Jan. 12, 1960 M. A. GLEESON 2,920,749

SUPPORTING STRUCTURE FOR FLEXIBLE SIDE-FRAME CONVEYOR

Filed May 15, 1958 2 Sheets-Sheet 1

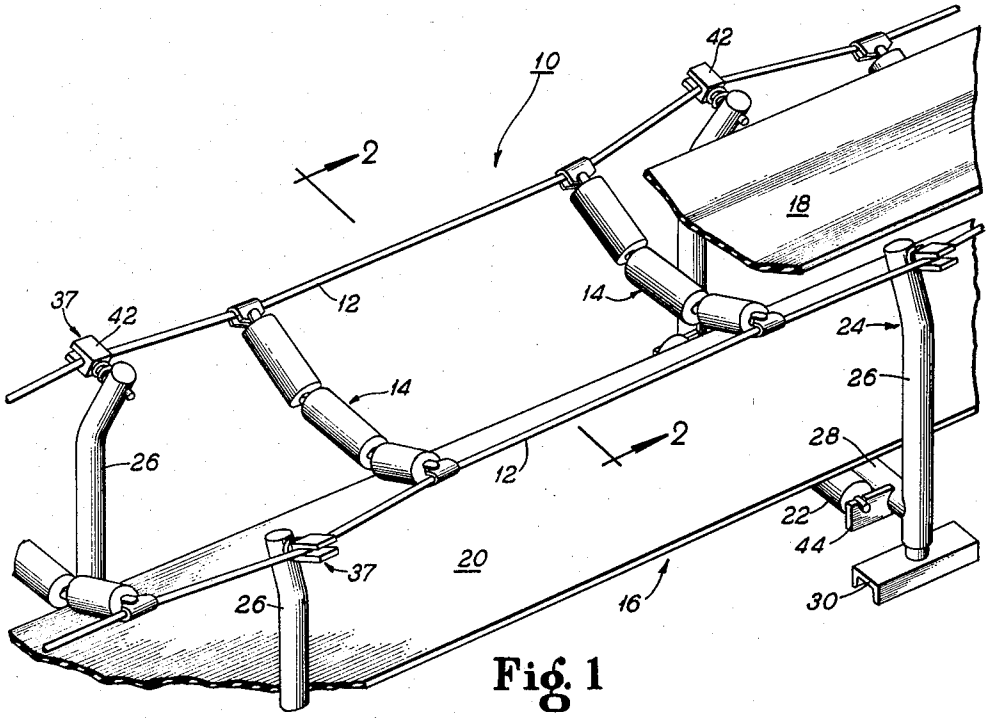


Fig. 1

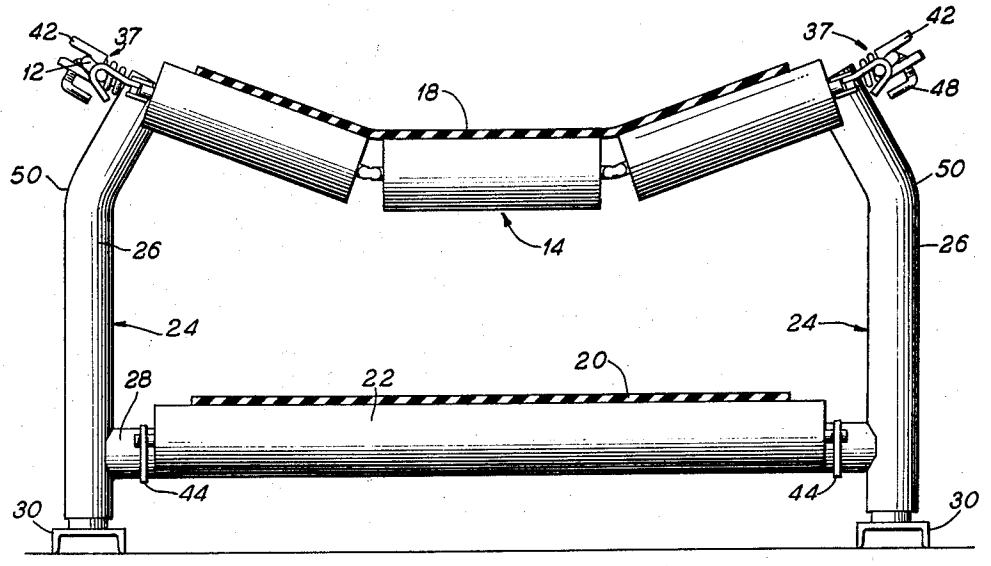


Fig. 2

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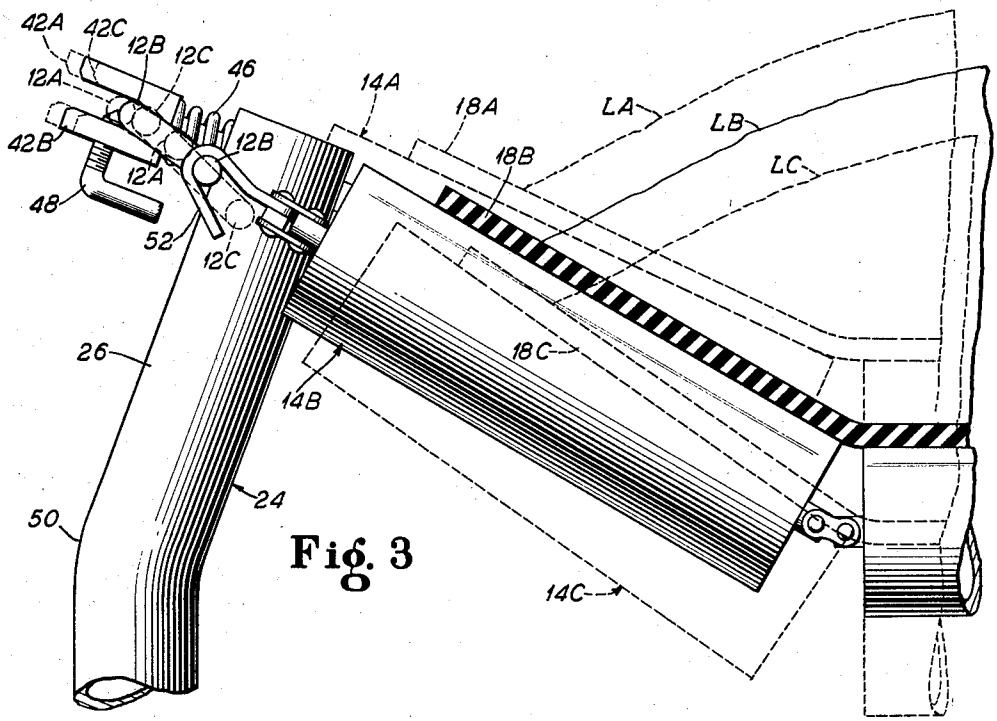


Fig. 3

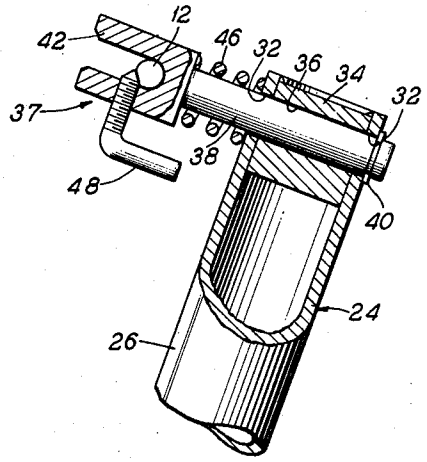


Fig. 4

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SUPPORTING STRUCTURE FOR FLEXIBLE SIDE-FRAME CONVEYOR

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11 Claims. (Cl. 198—184)

The present invention relates to flexible strand side-frame conveyors, and more particularly to an improved supporting structure for supporting the flexible strand means of a flexible side-frame conveyor.

In conveyors which have flexible side-frames, in the form of flexible strand means, as described in U.S. Patent No. 2,773,257, issued December 4, 1956, to Joseph Craggs and Keith McCann for Conveyors Having Flexible Strand Side Frames and Troughing Roller Assembly Therefor, the flexible strand means is normally restricted in flexing movement at the supported locations where the strand means is supported by the ground-engaging supporting structures and provision is made for normally enabling the strand means to have longitudinally shifting movement relative to the respective supporting structures at the supported locations in order to enable the troughing assemblies, which are carried by the flexible strand means, at locations thereon which are longitudinally spaced from the supported locations, to more readily trough in order to support the loads, which may vary, that are carried by the belt conveyor which is supported by the flexible troughing assemblies. This relative longitudinal shifting of the strand means at the supported locations is basically, per se, undesirable, since the longitudinal shifting movement will create a frictional drag by reason of the contact of the strand means with the mounting or connecting means of the respective supporting structures. However, it is to be understood, that the result of the longitudinal movement of the strand means at the supported locations is desirable since this movement enables the strand means to effectively cooperate with the troughing assemblies to permit and enable the troughing assemblies to trough without disturbing the slack or tension in the strand means in order to more readily support the varying load conditions which exist on the movable belt.

Various attempts have been made to compensate for and/or substantially decrease the frictional drag created by the longitudinal shifting movement of the strand means at the supported locations. Certain of the previous attempts have been to place a rocker means as the ground engaging portion of the supporting structures which will enable the supporting structures to rock with the associated strand means during the relative longitudinal movement thereof and other attempts have been to provide a mounting or connecting means for mounting and connecting the strand means to the supporting structures at the supported locations with the mounting or connecting means including various types of anti-friction devices which are interposed between the supporting structures and the associated strand means.

It is the primary object of this invention to provide supporting structures for supporting a flexible strand means of a flexible side-frame conveyor with a mounting or connecting means which enables generally transversely flexible movement of the strand means at the locations where the strand means is supported by the supporting structures while restraining the normal longitudinal shifting movement of the strand means at the supported locations.

Another object of this invention is to provide a supporting structure for a flexible strand means of a flexible side-frame conveyor which will enable the flexible strand means to flex continuously throughout substantially the full longitudinal length of the conveyor, in response to variations in loaded conditions on the belt conveyor, instead of supporting structures of the prior art devices wherein there is no compensating generally flexible movement of the strand means at the locations where the strand means is supported.

Another object of this invention is to provide supporting structures for flexible strand means of a flexible side-frame conveyor with means which biases the flexible strand means in a direction which is generally transverse to the course along which the strand means is trained.

Anothed object of this invention is to provide supporting structures for flexible strand means of a flexible side-frame conveyor with a mounting or connecting means which includes a resiliently yieldable biasing means for biasing the strand means, at locations where the strand means is supported, in a direction generally transverse to the course along which the strand means is trained while restraining the strand means against undesirable longitudinal shifting movement relative to the supporting structures at the supported locations.

Another object of this invention is to support a flexible strand means of a flexible side-frame conveyor by supporting structures which enable the strand means to flex generally transversely relative to the course along which the strand means is trained, at the locations where the strand means is supported, in order to further facilitate the troughing effect of flexible troughing assemblies carried by the strand means.

Still another object of this invention is to provide a connecting or mounting means for a flexible strand means of a flexible side-frame conveyor, having the advantages stated above, which is rugged in construction, relatively simple in operation and inexpensive to manufacture, which, without difficult modification, may be installed on supporting structures now being used to support the flexible strand means of flexible side-frame conveyors.

In order to acquire and accomplish the desired objects, as stated above, the present invention includes a mounting or connecting means which is interposed between the supporting structures and the flexible strand means at the supported locations which comprises an elongated shaft member disposed substantially transversely to the course along which the conveyor is trained, a U-shaped bight on one end of the shaft member which is adapted to be connected to the strand means with the other end of the shaft member being slidably mounted to a substantially upwardly projecting generally vertically disposed support member of the supporting structure, a yieldable resilient biasing means disposed on the shaft member between the U-shaped bight and the support member which biases the U-shaped bight, having the flexible strand means mounted therein, away from the support member. As the load on the belt conveyor, which is supported by the flexible strand means through the troughing assemblies, varies, the biasing means yields to enable the flexible strand means to flex generally transversely of the course along which the conveyor is trained at the locations thereon where the flexible strand means is mounted to the supporting structures.

Other objects and important features of the invention will be apparent from a study of the specification following taken with the drawing, which together show and describe a preferred embodiment of the invention and which is now considered to be the best mode of prac-

ticing the principles thereof. Other embodiments 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 spirit of the sub-joined claims.

In the drawing:

Fig. 1 is a perspective view of a portion of a flexible strand side-frame conveyor having the improvements according to the present invention embodied therein;

Fig. 2 is a vertical cross-sectional view of the conveyor illustrated in Fig. 1 taken along the line 2—2 thereof;

Fig. 3 is a partial view of the vertical cross-sectional view of Fig. 2 illustrating the location at which the flexible strand means is supported and modified to illustrate the variance in the troughing effect by flexing of the troughing assemblies of the conveyor, in dotted lines, as a result of a variance in the load carried thereon by the generally transversely relative movement of the strand means through the mounting means of the supporting structures at the supported location; and

Fig. 4 is a fragmentary vertical cross-sectional view of the mounting means of the invention.

Attention is now directed to the drawing wherein a flexible strand side-frame conveyor **10**, which is similar to that conveyor assembly as described in the Craggs and McCann U.S. Patent No. 2,773,257, identified above, is illustrated. The flexible strand side-frame conveyor **10** includes a pair of transversely spaced flexible strand means **12**, a plurality of elongated flexible troughing assemblies **14** longitudinally spaced along and carried by the strand means **12** at locations thereon where the strand means is relatively freely flexible and an endless belt conveyor **16** having a conveying reach **18** supported by the troughing assemblies **14** and a return reach **20** supported by idler structures **22**.

The strand means **12** is supported and trained along a desired given course by a plurality of longitudinally spaced supporting structures **24** which are positioned at intervals along the flexible strand means **12** where the strand means is relatively freely flexible with the intervals being longitudinally spaced and remote from the locations at which the troughing assemblies **14** are supported by the strand means **12**.

It is to be understood and noted that the flexible strand means **12—12** are transversely spaced apart a distance greater, at the locations thereon where the strand means is supported by the respective supporting structures **24**, than the transverse distance thereof where the troughing assemblies **14** are connected thereto.

Each of the supporting structures **24** include a pair of transversely spaced, substantially vertically upwardly projecting, generally upstanding tubular support members **26** which are maintained in the properly spaced transverse relationship to each other by a substantially transversely extending, generally horizontally disposed relatively rigid spacer member **28** and in the desired generally vertically upwardly projecting position by a ground-engaging base portion **30** which is secured, as by welding or the like, to the lower end portion of the respective support member **26**.

The upper end portion of each of the tubular support members **26** is open and also provided with a pair of transversely aligned openings **32—32**. A bushing member **34** having an opening **36** therein is positioned within the upper open end portion of each of the tubular support members **26** with the openings **32—32** therein and the opening **36** of the bushing member **34** being generally transversely disposed and in aligned relationship to each other, note Fig. 4.

A mounting member **37** for mounting the flexible strand means **12** to the supporting structures **24** is carried by the upper end portion of each of the support members **26** and includes a shaft member **38** which is slidably positioned within each of the series of aligned openings **32—32** and **36** of the support member **26** and the bushing member **34**, respectively, and the shaft member **38** projects therethrough with the longitudinal axis thereof being disposed substantially transversely to the course along which the conveyor **10** is trained. The shaft member **38** is removably slidably retained in the desired position in the series of aligned openings by a securing means **40** which is positioned adjacent the transverse inner end portion of the shaft member **38**. The mounting member **37** further includes a U-shaped bight portion **42** which is generally transversely outwardly opening relative to the given course of the conveyor **10**, and is secured to the transverse outer end portion of each of the shaft members **38**. The generally transversely outwardly opening U-shaped bight portion **42**, of the mounting member **37**, supports, secures and mounts the flexible strand means **12** to the respective supporting structure **24** and the U-shaped bight portions are oriented along the course of the conveyor **10** so that the bight portions **42**, which are disposed adjacent to one of the side edges of the belt conveyor **16**, will receive, support and mount the strand means **12** which extends along the same side edge of the belt conveyor with the strand means being mounted in a plurality of the aligned and oriented U-shaped bight portions.

The idler structures **22**, which train and guide the return reach **20** of the belt conveyor **16**, are supported by transversely spaced bracket means **44** which are secured to the spacer members **28** in such manner that the idler structures **22** are supported separately from and independent of the troughing assemblies **14** and are also disposed generally vertically below and in longitudinally spaced relationship thereto with the return reach **20** of the belt conveyor **16** being relatively more rigidly supported by the idler structures **22** than the conveying reach **18** of the belt conveyor, which is flexibly supported by the flexible troughing assemblies **14** and flexible strand means **12**.

From the description of the flexible strand side-frame conveyor **10**, above, it is believed to be evident, that when the load which is being carried by the conveying reach **18** of the belt conveyor **16** varies, that the flexible troughing assemblies **14** will trough in accordance with the variance in the load and that the flexible strand means **12** will also flex at the locations where the troughing assemblies **14** are connected to the strand means **12** in order to compensate for and to facilitate the troughing of the troughing assemblies. Normally, the flexing of the flexible strand means **12**, at the locations where the troughing assemblies **14** are supported, will cause a generally longitudinally shifting movement of the strand means **12**, relative to the supporting structures **24**, at the locations where the strand means **12** is supported by the supporting structures **24** in order to enable the strand means to flex at the locations where the troughing assemblies are secured thereto without disturbing the desired normal slack and tension in the strand means.

This longitudinal shifting of the strand means **12** relative to the supporting structures **24**, as such, is an undesirable movement since this shifting movement creates a frictional drag which may upset or cause movement of the supporting structures at the supported locations. However, the result of the longitudinal shifting movement of the strand means **12** relative to the supporting structures **24** at the supported locations is a desirable feature since this shifting movement enables the strand means **12** to flex at the locations thereon where the troughing assemblies **14** are secured thereto without disturbing the slack and tension therein so that the troughing assemblies may more readily trough in accordance with the varying loads being carried by the conveying reach **18** of the belt conveyor **16**.

In order to eliminate and/or substantially decrease the undesirable longitudinal shifting movement of the strand means **12** at the supported locations while retaining the

desirable flexing of the strand means 12 at the locations where the troughing assemblies 14 are secured thereto and in order to provide a substantially continuous flexing of the strand means 12 throughout the full longitudinal length of the conveyor 10 so that the conveyor may have a more constant troughing effect, each of the mounting members 37 is provided with a resiliently yieldable biasing means 46, in the form of a resilient coil spring, which is positioned around each of the shaft members 38 and interposed between the U-shaped bight portion 42 and the upper end portion of the support member 26. The specific disposition of the resiliently yieldable biasing means 46 will cause a force to be exerted against the respective strand means 12 which is mounted in the U-shaped bight portion 42 of the mounting member 37 with the force being primarily generally transverse of the course along which the conveyor 10 is trained. The resiliently yieldable biasing means 46 will also control the amount of slack, tension and catenary drop of the strand means 12 between the adjacent supporting structures 24 and also compensate for any necessary adjustments thereto as the troughing assemblies 14 react as the loaded condition on the conveying reach 18 of the belt conveyor 16 varies which is impressed thereon through the troughing assemblies 14 and the flexible strand means 12.

A restraining or locking means 48 may be provided on each of the U-shaped bight portions 42 of the mounting members 37 to insure that the flexible strand means 12 will remain within the respective U-shaped bight portions at all times. In addition, the restraining or locking means 48 may also be employed to restrain the strand means 12 from any longitudinal relative movement with respect to the supporting structures 24 at the supported locations.

In practicing the concepts of this invention, it has been found that it is advantageous to construct and form the upstanding tubular support members 26 in a manner to provide a small bend of elbow 50 intermediate the upper and lower end portions thereof. Each of the elbows 50 cause the upper end portion of the respective support member 26 to project generally transversely inwardly relative to the course along which the conveyor 10 is trained and the angle of each of the elbows 50 should be sufficient so as to dispose the longitudinal axis of the upper end portion of each of the support members 26 substantially normal to the orientation of the longitudinal axis of the adjacent end portion of an associated troughing assembly 14 which is positioned in close proximity thereto, either in the loaded or unloaded condition thereof, also, that the longitudinal axis of the shaft member 38 of the mounting members 37 may be disposed substantially parallel to the longitudinal axis of the end portion of the associated troughing assembly 14.

Further, the generally transversely inwardly projecting position of the upper end portion of each of the support members 26 further provides that there are no generally outwardly projecting elements which could cause damage to a person working with the flexible strand side-frame conveyor 10. It will be noted that by reason of the bend caused by the elbows 50, that there is no undesirable outwardly projecting elements along the side portions of the conveyor.

Attention is now directed to Fig. 3 wherein there is illustrated three loaded conditions designated generally by the reference letters LA, LB and LC wherein the loaded condition LA is the lighter of the three loaded conditions, the loaded condition LB being an intermediate loaded condition and the loaded condition LC being the heaviest loaded condition. Other reference characters have been given like designation, as A, B or C, to indicate their respective positions relative to each other depending upon the loaded condition which exists on the conveying reach 18 of the belt conveyor 16. It is to be noted that the strand means 12 will flex primarily generally transversely inwardly and outwardly, at the location where the troughing assembly 14 is secured thereto by connecting means 52, depending upon the loaded condition of the belt conveyor, and further that the troughing assembly 14 will also flex primarily generally upwardly and downwardly in similar degree in response to the corresponding loaded condition of the belt conveyor. Also, it is to be noted that the strand means 12 will also flex primarily generally transversely inwardly and outwardly at the locations thereon where the strand means 12 is supported by the supporting structures 24 in response to the loaded conditions of the belt conveyor in order to provide the desired advantages and results, as stated above.

It is believed to be apparent that the supporting structure 24 having the transversely yieldably resiliently biased mounting member 37, which supports the strand means 12 at the supported locations, will actually improve the performance of a flexible strand side-frame conveyor 10 in that the mounting member 37 will permit and enable the strand means 12 to flex at the supported locations so that the troughing assembly 14 will have improved troughing characteristics due to the flexing of the strand means which will be continuous throughout substantially the full length of the conveyor and will not only compensate for varying loaded conditions on the belt conveyor 16 but will also more readily control the slack, tension and catenary sag of the strand means 12 intermediate the adjacent supporting structures 24.

While the invention has been described in terms of an embodiment which it has assumed in practice, the scope of the invention should not be deemed to be limited by the precise embodiment herein shown, such other embodiments being intended to be reserved especially as they fall within the scope of the claims here appended.

I claim:

1. A supporting structure for effectively supporting flexible strand means of a flexible sideframe conveyor at a location thereon that is disposed along a given course while enabling such strand means to substantially retain the flexibility thereof at such location and by restraining such strand means against generally longitudinal shifting movement relative to the given course, said supporting structure comprising, a generally vertically disposed substantially upstanding member having a generally transversely extending opening in the upper portion thereof, an elongated shaft member positioned in the opening of the upstanding member and slidably supported for movement therein in a direction substantially transverse to the given course, securing means adjacent one end portion of the shaft member for removably securing the shaft member in the opening of the upstanding member, a mounting member having a U-shaped bight portion carried by the other end portion of the shaft member for engaging a portion of such strand means at such location, and yieldably resilient means interposed between the mounting member and the upstanding member enabling that portion of such strand means which may be mounted in the U-shaped bight portion of the mounting member to flex in a direction generally transverse of the given course while the mounting member restrains such strand means against generally longitudinal movement relative to the given course.

2. The supporting structure as set forth in claim 1, wherein said mounting member further includes a locking member for retaining that portion of such flexible strand means within the said U-shaped bight portion at such location along the given course.

3. A supporting structure for effectively supporting a flexible strand means of a flexible sideframe conveyor while enabling such strand means to be generally transversely flexible and by restraining such strand means against generally longitudinal shifting movement, said supporting structure comprising, a support member having a shaft member slidably supported thereon, a mount-

ing member carried by the shaft member adapted to mount a portion of such flexible strand means at a flexible location thereon to the supporting structure, and yieldable resilient means disposed intermediate the mounting member and the support member for enabling that portion of such strand means which may be mounted to the mounting member to substantially retain its effective flexibility at such location while said mounting member restrains such strand means against generally longitudinal shifting movement relative to the supporting structure at such location.

4. A supporting structure for supporting and training a flexible strand means of a flexible sideframe conveyor along a given course, said supporting structure including a base portion, a mounting member adapted to secure such strand means to the supporting structure, and means for movably supporting the mounting member to the base portion for movement thereon in a direction that is generally transverse to the given course to enable such strand means that may be secured to the mounting member to have movement corresponding thereto while such strand means is restrained against movement generally longitudinally of the given course.

5. A supporting structure for supporting a flexible strand means of a flexible sideframe conveyor along a given course, said supporting structure including a support member having a shaft member slidably supported thereon, said shaft member being adapted to connect the supporting structure to such strand means at a flexible location thereon to enable flexible movement thereof at such supported location while restraining generally longitudinal movement thereof relative to the given course at such supported location.

6. A supporting structure for supporting and training a flexible strand means of a flexible sideframe conveyor along a given course, said supporting structure including a mounting member movably supported for movement in a direction generally transverse to the given course, said mounting member being adapted to connect the supporting structure to such strand means at a flexible location thereon to enable flexible movement thereof in a direction generally transverse to the given course while restraining generally longitudinal shifting movement thereof relative to the given course.

7. In a flexible sideframe conveyor including flexible strand means having troughing assemblies carried thereby adapted to support a belt conveyor and supporting structures for supporting said strand means at locations thereon where the strand means is flexible, the improvement comprising, in combination with the supporting structures, mounting means for mounting the strand means to the supporting structures to enable said strand means to be flexibly supported by the supporting structures at the said locations while restraining the strand means against generally longitudinal movement relative to the supporting structures at the said locations.

8. In a flexible sideframe conveyor including flexible strand means having troughing assemblies carried thereby adapted to support a belt conveyor and supporting structure for supporting and training the strand means along a given course, the improvement comprising, in combination with the supporting structure, mounting means for mounting the strand means to the supporting structure to enable the strand means to be continuously effectively flexible throughout substantially the full length of the given course and for restraining the strand means against generally longitudinal movement relative to the given course.

9. In a flexible sideframe conveyor having flexible strand means, supporting structures for supporting and training the strand means along a given course, each of said supporting structures including a support member, a shaft member for mounting the strand means at a location thereon to the support member, means slidably supporting the shaft member to the support member, and yieldable resilient means interposed between a portion of the shaft member and the support member to enable the strand means to substantially retain the flexibility thereof at the said respective location thereon while each of said shaft members restrain the strand means against generally longitudinally shifting movement relative to the respective supporting structure at the respective location.

10. In a flexible strand sideframe conveyor, flexible strand means having flexible troughing assemblies carried thereby and connected thereto at first locations thereon where the flexible strand means is substantially flexible, and supporting structures for supporting and training the strand means along a given course, each of said supporting structures including mounting means for mounting said strand means to the respective supporting structure at other substantially flexible locations on the strand means which are remote from the first locations, said mounting means including a resiliently yieldable member which enables the strand means to be effectively flexible throughout substantially the full length of the given course, and restraining means for limiting generally longitudinal movement of the strand means relative to the given course.

11. In a flexible sideframe conveyor including flexible strand means having flexible troughing assemblies carried and connected thereto at first locations thereon where the strand means is generally flexible, supporting structures for supporting and training the strand means along a given course, and mounting means for mounting said strand means to the supporting structures at flexible locations on the strand means which are remote from the first locations, said mounting means including restraining means for restraining said strand means against generally longitudinal movement relative to the given course at the said other locations and yieldable means for yieldably enabling generally transverse movement of the strand means relative to the given course at the said other locations.

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