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- (73) Patenthaver: **Flexmove System (M) SDN BHD, 264, Jalan Permatang Damar Laut, MY - 11960 Penang, Malaysia**
- (72) Opfinder: **Jesper Olsen, Elgårdsvvej 1, 8370 Hadsten, Danmark**
Steffen Olsen, Elgårdsvvej 1, 8370 Hadsten, Danmark
- (74) Fuldmægtig: **Patentgruppen A/S, Arosgården, Åboulevarden 31, 8000 Århus C, Danmark**
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(54) Benævnelse: **Conveyor**

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(57) Sammendrag:

The present invention relates to a conveyor system (2) comprising a support frame (4) and an endless carrier chain (6); wherein said support frame extends in a longitudinal direction and comprises a first side (8) and a second side (10); wherein said endless carrier chain (6) is arranged upon said support frame (4); wherein in an orientation intended for use, in which the endless carrier chain (6) is arranged in a horizontally orientation, said endless carrier chain (6) defines an upper part (6a) moveable in one direction in relation to said support frame; and a lower part (6b) moveable in the opposite direction in relation to said upper part of said carrier chain; said endless carrier chain thereby having an inner side (12) and an outer side (14); wherein said support frame comprises a first main support element (16) supporting the upper part of the endless carrier chain at the first side (8) of the support frame; wherein said support frame comprises a second main support element (18) supporting the lower part of the endless carrier chain at the second side (10) of the support frame;

wherein said support frame comprises a first auxiliary support element (20) supporting the upper part of the endless carrier chain at the second side (10) of the support frame; wherein said support frame comprises a second auxiliary support element (22) supporting the lower part of the endless carrier chain at the first side (8) of the support frame; wherein said support frame comprises a shielding element (24)

extending from the first side (8) of the support frame to the second side (10) of the support frame in an area A defined between the inner side 12a of the upper part of the endless carrier chain (6) and the inner side (12b) of the lower part of the endless carrier chain (6); wherein said shielding element (24) itself, or said shielding element (24) in combination with said first main support element (16) and/or in combination with said second main support element (18) having an extension that blocks a direct access between any point P1 located on the inner side (12a) of the upper part of the endless carrier chain (6) and a corresponding point P2 located on the inner side (12b) of the lower part of the endless carrier chain, said point P2 being the most proximal point, in relation to the point P1, on the inner side (12b) of the lower part of the endless carrier chain.

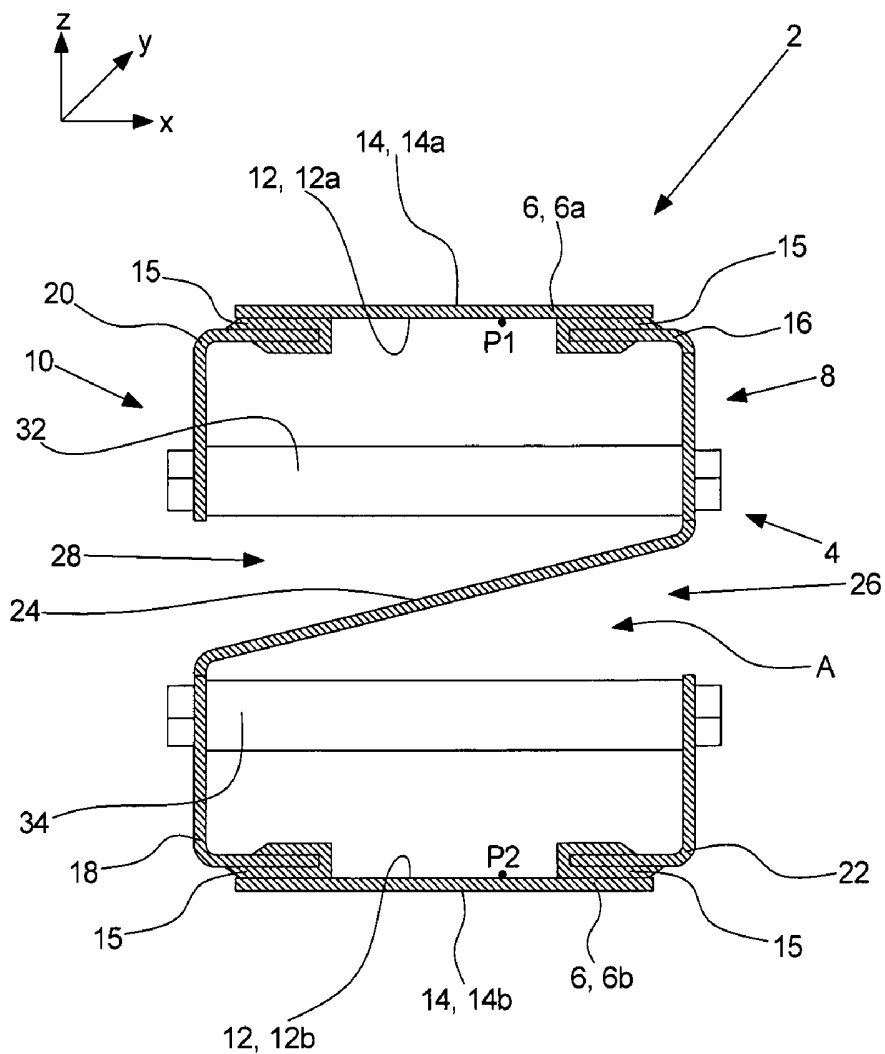


Fig. 3

CONVEYOR

Technical field

5 The present invention relates in a first aspect to a conveyor system. The present invention relates in a second aspect to a conveyor apparatus comprising a conveyor system according to the first aspect. The present invention relates in a third aspect to the use of a conveyor system according to the first aspect or a conveyor apparatus according to the second aspect for conveying an object.

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Background of the invention

Conveyor apparatuses have been known for decades. A conveyor apparatus provides a simple and price efficient way of moving goods or objects within relative small
15 distances, such as within a factory or a processing plant. Accordingly, conveyor apparatuses find use in a variety of different manufacturing and processing industries, such as in the food industry.

A conveyor apparatus in the general form comprises a support frame supporting an
20 endless carrier chain. The endless carrier chain is mounted on the support frame via at least two bearings, typically arranged at the opposite ends of the support frame. Drive means, such as an electrical motor is typically comprised in the apparatus and the drive means provides motion to the endless carrier chain.

25 Within the food industry a food manufacturing company in its processing line often needs to transport a food object in a non-packaged state from one part of the manufacturing plant to another part of the processing plant along the line defined by the various processing steps. For this purpose, use of a conveyor apparatus is an obvious choice.

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A conveyor apparatus due to its construction comprises many hidden surfaces and corners, which may form the foundation for accumulation of debris. Such deposits of debris may in turn lead to accumulation of various microorganisms.

5 In the food industry deposits of microorganisms in processing equipment are highly undesirably.

Moreover, in most countries increasingly strict legislation regulating the requirements to hygiene in food manufacturing industries persistently imposes increasingly strict standards to the hygiene of the equipment used.

10 The sources for contamination or soiling of a conveyor apparatus within the food industry are at least two-fold. One source of contamination or soil is associated with deposits from the surrounding environment originating from dust, moist and various particles from the air. Another source of contamination or soil is associated with debris originating from the conveyed objects themselves.

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In order to reduce the extent of the problems associated with deposits from the surrounding environment of dust, moist and various particles in hidden areas in a conveyor apparatus one specific design of a conveyor apparatus has been suggested and put on the market by the Swedish company Flexlink under the product name

20 XMX. The XMX conveyor apparatus comprises a support frame extending in a longitudinal direction and an endless carrier chain in the form of a multiflexing chain. The multiflexing chain defines an upper part moveable in one direction in relation to said support frame; and a lower part moveable in the opposite direction in relation to said upper part of said carrier chain. The upper part of the multiflexing
25 chain is accommodated in an upper part of the support frame, whereas the lower part of the multiflexing chain is accommodated in a lower part of the support frame.

When seen in cross-sectional profile, the longitudinal support frame itself comprises a rectangular element having a first side and a second side. The upper part of the profile comprises an opening for accommodating the multiflexing chain. Likewise,
30 the lower part of the profile comprises a small opening for accommodating the multiflexing chain. The two sides each comprises an opening extending in a

longitudinal direction. These openings provides for inlet of rinsing liquids during a rinsing procedure, yet the support frame of the XMX system is still relatively closed thus reducing the risk of deposits of debris from the surrounding environment. The principle of the XMX system is outlined in fig. 1.

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A problem associated with the XMX system is that debris that once has deposited on the upper part of the support frame may over time come off and fall down. When such debris falls down it may attach itself to various parts of the lower part of the support frame.

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In order to solve the first problem of XMX system as mentioned above, the Flexlink company has marketed an improved conveyor apparatus; viz. the XMY conveyor apparatus. The XMY conveyor apparatus comprises a support frame extending in a longitudinal direction and an endless carrier chain in the form of a multiflexing chain. The multiflexing chain defines an upper part moveable in one direction in relation to said support frame; and a lower part moveable in the opposite direction in relation to said upper part of said carrier chain. The upper part of the multiflexing chain is accommodated in an upper part of the support frame, whereas the lower part of the multiflexing chain is accommodated in a lower part of the support frame. The upper part of the support frame and the lower part of the support frame are completely separated from each other except at specific points located along the longitudinal direction of the support frame, where the two parts are fastened to each other.

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The upper part of the support frame comprises two side walls at a first side and a second side of the support frame, respectively. The upper part of the support frame thus comprises an opening at the top in which the multiflexing chain is accommodated. The design of the lower part of the support is characteristic in that it has a profile, in a direction perpendicular to the direction of movement of the multiflexing chain, defining an opposite V or U. That is, the lower part of the support frame of the XMY system is complete closed at the top, but comprises a longitudinal

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opening at the bottom, in which the lower part of the multiflexing chain is accommodated. The principle of the XMY system is outlined in fig. 2.

Accordingly, due to the side walls of the upper support part and due to Opposite V or U profile of the bottom part of the support frame of the XMY system, the XMY conveyor apparatus comprises a relatively closed structure which to a great extent reduced the problems of deposition of e.g. dust, moist and various particles from the surrounding environment, and thereby the XMY system also reduced the problems associated with microbiological growth in these particle deposits. Also, the XMY apparatus avoid the problem that debris originating from the upper part of the multiflexing chain deposits onto the lower part of the multiflexing chain.

The international patent application WO 02/02440 discloses a conveyor system comprising a closed frame for the support of an endless conveyor carrier chain, where the frame has a right side part and a left side part. The upper run of the carrier chain is supported by the upper parts of the right side part as well as the left side part of the frame. The lower run is correspondingly supported by the lower parts of the right side part as well as the left side part of the frame. A shielding element extends from the right side part of the frame to the left side part of the frame between the upper run and the lower run of the carrier chain, thus blocking the direct access between any point on the inner side of the upper run of the carrier chain and a corresponding point on the inner side of the lower run of the carrier chain.

As mentioned above, another type of contamination or soiling of the various parts of a conveyor apparatus is present in the situations in which unpackaged food objects are transported on a conveyor apparatus. In such a situation the soiling of the conveyor apparatus originates from the conveyed objects themselves, i.e. the unpackaged food objects.

Accordingly, in using a conveyor apparatus for transporting unpackaged food objects inevitably results in debris in the form of small parts of the food objects will fall off

the food object. Such debris may constitute protein material, carbohydrate material and fats originating from the food object.

5 A part of such debris may stick to various parts of the conveyor apparatus where it will decay over time and thereby form the foundation of growth of various species of microorganisms.

As a consequence, a conveyor apparatus used for transporting unpackaged food objects in a food processing industry needs thorough and frequent cleaning.

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The cleaning procedures are performed manually by a worker washing the conveyor apparatus with a cleansing liquid, brushing the dirty parts with a brush and subsequently rinsing the apparatus with water.

15 Although such cleaning procedure may leave the conveyor apparatus in a state that fulfils the requirement set by the legislation as to hygiene, such cleaning procedures are labour heavy and tedious work.

20 It is clear that due to the closed structure of the support frame with no or only limited possibility for mechanical cleaning (i.e. by using a brush or the like), neither one of the above referenced XMX system and the XMY system from the company Flexlink or the conveyor disclosed in WO 02/02440 is really suitable for conveying unpackaged food objects; this is especially the case in respect of meat products and the like.

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Accordingly, there exists a need for an improved conveyor system which is suitable for conveying unpackaged food products, and which provides for improved possibilities for fast and easy, yet efficient cleaning.

30 **Brief description of the invention**

Those needs are fulfilled according to a first, a second and a third aspect of the present invention.

In the first aspect, the present invention relates to a conveyor system 2 comprising a
5 support frame 4 and an endless carrier chain 6;

wherein said support frame extends in a longitudinal direction and comprises a first side 8 and a second side 10;

10 wherein said endless carrier chain 6 is arranged upon said support frame 4;

wherein in an orientation intended for use, in which the endless carrier chain 6 is arranged in a horizontally orientation, said endless carrier chain 6 defines an upper part 6a moveable in one direction in relation to said support frame; and a lower part
15 6b moveable in the opposite direction in relation to said upper part of said carrier chain; said endless carrier chain thereby having an inner side 12 and an outer side 14;

wherein said support frame comprises a first main support element 16 supporting the upper part of the endless carrier chain at the first side 8 of the support frame;

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wherein said support frame comprises a second main support element 18 supporting the lower part of the endless carrier chain at the second side 10 of the support frame;

wherein said support frame comprises a first auxiliary support element 20 supporting
25 the upper part of the endless carrier chain at the second side 10 of the support frame;

wherein said support frame comprises a second auxiliary support element 22 supporting the lower part of the endless carrier chain at the first side 8 of the support frame;

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wherein said support frame comprises a shielding element 24 extending from the first side 8 of the support frame to the second side 10 of the support frame in an area A defined between the inner side 12a of the upper part of the endless carrier chain 6 and the inner side 12b of the lower part of the endless carrier chain 6; and

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wherein said shielding element 24 itself, or said shielding element 24 in combination with said first main support element 16 and/or in combination with said second main support element 18 having an extension that blocks a direct access between any point P1 located on the inner side 12a of the upper part of the endless carrier chain 6 and a corresponding point P2 located on the inner side 12b of the lower part of the endless carrier chain, said point P2 being the most proximal point, in relation to the point P1, on the inner side 12b of the lower part of the endless carrier chain;

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characterised in that

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the first side 8 of the support frame 4 comprising an opening 26, preferably extending alongside essentially all said first side in the longitudinal direction, said opening 26 providing access to the inner side 12b of the lower part 6b of the endless carrier chain 6; said opening 26 being defined by the geometry of the first main support element 16, the shielding element 24 and the second auxiliary support element 22; and/or

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in that the second side 10 of the support frame 4 comprising an opening 28, preferably extending alongside essentially all said second side in the longitudinal direction, said opening 28 providing access to the inner side 12a of the upper part 6a of the endless carrier chain 6; said opening 28 being defined by the geometry of the second main support element 18, the shielding element 24 and the first auxiliary support element 20.

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30 In the second aspect, the present invention relates to a conveyor apparatus comprising a conveyor system according to the first aspect of the present invention

and further comprising drive means for moving the endless carrier chain relative to the support frame 4.

5 In the third aspect, the present invention relates to a use of a conveyor system according to the first aspect of the present invention or a conveyor apparatus according to the second aspect of the present invention for conveying an object.

10 The combination of the technical features of the invention according to a first aspect provides for improved hygiene in conveyor systems because the conveyor system according to the first aspect eliminates the movement of spillage of debris which has been deposited at an upper part of the carrier chain from said upper part of the carrier chain to the lower part of the carrier chain, on the one hand; and on the other hand provides for better access to the various parts of the carrier system with in a cleaning
15 process.

Such possibilities of improvements in hygiene in a conveyor system is highly desirable in various industries, such as in the food or dairy industries.

20 **Figures**

Fig. 1 is a cross-sectional view illustrating the principles of a prior art conveyor system.

25 Fig. 2 is a cross-sectional view illustrating the principle of an improved prior art conveyor system.

Fig. 3 is a cross-sectional view illustrating the principles of the conveyor system according to the first aspect of the present invention.

30 Fig. 4 is a cross-sectional view illustrating an embodiment of the conveyor system according to the first aspect of the present invention.

Fig. 5 is a perspective view illustrating the support frame of the embodiment of the conveyor system of fig. 4.

Fig. 6 is a cross-sectional view illustrating an embodiment of the conveyor system according to the first aspect of the present invention wherein the conveyor system comprises an endless carrier chain comprising a number of inter-engaging elements flexibly connected to each other.

Fig. 7 is a perspective view illustrating an embodiment of the conveyor system of fig. 6.

Detailed description of the invention

As mentioned above, the present invention in a first aspect relates to a conveyor system 2 comprising a support frame 4 and an endless carrier chain 6;

wherein said support frame extends in a longitudinal direction and comprises a first side 8 and a second side 10;

wherein said endless carrier chain 6 is arranged upon said support frame 4;

wherein in an orientation intended for use, in which the endless carrier chain 6 is arranged in a horizontally orientation, said endless carrier chain 6 defines an upper part 6a moveable in one direction in relation to said support frame; and a lower part 6b moveable in the opposite direction in relation to said upper part of said carrier chain; said endless carrier chain thereby having an inner side 12 and an outer side 14; wherein said support frame comprises a first main support element 16 supporting the upper part of the endless carrier chain at the first side 8 of the support frame;

wherein said support frame comprises a second main support element 18 supporting the lower part of the endless carrier chain at the second side 10 of the support frame;

wherein said support frame comprises a first auxiliary support element 20 supporting the upper part of the endless carrier chain at the second side 10 of the support frame;

5 wherein said support frame comprises a second auxiliary support element 22 supporting the lower part of the endless carrier chain at the first side 8 of the support frame;

wherein said support frame comprises a shielding element 24 extending from the first
10 side 8 of the support frame to the second side 10 of the support frame in an area A defined between the inner side 12a of the upper part of the endless carrier chain 6 and the inner side 12b of the lower part of the endless carrier chain 6; and

wherein said shielding element 24 itself, or said shielding element 24 in combination with said first main support element 16 and/or in combination with said second main
15 support element 18 having an extension that blocks a direct access between any point P1 located on the inner side 12a of the upper part of the endless carrier chain 6 and a corresponding point P2 located on the inner side 12b of the lower part of the endless carrier chain, said point P2 being the most proximal point, in relation to the point P1, on the inner side 12b of the lower part of the endless carrier chain;

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characterised in that

the first side 8 of the support frame 4 comprising an opening 26, preferably
extending alongside essentially all said first side in the longitudinal direction, said
25 opening 26 providing access to the inner side 12b of the lower part 6b of the endless carrier chain 6; said opening 26 being defined by the geometry of the first main support element 16, the shielding element 24 and the second auxiliary support element 22; and/or

30 in that the second side 10 of the support frame 4 comprising an opening 28, preferably extending alongside essentially all said second side in the longitudinal

direction, said opening 28 providing access to the inner side 12a of the upper part 6a of the endless carrier chain 6; said opening 28 being defined by the geometry of the second main support element 18, the shielding element 24 and the first auxiliary support element 20.

5 The conveyor system according to a first aspect of the present invention comprises an endless carrier chain 6 supported support frame 4 and the support frame having a first side 8 and a second side 10. The support frame extends in a longitudinal direction. The term "in a longitudinal direction" in the present description and in the appended claims shall be not be interpreted as necessarily mean that the support
10 frame extends in a linear direction. Rather the term "in a longitudinal direction" shall be interpreted as being the direction along the path of movement defined by the carrier chain. Hence, the carrier chain and consequently the support frame may very well extend in a linear direction, a sideward curved direction, a vertically curved direction or any combination thereof.

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In order to define the various directions of the conveyor system, the system is defined with reference to an orientation intended for use in which the endless carrier chain or part thereof is arranged in a horizontal orientation.

20 In fig. 3 and 4 the z-direction of the Cartesian coordinate system defines the longitudinal direction; the z-direction is the vertical direction; and the xy-plane is the horizontal plane.

In the orientation as set out in claim 1, said endless carrier chain 6 defines an upper
25 part 6a moveable in one direction in relation to said support frame; and a lower part 6b moveable in the opposite direction in relation to said upper part of said carrier chain; said endless carrier chain thereby having an inner side 12 and an outer side 14.

The support frame itself comprises a first main support element 16 supporting the
30 upper part of the endless carrier chain at the first side 8 of the support frame; a second main support element 18 supporting the lower part of the endless carrier

chain at the second side 10 of the support frame; a first auxiliary support element 20 supporting the upper part of the endless carrier chain at the second side 10 of the support frame; and a second auxiliary support element 22 supporting the lower part of the endless carrier chain at the first side 8 of the support frame. These support
5 elements serve the purpose of supporting the endless carrier chain along its path of movement.

The advantage of avoiding that debris located and deposited at the upper part of the endless carrier chain or located at the upper part of the support frame finds it way
10 down to the lower part of the endless carrier chain or to the lower part of the support frame is brought about by the shielding element 24 extending from the first side 8 of the support frame to the second side 10 of the support frame in an area A defined between the inner side 12a of the upper part of the endless carrier chain 6 and the inner side 12b of the lower part of the endless carrier chain 6.

15 The shielding element itself, optionally in combination with said first main support element 16 and/or in combination with said second main support element 18 of the conveyor system according to the first aspect of the present invention accordingly having an extension that blocks a direct access between any point P1 located on the
20 inner side 12a of the upper part of the endless carrier chain 6 and a corresponding point P2 located on the inner side 12b of the lower part of the endless carrier chain, said point P2 being the most proximal point, in relation to the point P1, on the inner side 12b of the lower part of the endless carrier chain.

25 Such blocked path between any point P1 on the located on the inner side 12a of the upper part of the endless carrier chain 6 and a corresponding point P2 located on the inner side 12b of the lower part of the endless carrier chain on the inner side 12b of the lower part of the endless carrier chain prevents that debris falling down will attach itself to the lower part of the endless carrier chain 6 or to the lower part of the
30 support frame.

It is clear that near the ends of the support frame, the endless carrier chain 6 during use will change direction of movement in one longitudinal direction to a direction of movement in the opposite direction in going from being the upper part 6a of the endless carrier chain to being the lower part 6b of the endless carrier chain.

- 5 It should be noted that the point P1 is located on the innerside 12a of the upper part 6a of the carrier chain at a location where a fixed point located on said carrier chain has not yet initiated/concluded – during use of the carrier chain – its change of direction from one direction to the opposite direction along the longitudinal direction.

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- In this way it is clear that the restriction relating to the blocking passage between the point P1 located on the inner side 12a of the upper part of the endless carrier chain 6 and a corresponding point P2 located on the inner side 12b of the lower part of the endless carrier chain applies preferably to the area of the endless carrier chain 6 not being located near the extreme ends of the support frame. As mentioned, near the ends of the support frame, the endless carrier chain 6 will change direction of movement in one longitudinal direction to a direction of movement in the opposite direction in going from being the upper part 6a of the endless carrier chain to being the lower part 6b of the endless carrier chain. Along the path of change of direction of movement, there may thus be two points located on the inner side 12a of an upper part of the endless carrier chain 6 and located on the inner side 12b of a lower part of the endless carrier chain, respectively, between which no blocking of passage is present. Accordingly, the restriction relating to the blocking passage between the point P1 located on the inner side 12a of the upper part of the endless carrier chain 6 and a corresponding point P2 located on the inner side 12b of the lower part of the endless carrier chain shall be interpreted to apply to all the path of the endless carrier chain except near the two extreme ends E of the carrier chain at which ends a fixed point on the endless carrier chain will change direction from moving in one longitudinal direction to moving in the opposite direction.

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It is preferred that the restriction relating to the blocking passage between the point P1 located on the inner side 12a of the upper part of the endless carrier chain 6 and a corresponding point P2 located on the inner side 12b of the lower part of the endless carrier chain shall be interpreted to apply to all the path of the endless carrier chain
5 except at a distance in the longitudinal direction from each of the two extreme ends E of the carrier chain independently selected from the ranges: 50 cm or less, such as 40 cm or less, for example 30 cm or less, such as 25 cm or less, e.g. 20 cm or less, for example 15 cm or less, such as 10 cm or less, or 5 cm or less.

Hence, in one embodiment of the invention according to the first aspect of the
10 present invention, the shielding element 24 extends all the way along the longitudinal direction of the endless carrier chain except 50 cm or less, such as 40 cm or less, for example 30 cm or less, such as 25 cm or less, e.g. 20 cm or less, for example 15 cm or less, such as 10 cm or less, or 5 cm or less from the two most extreme ends of said carrier chain.

15 In another embodiment of the invention according to the first aspect of the present invention, the shielding element 24 extends all the way between the two most extreme ends of said carrier chain, along the longitudinal direction of the endless carrier chain.

20 In another embodiment of the invention according to the first aspect of the present invention, the shielding element 24 extends 75% or more, such as 80% or more, e.g. 85% or more, such as 90% or more or 95% or more of the path the carrier chain defined between the two most extreme ends E of said carrier chain of along the
25 longitudinal direction.

In a preferred embodiment according to the first aspect of the present invention, the first side 8 of the support frame 4 comprising an opening 26, preferably extending alongside essentially all said first side in the longitudinal direction, said opening 26
30 providing access to the inner side 12b of the lower part 6b of the endless carrier chain 6; said opening 26 being defined by the geometry of the first main support

element 16, the shielding element 24 and the second auxiliary support element 22;
and/or said second side 10 of the support frame 4 comprising an opening 28,
preferably extending alongside essentially all said second side in the longitudinal
direction, said opening 28 providing access to the inner side 12a of the upper part 6a
5 of the endless carrier chain 6; said opening 28 being defined by the geometry of the
second main support element 18, the shielding element 24 and the second auxiliary
support element 20.

The openings 26 and/or 28 provides for better access to the interior of the support
10 frame and to the inner side of the endless carrier train, thereby providing improved
possibilities for thorough cleaning either by brush or by using pressurised water, such
as by using a foam gun.

In a preferred embodiment according to the first aspect of the present invention, the
15 shielding element 24 at least partly in the area A defines a planar surface extending
in an inclined orientation, relative to a horizontal plane, from the first side of the
support frame to the second side of the support frame.

Providing the shielding element with an inclined orientation provides for better drain
20 off of rinsing water in a rinsing situation. It is preferred that the inclination of the
shielding element is within the range of 5 – 60°, såsom 10 – 55°, e.g. 15 – 50°, for
example 20 – 45°, such as 25 – 40° or 30 – 35° in relation to the horizontal plane..

In another preferred embodiment according to the first aspect of the present
25 invention, the first main support element 16 at one or more specific locations 23
along the first side of the support frame is connected to the second auxiliary support
element 22 and/or wherein the second main support element 18 at one or more
specific locations 23 along the second side of the support frame is connected to the
first auxiliary support element 20.

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Connecting the first main support elements to the second auxiliary support elements at one or more specific locations 23 along the first side and/or the second side of the support frame provides for a more sturdy construction and thus improves the integrity of the support frame and thereby of the conveyor system.

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In yet another preferred embodiment according to the first aspect of the present invention, a gutter 30 is arranged on the second main support element 18 for collection of rinse water in a rinsing situation, said gutter 30 extending in a longitudinal direction of the support frame 4.

10 Providing the support element with such a gutter enables collection of the rinse water which may be applied to the upper part of the conveyor system in a rinsing and cleaning process.

In yet another preferred embodiment according to the first aspect of the present invention, one or more transversal upper struts 32 are arranged at predefined locations along the longitudinal direction of support frame 4; said transversal upper struts 32 connecting the first main support element 16 of the first side of the support frame with the first auxiliary support element 20 of the second side of the support frame.

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In yet another preferred embodiment according to the first aspect of the present invention, one or more transversal lower struts 34 are arranged at predefined locations along the longitudinal direction of support frame 4; said transversal lower struts 34 connecting the second main support element 18 of the second side of the support frame with the second auxiliary support element 22 of the first side of the support frame.

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Providing the support frame with such upper and/or lower struts 32,34 provides for a more sturdy construction and thus improves the integrity of the support frame and thereby of the conveyor system.

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In yet another preferred embodiment according to the first aspect of the present invention, the first main support element 16 of the first side of the support frame, the shielding element 24 and the second main support element 18 of the second side of the support frame are integrally formed in one piece.

5 Forming these elements in one piece may provide for a cost efficient manufacturing process as well as for less labour house needed in the assembly of the conveyor system. Additionally, this embodiment may provide for a more sturdy construction and thus improves the integrity of the support frame and thereby of the conveyor system.

10 In still another preferred embodiment according to the first aspect of the present invention, the profile of at least part of the group of elements comprising the first main support element 16 of the first side of the support frame, the shielding element 24 and the second main support element 18 of the second side of the support frame, seen in a transversal direction relative to the longitudinal direction (i.e. in the xz-
15 plane of the support frame 4, exhibits a Z-form.

Providing these elements with a profile exhibiting a Z-form has proven to provide efficiency in production of the involved elements as well as such form provides the possibility that the rinsing eater easily can be drained off the shielding element 24 in
20 a rinsing or cleaning situation.

In still another preferred embodiment according to the first aspect of the present invention, the endless carrier chain to be used in the is a conveyor system selected from the group comprising: a flexible conveyor system, in which the endless carrier
25 chain comprises a number of inter-engaging elements flexibly connected to each other and forming an endless chain; a conveyor belt comprising a polymeric material which may optionally be reinforced, such as by reinforcing wires or a reinforcing web; a lamella belt comprising a number of lamella elements inter-engagingly hinged to one another on one side; a wire belt comprising a number of wires woven together;
30 and any kind of steel belts, such as open or closed steel belts.

Such carrier chains are known per se from the prior art and they have all proven very useful in the present invention.

5 In still another preferred embodiment according to the first aspect of the present invention, one or more of the elements: first main support element 16, second main support element 18, first auxiliary support element 20, second auxiliary support element 22, the shielding element 24, the gutter 30, one or more of the transversal upper struts 32, one or more transversal lower struts 34, are made of steel, such as stainless steel, aluminium, a polymeric material, such as a plastic.

10 Such materials are well suited for the stated purpose due to their sturdiness, their chemical resistance and anti-corrosion properties.

In still another preferred embodiment according to the first aspect of the present invention, the conveyor system further comprising brushing means for brushing the
15 endless carrier chain 6 on the outer surface 14a at the upper part of the endless carrier chain 6 and/or on the outer surface 14b, at the lower part of the endless carrier chain 6.

In still another preferred embodiment according to the first aspect of the present
20 invention, the conveyor system further comprising carrier chain diverting means for diverting or leading said endless carrier chain 6 into the interior of a rinsing container for rinsing the endless carrier chain 6 with a rinsing liquid.

Such brushing means and chain diverting means provides for easy and even
25 continuously rinsing and cleaning in a processing line even during production and hence during movement under production of the endless carrier chain.

It is preferred that such brushing means and chain diverting means are provided at the lower part of the endless carrier chain.

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It is preferred that such brushing means and/or diverting means is/are provided with brushing engaging means and/or carrier chain diversion engaging means for reversibly engaging/disengaging said brushing means and/or said diverting means, respectively.

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Such brushing engaging means and/or carrier chain diversion engaging means provides for easy and swift engagement and disengagement of the means and chain diverting means from a rinsing/cleaning operation of the carrier chain to a non-rinsing/non-cleaning operation of the carrier chain.

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In one embodiment of the first aspect of the present invention, two or more conveyor systems are arranged on top of each other, such as 2, 3, 4, 5, 6, 7 or 8 conveyor systems arranged on top of each other.

15 Such arrangement is advantageous in that space is saved in a processing line of a manufacturing company.

The conveyor system according to the first aspect of the present invention is useful in a conveyor apparatus. Accordingly, the present invention according to the second
20 aspect of the present invention relates to a conveyor apparatus comprising a conveyor system according to the first aspect of the present invention and additionally drive means for moving the endless carrier chain relative to the support frame 4.

25 Such drive means may be an electrical motor, a hydraulic motor, an air-driven motor or a vacuum motor.

In a third aspect, the present invention relates to the use of a conveyor system according to the first aspect of the present invention or use of a conveyor apparatus
30 according to the second aspect of the present invention for conveying an object.

In a preferred embodiment of the use according to the third aspect, the object is a food or a food precursor.

It is especially useful to use the invention of the first and second aspect of the present invention within the food or dairy industry because high standards of hygiene are required within these industries.

In the following, the present invention will be described with reference to the figures.

Fig. 3 illustrates in a cross-sectional view of an embodiment of the first aspect of the present invention. Fig. 3 shows the support frame 4 having a first side 8 and a second side 10. The support frame extends in a longitudinal direction (i.e. in the y-direction). The support frame supports an endless carrier chain 6. The carrier chain 6 comprises an upper part 6a and a lower part 6b. In the embodiment of fig. 3 the endless carrier chain comprises a conveyor belt comprising a polymeric material which may optionally be reinforced, such as by reinforcing wires or a reinforcing web. However, any other type of endless carrier chains may be applied as well, such as those defined in the claims.

The support frame comprises a first main support element 16 supporting the upper part of the endless carrier chain at the first side 8 of the support frame; wherein said support frame comprises a second main support element 18 supporting the lower part of the endless carrier chain at the second side 10 of the support frame; wherein said support frame comprises a first auxiliary support element 20 supporting the upper part of the endless carrier chain at the second side 10 of the support frame; wherein said support frame comprises a second auxiliary support element 22 supporting the lower part of the endless carrier chain at the first side 8 of the support frame.

Support struts 26 and 28 serve as supporting and strengthening the integrity of the support frame.

The support frame comprises a shielding element 24 extending from the first side 8 of the support frame to the second side 10 of the support frame in an area A defined between the inner side 12a of the upper part of the endless carrier chain 6 and the inner side 12b of the lower part of the endless carrier chain 6. The shielding element 24 is arranged in such a way that the shielding element 24 itself, or said shielding element 24 in combination with said first main support element 16 and/or in combination with said second main support element 18 having an extension that blocks a direct access between any point P1 located on the inner side 12a of the upper part of the endless carrier chain 6 and a corresponding point P2 located on the inner side 12b of the lower part of the endless carrier chain, said point P2 being the most proximal point, in relation to the point P1, on the inner side 12b of the lower part of the endless carrier chain.

In fig. 3 the shielding element has a preferred Z-like form.

It is clearly seen from fig. 1 that in a situation where debris or other kind of dirt, which has been deposited in the upper part of the support frame and/or the upper part of the endless carrier chain, comes off, such debris or dirt is prevented from entering the inside of the lower part of the support frame and/or the lower part of the endless carrier chain by virtue of the shielding element 24 which prevents such entrance.

The same applies during use in a processing line. Once the conveyed product or object, such as a food or food precursor, gives off a little part of material this part may stick to the upper part of the support frame and/or the upper part of the endless carrier chain. However, such material which has fallen off the conveyed product or object will never enter the lower part of the support frame and/or the lower part of the endless carrier chain, because the shielding element 24 will make prevent that this fallen off object or product will enter the lower part of the support frame and/or the lower part of the endless carrier chain.

30

Furthermore, the openings 26 and 28 clearly provides for good access to the interior of the upper part of the conveyor system (via opening 28) as well as good access to the interior of the lower part of the conveyor system (via opening 26). Such good accesses are beneficial in cleaning processes.

- 5 In a rinsing or cleaning situation, the same principle of the shielding element 24 applies. Upon rinsing of the upper part of the support frame and/or the upper part of the endless carrier chain, the rinsing liquid used, such as water or detergent/water will by virtue of the shielding element be directed away from the lower part of the support frame and/or the lower part of the endless carrier chain so that these part will
10 not be contaminated with dirty rinsing water.

All in all the conveyor system of the first embodiment as shown in fig. 3 provides for an improved hygiene.

- 15 This is not the case in respect of the prior art systems shown in fig 1 and 2. Fig. 1 shows in a cross-sectional view an example of a prior art conveyor system (the XMX system of Flexlink mentioned in the introduction of the present application.

- The prior art system of fig. 1 comprises a carrier frame which in turn comprises a
20 first side part 106 and a second side part 108. The two side parts are spaced apart so that they together forms an upper longitudinal opening upon which the carrier chain 102 is supported, and a lower longitudinal opening supporting the lower carrier chain 104.

- 25 The system of fig. 1 does not prevent debris from the upper part of the system to reach the lower part of the system. Further, the system of fig. 1 does not provide good access to the interior of the conveyor system.

- An improvement to the system of fig. 1 is illustrated in fig. 2. This system
30 corresponds to the XMY system of Flexlink mentioned in the introduction of the present application.

Fig. 2 shows a conveyor system 200 comprising an upper part 220 and a lower part 210.

5 The upper part of the endless carrier chain 202 is accommodated in an upper part of the support frame 220, whereas the lower part of the endless carrier chain 204 is accommodated in a lower part of the support frame 230. The upper part of the support frame and the lower part of the support frame are completely separated from each other except at specific points located along the longitudinal direction of the
10 support frame, where the two parts are fastened to each other by brackets 214.

The upper part of the support frame comprises two side walls 206,208 at a first side and a second side of the support frame, respectively. The upper part of the support frame thus comprises an opening at the top in which the endless carrier chain 202 is
15 accommodated. As seen in fig. 2 the lower part of the support frame 230 has a profile defining an opposite V or U. That is, the lower part of the support frame of the system of fig. 2 is completely closed at the top, but comprises a longitudinal opening at the bottom, in which the lower part of the endless carrier chain 204 is
20 accommodating.

The prior art system of fig. 2 avoids the problem that debris originating from the upper part of the endless carrier chain deposits onto the lower part of the endless carrier chain.

25 However, due to its closed structure, and the poor access to the interior of the various parts of the prior art conveyor system of fig 2, cleaning and rinsing operations in this system is difficult and restricted.

Fig. 4 shows a cross-sectional embodiment of a conveyor system according to the
30 present invention. In this embodiment the conveyor system is provided with a gutter 30 for collecting debris and/or rinsing liquids originating from the upper part of the

conveyor system and lead to the said gutter 30 by the shielding element 24. This embodiment of the system without the corresponding endless carrier chain, i.e. of the corresponding support frame, is depicted in fig. 5 in a perspective view. The system of fig. 3 and 4 as depicted shows presence of gliding means 15. The gliding means 5 15 provides a smooth surface upon which the endless carrier chain is supported and/or glides.

In fig 6 and 7 are illustrated in a cross-sectional view and a perspective view respectively an embodiment of the conveyor system according to the first aspect of 10 the present invention. In these figures it is illustrated that the conveyor system may comprise, at one or more specific locations 23 along the first side of the support frame, a connection between the first main support element 16 and the second auxiliary support element 22. Such connections may also or alternatively in a correspondingly way be present at one or more specific locations 23 along the second 15 side of the support frame.

In fig. 3 and 4 a Cartesian coordinate system is included to illustrate the various directions of a conveyor system in an intended use as defined in claim 1. Hence, the z-direction defines a vertical direction. The x-y-plane defines a horizontal plane. In 20 Figs. 1, 2, 3, 4 and 6 the longitudinal direction of the support frame accordingly extends along the y-direction "into and out of the paper".

In a second aspect the present invention relates to a conveyor apparatus comprising a conveyor system according to the invention according to the first aspect of the 25 present invention and drive means for moving the endless carrier chain relative to the support frame.

The conveyor apparatus and the conveyor system according to the invention may be manufactured using materials and manufacturing processes and techniques well 30 known in the art. A person skilled in the art of manufacturing conveyor systems and apparatuses will - on the basis of the present description and the appended claims -

know how to manufacture the system and the apparatus according to the first and second aspect of the present invention, respectively.

It will be understood that the invention is not limited to the particular examples
5 described above but may be designed in a multitude of varieties within the scope of the invention, as specified in the claims.

List

- 2. Conveyor system
- 4. Support frame
- 5 6. Endless carrier chain
 - 6a. Upper part of endless carrier chain
 - 6b. Lower part of endless carrier chain
- 8. First side of support frame
- 10. Second side of support frame.
- 10 12. Inner side of endless carrier chain
 - 12a. Inner side of the upper part of endless carrier chain
 - 12b. Inner side of the lower part of endless carrier chain
- 14. Outer side of endless carrier chain
 - 14a. Outer side of the upper part of endless carrier chain
 - 15 14b. Outer side of the lower part of endless carrier chain
- 15. Gliding means
- 16. First main support element
- 18. Second main support element
- 20. First auxiliary support element
- 20 22. Second auxiliary support element
- 23. Location at which a main support element is connected to the an auxiliary support element.
- 24. Shielding element
- 26. Opening at first side of support frame
- 25 28. Opening at second side of support frame
- 30. Gutter
- 32. Transversal upper struts
- 34. Transversal lower struts
- 100. Conveyor system of prior art
- 30 102. Upper part of endless drive chain
- 104. Lower part of endless drive chain

- 106. First side of support frame
- 108. Second side of support frame
- 200. Conveyor system of prior art
- 202. Upper part of endless drive chain
- 5 204. Lower part of endless drive chain
- 206. First side of upper support frame
- 208. Second side of upper support frame
- 210. First side of lower support frame
- 112. Second side of lower support frame
- 10 214. Bracket connecting upper support frame with lower support frame
- 220. Upper support frame
- 230. Lower support frame

Patentkrav

1. Transportørsystem (2), som omfatter en støtteramme (4) og en endeløs bærekæde (6),

5

hvor støtterammen strækker sig i en længderetning og omfatter en første side (8) og en anden side (10),

hvor den endeløse bærekæde (6) er arrangeret på støtterammen (4),

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hvor den endeløse bærekæde (6), i en orientering beregnet til anvendelse, i hvilken den endeløse bærekæde (6) er arrangeret i en vandret retning, definerer en øvre del (6a), som er bevægelig i én retning i forhold til støtterammen, og en nedre del (6b), som er bevægelig i den modsatte retning i forhold til bærekædens øvre del, hvorved

15

den endeløse bærekæde har en indvendig side (12) og en udvendig side (14),

hvor støtterammen omfatter et første hovedstøtteelement (16), som understøtter den øvre del af den endeløse bærekæde ved støtterammens første side (8),

20 hvor støtterammen omfatter et andet hovedstøtteelement (18), som understøtter den nedre del af den endeløse bærekæde ved støtterammens anden side (10),

hvor støtterammen omfatter et første hjælpestøtteelement (20), som understøtter den øvre del af den endeløse bærekæde ved støtterammens anden side (10),

25

hvor støtterammen omfatter et andet hjælpestøtteelement (22), som understøtter den nedre del af den endeløse bærekæde ved støtterammens første side (8),

30 hvor støtterammen omfatter et afskærmningselement (24), som strækker sig fra støtterammens første side (8) til støtterammens anden side (10) i et område (A), der

er defineret mellem den indvendige side (12a) af den endeløse bærekædes (6) øvre del og den indvendige side (12b) af den endeløse bærekædes (6) nedre del, og

hvor afskærmningselementet (24) selv, eller afskærmningselementet (24) i
5 kombination med det første hovedstøtteelement (16) og/eller i kombination med det andet hovedstøtteelement (18), har en forlængelse, som blokerer en direkte adgang mellem et hvilket som helst punkt P1 på den indvendige side (12a) af den endeløse bærekædes (6) øvre del og et tilsvarende punkt P2 på den indvendige side (12b) af den endeløse bærekædes nedre del, idet punktet P2 er det mest proksimale
10 punkt, set i forhold til punktet P1, på den indvendige side (12b) af den endeløse bærekædes nedre del,

kendetegnet ved, at

15 støtterammens (4) første side (8) omfatter en åbning (26), som fortrinsvis strækker sig langs i det væsentlige hele den første side i længderetningen, idet åbningen (26) giver adgang til den indvendige side (12b) af den endeløse bærekædes (6) nedre del (6b), idet åbningen (26) er defineret af geometrien af det første hovedstøtteelement (16), afskærmningselementet (24) og det andet hjælpestøtteelement (22), og/eller

20

ved, at støtterammens (4) anden side (10) omfatter en åbning (28), som fortrinsvis strækker sig langs i det væsentlige hele den anden side i længderetningen, idet åbningen (28) giver adgang til den indvendige side (12a) af den endeløse bærekædes (6) øvre del (6a), idet åbningen (28) er defineret af geometrien af det andet
25 hovedstøtteelement (18), afskærmningselementet (24) og det første hjælpestøtteelement (20).

2. Transportørsystem ifølge krav 1, hvor afskærmningselementet (24) i det mindste delvist i området A definerer en plan overflade, som strækker sig i en skrånende
30 retning, set i forhold til et vandret plan, fra støtterammens første side til støtterammens anden side.

3. Transportørsystem ifølge krav 1 eller 2, hvor det første hovedstøtteelement (16) et eller flere specifikke steder (23) langs støtterammens første side er forbundet med det andet hjælpe støtteelement (22), og/eller hvor det andet hovedstøtteelement (18) på et eller flere specifikke steder (23) langs støtterammens anden side er forbundet med det første hjælpe støtteelement (20).
5
4. Transportørsystem ifølge et hvilket som helst af kravene 1-3, hvor der er arrangeret en rende (30) på det andet hovedstøtteelement (18) til opsamling af skyllevand i en skyllesituation, idet renden (30) strækker sig i en af støtterammen (4).
10
5. Transportørsystem ifølge et hvilket som helst af kravene 1-4, hvor en eller flere tværgående øvre stivere (32) er arrangeret på foruddefinerede steder langs støtterammens (4) længderetning, idet de tværgående øvre stivere (32) forbinder det første hovedstøtteelement (16) på støtterammens første side med det første hjælpe støtteelement (20) på støtterammens anden side.
15
6. Transportørsystem ifølge et hvilket som helst af kravene 1-5, hvor en eller flere tværgående nedre stivere (34) er arrangeret på foruddefinerede steder langs støtterammens (5) længderetning, idet de tværgående nedre stivere (34) forbinder det andet hovedstøtteelement (18) på støtterammens anden side med det andet hjælpe støtteelement (22) på støtterammens første side.
20
7. Transportørsystem ifølge et hvilket som helst af kravene 1-6, hvor det første hovedstøtteelement (16) på støtterammens første side, afskærmningselementet (24) og det andet hovedstøtteelement (18) på støtterammens anden side er integreret dannet i ét stykke.
25
8. Transportørsystem ifølge et hvilket som helst af kravene 1-7, hvor profilen af i det mindste en del af den gruppe af elementer, som omfatter det første hovedstøtteelement (16) på støtterammens første side, afskærmningselementet (24)
30

og det andet hovedstøtteelement (18) på støtterammens anden side, set i en tværgående retning i forhold til støtterammens (4) længderetning, udviser en Z-form.

5 9. Transportørsystem ifølge et hvilket som helst af kravene 1-8, hvor den endeløse bærekæde er en bærekæde valgt blandt gruppen, som omfatter: et fleksibelt transportørsystem, i hvilket den endeløse bærekæde omfatter et antal elementer i indbyrdes indgreb, som er fleksibelt forbundet med hinanden og danner en endeløs kæde, et transportbånd, som omfatter et polymermateriale, der eventuelt kan være forstærket, fx med forstærkningstråde eller et forstærkningsnet, et lamelbånd, som 10 omfatter et antal lamelelementer, der er hængslet til hinanden i indbyrdes indgreb på den ene side, et trådbånd, som omfatter et antal tråde, der er vævet sammen, hvilke som helst typer stålbånd, fx åbne eller lukkede stålbånd.

15 10. Transportørsystem ifølge et hvilket som helst af kravene 1-9, hvor et eller flere af elementerne: første hovedstøtteelement (16), andet hovedstøtteelement (18), første hjælpestøtteelement (20), andet hjælpestøtteelement (22), afskærmningsselementet (24), renden (30), en eller flere af de tværgående øvre stivere (32), en eller flere af de tværgående nedre stivere (34), er fremstillet af stål, fx rustfrit stål, aluminium, et 20 polymermateriale, fx en plast.

25 11. Transportørsystem ifølge et hvilket som helst af kravene 1-10, som yderligere omfatter et børsteorgan til at børste den endeløse bærekæde (6) på den udvendige overflade (14a) ved den endeløse bærekædes (6) øvre del og/eller på den udvendige overflade (14b) ved den endeløse bærekædes (6) nedre del.

30 12. Transportørsystem ifølge et hvilket som helst af kravene 1-11, som yderligere omfatter et bærekædeomdirigeringsorgan til omdirigering eller føring af den endeløse bærekæde (6) ind i det indre af en skyllebeholder til skylning af den endeløse bærekæde (6) med en skyllevæske.

13. Transportørsystem ifølge et hvilket som helst af kravene 11 eller 12, hvor børsteorganet og/eller omdirigeringsorganet er forsynet med børsteindgrebsorganer og/eller bærekædeomdirigeringsindgrebsorganer til på reversibel vis at gå i indgreb med/frakoble henholdsvis børsteorganet og/eller omdirigeringsorganet.

5

14. Transportørsystem, som omfatter to eller flere transportørsystemer ifølge et hvilket som helst af kravene 1-13 arrangeret oven på hinanden, fx 2, 3, 4, 5, 6, 7 eller 8 transportørsystemer arrangeret oven på hinanden.

10 15. Transportapparat, som omfatter et transportørsystem ifølge et hvilket som helst af kravene 1-14 og et drivorgan til bevægelse af den endeløse bærekæde i forhold til støtterammen (4).

15 16. Anvendelse af et transportørsystem ifølge et hvilket som helst af kravene 1-14 eller et transportapparat ifølge krav 15 til transport af en genstand.

17. Anvendelse ifølge krav 16, hvor genstanden er en fødevare eller et fødevareforstadium.

1 / 5

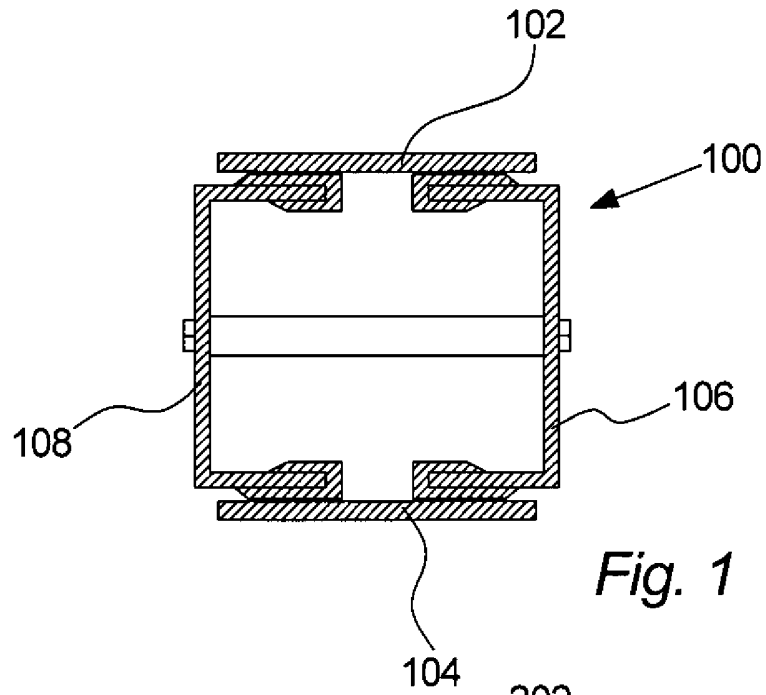


Fig. 1

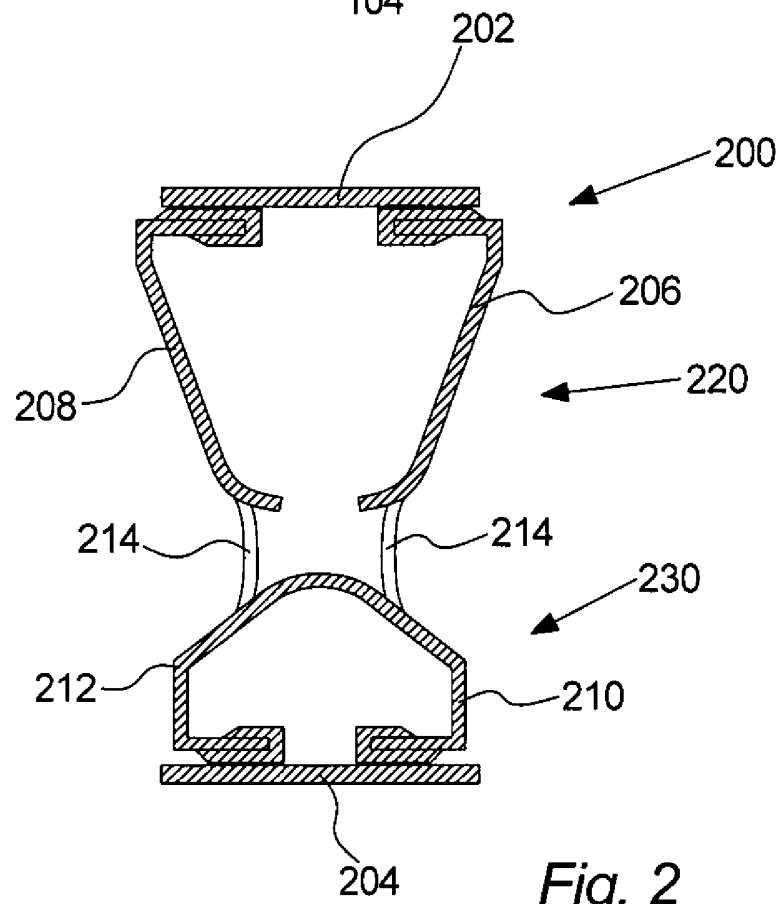


Fig. 2

4/5

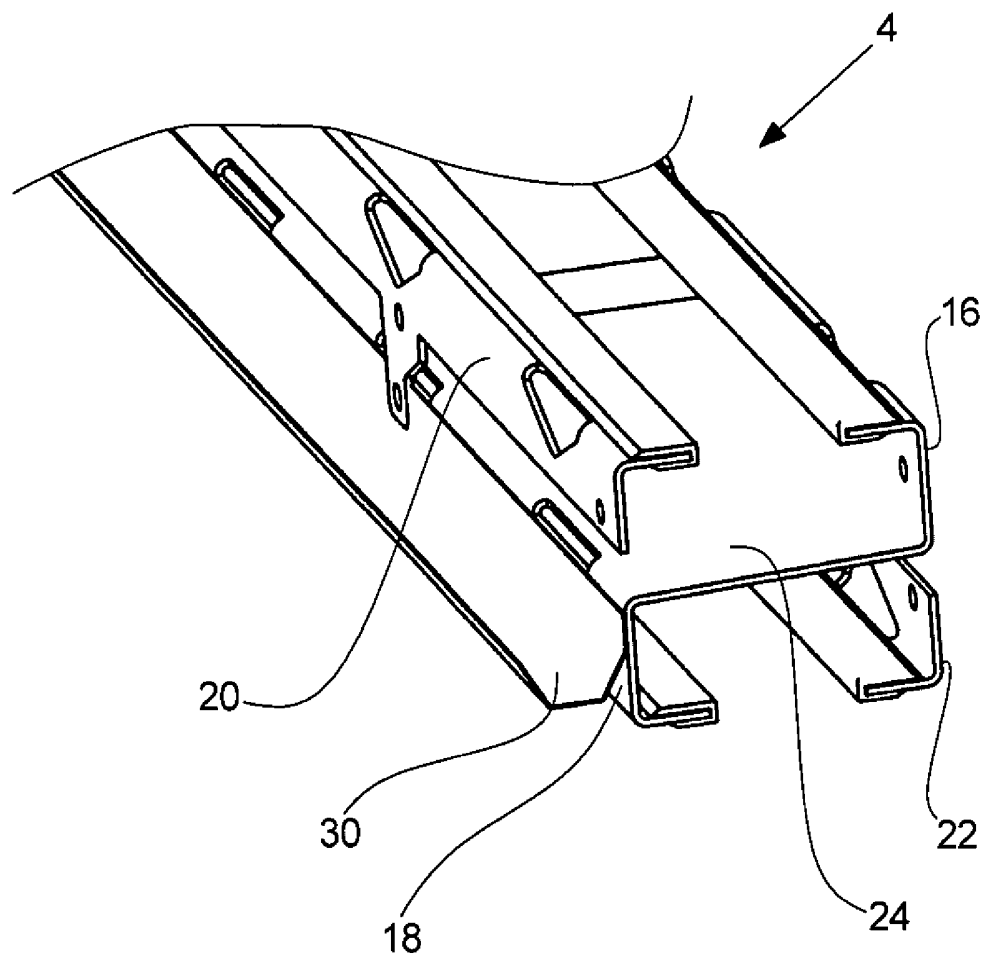


Fig. 5

5/5

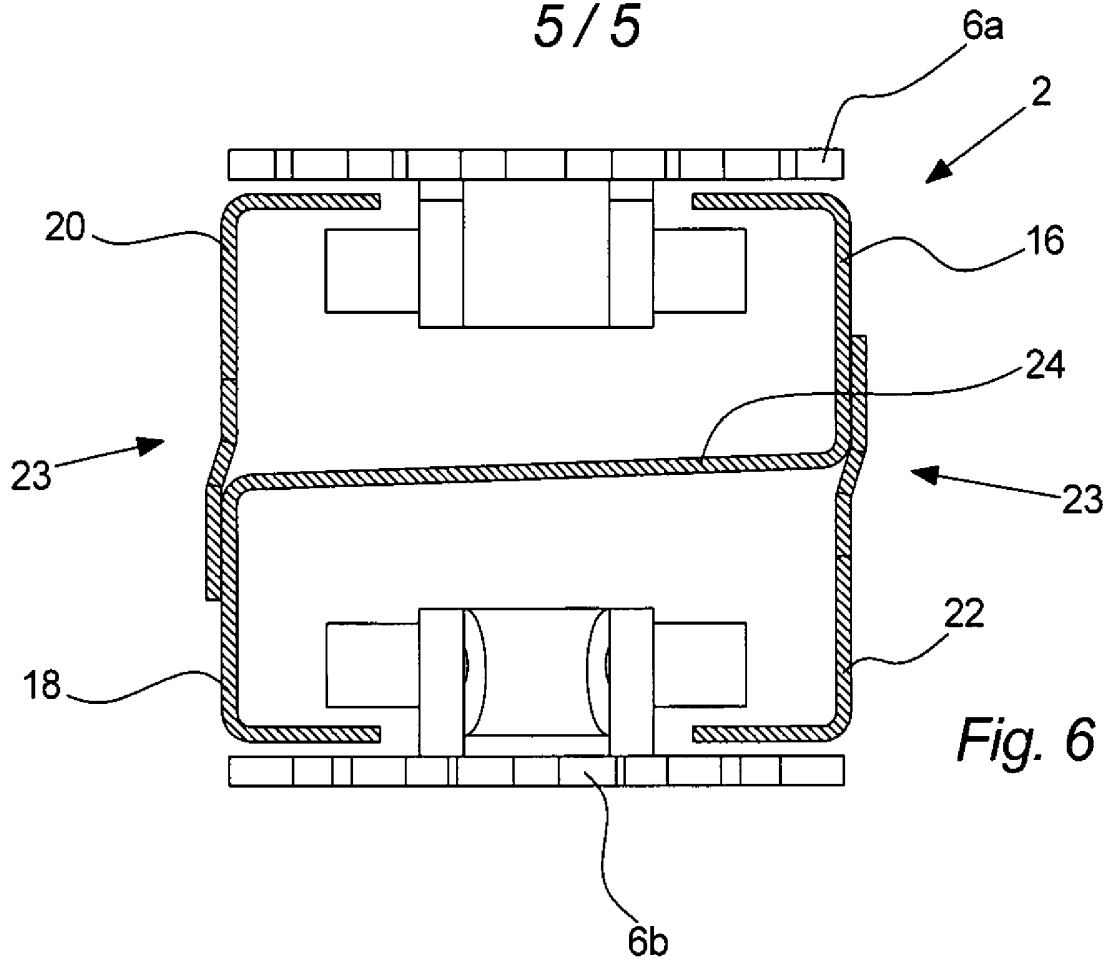


Fig. 6

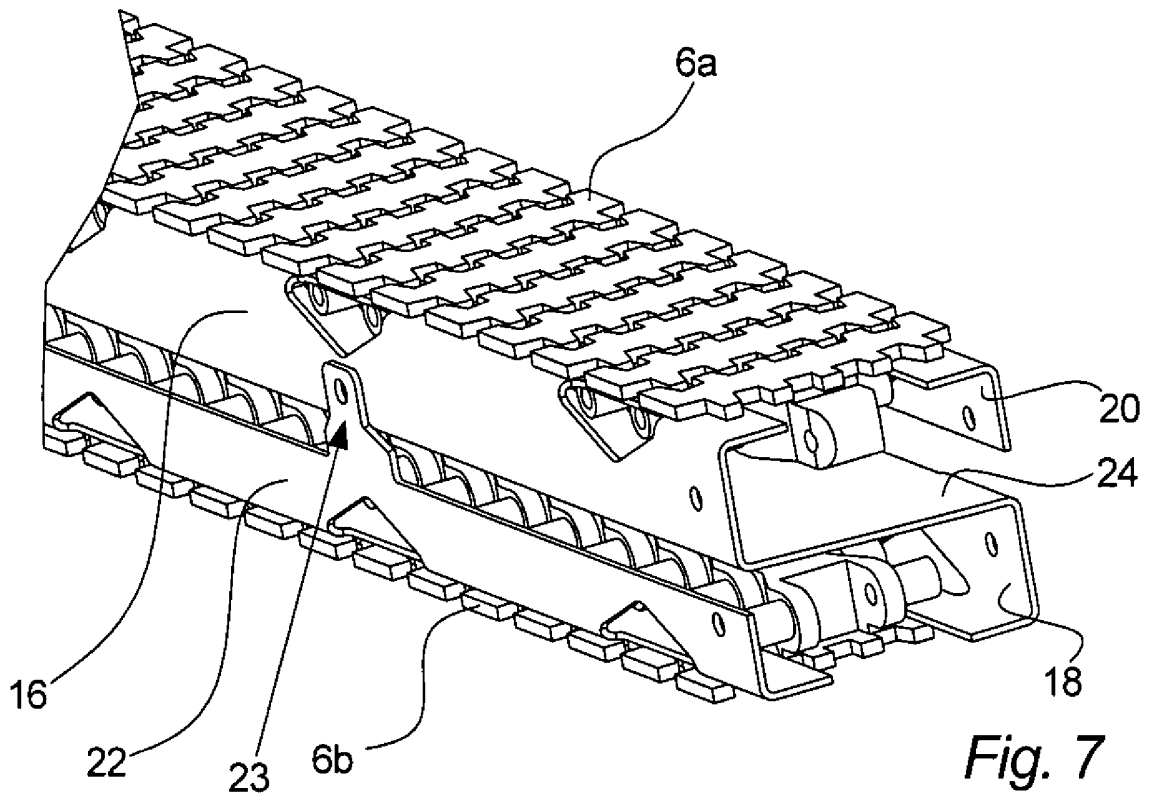


Fig. 7