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CABLE ATTACHING MEANS

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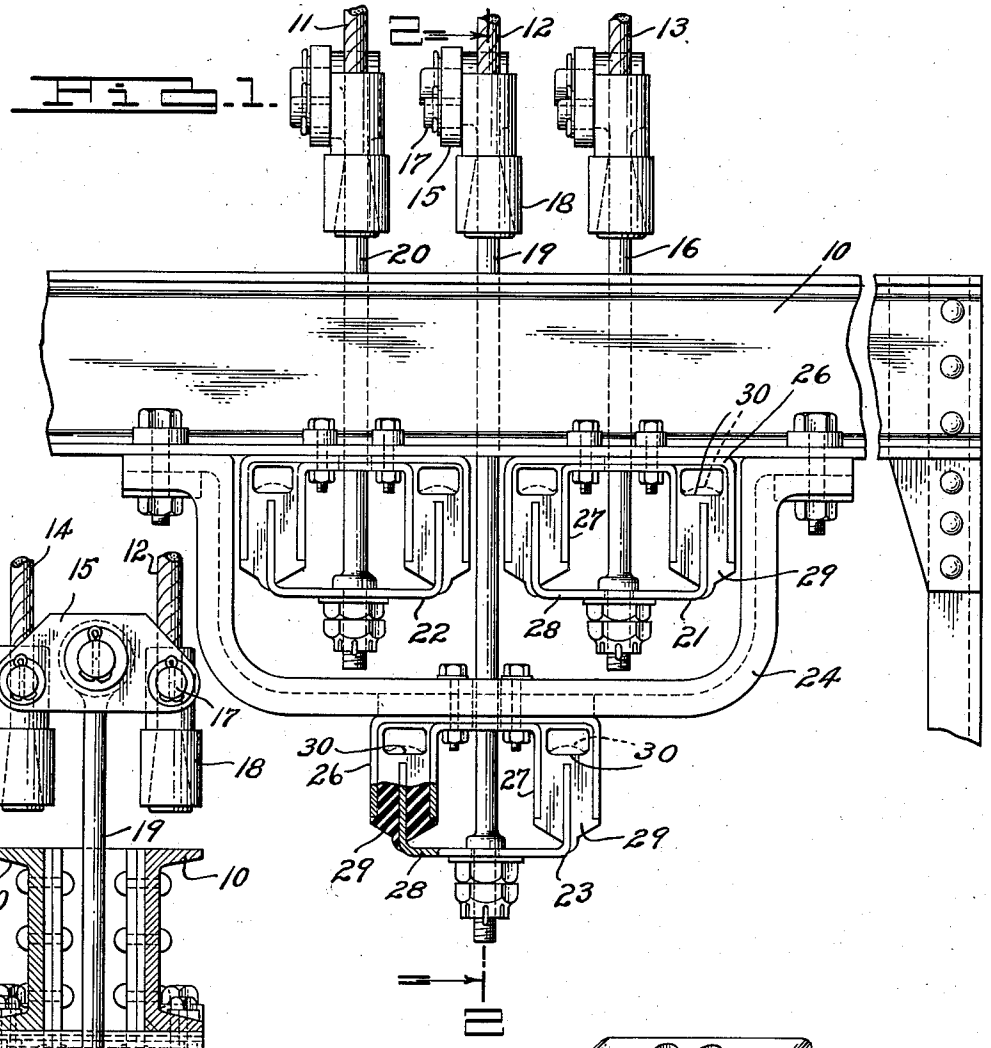


Fig. 1.

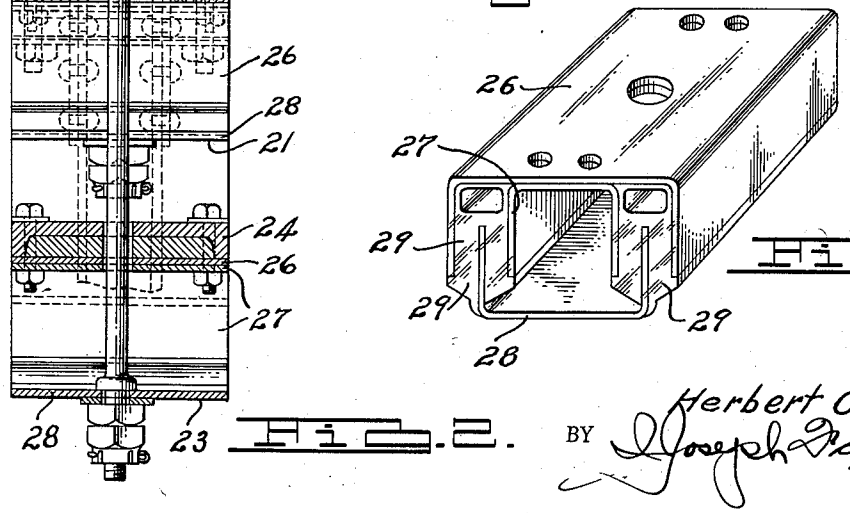


Fig. 2.

Fig. 3.

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CABLE ATTACHING MEANS

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7 Claims. (Cl. 187—1)

This invention relates to cable attachments whereby a plurality of cables may be attached to a suspended unit such as an elevator car in a manner which will provide for equalization of tension between a plurality of cables and will also afford adequate absorption of shocks between such cables and the car.

In elevator installations each elevator car is generally connected to a counterweight by means of a plurality of cables arranged to ride over a suitable grooved drum located at the top of the elevator shaft, which drum is rotated by the driving motor. In such installations it is essential that the weight of the car and the counterweight be at all times equally distributed betwen a plurality of cables which must necessarily be used to safely support the car and still maintain a size of cable suitable for operation in such an installation. When a plurality of cables are used to suspend an object having the weight of an elevator car it is somewhat of a problem to keep the tension on each of the cables at an equal amount mainly because of the difference in the length of the cables at different times due to unequal stretch of the cables originally cut the same length, and further because of slight variations in the diameter of the cables or the depth of the grooves of the drum in which they travel. Therefore, if no special means is provided to equalize the load on several cables, the tendency will be to possibly throw the entire load at some periods in the operation on one or two of the cables, thus causing them to wear out and require replacement at an earlier date than would be otherwise required. It is therefore of extreme importance that some means be provided for properly equalizing the load between the cables.

Further than the actual requirement of equal load distribution between the plurality of cables used, it is important that the vibration from the cable and the driving unit be absorbed so that it will not be transmitted to the interior of the car itself, or so that any vibration caused by sudden stopping or starting of the car will not only not be transmitted from the car through the cables and therefore into the building adjacent the elevator shaft, but also objectionable jarring or jolting of the occupants of the car will be avoided. A considerable number of equalizing and shock absorbing devices have been perfected and installed on elevators. A common type makes use of floating pulleys severally connected to the ends of each individual cable, or pairs of cables, and a single equalizing cable trained through all of these pulleys and through corresponding pulleys attached to the car, thereby connecting the plurality of cables to the car by means of a single cable unit which is supposed to equalize itself by automatic adjustment of the aforementioned floating pulleys.

Another method of equalizing cables provides a system of levers with suitable fulcrum points connecting the several cables to the car by means of an equalizing hitch. Other types of equalizers employ springs in combination with types above mentioned for the purpose of absorbing shock.

The aforementioned types of equalizing devices require a considerable number of additional parts which add materially to the cost of the installation, and furthermore, each additional moving part in these types of devices introduces another possible noise making element which adds rather than detracts from the noise produced by the elevator and cables. Moreover, due to the amount of movement not only permitted but required in the prior devices for obtaining the desired equalization effects, they frequently fail to perform their intended function properly because of the time lag involved in taking up lost motion.

It is a primary object of the present invention to provide attaching means for securing a plurality of cables to a unit to be suspended therefrom in such manner that the load on the cables is equalized while at the same time providing a shock absorbing connection between the cables and the suspended unit.

It is a further object to provide attaching means for a plurality of cables which will, with a minimum amount of relative movement, cushion the impact of starting and stopping the elevator and damp out vibrations which would otherwise be transmitted to the cables and to the building in which the elevator is operated.

It is another object to provide attaching means for a plurality of cables which will equalize the loads on a plurality of cables and at the same time reduce the shocks which these cables are called upon to withstand, thereby to increase the length of time such cables may be used.

It is a further object to provide a cushioning means in combination with a cable equalizing unit whereby the unit suspended from the cables is provided with means to prevent objectionable shocks and jarring.

It is another object to provide a rubber mounting for securing cables of a multiple cable unit to a car, or other load, whereby the unit is suspended by said rubber mounting in such manner as to provide an adequate secondary support for use in case of failure of the rubber mounting.

It is a further object to make use of standard rubber mountings available in quantity for securing cables to a unit to be suspended therefrom for the purpose of both equalizing the tension on the several cables and for use as a shock absorber between the cables and the unit suspended.

Although the interposition of a rubber mounting between an elevator cable and the car to absorb shocks is not broadly new, such proposals for the use of a rubber mounting as have heretofore been made, relied upon using the rubber in compression, which has not proven highly successful. In accordance with the present invention it is a principal object to interpose the rubber mounting between the cables and car in such a manner that the rubber is initially distorted in a direction such as to place it under shear and not under compression and so that jarring shocks are absorbed by movement of the rubber through the range where the load deflection curve is substantially a straight line, thus employing to the fullest practical extent the more highly resilient properties of rubber in shear than in compression.

The above and other objects of the invention will appear more fully from the following more detailed description of an illustrative embodiment of the invention found practical for actual use, and by reference to the accompanying drawing forming a part hereof and wherein:

Fig. 1 shows a side view of connections for securing a plurality of cables to an elevator car.

Fig. 2 is a section taken on line 2—2 of Fig. 1 showing further details of the connections.

Fig. 3 is a perspective view of one of the rubber mounting units used for connection of the cables.

Referring to the drawing, Fig. 1 shows a top cross-member 10 of an elevator car to which it is desired to secure a plurality of cables, three of which, 11, 12 and 13, are shown in Fig. 1. As shown in Fig. 2 at 12 and 14, cables are preferably arranged in pairs and connected to a yoke 15 pivoted at its center to the end of a rod 19, the yoke being provided with pin connections 17 for securing suitable cable terminals 18 of the cables 12 and 14.

Again referring to Fig. 1, each pair of cables connected by the yoke, as above described, is secured to a rod similar to 19, the remaining four cables of the six cable unit being suspended in pairs upon rods 16 and 20 shown in Fig. 1. The rods 16, 19 and 20 extend through the member 10 and are each secured to a rubber mounting unit shown in Fig. 1 at 21, 22 and 23. Each of the units 21 and 22 is of sufficient length to bolt onto the under side of the member 10, while the unit 23, because of insufficient space on member 10, is bolted to an offset bracket 24. The rods 16, 19 and 20 each extend through the mounting units 21, 22 and 23 and secure to a channel member as shown which forms a part of the rubber mounting later to be described in detail.

Referring to Fig. 1 it is noted that the three pairs of structural members here shown are in staggered relationship with each other, two of the units being placed directly on the cross-beam member 10 and a third positioned lower than the other two on the bracket 24. This construction enables the rubber mounting units to overlap each other and provides a means for bringing the three pairs of cables closer together than would be possible without the use of a staggered position for the units. It might be noted also that the staggered positioning enables a unit of sufficient size to employ the quantity of rubber necessary to give a sufficient deflection and effective shock absorption and still maintain the practical positioning of the cables for installation on existing elevator units.

Each of the rubber mountings is made up in a standard unit as shown in Fig. 3. It is composed of a base member 26 of a channel shape inside of which is secured a second smaller channel member 27, leaving a space between the downwardly projecting sides of the channels 26 and 27 as shown in Fig. 3. An oppositely disposed and separate channel 28 is provided of such width as to have its upstanding sides positioned centrally in the space between the channels 26 and 27. By a method now extensively used, rubber is secured in the space between the channels 26 and 27 and the sides of the channel 28 by bonding or adhering it to the steel plates of the channel so that the channel 28 and the oppositely disposed channels 26 and 27 are held in spaced relation by the rubber 29 securely bonded to the steel parts of the channels.

The rubber mounting per se is preferably of a type now quite generally used for other industrial applications and is made up by adhering the surfaces of a block of rubber between two steel plates which are positioned to move substantially parallel to each other for a limited distance when under load. The mounting is termed a shear mounting but because of the fact that the thickness of the rubber block is a material amount the rubber is actually subjected to a substantial component of tension. Furthermore, the deflection properties of the rubber mounting under load is more nearly comparable to the properties of rubber in tension than in compression.

Upon reference to Fig. 3 it is noted that the lower channel member 28 which has its upwardly extending legs imbedded in the rubber 29 are so positioned as to provide a quantity of rubber above the top edge of each of the legs. On considering the construction of the units shown in Fig. 1 it is apparent that if at any time the load should be so great as to compress the rubber until the opening shown at 30 in Fig. 1 was entirely closed, there would be some rubber in compression between the two top edges of the member 28 and the top structural member 26. It can therefore be said that there will never be a metal to metal contact between the two members even though the load be extremely great. It is also noted that the rubber will be stressed in shear for the greater portion of the travel allowed, but if extreme load is placed on a unit a quantity of rubber in compression will go into action.

It is also noted upon reference to the drawing, particularly Figs. 1 and 2, that the members 16, 19 and 20 are secured to the lower structural member 28 of the units 21, 23 and 22 in such manner that both upward and downward movement of the cable extension members, i. e. rods 16, 19 and 20, is resisted by rubber in shear.

One advantage of this type of mounting in this particular application is that the deflection of the rubber is substantially proportional to the load and does not increase its resistance materially or at as great a rate as would be the case with many types of spring mountings. The shear mounting also provides greater resilience than would be the case with rubber in compression.

In operation of the unit as set up the pairs of cables are equalized by the yoke 15 and the

equalization between the three units then remaining is accomplished by the rubber mountings 21, 22 and 23, the deflection of the rubber allowing vertical movement of the rods 16, 19 and 20 sufficient to bring any variation in length of the cables to such a position as to equalize the load between the three units. Not only does the unit accomplish equalization of the load between the cables, but it provides a highly resilient mounting for the cable and car with its resulting improvement in riding quality and in reducing noise.

As shown at 30 in Fig. 1 there is provided an opening at the top of each rubber block and under the initial load of the elevator each block of rubber will be deflected upwardly as shown by the dotted lines in Fig. 1. The rubber mountings 21, 22, 23 are so designed with consideration of the load to be carried that there remains a material deflection range of the rubber beyond that effected by the initial load for purposes of both equalization of the cables and for damping of vibrations which may be set up by the operation of the car and cable unit.

It is noted that the adaptation of the mounting for use as a cable equalizer requires that attaching members such as rods 16, 19 and 20 extend thru the top channels 26, 27 and be secured to the lower channel 28. By this construction when the mountings are secured to an elevator car as shown in Fig. 1 the advantages of the rubber mounting in suspension are made available while retaining the safety feature of positive metallic support in case of possible failure of the rubber mounting. This result is obvious on inspection of Figs. 1 and 3 since channel 28 is in effect interlocked with channels 26, 27. It is to be understood that failure of the rubber mountings is not a probable result but because of possible deterioration thru long use or because of excessive load it would not be practical to suspend an elevator in such manner as to obtain full use of the properties of rubber in shear without some secondary support such as this invention makes possible.

Although I have described my invention as applied to a particular unit, it is apparent that considerable variation in design might be used without departing from the fundamental principles thereof and I therefore do not desire to limit myself to the specific details of construction but rather to the scope of the following claims:

I claim:

1. In a cable attaching device for a load to be lifted, a structural member secured to said load to be lifted having downwardly extending projections, a cable extension member projecting through said structural member, a second structural member secured to said cable extension member and positioned under said first mentioned structural member and having upwardly extending projections so spacedly positioned as to provide an interlock with the downwardly extending projections on said first mentioned structural member, and rubber blocks bonded to the surfaces of said spaced projections thereby affording a rubber mounting between said structural members subjected to shear for normally supporting said load to be lifted while said interlock provided by said spacedly positioned projections assures adequate secondary support of said load in case of failure of support from said rubber mounting.

2. In a cable attaching device for a load to be lifted, a plurality of cables for supporting said load, a plurality of cable extension members, means for attaching said cable extension members to said load comprising structural channel members secured to said load having downwardly extending projections, other structural members having upwardly extending projections spaced from the downwardly extending projections, one of said structural members secured to each of said cable extensions and positioned under each of said first mentioned structural members in such position as to provide an interlock between said upwardly and downwardly extending projections, and rubber blocks bonded to the surfaces of said spaced projections whereby rubber mounting is provided between said structural members subjected to shear thereby to equalize the load on said cables and to absorb shocks between said cables and said load while affording adequate secondary support for said load by said interlock of said upwardly and downwardly extending projections in case of failure of support from said rubber blocks.

3. In a device for attaching a plurality of cables to a load to be lifted, a plurality of attaching units each comprising a pair of oppositely disposed channel members of unequal width one secured to the load to be lifted and the other secured to one or more of said cables in such relative position that a lifting force on said cables causes said pairs of oppositely disposed channels to approach each other in interlocked relationship, and rubber blocks bonded to said oppositely disposed channels whereby normal relative movement between said channel members is resiliently resisted by a shear load on said rubber blocks and the load equalized between the plurality of cables while said interlocked channel members provide adequate secondary support in case of failure of support from said rubber blocks.

4. In a cable attaching device for connecting a plurality of hoisting cables to a load to be lifted, a plurality of structural members secured to the load to be lifted, extensions from said cables projecting downwardly through each of said structural members, other structural members of such size and shape as to interlock with said first-mentioned members, one secured to each of said extensions and positioned below each of said first mentioned structural members forming pairs of interlocked members, and rubber mounted in such position as to be subjected to shear secured between each of said pairs of structural members thereby to equalize the load between said cables and to absorb normal shock between said cables and said load while affording adequate secondary support by said interlocked pairs of members in case of failure of support from said rubber.

5. In a cable attaching device for a load to be lifted, a plurality of cables for supporting said load, a plurality of cable extension members, means for attaching said cable extension members to said load while maintaining relatively close positioning of said cables comprising a plurality of structural members secured to said load positioned in staggered overlapping position through each of which structural members one of said cable extensions projects, other structural members, one secured to each of said cable extensions and positioned under each of said first mentioned structural members and in interlocked relation therewith, and resilient non-metallic noise insulating material mounted between said structural members in such position as to be stressed in shear under normal load thereby to equalize the load on said cables and to absorb shocks and noise

between said cables and said load while said structural members in interlocked relation assure adequate secondary support in case of failure of support from said resilient material.

6. In a cable attaching device for a load to be lifted, a structural member secured to said load to be lifted, a cable extension member projecting through said structural member, a second structural member secured to said cable extension member positioned under said first mentioned structural member, resilient non-metallic noise insulating material mounted between said structural members in such position as to be stressed in shear over the major portion of the range of relative movement of said structural members toward each other when said load is lifted by said cable, and a secondary portion of said resilient material positioned to be stresed in compression over a short range toward the end of the range of relative movement of said structural members toward each other.

7. A cable attaching device for a load to be lifted characterized by resilient material mounted in shear between a pair of structural members of such relative size and shape as to interlock with each other, one of the members of said pair being secured to the load to be lifted and the other member of said pair being positioned under said first mentioned member in spaced interlocked relation, and means for positively securing said cable to said second mentioned member such that both the upward and downward movement of said cable relative to said load is resisted by said resilient material subjected to shear while said interlocked structural members provide secondary support in case of failure of support from said resilient material.

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