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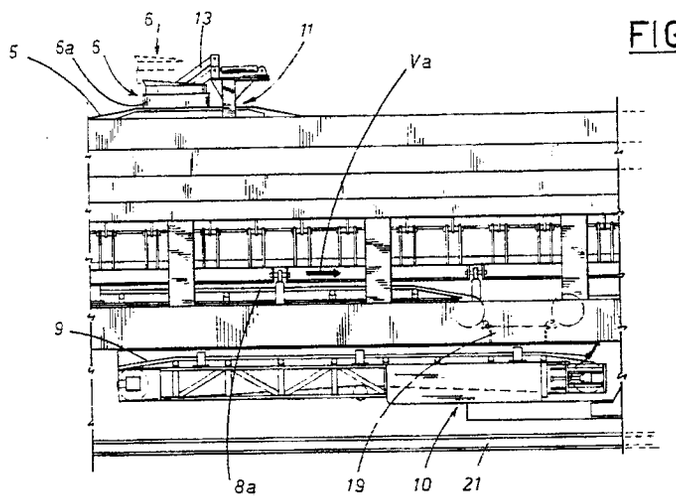
(54) A railway car for the transportation of debris.

(57) The car comprises a bin (3), and features a first horizontal belt (5) in receipt of excavated debris (4), occupying a central and longitudinal position over the bin and surmounted by a mobile wedge (6) traversed along the length of the bin and serving to distribute the incoming debris, also a plurality of flaps (7) arranged in opposing pairs along the bottom of the bin (3) and combining therewith to create a series of modular hopper sections, which are capable of movement between limit positions whereby the hopper sections are opened and closed; two further horizontal belts (8a, 8b) are installed end to end beneath the flaps (7), positioned to collect the falling contents of the hopper sections when opened up and direct them through a single dropping point onto one end of a third horizontal belt (9), remote from the bin and positioned below the second belts (8a, 8b), which is rotated by a slewing ring (10) between a non-operative inboard position and an operative position substantially transverse to the bin, adopted for the purpose of offloading.

FIG1



EP 0 419 423 A1

A RAILWAY CAR FOR THE TRANSPORTATION OF DEBRIS

The present invention relates to a railway car for the transportation of debris.

Prior art in the design and construction of rolling stock embraces certain types of car by which spoil, rubble and the like can be loaded at an operations site, transported to another location, and dumped. Such vehicles consist generally in two distinct parts, of which a first incorporates the components permitting movement, i.e. pairs of wheels enabling motion along a railway track, and a second consists in a high-sided open topped bin, or skip, resting on a chassis.

The bin serves to collect debris dropped in from above by excavating equipment. Naturally enough, there will be a train of such cars lined up at the operations site, and once loaded, the entire train is moved off to a designated dumping ground.

For dumping purposes, a car of the type in question is equipped generally with a number of telescopic arms operated by corresponding pneumatic cylinders mounted between the bin and the chassis; on arrival of the car at the dumping site, the cylinders will be actuated by an operater, whereupon the bin tilts to one side and its contents are discharged onto the ground below.

It is at this stage that one encounters certain drawbacks, attributable mainly to the structure of the car. A first drawback is that of the time taken to discharge the debris, and stems from the slow tilt of the bin; in effect, a considerable weight must be handled and it is therefore advisable to proceed with caution, otherwise the balance of the car might be upset, as indeed might the stability of the entire train. A second drawback is concerned with preparation of the ground where the debris is to be deposited; to avoid an accumulation of mounds that would occur if the contents of the bins were to be dumped on level ground, depressions or indeed fully excavated pits are prepared over the entire expanse of the dumping area, serving as a temporary deposit for the material pending its removal and transportation to a permanent site by truck. Such a procedure involves expenditure on personnel and equipment, and considerable loss of time, all of which signifying increased cost to the contractor.

Accordingly, the object of the present invention is to overcome the drawbacks outlined above through the provision of a debris transport car equipped with a combination of on-board features designed to enable a rational, speedy and convenient loading and offloading system whereby debris can be dumped successfully even on unprepared ground.

The stated object is realized in a transportation car as characterized in the appended claims; such a car comprises a first horizontal conveyor belt in receipt of debris loaded in from externally of the car, which occupies a substantially central and longitudinal position along an open topped bin and operates in combination with a horizontally mobile wedge traversing above and serving to distribute the incoming debris conveyed along the first belt; a plurality of flaps arranged in opposing pairs along the bottom of the bin which combine to create a series of modular hopper sections for temporary storage of the debris and are capable of movement between an open position and a closed position; a pair of second horizontal belts, positioned end to end beneath the flaps so as to take up the debris discharged from the modular hopper sections, and turning in opposite directions in such a way as to carry the debris convergently to a single dropping point; and a third horizontal belt remote from the bin and positioned below the pair of second belts with one end beneath the single dropping point, which is capable of movement, transmitted by way of drive means, between a non-operative position essentially of longitudinal alignment with the bin, and an operative offloading position rotated away from and substantially transverse to the bin.

Among the advantages afforded by the invention, the adoption of a chain of conveyor belts ensures swift and rational handling of the debris loaded into the bin; moreover, the third swinging belt permits of dumping material at a distance from the car and thus of dispensing with the need for preparatory excavations.

The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

-figs 1 and 1a together show a side elevation of the railway car according to the invention, with certain parts omitted better to reveal others;

-fig 2 is a front elevation of the car of fig 1-1a, in which certain parts are omitted better to reveal others.

Referring to the drawings, 1 denotes a four-wheel bogie running on railway tracks 21, associated with a horizontal chassis 2 that appears as a platform and supports a bin 3 for the collection of spoil, debris etc., denoted 4 in its entirety.

According to the present invention, such a car is equipped with a set of features allowing debris 4 to be collected, conveyed and subsequently dumped, consisting essentially in:

-a first horizontal conveyor belt 5 by which the debris 4 is collected externally and transferred to the bin 3;

-a plurality of flaps 7 serving to open and shut the

bottom of the bin 3;
-a pair of second horizontal conveyor belts 8a and 8b, positioned below and serving to collect and transfer debris dropping through the flaps 7;
-a third horizontal belt 9 positioned remote from the bin below the pair of second belts 8a and 8b and capable of slewing, by which the debris 4 is ultimately conveyed to a dumping site.

For practical purposes, the bin in which debris 4 is held comprises a fixed structure provided by the upright walls 3, an array of flaps 7, and a floor provided by the horizontal belts denoted 8a and 8b.

The first belt 5 occupies a central, longitudinal position over the car and is of length greater than the overall length of the bin 3, as may be observed in fig 1a which shows one of the ends of the belt 5 looped around a relative drum 5t and projecting marginally from the corresponding end of the bin. 6 denotes a wedge shaped element slidably mounted over the first belt 5 and serving to distribute the conveyed debris 4, which is rendered capable of movement horizontally along the entire length of the bin 3 by slide means 11. The wedge element 6 consists in a pair of blades 6a and 6b arranged so as to present a chevron profile when seen in plan; the two blades 6a and 6b connect uppermost with a parallelogram linkage 13 that is fixed in turn to the slide means 11, thereby enabling an adjustment in the height of the wedge element 6 between a lowered limit position, close to the belt 5, and a raised limit position, distanced from the belt (phantom line of fig 1).

The slide means 11 consist in a pair of arms 11a and 11b (see fig 2) arranged as a frame embracing the wedge element 6 from either side, which are fastened at one end to the parallelogram linkage 13 and provided at the remaining end, in the example illustrated, with respective wheels 14a and 14b that run on a pair of horizontal rails 15 forming part of the framework supporting the first belt 5 and extending the entire length of the bin 3 on either side of the belt; alternatively, the rails could be associated with the top of the bin itself. It will be observed from fig 2 that the plurality of flaps 7 are arranged in opposing pairs, and combine with the bottom of the bin 3 to create a series of hopper-like modular sections in which the debris 4 is accommodated. Through the agency of relative actuator means 12, the flaps 7 are capable of movement between a limit position in which the modular hopper section is closed and the flaps register in flush contact with the bottom of the bin, and a limit position in which the section is open, whereby the flaps 7 are distanced from the bottom of the bin 3 and allow the debris 4 to fall; in the example illustrated, such actuator means 12 consist in a plurality of hydraulic cylinders 16, one to each flap 7, hinged by one end to the inside of the chassis 2 and by the remaining end to the respective flap 7.

The second belts 8a and 8b are disposed with their working surfaces occupying a common plane below the array of flaps 7; the combined length of the second belts 8a and 8b will coincide substantially with the length of the bin 3, thereby ensuring that the debris 4 from all of the modular hopper sections is gathered up; more exactly, the two belts 8a and 8b are positioned end to end and driven in opposite directions, Va and Vb, such that the debris 4 is conveyed toward a single dropping point. 19 denotes a chute installed beneath the dropping point and anchored to the chassis 2, which serves to collect the debris 4 falling from the belts 8a and 8b. The third belt 9 is installed remote from the bin 3 with one end below the chute 19, mounted in such a way as to rotate in a lower plane parallel with the chassis 2. Rotation of the belt 9 is produced by drive means 10 that consist in a slewing ring 17 supporting the end of the belt below the chute 19 (see fig 2) and capable of swinging through an arc of 180°; in practice, the belt 9 would be rotated by the ring 17 between a non-operative position, essentially of longitudinal alignment with the chassis 2, and an operative position substantially transverse to the chassis 2, which is adopted in readiness to discharge the debris 4. Being located externally of the car body structure, the third belt 9 and the slewing ring 17 are protected by a frame 18 of cradle embodiment, which envelops the two components entirely with the sole exception, needless to say, of that end of the belt 9 from which the debris 4 ultimately discharges. Operation of the car will now be described.

Assuming a train of empty cars to be stationed in readiness at a given site, debris 4 is loaded onto the first belt 5 of the first car by such equipment as may be operating on the site, and conveyed along above the bin. The wedge element 6 of this car and those of successive cars down to the penultimate will be raised, by appropriate positioning of the parallelogram 13, in such a way that the debris 4 can pass right along to the final car, whereas the wedge element 6 of the final car will be stationed at the farthest end of the relative bin 3 and set in the lowered position, such that the debris 4 falls into the modular hopper section beneath.

Once this first section has been filled, the wedge element 6 moves forward in the direction denoted C, against the direction of the belt 5, in such a way as to prevent any further flow of debris 4 into the first modular section and begin filling the next section back along the direction of flow toward the loading station; once this endmost car has been filled completely, the wedge 6 of the penultimate car is lowered, and the process of filling the

relative modular sections will proceed in similar fashion.

When all cars are filled, the train is shunted off to the designated dumping ground, on arrival at which the third belt 9 of each car will be swung out through 90° or thereabouts on the side of the track where the debris is to be deposited. At this juncture, the flaps 7 are opened in succession by operating the relative cylinders 16, whereupon the debris 4 falls onto the second belts 8a and 8b and is carried by these to the single dropping point over the chute 19. The material now falls through the chute onto the third belt 9 beneath, and is conveyed out to the final dumping location.

It will be appreciated from the foregoing that the entire transportation and offloading procedure is particularly speedy, and can be repeated several times within a notably brief period.

The final discharge or dumping operation might be speeded up still further by addition of a further belt installed at ground level and combining with the third belt 9 to create an unbroken conveyor facility stretching, for example, to a loading point for road haulage vehicles that will carry the debris away to designated disposal sites. Such an expedient would be especially advantageous when emptying the cars at hardcored sites where there is no possibility of effecting preparatory excavations to receive the debris.

Claims

1) A railway car for the transportation of debris, consisting in at least two bogies (1) rolling on tracks (21) and interconnected by a chassis (2) supporting a open topped bin (3) into which the debris (4) is placed,
characterized
in that it comprises:
-a first horizontal conveyor belt (5) in receipt of debris (4) loaded in from externally of the car, occupying a substantially central and longitudinal position over the bin (3) and surmounted coaxially by a wedge element (6) traversed along the entire longitudinal length of the bin through the agency of slide means (11), by which incoming debris conveyed along the first belt (5) is distributed uniformly on either side into the bin (3);
-a plurality of flaps (7) arranged in opposing pairs along the bottom of the bin (3) and combining with the bin to create a series of modular hopper sections for temporary storage of the debris, which are operated by actuator means (12) and capable of movement between a limit position of flush contact with the bin, in which the modular hopper section is closed, and a limit position distanced from the bin, in which the modular hopper section is open and the debris can discharge from the bin;
-a pair of second horizontal conveyor belts (8a, 8b) located beneath the flaps (7), positioned end to end and disposed with conveying surfaces in a common plane in such a way as to establish the floor of the bin and take up the debris discharged from the modular hopper sections, and turning in opposite directions so as to direct the debris convergently to a single dropping point;
-a third horizontal belt (9), remote from the bin and positioned below the pair of second belts (8a, 8b) with one end beneath the single dropping point, which is rotatable about a vertical axis through the agency of drive means (10) between a non-operative position, essentially of longitudinal alignment with the bin, and an operative offloading position substantially transverse to the bin.

2) A railway car as in claim 1, wherein the wedge element (6) consists in a pair of blades (6a, 6b) disposed in chevron formation when seen in plan and connected uppermost to a parallelogram linkage (13) fastened in its turn to the slide means (11), which serves to vary the height of the wedge element (6) between a lowered limit position, with the blades close to the first belt (5), and a raised limit position in which the blades are distanced from the first belt.

3) A railway car as in claim 1, wherein the slide means (11) consist in a pair of arms (11a, 11b) fastened at one end to a parallelogram linkage (13) and furnished at the remaining end with respective wheels (14a, 14b) running on a pair of horizontal rails (15) afforded by the top of the bin (3) and disposed on either side of the first belt (5).

4) A railway car as in claim 1, wherein the flaps (7) are operated by actuator means (12) consisting in corresponding hydraulic cylinders (16) of which the opposite ends are hinged to the inside of the chassis (2) and to the relative flap, respectively.

5) A railway car as in claim 1, wherein drive means (10) consist in a slewing ring (17) by which the third belt (9) is supported at the end beneath the single dropping point.

6) A railway car as in claim 1, wherein the third belt (9) is accommodated by a frame (18) of cradle embodiment completely encompassing the belt and the relative drive means (10).

7) A railway car as in claim 1, further comprising a chute (19) located between the pair of second belts (8a, 8b) and the third belt (9) at the single dropping point.

FIG1

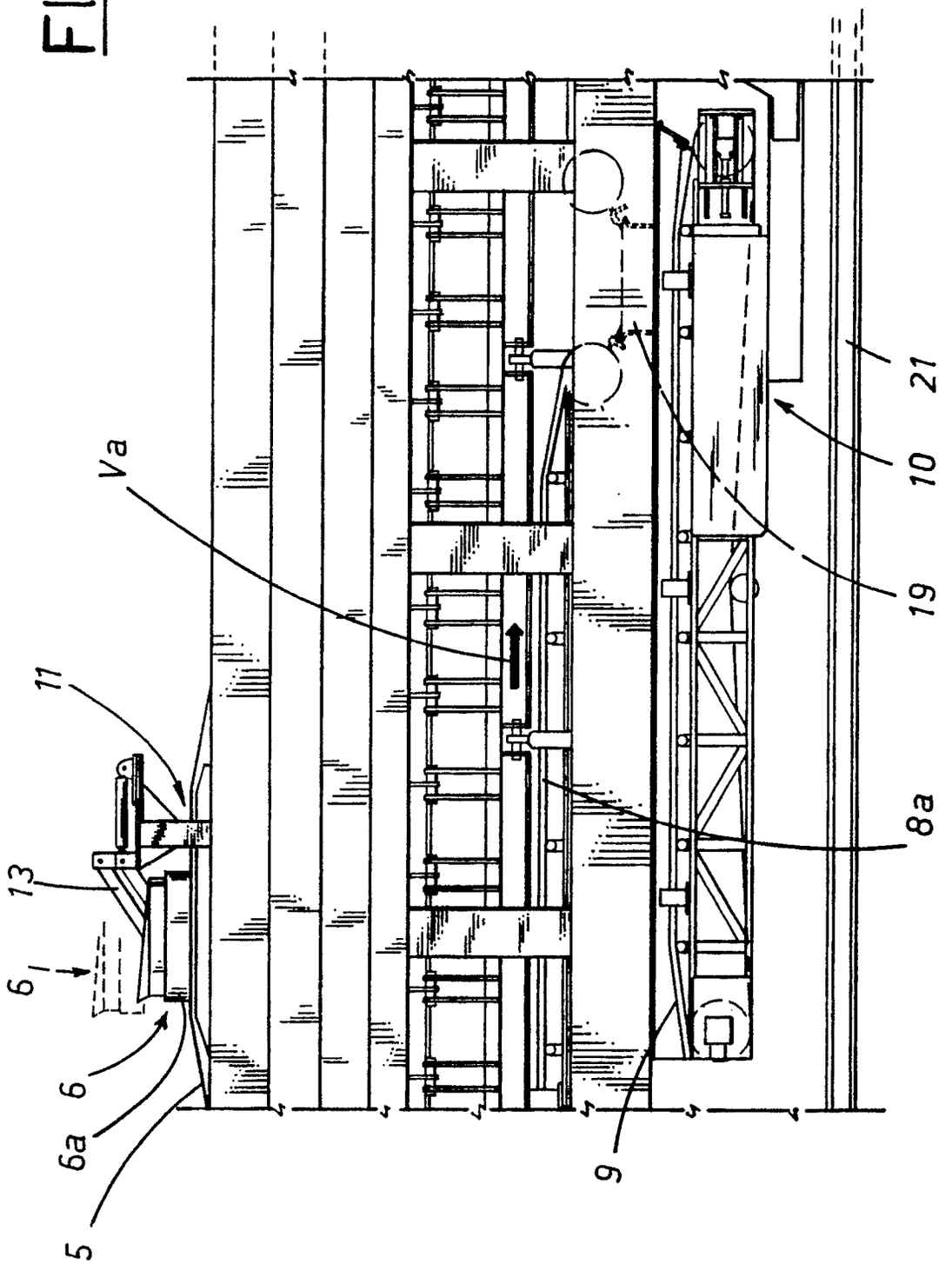
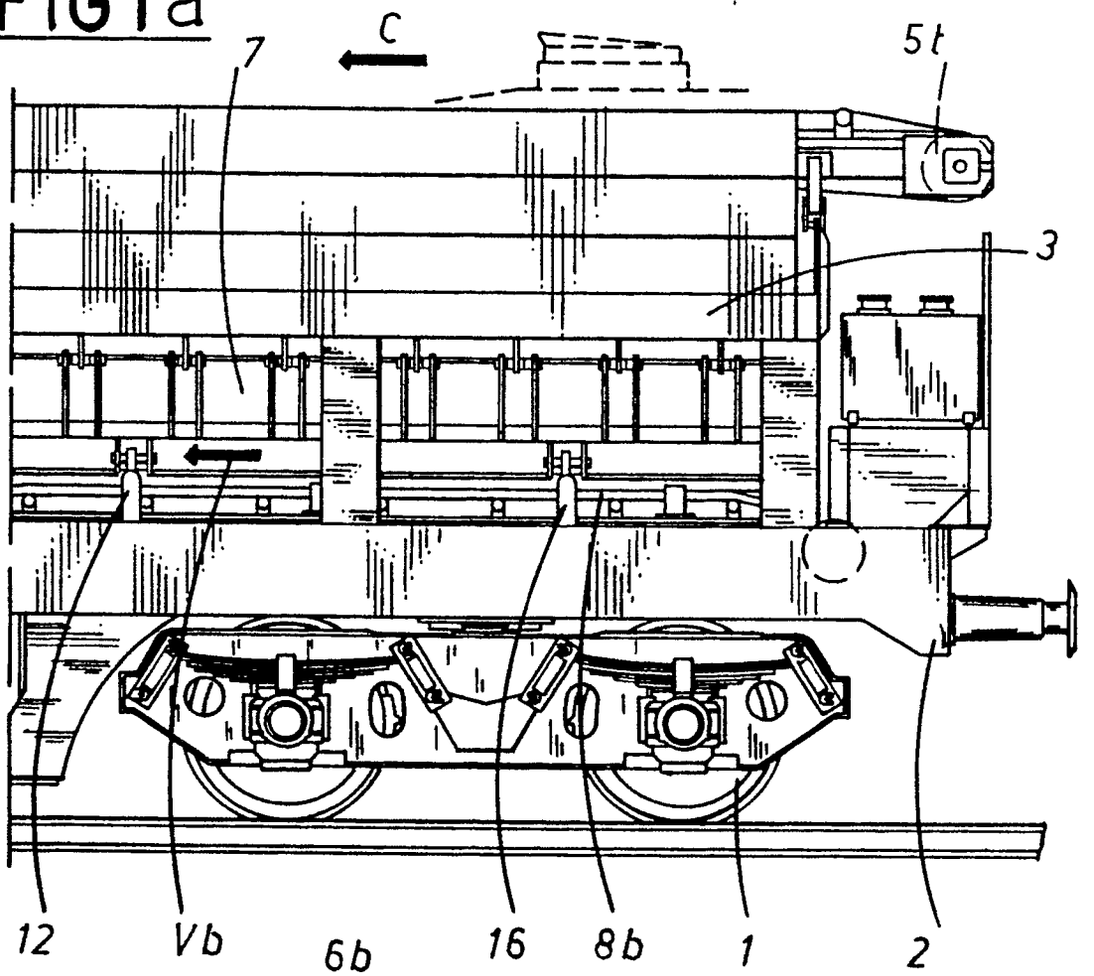


FIG1a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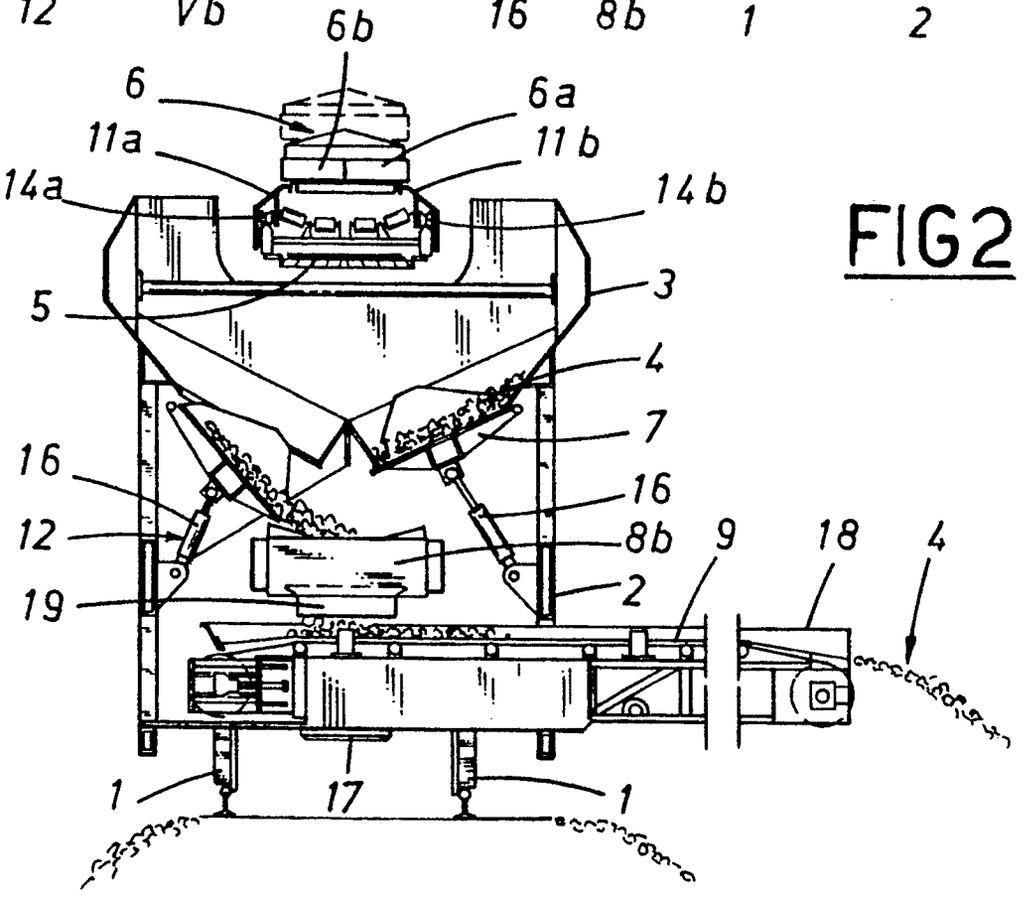
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FIG2

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EUROPEAN SEARCH REPORT

Application Number

EP 90 83 0335

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.5)
A	DE-A-2 303 984 (G. MÜSCH) * page 2, line 6 - page 2, line 26; figures 1, 2 *	1	B 61 D 7 32
A	DE-A-1 605 016 (SIEMENS AG) * page 2, paragraph 3 - page 3, paragraph 3; figures 1-3 *	1	
A	GB-A-2 098 169 (PROCOR(UK) * page 2, line 72 - page 2, line 94; figure 2 *	1	
A	DE-A-2 403 010 (WIEGER - MASCHINENBAU GMBH) * page 8, paragraph 7 - page 10, paragraph 2; figures 1-5 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 61 D
B 65 G

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	12 December 90	CHLOSTA P.

CATEGORY OF CITED DOCUMENTS

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