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(54) **Vertical flow wrapper with an epicyclic gear**

(57) The present invention relates to a vertical flow-wrapper (1) comprising:
- a film-feed (4), which feeds the film from a reel (2) to a forming-unit,
- a forming-tube (5) and a forming-shoulder (6), which form a film (3) into a film-tube,
- longitudinal sealing means to seal the longitudinal edges of the tube together,
- cross-sealing means (7) to provide a cross-seal to the film-tube to produce individual packages and
- cutting means (7) to separate the individual packages from the film-tube

wherein the cross-sealing means and the cutting means (7) are moved together with the film-tube during sealing and /or cutting and are driven by a crank mechanism with an upper (8) and lower (9) dead center, wherein the position of the lower (9) dead center can be adjusted.

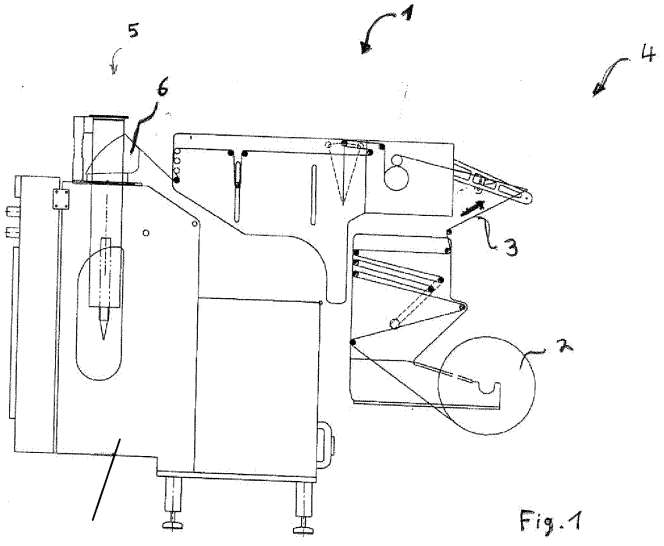

Fig.1

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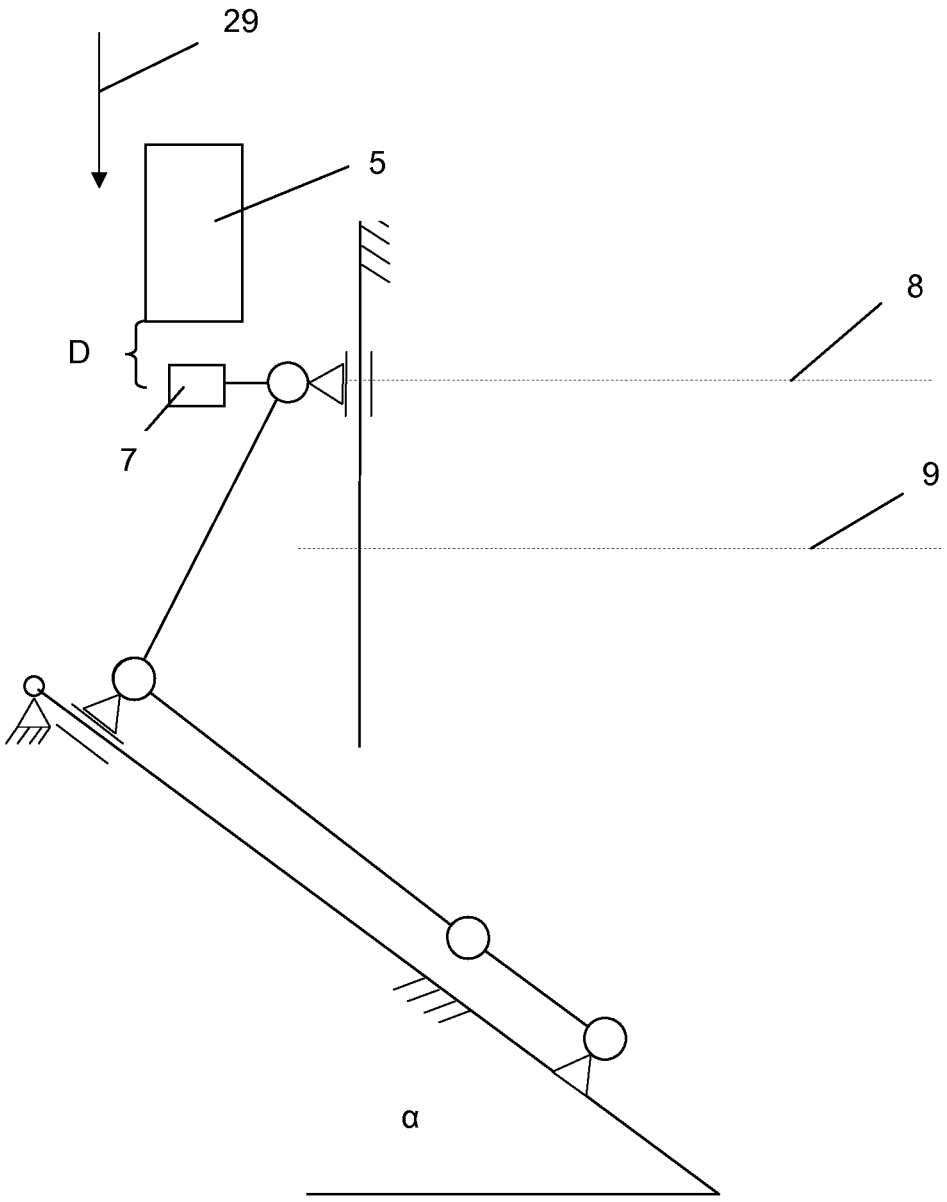

Fig. 2

Description

[0001] The present invention relates to a vertical flow-wrapper comprising:

- a film-feed, which feeds the film from a reel to a forming-unit,
- a forming-tube and a forming-shoulder, which form a film into a film-tube,
- longitudinal sealing means to seal the longitudinal edges of the film-tube together,
- cross-sealing means to provide a cross-seal to the film-tube to produce individual packages and
- cutting means to separate the individual packages from the film-tube,

wherein the cross-sealing means and the cutting means are moved together with the film tube during sealing and/or cutting and are driven by a crank-mechanism, with an upper- and a lower dead center.

[0002] This vertical flow wrapper is very well known to the person skilled of the art and is used, to form a web, for example a plastic film or a paper material, into a tube from which individual packages are produced. Nowadays, these wrappers need to be highly flexible in terms of the size and shape of the package to be produced as well as the material to be used.

[0003] It was therefore the objective of the present invention to provide a vertical flow wrapper that meets these requirements.

[0004] This objective is attained by a vertical flow-wrapper comprising:

- a film-feed, which feeds the film from a reel to a forming-unit,
- a forming-tube and a forming-shoulder, which form a film into a film-tube,
- longitudinal sealing means to seal the longitudinal edges of the film-tube together,
- cross-sealing means to provide a cross-seal to the film-tube to produce individual packages and
- cutting means to separate the individual packages from the film-tube,

wherein the cross-sealing means and the cutting means are moved together with the film-tube during sealing and/or cutting and are driven by a crank-mechanism, with an upper- and a lower dead center,
wherein a lever of the crank mechanism is mounted by a floating bearing on a ramp and reciprocates along the ramp during operation of the crank mechanism and wherein the inclination of the ramp is altered in order to change the position of the lower dead center.

[0005] The disclosure made regarding this subject matter of the present invention also applies to the other subject matters and vice versa. Subject matters disclosed regarding this subject matter can be combined with other subject matters and vice versa.

[0006] The present invention relates to a flow wrapper, which comprises a film feed, which feeds the film, for example a plastic film and/or a paper material from a reel to a forming unit. This forming unit comprises a forming tube and a forming shoulder which form the plane film into a tube. Subsequently, the longitudinal edges of the tube are sealed together by longitudinal sealing means. In a next step, the tube is filled with a packaging item and cross seals are provided to the tube to produce individually closed packages which are finally cut a part, wherein the cross seal is cut apart. The flow wrapper according to the present invention is operated with a continuously, semi-continuously or intermittently moving film and during sealing and/or cutting, the cross sealing means and/or the cutting means are moved together with the film tube.

[0007] According to the present invention, the cross sealing means, the cutting means and if needed forming means are driven by a crank-mechanism, with an upper- and a lower dead center, which transfers a rotational movement of a crank driven by a motor into an up and down movement of the means between the upper and the lower dead center. Preferably, the inventive flow wrapper also comprises forming means, for example to form gussets at the bottom and/or at the top of the package. This forming means are preferably also attached to the crank mechanism.

[0008] According to the present invention, a lever of the crank mechanism is mounted by a floating bearing on a ramp and reciprocates along the ramp during operation of the crank mechanism and wherein the inclination of the ramp is altered in order to change the position of the lower dead center. The angle α of the ramp can be altered between an angle > 0° and 90°, wherein the distance between the upper and the lower dead center increases with increasing angle α.

[0009] Preferably, the entire crank-mechanism can be rotated relative to a frame to adjust the angle of inclination of the ramp and hence the lower dead center. Even more preferred, the motor that drives the crank mechanism is rotated together with the crank mechanism. The crank mechanism and the motor that drives it are for example provided as one unit which can be rotated relative to the frame of the inventive flow wrapper. The adjustment of the inclination is preferably carried out by an electromotor, preferably motor that provides feed-back about the position of its drive shaft to a control unit, so that the control system always knows the exact position of the angle of inclination of the ramp. Examples for such a motor are a servo motor or a step motor.

[0010] The angle can be adjusted prior to the production of a bag to achieve the desired length of the package and/or the desired sealing time. However, the angle of inclination can also be adapted during operation, in order to adjust actual values of the package length and/or sealing time to set-values.

[0011] Another inventive or preferred embodiment of the present invention is a vertical flow wrapper, wherein

the distance between the upper dead center of the cross-sealing means and the lower end of the tube remains identical regardless of the length of the package and/or the sealing time. In other words, even though, the length of the package or the sealing time changes, the position of the upper dead center remains unchanged.

[0012] The disclosure made regarding this subject matter of the present invention also applies to the other subject matters and vice versa. Subject matters disclosed regarding this subject matter can be combined with other subject matters and vice versa.

[0013] This embodiment of the present invention has the advantage that the conditions to form the package as well as the dropping distance of the items filled into the respective package remain unchanged, even though, for example the sealing time or the length of the package is changed. Particularly in case in which the lower end of the forming tube is utilized to improve the forming, particularly folding of the package, the constant distance between the lower end of the forming tube and the upper dead center is particularly important.

[0014] Another preferred or inventive embodiment of the present invention is a vertical flow-wrapper, wherein the crank mechanism is a epicyclic gear.

[0015] The disclosure made regarding this subject matter of the present invention also applies to the other subject matters and vice versa. Subject matters disclosed regarding this subject matter can be combined with other subject matters and vice versa.

[0016] The motor that drives the crank is preferably an electromotor, more preferably a servo motor or a step motor. In case the floating bearing is moved relative to the frame, this is preferably also done by an electromotor, more preferably, a servo motor or a step motor.

[0017] Yet another preferred or inventive embodiment of the present invention is a vertical flow wrapper wherein the motor that drives the crank mechanism also changes the inclination of the ramp.

[0018] The disclosure made regarding this subject matter of the present invention also applies to the other subject matters and vice versa. Subject matters disclosed regarding this subject matter can be combined with other subject matters and vice versa.

[0019] This embodiment of the present invention has the advantage, that only one motor is needed to drive the crank mechanism and to change the position of the lower dead center.

[0020] Preferably, the inventive flow wrapper comprises means to reversibly fix the ramp and/or the cross sealing- and/or cutting means in a vertical position. The fixation can be used to adjust the lower dead center of the crank mechanism.

[0021] Another subject matter of the present invention is a method to continuously or semi continuously produce a package by applying a longitudinal seal with longitudinal sealing means and a cross-seal with cross sealing means to a tube made from a plane film and by cutting the package off the film by cutting means, wherein the cross sealing means and the cutting means are moved during sealing and cutting by a crank mechanism comprising a lever, wherein that the length of a package and/or the sealing time of the cross sealing means is adjusted by changing the inclination of the ramp.

[0022] The disclosure made regarding this subject matter of the present invention also applies to the other subject matters and vice versa. Subject matters disclosed regarding this subject matter can be combined with other subject matters and vice versa.

[0023] According to the present invention, the cross sealing means, the cutting means and if needed forming means are driven by a crank-mechanism, with an upper- and a lower dead center, which transfers a rotational movement of a motor into an up and down movement of the means between the upper and the lower dead center. Preferably, the inventive flow wrapper also comprises forming means, for example to form gussets at the bottom and/or at the top of the package. This forming means are preferably also attached to the crank mechanism.

[0024] According to the present invention, a lever of the crank mechanism is mounted by a floating bearing on a ramp and reciprocates along the ramp during operation of the crank mechanism and wherein the inclination of the ramp is altered in order to change the position of the lower dead center. The angle α of the ramp can be altered between an angle > 0° and 90°, wherein the distance between the upper and the lower dead center increases with increasing angle α.

[0025] According to a preferred embodiment of the inventive method, the distance between the upper dead center of the cross-sealing means and the lower end of the tube remains identical regardless of the length of the package and/or the sealing time. In other words, even though, the length of the package or the sealing time changes, the position of the upper dead center remains unchanged. Hence, during alteration of the angle of inclination of the ramp, one end of a lever is preferably shifted relative to the ramp.

[0026] Preferably, the crank mechanism comprises a motor and that the rotational position of the output of the motor is determined. This preferred embodiment of the present invention allows an exact control of the inventive method or the inventive flow wrapper, because the exact position of the cross sealing-, cutting- and/or forming means is always known and/or the motion of these means can be controlled exactly.

[0027] Preferably, the angle of inclination of the ramp is controlled by the control system of the inventive flow wrapper.

[0028] According to an inventive or a preferred embodiment of the inventive method, the upper dead center of the crank mechanism is maintained constant and only the lower dead center is altered in order to change the length of a package and/or the sealing time.

[0029] According to a preferred embodiment of the present invention, the ramp is pivotable around a pivot bearing and that the crank mechanism comprises a lever

with one end being pivotably mounted at a floating bearing, which reciprocates along the ramp during the operation of the crank mechanism, wherein, for the maintenance of the upper dead center, the axis of rotation of the pivot bearing and the axis of rotation of the pivot bearing at the floating bearing are maintained coaxially. This embodiment of the present invention has the advantage that the upper dead center of the crank mechanism remains unchanged during the alteration of the inclination of the ramp.

[0030] According to yet another preferred or inventive embodiment of the present invention, the inclination is adjusted by the same motor that drives the crank mechanism.

[0031] The disclosure made regarding this subject matter of the present invention also applies to the other subject matters and vice versa. Subject matters disclosed regarding this subject matter can be combined with other subject matters and vice versa.

[0032] The invention is now explained according to figures 1 - 4. These explanations do not limit the scope of protection. The explanations are applicable for all inventions of the present application, respectively.

Figure 1	shows the inventive flow wrapper.
Figures 2 and 3	show a first embodiment of the crank mechanism.
Fig. 4	shows a package.

[0033] Figure 1 shows the inventive flow wrapper 1 with a frame 27. A film 3, for example a plastic film or a paper material is unrolled from a reel 2 and transported by means of a film feed 4 to a forming unit, which comprises a forming-shoulder 6 and a forming tube 5 which form the plane film 3 into a tube 12, whose edges are subsequently sealed together by a longitudinal seal. The tube is then filled with the packaging-item and provided with cross seals by a cross sealing means 7. These packages, for example pouches or doy style bags, are then cut apart by a cutting means 7. In case that the package shall have gussets, forming means are also needed. The flow wrapper according to the present invention operates continuously or semi continuously, i.e. the film moves continuously or intermittently. The movement of the film tube can be utilized with drive means, which are, in most cases, provided next to the tube up stream from the means 7 and/or the means 7, particularly the sealing means can be used to pull the film tube down. Consequently, the cross sealing means 7, the cutting means and/or the forming means 7 have to be moved at least when they are in contact with the moving tube. This is utilized by a crank mechanism 23 which reciprocates the means 7 between an upper dead center 8 and a lower dead center 9. The distance between the upper and the lower dead center determines the length of the length X of the package and/or the sealing time.

[0034] A first inventive embodiment of this crank mechanism 23 is shown in Figures 2 and 3. A rotating motor 14 with a crank, for example an electro motor, particularly a servo motor, which sends a signal to a control unit about the current position of the drive shaft of the motor, is connected via a pivot bearing 11 with the first end of a first lever15. The second end of the first lever 15 is connected via a pivot bearing 11 to a floating bearing 12, which can move relative to a ramp 13 during the operation of the crank mechanism. The motor 14 moves the second bearing 12 up and down the ramp 13. This ramp 13 is provided at an angle α relative to a horizontal plane wherein α is larger than 0° and smaller than 90°. The angle α is adjustable and the inventive flow wrapper preferably comprises means (not depicted) to fix the ramp in a certain desired angle α for example during operation of the crank mechanism. The second end of lever 15 is connected via another pivot bearing to the first end of a second lever 16, whose second end is mounted via pivot bearing 11 to a floating bearing 27, which moves along a plane 10 fixed to the frame 17 of the flow wrapper, which is in the present case provided vertically. Preferably the inventive flow wrapper comprises means to fix the bearing 27 in a certain vertical position. However, during operation of the crank mechanism, this means is not activated. The second end of lever 16 and/or the bearing 27 are also directly or indirectly connected to the means 7. Due to the motion of the crank mechanism 23, the means 7 are reciprocated between the upper- and the lower dead center 8, 9 as depicted by double arrow 19. The lower dead center is adjusted by changing the angle of inclination α of the ramp 13, between an angle >0° and 90°, wherein the distance between the upper dead center 8 and the lower dead center 9 increases with increasing angle α. In order to adjust this angle, the ramp 13 is preferably pivotable around a bearing 20, preferably a fixed bearing connected to the frame of the inventive flow wrapper. Preferably, the bearing 12, the first lever 15 and the motor 14 are all provide such that they can be pivoted together. Preferably, regardless of the angle α, the distance D between the upper dead center 8 and the lower end of the forming tube 5 remains always constant. Only the position of the lower dead center 9 and hence the distance between the upper- and the lower dead center 9 is altered. This is particularly advantageous for example for packages which are not only sealed and cut but which are further formed by forming means, for example provided with one or more gussets, and wherein the forming means cooperate with the lower end of the forming tube. Hence, during the adjustment of the angel α, the floating bearing 12 moves relative to the plane 13. By increasing this angle, the distance between the upper dead center and the lower dead center has been reduced. The position of the upper dead center 8 however remains unchanged. As long as the same filling tube will be used, the distance D remains unchanged.

[0035] In order to maintain the upper dead center 8 always in the same position, the pivot axis 11 at the bear-

ing 12 and the pivot axis 28 at the bearing 28 have to be coaxially, i.e. in Figures 2 and 3, they have to be provided behind each other relative to the paper plane.

[0036] According to a preferred or inventive embodiment of the present invention, the motor 14 is not only utilized to drive the crank mechanism 23 but also to adjust the angle α to a new lower dead center 9. This is, for example, carried out as follows: The bearing 27 and/or the means 7 is moved to the new lower dead center 9 and then fixed in this position. This takes place while the angle α is fixed so that it can not be changed unintentionally. Subsequently, the means to fix the angle α are loosened and the motor 14 is rotated until the bearing 12 is in its lower dead center, which is in the present case the dead center on the right hand side. During this movement, the angle α changes and as soon as this lower dead center has been reached, the ramp is adjusted to the desired angle α and the ramp 13 is fixed in this position. Finally, the fixation of the bearing 27 is released again and the operation of the crank mechanism can start again. This procedure can be carried out automatically by the control system of the inventive flow wrapper. The operator only needs to provide the desired length X of the package and/or the desired sealing time. The person skilled in the art understands, that the bearing 27 need not be fixed at its lower dead center, but can be fixed at any other vertical position. The corresponding angular position of the crank of the motor 14 is, for example, stored in the control system of the flow wrapper and the crank of the motor is driven to this position. This also allows the exact adjustment of the angle α of the ramp 13.

[0037] Figure 4 shows an example of a package 26 which can be produced with the inventive vertical flow wrapper. The package is made from a plastic film whose ends are sealed together by the longitudinal seal 25. The top and the bottom of the package are closed by a cross seal 24, respectively. The length of the package can be altered by moving the lower dead cent away or towards the upper dead center parallel to the motion of the film tube. The same is true for the sealing time.

List of reference signs:

[0038]

1	Vertical Flow-wrapper
2	Reel
3	Film, plastic film, paper
4	Film-feed
5	Forming-tube
6	Forming shoulder
7	Cross sealing means, cutting means and/or forming means
8	Upper dead center
9	Lower dead center
10	Guiding means
11	Pivot bearing
12	Floating bearing
13	Plane, ramp
14	Rotating motor
15	First lever
16	Second lever
17	Machine frame
18	Movement of the floating bearing 12
19	Movement of the cross sealing means 7 and cutting means 8
20	Fixed bearing
21	Connection between the first lever 15 and the ramp 13
22	Motion of the film tube
23	Crank mechanism
24	Cross seal
25	Longitudinal seal
26	Package
27	Floating bearing
28	Pivot bearing at the bearing 20
D	distance between lower end of the tube and upper dead center
α	angel of inclination >0° < 90°
X	length of the packaging

Claims

1. Vertical flow wrapper (1) comprising:

- a film-feed (4), which feeds the film from a reel (2) to a forming-unit,
- a forming-tube (5) and a forming-shoulder (6), which form a film (3) into a film-tube,
- longitudinal sealing means to seal the longitudinal edges of the film-tube together,
- cross-sealing means (7) to provide a cross-seal to the film-tube to produce individual packages and
- cutting means (7) to separate the individual packages from the film-tube, wherein the cross-sealing means (7) and the cutting means (7) are moved together with the film-tube during sealing and/or cutting and are driven by a crank-mechanism (23), with an upper- and a lower dead center (8, 9), **characterized in, that** a lever (15, 16) of the crank mechanism (23) is mounted by a floating bearing (12) on a ramp (13) and reciprocates along the ramp (13) during operation of the crank mechanism (23) and wherein the inclination (α) of the ramp (13) is altered in order to change the position of the lower dead center (9).

2. Vertical flow wrapper (1) according to claim 1 or the preamble of claim 1, **characterized in, that** the crank-mechanism can be rotated relative to a frame (17) to adjust the lower dead center.

3. Vertical flow wrapper (1) according to claim 2, that

the motor (14) that drives the crank mechanism (23) is rotated together with the crank mechanism.

4. Vertical flow wrapper (1) according to one of the preceding claims or the preamble of claim 1, **characterized in, that** the distance (D) between the upper dead center of the cross-sealing means and the lower end of the tube remains identical regardless of the length of the package and/or the sealing time.

5. Vertical flow wrapper (1) according to claim 4, **characterized in, that** the ramp (13) is pivotable around a pivot bearing (28) and that one end of a lever (15) is mounted with a pivot bearing (11) at a floating bearing (12) which reciprocates at the ramp (13) during operation of the crank mechanism (23), wherein the axis of rotation of the two pivot bearings (28, 11) are provided coaxially to maintain an identical upper dead center (8) of the crank mechanism regardless of the inclination (α) of the ramp (13).

6. Vertical flow wrapper (1) according to one of the preceding claims or the preamble of claim 1, **characterized in, that** crank mechanism is an epicyclic gear.

7. Vertical flow wrapper (1) according to one of the preceding claims or the preamble of claim 1, **characterized in, that** the motor (14) that drives the crank mechanism also changes the inclination (α) of the ramp (13).

8. Method to produce a package (26) by applying a longitudinal seal (25) with longitudinal sealing means and a cross-seal (24) with cross sealing means (7) to a tube made from a plane film (3) and by cutting the package off the film (3) by cutting means (8), wherein the cross sealing means and the cutting means are moved during sealing and cutting by a crank mechanism (23) comprising a lever (16), which is mounted on a ramp (13), **characterized in, that** the length (X) of a package and/or the sealing time of the cross sealing means (8) is adjusted by changing the inclination (α) of the ramp.

9. Method according to claim 8, **characterized in that** the lever (16) reciprocates along the ramp (13)

10. Method according to one of claims 8 or 9, **characterized in, that** the crank mechanism comprises a motor (14) and that the rotational position of the output of the motor (14) is determined.

11. Method according to claims 8 - 10, **characterized in, that** the inclination (α) of the ramp (13) is determined.

12. Method according to one of the preceding claims, **characterized in, that** the upper dead center (8) of the crank mechanism is maintained constant and only the lower dead center (9) is altered.

13. Method according to claim 12, **characterized in, that** together with the ramp, at least one lever (15) and the motor (14) are shifted.

14. Method according to claims 8 - 13, **characterized in, that** the ramp (13) is pivotable around a pivot bearing (28) and that the crank mechanism comprises a lever (15) with one end being pivotably mounted at a floating bearing (12), wherein, during the adjustment of the angle of inclination of the ramp (13), the axis of rotation of the pivot bearing (28) and the axis of rotation of the pivot bearing (11) at the floating bearing (12) are maintained coaxially.

15. Method according to claims 8 - 14, **characterized in, that** the inclination (α) is adjusted by the same motor (14) that drives the crank mechanism.

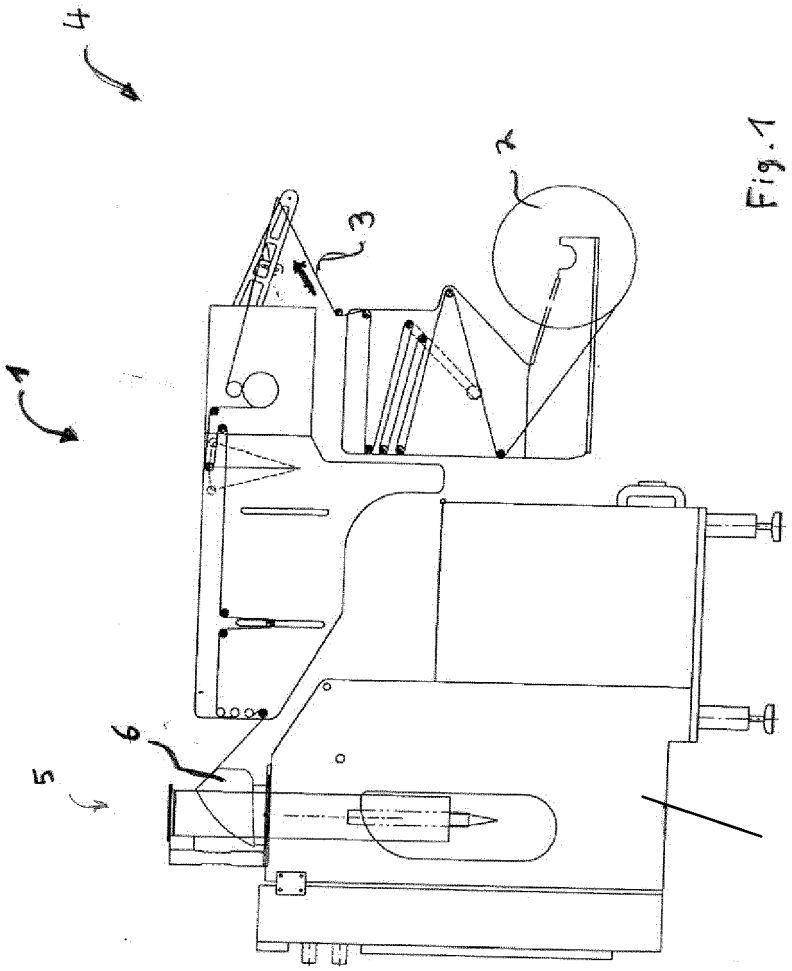

Fig. 1

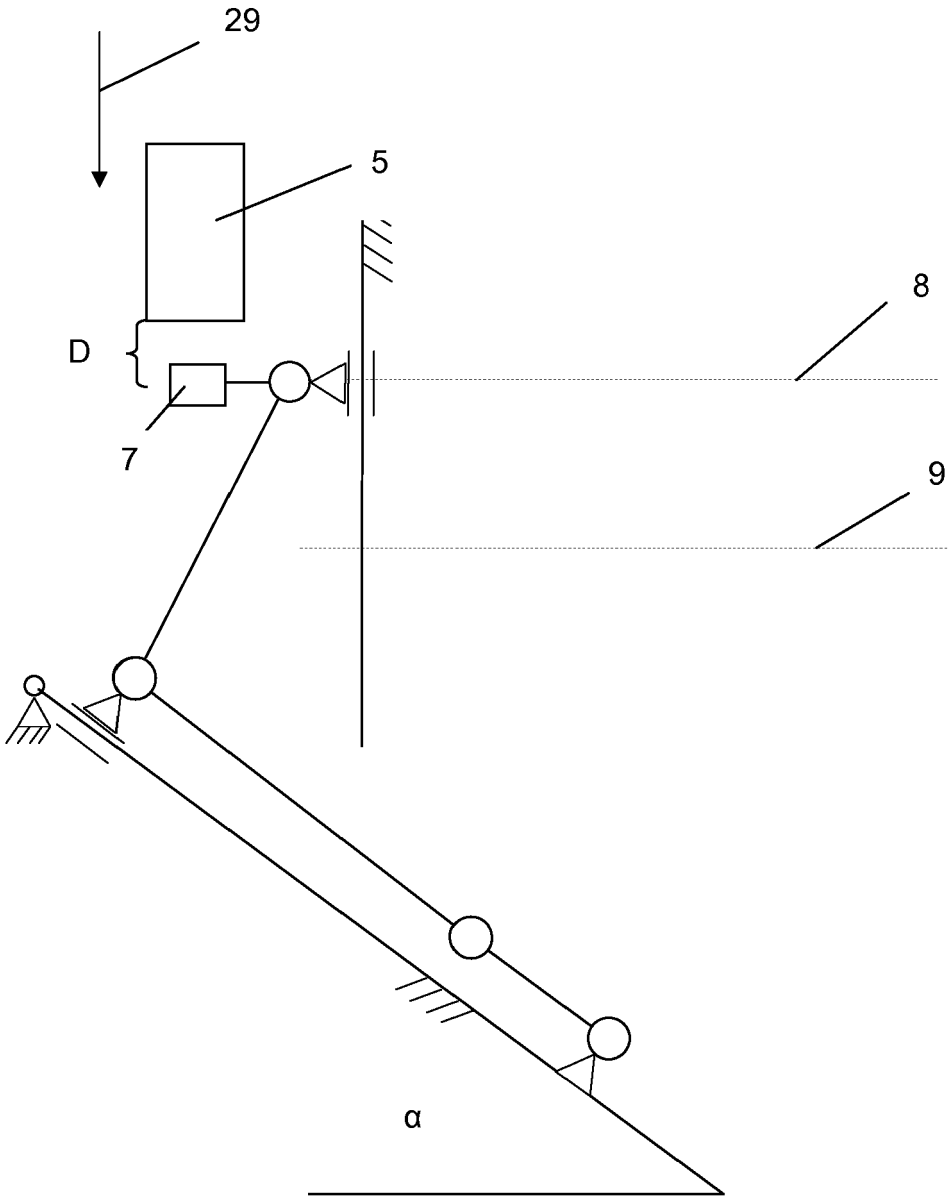

Fig. 2

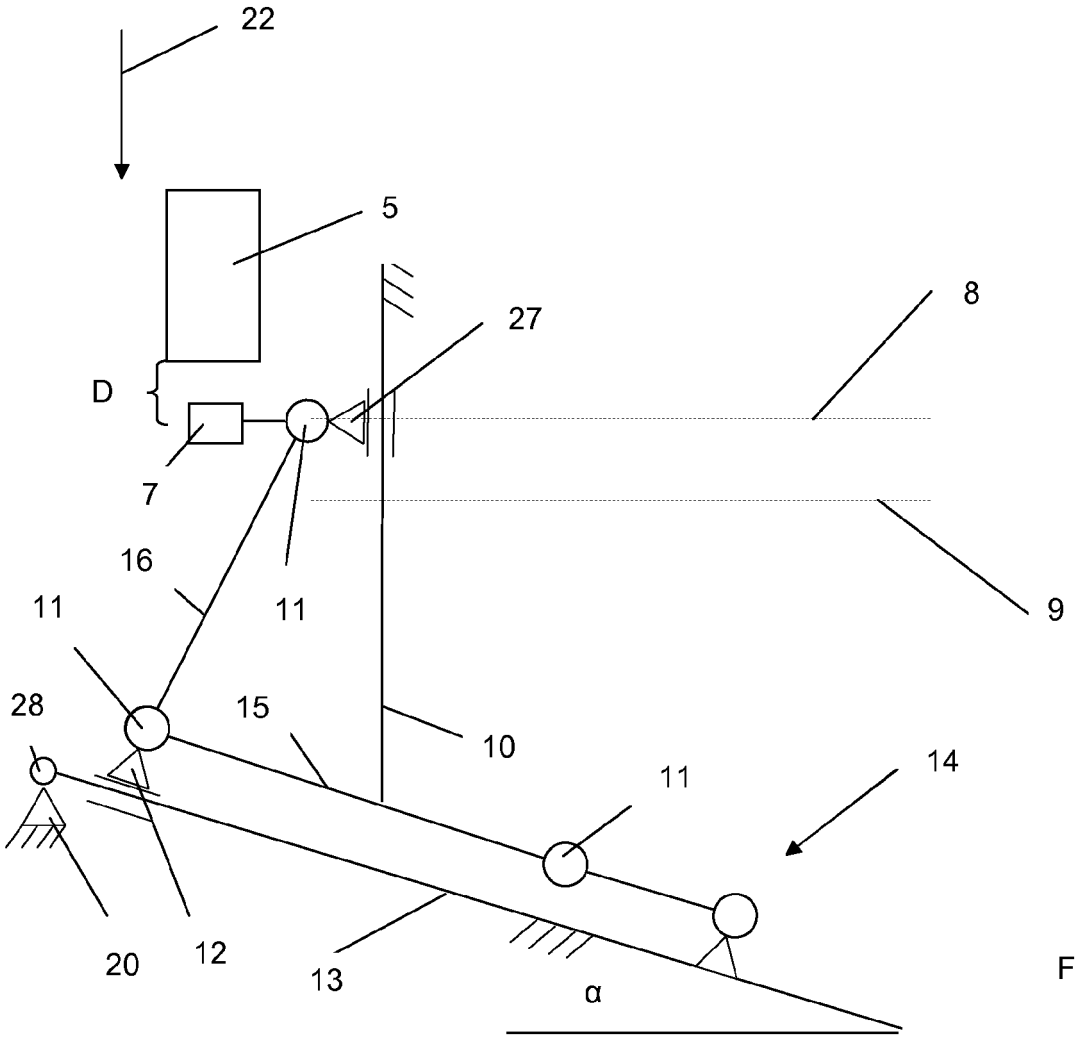

Fig. 3

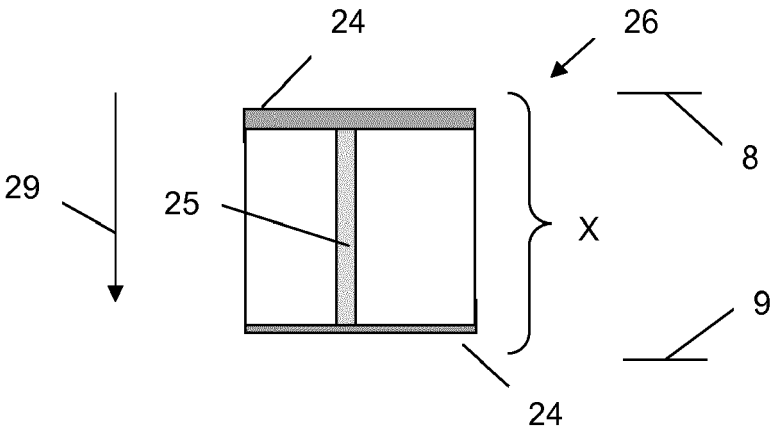

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 15 15 8610

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)
B29C
B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 May 2015	Vassoille, Philippe

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