July 16, 1968 C. A. KLESS 3,392,420

SUSPENSION ASSEMBLY

Filed Sept. 2, 1965 2 Sheets-Sheet 1

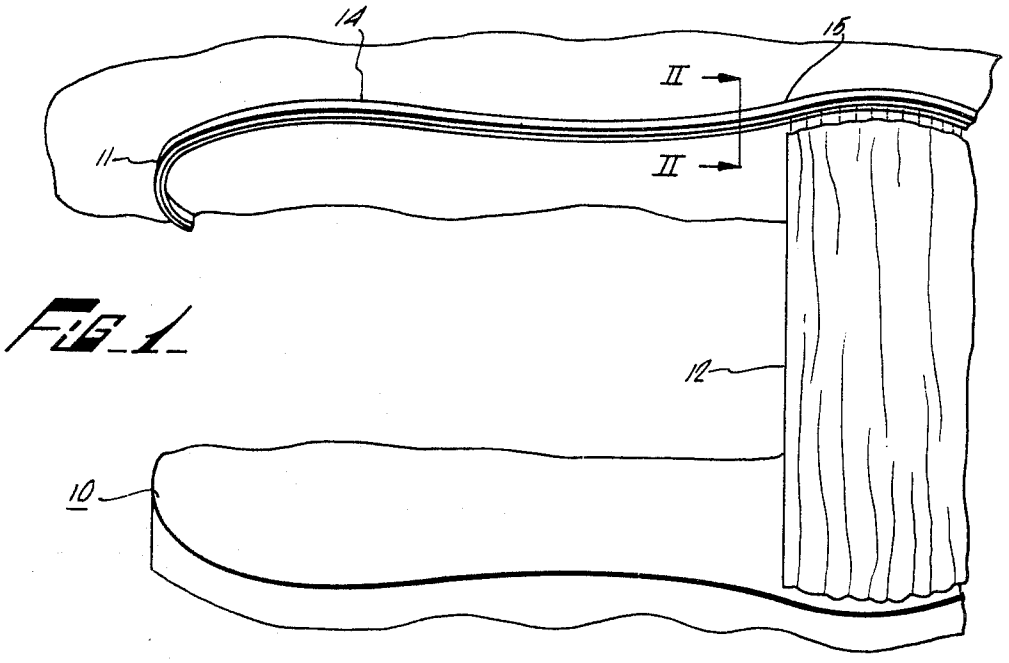


FIG. 1

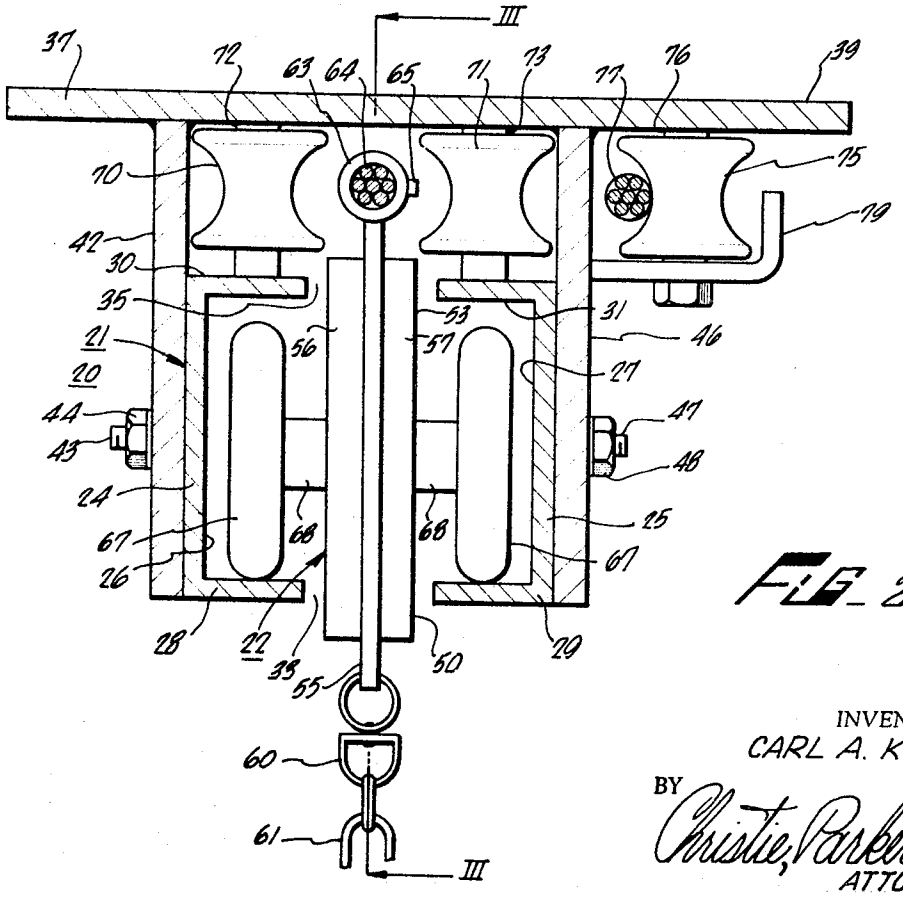


FIG. 2

INVENTOR.
CARL A. KLESS

BY Christie, Parker & Hale
ATTORNEYS.

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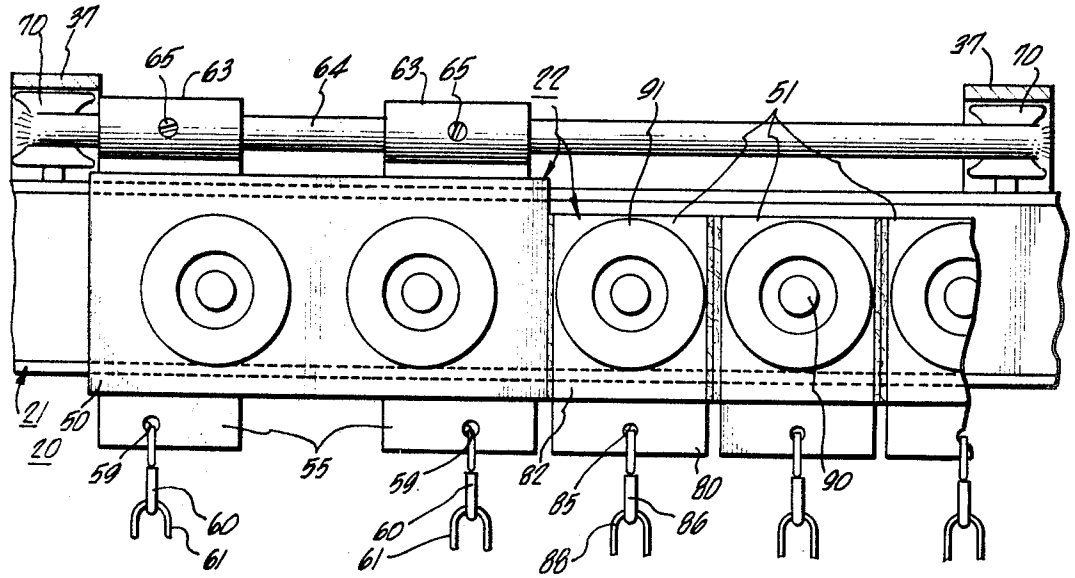


FIG. 3

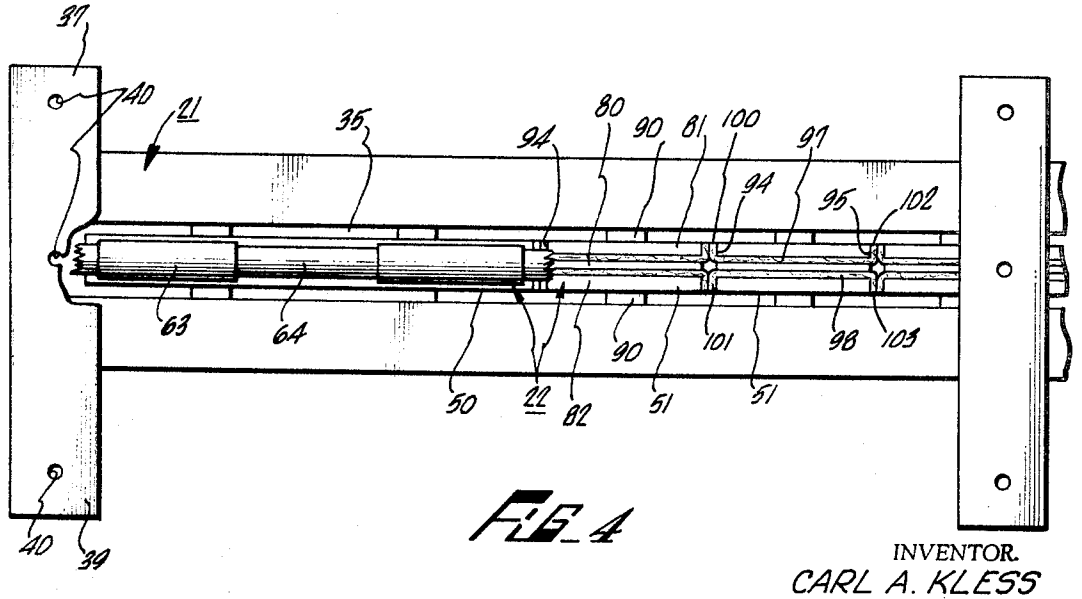


FIG. 4

INVENTOR.
CARL A. KLESS
BY Christie, Parker & Hale
ATTORNEYS.

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SUSPENSION ASSEMBLY

Carl A. Kless, Whittier, Calif., assignor to Curran Productions, Hollywood, Calif., a corporation of California

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ABSTRACT OF THE DISCLOSURE

A curtain suspension assembly having a pair of elongated, laterally spaced rails, and a plurality of curtain carriers supported by and movable along the rails. A master carrier extends upwardly between the rails to be secured to a curtain draw cable, and all the carriers extend downwardly between the rails to be coupled to a curtain. Plastic plates on the sides of the carriers prevent metal-to-metal contact between the carriers and the rails, and a cushioning material on the ends of the carriers provides efficient guidance and quiet operation.

Background of the invention

The subject invention relates to structure for suspending and moving objects and, more particularly, to an assembly for suspending and moving curtains.

The invention will be specifically described in connection with theatre curtains, although it is not necessarily so limited.

In recent years, there has been an increase in the demand for curtain suspension and handling equipment that could move heavy curtains along curved tracks. Existing systems that were designed to satisfy this demand are rather complicated and, as a rule, have to be pre-formed at the factory to define the desired curves.

The present invention provides a curtain suspension and moving assembly that is relatively simple in structure, provides for a very reliable operation, and permits the desired curves in the track to be formed on location.

A preferred embodiment of the invention comprises a track structure and a plurality of curtain carriers movable along the track structure. The track structure includes a pair of rails mounted in spaced parallel relationship and jointly defining a pair of substantially vertical bight portions, a first pair of legs extending toward each other from the lower edges of the bight portions and defining a first elongated slit therebetween, and a second pair of legs extending toward each other from the upper edges of the bight portions and defining a second elongated slit therebetween. The plurality of curtain carriers includes a master carrier having a carrier body that extends substantially vertically between the pair of rails of the track structure. This carrier body extends further through the above-mentioned first elongated slit to a first region below the above-mentioned first pair of legs. The carrier body has curtain suspension means attached thereto in this first region. The carrier body moreover extends through the second elongated slit to a second region above the above-mentioned second pair of legs. The carrier body has draw cable attachment means connected thereto in this second region. The master carrier further includes at least one wheel rotatably connected to the carrier body and located between one leg of the above-mentioned first pair of legs and a corresponding one leg of the above-mentioned second pair of legs. The master carrier in this preferred embodiment moreover includes at least one wheel rotatably connected to the carrier body and located between the other leg of the above-mentioned first pair of legs and the other leg of the above-mentioned second pair of legs.

The track structure employed in this embodiment is characterized by great simplicity, since each of the two

rails has a simple, substantially U-shaped profile. The spacial arrangement of the rails according to this embodiment is also very advantageous, since it provides a combination of various features presently to be described.

First, the two rails act as guards in that they enclose and protect the wheels of the carriages. At the same time, the rails provide a pair of legs on which the carriage wheels can travel. In addition, the rails provide a further pair of legs which extend above the carriage wheels and which prevent these wheels from jumping track.

Moreover, the two rails provide not only a first slit through which the carriage body may extend, but also a second, upper slit through which parts of the master carrier may extend for the attachment of means for connecting the curtain draw cable. The curtain draw cable thus extends above the two rails and acts on the carrier in a plane located midway between opposite rollers. This promotes the ease of operation and the guiding of the master carrier and the draw cable around curves, as will become more readily apparent as this description proceeds.

The invention also provides a curtain suspension assembly which comprises a curved track structure including a pair of spaced rails, and a plurality of movable curtain carriers. Each carrier includes wheels disposed for movement along the rails in one direction of travel and also in an opposite direction of travel. Each carrier further includes a carrier body for mounting the wheels and suspending a curtain portion. Each carrier body defines a first substantially vertical edge portion facing in the above-mentioned one direction of travel, and a second substantially vertical edge portion facing in the opposite direction of travel. Each carrier body further includes a sheet of a pliable material, such as felt, extending from the above mentioned first vertical edge to the second vertical edge of the carrier body and defining a first cushion at the first vertical edge and a second cushion at the second vertical edge.

During the operation of the assembly, the carriers, which are lined up along the track, move into contact with one another. Each first cushion of a carrier as defined above then abuts the second cushion of the next adjacent carrier. These cushions dampen the impact of adjacent carriers and reduce undesirable noise.

In some instances it may be found that a sufficiently quiet operation is obtained although cushions are not provided on each and every carrier body. For example, the above mentioned first and second cushions may, if desired, be provided only on alternate carrier bodies. In this case, each cushion on a carrier body will abut an exposed edge of the next adjacent carrier body.

On the other hand, a carrier body is able to exert a certain guiding action on an adjacent carrier body if these bodies are both provided with abutting cushions. This guiding action is due to the friction between abutting cushions of pliable material, which becomes particularly pronounced if felt or a similar fibrous material is used.

The invention and further features thereof will become readily apparent from the following detailed description of a preferred embodiment thereof, illustrated by way of example in the accompanying drawings, in which:

FIG. 1 is a schematic perspective view of sections of a stage which employs a curved curtain track;

FIG. 2 is a section of a curtain track assembly according to the invention, as seen along line II—II in FIG. 1;

FIG. 3 is a section along the line III—III in FIG. 2; and

FIG. 4 is a top view of the structure shown in FIGS. 2 and 3.

The stage **10** shown in FIG. 1 is of a curved configuration. The track **11** conforms to such configuration so as to move the curtain **12** accordingly. Of course, the curtain

can also be moved along curved paths if the stage is for example rectangular. It will be noted that the track **11** in FIG. 1 describes double bends, such as at **14** and **15**. These double bends render the proper movement of the curtain and the guidance of the carriers and cables particularly difficult.

FIGS. 2, 3 and 4 show a curtain suspension and moving assembly **20** which can handle this problem. The assembly **20** comprises a track structure **21** and a plurality of curtain carriers **22** movable along the track structure.

The track structure includes a pair of rails **24** and **25** mounted in spaced parallel relationship. The rails jointly define a pair of substantially vertical bight portions **26** and **27**, a first pair of legs **28** and **29**, and a second pair of legs **30** and **31**.

The legs **28** and **29** extend toward each other from the lower edges of the bight portions **26** and **27** and define a first elongated slit **33** therebetween. The legs **30** and **31** extend toward each other from the upper edges of the two bight portions and define a second elongated slit **35** therebetween.

The rails **24** and **25** are mounted in the position shown by a plurality of brackets **37**. Each of these brackets has a base **39** with holes **40** for the mounting of the base **39** to a ceiling by means of bolts or similar fastening devices. A first mounting leg **42** is welded to and extends downwardly from the base **39**. Rail **24** is mounted on the leg **42** by means of a counter sunk screw **43** and a nut **44**. A second mounting leg **46** is welded to and extends downwardly from the base **39** to mount the rail **25** by means of a counter sunk screw **47** and a nut **48**.

The carriers **22** include a master carrier **50** and a plurality of single carriers **51**. The master carrier has a substantially flat, plate-like carrier body **53** which extends vertically between the two rails **24** and **25**. The carrier body **53** extends through the slit **33** to a region below the track structure **21**. The carrier body **53** also extends through the upper slit **35** to a region above the two track rails.

In the illustrated embodiment, the carrier body **53** is composed of two metal plates or straps **55** sandwiched between a pair of non-metallic plates **56** and **57** (see FIGS. 2 and 3). The plates **56** and **57**, which may be of a tough plastic or another wear-resistant but noise-dampening material, effectively cover the sides of the central metal straps **55** so as to prevent their contact with the rails **24** and **25**. This provides for a more quiet operation and prevents damage to the outer edges of the rail legs **28**, **29**, **30** and **31**. The carriage body **53** can thus engage these rail edges for proper guidance around bends without damage to the carrier or the rails and without undesirable excessive noise.

Each of the straps **55** has an aperture **59** near its lower edge (see FIG. 3). Swivel members **60** engage the plates **55** at these apertures and carry chains **61** on which the curtain is suspended.

Tubular members **63** are welded to the metal straps **55** along the upper edges thereof above the slit **35**. These tubular members are capable of receiving a curtain draw cable **64**. Screws **65** in the tubular members **63** hold the cable in such member so that the master carrier **50** will be moved back and forth along the track **21** if the draw cable **64** is moved accordingly. If desired, one of the tubular members **63** may receive one end (not shown) of the cable **64**, while the other tubular member **63** may receive the other cable end (not shown).

The master carrier **50** further includes wheels **67** rotatably mounted by the arbors **68** that are attached to the carrier body **53**. In the illustrated embodiment, the arbors connect the plates **56** and **57** to the straps **55** and there are two wheels on either side of the master carrier body. If desired there may be only one wheel on each side, or two wheels on one side and one wheel on the other side. The number of wheels on each side may also be greater than two.

The legs **28** and **29** of the rails **24** and **25** provide a pair of tracks for the carrier wheels. The upper rail legs **30** and **31** act as guards and guiding aids in that they prevent the wheels **67** from jumping track. To this end, the bight portions **26** and **27** of the two rails may be dimensioned such that the clearance between wheels **67** and leg portion **30** or **31** is preferably from $\frac{3}{16}$ inch down to about $\frac{1}{16}$ inch. For ease of operation, the wheels **67** may be mounted on roller bearings (not shown), and may be provided with rubber tires or rims.

A first plurality of rollers **70**, one of which is apparent from FIG. 2 and two of which are shown in FIG. 3, and a corresponding second plurality of rollers **71**, are provided for guiding the draw cable **64**. The rollers **70** of the first plurality are spaced along and mounted above the rail **24**, and the rollers **71** of the second plurality are spaced along and mounted above the rail **25**. In the illustrated embodiment, the bracket bases **39** mount the rollers **70** and **71** by means of arbors **72** and **73** so that the roller axes extend vertically. Each bracket base **39** thus mounts one of the rollers **70** and one of the rollers **71**. The draw cable **64** is thus guided and protected against fouling on either side. Near and at bent portions of the track, the brackets **37** are installed closer together so as to increase their guiding and protective action. The basic simplicity of these brackets and of the rails **24** and **25** lends itself to the provision of the desired track bends on location. If desired, the rollers **70** and **71** may be moved closer together so as to exercise a closer guiding action on the cable **64** while still permitting the tubular members **63** to pass.

Each bracket **37** moreover mounts a roller **75** rotatably disposed on an arbor **76**. The plurality of rollers **75** thus provided serves the guidance of the return loop **77** of the draw cable **64**. Fouling of the cable is avoided by providing the rollers **75** outside of both mounting legs **42** and **46**. A lug member **79** below roller **75** protects the return loop **77**.

The single carriers **51** are similar in structure to the master carriers **50**, in that they have a metal plate **80** sandwiched between a pair of non-metallic or plastic plates **81** and **82**. The plates **80**, **81** and **82** extend through the lower slit **33**. The center plate **80** has an aperture **85** provided near the lower edge thereof (see FIG. 3). A swivel **86** engages the plate **80** at this aperture and carries a short length of chain **88** which, in turn, carries the curtain. The single carriers **51** further include a pair of arbors **90** which rotatably mount a wheel **91** on each side of the single carrier body and mount the plates **81** and **82** on the plate **80**. These wheels travel along the track structure in the same manner as the wheels **67** of the master carrier **50**.

Each carrier body has a vertically extending edge **94** facing in one direction of travel of the carriers and a substantially vertically extending edge **95** facing in the opposite direction of travel. A sheet **97** of a pliable, shock and sound dampening material, such as felt, extends between the plates **80** and **81** from the vertical edge **94** to the vertical edge **95**. A similar sheet **98** extends between the plates **80** and **82** from the edge **94** to the edge **95**. Sheets **97** and **98** form a pair of cushions **100** and **101** at the vertical edge **94** and a pair of cushions **102** and **103** at the vertical edge **95**.

The cushions **100** and **101** and the cushions **102** and **103** are connected to the edge portions **94** and **95**, respectively, by an adhesive. If desired, the sheets **97** and **98** may also be glued to the plates **81** and **82**, respectively. Felt sheets with an adhesive backing may be used for this purpose.

When during the operation of the assembly adjacent carriers move into mutual abutment, the cushions **100** and **101** of one carrier move into contact with the cushions **102** and **103** of the next adjacent carrier. This dampens shocks and noise. The fact that the cushions are formed by a sheet which extends through the carrier body prevents the cushions from being torn off and lost. It also

lends a certain tenacity to the adhesive bond between the edges of the carrier body and the cushions.

It will now be appreciated that the subject invention provides a series of substantial improvements which facilitate the handling of heavy curtains around bends and curves and which provide for an easier installation and a quieter and more reliable operation.

Those skilled in the art will appreciate that many modifications within the spirit and scope of the invention are possible or will suggest themselves.

What is claimed is:

1. A curtain suspension assembly comprising a track structure and a plurality of curtain carriers movable along the track structure, the track structure including a pair of rails mounted in spaced parallel relationship and jointly defining a pair of substantially vertical bight portions, a first pair of legs extending toward each other from the lower edges of the bight portions and defining a first elongated slit therebetween, and a second pair of legs extending toward each other from the upper edges of the bight portions and defining a second elongated slit therebetween, and said plurality of curtain carriers including a master carrier having a carrier body extending substantially vertically between the pair of rails and extending through said first elongated slit to a first region below the first pair of legs and having curtain suspension means attached thereto in said first region, and through said second elongated slit to a second region above the second pair of legs and having draw cable attachment means connected thereto in said second region, said master carrier further including at least one wheel rotatably connected to said carrier body and located between one leg of said first pair of legs and a corresponding one leg of said second pair of legs, and at least one wheel rotatably connected to said carrier body and located between the other leg of said first pair of legs and the other leg of said second pair of legs, said assembly including a first plurality of rollers and a second plurality of rollers for guiding a draw cable connected to said cable attachment means, the rollers of said first plurality being spaced along one of said rails and being mounted above said one rail with their axes extending substantially vertically, and the rollers of said second plurality being spaced along the other rail of said pair and being mounted above said other rail with their axes extending substantially vertically.

2. An assembly as claimed in claim **1**, including a third plurality of rollers for guiding a draw cable return loop, the rollers of said third plurality being spaced along the pair of rails and being mounted laterally of the pair of rails with their axes extending substantially vertically.

3. An assembly as claimed in claim **1**, including a plurality of brackets for mounting said rails and said rollers, each bracket including a base having a roller of said first plurality and a roller of said second plurality of rollers rotatably mounted thereon, a first mounting leg extending from said base and being adapted to mount the bight portion of one of said rails, and a second mounting leg extending substantially parallel to said first mounting leg and being adapted to mount the bight portion of the other one of said rails.

4. An assembly as claimed in claim **3**, wherein each bracket further mounts to one side of said mounting legs a roller for guiding a return loop of a draw cable.

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MARVIN A. CHAMPION, *Primary Examiner.*

JOSEPH H. McGLYNN, *Assistant Examiner.*