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The invention is based on a device and a method for loading a transporting unit intended for transporting piece goods in accordance with claim 1 and claim 9.

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On account of the requisite transport filling density the transportation of piece goods, in particular mail items, is today based predominantly on containers / swap bodies loaded in bulk and manually, and the transportation thereof by road.

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While the sortation in the sorting centres is today largely optimised and offers very high performance, the manual loading of the swap bodies / containers at the entrance gates

represents a constant bottleneck and results in the logistics companies needing significantly more loading gates, staff and

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the space requirement associated therewith in order to achieve a necessary increase in the throughput of the sorting centre. This involves considerable structural changes, in particular a new build.

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The manual loading of extremely inhomogeneous mail items into the swap body / container takes place today with a throughput of less than 1000 parcels per hour and is extremely marginal from an ergonomic point of view.

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Many different types of devices are hitherto known, such as in particular in the form of telescopic conveyors which can be moved into the transporting unit, which support the operator when loading said transporting unit. In addition, auxiliary equipment is made available by telescopic conveyor

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manufacturers which can be fitted to the existing telescopic conveyors. Such equipment primarily includes lifting platforms. Although said lifting platforms enable better

adaptation to the loading height, they do not however relieve the operator of the lifting effort required.

US 2003/0196873 A1 and DE 42 45 047 B4 describe known devices
5 for loading transporting units.

The aforementioned publication DE 42 45 047 B4 (Knapp AG) discloses a device for loading a transporting unit provided for transporting piece goods, such as a lorry or a railway
10 wagon. In this case a conveying unit which can be moved into the transporting unit is provided with multiple conveyor tracks. The conveyor tracks serve to convey and unload multiple streams of piece goods into the transporting unit. A
15 sorting unit is provided beforehand which is connected to the conveyor units using conveyor technology and sorts the stream of piece goods to be loaded according to a sorting criterion, wherein the sorting criterion relates to at least one physical
20 attribute of the piece goods, which is the weight and size as well as the height or volume. The sorted streams of piece goods are each stored temporarily in a buffer and then subsequently loaded into the transporting unit sorted in layers one after the other and/or one above the other.

Based on this prior art, the object of the invention is to
25 provide a device and a method for loading transporting units, by means of which device and/or method loading which is better with respect to the transport filling density of the transporting unit can be achieved with increased loading throughput and improved working convenience.

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This object is achieved by the features specified in claims 1 and 9.

The device has at least one second conveying unit which is intended for conveying and unloading a second stream of piece goods in the transporting unit, in which case the piece goods are distributed onto the streams of piece goods according to at least one sorting criterion. By this means it is possible to achieve optimum utilisation of the available usable space of the transporting unit in an at least partially automated manner on the basis of the sorting criterion. As a result of distributing the piece goods onto at least two streams of piece goods it is possible in particular to achieve an optimised spatial distribution of the piece goods in the usable space of the transporting unit according to the sorting criterion.

The invention is suitable in particular for use with a transporting unit which can be attached as a trailer to a motor vehicle and is designed in particular as a swap body or shipping container. When a loading operation is carried out by means of the device the transporting unit is expediently docked to a building from which the conveying units are extended and moved into the usable space of the transporting unit. Said building preferably serves the purpose of a sorting centre in which the piece goods to be loaded are sorted prior to the loading operation.

The conveying units can be designed in particular in each case as telescopic units. They can furthermore be moved independently of one another into the usable space of the transporting unit.

It is however advantageous if the first conveying unit and the

second conveying unit can be moved jointly into the transporting unit. The conveying units could in this case be driven separately from one another, but in an advantageous embodiment it is proposed that the conveying units are coupled
5 together mechanically for the purpose of joint inward movement.

In order to ensure that the at least two streams of piece goods are made available in a particularly quick and simple
10 manner it is proposed that the device comprises a sorting unit which is connected to the conveying units using conveyor technology and sorts a primary stream of piece goods in order to generate the first and the second streams of piece goods according to the sorting criterion. This means that the
15 conveying units can be fed with piece goods presorted according to the sorting criterion without human intervention to the greatest possible extent. Said sorting unit is preferably arranged in the region of a delivery point of a sorting centre which is assigned to a gate of the sorting
20 centre at which the transporting unit to be loaded is docked.

According to the invention the sorting criterion is related to at least one physical attribute of the piece goods, which is an extent, the weight, the volume, a surface, the shape and/or
25 a combination of a plurality of said features. As a result of taking into consideration one of said features or a combination of a plurality of said features it is possible to achieve a sortation of the piece goods which is directed at an optimum filling level of the usable space of the transporting
30 unit.

Expediently, the sorting unit is operatively connected with a

capture unit which is intended for capturing the physical attribute. This can be designed for example as a read and/or weighing device. A separating device which separates the piece goods from one another according to the sorting criterion
5 depending on the physical attribute captured or ascertained is preferably connected downstream of the capture unit.

In particular, the sorting criterion is used in order to differentiate between "conveyor-dischargeable" and "conveyor-
10 non-dischargeable" piece goods on the basis of the physical attribute. Piece goods which can be regarded as conveyor-dischargeable are conventionally handled differently by an operator from the other piece goods which per se are larger and/or heavier. As a result of a sortation according to this
15 criterion a distribution onto the conveying units can take place, in which case the conveying units are adapted in each case to the characteristics of the different, conveyor-dischargeable or conveyor-non-dischargeable piece goods. A different handling technique, a different unloading technique
20 in particular, can thus be employed in each case for the conveying units, which means that the best possible handling throughput can be achieved for the respective type of piece goods.

25 In order to check whether an individual piece good satisfies the sorting criterion "conveyor-dischargeable", in particular an edge length, a weight parameter and/or a variable based on said features can be taken into consideration as a physical attribute. The physical attribute is expediently compared with
30 a present threshold value, in which case undershooting or exceeding said threshold value results in an assignment to the corresponding sort category. For example, a value between 300

mm and 400 mm can be set as the threshold value for a maximum edge length.

5 The utilisation according to the invention of the usable space of the transporting unit and a high level of working convenience for the operator when carrying out loading in the uppermost region of the usable space are moreover achieved by the streams of piece goods being conveyed onto at least two conveyor tracks at different heights by means of the conveying
10 units. A height in this case is preferably defined relative to the floor of the transporting unit.

In this context it is proposed that the uppermost conveyor track is intended for conveying conveyor-dischargeable piece
15 goods. Conveyor discharging of said piece goods can thus take place particularly advantageously across a stack of further, larger and heavier piece goods which have been unloaded by means of a lower conveyor track in the usable space. This means that the unloading of the conveyor-dischargeable piece
20 goods by means of the uppermost conveyor track can take place in orderless fashion and with a high throughput and the operator is not required to do as much lifting.

In an advantageous development of the invention it is proposed
25 that the device has a chute which is arranged at the unloading end of the lowermost conveyor track. It is thereby possible to achieve a rapid unloading offering working convenience which takes place predominantly by means of a sliding motion of the piece goods. If the lowermost conveyor track is intended for
30 conveying piece goods which are regarded as "conveyor-non-dischargeable" according to the sorting criterion, a placement to a location determined by the operator in order to form a

stack can take place in a simple manner. In order to increase the accessibility of decentralised marginal regions of the usable space of the transporting unit the chute can be designed as a swivelling unit.

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The working convenience for the operator can be further increased in that the device has a lifting device which is intended for adjusting the height at least of the lowermost conveyor track. This preferably enables an adjustment at least
10 of the unloading end of the lowermost conveyor track to the growing height of an accumulation, in particular of a stack of piece goods. By means of the lifting device the unloading end can be positioned at a height which is ergonomic for the operator in regard to the height of accumulation. Unloading of
15 the piece goods without lifting effort on the part of the operator can be achieved particularly advantageously regardless of said height of accumulation.

In this context it is proposed that the device has a working
20 platform intended for the operator which is adjustable in height. By this means the manual handling range of the operator situated on the working platform can be significantly extended. In particular, the loading space situated overhead today in the transporting unit can be utilised. The working
25 platform is preferably coupled at the unloading end of the lowermost conveying unit. The lifting device for adjusting the height of the lowermost conveyor track or a lifting unit independent thereof can be employed for lifting the working platform.

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It is furthermore proposed that the device comprises a conveyor belt which is arranged at the unloading end of the

uppermost conveyor track and has a selectable conveying direction. A high degree of manoeuvrability of the uppermost conveyor track can be attained, which means that a large unloading space and thus a high filling level of the usable space of the transporting unit can be achieved. The conveying direction can if required be selected manually by the operator. In particular, the conveyor belt can be designed as a telescopable and/or swivelling conveyor belt.

10 If the uppermost conveyor track is intended for conveying piece goods which are considered to be conveyor-dischargeable, the piece goods can be deposited with a high throughput rate across a stack formed with the conveyor-non-dischargeable piece goods.

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A further optimisation of the filling level of the transporting unit can additionally be achieved if, with regard to the usable height of the transporting unit, the uppermost conveyor track is used for depositing piece goods in the uppermost third of the usable height. The "usable height" should in particular be understood as the vertical extent of the usable space of the transporting unit.

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In addition, a method for loading a transporting unit intended for transporting piece goods, in particular mail items, is proposed, wherein piece goods are distributed onto at least a first and a second conveying unit according to a sorting criterion, the conveying units are moved into the transporting unit, piece goods are unloaded in the transporting unit by means of the first conveying unit and piece goods are unloaded in the transporting unit by means of the second conveying unit. This means that an optimum utilisation of the available

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usable space of the transporting unit can be achieved in an at least partially automated fashion on the basis of the sorting criterion. As a result of distributing the piece goods onto at least two streams of piece goods it is possible according to
5 sorting criterion in particular to achieve an optimised spatial distribution of the piece goods in the usable space.

In this case the conveying units preferably form at least two conveyor tracks which have a different height, which means
10 that a particularly advantageous utilisation of the usable space of the transporting unit and a high level of working convenience for the operator can be attained when loading in the uppermost region of the usable space.

15 It is furthermore proposed that the sorting criterion is used in order to differentiate between "conveyor-dischargeable" and "conveyor-non-dischargeable" piece goods on the basis of a physical attribute of the piece goods, with piece goods which are regarded as conveyor-non-dischargeable being stacked by
20 means of the lowermost conveyor track in the transporting unit and piece goods which are regarded as conveyor-dischargeable being unloaded by means of the uppermost conveyor track onto the formed stack of conveyor-non-dischargeable piece goods. This means that a loading operation tailored to the attributes
25 of the piece goods with a high throughput can be attained.

An exemplary embodiment will be described with reference to the drawings. In the drawings:

30 Figure 1: shows a schematic illustration of a transporting unit docked at a sorting centre, into which a loading device has been moved and

Figure 2: shows a schematic illustration of a sorting unit from above, which is located upstream of the loading device and connected therewith using conveyor technology.

Figure 1 shows a schematic sectional view of the arrangement of a transporting unit 10 designed as a truck trailer or swap body for transporting piece goods 12 taking the form of mail items, in particular postal packages, in a position docked at a sorting centre 14. For loading the transporting unit 10 with piece goods 12 a device 16 is provided which has two different conveying units 18, 20, each of which is used for conveying and unloading a stream of piece goods 22 and 24 respectively in the transporting unit 10.

The conveying units 18, 20 can be moved together into the usable space 26 of the transporting unit 10 in a direction of movement 27 which corresponds in particular to the longitudinal direction of the transporting unit 10. In the exemplary embodiment under consideration they are coupled mechanically to one another as a contiguous unit which has running gear 28 capable of rolling on the floor 30 of the sorting and distribution centre 14 or on the floor 32 of the transporting unit 10.

Connected using conveyor technology to the conveying units 18, 20 is a sorting unit 34 shown in Figure 2 which serves to sort a primary stream of piece goods 36 in order to generate the first and second streams of piece goods 22, 24 according to a sorting criterion, as explained in detail further below. The sorting unit 34 is arranged in the region of the delivery

point of the sorting centre 14 which is assigned to the building gate at which the transporting unit 10 is docked. The primary stream of piece goods 36 is generated for example by means of a sorting system (not illustrated in more detail) of the sorting centre 14 which sorts the piece goods 12 for example according to their addressees.

The conveying units 18, 20 each have a respective conveyor track 38, 40 which are at different heights relative to the floor 30 or 32 respectively. In the exemplary embodiment under consideration the conveyor tracks 38, 40 are formed in each case by a set of conveyor belts which immediately adjacent to one another. In the embodiment shown, the conveyor track 38 corresponds to the lowermost conveyor track, while the conveyor track 40 corresponds to the uppermost conveyor track. The conveyor tracks 38, 40 can have a variable height in their course along the streams of piece goods 22, 24 by having - as illustrated - up and down gradients.

The loading operation for the transporting unit 10 takes place as described in the following.

Firstly, automatic recognition takes place of the piece goods 12 of the primary stream of piece goods 36. This serves to recognise whether an individual piece good 12 to be sorted satisfies a particular sorting criterion. In particular, features of the piece goods 12 such as a shape, an extent, a surface, the volume and/or the weight can be captured and used as the basis for a sortation according to the sorting criterion. In the exemplary embodiment under consideration the sorting criterion relates to an extent, which in particular is an edge length, and alternatively or additionally to the

weight of the piece goods 12. This is done by means of a capture device 42 which is intended for capturing the corresponding feature or features of the piece goods 12. The capture device 42 is in particular designed as a read and/or weighing device. On the basis of one or more parameters captured by the capture device 42 an evaluation is carried out by an evaluation unit 44 of the sorting unit 34, wherein it is determined whether or not the individual piece good 12 satisfies a predetermined sorting criterion. With reference to the parameters captured, the evaluation unit 44 is able to determine whether the individual piece good 12 examined exhibits the attribute "conveyor-dischargeable" or "conveyor-non-dischargeable".

Depending on said determination by the evaluation unit 44, the individual piece good 12 is moved on by means of a separating device 46, which is implemented in the example under consideration as a gate, either into the stream of piece goods 22 if the individual piece good 12 can be regarded as "conveyor-non-dischargeable", or into the stream of piece goods 24 if the individual piece good 12 can be regarded as "conveyor-dischargeable". The separating device 46 in cooperation with the capture device 42 and the evaluation unit 44 guides - according to the sorting criterion - the piece goods 12 into the first or into the second stream of piece goods 22 or 24 respectively, with the streams of piece goods 22, 24 each being assigned to a different conveyor track 38 or 40 of the respective conveying units 18, 20.

After the separation of the primary stream of piece goods 36 by means of sorting unit 34, the piece goods 12 are stored in storage units 48, 50 which are each arranged in one of the

streams of piece goods 22, 24. The storage units 48, 50 are illustrated schematically and can for example be designed as a spiral chute or spiral conveyor.

5 After being stored, the piece goods 12 from the respective streams of piece goods 22, 24 are conveyed automatically onto two separate conveyor sections 52, 54 to the respective conveying unit 18, 20. Here the conveyor tracks 38, 40 are filled with piece goods 12.

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The conveying units 18, 20 are subsequently moved together into the usable space 26 of the docked transporting unit 10. The device 16 furthermore has a working platform 56 on which an operator can stand and which is moved together with the
15 conveying units 18, 20 into the usable space 26. The inward movement is controlled by the operator and is powered.

First to be handled are the piece goods 12 from the first stream of piece goods 22 which are regarded as "conveyor-non-
20 dischargeable" and are arranged on the lowermost conveyor track 38.

Said piece goods 12 are unloaded onto the floor 32 of the transporting unit 10 and stacked upon one another. In this
25 case the piece goods 12 are simply shifted by the operator from their position at the end of the lowermost conveyor track 38 onto the floor 32 or into a stack position. The arduous task of lifting the piece goods 12 can hereby be avoided. The lowermost conveying unit 18 furthermore has a telescopable
30 chute 58 which supports the shifting of the piece goods 12 into the stack position by the operator.

The device 16 furthermore has a preferably powered lifting device 60 which is intended for adjusting the height of the lowermost conveyor track 38 such that the working height can be continuously adjusted to the growing height of the stack.

- 5 The height of the working platform for the operator can be altered by means of the lifting device 60 or a lifting device which can be driven independently of the lifting device 60.

- 10 The stacking described hereinabove of the piece goods 12 which are conveyed into the usable space 26 in the stream of piece goods 22 by means of the lowermost conveyor track 38 and are regarded as "conveyor-non-dischargeable" takes place up to a height relative to the floor 32 which corresponds to approx. two thirds of the height, in other words of the vertical
15 extent, of the usable space 26.

- The remainder of the loading height, in other words in particular the uppermost third of the height of usable space 26, is filled up by an orderless loading operation of the
20 piece goods 12 conveyed in the stream of piece goods 24 by means of the uppermost conveyor track 40 into the usable space 26. Said piece goods 12, which are regarded as "conveyor-dischargeable" goods, are in this case discharged on the stacks until a desired filling level has been reached. In
25 order to achieve a high freedom of movement the uppermost conveyor track 40 is formed at its unloading end by a conveyor belt 62 which is telescopable and can swivel around a horizontal axis 64.

- 30 The conveying units 18, 20 are subsequently withdrawn in the opposite direction from that indicated 27 in order to provide the operator again with an ergonomic working distance and to

perform the layer-wise construction of the stack described above.

P a t e n t k r a v

1. Indretning til læsning af en transportenhed (10), der er tilvejebragt til transport af stykgods (12), især postforsendelser, med:

5 - en første transportenhed (18), der kan køres ind i transportenheden (10) og er tilvejebragt til transport og aflæsning af en første stykgodsstrøm (22) i transportenheden (10), hvor den første transportenhed (18) danner en første transportbane (38);

10 - mindst en anden transportenhed (20), der kan køres ind i transportenheden (10) og er tilvejebragt til transport og aflæsning af en anden stykgodsstrøm (24) i transportenheden (10), hvor den anden transportenhed (20) danner en anden transportbane (40);

15 - en sorteringsenhed (34), som er forbundet transportteknisk med transportenhederne (18, 20) og sorterer en hovedstykgodsstrøm (36) med henblik på at generere den første (22) og den anden stykgodsstrøm (24) i henhold til et sorteringskriterium, hvor sorteringskriteriet vedrører mindst en fysisk egenskab ved stykgodset (12), som er en udstrækning, vægten, voluminet, en overflade, formen og/eller en kombination af flere af disse egenskaber, og
20 hvor de to transportbaner (38, 40) har en forskellig højde, således at stykgodset (12) kan læsses fra transportenhederne (18, 20) i forskellige højder i transportenheden (10).

25 2. Indretning ifølge krav 1, **kendetegnet ved, at** den første transportenhed (18) og den anden transportenhed (20) kan køres sammen ind i transportenheden (10).

30 3. Indretning ifølge krav 1 eller 2, **kendetegnet ved, at** sorteringskriteriet tjener til at skelne mellem stykgods (12), der kan hældes/øses, og stykgods (12), der ikke kan hældes/øses, ved hjælp af en fysisk egenskab ved stykgodset.

4. Indretning ifølge krav 3, **kendetegnet ved, at** den øverste transportbane (40) er beregnet til transport af stykgods (12), der kan hældes/øses.

35 5. Indretning ifølge et af kravene 1 til 4, **kendetegnet ved** en glidebane (58), som er anbragt ved læsseenden af den nederste transportbane (38).

6. Indretning ifølge et af kravene 1 til 5, **kendetegnet ved** en løfteindretning (60), som er tilvejebragt til højdeindstilling af mindst den nederste transportbane (38).

5 **7.** Indretning ifølge krav 6, **kendetegnet ved** en arbejdsplatform (56) for operatøren, hvilken platform kan indstilles i højden.

10 **8.** Indretning ifølge et af kravene 4 til 7, **kendetegnet ved** et transportbånd (62), som er anbragt ved aflæsningsenden af den øverste transportbane (40) og har en indstillelig transportretning.

15 **9.** Fremgangsmåde til læsning af en transportenhed (10), der er tilvejebragt til transport af stykgods (12), især postforsendelser, med en indretning ifølge et af kravene 1 til 8, ved hvilken

15 - stykgods (12) fordeles på mindst den første og den anden transportenhed (18, 20) i henhold til sorteringskriteriet;

15 - transportenhederne (18, 20) køres ind i transportenheden (10);

15 - stykgods (12) aflæsses i transportenheden (10) ved hjælp af den første transportenhed (18);

20 - stykgods (12) aflæsses i transportenheden (10) ved hjælp af den anden transportenhed (20);

20 stykgodset (12) aflæsses fra transportenhederne (18, 20) i forskellige højder i transportenheden (10).

25 **10.** Indretning ifølge krav 9, **kendetegnet ved, at** sorteringskriteriet tjener til at skelne mellem stykvarer (12), der kan hældes/øses, og stykvarer (12), der ikke kan hældes/øses, ved hjælp af en fysisk egenskab ved stykvarerne, hvor

25 - stykgods (12), der betragtes som ikke hældbart/øsbart, stables i transportenheden (10) ved hjælp af den nederste transportbane (38) og

30 - stykgods (12), der betragtes som hældbart/øsbart, aflæsses på den dannede stabel af ikke hældbart/øsbart stykgods (12) ved hjælp af den øverste transportbane (40).

FIG 1

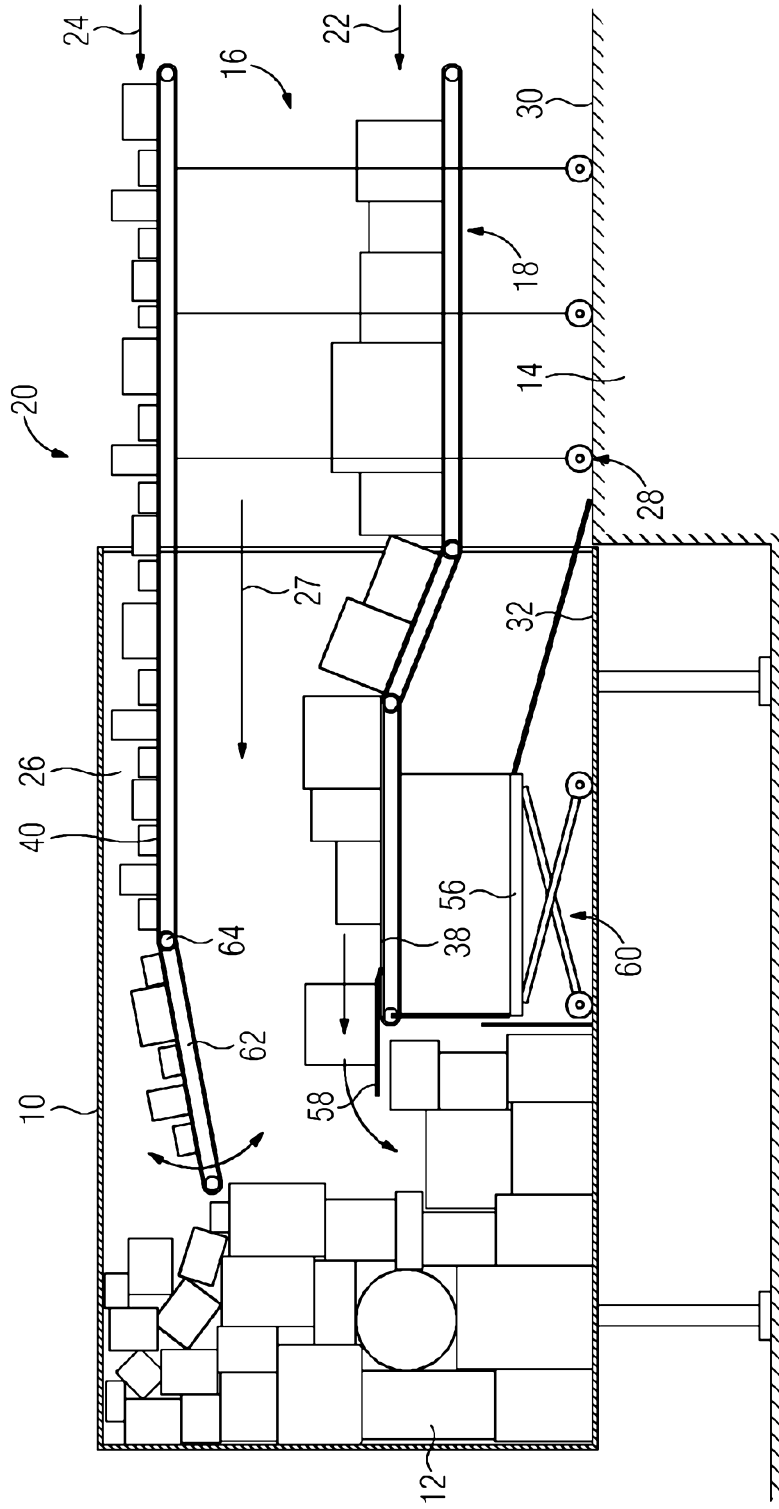


FIG 2

