(12) UK Patent Application (19) GB (11) 2 067 494 A

(21) Application No **8001287**
(22) Date of filing **15 Jan 1980**
(43) Application published **30 Jul 1981**
(51) **INT CL³**
B65G 15/62 // 15/02
15/10
(52) Domestic classification
B8A LC R8
(56) Documents cited
GB 942301
GB 723587
GB 672134
GB 668327
GB 609522
(58) Field of search
A1G
A1H
B8A
(71) Applicants
J. F. Turkington (Conveyors) Limited, 4 Abinger Street, Burnley, Lancashire
(72) Inventor
Peter Dawson
(74) Agents
Urquhart-Dykes and Lord, 11th Floor, Tower House, Merrion Way, Leeds LS2 8PB

(54) **Endless conveyors**

(57) An endless conveyor comprises a track bed (1), belt reversing means (5, 9) at each end of the track bed, and a plurality of belts (e.g. 20) extend in spaced parallel formation between the belt reversing means, wherein the upper run of each belt is located in a respective guide channel (e.g. 15) extending the length of the track bed, each belt and its associated channel having cross-sections such that the channel surrounds the lower part of the respective belt sufficiently to retain the belt in the channel, while allowing the upper part of the belt to lie above the channel. The track bed may be straight, but the conveyor is particularly useful with the track bed in curved form, belts in different channels being of different lengths and being driven in such a manner that at any section of the track the angular velocities of all the belts are substantially equal.

FIG.1.

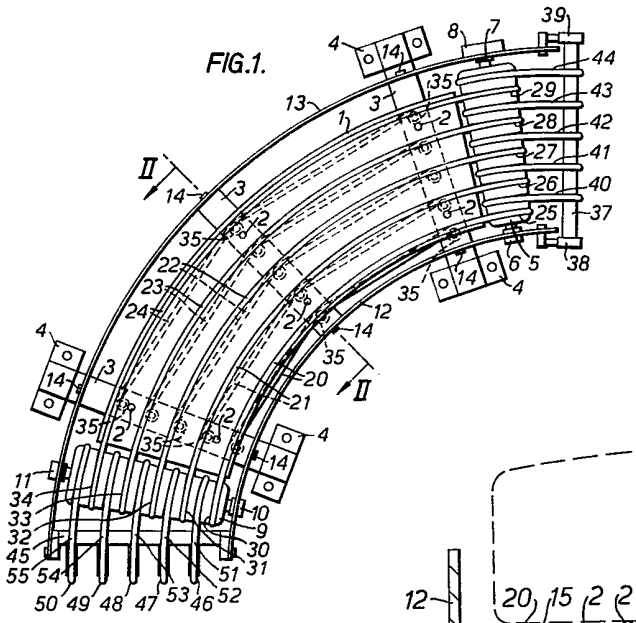
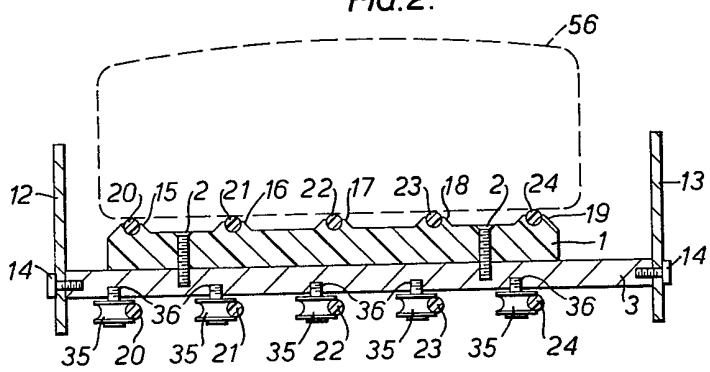


FIG.2.



GB 2 067 494 A

FIG.1.

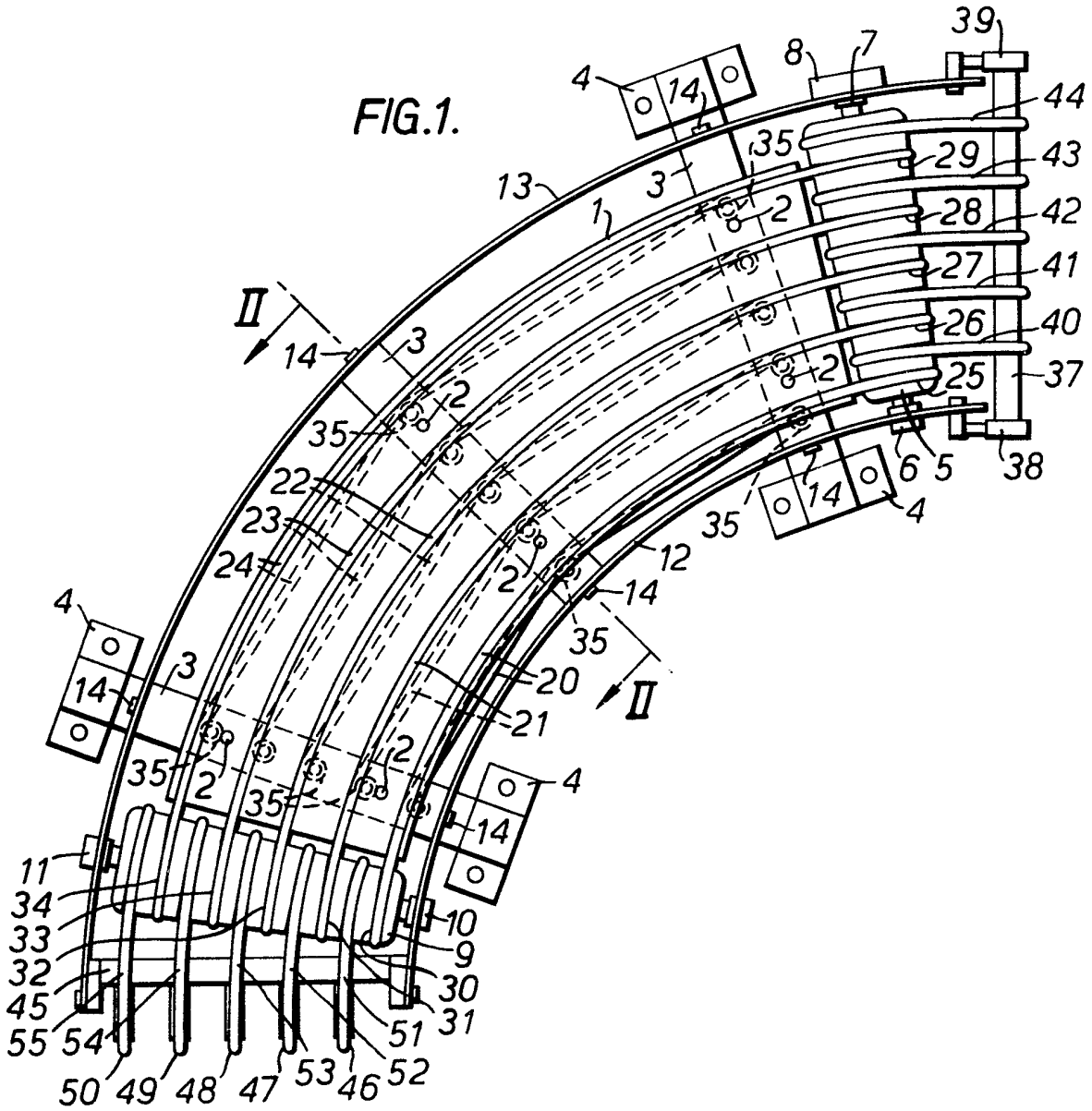
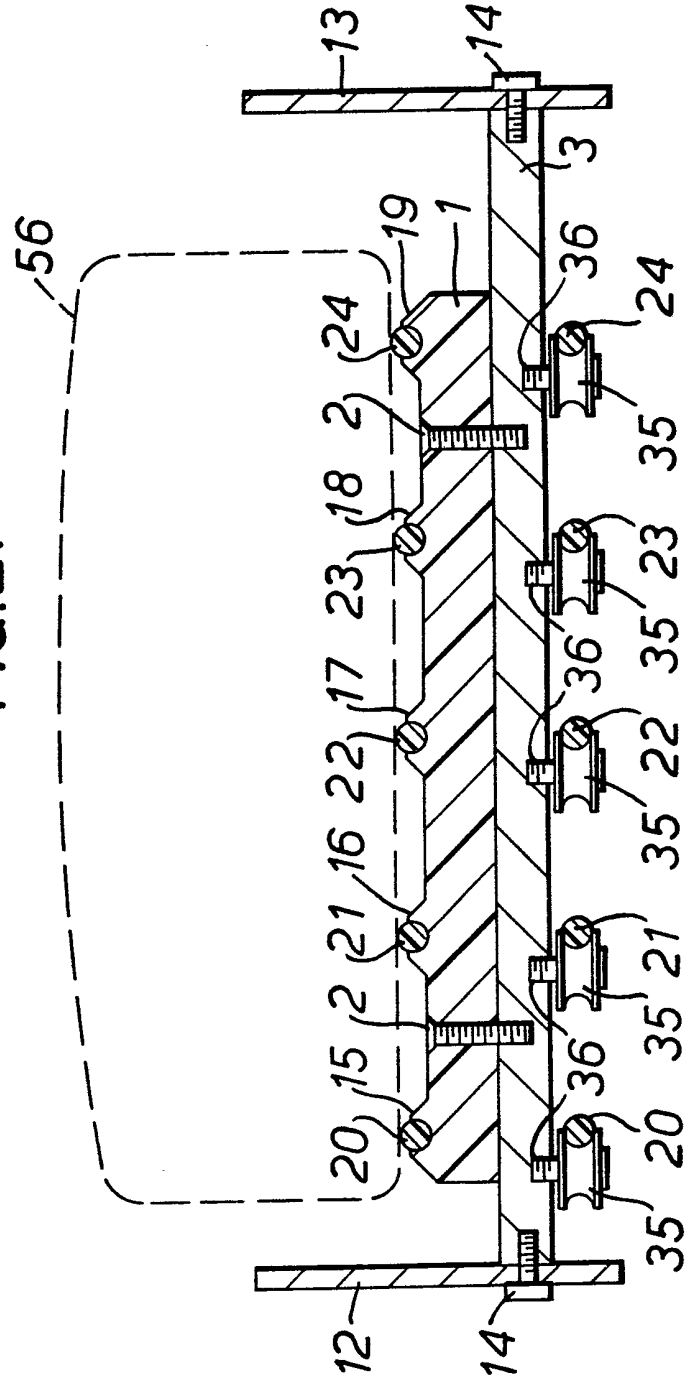

39
8
7
4
14
44
35
29
43
13
3
1
2
28
42
27
41
26
40
25
37
6
5
38
II
14
3
2
35
22
23
24
12
20
21
4
11
34
33
32
45
55
54
50
49
48
47
53
46
52
51
31
30
9
10

FIG.2.


13
14
3
56
19
1
36
24
24
2
35
18
23
23
35
36
17
22
22
35
16
21
21
35
2
36
15
20
20
35
12
14

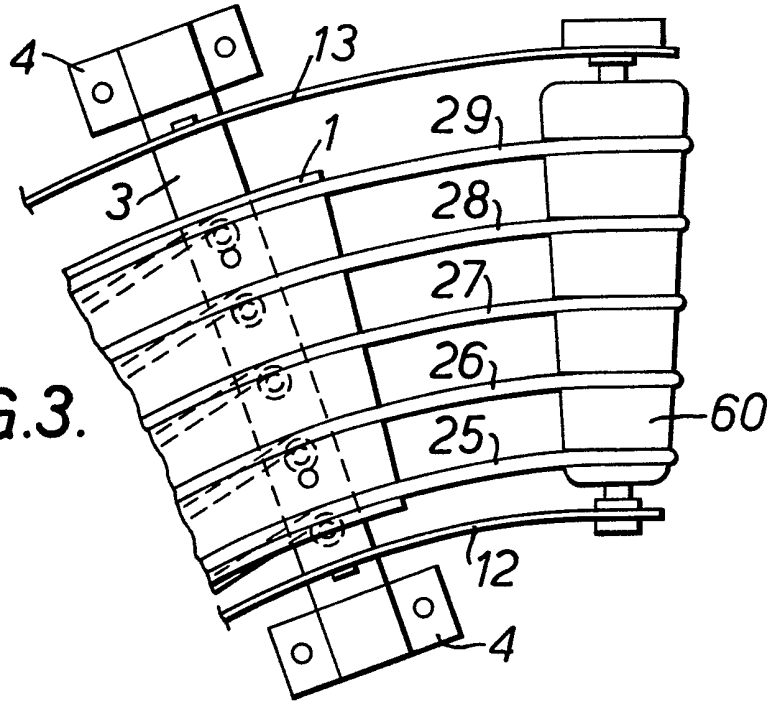


FIG.3.

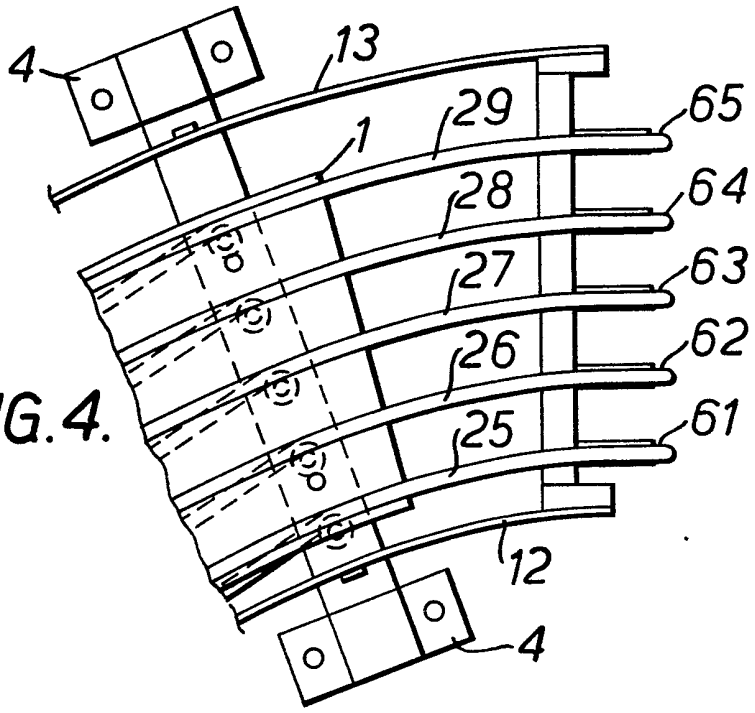


FIG.4.

SPECIFICATION

Conveyors

This invention relates to conveyors.

A large variety of different types of conveyors are used in various industries, many having been specially designed for the particular products to be conveyed. In the baking industry loaves of bread are frequently moved by so-called ladder belts, which are generally satisfactory but create problems at transfer points from one conveyor section to another and which are particularly difficult to arrange in a formation such that the loaves travel along a curved path. The object of the present invention is to provide a conveyor which may be used to overcome such problems and which, although finding particular use in the baking industry, is also widely applicable in other industries.

According to the present invention a conveyor comprises a track bed, belt reversing means at each end of the track bed, a plurality of belts extending in spaced parallel formation between the belt reversing means, each belt having an upper run located in a respective guide channel extending the length of the track bed, each belt and associated guide channel having cross-sections such that the channel surrounds the lower part of the respective belt sufficiently to retain the belt in the channel while allowing the upper part of the belt to lie above the channel.

Such a conveyor thus comprises a track bed having spaced parallel guide channels, in each of which there is retained a belt projecting above the channel so that articles to be conveyed may rest on the belts without lying in contact with the track bed. Such a conveyor may be used with a straight track bed, but it is particularly useful when the track bed is curved. In this context retention of the belt in each respective guide channel guides that particular belt around the curve of the track bed and the belts, and thus articles conveyed by them, can be made to follow any required path. When curved track beds are used it will be understood that the length of individual belts extending along different parts of the track bed will differ. For example, on a part-circular track bed the belts in channels at the radially inner part of the track bed will be shorter than the belts in channels of the radially outer part of the track bed. In order to ensure smooth conveyance of the articles the angular velocity of all the belts needs to be as uniform as possible along the full length of the track bed, and thus the longer belts need to be driven at higher linear speeds than the shorter belts. This is readily achieved by proper selection of the belt reversing means, either or both of which may be driven.

In the particular example of a part-circular track bed at least one of the belt reversing means is desirably in the form of a tapered roller having parallel circumferential grooves with each of which is engaged an individual belt, the diameter of the roller increasing from the inside towards the outside of the curve.

Conveniently each belt is of circular cross-section and the corresponding guide channel is of part-circular cross-section, the part of the belt enclosed by the guide channel subtending an angle of from 190° to 270°, preferably from 210° to 240°. Other belt cross-sections can be used as long as the formation is such that each belt can be retained in its respective guide channel with the upper part of the belt lying above the channel.

Preferably both the belt and at least the inner surfaces of the guide channels are of low friction material, and the clearance between the belt and the inner surface of the channel is from 0.12 to 0.38 mm. Any resistance to movement between the belt and the guide channel can thereby be reduced to negligible values.

Conveyors according to the invention can be designed with termination sections which allow the conveyor to be used in conjunction with other types of standard conveyors.

In order that the invention may be better understood, descriptions of particular embodiments thereof will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:—

Figure 1 is a top plan view of a first embodiment of conveyor;

Figure 2 is a cross-section on the line II of Figure 1; and

Figures 3 and 4 show alternative forms of termination which may be used with the conveyor of Figure 1.

Referring to Figures 1 and 2 there is shown a conveyor designed for moving loaves of bread around a 90° curve. The conveyor comprises a track bed 1 which is secured by bolts 2 to supports 3, two of the supports being mounted on stands 4 raising the conveyor above floor level. Obviously, other types of support may be used for the track bed depending on the particular location of the conveyor. At one end of the track bed a tapered drive roller 5 is mounted in bearings 6 and 7 and may be driven from an enclosed drive unit 8. At the other end of the track bed a tapered idler roller 9 is mounted in bearings 10 and 11. The bearings 6 and 10 are supported on an inner retaining wall 12, while the drive unit 8 and bearing 11 are supported on an outer retaining wall 13. The walls are secured to the supports 3 by belts 14.

The track bed is formed with five parallel guide channels 15 to 19 extending the full length of the track bed and is defined within a section raised above the track bed. Located within each guide channel is the upper run of one of a plurality of belts 20 to 24, each belt being of circular cross-section. The belts also engage respective grooves 25 to 29 in the drive roller 5 and respective grooves 30 to 34 in the idler roller 9. The return runs of the belts pass below the track bed, each belt being there supported and guided by three idler pulleys such as 35, each pulley running on a spindle bearing such as 36 secured to a respective one of the supports 3. If desired one or more of the pulleys 35 may be made adjustable relative to its support 3 in order that the tension of each belt may be adjusted.

As will be seen from Figure 2 each guide channel is of part-circular cross-section and surrounds the

lower part of the respective belt sufficiently to retain the belt in the channel while allowing the upper part of the belt to lie above the channel. It has been found that the optimum design is to leave about one third of the belt projecting above the channel, in other words the part of the belt enclosed by the channel subtends an angle of from 210° to 240° and particularly from 220° to 225°. Clearance between the outer surface of the belt and the inner surface of the guide channel is desirably from 0.12 to 0.38 mm a particularly preferred clearance being 0.25 mm. The track bed may be formed from nylon or other polymeric material having a low coefficient of friction and the belts may be conventional belts made from polyurethane or other material again having a reasonably low coefficient of friction.

Adjacent to the roller 5 there is a cylindrical end roller 37 supported in bearings 38, 39 and further circular section belts 40 to 44 extend between the roller 5 and the roller 37. Adjacent to the end roller 9 there is provided a bearer 45 on which is mounted a series of pulleys 46 to 50, further belts 51 to 55 extending between the roller 9 and respective ones of the pulleys.

Operation of the conveyor will be clear from the following description. As the roller 5 is driven each of the belts 25 to 29 is driven so driving the idler roller 9. The cylindrical roller 37 is driven through belts 40 to 44 and the pulleys 46 to 50 are each driven through belts 51 to 55. Each of the belts 25 to 29 moves along an arcuate path and is retained captive in that path by the associated guide channel. An article such as a loaf of bread 56 may be supported on the projecting parts of the upper runs of the belts and thus moved through an angle of 90° from the pulleys 46 to 50 to the roller 37 or vice-versa. The angle of taper of the rollers 5 and 9 is designed so that the linear speeds of the belts increases from the slowest belt 20 as the inner part of the track bed to the fastest belt 24 at the outer part of the track bed, the linear speeds being selected so that the angular velocity of each belt around the track bed is substantially identical. In this way an article supported by the belts is moved around the track bed with minimal relative movement between the article and any one of the support belts.

During normal operation it is found that the article is taken onto the belts in the position shown in Figure 2 and retains its position relative to the belts throughout its whole movement over the track bed, i.e. there is no tendency for the article to move laterally of the track bed. The lateral position of individual articles is only affected when for some reason the article may be held stationary while the conveyor is still running and there is then a tendency for the articles to be moved radially outwardly over the track bed. The presence of the retaining wall 13 prevents articles falling from the conveyor under these circumstances.

Use of pulleys such as 46 to 50 at one end of the conveyor allows the conveyor section shown to be placed end to end with a further conveyor section also terminating in pulleys, the pulleys of the two sections interdigitating one with the other. There is then a smooth transfer from the pulley belts at the end of one conveyor section onto the pulley belts of the other conveyor end section. Use of the roller 37 at the other end of the conveyor allows transfer to a similar roller terminated conveyor or to some other form of conveyor such as an elevating conveyor or a chute. The particular termination can of course be chosen as required for each end of the conveyor.

Figures 3 and 4 show alternative forms of termination which eliminate the need for additional short belts extending from the tapered rollers. Thus, Figure 3 shows how the conveyor may terminate in a tapered roller 60 spaced from the track bed 1, with the belts 25 to 29 extending across the space.

Figure 4 shows how the conveyor may terminate directly in a series of pulleys 61 to 65 spaced from the track bed 1 with the belts 25 to 29 extending across the space between the pulleys and the track bed. Other forms of termination will be readily apparent to those skilled in the art.

Although Figure 1 illustrates a conveyor for moving an article around a curve of 90° it will be obvious that curves of greater and lesser angles can equally be accommodated using the principles of the invention. Furthermore, the invention may be used where the track bed exhibits double curvature first through one hand and then the other. There is no need for the track bed to be located in a horizontal plane and it is found that the conveyor is equally capable of moving articles through inclined curved paths as well as flat curved paths. The particular arrangement of belt reversing and drive means may of course be varied as desired, as may the arrangement of supporting and guiding elements for the return runs of these belts.

CLAIMS

1. A conveyor comprising a track bed, belt reversing means at each end of the track bed, a plurality of belts extending in spaced parallel formation between the belt reversing means, each belt having an upper run located in a respective guide channel extending the length of the track bed, each belt and associated guide channel having cross-sections such that the channel surrounds the lower part of the respective belt sufficiently to retain the belt in the channel while allowing the upper part of the belt to lie above the channel.

2. A conveyor according to claim 1 in which the track bed is curved and the lengths of individual belts extending along different parts of the track bed differ one from another.

3. A conveyor according to claim 2 and including means for driving the belts in such a manner that at any section of the track the angular velocities of all the belts are substantially equal.

4. A conveyor according to claim 2 or claim 3 in which the track bed is part-circular and at least one of the belt reversing means is in the form of a tapered roller having parallel circumferential grooves with each of which is engaged an individual belt, the diameter of the roller increasing from the inside towards the outside of the curve of the track bed.

5. A conveyor according to claim 4 in which one of the rollers is driven directly from a motor.

6. A conveyor according to any one of the pre-

ceding claims in which each belt is of circular cross-section and the corresponding guide channel is of part-circular cross-section, the part of the belt enclosed by the guide channel subtending an angle of from 190° to 270°.

7. A conveyor according to claim 6 in which the angle subtended by the guide channel is from 210° to 240°.

8. A conveyor according to any one of the preceding claims in which the belts and at least the inner surfaces of the guide channels are of low friction material.

9. A conveyor according to any one of the preceding claims in which the clearance between any belt and the inner surface of its respective channel is from 0.12 to 0.38 mm.

New claims or amendments to claims filed on 8.10.80 and 19.2.81.

New or amended claims:—

2. A conveyor according to claim 1 in which each belt is of uniform cross-section throughout, and each guide channel is of uniform cross-section throughout and has a continuous inner surface.

3. A conveyor according to claim 1 or claim 2 in which the belts and at least the inner surfaces of the guide channels are of low friction material.

4. A conveyor according to any one of the preceding claims in which each belt is of circular cross-section and the corresponding guide channel is of part-circular cross-section.

5. A conveyor according to any one of the preceding claims in which the part of the belt enclosed by the guide channel subtends an angle of from 190° to 270°.

6. A conveyor according to claim 5 in which the angle subtended by the guide channel is from 210° to 240°.

7. A conveyor according to any one of the preceding claims in which the clearance between any belt and the inner surface of its respective channel is from 0.12 to 0.38 mm.

8. A conveyor according to any one of the preceding claims in which the track bed comprises a continuous base member.

9. A conveyor according to any one of claims 1 to 7 in which the track bed comprises a continuous base member and supports for the base member.

10. A conveyor according to claim 8 or claim 9 in which the guide channels are formed in the upper surface of the base member.

11. A conveyor according to any one of claims 1 to 10 in which the track bed is curved and the lengths of individual belts extending along different parts of the track bed differ one from another.

12. A conveyor according to claim 11 and including means for driving the belts in such a manner that at any section of the track the angular velocities of all the belts are substantially equal.

13. A conveyor according to claim 11 or claim 12 in which the track bed is part-circular and at least one of the belt reversing means is in the form of a tapered roller having parallel circumferential grooves with each of which is engaged an individual belt, the diameter of the roller increasing from the inside towards the outside of the curve of the track bed.

14. A conveyor according to claim 13 in which one of the rollers is driven directly from a motor.

15. A conveyor substantially as herein described with reference to Figures 1 and 2 of the accompanying drawings.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1981.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.