(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 493 670 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
05.01.2005 Bulletin 2005/01

(51) Int Cl.[7]: **B65B 43/18**

(21) Application number: **04101725.2**

(22) Date of filing: **26.04.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(30) Priority: **03.07.2003 IT SV20030030**

(71) Applicant: **SASIB S.p.A.**
40128 Bologna (IT)

(72) Inventor: **Spada, Walter**
40043 Marzabotto (BO) (IT)

(74) Representative:
Karaghiosoff, Giorgio Alessandro, Dr.
Studio Karaghiosoff e Frizzi S.a.S.,
Via Pecorile 25
17015 Celle Ligure (SV) (IT)

(54) Method and apparatus for unstacking and feeding blanks, particularly to a packaging machine.

(57) The invention addresses a feeder of blanks (1) made of cardboard or the like, which are fed in stacks (P) composed of a predetermined number of identical and congruently superimposed blanks (1), which feeder is composed of a feed magazine (2) and a feed hopper (3), which forms an extension of the magazine (2), the magazine (2) and the hopper (3) being oriented with their axes parallel to the direction of feed of the blanks (1) that are oriented downward with respect to the horizontal plane, each of which blanks (1) has at least two oppositely projecting portions (101), which are designed to lie on lateral slide guides provided within the magazine (2). According to the invention, said lateral guides consist of at least two parallel toothed belts (4, 4'), for transporting the blanks (1), which belts support the lower edges of the projecting portions (101) thereof, there being provided means (6) for synchronously driving the two belts (4, 4') toward the hopper (3). The invention also relates to a feeder which comprises means for breaking up the stacks of blanks (1). Such break-up is obtained by providing that the hopper (3) has a steeper slope than the magazine (2), with respect to the horizontal plane, and that the blanks (1) are guided along an arched path extending between the exit (102) of the magazine (2) and the entry (103) of the hopper (3) which causes them to open out in a fan shape.

EP 1 493 670 A1

Description

[0001] The invention addresses a blank feeder, particularly to a packaging machine, which blanks are made of cardboard or the like and are fed in stacks, composed of a predetermined number of identical, congruently superimposed blanks, which feeder is composed of a feed magazine and a feed hopper, which forms the extension of the feed magazine, the feed magazine and the feed hopper being oriented with their axes parallel to the feed direction of the blanks, that are oriented downward with respect to the horizontal plane, each of which blanks has at least two oppositely projecting portions, which are designed to lie on lateral slide guides provided within the feed magazine, the feed magazine and/or the feed hopper having a plurality of guides for laterally retaining the blanks and maintaining the alignment thereof.

[0002] Prior art feeders of the above mentioned type generally have at least one pair of inclined blank supporting guides within the feed magazine, the blanks being fed to the hopper substantially by being slid therein by gravity. This arrangement may have the drawback of an excessive load of blanks on the hopper, which is designed to contain a controlled, substantially constant number of blanks, generally smaller than the number of blanks contained in the feed magazine, which acts as a storage. If the blanks exert an excessive pressure on the hopper, two or more blanks may be undesirably withdrawn, instead of one, by the means for transferring the blanks to other means, which are in turn designed to transfer the blanks to the forming and packing units. It shall be noted that the stack of blanks may have a relatively large size and weight. Furthermore, stacked blank die cutting facilitates adhesion between blanks, and this drawback is aggravated by the relatively large weight loaded thereon, at least within the feed magazine. In order to obviate such drawback, blanks are continuously fed in small amounts to the feed magazine, so as to reduce the weight loaded on the blanks and on the feed hopper. However, this requires a continuous and careful presence of a machine loading operator. Certain types of feeders include automatic blank feed separating systems, which are generally very complex and expensive devices.

[0003] Therefore, this invention has the object of obviating the above drawbacks and to provide, by using simple and inexpensive means, a feeder like the one described hereinbefore, wherein such arrangements are provided that the feed hopper is not loaded with an excessive weight of blanks, without requiring too frequent interventions by the operators, and while ensuring a certain hopper loading continuity, which may be further adjusted and calibrated depending on the machine emptying level.

[0004] The invention fulfils the above objects by providing a feeder such as the one described hereinbefore, wherein the lateral blank slipping or sliding or transporting guides situated in the feed magazine consist of at least two parallel blank conveyor belts, on which the lower edges of the projecting portions lie at least partly. Each of said belts may have, on its outer surface, a plurality of blank retaining and slip preventing projections. Also, means may be provided for synchronously driving the two belts in the feed hopper direction.

[0005] In accordance with a preferred embodiment, to be described in greater detail in the description of the drawings, these retaining projections may consist of a succession of identical, equally spaced teeth, whereas each trough between each pair of adjacent teeth may have a predetermined width, adapted to accommodate at least one, preferably a subset of blanks, composed of a predetermined number of superimposed blanks.

[0006] The ridge of each of the teeth may have a predetermined width, adapted to accommodate at least one, preferably a subset of blanks, composed of a predetermined number of superimposed blanks.

[0007] In the above mentioned preferred embodiment, each of the tooth ridges may have a flat surface. Thanks to these arrangements, each subset of blanks lying over each tooth is retained by the subset of blanks immediately downstream therefrom, which gets into the adjacent trough by gravity. Hence, the blanks are retained all along the feed magazine.

[0008] The means for driving each belt may consist of at least one pair of pulleys, at least one whereof is motor-driven or dynamically connected to a power unit, the belt being returned around said pulleys. The axis of rotation of each pulley of one belt may be coaxial to the axis of rotation of the corresponding pulley of the other belt.

[0009] According to a highly advantageous preferred embodiment, each belt may be returned around three pulleys disposed at the vertices of an ideal triangle, particularly a right triangle. A first idler pulley may be placed at the entry of the feed hopper, a second motor-driven pulley may be placed downstream therefrom, with reference to the blank feed direction, and be on the same horizontal plane as the first pulley, whereas a third idler pulley may be placed on the vertical of the second pulley, at a predetermined distance therefrom. The portion of the belt between the first and the third pulley, which corresponds to the ideal hypotenuse, is inclined toward the feed hopper parallel to the feed magazine axis and/or to the blank feed direction, and is designed to support the blanks. As is better explained in the description of the drawings, this arrangement advantageously allows to place the motor and/or the members for transmitting motion from said motor to the motor-driven pulley in a lower position.

[0010] According to an improvement, at the blank support portion of each belt, belt supporting means may be provided for preventing the belt from excessively bending due to the blank weight.

[0011] These means for preventing bending may be formed by at least one tab or a belt guide provided at the lateral inner edge of the blank support portion of each belt and/or by at least one tab or guide provided

at the inner surface of said belt portion.

[0012] Advantageously, the two motor-driven pulleys may be rotatably driven by a single drive shaft, which is mounted coaxially thereto and is connected to a single drive motor.

[0013] In accordance with an improvement, each of the two belts may also have teeth, on its inner side, for engagement in the corresponding teeth of the outer peripheral surface of at least its respective motor-driven pulley, preferably on the outer peripheral surface of each of the three pulleys. Thanks to this arrangement, any slipping and/or skidding is prevented between each belt and one or more of its respective pulleys.

[0014] The motor of the two rear motor-driven pulleys may be controlled by fill-up level sensors, which are placed in or associated to the feed hopper. Therefore, the motor may drive the pulleys and the toothed belts to a predetermined amount, such as to maintain a certain constant fill-up level in the feed hopper.

[0015] Fill-up level sensors may be further provided for the feed magazine, which sensors are connected to means for signaling the need of reloading blanks in such magazine by the operators.

[0016] The exit of the feed magazine and the entry of the feed hopper may be at a predetermined distance, which is a function of a predetermined number of superimposed blanks.

[0017] Withdrawing/transferring means may be further provided for withdrawing each first blank at the exit of the feed hopper and for transferring it to means that are designed to convey a succession of blanks to a subsequent folding unit and to a filling unit, contained in the packaging machine. These conveyor means may preferably consist of one or two horizontal belt conveyors, disposed parallel to and at a predetermined distance from each other.

[0018] The withdrawing means may consist of a swinging suction arm, which withdraws the first blank at the exit of the feed hopper and transfers it by an arcuate motion, on the belt conveyors.

[0019] In accordance with the above mentioned preferred embodiment, which will be described in greater detail in the description of the drawings, a number of other construction characteristics are provided, as detailed in said description.

[0020] The advantages of this invention are self-evident from the above description and consist in that, thanks to the two toothed belts, the blanks are divided within the feed magazine into small partial stacks which are separately held against a spontaneous gravity feed into the feed magazine. The belt feed causes the blanks to reach the end of their stroke, whereby a predetermined number of blanks fall into the hopper. Hence, a relatively large amount of blanks may be fed to the magazine, thereby avoiding the need of continuous interventions by the personnel, whereas a small predetermined number of blanks are fed to the hopper. This prevents the hopper from being loaded with an excessive blank weight, and ensures a certain continuity of operation of the machine. A further advantage is that, by laying the blanks alternately at the tooth ridges and onto the troughs between one tooth and the other, a wavy arrangement of blanks is provided, which assists a preliminary blank stack break-up operation. Also, by providing that blanks do not weigh on blanks downstream therefrom facilitates individual separation thereof.

[0021] In this regard, this invention has the object of satisfactorily solving the problem of separating the blanks, which may stick together due to the above die cutting operation in stacks, to the presence of electrostatic charges, to painting and/or moisture variations as well as to weight.

[0022] The invention achieves this additional object by providing that, between the exit of the feed magazine and the entry of the feed hopper, blank subset stack break-up means are provided at the troughs and ridges respectively of the conveyor belts of the feed magazine.

[0023] These stack break-up means may consist of at least one interconnection between the feed magazine and the feed hopper.

[0024] The feed magazine may have a less steep slope with respect to the horizontal plane and the feed hopper may have a second steeper slope with respect to the horizontal plane.

[0025] According to a preferred embodiment, the conveyor belts of the feed magazine may extend along said arcuate interconnection and form themselves the blank stack break-up means.

[0026] This arcuate interconnection may be generated by two arcuate segments of belts, each extending at its respective return pulley situated between the exit of the feed magazine and the entry of the feed hopper.

[0027] Thanks to the above arrangements, the blanks are guided along an arcuate path, and the lower edges thereof are held in mutual contact by the belt teeth, in such a manner as to cause them to open out in a fan shape and/or to cause two adjacent blanks to partly slip over each other. In other words, while the blanks are driven along said arcuate portion of the belts, they progressively change their inclination due to the slope difference between the hopper and the magazine, and are simultaneously retained at their lower side, while taking an inclined position as they become slightly offset from each other.

[0028] Further characteristics and improvements will form the subject of the dependent claims.

[0029] The characteristics of the invention and the advantages derived therefrom will be more apparent from the following detailed description of the annexed drawings, in which:

Figs. 1 and 2 are a side view of a feeder according to this invention, the feed magazine and the feed hopper being loaded with blanks, and the withdrawing/conveyor arm being in a lowered blank releasing condition.

Fig. 3 is a partially sectional front view of the feed magazine as taken along an axis passing through the axles of the four rear pulleys.

Fig. 4 is a close view of the area between the exit of the magazine and the entry of the hopper, wherein stack break-up occurs.

Fig. 5 is a partially sectional front view of the entry side of the feed hopper, the withdrawing arm being in a blank withdrawing, swung position against the hopper.

Fig. 6 is a partially sectional top view of the withdrawing arm in a lowered blank releasing condition, of the arm driving motor and of some blanks that lay over the belt conveyors.

Fig. 7 is a partially sectional top view that only shows the withdrawing arm in a lowered blank releasing condition, the arm driving motor and the two rear pulleys.

Fig. 8 is a partial enlarged view of the intermediate area between the exit of the feed magazine and the entry of the feed hopper, which shows more clearly the partial stack arrangement of blanks in the feed magazine.

[0030] Referring to the figures, and particularly to Fig. 1, a preferred embodiment of a feeder of blanks 1 in a cigarette packaging machine is shown. The blanks 1 are designed to be folded in such a manner as to form a carton to be later filled with a predetermined number of cigarette packs. In this regard, it shall be noted that the present invention may advantageously find application in packaging machines for other products, e.g. foodstuffs. With reference to the direction of feed of the blanks 1, the feeder as shown is the first device of the packaging machine. It consists of a feed magazine 2 and a feed hopper 3, which forms in all respects an extension of the feed magazine 2. The feed magazine 2 and the feed hopper 3 are oriented with their axes parallel to the direction of feed of the blanks 1 and inclined downward with respect to the horizontal plane. Nevertheless, as is apparent from the Figures, the feed magazine 2 has a lower slope than the feed hopper 3, in such a way as to facilitate the breaking up of the stack of blanks 1, as is better explained hereafter. The feed magazine 2 is loaded by an operator with blanks 1, grouped in stacks P, which are composed of a predetermined number of identical and congruently superimposed blanks 1, made of carboard or the like. The shape of the blank 1, as shown in the Figures, shall be intended by way of example only and without limitation. The blank 1 has a pair of tabs 101 which project on opposite sides, each of whose lower edges lies on a belt 4 which conveys the blank 1 toward the feed hopper 3. In fact, instead of the traditional lateral slide guides, this invention provides two parallel conveyor belts 4, 4' for the blanks 1, which are synchronously driven in the direction of the feed hopper 3. Each of said belts 4, 4' is internally toothed, having a succession of identical, equally spaced teeth 104. The ridges of the teeth 104 are flattened and have a predetermined width, which is substantially equal to the width of each trough 204 between each pair of adjacent teeth 104. By this arrangement, the ridge of each tooth 104 and each trough 204 may accommodate a subset P' of blanks 1 composed of a predetermined number of superimposed blanks 1. This results in an effective retaining and slip preventing effect on blanks 1, even though the latter are disposed in the feed magazine in a wavy arrangement which facilitates breaking up of their stacks. Each belt 4 is driven around 3 pulleys 5, 6 and 7, which are placed at the vertices of an ideal right triangle. The axis of rotation of each return pulley 5, 6 and 7 of a belt 4 is coaxial to the axis of rotation of the corresponding return pulley of the other belt 4'. A first pulley 5 is an idler and is placed at the entry 103 of the feed hopper 3, and more precisely its axis lies substantially along the bisector of the angle region between the intersection axis of the plane that defines the exit 102 of the feed magazine 2 and the plane that defines the entry 103 of the feed pulley 3. As better explained hereafter, the particular location of the two pulleys 5 is critical for breaking up the stacks of blanks 1. A second pulley 6 is placed behind the former, with reference to the direction of feed of the blanks 1, and lies on the same horizontal plane as the first pulley 5. Said second pulley 6 and its corresponding pulley 6 are rotatably driven by a single shaft 10 which is mounted coaxially thereon and is driven by a motor 8, dynamically connected thereto, by using signals from sensors 9 for detecting the fill-up level of the feed hopper 3, which will be described below. Said motor 8 drives the pulleys 6, hence the toothed belts 4, 4' to a predetermined extent, such as to maintain a substantially constant amount of blanks 1 within the hopper 3. A third idler pulley 7 is placed on the vertical of the second pulley 6 and at a predetermined distance therefrom. The portion 304 of the belt 4, 4' between the first pulley 5 and the third pulley 7 is inclined parallel to the axis of the feed magazine 2 and to the direction of feed of the blanks 1 and is designed to support the blanks 1. As shown in the Figures, the inclination of such portion 304 is not excessive and is such as to allow the retention of blanks 1. Each belt 4, 4' has further internal teeth for engagement in corresponding teeth on the outer peripheral surface of each of the three pulleys 5, 6, 7 respectively, in such a manner as to avoid any slipping and/or skidding between the belt 4, 4' and the pulleys 5, 6, 7 and in such a manner as to keep the teeth and the troughs between the two belts 4, 4' in corresponding positions and to allow a synchronous feed thereof. In accordance with a preferred embodiment, the external and internal teeth of each belt 4, 4' are generated by the wavy regular profile of the belt 4, 4'. On the inner flank of the inclined portion 304 of each toothed belt 4, 4' and level with the surface of the troughs 204 thereof, a slide guide 11 for the blanks 1 is provided to prevent the belt 4, 4' from excessively bending due to the weight of the blanks 1. The feed magazine

2 is further provided with a pair of lateral guides for retaining and maintaining the alignment of the blanks 1 in the magazine 2.

[0031] The hopper 3 also has a pair of upper rods 203 and a pair of lower rods 303 which extend toward the exit 102 of the feed magazine 2 parallel to the direction of feed of blanks 1 into the hopper 3, and have the function of laterally retaining and maintaining the alignment of the blanks 1 both inside the hopper 3 and in the angle formed by the plane that defines the entry 103 of the hopper 3 and the plane that defines the exit 102 of the magazine 2. At said angle, each of the two upper retaining rods 203 extends in an opened apart direction and forms, with the other corresponding rod, a widened lead-in guide to facilitate the introduction of blanks 1 in the hopper 3. The hopper 3 further has a pair of rods 403 for supporting and guiding the sliding blanks 1, which rods are inclined parallel to the direction of feed of the blanks 1 into the hopper 3. The two rods 402 are in such a position that, even inside the hopper 3, the blanks 1 lie on the tabs 101.

[0032] At the side edges and the upper edge of the exit 503 of the feed hopper 3, sensors 12 are provided for detecting the weight of the stack P'' of blanks 1, which is inside the hopper 3, which sensors signal the motor 8 that the pulleys 6, 6' of the belts 4, 4' are to be driven for controlled feed of blanks 1 to the hopper 3. At the end turned toward the direction of feed of blanks 1, each of said weight sensors 12 has a circular plate 112, whose axis is oriented parallel to the direction of feed of blanks 1 into the hopper 3. This plate 112 projects into the hopper 3 to a slightly larger extent than the size of the blanks 1, in such a manner as to act as an end-of-stroke and retention abutment for the blanks 1 within the feed hopper 3. The blanks 1 fall against the plates 112 by gravity.

[0033] Particularly referring now to Figs. 4 and 8, it is apparent that, within the angle between the exit 102 of the feed magazine 2 and the entry 103 of the feed hopper 3, the two belts 4, 4' extend along an arcuate portion which corresponds to a portion of the return path thereof around the pulleys 5. By appropriately dimensioning the diameter of the pulleys 5, a relatively long arcuate portion, having a relatively long radius of curvature, may be generated. Now, the subsets P' of blanks 1 are held at their bottom substantially in contact with one another thanks to the presence of the teeth 104 and troughs 204, whereas they tend to open out in a fan shape at the top, due to the difference of slopes between the hopper 3 and the magazine 2 and tend to slide over one another, thereby causing a stack break up effect.

[0034] Downstream from the exit 503 of the hopper 3, with reference to the direction of feed of the blanks 1, a swinging suction arm 13 is provided which withdraws the first blank 1 at the exit 503 of the hopper 3 and transfers it by an arcuate motion over a pair of horizontal belt conveyors 14, which are disposed in parallel arrangement and at a predetermined distance from each other. The hopper 3 has such a shape that the amplitude of such arcuate motion is not excessive. This shape substantially corresponds to the slope angle between the surface of the blanks 1 contained in the hopper 3 and the blank 1 support surface of the belt conveyors 14. Said belt conveyors 14 successively transfer the blanks 1 to a subsequent folding unit and to a filling unit which are contained in the packaging machine (said units are not shown). This suction arm 13 is pivoted substantially at the lower edge of the exit 503 of the hopper 3, whereas its swinging axis is disposed horizontally and transverse to the direction of feed of the blanks 1. This withdrawing and transferring arm 13 has a comb shape and is provided with a pair of outer parallel branches 113 for supporting each blank 1 as it is transferred and a pair of inner parallel branches, which are disposed at a predetermined distance from each other and have suction heads 413, alternately connected by switching means to a negative pressure source and to ambient pressure, or to an overpressure source, whereby the blank 1 is only retained as it follows the arcuate path to be transferred from the exit 503 of the hopper 3 to the belt conveyors 14. The suction heads 413 are operated when the arm 13 is swung toward the exit 503 of the hopper 3 to withdraw the blank 1 and are idle when the arm 13 is in the horizontal end-of-stroke position, to allow the blank 1 to be transferred to the belt conveyors 14. To this end, the two belt conveyors 14 are at an adequate distance from each other to allow the passage of the two suction branches 213 of the withdrawing/transferring arm 13, and the latter has an end of transferring stroke position in which the suction branches 213 release the blank 1 when the latter lies on the conveyors 14. In fact, longitudinal apertures 15 are formed between the two conveyors 14, for insertion of the suction branches 213 in such a manner as to be at least slightly below the conveying plane.

[0035] Each suction head 413 consists of a suction nozzle, which is placed at the center of the convex portion of a conical suction cup, which is designed to adhere against the lower surface of the blank 1. As the blank 1 is released onto the conveyors 14, the suction heads 413 are lowered below the conveying plate for releasing the blank 1.

[0036] Obviously, the invention is not limited to the embodiment described and illustrated herein, but may be greatly varied, especially as regards construction, without departure from the guiding principle disclosed above and claimed below.

Claims

1. A feeder of blanks (1), particularly to a packaging machine, which blanks (1) are made of cardboard or the like and are fed in stacks (P), composed of a predetermined number of identical, congruently superimposed blanks, which feeder is composed of a

feed magazine (2) and a feed hopper (3), which forms an extension of the feed magazine (2), the feed magazine (2) and the feed hopper (3) being oriented with their axes parallel to the feed direction of the blanks (1), that are oriented downward with respect to the horizontal plane, each of which blanks (1) has at least two oppositely projecting portions (101), which are designed to lie on lateral slide guides provided within the feed magazine (2), the feed magazine (2) and/or the feed hopper (3) having a plurality of guides (202, 203, 303) for laterally retaining the blanks (1) and maintaining the alignment thereof, **characterized in that** said lateral slipping or sliding or transporting guides are situated in the feed magazine (2) and consist of at least two parallel conveyor belts (4, 4') for the blanks (1), on which the lower edges of the projecting portions (101) of the blanks (1) lie at least partly, each of which belt (4, 4') has a plurality of external blank (1) retaining and slip preventing projections (104), there being provided means (6) for synchronously driving the two belts (4, 4') toward the feed hopper (3).

2. A feeder as claimed in claim 1, **characterized in that** said retaining projections consist of a succession of identical, equally spaced teeth (104), whereas each trough (204) between each pair of adjacent teeth may have a predetermined width, adapted to accommodate at least one, preferably a subset of blanks (1), composed of a predetermined number of superimposed blanks (1).

3. A feeder as claimed in claims 1 and 2, **characterized in that** the ridge of each of the teeth (104) has a predetermined width, adapted to accommodate at least one, preferably a subset of blanks (1), composed of a predetermined number of superimposed blanks (1).

4. A feeder as claimed in claim 3, **characterized in that** each of the tooth ridges (104) has a flat surface.

5. A feeder as claimed in one or more of the preceding claims, **characterized in that** the means for driving each belt (4, 4') consist of at least one pair of pulleys (5, 6, 7), at least one (6) whereof is motor-driven or dynamically connected to a power unit (8), the belt (4, 4') being returned around said pulleys (5, 6, 7), whereas the axis of rotation of each pulley (5, 6, 7) of one belt (4, 4') is coaxial to the axis of rotation of the corresponding pulley (5, 6, 7) of the other belt (4, 4').

6. A feeder as claimed in one or more of the preceding claims, **characterized in that** each belt (4, 4') is driven around three pulleys (5, 6, 7), which are placed at the vertices of an ideal triangle, particularly a right triangle, a first idler pulley (5) being placed at the entry (103) of the feed hopper (3), a second motor-driven pulley (6) being placed downstream therefrom, with reference to the direction of feed of the blanks (1), and being on the same horizontal plane as the first pulley (5), and a third idler pulley (7) being placed on the vertical of the second pulley (6), at a predetermined distance therefrom, whereas the portion (304) of the belt (4, 4') between the first (5) and the third pulley (7), which corresponds to the ideal hypotenuse, is inclined parallel to the axis of the feed magazine (2) and/or to the direction of feed of the blanks (1), and is designed to support the blanks (1).

7. A feeder as claimed in one or more of the preceding claims, **characterized in that** at the blank (1) support portion (304) of each belt (4, 4'), means (11) are provided for supporting the belt (4, 4') which prevent the belt (4, 4') from excessively bending due to the weight of blanks (1).

8. A feeder as claimed in one or more of the preceding claims, **characterized in that** said means (11) for preventing bending are formed by at least one tab (11) or a guide for the belt (4, 4'), which is provided at the lateral inner edge of the blank (1) support portion (304) of each belt (4, 4') and/or by at least one tab or guide provided at the inner surface of said portion (304) of the belt (4, 4').

9. A feeder as claimed in one or more of the preceding claims, **characterized in that**, on one flank of the toothed belt (4, 4'), particularly the inner flank, and level with the surface of the troughs (204) of the belt (4, 4'), a slide guide (11) for the blanks (1) extends along a certain longitudinal portion of the conveying branch of the belt (4, 4').

10. A feeder as claimed in one or more of the preceding claims, **characterized in that** the two motor-driven pulleys (6) are rotatably driven by a single drive shaft (10), which is mounted coaxially thereto and is connected to a single drive motor (8).

11. A feeder as claimed in one or more of the preceding claims, **characterized in that** each of the two belts (4, 4') also has teeth, on its inner side, for engagement in corresponding teeth of the outer peripheral surface of at least its respective motor-driven pulley (6), preferably on the outer peripheral surface of each of the three pulleys (5, 6, 7).

12. A feeder as claimed in one or more of the preceding claims, **characterized in that** a motor (8) for driving the motor-driven pulleys /6) is provided, which motor (8) is controlled by fill-up level sensors (12), which are placed in or associated to the feed hopper

(3), and which motor (8) drives the pulleys (6) and the toothed belts (4, 4') to a predetermined amount, such as to maintain a certain constant fill-up level in the feed hopper (3).

13. A feeder as claimed in one or more of the preceding claims, **characterized in that** fill-up level sensors may be further provided for the feed magazine (2), which sensors are connected to means for signaling the need of reloading blanks (1) in said magazine (2).

14. A feeder as claimed in one or more of the preceding claims, **characterized in that** the exit (102) of the feed magazine (2) and the entry (103) of the feed hopper (3) are at a predetermined distance from each other, which is a function of a predetermined number of superimposed blanks (1).

15. A feeder as claimed in one or more of the preceding claims, **characterized in that** means (203, 303) for lateral retention of blanks (1) are provided in the area between the exit (102) of the feed magazine (2) and the entry (103) of the feed hopper (3).

16. A feeder as claimed in one or more of the preceding claims, **characterized in that** said lateral retention means for the blanks (1) consist of at least one pair of lateral guide rods (203, 303), each of which is situated at a side edge of the entry (103) of the hopper (3) and extends toward the exit (102) of the feed magazine (2), preferably all along the distance between the entry (103) of the feed hopper (3) and the exit (102) of the feed magazine (2).

17. A feeder as claimed in one or more of the preceding claims, **characterized in that** each of the two lateral guide rods (203) extends at least partly in an opened apart direction and forms, with the other rod, a widened lead-in for the blanks (1).

18. A feeder as claimed in one or more of the preceding claims, **characterized in that** the feed hopper (3) has at least one pair of lateral retention rods (203, 303) for the blanks (1) and at least one pair of support and slide guide rods (403) for the blanks (1) therein.

19. A feeder as claimed in one or more of the preceding claims, **characterized in that** the feed hopper (3) has end of stroke means (12) for the blanks (1) at its exit end (503).

20. A feeder as claimed in one or more of the preceding claims, **characterized in that** said end of stroke means (12) are provided at the side edges and/or the upper edge of the exit (503) of the feed hopper (3).

21. A feeder as claimed in one or more of the preceding claims, **characterized in that** each of said end of stroke means (12) for the blanks (1) also acts as a feed hopper (3) fill-up level sensor (12).

22. A feeder as claimed in one or more of the preceding claims, **characterized in that** the hopper fill-up level sensors are weight sensors (12) for detecting the weight of the stack (P'') of blanks (1) in the feed hopper (3).

23. A feeder as claimed in one or more of the preceding claims, **characterized in that**, at the end of each weight sensor (12) turned toward the direction of feed of the blanks (1), a circular plate (112) is provided whose axis is oriented parallel to the axis of the feed hopper (3) and/or to the blank (1) feed axis therein, and which plate (112) projects into the hopper (3) to a slightly larger extent than the size of the blanks (1), said projection also acting as an end-of-stroke and retention abutment for the blanks (1) within the feed hopper (3).

24. A feeder as claimed in one or more of the preceding claims, **characterized in that** withdrawing/transferring means (13) are provided for withdrawing each first blank (1) at the exit (503) of the feed hopper (3) and for transferring it to means (14) that are designed to convey a succession of blanks (1) to a subsequent folding unit and to a filling unit, contained in the packaging machine, said means preferably consisting of one or two horizontal belt conveyors (14), disposed parallel to and at a predetermined distance from each other.

25. A feeder as claimed in one or more of the preceding claims, **characterized in that** said withdrawing means consist of a swinging suction arm (13), which withdraws the first blank (1) at the exit (503) of the feed hopper (3) and transfers it by an arcuate motion, on the belt conveyors (14), said suction arm (13) having have suction heads (413), alternately connected by switching means to a negative pressure source and to ambient pressure, or to an overpressure source, whereby the withdrawn blank (1) is only retained as it follows the arcuate path to be transferred from the exit (503) of the feed hopper (3) to the conveying means or belts (14), the suction heads (413) being operated when the withdrawing/transferring arm (13) is swung toward the exit (503) of the feed hopper (3) to withdraw the blank (1) and are idle when the withdrawing/transferring arm (13) is in the horizontal end-of-stroke position, to allow the blank (1) to be transferred to the belt conveyors (14).

26. A feeder as claimed in one or more of the preceding claims, **characterized in that** said withdrawing/

transferring arm (13) is pivoted substantially at the lower edge of the exit (503) of the feed hopper (3), its swinging axis being disposed horizontally and transverse to the direction of feed of the blanks (1), whereas the amplitude of the arched motion corresponds to the slope angle between the surface of the blanks (1) contained in the hopper (3) and the blank (1) support surface of the belt conveyor/s (14).

27. A feeder as claimed in one or more of the preceding claims, **characterized in that** said withdrawing and transferring arm (13) has a fork or comb shape and is provided with at least one pair of parallel suction branches (113), at a predetermined distance from each other, whereas at least in the area of the withdrawing/transferring arm (13) that interacts with the conveyor (14), the latter has apertures (15) for the passage of the at least two suction branches (213) of the withdrawing/transferring arm (13), which has an end of transferring stroke position in which the suction branches (213) retain the blank (1) at least when it lays on the conveyor (14).

28. A feeder as claimed in one or more of the preceding claims, **characterized in that** each suction head (413) consists of a suction nozzle, which is placed at the center of the convex portion of a conical suction cup, which is designed to adhere against a predetermined portion of the lower surface of the blank (1), the suction cups (613) being placed at a crosspiece that may be lifted and lowered, with reference to the withdrawing/transferring arm (13) between a position in which it adheres against the blank (1) laying over said transferring arm (13) and a position of non adherence, which crosspiece is a part of a four-bar linkage handling mechanism.

29. A feeder as claimed in one or more of the preceding claims, **characterized in that**, between the exit (102) of the feed magazine (2) and the entry (103) of the feed hopper (3), stack break-up means are provided for the subsets (P') of blanks disposed at the troughs (204) and tooth ridges (104) respectively of the conveyor belts (4, 4') of the feed magazine (2).

30. A feeder as claimed in one or more of the preceding claims, **characterized in that** said stack break-up means consist of at least one arcuate interconnection between the feed magazine (2) and the feed hopper (3), the feed magazine (2) having a first less steep slope with respect to the horizontal plane and the feed hopper (3) having a second steeper slope with respect to the horizontal plane.

31. A feeder as claimed in one or more of the preceding claims, **characterized in that** the conveyor belts (4, 4') of the feed magazine (2) extend along said arcuate interconnection and form themselves the blank stack break-up means (1).

32. A feeder as claimed in one or more of the preceding claims, **characterized in that** said arcuate interconnection is generated by two arcuate segments of belts (4, 4'), each extending at its respective return pulley (5) situated between the exit (102) of the feed magazine (2) and the entry (103) of the feed hopper (3).

33. A feeder as claimed in one or more of the preceding claims, **characterized in that** the axis of said coaxial return pulleys (5) of the two toothed belts (4, 4') is situated in the proximity of the intersection axis of the plane that defines the entry (103) of the feed hopper (3).

34. A feeder as claimed in one or more of the preceding claims, **characterized in that** the axis of said coaxial return pulleys (5) of the two toothed belts (4, 4') is situated in the angle area above the intersection axis between the plane that defines the exit (102) of the feed magazine (2) and the plane that defines the entry (103) of the feed hopper (3) and along the bisector of such angle.

35. A method for separate feeding of blanks (1) from a feed magazine (2) to a feed hopper (3), which forms an extension of the feed magazine (2), which blanks (1) are made of cardboard or the like and are fed in stacks (P), composed of a predetermined number of identical, congruently superimposed blanks, the feed magazine (2) and the feed hopper (3) being oriented with their axes parallel to the direction of feed of the blanks (1), that are oriented downward with respect to the horizontal plane, which blanks (1) are divided at least or only within the feed magazine (2) into partial stacks (P') which are separately held against a spontaneous gravity feed into the feed magazine (2) by toothed conveyors (4, 4').

36. A method for breaking up the stacks of blanks (1) from a feed magazine (2) to a feed hopper (3), which forms an extension of the feed magazine (2), which blanks (1) are made of cardboard or the like and are fed in stacks (P), composed of a predetermined number of identical, congruently superimposed blanks, the feed magazine (2) and the feed hopper (3) being oriented with their axes parallel to the direction of feed of the blanks (1), that are oriented downward with respect to the horizontal plane, each of which blanks (1) has at least two oppositely projecting portions (101), which are designed to lie on lateral slide or conveying guides provided within the feed magazine (2), **characterized in that** the blanks (1) are guided along an arched path extend-

ing between the exit (102) of the magazine (2), which has a less steep slope with respect to the horizontal plane, and the entry (103) of the feed hopper (3), which has a steeper slope with respect to the horizontal plane, the lower edges of the blanks (1) being held in mutual contact, in such a manner as to cause them to open out in a fan shape and/or to cause two adjacent blanks (1) to partly slip over each other.

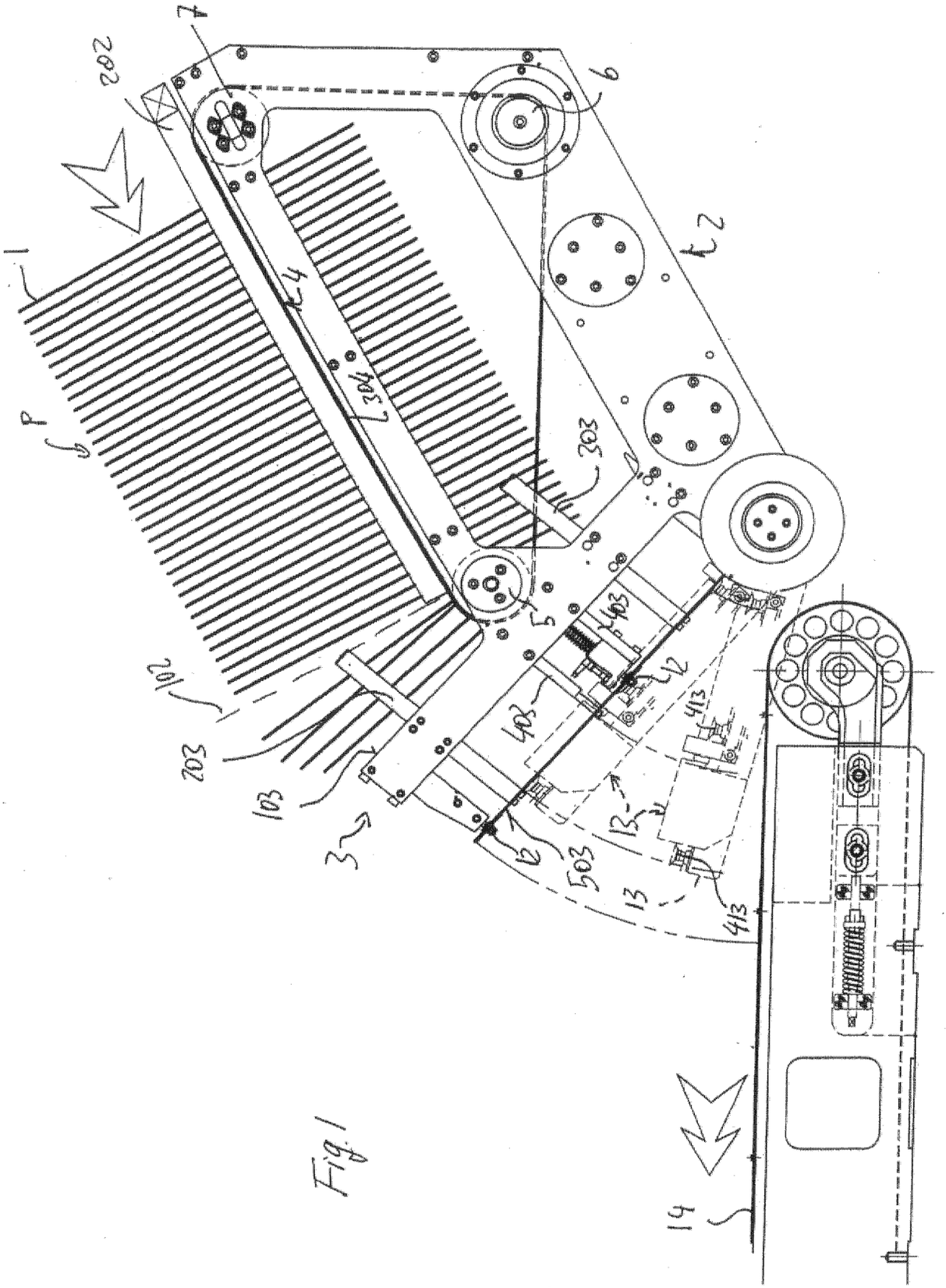

Fig. 1

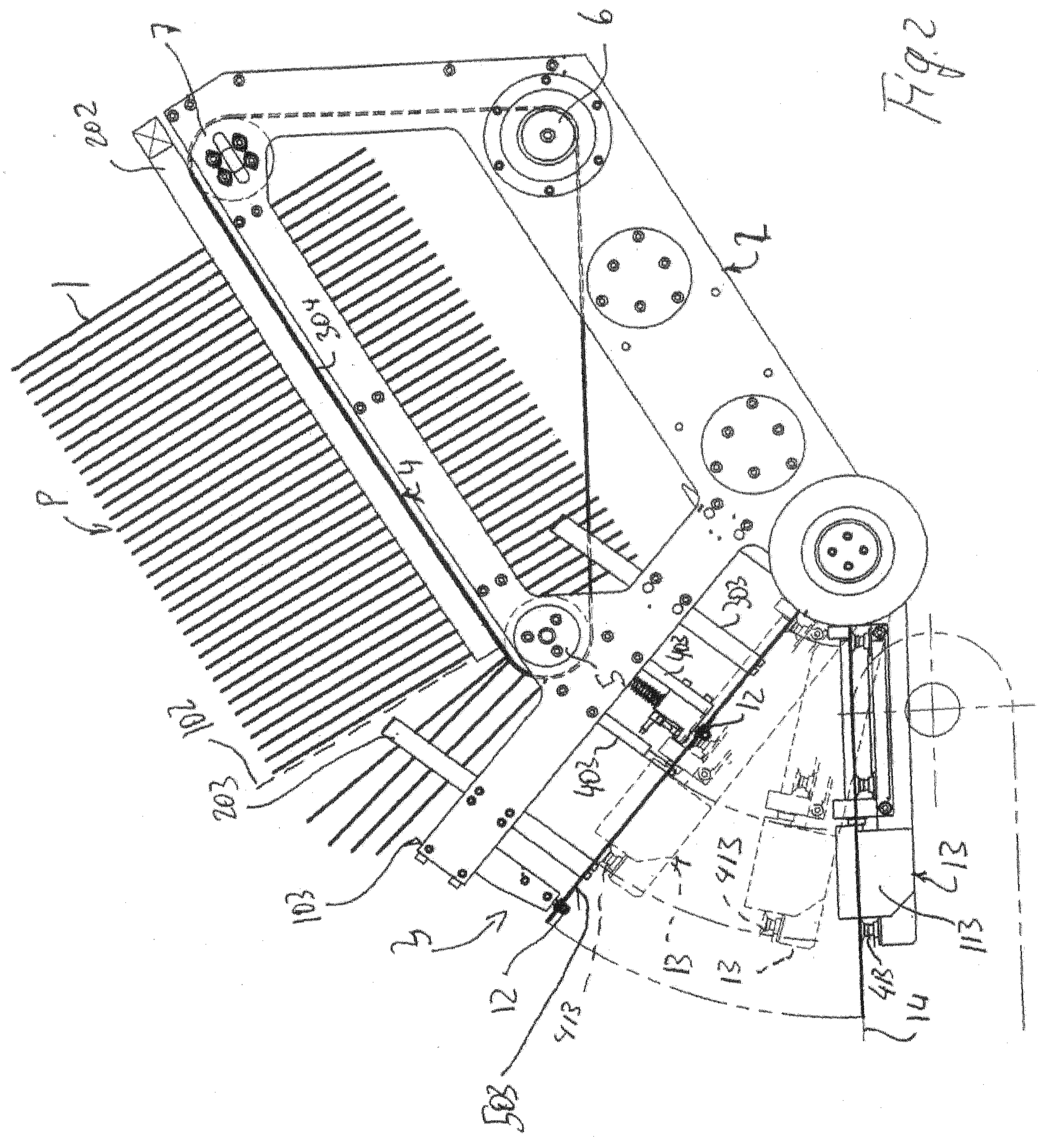

Fig. 2

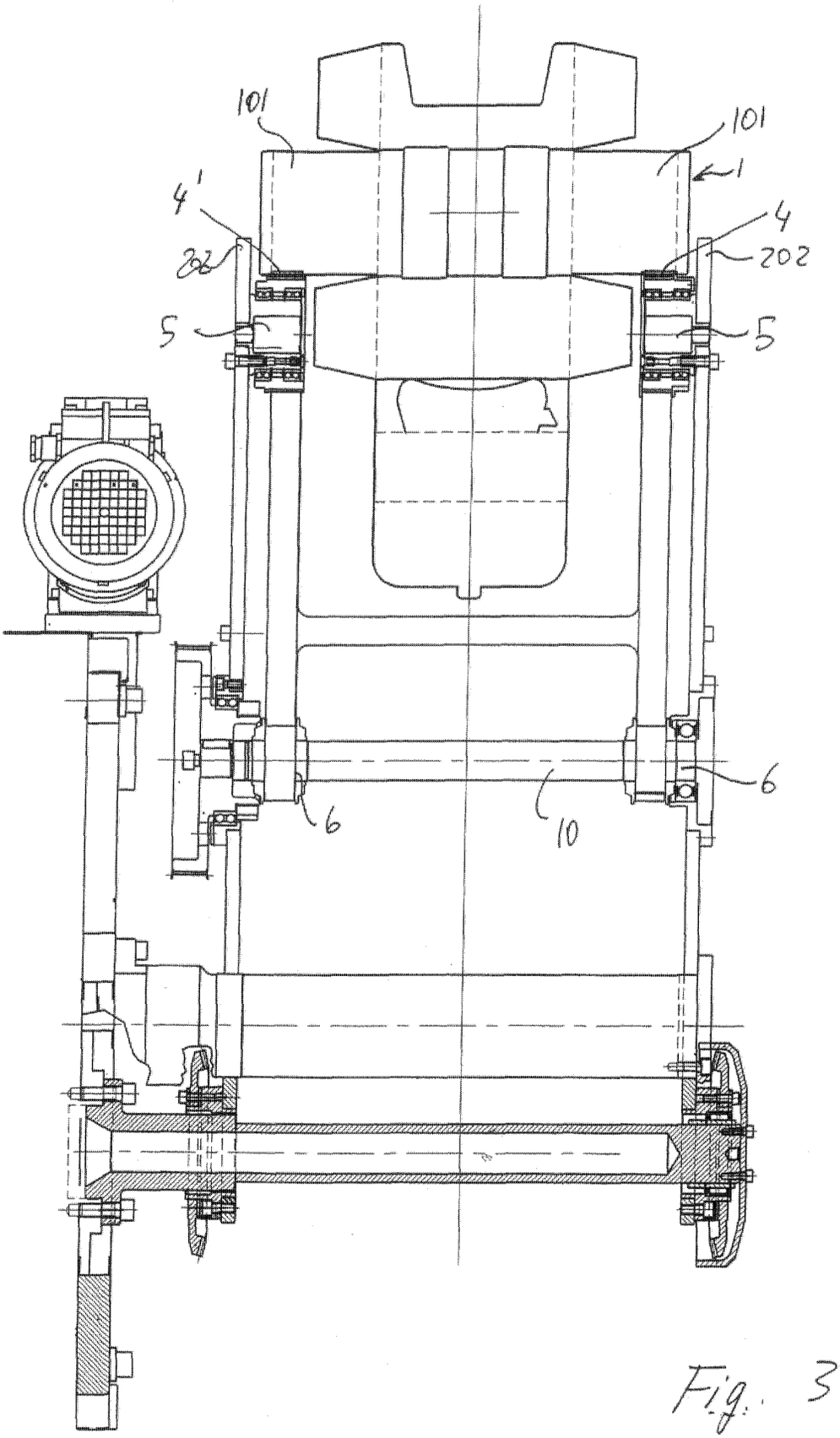

Fig. 3

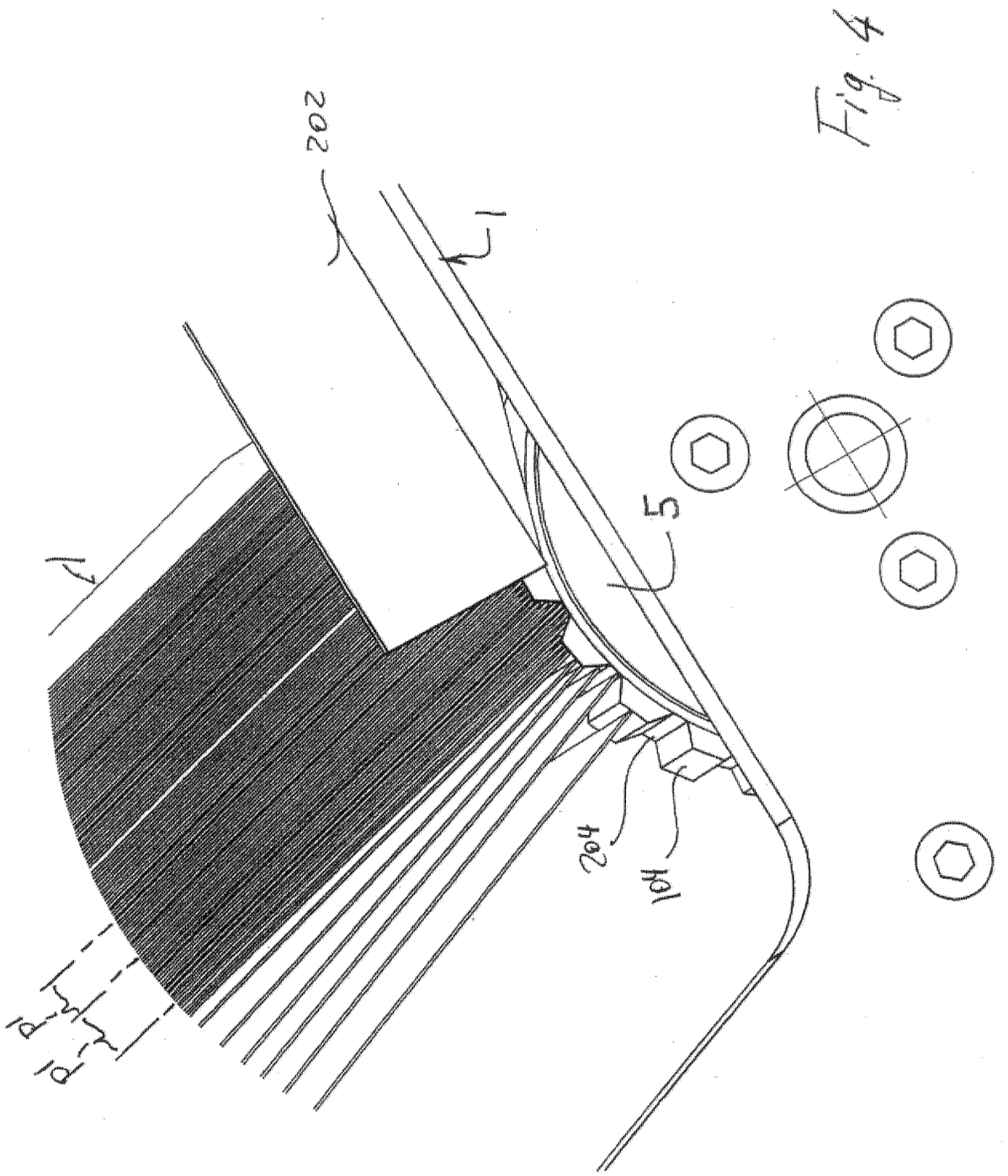

Fig. 4

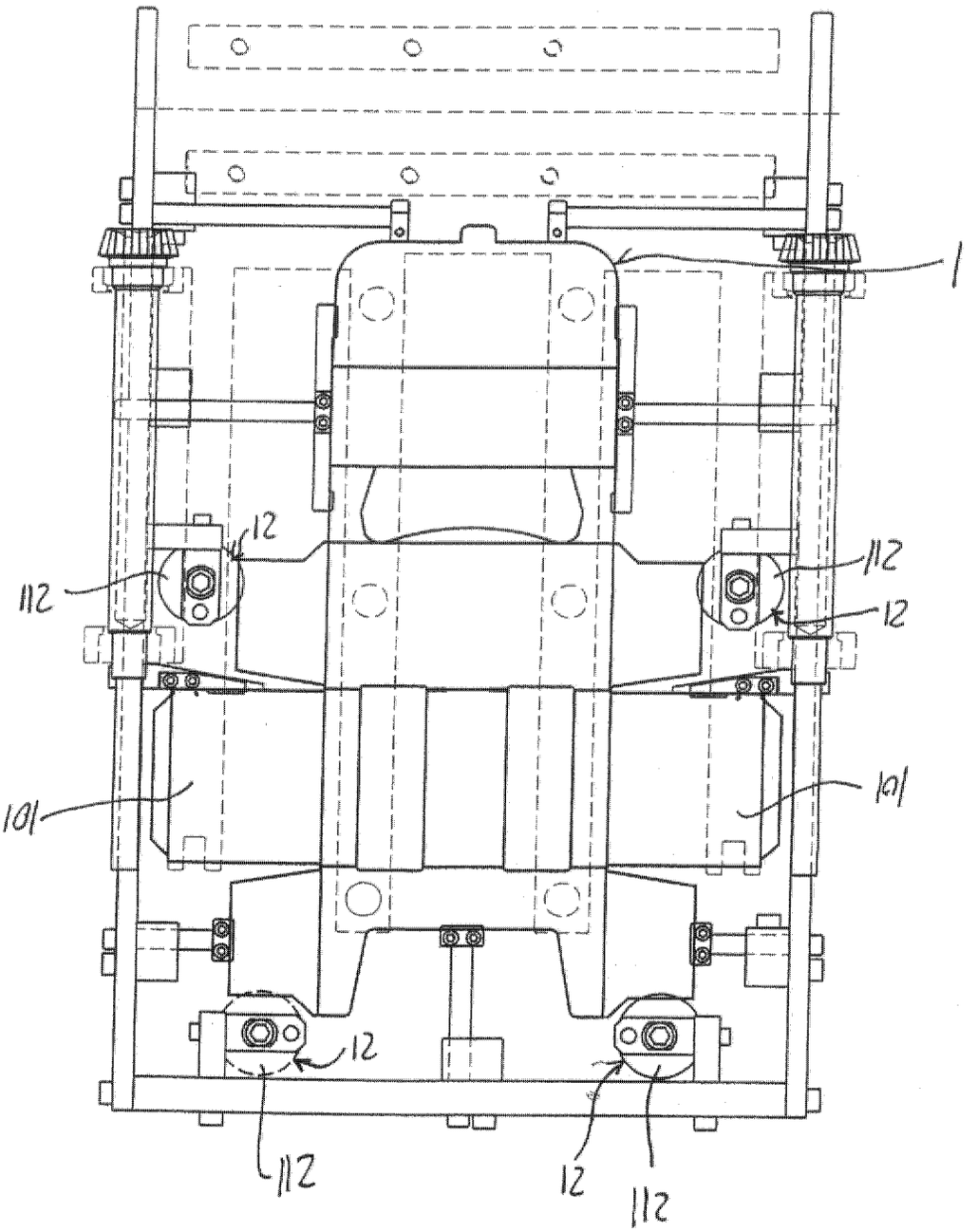

Fig. 5

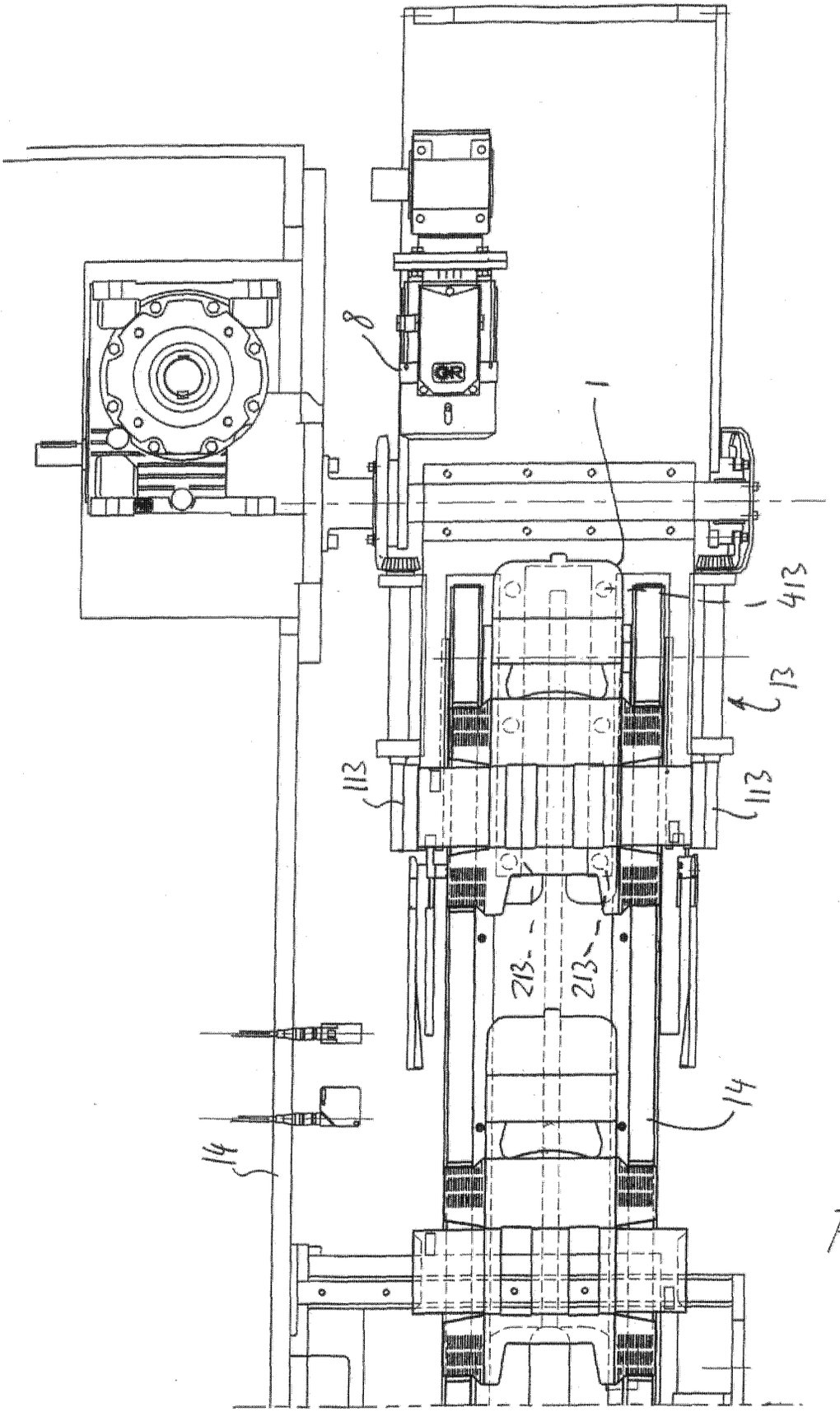

Fig. 6

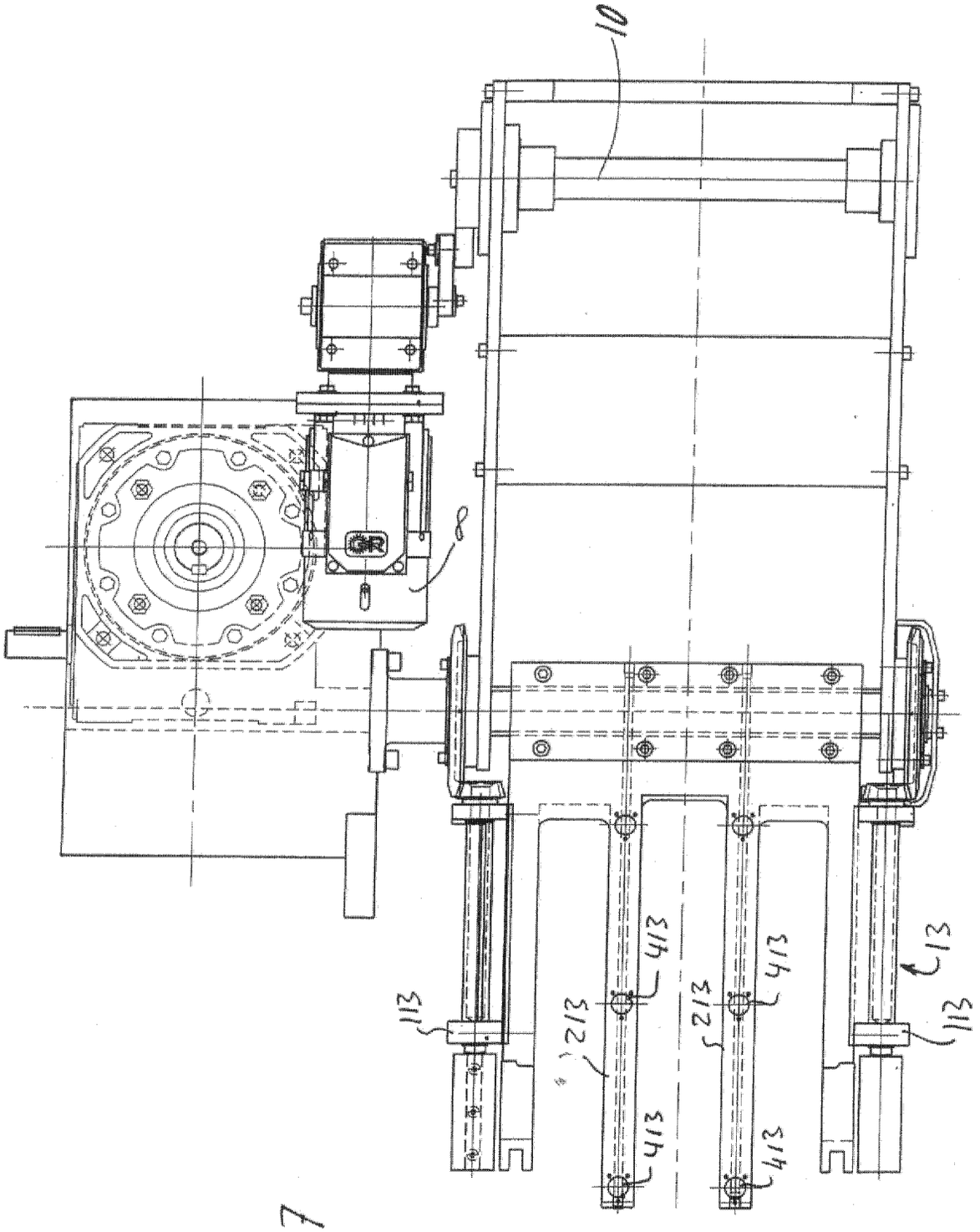

Fig. 7

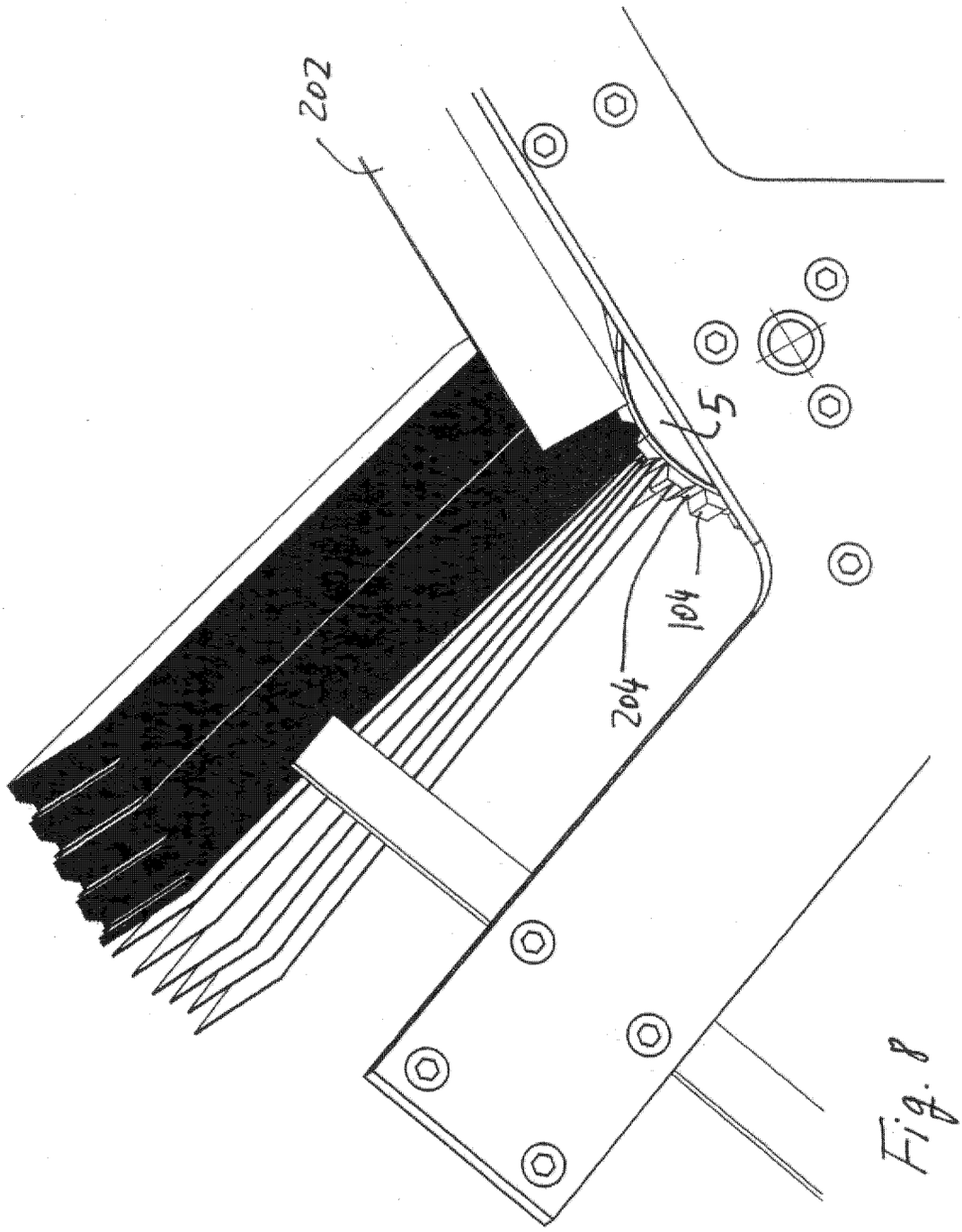

Fig. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 10 1725

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	EP 0 339 178 A (TOKYO AUTOMATIC MACH WORKS) 2 November 1989 (1989-11-02) * column 9, line 27 - column 14, line 51; figures *	1,2,5, 7-13,15, 16,18, 24-28, 35,36	B65B43/18
Y	EP 1 316 521 A (BELL & HOWELL POSTAL SYSTEMS I) 4 June 2003 (2003-06-04) * column 19, line 28 - column 22, line 40; figures *	1,2,5, 7-13,15, 16,18, 24-28, 35,36	
Y	US 3 999 683 A (LANGEN MARINUS J M) 28 December 1976 (1976-12-28) * column 12, line 27 - column 16, line 28; figures *	15,16,18	
Y	US 2 817 518 A (ANNESS RUSSELL W) 24 December 1957 (1957-12-24) * column 11, line 38 - column 18, line 57; figures *	24-28	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B65B B65H
Y	DE 22 15 981 A (HESSER AG MASCHF) 11 October 1973 (1973-10-11) * page 7, line 6 - page 8, line 2; claims; figures *	35	
A	US 5 344 279 A (ASHBAUGH DEAN L ET AL) 6 September 1994 (1994-09-06)		
A	DE 42 17 178 A (IWK VERPACKUNGSTECHNIK GMBH) 25 November 1993 (1993-11-25)		

-/--

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 October 2004	Jagusiak, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 10 1725

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 5 511 772 A (GANZ ROBERT H ET AL) 30 April 1996 (1996-04-30)		
A	DE 11 58 352 B (ROSE BROTHERS LTD) 28 November 1963 (1963-11-28)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 October 2004	Jagusiak, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 10 1725

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

26-10-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0339178 A	02-11-1989	DE 68903669 D1	14-01-1993
		DE 68903669 T2	01-04-1993
		EP 0339178 A1	02-11-1989
		ES 2035957 T3	01-05-1993
		JP 2009304 C	11-01-1996
		JP 2127226 A	15-05-1990
		JP 7037246 B	26-04-1995
		US 5057066 A	15-10-1991
		US 5131899 A	21-07-1992
EP 1316521 A	04-06-2003	US 5829742 A	03-11-1998
		EP 1316521 A1	04-06-2003
		AU 6950896 A	10-09-1997
		CA 2246655 A1	28-08-1997
		DE 69628589 D1	10-07-2003
		DE 69628589 T2	29-04-2004
		EP 0883562 A1	16-12-1998
		US 5934666 A	10-08-1999
		WO 9730917 A1	28-08-1997
		ZA 9606677 A	18-02-1997
US 3999683 A	28-12-1976	US 3968623 A	13-07-1976
		US 4028866 A	14-06-1977
		US 4015403 A	05-04-1977
US 2817518 A	24-12-1957	NONE	
DE 2215981 A	11-10-1973	DE 2215981 A1	11-10-1973
		IT 978658 B	20-09-1974
US 5344279 A	06-09-1994	NONE	
DE 4217178 A	25-11-1993	DE 4217178 A1	25-11-1993
		IT 1272440 B	23-06-1997
US 5511772 A	30-04-1996	NONE	
DE 1158352 B	28-11-1963	NONE	

EPO FORM P0459

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