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(54) **APPARATUS FOR WASTE COLLECTION AND/OR TREATMENT**

(57) The invention relates to a group 1 of accessories for guiding and supporting pipes of an apparatus for waste collection and/or treatment. The group substantially comprises a first accessory (10) rotatable about a first axis of rotation (102) and a second accessory (20) rotatable about a second axis of rotation (102). The group further comprises first actuating means (14) of the first accessory (10) and second actuating means (24) of the second accessory. According to the invention, the group (1) comprises a control and command unit (50) configured to control and command said actuating means (14, 24) according to at least a first operating configuration in which the actuating means of one of said accessories (10, 24) are commanded as a function of the angular position occupied by the other of said accessories (10, 20).

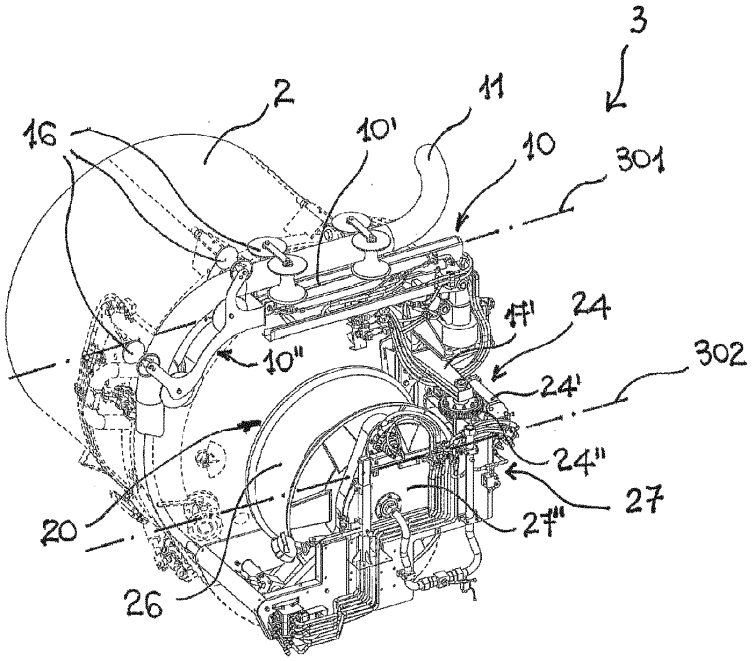

Fig. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of manufacturing fixed or movable apparatus that can be used for waste collection and/or treatment in the semi-solid, muddy, liquid or gaseous state. In particular, the present invention relates to an apparatus for waste collection and/or treatment comprising a group of accessories for guiding and supporting pipes.

PRIOR ART

[0002] The use of tank trucks for loading, transporting and unloading products, typically solid, semi-solid, muddy, liquid or gaseous waste, is known. A tank truck comprises a vehicle on the frame of which a tank and a series of devices are mounted, designed for loading/unloading said products. In particular, a tank truck typically comprises a suction assembly, through which the vacuum (pressure lower than the atmospheric) inside the tank is formed, and a high-pressure hydraulic pump typically used for generating a flow useful for washing the site of interest and/or for the fluidization of the products to be loaded.

[0003] Normally, a tank truck is provided with a main pipe, called suction pipe, through which the tank is connected to the site (basin, storm drain, sump, etc.) where the waste to be loaded is. The pressure difference in addition to the airflow generated by the suction assembly allows filling the tank. The main pipe is normally guided and supported by a revolving arm installed on the tank. According to known embodiments, opposite pairs of rollers can be installed on such an arm, between which the suction pipe is slidably inserted.

[0004] A tank truck also comprises a washing/fluidization pipe connected to the outlet of the high-pressure hydraulic pump and comprising a dispensing nozzle. Such a washing pipe, whose diameter is typically smaller than the suction pipe, is wound on a winding device, referred to as hose reel. In the most recent apparatuses, such a hose reel is rotatable about a vertical axis of rotation and is also referred to as "*swivel hose reel*".

[0005] In a first type of known solutions, the movement of the suction pipe is controlled totally independently of that of the washing/fluidization pipe. Substantially, the two pipes are moved by an operator who decides the movement order, the movement speeds and the final positions for the two pipes. In most of the actions required, the operator is faced with the need to rotate the two accessories so that the pipes associated with them are both in the vicinity of the site where the waste is. It is therefore clear that the accuracy and speed with which the two accessories are positioned, or ultimately, the intervention time and cost, only depend on the operator's skill and attention. In this regard the operator, only if particularly capable, in an attempt to reduce the intervention times, can move the two accessories (trunk arm and hose reel) simultaneously by actuating two different control devices that are electrically and mechanically independent.

[0006] In other known solutions, the trunk arm and the hose reel are mechanically connected, such as by means of a Cardan shaft. It follows that the rotation of one of the two accessories determines a corresponding rotation of the other accessory, either synchronous or discordant, depending on the configuration of mechanical transmission. However, it has been seen that the stiffness of the mechanical connection makes the group of accessories consisting of hose reel and trunk operationally little versatile since it can actually be used only where there are no obstacles and/or hindrance to the rotation of one and/or both accessories. In other words, in all those situations where it is not physically possible to move the hose reel, for example due to the presence of another vehicle, a wall or any other obstacles alongside the tank truck, the technical solution at issue cannot be used.

[0007] In view of the above considerations, the main task of the present invention is to provide an apparatus for waste collection and/or treatment that allows overcoming the drawbacks described above. Within this task, a primary object of the present invention is to provide an apparatus that is extremely versatile, from an operational point of view, i.e. which can be used regardless of the presence of obstacles near the apparatus. Another object of the present invention is to provide an apparatus provided with a group of accessories that can be positioned quickly and safely. Last but not least, an object of the present invention is to provide an apparatus that is reliable and easy to be implemented in a cost-effective manner.

SUMMARY

[0008] Therefore, the present invention relates to an apparatus for waste collection and/or treatment comprising a group of accessories for guiding and supporting at least a first pipe and at least a second pipe. The group comprises at least a first accessory, rotatable about a first axis of rotation, and a second accessory, rotatable about a second axis of rotation substantially parallel to said first axis of rotation. The two axes of rotation keep a fixed position with respect to each other during the rotation of the first and/or the second accessory. The group further comprises first actuating means configured to rotate the first accessory about the first axis of rotation and second actuating means configured to rotate the second accessory about the second axis of rotation. The group according to the invention further comprises a first position sensor operatively associated with the first accessory and configured to detect the angular position of said first accessory. The group also comprises a second position sensor operatively associated with the second accessory and configured to detect the angular position of the second accessory. The apparatus according to the invention comprises a control and command unit con-

nected to the actuating means of the two accessories and to said sensors. The unit is configured to control and command the actuating means according to at least a first operating configuration in which the unit itself commands the actuating means of one of said accessories as a function of the angular position detected by the sensor operatively associated with the other of said accessories. The first configuration of the control unit allows a synchronous rotation of the two accessories, and more precisely, the rotation is determined in terms of position and speed, by the rotation of the other. The synchronism of the two accessories allows obtaining a faster and more accurate positioning of the two accessories, with the advantage of a reduction of the intervention times and irrespective of the operator's skills.

[0009] According to a different aspect of the present invention, the control and command unit is configured to control and command the actuating means of the two accessories also according to a second operating configuration. In particular, in this second operating configuration, the unit commands the actuating means of the first accessory independently of the actuating means of the second accessory. The apparatus further comprises switching means for switching the unit to the first operating configuration or to the second operating configuration.

[0010] This further aspect of the invention allows having an apparatus in which the group of accessories is particularly versatile; in the context of use of the apparatus, if for example an obstacle is encountered which prevents or limits the rotation of one of the two accessories, an operator may advantageously intervene on the switching means for switching the control and command unit to the second operating configuration in order to rotate, for example, only the accessory that is actually free to move.

LIST OF FIGURES

[0011] Further features and advantages of the present invention will become more apparent from the following detailed description, given by way of a non-limiting example and shown in the accompanying figures, in which:

- figures 1 and 2 are a first perspective view and a second perspective view of an apparatus according to the present invention, respectively;
- figure 3 is a first block scheme of a first possible embodiment of a group of accessories of an apparatus according to the present invention;
- figure 4 is a second block scheme of a second possible embodiment of a group of accessories of an apparatus according to the present invention;
- figures 5 and 6 are schemes referring to variants of the embodiment in figure 4;
- figure 7 is a third block scheme of a third possible embodiment of a group of accessories of an apparatus according to the present invention;
- figure 8 is a further block scheme of a further possible embodiment of a group of accessories of an apparatus according to the present invention;
- figures 9 and 10 are schemes referring to variants of the embodiment in figure 8;
- figures 11 to 14, each of which shows a possible use of a group of accessories of an apparatus according to the present invention;
- figure 15 is a figure explaining the scheme in figure 4.

DETAILED DESCRIPTION

[0012] With reference to the cited figures, the apparatus for waste collection and/or treatment is generically indicated with reference numeral 3 and comprises a group of accessories for guiding and/or supporting pipes, in general indicated with reference numeral 1. Preferably, but not exclusively, the apparatus according to the invention may be installed on a movable vehicle, such as a tank truck. To this end, in figures 1 and 2, apparatus 3 comprises a tank 2 on whose back portion the group of accessories 1 is installed. In any case, the apparatus may not necessarily be installed on a moving vehicle.

[0013] Group 1 according to the invention comprises at least a first accessory 10 for guiding and supporting a first pipe 11 and at least a second accessory 20 for guiding and supporting a second pipe (not shown in the figures). The first accessory 10 defines a prevailing extension direction 301. Likewise, the second accessory 20 defines a second prevailing extension direction 302. In general, for the purposes of the present invention, the term "*prevailing extension direction"* of an accessory indicates a direction in which the accessory extends in a prevailing manner with respect to the others. Hereinafter and for more clarity, the prevailing extension direction 301 of the first accessory 10 is indicated by the expression "*first extension direction 301*", while the prevailing extension direction 302 of the second accessory 20 is indicated by the expression "*second extension direction 302*".

[0014] According to the invention, the first accessory 10 is rotatable about a first axis of rotation 102 while the second accessory 20 is rotatable about a second axis of rotation 102. Preferably, the two axes of rotation 101 and 102 are parallel to each other and substantially vertical. Moreover, the two axes of rotation 101, 102 are independent during the rotation of one or both accessories 10, 20. By this it is meant that the first axis of rotation 101 and the second axis of rotation 102 do not change their position in space during the rotation of one or both accessories 10, 20. In other words, the rotation of the first accessory 10 does not affect the position of the second axis of rotation 102 and similarly, the rotation of the second accessory 20 does not cause any change in the spatial position of the first axis of rotation 101.

[0015] Figures 1 and 2 illustrate a possible, and thus non-exclusive, embodiment of the first accessory 10 and of the second accessory 20. In the case shown, the first

accessory 10 is defined by an arm having a first rectilinear portion 10' and a second arched portion 10" which imparts a typical configuration called "*trunk*" to the arm itself. The first accessory 10 mainly extends along direction 301 in which the rectilinear portion 10' extends. According to a per se known solution, means 16 for containing and guiding the first pipe 11 may be installed on the upper part of the trunk arm. According to another per se known solution, such a pipe 11 may coincide with a suction pipe which may be connected to tank 2 for the suction of the material to be collected into the tank itself.

[0016] Again with reference to the embodiment shown in figures 1 and 2, the second accessory 20 comprises a hose reel 26, i.e. a substantially drum-shaped body around which a second pipe (not shown) is wound. According to a typical solution, such a second pipe consists of a hose which may be connected to the outlet of a hydraulic pump for the high-pressure washing of the site where the waste is and/or for the fluidization of the waste itself.

[0017] Apparatus 3 comprises a first frame 17 supporting the first accessory 10 and defining the first axis of rotation 101. Therefore, the expression "*first frame 17*" generically indicates the group of components configured to support the first accessory 10 and to define the first axis of rotation 101 as well as the position of the same. In the example in figures 1 and 2, the first frame 17 comprises at least one connecting portion 19 for connecting the first accessory 10 to the tank 2.

[0018] Apparatus 3 also comprises a *second frame* 27 supporting the second accessory 27 and defining the second axis of rotation 102. As shown in figures 1 and 2, in addition to the hose reel 26, the second accessory 20 comprises a support body 27" supporting the hose reel itself. Preferably, the hose reel 26 is rotatably mounted to the support body 27" so as to rotate about a further axis 103 that is substantially orthogonal to the second axis of rotation 102 and thus to the first axis of rotation 101. The hose reel 26 and the support body 27" are thus parts of the second accessory 20. Also the latter extends along a prevailing extension direction 302 which substantially coincides with the prevailing extension direction of the support body 27". In a preferred embodiment, the support body 27" can be provided with means that allow changing/adjusting its extension along the prevailing extension direction 302.

[0019] In the embodiment shown in figures 1 and 2, the support body 27" is connected to the second frame 27 by means of connecting means defining the second axis of rotation 102. The second frame 27 comprises two support portions 17" rigidly connected to the first frame 17. This solution advantageously simplifies the installation operations and allows a particularly compact configuration for group 1. In any case, the possibility of configuring the second axis of rotation 102 falls within the scope of the present invention. In an alternative embodiment, for example, the two support portions of the second frame 27 may be directly connected to tank 2. In other words, in this case, the second accessory 20 would be connected to the tank 2 by the second frame 27, similarly to what provided for the first accessory 10. According to a further variant described hereinafter with reference to Figure 15, the position of the second frame 27 may be varied so as to adjust, according to the needs, the position of the second axis of rotation 102 with respect to the first axis of rotation 101.

[0020] In all cases, group 1 according to the present invention comprises first actuating means 14 configured to rotate the first accessory 10 about the first axis of rotation 101 and second actuating means 24 configured to rotate the first accessory 20 about the second axis of rotation. More precisely, the first actuating means 14 and the second actuating means 24 rotate the respective accessories 10, 20 with respect to apparatus 3 which keep a fixed position during the rotation (therefore, with respect to the first frame 17, to the second frame 27 and to tank 2).

[0021] The first and/or the second actuating means 14, 24 preferably consist of hydraulic actuators of the type normally used in the field. Alternatively, electric actuators may also be used. In the embodiment shown in figures 1 and 2, for example, the first actuating means 14 comprise a hydraulic motor (either electric or pneumatic) moving a worm screw. The latter engages with a motion fifth wheel coaxial to the first axis of rotation 101 and mechanically connected to the first accessory 10 so that the rotation of the worm screw translates into a corresponding rotation of the first accessory 10. In the solution shown, the second actuating means 24 have a configuration substantially similar to that of the first actuating means 14 just described. To this end, figures 1 and 2 show the connection between the worm screw 24' actuated by a hydraulic motor and the corresponding motion fifth wheel 24" coaxial to and mechanically integral with frame 27 of the second accessory 20.

[0022] Figure 3 is a block diagram of a group 1 according to the present invention which comprises a first position sensor 12 configured to detect the angular position of the first accessory 10 and a second position sensor 22 configured to detect the angular position of the second accessory 20. Therefore, each of said sensors 12, 22 is operationally associated with a corresponding accessory 10, 20. The expression "*angular position"* means the angle between the extension direction 301, 302 of each accessory 10, 20 and a direction parallel to a reference direction 401 of a reference system associated with, for example, the first axis of rotation 101 of the first accessory 10. Considering for example the embodiment shown in figures 1 and 2, for example, the first sensor 12 and the second sensor 22 may consist each of an absolute multiturn encoder that is installed on the shaft of the hydraulic motor (electric or pneumatic) of the corresponding actuating means 14, 24. Alternatively, the position sensors 12, 22 may consist of a single-turn encoder attached to the axis of rotation 101, 102 of the corresponding accessory 10, 20. According to yet another alternative solution, if the actuating means 14, 24 comprise each a hydraulic

motor (electric or pneumatic), the axis of each motor may be connected to a toothed wheel with two inductive sensors configured to detect the teeth and the slots of the same wheel in a non-synchronized manner. The square wave generated by the two inductive sensors will not be in phase, and thus the pulse count will provide the position, while the phase difference between the two waves will provide the direction of rotation of the corresponding accessory.

[0023] With reference again to the diagram in figure 3, group 1 according to the invention comprises a control and command unit 50 for controlling and commanding the first actuating means 14 and the second actuating means 24. Therefore, unit 50 is connected to said actuating means 14, 24 and also to the position sensors 12, 22. The latter have the function of sending a signal to unit 50 which is characteristic of the angular position reached by the first accessory 10 and by the second accessory 20, respectively. In other words, each sensor 12, 22 provides unit 50 with the exact angular position of the corresponding accessory 10, 20 using, for example, a CAN Open protocol. In this regard, the unit 50 is preferably configured to continuously store the data provided by sensors 12, 22 even if group 1 is switched off.

[0024] According to the invention, unit 50 controls and commands the actuating means 14, 24 of the two accessories 10, 20 according to at least a first operating configuration for which the actuating means of one of the two accessories 10, 20 (hereinafter also referred to as "*driven accessory*") are commanded as a function/on the basis of the angular position of the other accessory 10, 20 (hereinafter also referred to as "*driving accessory*") detected by the corresponding position sensor 12, 22.

[0025] Therefore, in this first operating configuration, the control of one of the two accessories 10, 20 (*driven accessory*), in terms of angular position and speed, is carried out autonomously by unit 50 on the basis of a parameter (angular position) that is characteristic of the other accessory (*driving accessory*). In other words, the movement of the two accessories 10, 20 takes place synchronously irrespective of the operator's skill and to the advantage of the intervention times, which can advantageously be contained.

[0026] Preferably, the control unit 50 is configured to control the actuating means 14, 24 of accessories 10, 20 also according to a second configuration for which the first actuating means 14 are controlled independently by the second actuating means 24. In other words, in this second operating configuration, each accessory 10, 20 rotates about the corresponding axis of rotation 101, 102 totally independently of the other. This means, for example, that the command unit 50 can command the rotation of one of the two accessories 10, 20, without providing any command to the other accessory, which can thus remain stationary (to this end, reference shall be made to figures 13 and 14 discussed hereinafter). In such a second operating configuration, unit 50 may also command a simultaneous rotation of the two accessories 10, 20, but in terms of position and speed the two rotations are totally independent.

[0027] In view of the two possible operating configurations, group 1 comprises switching means 40 connected to unit 50 for switching the same to the first operating configuration or to the second operating configuration. Such switching means 40 are accessible to an operator who, depending on the needs, may decide which configuration unit 50 should be switched to. For example, if there is an obstacle that potentially prevents the free rotation of one of accessories 10, 20, the operator may decide, for example, to switch unit 50 to the first configuration. Alternatively, if there are not hindrances, the operator may switch unit 50 to the second operating configuration to obtain a substantially synchronous rotation of the two accessories 10, 20 and thus a reduction in the intervention times.

[0028] With reference again to the diagram in Figure 3, according to the present invention, group 1 comprises first command means 61 and second command means 62, both accessible to an operator. Such command means 61, 62 are provided for commanding the first accessory 10 and the second accessory 20, respectively. Moreover, they are connected to unit 50 to provide a command signal as a result of which the unit itself commands the rotation of the corresponding accessory 10, 20. Unit 50 and/or the switching means 40 and/or the command means 61, 62 may be integrated into a control panel which may be installed on the apparatus for which group 1 is intended. Alternatively, unit 50 and/or the switching means 40 and/or the command means 61, 62 may be integrated into a portable device 8 (such as a wired push-button panel or a remote control) available to the operator. The switching means 40 and/or the command means 61, 62 may also comprise one or more switching elements, in the form of a key, a lever or any other functionally equivalent type.

[0029] Unit 50 is configured to command, when switched to said second operating configuration, the first actuating means 14 and the second actuating means 24 of group 1 as a function of the control signals sent by the first command means 61 and by the second command means 62, respectively. Such command signals are thus determined by an operator's intervention. In this regard, in the second operating configuration, the operator can activate the command means 61, 62 also simultaneously since the unit recognizes and manages the command signals independently.

[0030] Instead, when unit 50 is switched to the first operating configuration, it commands the actuating means of one of the two accessories 10 or 20 (*driving accessory*) as a function of the command signal sent by the corresponding command means 61 or 62, while it commands the actuating means of the other accessory 20 or 10 (*driven accessory*) on the basis of a signal from sent by the position sensor 12 or 22 associated with the (driving) accessory commanded by means of the corresponding command means. Therefore, according to the

present invention, unit 50 is configured to autonomously provide a command signal to the command means of the accessory that is not directly commanded by the operator.

[0031] For more clarity, it should be noted that in the present description, the expression *"operatively associated with an accessory"* generically means that a command means and/or a sensor are provided for providing a command signal and/or for detecting a parameter referred to that accessory, respectively.

[0032] Still for more clarity, it should be noted that in the following description, with reference to the second operating configuration of unit 50, the accessory commanded by a command means is also referred to as *"driving accessory',* while that autonomously commanded by unit 50 by the expression "*driven accessory*".

[0033] It is noted that unit 50 can be configured in such a way that in the first operating configuration, the rotation of the driven accessory may be simultaneous or alternatively delayed with respect to that of the driving accessory. During the routine use of group 1, the operator, depending on the needs, may intervene on the first command means 61 or on the second command means 62. To this end, unit 50 is configured so as to recognize as *driving accessory* that corresponding to the first command signal received. Therefore, in said second operating configuration, if for example unit 50 first receives the command signal sent through the first means 61, the unit itself excludes the command through the second means 62, and vice versa.

[0034] In figure 3, the first accessory 10 is schematically shown with a continuous line having an extension/length L measured along the first extension direction 301 (dashed with a point-dash line). Likewise, also the second accessory 20 is schematically shown with a continuous line having an extension/length L_N measured along the second extension direction 302 (dashed with a point-dash line). Still in figure 3, the symbol α indicates the angular position taken by the first accessory 10 with respect to a first reference direction 401 of a reference system centered on the axis of rotation 101. On the other hand, the symbol β indicates the angular position of the second accessory 20 with respect to a direction 402 intersecting the axis of rotation 102 of the same and parallel to said first reference direction 401. The angular position α is therefore detected by the first sensor 11, while the angular position β is detected by the second sensor 22.

[0035] With reference again to figure 3, when switched to the second operating configuration, unit 50 calculates the angular position to be reached by the *driven accessory* on the basis of the instantaneous angular position of the *driving accessory* (detected by the sensor associated with the driving accessory). More precisely, the position of the *driving accessory* is calculated by a predetermined formula. On the basis of such a calculation, unit 50 then sends a command signal to the actuating means of the *driven accessory* after which they rotate the accessory itself up to reaching the calculated angular position.

[0036] The variation of the angular position of the *driven accessory* is constantly monitored by the position sensor associated with the accessory itself. Upon reaching the desired angular position for the *driven accessory,* unit 50 sends a rotation stop signal to the actuating means of the driven accessory. According to the invention, unit 50 is configured to continuously recalculate the angular position and the speed of *driven accessory* so as to maintain the synchronism of the system formed by the two accessories 10, 20.

[0037] Figures 11 to 14 are plan views of group 1 shown in Figures 1 and 2 and are intended to clarify the possible applications of group 1 according to the present invention. In particular, figure 11 is a plan view showing group 1 in a reference mode corresponding to a minimum footprint configuration. In this configuration, the two accessories 10, 20 (trunk arm 10 and swivel hose reel 20 in figures 1 and 2) occupy each the position most adjacent to the rear side of tank 2 (dashed), i.e. to the apparatus on which group 1 is installed. In figure 11, each accessory 10, 20 is shown with the relative extension direction 301, 302.

[0038] Figure 12 refers to a condition for which the second accessory 20 (swivel hose reel) rotates synchronously with the first accessory 10 (trunk arm). This condition can be achieved by switching unit 50 to the first operating configuration and subsequently commanding the rotation of the first accessory 10 by means of the corresponding first command means 61. In fact, when the operator intervenes on the latter, unit 50 recognizes the first accessory 10 as *"driving accessory"* and proceeds to calculate the angular position β of the second accessory 20, which is recognized as "*driven accessory*". The angular position α of the first accessory 10 is thus determined directly by the intervention of an operator on the first command means 61, while the second angular position β is calculated and commanded independently by the command and control unit 50, preferably on the basis of formula [1] shown and discussed hereinafter.

[0039] Figures 13 and 14 refer to two possible applications of group 1 allowed when unit 50 is switched to the second operating configuration. In particular in figure 13, the second accessory 20 (swivel hose reel) is rotated with respect to the reference position (Figure 11), while the first accessory 10 (trunk arm) keeps the reference position. The second accessory 20 takes an angular position β with respect to a direction 402 intersecting the axis of rotation 102 thereof and parallel to the reference direction 401. Such an angular position β is determined by the operator's intervention who commands, through the second command means 62, the rotation of the second accessory 20 after switching, through the switching means 40, unit 50 to the second operating configuration, i.e. after having made the rotations of the two accessories 10, 20 independent.

[0040] In Figure 14, the first accessory 10 (trunk arm) is rotated with respect to the reference position (Figure

11), while the second accessory 20 (swivel hose reel) keeps the reference position. The first accessory 10 takes an angular position α with respect to a reference direction 401. Such an angular position α is determined by the operator's intervention who commands, through the first command means 62, the rotation of the first accessory 10 after switching, through the switching means 40, unit 50 to the second operating configuration.

[0041] According to a preferred embodiment of the invention, the command and control unit 50 is preferably configured to calculate, when switched to said first operating configuration, the angular position of the driven accessory according to the formula:

$$\beta = \tan^{-1}\left[\frac{(L * \sin\alpha) - A}{(L * \cos\alpha) - B}\right] \quad [1]$$

in which:

- β is the angular position of the second accessory 20;
- α is the angular position of the first accessory 10 detected by the first sensor 11;
- L is the extension of the first accessory 10 along the first extension direction 301 of the first accessory 10 itself;
- B is the distance, measured along the first reference direction 401, between the position of the first axis of rotation 101 and the position of the second axis of rotation 102;
- A is the distance, measured along a second reference direction 402, orthogonal to said first reference direction 401, between the first axis of rotation 101 and the second axis of rotation 102.

[0042] It is first noted that the values of parameters A and B depend on the installation conditions. In particular, such parameters may be constants for formula [1]. However, parameter B for example, could represent a variable if the second accessory 20 was made movable, as in the diagram in figure 4 discussed hereinafter. Likewise, also parameter L, depending on the installation, may be a constant or a variable, as shown hereinafter in the comments to the schemes in Figures 7 and 8.

[0043] With reference again to Figure 3, if therefore the operator commands a counter clockwise rotation of the first accessory 10 by the first command means 61, unit 50 continuously recalculates the value of the angular position β of the second accessory 20 on the basis of formula [1] above, suitably adjusting the rotation speed of the second accessory 20 to the first accessory 10. In this case, therefore, the control unit 50 recognizes the first accessory 10 as *driving accessory* and the second accessory 20 as *driven accessory.* On the other hand, if the operator commands a counter clockwise rotation of the second accessory 20 by the second command means 62, unit 50 continuously recalculates the value of the angular position β of the second accessory 10 on the basis of formula [1] above and adjusting the rotation speed of the first accessory 20 to that of the second accessory 20 commanded by the operator. In the latter case, the first accessory 10 and the second accessory 20 will be recognized as driven accessory and driving accessory, respectively.

[0044] It is noted that by the formula [1] above, the command and control unit 50 actually calculates an angular position β for the second accessory 20 (swivel hose reel in figure 12) such that the intersection between the second extension direction 302 and the first extension direction 301 coincide with end 111 of length L of the first accessory 10 (trunk arm in figure 12). From the operative point of view, this condition results in an alignment of pipes 11, 21 associated with the two accessories 10, 20 which allows an operator to easily arrange both at the waste collection sump/basin or the like, with considerable advantages in terms of practicality. More precisely, when the two accessories 10, 20 rotate synchronously according to formula [1], then the ends of the pipes associated with the two accessories 10 and 20 are advantageously aligned along a direction substantially corresponding to the second extension direction of the second accessory 20.

[0045] Figure 4 is a block diagram of a second possible embodiment of the present invention, which substantially differs from that in Figure 3 in that the position of the axis of rotation 102 of the second accessory 20 is adjustable/variable with respect to that of the axis of rotation 101 of the first accessory 10. To this end, group 1 comprises displacement means 200 configured to change/adjust the position of the axis of rotation 102 in question between at least a first predetermined position (indicated by reference numeral 81) and a second predetermined position (indicated by reference numeral 82). In this regard, figure 16 is a plan view of a group 1 according to the invention in which the two accessories 10, 20 are configured as in the example shown in figures 1 and 2 (trunk arm and swivel hose reel, respectively). In figure 15, reference numeral 205 indicates guiding means for displacing the second accessory 20 (swivel hose reel) between the two predetermined positions 81, 82. In particular, the second accessory 20 is shown with a continuous line in the first predetermined position 81 and with a dashed line in the second predetermined position 82.

[0046] Alternatively, the displacement means 200 may be configured to displace the axis of rotation 102 of the second accessory 20 to any position along a displacement direction 201 between two predetermined positions 81, 82.

[0047] Anyway, in this embodiment (scheme in figure 4), group 1 is provided with further command means 65, accessible to an operator for commanding the displacement means 200. Such further command means 65 are connected to unit 50 so that the same directly commands the displacement means 200. Alternatively, the latter may be commanded directly by the further command means 65 without the interface of unit 50.

[0048] In any case, further position sensor means 54 are provided, connected to unit 50 and configured to send a signal characteristic of the actual position of the axis of rotation 102 of the second accessory 20 to the unit itself.

[0049] In the diagram in Figure 4, unit 50 is configured to command, in said second operating configuration, a rotation in a direction according to or discordant with the rotation of the second accessory 20 according to the signal sent by the sensor means 54. For example, if the displacement means 200 are configured to displace the axis of rotation 102 to two or more predetermined positions, unit 50 may be configured to determine the direction of rotation of the second accessory 20 as a function of the predetermined position actually reached by the axis of rotation. If the displacement means 200 are configured to allow the operator to select the position of the axis of rotation 102 between anyone comprised between two predetermined positions 81, 82, then unit 50 is configured to determine the direction of rotation of the second accessory 20 as a function of the actual distance taken by the axis of rotation 102 thereof with respect to a reference position coincident, for example, with the position of the axis of rotation 101 of the first accessory 10.

[0050] In this regard, always according to a preferred embodiment, unit 50 is configured to command, in said first operating configuration, a rotation of the second accessory 20 according to that of the first accessory 10 if the actual distance between the two axes of rotation 101, 102 is smaller than a predetermined value, discordant if such a value is greater than said predetermined threshold. To this end, unit 50 is preferably configured to calculate the angular position β of the second accessory 20 according to formula [1] above and to command a rotation according to that of the first accessory 10 if the relation B<L/2 is satisfied, in which parameters B and L coincide with those defined for formula [1]. Still with reference to the first operating configuration, unit 50 is also configured to command a rotation of the second accessory 20 discordant with that of the first accessory 10 if the following relationship is satisfied: B>L/2.

[0051] With reference to the diagram in Figure 5, according to a preferred embodiment, when the angular position β of the second accessory 20 detected by the second sensor means 21 is null ($\beta = 0$), unit 50 commands a rotation of the second accessory 20, according to that of the first accessory 10, only when the angular position α of the first accessory 10 exceeds a predetermined minimum value α_m calculated by the formula:

$$\alpha_m = sin^{-1}\left(\frac{A}{L}\right) \qquad [2]$$

in which A and L correspond to the values defined above for formula [1]. In practice, the predetermined minimum value α_m indicates the first position in which the alignment of the ends of the pipes associated with accessories 10, 20 can be actually obtained, if the angular position β of the second accessory 20 is null.

[0052] With reference to the diagram in Figure 6, unit 50 is further configured to calculate, if the relation B>L/2 is satisfied, the angular position of the second accessory 20 according to formula [1] and to rotate the same in a discordant direction with that of said first accessory 10 until the following relation is satisfied:

$$\alpha_s = sin^{-1}\left[\frac{L_N\, sin(\beta_s)+A}{L}\right] \qquad [3]$$

in which parameters A and L coincide with those defined above for formula [1] and in which α_s and β_s are instantaneous values of the angular position of the first accessory 10 and of the second accessory 20 upon reaching which, an extreme point 111 of the first accessory 10 substantially coincides with an extreme point 121 of the second accessory 20; L_N is the extension of the second accessory 20 measured along its prevailing extension direction.

[0053] Figure 7 is a diagram of a third possible embodiment of a group 1 which differs from that shown in Figure 3 in that the first accessory 10 is configured so as to extend along the first extension direction 301. In order to obtain this embodiment, the trunk arm (first accessory 10) of group 1 shown in figures 1 and 2 may also be configured as telescopic. According to the diagram in Figure 7, group 1 therefore comprises third actuating means 34 configured to change the extension of the first accessory 10 along the first extension direction 301. In this possible embodiment, group 1 comprises third command means 63 operationally associated with the first accessory 10 to command the extension of the same. Also such third command means 63 are connected to unit 50, to which said third actuating means 34 are also connected.

[0054] According to the diagram in Figure 7, group 1 also preferably comprises a first length sensor 32 connected to unit 50 and configured to detect the variation in the extension of the first accessory 10 along the first prevailing extension direction 301.

[0055] Still with reference to the first operating configuration, unit 50 is preferably configured to calculate the angular position of the second accessory 20 as a function of the angular position detected by sensor 12 operationally associated with the first accessory 10 and according to the actual extension of the first accessory 10 itself detected by the first length sensor 32. In practice, according to the diagram in Figure 8, unit 50 carries out a control of the second accessory 20 substantially on the basis of a signal sent by the first position sensor 12 and of a further signal sent by the first length sensor 32.

[0056] Preferably, also in the diagram in Figure 8, unit 50 is configured to calculate the angular position of the second accessory 20 on the basis of formula [1] above, in which L can therefore represent a variable whose value

is consistently detected by the third sensor 32.

[0057] Figure 8 is a diagram of a further possible embodiment of a group 1 which differs from that shown in Figure 7 in that also the second accessory 20 is configured so as to extend along the prevailing extension direction 302 thereof. Still with reference to what is shown in the figures 1 and 2, also frame 27 of the swivel hose reel 27 (second accessory 20) may be configured in a telescopic manner. According to the diagram in Figure 8, group 1 therefore comprises fourth actuating means 44 configured to change the extension of the second accessory 20 along the prevailing extension direction 302 and fourth command means 64, operationally associated with the first accessory 10 to command the extension variation thereof. The fourth command means 64 are connected to unit 50, to which the fourth actuating means 34 are also connected.

[0058] Again with reference to the diagram in Figure 8, group 1 also preferably comprises a second length sensor 42 connected to unit 50 and configured to detect the variation in the extension of the second accessory 20 along the second extension direction 302.

[0059] In the diagram in Figure 8, unit 50 is further configured to control a variation in the extension, along the corresponding extension direction 301 or 302, of accessory 10 or 20 installed in an upper position as a function of the actual length of accessory 20 or 10 installed in a lower position, wherein the upper and lower positions are evaluated with respect to a substantially vertical reference direction. Preferably, unit 50 is configured to control the actuating means of the accessory installed in upper position as a function of the signal sent by the length sensor associated with the accessory installed in lower position and according to formula:

$$L_{min} = \left[\frac{L_N sin(\beta)+A}{sin\alpha}\right] + L_S \qquad [4]$$

in which:

- L_{min} is the extension value, along the prevailing extension direction thereof, of the accessory installed in upper position;
- L_N is the actual extension value, along the prevailing extension direction thereof, of the accessory installed in lower position;
- A coincides with the parameter defined for formula [1];
- L_s is a predetermined constant.

[0060] With reference to formula [4] above, figure 9 is a diagram related to the embodiment shown in figures 1 and 2 in which the trunk arm (first accessory 10) is installed at a height H1 (upper position), while the second accessory 20 is installed at a height H2 (lower position) with respect to a horizontal reference plane 500. In the same diagram, reference numeral 550 indicates a waste collection basin.

[0061] By calculating the angular position β of the second accessory 20 according to formula [1] above, unit 50 synchronizes the rotation of the two accessories so as to obtain an operating condition for which pipes 11,21 (dashed in Figure 9) associated with the two accessories 10, 20 are both in the vicinity of the waste collection basin 550. Through the implementation of formula [4] above, unit 50 actually prevents the collision of the two pipes 11, 21 since pipe 11 associated with the first accessory 10 (such as the suction tube associated with the trunk arm, in the embodiment in figures 1 and 2) will always be ahead with respect to pipe 21 associated with the second accessory 20 (washing pipe associated with the swivel hose reel, to continue with the example). As is clear from the diagram in Figure 9, the "advance" condition is evaluated along the extension direction 302 of the second accessory 20.

[0062] The possibility that the embodiments referring to diagrams 7 and 8 may comprise a movable accessory as in the diagram in figure 4 falls within the scope of the present invention. In other words, possible embodiments comprising combinations of those described above fall within the scope of the present invention.

[0063] Also in view of the above description, therefore, the present invention also relates to a method for controlling a group of accessories for guiding and supporting pipes of an apparatus for waste collection and/or treatment. More precisely, the method according to the invention includes at least the following steps:

a) rotating the first accessory 10;
b) detecting the angular position α of the first accessory 10;
c) calculating the angular position β of the second accessory 20 as a function of the angular position α of the first accessory 10; and
d) rotating the second accessory 20 as a function of the value of the angular position β calculated for the second accessory 20.

[0064] From the above description, in the embodiments of group 1 described above, the control described in steps b), c) and d) is carried out by the command and control unit 50. According to the first aspect, therefore, the method according to the invention provides for calculating the angular position β of said second accessory 20 through formula [1] above.

[0065] According to another aspect, the method according to the invention therefore provides for detecting the distance between the axes of rotation of the two accessories and rotating the second accessory 20 according to said first accessory 10 if the relation B<L/2 is satisfied, and discordant if the relation B>L/2 is verified, in which B indicates the distance between said axes of rotation 101, 102 detected along a first reference direction 401 and in which L is the extension of said first accessory 10 along said first extension direction 301.

[0066] Preferably, the method further provides for rotating the second accessory 20 according to the first accessory 10 when the relation B<L/2 is satisfied and only when the angular position α of the first accessory 10 exceeds a predetermined minimum value α_m calculated according to formula:

$$\alpha_m = sin^{-1}\left(\frac{A}{L}\right)$$

[0067] in which A is the distance between the axes of rotation 101, 102 of accessories 10, 20 evaluated along a second reference direction 402 orthogonal to the first reference direction 402.

[0068] The method also provides for rotating the second accessory 20 in a direction discordant with the first accessory 10 when the relation B>L/2 is satisfied and until the following condition is satisfied:

$$\alpha_s = sin^{-1}\left[\frac{L_N\, sin(\beta_s)+A}{L}\right]$$

[0069] in which αs and βs are instantaneous values of the angular position of the first accessory 10 and of the second accessory 20, respectively, and L_N is the extension of the second accessory 20 evaluated along said second extension direction 302.

[0070] According to yet another aspect, when the second accessory 20 is installed in a position lower than that of said first accessory 10 and when the extension of said first accessory 10 and the extension of said second accessory 20 are variable along said first extension direction 301 and along said second extension direction 302, respectively, the method further provides the steps of:

- detecting the actual extension of said second accessory 20 along the second extension direction 302 and calculating a minimum extension L_{min} for said first accessory 10 according to formula:

$$L_{min} = \left[\frac{L_N sin(\beta)+A}{sin\alpha}\right] + L_S$$

  in which L_N is the extension of the second accessory 20 along the second extension direction 302, α is the angular position of the first accessory 10, β is the angular position of the second accessory 20 and Ls is a constant;
- varying the extension of the first accessory 10 up to reaching value L_{min}.

[0071] The apparatus and the method thus conceived allow achieving the tasks and objects set. In particular, the group of accessories of the apparatus make it particularly versatile and easy to use, irrespective of the presence of obstacles adjacent to the working area. In addition, the positioning of the apparatus accessories is quick and safe.

Claims

1. An apparatus (3) for waste collection and/or treatment comprising a group (1) of accessories for guiding and/or supporting a first pipe (11) and a second pipe, said group (1) comprising at least:

   - a first accessory (10) for said first pipe (11), said first accessory being rotatable about a first axis of rotation (101);
   - first actuating means (14) configured to rotate said first accessory (10) about said first axis of rotation (101);
   - a second accessory (20) for said second pipe, said second accessory (20) being rotatable about a second axis of rotation (102) substantially parallel to said first axis of rotation (101), said second axis of rotation (102) being fixed in space with respect to said first axis of rotation (101) at least during the rotation of said first accessory (10) and/or of said second accessory (20);
   - second actuating means (24) configured to rotate said second accessory (20) about said second axis of rotation (102),

   characterized in that it comprises:

   - a first sensor (12) operatively associated with said first accessory (10) and configured to detect the angular position of said first accessory (10) and a second sensor (22) operatively associated with said second accessory (20) and configured to detect the angular position of said second accessory (20);
   - a control and command unit (50) connected to said actuating means (14, 24) and to said sensors (12, 22), said unit (50) being configured to control and command said actuating means (14, 24) according to at least a first operating configuration in which said unit (50) commands the actuating means of one of said accessories (10, 24) as a function of the angular position detected by the sensor (12, 22) operatively associated with the other of said accessories (10, 20).

2. An apparatus (3) according to claim 1, wherein said unit (50) is configured to command to said actuating means (24 or 14) of one of said accessories (20 or 10) a rotation according to or discordant with that of said other of said accessories (10 or 20) as a function of the distance between said axes of rotation (101, 102) evaluated along a reference direction (401).

3. An apparatus (3) according to claim 1 or 2, wherein said unit (50) is configured to control and command said actuating means (14, 24) according to at least a second operating configuration in which said unit (50) commands said first actuating means (14) independently of said second actuating means (24), said group (1) comprising switching means (40) for switching said unit (50) to said first operating configuration or to said second operating configuration.

4. An apparatus (3) according to any one of claims 1 to 3, wherein said group (1) comprises first control means (61) operatively associated with said first accessory (10) and second command means (62) operatively associated with said second accessory (20), said first command means (61, 62) and said second command means (62) being connected to said unit (50) and sending a command signal to said unit (50) for the rotation of said first accessory (10) and for the rotation of said second accessory (20), respectively.

5. An apparatus (3) according to claim 3, wherein said unit (50) is configured to:

- command, when switched to said second operating configuration, the first actuating means (14) and the second actuating means (24) as a function of the control signals sent by said first command means (61) and by said second command means (62), respectively;
- command, when switched to said first operating configuration, the actuating means of one of said accessories (10 or 20) as a function of the command signal sent by the command means (61 or 62) associated with said one of said accessories (10 or 20), and to command the actuating means of another accessory (20 or 10) on the basis of a signal sent by the sensor (12 or 22) associated with said one of said accessories (10 or 20).

6. An apparatus (3) according to any one of claims 1 to 5, wherein said unit (50) commands the actuating means of one of said accessories (10, 20) as a function of the angular position detected by the sensor (12, 22) operatively associated with the other of said accessories (10, 20) and according to the formula:

$$\beta = \tan^{-1}\left[\frac{(L * \sin\alpha) - A}{(L * \cos\alpha) - B}\right]$$

in which:

- β is the angular position of the second accessory (20);
- α is the angular position of the first accessory (10);
- L is the extension of the first accessory (10) along said first extension direction (301) of said first accessory (10);
- B is the distance, measured along a first reference direction (401), between the position of the first axis of rotation (101) and the position of the second axis of rotation (102);
- A is the distance, measured along a second reference direction (402), orthogonal to said first reference direction (401), between the first axis of rotation (101) and the second axis of rotation (102).

7. An apparatus (3) according to any one of claims 1 to 6, wherein said group (1) comprises displacement means (200) configured to vary the position of said second axis of rotation (102) relative to said first axis rotation (101), said group (1) comprising further sensor means (54) connected to said unit (50) and configured to detect the actual position of said axis of rotation (102) of said second accessory, said unit (50) being configured to command to said actuating means (24) of said second accessory (20) a rotation according to or discordant with that of said first accessory (10) as a function of the distance between said axes of rotation (101, 102) evaluated along a first reference direction (401).

8. An apparatus (3) according to claim 7, wherein said unit (50) is configured to command to said second actuating means (24) of said second accessory (20) a rotation according to that of said first accessory (10) if the relation B<L/2 is satisfied, and discordant if the relation B>L/2 is satisfied, wherein B denotes the distance between said axes of rotation (101, 102) calculated along said first reference direction (401) and L is the extension of said first accessory (10) along said first extension direction (301) of said first accessory (10).

9. An apparatus (3) according to claim 8 wherein when said relation B<L/2 is satisfied, then said unit (50) commands a rotation of said first accessory (10) according to that of said first accessory (10) only when the angular position (α) of said first accessory (10) exceeds a predetermined minimum value (α_m) calculated with the formula:

$$\alpha_m = sin^{-1}\left(\frac{A}{L}\right)$$

in which A is the distance between the axes of rotation (101, 102) of said accessories (10, 20) evaluated along a second reference direction (402) orthogonal to said first reference direction (401).

10. An apparatus (3) according to claim 9 wherein when said relation B>L/2 is satisfied, then said unit (50) commands a rotation of said first accessory (10) discordant with that of said first accessory (10) until the following relation is satisfied:

$$\alpha_s = sin^{-1}\left[\frac{L_N\, sin(\beta_s)+A}{L}\right]$$

in which:

- αs and βs are instantaneous values of the angular position of the first accessory (10) and of the second accessory (20), respectively;
- L_N is the extension of the second accessory (20) evaluated along said extension direction (302) of said second accessory (20).

11. An apparatus (3) according to any one of claims 1 to 10, wherein said group (1) comprises third actuating means (34) configured to vary the extension of said first accessory (10) along said first extension direction (301), said group (1) comprising a first length sensor (32) configured to detect the actual extension of said first accessory (10) along said first extension direction, and wherein said unit (50), when in said first operating configuration, commands the rotation of said second accessory (20) also as a function of the actual extension of said first accessory (10) detected by said first length sensor (32).

12. An apparatus (3) according to claim 11, wherein said group (1) comprises fourth actuating means (44) configured to vary the extension of said second accessory (20) along said second extension direction, said group (1) comprising a second length sensor (42) configured to detect the actual extension of said second accessory (20) along said second extension direction (302), and wherein when said second accessory (20) is installed in a lower position than that of said first accessory (10), said unit (50) calculates a minimum extension (L_{min}) for said first accessory (10) according to the formula:

$$L_{min} = \left[\frac{L_N sin(\beta)+A}{sin\alpha}\right] + L_S$$

in which:

- L_N is the extension of said second accessory (20) along said second extension direction (302);
- α is the angular position of said first accessory (10);
- β is the angular position of said second accessory (20);
- Ls is a constant.

13. A method for controlling a group of accessories for guiding and supporting pipes of an apparatus for waste collection and/or treatment, wherein said group (1) comprises:

- a first accessory (10) for said first pipe (11), said first accessory being rotatable about a first axis of rotation (101);
- first actuating means (14) configured to rotate said first accessory (10) about said first axis of rotation (101);
- a second accessory (20) for said second pipe, said second accessory (20) being rotatable about a second axis of rotation (102) substantially parallel to said first axis of rotation (101), said second axis of rotation (102) being fixed in space with respect to said first axis of rotation (101) at least during the rotation of said first accessory (10) and/or of said second accessory (20);
- second actuating means (24) configured to rotate said second accessory (20) about said second axis of rotation (102);

characterized in that said method comprises the steps of:

a) rotating said first accessory (10) about said first axis of rotation (101);
b) detecting the angular position (α) of said first accessory (10);
c) calculating the angular position (β) of said second accessory (20) as a function of said angular position (α) of said first accessory (10); and
d) rotating said second accessory (20) as a function of the value of the angular position (β) calculated for the second accessory (20).

14. A method according to claim 13, wherein the angular position (β) of said second accessory (20) is calculated by the formula:

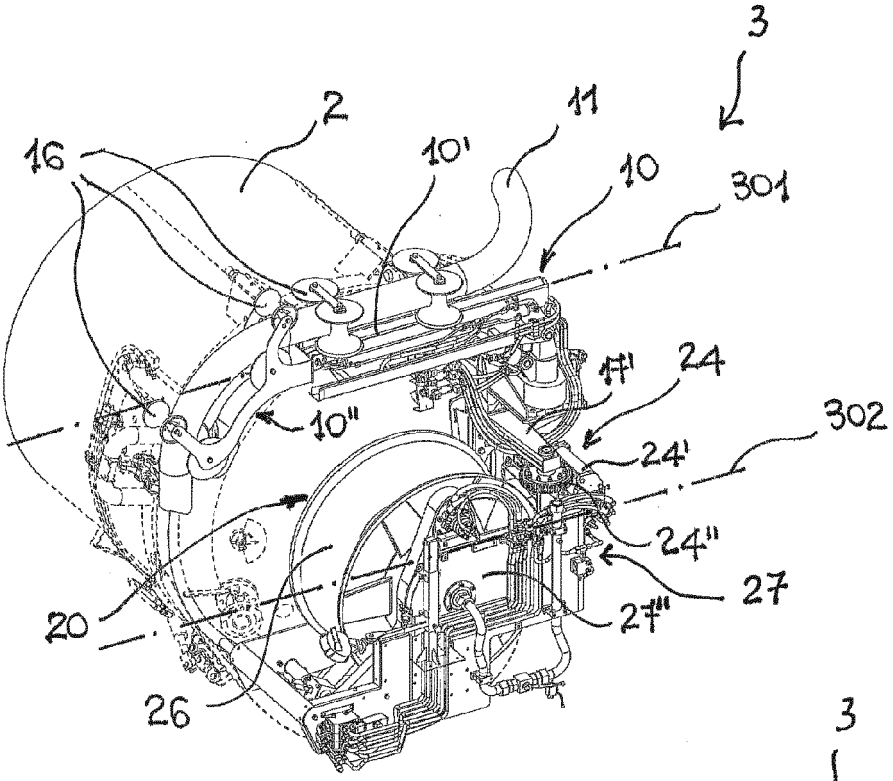
$$\beta = \tan^{-1}\left[\frac{(L * \sin\alpha) - A}{(L * \cos\alpha) - B}\right]$$

in which:

- α is the angular position of the first accessory (10);
- L is the extension of the first accessory (10) along said first extension direction (301) of said first accessory (10);
- B is the distance, measured along a first reference direction (401), between the position of the first axis of rotation (101) and the position of the

second axis of rotation (102);
- A is the distance, measured along a second reference direction (402), orthogonal to said first reference direction (401), between the first axis of rotation (101) and the second axis of rotation (102).

15. A method according to claim 13 or 14, wherein said accessories (10, 20) are rotated in the same direction if the relation B<L/2 is satisfied and in a discordant direction if the relation B>L/2 is satisfied, wherein B denotes the distance between said axes of rotation (101, 102) calculated along said first reference direction (401) and L is the extension of said first accessory (10) along an extension direction (301) of said first accessory (10).


3
2
11
16
10'
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301
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24
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302
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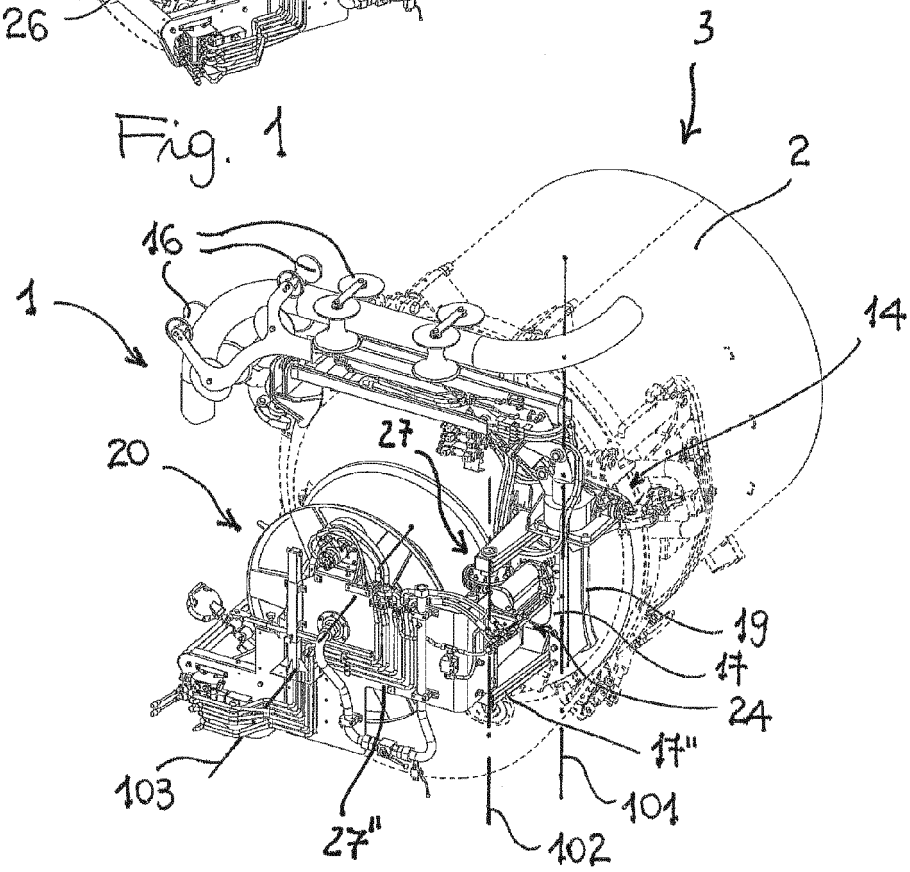
27
27"
20
26

Fig. 1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14
27
20
19
17
24
17"
103
101
27"
102

Fig. 2

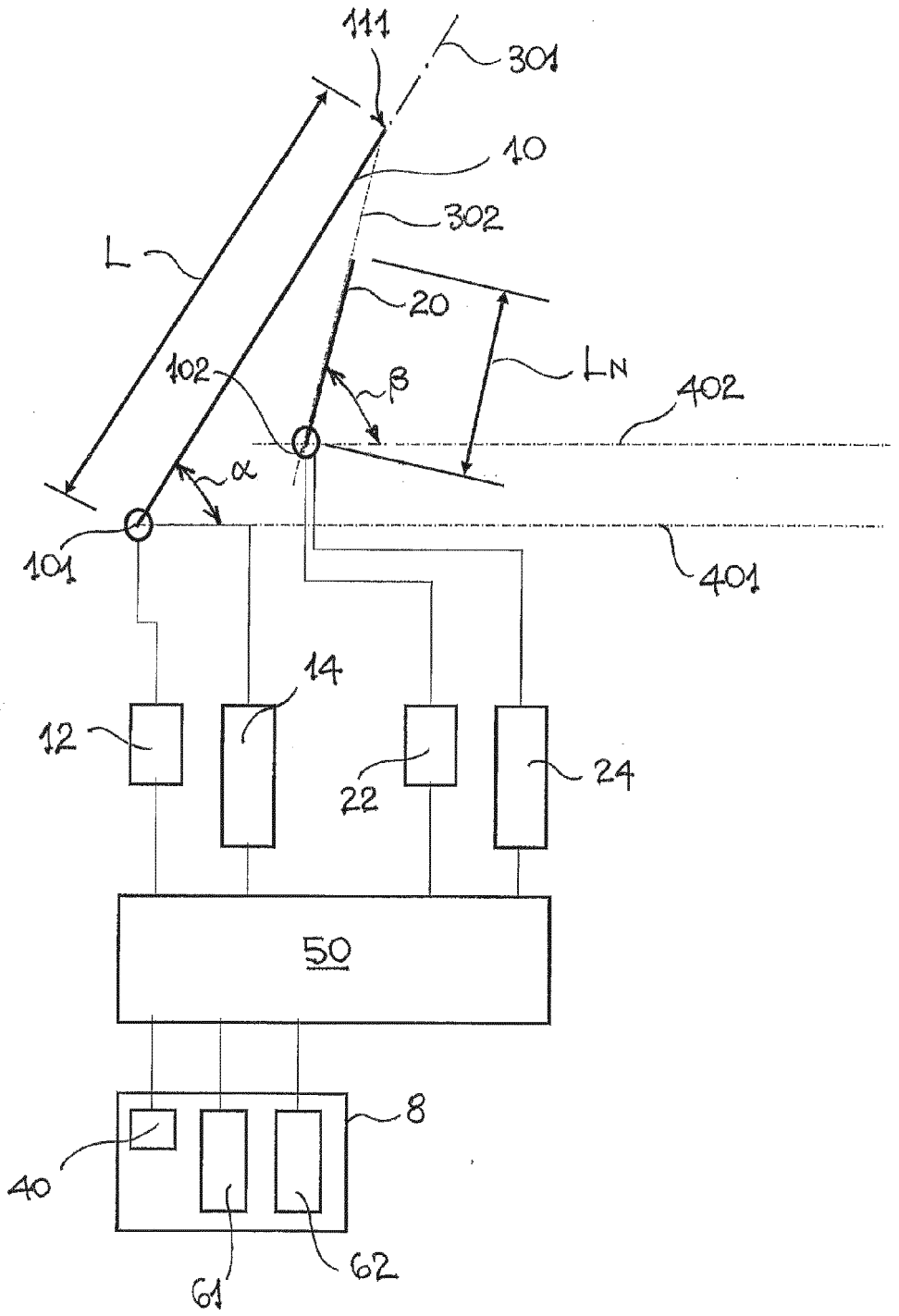

Fig. 3

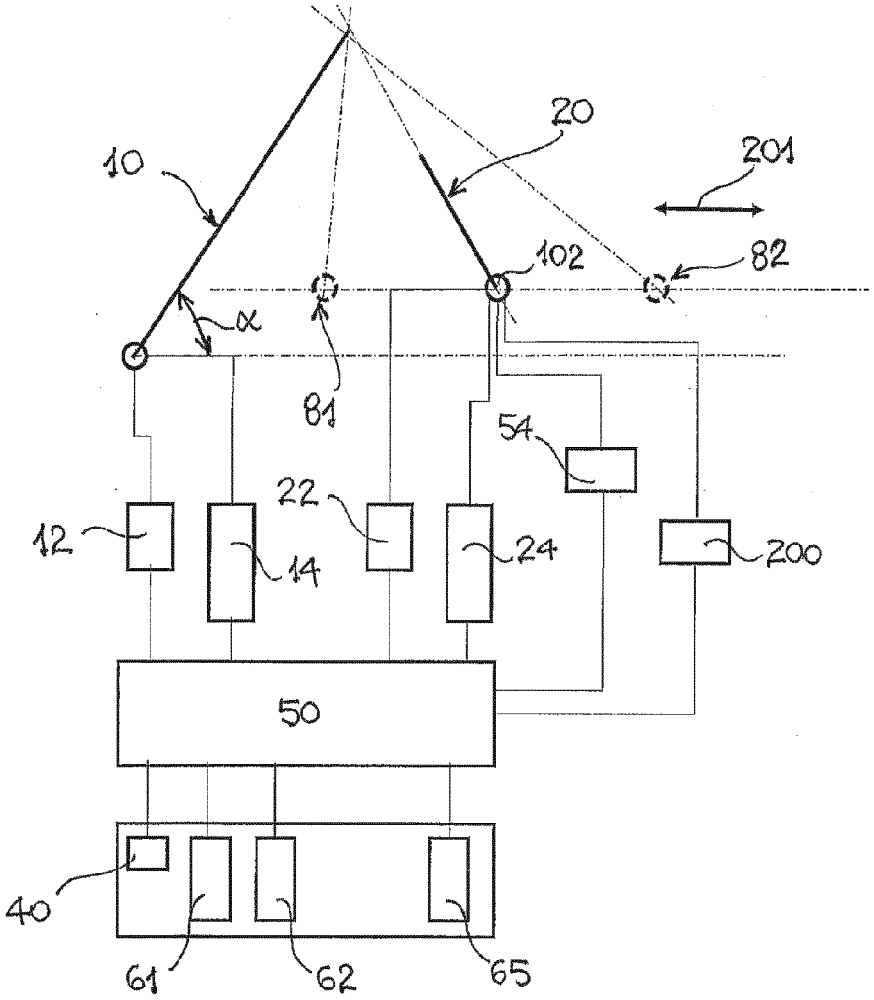

Fig. 4

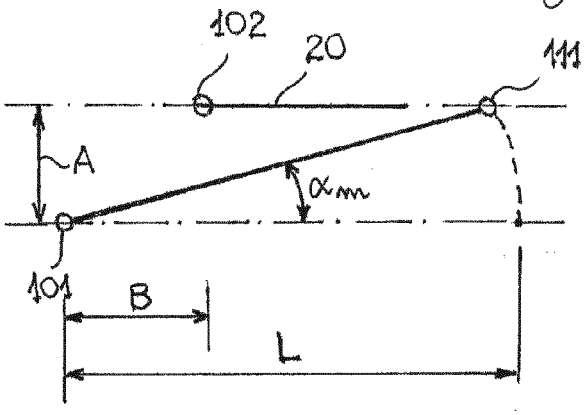

Fig. 5

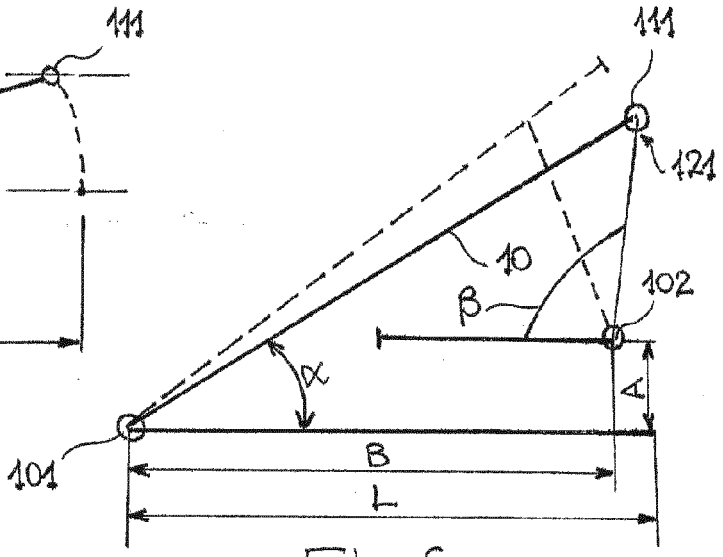

Fig. 6

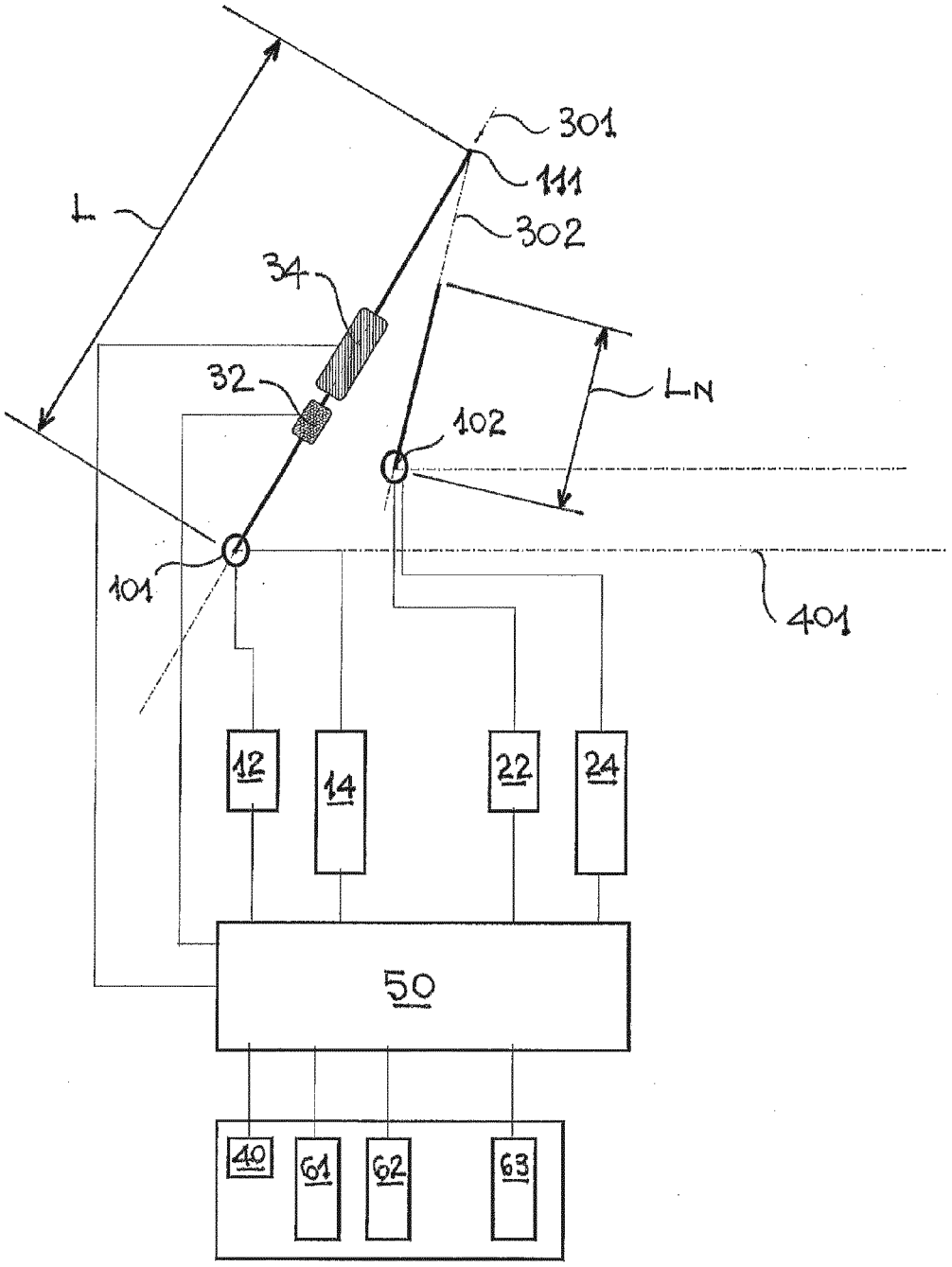

Fig. 7

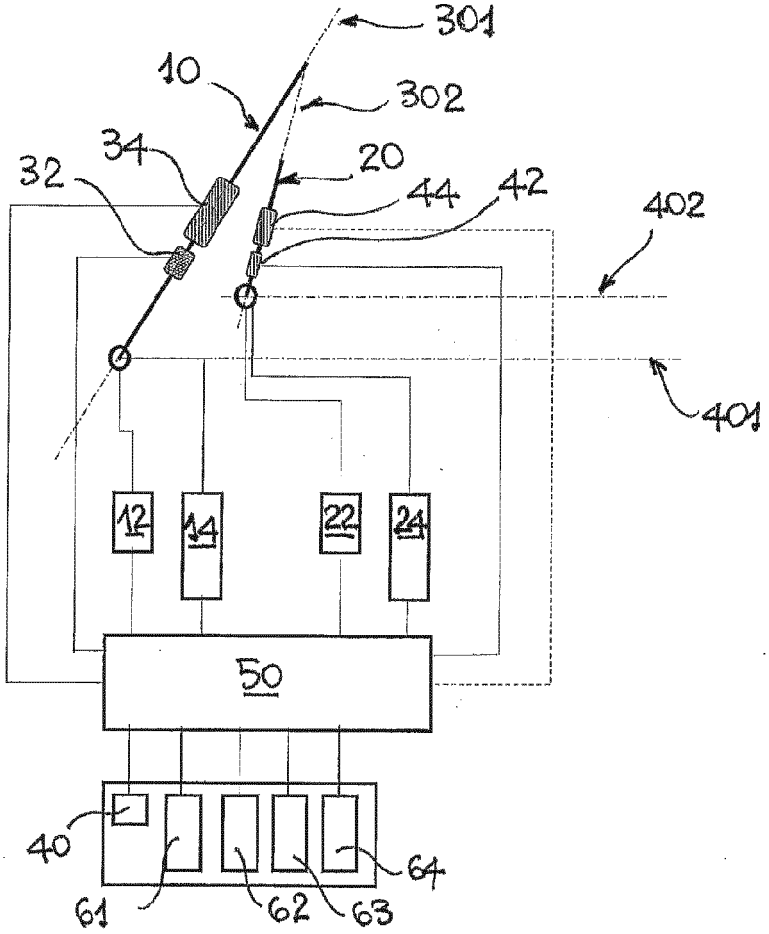

Fig. 8

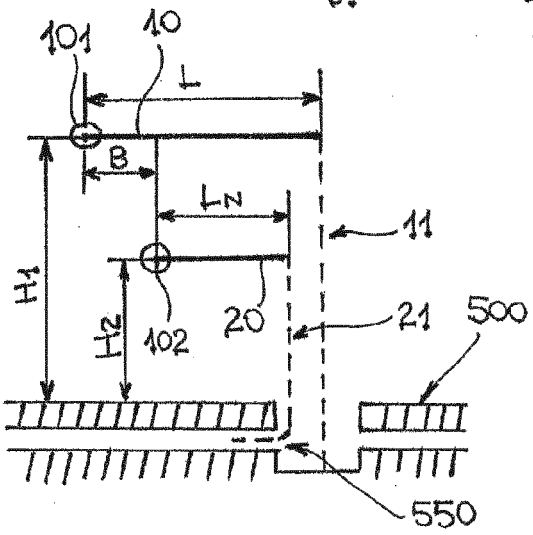

Fig. 9

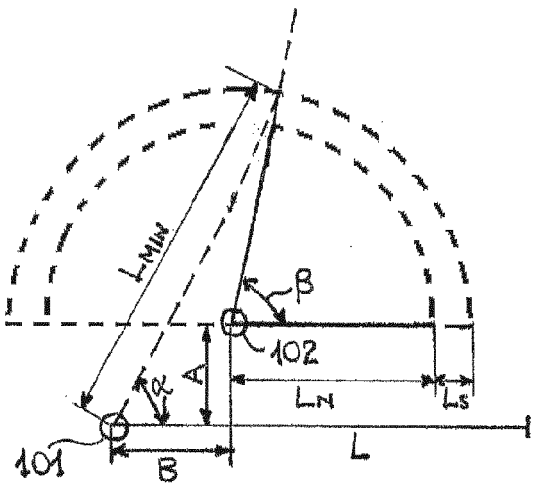

Fig. 10

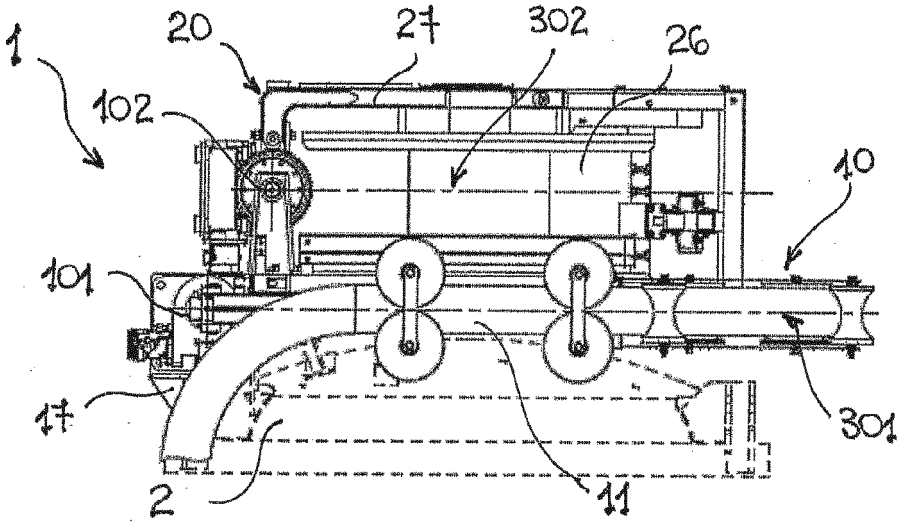

Fig. 11

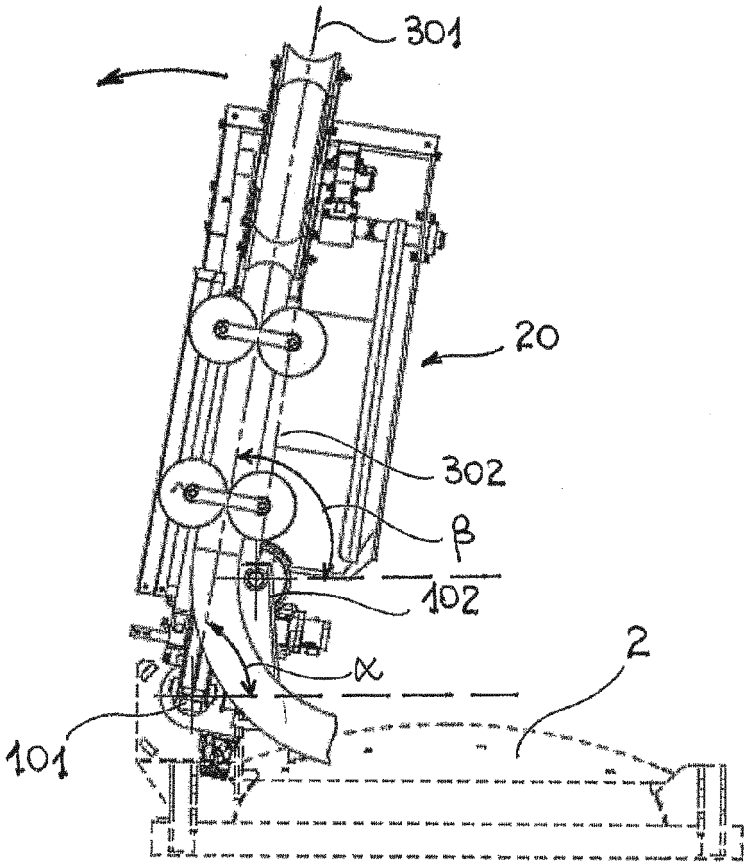

Fig. 12

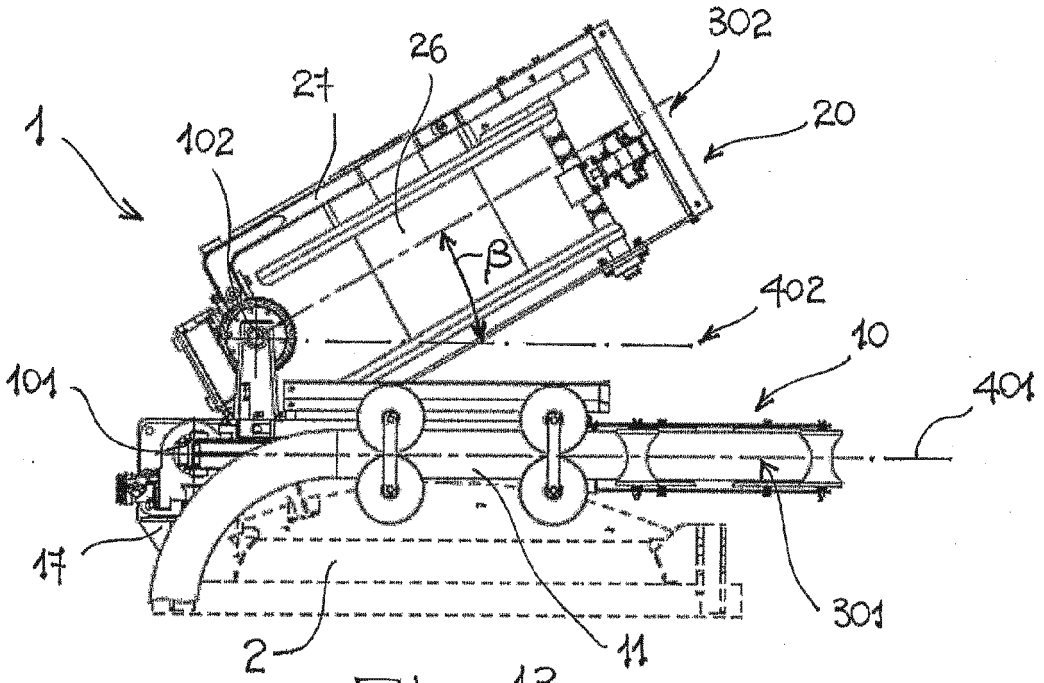
1
102
27
26
302
20
β
402
10
101
401
17
2
11
301

Fig. 13

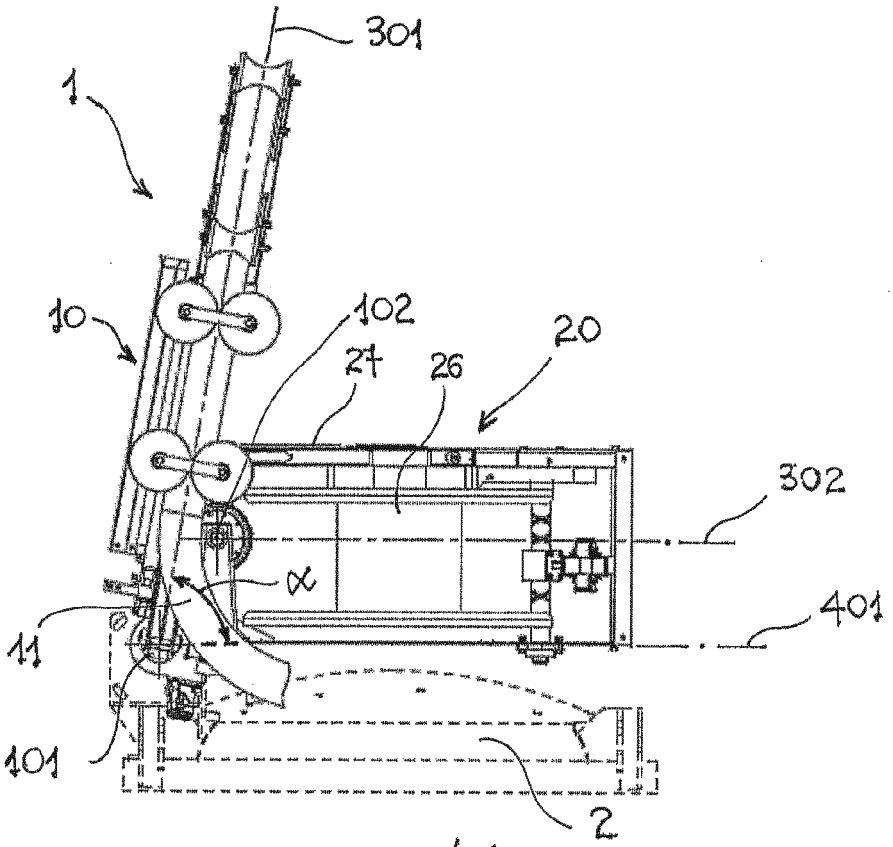
301
1
10
102
27
26
20
302
α
11
401
101
2

Fig. 14

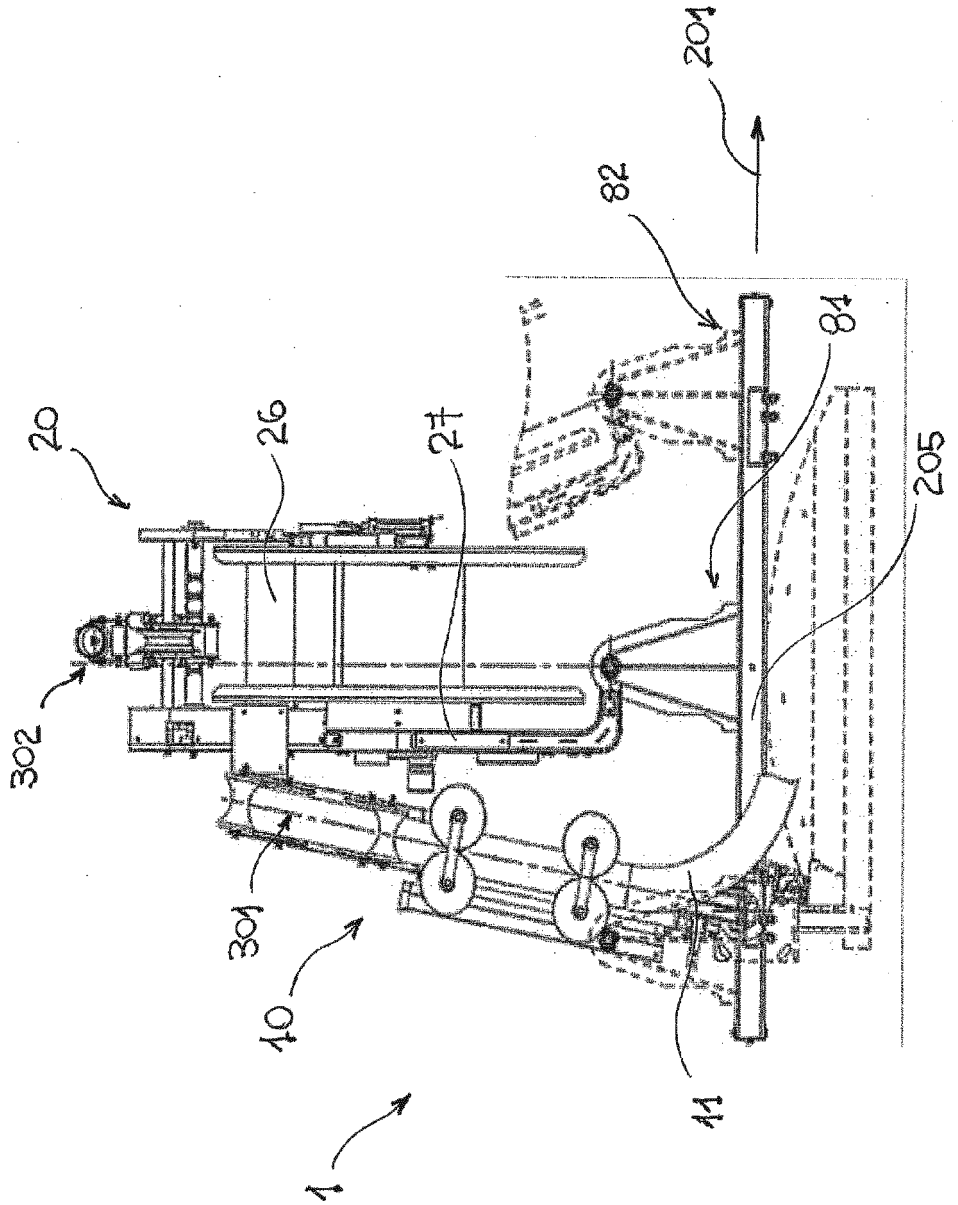

Fig. 15

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 16 15 9787

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 964 648 A1 (MONDINI ENGINEERING SA [CH]) 16 March 2012 (2012-03-16)	1	INV. B25J9/00
Y	* claims 1,11; figure 2 *	2-5	B65F3/02
A		6-15	B65F3/04 E03F7/10
Y	DE 20 2008 013050 U1 (ASSMANN PETER [DE]) 8 January 2009 (2009-01-08)	2-5	E03F7/00
A	* claim 1; figure 1 *	1,6-15	
Y	EP 2 803 604 A1 (HEIL CO [US]) 19 November 2014 (2014-11-19)	2-5	
A	* claims 1,2,4 *	1,6-15	
Y	US 5 071 307 A (CARSON WILLIAM S [US]) 10 December 1991 (1991-12-10)	2-5	
A	* claims 1,6; figures 7,9,10 *	1,6-15	
A	EP 1 050 634 A2 (CAPPELLOTTO S P A [IT]) 8 November 2000 (2000-11-08) * paragraph [0016] *	1-15	
Y	US 5 577 772 A (KAISER DIETMAR [AT]) 26 November 1996 (1996-11-26)	2-5	TECHNICAL FIELDS SEARCHED (IPC)
A	* the whole document *	1,6-15	B25J B65F A62C E03F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 July 2016	Devilers, Erick

CATEGORY OF CITED DOCUMENTS

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14-07-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2964648 A1	16-03-2012	CH 703732 A2	15-03-2012
		ES 2399498 A2	01-04-2013
		FR 2964648 A1	16-03-2012
DE 202008013050 U1	08-01-2009	DE 102009042687 A1	08-04-2010
		DE 202008013050 U1	08-01-2009
EP 2803604 A1	19-11-2014	AU 2014202671 A1	04-12-2014
		CA 2851938 A1	17-11-2014
		EP 2803604 A1	19-11-2014
		US 2014343801 A1	20-11-2014
US 5071307 A	10-12-1991	NONE	
EP 1050634 A2	08-11-2000	AT 287995 T	15-02-2005
		CA 2307731 A1	03-11-2000
		DE 60017632 D1	03-03-2005
		DE 60017632 T2	30-03-2006
		DK 1050634 T3	06-06-2005
		EP 1050634 A2	08-11-2000
		ES 2234473 T3	01-07-2005
		IT PD990091 A1	03-11-2000
		US 6438792 B1	27-08-2002
US 5577772 A	26-11-1996	AT 400053 B	25-09-1995
		DE 59409978 D1	10-01-2002
		EP 0663481 A1	19-07-1995
		JP H07206096 A	08-08-1995
		US 5577772 A	26-11-1996

EPO FORM P0459

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