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[54] **POWER CONDUCTOR TAKEUP SYSTEM**
10 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **198/139**
[51] **Int. Cl.** **B65g 15/26**
[50] **Field of Search** ..... 198/89, 139; 212/55; 187/9; 191/12 C, 12 R

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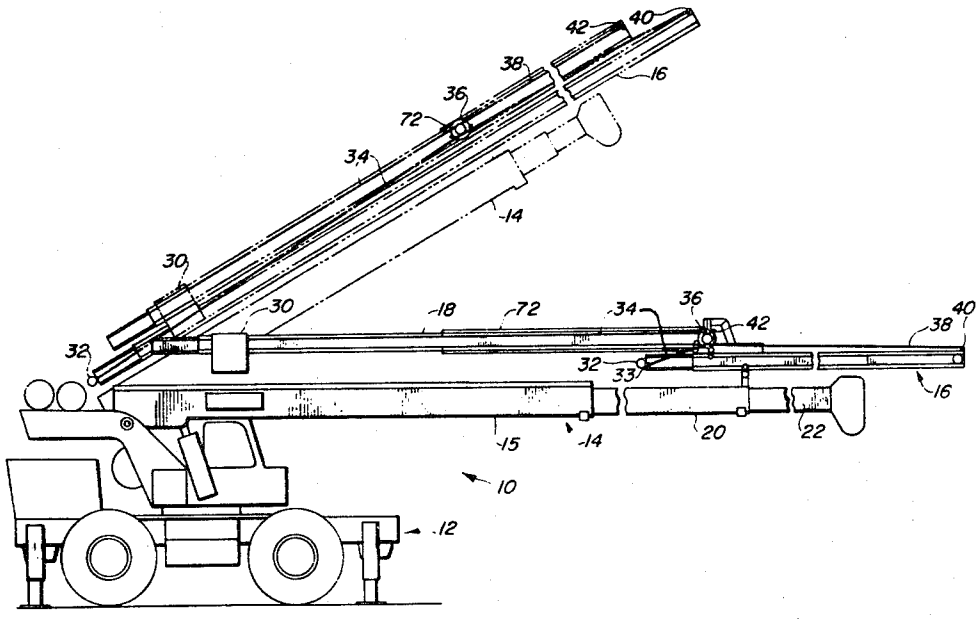
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ABSTRACT: This invention relates to an improved system for providing power to the extremities of telescopable or expandable equipment comprising a fixed member and a movable member. A pulley system, independently movable with respect to the fixed and movable members, is rotatably transversed by a substantially lineal flexible power conductor. This power conductor is attached at one of its ends to a power source on the fixed portion of the equipment and at its other end to a power utilizing means on the movable portion of the equipment. Means are provided to move the pulley system in relation to the movement of the movable member so that the power conductor is held in a substantially taut condition throughout the range of movement of the movable portion of the equipment.



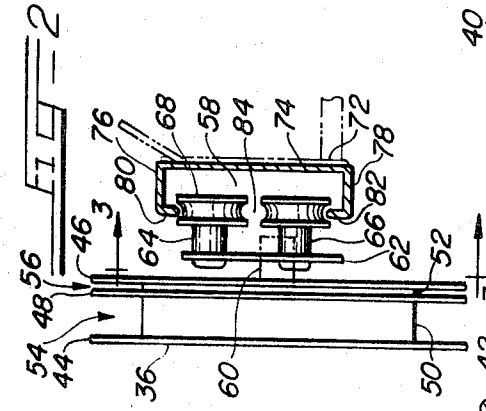


FIG-2

FIG-1

FIG-3

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POWER CONDUCTOR TAKEUP SYSTEM

CROSS-REFERENCE

This application is a continuation-in-part of applicant's copending Ser. No. 858,298 application, filed Sept. 16, 1969, now abandoned for APPARATUS FOR PLACING CONCRETE MIX OR THE LIKE.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an improved system for providing power to movable portions of expandable or telescopable equipment. More specifically, it relates to a system which requires a minimum length of power conductor and eliminates the necessity for expensive and unreliable slidable or rotatable fittings.

2. Description of the Prior Art

Movable or telescopable conveyor systems have been found to be extremely useful in the various operations involving the short-range movement of various materials such as grains, coal, gravel, and concrete mix. For example, conveyor belt systems for the conveyance of concrete mix are illustrated in Oury, et al., U.S. Pat. No. Re-26,298, reissued Nov. 21, 1967; Oury, U.S. Pat. No. Re-26,347, reissued Feb. 20, 1968; Oury, et al., U.S.. Pat. No. 3,343,651, issued Sept. 26, 1967; and in the Ser. No. 858,298 application of which this application is a continuation-in-part. As illustrated therein, a series of conveyor belt units can be combined to convey concrete mix to a particular area at the construction site where the mix is to be placed. Since it is more economical and expeditious to place as much concrete mix as possible before the conveyor system is moved, all of the above-references illustrate a movable or telescopable discharge conveyor at the end of the conveyor system to allow a greater area of coverage by the discharge conveyor.

In all of the above-illustrated conveyor systems, each individual conveyor apparatus is a self-contained unit. Consequently, each conveyor apparatus has a self-contained drive unit to propel the conveyor belt. Various types of drive units can be utilized including electric motors, hydraulic motors, or gasoline engines. However, because of the start-and-stop nature of the concrete pouring operation in construction, electric or hydraulic motors have been found to provide the greatest ease of operation.

Typically, at a construction site, power is provided by a gasoline engine driven electrical generator or hydraulic compressor. In either case, it is reasonably simple to extend either an electrical cable or a hydraulic hose along the stationary portions of the conveyor system to provide power to the individual conveyor drive units. However, problems have been experienced in providing power to the power drive unit contained on the final movable or telescopable discharge conveyor. If the electrical cable or hydraulic hose is long enough to provide power at the furthest extension of the telescopable conveyor apparatus, the cable or hose will have many feet of slack when the discharge conveyor is in its fully retracted position. Allowing the cable or hose to remain in a slack condition is extremely dangerous since workmen may become entangled or it may be severed or become tangled by other equipment being utilized at the construction site. One method of solving this problem is to provide a spring-loaded spool or reel arrangement which allows the feed out of the cable to the discharge conveyor as it is moved. However, such reel arrangements have not proved satisfactory since they require extremely expensive and unreliable slidable or rotatable fittings to provide power to the hose or cable on the reel as the reel is rotated.

Thus, it is the principal object of the present invention to provide simple and reliable power conductor take up system which allows power to be conducted to the extremities of expandable or telescopable equipment without limiting the range of motion of said equipment.

A further object of the present invention is to provide an improved power conductor takeup system which eliminates dangerous slack in the power conductor without the need for expensive or unreliable takeup spools or reels and related fittings.

A further object of the present invention is to provide a power conductor takeup system which is simple, reliable, economical, and adaptable to use on a variety of telescopable or expandable pieces of equipment.

SUMMARY OF THE INVENTION

The foregoing and other objects, advantages, and features of the subject invention may be achieved in expandable or telescopable equipment comprising a relatively stationary first base member with a power source thereupon and a second expandable or telescopable member with a power utilization means attached thereto adapted to engage and move relative to the first base member. An improved power conductor takeup system for such equipment comprises an independently movable pulley system; a substantially lineal flexible power conductor attached at one of its ends to said power source and at its other end to the power utilization means and adapted to engage and rotatably transverse the pulley system along its length; and a power conductor take up means adapted to move the pulley system so that the power conductor is held in a substantially taut condition throughout the range of movement of the second member.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side fragmentary elevational view of a crane-mounted conveyor system with a preferred embodiment of the present invention provided thereon.

FIG. 2 is a fragmentary end view of the conveyor frame and the carriage and pulley system.

FIG. 3 is a sectional view taken substantially along Line 3—3 of FIGURE 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With respect to the drawings, FIGURE 1 shows a concrete placement apparatus **10** comprising a base **12**, a supporting assembly **14**, a telescoping conveyor assembly **16**, and a fixed conveyor assembly **18**. Supporting assembly **14** comprises fixed member **15**, and hydraulically expandable members **20** and **22** which can be extended to increase the length of supporting assembly **14**.

The base **12** and support assembly **14** advantageously take the form of a hydraulic crane which is, per se, old in the art, and itself forms no part of the present invention. Further, the fixed conveyor assembly **18** and telescoping conveyor assembly **16** are disclosed and described in copending application, Ser. No., 858,298, filed Sept. 16, 1969, of which this application is a continuation-in-part. The details of the attachment and operation of the fixed conveyor assembly **18** and the telescoping conveyor assembly **16** are described in detail in the parent application.

As disclosed in the parent application, extension of hydraulically expandable members **20** and **22** of the supporting assembly **14** causes a corresponding telescopic movement of telescoping conveyor assembly **16** with respect to fixed conveyor assembly **18**. A power hook-up assembly **30** is provided on the fixed conveyor assembly **18**, and, depending on the type of power being utilized, assembly **30** may take the form of an electrical terminal box or a hydraulic junction box. Provided on the telescoping conveyor assembly **16** is a power utilization means **32** which, again depending on the type of power utilized, may take the form of either an electric motor or a hydraulic motor. Attached at one of its ends to the power hookup assembly **30** and at its other end to the power utilizing means **32** at point **33** is a substantially lineal flexible power conductor **34**. Depending on the type to be conducted, power conductor **34** may take the form of either an electrical cable

or an hydraulic hose. The purpose of the power conductor **34** is to transmit power from the power hookup assembly **30** to the power utilization means **32**. The power conductor **34** is looped around and in circumferential engagement with a pulley system **36**.

A takeup cable **38** is attached at one of its ends to the telescoping conveyor system **16** at point **40** and to the fixed conveyor assembly **18** at point **42**. The takeup cable **38** is likewise looped around and in circumferential engagement with pulley system **36**.

FIGURE 2 shows an end view of pulley system **36**. Pulley system **36** comprises circular end plates **44** and **46**, and a circular divider plate **48**. Circular end plate **44** is separated from circular divider plate **48** by a cylindrical hub **50** to form a pulley groove **56**. Circular end plate **44**, hub **50**, divider plate **48**, cylindrical hub **52** and circular end plate are all bonded together to form a single integral pulley system **36**. Power conductor **34** engages and rides in pulley groove **54** and takeup cable **38** engages and rides in pulley groove **56**.

Pulley system **36** is pivotably mounted to a roller carriage assembly **58** by means of an axle **60**. Roller carriage assembly **58** comprises a plate **62** to which axle **60** is attached. Also mounted to plate **62** are roller axles **64**, **65**, and **66** to which rollers **68**, **69** and **70** are respectively pivotably mounted.

Attached to one side of fixed conveyor assembly **18** is a channel member **72** which may be the side channel of the conveyor. Channel member **72** comprises a main plate **74**, side channels **76** and **78**, at each end and perpendicular to main plate **74**, and channel flanges **80** and **82** extending perpendicular from side channels **76** and **78**, respectively toward one another (see FIG. 2). Each roller, **68**, **69** and **70**, has a roller groove **84** which engages one of the channel flanges **80** and **82**. Thus, roller carriage assembly **58** can move in a substantially linear direction along channel member **72** as rollers **68**, **69** and **70** roll in engagement with channel flanges **80** and **82**.

Operation of this particular embodiment of the power conductor takeup means of the present invention may be described with reference to FIG. 1. In FIG. 1, the solid lines depict supporting assembly **14** and telescoping conveyor assembly **16** in a substantially extended condition with respect to fixed conveyor assembly **18**. The broken lines in FIG. 1 depict support assembly **14** in a raised position with respect to the base **12** and show support assembly **14** and telescoping conveyor assembly **16** in a substantially retracted position with respect to fixed conveyor assembly.

As is illustrated in FIG. 1, when telescoping conveyor assembly **16** is in its fully retracted position (as depicted by the broken lines), pulley system **36** and roller carriage assembly **58** are positioned at the end of channel **72** closest to power hookup assembly **30**. The positioning of roller carriage assembly **58** and pulley system **36** results from the interaction of power conductor **34** and takeup cable **38** as further described below.

As telescoping conveyor assembly **16** is extended outward from its fully retracted position as a result of hydraulic extension of expandable members **20** and **22**, force is exerted on takeup cable **38** at point **40** wherein it is attached to telescoping conveyor assembly **16**. This force causes tension in the takeup cable **38** which in turn causes force to be exerted against the circumference of pulley system **36**. Since roller carriage assembly **58** is freely movable along channel member **72**, movement of point **40** on telescoping conveyor assembly **16** tends to cause a movement of pulley system **36** and roller carriage assembly **58** by an increment of approximately one-half the distance of the movement of point **40**. The one-half increment is in accordance with the principles of pulley mechanics for a single pulley system, i.e., the center of the pulley moves linearly by an increment of one-half the angular distance of travel of a point on the circumference all the pulley. Since point **33** where power conductor **34** attaches to power utilizing means **32** is a point on a substantially rigid member (i.e., telescoping conveyor assembly **16**), point **33** moves the same distance as point **40**. Consequently, as takeup cable **38** moves pulley system **36** and roller carriage assembly **58** along channel member **72**, movement of point **33** will allow sufficient slack in power conductor **34** to prevent power conductor **34** from impeding the movement of pulley system **36** and roller carriage assembly **58**. However, since the diameter of pulley groove **54** and **56** are the same, substantially all of the slack generated by the movement of point **33** is immediately taken up by the corresponding movement of the pulley system **36** and roller carriage assembly, **58**, and thus, power conductor **34** is maintained in a substantially taut condition throughout the range of movement of telescoping conveyor assembly **16**.

When telescoping conveyor assembly **16** is in its fully extended position (as depicted by solid lines in FIG. 1), the roller carriage assembly **58** and pulley system **36** will have been moved to the end of channe member **72** furthest from power hookup assembly **30** as a result of takeup cable **38** being pulled through pulley system **36**.

If telescoping conveyor **16** is retracted from its extended position, movement of point **33** creates a tension in power conductor **34** which exerts corresponding force upon the circumference of pulley system **36**. This force causes pulley system **36** and roller carriage assembly **58** to roll back along channel member **72**. As when telescoping conveyor assembly **16** was extended, movement of point **33** causes a corresponding equal movement of point **40** which permits sufficient slack in takeup cable **38** to allow free movement of roller carriage assembly **58**. However, because point **33** and point **40** move an equal distance, and because the circumference of pulley groove **54** and **56** are the same, movement of the telescoping conveyor assembly **16** causes power conductor **34** to move pulley system **36** and roller carriage assembly **58** so that takeup cable **38** is held in a substantially taut condition throughout the range of motion of conveyor assembly **16**.

Thus, the interaction of power conductor **34** and takeup cable **38** when transversing pulley assembly **36** causes pulley assembly **36** and roller carriage assembly **58** to move laterally along channel member **72** proportionally as to the lateral movement of telescoping conveyor assembly **16** so that both power conductor **34** and takeup cable **38** are held in a substantially taut condition throughout the range of motion of telescoping conveyor system **16**.

It should be expressly understood that because of the arrangement of the conveyors in this embodiment, utilization of a takeup cable **38** provides an economical and reliable means of positioning the pulley system **36** to takeup substantially all the slack in power conductor **34**. However, a takeup cable is not the only means to perform this function. For example, a long helical spring could be utilized to spring bias and move pulley system **36** to hold power conductor **34** in a substantially taut condition throughout the range of movement of the telescoping conveyor assembly **16** without departing from the concept of this invention.

I claim:

1. In an apparatus comprising a relatively stationary first base member with a power source provided in association therewith and a second member movable with respect thereto and having a power utilization means provided in association therewith, an improved power conductor system adapted to conduct power from power source to said power utilization means comprising:

a rotatable pulley adapted to move in substantially linear direction substantially parallel to the direction of movement of the second member;

substantially lineal flexible power conductor means engaging and rotatably transversing the pulley, the power conductor means being attached at one of its ends to the power source and at its other end to the power utilization means; and

power conductor takeup means in engagement with the pulley adapted to move the pulley so that the power conductor is held in a substantially taut condition throughout the range of movement of the second member.

2. An improved power conductor system, as claimed in claim 1 wherein:

the takeup means comprises a takeup cable attached at one end to the first member and at its other end to the second member and position so as to engage and rotatably transverse the pulley; and

the power conductor and the takeup cable are positioned to cooperate with the pulley so that movement of the second member causes the pulley to move in such a manner as to hold the power conductor means and the takeup cable in a substantially taut condition throughout the range of movement of the second member.

3. An improved power conductor system, as claimed in claim 2, wherein the pulley is rotatably mounted on a carriage assembly which is mounted in engagement with the first member for translational movement with respect thereto.

4. An improved power conductor system, as claimed in claim 3, wherein the first member comprises a flanged channel member and wherein the carriage assembly has a plurality of rollers rotatably attached thereto, which rollers engage the flanged channel member and allow the carriage assembly to translate freely in engagement with the flanged channel member.

5. An improved power conductor system, as claimed in claim 3, wherein the pulley comprises a pulley wheel having a pair of pulley grooves formed thereon, with the power conductor engaging a first one of the grooves and the takeup cable engaging the other of the grooves.

6. In a telescopable belt conveyor system for conveying material comprising a first conveyor belt unit and a second conveyor belt unit, with the first and second conveyor belt units including a continuous conveyor belt loop, roller means for supporting the belt, a frame supporting the rollers, and power utilization means on the frame for causing the belt to move across the rollers, the first and second units being mounted so that the second conveyor belt unit is telescopably movable with respect to the first conveyor belt unit, and with the belt of the first conveyor belt unit being adapted to discharge its contents onto the belt of the second conveyor belt unit, an improved power conductor takeup system comprising:

a pulley movable in a substantially linear direction substantially parallel to the direction of movement of the second conveyor belt unit;

substantially flexible lineal power conductor means for conducting power from a power source mounted on the first unit to the power utilization means on the second unit;

the power conductor means being attached at one of its ends to the power source and at its other end to the power utilization means and being position to engage and rotatably transverse the pulley; and

takeup means in engagement with the pulley operably responsive to the movement of the second conveyor belt unit to move the pulley so that the power conductor means is held in a substantially taut condition throughout the range of movement of the second conveyor belt unit.

7. An improved power takeup system, as claimed in claim 6, wherein:

the takeup means comprises a takeup cable attached at one end to the first conveyor belt unit and at its other end to the second unit and positioned so that it engages and rotatably transverses the pulley; and

the power conductor and the takeup cable are positioned in cooperation with the pulley so that movement of the second unit causes the pulley to move in such a manner as to hold the power conductor means and the takeup cable in a substantially taut condition throughout the range of movement of the second unit.

8. An improved power conductor takeup system, as claimed in claim 7, wherein the pulley is rotatably mounted on a carriage assembly which is mounted in engagement with the first unit for translational movement with respect thereto.

9. An improved power conductor takeup system, as claimed in claim 8, wherein the first conveyor belt unit comprises a flanged channel member and wherein the carriage assembly has a plurality of rollers rotatably attached thereto, which rollers engage the flanged channel member and allow the carriage assembly to translate freely in engagement with the flanged channel member.

10. An improved power conductor takeup system, as claimed in claim 8, wherein the pulley comprises a pulley wheel having a pair of pulley grooves formed thereon, with a first one of the pulley grooves being engaged by the power conductor means and the other pulley groove being engaged by the takeup cable.