(19) DANMARK

(10) DK/EP 3597569 T3

(12) Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: *B 65 G 15/00 (2006.01)* *B 66 F 3/40 (2006.01)*

(45) Oversættelsen bekendtgjort den: **2025-06-10**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2025-03-12**

(86) Europæisk ansøgning nr.: **19187065.8**

(86) Europæisk indleveringsdag: **2019-07-18**

(87) Den europæiske ansøgnings publiceringsdag: **2020-01-22**

(30) Prioritet: **2018-07-20 FR 1856765**

(84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(73) Patenthaver: **Brunone, René, 46 rue du Général Leclerc, 27950 Saint Marcel, Frankrig**

(72) Opfinder: **Brunone, René, 46, rue du Général Leclerc, 27950 Saint-Marcel, Frankrig**

(74) Fuldmægtig i Danmark: **Zacco Denmark A/S, Arne Jacobsens Allé 15, 2300 København S, Danmark**

(54) Benævnelse: **FREMGNGSMÅDE OG ENHED TIL VEDLIGEHOLDELSE AF ET TRANSPORTBÅND**

(56) Fremdragne publikationer:
WO-A2-2009/122230
FR-A1- 2 658 495
US-B1- 9 056 755

Process and assembly comprising a belt conveyor and a maintenance device

The invention generally relates to the conveyor belt maintenance.

Such belt conveyors typically comprise a longitudinal conveyor belt and a plurality of support stations for the conveyor belt, distributed along the belt.

Each support station includes a cradle, formed by one or several support members.

The conveyor belt rests on the support members, which give it a determined shape, typically in a deep trough.

The support members are typically rollers or pads.

It is necessary to replace the support members periodically, which are worn out by the contact with the belt.

Such an operation is not very convenient, since the operator must lift the belt to disassemble the support members and separate them from the chassis.

WO2009/122230A2 discloses a belt conveyor maintenance process according to the preamble of the claim 1, and an assembly according to the preamble of the claim 7.

In this context, the invention aims to facilitate the maintenance of the belt conveyor.

According to a first aspect, the invention relates to a belt conveyor maintenance process according to the claim 1.

Thus, the inflatable pad makes it possible to lift the belt above the support station in which the maintenance operation must be performed.

The operator can therefore intervene easily on the support station, in particular to replace one of the support members of the belt. The inflatable pad forms a sort of inflatable jack.

Using an inflatable pad makes it possible to shim the belt stably, in a position where it no longer has any contact with the support station.

The lifting of the belt is therefore obtained easily, without requiring the implementation of a sophisticated mechanical system.

The inflatable pad can be moved easily along the conveyor belt, to provide maintenance at different points of the conveyor.

The process is cost-effective, since it only requires the implementation of simple and inexpensive means.

The maintenance process can further present the features of the dependant claims 2 to 6.

According to a second aspect, the invention relates to an assembly according to the claim 7.

The assembly can further present the features of the claim 8.

Other features or advantages of the invention will emerge from the detailed description given below, by way of indication and without limitation, with reference to the annexed figures, including:

- figure 1 is a schematic profile illustration of an assembly according to the invention, the inflatable pad being in the deflated state;
- figure 2 is a front view of one of the support stations of figure 1;
- figure 3 is a view similar to that of figure 1, the inflatable pad being in its inflated state;
- figures 4 and 5 are side and front views of the maintenance device of figure 1, the inflatable pad being shown in the inflated state; and
- figure 6 is a view similar to that of figure 5, for an embodiment variant of the invention.

The assembly 1 shown in figure 1 comprises a belt conveyor 2.

This conveyor is typically intended to transport divided materials, for example sand or ores from a mine.

The conveyor belt 2 includes a longitudinal conveyor belt 3 and a plurality of support stations 5 for the conveyor belt, distributed along the belt.

The conveyor belt 3 is folded in a loop and engaged at its ends around two switchback rollers 6, 7.

Typically, one of the two rollers is a driver to provide the driving of the belt 3.

The belt 3 is thus divided into an upper transport segment 8 and a lower return segment 8', which is only partially shown in figure 1.

The stations 5 support the belt along the upper segment 8, and also along the lower segment 8'.

Each support station 5 comprises a cradle 9 on which the conveyor belt 3 rests (see figure 2). It also includes a support chassis 11, by means of which the station 5 rests on the ground. For example, the chasses 11 of the different support stations 5 are structurally connected to one another by connecting structures 15, as shown in figure 1. The chasses 11 and the connecting structures 15 make up the chassis 17 of the conveyor.

The cradle 9 comprises a plurality of support members 19, mounted on the support chassis 11.

The support members 19 are typically rollers mounted rotating on the support chassis 11, or pads that are stationary relative to the support chassis 11.

In the case of rollers, anti-jamming protections 21, visible in figure 2, hide the so-called reentrant angle formed by the belt 3 and the support rollers 19.

The conveyor belt rests on the cradle 9 of the support station by a support surface 23, typically facing downward.

The cradle 9 is provided both to support the conveyor belt 3 and to give it a determined shape, for example a deep trough shape of the type shown in figure 2.

To that end, in the illustrated example, the support station includes three support members 19, arranged transversely next to one another. The central support member 19 is substantially horizontal. The other two support members 19 are inclined toward the central support member.

Thus, the support surface 23 has a determined shape in cross-section when the conveyor belt 3 rests on the cradle 9.

This shape is close to the shape of the cradle 9.

The assembly 1 also includes a maintenance device 25, intended to facilitate the maintenance of the belt conveyor. This device 25 is shown schematically in figures 1 and 3, and in more detail in figures 4 and 5.

The maintenance device 25 includes:

- an inflatable pad 27 capable of selectively adopting an inflated state and a deflated state;
- an inflation member 29, arranged so as to inflate the inflatable pad 27 to its inflated state.

The pad 27 is shown in the deflated state in figure 1, and in the inflated state in figures 3, 4 and 5.

The inflatable pad 27 is an airtight pouch. It is made from any appropriate flexible material, for example natural or synthetic rubber, polyurethane, or a coated and/or tight fabric.

In the deflated state, the pad 27 is in the form of a thin wafer, as illustrated in figure 1.

Thus, the inflatable pad 27 is configured in order, in the inflated state, to be inserted below the belt 3 in a lifting position, near one of the support stations 5, as shown in figure 1.

Furthermore, the inflatable pad 27 is configured in order, in the lifting position and in the inflated state, to lift the conveyor belt 3 such that the conveyor belt 3 rests directly on the inflatable pad 27 and no longer rests on the cradle 9 of the support station 5. Such a situation is illustrated in figure 3.

To that end, the inflatable pad has a bearing surface 29 provided to bear against the conveyor belt 3 in the inflated state.The bearing surface 31, in the inflated state and in the absence of stress, has, in cross-section, the same determined shape as the support surface 23 of the conveyor belt 3.

In the illustrated example, the bearing surface 31 has a deep trough shape. "Cross-section in the absence of stress" here means the section of the bearing surface 31 when no outside force is applied to the inflatable pad 27, the shape of the bearing surface 31 resulting solely from the pressure inside the inflatable pad 27, this pressure being nominal.

Because the support surface 23 of the belt 3 and the bearing surface 31 of the inflatable pad 27 have the same cross-section, the inflatable pad 27 adapts easily below the belt 3, and can lift the latter without excessive burden, since the force applied to the inflatable pad 27 does not cause a pronounced deformation of the belt.

Thus, in the invention, the bearing surface 31 adopts the same cross-section as the support surface 23 only without the effect of the inflation. No mechanical action is necessary.

The inflation member 29 is typically a fan. In a variant, the inflation member is an electric pump, a blower, a manual pump, or any other device making it possible to inject a fluid into the inflatable pad.

The use of a fan is particularly advantageous, since such equipment is inexpensive and light. A compressor could also be used if it is necessary to reach high pressures inside the inflatable pad. However, this type of equipment is heavier than a fan and more expensive.

The inflatable pad 27, in the inflated state, has a pressure of between one absolute bar and three absolute bars. Here, this is the inner pressure of the inflatable pad 27.

The bearing surface 31 extends over the entire transverse width of the belt. Longitudinally, it extends over a width of between 10 cm and 1 m.

The maintenance device 25 also includes a chassis 33 on which the inflatable pad 27 and the inflation member 29 are mounted.

For example, a lower face 35 of the inflatable pad, opposite the bearing surface 31, is adhered to the chassis 33.

The inflation member 29 is rigidly fastened to the chassis 33 by any appropriate means.

The chassis 33 is for example an Omega-shaped metal profile, of the type shown in figures 3 and 4.

In a variant, it is of any other type.

Advantageously, the maintenance device 25 is provided to be mounted on the chassis 17 of the belt conveyor when it is placed in the lifting position, as illustrated in figure 1 and in figure 3.

The invention also relates to a maintenance process for a belt conveyor 2 comprising a longitudinal conveyor belt 3 and a plurality of support stations 5 for the conveyor belt 3, distributed along the belt.

Thus, the maintenance process is provided for the belt conveyor described above.

It is in particular provided to be carried out with the maintenance device 25 described above.

The maintenance process comprises the following steps:

- inserting an inflatable pad 27 in a deflated state below the belt 3, in a lifting position near one of the support stations 5;
- inflating the inflatable pad 27 to an inflated state in which the conveyor belt 3 rests directly on the inflatable pad 27 and no longer rests on the cradle 9 of said support station 5;
- performing a maintenance operation on said support station 5;
- deflating the inflatable pad 27 to its deflated state.

The inflatable pad 27 is as described above relative to the assembly 1.

The inflatable pad 27 is inserted below the belt 3 such that the bearing surface 31 is immediately below the support surface 23 of the belt. It is oriented such that the inflatable pad 27, once in its inflated state, nests exactly on the support surface 23, since the support surface 23 and the bearing surface 31 have the same cross-section.

The inflatable pad 27 is mounted on the conveyor chassis 17 in the lifting position.

The inflatable pad 27 is inflated by an inflation member 29, as described relative to the assembly 1. This member 29 is typically a fan.

The lifting position is chosen to be close enough to the support station 5 so that, when the inflatable pad 27 is inflated, the conveyor belt 3 is lifted above the cradle 9 and no longer rests on the latter.

Such a situation is illustrated in figure 3.

In the inflation step, the inflation member 29 is triggered and sends air inside the inflatable pad 27. The latter goes gradually from its deflated state to its inflated state.

The inflatable pad 27 and the fan 29 are mounted on a chassis 33, as described above.

They thus advantageously form a single-piece portable subassembly.

They rest on the conveyor chassis 17 by means of the chassis 33.

At the end of the inflation step, the inflatable pad has a pressure of between one absolute bar and three absolute bars.

The inflatable pad 27 is kept in an inflated step throughout the entire maintenance step on the support station 5. The operators therefore have easy access to the support station and are not bothered by the belt 3.

The maintenance step typically comprises a replacement operation of one or several support members 19. It can comprise other operations, for example procedures on other elements of the cradle 9 or on the chassis 11.

After the end of the maintenance step, the inflatable pad 27 is deflated to its deflated state. This next makes it possible to extract the inflatable pad from its lifting position.

The maintenance device can next be transported to other points of the belt conveyor, to perform other maintenance operations.

The conveyor belt 3 is stopped, i.e., immobile, during the steps that have been described above.

The invention has been described above with a pad inflated by air. In a variant, the pad is inflated with another gas. According to another variant, the pad is inflated by a liquid such as water.

The invention has been described with an inflatable pad whereof the bearing surface has the same cross-section as the support surface of the belt. In a variant not covered by the claims, the bearing surface has another shape. For example, it is in the shape of a transverse tubular bead, or other suitable shapes.

According to an embodiment variant illustrated in figure 6, the maintenance device 25 comprises two inflatable pads 27.

These pads 27 are preferably identical to one another and are oriented in the same way.

The two inflatable pads 27 are mounted on two independent chasses 33. In a variant, they are mounted on the same chassis 33.

The two pads 27 each have two orifices 35 placing the inner volume of the pad in communication with the outside.

The orifice 35 of a first of the two pads 27 is fluidly connected to one of the orifices 35 of the second pad 27 by a pipe 37. The pipe 37 is preferably removable. The other orifice 35 of the first pad is connected to the discharge of the inflation member 29. The other orifice 35 of the second pad 27 is closed off by a stopper, not shown.

Thus, when the pipe 37 is connected on the orifices 35, the inflation member 29 makes it possible to inflate both pads 27 at once.

The two pads 27 are arranged so as to be able to be placed on either side of a support station 5, in the deflated state, in respective lifting positions. In the inflated state of the two inflatable pads 27, the conveyor belt 3 rests directly on the two inflatable pads 27 and no longer rests on the cradle 9 of the support station 5.

Such an arrangement is particularly suitable for very heavy conveyor belts, or for a belt conveyor stopped with a load, i.e., with products on the conveyor belt.

It also makes it possible to provide very fast maintenance, since the cradle 9 of the support station 5 is indeed freed and accessible when the belt is lifted on both sides.

In a variant, several pads 27 are placed on each side of the support station 5, for example two pads on each side, or three pads, or more than three pads.

In a variant, several pads 27 are placed next to several consecutive support stations 5, for example one or more pads per station for two or more support stations 5. This allows the simultaneous maintenance of two or more support stations, once the pads are inflated.

All of the pads 27 are fluidly connected to one another as described in reference to figure 6, by pipes 37. A single inflation member 29 makes it possible to inflate all of the pads 27 at once.

Alternatively, all of the pads 27 placed on a same side of the support station 5 are fluidly connected to one another as described in reference to figure 6, by pipes 37. Two inflation members 29 are sufficient to inflate all of the pads 27.

Patentkrav

1. Fremgangsmåde til vedligeholdelse af en båndtransportør (2) omfattende et langsgående transportbånd (3) og en flerhed af støttestationer (5) af transportbåndet (3), som er fordelt langs transportbåndet (3), hvor hver støttestation (5) omfatter en vugge (9), hvorpå transportbåndet (5) hviler ved hjælp af en støtteflade (23), hvor fremgangsmåden omfatter følgende trin:

- indsættelse af en oppustelig pude (27) i en lufttom tilstand under transportbåndet (3), i en løfteposition nær en af støttestationerne (5);
- oppustning af den oppustelige pude (27) til en oppustet tilstand, hvor transportbåndet (3) hviler direkte på den oppustelige pude (27) og ikke længere hviler på vuggen (9) af støttestationen (5);
- udførelse af en vedligeholdelsesoperation på støttestationen (5);
- tømning af den oppustelige pude (27) til dens lufttomme tilstand;

hvor støttefladen (23) i tværsnit har en bestemt form, når transportbåndet (3) hviler på vuggen (9) af støttestationen (5), hvor den oppustelige pude (27) har en anlægsflade (31), der er beregnet til at hvile mod transportbåndet (3) i oppustet tilstand,

kendetegnet ved, at anlægsfladen (31) i oppustet tilstand og i fravær af belastning har det bestemte tværsnit, hvor det tværsnit, der er bestemt i fravær af belastning, er tværsnittet af anlægsfladen (31), når der ikke påføres nogen ekstern kraft på den oppustelige pude (27), hvor formen på anlægsfladen (31) udelukkende skyldes trykket inde i den oppustelige pude (27), hvor dette tryk er nominelt.

2. Fremgangsmåde til vedligeholdelse ifølge krav 1, hvor vuggen (9) omfatter flere støtteelementer (19) af transportbåndet (3), hvor vedligeholdelsesoperationen omfatter udskiftning af mindst et af støtteelementerne (19).

3. Fremgangsmåde til vedligeholdelse ifølge et hvilket som helst af de foregående krav, hvor den oppustelige pude (27) pustes op af en ventilator (29).

4. Fremgangsmåde til vedligeholdelse ifølge krav 3, hvor den oppustelige pude (27) og ventilatoren (29) er monteret på et chassis (33) og således danner en bærbar underenhed i ét stykke.

5. Fremgangsmåde til vedligeholdelse ifølge et hvilket som helst af de foregående krav, hvor den oppustelige pude (27) i oppustet tilstand har et tryk på mellem 1 absolut bar og 3 absolut bar.

6. Fremgangsmåde til vedligeholdelse ifølge et hvilket som helst af de foregående krav, hvor transportbåndet (2) omfatter et transportørchassis (17), hvor den oppustelige pude (27) er monteret på transportørchassiset (17) i løfteposition.

7. Enhed (1), omfattende:
- en båndtransportør (2) omfattende et langsgående transportbånd (3) og en flerhed af støttestationer (5) af transportbåndet (3), som er fordelt langs transportbåndet (3), hvor hver støttestation (5) omfatter en vugge (9), hvorpå transportbåndet (3) hviler ved hjælp af en anlægsflade (23); og
- en indretning til vedligeholdelse (25) af transportbåndet (2), hvor indretningen til vedligeholdelse (25) omfatter:
- en oppustelig pude (27), der er i stand til selektivt at indtage en lufttom tilstand og en oppustet tilstand;
- et oppustningselement (29), der er anbragt således, at den oppustelige pude (27) kan pustes op til sin oppustede tilstand;
hvor den oppustelige pude (27) er konfigureret til, i oppustet tilstand, at blive indsat under transportbåndet (3) i en løfteposition nær en af støttestationerne (5);

hvor i løftepositionen og i oppustet tilstand er den oppustelige pude (27) konfigureret til at løfte transportbåndet (3), således at transportbåndet (3) hviler direkte på den oppustelige pude (27) og ikke længere hviler på vuggen (9) på støttestationen (5);

hvor anlægsfladen (23) i tværsnit har en bestemt form, når transportbåndet (3) hviler på vuggen (9) af støttestationen (5), hvor den oppustelige pude (27) har en anlægsflade (31), der er beregnet til at hvile mod transportbåndet (3) i oppustet tilstand,

kendetegnet ved, at anlægsfladen (31) i oppustet tilstand og i fravær af belastning har det bestemte tværsnit, hvor det tværsnit, der er bestemt i fravær af belastning, er tværsnittet af anlægsfladen (31), når der ikke påføres nogen ekstern kraft på den oppustelige pude (27), hvor formen på anlægsfladen (31) udelukkende skyldes trykket inde i den oppustelige pude (27), hvor dette tryk er nominelt.

8. Enhed ifølge krav 7, hvor indretningen til vedligeholdelse (25) omfatter et chassis (33), hvorpå den oppustelige pude (27) og oppustningselementet (29) er monteret, hvorved der dannes en bærbar underenhed i ét stykke.

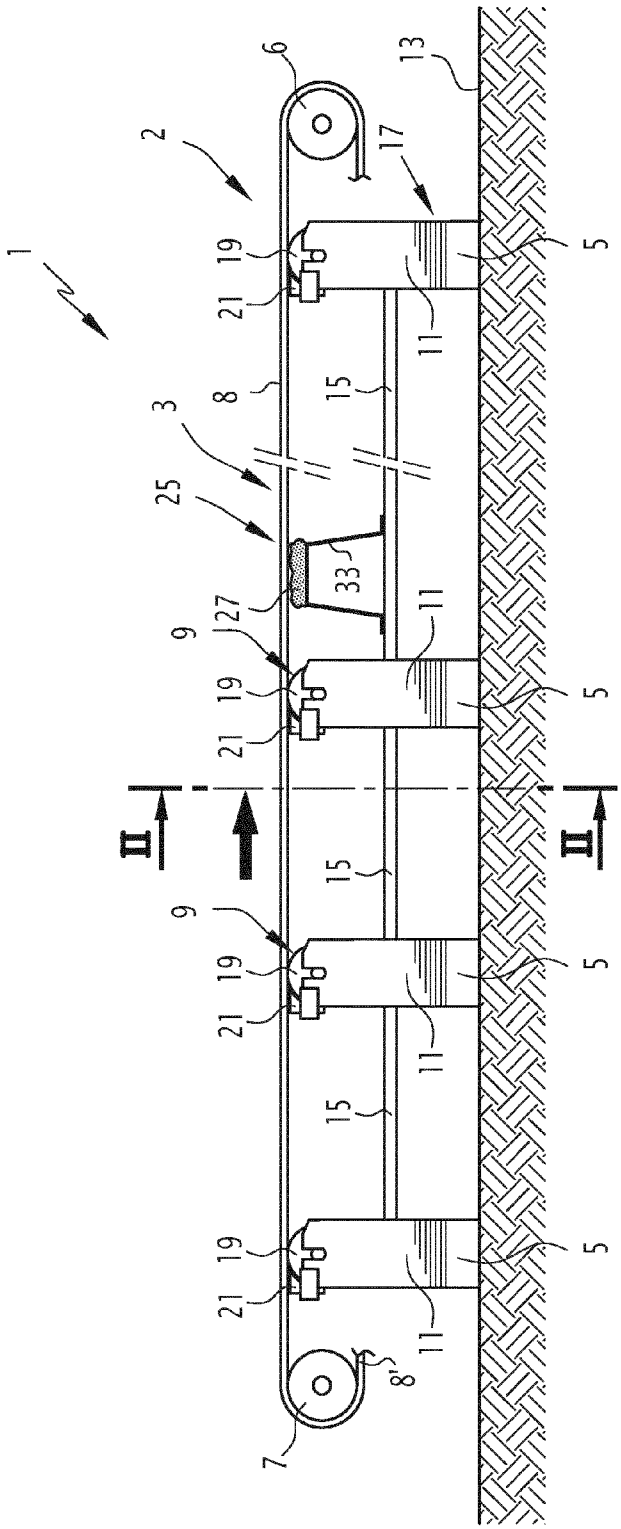

FIG.1

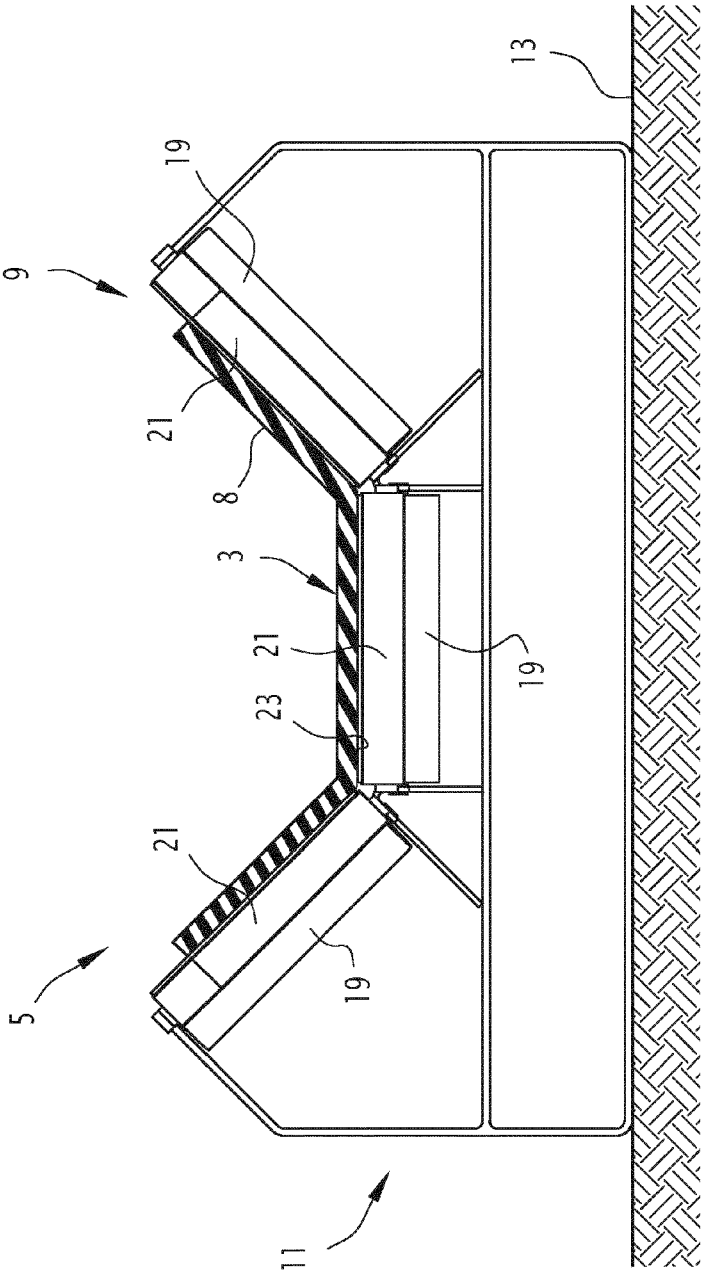

FIG.2

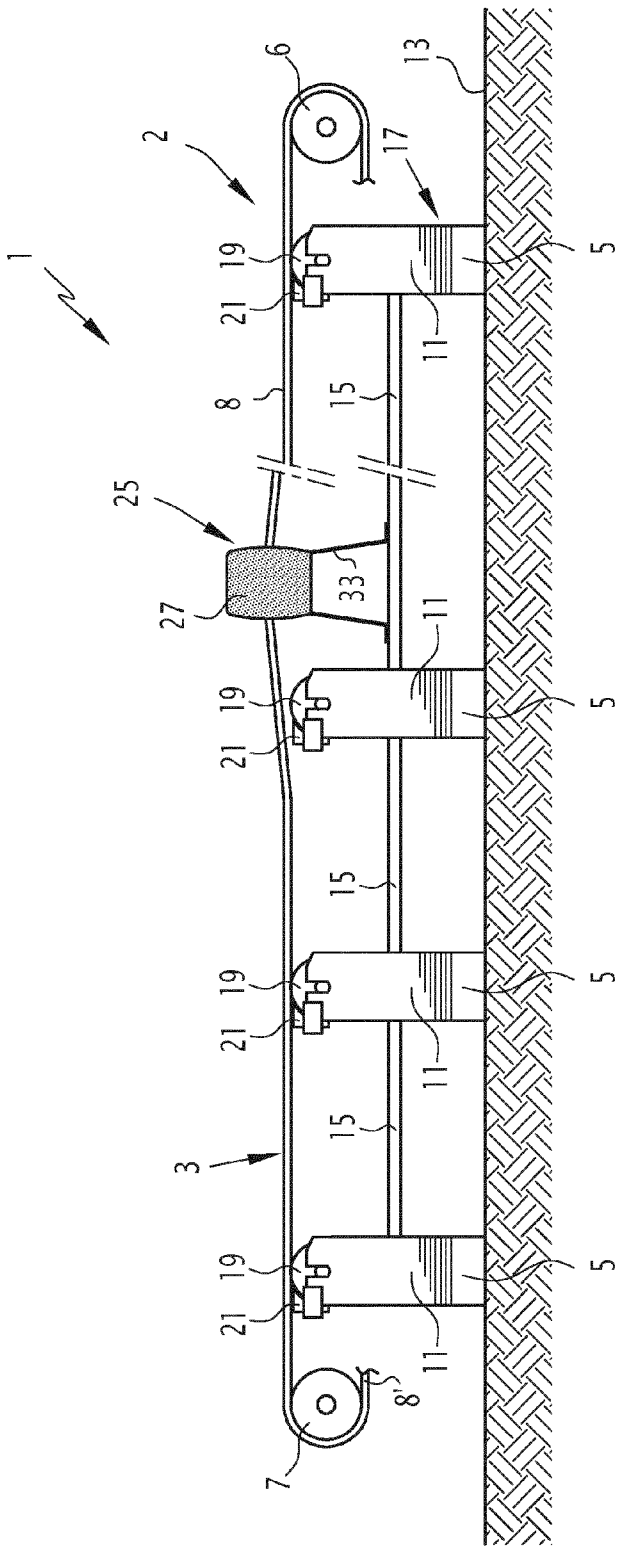

FIG.3

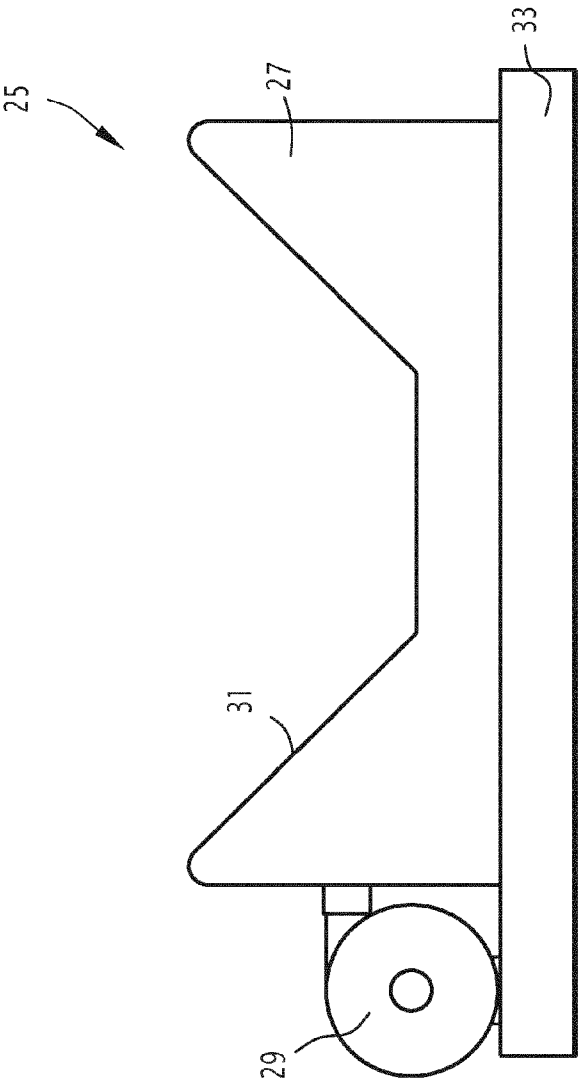

FIG.5

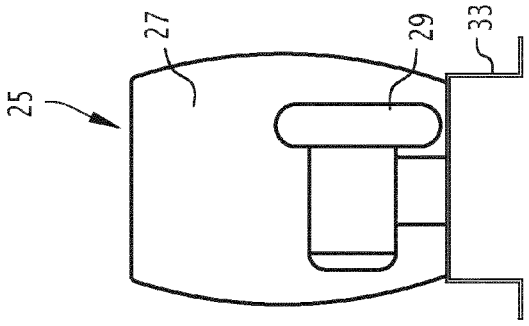

FIG.4

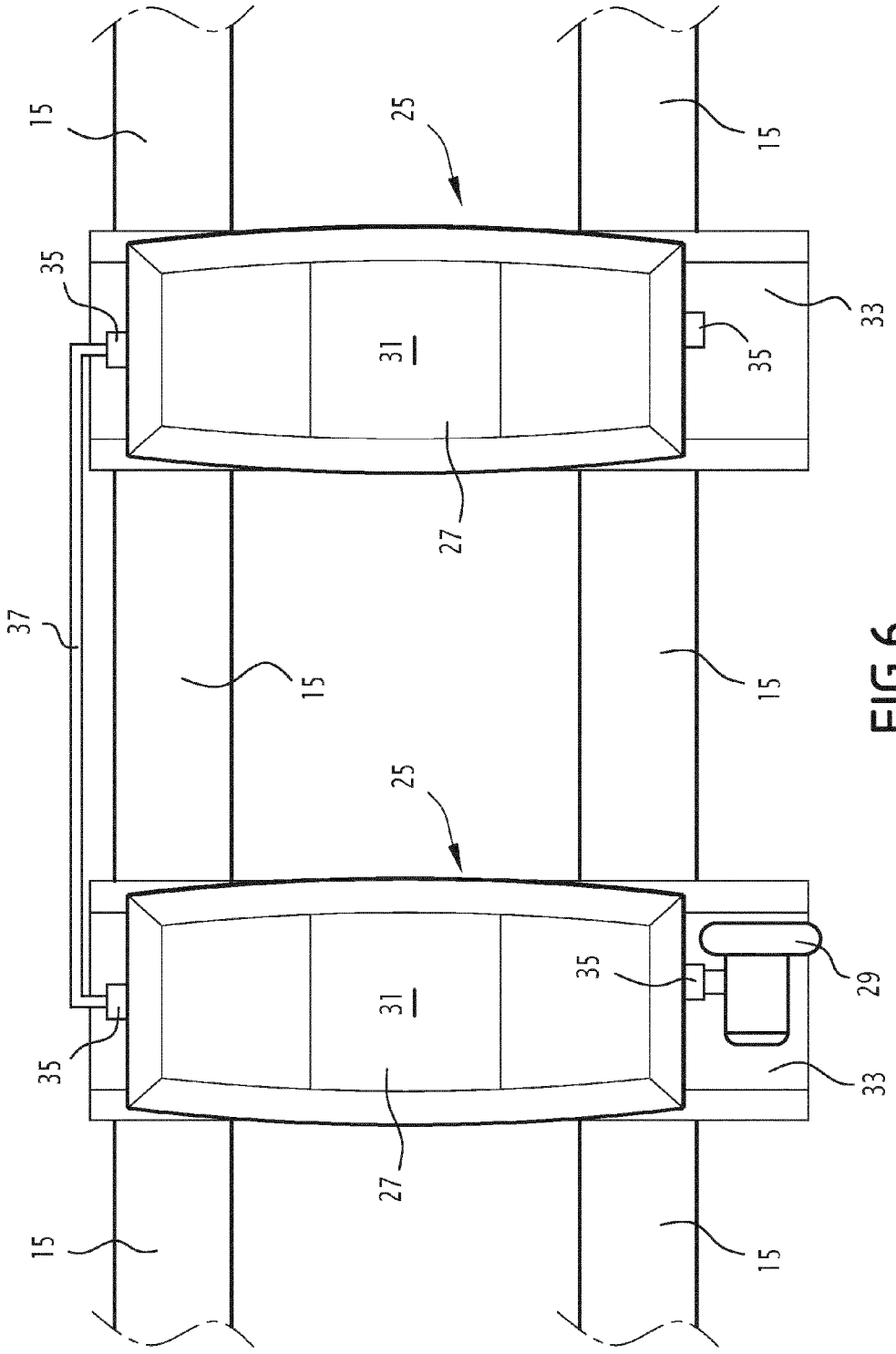

FIG.6