice some operators attempt to manipulate the sensor, e.g. by arranging a plate in front of it. It may be more time effective for them to operate the compaction system in an automatic operation mode while the guide flap is in the lowered position. However, this is not desired from a safety perspective.

[0008] It is an object of the present invention to provide a guide flap system that is harder to manipulate by an operator, or at least to provide an alternative for the prior art.

[0009] This object is achieved by a guide flap system for a refuse collection vehicle, comprising

- a guide flap, wherein the guide flap is moveable along a trajectory from a lowered position to a predetermined raised position,
- a sensor configured to sense a predetermined sensing position of the guide flap relative to the trajectory and to generate a sensor signal representative for the guide flap being at the predetermined sensing position, and
- a processor unit configured to receive the sensor signal, and generating a processor signal in dependence of the received sensor signal;

wherein the guide flap system is configured to determine according to a predetermined criterion whether the guide flap has followed at least part of the trajectory; and
wherein the processor unit is configured to generate said processor signal if:

- the guide flap is in the predetermined raised position, and
- during moving of the guide flap along the trajectory into the predetermined raised position, the predetermined criterion has been met.

[0010] The invention thus relates to a guide flap system for a refuse collection vehicle. The refuse collection is configured to collect refuse, e.g. household waste, recyclable waste such as plastics, green waste, glass, and old paper. The guide flap system may in practice be arranged on the rear end of the refuse collection vehicle, optionally as part of a tailgate. The guide flap system comprises a guide flap, which can be arranged in at least a lowered position and a predetermined raised position. Generally, in the predetermined raised position the guide flap is intended to protect the operator, e.g. from a compaction system. The guide flap is intended to be used in the predetermined raised position when refuse in a refuse bin is collected with the refuse collection vehicle. The guide flap is intended to be used in the lowered position when the refuse is e.g. loose refuse or provided in refuse bags.

[0011] The guide flap can thus be arranged in the lowered position or the predetermined raised position based on how the refuse to be collected is provided. In accordance with the invention, the guide flap is moved according to a trajectory when moved from the lowered position to the predetermined raised position. Optionally, the guide flap is moved according to an opening trajectory when moved from the predetermined raised position to the lowered position. The opening trajectory can be the reverse of the trajectory, but it can also be another trajectory.

[0012] The guide flap system comprises a sensor. The sensor senses a predetermined sensing position of the guide flap relative to the trajectory. For example, the predetermined sensing position can be the predetermined raised position or the lowered position. The sensor may e.g. be a proximity sensor. The sensor is configured to generate a sensor signal representative of the guide flap being at the predetermined sensing position. For example, the sensor may be configured to adapt the sensor signal when the guide flap is sensed, e.g. while continuously generating the sensor signal. For example, the sensor may be configured to only generate the sensor signal when the guide flap is sensed, e.g. when the guide flap is arranged in or passes the predetermined sensing position. A processor unit is configured to receive the sensor signal and generate a processor signal in dependence of the received sensor signal.

[0013] The guide flap system is configured to determine when the guide flap has been moved along at least a part of the trajectory. This is done according to a predetermined criterion. The predetermined criterion can be implemented in various ways, some of which are elaborated on herein. In general, the predetermined criterion can e.g. be based on sensor signals generated by the sensor and optionally one or more further sensors. Said further sensors can e.g. be configured to sense the guide flap at one or more positions relative to the trajectory. The predetermined criterion can e.g. also be based a time period for which said sensors do or do not sense the guide flap. It is also possible that a further sensor detects actions or positions that are dependent of the position of the guide flap, e.g. pertaining to a lock for locking the guide flap in the lowered position of in the predetermined raised position.

[0014] If the guide flap is in the predetermined raised position, and the predetermined criterion has been met, the processor unit is configured to generate said processor signal. The processor signal can e.g. be used to determine if and how other components of the refuse collection vehicle can be used. Said other components can e.g. include a compaction system or a lifting system.

[0015] The processor signal thus represents that the guide flap is arranged in the predetermined raised position, with an additional threshold that the predetermined criterion is met. The predetermined criterion relates to whether or not the guide flap has been moved along the trajectory. The invention thus entails that instead of merely taking into account whether the guide flap is considered to be in the raised position, it is also taken into account whether the guide flap has actually been moved according to the trajectory. This ensures that it is not possible to e.g. manipulate the processor unit by tricking the sensor into sensing something that actually is not the guide flap. In practice, operators may e.g. attempt this by arranging a piece of metal in front of the sensor when the sensor is a proximity sensor. The invention thus makes it harder to manipulate the system. The safety for the operators has as such been improved.

[0016] In embodiments, the predetermined raised position is arranged between the lowered position and a beyond raised position. The trajectory extends from the lowered position, to the beyond raised position, and to the predetermined raised position so that the guide flap is configured to, when the guide flap is moved along the trajectory from the lowered position to the predetermined raised position, first pass the predetermined raised position when being moved to the beyond raised position and subsequently return to the predetermined raised position. The predetermined sensing position that the sensor is configured to sense is the predetermined raised position. The processor unit is configured to determine that the predetermined criterion has been met based on: a passing time representing a time period that the sensor senses the guide flap when the guide flap passes the predetermined raised position when being moved to the beyond raised position; and/or a raised position time representing a time period that the sensor senses the guide flap when the guide flap is arranged in the predetermined raised position; and/or a trajectory time representing a time period between a moment that the sensor senses the guide flap passing the predetermined raised position and a moment that the sensor senses the guide flap being arranged in the predetermined raised position.

[0017] By providing the trajectory with the beyond raised position, it is ensured that the guide flap first passes the predetermined raised position before being arranged in the predetermined raised position. Advantageously, the predetermined criterion can be verified using a single sensor, thereby reducing the cost and complexity of the system.

[0018] Since the predetermined sensing position is the predetermined raised position, the sensor can sense, e.g. for the passing time, when the guide flap passes the predetermined raised position. The processor unit can e.g. determine that the guide flap is being moved according to the trajectory based on the passing time, because the sensor will only detect the guide flap for a relatively short period of time. For example, the processor unit may be configured to determine that the predetermined criterion is met if at least the passing time is less than a predetermined passing time period. The processor unit may be configured to compare the passing time with the predetermined passing time period. The predetermined passing time period may e.g. be 5 seconds, 4 seconds, seconds, 2 seconds or 1 second. The processor unit is thus able to distinguish between the guide flap passing the predetermined raised position and the guide flap being arranged in the predetermined raised position.

[0019] When the guide flap is arranged in the predetermined raised position, the sensor senses the guide flap for a longer time period, i.e. the raised position time. In embodiments, the processor unit is configured to determine the guide flap is in the predetermined raised position based on the raised position time that the sensor detects the guide flap in the predetermined raised position. For example, processor unit may be configured to determine that the guide flap is in the predetermined raised position when raised position time is more than a predetermined raised time period. The processor unit may be configured to compare the raised position time with the predetermined raised time period. The predetermined raised time period can e.g. be 1 second, 2 seconds, 3 seconds, 4 seconds, or 5 seconds. Since the guide flap is detected for a relatively long time, it can be concluded that the guide flap remains in the predetermined raised position rather than moving past it while being moved to the beyond raised position in the trajectory. In case both the predetermined raised time period and the predetermined passing time period are used, the predetermined raised time period should not be smaller than the predetermined passing time period.

[0020] The trajectory time is an indication of how fast the guide flap is moved along the trajectory. When the trajectory time is longer or shorter than expected, this may indicate that the guide flap is not actually moved along the trajectory, but e.g. that an operator is attempting to manipulate the guide flap system. Therefore, the processor unit can e.g. be configured to determine that the predetermined criterion has been met if at least the trajectory time is within a predetermined trajectory time range. The processor unit may be configured to compare the trajectory time with the predetermined trajectory time range.

[0021] In embodiments, the guide flap system further comprises a locking mechanism configured to lock the guide flap in the predetermined raised position. In embodiments, the locking mechanism may be configured to be activated by the guide flap being moved along the trajectory towards the predetermined raised position. This may be advantageous, since the operator may think that the trajectory must be followed in order to lock the guide flap. It may not be obvious for the operator that predetermined criterion is verified at the same time, thereby making it harder for the operator to figure out a way to manipulate the guide flap system. For example, the locking mechanism configured to lock the guide flap in the predetermined raised position after being moved from the beyond raised position to the predetermined raised position. For example, the locking mechanism may be a mechanical system configured to lock the guide flap in the predetermined raised position when the guide flap is moved from in the direction from the beyond raised position to the predetermined raised position, but not when the guide flap is moved from the lowered position to the predetermined raised position. For example, the processor unit may be configured to activate the locking mechanism after the guide flap has passed the predetermined raised position while moving towards the beyond raised position, and/or when the guide flap arrives in the predetermined raised position from the beyond raised position.

[0022] In embodiments, the guide flap is rotatable around a horizontal rotation axis. The movement of the guide flap from the lowered position up to the predetermined raised position comprises a rotation around the rotation axis. Optionally, the horizontal rotation axis extends through in guide flap. In embodiments, the guide flap may have a cuboid-shape, wherein optionally the horizontal rotation axis extends in a face of the guide flap.

[0023] In embodiments, the guide flap is arranged substantially horizontal in the lowered position. By being arranged horizontally, an upper side of the guide flap is arranged at a smaller height from ground level, such that it is easier for an operator to deposit loose refuse of refuse bags into the refuse collection vehicle. In addition, it may allow the operator to arrange heavy loose refuse or refuse bags on the guide flap and thereafter pushing it into the refuse collection vehicle.

[0024] In embodiments, the guide flap is arranged at an angle of 45-135 degrees to the horizontal in the predetermined raised position, e.g. at an angle of 60-120 degrees, e.g. at an angle of 75-105 degrees or at an angle of 75-90 degrees. By arranging the guide flap into an at least partially upright position, an upper side of the guide flap is arranged at a higher height from ground level in the predetermined raised position, such that it is less likely that the operator injures his hands in the compaction system. For example, the guide flap may be configured to be rotated upwards when being moved from the lowered position to the predetermined raised position.

[0025] In embodiments, the guide flap is arranged at a larger angle to the horizontal in the beyond raised position than in the predetermined raised position. For example, if the guide flap is configured to be pivoted upwards when being moved from the lowered position to the predetermined raised position, the guide flap is pivoted past the predetermined raised position to the beyond raised position. For example, the guide flap may be arranged substantially vertical in the beyond raised position.

[0026] In embodiments, the guide flap system comprises a single locking mechanism for locking and/or unlocking the guide flap, and a single handle for operating the locking mechanism. This is advantageous in comparison to prior art systems since it is easier for the operator to move the guide flap from the lowered position to the predetermined raised position or vice versa.

[0027] In embodiments, the sensor is a safety proximity sensor. For example, the sensor may be configured to generate a magnetic field, wherein the sensor and/or processor unit is configured to determine that the guide flap is sensed based on the strength of said magnetic field. For example, the sensor may be configured to generate sensor signal proportional to strength of the magnetic field and/or the sensor may be configured to generate the sensor signal only when the strength of the magnetic field is above and/or below predetermined threshold(s). When the guide flap is made of ferromagnetic material, the strength of the magnetic field is dependent of the distance of the guide flap to the sensor. When the guide flap is relatively far from the sensor, e.g. in the lowered position or in the beyond raised position, the guide flap does not affect the magnetic field, or at least the influence is small, and it can be concluded from the strength of the magnetic field that the guide flap is not in the predetermined raised position. When the guide flap is in the predetermined raised position, the guide flap does affect the magnetic field, and it can be concluded from the strength of the magnetic field that the guide flap is in the predetermined raised position.

[0028] A particular advantage is provided by this type of sensor if in the predetermined raised position, the guide flap is arranged at a small distance of the sensor, wherein a gap is present between the sensor and the guide flap. Said gap is usually an air gap. Said air gap affects the strength of the magnetic field by weakening it. As explained above, it has been found that in practice some operators attempt to manipulate the sensor into incorrectly determining that the guide flap is in the predetermined raised position. One way of doing this in known guide flap systems, is arranging a manipulation component, e.g. a metal plate, in front of the sensor such that the sensor detects said manipulation component instead of the guide flap. Usually said manipulation component is arranged directly against the sensor, because this is the easiest way of fixing the manipulation component in a position where the sensor can detect it. Since the manipulation component is arranged directly against the sensor, there is no air gap between the sensor and the manipulation component. When the sensor applying a magnetic field is used, the strength of the magnetic field is in this situation not weakened by an air gap. It is thus possible to detect that the guide flap actually is not in the predetermined raised position.

[0029] In embodiments, the processor unit is configured to detect a manipulation attempt of the sensor. In this context, a manipulation attempt corresponds with an attempt of the operator to manipulate the guide flap system into incorrectly determining that the guide flap is in the predetermined raised position. For example, the processor unit may be configured to determine that a manipulation attempt has occurred when the sensor appears to detect the guide flap in the predetermined raised position, but the guide flap has not been moved according to the trajectory. For example, if the sensor is a safety proximity sensor, the processor unit may be configured to determine that a manipulation attempt has occurred when the strength of the magnetic field is above a predetermined threshold. This may indicate that an operator has arranged a manipulation component in a position where the sensor can detect it. Optionally, after detecting the manipulation attempt, the processor unit may be configured to perform one or more of the following actions: trigger an alarm, e.g. a visual alarm and/or an audible alarm; require a reset of at least a part of the guide flap system; require the guide flap to be arranged in the lowered position or in the predetermined raised position; log the manipulation attempt in a memory; prevent a compaction system from being operated in an automated operation mode, prevent a lifting system from being operated.

[0030] In embodiments, the guide flap comprises one or more of: steel, aluminium, and a synthetic material.

[0031] In embodiments, in the lowered position a lowered position upper side of the guide flap is arranged at least 1 m from ground level and/or in the predetermined raised position a raised position upper side of the guide flap is arranged at least 1.4 m from ground level. In this context, the upper side is considered the highest point of the guide flap in a given arrangement. Thus, the lowered position upper side may be a different part of the guide flap than the raised position upper side. In these embodiments, the safety of the operators can be guaranteed while in the lowered position the operator can easily deposit loose refuse or refuse bags in the collection body.

[0032] The invention further relates to a lifting system for a refuse collection vehicle, comprising a lift for receiving a refuse bin, wherein the lift is moveable between a receiving position and an emptying position in which the refuse bin is tilted. The lifting system further comprises a guide flap system according to the invention. The lifting system is configured, based on the processor signal, to prevent the lift from moving to the emptying position when the guide flap is not in the predetermined raised position.

[0033] The lifting system advantageously allows emptying the refuse bin without requiring the operator to tilt the refuse bin manually, which may be heavy. However, for safety reasons it is desired that the lift system only moves the lift when the guide flap is in the predetermined raised position. From the processor signal, it can be determined when the guide flap is in said predetermined raised position, such that safety can be guaranteed.

[0034] The invention further relates to a refuse handling system for a refuse collection vehicle, comprising a compaction system. The refuse handling system comprises a collection body for receiving refuse and configured to be arranged on the refuse collection vehicle. The compaction system further comprises at least one press configured to press the refuse together. The refuse handling system further comprises a guide flap system according to the invention. The refuse handling system is configured, based on the processor signal, to select an operation mode of the compaction system.

[0035] In embodiments, the compaction system comprises at least an automatic operation mode and a manual operation mode, wherein the refuse handling system is configured, based on the processor signal, to prevent the compaction system from being operated in the automatic operation mode when the guide flap is not in the predetermined raised position.

[0036] A receiving opening may be provided through which the refuse can be deposited into the refuse collection vehicle, e.g. into a hopper. When the guide flap is in the predetermined raised position, the receiving opening is higher than when the guide flap is in the lowered position. The compaction system may e.g. press the refuse together such that it is smaller and more refuse can be collected by the refuse collection vehicle. The compaction system can be operated in various modes. For example, the compaction system can operated in a manual operation mode, which may e.g. entail that an operator needs to keep pressing a button for the compaction system to press the refuse together. For example, the compaction system can also be operated in an automatic operation mode, which may e.g. entail that the operator only needs to press a button once for the compaction system keep pressing refuse together. It will be understood that the automatic operation mode entails a higher risk for the operator to be injured. Therefore, the automatic operation mode can only be selected when the guide flap is in the predetermined raised position, such that the operator is protected. The automated operation mode may optionally be provided for emptying refuse bins, e.g. being emptied by means of a lifting system that is also operated in an automated operation mode.

[0037] The invention further relates to a refuse collection vehicle comprising a guide flap system, lifting system, and/or refuse handling system according to the invention. In embodiments, the refuse collection vehicle further comprises a chassis; a driver's cab provided on the chassis; at the front of the chassis; and a collection body for collecting refuse, provided on the chassis, behind the driver's cab. The guide flap system is optionally provided at the back of the chassis with the collection body arranged between the guide flap system and the driver's cab.

[0038] The invention further relates to methods as described below. The methods according to the invention may be performed with one or more of the devices according to the invention, i.e. with the guide flap system, the lifting system, the refuse handling system, and/or the refuse collection vehicle. However, neither the methods nor the devices are limited thereto. Nevertheless, features and definitions explained with reference to the devices according to the invention may be interpreted similarly when mentioned in reference to the methods, and vice versa. Furthermore, features and/or embodiments explained with reference to the devices according to the invention may be added to the method according to the invention to achieve similar advantages, and vice versa.

[0039] The invention relates to a method for arranging a guide flap in a raised position, wherein the guide flap is part of a guide flap system for a refuse collection vehicle. The method comprises the following steps:

- moving the guide flap along a trajectory, wherein the trajectory entails moving the guide flap upwards towards a beyond raised position, thereby passing the predetermined raised position,
- moving the guide flap from the beyond raised position to the predetermined raised position,
- determining, based on a predetermined criterion, that the guide flap has followed the trajectory, and
- generate a processor signal if:

  i. the guide flap is in the predetermined raised position, and

  ii. during moving of the guide flap along the trajectory into the predetermined raised position, the predetermined criterion has been met.

[0040] The invention further relates to a method for operating a processor unit. The method optionally starts with a first step that entails a reset. It is assumed that the guide flap is in the lowered position after the reset.

[0041] In a second step, the processor unit verifies whether the sensor senses the guide flap, based on the sensor signal. In case the guide flap is not sensed, the method restarts at the first step. In addition, it is possible to verify in a further step whether the guide flap is not sensed for a time period that is larger than a predetermined lowered position time period. If this is the case, the processor unit can be configured to determine that the guide flap is in the lowered position. For example, the predetermined lowered position time can be 1 second.

[0042] When the sensor does sense the guide flap in the second step, the method optionally continues to a third step, a fourth step, or a fifth step.

[0043] In the optional third step, the processor unit verifies for whether the sensor senses the guide flap for a passing time which is smaller than a predetermined passing time. Assuming that the guide flap was previously in the lowered position and is now being moved towards the beyond raised position, the guide flap should pass the sensor for a short period of time. The sensor should thus sense the guide flap for a passing time which is smaller than a predetermined passing time. For example, the predetermined passing time can correspond with a pulse of the sensing signal, or with 1 second.

[0044] After having passed the sensor, the guide flap should be arranged in the beyond raised position. At this moment, the sensor does not sense the guide flap. The guide flap is then moved back to the predetermined raised position, wherein the sensor senses the guide flap. Thus, the sensor should not detect the guide flap for a relatively short period of time. In the optional fourth step, the processor unit is configured to verify whether the guide flap is not sensed for a trajectory time that is within a predetermined trajectory time range. For example, the predetermined trajectory time range may be from 0.1 second to 1 second. Optionally, the upper limit of the predetermined trajectory time range is smaller than the predetermined lowered position time.

[0045] In the optional fifth step, the processor unit is configured to verify whether the sensor senses the guide flap for a raised position time that is larger than a predetermined raised position time. For example, the predetermined raised position time may be 1 second. Preferably, the predetermined raised position time is not smaller than the predetermined passing time.

[0046] In a sixth step, the processor unit can be configured to determine that the predetermined criterion has been met, e.g. based on one or more of the third, fourth and fifth step. The processor unit can also be configured to determine that the guide flap is in the predetermined raised positon, e.g. based on the fifth step.

[0047] In a seventh step, the processor unit is configured to generate the processor signal.

[0048] In an optional eight step, the processor unit can be configured to verify whether the senor still senses the guide flap. In case the sensor does, the method reverts to the sixth step. In case the sensor does not sense the guide flap anymore, the method is restarted in the first step.

[0049] Optionally, in case in any of steps third, fourth and fifth step the respective condition is not met, the method will restart in the first step. In addition, this may indicate that something unexpected has happened. The processor unit may, therefore, optionally be configured to determine in a further step that a manipulation attempt has occurred.

[0050] It will be understood that the method as described above shows various steps that can but not have to be combined in the method performed by the processor unit. For example, one or more of third, fourth and fifth steps can be omitted, since one or two of these steps may already provide a sufficient degree of certainty that the guide flap has been moved along at least a part of the trajectory.

[0051] The invention further relates to a computer-readable program, comprising instructions that cause a processor unit to perform a method according to one of the embodiments described above.

[0052] The processor unit of the guide flap system according to the invention may in embodiments be configured to perform a method according to one of the embodiments described above.

[0053] Examples of embodiments of the invention are described below with reference to the figures. The figures will not be construed as limiting the claims in any way. In the various figures, like reference numerals indicated like features.

[0054] In the figures:

Fig. 1a: shows a refuse collection vehicle;
Fig. 1b-1c: illustrate the rear end of the refuse collection vehicle when emptying a refuse bin;
Fig. 1d-1e: illustrate a clearer view of the rear end without the refuse bin;
Fig. 2: illustrates a guide flap system in more detail;
Fig. 3a-3c: illustrate the movement of the guide flap from the lowered position to the predetermined raised position;
Fig. 4a-4c: illustrate the movement of the guide flap from the lowered position to the predetermined raised position from a side view;
Fig. 5: schematically illustrates a processor unit;
Fig. 6: schematically illustrates a method that the processor unit may be configured to perform.

[0055] Fig. 1a-1e illustrate a refuse collection vehicle 1. Fig. 1a shows the complete refuse collection vehicle 1, fig. 1b-1c illustrate the rear end 5 of the refuse collection vehicle 1 when emptying a refuse bin 31, and fig. 1d-1e illustrate a clearer view of the rear end 5 without the refuse bin 31.

[0056] The refuse collection vehicle 1 may comprise a chassis 3. A driver's cab 2 is usually provided on the chassis 3, at the front of the chassis 3. The driver's cab 2 provides space for at least a driver, and includes the necessary tools for the driver to drive the refuse collection vehicle 1, such as a steering wheel, a gas pedal, a brake pedal, optionally a clutch pedal and a gear stick. The refuse collection vehicle 1 is driven by a driver in the driver's cab 2, and stops frequently to collect refuse offered along the road. The refuse may e.g. be household waste, recyclable waste such as plastics, green waste, glass, or old paper. Refuse comes in many forms, including loose and bulky refuse, refuse collected in bags, and refuse collected in bins of different sizes and comprising a plurality of wheels, typically two or four. A refuse bin with four wheels is sometimes referred to as a refuse container. Refuse bins - in practise called 'bins' - up to about 400 litres - such as a 60 litres, a 80 litres, a 140 litres, a 240 litres, and a 360 litres refuse bin - have in general two wheels, two corners of the bottom each having one wheel. Refuse bins - in practise in general called containers - from about 500 litres to about 1300 litres - such as 660 litres, 770 litres, and 1100 litres refuse bins - have in general 4 wheels, one at each corner of the bottom. These bins are in practise standardized, at least per region, and the refuse collection vehicles in a region are provided with handling adapters in correspondence with the 'standardized' bins used in that region. The refuse collection vehicle 1 is operated by operators accompanying the refuse collection vehicle 1 on foot. These operators perform manual tasks, such as moving the refuse bin towards the lifting device, picking up loose and bulky refuse and throwing the refuse in the refuse collection vehicle 1, etc.

[0057] Referring to the above paragraph, it is noted that that the term 'bin' as used in this application comprises containers as well, in other words the term 'bin' as used in this application comprises the term 'bin' as used in practise as well as the term 'container' as used in practise.

[0058] The refuse collection vehicle 1 may also comprise a collection body 4 for collecting refuse. The collection body 4 can be provided on the chassis 3, behind the driver's cab 2. The refuse can be deposited into a hopper 7 via an opening 10 of a tailgate 6 for feeding refuse into the collection body 4. The refuse collection vehicle 1 may further comprise a compaction system that comprises at least one press configured to press the refuse together. This makes it possible to collect more refuse in the collection body 4. The press can e.g. be provided in the tailgate 6, e.g. between hopper 7 and the collection body 4.

[0059] The compaction system entails an inherent risk to which an operator of the refuse collection vehicle 1 is exposed. In case the operator's hands or arm would be stuck behind the press, the operator could be seriously injured. The collection refuse vehicle 1, therefore, comprises a guide flap 101. In fig. 1a-1d the guide flap 101 is in a predetermined raised position, such that the opening 10 is at a higher level. This makes it harder for the operator to get his hands injured in the press.

[0060] The predetermined raised position of the guide flap 101 can e.g. be used when the refuse to be collected is provided in a refuse bin 31. A lifting system 20 can be provided for emptying the refuse bin 31. Fig. 1b-1c illustrate this for a household refuse bin 31, which usually has two wheels. The lifting system 20 comprises at least one lift 21 that in fig. 1a, 1b, 1d and 1e is shown in a receiving position. In the receiving position, the refuse bin 31 can be received by the lift 21. The lift 21 can then be rotated by means of a rotating lever 24, part of which extends below a cover 25. The lift 21 is attached to the rotating lever 24 by a connecting element 23. In particular, the lift 21 is rotated towards the opening 10 to an emptying position, which is shown in fig. 1c. In the emptying position the refuse bin 31 is tilted, such that the refuse falls out of the refuse bin 31 into the opening 10. Optionally the lifting system 20 is configured to shake the refuse bin 31, which may enhance the emptying of the refuse bin 31. In the shown example, the lifting system 20 comprises two lifts 21. Each lift 21 can be used for a regular household refuse bin as shown in fig. 1b-1c. Although only a single refuse bin 31 is shown in these figures, it is also possible to empty two refuse bins 31, optionally simultaneously. Both lifts 21 together can be used for a larger refuse bin, e.g. a container that usually has four wheels. The lifting system 20 can further comprise a supporting element 22 for supporting the refuse bin in the emptying position.

[0061] When the refuse is provided in refuse bags or as loose refuse, the lifting system 20 cannot be used. The operator needs to provide to refuse manually into the opening 10. Since the refuse bags or the loose refuse can be heavy, it is not desirable for ergonomic reasons that the opening 10 is high. The guide flap 101 can, therefore, be arranged in lowered position as shown in fig. 1e. This makes it easier for the operator to deposit the refuse in the opening 10. At the same time, however, it is easier for the hands of the operator to be injured by the press. The compaction system can therefore be configured to be operated in a manual operation mode when the guide flap 101 is in the lowered position. In the shown example, a sensor 121 is provided for sensing the guide flap 101 when it is in the predetermined raised position. The manual operation mode can e.g. entail that the operator needs to press a button to activate the press for pressing the refuse together. This guarantees the safety of the operator. However, it has been found that in practice, some operators try to manipulate the system such that the compaction system can be used in an automatic operation mode while the guide flap 101 is in the lowered position. For example, the operator may provide a component in front of the sensor 121 such that it is incorrectly determined that the sensor 121 senses the guide flap 101. This may be more time-efficient for the operator, but is not desired because of the associated safety risk.

[0062] The invention provides a guide flap system 100 of which an example is illustrated in more detail in fig. 2. The guide flap system 100 is harder to manipulate. The guide flap system 100 comprises the guide flap 101, which in fig. 2 is shown in the predetermined raised position. The guide flap 101 can be moved between a lowered position and the shown predetermined raised position, by moving the guide flap 101 along a trajectory that is explained in more detail further below. In the shown example, the guide flap 101 is rotatable around a horizontal rotation axis 132 for said movement. Hinges 133 are provided for allowing said rotation.

[0063] A locking mechanism 112, 113 comprises a first lever part 112 and a second lever part 113. The locking mechanism 112, 113 is connected to lock the guide flap 101 in the predetermined raised position, as is explained further below. In the shown example, the locking mechanism 112, 113 connects the guide flap 101 to a rotation pin 114. In the shown arrangement, the first lever part 112 and the second lever part 113 are in a locked position, such that the guide flap 101 is locked in the predetermined raised position and thus prevented from rotating around the rotation axis 132. A handle 111 allows an operator to unlock guide flap 101, e.g. by moving the guide flap 101 upwards with one hand and unlocking the first lever part 112 with the other hand by pulling the handle 111. In this embodiment, only a single handle 111 and a single locking mechanism 112, 113 are provided. This makes it easy for the operator to unlock the guide flap 101. Fig. 2 further shows that the rotation pin 114 can be connected to the rotating lever 24 of the lifting system by connection element 115, but other arrangements are also possible. Furthermore, in the shown example the second lever part 113 is provided with a curved part such that it can be arranged over the rotating lever 24 when the guide flap 101 is arranged in the lowered positon.

[0064] The guide flap system 101 further comprises a stop 131. The guide flap 101 is configured to be arranged on the stop 131 when the guide flap 101 is in the lowered position. The stop 131 ensures that the lowered position corresponds with a predetermined position, e.g. wherein the guide flap 101 is arranged horizontally. On the side of the guide flap system 100 that is not visible in the figure, another stop is provided.

[0065] The guide flap system 100 comprises a sensor 121. The sensor 121 is configured to sense a predetermined sensing position of the guide flap 101 relative to the trajectory. The sensor 121 is further configured to generate a sensor signal representative for the guide flap 101 being at the predetermined sensing position. In the shown example, the predetermined sensing position is the predetermined raised position.

[0066] The guide flap 101 comprises an optional sensor detection portion 103 at the side where the sensor

121 is provided. The sensor detection portion 103 is configured to be arranged before the sensor 121 when the guide flap 101 is in the predetermined raised position. The sensor 121 is configured to detect the sensor detection portion 103. In the shown example, the sensor detection portion 103 is configured to be at a predetermined distance from the sensor 121 when the guide flap 101 is in the predetermined raised position, when seen directly in front of the sensor 121. This may in particular be advantageous when the sensor 121 is a safety sensor. Said safety sensor is configured to sense whether a component is at a distance within a predetermined range. This can e.g. be accomplished by using a sensor 121 that senses the guide flap 101 based on the strength of a magnetic field when the guide flap 101, or at least the sensor detection portion 103, is made of a ferromagnetic material such as steel, since the air gap between the sensor 121 and the sensor detection portion 103 affects the strength of the magnetic field. This embodiment makes it harder for the operator to manipulate the sensor 121, since simply placing a metal component in front of the sensor 121 will not result in a magnetic field with the same strength as when the guide flap 101 is in the predetermined raised position. In the shown example, the sensor detection portion 103 has an enlarged area, such that the sensor 121 detects the sensor detection portion 103 even when there is a small misalignment of the guide flap 101.

[0067] Fig. 2 further shows that the guide flap 101 can comprise a raised portion 102. Said raised portion is provided to provide space for connecting element 23 that is shown in fig. 1d-1e, when the lift 21 is arranged in the emptying position. It will be understood that other implementation are possible.

[0068] Fig. 3a-3c illustrate the movement of the guide flap 101 from the lowered position to the predetermined raised position in the shown embodiment. In this example, the trajectory along which the guide flap 101 is moved during said movement extends from the lowered position (shown in fig. 3a) to a beyond raised position (shown in fig. 3b) and to the predetermined raised position (shown in fig. 3c). The predetermined raised position is arranged between the lowered position and the beyond raised position. The guide flap 101 is configured to, when the guide flap 101 is moved along the trajectory from the lowered position to the predetermined raised position, first pass the predetermined raised position when being moved to the beyond raised position and subsequently return to the predetermined raised position.

[0069] In addition, the predetermined sensing position in which the sensor 121 is configured to sense the guide flap 101 is the predetermined raised position. Thus, when the guide flap 101 passes the predetermined raised position while being moved towards the beyond raised position, the sensor 121 senses the guide flap 101 for a time period that is represented by a passing time. When the guide flap 101 is thereafter arranged in the predetermined raised position, the sensor 121 senses the guide flap 101 for a time period that is represented by a raised position time. Optionally, a trajectory time can be defined which e.g. represents a time period between a moment that the sensor 121 senses the guide flap 101 passing the predetermined raised position and a moment that the sensor 121 senses the guide flap 101 being arranged in the predetermined raised position.

[0070] Fig. 4a-4c show the guide flap system 100 from a side view, and illustrate how the trajectory can be implemented. Fig. 4a illustrates the guide flap 101 in the lowered position, fig. 4b illustrates the guide flap 101 in the beyond raised position, and fig. 4c illustrates the guide flap 101 in the predetermined raised position.

[0071] Fig. 4a shows that the guide flap 101 is resting on the stop 131 in the lowered position. The first lever part 112 and the second lever part 113 of the locking mechanism 112, 113 are in a substantially perpendicular position relative to each other. In the shown example, the first lever part 112 comprises a slot 112a and the second lever part 113 comprises a pin 113a which extends through the slot 112a. The slot 112a is larger than the pin 113a, such that the pin 113a can move within the slot 112a. When the guide flap 101 is in the lowered position, the pin 113a is arranged in an upper part of the slot 112a. The second lever part 113 further comprises a notch 113b in an end part 113c. As is better visible in fig. 2, the first lever part 112 comprises two parallel parts 112b, 112c which are connected to each other by pins 112d, 112e.

[0072] The guide flap 101 can be rotated around rotation axis 131 until the guide flap 101 is in the beyond raised position, which is shown in fig. 4b. During this movement along the trajectory, the guide flap 101 has passed the sensor 121. In the beyond raised position, the first lever part 112 and the second lever part 113 are arranged substantially aligned. The pin 113a is arranged in a lower part of the slot 112a, which limits the movement of the first lever part 112 relative to the second lever part 113. The movement of the guide flap 101 is thereby limited to the beyond raised position. The end part 113c of the second lever part 113 has moved between the parallel parts (112b, 112c, see fig. 2) of the first lever part 112. Since the pin 113a is in the lower part of the slot 112a, the end part 113c is able to move below the pin 112d, such that the pin 112d of the first lever part 112 is arranged in the notch 113b of the second lever part 113.

[0073] When the guide flap 101 is now rotated back downwards, the pin 112d being arranged in the notch 113b prevents the guide flap 101 from rotating further than the predetermined raised position, which is shown in fig. 4c. The guide flap 101 is thus locked in said predetermined raised position. The guide flap 101 can be unlocked by moving the guide flap 101 back towards the beyond raised position and/or by means of the handle 111.

[0074] To unlock the guide flap 101 and move the guide flap 101 back into the lowered position, the operator can move the guide flap 101 to the beyond raised position with one hand. With the other hand, he can use the handle 111 to pull the end part 113c of the second lever part 113 out of the parallel parts 112b, 112c, see fig. 2) of the first lever part 112, such that the pin 112d is no longer arranged in the notch 113b. The guide flap 101 can now be rotated down to the lowered position.

[0075] Fig. 4a-4c show a flexible guide flap extension 104 that is attached to the guide flap 101. The flexible guide flap extension 104 is configured to guide refuse, e.g. into the hopper of the refuse collection vehicle.

[0076] In the lowered position, the guide flap 101 is preferably arranged substantially horizontal, as can be seen in fig. 3a and fig. 4a. In addition, a lowered position upper side 105a of the guide flap 101 is arranged at least 1m from ground level. Fig. 4c shows that in the shown embodiment, the guide flap 101 is not arranged completely vertical in the predetermined raised position. Instead, the guide flap 101 is arranged at an angle of 50-80 degrees with the horizontal. In addition, a raised position upper side 105b is arranged at least 1.4m from ground level. Note that the lowered position upper side 105a (fig. 3a) in the lowered position is different from the raised position upper side 105b (fig. 4c) in the predetermined raised position. Fig. 4b shows that in the beyond raised position, the guide flap is arranged at a larger angle with the horizontal than in the predetermined raised position shown in fig. 4c.

[0077] Fig. 5 schematically illustrates a processor unit 122 which the guide flap system may comprise. Fig. 5 schematically shows the sensor 121. The sensor 121 is configured to generate a sensor signal 121a, which is representative for the guide flap being at the predetermined sensing position. In the embodiment shown in the figures, said predetermined sensing position corresponds with predetermined raised position. The processor unit 122 is configured to receive the sensing signal 121a, in the shown example via output terminal 121.1 and input terminal 122.4. The processor unit 122 is further configured to generate a processor signal 122a, 122b, 122c in dependence of the received sensor signal 121a.

[0078] The guide flap system 100 is configured, e.g. by means of the processor unit 122, to determine according to a predetermined criterion whether the guide flap has followed at least a part of the trajectory when being moved from the lowered position to the predetermined raised position. If the guide flap is arranged in the predetermined position, and during moving of the guide flap along the trajectory into the predetermined raised position the predetermined criterion has been met, then the processor unit 122 is configured to generate the processor signal 122a, 122b, 122c. By taking into account the predetermined criterion, it is ensured that the guide flap has to be moved according to the trajectory. This makes it harder for an operator to manipulate the guide flap system, because when e.g. a component is arranged before the sensor the predetermined criterion will not be met.

[0079] In the shown example, the processor unit 122 is configured to determine that the predetermined criterion has been met based on the passing time, and/or the raised position time, and/or the trajectory time. For example, the processor unit 122 may be configured to compare the passing time with the predetermined passing time period; and/or to compare the raised position time with the predetermined raised time period; and/or to compare the trajectory time with the predetermined trajectory time range. In case one or more of the passing time, raised position time, and trajectory time are not within the respective expected predetermined values, this may be an indication that the guide flap has not actually been moved along the trajectory. The processor unit 122 may, therefore, be configured to determine that the predetermined criterion has not been met. Possible implementations hereof are explained further below with reference to fig. 6.

[0080] Fig. 5 further shows that in the shown example, the lifting system comprises a lifting control unit 27. The lifting control unit 27 is configured to receive a first processor signal 122a generated by the processor unit 122, in the shown example via output terminal 122.1 and input terminal 27.1. The lifting control unit 27 is configured to generate a control signal 27a for controlling a lifting actuator unit 28, in the shown example via output terminal 27.2 and input terminal 28.1. The lifting actuator unit 28 is configured for moving the components of the lifting system between the receiving position and the emptying position. The lifting control unit 27 is configured to, based on the first processor signal 122a, control the lifting actuator unit 28 such that the lift remains in the receiving position when the guide flap is not in the predetermined raised position.

[0081] In the shown example, the compaction system comprises a compaction control unit 201. The compaction control unit 201 is configured to receive a second processor signal 122b generated by the processor unit 122, in the shown example via output terminal 122.2 and input terminal 201.1. The compaction control unit 201 can be configured to generate an operation mode signal 201a for controlling a compaction actuator unit 202, in the shown example via output terminal 201.2 and input terminal 202.1. In addition and/or alternatively, the compaction control unit 201 can be configured to control a packer by releasing it to move automatically, wherein the compaction actuator unit 202 - which may or may not be controlled by the compaction control unit 201 - is configured to move the packer. The compaction actuator unit 202 is configured for moving at least one press of the compaction system for pressing the refuse together. The compaction control unit 201 is configured to, based on the second processor signal 122b, select an operation mode for the compaction system. For example, the compaction system may have an automated operation mode and a manual operation mode. The compaction control unit 201 may be configured to control the compaction actuator unit 202 such that the compaction system cannot be operated in an automated operation mode when the guide flap is not in the predetermined raised position.

[0082] Optionally, the processor unit 122 is configured to detect a manipulation attempt of the sensor. In this context, a manipulation attempt corresponds with an attempt of the operator to manipulate the sensor into incorrectly determining that the guide flap is in the predetermined raised position. For example, the processor unit 122 may be configured to determine that a manipulation attempt has occurred when the sensor appears to sense the guide flap in the predetermined raised position, but the guide flap has not been moved according to the trajectory. In the shown example, the processor unit 122 comprises a memory 123 for saving data regarding such manipulation attempt. Said data may e.g. include the date, time and location. In the shown example, the refuse collection vehicle comprises an alarm system 211. The alarm system 211 is configured to control an alarm 212 via an alarm control signal 201b, in the shown example via output terminal 211.2 and input terminal 212.1. The alarm 212 may be a visual alarm, e.g. on a control display or in the driver's cab, or an audible alarm. The alarm system 211 is configured to receive a third processor signal 122c generated by the processor 122, in the shown example via output terminal 122.3 and input terminal 211.1. The alarm system 211 may be configured to activate the alarm 212 when the processor unit 122 detects a manipulation attempt. It is also possible that the alarm system 211 is configured to activate the alarm 212 when the guide flap is not in the predetermined raised position and the operator attempts to operate the compaction system in the automated operation mode and/or when the operator attempts to arrange the lift in the emptying position.

[0083] Although shown in fig. 5 as separate components, it will be understood that in practice one or more of the shown components can be integrated in a single unit, e.g. a general control unit or processing unit of a refuse collection system or of the refuse collection vehicle.

[0084] Fig. 6 illustrates an example of how the processor unit can be implemented, in particular the steps of a method that the processor unit can be configured to perform. The method generally starts with a first step 301 that entails a reset. It is assumed that the guide flap is in the lowered position after the reset. In a second step 302, the processor unit verifies whether the sensor senses the guide flap, based on the sensor signal. In case the guide flap is not sensed, the method restarts at step 301. In addition, it is possible to verify in step 310 whether the guide flap is not sensed for a time period that is larger than a predetermined lowered position time period. If this is the case, the processor unit can be configured to determine that the guide flap is in the lowered position. For example, the predetermined lowered position time can be 1 second.

[0085] When the sensor does sense the guide flap in step 302, the method continues to step 303. In step 303, the processor unit verifies for how long the sensor senses the guide flap. Assuming that the guide flap was previously in the lowered position and is now being moved towards the beyond raised position, the guide flap should pass the sensor for a short period of time. The sensor should thus sense the guide flap for a passing time which is smaller than a predetermined passing time. For example, the predetermined passing time can correspond with a pulse of the sensing signal, or with 1 second.

[0086] After having passed the sensor, the guide flap should be arranged in the beyond raised position. At this moment, the sensor does not sense the guide flap. The guide flap is then moved back to the predetermined raised position, wherein the sensor senses the guide flap. Thus, the sensor should not detect the guide flap for a relatively short period of time. The processor unit is configured to verify in step 304 whether the guide flap is not sensed for a trajectory time that is within a predetermined trajectory time range. For example, the predetermined trajectory time range may be from 0.1 second to 1 second. Optionally, the upper limit of the predetermined trajectory time range is smaller than the predetermined lowered position time.

[0087] In case the condition in step 304 has been satisfied, the processor unit is configured in step 305 to verify whether the sensor senses the guide flap for a raised position time that is larger than a predetermined raised position time. For example, the predetermined raised position time may be 1 second. Preferably, the predetermined raised position time is not smaller than the predetermined passing time.

[0088] If the condition in step 305 is also satisfied, the processor unit can be configured to determine in step 306 that the predetermined criterion has been met, and that the guide flap is in the predetermined raised positon. The processor unit is configured in step 308 to generate the processor signal. In addition, the processor unit can be configured in step 307 to verify whether the senor still senses the guide flap. In case the sensor does, the method reverts to step 306. In case the sensor does not sense the guide flap anymore, the method is restarted in step 301.

[0089] In case in any of steps 303, 304, or 305 the respective condition is not met, the method will restart in step 301. In addition, this may indicate that something unexpected has happened. The processor unit may, therefore, be configured to determine in step 321 that a manipulation attempt has occurred.

[0090] It will be understood that the method as shown in fig. 6 shows various steps that can but not have to be combined in the method performed by the processor unit. For example, one or more of steps 303, 304, 305 can be omitted, since one or two of these steps may already provide a sufficient degree of certainty that the guide flap has been moved along at least a part of the trajectory. It is also possible that steps 310 and 311 are omitted, because in some embodiments the only thing of interest is whether the guide flap is in the predetermined raised position. The conditions for determining that a manipulation attempt according to step 321 has occurred may also be stricter or only be linked to one or two of steps 303, 304, 305.

[0091] A computer-readable program may be provided, comprising instructions that cause a processor unit to perform a method according to fig. 6 or a variant thereof.

[0092] The invention thus entails that besides verifying that the guide flap is in the predetermined raised position, it is also verified that the guide flap has followed at least a part of the trajectory. This makes it harder for the operator to manipulate the system, thereby increasing the safety of the operator. The figures show one example of implementing the invention, but it will be understood that numerous other implementation are possible. For example, additional sensors can be provided for verifying that the guide flap is moved along the trajectory, e.g. avoiding the need for passing the sensor while moving towards the predetermined raised position.

[0093] The principle shown in the figures regarding the beyond raised position is in particular advantageous, because it allows verifying the movement along the trajectory according to the predetermined criterion with a single sensor. This is cost effective, and relatively easy to implement.

[0094] The mechanical construction of the embodiment shown in the figures is furthermore advantageous, in particular regarding the locking mechanism. It requires moving the guide flap to the beyond raised position in order to lock the guide flap in the predetermined raised position. An operator may, in practice, think that this is the actual reasons that the trajectory includes the beyond raised position. The fact that the predetermined criterion is also verified during this movement is not obvious. It is, therefore, harder to figure out for an operator how the guide flap system works and how to manipulate the guide flap system.

[0095] As required, this document describes detailed embodiments of the present invention. However it must be understood that the disclosed embodiments serve exclusively as examples, and that the invention may also be implemented in other forms. Therefore specific constructional aspects which are disclosed herein should not be regarded as restrictive for the invention, but merely as a basis for the claims and as a basis for rendering the invention implementable by the average skilled person.

[0096] Furthermore, the various terms used in the description should not be interpreted as restrictive but rather as a comprehensive explanation of the invention.

[0097] The word "a" used herein means one or more than one, unless specified otherwise. The phrase "a plurality of" means two or more than two. The words "comprising" and "having" are constitute open language and do not exclude the presence of more elements.

[0098] Reference figures in the claims should not be interpreted as restrictive of the invention. Particular embodiments need not achieve all objects described.

[0099] The mere fact that certain technical measures are specified in different dependent claims still allows the possibility that a combination of these technical measures may advantageously be applied.

[0100] Embodiments and further embodiments of the present invention may be expressed in words as set out in the following clauses:

Clause 1: Guide flap system (100) for a refuse collection vehicle (1), comprising

- a guide flap (101), wherein the guide flap is moveable along a trajectory from a lowered position to a predetermined raised position,
- a sensor (121) configured to sense a predetermined sensing position of the guide flap relative to the trajectory and to generate a sensor signal (121a) representative for the guide flap being at the predetermined sensing position, and
- a processor unit (122) configured to receive the sensor signal, and generating a processor signal (122a, 122b, 122c) in dependence of the received sensor signal;

wherein the guide flap system is configured to determine according to a predetermined criterion
whether the guide flap has followed at least a part of the trajectory; and
wherein the processor unit is configured to generate said processor signal if:

- the guide flap is arranged in the predetermined raised position, and
- during moving of the guide flap along the trajectory into the predetermined raised position, the predetermined criterion has been met.

Clause 2: Guide flap system according to clause 1,

wherein the predetermined raised position is arranged between the lowered position and a beyond raised position;
wherein the trajectory extends from the lowered position, to the beyond raised position, and to the predetermined raised position so that the guide flap is configured to, when the guide flap is moved along the trajectory from the lowered position to the predetermined raised position, first pass the predetermined raised position when being moved to the beyond raised position and subsequently return to the predetermined raised position;
wherein the predetermined sensing position, which the sensor is configured to sense, is the predetermined raised position;
wherein the processor unit is configured to determined that the predetermined criterion has been met based on:

- a passing time representing a time period that the sensor senses the guide flap when the guide flap passes the predetermined raised position when being moved to the beyond raised position,
  and/or
- a raised position time representing a time period that the sensor senses the guide flap when the guide flap is arranged in the predetermined raised position,
  and/or
- a trajectory time representing a time period between a moment that the sensor senses the guide flap passing the predetermined raised position and a moment that the sensor senses the guide flap being arranged in the predetermined raised position.

Clause 3: Guide flap system (100) for a refuse collection vehicle (1),
which guide flap system comprises:

- a guide flap (101), wherein the guide flap is moveable along a trajectory from a lowered position to a predetermined raised position,
- a sensor (121) configured to sense a predetermined sensing position of the guide flap relative to the trajectory and to generate a sensor signal (121a) representative for the guide flap being at the predetermined sensing position, and
- a processor unit (122) configured to receive the sensor signal, and generating, in dependence of the received sensor signal, a processor signal (122a, 122b, 122c) representative for the guide flap being in the predetermined raised position;

  wherein the guide flap system is configured to determine according to a predetermined criterion whether the guide flap has followed at least a part of the trajectory;
  wherein the processor unit is configured to generate said processor signal if:

  - the guide flap is arranged in the predetermined raised position, and
  - during moving of the guide flap along the trajectory into the predetermined raised position, the predetermined criterion has been met;

  wherein the predetermined raised position is arranged between the lowered position and a beyond raised position;
  wherein the trajectory extends from the lowered position, to the beyond raised position, and to the predetermined raised position so that the guide flap is configured to, when the guide flap is moved along the trajectory from the lowered position to the predetermined raised position, first pass the predetermined raised position when being moved to the beyond raised position and subsequently return to the predetermined raised position;
  wherein the predetermined sensing position, which the sensor is configured to sense, is the predetermined raised position; and
  wherein the processor unit is configured to determined that the predetermined criterion has been met based on:

  - a passing time representing a time period that the sensor senses the guide flap when the guide flap passes the predetermined raised position when being moved to the beyond raised position,
    and/or
  - a raised position time representing a time period that the sensor senses the guide flap when the guide flap is arranged in the predetermined raised position,
    and/or
  - a trajectory time representing a time period between a moment that the sensor senses the guide flap passing the predetermined raised position and a moment that the sensor senses the guide flap being arranged in the predetermined raised position.

Clause 4: Guide flap system according to any of the preceding clauses, wherein the processor unit is configured to determine that the guide flap is in the predetermined raised position based on a raised position time that the sensor detects the guide flap in the predetermined raised position.
Clause 5: Guide flap system according to any of the preceding clauses, wherein the guide flap system further comprises a locking mechanism (112, 113) configured to lock the guide flap in the predetermined raised position, wherein the locking mechanism is configured to be activated by the guide flap being moved along the trajectory towards the predetermined raised position. Clause 6: Guide flap system according to one of the preceding clauses, wherein the guide flap is rotatable around a horizontal rotation axis (132), and wherein the movement of the guide flap from the lowered position up to the predetermined raised position comprises a rotation around the rotation axis.
Clause 7: Guide flap system according to one or more of the preceding clauses, wherein the guide flap is arranged

- substantially horizontal in the lowered position,
- at an angle of 45-135 degrees to the horizontal in the predetermined raised position,
- and optionally at a larger angle to the horizontal in the beyond raised position than in the predetermined raised position.

Clause 8: Guide flap system according to one or more of the preceding clauses, comprising a single locking mechanism (112, 113) for locking and unlocking the guide flap, and a single handle (111) for operating the locking mechanism.
Clause 9: Guide flap system according to one or more of the preceding clauses, wherein the sensor is a safety proximity sensor.
Clause 10: Guide flap system according to one or more of the preceding clauses, wherein the processor unit is configured to detect a manipulation attempt of the sensor.
Clause 11: Guide flap system according to one or more of the preceding clauses, wherein the guide flap comprises steel.
Clause 12: Guide flap system according to one or more of the preceding clauses, wherein in the lowered position a lowered position upper side of the guide flap (105a) is arranged at least 1 m from ground level and/or in the predetermined raised position a raised position upper side (105b) of the guide flap is arranged at least 1.4 m from ground level.
Clause 13: Lifting system (20) for a refuse collection vehicle, comprising

- a lift (21) for receiving a refuse bin (31), wherein the lift is moveable between a receiving position and an emptying position in which the refuse bin is tilted,
- a guide flap system according to one or more of the preceding clauses,

wherein the lifting system is configured to, based on the processor signal, prevent the lift from moving to the emptying position when the guide flap is not in the predetermined raised position.
Clause 14: Refuse handling system for a refuse collection vehicle, comprising

- a collection body (4) for receiving refuse and configured to be arranged on the refuse collection vehicle, and
- a compaction system comprising at least one press configured to press the refuse together,
- a guide flap system according to one or more of the preceding clauses,

wherein the refuse handling system is configured to, based on the processor signal, select an operation mode of the compaction system.
Clause 15: Refuse handling system according to clause 14, wherein the compaction system comprises at least an automatic operation mode and a manual operation mode, wherein the refuse handling system is configured, based on the processor signal, to prevent the compaction system from being operated in the automatic operation mode when the guide flap is not in the predetermined raised position.
Clause 16: Refuse collection vehicle comprising a guide flap system, lifting system, and/or refuse handling system according to one or more of the preceding clauses.
Clause 17: Refuse collection vehicle according to clause 16, wherein the refuse collection vehicle further comprises:

- a chassis (3),
- a driver's cab (2) provided on the chassis, at the front of the chassis,
- a collection body (4) for collecting refuse, provided on the chassis, behind the driver's cab, and

wherein the guide flap system is optionally provided at the back of the chassis with the collection body arranged between the guide flap system and the driver's cab.
Clause 18: Method for arranging a guide flap in a predetermined raised position,

wherein the guide flap is part of a guide flap system for a refuse collection vehicle;
wherein the method comprises the following steps:

- moving the guide flap along a trajectory, wherein the trajectory entails moving the guide flap upwards towards a beyond raised position, thereby passing the predetermined raised position,
- moving the guide flap from the beyond raised position to the predetermined raised position,
- determining, based on a predetermined criterion, that the guide flap has followed the trajectory, and
- generating a processor signal if:
    - the guide flap is in the predetermined raised position, and
    - during moving of the guide flap along the trajectory into the predetermined raised position, the predetermined criterion has been met.

Clause 19: Method according to clause 18, wherein the processor signal is representative for the guide flap being in the predetermined raised position.
Clause 20: Method for operating a processor unit,

comprising the following steps:

- verifying, with the processor unit, whether a sensor senses the guide flap, based on a sensor signal;
- determining, with the processor unit, whether a predetermined criterion has been met, optionally based on one or more of the following steps:
  - verifying, with the processor unit, whether the sensor senses the guide flap for a passing time which is smaller than a predetermined passing time,
  - verifying, with the processor unit, whether the guide flap is not sensed for a trajectory time that is within a predetermined trajectory time range,
  - verifying, with the processor unit, whether the sensor senses the guide flap for a raised position time that is larger than a predetermined raised position time;
- determining, with the processor unit, whether the guide flap is in a predetermined raised position; and
- generating a processor signal with the processor unit.

Clause 21: Method for operating a processor unit, comprising the following steps:

- verifying, with the processor unit, whether a sensor senses the guide flap, based on a sensor signal;
- determining, with the processor unit, whether a predetermined criterion has been met, optionally based on one or more of the following steps:
  - verifying, with the processor unit, whether the sensor senses the guide flap for a passing time which is smaller than a predetermined passing time,
  - verifying, with the processor unit, whether the guide flap is not sensed for a trajectory time that is within a predetermined trajectory time range,
  - verifying, with the processor unit, whether the sensor senses the guide flap for a raised position time that is larger than a predetermined raised position time;
- determining, with the processor unit, whether the guide flap is in a predetermined raised position; and
- generating, when the guide flap is in the predetermined raised position, a processor signal with the processor unit, which processor signal is representative for the guide flap being in the predetermined raised position.

Clause 22: Computer-readable program, comprising instructions that cause a processor unit to perform a method according to clause 20 or 21.

Claims

1. Guide flap system (100) for a refuse collection vehicle (1),
comprising

- a guide flap (101), wherein the guide flap is moveable along a trajectory from a lowered position to a predetermined raised position,
- a sensor (121) configured to sense a predetermined sensing position of the guide flap relative to the trajectory and to generate a sensor signal (121a) representative for the guide flap being at the predetermined sensing position, and
- a processor unit (122) configured to receive the sensor signal, and generating a processor signal (122a, 122b, 122c) in dependence of the received sensor signal;

wherein the guide flap system is configured to determine according to a predetermined criterion
whether the guide flap has followed at least a part of the trajectory; and
wherein the processor unit is configured to generate said processor signal if:

- the guide flap is arranged in the predetermined raised position, and
- during moving of the guide flap along the trajectory into the predetermined raised position, the predetermined criterion has been met.

2. Guide flap system according to claim 1,

wherein the predetermined raised position is arranged between the lowered position and a beyond raised position;
wherein the trajectory extends from the lowered position, to the beyond raised position, and to the predetermined raised position so that the guide flap is configured to, when the guide flap is moved along the trajectory from the lowered position to the predetermined raised position, first pass the predetermined raised position when being moved to the beyond raised position and subsequently return to the predetermined raised position;
wherein the predetermined sensing position, which the sensor is configured to sense, is the

predetermined raised position; and
wherein the processor unit is configured to determine that the predetermined criterion has been met based on:

- a passing time representing a time period that the sensor senses the guide flap when the guide flap passes the predetermined raised position when being moved to the beyond raised position,

and/or

- a raised position time representing a time period that the sensor senses the guide flap when the guide flap is arranged in the predetermined raised position,

and/or

- a trajectory time representing a time period between a moment that the sensor senses the guide flap passing the predetermined raised position and a moment that the sensor senses the guide flap being arranged in the predetermined raised position.

3. Guide flap system according to any of the preceding claims, wherein the processor unit is configured to determine that the guide flap is in the predetermined raised position based on a raised position time that the sensor detects the guide flap in the predetermined raised position.

4. Guide flap system according to any of the preceding claims, wherein the guide flap system further comprises a locking mechanism (112, 113) configured to lock the guide flap in the predetermined raised position, wherein the locking mechanism is configured to be activated by the guide flap being moved along the trajectory towards the predetermined raised position.

5. Guide flap system according to one of the preceding claims, wherein the guide flap is rotatable around a horizontal rotation axis (132), and wherein the movement of the guide flap from the lowered position up to the predetermined raised position comprises a rotation around the rotation axis.

6. Guide flap system according to one or more of the preceding claims, wherein the guide flap is arranged:

- substantially horizontal in the lowered position,
- at an angle of 45-135 degrees to the horizontal in the predetermined raised position,
- and optionally at a larger angle to the horizontal in the beyond raised position than in the predetermined raised position.

7. Guide flap system according to one or more of the preceding claims, comprising a single locking mechanism (112, 113) for locking and unlocking the guide flap, and a single handle (111) for operating the locking mechanism.

8. Guide flap system according to one or more of the preceding claims, wherein:

- the sensor is a safety proximity sensor;
and/or
- the processor unit is configured to detect a manipulation attempt of the sensor;
and/or
- the guide flap comprises steel;
and/or
- in the lowered position, a lowered position upper side of the guide flap (105a) is arranged at least 1 m from ground level and/or in the predetermined raised position a raised position upper side (105b) of the guide flap is arranged at least 1.4 m from ground level.

9. Lifting system (20) for a refuse collection vehicle, comprising:

- a lift (21) for receiving a refuse bin (31), wherein the lift is moveable between a receiving position and an emptying position in which the refuse bin is tilted, and
- a guide flap system according to one or more of the preceding claims;

wherein the lifting system is configured to, based on the processor signal, prevent the lift from moving to the emptying position when the guide flap is not in the predetermined raised position.

10. Refuse handling system for a refuse collection vehicle,
comprising:

- a collection body (4) for receiving refuse and configured to be arranged on the refuse collection vehicle,
- a compaction system comprising at least one press configured to press the refuse together, and
- a guide flap system according to one or more of the preceding claims;

wherein the refuse handling system is configured to, based on the processor signal, select an operation mode of the compaction system.

11. Refuse handling system according to claim 10, wherein the compaction system comprises at least an automatic operation mode and a manual operation mode, wherein the refuse handling system is configured, based on the processor signal, to prevent the compaction system from being operated in the automatic operation mode when the guide flap is not in the predetermined raised position.

12. Refuse collection vehicle comprising a guide flap system, lifting system, and/or refuse handling system according to one or more of the preceding claims;
wherein, optionally, the refuse collection vehicle further comprises:

- a chassis (3),
- a driver's cab (2) provided on the chassis, at the front of the chassis,
- a collection body (4) for collecting refuse, provided on the chassis, behind the driver's cab; and

wherein the guide flap system is optionally provided at the back of the chassis with the collection body arranged between the guide flap system and the driver's cab.

13. Method for arranging a guide flap in a predetermined raised position,

wherein the guide flap is part of a guide flap system for a refuse collection vehicle;
wherein the method comprises the following steps:

- moving the guide flap along a trajectory, wherein the trajectory entails moving the guide flap upwards towards a beyond raised position, thereby passing the predetermined raised position,
- moving the guide flap from the beyond raised position to the predetermined raised position,
- determining, based on a predetermined criterion, that the guide flap has followed the trajectory, and
- generating a processor signal if:

  - the guide flap is in the predetermined raised position, and
  - during moving of the guide flap along the trajectory into the predetermined raised position, the predetermined criterion has been met.

14. Method for operating a processor unit, comprising the following steps:

- verifying, with the processor unit, whether a sensor senses the guide flap, based on a sensor signal;
- determining, with the processor unit, whether a predetermined criterion has been met, optionally based on one or more of the following steps:

  - verifying, with the processor unit, whether the sensor senses the guide flap for a passing time which is smaller than a predetermined passing time,
  - verifying, with the processor unit, whether the guide flap is not sensed for a trajectory time that is within a predetermined trajectory time range,
  - verifying, with the processor unit, whether the sensor senses the guide flap for a raised position time that is larger than a predetermined raised position time;

- determining, with the processor unit, whether the guide flap is in a predetermined raised position; and
- generating a processor signal with the processor unit.

15. Computer-readable program, comprising instructions that cause a processor unit to perform a method according to claim 14.

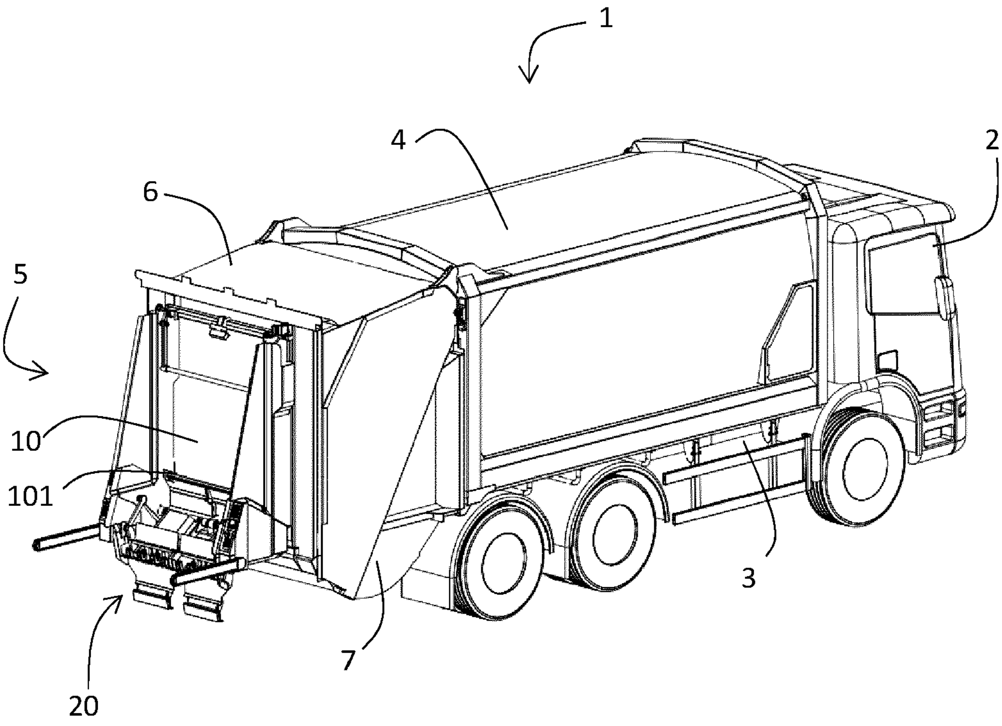

Fig. 1a

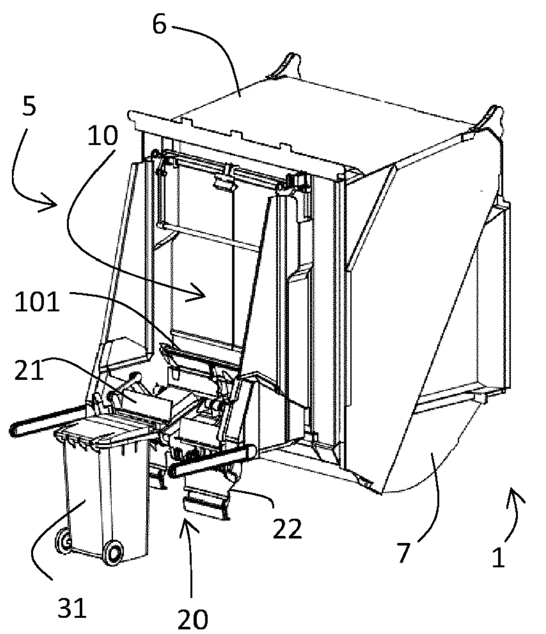

Fig. 1b

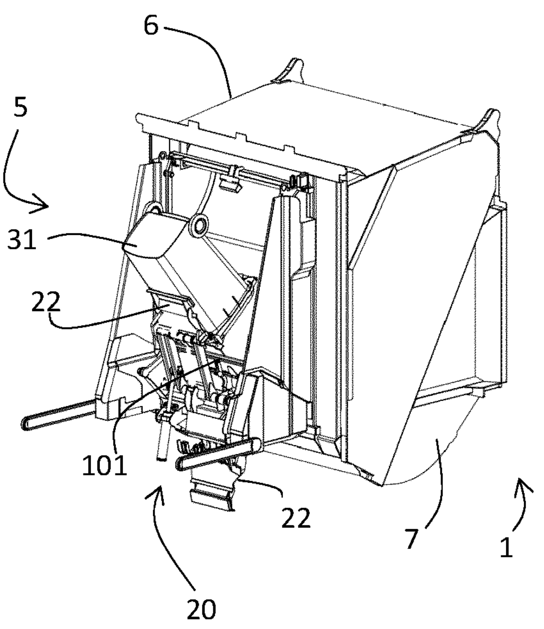

Fig. 1c

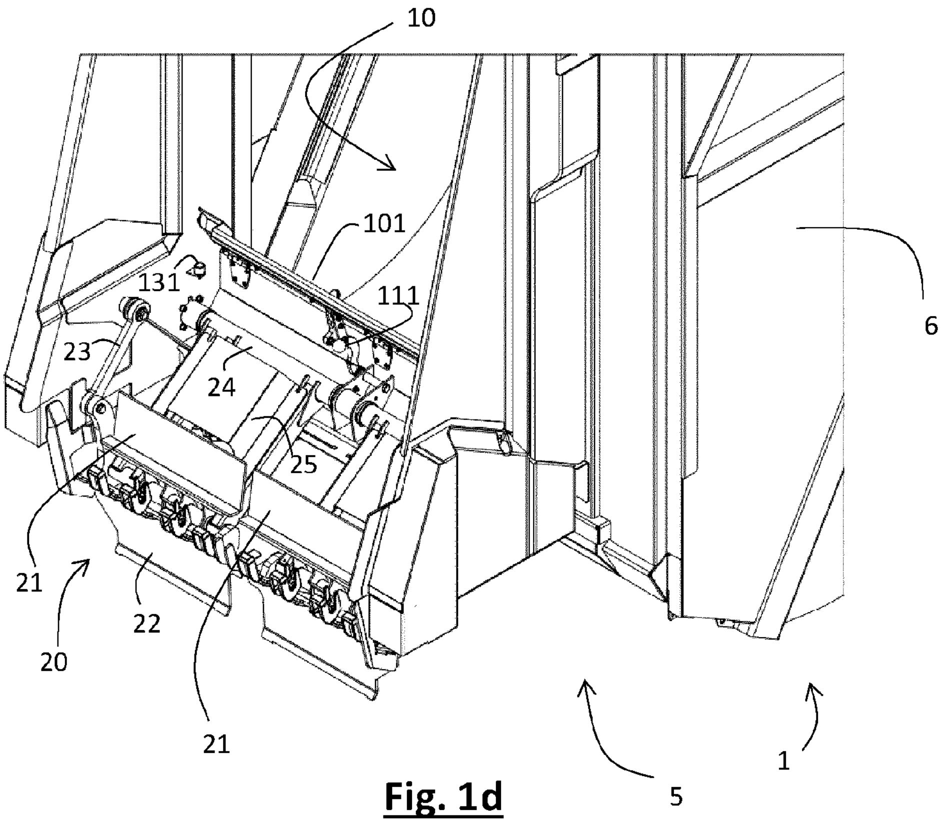
10
101
131
111
6
23
24
25
21
22
20
21
5
1

Fig. 1d

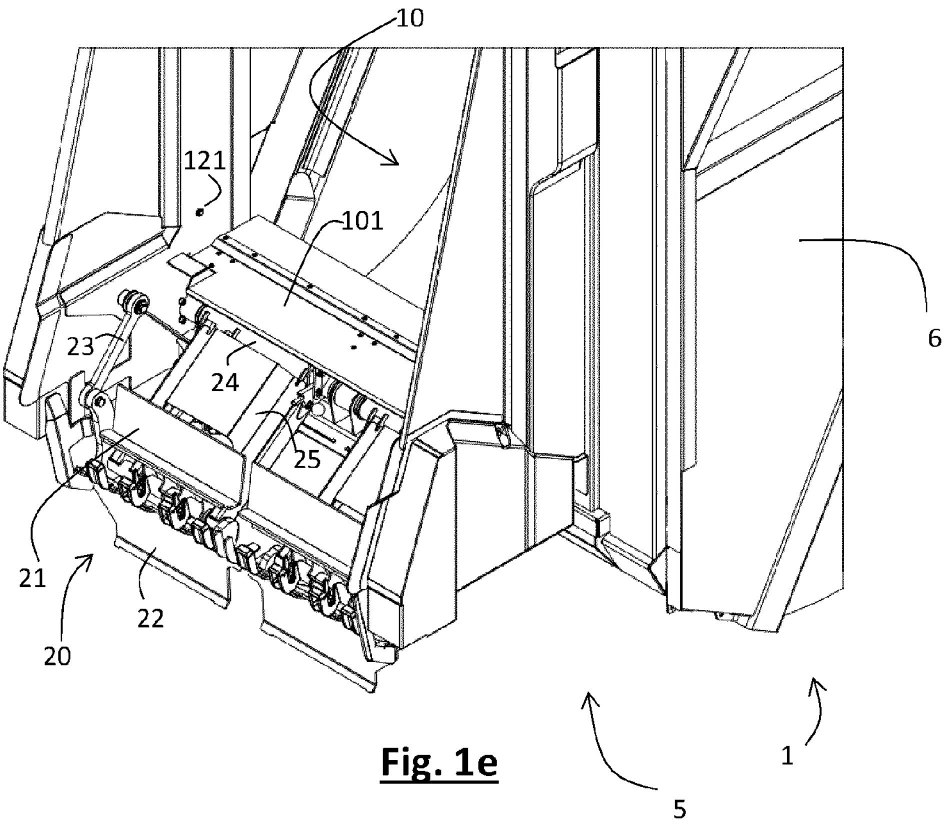
10
121
101
6
23
24
25
21
22
20
5
1

Fig. 1e

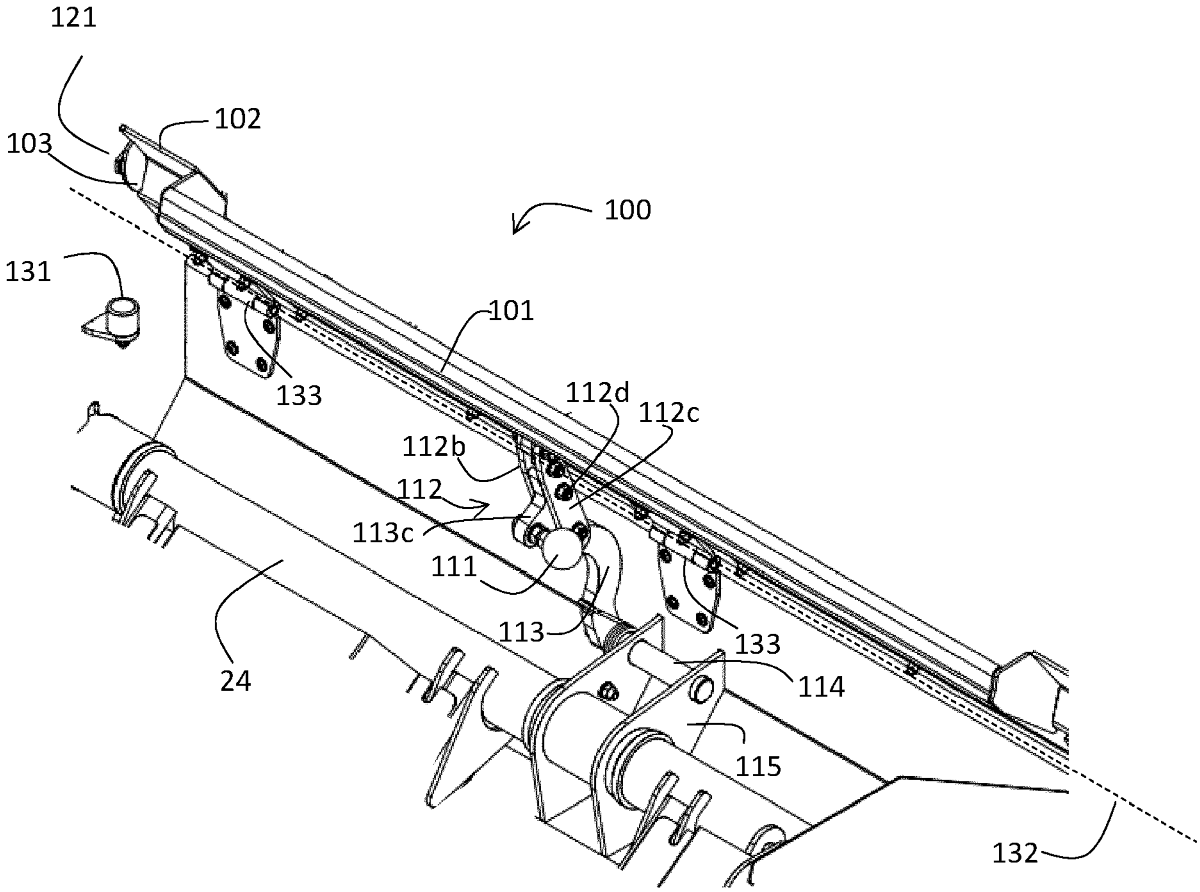
121
102
103
100
131
101
133
112d
112c
112b
112
113c
111
113
133
114
24
115
132

Fig. 2

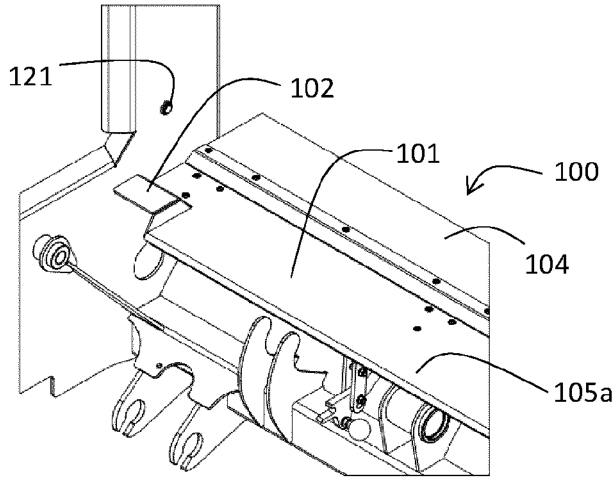

Fig. 3a

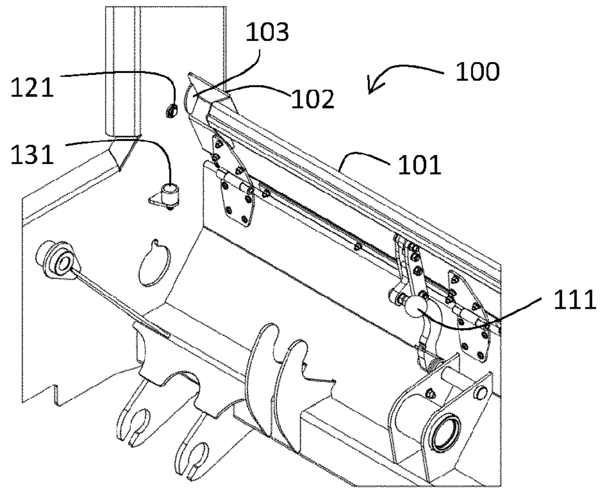

Fig. 3b

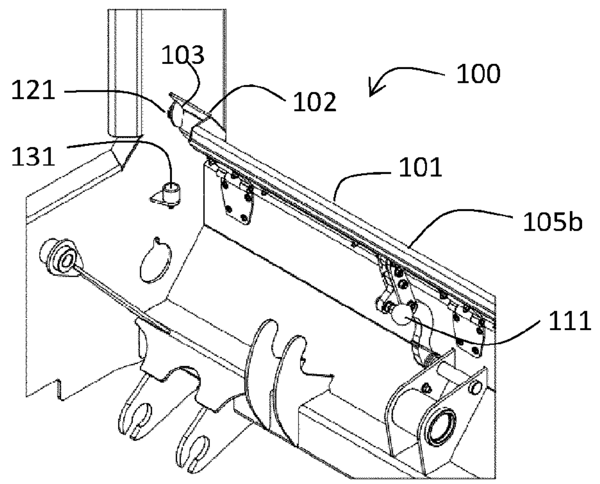

Fig. 3c

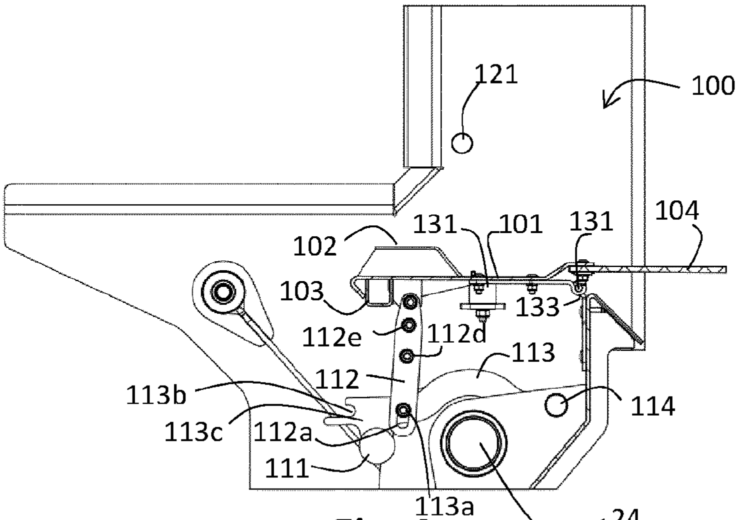

Fig. 4a

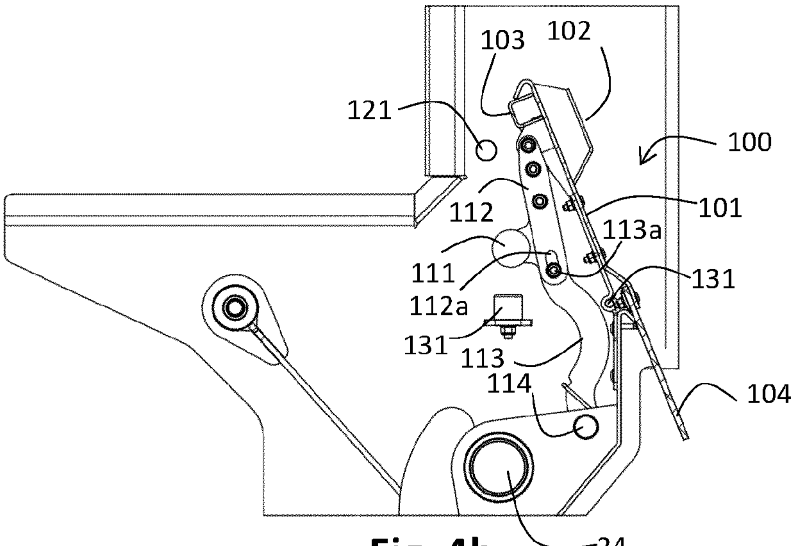

Fig. 4b

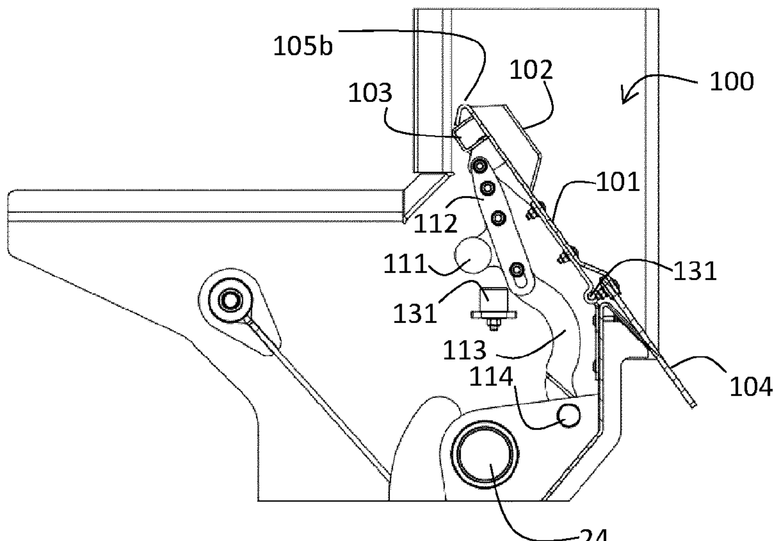

Fig. 4c

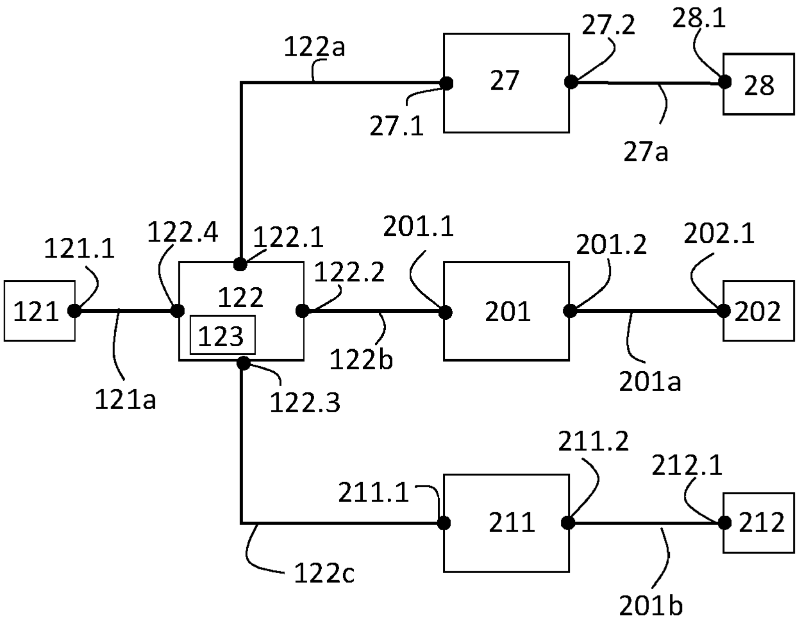
122a
27
27.2
28.1
28
27.1
27a
122.4
122.1
201.1
201.2
202.1
121.1
122.2
122
121
201
202
123
122b
201a
121a
122.3
211.2
212.1
211.1
211
212
122c
201b

Fig. 5

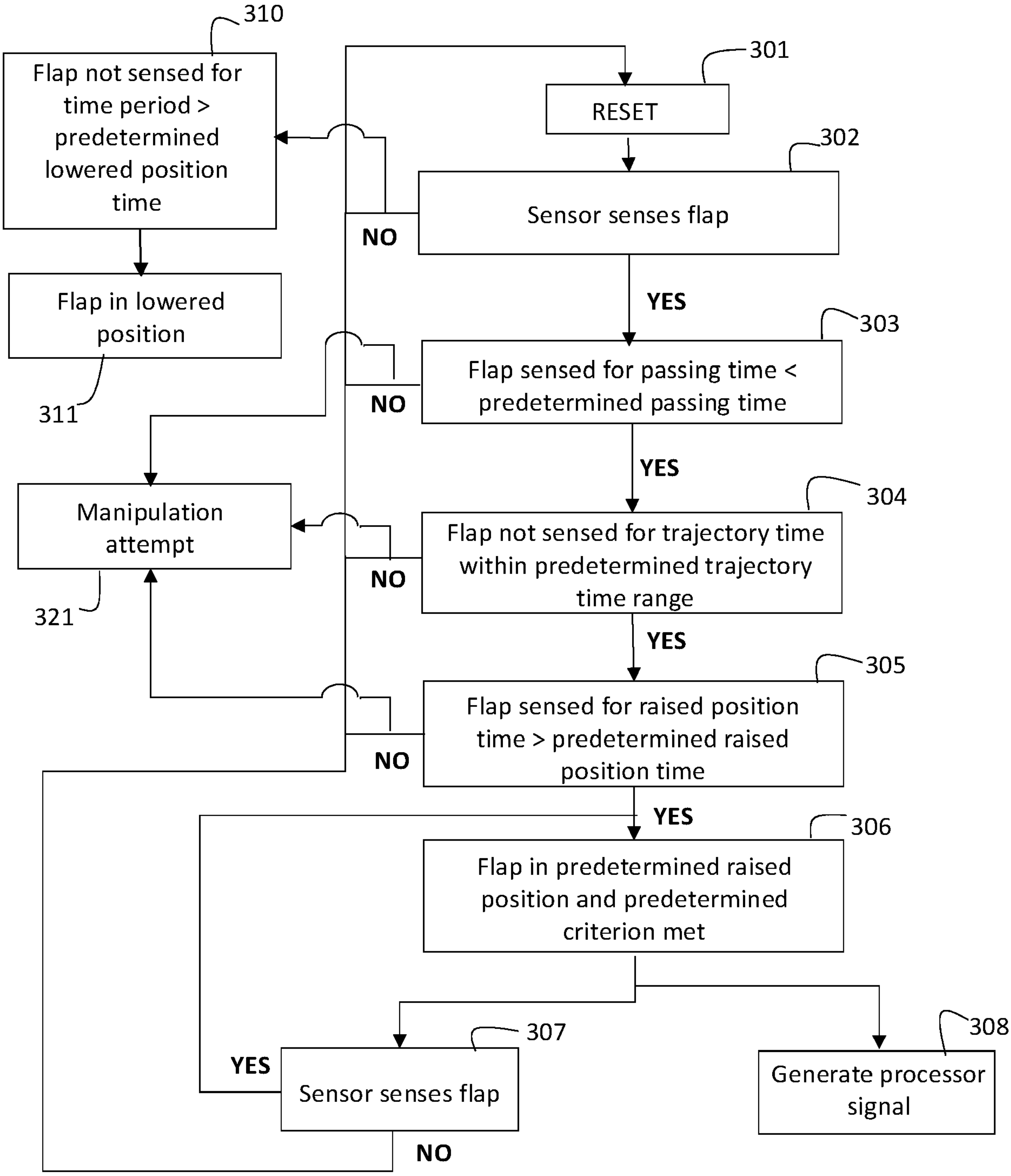
310
Flap not sensed for time period > predetermined lowered position time
Flap in lowered position
311
301
RESET
302
Sensor senses flap
NO
YES
303
Flap sensed for passing time < predetermined passing time
NO
YES
Manipulation attempt
321
304
Flap not sensed for trajectory time within predetermined trajectory time range
NO
YES
305
Flap sensed for raised position time > predetermined raised position time
NO
YES
306
Flap in predetermined raised position and predetermined criterion met
307
YES
Sensor senses flap
NO
308
Generate processor signal

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 21 21 0226

DOCUMENTS CONSIDERED TO BE RELEVANT

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X Y	WO 2006/048667 A1 (NAMENEEDED LTD [GB]; SKEA ROBERT GORDON [GB] ET AL.) 11 May 2006 (2006-05-11) * page 11, line 4 - line 23 * * page 12, line 28 - page 13, line 30 * * figures 1, 5 * -----	1-8, 10-15 9	INV. B65F3/04 B65F3/14
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X	DE 925 037 C (SOVEL VEHICULES ELECTR IND SA) 10 March 1955 (1955-03-10) * page 2, line 122 - page 3, line 42; figures 1-6 * -----	1-8, 10-15	
A	JP 2013 155041 A (HAMASAKI SHOKO KK) 15 August 2013 (2013-08-15) * paragraph [0012]; figures 1, 2 * -----	2,3,14, 15	TECHNICAL FIELDS SEARCHED (IPC) B65F

The present search report has been drawn up for all claims

2

Place of search	Date of completion of the search	Examiner
The Hague	29 March 2022	Luepke, Erik

CATEGORY OF CITED DOCUMENTS

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L : document cited for other reasons

& : member of the same patent family, corresponding document

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29-03-2022

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82