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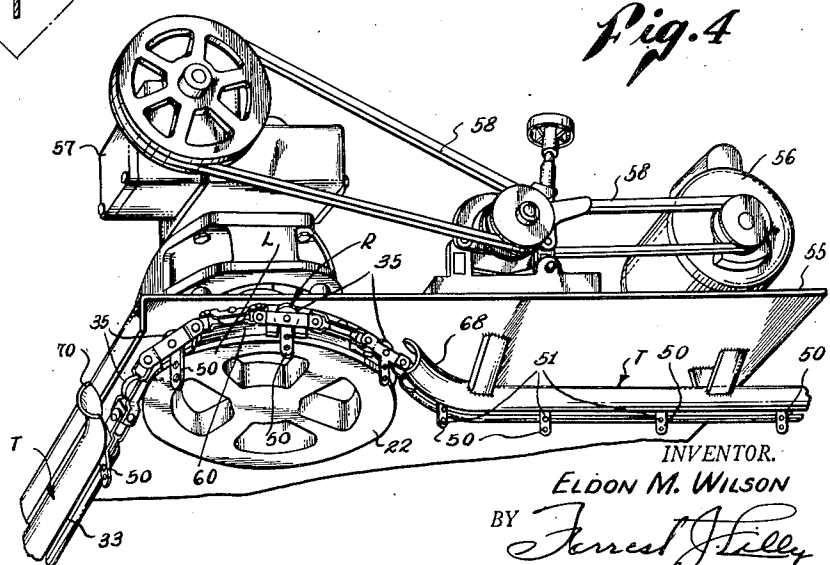
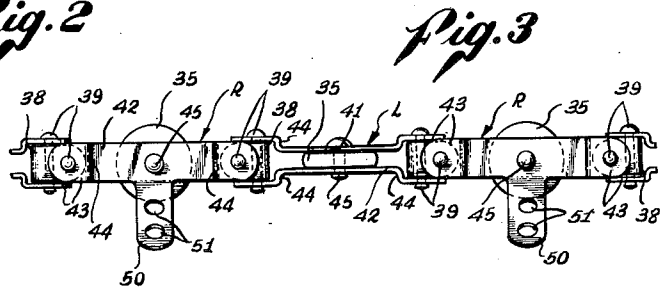
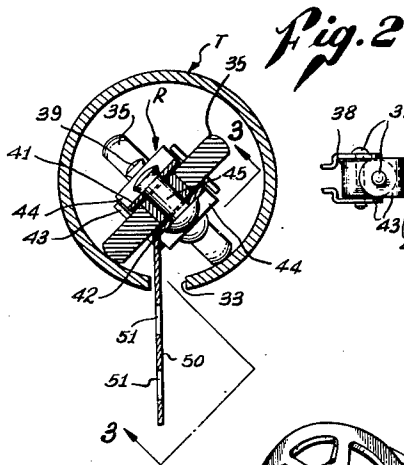
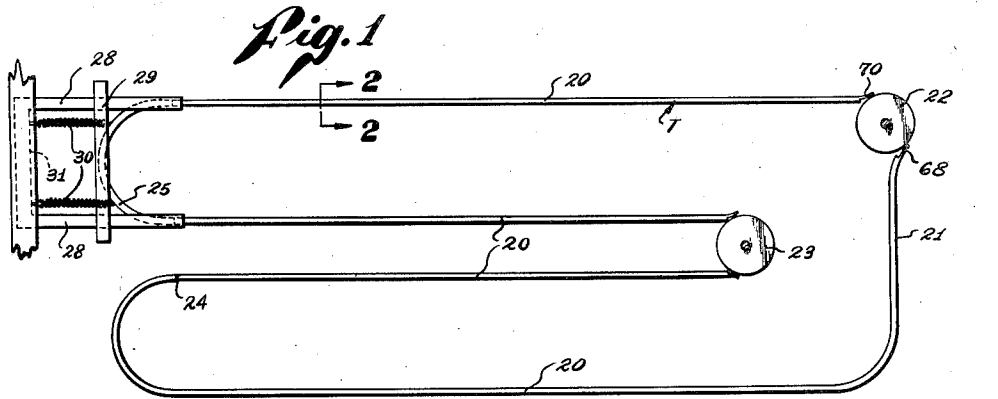
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HOLLOW TRACK CONVEYER

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2 Sheets-Sheet 1



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HOLLOW TRACT CONVEYER

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13 Claims. (Cl. 198—177)

This invention relates to conveyer systems of the type in which a conveyer chain travels along a guiding track, referring particularly to systems in which the conveyer chain is inside a hollow track and has means extending through a longitudinal slot in the track for the purpose of moving objects along a predetermined path.

In such a system the conveyer chain comprises a series of links that are pivotally interconnected to follow changes in direction of the hollow track and are provided with both supporting wheels and guiding wheels in contact with the inner surface of the track. In a well known construction, vertical support wheels ride on opposite sides of the longitudinal slot in the track, and horizontal guide wheels are positioned for contact with the opposite side walls of the track.

The general object of this invention is to provide an improved conveyer system of this general type that is of relatively simple and inexpensive construction, and at the same time is superior in important respects to other similar conveyers.

Three specific objects of the invention are closely related in the construction of the preferred embodiment of the conveyer. One of these specific objects is to provide a hollow track that may be easily fabricated not only for straight runs, but also, and with the same simplicity, for curves in any direction. The second specific object is to provide a combination of hollow track and traveling conveyor chain therein that provides for effective supporting and guiding cooperation between the chain and track in all the various possible changes in direction. The third specific object is to simplify the construction of the conveyer chain itself both with respect to the construction of the individual links of the chain and with respect to the arrangements of the wheels employed to support and guide the chain.

A basic feature of the invention in the attainment of these three objects is the concept of replacing the usual set of vertical support wheels and the usual set of horizontal guide wheels of the prior art with a single set of oppositely inclined support wheels having the dual function of both supporting and guiding the conveyer chain. Thus each wheel is positioned to resist one component of force for supporting the weight of the chain and a second component for guiding the chain with both of these components normally at an acute angle to the axis of rotation of the wheel.

In the preferred practice of the invention the inner wall of the hollow track is laterally inclined or banked on each side of the track to provide support surfaces that are more or less normal to the inclined wheels that ride thereon. To this end, the hollow track may be curved in cross-section. A simple cylindrical or tubular configuration for the track has been found desirable, especially so since it is a relatively simple matter to fabricate a tubular structure in curved lengths as well as in straight lengths.

Preferably, the wheels are inclined 90 degrees from each other and 45 degrees from the vertical, thus provid-

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ing four possible contact points substantially equally spaced around the inner circumference of the track. By virtue of this arrangement the conveyer chain may thrust in all radial directions against the surrounding track with equally effective guiding and supporting cooperation between the wheels and the track. With the wheels at 45 degrees from the vertical, the conveyer chain will readily negotiate horizontal and vertical curves in the track.

Other objects of the invention relate to the manner in which load forces are conveyed to the wheels to avoid any binding of the parts and to avoid any undesirable tendency for the load forces to turn the wheels out of position.

In the preferred practice of the invention a further object is to provide an efficient arrangement for driving the conveyer chain. In this regard the invention is characterized by the use of a drive wheel at a 90 degree turn in the path of the conveyer chain with the hollow track arranged to cooperate with the drive wheel in such manner as to utilize more than 90 degrees of the circumference of the drive wheel. A still further object is to transmit the actuating force from the drive wheel to the traveling conveyor chain at points relatively close to the longitudinal axis of the chain.

The above and other objects and advantages of the invention will be apparent from the detailed description to follow taken with the accompanying drawings.

In the drawing, which is to be regarded as merely illustrative,

Figure 1 is a simplified plan view of a conveyer system constructed in accordance with the principles of my invention, much of the supporting structure being omitted for clarity;

Figure 2 is an enlarged transverse section taken as indicated by the line 2—2 in Figure 1;

Figure 3 is a side view of the traveling conveyer chain taken at the angle indicated by the line 3—3 of Figure 2;

Figure 4 is a perspective view taken from below, illustrating how the conveyer chain may be actuated in an overhead conveyer system;

Figure 5 is an enlarged fragmentary section of the periphery of the drive wheel shown in Figure 4;

Figure 6 is a view similar to Figure 5 showing the conveyer chain engaged by the drive wheel;

Figure 7 is a section taken as indicated by the line 7—7 of Figure 6;

Figure 8 is a fragmentary perspective view showing how the conveyer system may be employed to transport garment hangers;

Figure 9 is a fragmentary view in side elevation showing how the conveyer system may be used at floor level to move small trucks along a predetermined path;

Figure 10 is a side elevation of a second embodiment of the invention with the hollow track shown in section to reveal the construction of the conveyer chain; and

Figure 11 is a transverse section taken as indicated by the line 11—11 of Figure 10.

Figure 1 is a simplified plan view showing, by way of example, an overhead conveyer system constructed in accordance with my invention. The system includes a hollow track generally designated T which in this particular installation forms four longitudinal runs 20 and a lateral run 21 at one end. A 90 degree turn in direction on a relatively small radius is made around a drive wheel 22 and a 180 degree change in direction is made around a second idler wheel 23. A 180 degree change in direction on a larger radius is provided by a fixed curve 24 in the track and a second similar change in direction is made by what may be termed a take-up curve 25 in the track T.

The take-up curve 25 is provided for the purpose of keeping the conveyer chain in the track T under suitable tension with automatic compensation for changes in di-

mensions arising from changes in temperature. For this purpose the U-shaped portion of the track T forming the take-up curve 25 is movably supported by two longitudinal frame members 28 that maintain the end of the curve in alinement with the two corresponding longitudinal runs 20 of the track. The midpoint of the take-up curve is further supported by a floating transverse bar 29 which rests in a freely sliding manner on the two longitudinal frame members 28. A pair of helical springs 30 interconnecting the take-up curve 25 and a fixed transverse frame member 31 continually pulls on the take-up curve against the tension of the concealed conveyer chain traveling through the track T.

The hollow track T is curved in cross-sectional configuration and in the preferred practice of my invention comprises a simple metal tube or cylinder as shown in Figure 2, the tubular track having a longitudinal slot 33. It is a simple matter to fabricate such a tubular track by rolling metal sheets of proper width to the slotted configuration. The same end may be achieved by simply cutting the longitudinal slot 33 in stock tubing. An important advantage of fabricating the track from standard tubing is that the tubing may be bent by conventional tubing bending devices to form curves before the longitudinal slot is cut in the tubing. The curves may be in any lateral direction relative to the slot. Such a track may be readily installed to form a system such as shown in Figure 1 by using support brackets of a type well known in the art.

The conveyer chain for travel in the track T may take various forms under the broad concept of such a conveyer chain traveling on wheels inclined in opposite respects across the interior of the track to ride on opposite sides of the longitudinal slot 33. Preferably, the series of wheels will be arranged with wheels inclined in one direction alternating with wheels inclined in the opposite direction. The presently preferred form of traveling conveyer chain for relatively light loads is shown in Figures 2 and 3. The form preferred for heavy duty is shown in Figures 10 and 11. In both of these forms the wheels are inclined 45 degrees from the vertical and 90 degrees from each other, but the angles may be varied if desired.

The light duty conveyer chain shown in Figure 3 comprises a continuous series of links in which rightwardly inclined links designated R alternate with leftwardly inclined links designated L, rightward and leftward referring to inclination away from a central vertical plane as viewed in Figure 2. Each of the links R and L carries one of the supporting wheels 35 the periphery of which is preferably rounded in profile as viewed in Figure 2.

The successive links are pivotally interconnected for articulation as the chain negotiates curves in the track T but for the sake of cooperation among the links, as will be explained, the pivotal joints prevent relative rotation among the links about their longitudinal axes. In the preferred construction shown in the drawings, the two links of each successive pair are interconnected by a universal joint comprising a metal body 38 carrying two pivot pins 39 inclined from each other at 90 degrees, the pivot pins lying in the same two inclined planes as the supporting wheels 35.

The individual chain links R and L may be of any suitable construction. For this light duty chain relatively thin supporting wheels 35 are desirable with the intermediate portion of each link relatively thin or narrow in comparison with the cross-sectional dimension of the universal joints interconnecting the links. One reason for making the links relatively narrow in their intermediate portions is to make possible the transmission of driving force to the chain relatively close to the longitudinal axis of the chain, as will be explained.

A feature of the particular chain construction shown in Figures 2 and 3 is that the links R and L are of simple construction fabricated from sheet metal stampings. The body of each link comprises two metal plates or straps, a left strap 41, and a right strap 42 as viewed in Figure 2.

The two straps are rounded at their opposite ends and offset to form a pair of ears 43 at each end of the link for pivotal engagement with a corresponding pivot pin 39 of the corresponding universal joint. Thus each of the links is relatively thin or narrow in its intermediate portion and has two shoulders 44 on each side formed by the offsetting of the ears 43.

Each of the wheels 35 is mounted on a suitable pivot pin or axle 45 that interconnects the two body straps of the link. Preferably each of the wheels 35 is provided with a well known type of bearing 46 formed of porous metal impregnated with lubricant.

The described chain may be adapted in any suitable manner for moving the material along the path determined by the track T. For example, in the particular construction shown in the drawing, each of the righthand links R is provided with what is commonly known as a pendant 50 that extends through the slot 33 and has one or more holes 51 for the attachment of loads thereto. Each of the pendants 50 is an arm in the form of a short metal strap provided with suitable apertures to facilitate connection with loads to be carried by the conveyer. A feature of this particular construction is that the pendants 50 are simply extensions of the metal straps 42 on the right sides of the links R.

As may be seen in Figure 2 each wheel 35 may possibly make contact with the surrounding track T at two diametrically opposite points of the wheel, and since there are two sets or series of wheels oppositely inclined there are four possible points of contact as the chain is viewed in cross-section in Figure 2, the four points being substantially equally spaced around the circumference of the track. Thus the oppositely inclined wheels 35 are effective in all possible lateral directions in which the traveling chain may thrust against the surrounding track.

In a light duty chain such as shown in Figures 2 and 3, the wheels 35 may be substantially smaller in diameter than the inside diameter of the track T as may be seen in the drawings, but if desired the supporting wheels may be of larger diameter as shown in Figure 11 to minimize clearance for lateral play on the part of the chain with respect to the surrounding track.

It will be noted in Figure 2 that the pendant 50 is bent to an angle of approximately 45 degrees from the plane of the side plate or strap 42 of the associated chain link. Any load carried by the pendant 50 will tend to hold the pendant substantially vertical and thus maintain the oppositely inclined wheels 35 at the desired 45 degree angles from the vertical. In the absence of any load on the pendants 50, however, the slot 33 of the track will limit lateral movement of the pendants and thereby limit the degree to which the wheels 35 may shift out of the desired angle of inclination.

As viewed from the side in Figure 3 the pendant 50 of each right hand link R is at the longitudinal center of the link in alinement with the axle 45 of the corresponding support wheel 35 so that there is no tendency on the part of the load carried by the pendant to rock the link R about the axis of the axle 45. It is also apparent from an inspection of Figure 2 that a load carried by the pendant 50 has a stabilizing effect with respect to rotation of the link about its longitudinal axis. Thus when the described conveyer chain is used in an overhead system each of the links R has a certain inherent ability notwithstanding the fact that the link is supported by a single wheel and that wheel is inclined away from the vertical.

In effect the track T forms a covered trough for the conveyer chain and the traveling chain tends by gravity to seek a relatively low position in this trough. The wheels do not however seek lower positions in the trough than shown in Figure 2 largely because of the rigid angular relation between the pendants 50 and the right hand links R.

The inclined wheels 35 of the load-carrying links R are placed under a certain degree of side thrust by the normal vertical load forces, but this normal side thrust is

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found to have no unfavorable effect whatsoever, there being no appreciable resultant wear or appreciable reduction in the freedom of rotation of the wheels. A fact to be kept in mind is that any change in direction actually reduces such side thrust on the wheels 35. Thus if the change in direction is such as to create leftward centrifugal force as viewed in Figure 2, the load on the wheel 35 will shift towards the plane of the wheel to reduce the side thrust. On the other hand, if the change in direction causes centrifugal force to the right, as viewed in Figure 2, the load will tend to be transferred from the righthand links R to the two immediately adjacent lefthand links L and the load will shift towards the planes of the wheels 35 of the lefthand links to reduce the side thrust on those wheels. This cooperation among the successive righthand and lefthand links is made possible by the described universal joints that prevent relative rotation among the links about their longitudinal axes.

In an overhead conveyer system such as shown in Figure 1, a feature of the preferred practice of my invention is the manner in which the drive wheel 22 is adapted to cooperate with the described conveyer chain. This drive wheel 22 may, as shown in Figure 4, be carried by an overhead plate 55 that serves as a platform for carrying a drive motor 56 and suitable reduction gearing in a unit 57. The usual arrangement of belts 58 operatively connect the motor 56 with the speed reduction unit 57 and the drive wheel 22 is directly connected to the unit 57. It is contemplated that the drive wheel 22 will be adapted to function in effect as a sprocket wheel and that the engagement with the traveling conveyer chain will be made at the previously mentioned pairs of shoulders 44 of the righthand links R.

In the preferred practice of the invention, the drive wheel 22 is formed with a peripheral groove 60 that is semi-circular in configuration as best shown in Figure 5, and shoulders for driving engagement with the traveling conveyer chain are provided by mounting suitable metal blocks across the groove 60 as may be seen in Figures 4 and 5, the metal blocks being secured by suitable welding. In the construction shown there is a pair of spaced lower blocks 61 positioned on the wheel circumference to register with each succeeding righthand link R and also a pair of upper blocks 62 at the same point. As best shown in Figures 5, 6 and 7, the pair of upper blocks 62 forms a pair of shoulders 63 for engagement with the shoulders 44 on the lefthand side of the righthand links R. The two upper blocks 62 together with the adjacent lower blocks 61 provide two adjacent inclined faces 64 and 65, which form a vertex or V-shaped recess to receive the links of the conveyer chain.

The springs 30 of the previously described take-up curve 25 in the track T place the conveyer chain under sufficient tension to draw the chain into the recess or vertex formed by the two faces 64 and 65 as the chain passes around the drive wheel 22. The inclined bottoms of the righthand links R will make initial contact with the lower faces 65 and because of the tension of the conveyer chain the links will tend to slide up the faces 65 to position the inclined sides of the links against the faces 64 with the shoulders 44 of the link snugly engaged by the shoulders 63 of the drive wheel. Thus, a driving force is transmitted from the drive wheel 22 directly to the righthand links R at points relatively close to the longitudinal axes of the links. It can be seen that care is taken to avoid exerting driving force on the pendants 50, one reason being that such driving force would tend to rock the links.

A further feature of the invention is the concept of employing the drive wheel 22 at a 90 degree change in direction of the track T as shown in Figure 1, in such manner as to provide for effective use of more than 90 degrees of the circumference of the drive wheel. As may be seen in Figures 1 and 4, the extent to which the conveyer chain wraps around the periphery of the drive wheel 22 is increased by offsetting the run 21 of the track T inward toward the axis of the drive wheel 22 and curving

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the adjacent end 68 of the offset track into tangential alinement with the wheel.

Preferably each end of the track T associated with the drive wheel 22 is cut away on the side toward the wheel as may be seen in Figure 4. The tongue 70 thus formed in the track that receives the chain from the wheel is flared outwardly as shown.

In the described overhead conveyer system the pendants 50 are intended to be used for direct support of the material or objects moved by the conveyer. It will be apparent to those skilled in the art, however, that the track and conveyer chain may be utilized in other ways for moving objects along the conveyer path. By way of example, Figure 8 shows how the track T may be installed with the slot 33 uppermost in an overhead system for conveying garments by means of hangers 71. The hangers are hooked over the track T in Figure 8 and are shoved along the track by the upwardly turned pendant 50.

By way of further illustration, Figure 9 shows how the track T may be laid on the floor with the track slot uppermost for the purpose of moving small four-wheeled trucks 72 along the conveyer path. Each of the trucks 72 has a tongue 73 connected to one of the upwardly turned pendants 50.

The heavy duty conveyer chain shown in Figures 10 and 11 is of the same general character as the first described conveyer chain but preferably has somewhat wider wheels 80 and also has two such wheels on each of its links 81, the two wheels being inclined in opposite directions.

Each of the links 81 comprises a pair of metal side plates 82 that are centrally joined by a vertical block of metal 83. The two side plates 82 are twisted with respect to the central block 83 to incline the two associated wheels 80 in opposite directions and at their ends the two side plates are offset to provide the usual ears 84. The successive links 81 are pivotally interconnected for universal movement in the manner heretofore described by oppositely inclined pivot pins 85 carried by interposed metal bodies 86, the pivot pins engaging the ears 84 of the links.

The oppositely inclined wheels 80 are carried by suitable axles 88 and the loads to be carried along the conveyer path are supported by suitable hooks 90 that are mounted in the metal blocks 83 and extend downward through the slot 33 of the track T. Preferably the shank of each hook 90 has welded thereto a suitable washer 91 to support a loose rotatable sleeve 92 to minimize friction whenever the hooks shift laterally towards the side of the slot 33.

This second form of conveyer chain moves through the track T with the same efficiency and freedom as the first described conveyer chain, and has the advantage of equally distributing each load between two successive wheels with the load in precise alinement with the longitudinal axis of the link.

The presently preferred specific forms of my invention described in detail herein for the purpose of disclosure will suggest to those skilled in the art various changes, substitutions and other departures that properly fall within the scope and spirit of my appended claims.

Having described my invention, I claim:

1. In a conveyer, the combination of: a hollow track of curved cross-sectional configuration with a longitudinal slot in a vertical plane centrally thereof, and a traveling conveyer chain inside the track, said chain comprising: a series of links having relatively wide end portions and relatively narrow intermediate portions with longitudinal slots therein; a wheel mounted in each of said link slots, the successive links being oppositely inclined relative to said vertical plane thereby to incline said wheels in opposite respects; joint means interconnecting said wide end portions of said links, said joints means having transverse pivot axes to permit lateral swinging movement of the links relative to each other; and means extending

through said track slot from the narrow intermediate portion of at least some of said links.

2. In a conveyer, the combination as set forth in claim 1 in which each of said joint means has two pivot axes inclined at 90 degrees relative to each other.

3. In a conveyer, the combination as set forth in claim 2 in which said wheels and said joint axes are inclined 45 degrees from the vertical.

4. In a conveyer, the combination as set forth in claim 1 in which the body of said links comprises two side plates interconnected by an axle carrying one of said wheels.

5. In a conveyer, the combination as set forth in claim 4 in which said two side plates are also interconnected at their opposite ends by pivot means included in said joint means.

6. In a conveyer, the combination as set forth in claim 1 in which the body of each of said links comprises two side plates and said means extending through the track slot is integral with one of said plates and aligned with the axis of the wheel carried by the link.

7. A traveling conveyer chain adapted to run in a longitudinally slotted tubular track of curved cross-sectional configuration, comprising: a series of links having relatively wide end portions and relatively narrow intermediate portions with longitudinal slots in said intermediate portions, transverse shoulder means at the juncture of said relatively wide end portions with said relatively narrow intermediate portions by which certain of said links may be driven, a running wheel mounted in each of said link slots and adapted to protrude from both sides thereof to run on the inside surfaces of said track on opposite sides of said chain, universal joint means articulating said wide end portions of said links to one another on transverse pivot axes, some of said link slots and wheels being in planes at right angles to the remainder of said link slots and wheels, and guide and article carrier means on some of said links adapted to run in the longitudinal slot in said tubular track.

8. A travelling conveyer chain adapted to run in a longitudinally slotted tubular track of curved cross-sectional configuration, comprising: a series of links having relatively wide end portions and relatively narrow intermediate portions with longitudinal slots in said intermediate portions, transverse shoulder means at the juncture of said relatively wide end portions with said relatively narrow intermediate portions by which certain of said links may be driven, a running wheel mounted in each of said link slots and adapted to protrude from both sides thereof to run on the inside surfaces of said track on opposite sides of said chain, universal joint means articulating said wide end portions of said links to one another on transverse pivot axes, with said slots and wheels of successive links in planes at right angles to one another, and guide and article carrier means on some of said links adapted to run in the longitudinal slot in said tubular track.

9. A travelling conveyer chain adapted to run in a longitudinally slotted tubular track of curved cross-sectional configuration, comprising: a series of links each comprising a pair of spaced parallel straps, end portions of said straps being outwardly offset to form a two armed yoke for a universal joint at each end of the link, the yoke arms of successive links being oriented at right angles to one another, universal joint blocks received between the arms of the yokes at the proximate ends of adjacent links, pivot pins at right angles to one another extending between the arms of the two yokes and through the block between said arms, running wheels mounted between said parallel straps, and means

projecting laterally from some of said links to run in said longitudinal track slot.

10. The subject matter of claim 9, wherein said laterally projecting means comprise pendants depending from an intermediate portion of one of the parallel straps of some of said links.

11. A travelling conveyer chain adapted to run in a longitudinally slotted tubular track of curved cross-sectional configuration, comprising: a series of links having longitudinally slotted intermediate portions and having end portions articulated to one another by means of universal joints, transverse shoulder means facing towards one another at the two end portions of certain of said links by which said chain may be longitudinally driven, running wheels mounted on said links within the longitudinal slots therein, and guide and article carrier means on some of said links adapted to run in the longitudinal slot in said tubular track.

12. A travelling conveyer chain adapted to run in a longitudinally slotted tubular track of curved cross-sectional configuration, comprising: a series of links having longitudinally slotted intermediate portions and having end portions articulated to one another by means of universal joints, transverse shoulder means facing towards one another at the two end portions of said links by which said chain may be longitudinally driven, running wheels mounted on said links within the longitudinal slots therein, guide and article carrier means on some of said links adapted to run in the longitudinal slot in said tubular track, and a drive sprocket for said chain having spaced drive elements engageable with said transverse shoulder means on said chain links.

13. A travelling conveyer chain adapted to run in a longitudinally slotted tubular track of curved cross-sectional configuration, comprising: a series of links having relatively wide end portions and relatively narrow intermediate portions with longitudinal slots in said intermediate portions, transverse drive shoulder means at the juncture of said relatively wide end portions with said relatively narrow intermediate portions, a running wheel mounted in each of said link slots and adapted to protrude from both sides thereof to run on the inside surfaces of said track on opposite sides of said chain, universal joint means articulating said wide end portions of said links to one another on transverse pivot axes, some of said link slots and wheels being in planes at right angles to the remainder of said link slots and wheels, guide and article carrier means on some of said links adapted to run in the longitudinal slot in said tubular track, and a drive sprocket for said chain having circumferentially spaced drive elements spaced to be engageable with the shoulder means at the ends of alternate links of said chain.

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