United States Patent
Arnold

[15] **3,707,275**

[45] **Dec. 26, 1972**

[54] HOISTING DEVICE

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[21] Appl. No.: **69,709**

[52] **U.S. Cl.** **254/150,** 254/190, 242/117, 242/47.01, 254/DIG. 11

[51] **Int. Cl.** **B66d 1/30**

[58] **Field of Search**.254/150, 190, DIG.11; 242/117, 242/47.01, 54; 187/23

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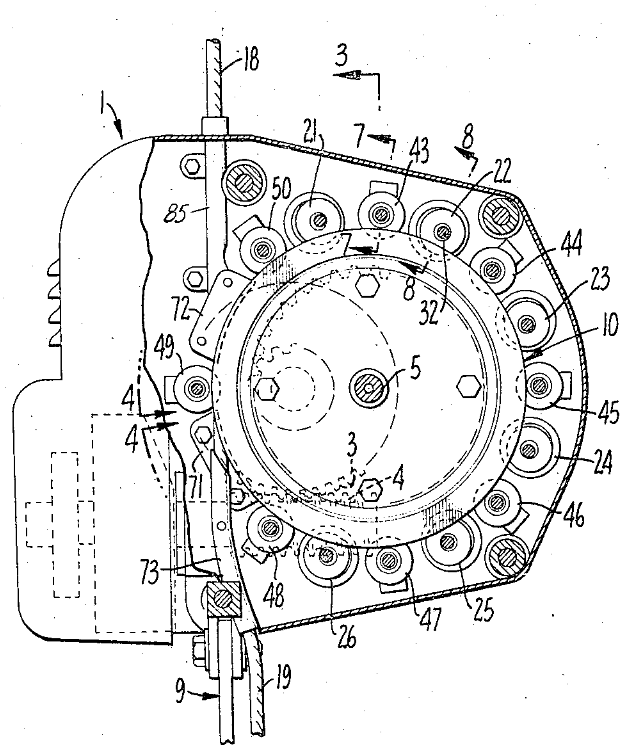
[57] **ABSTRACT**

A hoisting device of the type in which a rope is wound around a drum to provide a plurality of windings in side by side substantially parallel relationship. The shunting of the rope from one winding to the adjacent winding and the tensioning of the rope is accomplished by rollers so as to provide automatic self-reeving action and to reduce power loss due to friction as well as minimizing rope wear and enhancing reliability of the hoisting apparatus.

12 Claims, 13 Drawing Figures



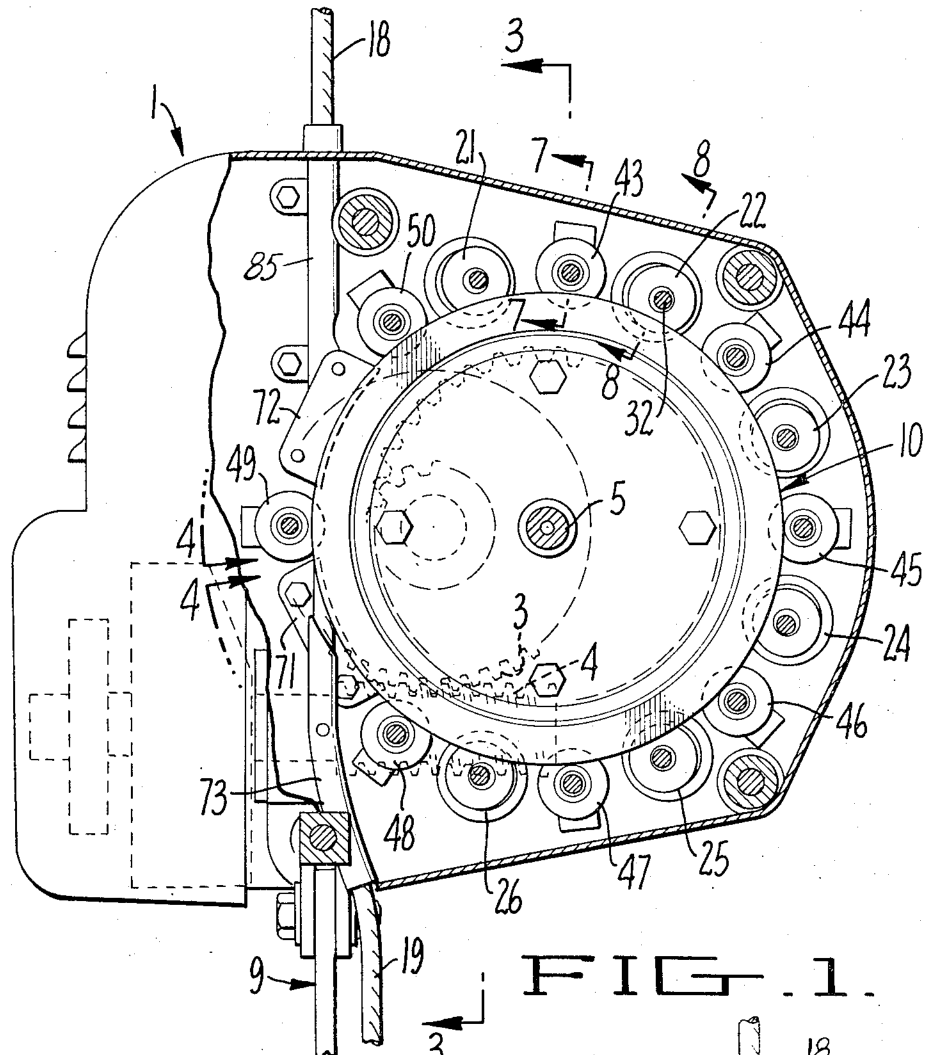


FIG. 1.

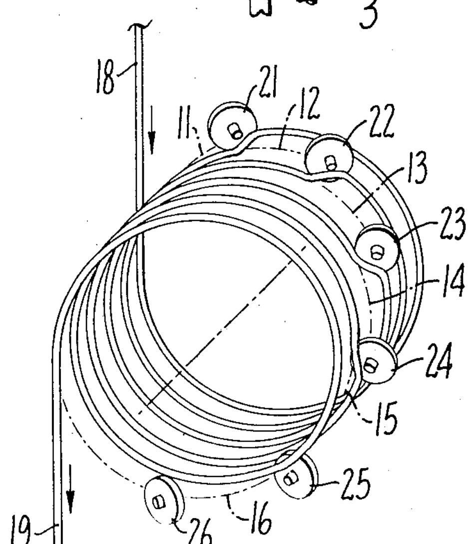


FIG. 2.

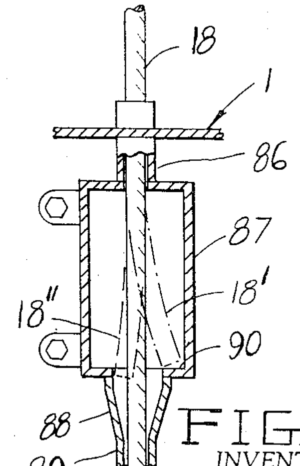


FIG. 10

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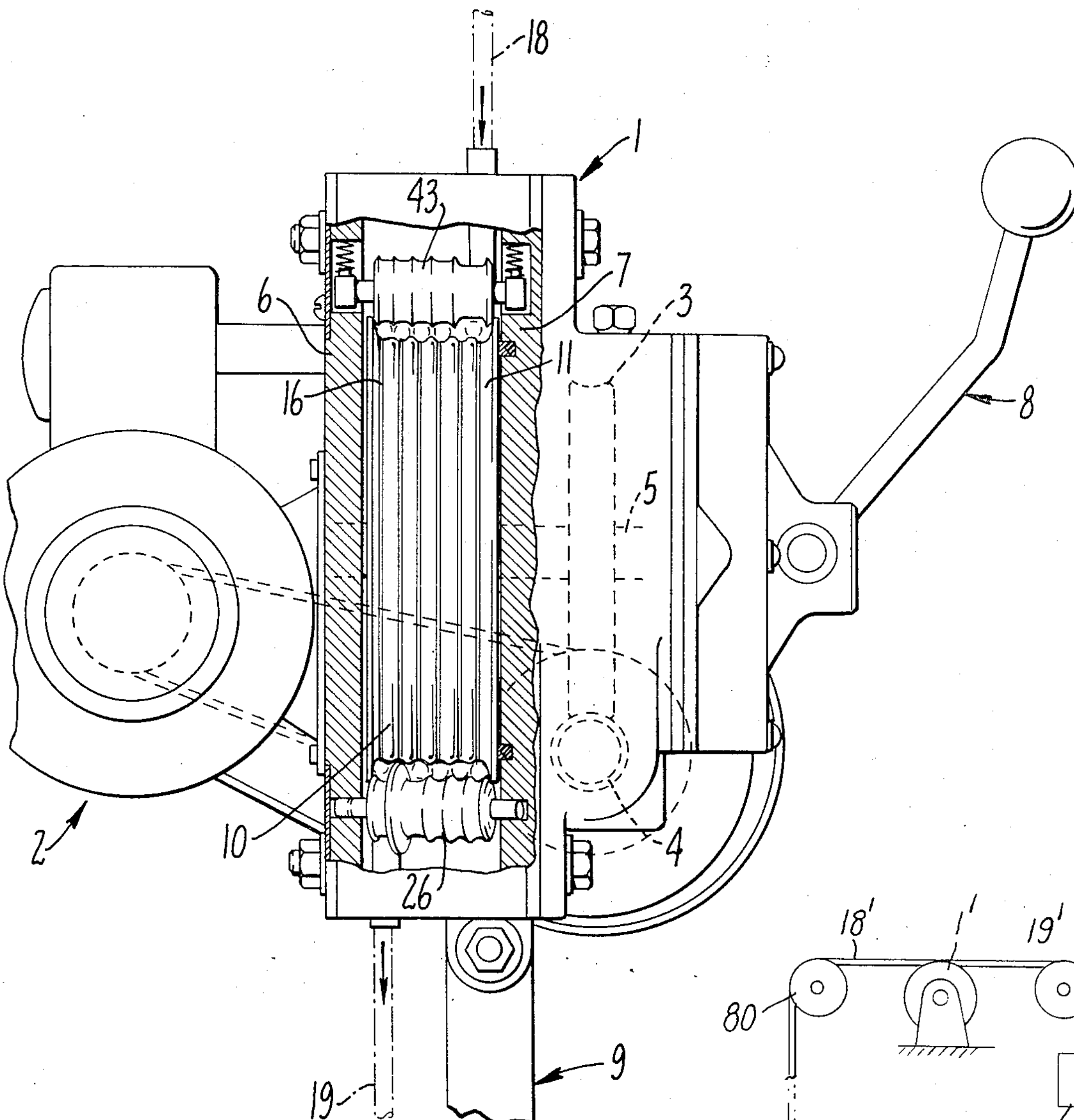

FIG. 3.

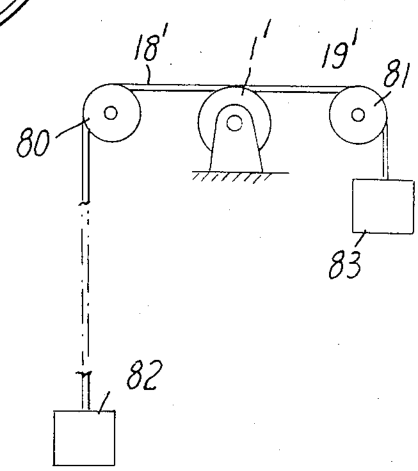

FIG. 9.

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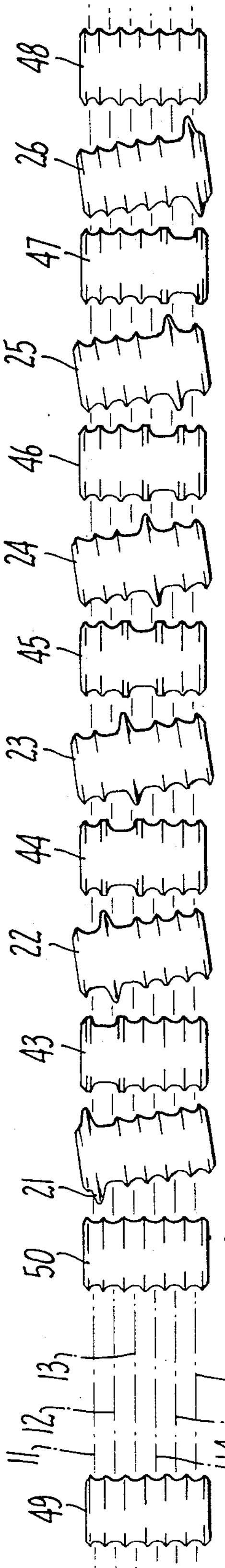

FIG. 4.

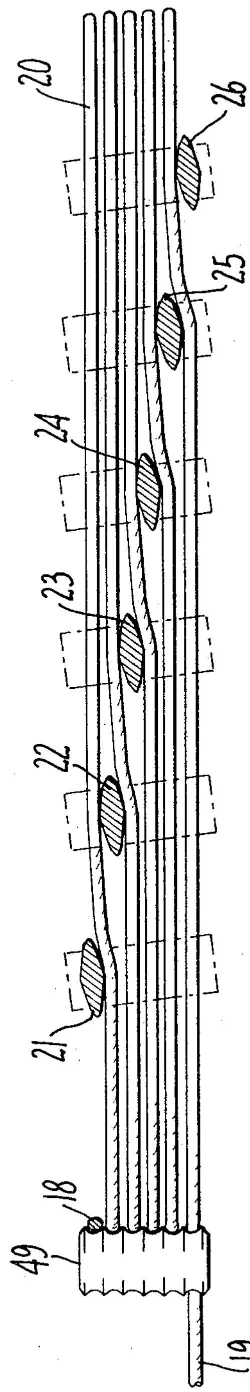

FIG. 5.

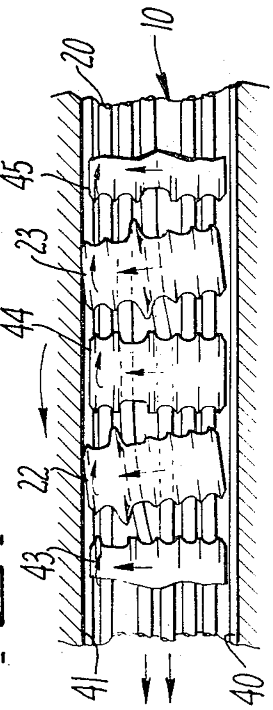

FIG. 6B.

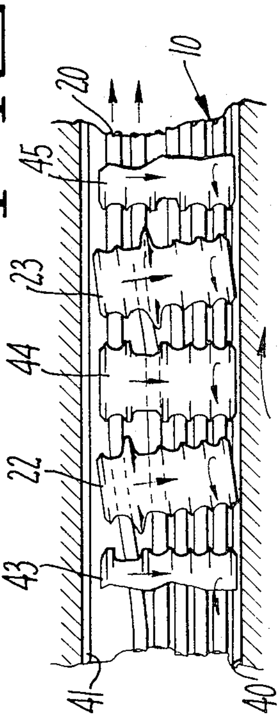

FIG. 6A.

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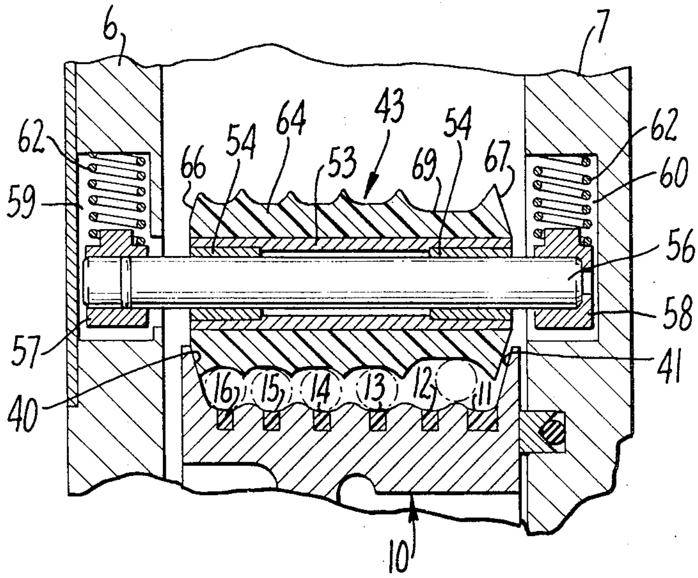

FIG. 7.

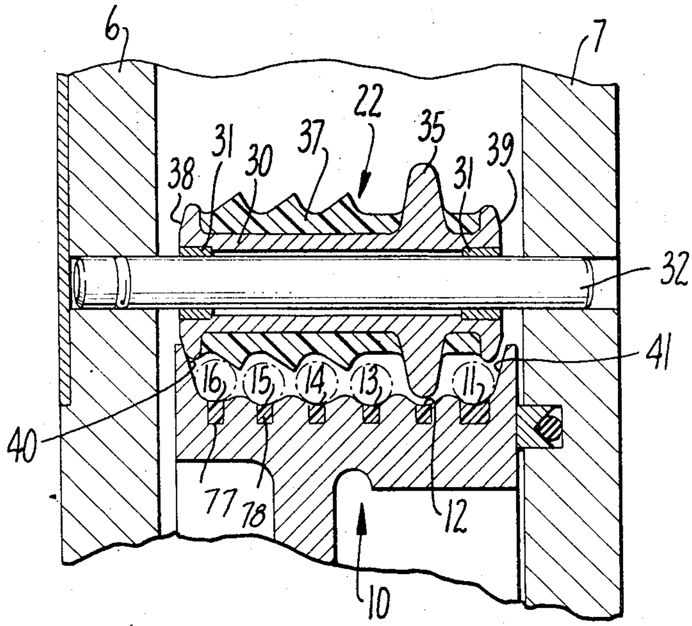

FIG. 8.

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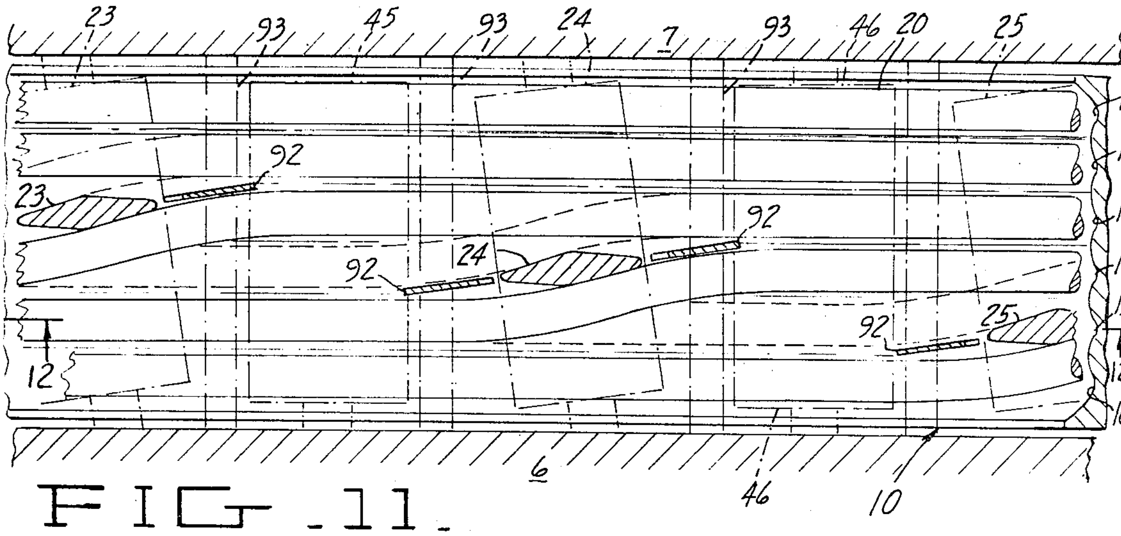

FIG_11

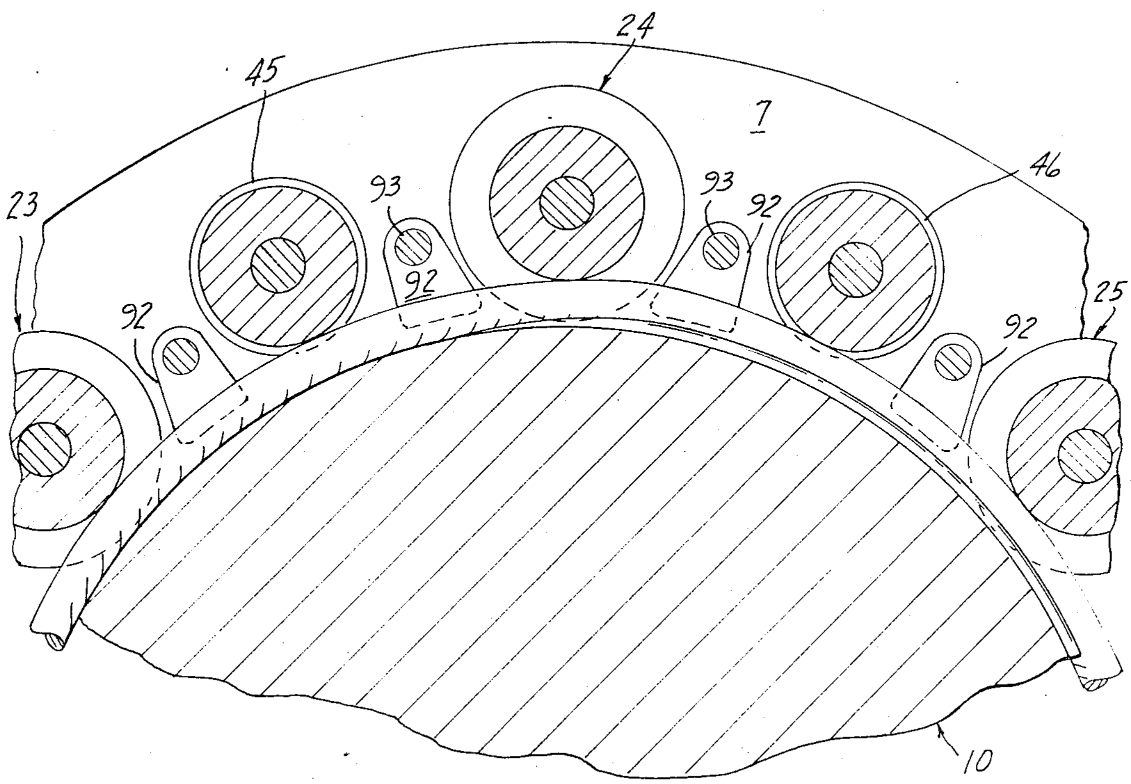

FIG_12

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HOISTING DEVICE

This invention relates to an improved hoist of the type in which a rope is wound around a drum to provide a plurality of windings in side by side relationship. The invention provides certain improved features over the hoist diclosed in U.S. Pat. No. 3,063,653.

Prior art hoists of the subject type usually include a drum having a plurality of peripherally extending parallel grooves in which the rope windings are received and the shunting of the rope from one winding to an adjacent winding is accomplished by guide elements fixedly secured relative to the housing of the drum. Since the forces on the rope are normally quite high the engagement of the rope with the shunting elements has created a considerable amount of friction with its attendant loss of power and has also caused wear on the rope and the shunting elements. By the present invention both wear and friction are minimized by providing rollers for shunting the rope from one winding to an adjacent winding. Furthermore, by the present invention the tension rollers which apply tension to the rope are driven in the direction of travel of the rope so as to further minimize wear and friction.

Another limitation of hoists of the type shown in U.S. Pat. No. 3,063,653 is that they are designed for use in hoisting applications wherein one end of the rope is always loaded and the other end is always slack. The hoist of the present invention lends itself to use in hoisting applications wherein either end may be loaded or unloaded.

Another advantage of the present invention is that a closed tamper proof housing is provided and the drum is made self-reeving by a unique arrangement of the tension and transfer rollers. With this self-reeving feature the proper operation of the rollers can not be interfered with even by the operator and, when the drum is first reeved, it may be done simply by feeding the rope in an opening in the housing so that said rope is reeved around the drum and shunted from one groove to another automatically without intervention of the operator.

Other objects and advantages of the invention will be apparent from the following specification and from the drawings:

FIG. 1 is a side elevation of the hoist with one side broken away to show internal structure;

FIG. 2 is a schematic perspective of the rope windings showing the manner in which the transfer rollers act on the rope;

FIG. 3 is a partial elevation and vertical section through the hoist taken in a plane indicated by lines 3—3 of FIG. 1;

FIG. 4 is a schematic developed view of the rollers around the periphery of the drum showing their contours and arrangement relative to each other;

FIG. 5 is a view similar to FIG. 4 showing the shunting action of the transfer rollers;

FIG. 6A is a schematic view of a portion of the drum periphery showing the manner in which the drum drives the rollers

FIG. 6B is a view similar to FIG. 6A but with the drum rotating in the opposite direction;

FIG. 7 is a longitudinal section through a tension roller and the periphery of the drum as taken in a plane indicated by lines 7—7 of FIG. 1;

FIG. 8 is a longitudinal section through a transfer roller and the periphery of the drum as taken in a plane indicated by lines 8—8 of FIG. 1; and

FIG. 9 is a schematic of a hoisting arrangement wherein both ends of the rope may be loaded;

FIG. 10 is a vertical sectional view partly in elevation of a modified rope guide for testing the straightness of the wire;

FIG. 11 is a fragmentary expanded top plan view of the drum periphery adjacent the rope windings showing a modified form of the invention;

FIG. 12 is a fragmentary cross section through the drum as taken in a plane indicated by lines 12—12 of FIG. 11.

In detail, and first with reference to FIG. 3, the invention includes a housing generally designated **1** which supports an electric motor or air motor **2** which in turn drives a worm gear **3** through a worm **4**. The worm gear **3** drives a drum shaft **5** which in turn is rotatably supported on side plates **6**,**7** of housing **1**. Control of the hoist may be effected by switches (not shown) actuated by handle **8**. Fixedly secured to shaft **5** is the hoisting drum **10**. In the particular application shown in FIGS. 1,3 a scaffold or other load may be connected to housing **1** by support member **9**.

The periphery of drum **10** is provided with a plurality of circumferentially extending parallel grooves which are numbered **11** to **16** from right to left in FIGS. 7 and 8. As will be seen later on the tension end **18** of rope **20** is received in the first groove **11** and extends substantially 300° around said groove until it is shunted to groove **12**. The rope is wrapped in groove **12** for substantially 300° until it is shunted to groove **12** and so on until the rope is fed off groove **16** to constitute the tail end or slack end **19** of the rope.

The shunting from groove **11** to groove **12** is performed by a transfer roller **21** (see FIGS. 1, 4 and 5). Similarly the transfer from groove **12** to groove **13** is performed by a transfer roller **22**. In like manner transfer rollers **23**, **24**, **25** shunt the remaining windings into the adjacent grooves until the tail end **19** of the rope is discharged from the drum and out of engagement with the last groove **16**.

The action of the above noted transfer rollers has been described with reference to rotation of the drum **10** in a counterclockwise direction as seen in FIGS. 1 and 2 so that the load carried by the housing **1** is raised along the length of the tension end **18** of the rope. An additional transfer roller **26** is provided which is inoperative when the hoist is going up, but becomes operative when the hoist is being lowered. In this latter case transfer roller **26** functions to shunt the rope from groove **16** into groove **15** and rollers **25**, **24**, **23** and **22** act to shunt the rope from groove to groove until the last groove **11** is reached and the rope is discharged as tension end **18**. When the hoist is thus operated to lower the load transfer roller **21** becomes inoperative.

Transfer roller **22** and the mounting thereof is shown in detail in FIG. 8 and the roller comprises a generally cylindrical body portion **30** which is provided at its opposite ends with sleeve bearings **31** for rotatably supporting the roller structure on a fixed shaft **32** extending between opposite side plates **6**,**7** of the hoist housing. As seen in FIGS. 4 and 5 shaft **32** is angularly disposed relative to the axis of the drum shaft.

For the purpose of shunting the rope, body portion 30 of the roller 22 is provided with an annular projection 35 of the cross sectional shape indicated and which projection is sufficiently large in diameter to extend well into the associated groove 12 of the drum thereby permitting a smooth shunting action of the rope.

Surrounding the body portion 30 of the roller 22 is a shell 37 preferably formed of a tough resilient plastic material such as polyurethane. As will be seen later on this shell 37 is contoured to provide annular grooves cooperating with the rope in a manner to be described. The opposite ends of the roller 22 are diametrically enlarged and formed to provide a pair of generally axially directed frustoconical surfaces 38,39 which are adapted to cooperate respectively with complementary formed enlarged ends 40,41 of drum 10.

The body portion 30 of roller 22 is preferably formed of steel and the opposite ends 38,39, engaging the ends 40,41 of steel drum 10, act to position the transfer roller in a predetermined position axially relative to the drum thereby properly positioning the wire windings. A slight axial shifting of roller 22 is permitted to conform to the inherent tendency of the rope windings to "walk" axially along the length of the drum due to the helical form of the windings. Depending upon the direction of rotation of the drum the roller 22 is urged against one or the other of the ends 40,41 of the drum providing a substantially positive positioning of the windings. By this structure it will be apparent that no thrust from the windings is transferred to the side plates 6,7 of the housing but is absorbed by the drum 10.

The remaining transfer rollers are identical in structure and mounting to the above described roller 22 except that, as seen in FIGS. 4, 5 and 6, the annular projection 35 is in a different position for each roller as indicated since said projections cooperate with different grooves of the drum 10.

At spaced points around the periphery of the drum 10 and interposed between each pair of adjacent transfer rollers are a plurality of tension rollers which are spring urged radially inwardly of the drum 10 in order to enhance the frictional engagement between the rope and the periphery of the drum. In addition to the tension rollers interposed between pairs of transfer rollers and numbered 43 to 47, additional similar tension rollers 48,49,50 are also provided, it being understood that the greater number of tension rollers the greater will be the traction developed between the rope and the drum periphery. The required pressure in the rope is thus reduced and reeving made easier.

In FIG. 7 tension roller 43 is shown in detail and it is seen that the same is provided with an inner cylindrical portion 53 to the opposite ends of which are secured sleeve bearings 54 rotatably supported on shaft 56. The opposite ends of shaft 56 are mounted in blocks 57,58 slidably supported for movement radially of the drum in grooves 59,60 formed in side plates 6,7 of the housing 1. The blocks 57,58 are urged radially inwardly of the drum 10 at all times by means of compression springs 62.

Mounted on the sleeve 53 of roller 43 is a shell 64 also preferably formed of polyurethane plastic and peripherally formed to cooperate with the rope windings in a manner to be described. The remaining tension rollers are similar to roller 43 in construction and mounting except that their peripheries are appropriately formed depending upon the location of the tension rollers relative to the rope windings. As in the case of the transfer rollers the tension rollers are similarly formed with frustoconical ends 66,67 adapted to cooperate with the complementarily formed end portions 40,41 of the drum 10. As can be seen in FIG. 7 the steel drum 10 is driving the polyurethane tension roller 43 by frictional engagement with the left hand end of the latter. As will be seen later on, upon reversal of the direction of rotation of the drum tension roller 43 is shifted to the right in FIG. 7 so that the roller is driven through engagement of the drum with its right hand end.

In FIGS. 2, 5 and 6B the engagement between rope and the transfer rollers is shown for the condition in which the drum 10 is rotating in a counterclockwise direction as seen in FIG. 1 and the rope is moving relative to the housing in a direction from right to left in FIGS. 5 and 6B. When the direction of rotation is reversed and the rope is driven relative to the housing from left to right as seen in FIG. 6A the opposite sides of transfer rollers 22, 23, 24 and 25 become active and transfer roller 26 functions to shunt the rope from groove 16 to groove 15 but in such an event transfer roller 21 becomes inoperative. This action can best be seen with reference to FIG. 5.

Also with reference to FIGS. 5, 6A and 6B it is seen that the shunted portions of the rope between adjacent transfer rollers change their positions depending upon the direction of rotation of the drum 10. This change of position of the juncture between adjacent windings and the actual shifting of the rope windings within their grooves is employed to shift the tension rollers axially of their supporting shafts so that the rollers are driven by different sides of the drum 10. In this manner the direction of movement of the rope engaging portions of the rollers relative to the adjacent rope windings is the same as the direction of movement of the drum periphery. For this reason power loss by friction between the rope and the rollers is considerably reduced. Furthermore from a consideration of FIG. 7 it will be seen that the linear speed of the rollers at their points of engagement with the rope is slightly greater than the speed of the rope itself so that the rollers actually tend to urge the rope forward in whatever direction the latter is traveling. This urging of the rope forwardly is resilient in nature since the drive between the drum and the rollers relies on friction. Excessive wear on the rollers by the rope is therefore avoided.

Because of the fact that the windings and the junctures between adjacent windings of the rope 20 shift depending upon the direction of rotation of the drum the peripheral grooves in the tension rollers are appropriately formed to permit continuous frictional engagement with the rope. For example in FIG. 7 the relatively wide groove 69 that receives the rope 20 is of sufficient width to permit the shifting of the associated rope juncture depending upon the rotation of the latter. The minimum diameter of groove 69 is also less than the minimum diameter of the remaining grooves since the rope 20 is displaced radially outwardly between adjacent grooves. This same method of forming the transfer rollers will be seen from the configuration of the shell 37 in FIG. 8.

One of the most important features of the present invention is the arrangement of transfer rollers and tension rollers as above described which results in the hoist being self-reeving. By this is meant that the rope **20** may be fed into the housing from the upper end of the latter as seen in FIG. **1** and the drum rotated in a hoisting direction. The rope **20** is thus automatically engaged by tension roller **49** and enters a short guide **71** positioned over groove **11** and is then successively guided by the tension rollers and transfer rollers until it reaches transfer roller **21** which shunts it into adjacent groove **12** where it is immediately gripped by tension roller **50** and passed through short guide **72** into the control of tension roller **49** and so on. After all of the windings have been formed the rope is then discharged out the tail end through a guide **73**. It will be apparent that this self-reeving feature is realized whether the rope is fed into the upper end or into the lower end of the housing. Since it is never necessary for the operator to open the housing it is impossible for him to make any mistake of judgment that would adversely affect the operation of the hoist and effective traction between the rope and the drum is established at all times making undue slipping impossible.

In the particular application of the hoist shown in FIGS. **1**,**3** wherein rope end **18** is always the loaded end and tail end **19** is always slack the wear between the rope and drum may be reduced and the traction enhanced by forming the grooves receiving the windings having the greatest tension to a larger diameter than the remaining windings. For example in a drum having a nominal diameter of 8 inches groove **11** may be, for example, 0.014 inch greater in diameter than groove **12** and the latter is 0.006 inch greater in diameter than groove **13**. Since the last three grooves **14–16** are under comparatively little tension they may be of equal diameter. This graduation in groove diameter appropriately adjusts for the fact that the stretch in the rope adjacent the loaded end **18** is greater than adjacent the slack end. Thus wear is reduced and traction improved because the length of each winding, having regard for the tension therein, closely conforms to the peripheral extent of its respective groove. It will be apparent that the above described graduation of groove diameters is not appropriate if either end of the rope may become loaded.

The performance of the hoist of FIGS. **1**,**3** may be enhanced by forming the frustoconical end portion **66** to a slightly smaller effective diameter than the opposite end **67**. Referring to FIG. **7** it is seen that, as the hoist is raising the load, the tension roller **43** is being driven by the left hand end **40** of the drum and the tail end of the rope is urged out of groove **16** by roller **43** which, acting at a greater radius on drum **10** has a greater peripheral speed than the drum. On the other hand when the drum rotation is reversed frustoconical end **67** acting at a smaller radius on shoulder **41** provides a slight drag with respect to the unloaded end. The result of this structure is that the windings are more effectively urged against the grooves and traction is improved.

The hoisting arrangement of FIGS. **1**,**3** is appropriate for use in raising and lowering scaffolding, however the invention is not restricted to such an arrangement. For example in FIG. **9** there is shown schematically a hoisting arrangement wherein the hoist housing **1'** is fixed to an elevated structure and the rope ends **18'**, **19'** are run over sheaves **80**,**81** and are connected to cages **82**,**83** respectively. In this arrangement the cages **82**,**83** may be simultaneously loaded and unloaded or one load may be employed as a counterweight to permit raising the other with twice the load for a given horsepower than if no counterweight were present.

The present invention lends itself to this last mentioned application because of the fact that the tension rollers and shunt rollers are provided at spaced points around the entire periphery of the drum so that adequate traction is provided at all times regardless of the direction of drum rotation and regardless of the tension differential in the rope ends. As stated above a drum having graduated groove diameters is not used in an arrangement such as shown in FIG. **9**.

Not only does the use of transfer rollers as distinguished from fixed guides reduce the wear and loss of power but it also prevents excessive wear and damage to the rope.

It has been found that better traction is achieved between the rope and drum of hoists of this character when a maximum number of relatively light radially inwardly directed forces are applied to the rope rather than a few relatively heavy forces. The arrangement of the tension rollers around the drum as above described achieves the desirable optimum traction. Furthermore damage to the wire by the imposition of relatively heavy forces is avoided.

Improved traction between the rope and the drum may also be achieved by forming a circumferentially extending recess **77** in the bottom of the rope grooves and inserting a tough plastic **78** such as polyurethane in the recesses so that a portion of the inner side of the rope is in engagement with said plastic. (See FIGS. **7**,**8**).

The provision of the plastic **78** results in a reduction of the effective area of engagement between the rope and the hard metal of the groove thus increasing the unit pressure. The plastic **78** also keeps foreign matter out of the bottom of the groove and improves the reeving action.

It will be understood that in order to achieve the above described self-reeving feature it is desirable that the end of the rope which is inserted into the hoist be as straight as possible so as to minimize any tendency of the rope to be deflected out of the control of the transfer rollers and tension rollers. This problem is of course aggravated if the peripheral spacing between the rolls is increased.

In FIG. **1** a tubular guide **85** is shown to direct the end of rope **18** to short guide **72** and tension roller **49**. An alternative arrangement is illustrated in FIG. **10** wherein the rope **18** is inserted into the housing **1** through a tubular guide **86** formed with an enlarged diameter section **87**. This section **87** connects at its lower end with a flared portion **88** which in turn connects with a continuation **89** of guide **86**.

The lower end of enlarged section **87** thus provides an annular shoulder **90** which engages and acts as an abutment stop for the end of the wire in the event the terminal portion of the wire deviates from a straight line beyond a predetermined limit. For example, the terminal portion schematically indicated by dot dash lines at **18'** is bent to a degree which would make proper selforeeving past the various rollers unlikely. The operator cannot insert said terminal portion **18'** through the enlarged section and is obliged to withdraw the wire and straighten the same to a sufficient degree of straightness that the end of the wire passes the shoulder **90**. In FIG. **10** a slightly bent wire indicated by dotted lines at **18''** has a sufficient degree of straightness to pass the annular shoulder **90** and therefore pass the various rollers to insure the self-reeving feature.

It will be apparent that the length of enlarged section **87** and the inside diameter of annular shoulder **90** may be varied to test the straightness of the wire so that any predetermined degree of straightness may be achieved.

In FIGS. **11**, **12** there is illustrated a modified form of the invention which may be employed to enhance the self-reeving action in the event the wire rope is not straight or the rope is frayed or otherwise damaged and includes loose strands of wire. In this connection it will be understood that the use of a damaged wire rope increases the likelihood that one or more loose strands may enter the small space between the outer periphery of one of the transfer rollers and its associated groove on the drum. If this in ; fact occurs the coaction between the transfer roller and the drum could pull the remainder of the rope into said small space thus causing additional damage to the wire rope. Naturally it is not good practice to employ wire rope that is not in good condition but in the interest of safety it is desirable to take all possible precautions against improper usage.

In FIGS. **11**, **12** that portion of the drum **10** that cooperates with transfer rollers **23**, **24**, **25** is shown together with tension rollers **45**, **46**. This embodiment of the invention includes a fixed guide **92** positioned on each side of each transfer roller. Each guide is carried by a shaft **93** which is fixedly secured at its opposite ends in side plates **6**, **7**. It will be seen in FIG. **11** that guides **92** may be made from relatively thin plate and are secured to their supporting shafts **93** at an angle so that they are coplanar with the central plane of the associated transfer roller.

Further with reference to FIG. **11** it is seen that the guides **92** associated with transfer roller **24** serve to constrain the rope between the adjacent tension roller and the transfer roller. For example, while the rope is being reeved on the drum and traveling from right to left as seen in FIG. **11** the rope end coming from the tension roller **46** strikes the guide **92** between said tension roller **46** and transfer roller **24** and is directed to the working side of the latter. In this manner the shunting of the rope into the influence of tension roller **45** is made more smoothly. More importantly, if the rope is frayed and includes loose strands there is very little liklihood that such loose strands will enter the small space between the periphery of transfer roller **24** and its associated groove **14** since such loose strands are directed away from said space by guide **92**.

As noted above, if the direction of the drum is reversed and the rope deflected by transfer roller **24** approaches from the left, then the fixed guide **92** on the left side of roller **24** deflects the rope to the working side of roller **24**. This action of the rope is indicated by dotted lines in FIG. **11**. Thus by providing a fixed guide on each side of each transfer roller the hoist is guarded against failure by the use of damaged wire regardless of the direction of rotation of the drum.

The inner edge of each guide **92** may be positioned closely adjacent the periphery of the drum and, as shown in FIG. **12**, the extent of each guide may be increased toward the drum to provide substantially complete restraint of the wire at all times.

It will be understood that some variation in the particular location of the shunting rollers may be made over that shown in FIG. **1**. It will be understood that it is preferable to permit the first winding from tension end **18** to substantially encircle the drum before said first winding is shunted from groove **11** to groove **12** (FIG. **7**). In this manner traction is improved since an optimum length of contact between the tensioned end of the rope and the drum results. Similarly the second winding should be as long as possible before it is shunted into the third groove and so one. For this reason shunt roller **21** could be moved closer to the tensioned end **18** of the rope and, in fact, could be interchanged with tension roller **50**. In a similar manner shunt roller **26** could be interchanged with tension roller **48**. The arrangement thus resulting would be similar to that shown in pending application Ser. No. 69,710 filed Sept. 4, 1970.

However it will be apparent that the first winding, as disclosed herein, and subsequent windings engage the drum along substantially the entire periphery of the latter before being shunted to the next groove.

I claim:

1. A hoisting device comprising:

a housing,

a drum rotatably mounted in said housing,

said drum being formed with a plurality of axially spaced parallel grooves in planes perpendicular to the axis of said drum,

a rope formed intermediate its ends to provide a plurality of windings respectively received in said grooves and junctures connecting adjacent windings,

means for deflecting said rope from one winding to an adjacent winding during rotation of said drum with the deflected portions of said rope forming said junctures in engagement with the periphery of said drum,

said deflecting means comprising a roller free for axial movement and rotatably supported in said housing and in engagement with a winding of said rope at one side of the latter,

said drum being formed at one of its opposite ends with an annular coaxial abutment and said roller being formed with an annular abutment adapted to engage said drum at said drum abutment to limit movement of said roller axially relative to said drum.

2. A device according to claim **1** wherein said drum is formed with a coaxial abutment at each end and said roller is rotatably supported on a shaft carried by said housing and is adapted to shift axially on said shaft into engagement with one or the other of the abutments on said drum.

3. A device according to claim **1** wherein said roller is provided with a peripherally extending groove in registration with an adjacent undeflected winding therein.

4. A hoisting device comprising:

a housing,

a drum rotatably mounted in said housing,

said drum being formed with a plurality of axially spaced parallel grooves in planes perpendicular to the axis of said drum,

a rope formed intermediate its ends to provide a plurality of windings respectively received in said grooves and junctures connecting adjacent windings,

means for deflecting said rope from one winding to an adjacent winding during rotation of said drum with the deflected portions of said rope forming said junctures in engagement with the periphery of said drum,

a tension roller free for axial movement and supported for rotation relative to said housing,

means urging said roller radially inwardly of said drum,

said roller being provided with a plurality of peripherally extending grooves adapted to receive said rope windings therein for reducing the pressure on said rope,

said drum being formed at one of its opposite ends with an annular coaxial abutment and said tension roller being formed with an annular abutment adapted to engage said drum abutment to limit movement of said roller axially relative to said drum.

5. A device according to claim 4 wherein said tension roller is supported for axial movement to permit shifting of said roller by said rope windings.

6. A device according to claim 4 wherein said drum is formed at each of its opposite ends with an axially inwardly directed coaxial shoulder and said roller is supported for slidable axial movement into engagement with one or the other of said shoulders.

7. A hoisting device incorporating automatic reeving wherein a wire rope is reeved around a drum in a plurality of windings and means is provided for leading the free end of such rope circumferentially around said drum to so form said windings without manual intervention, said device comprising:

a housing,

a drum rotatably mounted on said housing,

a rope formed intermediate its ends to provide a plurality of parallel windings in planes at right angles to the axis of said drum,

means for holding said windings against axial shifting relative to said drum,

shunt rollers for deflecting said rope from one winding to an adjacent winding during rotation of said drum with the deflected portions of said rope in engagement with the periphery of said drum,

a plurality of tension rollers arranged in a circular row around the entire periphery of said drum, and

means for urging said tension rollers radially inwardly of said drum and against said windings to increase the traction of the latter relative to said drum,

adjacent of said shunt and tension rollers being spaced sufficiently close together that the end of a semi-rigid rope being reeved around the drum and extending tangentially from said drum under one roller is deflected radially inwardly toward the drum by an adjacent roller to allow such automatic reeving.

8. A device according to claim 7 wherein a shunt roller is interposed between at least one pair of adjacent tension rollers.

9. A hoisting device comprising:

a housing,

a drum rotatably mounted in said housing,

said drum being formed with a plurality of axially spaced parallel grooves in planes perpendicular to the axis of said drum,

a rope forward intermediate its ends to provide a plurality of windings respectively received in said grooves and junctures connected adjacent windings,

means for deflecting said rope from one winding to an adjacent winding during rotation of said drum with the deflected portions of said rope forming said junctures in engagement with the periphery of said drum,

said rope having a loaded end and a slack end whereby the tension in said rope decreases along the lengths of said windings toward said slack end,

said groove being formed to a larger diameter at said loaded end than at said slack end to reduce the relative movement between rope and drum and to improve traction and decrease wear,

the difference in diameter between the loaded and slack ends of the drum being in the order of the difference in lengths of the windings at said ends due to elongation of the rope at said loaded end.

10. A hoisting device comprising:

a housing,

a drum rotatably mounted in said housing,

said drum being formed with a plurality of axially spaced parallel grooves in planes perpendicular to the axis of said drum,

a rope formed intermediate its ends to provide a plurality of windings respectively received in said grooves and junctures connecting adjacent windings,

shunt rollers for deflecting said rope from one winding to an adjacent winding during rotation of said drum with the deflected portions of said rope forming said junctures in engagement with the periphery of said drum,

each of said rollers being rotatably supported in said housing and each being positioned with its axis of rotation substantially parallel to the periphery of said drum and spaced apart peripherally of said drum from an adjacent roller.

11. A device according to claim 10 wherein said rollers are spaced apart around the entire periphery of said drum.

12. A device according to claim 10 wherein each of said rollers is provided with only one shunting element thereon.

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