June 9, 1959 R. F. BOERSMA ET AL 2,889,913

SWIVEL CONNECTION FOR CONVEYORS

Filed June 28, 1956 3 Sheets-Sheet 1

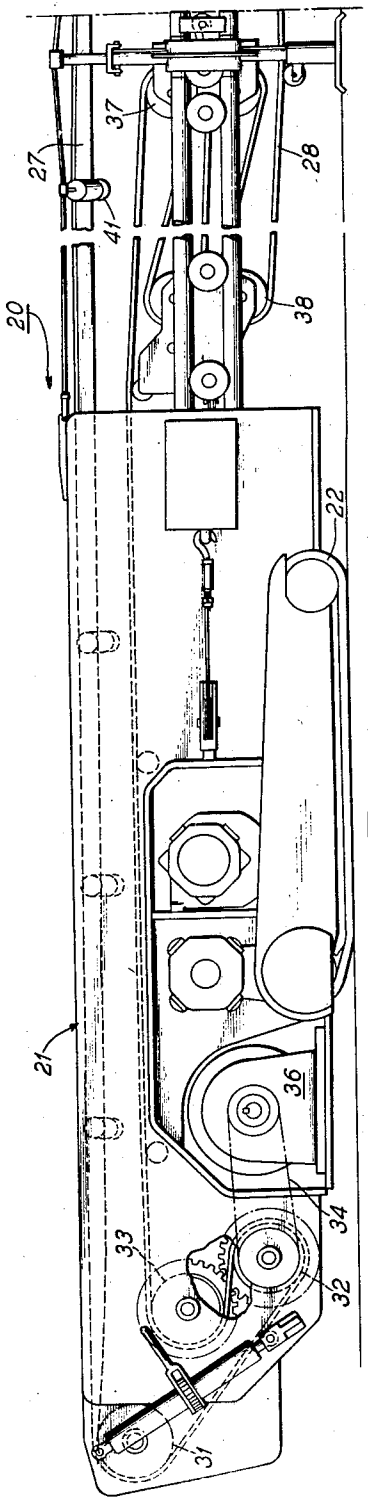


Fig. 1

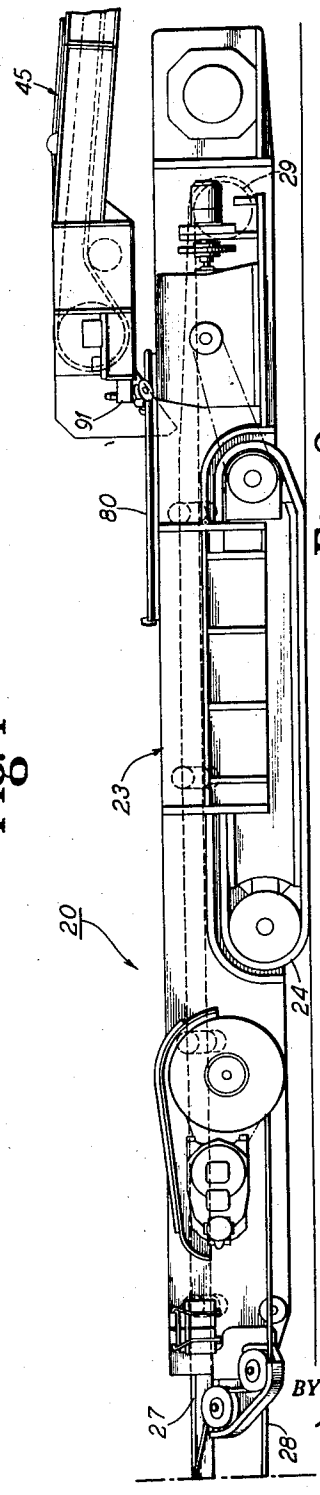


Fig. 2

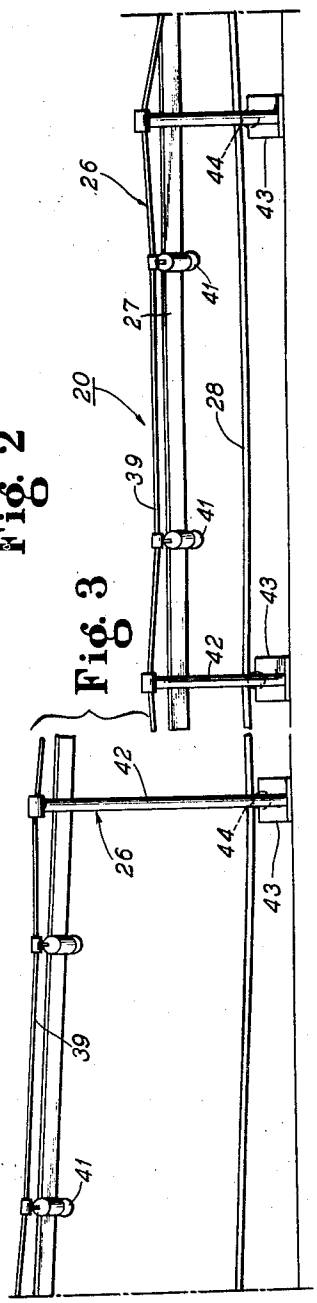


Fig. 3

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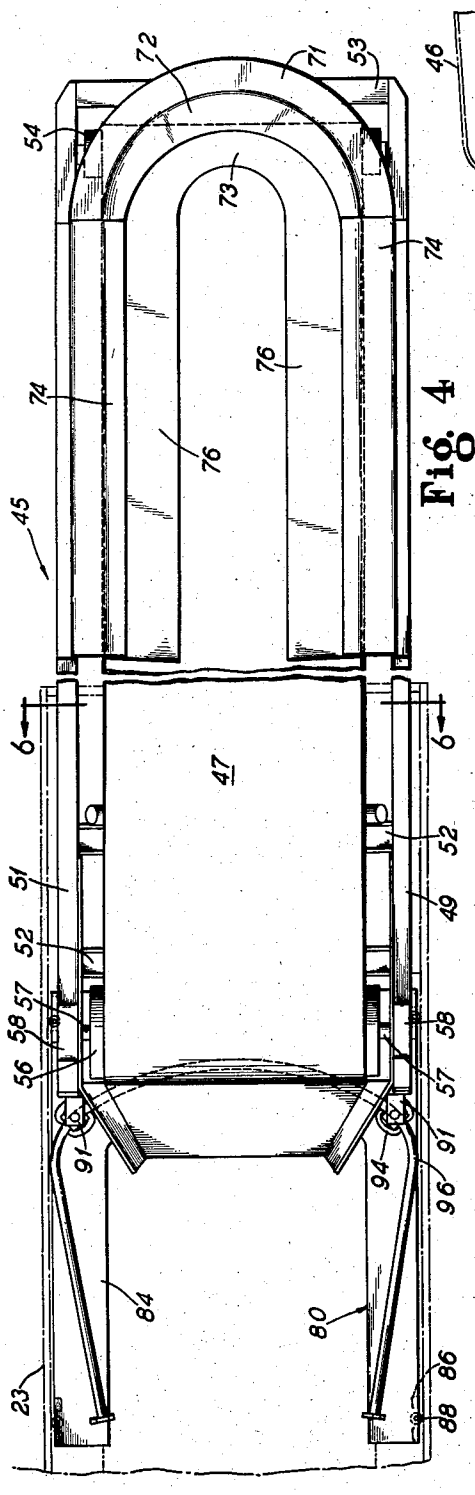


Fig. 4

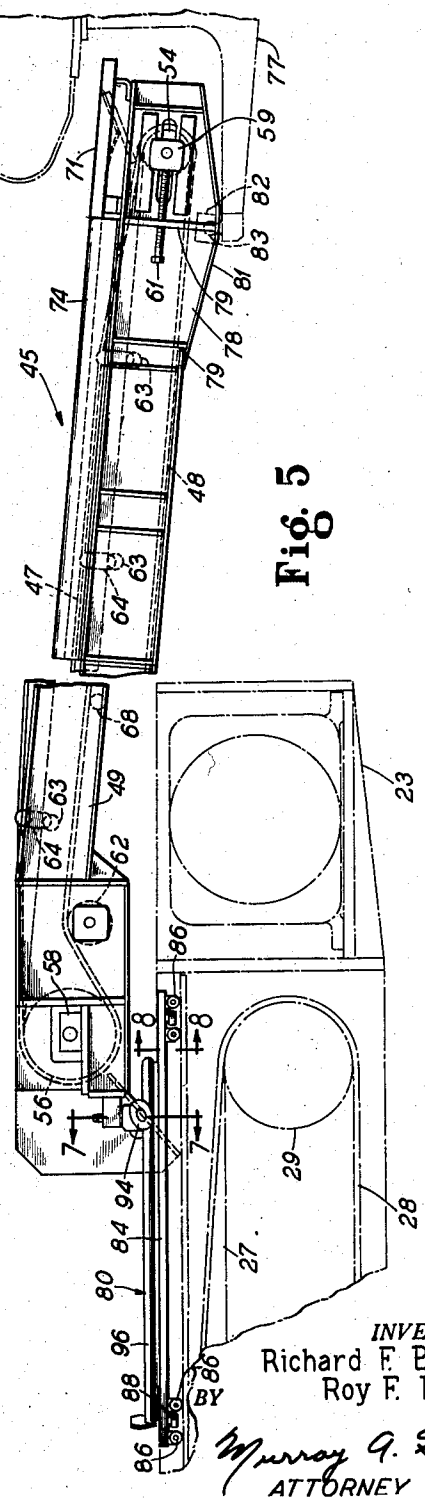


Fig. 5

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SWIVEL CONNECTION FOR CONVEYORS

Filed June 28, 1956 3 Sheets-Sheet 3

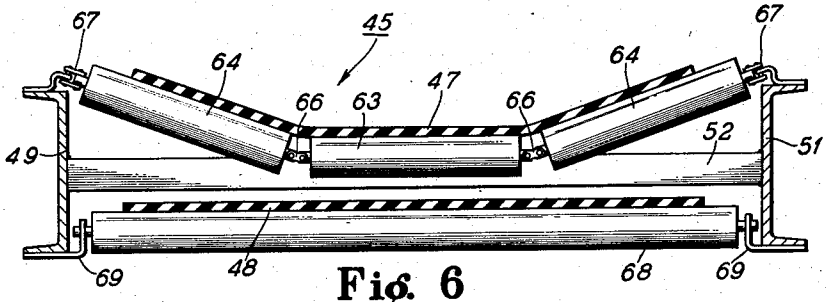


Fig. 6

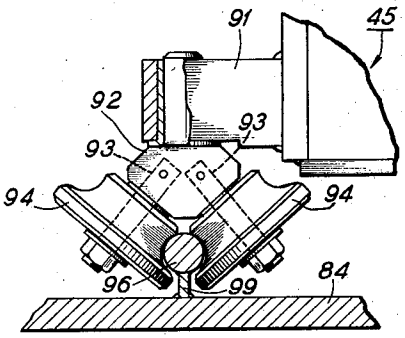


Fig. 7

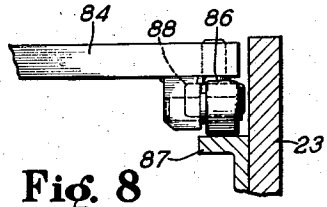


Fig. 8

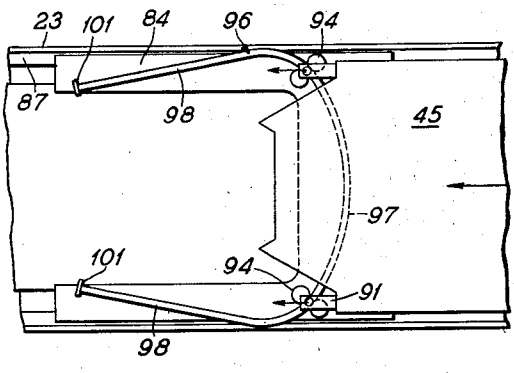


Fig. 9

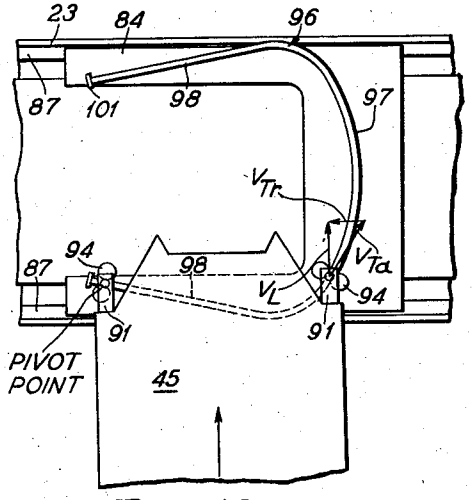


Fig. 10

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SWIVEL CONNECTION FOR CONVEYORS

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Application June 28, 1956, Serial No. 594,409

5 Claims. (Cl. 198—95)

This invention relates generally to improvements in endless conveyors and to an improvement in an articulated connection between a pair of cascading conveyors.

Modern mining practices have been dictating the use of endless conveyors disposed in the room behind a continuous miner, the continuous miner discharging upon the room conveyor, and the room conveyor in turn discharging upon an entry conveyor. It is possible with such continuous miners to mine a room of such width that the discharge boom of the miner cannot conveniently reach the inby end of the room conveyor, even though such room conveyor may be of extensible type and arranged to follow closely the advance of the miner. Accordingly the distance between the outby end of the discharge boom and the room conveyor is spanned by what is known as a bridge conveyor.

Since such miners may be operated off to either side of the room conveyor, a swiveling connection must be afforded between the discharge boom and the bridge conveyor, and a second swiveling connection must also be afforded between the bridge conveyor and the room conveyor. Such a swiveling connection is especially necessary where the continuous miner is employed for making cross cuts in the rib.

Heretofore such swiveling connections have been provided between the outby end of the bridge conveyor and the inby end of the room conveyor, but in some cases the amount of swiveling movement has been greatly limited, and in some other cases the swiveling connection has not been entirely satisfactory because of its tendency to bind.

Certain types of swiveling connection at the room conveyor include a dolly mounted for translational movement longitudinally of the room conveyor, and as the swiveling angle changes, the dolly moves along the room conveyor correspondingly. In some cases the continuous miner may be operating at substantially right angles to the room conveyor, and when retreating, the swivel joint at the dolly does not provide the proper amount of swiveling action with the result that the dolly is forced off the room conveyor laterally, instead of being shifted translatively thereof.

With the foregoing considerations in mind it is a principal object of the invention to provide an improved swiveling connection between a bridge conveyor extending between a continuous miner and a gathering conveyor, said swiveling connection being characterized by providing as much as 180° of swiveling movement.

Another object is to provide a swivel connection for a pair of cascading conveyors, which connection is characterized by freedom from binding or sticking, so that the support structure for the swivel connection may freely move translatively along the room or gathering conveyor.

Still another object is to provide a swivel connection between a pair of cascading conveyors, which swiveling connection will at all times provide a component of force longitudinally of the gathering conveyor, so that the support for the connection can freely move longitudinally of such gathering conveyor.

Other objects and important features of the invention will be apparent from a study of the specification following taken with the drawings, which together describe and illustrate a preferred embodiment of the invention, and what is now considered to be the best mode of practicing the principles thereof. Other embodiments of the invention may be suggested to those having the benefit of the teachings herein, and such other embodiments are intended to be reserved especially as they fall within the scope and purview of the subjoined claims.

In the drawings:

Fig. 1 is a side elevation view of the head section of an extensible conveyor having an improved bridging conveyor cooperating therewith, said bridging conveyor having the improvements according to the present invention embodied therein;

Fig. 2 is a side elevation view of the tail or inby section of the extensible conveyor, showing the bridging conveyor in position with its discharge or outby end in position for discharge onto the extensible conveyor;

Fig. 3 is a side elevational view of intermediate framing portions of an extensible belt conveyor of the type where the conveying reach is supported upon the spaced flexible strands;

Fig. 4 is a plan view of a bridging conveyor having the improvements according to the present invention embodied therewith, certain parts being broken away to show details of the support frame thereof;

Fig. 5 is a side elevation view thereof;

Fig. 6 is a transverse section taken along the lines **6—6** of Fig. 4, looking in the direction of the arrows;

Fig. 7 is a section to an enlarged scale taken along the lines **7—7** of Fig. 5, looking in the direction of the arrows, showing details of a swivel connection between the bridge conveyor and the tail section;

Fig. 8 is a view taken along the line **8—8** of Fig. 5, looking in the direction of the arrows, showing details of rollers mounting the support dolly of the swivel connection for translative movement at the inby end of the tail section;

Fig. 9 is a plan view showing guide rails cooperating with the guided rollers of Fig. 7, forming part of a swivelable connection between the bridge conveyor and the tail section seen in Figs. 4 and 5; and

Fig. 10 is a plan view similar to Fig. 9, but showing the bridging conveyor taking a position of extreme swiveling movement with respect to the tail section.

Referring now to the drawings, the improved bridging conveyor according to the present invention is particularly adapted for use with an extensible conveyor indicated generally by the reference numeral **20**. Such an extensible conveyor includes an outby or head section **21** mounted for movement on endless crawler treads **22**, an inby or tail section **23** likewise mounted for movement upon endless crawler treads **24**, and intermediate framing sections referred to generally by the reference numeral **26**. The extensible conveyor may be of the type as more completely disclosed in an application of Hardy et al., Serial No. 541,162, filed October 18, 1955, for Extensible Conveyor, now U.S. Patent No. 2,858,933, issued November 4, 1958. Such a conveyor includes an endless belt having a conveying reach **27** and a return reach **28**, the reaches being reversed in direction about an idler pulley **29** at the tail section **23**, and also being reversed about an idler pulley **31** at the head section **21**, the belt being snubbed around and driven by means of mating driving rollers **32** and **33** driven through a sprocket chain **34** from a drive motor **36**. As disclosed in the aforementioned application, the return reach **28** may be reeved about a fixed cluster of idler pulleys **37** and about a movable

cluster of idler pulleys 38, the distance between the fixed cluster 37 and the movable cluster 38 varying in accordance with the distance between the head section 21 and the tail section 23.

The extensible conveyor 20 may also be of the type where the conveying reach 27 is supported upon spaced flexible strands 39, the strands 39 being spanned at intervals by troughing roller assemblies 41, and the strands 39 being supported at intervals upon standards 42 having feet 43 resting upon a mine floor or the like. The standards 42 are also provided with return idler rollers 44 for guiding the return reach 28.

The description thus far is merely for the purpose of showing a possible environment for a bridging conveyor referred to generally by reference numeral 45, and seen particularly with reference to Figs. 4 and 5 of the drawings.

Referring now to Fig. 5 of the drawings, particularly, the bridging conveyor 45 has its inby or material receiving end disposed beneath a discharge boom 46 of a continuous miner, not shown, the discharge boom 46 having extending longitudinally thereof an endless conveyor, which may be of chain flight type. The outby end of the bridging conveyor 45 is arranged to rest upon the inby end of the tail section 23, and the bridging conveyor 45 has an endless conveyor belt consisting of a conveying reach 47 and a return reach 48, whereby the endless belt can convey material from the discharge boom 46 to the conveying reach 27 at the inby end of the tail section 23.

The bridging conveyor 45 includes a pair of laterally spaced side frame members 49 and 51, these being maintained in laterally spaced relationship by spreader members 52 extending between the conveying reach 47 and the return reach 48, see also Fig. 6, and by means of an end spreader 53 at the inby end thereof.

The endless belt consisting of the conveying reach 47 and the return reach 48 is reversed in direction about an idler pulley 54 at the inby end of the bridging conveyor 45, and about a driving pulley 56 at the outby end thereof. The driving pulley 56 is supported upon a dead shaft 57 held at each end in brackets 58 supported upon the respective side frame members 49 and 51. The pulley 56 may be of the type where the driving motor therefor is wholly enclosed therein, but the pulley 56 may be driven by means of an hydraulic motor supplied with motive fluid from either the tail section 23 or the continuous miner at the working face.

As seen in Fig. 5, the tension in the endless belt is adjusted by moving the idler pulley 54 upon support blocks 59, the position of the support blocks being adjusted by means of a screw 61. Additionally, the return reach 48 may be guided about a snubber pulley 62 extending between the spaced frame members 49 and 51.

Referring now to Fig. 6, the conveying reach 47 of the bridging conveyor 45 is supported upon a plurality of troughing roller assemblies consisting of a central load supporting idler roller 63 and inclined wing rollers 64, the central load supporting roller being articulately connected at 66 to its adjacent wing roller 64, and the outer end of each wing roller being articulately connected at a bracket 67 to the top flanges of the side frame members 49 and 51. Details of construction of such a troughing roller assembly may be as shown in an application of Craggs et al. Serial No. 521,355, filed July 11, 1955, for Rope Frame Conveyor and Troughing Roller Assembly Therefor, now abandoned.

The return reach 48 of the bridging conveyor 45 is guided upon return idlers 68 support at each end on brackets 69 mounted to the lower flange of the side frames 49 and 51.

The inby or material receiving end of the bridging conveyor 45 is provided with a material receiving trough or hopper 71 consisting of a generally conical shaped end portion 72 which is flaired downwardly toward the conveying reach 47, the inner edge being continuous with resilient material such as rubber 73 to protect the conveying reach 47 against impact. The conical shaped end portion 72 is continuous with similar longitudinally extending plates 74 having a rubber apron 76 extending therefrom to protect the conveying reach 47 against impact, and also to direct the material discharged at the discharge boom 46 on to the central portion of the conveying reach 47.

The inby end of the bridging conveyor 45 is mounted for swiveling movement beneath the discharge boom 46, there being a hanger 77 extending down from the discharge boom 46 as seen in Fig. 5. The inby end of the bridging conveyor 45 has the inby ends of its side frames 49 and 51 extending downward as at 78 as seen in Fig. 5, the side frames being additionally stiffened by ribs 79. The side frame extensions 78 are connected by a plate 81 having a socket member 82 to receive a ball joint 83 mounted at the end of the hanger 77. By the arrangement described it is possible for the bridge conveyor 45 to have swiveling movement in vertical as well as horizontal planes with respect to the discharge boom 46.

The discharge end of the bridge conveyor 45 has a swivel connection to the tail section 23 indicated generally by the reference numeral 80. The swivel connection includes a support dolly 84 having a single guide means 96 thereon, see also Figs. 8 to 10 inclusive, which is movably mounted to the tail section 23 by mounting and guiding means which include first roller elements 86 turning on generally horizontally disposed axes with the roller elements 86 resting upon support angles 87 welded to the innerside of the side frames of the tail section 23. The dolly 84 also has guide or second roller elements 88 turning on generally vertical axes to transmit the thrusts against the dolly 84 into the side frames 23, see also Fig. 5.

The bridge conveyor 45 is provided with a connector means for connecting the bridge conveyor to the guide means 96 and the connector means includes brackets 91 extending from the outby end thereof to each side of the conveying reach 47. Each of the brackets has journaled therein guided means which includes a swivel block 92 rotatable about a vertical axis as seen more clearly in Fig. 7. The lower end of the swivel block 92 receives stub shafts 93 each having freely rotatable thereon a guide roller 94, the two guide rollers 94 being arranged to engage each side of the guide means 96 forming a guide for the swiveling movement of the bridge conveyor 45.

As seen more particularly in Figs. 9 and 10, the guide means 96 includes a continuous rail having an arcuate intermediate portion 97 disposed generally centrally relative to the longitudinal axis of the tail section 23 and extending generally laterally therefrom with the end portions having a slightly more pronounced curvature than the central portion. Each end portion of the arcuate intermediate portion 97 is continuous with a tangent portion 98, the two tangent portions extend longitudinally and converge towards each other and terminate in laterally spaced relationship relative to the tail section 23. As seen in Fig. 7, the rail of the guide means 96 is supported on the dolly 84 by means of a web member 99. A stop 101 is provided at each end of the tangent portion 98 remote from its point of connection to the arcuate portion 97.

As has been described, the bridge conveyor 45 may at times be required to swing to a position 90° to either side of the tail section 23. Under certain conditions an endwise thrust may be imposed upon the bridge conveyor through the hanger 77 and such endwise thrust has heretofore been sufficient at times to cause the swivel connection at the discharge end of the conveyor to be displaced laterally of the material receiving conveyor.

Such a possibility is obviated by the invention herein, and the guide means 96 is so arranged that such axial thrust on the bridge conveyor 45 creates a component

of force to cause shifting of the dolly **84** translatively of the tail section **23**.

Referring now to Fig. 10, there is shown a condition where the bridge conveyor **45** is swung to substantially a 90° position with respect to the tail section **23**. The rollers **94** engaging the rail of the guide means **96** will under such condition operate to furnish the translative component previously discussed. Under such condition the left hand pair of rail engaging rollers **94** may be considered as a pivot point, whilst the other pair to the right operate to provide at such point a force vector V_L. This force vector V_L can be resolved into a component V_{Ta} tangent to the guide means **96** and a translative component V_{Tr} in a direction corresponding to the longitudinal axis of the tail section **23**. This latter component is sufficient to cause the translative movement of the dolly **84** to the left, as seen in Fig. 10, and to prevent any dislodgement of the dolly **84** from the rails **87**.

As has been explained above, previous forms of such swivel connections also tend to "hang," especially when the bridge conveyor is in a "straightaway" position with respect to the tail section **23**. In such types of swivel connections, the bridge conveyor, instead of swiveling with respect to the tail section **23** tends to swivel the support therefor, instead of swiveling with respect to the support, thereby dislodging the support from its position on the tail section.

In the construction disclosed herein, the rollers **94** are always free to swing on the arcuate portion **97**, and once such swinging movement has taken place along such arcuate portion, the rail engaging rollers **94** are free to move onto the tangent portions **98**.

In the embodiment of the invention shown herein, the swivel connection consists of a rail engaged by the laterally spaced pair of rollers. It is conceivable in another embodiment of the invention, that such a rail may be substituted for a groove of the same general or similar configuration formed in a plate or the like, with guide rollers moving in such groove. Whatever the form of the guide for the swivel connection may take, the translative vector component previously described will still be had. Such other forms of a swivel connection are accordingly intended to be reserved especially as they may be covered by the claims here appended.

We claim as our invention:

1. A swivel connection for a pair of conveyors arranged in cascading relationship to each other to enable one of the conveyors to swingably move between opposed extreme positions that are each substantially normal to the other conveyor, said connection including a dolly having guide means thereon, mounting means for mounting and guiding the dolly on said other conveyor for longitudinal movement relative thereto, said guide means including an elongated arcuate portion disposed generally centrally relative to the longitudinal axis of the said other conveyor and extending generally laterally therefrom with the end portions having a more pronounced curvature than the central portion thereof, and an elongated tangent portion extending from each end portion of the arcuate intermediate portion with the tangent portions converging longitudinally of the said other conveyor and terminating in laterally spaced relationship to each other, and connector means for connecting the said one conveyor to the guide means, said connector means including guided means carried by the said one conveyor, said guided means being pivotal relative to the said one conveyor and movably supported by the guide means, whereby a thrust on the said one conveyor that is generally lateral relative to the said other conveyor may cause the said movement of the dolly generally longitudinally relative to the said other conveyor.

2. The connection as set forth in claim 1 wherein said guided means includes a pair of swivel blocks journalled on the said one conveyor for rotation about generally vertical axes, and a pair of guide rollers rotatably mounted in opposed relation to each other on each swivel block, each pair of guide rollers engaging opposed sides of the guide means at space intervals therealong.

3. The connection as set forth in claim 1, wherein said mounting means includes first roller elements rotatably journalled on the dolly for rotation about generally horizontal axes, said first roller elements engaging support means disposed generally longitudinally on the said other conveyor for guiding the dolly during the longitudinal movement thereof, and second roller elements rotatably journalled on the dolly for rotation about generally vertical axes for engaging a part of the said other conveyor to transmit generally lateral thrusts which may occur against the dolly to the said other conveyor.

4. A swivel connection for a pair of conveyors arranged in cascading relationship to each other to enable one of the conveyors to swingably move from an intermediate position that is generally longitudinally aligned with the other conveyor to laterally opposed extreme positions that are each substantially normal to the said other conveyor, said connection including a dolly mounted on the said other conveyor for movement generally longitudinally relative thereto, said dolly having a single continuous elongated guide means thereon having only the intermediate portion thereof arcuate, said arcuate intermediate portion being disposed generally centrally relative to the longitudinal axis of the said other conveyor and extending generally laterally therefrom with the end portions having a more pronounced curvature than the central portion thereof, the remaining portions of the guide means being tangential to the end portions of the arcuate intermediate portion and extending generally longitudinally therefrom and terminating in laterally spaced relationship to each other relative to the said other conveyor, and connector means for connecting the said one conveyor to the guide means, said connector means including a pair of spaced guided members pivotally mounted on the said one conveyor and movably supported by the guide means, one of said guided members being supported by one of the tangential portions of the guide means with the other guided member being supported by the arcuate portion of the guide means when the said one conveyor is in the extreme positions, whereby a thrust on the said one conveyor that is generally lateral relative to the said other conveyor may create a force component to urge the dolly to move in the said longitudinal direction relative to the said other conveyor with the said one conveyor, in effect, pivoting about the guided member that is on the tangential portion of the guide means with the other guided member on the arcuate intermediate portion of the guide means creating the desired force component.

5. The connector as set forth in claim 4 wherein said guide means is a rigid rail upwardly spaced from and secured to the dolly by a generally vertically upwardly projecting web.

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