

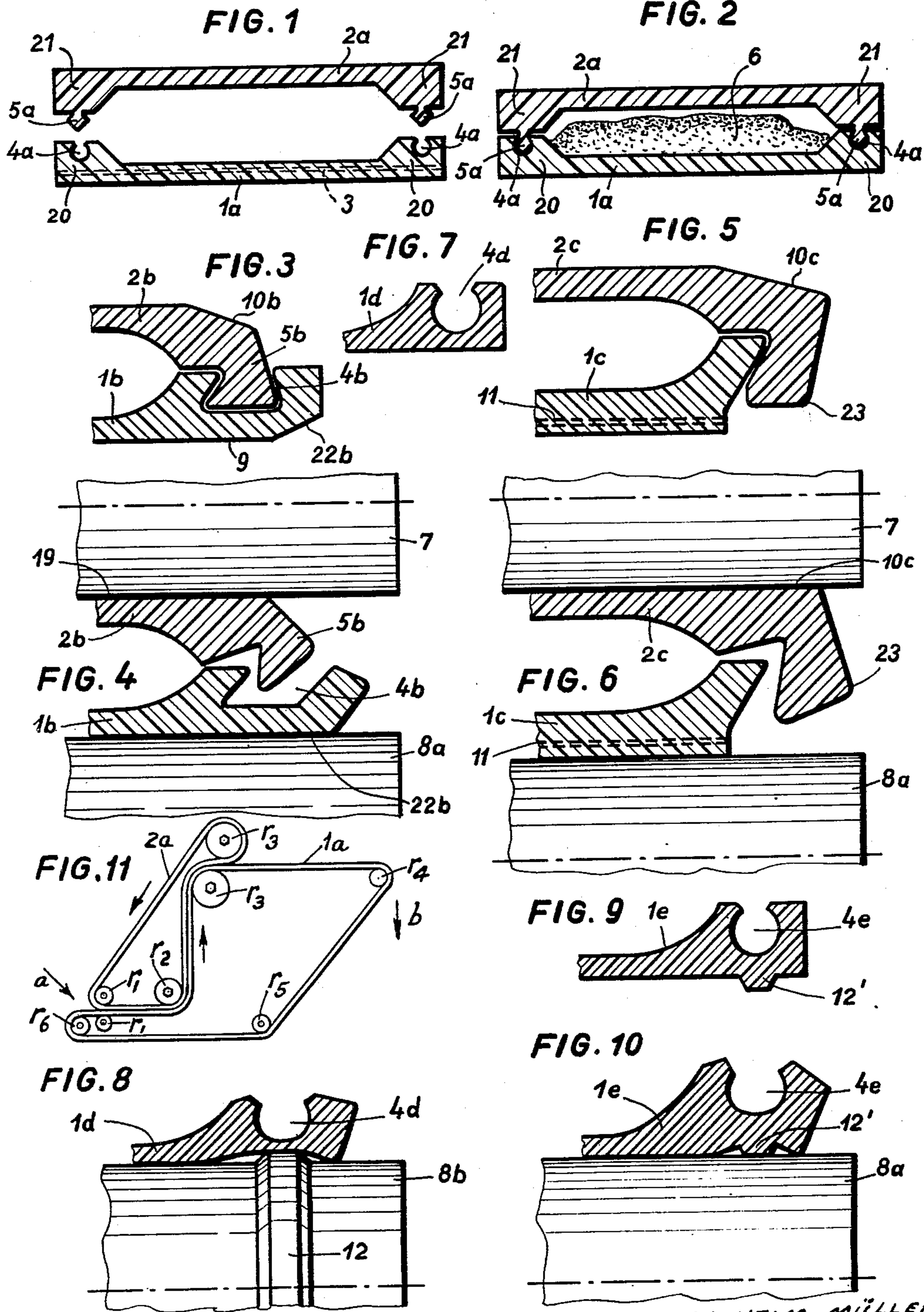
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W. MÜLLER

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BELT CONVEYER APPARATUS

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INVENTOR: WILHELM MÜLLER
BY: *Medard G. [signature]*

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BELT CONVEYER APPARATUS

Wilhelm Müller, Neuss (Rhine), Germany, assignor to
Firma Continental Gummi-Werke Aktiengesellschaft,
Hannover, Germany

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The present invention relates to conveyer apparatus.

More particularly, the present invention relates to belt conveyers, particularly of the type where a pair of belts are located opposite each other and hold the material being conveyed therebetween.

Belt conveyers of this type have several disadvantages. For one thing the cross section of the space between the belts undesirably decreases during turning of such belts about guide rolls, which results in compression of the conveyed material or undesirable stretching of one of the belts. Furthermore, where the belts are locked to each other, there is excessive wear at the locked portions of the belts particularly during turning of the belts about guide rolls and the like because of the tendency of the belts to move longitudinally with respect to each other during such turning.

One of the objects of the present invention is to overcome the above drawbacks by releasably locking a pair of belts to each other in such a way that the belts are free to move longitudinally with respect to each other. Thus, excessive wear of the belts at their locked portions is avoided and the life of the belts is very greatly increased.

A further object of the present invention is to construct the belts in such a way that they do not fold during turning about a guide roll and instead smoothly curve about a guide roll so as to maintain the cross section of the space between the belts constant during turning of the belts.

Another object of the present invention is to provide a means for automatically releasing the belts from each other and locking the belts together.

With the above objects in view, the present invention mainly consists of a conveyer apparatus which includes a bottom belt having a top face and a pair of opposite side wall portions extending upwardly from this top face, these side wall portions each having a top face located above the top face of the belt and these opposite side wall portions respectively extending along opposite side edges of this bottom belt. A top belt is provided with a bottom face located over and spaced from the top face of the bottom belt and has a pair of opposite side wall portions extending downwardly from this bottom face and each having a bottom face located beneath the bottom face of the top belt, and these opposite side wall portions of the top belt extend along opposite side edges thereof. The bottom faces of the opposite side wall portions of the top belt engage and are located over the top faces of the opposite side wall portions of the bottom belt. A releasable lock means releasably holds the top and bottom belts together at the opposite side wall portions thereof and permits lengthwise movement of the top and bottom belts with respect to each other.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together

with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a transverse sectional view of a pair of belts constructed in accordance with the present invention and shown slightly spaced from each other;

Fig. 2 is a transverse sectional view of the belts of Fig. 1 in their locked position with material being conveyed shown therebetween;

Fig. 3 is a fragmentary transverse sectional view of side edge portions of a pair of belts constructed differently from those of Figs. 1 and 2;

Fig. 4 is a fragmentary, transverse, partly sectional view showing the belts of Fig. 3 associated with a guide means therefor and showing how the belts are automatically locked or released;

Fig. 5 is a fragmentary, transverse, sectional view of side edge portions of another embodiment of belts constructed in accordance with the present invention;

Fig. 6 is a fragmentary, transverse, partly sectional view of the belts of Fig. 5 in association with guide rolls therefor and showing how the belts of Fig. 5 are released and locked;

Fig. 7 is a transverse, fragmentary, sectional view of the side edge portion of a locked belt;

Fig. 8 illustrates the belt portion of Fig. 7 when it is opened;

Fig. 9 shows still another embodiment of a side edge portion of a belt constructed in accordance with the present invention and shown in its locked condition;

Fig. 10 illustrates how the belt portion of Fig. 9 is opened; and

Fig. 11 is a diagrammatic side view of a belt conveyor apparatus according to the present invention.

Referring now to the drawings, Fig. 1 shows a pair of mating belts 1a and 2a constructed in accordance with the present invention. As is apparent from Fig. 1, these belts are substantially trough-shaped and are practically mirror images of each other. The belts are preferably made of an elastic material such as rubber or the like and the bottom belt 1a has a top face and a pair of opposite side wall portions 20 extending upwardly from the top face thereof and each having a top face located above the top face of belt 1a. Belt 2a has a bottom face located opposite the top face of belt 1a and a pair of opposite side wall portions 21 extending downwardly from this bottom face and each having a bottom face located beneath the bottom face of belt 2a. The belt 1a is adapted to engage driven guide rolls and is provided with one or more webs 3 of a substantially non-stretchable material such as a fabric or the like, these webs being embedded in the belt 1a.

As is apparent from Fig. 2, the bottom faces of opposite side wall portions 21 engage the top faces of opposite side wall portions 20, and the belts 1a and 2a are releasably locked to each other through the medium of elongated cutouts 4a formed in the opposite side wall portions 20 and elongated projections 5a extending downwardly from the opposite side wall portions 21 and being located in the grooves 4a, as shown in Fig. 2. The projections 5a are longitudinally movable in the cutouts 4a, respectively, so that the belts 1a and 2a are movable lengthwise with respect to each other, and in this way undesired stresses during turning of the belts about a guide roll are avoided so that the life of the belts is greatly increased.

Fig. 2 shows how the meeting surfaces of the belts 1a and 2a are located in a neutral plane substantially midway between the belts so that in this way also undesired stresses are avoided. As is evident from Figs. 1 and 2, the side wall portions 20 and 21 are less than three times

as thick as the belts and in fact are approximately twice as thick as the belts. Thus, during turning of the belts these side wall portions will not form sharp folds and will curve smoothly so that the cross section of the space included between the belts remains substantially constant even during turning of the belts. Moreover, the disclosed construction of the side wall portions 20 and 21 insulate the releasable lock means 4a, 5a from bending stresses.

In order to load the belts with a material 6 to be conveyed, as shown in Fig. 2, the top belt 2a either is entirely separated from the bottom belt 1a or is released at only one side and turned upwardly away from the belt 1a. The opening of the belts can be automatically produced by guiding the belts along different paths by changing their directions of movement as by guiding the belt 2a about a guide roll which guides this belt 2a upwardly while the bottom belt continues to move horizontally, for example. A second guide roll may change the direction of the lower belt 1a, if desired, so as to guide this belt downwardly from a horizontal position, for example, and the projections 5a automatically move out of the cutouts 4a when the belts are guided so as to move through different paths.

After the bottom belt 1a is loaded with material to be conveyed, the belts are again moved along in the same path and a guide roll guides the top belt 2a onto the bottom belt 1a, and at the point where these belts meet, the projections 5a snap into the cutouts 4a so that the releasable lock means 4a, 5a is automatically releasable and engageable.

Such an arrangement as described above is schematically shown in Fig. 11, in which guide means or standard guide rollers having the length substantially the same as the width of the belts 1a and 2a are used to guide the belts between the rollers r1 over the roller r2 up to the rollers r3 along the same path and the belt 1a from the rollers r3 over the rollers r4, r5, and r6 toward the rollers r1 over a path different from the path of the belt 2a. The material is adapted to be fed in the direction of the arrow a between the two belts 1a and 2a and to leave the belt 1a in the direction of the arrows b as the belt turns over the roller r4.

The elongated projections 5a and the grooves 4a may be of a substantially circular cross section, as shown in Figs. 1 and 2, or they may have the shape of an arrow-head, for example, in accordance with the force with which it is desired to hold the belts together and the desired force required to separate the belts from each other. As was mentioned above, it is, however, best that projections 5a have a cross section which permits them to be longitudinally movable in the cutouts 4a.

According to the embodiment of the invention which is shown in Fig. 3, the top belt 2b which is otherwise identical with belt 2a, is provided with projections 5b of a substantially trapezoidal cross section mating with elongated cutouts 4b which are also of trapezoidal cross section, as shown fragmentarily in Fig. 3, the opposite side of the belts which are not illustrated in Fig. 3 being identical with the side shown in Fig. 3.

Each of these belts has opposite bevelled side edges at its outer face, and Fig. 3 shows one of the bevelled side edges 10b of belt 2b and one of the bevelled side edges 22b of belt 1b. As is apparent from Fig. 4 when the bottom belt 1b has its outer face 9 in engagement with a guide roll 8a and turns about the latter, the bevelled edges 22b contact this guide roll to spread the cutouts 4b so that they release or engage the projections 5b, and the same is true of the outer face 19 of belt 2b when this face 19 engages a guide roll 7 to cause the bevelled edges 10b to engage the guide roll so as to turn the projections 5b to the position shown in Fig. 4. Thus, if in the position shown in Fig. 4 the belts are just starting to move along the same path, the projections 5b will automatically be located in the cutouts 4b, and if the belts at the position shown in Fig. 4 are just starting to move along dif-

ferent paths the projections 5b are automatically released from the cutouts 4b.

According to the embodiment shown in Figs. 5 and 6, the bottom belt 1c, corresponding to belts 1a and 1b, is provided with webs 11 of substantially non-stretchable material, such as a fabric, for example, so that the stretchability of belt 1c is materially reduced. As is evident from Figs. 5 and 6, the opposite side wall portions of belt 1c are undercut at their outer side faces and the projections 23 extending downwardly from the opposite side wall portions of top belt 2c extend into the undercut portions of the sides of belt 1c to releasably lock the belts together. In this case, only the top belt 2c is provided with opposite bevelled edge portions 10c at its outer face so as to turn the projections 23 to the position shown in Fig. 6 when the belts move about guide rolls 7 and 8a so as to automatically release the belts from each other or automatically lock the belts to each other.

Fig. 7 shows a cutout 4d of belt 1d which is of substantially same shape as cutout 4a of belt 1a, and Fig. 8 shows how a guide roll 8b is provided with an annular projection 12 located opposite the cutout 4d to spread the latter during turning of the belt 1d about the guide roll 8b so that the cutout 4d automatically releases or engages a projection of the top belt, and with this embodiment of the invention, it is unnecessary to provide bevelled edges at the outer faces of either of the belts because the cutouts 4d are spread sufficiently to release or engage the projections of the top belt.

Figs. 9 and 10 show a reversal of the arrangement of Figs. 7 and 8, in that the belt 1e is itself provided with an elongated projection 12' located opposite each cutout 4e so as to spread the latter during turning of the belt about a guide roll 8a or the like, as shown in Fig. 10.

In order to further reduce the great reduction of wear and friction produced by the present invention, it is possible to form the cutouts and projections of low friction materials as by mixing paraffin or the like with the opposite side wall portions of the belts, or a friction reducing powder or the like may be spread in the cutouts and on the projections.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of belt conveyer apparatus differing from the types described above.

While the invention has been illustrated and described as embodied in automatically releasable belt conveyer apparatus, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. Conveyer apparatus comprising, in combination, a bottom belt having a web of rectangular cross section provided with a top face and said belt having a pair of opposite side wall portions extending upwardly from said top face of said web, each having a top face located above said top face of said belt, and said opposite side wall portions respectively extending along opposite side edges of said belt and having a height considerably shorter than the length of said web; a top belt having a web of rectangular cross section provided with a bottom face located over and spaced from said top face of said web of said bottom belt and said top belt having a pair of opposite side wall portions extending downwardly from

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bottom face of said web of said top belt, each having a bottom face located beneath said bottom face of said top belt, and said opposite side wall portions of said top belt extending along opposite side edges thereof, said bottom faces of said opposite side wall portions of said top belt engaging and being located over said top faces of said opposite side wall portions of said bottom belt, and said belts defining an elongated chamber of substantially rectangular cross section when said side wall portions of said top belt engage said side wall portions of said bottom belt; and releasable lock means releasably holding said top and bottom belts together at said opposite side wall portions thereof and permitting lengthwise movement of said top and bottom belts with respect to each other.

2. Conveyer apparatus comprising, in combination, a bottom belt having a web of rectangular cross section provided with a top face and said belt having a pair of opposite side wall portions extending upwardly from said top face, each having a top face located above said top face of said web, and said opposite side wall portions respectively extending along opposite side edges of said belt; a top belt having a web of rectangular cross section provided with a bottom face located over and spaced from said top face of said web of said bottom belt and said top belt having a pair of opposite side wall portions extending downwardly from bottom face, each having a bottom face located beneath said bottom face of said web of said top belt, and said opposite side wall portions of said top belt extending along opposite side edges thereof, said bottom faces of said opposite side wall portions of said top belt engaging and being located over said top faces of said opposite side wall portions of said bottom belt, and said belts defining an elongated chamber of substantially rectangular cross section when said side wall portions of said top belt engage said side wall portions of said bottom belt; releasable lock means releasably holding said top and bottom belts together at said opposite side wall portions thereof and permitting lengthwise movement of said top and bottom belts with respect to each other, said releasable lock means comprising a pair of cutouts respectively forming part of said opposite side wall portions of one of said belts and a pair of projecting portions respectively forming part of said opposite side wall portions of the other of said belts and respectively extending into said cutouts; guide means for guiding said belts partly along the same path and partly along different paths; and means for automatically releasing said belts from each other by deforming said opposite side wall portions of at least said one belt for spreading said cutouts to automatically release said projecting portion without pulling from said cutouts when said belts begin to move along said different paths so that said belts are automatically released from each other when they begin to move along said different paths.

3. Conveyer apparatus comprising, in combination, a bottom belt having a web of rectangular cross section provided with a top face and said belt having a pair of opposite side wall portions extending upwardly from said top face, each having a top face located above said top face of said web, and said opposite side wall portions respectively extending along opposite side edges of said belt; a top belt having a web of rectangular cross section provided with a bottom face located over and spaced from said top face of said web of said bottom belt and said top belt having a pair of opposite side wall portions extending downwardly from bottom face, each having a bottom face located beneath said bottom face of said web of said top belt, and said opposite side wall portions of said top belt extending along opposite side edges thereof, said bottom faces of said opposite side wall portions of said top belt engaging and being located over said top faces of said opposite side wall portions of said bottom belt, and said belts defining an elongated chamber of substantially rectangular cross section when said

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side wall portions of said top belt engage said side wall portions of said bottom belt; releasable lock means releasably holding said top and bottom belts together at said opposite side wall portions thereof and permitting lengthwise movement of said top and bottom belts with respect to each other, said releasable lock means comprising a pair of cutouts respectively forming part of said opposite side wall portions of one of said belts and a pair of projecting portions respectively forming part of said opposite side wall portions of the other of said belts and respectively extending into said cutouts; guide means for guiding said belts partly along the same path and partly along different paths; and means for automatically releasing said belts from each other when they begin to move along said different paths and without pulling said projecting portions from said cutouts, respectively, and for automatically locking said belts together when they begin to move along said same path and without pushing said projecting portions into said cutouts, respectively, said means for automatically releasing and locking said belts comprising bevelled opposite side edge portions of said one belt located at the face thereof distant from said other belt and engaging a guide roll, forming part of said guide means, during turning movement about said guide roll to spread said cutouts so as to automatically release or engage said projecting portions of said other belt.

4. Conveyer apparatus comprising, in combination, a bottom belt having a web of rectangular cross section provided with a top face and said belt having a pair of opposite side wall portions extending upwardly from said top face, each having a top face located above said top face of said web, and said opposite side wall portions respectively extending along opposite side edges of said belt; a top belt having a web of rectangular cross section provided with a bottom face located over and spaced from said top face of said web of said bottom belt and said top belt having a pair of opposite side wall portions extending downwardly from bottom face, each having a bottom face located beneath said bottom face of said web of said top belt, and said opposite side wall portions of said top belt extending along opposite side edges thereof, said bottom faces of said opposite side wall portions of said top belt engaging and being located over said top faces of said opposite side wall portions of said bottom belt, and said belts defining an elongated chamber of substantially rectangular cross section when said side wall portions of said top belt engage said side wall portions of said bottom belt; releasable lock means releasably holding said top and bottom belts together at said opposite side wall portions thereof and permitting lengthwise movement of said top and bottom belts with respect to each other, said releasable lock means comprising a pair of cutouts respectively forming part of said opposite side wall portions of one of said belts and a pair of projecting portions respectively forming part of said opposite side wall portions of the other of said belts and respectively extending into said cutouts; guide means for guiding said belts partly along the same path and partly along different paths; and means for automatically releasing said belts from each other when they begin to move along said different paths and without pulling said projecting portions from said cutouts, respectively, and for automatically locking said belts together when they begin to move along said same path and without pushing said projecting portions into said cutouts, respectively, said means for automatically releasing and locking said belts comprising a pair of additional projecting portions extending from the face of said one belt distant from said other belt, being located opposite said cutouts of said one belt, and engaging a guide roll forming part of said guide means for spreading said cutouts during turning of said one belt about said guide roll.

5. Conveyer apparatus comprising, in combination, a

bottom belt made of an elastic material and having a top face and a pair of opposite side wall portions extending upwardly from said top face, each having a top face located above said top face of said belt, and said opposite side wall portions respectively extending along opposite side edges of said belt; a top belt made of an elastic material and having a bottom face located over and spaced from said top face of said bottom belt and having a pair of opposite side wall portions extending downwardly from bottom face, each having a bottom face located beneath said bottom face of said top belt, and said opposite side wall portions of said top belt extending along opposite side edges thereof, said bottom faces of said opposite side wall portions of said top belt engaging and being located over said top faces of said opposite side wall portions of said bottom belt; releasable lock means releasably holding said top and bottom belts together at said opposite side wall portions thereof and permitting lengthwise movement of said top and bottom belts with respect to each other, said releasable lock means comprising a pair of cutouts respectively forming part of said opposite side wall portions of one of said belts and a pair of projecting portions respectively forming part of said opposite side wall portions of the other of said belts and respectively extending into said cutouts; guide means for guiding said belts partly along the same path and partly along different paths; and means for automatically releasing said belts from each other when they begin to move along said different paths and for automatically locking said belts together when they begin

to move along said same path, said means for automatically releasing and locking said belts comprising a pair of annular projections extending from the outer surface of a guide roll forming part of said guide means and engaging said one belt, said annular projections being located opposite said cutouts of said one belt to spread said cutouts during turning said one belt about said guide roll.

6. Conveyer apparatus comprising, in combination, a pair of trough-shaped belts each defining a channel of substantially rectangular cross section and each having inner and outer faces and being arranged with said inner faces thereof confronting each other, one of said belts having opposite side wall portions engaging opposite side wall portions of the other of said belts, and said opposite side wall portions of said one belt being formed with elongated cutouts respectively extending along the same, said opposite side wall portions of said other belt having undercut outer side faces and extending into said cutouts, respectively, said one belt having opposite bevelled side edge portions at its outer face adapted to engage a guide roll to spread said cutouts of said one belt to release or receive said opposite side wall portions of said other belt.

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