United States Patent [19]

Holbert

[11] E **Re. 28,909**

[45] **Reissued July 20, 1976**

[54] **CONVEYOR**

[75] Inventor: **Dimitry Holbert,** Birmingham, Mich.

[73] Assignee: **Standard Alliance Industries, Inc.,** Chicago, Ill.

[22] Filed: **July 18, 1974**

[21] Appl. No.: **489,798**

Related U.S. Patent Documents

Reissue of:

[64] Patent No.: **3,678,861**
Issued: **July 25, 1972**
Appl. No.: **63,392**
Filed: **Aug. 13, 1970**

[52] **U.S. Cl.** ..... **104/172 B;** 198/137; 198/181

[51] **Int. Cl.**[2] **B61B 13/00**

[58] **Field of Search** ..... 104/172 R, 172 B, 172 BT, 104/172 C, 172 S, 178, 25; 198/203, 181, 182, 189, 137, 168, 164

[56] **References Cited**

UNITED STATES PATENTS

802,047	10/1905	Krell	198/203
1,706,905	3/1929	Stockly	198/203
2,642,176	6/1953	De Burgh	198/203 X
2,685,361	8/1954	Garman	198/181
3,435,780	4/1969	Czarnecki et al.	104/172 C
3,590,745	7/1971	Ouska	104/172 B

Primary Examiner—Robert J. Spar
Assistant Examiner—Randolph A. Reese
Attorney, Agent, or Firm—Harness, Dickey & Pierce

[57] **ABSTRACT**

A conveyor chain for conveyor cars and the like having a plurality of rollers for engagement with guide rails for the chain and a plurality of members carried by the chain having at least one substantially flat surface extending laterally of the chain adapted to be engaged by a chain driving member.

12 Claims, 5 Drawing Figures

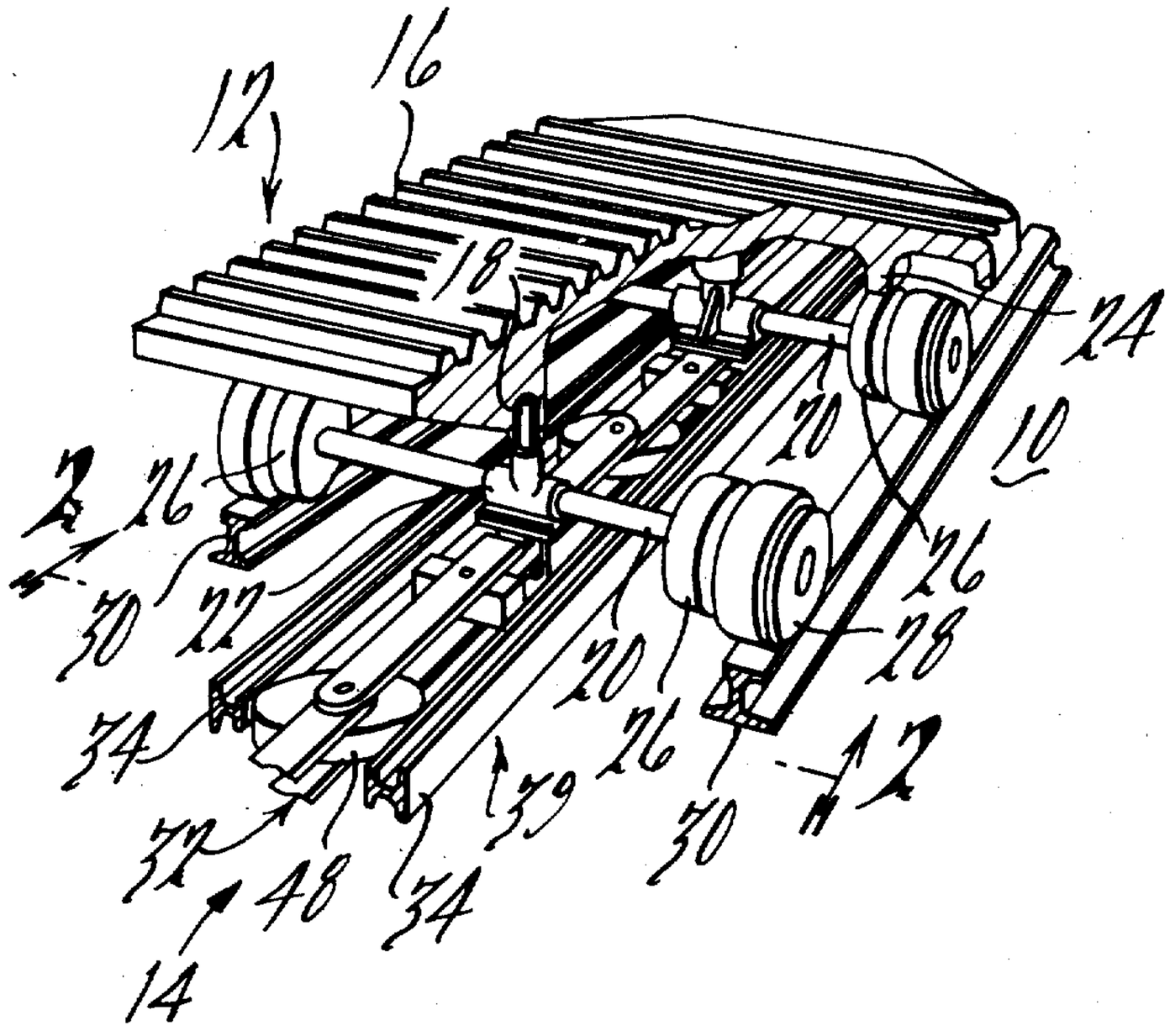
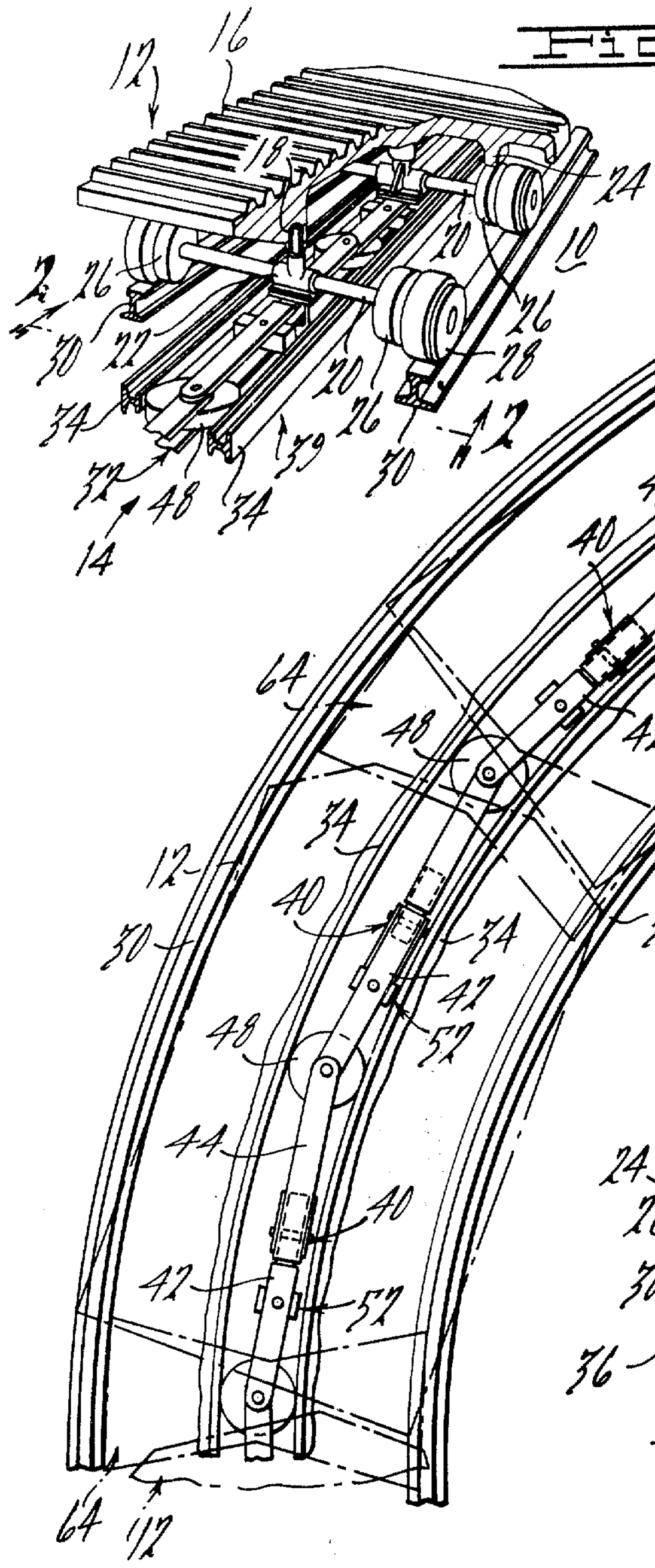


Fig. 1.



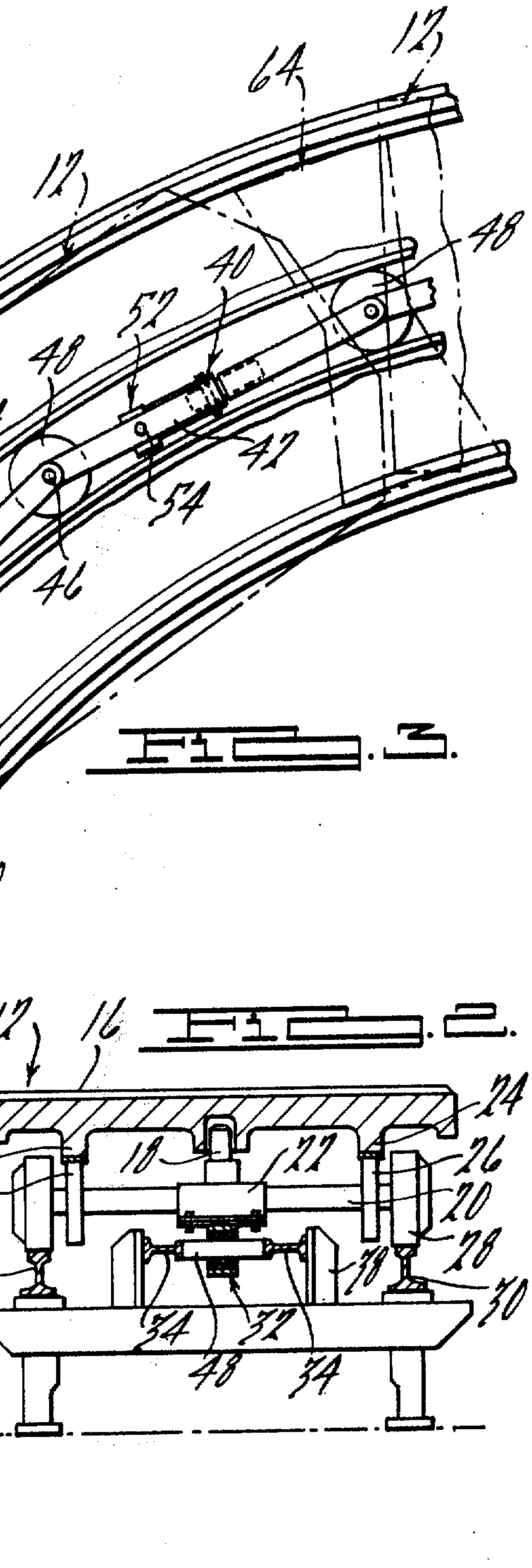
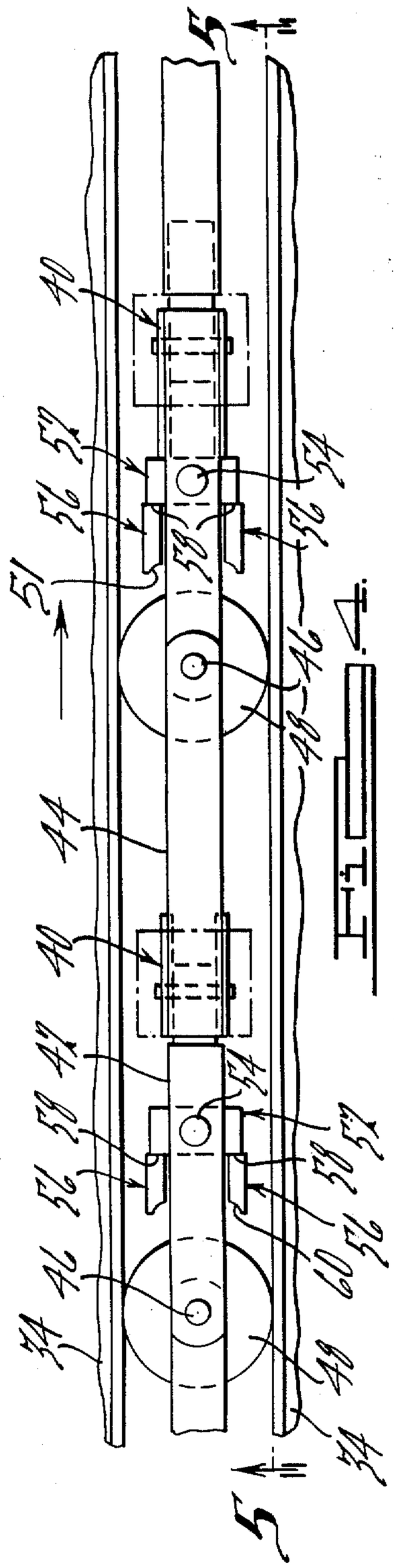
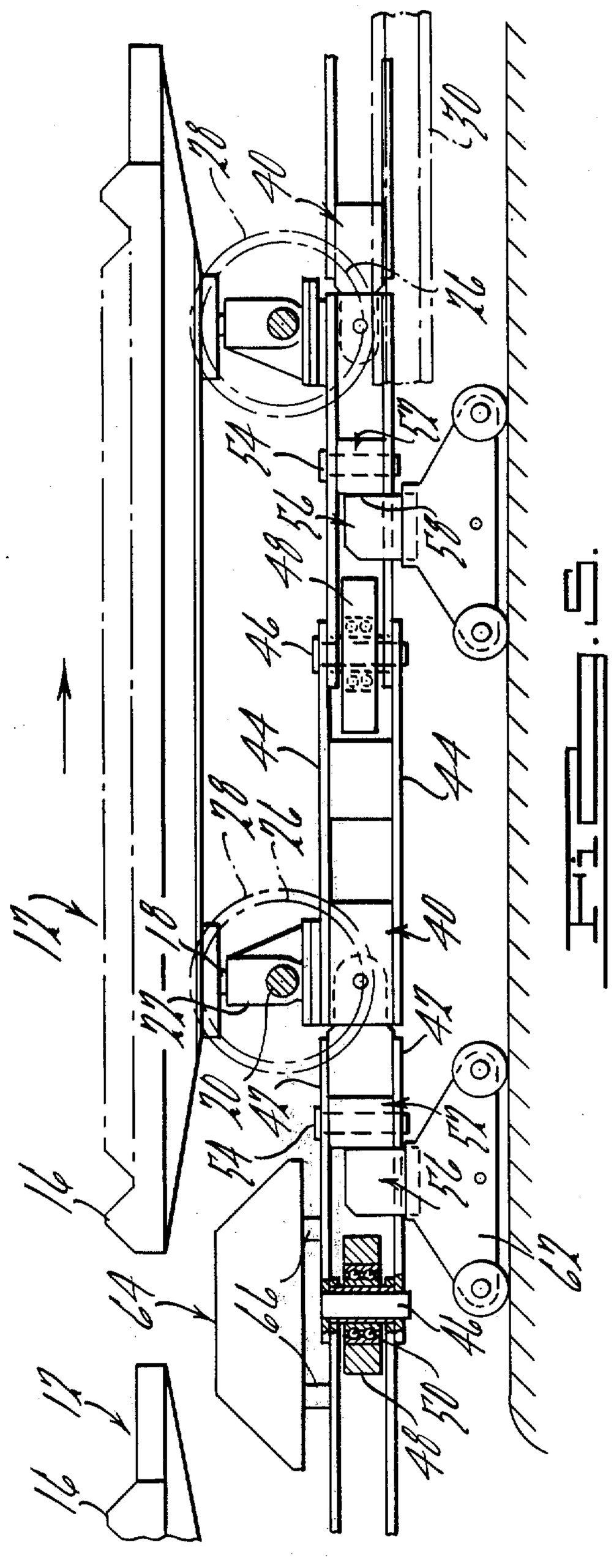


Fig. 3.

Fig. 2.





CONVEYOR

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates generally to conveyor chains for conveyor systems, for example, for a system like that disclosed in the patent to Czarnecki et al, U.S. Pat. No. 3,435,780, issued Apr. 1, 1969, and assigned to the assignee of this application. As shown in the above patent, conveyor chains are conventionally driven by driving members disposed on opposite sides of the chain which engage the arcuate surfaces of rollers carried by the chain. In some installations, for example, in foundries where the conveyor assembly may carry heavy molds between various levels of the foundry, very large driving forces are required to move the conveyor assembly. With large driving forces, the arcuate surfaces of the rollers develop laterally-outward forces tending to spread the driving members. In addition to the above undesirable tendency, the force of the driving members against the rollers is generally detrimental to the life of the bearings for the rollers. As a still additional disadvantage, the rollers must be sufficiently large in diameter to extend laterally outwardly of the driving members to provide a substantial surface component which is crosswise of the chain to efficiently receive the force of the driving members. As a result, the rollers tend to engage the guides for the chain during chording of the chain when a curved path of relatively small radius is negotiated.

The present invention solves the above problems by providing a laterally extending driven member or block on the chain which has flat surfaces disposed crosswise of the chain for engagement by the driving members of the drive means. Accordingly, substantially no laterally-outward forces are developed, and consequently, there is no tendency to spread the driving members. Furthermore, since the crosswise flat surfaces of the driven members may readily extend to the lateral extremities of the driven members, the driven members may be constructed with a lesser extension laterally of the chain than rollers used for this purpose so as to avoid engagement of the driven members with the guide rails of the chain during chording of the chain as it negotiates a curved path. Additionally, the bearings for the rollers no longer receive the driving force thereby providing increased roller bearing life. Preferably, the driven members are pivotally mounted to the chain so as to accommodate any angular misalignment between the driving members and driven members. Also, preferably, the driven members are mounted intermediate the pivot for the chain so that they may be removed for replacement or repair without dismantling of the chain.

In view of the above and the following detailed description of the preferred embodiment of this invention, it will be appreciated that the improved conveyor chain provided by this invention is a significant advance in this art.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective illustration of a mold car driven by an exemplary conveyor chain construction according to this invention;

FIG. **2** is an end cross-sectional view of the mold car and conveyor chain construction shown in FIG. **1**;

FIG. **3** is a top view illustrating the manner in which the conveyor chain construction of FIG. **1** negotiates a curved path;

FIG. **4** is a top view of a conveyor chain construction of FIG. **1** showing the manner of engagement of the chain with driving dogs of a drive means for the conveyor chain; and

FIG. **5** is a side view, partially in section, illustrating the mold car and conveyor chain construction of FIG. **1** showing the manner of engagement of the chain with driving dogs of a drive means for the conveyor chain.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. **1,** an exemplary conveyor car and conveyor chain assembly is shown generally designated **10** which is suitable for use, for example, in a foundry for conveying molds to various molding operation locations. The assembly **10** may include a conveyor car generally indicated at **12** and a conveyor chain assembly generally indicated at **14.** The conveyor cars **12** may comprise a top **16** on which conveyable articles are carried, for example, the molds for a molding operation. The car tops **16** are mounted on king pins **18** which are connected to the axles **20** by means of T-connectors **22.** The car top **16,** in addition to being mounted on the king pins **18,** is also supported by downwardly extending flanges **24** which support the car top **16** on four bolster wheels **26.** The bolster wheels **26** are free wheeling on the axle **20** and there is normally relative movement between the bolster wheels **26** and the flanges **24** only when the conveyor car **12** is negotiating turns. The conveyor car **12** moves along a path taken by the conveyor system by rolling on wheels **28** which are guided along a roadway or track for the conveyor car **12** consisting of a pair of rails **30.** A chain **32,** *comprising pivotally interconnected pairs of links is* guided along a path provided by a pair of *vertical* rails **34,** *and* drives or propels the cars **12** along the path defined by the rails **30.** The rails **30** may be mounted on a bed **36** while the rails **34** may be mounted on vertical extensions **38.**

The T-connector **22** is removably secured to *the conveyor chain 32 at* a [pivotal] *universal* joint **40** *which comprises a part* of the chain **32** [which] *and* provides for vertical articulation of the chain when the path defined by the rails **30** changes upwardly or downwardly. [The] *In the form of the invention here shown, a* universal joint **40** generally [connects vertically spaced pairs] *is provided midway between the ends of each pair* of chain links. *It will be observed that the two links of each pair are spaced vertically apart and are formed of two separate left and right portions* **42** and **44** *of substantially equal length, as perhaps best shown in FIG. 5. In each instance, the left hand portions 42 are welded or otherwise fixedly connected at the inner ends thereof to one end portion of the universal joints 40 and the right hand portions 44 are similarly welded at the inner ends thereof to the other end portion of the universal joints. At the outer ends thereof, the left and right link portions 42 and 44* [which pairs] are pivotally con-

nected by pins **46** to adjacent *similar and* complementary [pins] *pairs* of links [**42** or **44**]. The pins **46** provide for horizontal articulation of the chain **32** when the guide rails **30** bend leftwardly or rightwardly in the horizontal plane, [or] *viz, in* a plane parallel to the car top **16.** The pins **46** also carry rotatably mounted rollers **48** which *space the outer end portions of the upper and lower links of the chain 32 and* are preferably mounted by bearings **50** as illustrated in FIG. **5.** In the general arrangement as shown, a roller **48** is mounted intermediate each pair of adjacent conveyor cars **12** as well as centrally of each conveyor car **12.**

Rectangular blocks **52** are carried by the chain **32** between the [links] *link portions* **42** [and] *adjacent to a universal joint 40 and between the universal joint and an adjacent roller 48. The drive blocks 52* extend laterally [thereof,] *of the chain 32* and are preferably mounted for limited [rotation] *pivotal movement* in a horizontal plane as by pins **54** extending through the [links] *link portions* **42** and the blocks **52.** The blocks **52** are disposed a predetermined distance [forward] *forwardly* of the nearest roller **48** so as to accommodate an upward arcuate movement of a pair of driving dogs or members **56** of a *conventional* driving apparatus, only partially shown in FIG. **5.** As can be best seen in FIG. **4,** *each pair of driving dogs 56 straddle the chain 32, and each* [*the blocks*] *block* **52** [have] *has* a pair of flat surfaces **58,** [each extending] *which extend* laterally from [one side] *opposite sides* of the *chain* links [**42**] and [being] *are* adapted to *be engaged by correspondingly* [*engage a corresponding*] flat [surface] *surfaces* on a driving dog **56.** It will be appreciated that *if the blocks are pivotally mounted on the pins 54 in the preferred manner* any angular misalignment between the flat surfaces [on] *of* the dogs **56** and the driven blocks **52** are accommodated by pivotal movement of the blocks **52** about [pivot] *pivots* **54.** Thus, the driving force provided by the driving dogs **56** is transmitted to the chain **32** through the pivot pins **54.** The [rearward] *rearwardly* facing surfaces [**50**] *51* of the driving dogs **56** may be arcuate in cross section so as to be adapted to fully engage the arcuate surfaces of the nearest rearward roller **48** [upon] *which functions also as a hold back dog to limit* coasting of the chain **32** after driving movement of the dogs **56** has ceased [to limit such coasting movement of the chain **32**] thereby facilitating relatively accurate positioning of the cars **12.** As can be best seen in FIG. **3,** the blocks **52** extend laterally of the chain links **42** a distance less than the lateral extension of the rollers **48** so as to prevent engagement of the blocks **52** with the rails **34** during chording of the chain **32** as it negotiates a curved path. The blocks **52** may have a lesser lateral extension than a roller used for this purpose since it provides a continuous crosswise surface to its lateral extremities while a roller used for this purpose has only a slight crosswise surface component near its lateral extremities, and accordingly, must be made correspondingly larger in diameter to provide a suitable engaging surface for the driving members. In the general arrangement of the conveyor as shown, each of the driven blocks **52** is positioned intermediate a pair of rollers **48,** and particularly, between a roller **48** and a vertical articulation point **40.**

As can be best seen in FIG. **5,** the driving dogs **56** are *conventionally* mounted on rolling carriages **62** which are driven by a *caterpillar* chain and motor assembly,

for example, as illustrated in the aforementioned patent to Czarnecki et al, U.S. Pat. No. 3,435,780.

In one of its intended uses, the cars **12** carry sand molds for a foundry operation. To prevent any spilled sand from interfering with the bearings **50** and the rollers **48,** a sand shield **64** is mounted intermediate the cars as by pins or studs **66** extending from the chain links **42** and **44** into receptacles in the sand shield **64** as shown. To accommodate the relative angular motion of the chain links **42** and **44** when the chain **32** negotiates a curved path, the receptacle for one of the pins **66** may be slotted or elongated. The sand shield **64** preferably slopes laterally as shown to deflect the sand to the sides of the conveyor **10.** It may also have fore and aft bevels or slopes, if desired.

In view of the above description of an exemplary conveyor system **10** according to this invention, it will now be appreciated that an efficient driving engagement is provided between the drive dogs **56** and the driven blocks **52.** Moreover, the bearings **50** supporting the rollers **48** are not carrying the driving forces, and therefore, are only forcibly loaded upon engagement of the rollers **48** with the guide rails **34** when negotiating a curved path and occasionally when the rollers **48** engage the guide rails **34** when the conveyor chain **32** is transversing a straight path. Accordingly, the service [lie] *life* of the bearings **50** is benefitted. In addition to the above advantages, the driven blocks **52** may be easily removed for repair or replacement without dismantling the chain **32.** It will be appreciated that this is a significant advantage as the difference in elevation between the different levels of a foundry may exert a force on the chain preventing convenient assembly of the chain after dismantling.

While it will be apparent that the teachings herein are well calculated to teach one skilled in the art the method of making the preferred embodiment of this invention, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or meaning of the subjoined claims.

What is claimed is:

1. In a conveyor chain assembly, a chain comprising connected pairs of spaced links, curved guide rails on opposite sides of said chain, a plurality of rollers carried by pins connected between said pairs of links and engageable with said guide rails as said chain passes therethrough, whereby intermediate portions of said links between said rollers will approach relatively closely to said guide rails, means for driving said conveyor chain assembly comprising a plurality of blocks disposed between said pairs of links, each block having a pair of planar surfaces extending laterally outwardly in opposite directions from said links, the extent of said surfaces being less than that which will cause engagement of said blocks with said guide rails during the chain assembly movement means for mounting said blocks for limited rotation with respect to said links at intermediate portions thereof between said guide rollers, and a forked driving apparatus having a pair of driving dogs movable into position on opposite sides of a pair of links with lateral planar surfaces engageable with the lateral surfaces on said blocks.

2. A conveyor chain assembly according to claim **1** wherein said chain is pivotally connected for vertical articulation intermediate said rollers.

3. A conveyor chain assembly according to claim 1 further including a plurality of conveyor cars carried by said chain.

4. A conveyor chain assembly according to claim 3 wherein said conveyor cars are serially mounted to said chain with one of said rollers intermediate adjacent ones of said conveyor cars.

5. A conveyor chain assembly according to claim 4 including a shield mounted intermediate said cars adapted to deflect material falling from said conveyor cars from said rollers intermediate said adjacent ones of said conveyor cars.

6. In a conveyor chain assembly, a chain comprising connected pairs of spaced links; curved guide rails on opposite sides of said chain; a plurality of rollers carried by pins connecting said pairs of links and engageable with said guide rails as said chain passes therebetween, whereby intermediate portions of said links between said rollers approach relatively closely to said guide rails; and means for driving said chain comprising a plurality of blocks spaced along the length of said chain, each block being disposed between and attached to the links of a pair of said chain links and having planar surfaces extending laterally outwardly in opposite directions from said links, said rollers following and being disposed adjacent to but spaced from respective of said blocks, the lateral extent of said surfaces being less than that which will cause engagement of said blocks with said guide rails during operation of said chain assembly, and a driving apparatus having pairs of forked driving dogs movable into position on opposite sides of said chain, said dogs having lateral planar surfaces engageable with the lateral surfaces of said blocks.

7. In a conveyor chain assembly, a chain adapted to move along a predetermined path and comprising pairs of spaced links arranged in end-to-end relation; means including pins interconnecting said pairs of links; curved guide rails alongside said chain at curved sections of said predetermined path; antifriction rollers mounted on said pins adapted to ride on said guide rails as said chain negotiates said curved sections in use, portions of said links between said rollers approaching relatively closely to said guide rails due to chording of the links as the rollers move on said guide rails; blocks connected to at least certain of said pairs of links, each of said blocks being disposed ahead of and adjacent to but spaced from a respective one of said rollers and said blocks having planar surfaces extending laterally outwardly in opposite directions from said links, the lateral extent of said planar surfaces being less than that which will cause engagement of said blocks with said guide rails in the operation of said chain assembly; and a driving apparatus coactive with said chain to move the same under power along said predetermined path, said apparatus having pairs of driving dogs, each pair of dogs disposed to straddle said chain behind one of said blocks and being engageable with the planar surfaces of said block.

8. In a conveyor chain assembly, a chain comprising a plurality of links arranged in pairs and connected end-to-end by means including pivots; rollers on said pivots; curved guide rails coactive with said rollers to control the path of movement of said chain in use; intermediate portions of said links between said rollers approaching relatively closely to said guide rails in use; and means for driving said conveyor chain comprising a plurality of blocks spaced along the length of said chain, each block being attached to links of said chain ahead of and adjacent to but spaced from a respective one of said rollers,

said blocks having planar surfaces extending laterally outwardly in opposite directions from said links, the lateral extent of said surfaces being less than that which will cause engagement of said blocks with said guide rails during operation of said chain assembly; and a drive apparatus having pairs of driving dogs, each pair of dogs adapted in operation of said drive to straddle said chain between one of said blocks and the adjacent roller and being provided with lateral planar surfaces engageable during said operation with the planar surfaces of said block, said dogs when in driving position against said blocks being spaced from the adjacent rollers but operative to be engaged by said rollers to limit over-travel and coasting of said chain during certain operating conditions of said conveyor chain assembly.

9. A conveyor chain assembly adapted to travel between guide rails at least certain portions of which are curved, said chain assembly comprising pairs of spaced links having overlapping end portions; pins interconnecting the overlapping end portions of said links; rollers mounted for rotation on said pins extending laterally of said links for rolling engagement with said guide rails and operative to hold the portions of said links between said rollers free from engagement with said rails; means for driving said conveyor chain comprising a plurality of blocks disposed between and connected to at least certain of said links and having planar driving surfaces extending laterally outwardly in opposite directions from said links, said rollers following and being disposed adjacent to but spaced from said blocks, the length of said blocks and the lateral extent of said driving surfaces being less than that which will cause engagement of said blocks with said guide rails during operation of said chain assembly; and a forked driving apparatus having pairs of driving dogs movable into position on opposite sides of said chain and engageable with the planar driving surface of said blocks.

10. In a chain conveyor of the type having an endless chain; means for guiding said chain through a predetermined path of travel including laterally spaced guide rails along curved sections of said path on opposite sides of said chain and rollers carried by and extending laterally from opposite sides of said chain engageable with said guide rails; and a power drive for said chain having a plurality of spaced forked driving elements arranged to straddle said chain, the improvement comprising a plurality of blocks carried by said chain and having portions thereof extending laterally in opposite directions from said chain, said blocks being disposed ahead of and adjacent to but spaced from respective of said rollers, said blocks being spaced along the chain for engagement by said forked driving elements and said laterally extending portions having transverse planar surfaces on which said elements seat, said rollers extending laterally from the chain sufficiently farther than said blocks to hold the latter free from engagement with said guide rails.

11. The combination as set forth in claim 10 wherein said rollers define holdback means engageable with the forked elements to limit coasting of said chain under certain operating conditions of said conveyor.

12. In a chain conveyor of the type having an endless chain; means for guiding said chain through a predetermined path of travel having opposed, laterally spaced, vertical guide surfaces along curved sections of said path and rollers carried by and extending laterally from opposite sides of said chain engageable with said guide surfaces; and a power drive for said chain having a plurality of spaced forked driving elements arranged to straddle said chain, the improvement comprising a plurality of

blocks carried by and having portions thereof extending laterally in opposite directions from said chain, said blocks being disposed ahead of and adjacent to but spaced from respective of said rollers, said driving elements being operative to move progressively into position behind successive blocks for driving engagement with the latter and said blocks having planar rear surfaces disposed substantially transversely of said chain against

which said elements seat to drive the chain, said rollers extending laterally from the chain sufficiently farther than said blocks to hold the latter free from engagement with said guide surfaces, and said following rollers being engageable with said forked driving elements to limit over-travel and coasting of said chain.

* * * * *