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(54) Bag supplying apparatus for a bag-filling packaging machine

(57) A bag supplying apparatus for a bag-filling packaging machine, including a vibrating feeder that involves a trough (6) in which bags are placed in a cascade fashion and a vibration driver (7) which vibrates the trough (6) so as to cause the bags (W0) to be conveyed forward, a positioning stopper (2) provided at a final end of a conveying path of the bags so that the tip end of a leading bag (W1) being conveyed comes into contact with the stopper (2), and a suction disk (3) that suction-chucks and lifts a bag positioned by the position stopper (2) and feeds the bag to another location.

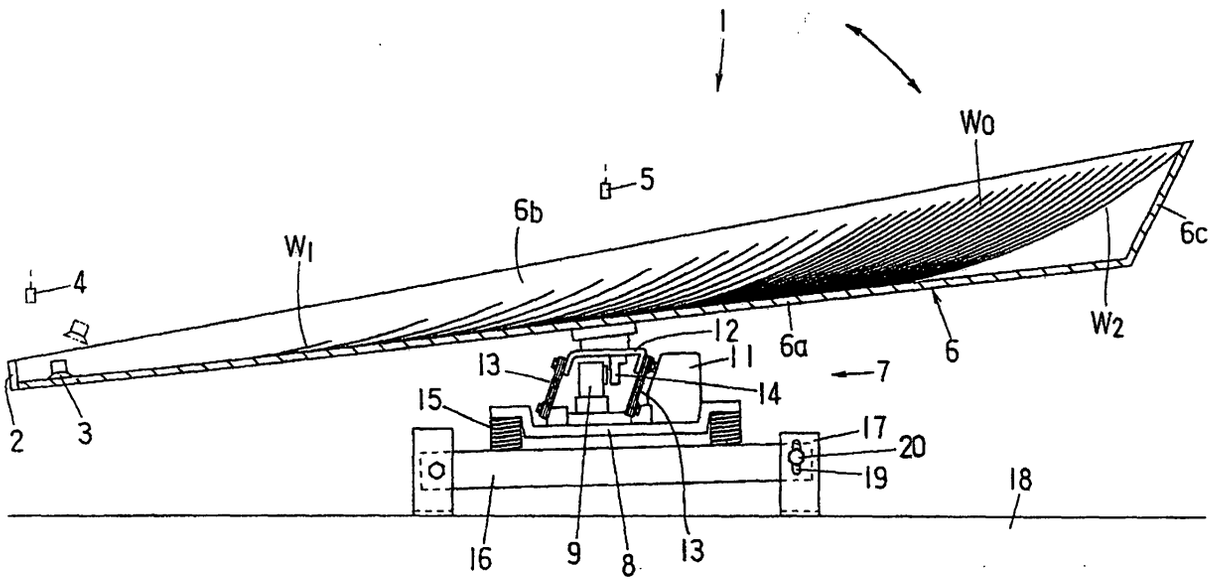

FIG. 1

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Description

BACKGROUND OF THE INVENTION

1. Technical Field

[0001] The present invention relates to a bag supplying apparatus that separates a single bag from a group of stacked bags in which the bags on the upper part of the stack are shifted in the longitudinal direction so that these bags are located on the forward side, thus supplying these bags to a bag-filling packaging machine.

2. Description of the Related Art

[0002] In the past, conveyor magazine type bag supplying apparatuses have been known as bag supplying apparatuses of the above-described type.

[0003] As is disclosed in, for instance, Japanese Utility Model Registration No. 2603966 and Japanese Patent Application Laid-Open (Kokai) No. 5-51016, a conveyor magazine type bag supplying apparatus generally includes: a belt conveyor which conveys stacked bags with the bag mouths facing forward and with the bags on the upper part of the stack shifted in the longitudinal direction so that these bags are located on the forward side; a fast-feeding belt which separates the bag on the uppermost part of the belt conveyor from the group of bags and fast-feeds this bag in the forward direction; a positioning stopper that is contacted by the tip end of each bag that is fed; a suction disk that suction-chucks the bag that has contacted this stopper; and a reciprocating motion driving means that causes the suction disk to make a vertical reciprocating motion between a suction chucking position at the lower end and a transfer position where transfer to a next apparatus is performed.

[0004] In the above structure, a bag that has been positioned by contacting the stopper is lifted by the suction disk, and this bag is transferred to the suction disk or chuck, etc., of the next apparatus. If necessary, furthermore, a claw wheel which has projections that can contact the upper surfaces of the bags around the circumference of this wheel, and which rotates at a circumferential speed that is faster than the speed of the above-described belt conveyor, is disposed in front of the above-described fast-feeding belt, and the bags are fed out in the forward direction by this claw wheel.

[0005] In the above-described conveyor magazine type bag supplying apparatus, in order to ensure that the bags on the belt conveyor are reliably and stably separated from the group of following bags and fast-fed in the forward direction by the fast-feeding belt, it is indispensable that the group of bags be carried on the belt conveyor so that the bags are arranged in the above-described configuration (i.e., a state in which the bags are shifted substantially uniformly in the longitudinal direction). In cases where the bags are not carried in a state in which the bags are thus arranged (and especially in cases where the spacing between the bags is reduced), the work of separating the bags on the upper part one at a time from the group of following bags and fast-feeding these bags by the fast-feeding belt is hindered.

[0006] Placing of bags on the belt conveyor is generally performed by an operator. However, such placing of bags as in a state in which the bags are arranged in the above-described configuration is extremely bothersome and requires experience. This fact is especially conspicuous in cases where bags with locally varying thicknesses are handled, as in the case of bags attached with chucks or spouts (see, for instance, Japanese Patent Application Laid-Open (Kokai) Nos. 2000-168729 and 10-194238). As a result, the structure of the bag supplying apparatus also becomes unavoidably complicated.

BRIEF SUMMARY OF THE INVENTION

[0007] The present invention is to overcome the problems encountered in a conveyor magazine type bag supplying apparatus that supplies bags to a bag-filling packaging machine.

[0008] It is an object of the present invention to reduce the burden on the operator by making it possible to supply bags to the bag-filling packaging machine without any problem even if the bags are not carried in a completely arranged state in cases where the operator places the stacked bags in specified positions of the bag supplying apparatus with the bags on the upper part shifted in the longitudinal direction so that these bags are located on the forward side.

[0009] It is another object of the present invention to realize such an effect by means of a simple mechanism.

[0010] A vibrating feeder in which vibration is mechanically applied to a horizontal or inclined trough so that an associated motion that throws products in the trough obliquely forward is applied to these products, thus conveying the products, is in itself universally known. However, the use of such a vibrating feeder as a part of the bag supplying apparatus in a bag-filling packaging machine is unknown.

[0011] The inventors of the present application discovered that in cases where bags are stacked in a cascade fashion, in other words, in cases stacked bags are placed in a trough of a vibrating feeder with the bags on the upper part of the stack shifted in the longitudinal direction so that these bags are located on the forward side, the bags are not only conveyed forward, but also, even if the bags are not placed in a completely arranged state (i.e., even if the bags are placed at random), the irregularity in the amount of shifting is evened out in the process of the forward conveying of the bags, and at the same time, the amount of shifting of the bags increases in a more or less regular manner with the adjacent bags overlapped "as is" as the bags proceed in the forward direction. The present invention is made based on this

finding.

[0012] The above objects are accomplished by a unique structure of the present invention for a bag supplying apparatus used in a bag-filling packaging machine, and the bag supplying apparatus of the present invention includes:

a vibrating feeder that is a conveying means and is comprised of a trough, in which bags that are stacked are placed so that a bag on another bag is shifted so that the bag on anther bag is located on a forward side, and a vibration driver, which conveys the bags forward by vibrating the trough;
a positioning stopper with which a tip end of a leading bag comes into contact, the positioning stopper being provided at a final end of a conveying path of the conveying means; and
a suction disk that suction-chucks and lifts a bag positioned by the stopper and feeds the bag to another location.

[0013] In order to ensure the reliable and stable separation of the bags that are fed forward from the group of following bags, a fast-feeding belt can be installed that contacts the upper surfaces of the bags, which are conveyed in the trough, and fast-feeds these bags in the forward direction.

[0014] A claw wheel which has projections that can contact the upper surfaces of the bags can be disposed in front of the fast-feeding belt, thus allowing the leading (first) bag to be fed out further in the forward direction.

[0015] In the present invention, the amount of shifting of adjacent bags in the group of bags conveyed in the trough becomes greater as they are moved in the forward direction. Accordingly, the fast-feeding belt and claw wheel that are generally disposed in a conventional conveyor magazine type bag supplying apparatus (in which the amount of shifting between adjacent bags in the group of bags carried on the belt conveyor does not vary during conveying) are not essential in the present invention.

[0016] In the above-described bag supplying apparatus of the present invention, the conveying means can be the vibrating feeder alone, and it is also possible that the supplying apparatus includes another conveying means in addition to this vibrating feeder. When another conveying means is involved, it is preferable that the vibrating feeder is disposed at the beginning of the conveying path. In cases where such another conveying means that conveys the bags that are fed out from the vibrating feeder even further in the forward direction is installed, such another conveying means can be, for example, a belt conveyor or another (or separate) vibrating feeder. It is also preferable that the conveying speed of such another conveying means be set at a speed that is greater than that of the vibrating feeder.

[0017] Furthermore, it is also preferable to install a fast-feeding belt in the vicinity of the front end of the vibrating feeder so that the leading (first) bag in the trough is separated from the group of following bags and fed out to another conveying means.

[0018] In the bag supplying apparatus of the present invention, any type of known electromagnetic type driving device or vibration motor type driving device can be used as the vibration driver of the vibrating feeder. In any case, it is preferable that the vibration frequency and/or amplitude of the trough be variable so that a conveying speed that matches the required bag supply speed (bags/minute) can be realized.

[0019] Furthermore, since the angle of inclination of the trough in the forward-rearward direction (downward inclination toward the front - horizontal - upward inclination toward the front) affects the conveying speed, it is preferable that an adjustment means for adjusting this angle of inclination of the trough be provided. The left and right side plates of the trough function to guide the conveying of the bags in the forward direction, and they are set in accordance with the lateral width of the bags so that the gap between these plates is slightly larger than the lateral width of the bags. It is, however, preferable that the gap between the left and right side plates be made adjustable so that bags of various sizes can be handled.

[0020] It is further preferable that a detector that detects the remaining quantity of bags that are conveyed in the trough be provided. When such a detector is provided, it is preferable that the operator be informed by a monitor display, alarm, etc. in cases where the remaining quantity of bags detected by the detector has dropped below a specified quantity.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0021]

Figure 1 is a sectional side view of the bag supplying apparatus according to one embodiment of the present invention;
Figure 2 is a sectional side view of the bag supplying apparatus according to another embodiment of the present invention;
Figure 3 is a sectional side view of the bag supplying apparatus according to still another embodiment of the present invention; and
Figure 4 is a sectional side view of the bag supplying apparatus according to still another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Below the bag supplying apparatus of the present invention will be described in concrete terms with reference to Figures 1 through 4.

[0023] The apparatus shown in Figure 1 is a bag supplying apparatus in which the conveying means is an

electromagnetic feeder (one type of vibrating feeder) only; and this apparatus includes an electromagnetic feeder 1, a positioning stopper 2, a suction disk 3 that suction-chucks and lifts a leading (first) bag W 1 positioned by the stopper 2, and detectors 4 and 5.

[0024] The electromagnetic feeder 1 includes a trough 6 and a vibration drive section (or a vibration driver) 7. The trough 6 is comprised of a bottom plate 6a, left and right side plates 6b (only one of which is shown in the drawings), and a rear closing plate 6c; and the stopper 2 is disposed in the foremost part of the trough 6. The gap between the side plates 6b can be adjusted in accordance with the lateral width of the bags that are to be conveyed. The vibration driver 7 is comprised of an electromagnet 9 that is fastened to a supporting stand 8, a controller 11 that excites the electromagnet 9 in a pulsating manner, an attachment stand 12 to which the trough 6 is fastened, plate springs 13 that connect the electromagnet 9 and attachment stand 12, and a movable element 14 that is fastened to the undersurface of the attachment stand 12. The supporting stand 8 is attached to a base stand 16 via coil springs 15, and the base stand 16 is fastened to the upper surface of a machine base 18 via a stand 17.

[0025] The controller 11 alters the frequency and voltage of the power that is supplied to the electromagnet 9. The controller 11 thus varies the vibration frequency and amplitude of the trough 6. The vibration amplitude of the trough 6 can also be varied by altering the number of plate springs 13 or changing these springs to other springs having different spring constants.

[0026] In the above-described bag supplying apparatus, a slit 19 is formed in one side of the stand 17, and the inclination of the base stand 16, i.e., the inclination or angle of the bottom plate 6a of the trough 6, is adjustable within a specified range of angle by moving a fastening bolt 20 attached the base stand 16 along the slits 19. In the shown embodiment, the bottom plate 6a is inclined downward in the forward direction (leftward in Figure 1). In this case, the conveying speed is greater than in cases where the bottom plate is horizontal or inclined upward in the forward direction.

[0027] The suction disk 3 makes a vertical reciprocating motion between a suction chucking position (shown by solid lines) and a transfer position (shown by dotted lines) where transfer of bags to a next apparatus is performed. The suction disk 3 is lowered to the suction chucking position, where the suction disk 3 suction-chucks a leading (first) bag W1; then, the suction disk 3 is raised, and transfers the bag to the next apparatus to another location. For example, the next apparatus is a transfer apparatus (suction disk or chuck, etc., that can swing upward and downward) which is disposed between the suction disk 3 and, for example, the grippers of a rotary type bag-filling packaging machine. After receiving the bag from the suction disk 3 in the above-described transfer position, the suction disk 3 swings upward and transfers the bag to the grippers. The combination of this suction disk 3 and the above-described next apparatus is in itself the same as in the above-described conveyor magazine type bag supplying apparatus (see Patent References 1 through 4). The suction disk 3 itself may also transfer the bag directly to the above-described grippers.

[0028] A group of stacked bags W0 is placed in the trough 6 with the bag mouths facing forward (left side in Figure 1) and with the bags shifted in the longitudinal direction so that the bags on the upper part of the stack are located on the forward side, so that the bags are stacked in a cascade fashion. When the electromagnet 9 is excited (actuated), vibrations that are oriented upward toward the front and oriented in the opposite direction (as shown by the arrow in Figure 1) are applied to the trough 6, and these vibrations are also applied via the trough to the respective bags of the group of bags W0 placed in the trough 6; as a result, the bags W0 are conveyed or moved forward, and the irregularity in the amount of shifting of the bags is evened out in the process of this conveying, and in addition, as the bags proceed in the forward direction, the amount of shifting between adjacent bags increases in a more or less regular manner.

[0029] When the leading (first) bag W1 comes into contact with the positioning stopper 2, this contact is detected by the detector 4, and the suction disk 3 is lowered to the suction chucking position by the command of a control device (not shown in the drawings) based upon the signal from the detector 4. The suction disk 3 then suction-chucks the bag W 1 and is raised to the transfer position, so that the bag W 1 is transferred to the next apparatus.

[0030] The above action is repeated so that the number of bags in the trough 6 decreases; and when the last bag W2 of the group of bags W0 passes through the position of the detector 5 so that the detector 5 no longer detects bags, a control device (not shown in the drawings) informs the operator of an insufficiency in the remaining quantity of bags by means of a monitor display, alarm signal, etc. based upon the non-detection signal.

[0031] The apparatus shown in Figure 2 (the same reference numbers are assigned to parts that are substantially the same as those in the apparatus of Figure 1) is similarly a bag supplying apparatus in which the conveying means is only an electromagnetic feeder 1, and a fast-feeding belt 21 is disposed above the trough 6, which is the difference from the apparatus of Figure 1.

[0032] The fast-feeding belt 21 is the same as that used in a conventional conveyor magazine type bag supplying apparatus. The belt is mounted on a pair of pulleys 22 and 23 and is set so as to be free to swing upward and downward about the axial center of the upper pulley 23. The belt 21 is driven by a motor 24, so that the belt rotates at a circumferential speed that is greater than the conveying speed of the trough 6. The reference number 25 is a detector that is disposed di-

rectly above the pulley 22, and it detects the height of the fast-feeding belt 21.

[0033] The fast-feeding belt 21 is ordinarily at its lower swing end path by gravity, and there is a small gap between the lower end of the fast-feeding belt 21 and the bottom plate 6a of the trough 6. When bags are conveyed in the trough 6, and the amount of shifting between adjacent bags has increased in a regular manner so that a bag arrives in the position beneath the fast-feeding belt 21, the fast-feeding belt 21 contacts the upper surface of the bag and feeds this bag out in the forward direction (left side in Figure 2), so that the bag is separated from the following group of bags W0.

[0034] If there should happen to be areas in which the spacing between adjacent bags is reduced in the group of bags W0 so that numerous bags enter the area beneath the fast-feeding belt 21 at one time, the fast-feeding belt 21 swings upward. When the detector 25 detects this rise of the fast-feeding belt 21, a control device (not shown in the drawings) issues a command to the controller 11 based upon the detection signal of the detector 25, so that the electromagnetic feeder 1 is stopped.

[0035] Subsequently, when the bags beneath the fast-feeding belt 21 are successively fed out and this fast-feeding belt 21 swings back downward, the detector 25 detects this downward movement of the fast-feeding belt 21, and the control device issues a command to the controller 11 based upon the detection signal of the detector 25, so that the electromagnetic feeder 1 is restarted.

[0036] Matters other than those described above are the same as in the apparatus shown in Figure 1.

[0037] The apparatus shown in Figure 3 (the same reference numbers are assigned to parts that are substantially the same as those in the apparatuses shown in Figures 1 and 2) is a bag supplying apparatus in which the conveying means comprises an electromagnetic feeder 1 and a belt conveyor 26, which are disposed in a series configuration.

[0038] A fast-feeding belt 21 is disposed in the vicinity of the front end of the electromagnetic feeder 1, a claw wheel 27 is disposed on the belt conveyor 26, and a positioning stopper 2 is disposed in the vicinity of the front end of the belt conveyor 26. The belt conveyor 26 is rotated by a motor 28. The conveying speed of this conveyor is set at a higher speed than the conveying speed of the electromagnetic feeder 1. The claw wheel 27 is the same as that used in a conventional conveyor magazine type bag supplying apparatus, and it is rotated by a motor 31 via a pulley 29 and a belt 30. The circumferential speed of this claw wheel is higher than the speed of the belt conveyor 26, and the claw wheel 27 is controlled so that it is rotated when the leading (first) bag W 1 is not in contact with the stopper 2 and it stops its rotation when the leading (first) bag W 1 contacts the stopper 2.

[0039] The bags that are separated from the group of bags W0 and fed out to the belt conveyor 26 by the fast-feeding belt 21 are conveyed forward by the belt conveyor 26, and then they are fed out in the forward direction (left side in Figure 3) by the claw wheel 27 so that the bags contact the stopper 2. The detector 4 detects the contacts of the bags, and the claw wheel 27 is stopped by a command from a control device (not shown in the drawings) based upon the signal of the detector 4. Furthermore, as described above, the suction disk 3 is lowered to the suction chucking position and suction-chucks the bag W1, and then it is raised to the transfer position, where the suction disk 3 transfers the bag W 1 to the next apparatus. When the detector 4 detects bags, the claw wheel 27 is again rotated by a command from the control device based upon the non-detection signal of the detector 4, so that bags are fed out in the forward direction. The claw wheel 27 can be set so that it rotates intermittently for a short time at an appropriate timing.

[0040] Matters other than those described above are the same as in the apparatuses shown in Figures 1 and 2.

[0041] The apparatus shown in Figure 4 (the same reference numbers are assigned to the parts that are substantially the same as those in the apparatuses shown in Figures 1 and 2) is a bag supplying apparatus in which the conveying means is comprised of an electromagnetic feeder 1 and another electromagnetic feeder 32, which are installed in a series configuration. The electromagnetic feeder 32 is provided at the feeding end of (or in front of) the electromagnetic feeder 1 with a space in between, and the electromagnetic feeder 32 is provided with a trough 6' .

[0042] The electromagnetic feeder 32, which has thereon the trough 6', has substantially the same construction as the electromagnetic feeder 1, which has thereon the trough 6, except that the conveying speed of the secondary electromagnetic feeder 32 is set at a higher speed than that the electromagnetic feeder 1. The fast-feeding belt 21 and the detectors 5 and 25 are provided in association with the electromagnetic feeder 1; and the positioning stopper 2, the suction disk 3 and the detector 4 are provided in association with the electromagnetic feeder 32.

[0043] The bags that are separated from the following group of bags W0 and fed out onto the trough 6' disposed on the electromagnetic feeder 32 by the fast-feeding belt 21 are conveyed forward (left side in Figure 4) by the electromagnetic feeder 32, and the leading bag W 1 contacts the stopper 2.

[0044] Matters other than those described above are the same as in the apparatuses shown in Figures 1 and 2.

[0045] As seen from the above, according to the bag supplying apparatus of the present invention, even if bags are randomly placed in the trough, the irregularity in the amount of shifting between the bags is evened out as the bags are conveyed forward in the trough, and at the same time, the amount of shifting between adja-

cent bags more or less regularly increases as the bags proceed in the forward direction in the trough. Accordingly, the supply of bags to a bag-filling packaging machine is accomplished without any problems, and the operator has a reduced burden on the operation. The same is true in cases where bags with locally varying thickness are handled, as in bags attached with chucks and bags attached with spouts. Furthermore, the above functions are realized by a simple mechanism of a vibrating feeder of the present invention.

Claims

1. A bag supplying apparatus for a bag-filling packaging machine, comprising:

a vibrating feeder that is a conveying means and includes:

a trough in which bags that are stacked are placed so that a bag on another bag is shifted on a forward side, and
a vibration driver that causes said bags to convey forward by vibrating said trough;

a positioning stopper with which a tip end of a leading bag comes into contact, said positioning stopper being provided at substantially a final end of a conveying path of said conveying means; and
a suction disk that suction-chucks and lifts a bag positioned by said stopper and feeds said bag to another location.

2. The bag supplying apparatus for a bag-filling packaging machine according to Claim 1, wherein said trough includes side plates, and a gap between said side plates is adjustable.

3. The bag supplying apparatus for a bag-filling packaging machine according to Claim 1 or 2, wherein said vibrating feeder further includes an adjustment means for adjusting an angle of inclination of said trough in a forward-rearward direction.

4. The bag supplying apparatus for a bag-filling packaging machined according to any of Claims 1 through 3, wherein a vibration frequency and/or amplitude of said trough of said vibrating feeder is variable.

5. The bag supplying apparatus for a bag-filling packaging machine according to any of Claims 1 through 4, further comprising a detector which detects remaining quantity of bags in said trough.

6. The bag supplying apparatus for a bag-filling packaging machine according to any of Claims 1 through 5, further comprising a fast-feeding belt which contacts upper surfaces of said bags conveyed in said trough and fast-feeds said bags in a forward direction.

7. The bag supplying apparatus for a bag-filling packaging machine according to any of Claims 1 through 6, further comprising another conveying means which is provided at a feeding end of said vibrating feeder so as to convey said bags that have been fed out from said vibrating feeder even further forward.

8. The bag supplying apparatus for a bag-filling packaging machine according to Claim 7, wherein said another conveying means is a belt conveyor.

9. The bag supplying apparatus for a bag-filling packaging machine according to Claim 7, wherein said another conveying means is a vibrating feeder.

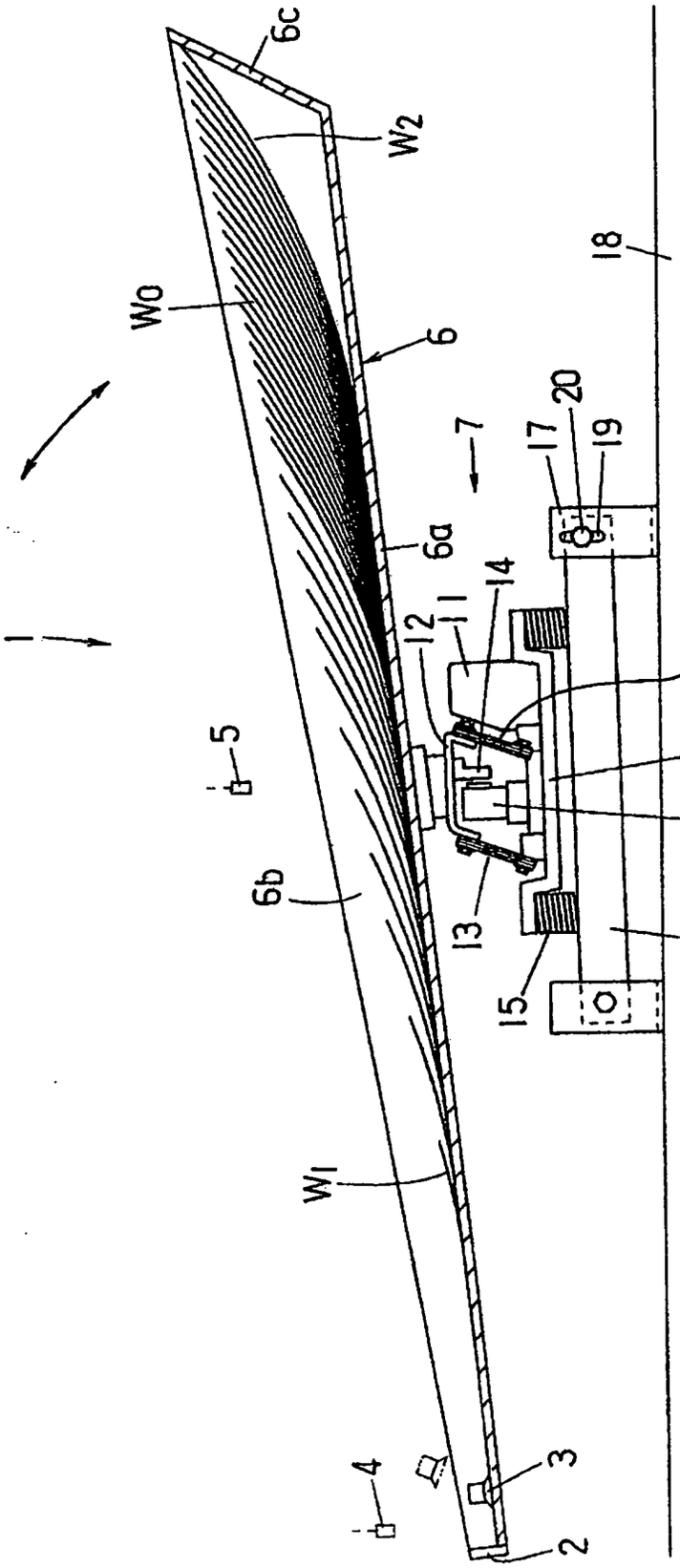

FIG. 1

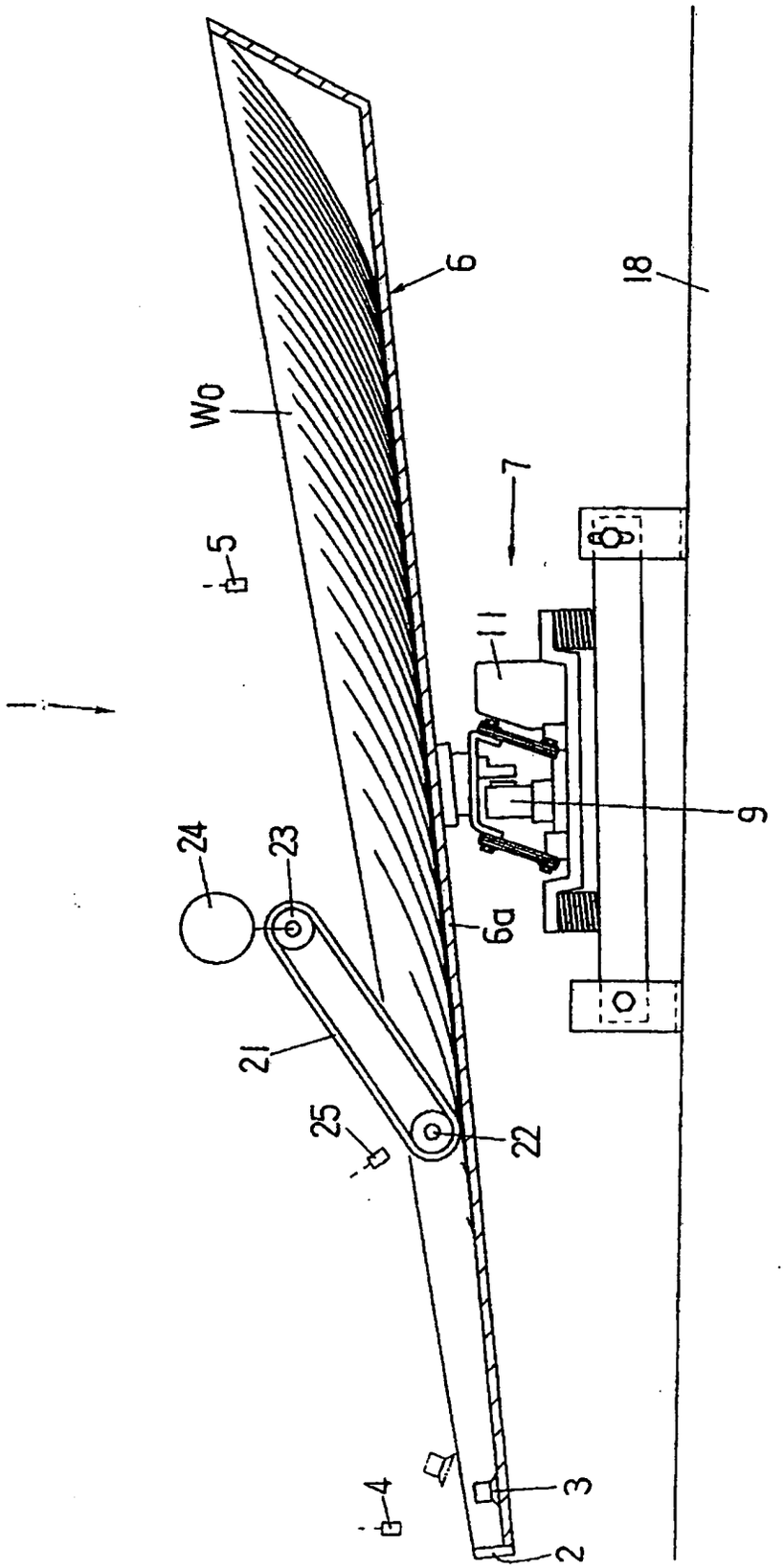

FIG. 2

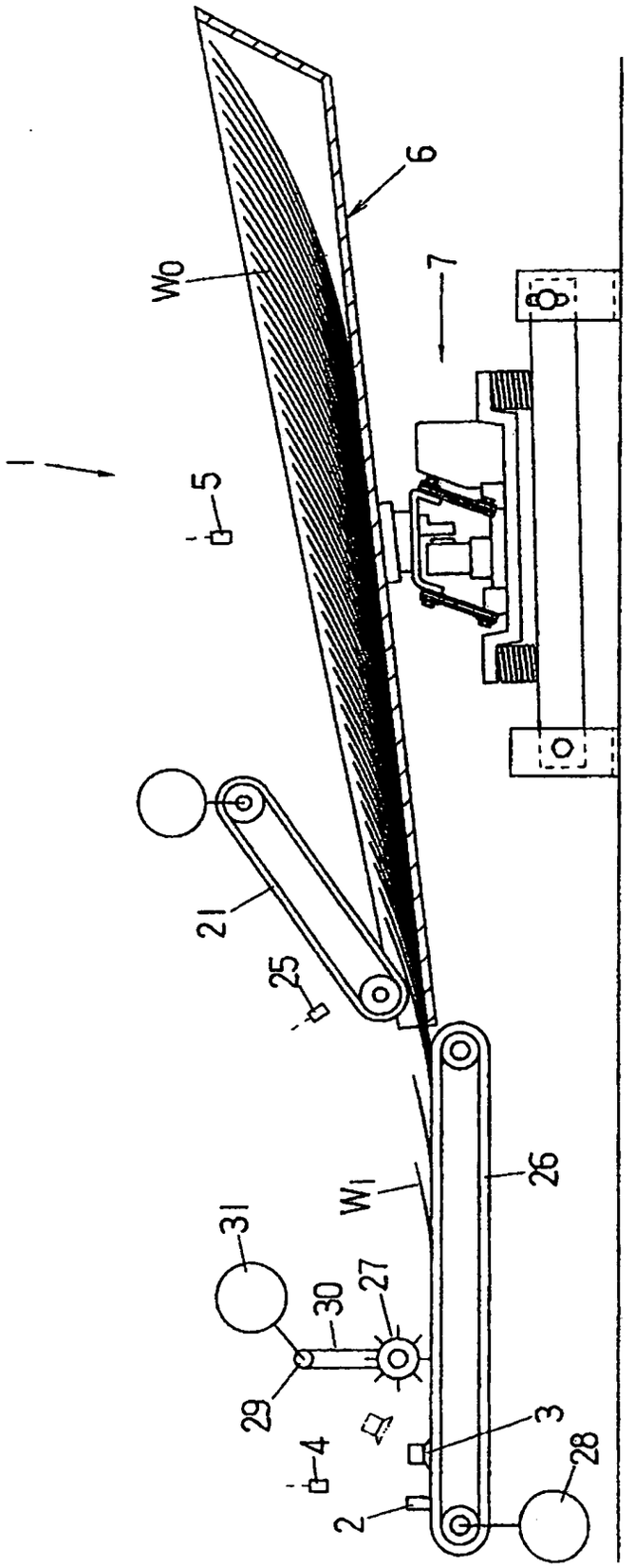

FIG. 3

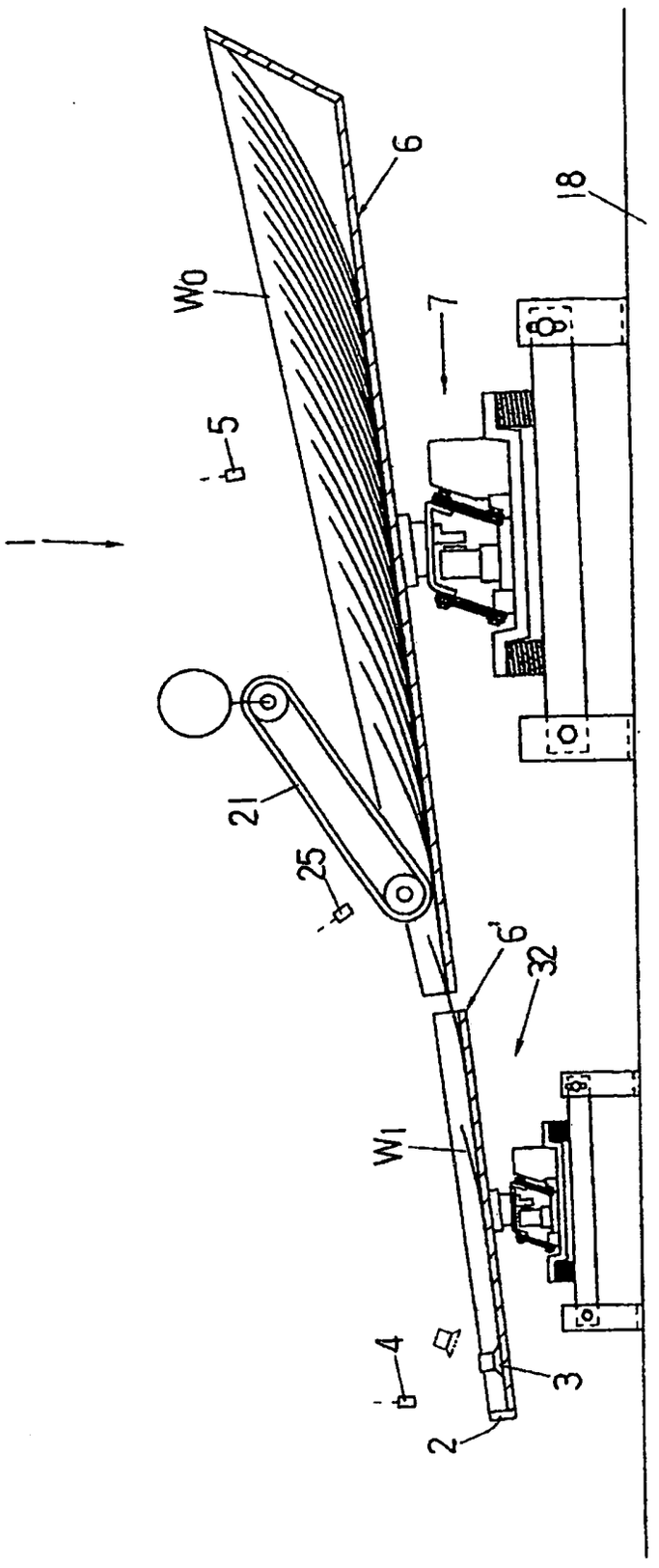

FIG. 4