A substantially dampening paste, such as grease. The dampening paste inhibits movement of the cable (50) in a direction perpendicular to axis of the cable (50), thereby reducing or eliminating the transmission of undesired vibration.
TWO-PIECE VIBRATION DAMPENER

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application Number 60/739,517 filed November 23, 2005.

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0002] The present invention relates to fittings for flexible cable and conduit assemblies, in particular to fittings for reducing vibrations carried by the cable.

RELATED ART

[0003] Cable and conduit assemblies are used in many contexts to transmit forces over a distance, particularly where the path of force transmission is not always in a straight line. A cable, or core element, runs through a conduit and moves in an axial direction. Many such cable and conduit assemblies are used in automobiles, for example to connect the vehicle transmission system to the shift lever, particularly when the cable is taut. A problem with this type of assembly, however, is that vibrations from the engine can be transmitted through the cable to the shift lever. These vibrations can lead to unacceptable vibrations and noise within the passenger compartment of the vehicle.

[0004] Numerous methods have been employed to reduce vibrations carried through such a cable and conduit assembly. One method that has been used to
address this problem has been to attach a mass dampener to the conduit. Another method has been to design the fitting of such a conduit with a rubber isolator. In both cases, these solutions help to reduce vibrations transmitted through the conduit but not those transmitted through the cable itself.

[0005] What is needed is a method of reducing some or all of the vibrations that are transmitted through the cable.

SUMMARY OF THE INVENTION

[0006] The present invention is a vibration-dampening fitting comprising a two-piece construction having a continuous axial channel through both pieces of the fitting through which a cable runs when the two parts are assembled. The axial channel is dimensioned such that a cavity exists between surface of the axial channel and the outer surface of the cable. This cavity is filled with a dampening paste such as grease, which permits the cable to move axially but dampens movement, particularly movement perpendicular to the axis of the cable. Thus vibrations, especially those that are perpendicular to the axis of the cable, are dampened. Therefore, vibrations that would otherwise be transmitted through the cable are reduced or eliminated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:
Figure 1 illustrates a side plan view of two pieces of a vibration dampening fitting, wherein the two pieces are in a connected state and have a cable running through them.

Figure 2 illustrates a perspective view of an outer part of a vibration-dampening fitting.

Figure 3 illustrates a perspective view of an inner part of a vibration-dampening fitting.

Figure 4 illustrates a plan view of a vibration-dampening fitting in a vehicle transmission environment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following description of the preferred embodiments is merely exemplary in nature and is in no way intended to limit the invention, its application, or its uses.

In a preferred embodiment depicted in Figures 1 through 3 a dampening fitting 20 comprises an inner part 22 and an outer part 24. The outer part 24 has a cylindrical cavity 46 of a substantially similar diameter as the outside diameter of the inner part 22. The outer part 24 further comprises a plurality of radially-oriented gussets 48 that run parallel to the long axis of the outer part 24 to strengthen the fitting 20.

When the inner part 22 and the outer part 24 are assembled a first channel 26 through the inner part 22 and a second channel 28 through the outer part 24 form a continuous axial channel 30 through which the cable 50 runs. The fitting
20 is dimensioned such that a cavity 38 is formed between the inner surface of the first channel 26 and the outer surface of the cable 50 and such that the cavity 38 is substantially isolated from the remainder of the continuous axial channel 30. The first channel 26 is substantially filled with dampening grease prior to assembly of the inner part 22 and outer part 24, resulting in the cavity 38 being substantially filled with dampening grease after assembly. Preferably the dampening grease has a viscosity slightly lower than that of conventional wheel bearing grease. For reference, one type of dampening grease that may be used is made by Timken Automotive (part number GR224C) and is a general purpose lithium complex grease having a viscosity at 100° C, ASTM D 445, of 17-20 Centistokes and a viscosity at 40° C, ASTM D 445, of 200-240 Centistokes, and a Viscosity Index of 95.

[0015] In the depicted embodiment the inner part 22 has male threads 42 on the outside while the outer part 24 has matching female threads 44 on the inside. The fitting 20 is assembled by screwing the inner part 22 into the outer part 24. Preferably the inner part 22 and the outer part 24 fit together with a snug, low-tolerance connection that inhibits loss of grease through the point of contact between the two parts. In one embodiment a distal face 32 of the inner part 22 mates snugly with a receiving face 34 of the outer part 24 to make a substantially tight connection.

[0016] The inner part 22 and outer part 24 preferably have means for being attached and locked to one another. In one embodiment the means for attaching comprise complementary threads 26, 28 on each respective part 22, 24. The means for locking in one embodiment comprises a C-clip 54 that slides onto the outer part 24 and snaps into place. The C-clip 30 has a protrusion from its concave side that
overlaps with a shoulder on the inner part 22, the shoulder being adjacent to the male threads 42, to prevent the inner part 22 from becoming unscrewed from the outer part 24.

[0017] The two parts of the fitting 20 are attached to a cable conduit 52 using known means such as crimping. Preferably the attachment of the inner part 22 and the outer part 24 to the respective portions of the conduit 52 is done in a manner that forms a relatively tight connection preventing the grease from escaping.

[0018] Figure 4 illustrates the present invention working in a vehicle transmission environment, wherein the vibration-dampening fitting 20 is attached in-line as part of an assembly that connects a shifter 60 to a vehicle transmission 62. In some instances, in the absence of a vibration-dampening component, vibrations in the range of about 4300 to about 4500 Hertz can be transmitted from the transmission to the shifter via the cable and conduit assembly, producing undesirable vibration and noise in the passenger compartment. The present invention eliminates or reduces the transmission of such vibration.

[0019] As various modifications could be made to the exemplary embodiments, as described above with reference to the corresponding illustrations, without departing from the scope of the invention, it is intended that all matter contained in the foregoing description and shown in the accompanying drawings shall be interpreted as illustrative rather than limiting. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims appended hereto and their equivalents.
What is claimed is:

1. An apparatus for transmission of force over a distance comprising
   a cable;
   a conduit, wherein said cable runs through said conduit;
   a first fitting portion having a first axial channel therethrough;
   a second fitting portion, having a second axial channel therethrough,
   wherein said first fitting portion and said second fitting portion are coupled such that
   said first axial channel and said second axial channel are in communication and form
   a continuous axial channel, and wherein said cable runs through said continuous axial
   channel; and
   a cavity defined by a distance between an outer surface of said cable
   and an inner surface of said continuous axial channel, wherein said cavity is
   substantially filled with a dampening paste, and wherein said first fitting portion, said
   second fitting portion and said cable are dimensioned such that said cavity is
   substantially isolated from the remainder of said continuous axial channel.

2. The apparatus of claim 1, wherein at least one end of said coupled first
   and second fitting portions is attached to said conduit.
3. The apparatus of claim 1 further comprising a locking mechanism, wherein said locking mechanism inhibits the uncoupling of said first fitting portion and said second fitting portion.

4. The apparatus of claim 3, wherein said locking mechanism comprises a C-clamp.

5. The apparatus of claim 1, wherein said dampening paste is grease.

6. The apparatus of claim 5, wherein said grease has a viscosity at 100° C, ASTM D 445, of 17-20 Centistokes and a viscosity at 40° C, ASTM D 445, of 200-240 Centistokes.

7. The apparatus of claim 1, wherein said distance between said outer surface of said cable and said inner surface of said continuous axial channel is substantially uniform.

8. The apparatus of claim 1, wherein said apparatus is adapted for use in a vehicular environment, and wherein said apparatus is placed in-line between a shift lever and a transmission system.
9. A vibration-dampening fitting for a cable and conduit comprising
an inner part having a cylindrical outer portion at an end and having a
first axial channel therethrough, said first axial channel being substantially filled with
a dampening paste; and
an outer part having a second axial channel therethrough, an end
portion of said second channel comprising a cylindrical portion sized to matingly
interact with said outer portion of said inner part, such that said first axial channel and
said second axial channel are substantially co-axial.

10. The vibration-dampening fitting of claim 9, wherein said inner part is
attached to said outer part by means of complimentary threads on an outer surface of
said inner part and an inner surface of said outer part.

11. The vibration-dampening fitting of claim 10 further comprising a
locking mechanism, wherein said locking mechanism inhibits the uncoupling of said
inner part and said outer part.

12. The vibration-dampening fitting of claim 9 further comprising a cable,
wherein said cable runs through said first axial channel and said second axial channel.

13. The vibration-dampening fitting of claim 12 further comprising a
conduit, wherein said conduit is attached to either said inner part, said outer part, or
both said inner part and said outer part, and wherein said cable runs through said conduit.

14. The vibration-dampening fitting of claim 9 further comprising a plurality of radially oriented gussets attached to said outer part.

15. The vibration-dampening fitting of claim 9, wherein said dampening paste is grease.

16. The vibration-dampening fitting of claim 15, wherein said grease has a viscosity at 100°C, ASTM D 445, of 17-20 Centistokes and a viscosity at 40°C, ASTM D 445, of 200-240 Centistokes.

17. The vibration-dampening fitting of claim 9, wherein said vibration-dampening fitting is adapted for use in a vehicular environment, and wherein said vibration-dampening fitting is placed in-line between a shift lever and a transmission system.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. F16C1/12 G05G25/02 F16C1/26

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

605G F16C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of Box C

See patent family annex

**Date of the actual completion of the international search**

19 April 2007

**Date of mailing of the international search report**

25/04/2007

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