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(54) Title of the Invention: **Flexible conveyor**
Abstract Title: **Extendable conveyor**

(57) A flexible or extendable conveyor has opposed extendible sides made of pivotally connected arms 21a, 21b, with one or more of the arms 21a, 21b also being slidably engaged with a guide element 22. The conveyor carries multiple rollers 12 which may be driven from motors. The conveyor may also feature support legs (13, fig. 1), and wheels (16, fig.3).

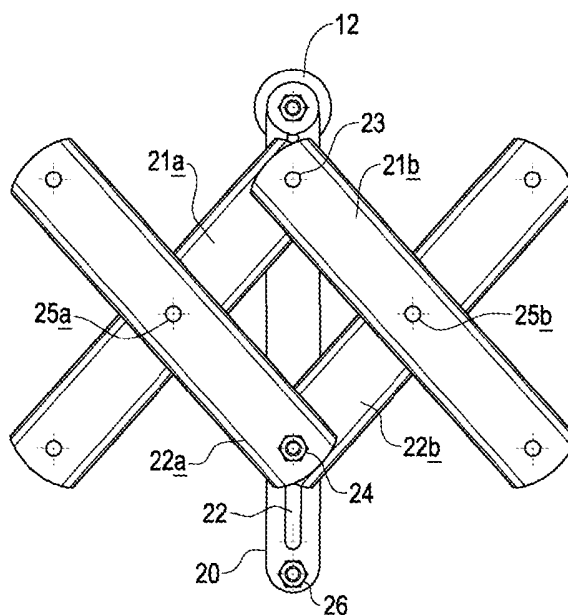


FIG. 4

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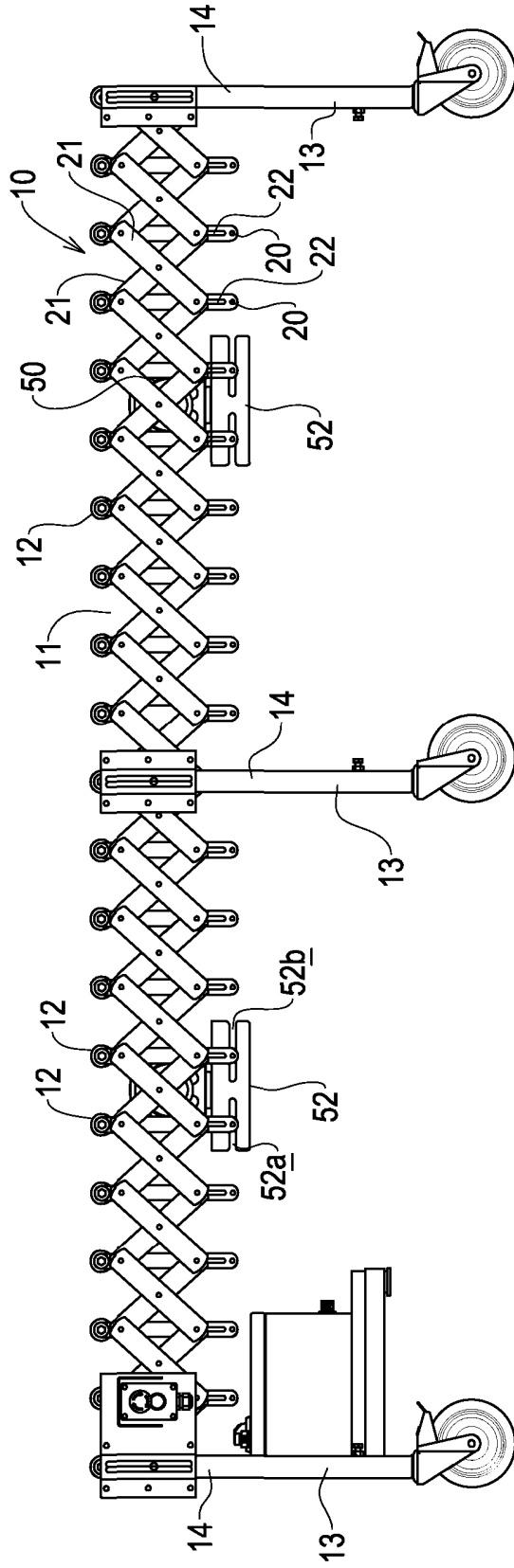


FIG. 1

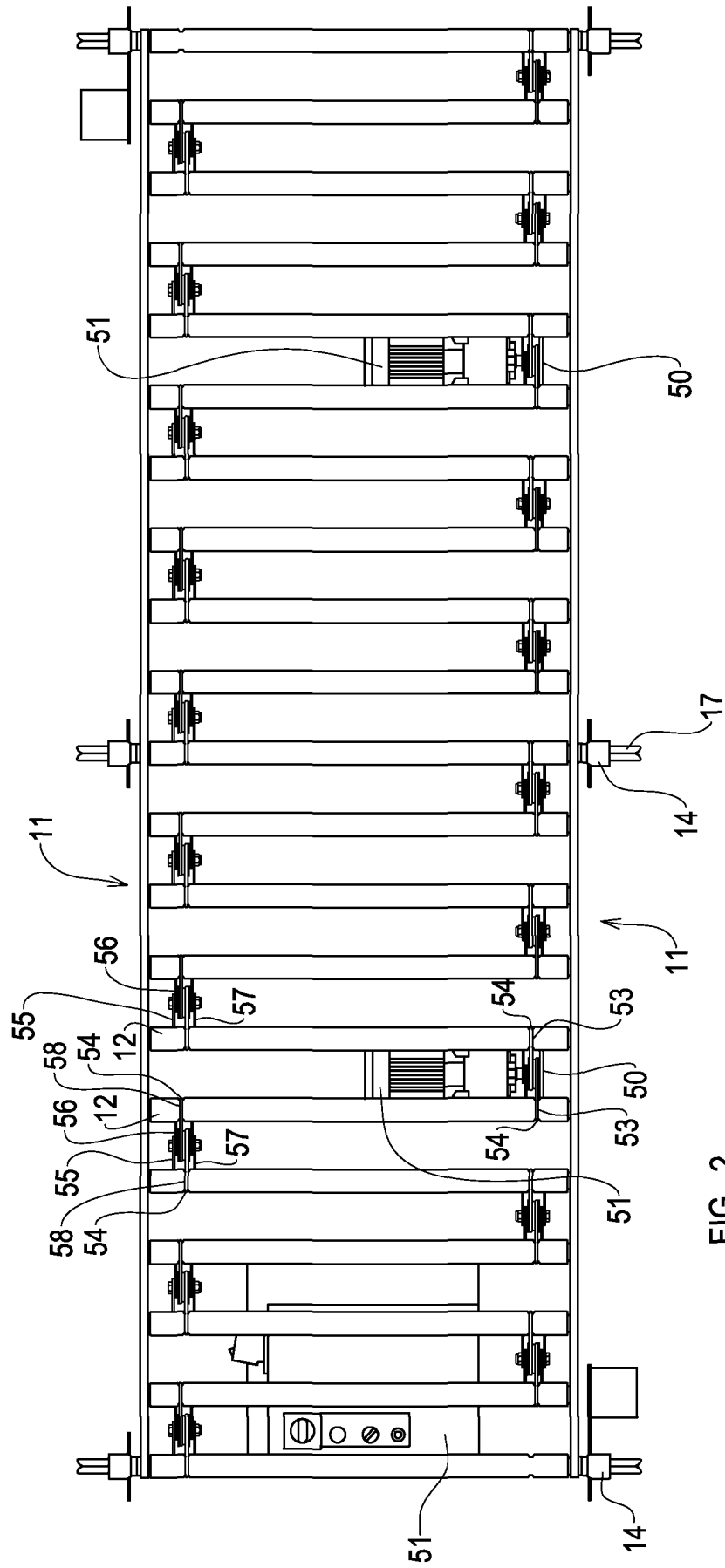


FIG. 2

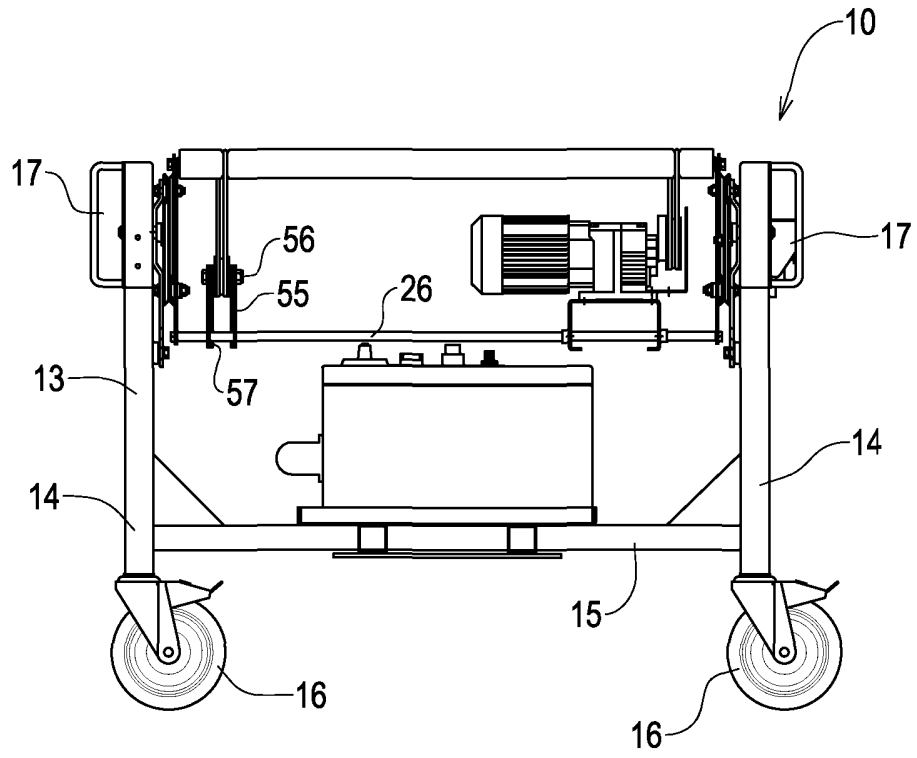


FIG. 3

06 05 11

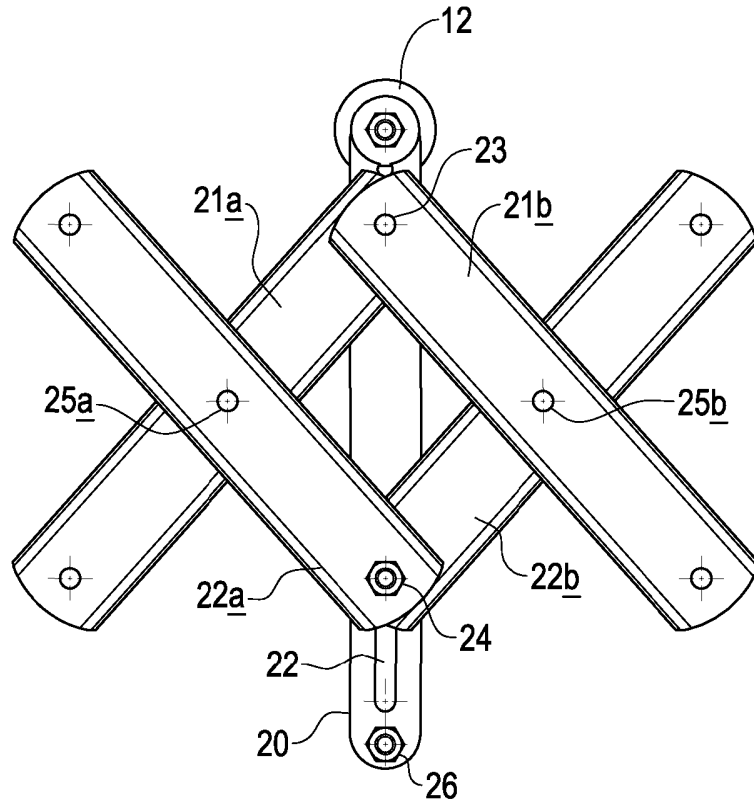


FIG. 4

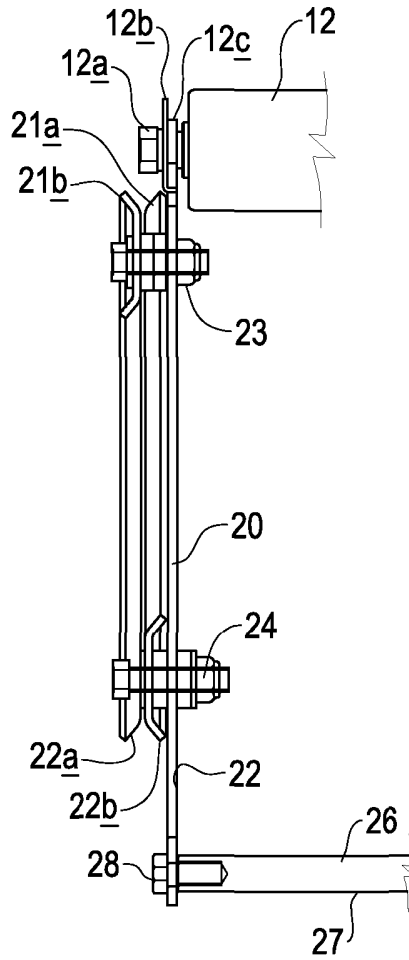


FIG. 5

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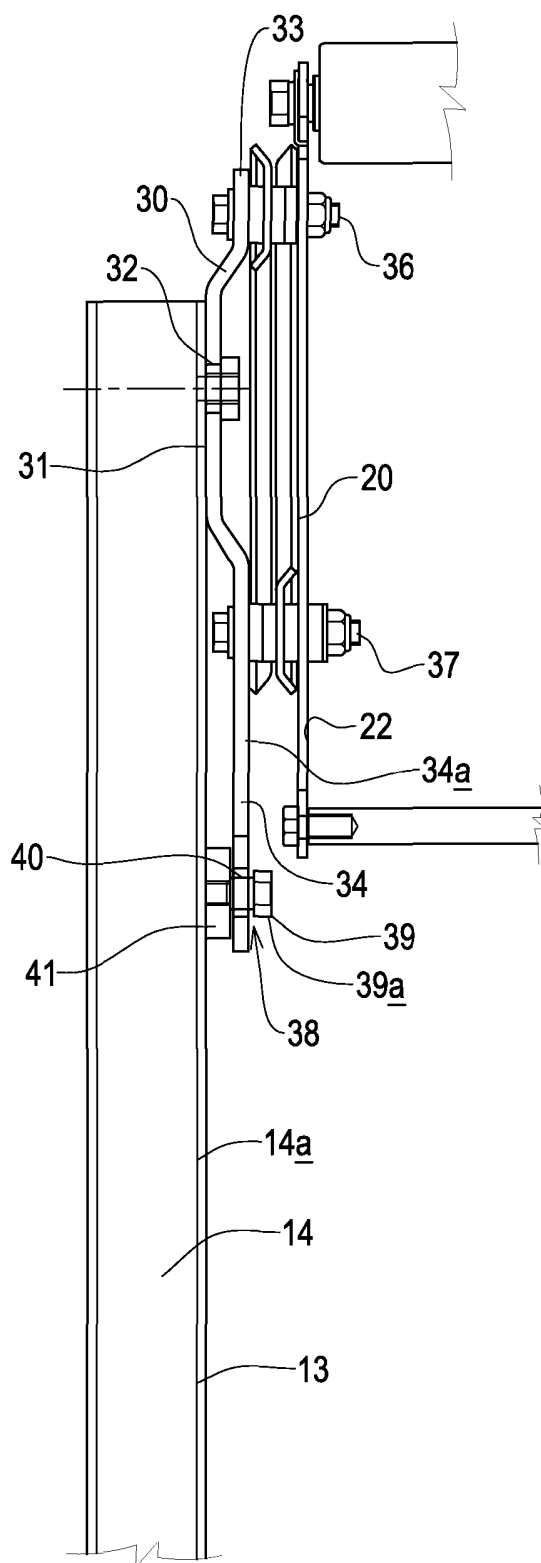


FIG. 6

FIG. 7a

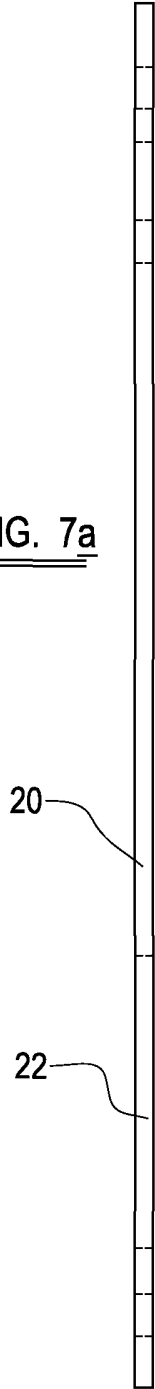
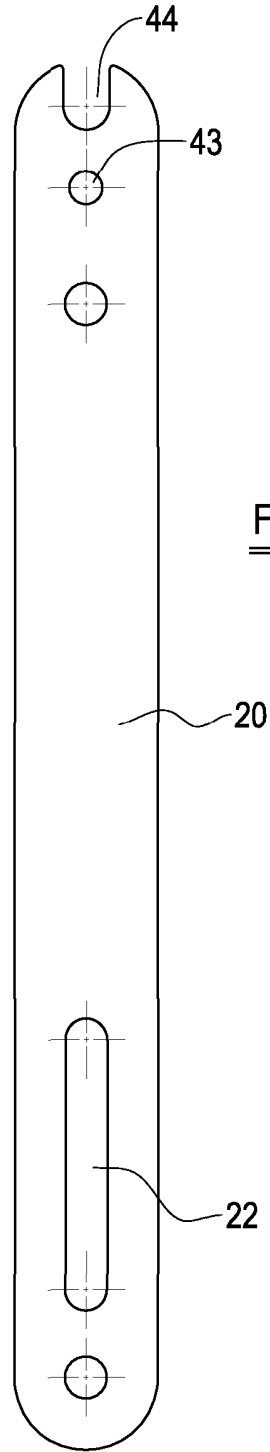


FIG. 7b



06 05 11

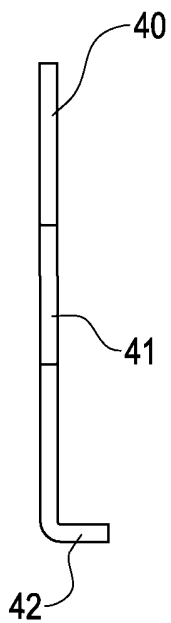


FIG. 8a

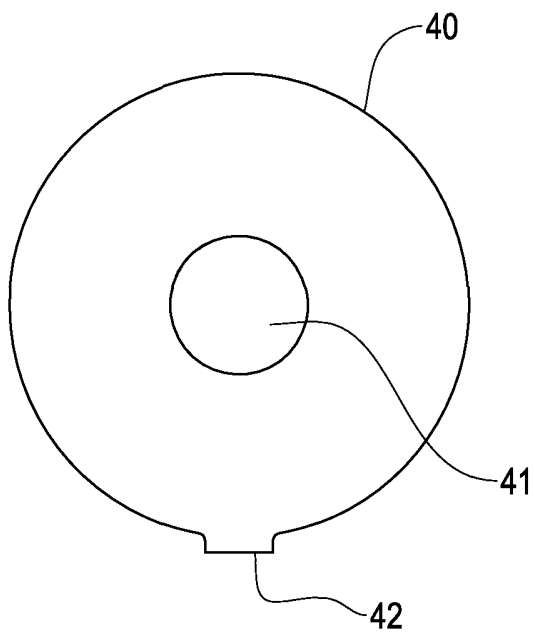


FIG. 8b

Title: Flexible Conveyor

5 Description of Invention

This invention relates to flexible conveyors, and more specifically flexible roller conveyors.

10 Extendible flexible roller conveyors are generally known to provide temporary or adaptable conveyors in circumstances where a permanent conveyor is not required or is undesirable. In general, known flexible roller conveyors comprise a scissors or "lazy tong" mechanism to provide opposed sides of the conveyor extending between wheeled supports, and rollers are supported
15 between the opposed sides of the flexible conveyor.

A problem with such known conveyors is that due to the large number of moving parts, it is possible for the conveyor to fail after a relatively small number of extend-contract operating cycles. Another problem is supplying
20 drive to the rollers in such a way that an appropriate level of drive is provided whatever the degree of extension of the conveyor. Conventionally, the drive is provided with a three-phase electric motor requiring an appropriate power supply. Finally, it is necessary for such conveyors to be robust to cope with mishandling within a working environment.

25

According to a first aspect of the invention, we provide a flexible conveyor comprising opposed extendible sides, the extendible sides supporting a plurality of rollers therebetween, each of the opposed extendible sides comprising a plurality of guide elements, the guide elements having a
30 connection part thereof to engage a roller, each guide element being connected to an opposing guide element by a rigid connector, each guide element being connected to an adjacent guide element by a pair of arms one

of the arms being pivotally attached at an end part of to the guide element, the other of the arms being slidably engaged with the guide element.

The opposed extendible sides may extend between supports.

5

A guide element of the opposed extendible side may be connected to the support through a support bracket, the support bracket having a first connection fixedly connected to the support, and a second floating connection at a lower point whereby the support bracket is submitted to flex irrelative to
10 the support.

The support bracket may have a guide to slidably engage with a guide element.

15 The supports may be provided with wheels at a lower part thereof.

At least one of the rollers may be driven.

20 The driven roller may be driven by a motor supported on the rigid connectors extending between a plurality of the guide elements.

The motor may be mounted on a motor support bracket, the motor support bracket having opposed recesses to engage the rigid connectors.

25 A plurality of the rollers may be driveably connected to the driven roller.

The rollers may be drivingly connected via drive belts.

The drive belts may engage pulley wheels supported on the rigid connectors.

30

The motor may comprise a 24 VDC motor.

An end part of at least one of the rollers may be connected to a locking element, the locking element being shaped to engage the guide element when the roller is supported by the guide element, the locking element being operable to resist this disengagement of the roller and the guide element.

The locking element may comprise an aperture to receive an end part of the roller and a projection to engage a recess on the guide element.

10 Embodiments of the invention will now be described by way of example only with reference to the accompanying drawings, wherein;

Figure 1 is a side view of a roller conveyor embodying the present invention,

15 Figure 2 is a plan view of the flexible conveyor of Figure 1,

Figure 3 is an end view of the flexible conveyor of Figure 1,

Figure 4 is a view of part of the conveyor of Figure 1 in more detail,

20 Figure 5 is a side view of the part of the conveyor of Figure 4,

Figure 6 is a side view in more detail of part of the conveyor of Figure 1,

25 Figure 7A shows a side view of a guide element 20, and

Figure 7B is a plan view of the guide element 20,

Figure 8A is an end view of a locking element of the conveyor of Figure 1, and

30 Figure 8B is a side view of the locking element of Figure 8A.

Referring now to Figures 1 to 3, a flexible conveyor is shown generally at 10 having opposed extendible sides generally shown at 11. A plurality of rollers 12 are supported between the opposed extendible sides 11 for rotational movement to convey a package supported on the rollers 12. The sides 11 are supported at each end and at one or more intervals by supports 13. In this example, the supports 13 each comprises a pair of uprights 14 connected by a cross-bar 15 and provided with wheels 16 to enable the conveyor 10 to be moved to a desired position. Handles 17 are provided at an upper part of the uprights 14 to provide a part of the conveyor 10 which may be safely grasped to enable the conveyor to be moved, extended and contracted as appropriate.

Referring now to Figures 1 to 7b, the sides 11 comprise a plurality of generally vertically extending guide elements 20. Each adjacent pair of guide elements 20 is interconnected by a pair of arms 21. At a lower part of the guide elements 20, a slideable connection to engage an end of an arm 21 is provided. In this example, the guide comprises an elongate slot 22. As best seen in Figure 4, arms 21a, 21b are pivotally connected to the guide element 20 through a pivot 23 at an upper part thereof. Arms 22a, 22b are pivotally connected to one another by a pivot 24 which is in sliding engagement with the slot 22. In the present example, a bolt 25 passes through arms 22a and 22b and through an elongate slot 22 such that arms 22a, 22b are in sliding engagement with the guide element 20. Arms 21a and 22a are pivotally connected at their mutual midpoint as shown at 25a, and arms 21b, 22b are pivotally connected at their mutual midpoint as shown at 25b. At a lower part of the guide elements 20, a rigid connector 26 is provided which rigidly connects the guide element 20 in one side 11 with the opposed guide element 20 in the opposite side 11. Accordingly, it will be seen that opposing guide elements 20 are interconnected at the upper part by a roller 12 supported by each guide element 20 and at their lower part by a rigid connector 26. As seen in Figures 5 and 6, in the present example the rigid connector 26

comprises a rod 27 attached to the guide element 20 by a bolt 28, but it will be apparent that any other appropriate rigid connection will be provided as desired.

5 Consequently, when the conveyor 10 is extended or contracted, the spacing between guide elements 20 will vary as arms 21a and 21b pivot relative to guide member 20 as seen in Figure 4 while arms 22a, 22b pivot relative to one another and also move by sliding relative to the guide member 20 in slot 22. Of course, the upper end of arms 22a and 22b are pivotally connected to
10 adjacent guide members 20, while the lower ends of arms 21a, 21b are similarly in sliding engagement with adjacent guide members 20. Consequently, the conveyor 10 is extendible and contractible in a simple manner, whilst the spacing between the rigid connector 26 and the roller 12 remains constant and the height of the rollers 12 similarly remains constant.

15

The connection between the extendible side part 11 and the upright 14 of the support 13 is shown in Figure 6. A support bracket is shown at 30 having a first section 31 which sits flush against an inner face 14a of the upright 14 and is rigidly connected thereto by a bolt 32. The bracket 30 further has a second
20 upper end section 33 which is displaced inwardly of the conveyor 10 relative to the first section 11. The bracket 30 also has a third, lower section 34 which similarly is inwardly directed of the conveyor 10 relative to the first portion 31. A guide element 20 is connected to the bracket 30 by an upper bolt 36 which passes through the second section 33 of the bracket 31, arms 21a and 21b
25 and the guide element 20. This provides a fixed pivotal connection between the bracket 31, the arms 21a, 21b and guide element 20 in like manner to the connection shown in Figure 4. Similarly, the third section 34 is connected in a slideable manner to the guide element 20 by a bolt 37 which passes through the third section 34 of the bracket 30, arms 22a and 22b and the elongate slot
30 22 of the guide element 20. The third section 34 of the bracket 30 has an elongate slot 34a in which bolt 37 is moveable. Thus, it will be apparent that

the guide element 20 and arms 21a, 21b, 22a, 22b connected to the upright 14 are moveable in exactly the same manner as the arms of the guide element of Figures 4 and 5.

- 5 At an end part of the third section 34 of the bracket 30 a floating connection to the upright 14 is shown generally at 38. A bolt 39 is connected to the upright 14 and passes through an unthreaded aperture 40 in the third section 34 of the bracket 30. The spacing of the third section 34 of the bracket 30 and the inner face 14a of the upright 14 is maintained by a washer 41. The third section 34
10 of the bracket 30 is thus permitted to flex in a general direction inwardly of the conveyor 10, its range of movement being constrained by a head 39a of the bolt 39.

To resist disengagement of a roller 12 from the upper part of a guide element
15 20, each end part is provided by a locking element as shown at 40 in Figures 8a and 8b. The locking element 40 comprises an aperture to receive an end part of a roller 12, and an element to engage the guide member 20, in the present example a tab 42. An appropriate recess is provided at 43 in the guide element 20. To provide support for a roller, each roller 12 is provided
20 with an end part 12a comprising a head 12b and a shank 12c which is engaged with rolling bearings within the roller 12. The shank 12c is received in a suitable recess 44 provided in the upper part of the guide element 20 whilst the head 12b engages the outer face of the guide element 20 to stop lateral movement of the roller 12. In the present example, locking element 40
25 is received over the shank 12c and is located between the head 12b and the upper part of the guide element 20 such that the tab 42 is received in aperture 43. It will be apparent that the engagement of tab 42 and aperture 43 is such that any upward force on the roller 12, which would otherwise act to disengage the connector 12a from the guide element 20, will be resisted or prevented by
30 the locking element 40.

To provide drive to the rollers 12 the conveyor 10 is provided with one or more motors generally shown at 50. In the present example, the motors 50 comprise 24VDC motors and an appropriate power supply and controller is shown at 51. Each motor 50 is supported on a motor bracket generally shown at 52 which is supported on a pair of adjacent rigid connectors 26. As best seen in Figure 1, the bracket 52 has a pair of sideways extending slots 52a, 52b of differing lengths. The lengths of the slots 52a, 52b are selected such that when the conveyor 10 is extended sufficiently, the bracket 52 may be engaged with the rigid connectors 26 by first engaging the relatively long slot 52b with a first rigid connector and then moving the bracket 52 sideways sufficiently that the relatively short slot 52a can then be engaged with the adjacent rigid connector 26. It will be apparent that when the conveyor is extended or contracted, the slots 52a, 52b will permit movement of the corresponding rigid connectors 26 whilst remaining engaged with the rigid connectors 26. As seen in plan view in Figure 2, the motor 50 drives adjacent rollers 12 via flexible elastic belts 53 which are received in corresponding grooves 54 in the rollers 12. It will be apparent that the tension in the drive belts 53 will act to maintain the motor 50 in a position midway between the adjacent rollers 12, and accordingly serve to maintain the bracket 52 in engagement with the rigid connectors 26.

To supply drive from the motor-driven rollers to further adjacent rollers, an appropriate pulley mechanism is shown at 55 in Figures 1 and 3. A pulley wheel 56 is held in place by arms 57 which hook over adjacent rigid connectors 26. Belts 58 pass around the pulley wheel 56 and engage corresponding grooves 54 in the rollers 12. Adjacent pairs of rollers 12 are connected in this manner at alternating ends of the rollers 12 as best seen in plan view in Figure 2, thus passing drive from the motor 50 to some or all of the rollers 12 of the conveyor 10. Although in Figures 1 and 2 the rollers 12 are all driven by both motors 50, it will be apparent that, for example, zone control may be provided by having separate zones or groups of rollers 12 each

driveable by independently controllable motors 50. A zero end pressure flexible roller conveyor may be thus provided, or other control methods provided as desirable.

5 Such a flexible roller conveyor has been found to be advantageous over known flexible conveyors for a number of reasons. The conveyor as a whole has been found to be considerably less prone to wear and failure as a result of the tolerance to movement and misalignment provided by the floating part of the support bracket 30. The configuration of the rollers 12, guide elements 20
10 and rigid connectors 26 ensures that the roller 12 are at a constant height and the rigid connectors 26 are similarly at a constant height and constant spacing from the rollers 12. This additionally enables the motors 50 to be safely and reliably supported on the conveyor without the disadvantages of known configurations. The provision of a 24VDC driving motor removes the need for
15 complicated and potentially dangerous power supplies and the provision of a locking mechanism prevents the accidental disengagement of the rollers 12 from the guide elements 20. Accordingly, these improvements provide a more robust and reliable flexible roller conveyor.

20 When used in this specification and claims, the terms "comprises" and "comprising" and variations thereof mean that the specified features, steps or integers are included. The terms are not to be interpreted to exclude the presence of other features, steps or components.

25 The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse
30 forms thereof.

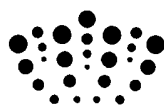
CLAIMS

1. A flexible conveyor comprising opposed extendible sides, the extendible sides supporting a plurality of rollers therebetween,
5 each of the opposed extendible sides comprising a plurality of guide elements, the guide elements having a connection part thereof to engage a roller, each guide element being connected to an opposing guide element by a rigid connector,
each guide element being connected to an adjacent guide element by a
10 pair of arms one of the arms being pivotally attached at an end part of to the guide element, the other of the arms being slidably engaged with the guide element.
2. A flexible conveyor according to claim 1 wherein the opposed
15 extendible sides extend between supports.
3. A flexible conveyor according to claim 2 wherein a guide element of each opposed extendible side is connected to the support through a support bracket, the support bracket having a first connection fixedly connected to the
20 support, and a second floating connection at a lower point whereby the support bracket is permitted to flex irrelative to the support.
4. A flexible conveyor according to claim 3 wherein the support bracket has a guide to slidably engage with a guide element.
25
5. A flexible conveyor according to any one of claims 2 to 4 wherein the supports are provided with wheels at a lower part thereof.
6. A flexible conveyor according to any one of the preceding claims
30 wherein at least one of the rollers is driven.

7. A flexible conveyor according to claim 6 wherein the driven roller is driven by a motor supported on the rigid connectors extending between a plurality of the guide elements.
- 5 8. A flexible conveyor according to claim 7 wherein the motor is mounted on a motor support bracket, the motor support bracket having opposed recesses to engage the rigid connectors.
9. A roller conveyor according to any one of claims 6 to 8 wherein a
10 plurality of the rollers are driveably connected to the driven roller.
10. A flexible conveyor according to claim 9 wherein the rollers are drivingly connected via drive belts.
- 15 11. A flexible conveyor according to claim 10 wherein the drive belts engage pulley wheels supported on the rigid connectors.
12. A flexible conveyor according to any one of claims 7 to 11 wherein the motor comprises a 24 volt DC motor.
- 20 13. A flexible conveyor according to any one of the preceding claims wherein an end part of at least one of the rollers is connected to a locking element, the locking element being shaped to engage the guide element when the roller is supported by the guide element, the locking element being
25 operable to resist this engagement of the roller and the guide element.
14. A flexible conveyor according to claim 13 wherein the locking element comprises an aperture to receive an end part of the roller and a projection to engage a recess on the guide element.

15. A flexible conveyor substantially as hereinbefore described with reference to and/or as shown in the accompanying drawings.

16. Any novel feature or novel combination of features described herein
5 and/or in the accompanying drawings.



Application No: GB1002087.3

Examiner: Mr Michael Young

Claims searched: 1-15

Date of search: 24 March 2010

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-15	US 5632371 A (BEST) Whole document relevant.
X	1-15	US 5456347 A (BEST) Whole document relevant.
X	1-15	US 5224584 A (BEST) Whole document relevant.
X	1-15	US 5456348 A (WHETSEL) Whole document relevant.
X	1-15	US 5595283 A (WHETSEL) Whole document relevant.
X	1-15	JP 2002240915 A (KANEYASU) See translated abstract & figs.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

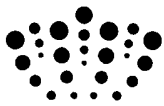
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Worldwide search of patent documents classified in the following areas of the IPC

B65G

The following online and other databases have been used in the preparation of this search report

WPI EPODOC



International Classification:

Subclass	Subgroup	Valid From
B65G	0013/12	01/01/2006
B65G	0041/00	01/01/2006