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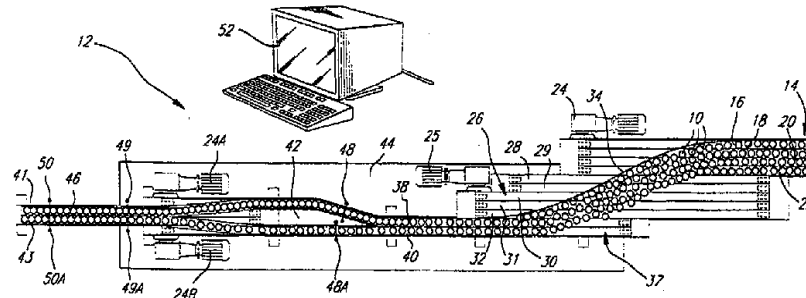


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(54) Title: PRESSURELESS MULTI-LANE DIVIDING APPARATUS



(57) Abstract

Disclosed herein is an apparatus (12) for pressureless division of a flow of objects (10) from a conveyor system into multiple paths. The apparatus is ideally suited for use in conveying and combining streams of bottles. The apparatus generally is connected to a feed conveyor (14) carrying a bulk flow of articles. The apparatus comprises a conveyor system which permits the division of bulk flow of bottles into discrete delivery channels (41, 43). The apparatus is also provided with detectors (48, 48A, 49, 49A, 50, 50A) to monitor and allow adjustment of the flow of bottles in each delivery channel.

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TITLE: PRESSURELESS MULTILANE COMBINER

BACKGROUND OF THE INVENTION

1. Field Of The Invention

This invention relates to conveying apparatus concerned with combining conveyed products, such as bottles, into multiple discrete product paths.

2. Description of the Prior Art

5 In the prior art, numerous conveyor systems have been developed to separate a mass of articles into discrete delivery paths leading to labelling, filling or other packaging devices. To this end, it is known to use deflectors, guides and separators placed in the stream of articles being conveyed so as to achieve a single aligned stream. However, those conveyor systems
10 promote frictional contact between the products being conveyed and result in surface wear of the products, noise and a propensity to jam and damage the products being conveyed.

It is also known to use what are commonly called "pressureless" conveyors systems such as described in US patent 4,974,720. Those conveyor
15 systems generally comprise a feed conveyor on which a mass of articles, such as bottles, are disposed at random and advance forward. The feed conveyor leads to an intermediate multi-track conveyor. Each track is driven at a different speed according to a speed gradient. This accelerates the



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bottles on the side of the conveyor having the fastest track. This promotes separation of the bottles and gradual flow alignment. Moreover, the intermediate conveyor is equipped with a curved guide plate channelling the bottles to a single file output. Once in a single file, the bottles transfer onto
5 a delivery conveyor and exist the pressureless conveyor. However, such systems are designed for single file output and must be installed in parallel in order to provide multiple aligned feed lines as required by most packaging machines. Installing many such machines in parallel consumes valuable factory floor space, adds to cost, noise pollution and requires additional
10 maintenance.

Thus, the present invention addresses the need for a machine that can combine a mass flow of product into two or more discrete output paths with automatic control of the flow of each output paths. Moreover, the present invention also addresses the need for a machine which can be operated to
15 selectively switch from two or more discrete output paths to a single file output path. As an added benefit, the present invention also addresses the need for a machine that can separate a single file product input trail into two or more discrete output paths with automatic control of the flow of each output paths.

20 Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. It should

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be understood, however, that this detailed description, while indicating preferred embodiments of the invention, is given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art.

5 **SUMMARY OF THE INVENTION**

The present invention relates to a multilane combiner for combining a mass input flow or alternatively a single file input flow into two or more distinct and controlled output flows. The apparatus of the invention is designed for installation in a conveyor line of the type used to feed a machine requiring
10 the orderly and sequential input of articles. The apparatus of the invention is used for the division of a flow of objects travelling on said conveyor line into multiple output paths, said apparatus comprising:

- (a) an input conveyor portion for supporting and advancing a mass of objects in a generally longitudinal direction;
- 15 (b) a drive mechanism for driving said input conveyor;
- (c) an intermediate multi-track conveyor generally downstream from and connected to the bulk feed conveyor for receiving the objects from the bulk feed conveyor, said multi-track conveyor having guide means mounted orthogonally with respect to said conveyor surface to urge said objects
20 transversely from one conveying track to the next, each conveying track of said multi-track conveyor being driven at a velocity gradient with the fastest conveying track being located the furthest from said guide means;



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- (d) at least one drive mechanism for driving said intermediate conveyor;
- (e) a separation conveyor generally downstream from and connected to the intermediate conveyor for receiving the objects from the intermediate conveyor, said separation conveyor having at least two tracks; each track of
- 5 said separation conveyor being driven at a velocity gradient with the fastest conveying track being located the furthest from said guide means of said intermediate conveyor thereby achieving a separation of the objects between each track, said tracks each bearing a single file procession of articles;
- (f) at least one drive mechanism for driving said separation conveyor;
- 10 (g) an output conveyor assembly comprising at least two output channels each connected to a track of the separation conveyor for the linear transfer of articles exiting each track of said separation conveyor;
- (h) a drive mechanism for driving each said output channels of said output conveyor assembly;
- 15 (i) detection means for detecting the flow of articles in said apparatus including the flow of articles in each said output channels and for generating a signal corresponding to the detected flows;
- (j) computer means for receiving the flow signals from said detection means and for processing a response signal selectively directing said drive
- 20 mechanisms connected respectively to said input, intermediate and output conveyors so as to maintain a substantially even flow of articles in all of said output channels.



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The apparatus of the present invention will advantageously be used to obtain, at will, one or two controlled single file delivery streams from a bulk conveyor feed.

BRIEF DESCRIPTION OF THE DRAWINGS

- 5 Figure 1 is a diagrammatic plan view of a pressureless multilane combiner of the present invention wherein the division is made from a bulk flow of articles to two output lanes;
- Figure 2 is a diagrammatic plan view of three pressureless multilane combiner as in Figure 1 and shown in an arrangement in accordance with a
10 preferred embodiment of the invention;
- Figure 3 is a diagrammatic plan view of a conventional (prior art) pressureless single file combiner; and
- Figure 4 is a diagrammatic plan view of a conventional arrangement of the pressureless single file combiner of Figure 3 (prior art).
- 15 Figure 5 is a diagrammatic plan view of a pressureless multilane combiner of the present invention wherein the division is made from a single line flow of articles to two output lanes;

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

- In accordance with a preferred embodiment, the apparatus of the present
20 invention consists of a pressureless multilane combiner intended for conveying a mass input flow of bottles or other similar articles and delivering

the bottles in multiple single files for feeding in a packaging unit disposed downstream. One notable imperative in devising such equipment is to minimize damage to the articles being conveyed. Another design imperative is to minimize the size of the equipment to save crucial factory floor space.

5 Yet another design objective is to allow evacuation of bottles which have fallen-over and should therefore not be conveyed to the packaging unit. A fourth objective is to balance the flow between a plurality of lanes of articles being conveyed.

With those imperatives in mind, a preferred embodiment of the invention

10 consists of a two lane pressureless combiner from bulk. In other words, a mass flow of randomly advancing bottles are conveyed to the apparatus of the invention and exit in two single lanes having controlled flows.

It must be understood that although the apparatus of the present invention is ideally suited for use in a bottling plant, other uses are envisaged. For

15 example, the apparatus could be used to convey other articles than bottles, such as plastic or metal containers, or many forms of consumer or industrial goods which require filling, labelling or packaging operations prior to the shipment.

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It must also be understood that the apparatus of the present invention can be operated, at will, as a single file output conveyor as will be explained further below.

It must also be understood that the apparatus of the present invention can
5 be combined with a "pressure" type device to funnel articles from bulk into a narrower stream by using curved guide plates, vibration plates, etc.

Referring now to the first preferred embodiment for combining a mass flow of bottles in two single files, the apparatus of the present invention will be described in more detail. Referring to Fig. 1, a bulk stream of bottles
10 enter the two lane pressureless combiner generally referred to as numeral 12. The bulk stream of bottles 10 enter combiner 12 from an input bulk conveyor 14 having several tracks 16, 18, 20, and 22 disposed side by side and driven at the same linear velocity. The drive mechanism of course comprises appropriate electrical motors 24 and linkages (not shown).

15 Bulk conveyor 14 leads to a multi-track intermediate conveyor 26 for accelerating and narrowing and thus separating the stream of bottles 10 received from the bulk conveyor 14.

The intermediate conveyor 26 comprises a plurality of parallel and adjacent tracks 28, 29, 30, 31, 32, ... each driven at a different velocity (velocity

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gradient) increasing transversely relative to the linear direction of the bottles 10 when received from the bulk conveyor 14. The adjacent tracks 28, 29, 30, 31, 32 are driven by a drive mechanism including an appropriate electrical motor 25 and linkages (not shown). Overlying this intermediate conveyor 26 is a curved guide plate 34 essentially orthogonal to the plane of conveyor 26. The guide plate 34 is adapted to gently push and urge the bottles 10 from low speed tracks to higher speed tracks. Thus, the bottles 10 are gradually accelerated and the width of the stream of bottles 10 delivered to the intermediate conveyor 26 is gradually reduced. So far, this arrangement is conventional and known to those skilled in the art who can calculate and design the velocity gradient of the tracks, the dimensions of the intermediate conveyor 26 and the dimension and shape of guide plate 34 to obtain a single file of bottles 10. Referring to Fig. 3 there is shown a typical prior art version of such single file lane combiner.

15 Surprisingly, the inventors have invented an improved conveyor which allows multiple single file outputs of articles such as bottles 10. Referring once again to Fig. 1, it is shown how apparatus 12 is designed to provide a separation conveyor 37 downstream from intermediate conveyor 26. The separation conveyor 37 includes two tracks 38 and 40.

20 To achieve this, a velocity differential is maintained between track 38 and track 40, whereby track 40 is maintained at a higher velocity so as to

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separate the bottles **10** in two discrete streams. Tracks **38** and **40** are respectively driven by motors **24a** and **24b** through suitable linkages. To perfect the separation process, bottles **10** which are misaligned on either of tracks **38** or **40** or which have fallen over will be discarded at drop-off zone

5 **42** which consists of a recuperation bin **44** consisting of a depression between a borderless split in tracks **38** and **40**. Any bottles **10** which as not properly aligned and standing on tracks **38** and **40** will fall into recuperation bin **44**. Tracks **38** and **40** are later juxtaposed once again but this time with combining wall **46** in between two avoid any mixing of the two discrete single

10 files. Moreover, tracks **38** and **40** are connected to further conveying output tracks **41** and **43** defining an output conveyor and having their own linear velocity controls. As the bottles **10** reach the end of tracks **38** and **40**, bottles **10** will simply transfer onto tracks **41** and **43**, respectively.

To monitor the flow of bottles **10** on all tracks, detection devices **48**, **48A**, **49**,

15 **49A** and **50**, **50A** are installed and connected to a computer **52**. It is to be understood that the term "computer" is used in a general sense and is meant to encompass any other similar device such as any programmable logic controller or other form of microprocessor or similar device. The detection devices **48**, **48A**, **49**, **49A** and **50**, **50A** can be of the various types commonly

20 available and easily known to those conversant in the art.

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Of course computer 52, is designed to maintain even flows of bottles 10 in each track 38 and 40 so that the processing unit located downstream is equally fed in bottles 10. Computer 52 is also designed to permit a gradual ramp-use and shutdown of combiner 12 to avoid causing bottles 10 to fall
5 over or jam as a result of abrupt changes in speed.

Referring now to Fig. 2, there is shown a cluster of three similar combiners 54, 56 and 58 substantially as described above with reference to apparatus 12. All three combiners 54, 56 and 58 are connected to a single bulk bottle conveyor 60. Output paths are directed to a downstream packaging machine
10 62. This arrangement has tremendous advantages over the prior art since it saves valuable space by essentially replacing the need for six single file combiners as taught in the prior art and depicted in Fig. 4. The apparatus of the present invention saves valuable factory floor space and allows more flexibility in installation and operation.

15 It is to be understood that a similar apparatus could be adapted to provide not just two but up to three or more discrete output flows. Moreover, by stopping output track 40, combiner 12 could essentially function as a single file output conveyor. Thus, the apparatus of the present invention can be switched, at will, from a dual output channel to a single output channel
20 conveyor.

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Turning now to Figure 5, there is illustrated a diagrammatic plan view of a pressureless multilane combiner of the present invention wherein the division is made from a single line flow of articles to two output lanes. Such arrangement would be useful for dividing the flow of single file articles exiting
5 from one apparatus, for example a bottle filling station, into two or more discrete output paths directed to a downstream packaging machine.

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What is claimed:

1. An apparatus for the division of a flow of objects travelling on a conveyor line of the type used to feed a machine requiring the orderly and sequential input of articles, said apparatus comprising:
 - 5 (a) an input conveyor portion for supporting and advancing a mass of objects in a generally longitudinal direction;
 - (b) a drive mechanism for driving said input conveyor;
 - (c) an intermediate multi-track conveyor generally downstream from and connected to the input conveyor for receiving the objects from the input
 - 10 conveyor, said multi-track conveyor having guide means mounted orthogonally with respect to said conveyor surface to urge said objects transversely from one conveying track to the next, each conveying track of said multi-track conveyor being driven at a velocity gradient with the fastest conveying track being located the furthest from said guide means; and
 - 15 (d) at least one drive mechanism for driving said intermediate conveyor;
- the improvement consisting of:
 - (e) a separation conveyor generally downstream from and connected to the intermediate conveyor for receiving the objects from the intermediate conveyor, said separation conveyor having at least two tracks; each track of
 - 20 said separation conveyor being driven at a velocity gradient with the fastest conveying track being located the furthest from said guide means of said



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intermediate conveyor thereby achieving a separation of the objects between each track, said tracks each bearing a single file procession of articles;

(f) at least one drive mechanism for driving said separation conveyor;

(g) an output conveyor assembly comprising at least two output channels
5 each connected to a track of said separation conveyor for the linear transfer of articles exiting each track of said separation conveyor;

(h) a drive mechanism for driving each said output channels of said output conveyor assembly;

(i) detection means for detecting the flow of articles in said apparatus
10 including the flow of articles in each said output channels and for generating a signal corresponding to the detected flows; and

(j) computer means for receiving the flow signals from said detection means and for processing a response signal selectively directing said drive mechanisms connected respectively to said input, intermediate and output
15 conveyors so as to maintain a substantially even flow of articles in all of said output channels.

2. The apparatus of claim 1, wherein the separation conveyor comprises two tracks.

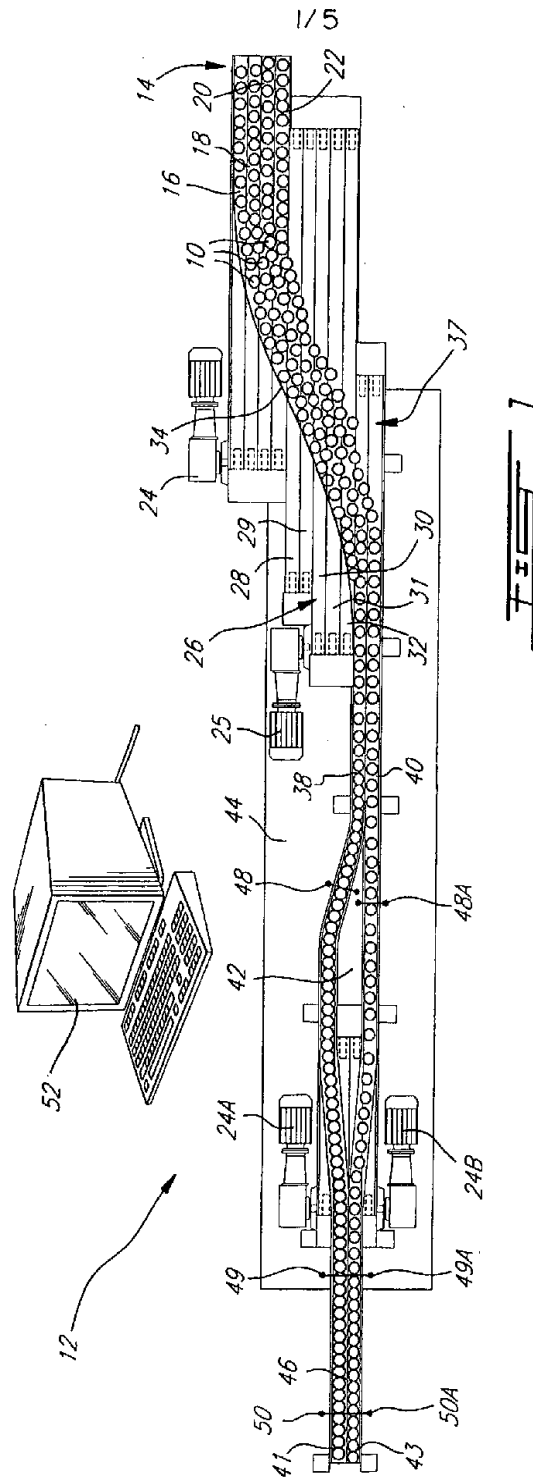
3. The apparatus of claim 2, wherein said articles are bottles.



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4. The apparatus of claim 2, further comprising evacuating means interposed between said separating and output conveyors for evacuating articles in poor alignment along a given conveying track, said evacuating means consisting of a drop-off area located on the separation conveyor, generally downstream from where the articles have achieved substantial division on each tracks of said separation conveyor, said drop-off area being characterized by a borderless portion of each output tracks so that articles in poor alignment along each output track will tend to fall off the conveying track into a drop-off receptacle.
5. The apparatus of claim 1, wherein (a) the separation conveyor comprises three tracks, and (b) the output conveyor assembly comprises three output channels.
6. The apparatus of claim 1, wherein the input conveyor is a bulk conveyor for advancing a mass and random flow of articles.
7. The apparatus of claim 2, wherein the input conveyor is a bulk conveyor for advancing a mass and random flow of articles.
8. The apparatus of claim 1, comprising two separate drive mechanisms for driving said separation conveyor.





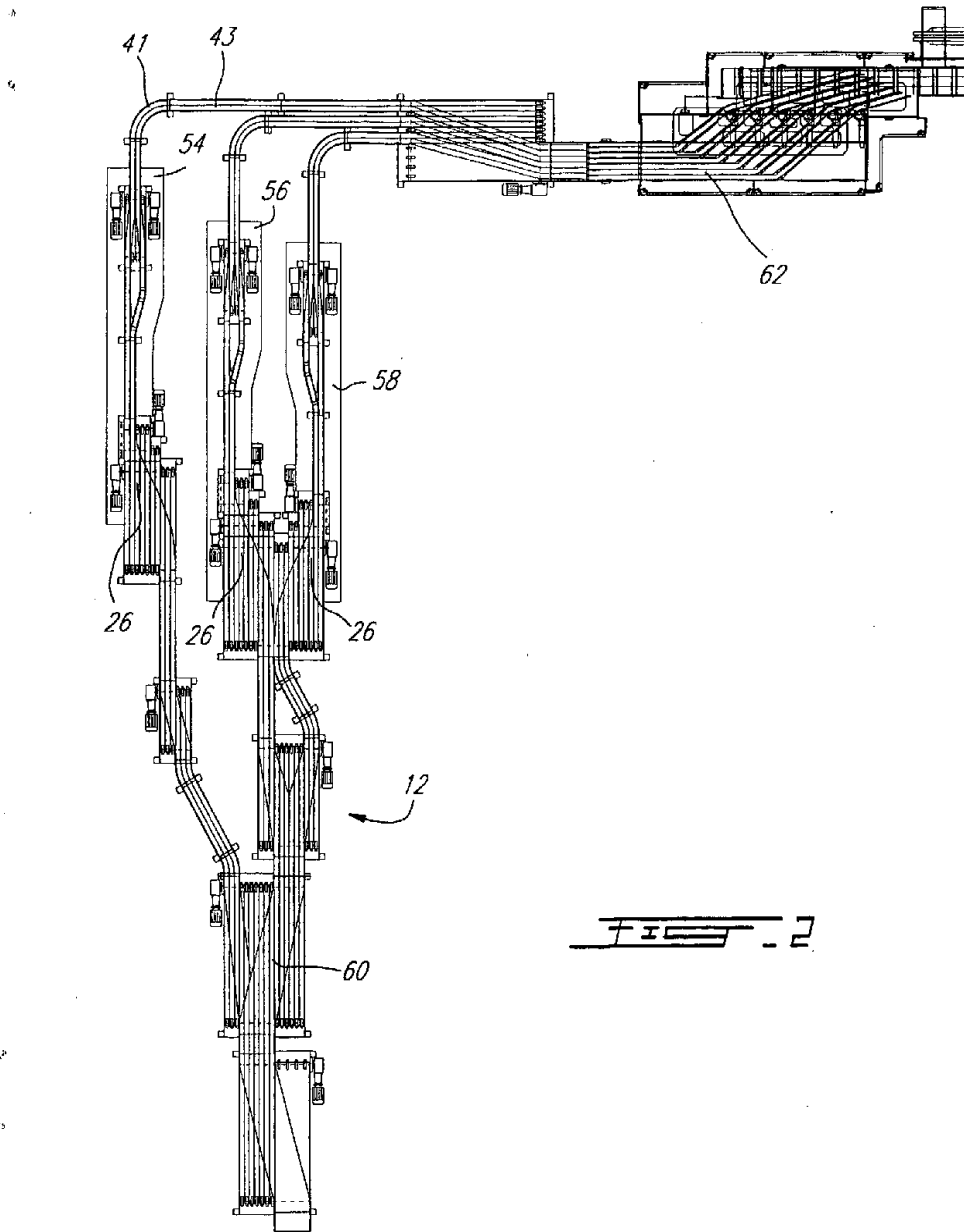


FIG. 2

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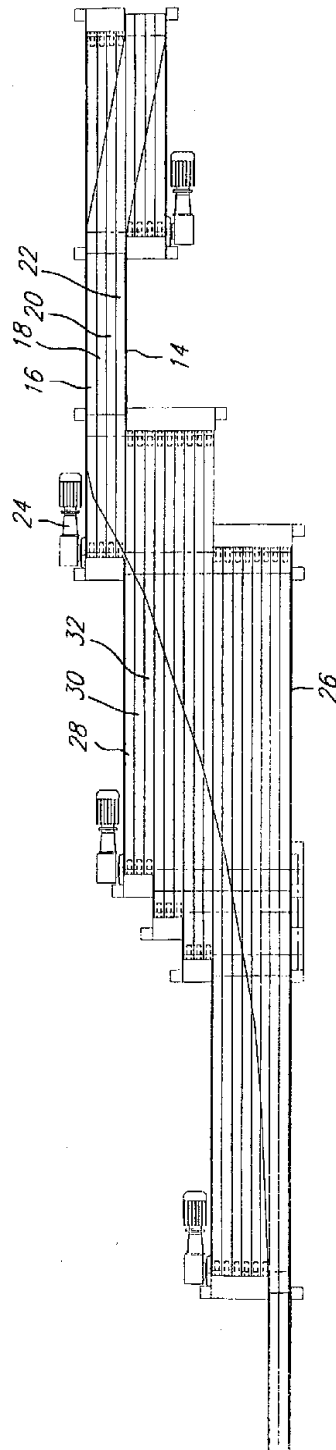


FIG. 3 (PRIOR ART)

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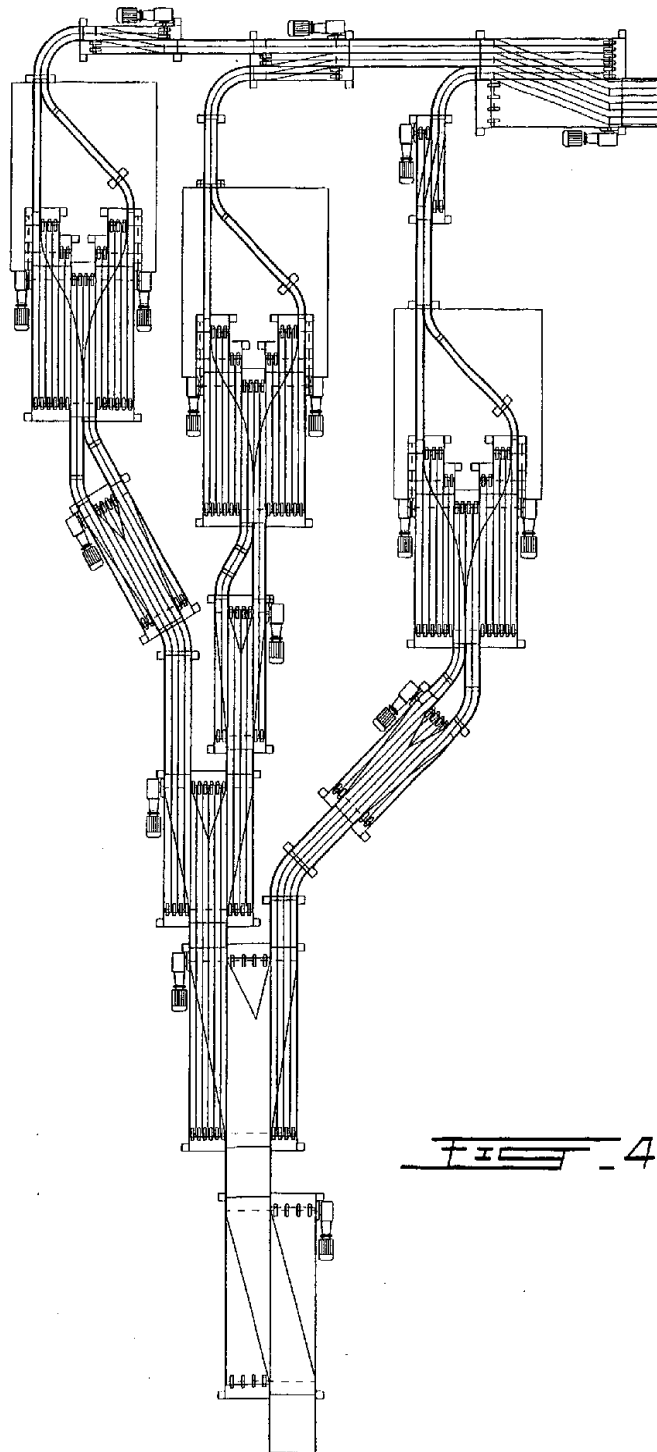


FIG. 4 (PRIOR ART)

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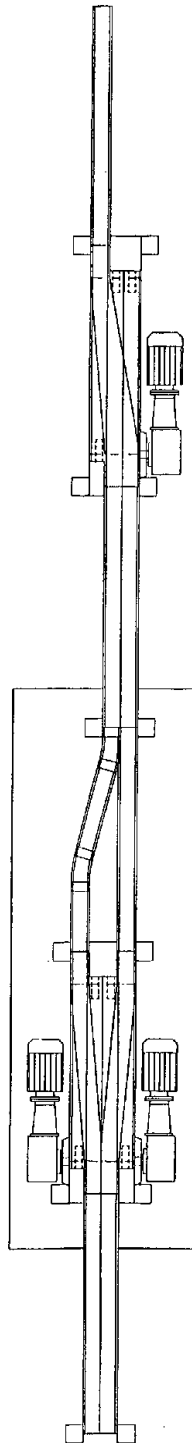


Fig. 5