

11 MAR 2000

VARIABLE WIDTH CONVEYOR**Field of the Invention**

The present invention relates to conveyors to convey items such as circuit
5 board assemblies. In particular, the present invention relates to, but is not necessarily
limited by, a variable width conveyor having at least two tracks and a method for
providing such a conveyor.

Background

10 Circuit board assemblies are typically assembled along assembly lines using
conveyors. Such conveyors typically have two or more parallel tracks. For circuit
board assemblies having different board widths, the width between tracks of a
conveyor can be adjusted to accommodate the different board widths.

Adjusting the width between tracks of a conveyor is known. For example, US
15 Patent 4,631,812 issued to Young on December 30th 1986 describes a conveyor in
which the width is adjusted by movement of a carriage plate 82 supporting
movement of a movable rail 70.

However, conventional conveyors, such as the conveyor described in
US Patent 4,631,812, do not provide for easy pivotal adjustments of movable
20 rails or tracks when assembled. Consequently, any track that is not substantially
parallel to other tracks may therefore cause the width between tracks to
undesirably vary. Although precise alignment to ensure that the tracks are
substantially parallel can be achieved initially, movement of the tracks may
cause such tracks to be laterally offset and therefore not substantially parallel
25 after heavy use. To readjust the tracks and keep them substantially parallel may
require a change of conveyor parts. As is known in the art, such a change can
be costly, especially when the conveyor parts have to be specially tooled or
purchased. In addition, undesired pivoting of a track during use can be a
problem as such pivoting can cause the width to also undesirably vary.

30 Therefore, a need exists for a conveyor with tracks that can be pivotally
adjusted to alleviate tedious readjustments to the tracks or costly change of
parts.

Summary

In accordance with one aspect of the invention, there is disclosed a conveyor having a variable width between at least two tracks, the conveyor includes:

a guide;

5 a carrier member slidably mounted to the guide, the guide being coupled to the tracks for movement of the carrier member in a transverse direction relative to a conveying direction of the conveyor;

means for mounting at least one movable track of the tracks to the carrier member;

10 and

means for aligning the tracks relative to each other and thereby position the movable track substantially parallel to at least one other track of the tracks for adjustments to the variable width.

15 Preferably, the mounting means can include means for attaching the movable track to at least two track mounting members, the track mounting members being disposed on opposite sides of the carrier member.

Suitably, the attaching means can include means for positioning at least one
20 guide member against at least one guide track of the guide, the guide track having at least some portion abutting the track mounting members during the movement.

Preferably, the positioning means can include means for coupling the guide member to a set screw, the set screw being mounted to a respective one of the track
25 mounting members.

Suitably, the aligning means can include means for adjusting the guide member to thereby pivot the movable track relative to the other track.

30 Preferably, the adjusting means can include means for setting the set screw to thereby vary contact pressure of the guide member against the guide track.

Suitably, the mounting means can include means for coupling the carrier member to a lead screw, the lead screw being arranged to effect the movement in response to a movement force.

- 5 Preferably, the coupling means can include means for affixing at least one lead screw nut to the carrier member, the at least one lead screw nut being arranged to coact with the lead screw for the adjustments to the variable width.

- 10 Suitably, the mounting means can include means for coupling the carrier member to a chain, the chain being arranged to effect the movement in response to a movement force.

- 15 Preferably, the mounting means can include means for coupling the carrier member to a drive belt, the drive belt being arranged to effect the movement in response to a movement force.

In accordance with another aspect of the invention, there is disclosed a method for providing a conveyor having a variable width between at least two tracks, the method including the steps of:

- 20 mounting at least one movable track of the tracks to a carrier member, the carrier member being slidably mounted to a guide, the guide being coupled to the tracks for movement of the carrier member in a transverse direction relative to a conveying direction of the conveyor;
- and
- 25 aligning the tracks relative to each other and thereby position the movable track substantially parallel to at least one other track of the tracks for adjustments to the variable width.

- 30 Preferably, the mounting step can include the step of attaching the movable track to at least two track mounting members, the track mounting members being disposed on opposite sides of the carrier member.

Suitably, the attaching step can include the step of positioning at least one guide member against at least one guide track of the guide, the guide track having at least some portion abutting the track mounting members during the movement.

- 5 Preferably, the positioning step can include the step of coupling the guide member to a set screw, the set screw being mounted to a respective one of the track mounting members.

- 10 Suitably, the aligning step can include the step of adjusting the guide member to thereby pivot the movable track relative to the other track.

Preferably, the adjusting step can include the step of setting the set screw to thereby vary contact pressure of the guide member against the guide track.

- 15 Suitably, the mounting step can include the step of coupling the carrier member to a lead screw, the lead screw being arranged to effect the movement in response to a movement force.

- 20 Preferably, the coupling step can include the step of affixing at least one lead screw nut to the carrier member, the at least one lead screw nut being arranged to coact with the lead screw for the adjustments to the variable width.

- 25 Suitably, the mounting step can include the step of coupling the carrier member to a chain, the chain being arranged to effect the movement in response to a movement force.

- 30 Preferably, the mounting step can include the step of coupling the carrier member to a drive belt, the drive belt being arranged to effect the movement in response to a movement force.

Brief Description of the Drawings

A small number of preferred embodiments of the invention is described hereinafter with reference to the drawings, by way of example only, in which:

5 FIG. 1 is an isometric view that illustrates part of a conveyor having two tracks and a guide in accordance with a first preferred embodiment of the invention;

FIG. 2 is a plan view of the conveyor of FIG. 1;

10 FIG. 3 is an exploded view of the guide and a carrier member for the conveyor of FIG. 1;

FIG. 4 is a cross-sectional view of the carrier member and the guide in the direction of line A-A' of FIG. 1;

15

FIG. 5 is a flow diagram of a method for providing the conveyor of FIG. 1;

Fig. 6 illustrates a first alternate preferred embodiment of the guide of FIG. 1;
and

20

Fig. 7 illustrates a second alternate preferred embodiment of the guide of FIG. 1.

Detailed Description

25 A conveyor having a variable width between at least two tracks and a method for providing such a conveyor are described. In the following description of the preferred embodiments of the invention, numerous details are described in order to provide a more thorough description of these embodiments. It will be apparent to one skilled in the art, however, that the invention may be practiced without some of such
30 details. In other instances, well-known details have not been described at length so as not to obscure the invention.

The advantages of the embodiments of the invention are manifold. One advantage is that desired pivotal adjustments of the conveyor can be done without having to dismantle or disassemble the conveyor or specific parts thereof.

5 Another advantage of the invention is that undesired pivotal movement of a movable track of the conveyor is alleviated. This pivotal movement typically occurs during movement of the movable track to adjust the conveyor's variable width.

Referring now to FIG. 1, an isometric view of part of a conveyor 10 having two tracks 12,14 and a guide 16 in accordance with a preferred embodiment of the invention is illustrated. Track 12 is mounted to a carrier member 18 and is movable with respect to track 14. The carrier member 18 is slidably mounted to the guide 16. The guide 16 is coupled to the tracks 12,14 for movement of the carrier member 18 in a transverse direction 20. This transverse direction 20 is relative to a conveying direction 22 of the conveyor 10. Also shown in FIG. 1 is a tip of a lead screw 24 projecting out from a front end plate 26. The lead screw 24 effects movement of the carrier member 18 in response to a movement force that is explained below.

A plan view of the conveyor 10, as illustrated in FIG. 2, shows a width 28 between the tracks 12,14. This width 28 is variable depending on position of track 12 with respect to track 14. Relative positions of two track mounting members 30,32 of the carrier member 18 and the lead screw 24 are indicated.

Referring now to FIG. 3, an exploded view of the guide 16 and the carrier member 18 is shown. The track mounting members 30,32 are integrally disposed on opposite sides of the carrier member 18. On a top surface of each of the track mounting members 30,32 are mount openings 34. These mount openings 34 can be implemented with, for example, screw threads to provide means for attaching the track 12 to the carrier member 18.

30

The carrier member 18 is slidably mounted to the guide 16 by means of four guide members 36. These guide members 36 are positioned against two guide tracks

38,40 on the guide 16. The guide members 36 can be implemented with materials such as Nylon or Delrin®. As is known in the art, such materials are durable and do not cause much friction during travel of the carrier member 18 along the guide tracks 38,40.

5

Coupling to the guide members 36 are sets screws 42 mounted to respective track mounting members 30,32. The set screws 42 coact with respective guide members 36 to position the carrier member 18 for movement along the guide 16. When slidably mounted to the guide 16, at least some portion of each of the guide 10 tracks 38,40 abut the track mounting members 30,32 during such movement.

FIG. 3 also shows a lead screw nut 44 affixed to the carrier member 18 along a longitudinal axis 46 of the guide 16. The lead screw nut 44 coacts with the lead screw 24 to provide movement of the carrier member 18 in response to a movement 15 force. The movement force, applied by a user or other electromechanical or motor means onto a rotating member 54, rotates the lead screw 24. Rotation of the lead screw 24 translates the movement force to linear motion of the carrier member 18 along the transverse direction 20.

20 In addition to the front end plate 26, the lead screw 24 couples to a back end plate 48. These two end plates 26,48 attaches to opposite ends 50,52 of the guide 16 and also couples the guide 16 to the tracks 12,14. FIG. 3 also shows a bottom cover 56 for the guide 16. When fully assembled, the guide 16, the end plates 26,48 and the bottom cover 56 substantially encloses the lead screw 24.

25

In setting the set screws 42 to thereby vary contact pressure of the guide members 36 against the guide tracks 38,40, the track 12 can be pivoted relative to the track 14. Pivoting as such enables the track 12 to be laterally aligned to a position in which the track 12 is substantially parallel to the track 14. Details of the set screws 30 42 coupling to the guide members 36 can be seen in a cross-sectional view of the carrier member 18 and the guide 16 in the direction of line A-A' of FIG. 1.

Advantageously, the preferred embodiment of the invention alleviates undesired pivotal movement of the track 12. This is because the carrier member 18 is slidably mounted to the guide 16 using the guide members 36 that are spaced apart as far as possible along the guide 16 without limiting a desired range of the variable width. Furthermore, desired pivotal adjustments of the track 12 when setting up conveyor 10 can be done using the set screws 42 without having to dismantle or disassemble the conveyor 10 or specific parts thereof.

Referring now to FIG. 5, a flow diagram of a method 60 for providing conveyor 10 is shown. Beginning with step 62, the carrier member 18 is assembled by affixing the lead screw nut 44 so that the lead screw 24 can be coupled to the carrier member 18. In addition, assembling step 62 includes coupling the guide members 36 to the set screws 42 of respective track mounting members 30,32. When thus assembled, method 60 proceeds to step 64 in which the carrier member 18 is mounted to the guide 16 using the end plates 26,48 and positioning the guide members 36 against respective guide tracks 38,40. With the carrier member 18 thus mounted to the guide 16, this assembly is then mounted to the tracks 12,14 of the conveyor 10 at step 66. In step 66, the track 12 is mounted to the carrier member 18 using the mount openings 34 on the track mounting members 30,32. For mount openings 34 that are screw threads, then screws are used to mount the track 12 to the carrier member 18. Finally, at least one of the guide members 36 is adjusted to pivot the track 12. Such pivoting is achieved by setting the set screw(s) 42 associated with the guide members 36 being adjusted. Setting the set screw(s) 42 vary contact pressure of the guide members 36 against respective guide tracks 38,40.

25

The above embodiment is described with reference to the drawings as illustrated with FIGs. 1 to 5. For alternate embodiments of the guide 16 with reference to FIG. 6 and FIG. 7, it is to be noted that reference numbers for elements similar to those illustrated in FIGs. 1 to 5 are retained to simplify description of the alternate embodiments.

30

Referring now to Fig. 6, a first alternate preferred embodiment 70 of the guide 16 for the conveyor 10 is illustrated. In this embodiment 70, a chain 72 is provided to translate a movement force acting on the carrier member 18. The chain 72 is mounted to two sprockets 74,76 and coupled to the carrier member 18 by a chain bracket 78. One of the sprockets 74,76 can be coupled to, for example, an electromechanical drive (not shown) to provide the movement force when required. Coupling of the electromechanical drive to a sprocket 74,76 can be effected by methods well known in the art and therefore not shown in FIG. 6.

10 A second alternate preferred embodiment 80 of the guide 16 for the conveyor 10 is illustrated in FIG. 7. In this embodiment 80, a drive belt 82 is mounted to two belt wheels 84,86 and coupled to the carrier member 18 by a drive bracket 88. One of the wheels 84,86 can be coupled to, for example, an electromechanical drive (not shown) to provide the movement force when required. Coupling of the
15 electromechanical drive to a wheel 84,86 can be effected by methods well known in the art and therefore not shown in FIG. 7.

 In the foregoing description, a conveyor having a variable width between at least two tracks and a method for providing such a conveyor are disclosed. Only a
20 small number of embodiments are described. However, it will be apparent to one skilled in the art in view of these embodiments that numerous changes and/or modifications can be made without departing from the scope and spirit of the invention. It is to be understood that the present invention should not be restricted to the small number of preferred embodiments specifically described.

Claims

1. A conveyor having a variable width between at least two tracks, said conveyor includes:
 - a guide;
 - 5 a carrier member slidably mounted to said guide, said guide being coupled to said tracks for movement of said carrier member in a transverse direction relative to a conveying direction of said conveyor;
 - means for mounting at least one movable track of said tracks to said carrier member,
 - 10 and
 - means for aligning said tracks relative to each other and thereby position said movable track substantially parallel to at least one other track of said tracks for adjustments to said variable width.
- 15 2. The conveyor as claimed in Claim 1, wherein said mounting means includes means for attaching said movable track to at least two track mounting members, said track mounting members being disposed on opposite sides of said carrier member.
- 20 3. The conveyor as claimed in Claim 1, wherein said attaching means includes means for positioning at least one guide member against at least one guide track of said guide, said guide track having at least some portion abutting said track mounting members during said movement.
- 25 4. The conveyor as claimed in Claim 3, wherein said positioning means includes means for coupling said guide member to a set screw, said set screw being mounted to a respective one of said track mounting members.
- 30 5. The conveyor as claimed in Claim 4, wherein said aligning means includes means for adjusting said guide member to thereby pivot said movable track relative to said other track.



6. The conveyor as claimed in Claim 5, wherein said adjusting means includes means for setting said set screw to thereby vary contact pressure of said guide member against said guide track.
- 5 7. The conveyor as claimed in Claim 1, wherein said mounting means includes means for coupling said carrier member to a lead screw, said lead screw being arranged to effect said movement in response to a movement force.
- 10 8. The conveyor as claimed in Claim 7, wherein said coupling means includes means for affixing at least one lead screw nut to said carrier member, said at least one lead screw nut being arranged to coact with said lead screw for said adjustments to said variable width.
- 15 9. The conveyor as claimed in Claim 1, wherein said mounting means includes means for coupling said carrier member to a chain, said chain being arranged to effect said movement in response to a movement force.
- 20 10. The conveyor as claimed in Claim 1, wherein said mounting means includes means for coupling said carrier member to a drive belt, said drive belt being arranged to effect said movement in response to a movement force.



11. A method for providing a conveyor having a variable width between at least two tracks, said method including the steps of:
- 5 mounting at least one movable track of said tracks to a carrier member, said carrier member being slidably mounted to a guide, said guide being coupled to said tracks for movement of said carrier member in a transverse direction relative to a conveying direction of said conveyor;
- and
- 10 aligning said tracks relative to each other and thereby position said movable track substantially parallel to at least one other track of said tracks for adjustments to said variable width.
12. The method as claimed in Claim 11, wherein said mounting step includes the step of attaching said movable track to at least two track mounting members,
- 15 said track mounting members being disposed on opposite sides of said carrier member.
13. The method as claimed in Claim 12, wherein said attaching step includes the step of positioning at least one guide member against at least one guide track
- 20 of said guide, said guide track having at least some portion abutting said track mounting members during said movement.
14. The method as claimed in Claim 13, wherein said positioning step includes the step of coupling said guide member to a set screw, said set screw being
- 25 mounted to a respective one of said track mounting members.
15. The method as claimed in Claim 14, wherein said aligning step includes the step of adjusting said guide member to thereby pivot said movable track relative to said other track.
- 30



16. The method as claimed in Claim 15, wherein said adjusting step includes the step of setting said set screw to thereby vary contact pressure of said guide member against said guide track.
- 5 17. The method as claimed in Claim 11, wherein said mounting step includes the step of coupling said carrier member to a lead screw, said lead screw being arranged to effect said movement in response to a movement force.
- 10 18. The method as claimed in Claim 17, wherein said coupling step includes the step of affixing at least one lead screw nut to said carrier member, said at least one lead screw nut being arranged to coact with said lead screw for said adjustments to said variable width.
- 15 19. The method as claimed in Claim 11, wherein said mounting step includes the step of coupling said carrier member to a chain, said chain being arranged to effect said movement in response to a movement force.
- 20 20. The method as claimed in Claim 11, wherein said mounting step includes the step of coupling said carrier member to a drive belt, said drive belt being arranged to effect said movement in response to a movement force.

