

### Conveyor Device for Shelf Channels in Shelf-Storage Systems

The invention refers to a conveyor device for shelf channels in shelf-storage systems according to the preamble of claim 1.

Conveying apparatuses for shelf channels of shelf storage facilities of the kind discussed herein usually comprise two circulating conveying means arranged parallel to each other by means of which the goods in the particular shelf channels can be loaded and also unloaded again. The conveying means are not driven, but are displaced by an unloading vehicle, for instance a fork lift truck, upon loading and unloading the goods. Usually, one half of the conveying means is designed as a roller chain or a support roller chain, while the other half consists of a rope that interconnects the chain to a continuously circulating conveying means. Such a design lowers the costs and saves weight as compared to a conveying means that is entirely constituted by a chain.

As the two conveying means of a shelf channel are not coupled to each other, the danger exists that they are displaced relative to each other. One reason for such a displacement can consist in the fact that the first pallet is put skewed and/or offset onto the particular conveying means upon loading, and that the last pallet is unloaded skewed or offset. Such errors can add in time to a

large relative offset between the two conveying means. Finally, this can lead to a situation in which stored goods rest not only on the chain, but on the rope on one side. It is understood that this is unwelcome and can lead to malfunctions and defects.

Thus, it is the object of the invention to suggest a conveying apparatus for shelf channels of shelf storage facilities that is put, upon unloading the last pallet, into a defined initial state in which both conveying means are aligned both with reference to each other as well as absolutely.

This object is met by the characteristics listed in the characterizing portion of claim 1.

In the conveying apparatus designed according to the present invention, the conveying means is entrained up to an end stop member upon unloading the last pallet. Thereafter, the last pallet can be pulled off the chain easily as the last chain links are provided with a smooth surface. Once the last pallet has been unloaded, the two conveying means are aligned parallel to each other. Upon loading a new pallet, it slides over the chain links that are provided with a smooth surface until it abuts against an entrainment device that is provided in the initial region close to the loading end of

the particular conveying means. Only then the two conveying means are entrained by the pallet.

Preferred embodiments of the conveying apparatus defined in claim 1 are described in the dependent claims 2 to 9.

In order to make sure that the two conveying means are not entrained by the inserted pallet as long as the pallet has not abutted the entrainment device, in a preferred embodiment, a catch member is suggested that arrests the particular conveying means in the final position.

In a further preferred embodiment, a stationary slide member is suggested that is located in the end region of each shelf channel at the unloading end thereof, the top surface of the slide member at least partially extending above the chain links that have a smooth top surface. Preferably, the top surface of that slide member extends at least partially below the means for ensuring a non-positive connection between the chains and the pallets. By means of such a slide member, upon unloading the last pallet, the chain is entrained by the pallet as long as the last chain links provided with a non-positive connection move downwards at the deflection. In this manner, the two conveying means are parallelly aligned upon unloading the last pallet.

Such a slide member has the further advantage that the moving conveying means and the now frontmost pallet, respectively, can slow down on the slide member upon unloading the in each case frontmost pallet, without the danger that stored goods would be moved beyond the end of the shelf.

In the following, an embodiment of the invention shall be further described with the help of drawings. In the drawing,

Fig. 1a shows a schematically illustrated conveying means of a shelf channel in a longitudinal section;

Fig. 1b shows a window of the conveying means according to Fig. 1 in an enlarged view, upon unloading the last pallet;

Fig. 2a shows a detailed view of a first embodiment of the conveying means in the region of the deflection at the unloading end; and

Fig. 2b shows a detailed view of a second embodiment of the conveying means in the region of the deflection at the unloading end.

Fig. 1a shows a longitudinal section through a schematically illustrated conveying means 2 of a conveying apparatus 1 that is used in a shelf channel of a shelf storage facility.

In order to be able to load and unload the goods one behind the other one in a shelf channel, each shelf channel is provided with a conveying apparatus 1 that essentially consists of two parallel, circulating conveying means 2. As the real supporting element of the conveying means 2, there is provided a support roller chain 3, only schematically shown in this drawing. In order to be in a position to optimize costs and weight, the conveying means 2 is designed only by approximately its half as chain 3. The other half is constituted by a rope 4 that is connected to the both end links of the chain 3. For deflecting the conveying means 2, there is provided a front deflection 5 in the region of the loading end of the shelf channel as well as a rear deflection 6 in the region remote of the loading end of the shelf channel. By means of these two deflections 5, 6, the conveying means 3 is divided into an upper and a lower run 7, 8. As a track for the upper run 7 of the chain 3, a rail is provided which cannot be seen in this illustration. The lower run 8 of the chain 3 is supported at the lower side of the rail by supporting means not further shown. In the region of the deflection 5 at the loading end, a slide member 10 is provided that is important for loading and unloading goods.

At the loading end, the chain 3 is provided with an angled element 12 that serves as a stop member against which the first pallet abuts upon loading whereby a non-positive connection between pallet and conveying means 2 is ensured.

By some chain links in front of the angled element 12, an entrainment device 13 is provided that is designed as a projection and ensures a non-positive connection between pallet and chain upon unloading the last pallet. In order to ensure a non-positive connection between all pallets that are received on the chain 3 and the conveying means 2, the individual chain links are provided with acute projections located on their top sides. However, those chain links that are located between stop member 12 and entrainment device 13 have a smooth upper surface. The design both of the angled element 12 and of the entrainment device 13 will be further explained herein below, with reference to Figs. 2a and 2b. The slide member 10 located in the region of the deflection 5 at the loading end preferably surrounds the conveying means 2 at both sides.

At the end region close to the loading end, the conveying means is provided with an end stop member 15 that is designed to cooperate

with a stationary buffer 16 and that limits the path of displacement of the chain 3 in the direction of unloading.

Fig. 1b shows the region of the deflection of the conveying means 2 according to Fig. 1a at the unloading end in an enlarged view, whereby the conveying means 2 is but schematically shown again. With the help of this drawing, the operation of the conveying apparatus upon unloading the last pallet shall be further explained, whereby the conveying apparatus, in the present example, is designed to be used with pallets whose floorboards are not interconnected, as seen in the longitudinal direction of the conveying means.

Upon unloading the last pallet, the conveying means 2 is entrained by the pallet until its central floorboard B2 has left the chain 3 and rests on the slide member 10. As the last links of the chain 3 that are located between the entrainment device 13 and the stop member 12 are provided with a smooth surface, the non-positive connection between pallet P and chain 3 is essentially released if only the rearmost floorboard B1 rests on the chain 3. Thus, the pallet P can slide forward on the chain 3. However, as soon as the rearmost floorboard B1 abuts against the entrainment device 13, the non-positive connection is re-established and the chain 3 is entrained again. Upon further displacing the chain 3, the entrain-

ment device moves downwards at the deflection 5 located near the unloading end, whereby the non-positive connection between pallet P and chain 3 is finally released. However, due to the inherent kinetic energy, the chain 3 continues to move further until the end stop member 15 abuts against the buffer 16 (Fig. 1a).

In Fig. 2a, a preferred embodiment of the conveying means is shown in a still further enlarged view of the portion near the deflection at the unloading end, whereby the illustrated conveying means is located shortly in front of the end position at the unloading end.

The illustrated conveying apparatus 1 is particularly suitable for pallets with continuous floorboards BB. In this illustration, it can be seen that the first chain link 3A at the loading end is provided with an angled element 12, that the last four chain links 3A, 3B, 3C, 3D are provided with a smooth surface, and that the remaining chain links are provided with acute projections 9 for ensuring a non-positive connection. The surface of the slide member 10 located in the region of the front deflection 5 extends a few millimeters above the upper side of the chain 3 and of the chain links 3A, 3B, 3C, 3D having a smooth surface, respectively. On the other side, the acute projections 9A tower above the surface of the slide member 10. This design ensures that the chain 3

is entrained upon unloading of the pallet P for as long until the last chain links provided with the acute projections have moved downwards at the deflection 5. Then, the chain 3 continues to move, driven by the kinetic energy, until it has reached its end stop member.

Upon shifting in the first pallet, the provision of the slide member 10 ensures that the chain 3 is not entrained for as long until the pallet P abuts against the angled element 12.

Instead of the here shown horizontally extending slide member 10, it is understood that a slide member 10 can be provided that extends obliquely or that is provided with a ramp in the region of its beginning.

Fig. 2b shows an alternative embodiment of a conveying apparatus, as compared to the one shown in Fig. 2a. In the present example, the surface of the slide member 10A extends approximately in the same height as the surface of the last chain links 3A, 3B, 3C, 3D that are provided with a smooth surface. In order to arrest the conveying means 2 in its end position, a catch lever 20 is provided that is pivotally mounted on the first chain link 3A. If the chain 3 is in its end position as shown in this drawing, the catch lever 20 engages with its catch nose 20A a recess 22 provided in

the slide member 10A. By means of this catch lever 20, it is ensured that the first pallet P slides on the slide member 10A and its smooth surface, respectively, over the chain links upon loading, without entraining thereby the chain 3.

Only if the front face of the pallet P abuts against the catch lever 20, the latter one is rotated around its axis of rotation due to its inclined front face that faces the pallet P, whereby the catch nose 20A is raised in the direction of the arrow 21 and is released from the recess 22. Thereafter, the chain 3 is entrained by the pallet P, whereby the catch lever 20 takes the effect of the entrainment device.

In order to ensure a non-positive connection between the pallet and the chain 3 even upon unloading the last pallet, after the central floorboard B2 has left the chain 3, that chain link which is next to the chain links having a smooth surface is provided with an entrainment device 11.



### Patent Claims

1. Conveying apparatus (1) for shelf channels of shelf storage facilities, with two parallelly arranged, circulating conveying means (2) for receiving goods (G) to be stored that are received on pallets (P), whereby the conveying means (2) are partially designed as roller or support roller chains (3) whose ends are interconnected by a rope (3), and whereby the two chains (3) are provided at their upper sides with means for ensuring a non-positive connection between the conveying means (2) and the pallets (P), characterized in that several chain links (3A, 3B, 3C, 3D) of the end region of the particular chain (3) near the unloading end are provided with a smooth surface, that an end stop member (15, 16) is provided for each conveying means (2) that limits the path of displacement of the chain (3) in the unloading direction, and that both conveying means (2) are provided in their beginning region near the loading end with a entrainment member (12, 19) that ensures a non-positive and/or positive connection in loading direction between the conveying means (2) and the first pallet (P) to be loaded.

2. Conveying apparatus (1) according to claim 1, characterized in that a catch member (20, 20A) is provided for each conveying means



(2) that arrest the particular conveying means (2) in the initial position.

3. Conveying apparatus (1) according to claim 2, characterized in that the catch member is designed as a rotatable catch lever (20) which is provided with a catch member (20A) that is meant to cooperate with a recess or aperture (20) provided in a support element.

4. Conveying apparatus (1) according to claim 3, characterized in that the catch lever (20) is mounted on the last chain link (3A), as seen in the direction of unloading, whereby the catch lever (20) towers above the last chain link (3A) such that the first pallet (P) to be loaded abuts against the catch lever (20) and rotates it, such that its catch member (20A) is released from the recess (22) and the conveying means (2) is displaceable.

5. Conveying apparatus (1) according to one of the preceding claims, characterized in that the chain link (3E) which is next to the last chain link (3D) having a smooth surface is provided with a projection (13), in order to ensure a non-positive connection between pallet (P) and conveying means (2).



6. Conveying apparatus (1) according to one of the preceding claims, characterized in that a stationary slide member (10) is provided in the end region of each shelf channel near the unloading side, the upper side thereof at least partially extending above the chain links (3A, 3B, 3C, 3D) having a smooth surface.

7. Conveying apparatus (1) according to claim 6, characterized in that the upper side of the stationary slide member (10) extends at least partially below the means (9A) for ensuring a non-positive connection between the chain (3) and the pallet (P).

8. Conveying apparatus (1) according to one of the preceding claims, characterized in that the means for ensuring a non-positive connection between the chain (3) and the pallet (P) are designed as acute projections (9, 9A).

9. Conveying apparatus (1) according to one of the preceding claims, characterized in that at least the first four chain links (3A, 3B, 3C, 3D), as seen in the loading direction, are provided with a smooth surface.