

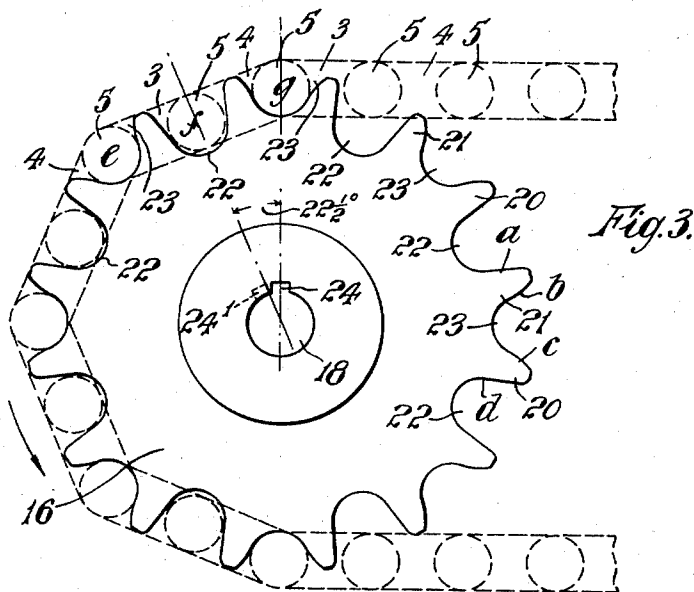
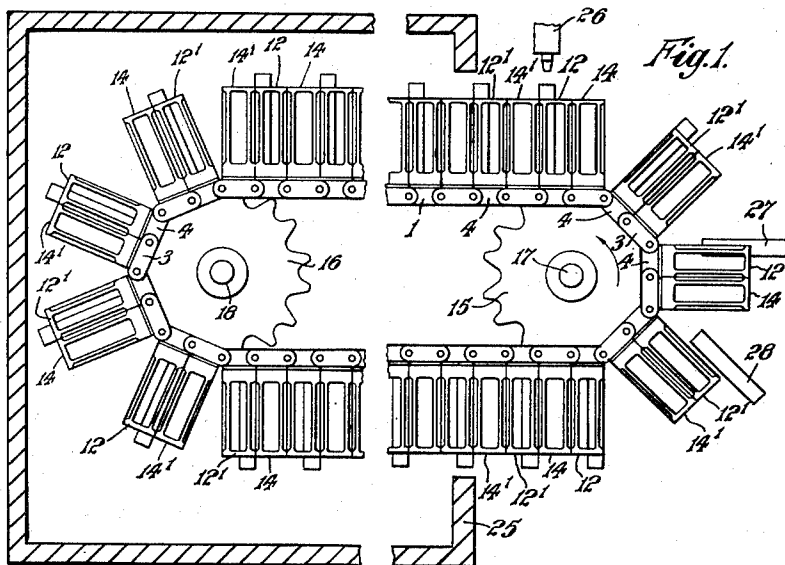
June 2, 1959

M. H. TROWER
CONVEYORS

2,889,032

Filed Feb. 16, 1956

2 Sheets-Sheet 1



INVENTOR

MERVYN HUBERT TROWER by
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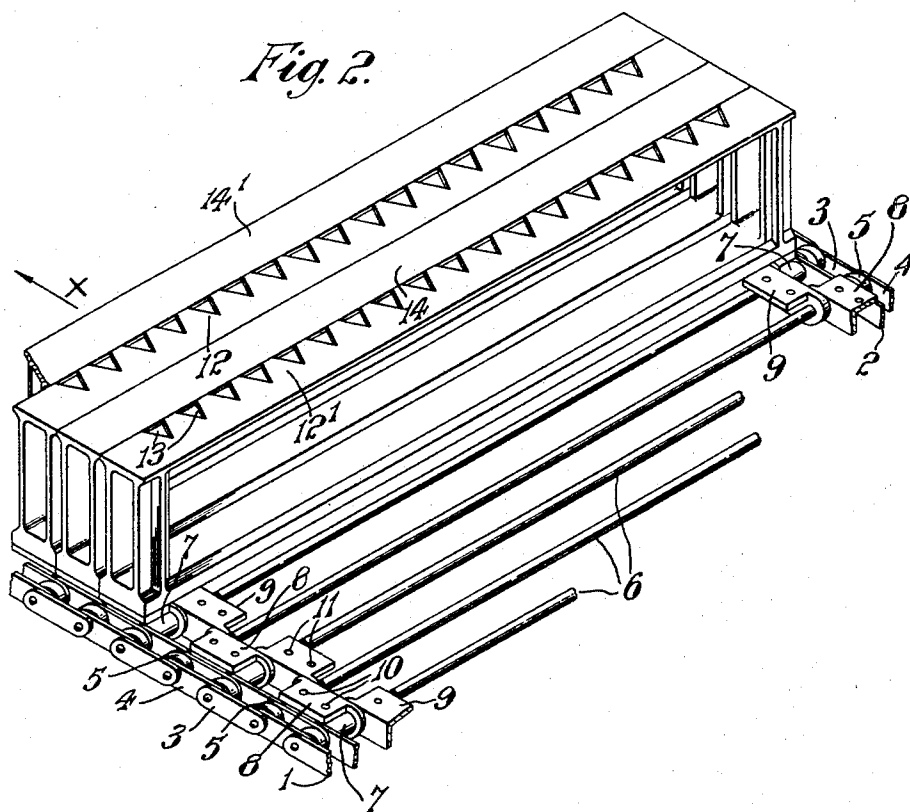
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CONVEYORS

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13 Claims. (Cl. 198—179)

The present invention relates to conveyors.

The invention provides a conveyor including an endless belt having two side flights connected by end flights, a plurality of pairs of vanes secured to the belt, each pair of vanes being face-to-face and parallel to each other over the side flights and one end flight, means for constraining each pair of vanes to maintain the vanes face-to-face and parallel over one end flight, and means for constraining each pair of vanes to create an outward acute angle between them over the other end flight.

In a preferred embodiment of the invention the side flights of the belt are parallel to one another.

Any three consecutive vanes are hereinafter referred to as "a leading vane," "a middle vane" and "a following vane," the terms "leading," "middle" and "following" being used in relation to the direction of movement of the vanes over the flights of the conveyor. Considering any three such vanes, the leading vane and the middle vane may be face-to-face and parallel over one end flight, and the middle vane and the following vane may be face-to-face and parallel over the other end flight. With this arrangement it follows that an outward acute angle will be created between the middle vane and the following vane over that end flight which maintains the face-to-face and parallel relationship of the leading vane and the middle vane. It also follows that an outward acute angle will be created between the leading vane and the middle vane over that end flight which maintains the face-to-face and parallel relationship of the middle vane and the following vane.

In a still further preferred embodiment of the invention the plurality of pairs of vanes extends over the whole length of the endless belt.

In an embodiment specially adapted for receiving a succession of containers (for conveying them around the major portion of an endless path and for discharging them in close proximity to the point of receipt) the leading face of each middle vane may be suitably shaped to accommodate containers, whilst the other face of the middle vane and both faces of the interposed vanes are, for preference, plain. Both the middle and the interposed vanes may consist of rectangular frames. In such an arrangement a row of notches may be provided in the leading face of the middle vane, each notch being capable of accommodating the cross sectional shape of a container. The row of notches would generally be located in the side of the frame opposite to that secured to the endless belt. Thus, the leading and middle vanes form a pair which are constrained to retain containers between them over both side flights and one end flight and to discharge and receive containers over the other end flight of the belt.

The end flights of the belt may be shaped by passing the belt over two arrangements of pulleys. At least one arrangement of pulleys is so designed as to support in a flat condition successive portions of the belt passing over it. It is preferred to have the two arrangements of pulleys oriented with respect to one another and the vanes fixed

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to the belt in such a way that any two consecutive vanes attached to portions of the belt are always in face-to-face alignment when the belt moves over one arrangement of pulleys, and are at an acute angle to one another when the belt moves over the other arrangement of pulleys. When the belt is made up of a series of links with a vane attached to each link, any two consecutive links having vanes in face-to-face alignment over one of the arrangements of pulleys will form the flat portion of the belt on passing over it. These same two links will be angularly displaced with respect to one another on passing over the second arrangement of pulleys.

Either or both arrangements of pulleys may consist of one or more sprocket wheels. Such sprocket wheels have at least one deep depression between two shallow depressions, the relative depths of the three depressions being such that any pair of links of a chain engaged by teeth between the depressions are in alignment. Preferably the sprocket wheels have a succession of alternate deep and shallow depressions around their perimeter.

In a preferred embodiment of the conveyor according to the present invention, two endless parallel chains, each travelling over a pair of such sprocket wheels, move a succession of vanes between them. Preferably, corresponding links of the two chains are connected by parallel rods which assist in securing the vanes.

The invention will now be illustrated by means of the accompanying drawings in which:

Fig. 1 is a side view of a general arrangement of a conveyor according to the present invention suitable for conveying bags of frozen confection such as is described in British patent specification No. 732,434 through a refrigerating blast tunnel,

Fig. 2 is an isometric view of part of the conveyor of Fig. 1 with certain parts removed, and

Fig. 3 is a side view of a sprocket wheel used in the conveyor of Fig. 1.

Referring to the drawings, a succession of frames 12', 14, 12, 14', constituting the vanes referred to above, are supported between two parallel endless chains 1 and 2 spaced apart as in Fig. 2. (In Fig. 2 a number of frames have been removed to illustrate the manner in which the frames are supported by the chains.) Each chain is formed from a succession of pairs of links 3 and 4 having rollers 5 on hollow bearing pins. The bearing pins of one chain are linked to the corresponding pins on the other chain by a succession of parallel mild steel pivot bars 6. Tubular distance pieces 7 are secured to the end of each bar adjacent the bearing pins. Consecutive bars 6 are connected by angle iron cleats 8 or 9 separated from the links of the chains by the distance pieces 7. The set of cleats 8 face towards the chains nearest them, whilst the set of cleats 9 face away from the chains nearest them. Over the whole series of bars cleats 8 and 9 are in alternate succession. Cleats 8 are provided with screw holes 10 and cleats 9 with screw holes 11. A rectangular frame 12' is screwed to opposite cleats 8 by screws (not shown) passing through the lower side of the frame and the screw holes 10. The frame 12' has a row of triangular notches 13 in the face which constitutes the leading face when the frame 12' is moving in the direction of the arrow X. A frame 14 similar to frame 12' but without the notches 13, is secured, face-to-face and in contact with the notched face of frame 12', to an opposite pair of cleats 9 by screws (not shown) passing through the bottom of the frame into screw holes 11. Another frame 12 secured in a similar manner to the first frame 12' is in face-to-face contact with frame 14', and so on, so that a succession of pairs of frames 12', 14 and 12, 14', are supported between every opposite pair of links 4 and 3 respectively of chains 1 and 2, to form the conveyor illustrated in side view in Fig. 1.

In the succession of vanes, frames 12 and 12' are middle vanes, and frames 14 and 14' are interposed vanes. Frame 14 is a leading vane with respect to frame 12', and a following vane with respect to frame 12 (when the frames are moving in the direction of arrow X in Fig. 2).

The parallel chains 1 and 2 are supported at each end flight by two parallel sprocket wheels. One each of two pairs of sprocket wheels 15 and 16, namely the ones which support chain 1 are shown in Fig. 1, and are keyed to shafts 17 and 18 respectively. Teeth on the sprocket wheels engage the spaces between the rollers 5 of the links in chains 1 and 2 to drive the belt. One of the shafts, namely 18, is driven by an electric motor (not shown) through suitable gearing imparting intermittent motion to the shaft and also by means of the chain to sprocket wheel 15.

The construction of a suitable sprocket wheel is illustrated in Fig. 3. The sprocket wheel is provided with alternate teeth 20 and 21. Side *d* of any tooth 20 is longer than side *c*. In the case of any tooth 21, side *b*, corresponding to side *c* of a tooth 20, is shorter than side *a*, which corresponds to side *d* of a tooth 20. Between the teeth of the sprocket wheel there is, therefore, a succession of alternate deep and shallow depressions 22 and 23 extending around the circumference of the wheel. These depressions accommodate the rollers carried by the bearing pins of the links 3 and 4 of the chains 1 and 2. The links are represented by broken lines in Fig. 3. The depth of any depression 22 compared with that of any depression 23 should be such that the axis of a roller *f* is on the line joining the axes of rollers *e* and *g*, which latter rollers are engaged in depressions 23 immediately adjacent to a depression 22.

Thus, a pair of consecutive links, 3 and 4, are aligned when engaged by a pair of teeth 20 and 21 flanking a deep depression 22 and are disaligned when engaged by a pair of teeth 20 and 21 flanking a shallow depression 23.

As pointed out above, the present invention requires that any specific pair of consecutive links 3 and 4 be aligned over one sprocket wheel and disaligned over the other. This is achieved in the case of the illustrated embodiment by rotationally positioning the pair of sprocket wheels 15 with respect to the pair of sprocket wheels 16 so that a pair of consecutive links 3 and 4, which are engaged by a pair of teeth flanking a deep depression 22 on the wheel 16 and are thereby aligned, are engaged by a pair of teeth on the wheel 15 flanking a shallow depression 23, and are thereby disaligned.

A refrigerant blast tunnel 25 shown in Fig. 1 encloses the conveyor arrangement described above except for that part passing over and near to sprocket wheels 15. A suitable device 26 for filling liquids into containers is located near the entrance to the tunnel 25.

The operation of the above described arrangement is as follows:

The chains 1 and 2 are moved intermittently in the direction indicated by the arrow in Fig. 1 by an electric motor and gearing through driving shaft 18 and sprocket wheels 16. As the endless belt travels around sprocket wheels 15 any link 4 is in alignment with the succeeding link 3. Thus pairs of frames 12, 14 and 12', 14', are always in face-to-face contact when travelling over the end flight of the conveyor formed on sprocket wheels 15 and frames 14' and 12, and 14 and 12' are at an angle to one another over this end flight. A row of containers 27, of triangular prism shape, such as are described in British patent specification No. 732,434, are transferred by a suitable mechanism (not shown) on to frames 12 and 12' when these frames reach a substantially horizontal position during their traverse round sprocket wheels 15. After passing round part of the upper portion of sprocket wheels 15 all the frames become vertical and in face-to-face contact over the upper side flight of the conveyor. The containers are filled with a suitable liquid, such as the confection described in British patent specification No.

732,434, in any conventional manner by the device 26, after which the frames carrying the filled containers between them pass into the refrigerating blast tunnel 25. When the frames arrive at the other end flight of the conveyor they pass round the sprocket wheels 16 in contacting pairs of frames made up of one frame 12 and one frame 14', or one frame 12' and one frame 14. The difference in contacting pairs over the two end flights is due to the orientation of sprocket wheels 16 with respect to sprocket wheels 15. Since a row of containers is clamped between a frame 12 and a frame 14', or a frame 12' and a frame 14 the containers do not fall out from the frames when they are traversing the lower side flight. Also, when they reach an upside down position any liquid in the containers will have been frozen. When the frames carrying the containers leave the refrigerating blast tunnel, they pass around part of the lower portion of sprocket wheels 15 once again. As described above, face-to-face contact round these sprocket wheels is maintained between pairs of frames 12, 14 and 12', 14', and any row of containers previously clamped between frames 12 and 14' or 12' and 14 is released. A suitable ejector device (not shown) is provided for ejecting the rows of containers from the frames 12 and 12'. One of a row of containers 28 is shown in the process of being ejected. Empty frames 12 and 12' then advance round sprocket wheels 15 still in contact with a frame 14 or 14' until they are substantially horizontal and ready to receive a further row of containers 27. The above described sequence of operations is then repeated.

I claim:

1. A conveyor comprising an endless belt having two side flights and two end flights; a plurality of article-retaining members each consisting of a separate pair of adjacently disposed retaining elements secured to the belt, each said pair being constrained into a retaining disposition of mutual approach over said side flights; first pulley means at one of the end flights supporting the belt at positions between the article-retaining members, and second pulley means at the other end flight supporting the belt at positions between the pair of retaining elements of each member, thereby urging the pairs of retaining elements into a retaining disposition over one end flight and constraining each said pair apart into a non-retaining disposition over said other end flight.

2. A conveyor according to claim 1 in which said elements each comprises a frame structure.

3. A conveyor according to claim 2 in which the pair of frame structures of each article-retaining member are in a substantially face to face relation in the article-retaining disposition while in said non-retaining disposition said pair of structures are disposed at an acute angle to each other.

4. A conveyor comprising an endless belt having two side flights connected by a first end flight and a second end flight; a plurality of article-retaining members each consisting of a separate pair of adjacently disposed vanes secured to said belt, each said pair being constrained into a substantially face to face retaining disposition over said side flight; a pulley disposed at the first end flight and over which said belt passes supporting the belt at positions between the article-retaining members to constrain the vanes of each member into the article-retaining disposition, a second pulley disposed at the second end flight and over which said belt passes supporting the belt at positions between the vanes of each pair to constrain the vanes at an outward acute angle to each other in a non-retaining disposition over said second end flight.

5. A conveyor according to claim 4 in which each pair of adjacent vanes associated with consecutive members are disposed in a substantially face to face disposition over said second end flight and so as to be at an outward acute angle to each other over said first end flight.

6. A conveyor according to claim 4 in which said endless belt is constituted by at least one endless chain and

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each of the pulleys comprises a sprocket wheel having teeth which engage the links of the chain.

7. A conveyor according to claim 6 in which each vane is connected to a separate link of the chain, the pair of vanes of any article-retaining member being connected to a pair of consecutive links and being disposed in the article-retaining disposition only when these links are aligned, and in which the sprocket teeth of each pulley are flanked on either side by deep and shallow depressions respectively, the relative depth of consecutive depressions being such that any pair of consecutive links on either end flight are aligned only when engaged by a pair of teeth flanking a deep depression.

8. A conveyor comprising an endless belt having two side flights connected by two end flights, said belt being constituted by two parallel endless chains; a plurality of adjacent retaining members each consisting of a separate pair of adjacently disposed substantially planar structures, each of said structures being secured at one end to a separate and oppositely disposed link of each of said chains, each said pair of structures being disposed in a substantially face to face and parallel disposition when the pair of links of each chain to which they are secured are aligned; a pair of sprocket wheels disposed at each of said end flights, each chain passing over one of each pair of wheels at each end flight, each of said wheels having sprocket teeth each of which is flanked on either side by deep and shallow depressions respectively, said teeth engaging the links of the chain passing over said wheel the relative depth of consecutive depressions being such that any pair of consecutive links of each chain on either end flight are aligned only when engaged by a pair of teeth flanking a deep depression; each pair of links of each chain secured to each said pair of structures being aligned over two side flights and one end flight and not aligned over the other end flight.

9. A conveyor according to claim 8 in which each pair of links of each chain secured to each pair of adjacent structures associated with consecutive members are

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aligned over said side flights and said other end flight but not aligned over said first mentioned end flight.

10. A conveyor comprising an endless belt having two side flights connected by two end flights, said belt being constituted by two parallel endless chains; a plurality of adjacent retaining members each consisting of a separate pair of adjacently disposed vanes for retaining an article therebetween, each of said vanes being secured to a separate and oppositely disposed link of each of said chains, each said pair of vanes being disposed in a substantially face to face and parallel disposition when the pair of links of each chain to which they are secured are aligned; a pair of sprocket wheels disposed at each of said end flights, each chain passing over one of each pair of wheels at each end flight, each of said wheels having sprocket teeth each of which is flanked by a deep depression and a shallow depression, the teeth of each wheel engaging the links of the chain passing over that wheel, the relative depth of consecutive depressions being such that any pair of consecutive links of each chain on either end flight are aligned only when engaged by a pair of teeth flanking a deep depression; each pair of links of each chain secured to a said pair of vanes being aligned over two side flights and one end flight and not aligned over the other end flight.

11. A conveyor according to claim 10 in which each pair of links of each chain secured to two adjacent vanes associated with consecutive members are aligned over said side flights and said other end flight but not aligned over said first mentioned end flight.

12. A conveyor according to claim 7 in which any pair of consecutive chain links is aligned over one of the end flights and not aligned over the other end flight.

13. A conveyor according to claim 4 wherein each vane comprises a rectangular frame structure.

References Cited in the file of this patent

UNITED STATES PATENTS

807,541	Cunningham et al.	Dec. 19, 1905
2,751,064	Russell	June 19, 1956