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Kohl

[11] **3,724,643**

[45] **Apr. 3, 1973**

[54] **TAPERED ROLL CONVEYOR CURVE CONSTRUCTION**

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[52] **U.S. Cl.** .....**198/127 R,** 198/181

[51] **Int. Cl.** **B65g 13/02**

[58] **Field of Search** .....198/127 R, 181, 105

[56] **References Cited**

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Attorney—John H. Bishop et al.

[57] **ABSTRACT**

A power driven material handling conveyor curve section having an improved tapered roll construction mounted therein. A tapered sleeve is fixed to a section of or all of a usual cylindrical conveyor roll. A portion of the cylindrical roll or section extends out beyond the large end of the tapered sleeve. The roll shaft is non-rotatably mounted in a support frame, and the cylindrical roll or section and tapered sleeve fixed thereto rotate on bearings journalled on the roll shaft. A pair of chain drive sprockets are mounted on the extended end of the cylindrical roll and are connected by drive chains to similar sprockets on adjacent rolls. The rolls are snapped into and out of mounted position by usual spring means mounted within the roll.

9 Claims, 11 Drawing Figures

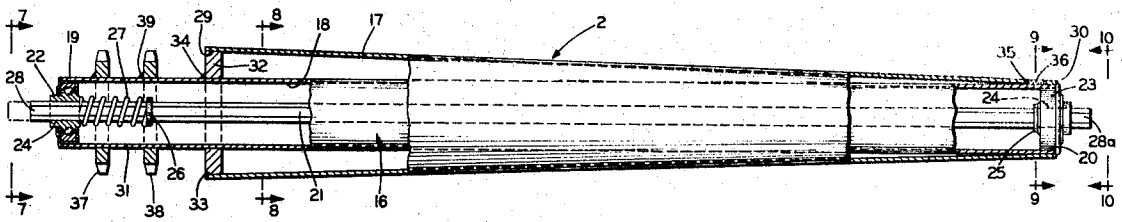
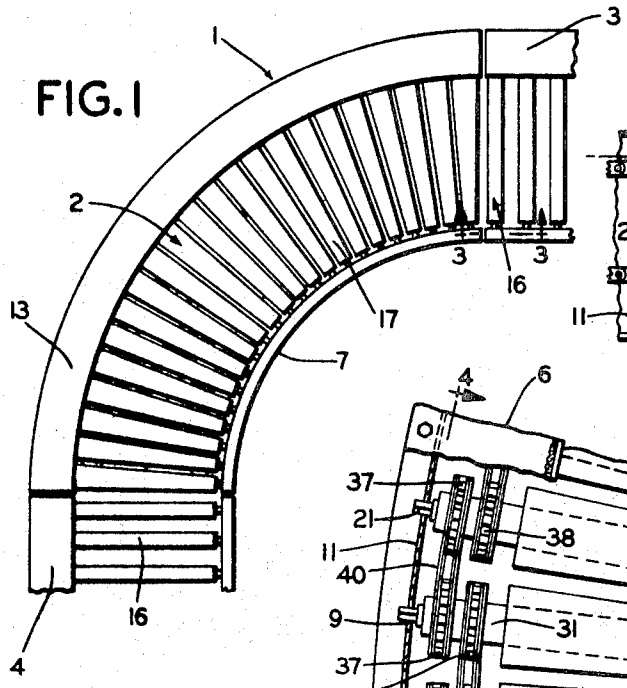


FIG. 1



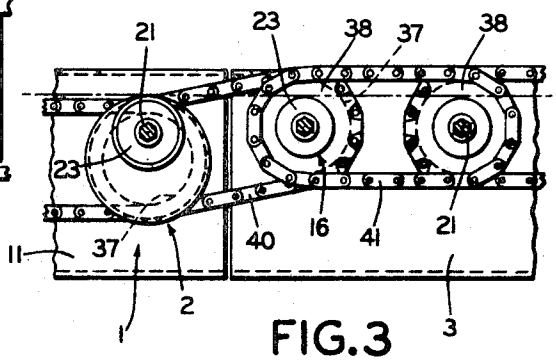


FIG. 3

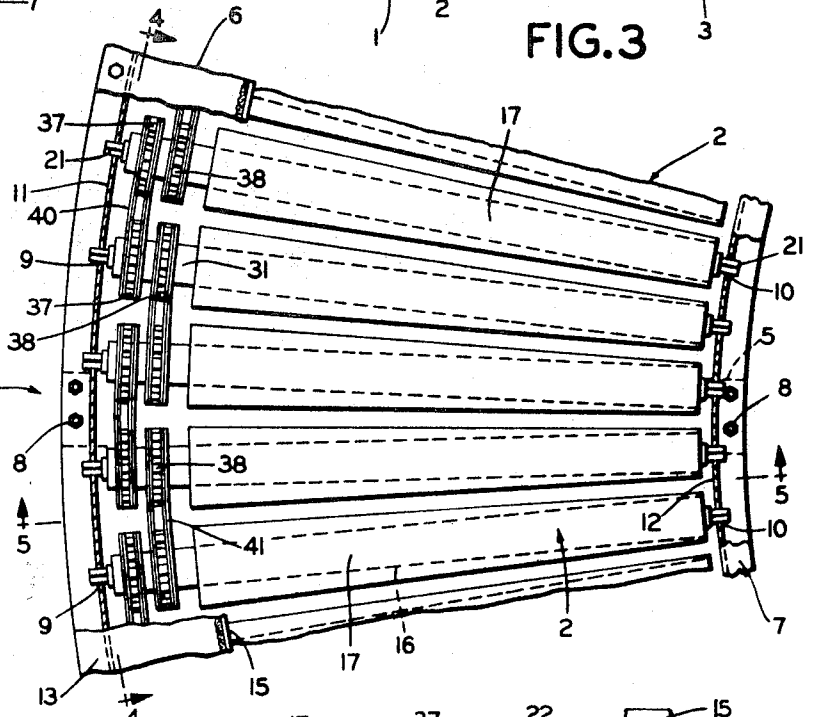


FIG. 2

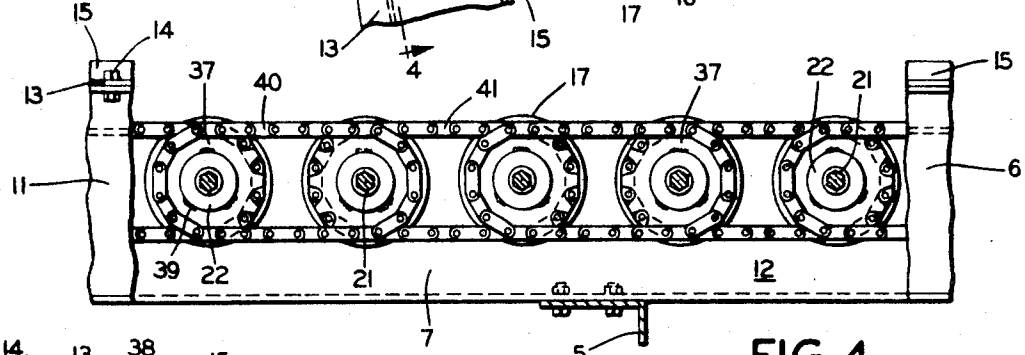


FIG. 4

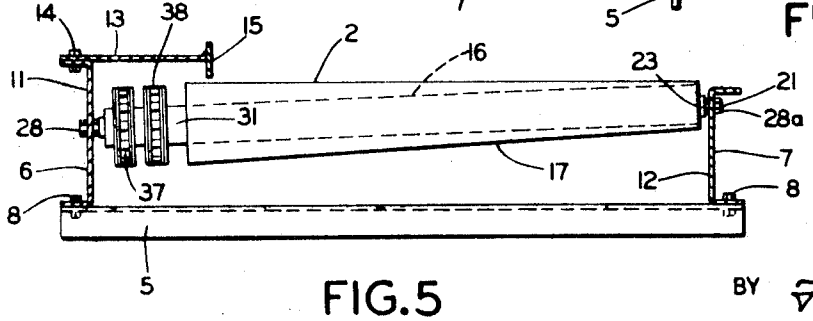


FIG. 5

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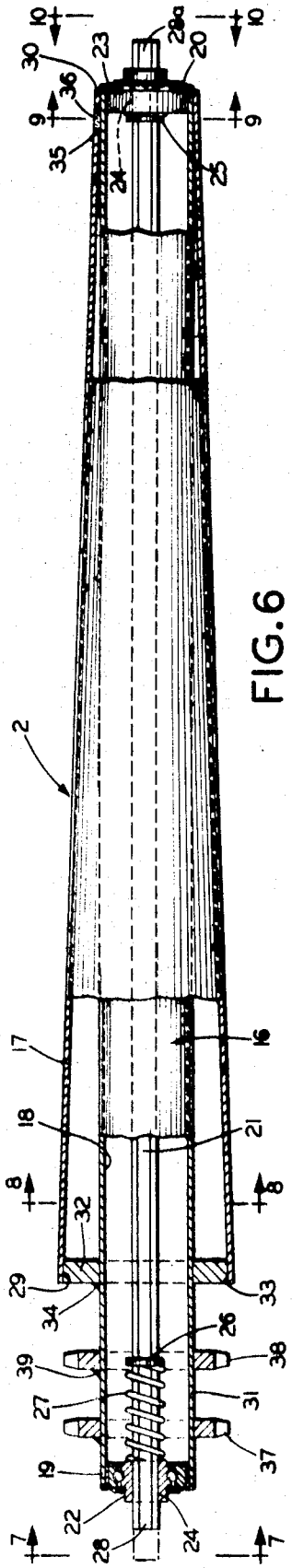

FIG. 6

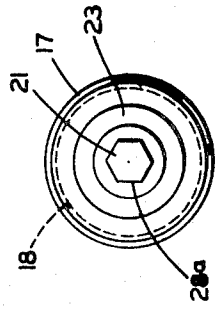

FIG. 10

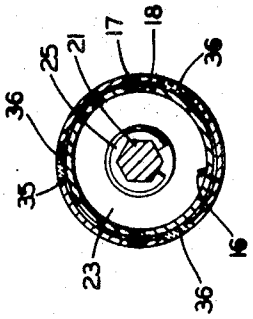

FIG. 9

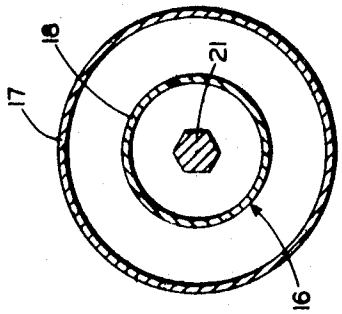

FIG. 8

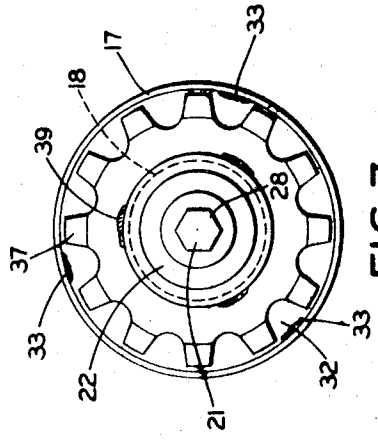

FIG. 7

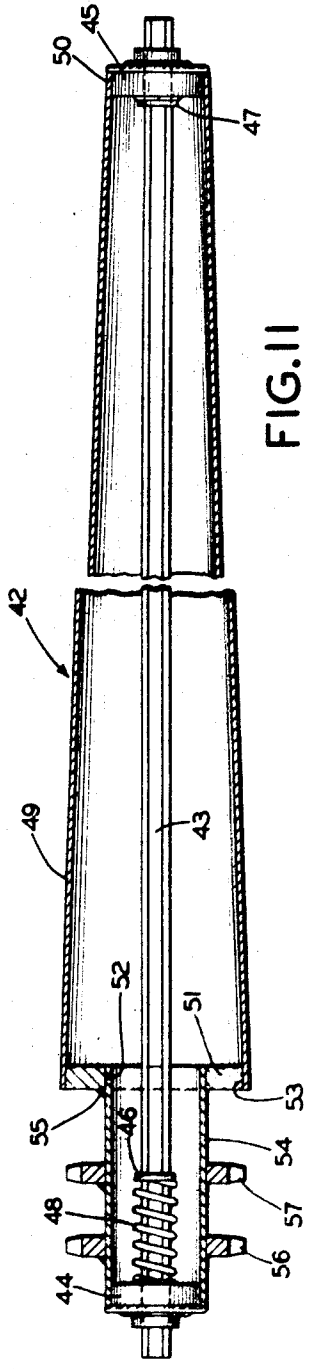

FIG. 11

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TAPERED ROLL CONVEYOR CURVE CONSTRUCTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to power driven, material handling conveyors and in particular to curved conveyor sections generally connected between two straight conveyor sections for turning a corner or conveyor line angle. More particularly the invention relates to an improved tapered roll construction for mounting within the curved conveyor section which enables close roll spacing and high conveyor speed operation to be achieved in a relatively inexpensive manner.

2. Description of the Prior Art

Various curved conveyor sections using a variety of roll constructions have been used in power driven conveyors for movement of innumerable types of material. A tapered roll is used in many curved sections because the roll surface at the outer or larger roll end travels at a faster rate of speed than does the roll surface at the inner or smaller roll end due to the difference in roll diameters at these points. Thus material traveling on such tapered rolls has a natural tendency due to this difference in surface speeds, to guide itself around the curve preventing pileups along the outer conveyor edge.

Various drive means for the rolls within the curved conveyor section have been used, such as turntables, flexible cables, belts and gears located within the radius of the curved section and connected usually to the smaller roll ends. Likewise, various continuous chains, belts and gear arrangements have been connected to the outer roll ends to impart positive driving power to the rolls. Many of these constructions have proven expensive, impractical and hard to maintain.

Problems have arisen in the use of chain drives which connect with sprockets which are mounted on conveyor rolls. Where the drive sprockets have been mounted on the larger or smaller ends of tapered rolls, the sprockets in effect project beyond the roll surface resulting in wide roll spacing. Such larger sprockets also involve higher chain speeds than the roll speeds, imposing a limiting chain speed design factor.

Tapered rolls which are driven by small chain sprockets, permitting close roll centers in the curved sections, have required the sprockets to be outside the support structures in which the rotating roll shafts are journalled. This has involved high material and construction costs.

Prior tapered roll constructions generally have consisted of rotatable central shafts journalled in bearings which are mounted in support frames and each roll includes a tapered sleeve mounted over the shaft. In other prior tapered roll constructions the roll has been a solid member with the mounting shaft connected thereto. Both of these prior types of constructions are expensive in material and to manufacture and require an entirely different roll construction for the conveyor curved section than the roll construction used for conveyor straight sections.

These considerations, thus, have presented a need for a tapered roll conveyor curve construction permitting the use of chain driven power drive means in which the drive sprockets are mounted within the support frame, and are smaller than the tapered roll large

end, in which close roll spacing can be maintained, in which the drive chain speed is not a limiting factor, and in which the conveyor construction and tapered rolls are relatively inexpensive and easily constructed, assembled and maintained.

SUMMARY OF THE INVENTION

Objectives of the invention include providing a tapered roll conveyor curve section in which the tapered rolls have chain drive sprockets which are smaller than the large end of the tapered rolls and are located within the roll mounting frame adjacent the larger roll ends; providing a tapered roll conveyor curve section in which the tapered rolls are easily mounted within and removed from the mounting frame; providing a tapered roll conveyor curve section in which the tapered rolls permit the drive chain means to be easily connected to the rolls and to be located around the outer ends of the rolls at the curve, and which connect easily to adjacent straight conveyor sections enabling the same type of power drive means to be used for both curved and straight conveyor sections without separate connections so that a uniform speed is maintained in all conveyor sections; providing a tapered roll conveyor curve section in which the tapered roll permits a usual cylindrical roll or a section thereof of the type used in the straight sections to be inexpensively modified by mounting a tapered sleeve over the cylindrical roll or roll section; providing a tapered roll conveyor curve section in which the tapered roll support shaft does not rotate within the usual channel mounting frame thus eliminating expensive bearings and safety end frame covers; and providing a tapered roll conveyor curve section in which the tapered rolls are of simple construction, eliminate maintenance and repair problems, and achieve the stated objectives in an effective and inexpensive manner, and which solve problems and satisfy needs existing in the art.

These and other objectives and advantages may be obtained by the tapered roll conveyor curve section construction, the general nature of which may be stated as including frame means having outer and inner arcuate mounting rails or channels; a plurality of roll means supported on and between the rails, each roll means having a tapered portion and a cylindrical portion; the tapered portion having a small end and a large end, the small end being located adjacent the inner rail; the cylindrical portion extending from adjacent the outer rail and being fixed to the tapered portion large end; mounting shaft means having at least one flat side extending outward axially from each end of the roll means for insertion into and support in complementary shaped openings formed in the outer and inner rails; a pair of spaced inner and outer chain drive sprockets mounted on the cylindrical portion of each roll means beyond the large end of the tapered portion; a plurality of continuous drive chains alternately connecting the inner and outer drive sprockets of adjacent rolls; the shaft means including a shaft member extending throughout the length of the roll means; the tapered roll portion including a tapered sleeve journalled at its small end on the shaft and fixed at its large end to the cylindrical portion; and the cylindrical portion including a cylindrical tube journalled at one end on the shaft;

bearing means mounted within each end of the roll means and forming the roll journals on the shaft, whereby the tapered and cylindrical portions rotate on the shaft; a first retainer means mounted on the shaft adjacent one end bearing means and spring means mounted on the shaft adjacent the opposite end bearing means; and second retainer means mounted on the shaft spaced from said opposite end bearing means and engaging the spring means thereby placing the spring means in partial compression to permit the shaft to be moved axially within the tapered and cylindrical roll portions to further compress the spring means whereby one end of the shaft may be withdrawn through its end bearings for mounting and removing the roll means within and from the mounting rails.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention — illustrative of the best modes in which applicant has contemplated applying the principles — are set forth in the following description and shown in the drawings and are particularly and distinctly pointed out and set forth in the appended claims.

FIG. 1 is a diagrammatic top plan view of the tapered roll curved conveyor section connecting two straight conveyor sections;

FIG. 2 is an enlarged top plan view with portions broken away and in section showing a series of the improved tapered rolls within the curved conveyor section of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken on the line 3—3, FIG. 1;

FIG. 4 is an enlarged fragmentary sectional view, with portions broken away taken on line 4—4, FIG. 2;

FIG. 5 is a sectional view taken on line 5—5, FIG. 2;

FIG. 6 is an enlarged view, with portions broken away and in section showing details of the improved tapered roll construction;

FIG. 7 is an enlarged end elevation looking in the direction of arrows 7—7, FIG. 6;

FIG. 8 is an enlarged sectional view taken on line 8—8, FIG. 6;

FIG. 9 is an enlarged sectional view taken on line 9—9, FIG. 6;

FIG. 10 is an enlarged end elevation looking in the direction of arrows 10—10, FIG. 6; and

FIG. 11 is a fragmentary sectional view showing a modified form of the improved tapered roll construction.

Similar numerals refer to similar parts throughout the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A curved conveyor section 1 having the improved tapered roll construction, generally indicated at 2, mounted therein, is shown in FIG. 1 joining together two straight conveyor sections 3 and 4.

Conveyor section 1 preferably includes a support base 5 (FIG. 5) having outer and inner arcuate mounting channels 6 and 7, respectively, extending upward from each end of base 5 for mounting rolls 2. Channels 6 and 7 are attached to base 5 by bolts 8 and have a row of holes 9 and 10 formed in the vertical channel webs 11 and 12, respectively. Holes 9 are located below the level of holes 10. Holes 9 and 10 each are formed with at least one flat side and preferably are hexagonally shaped.

A cover plate 13 may be attached to outer support channel 6 by bolts 14 extending horizontally inwardly therefrom to conceal the power chain drive means located adjacent channel 6. A flange 15 is welded to the inner end of plate 13 acting as a guard rail to prevent material moving on conveyor section 1 from contacting the chain drive means or from being ejected from the conveyor at the corner.

In accordance with the invention the improved tapered roll 2 (FIG. 6–10) may be fabricated using a typical or usual cylindrical conveyor roll 16, such as used in straight sections 3 and 4. A tapered sleeve 17 is telescoped over roll 16.

A typical cylindrical conveyor roll 16 has a preferably hollow, cylindrical tube 18 with open ends 19 and 20, and a central shaft 21 extends throughout the length of tube 18 and through bearings 22 and 23 on which the tube 18 is journalled in the open ends 19 and 20. Shaft 21 is non-rotatable and may be keyed by having a flat side. As shown, shaft 21 is hexagonal in cross section and its ends extend through hexagonal holes 9 and 10 in channels 6 and 7. Bearings 22 and 23 may be usual ball bearings, and the inner bearing races have hexagonal inner openings through which shaft 21 extends. Bearings 22 and 23 preferably are mounted with a press-fit in the open tube ends 19 and 20, respectively.

A retainer ring or washer 25 is mounted on shaft 21 adjacent end bearing 23 to prevent movement of shaft 21 through bearing opening 24 in a right-hand direction as viewed in FIG. 6. A similar retainer ring 26 is mounted a short distance inward from bearing 22 on shaft 21, and partially compresses spring 27 extending on shaft 21 between bearing 22 and retainer 26, to bias shaft 21 to the right.

Spring 27 serves the dual function of holding shaft 21 tightly within tube 18 by continually forcing retainer ring 25 against end bearing 23, and also of enabling shaft 21 to be moved to the left, with respect to tube 18, so that the left-hand shaft end portion 28 assumes a position shown by dot-dash lines in FIG. 6 compressing spring 27. In this position, right-hand shaft end portion 28*a* is retracted within bearing 23 enabling roller 2 to be installed in or removed easily from channels 6 and 7.

Tapered sleeve 17 preferably is formed of metal and has large and small open ends 29 and 30, respectively. Sleeve 17 surrounds cylindrical tube 18 from its small end 30, which is welded to one end 20 of tube 18, almost the entire length of tube 18, leaving an end section 31 of tube 18 exposed. A washer-like collar 32 is welded at 33 within and supports the large open end 29 of tapered sleeve 17, and also is welded at 34 to tube 18.

The small end 30 of tapered sleeve 17 has an inner diameter equal to the outer diameter of tube 18. A plurality of holes 35 are formed in sleeve 17 adjacent end 30 for attaching sleeve 17 to tube 18 by plug welds 36.

Thus, the improved tapered roll 2 may be formed readily with the desired taper merely by changing the size of the large end of sleeve 17 and of supporting collar 32, and may be fabricated easily and inexpensively by modifying a usual cylindrical conveyor roll 16. Roll

strength is achieved through the design of usual cylindrical rolls **16** and of end support collars **32**.

A pair of spaced, similar chain drive sprockets **37** and **38** are welded at **39** on end section **31** of tube **18**. Sprockets **37** and **38** are the same size as similar sprockets on the cylindrical conveyor rolls **16** in conveyor straight sections **3** and **4**, and are smaller in outer contour than or at least not larger than the diameter of the large end **29** of tapered sleeve **17** so that the connected drive chain speed is not a limiting design factor.

Tapered rolls **2** are snap-mounted easily between channels **6** and **7** by inserting shaft end portion **28** into hole **9** in channel **6** then retracting opposite shaft end portion **28***a* within bearing **23** which is then released when aligned with the proper hole **10** in channel **7** to extend through such hole **10**. Shafts **21** thus are non-rotatably mounted between channels **6** and **7**, and there are no rotating members outside the mounting channels requiring safety enclosures. Also expensive bearings heretofore required to mount tapered roll shafts are eliminated.

The axes of shafts **21** are mounted in a slanted position (FIGS. **3** and **5**) in order that the material supporting surfaces of tapered sleeves **17** are horizontal and aligned with similar surfaces of the straight section cylindrical conveyor rolls.

The conveyor drive means includes a plurality of continuous drive chains **40** and **41** which connect adjacent pairs of outer and inner sprockets **37** and **38** as shown in FIGS. **2** and **4**. The length of each chain **40** and **41** is comparatively short which accomodates the changing arcuate locations of the tapered rolls **2**.

The tapered roll **2** at each end of curved section **1** is connected to the first roll **16** of straight sections **3** or **4** by a chain **40** extending between adjacent outer sprockets **37** (FIG. **3**). The conveyor power source preferably is connected to one of the straight conveyor sections and thus the chain and roll speed is the same in both the straight and curved sections because of the direct interconnection between similar sprockets on the straight and curved section rolls **16** and **2**, respectively.

A modified form of the improved tapered roll construction is shown in FIG. **11** and is generally indicated at **42**. Roll **42** is similar to roll **2** except that only a section of a cylindrical tube **18** is used extending from the larger end of the tapered sleeve **17** to the cylindrical section bearing.

Modified roll **42** includes a preferably hexagonal-shaped central shaft **43** having bearings **44** and **45** journalled on the ends thereof. Retainer rings **46** and **47** are fixed on shaft **43** and ring **46** holds spring **48** in partially compressed position.

A hollow tapered sleeve **49** has its small end **50** secured to bearing **45** by a press-fit. A collar **51** formed with a large central opening **52** is welded within the large open end **53** of sleeve **49**. One end of a short section of a typical cylindrical conveyor roll tube **54** extends into collar opening **52** and is secured therein by welds **55**. Bearing **44** is mounted by a press-fit in the outer end of the cylindrical section **54**.

A pair of drive sprockets **56** and **57** are mounted on tube section **54** and connect to drive chains in a manner similar to that described concerning tapered rolls **2**.

The improved tapered roll construction for use in curved conveyor sections enables the chain drive sprockets to be mounted within the support frame where they are concealed and protected easily for safer working conditions around the conveyor and to present a more attractive and uncluttered conveyor appearance. The stationary mounting of the roll shafts in the support channels eliminate exposed moving parts and eliminates the need for expensive support means having bearings mounted therein.

The tapered rolls are easily constructed from usual cylindrical rolls used for straight conveyor sections which reduce construction costs and duplication of parts inventory. The mounting of the drive sprockets on the cylindrical section of the tapered rolls permit them to be smaller than the enlarged ends of the tapered rolls, enabling higher chain and roll speeds to be used.

Accordingly, the tapered roll conveyor curve construction is simplified, provides an effective, safe, inexpensive and efficient structure which achieves all the enumerated objectives, provides for eliminating difficulties encountered with prior structures, and solves problems and obtains new results in the art.

In the foregoing description, certain terms have been used for brevity, clearness and understanding; but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such terms are used for descriptive purposes and are intended to be broadly construed.

Moreover, the description and illustration of the invention is by way of example and the scope of the invention is not limited to the exact details shown or described.

Having now described the features, discoveries and principles of the invention, the manner in which the tapered roll conveyor curve is constructed and used, the characteristics of the construction, and the advantageous, new and useful results obtained; the new and useful structures, devices, elements, arrangements, parts, and combinations, are set forth in the appended claims.

I claim:

1. A tapered roll conveyor curve construction including frame means having outer and inner arcuate mounting rails; a plurality of roll means supported on and between the rails, each roll means having a tapered portion and a cylindrical section, said tapered portion having a small end and a large end, the small tapered end being located adjacent the inner rail; said cylindrical section extending at least from the tapered portion large end to the outer rail; shaft means extending through the cylindrical section and tapered portion and outward from each end of the roll means for mounting the roll means on said rails; a pair of spaced inner and outer chain drive sprockets mounted on the cylindrical section of each roll means beyond the large tapered section end; and a plurality of continuous drive chains alternately connecting the adjacent inner and outer drive sprockets of adjacent roll means.

2. The construction defined in claim **1** in which the shaft means includes a shaft extending throughout the length of the roll means; in which the tapered portion includes a tapered sleeve journalled at its small end on one end of said shaft; and fixed at its large end on the

cylindrical section; and in which the cylindrical section includes a cylindrical tube telescoped within the large end of the tapered sleeve and having an outer end journalled on the other end of said shaft.

3. The construction defined in claim 2 in which the cylindrical tube section has a portion extending within the tapered sleeve throughout the length of the tapered sleeve; in which said cylindrical tube is formed with open ends; in which bearing means are mounted within said open tube ends; in which the shaft extends through openings formed in said bearing means; and in which said shaft is non-rotatably mounted on the mounting rails, whereby the cylindrical tube and tapered sleeve rotate about said shaft on said bearing means.

4. The construction defined in claim 2 in which the tapered sleeve is formed with open ends; in which bearing means are secured within the small open tapered sleeve end; in which a collar is secured within the large open tapered sleeve end; in which one end of the cylindrical tube section is secured to said collar; and in which the other end of the cylindrical tube section has bearing means secured therein.

5. The construction defined in claim 2 in which bearing means are journalled on each end of the shaft; in which first retainer means is mounted on said shaft adjacent the bearing means at one shaft end; in which spring means is mounted on said shaft adjacent the bearing means at the other shaft end; and in which second retainer means is mounted on the shaft spaced from said other shaft end confining the spring means in partial compression, enabling the shaft to be moved axially within the tapered sleeve and cylindrical sections to further compress the spring means, whereby one end of the shaft may be withdrawn into its end bearing means for mounting and removing said roll means on and from the mounting rails.

6. The construction defined in claim 1 in which the shaft means is formed with at least one flat side; in which the outer and inner rails are formed with holes complementary to the cross sectional shape of said shaft means; in which said shaft means extends through said rail holes; and in which the inner rail holes are higher in elevation than the outer rail holes whereby the material supporting surface of the tapered portion lies in a horizontal plane.

7. The construction defined in claim 1 in which the diameters of the drive sprockets are smaller than the diameter of the larger end of the tapered portion.

8. A tapered roll construction including a central shaft; a cylindrical section formed with open ends journalled on said shaft; bearing means mounted on each end of the shaft and secured within the cylindrical section open ends rotatably supporting the cylindrical section on the shaft; a tapered sleeve formed with open small and large ends journalled on the shaft and surrounding a portion of the cylindrical section; the small tapered sleeve end being adjacent one end of the shaft and surrounding and being connected to one end of the cylindrical section; collar means secured within the large tapered sleeve end, the cylindrical section being connected with the collar means and extending through and outwardly from the collar means toward the other shaft end; and a pair of spaced chain drive sprockets mounted on the cylindrical section adjacent the tapered sleeve large end.

9. A tapered roll construction including a central shaft; a cylindrical section and a tapered sleeve journalled on said shaft; the tapered sleeve having a small end and a large end with the small end being adjacent one end of the shaft; the cylindrical section being connected with the tapered sleeve large end and extending outward therefrom toward the other shaft end; a pair of spaced chain drive sprockets mounted on the cylindrical section adjacent the tapered sleeve large end; bearing means mounted on each end of the shaft rotatably supporting said cylindrical section and tapered sleeve; first retainer means mounted on the shaft adjacent the bearing means on one shaft end; spring means mounted on the shaft adjacent the bearing means at the other shaft end; and second retainer means mounted on the shaft spaced from the other shaft end confining the spring means in partial compression biasing said first retainer means against said adjacent one shaft and bearing means.

* * * * *