(19) DANMARK

(10) DK/EP 3475486 T3

(12) Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: *E 01 B 27/00 (2006.01)* *B 61 D 7/32 (2006.01)* *B 61 D 15/00 (2006.01)*
E 01 B 27/02 (2006.01) *E 01 B 27/10 (2006.01)* *E 01 C 19/00 (2006.01)*

(45) Oversættelsen bekendtgjort den: **2022-06-20**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2022-04-06**

(86) Europæisk ansøgning nr.: **17832912.4**

(86) Europæisk indleveringsdag: **2017-12-11**

(87) Den europæiske ansøgnings publiceringsdag: **2019-05-01**

(86) International ansøgning nr.: **EP2017001414**

(87) Internationalt publikationsnr.: **WO2018108314**

(30) Prioritet: **2016-12-14 DE 102016014833**

(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: **Zuercher Holding GmbH, Robert-Zuercher-Strasse 1-6, 77974 Meissenheim, Tyskland**

(72) Opfinder: **Zürcher, Ralf, Binzenweg 12, 77974 Meissenheim, Tyskland**

(74) Fuldmægtig i Danmark: **Novagraaf Brevets, Bâtiment O2, 2 rue Sarah Bernhardt CS90017, F-92665 Asnières-sur-Seine cedex, Frankrig**

(54) Benævnelse: **MATERIALETRANSPORTVOGNSSAMLING OG FREMGANGSMÅDE TIL LÆSNING AF MATERIALETRANSPORTVOGNSSAMLINGEN**

(56) Fremdragne publikationer:
EP-A2- 1 249 535
EP-A2- 2 194 189
EP-A2- 2 500 470
EP-A2- 2 708 647
EP-A2- 2 716 815
WO-A1-92/03617
FR-A1- 3 014 066
US-A1- 2005 281 643

MATERIAL HAULING WAGON ASSEMBLY, AND METHOD FOR LOADING THE MATERIAL HAULING WAGON ASSSEMBLY

Description

[0001] The invention relates to a material conveying wagon assembly consisting of different material conveying wagons which comprise a material conveying wagon for functional coupling to a second material conveying wagon, and to a method for loading the material conveying wagon assembly.

[0002] It is known from the prior art, in the case of railroad construction and in the case of railroad renovation, to use work trains in the case of which removed materials and/or materials which are to be incorporated are stored temporarily in material conveying silo wagons (also referred to in the following as MCS wagons or material conveying wagons), and transported, at an intermediate store or at a site of use, from a loading point, via conveying means from wagon to wagon or to an unloading point via the conveying means of the wagons. Material conveying wagons of different designs and types exist, which differ with respect to the type and arrangement of the conveying means present. In general, MCS wagons comprise a bottom conveying means in the wagon container, usually a bottom conveyor belt (there may also be a plurality of conveyor belts extending in parallel) which is or are associated, at least at one end (in the conveying direction), with a transfer conveying means (usually a pivotable transfer conveyor belt), by means of which material is conveyed onto the bottom conveyor belt of a neighboring wagon. Simple MCS wagons are merely equipped with a bottom conveying means of this kind and an associated transfer conveying means.

[0003] The materials are loaded onto a frontmost of said simple material conveying wagons, for example at a site of use of a construction site, from a loading station or a mechanical cleaning machine which is coupled in the assembly of the work and material conveying wagons. The material accumulates on the bottom conveyor belt at the loading point inside the wagon container. After the accumulation has reached a maximum loading height, the bottom conveyor belt, which may make up the entire bottom of the wagon container, is operated so as to move in a conveying direction away from the loading point,

such that the wagon container of said material conveying wagon is loaded, proceeding from the loading point, in the conveying direction. If the material reaches the end of the bottom conveyor belt of said material conveying wagon, the transfer of the material by means of the transfer conveying means onto the bottom conveyor belt of an adjacently coupled corresponding material conveying wagon and optionally further coupled wagons of the same design follows.

[0004] After loading of the material conveying wagons, the wagon assembly is transported to an intermediate store and unloaded there. Only then is it possible for new material to be loaded from the intermediate store into the material conveying wagon and transported to the installation site. Thus, double travel paths are to be covered by means of these simple material conveying wagons, or it is necessary to use two wagon assemblies consisting of material conveying wagons for transporting removed materials from the site of use to the intermediate store, and for transporting new materials in the opposite direction.

[0005] MCS wagons therefore exist which comprise not only a bottom conveying means comprising an associated transfer conveying means at at least one end, but rather additionally comprise a roof conveying means, on the wagon container, which roof conveying means is also usually designed as conveyor belts. These extend as an additional transport path over the entire wagon length, and typically comprise pivotable ends for transferring the material onto the roof conveying means of an adjacent wagon. It is thus possible, for example, for material removed at the site of use to be deposited onto the roof conveyor belt, at the loading point, and to be transported away from the loading point, while simultaneously new material is transported to the installation location, from the material conveying wagon, in the opposite direction, via the bottom conveying means. In this case, loading space becomes free in the loading container of the material conveying wagon which is furthest from the installation and loading point, which loading space can be filled with removed scrap material which can be transported via the roof conveyor belts. For this purpose, the last, terminal material conveying wagon comprises a shortened roof conveying means, such that the material in the loading container can fall onto the bottom conveyor belt. Thus, in this case, the loading of the extended material

conveying wagon with removed material via the bottom conveying means takes place in the reverse direction compared with the simple material conveying wagons.

[0006] Following completed unloading of the new materials and loading with removed material, the wagon assembly can be moved to the intermediate store, and there, in an analogous manner, the scrap material can be unloaded via the bottom conveyor belts and new material deposited via the roof conveyor belts onto the bottom conveyor belt of the last wagon, which becomes free simultaneously, and thereafter into the front wagons which become free correspondingly.

[0007] Therefore, in the case of said material conveying wagons which are extended by a roof conveying means only half the travel paths have to be traveled, and/or a single wagon assembly is sufficient for the same capacity, compared with the simple material conveying wagons.

[0008] A wagon assembly of this kind consisting of extended material conveying wagons is known from EP 2 194 189 A2, each of which material conveying wagons comprising, in addition to bottom and transfer conveying means, a roof conveying means, which is formed by two shortened overlapping roof conveyor belts for the purpose of simplified decoupling of the wagons. The second roof conveyor belt in the conveying direction ends above the first roof conveyor belt, in the conveying direction, of a coupled material conveying wagon. For the purpose of loading the respective material conveying wagons, the roof conveyor belts can be shortened, such that there is no longer any overlap present, and the material fed from the first roof conveyor belt falls into the material container located therebelow.

[0009] Although in the case of wagon assemblies consisting of simple material conveying wagons, twice the number of wagons or shuttle transport means having double travel paths are required for the same transport capacity, compared with the material conveying wagons extended by roof conveyor belts, the simple material conveying wagons in shift operation are nonetheless sometimes more cost-effective, on account of the simpler technology, especially since there is a very large stock of said simple material conveying

wagons on the market, and therefore said material conveying wagons are available in large numbers.

[0010] The use of different material conveying wagons in one work train is known for example from EP 2 708 647 A2, although in this case the different material conveying wagons for loading are not directly coupled, functionally, but rather separated by reprocessing work wagons: From a construction site, removed material is transported via the roof conveyor belts of the extended material conveying wagon is transported as far as the reprocessing wagon, in which the removed materials are reprocessed. Material which can be recycled is then transported via the bottom conveyor belts of the same extended material conveying wagon, back to the site of work, while materials which cannot be recycled are transferred, via a transfer conveyor belt, from the reprocessing device of the reprocessing wagon in the opposite direction, as spoil, onto the bottom conveyor belt of a simple material conveying wagon.

[0011] The working directions of the simple and extended material conveying wagons during loading are opposing with respect to the bottom conveying means and the transfer conveying means. A sequence of different types of work wagons for loading according to the prior art thus leads to a functional interruption. The object of the present invention is furthermore that of providing a material conveying wagon assembly which combines simple and extended material conveying wagons, the conveying directions of which during loading are opposing with respect to the bottom conveying means and the transfer conveying means, and which nonetheless is not subject to any functional interruption.

[0012] This object is achieved by a material conveying wagon assembly having the features of claim 1.

[0013] The further object of allowing for loading without functional interruption of a material conveying wagon assembly consisting of different material conveying wagons, is achieved by the method having the features of independent claim 8. Developments of the devices and of the method are set out in the dependent claims.

[0014] A material conveying wagon assembly according to the invention consists of at

least two different material conveying wagons which are coupled to one another, a first material conveying wagon being a material conveying wagon having a shortened roof conveying means and the intermediate wagon conveying means. In this case, "first" material conveying wagon is primarily intended to be understood not as the position of the wagon in the sequence of the material conveying wagon assembly, but rather as a "first type" of a material conveying wagon.

[0015] A first material conveying wagon, via which different material conveying wagons can be functionally coupled together, in particular material conveying wagons which differ with respect to the loading conveying direction of the bottom conveying means, comprises a roof conveying means which is shortened with respect to a wagon length, which leaves free a roof portion at one

[0016] end of the material conveying wagon, and which is operated for loading in a first conveying direction towards the free end. The roof portion left free is open or can be opened, such that material from the roof conveying means can fall through the roof portion, onto the bottom conveying means.

[0017] The first material conveying wagon further comprises a bottom conveying means, which is operated for loading in a second direction, which is opposite to the first conveying direction, and a transfer conveying means which is assigned to the bottom conveying means in the second conveying direction. For the purpose of functional coupling to a second material conveying wagon, the first material conveying wagon comprises an intermediate wagon conveying means which can be operated for loading in the first conveying direction, which is assigned to the shortened roof conveying means of the material conveying wagon, and which extends from below an ejection end of the shortened roof conveying means beyond the free end of the material conveying wagon, such that the ejection end of the intermediate wagon conveying means can be positioned above a conveying means of the coupled second material conveying wagon, and thus allows for purposeful conduction of the material, fed in the first conveying direction via the shortened roof conveying means, onto a coupled material conveying wagon. It is advantageously possible to retrofit existing material conveying wagons with a shortened roof conveyor belt and the open free roof end, by means of arranging a corresponding

intermediate wagon conveying means, so as to form a first material conveying wagon offering different logistical possibilities.

[0018] In the wagon assembly according to the invention, the first material conveying wagon is coupled, at the end free of the shortened roof conveyor belt, with respect to the first loading conveying direction, to a second material conveying wagon (i.e. a material conveying wagon of the second type, which differs from the first type), which second material conveying wagon comprises at least one bottom conveying means and at least one transfer conveying means which is associated with the bottom conveying means. In this case, the ejection end of the intermediate wagon conveying means of the first material conveying wagon can be positioned above the bottom conveying means of the coupled second material conveying wagon, which is a simple material conveying wagon without a roof conveying means, comprising only the bottom conveying means and the associated transfer conveying means which are used for loading in a conveying direction which is opposite to the second conveying direction of the bottom conveying means of the first material conveying wagon. As a result, the ejection end of the intermediate wagon conveying means of the first material conveying wagon comes to be located above the bottom conveying means of the coupled second material conveying wagon. It is thus possible to combine the material conveying wagons, which differ with respect to the conveying direction of the bottom conveying means, to form a material conveying wagon assembly, and thus to make use of the advantages of both wagon types.

[0019] The combination, made possible thereby, of material conveying wagons extended by a roof conveying means and the simple material conveying wagons which do not comprise any roof conveying means, results in logistical advantages when developing a construction site. Depending on the amounts of material to be unloaded and received on a construction site, it is thereby possible to combine the low-cost simple material conveying wagons, available in large quantities, with the costly material conveying wagons extended by a roof conveying means, which can then be used in the minimum number required. Thus, construction site development can then also be achieved without shuttle transport, and thus in particular also without interruption, in the case of a continuous loading and unloading operation, if the actual number of material conveying wagons extended by roof conveying means, required for this, is not available. There are

furthermore cost advantages due to using the simple material conveying wagons, present and available in larger numbers, in the combination according to the invention with the extended material conveying wagons, the number of which in the material conveying wagon assembly can be restricted to a necessary minimum. The sequence of the material conveying wagon assembly can thus be achieved individually, using the largest possible number of the more cost-effective simple material conveying wagons without roof conveying means, in a manner dependent on the type of construction site development.

[0020] An intermediate wagon conveying means can be formed by an intermediate roof conveying means which is fixedly or detachably arranged on the first material conveying wagon and which bridges the distance between the shortened roof conveyor belt of the first material conveying wagon, and the coupled second material conveying wagon.

[0021] Alternatively, an intermediate wagon conveying means can also be formed by a combination of an intermediate roof conveying means which is fixedly or detachably arranged on the first material conveying wagon, in cooperation with a supplementary conveying means which is fixedly or detachably arranged on the second material conveying wagon, the shortened intermediate roof conveying means together with the supplementary conveying means bridging the distance between the shortened roof conveyor belt of the first material conveying wagon, and the coupled second material conveying wagon.

[0022] A further alternative provides for the intermediate wagon conveying means to be formed by a combination of a pivotable conveying means, which is articulated in the bottom area of the first material conveying wagon and which can be moved between a use and a non-use position, and an auxiliary conveying means, which cooperates therewith and is arranged in a pivotable and/or displaceable manner at the first material conveying wagon or removably at the first and/or the second material conveying wagon.

[0023] The intermediate roof conveying means can be a conveyor belt assembly in a carrier frame. Correspondingly, the shortened intermediate roof conveying means, as well as the supplementary conveying means, can also each be formed by a conveyor belt assembly in a carrier frame.

[0024] The intermediate roof conveying means as a whole, or the conveyor belt assembly in the carrier frame, can preferably be movable from a use position, in which the conveyor belt assembly extends from below the ejection end of the shortened roof conveying means, into a non-use position, and vice versa.

[0025] The non-use position can for example either be located under the shortened roof conveying means, or can be spaced apart from the ejection point of the shortened roof conveying means, in the longitudinal and/or transverse direction. In the case of the embodiment having the shortened intermediate roof conveying means, too, movability of the conveying device as a whole or in each case the conveyor belt assembly in the carrier frame, from a use position into a non-use position, can be provided, possible non-use positions of the shortened intermediate roof conveying means corresponding to the stated non-use positions of the intermediate roof conveying means. The supplementary conveying means can optionally also be designed so as to be movable, in order to be able to be transferred from a use position into a non-use position, and back.

[0026] Every intermediate wagon conveying means which is movable between a use position and a non-use position is equipped with or operatively, i.e. cooperatively, connected to at least one drive, e.g. a longitudinal and/or transverse drive, guide elements, and/or control elements for transferring the intermediate wagon conveying means between the use position and the non-use position.

[0027] In order to transfer the intermediate wagon conveying means, the at least one drive and/or the control elements can be actuated manually or in a semi-automatic or fully automatic manner, by means of at least one control device of the material conveying wagon assembly. In particular for the fully automatic control of the transfer of the intermediate conveying means between the use position and the non-use position, the at least one control device is coupled to at least one sensor, which is designed for example for detecting a load state of one of the material conveying wagons.

[0028] In order to allow for central transfer of the material from the first to the second wagon in the case of curved travel during operational use of the material conveying

wagon assembly on a railroad construction site, and to compensate height differences in the case of an undulating track course, and in particular also to prevent collisions of the intermediate roof conveying means, the intermediate roof conveying means can be pivotable about a vertical axis and/or about a wagon transfer axis.

[0029] The same can be provided for the supplementary conveying means which cooperates with the shortened intermediate roof conveying means. The auxiliary conveying means, which cooperates with the pivotable conveying means as an alternative intermediate wagon conveying means, can accordingly also be designed so as to be pivotable about a vertical axis and/or about a wagon transverse axis. The pivot drives and/or control elements provided therefor in each case can be actuated manually or by means of at least one control device of the material conveying wagon assembly in a semi-automatic or fully automatic manner, the at least one control device preferably being coupled to at least one sensor for detecting a track position and/or a track course. The control device can be a further control device in addition to the above control device for actuating the transfer between the use position and the non-use position; however, the material conveying wagon assembly can also comprise a central control device for all control tasks.

[0030] The elements of the various embodiments of the intermediate wagon conveying means of the material conveying wagon assembly which are designed so as to be detachable or removable, i.e. the intermediate roof conveying means detachably arranged on the first material conveying wagon, the supplementary conveying means detachably arranged on the second material conveying wagon, or the auxiliary conveying means removably arranged on the first and/or the second material conveying wagon, can in each case comprise engagement elements which are designed for engaging in a gripping device of a lifting apparatus, it being possible for this to be a crane device or an excavator for example. The crane device can optionally be a gantry crane which, if the material conveying wagon assembly comprise corresponding longitudinal rails, can be moved along the assembly, in order to transport the relevant conveying device, if required, between a storage location on a wagon which is provided and designed for this purpose and is coupled to the material conveying wagon assembly, and the site of use between the first and second material conveying wagon.

[0031] For the purpose of simple fastening and exact orientation of the detachable or removable elements of the various embodiments of the intermediate wagon conveying means, the first and/or the second material conveying wagon can accordingly in each case comprise receiving and/or positioning elements. For example alignment bolts, displaceable supports or guides are possible for this, ensuring correct positioning, and also movements in the horizontal or vertical direction.

[0032] Furthermore, a material conveying wagon assembly according to the invention can comprise at least one (third) material conveying wagon comprising a roof conveying means which is continuous with respect to the wagon length, and which can be operated for loading in a first conveying direction. Just like the first material conveying wagon, these material conveying wagons are also equipped with a bottom conveying means, which can be operated for loading in the second direction, which is opposite to the first conveying direction, and a transfer conveying means which is assigned to the bottom conveying means in the second conveying direction. The third material conveying wagons having the continuous roof conveying means can be coupled on the side of the first material conveying wagon which is remote from the free end.

[0033] A preferred sequence may provide for the material conveying wagon assembly, proceeding from a loading point, to comprise one or more third material conveying wagons having a continuous roof conveying means, which is/are adjoined by a first material conveying wagon having a shortened roof conveying means and the intermediate wagon conveying means, which is adjoined by one or more second material conveying wagons without roof conveying means. This makes it possible, proceeding from the loading point, to first load the second material conveying wagon(s), via the roof conveying means and the shortened roof conveying means, and via the intermediate wagon conveying means. Subsequently or alternatively, dismantling the intermediate wagon conveying means or transferring it into a non-use position makes it possible for the first material conveying wagon, and, in the further course the front third material conveying wagon, to be loaded in the opposite direction, via the bottom conveyor belts.

[0034] Other sequences are conceivable, however, and it is also possible, if required, for

more than one first material conveying wagon having a shortened roof conveyor belt and intermediate wagon conveying means to be used, if optional further transport onto another wagon type is provided.

[0035] The material conveying wagons of the wagon assembly according to the invention serve to convey and store bulk material. The material conveying wagons do not serve for processing the material. However, the possibility that a material conveying wagon assembly according to the invention may be extended by work wagons which, in addition to conveying means, also comprise reprocessing means or removal and/or incorporation means for the material, in order to become a railroad work train, is not excluded.

[0036] A method according to the invention for loading a material conveying wagon assembly comprising different material conveying wagons provides for the different material conveying wagons to be strung together such that a first material conveying wagon comprising the shortened

[0037] roof conveying means and comprising the intermediate wagon conveying means is arranged, with respect to a first loading conveying direction, in front of a second material conveying wagon, which is a second material conveying wagon comprising a bottom and transfer conveying means but without a roof conveying means, such that the intermediate wagon conveying means is positioned in a use position, above the bottom conveying means of the coupled second material conveying wagon. As a result, material which is fed from the shortened roof conveying means can be conveyed via the intermediate wagon conveying means onto the second material conveying wagon, and can there be conveyed further, in the first conveying direction, by means of the bottom conveying means. The method further provides that, alternatively to the conveying via the intermediate wagon conveying means, or temporally before or afterwards, material fed by the shortened roof conveying means falls through the open free roof end onto the bottom conveying means of the first material conveying wagon by removing the intermediate wagon conveying means or by transferring the intermediate wagon conveying means into a non-use position, and is conveyed there in a second conveying direction, which is opposite to the first conveying direction. Particularly preferably, the method can provide for a first material conveying wagon having a shortened roof

conveying means to be arranged at least between the (third) material conveying wagon comprising a continuous roof conveying means and the (second) material conveying wagon without a roof conveying means, such that the ejection end of the intermediate wagon conveying means can be positioned in a use position above the bottom conveying means of the coupled second material conveying wagon. The loading then takes place by depositing material onto the continuous roof conveying means of a frontmost (third) material conveying wagon with respect to the first conveying direction, conveying the material in the first conveying direction, via the continuous roof conveying means as far as the shortened roof conveying means of the first material conveying wagon, the selective arrangement of the intermediate wagon conveying means in the use position or in the non-use position making it possible for the material to either be conveyed to the coupled second material conveying wagon, onto the bottom conveyor belt thereof, and further transported there in the first conveying direction, or to fall from the shortened roof conveying means through the open free roof end and onto the bottom conveying means of the first material conveying wagon where it can be conveyed further in the second conveying direction which is opposite to the first.

[0038] The created combination possibilities of different material conveying wagons and the different operating variants open up various possibilities for loading, in order to make optimum use of the material conveying wagons present and to optimize the transport logistics.

[0039] Further embodiments, and some of the advantages associated with this and further embodiments, will become clear and more easily understandable from the following detailed description with reference to the accompanying drawings. Objects or parts which are substantially identical or similar may be provided with the same reference signs. The figures are merely schematic illustrations of embodiments of the invention.

[0040] In the figures:

Fig. 1: is a sectional side view of a work wagon assembly according to the prior art, consisting of material conveying wagons extended by roof conveyor belts for two material conveying directions,

Fig. 2: is a sectional side view of a work wagon assembly according to the prior art, consisting of simple material conveying wagons comprising bottom conveyor belts for one material conveying direction,

Fig. 3: is a sectional side view of a work wagon assembly according to the invention consisting of extended and simple material conveying wagons, comprising an intermediate wagon conveying means of the material conveying wagon of the first type at the coupling point of the different work wagons,

Fig. 4: is an enlarged sectional side view of the material conveying wagon of the first type, comprising the intermediate wagon conveying means, which is coupled to the simple material conveying wagon,

Fig. 5: is an enlarged sectional side view of the material conveying wagon of the first type, comprising an alternatively fastened intermediate wagon conveying means, which is coupled to the simple material conveying wagon,

Fig. 6: is an enlarged sectional side view of the material conveying wagon of the first type, comprising an alternative two-part intermediate wagon conveying means, which is coupled to the simple material conveying wagon,

Fig. 7: is an enlarged sectional side view of the material conveying wagon of the first type, comprising an alternative arrangement of the intermediate wagon conveying means for an alternative operating mode of the material conveying wagon, which is coupled to the simple material conveying wagon,

Fig. 8: is a plan view of the intermediate wagon conveying means from Fig. 7,

Fig. 9: is an enlarged sectional side view of the material conveying wagon of the first type, comprising an alternative intermediate wagon conveying means for an alternative operating mode of the material conveying wagon, which is coupled to the simple material conveying wagon,

Fig. 10: is a plan view of the intermediate wagon conveying means from Fig. 9,

Fig. 11: is an enlarged sectional side view corresponding to Fig. 9, comprising an alternative intermediate wagon conveying means,

Fig. 12: is a plan view of the intermediate wagon conveying means from Fig. 11,

Fig. 13: is a sectional side view of a work wagon assembly according to the invention consisting of extended and simple material conveying wagons, comprising a material conveying wagon of the first type having an intermediate wagon

conveying means at the coupling point of the different work wagons, in a loading and unloading operating mode,

Fig. 14: is a sectional side view corresponding to Fig. 13, in an alternative operating mode,

Fig. 15: is an enlarged sectional side view of the material conveying wagon of the first type, comprising an intermediate wagon conveying means arranged under the roof conveyor belt, in a non-use position, which material conveying wagon is coupled to the simple material conveying wagon,

Fig. 16: is an enlarged sectional side view corresponding to Fig. 15, comprising the intermediate wagon conveying means in the use position,

Fig. 17: is a plan view of the material conveying wagon of the first type, comprising the intermediate wagon conveying means in the use position in forwards travel, which is coupled to the simple material conveying wagon,

Fig. 18: is a plan view corresponding to Fig. 17 during cornering,

Fig. 19: is an enlarged sectional side view of the material conveying wagon of the first type, comprising an alternative two-part intermediate wagon conveying means in a non-use position, which is coupled to the simple material conveying wagon,

Fig. 20: is an enlarged sectional side view corresponding to Fig. 19, comprising the two-part intermediate wagon conveying means in the use position,

Fig. 21: is an enlarged sectional side view of the material conveying wagon of the first type, comprising an alternative two-part intermediate wagon conveying means in a use position, which is coupled to the simple material conveying wagon, and

Fig. 22: is an enlarged sectional side view corresponding to Fig. 21, comprising the two-part intermediate wagon conveying means in the non-use position.

[0041] A material conveying wagon assembly according to the invention consisting of different material conveying wagons, the working directions of which in the assemblies formed in each case of simple or extended material conveying wagons are opposing, with respect to the bottom conveyor belt and the associated transfer conveyor belts, during loading, provides the sequence of the different material conveying wagons for use in combination.

[0042] As a result, use can be made both of the advantages of the extended material conveying wagons and those of the more cost-effective simple material conveying

wagons. This sequence and the associated procedure make it possible for example for new materials to be introduced into the construction site by means of extended material conveying wagons, and for removed scrap material to be loaded onto simple material conveying wagons. The combination, made possible by means of the material conveying wagon of the first type, of simple and extended material conveying wagons having a functional coupling for loading makes it possible for construction site development to be optimized with respect to the costs and logistics, by adjusting the wagon space requirement, in that the number of extended material conveying wagons necessary for the construction site requirement can be reduced to a minimum.

[0043] Fig. 1 shows a conventional wagon assembly which is formed of material conveying wagons 1, 2' extended by roof conveyor belts 6, 60, and which is operated in a rolling system, together with the bottom and the associated transfer conveyor belts 4, 5, as indicated by the arrows. The last wagon 2', which is arranged furthest from the loading and unloading point, differs from the front wagon 1 (which may be a head wagon or an intermediate wagon) in that the roof conveyor belt 60 is shortened and, unlike the roof conveyor belt 6, does not extend over the entire wagon length. Material which reaches the shortened roof conveyor belt 60, from a loading point (on the left in the drawing) in accordance with the unfilled arrows, via the roof conveyor belt 6, over the overlapping pivot ends 61, falls, at the end of said roof conveyor belt, through the open wagon container and onto the loading end of the bottom conveyor belt 4, which is operated in the opposing direction (indicated by the solid arrows), in order to there transport stored material, via the transfer conveyor belt 5, into the front wagon 1, which in the same way feeds stored and conveyed material, via the bottom conveyor belt 4 and the transfer conveyor belt 5, forwards to an unloading point. The space which becomes free, proceeding from the loading end, on account of said unloading process, is filled with the material fed via the roof conveyor belts 6, 60. Of course, the wagons 1, 2' can also be loaded in this way, if no material to be unloaded is present in the wagon containers. The bottom conveyor belts 4 are consequently always filled in a conveying direction from the loading end towards the loading and unloading point.

[0044] Fig. 2 shows a conventional wagon assembly consisting of simple material conveying wagons 3 which comprise merely bottom conveyor belts 4 and associated

transfer conveyor belts 5. In this case, the unfilled arrows show the loading conveying direction of the bottom conveyor belts 4 proceeding from the loading point (on the left in the drawing), in which the wagon containers are filled and which is opposite to the conveying direction of the bottom conveyor belts 4 of the wagon assembly consisting of extended material conveying wagons 1, 2' in Fig. 1.

[0045] In order to combine the use of material conveying wagons of different types, an interface is required between the material conveying wagons of the different types, which interface allows sequential work in the case of different working directions of the respective material conveying wagons. This is achieved by the intermediate wagon conveying means, which preferably, and in the simplest case, may be formed by a conveyor belt, also referred to in the following as an intermediate roof belt.

[0046] As can be seen in **Fig. 3 to 22**, the intermediate conveying means 7 is arranged in the terminal or last extended material conveying wagon 2 with respect to the loading and unloading point, which material conveying wagon comprises the shortened roof conveyor belt 60 at the loading end and to which a (first) simple material conveying wagon 3 is coupled. The intermediate wagon conveying means 7 is associated with the shortened roof conveyor belt 60, such that material conveyed via the roof conveyor belt 60 is conveyed further by the intermediate wagon conveying means 7. At least a portion of the intermediate wagon conveying means 7 can be detachably or permanently fastened in said terminal or last extended material conveying wagon 2. The intermediate wagon conveying means 7 extends as far as the coupled simple material conveying wagon 3, such that it allows for the transfer of material from the shortened roof conveyor belt 60 onto the bottom conveyor belt 4 of the coupled simple material conveying wagon 3.

[0047] It goes without saying that a wagon assembly according to the invention, unlike what is shown, can also comprise more than the two or four material conveying wagons 1, 2, 3 shown, depending on the amount of material to be transported, or availability.

[0048] Said intermediate wagon conveying means 7 now makes it possible for material to be fed from the roof conveyor belts 6 of the extended material conveying wagons 1, via the shortened roof conveyor belt 60 of the extended material conveying wagon of the

first type 2, to the simple material conveying wagons 3, which are loaded via their bottom conveying means 4 (bottom conveyor belts). It is thus possible, by means of the wagon assembly 10 according to the invention, to simultaneously introduce new material into a construction site, via the bottom conveyor belts 4 of the extended material conveying wagons 1 and of the material conveying wagon of the first type 2, via an unloading point, and to load removed old material in the wagon assembly 10 consisting of extended material conveying wagons 1, material conveying wagons of the first type 2, and simple material conveying wagons 3. Thus, extended material conveying wagons 1, material conveying wagons of the first type 2, and simple material conveying wagons 3 can be lined up and nonetheless at the same time old material can be removed from the construction site and new material supplied to the construction site using just one wagon assembly 10.

[0049] The material conveying wagon assembly according to the invention, which combines extended and simple material conveying wagon assemblies, also allows for the combination of different operating modes, specifically that of the rolling system of the extended material conveying wagon assemblies using a freely selectable removal and incorporation unit, and the use of the simple material conveying wagons. The number and sequence of the wagons can be arbitrary in this case. However, it is expedient to arrange the simple material conveying wagons behind the extended material conveying wagons, in the loading direction, the extended material conveying wagons of the first type, comprising the shortened roof conveying means and the intermediate wagon conveying means, allowing for the transfer between the different material conveying wagons in general, however, the possibility of material transfer from a simple material conveying wagon, via the transfer conveying means, to the roof conveying means of an extended material conveying wagon, is not excluded.

[0050] The type and the design, as well as the fastening, of the intermediate wagon conveying means 7 may be different. Fig. 3 and, enlarged, Fig. 4 show a wagon assembly 10 comprising an intermediate roof belt 70 as the intermediate wagon conveying means 7, which is fixedly installed on the terminal extended material conveying wagon of the first type 2 having the shortened roof conveyor belt 60. The intermediate roof belt 70 extends from the ejection point of the shortened roof conveyor belt 60 as far as beyond the container wall of the coupled simple material conveying wagon 3, in order to there

eject material onto the bottom conveyor belt 4. The material accumulates at the ejection point up to a predetermined load height, which can be detected by means of sensors, before the bottom conveyor belt 4 is moved further in the same conveying direction (non-solid arrows), in order to fill the container. If the debris cone reaches the other end of the wagon, the material is transferred to the next simple material conveying wagon 3, via the transfer conveyor belt 5. While the simple material conveying wagons 3 are loaded from the roof conveyor belts 6 of the extended material conveying wagons 1, via the shortened roof conveyor belt 60 and the intermediate roof belt 70 of the terminal extended material conveying wagon of the first type 2, the bottom conveyor belts 4 and associated transfer conveyor belts 5 supply the extended material conveying wagons 1, 2 there with stored material of the unloading point, in the opposite direction, without renewed loading taking place there first.

[0051] However, the intermediate wagon conveying means 7 can also be installed so as to be removable, either in order to be able, if required, to combine the individual material conveying wagons as desired, or also to be able to perform curved or undulating transfer travel in a simpler manner. In Fig. 5, the intermediate roof belt 70 is fastened to the material conveying wagon 2 by means of a retaining device 73, which allows for removal of the intermediate roof belt 70. For the purpose of fixing the removable intermediate roof belt 70, one-sided stops may be provided on the extended material conveying wagon of the first type 2, such that the intermediate roof belt 70 can be screwed or bolted. In this case, rotatable mounting can also be achieved.

[0052] In an embodiment shown by way of example in Fig. 6, the intermediate wagon conveying means 7 is in two parts and consists of two conveyor belts 70, 71, which are arranged so as to overlap, by means of pivotable ends 72, in the conveying direction. The first conveyor belt, the intermediate roof conveyor belt 70, is arranged on the terminal material conveying wagon 2, and the second conveyor belt, the supplementary conveyor belt 71, is (fixedly or detachably) fastened to the simple material wagon 3 which is coupled to the terminal extended material conveying wagon of the first type 2.

[0053] The intermediate roof conveyor belt(s) 70, 71 may be pivotable (about a horizontal wagon transverse axis and/or about a vertical axis), in order to equalize movements of

the wagon assembly in the case of track travel in mountains and valleys, as well as on corners, and also to prevent collisions of the intermediate roof conveying means 7. In Fig. 17, the arrows indicate the pivotability of the intermediate roof conveyor belt 7 about the vertical axis, while in Fig. 18 the intermediate roof belt 7 is shown pivoted in the arrow direction, in order to thus allow for central material conveyance on the bottom conveyor belt 4 of the simple material conveying wagon 3, in the curve region. Pivoting about the horizontal wagon transverse axis is provided for the purpose of correction and collision prevention in the case of undulating travel. The control of the pivoting may take place in an automated manner, depending on the track position and the track course, which can be detected by sensors. Depending on the variant, the position of the intermediate roof conveyor belt (or the intermediate roof conveyor belts) can optionally also be displaceable, in order that the cornering can be ensured.

[0054] A slidable or displaceable intermediate roof conveyor belt 70 has a further advantage which is shown in Fig. 7, in which the intermediate roof conveyor belt 70, which is fastened to a retaining device 73 suitable therefor, is displaced away from the end of the shortened roof conveyor belt 60, in the longitudinal direction, such that material fed via the roof conveyor belt 60 is no longer conveyed further into the simple material conveying wagons 3, but rather falls via the open container roof onto the loading end of the bottom conveyor belt 4 of the last extended material conveying wagon of the first type 2, such that the operating mode of the rolling system is achieved. The retaining device 73 can for example be designed so as to be telescopic, for which purpose for example a sliding carriage or a rack and pinion assembly can be used. Other conventional sliding techniques can also be used. Alternatively to the longitudinal displacement, a transverse displacement (not shown) of the intermediate roof conveyor belt is also conceivable, or a combination of longitudinal and transverse displacement, such that the material falls via the shortened roof conveyor belt 60, through the open wagon roof, and onto the bottom conveyor belt 4.

[0055] It is possible that the intermediate roof belt 70 may either be completely displaceable, i.e. carrier frame 7a and belt assembly 7b together (**Fig. 7 and 8**), or that only the belt assembly 7b may be displaceable, in the longitudinal direction (solid arrow), within the frame 7a (**Fig. 9 and 10**). As a result of this, too, the alternative modes of

operation are made possible via the roof conveyor belt 60; firstly, in the use position of the intermediate roof belt 70, the further conveyance on the simple material conveying wagons 3 which is provided according to the invention, and secondly, in the pushed-forward non-use position of the intermediate roof conveyor belt 70, the loading of the bottom conveyor belt 4 of the terminal extended material wagon of the first type 2, in the conventional manner of a rolling system. Specifically for different construction site types and for the loading of the wagons 1, 2, 3 at the intermediate store, further advantages of the system are made possible here, in that material is selectively deposited into the material conveying wagon 2 or conveyed further on the simple material conveying wagons 3, depending on the position of the intermediate roof belt 70. Thus, different materials can also be separated according to the type of the material, and loaded onto the different material conveying wagons.

[0056] Following completed loading of the simple material conveying wagons 3 from the roof conveyor belts 6 of the extended material conveying wagons, via the roof conveyor belt 60 and the intermediate roof belt 70 of the extended material conveying wagon of the first type 2, the extended material conveying wagons 1, 2 can be loaded via the bottom conveyor belts 4 and associated transfer conveyor belts 5, in that the intermediate roof belt 70 is moved into the non-use position.

[0057] Furthermore, an intermediate roof belt 70 can also be designed to be displaceable, such that the intermediate roof belt 70 can be moved between a non-use position, in which it is arranged under the shortened roof conveyor belt 60 (Fig. 15), into a use position (Fig. 16), in order to perform the further conveyance of the material, fed from the roof conveyor belt 60, into the simple material conveying wagons 3. The non-use position can be assumed both for transfer journeys or if the wagon assembly is intended to be operated in the conventional rolling system of the extended material conveying wagons. Here, too, it is possible for the intermediate roof belt 70 to be displaced completely, or for only the belt arrangement 7b inside the carrier framer 7a to be displaced.

[0058] As an alternative to the slidable nature, the intermediate roof belt 70 or every intermediate wagon conveying means 7 can also be designed so as to be removable, in

order to dismantle or assemble it in the construction site region, depending on the intended use of the wagon assembly 10. In this case engagement means 74 (**Fig. 11 and 12**) for a suitable lifting apparatus (not shown), by means of which the belt 70 can be deposited and raised, may be provided on the intermediate wagon conveying means 7, for example on the frame 7a of an intermediate roof belt 70. In order to simplify the assembly, it is furthermore possible for receiving and/or positioning elements, such as struts, profile rails, stops, lugs and bolts, etc., to be provided on the material conveying wagon. Furthermore, quick-plug systems can be arranged on the intermediate roof belt and the material conveying wagon, in order to easily and quickly provide a connection of the detachable intermediate roof belt to the power supply and controller of the material conveying wagon assembly.

[0059] As an alternative to a single-piece or two-part intermediate roof belt, which is fixedly, removably or displaceably mounted in the roof region, an intermediate wagon conveying means 7 can, as shown in Fig. 19 to 22, comprise a pivotable conveying means 75 which is arranged at the loading end of the terminal extended material conveying wagon 2, in the bottom area, in a manner spaced apart horizontally from the end of the shortened roof conveyor belt 60, and so as to be pivotable about a wagon transverse axis. The pivotable conveying means 75 can for example be a belt or simply a chute. In Fig. 20 and 21 the pivotable conveying means 75 is shown in the use position, in which further conveyance of the material, conveyed via the roof conveyor belt 60, onto the coupled simple material conveying wagon 3 is made possible. In this case, the pivotable end of the pivotable conveying means 75 is located underneath the ejection end of the shortened roof conveyor belt 60. In the non-use position shown in **Fig. 19 and 22**, the pivotable end of the pivotable conveying means 75 is pivoted away from the roof conveyor belt end at the container wall.

[0060] The material which is conveyed from the roof conveyor belt 60 via the pivotable conveying means 75 which is arranged so as to be inclined in the conveying direction, in the use position, reaches an auxiliary conveying means 76 which extends from the articulated end of the pivotable conveying means 75 to the coupled simple material conveying wagon 3, where it ends above the bottom conveyor belt 4 thereof, and can thus discharge the material there. The auxiliary conveying means 76 may, as in **Fig. 19 and**

20, be designed in accordance with a conventional transfer conveyor belt 5 which is associated with the bottom conveyor belt 4, with the difference that it is functionally associated not with the bottom conveyor belt 4 but rather with the pivotable conveying means 75, even if a functional coupling to the bottom conveyor belt 4 can be established when dismantling the pivotable conveying means 75. The auxiliary conveying means 76 designed as a transfer conveyor belt may be pivotable and/or displaceable. It can optionally also be introduced under the bottom conveyor belt 4, for transfer travel or in the non-use position of the pivotable conveying means 75.

[0061] Alternatively to a transfer conveyor belt that is fixedly arranged, in a pivotable and/or displaceable manner, on the extended material conveying wagon of the first type 2, as the auxiliary conveying means 76 which supplements the pivotable conveying means 75, as shown in **Fig. 21 and 22**, a bridging belt which can be mounted between the material conveying wagons only if needed can also be used as the auxiliary conveying means 76, which bridging belt then extends from the articulated end of the pivotable conveying means 75 as far as beyond the bottom conveyor belt 4 of the coupled simple material conveying wagon 3. However, as in the case of the detachable intermediate roof belt, here, too, corresponding engagement means and plug connection systems can be provided on the bridging belt and the material conveying wagon, in order to provide simple and exact positioning, detachable fastening, and energy supply and actuation.

[0062] The intermediate wagon conveying means can be actuated both electrically and hydraulically by means of corresponding drives and control elements. It can be semi-automatic or fully automatic, and optionally be actuated depending on the transport speed of the material-conveying roof conveyor belts of the extended material conveying wagons and/or of the material-removing bottom conveyor belts of the simple material conveying wagons, or actuated manually.

[0063] The material conveying wagon assemblies according to the invention, in which the last extended material conveying wagon of the first type is connected to a simple material conveying wagon, via an intermediate wagon conveying means which is displaceable or pivotable between a use position and a non-use position, can be used in various operating modes, which make it possible to achieve different loading variants. While in the use

position the intermediate wagon conveying means allows for the material fed via the roof conveyor belts to be conveyed through and onto the coupled simple material conveying wagons, the extended material conveying wagons can be operated in the rolling system when the intermediate wagon conveying means is arranged in the non-use position (parked position under the roof, or spaced apart from the roof conveyor belt end in the longitudinal direction or pivoted away therefrom). **Fig. 13 and 14** show the two modes of operation, on the basis of the example of an intermediate conveyor belt 70, the belt assembly 7b of which is displaceable in the carrier frame 7a. Furthermore, loading and unloading points of the wagon assembly 10 are visible here: The roof conveyor belt 6 of the first extended material conveying wagon 1 is loaded by means of a loading conveying means 8 which extends in an inclined manner and supported by a fastening device 82, from an output device 81 (e.g. loading funnel) arranged close to the bottom, in front of the head, as far as an ejection end which is arranged above the roof conveyor belt 6. The loading conveying means 8 can also optionally be moved between a use position and a non-use position (for example in the case of transfer travel), for which purpose the fastening device 82 can be designed so as to be telescopic and/or pivotable, etc. In this case, the pivotable roof conveyor belt 61 is pivoted in. The unloading takes place under the loading conveying means 8, via the pivoted-out transfer conveyor belt 5 of the first extended material conveying wagon 1.

[0064] A material conveying wagon assembly according to the invention can comprise any number of material conveying wagons, more precisely any number of extended material conveying wagons 1 comprising a continuous roof conveying means 6, and simple material conveying wagons 3 - merely the number of extended material conveying wagons of the first type 2, having a shortened roof conveying means 60 and the intermediate wagon conveying means 7 is predetermined and depends on the number of changes from extended material conveying wagons 1, 2 to simple material conveying wagons 3 in the assembly. Thus not only the number and sequence of the material conveying wagons 1, 2, 3 shown in **Fig. 3 to 22** is conceivable; the different wagon types can optionally also be arranged in an alternating manner, etc., it being necessary to pay attention only to the arrangement of a material conveying wagon of the first type 2 at the transition between an extended material conveying wagon 1 and a simple material conveying wagon 3. Material transfer from a simple material conveying wagon 3 onto an

extended material conveying wagon 3 is therefore in principle also conceivable (even if not shown) in that the transfer conveying means 5 of the simple material wagon 3 deposits the material onto the roof conveying means 6, 60 of an extended material conveying wagon 1, 2. It can optionally also be provided, for example in order to achieve a desired separation of materials during loading, to arrange the extended material conveying wagon of the first type 2 having a shortened roof conveying means 60 and intermediate wagon conveying means 7 in front of an extended material conveying wagon 1, in order to convey material from the shortened roof conveying means 60, via the intermediate wagon conveying means 7, onto the roof conveying means 6 of the coupled extended material conveying wagon 1. In this way, different spoil types can be purposely fed into different material conveying wagons of the different types, at a specified sequence location in the material conveying wagon assembly, during loading.

[0065] The conveying means can preferably be conveyor belts. However, as is clear with reference to the example of the chute as the pivotable conveying means, alternative conveying means are in principle also possible, which means allow for material conveyance of bulk materials in the directions shown (horizontal, inclined upwards and downwards).

LIST OF REFERENCE SIGNS

[0066]

1	extended head or intermediate material conveying wagon
2'	extended independent material conveying wagon
2	extended material conveying wagon of the first type
3	simple material conveying wagon
4	bottom conveying means
5	transfer conveying means associated with the bottom conveying means
6	roof conveying means
60	shortened roof conveying means of the terminal material conveying wagon
61	roof conveying means pivot end
62	fastening strut
7	intermediate wagon conveying means
7a	frame
7b	conveyor belt
70	intermediate roof conveying means
71	supplementary conveying means
72	intermediate roof conveying means pivot end
73	retaining device
74	engagement element
75	pivotable conveying means
76	auxiliary conveying means
8	loading conveying means
81	output device
82	fastening device (pivotable/telescopic, etc.)
10	material conveying wagon assembly

Patentkrav

1. Materialetransportvognssamling (10) af mindst to materialetransportvogne (1, 2, 3), der er funktionsmæssigt sammenkoblet med hinanden,

hvor

en første materialetransportvogn i materialetransportvognssamlingen (10) er en materialetransportvogn (2), der har

– en tagtransportanordning (60), der er afkortet i forhold til en vognlængde, og som efterlader en fri tagdel i én ende af den første materialetransportvogn (2), og som kan betjenes til læsning i en første transportretning mod den frie ende, og

– en bundtransportanordning (4), der kan betjenes til læsning i en anden retning, der er modsat den første transportretning, og

– en overførselstransportanordning (5), der er tildelt bundtransportanordningen (4) i den anden transportretning, og

– en mellemliggende vogntransportanordning (7), der kan betjenes til læsning i den første transportretning, til den funktionsmæssige sammenkobling med en anden materialetransportvogn (1, 3),

der er tildelt den afkortede tagtransportanordning (60) på materialetransportvognen (2), og som strækker sig fra under en udføringsende af den afkortede tagtransportanordning (60) ud over den frie ende af materialetransportvognen (2), og hvor

materialetransportvognssamlingen (10) har mindst én anden materialetransportvogn (1, 3), der omfatter mindst én bundtransportanordning (4) og mindst en overførselstransportanordning (5), der er tildelt bundtransportanordningen (4), hvor den

anden materialetransportvogn (1, 3) er sammenkoblet med den første materialetransportvogn (2) på den, i forhold til det afkortede tagtransportbånd (60), frie ende, hvor

den anden materialetransportvogn (1, 3) er en materialetransportvogn (3) uden tagtransportanordning, og bundtransportanordningen (4) og den tildelte overførselstransportanordning (5) har en transportretning til læsning, som er modsat den anden transportretning af bundtransportanordningen (4) på den første materialetransportvogn (2), og hvor

udføringsenden af den mellemliggende vogntransportanordning (7) på den første materialetransportvogn (2) kan placeres over bundtransportanordningen (4) på den sammenkoblede anden materialetransportvogn (3).

2. Materialetransportvognssamlingen (10) ifølge krav 1, **kendetegnet ved, at**

den mellemliggende vogntransportanordning (7) er dannet af

– en mellemliggende tagtransportanordning (70), der er fastgørligt eller aftageligt arrangeret ved den første materialetransportvogn (2) eller

– en kombination af en mellemliggende tagtransportanordning (70), der er fastgørligt eller aftageligt arrangeret ved den første materialetransportvogn (2), som omfatter en supplerende transportanordning (71), der er fastgørligt eller aftageligt arrangeret ved den anden materialetransportvogn (3) eller

– en kombination af en drejelig transportanordning (75), der er drejet i bundområdet af den første materialetransportvogn (2), og som kan bevæges mellem en brugsposition og en ikke-brugsposition, og en ekstra transportanordning (76), der er arrangeret på en drejelig og/eller forskydelig måde ved den første materialetransportvogn (2) eller aftageligt ved den første og/eller anden materialetransportvogn (3).

3. Materialetransportvognssamlingen (10) ifølge krav 2, **kendetegnet ved, at**

den mellemliggende tagtransportanordning (70) har en transportbåndssamling (7b) i en bæreramme (7a), hvor

den mellemliggende tagtransportanordning (70) som et hele eller transportbåndssamlingen (7b) kan fortrinsvis forskydes i bærerammen (7a) fra en brugsposition, hvor transportbåndssamlingen (7b) strækker sig fra under udføringsenden af den afkortede tagtransportanordning (60), til en ikke-brugsposition, der er placeret under den afkortede tagtransportanordning (60), eller som er placeret med afstand i den langsgående og/eller tværgående retning fra udføringspunktet for den afkortede tagtransportanordning (60).

4. Materialetransportvognssamlingen (10) ifølge krav 2 eller 3, **kendetegnet ved, at** den mellemliggende vogntransportanordninger (7), der kan bevæges mellem en brugsposition og en ikke-brugsposition, har mindst ét drev og/eller kontrolelementer til overførsel af den mellemliggende vogntransportanordning (7) mellem brugsposition og en ikke-brugsposition, hvor det mindst ene drev og/eller kontrolelementerne kan aktiveres manuelt eller ved hjælp af mindst én kontrolanordning til materialetransportvognssamlingen (10) på en halvautomatisk eller fuldautomatisk måde, hvor den mindst ene kontrolanordning fortrinsvis er sammenkoblet med mindst én sensor til detektion af en grad af læsning af én af materialetransportvognene (1, 2, 3).

5. Materialetransportvognssamlingen (10) ifølge mindst ethvert af kravene 2 til 4,

kendetegnet ved, at

den mellemliggende tagtransportanordning (70) og eventuelt den supplerende transportanordning (71) kan drejes omkring en vertikal akse og/eller omkring en tværgående vognakse,

hvori tilsvarende pivotdrev og/eller kontrolelementer fortrinsvis er tilvejebragt, som kan aktiveres manuelt eller ved hjælp af mindst én kontrolanordning til materialetransportvognssamlingen (10) på en halvautomatisk eller fuldautomatisk måde, hvor den mindst ene kontrolanordning fortrinsvis er sammenkoblet med mindst én sensor til detektion af en sporposition og/eller et sporforløb.

6. Materialetransportvognssamlingen (10) ifølge mindst ethvert af kravene 2 til 5,

kendetegnet ved, at

– den mellemliggende tagtransportanordning (70), der er aftageligt arrangeret ved den første materialetransportvogn (2),
– den supplerende transportanordning (71), der er aftageligt arrangeret ved den anden materialetransportvogn (3),
– den ekstra transportanordning (76), der er aftageligt arrangeret ved den første og/eller den anden materialetransportvogn (2, 3),

har indgrebselementer (74) til et løfteapparat, hvor den første og/eller anden materialetransportvogn (2, 3) hver fortrinsvis har modtagelses- og/eller positioneringselementer til den aftageligt arrangerede mellemliggende tagtransportanordning (70), den aftageligt arrangerede supplerende transportanordning (71) og/eller den aftageligt arrangerede ekstra transportanordning (76).

7. Materialetransportvognssamlingen (10) ifølge mindst ethvert af kravene 2 til 6,

kendetegnet ved, at

materialetransportvognssamlingen (10) har mindst én materialetransportvogn (1), der omfatter en tagtransportanordning (6), der er kontinuerlig i forhold til vognlængde, og som kan betjenes til læsning i den første transportretning, som omfatter en bundtransportanordning (4), der kan betjenes til læsning i en anden retning, der er modsat den første transportretning, og en overførselstransportanordning (5), der er tildelt bundtransportanordningen (4) i den anden transportretning, hvor materialetransportvognen (1), der omfatter den kontinuerlige tagtransportanordning (6), er koblet til enden af den første materialetransportvogn (2), der vender væk fra den frie ende.

8. Fremgangsmåde til læsning af en materialetransportvognssamling (10), som omfatter forskellige materialetransportvogne (1, 2, 3) ifølge mindst ethvert af kravene 1 til 7, **hvor**

en første materialetransportvogn (2), der omfatter den afkortede tagtransportanordning (60) og omfatter den mellemliggende vogntransportanordning (7), er arrangeret foran en anden materialetransportvogn (3) i forhold til en første læsningstransportretning, så den mellemliggende vogntransportanordning (7) er placeret i en brugsposition over en bundtransportanordning (4) på den sammenkoblede anden materialetransportvogn (3), hvor materialet, der fødes fra den afkortede tagtransportanordning (60), transporteres via den mellemliggende vogntransportanordning (7) over på den anden materialetransportvogn (3) og desuden transporteres dertil i den første transportretning, og hvor

alternativt, før det eller bagefter, materiale, der fødes af den afkortede tagtransportanordning (60), falder gennem den åbne frie tagende ned på bundtransportanordningen (4) på den første materialetransportvogn (2) gennem fjernelse af den mellemliggende vogntransportanordning (7) eller ved at overføre den mellemliggende vogntransportanordning (7) til en ikke-brugsposition, og transporteres dertil i en anden transportretning, der er modsat den første transportretning.

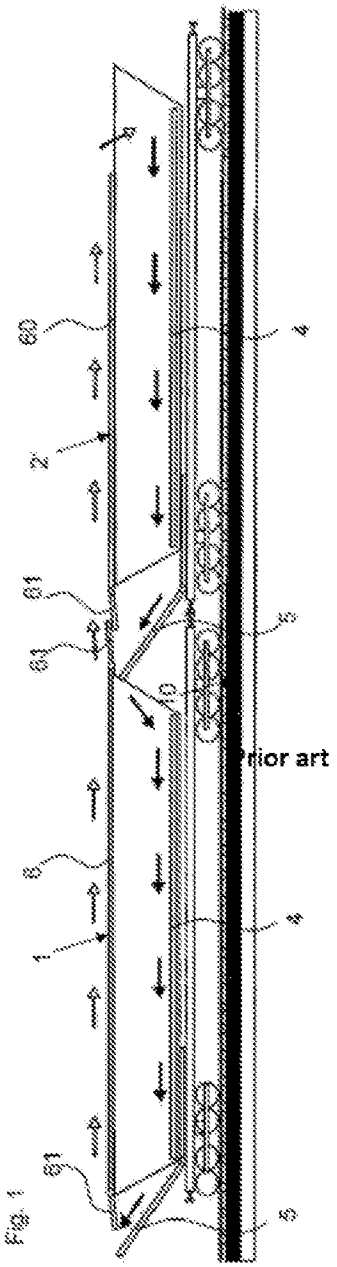

Fig. 1 Prior art

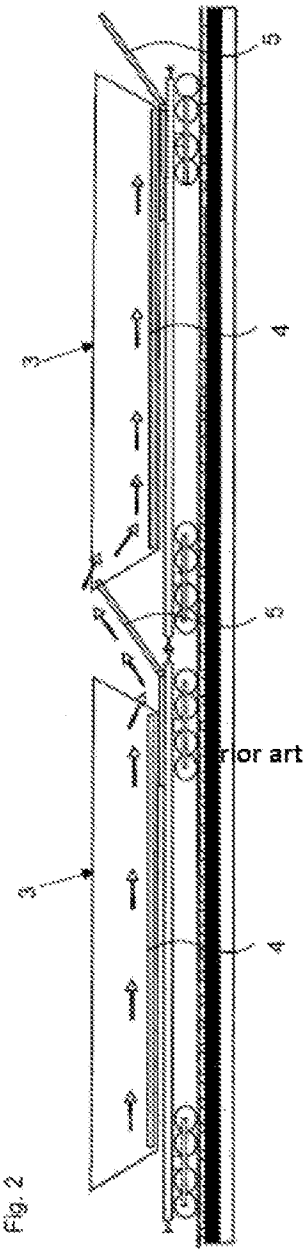

Fig. 2 Prior art

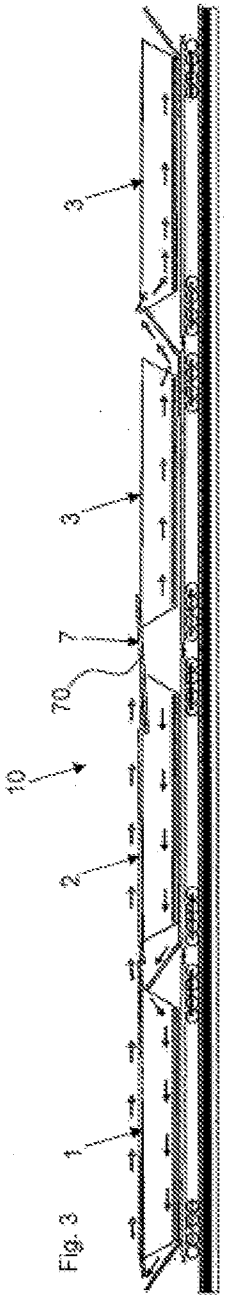

Fig. 3

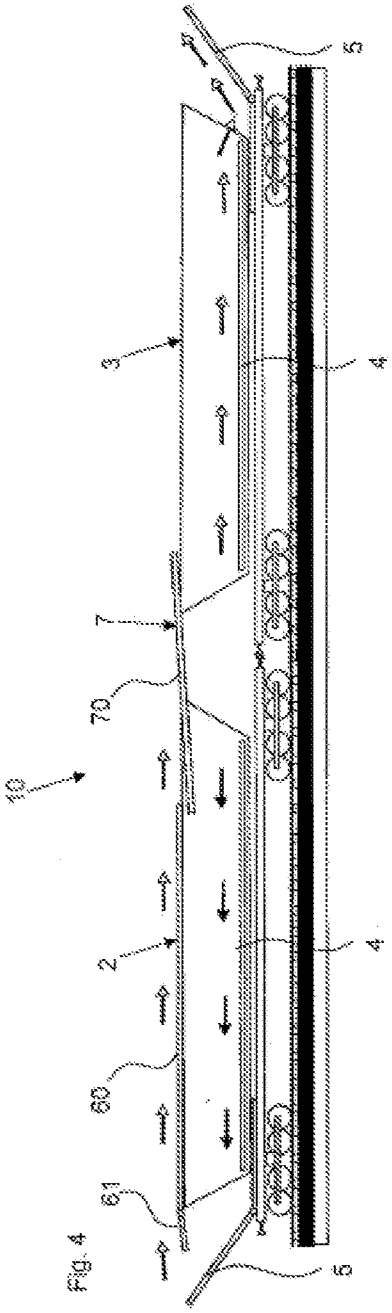

Fig. 4

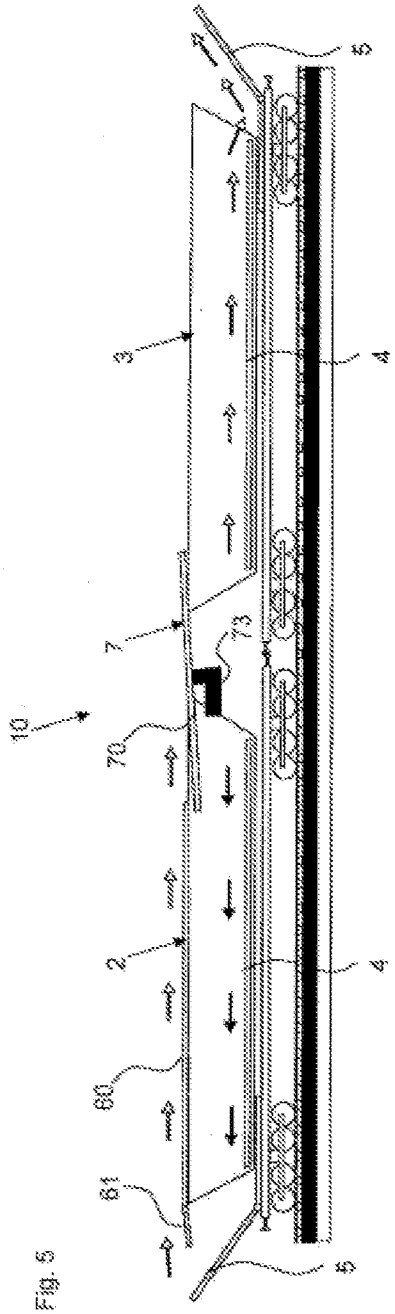

Fig. 5

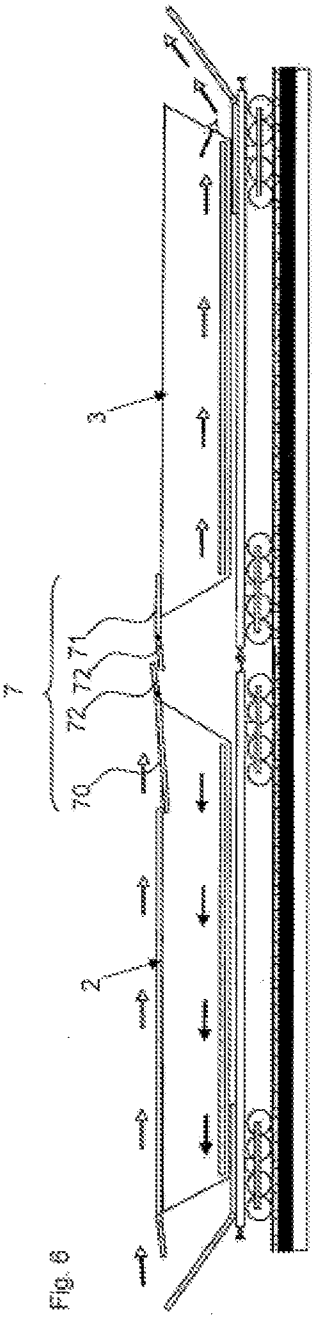

Fig. 6

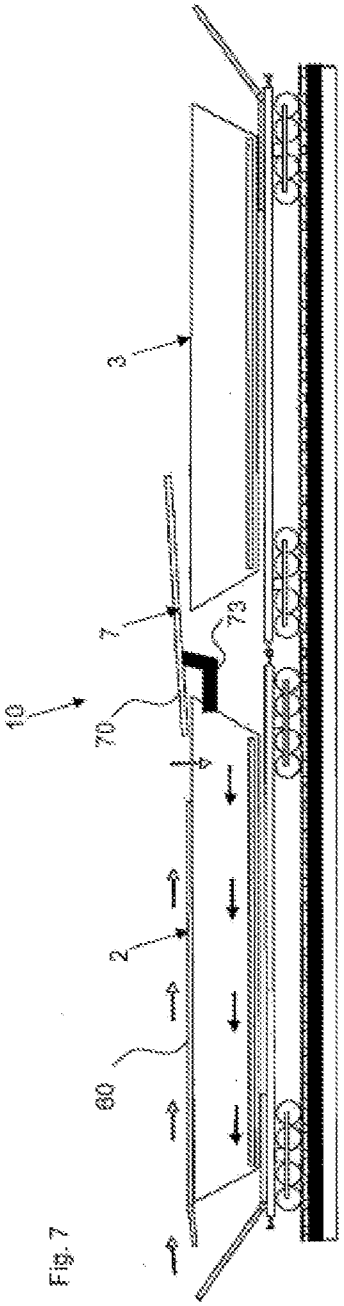

Fig. 7

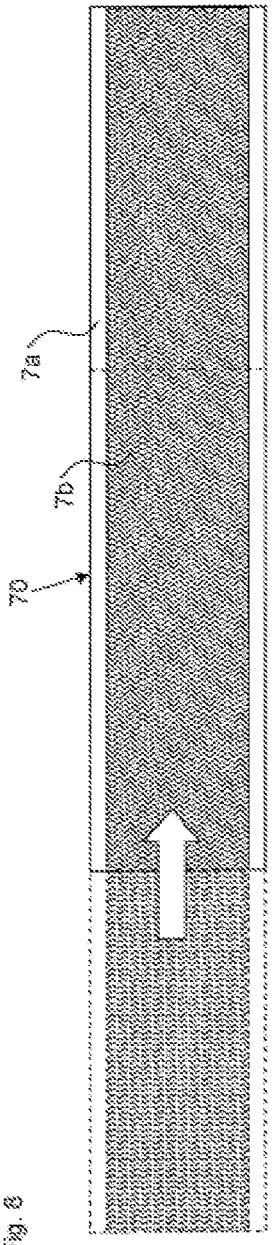

Fig. 8

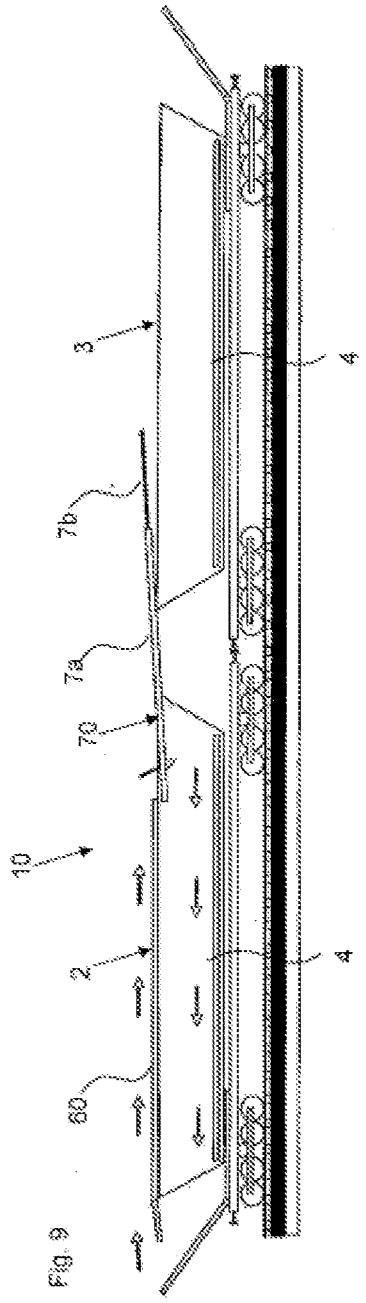

Fig. 9

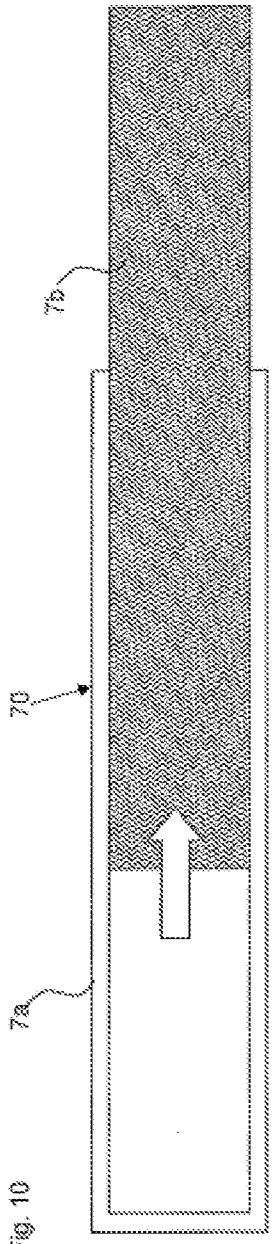

Fig. 10

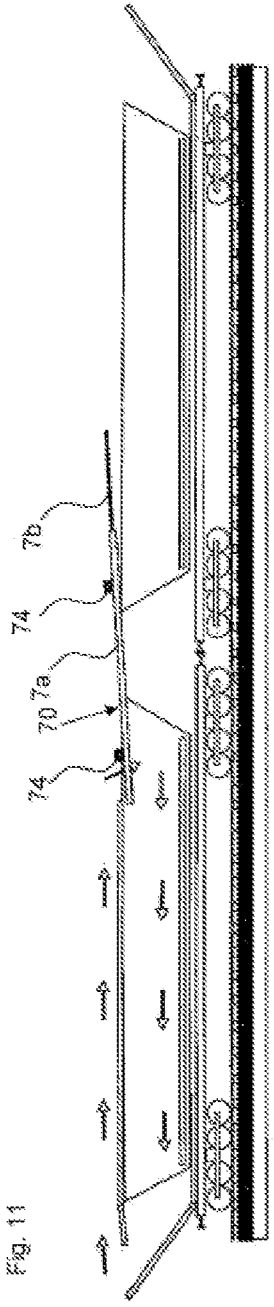

Fig. 11

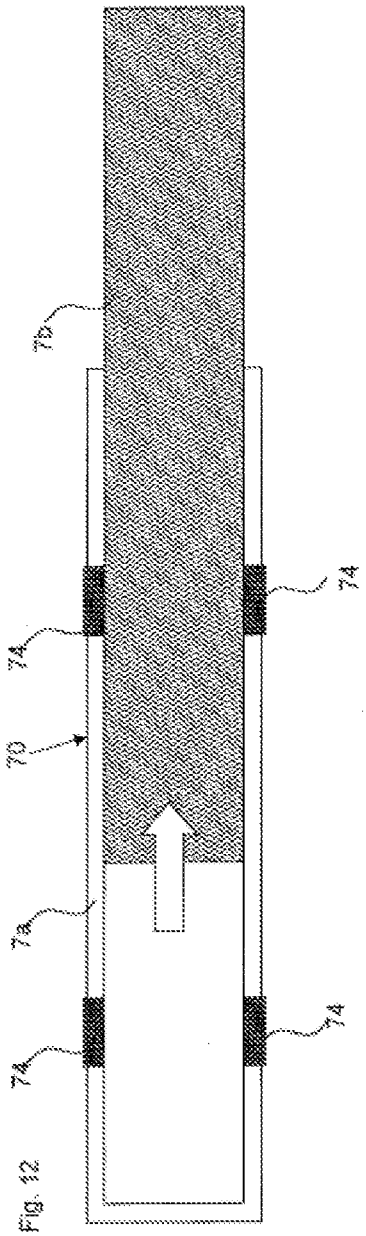

Fig. 12

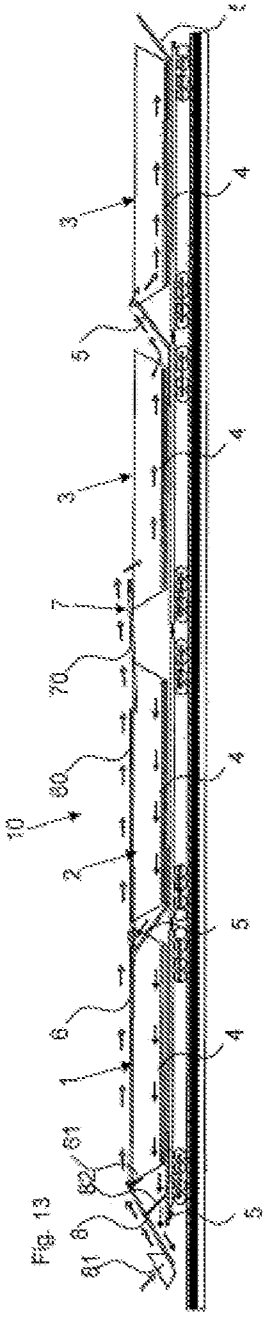

Fig. 13

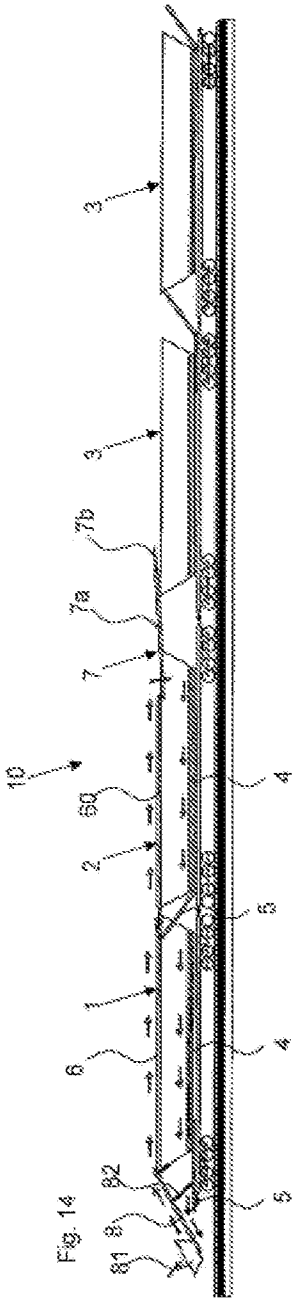

Fig. 14

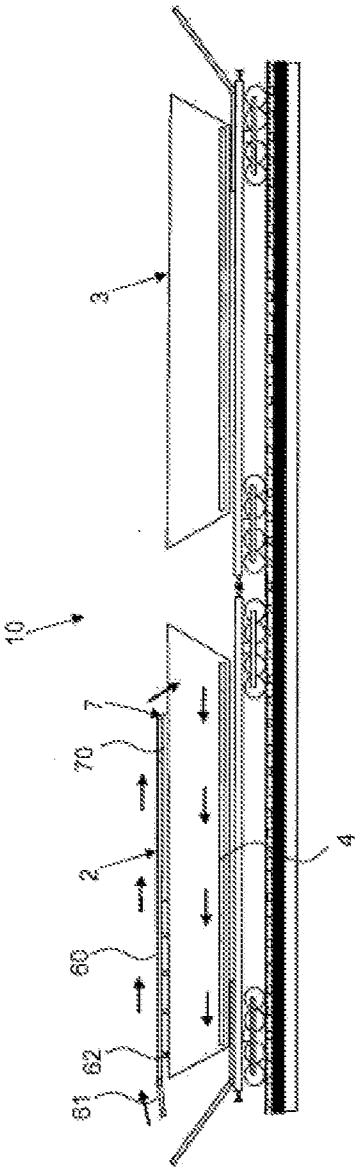

Fig. 15

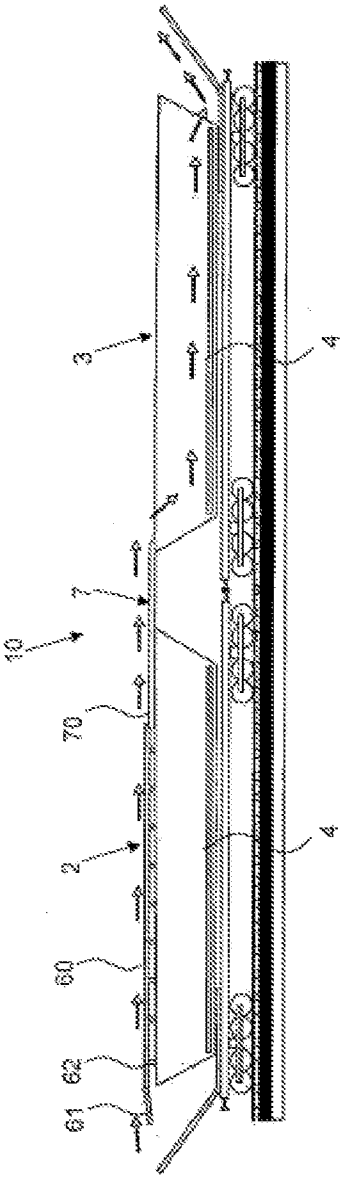

Fig. 16

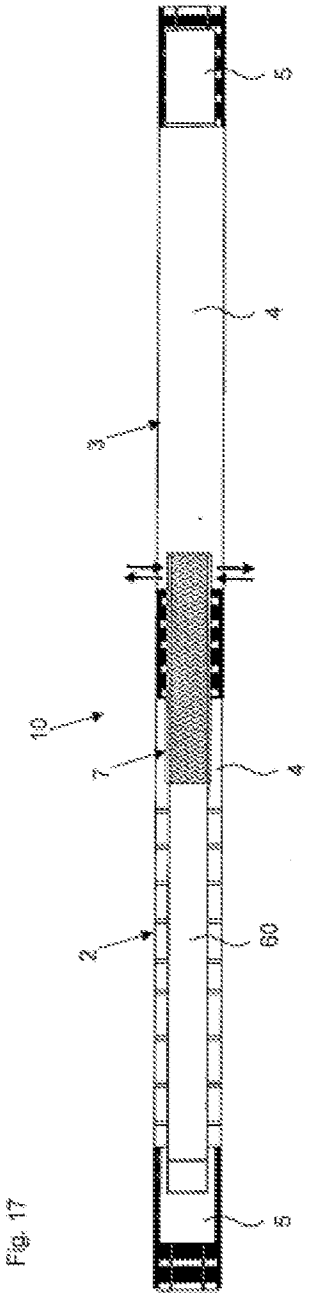

Fig. 17

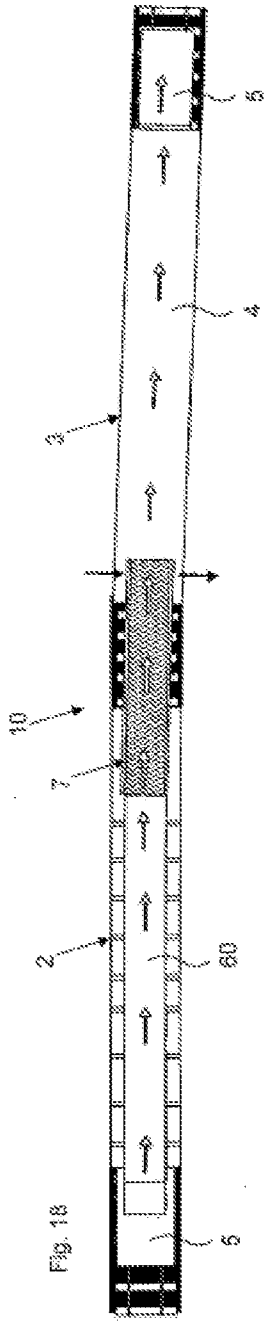

Fig. 18

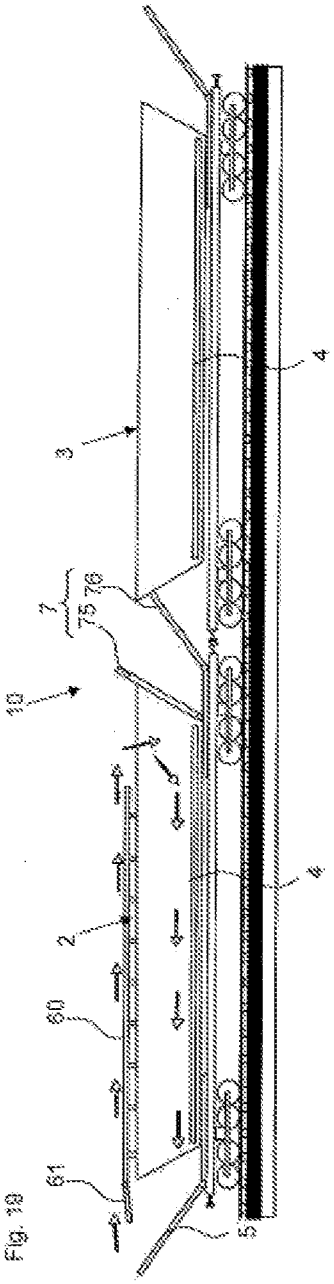

Fig. 1B

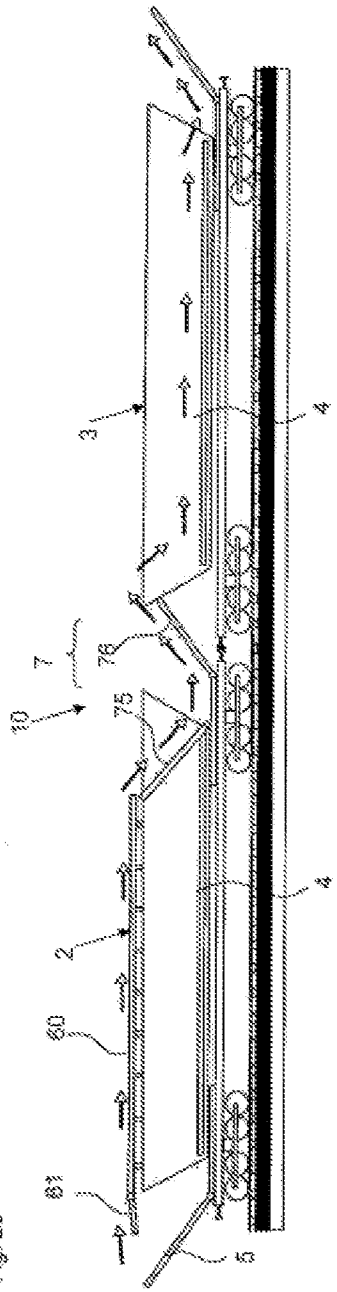

Fig. 2B

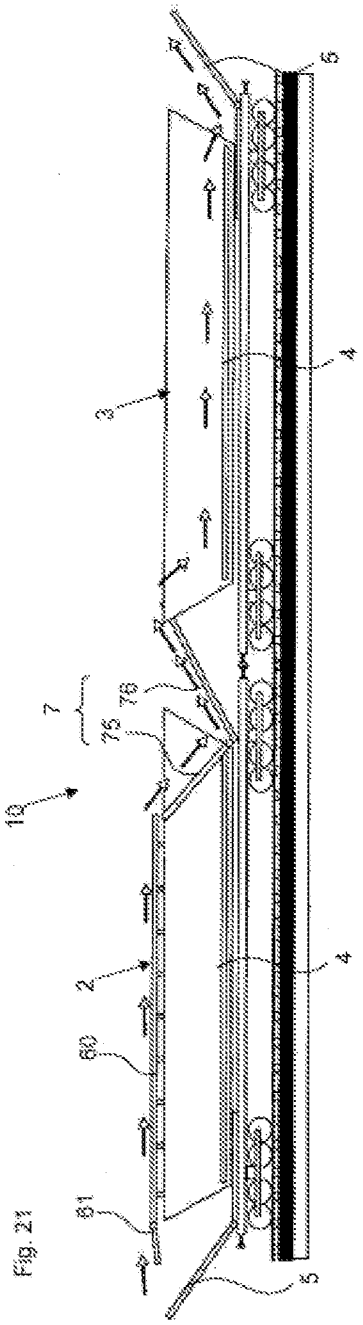

Fig. 21

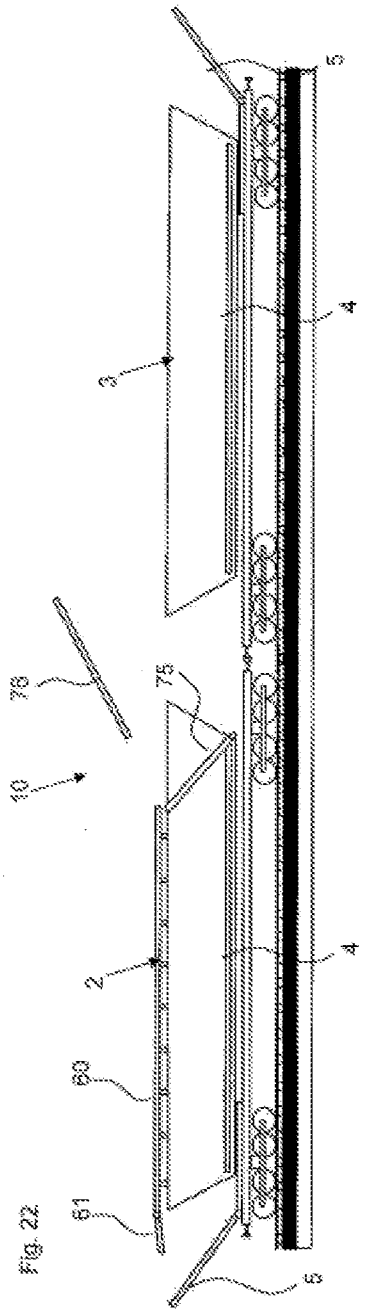

Fig. 22