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(54) **NOISE REDUCING CABLE SPLITTER**

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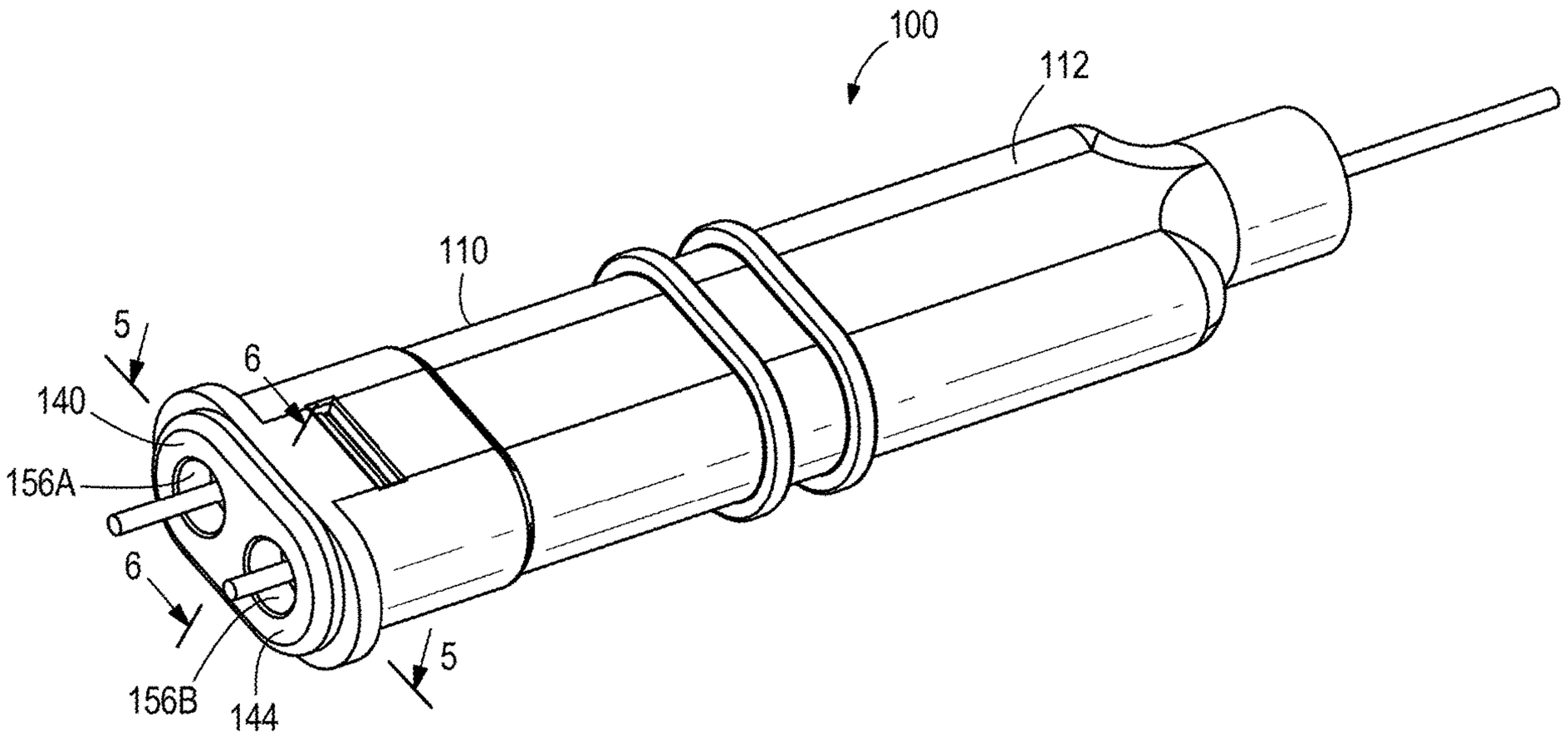
(57) **ABSTRACT**

A latching system includes a first lever connected to a first cable having a first cable end, a second lever connected to a second cable having a second cable end, a latch connected to a third cable having a third cable end, and a cable splitter assembly. The cable splitter assembly has a housing with a first end and a second end and a body with an interior surface defining an interior chamber. A carriage is configured to translate within the interior chamber. The carriage includes a carriage body with a plurality of cavities arranged to seat the respective first, second, and third cable ends and a plurality of resilient arms integrally formed as one piece with the carriage body.



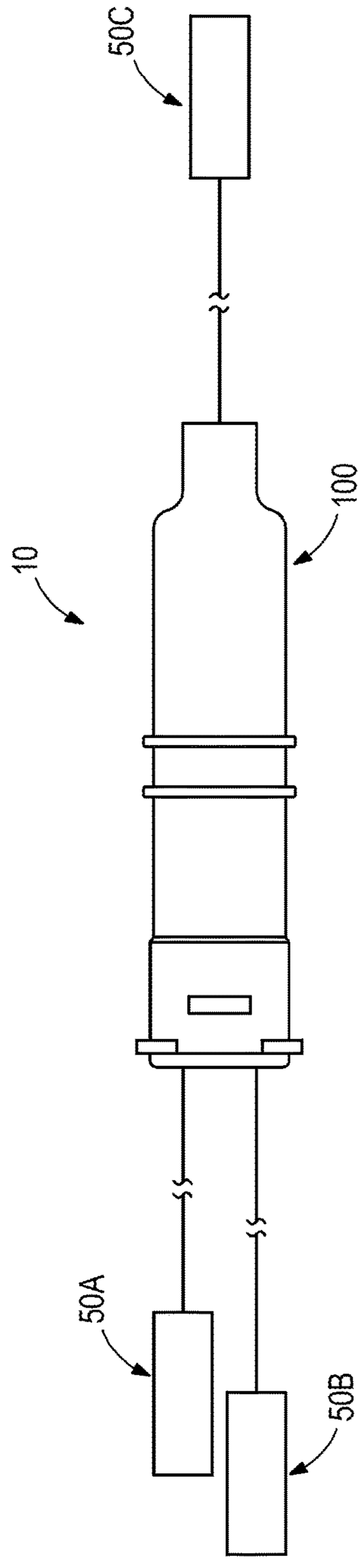


FIG. 1

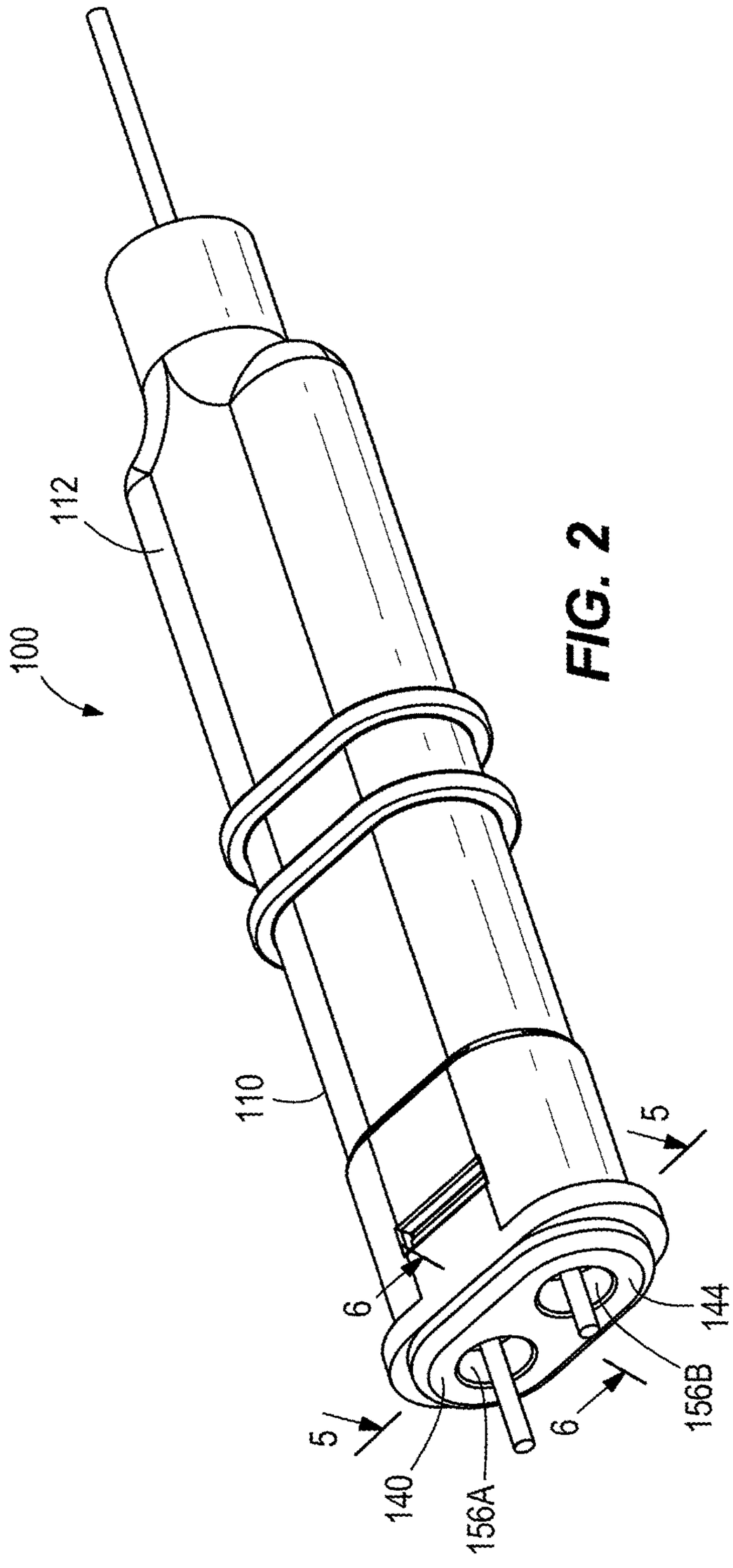


FIG. 2

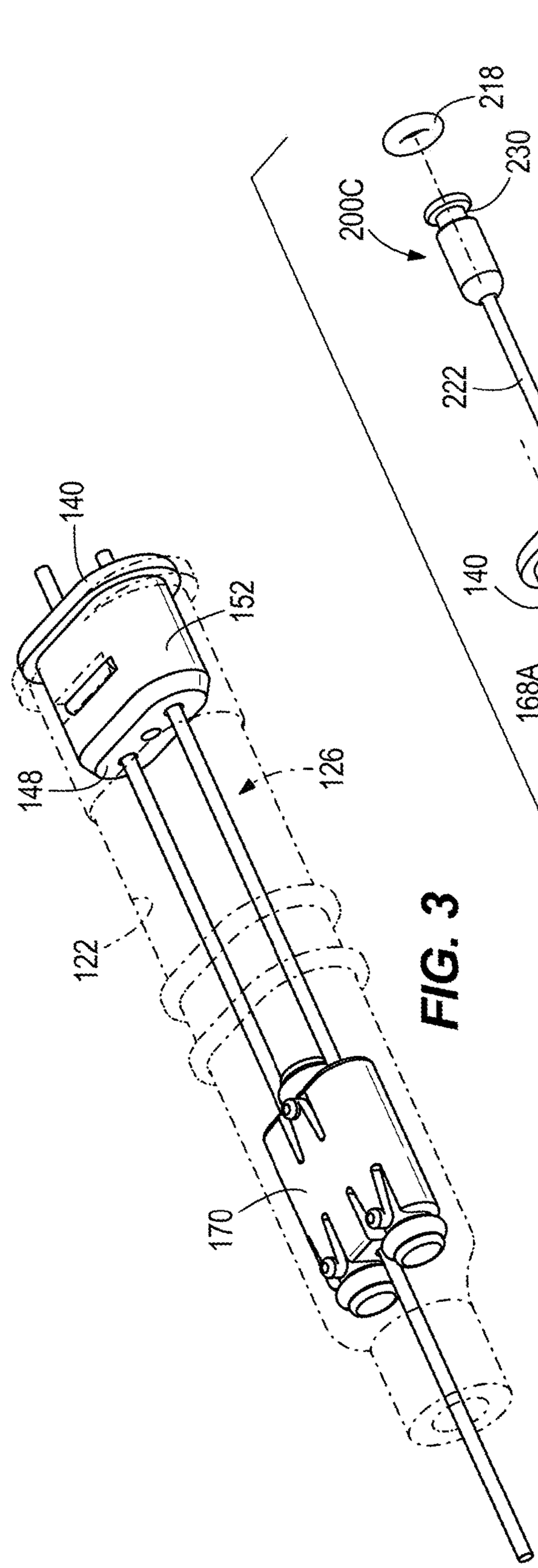

140
152
148
126
122
170

FIG. 3

114
218
230
200C
134A
110
222
140
152
168A
148
170
222
200B
112
118
200A
234
218
230
218

FIG. 4

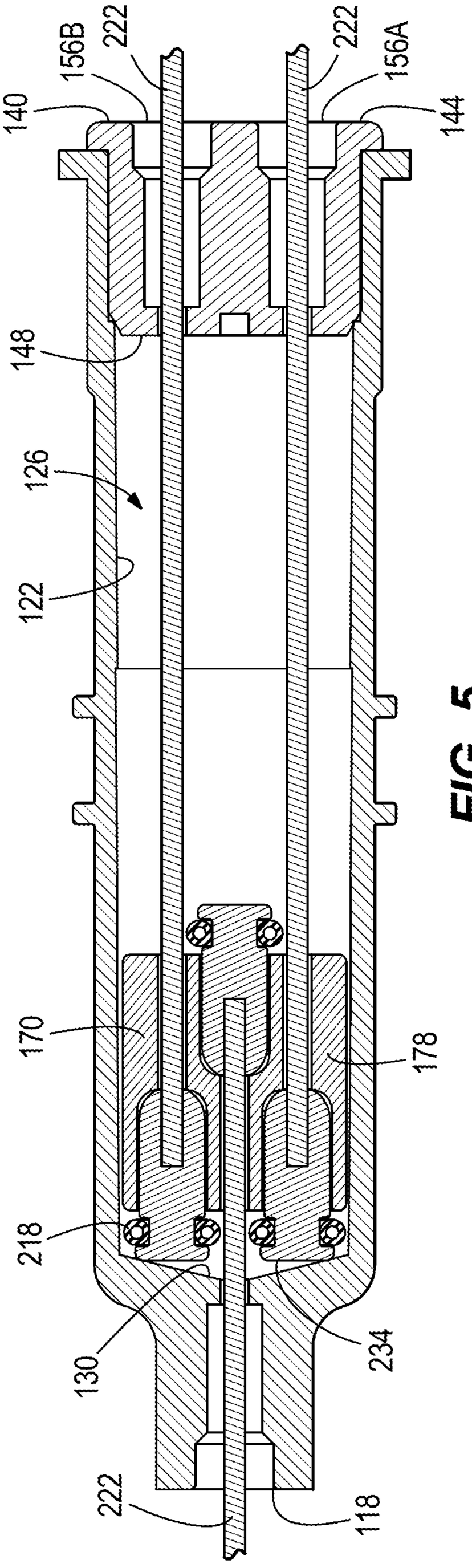

140
156B
222
222
156A
144
148
126
122
170
178
218
130
234
222
118

FIG. 5

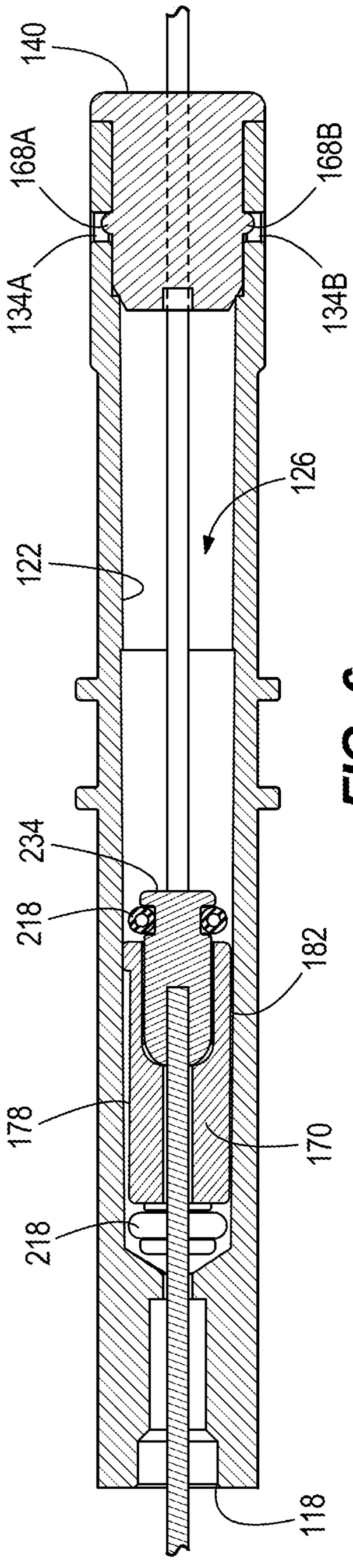

140
168A
168B
134A
134B
126
122
234
218
182
178
170
218
118

FIG. 6

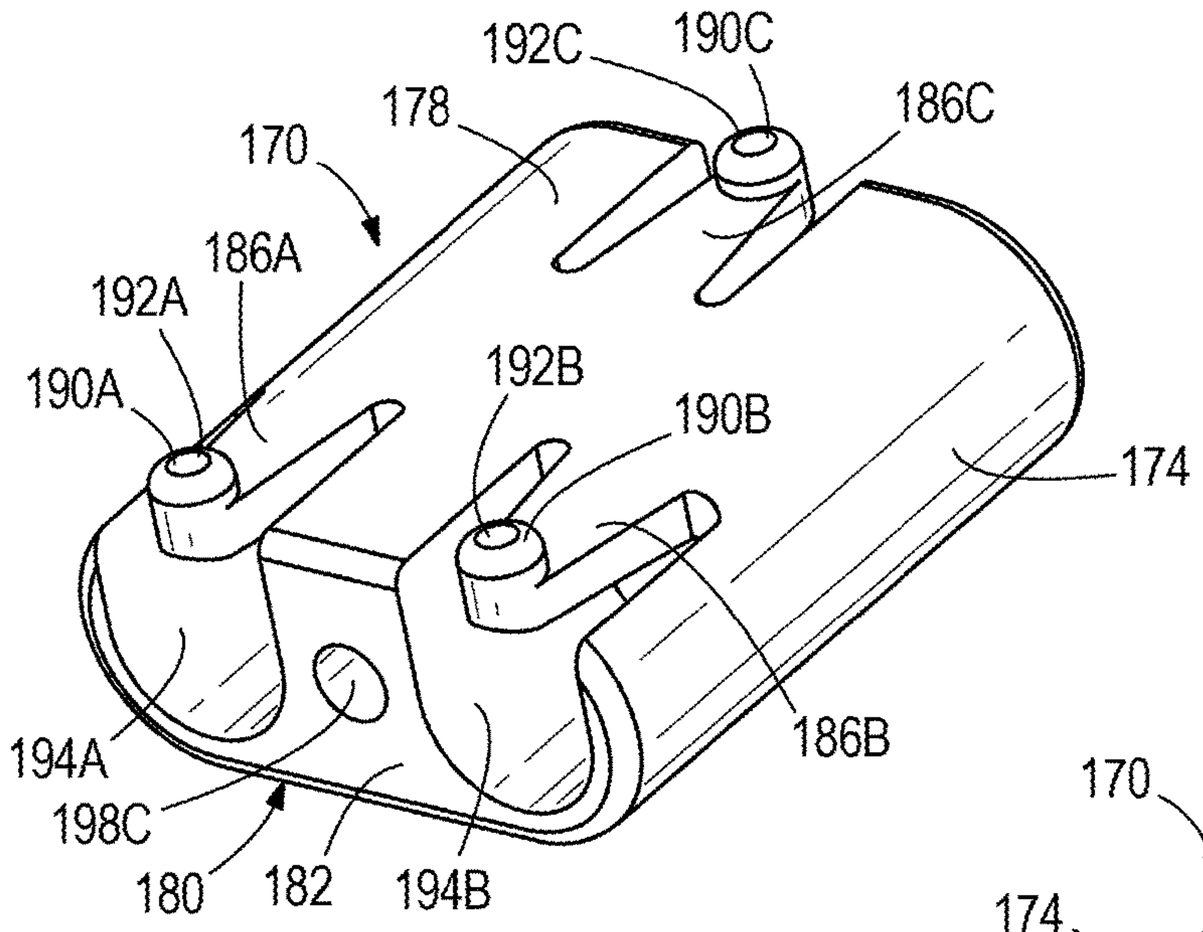


FIG. 7A

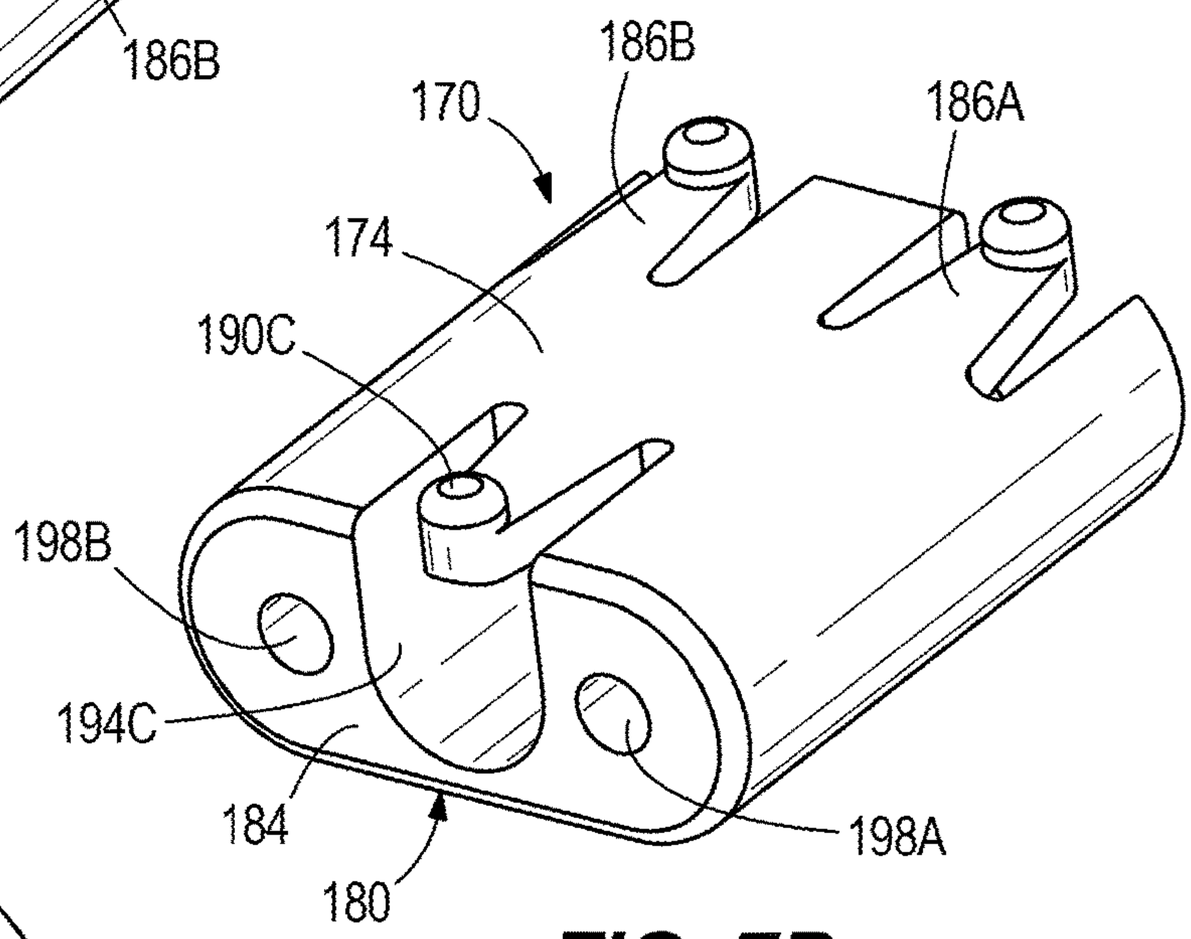


FIG. 7B

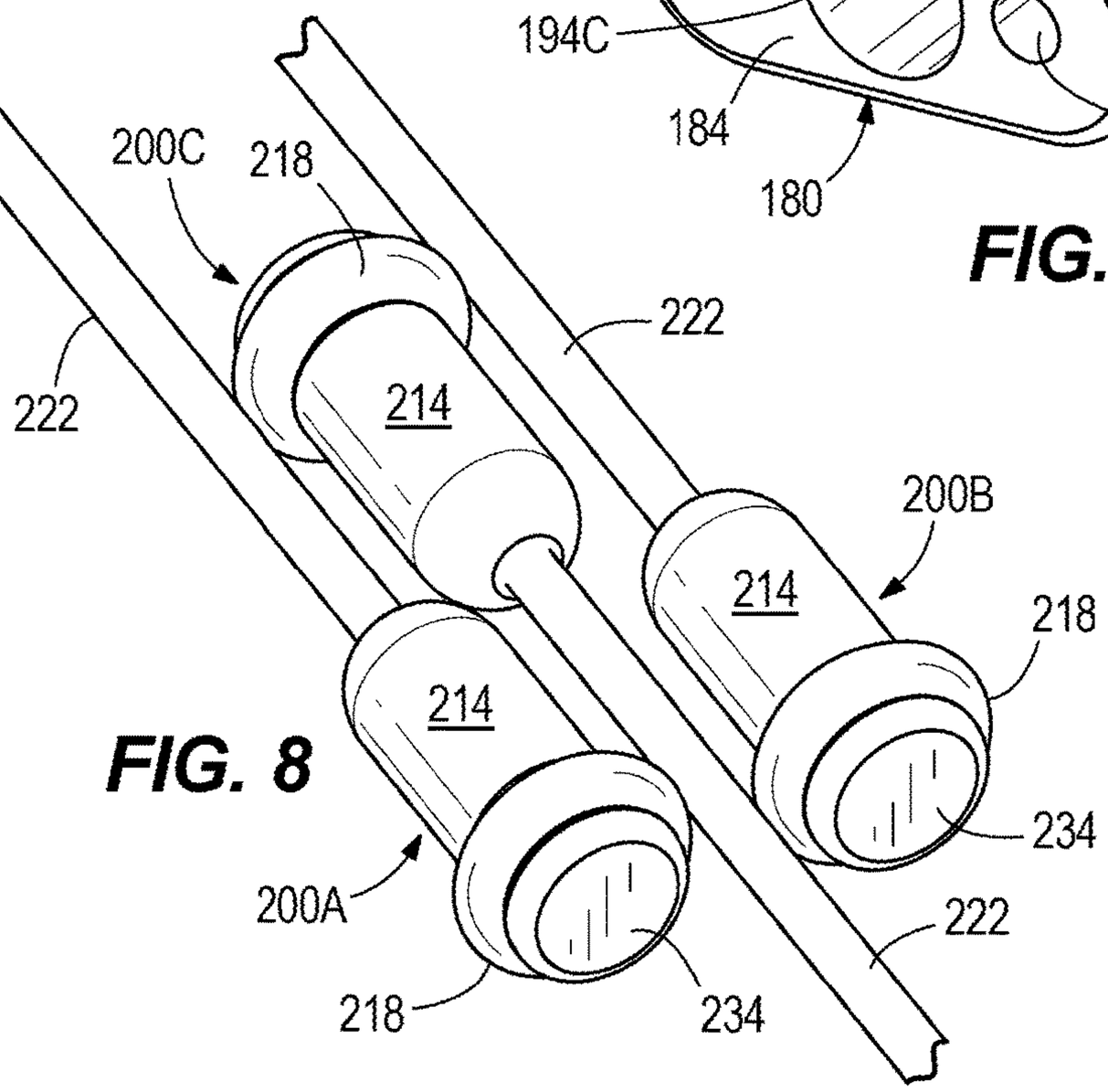


FIG. 8

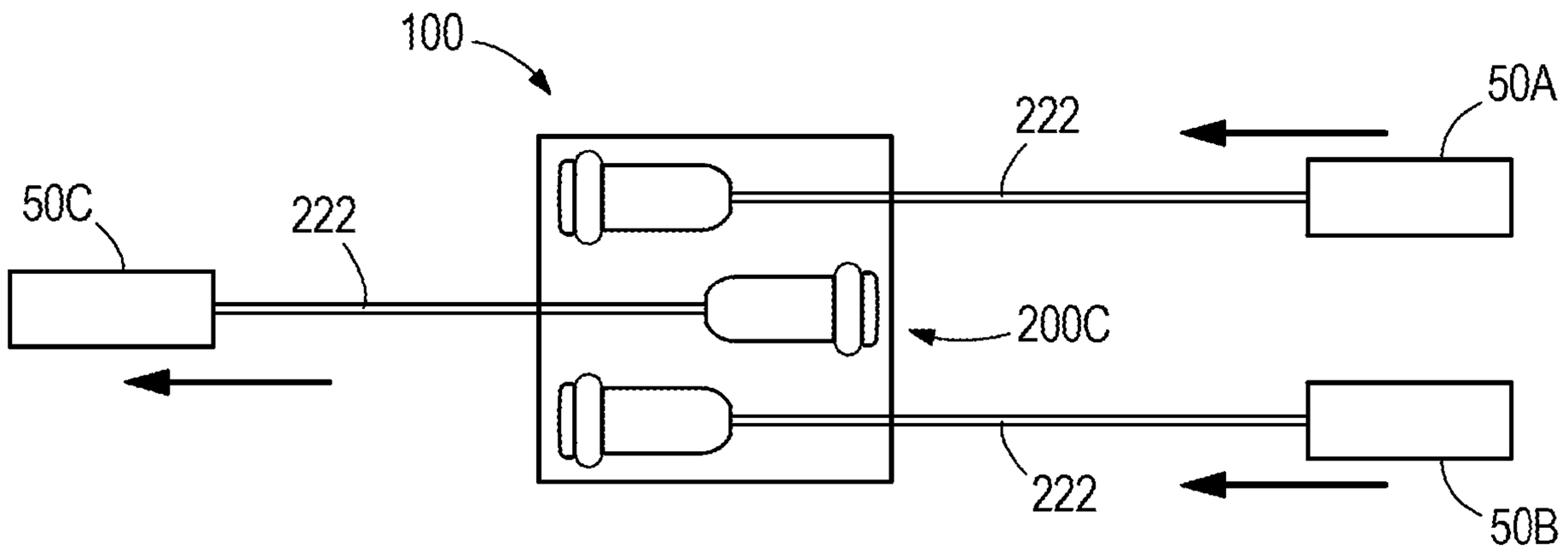


FIG. 9A

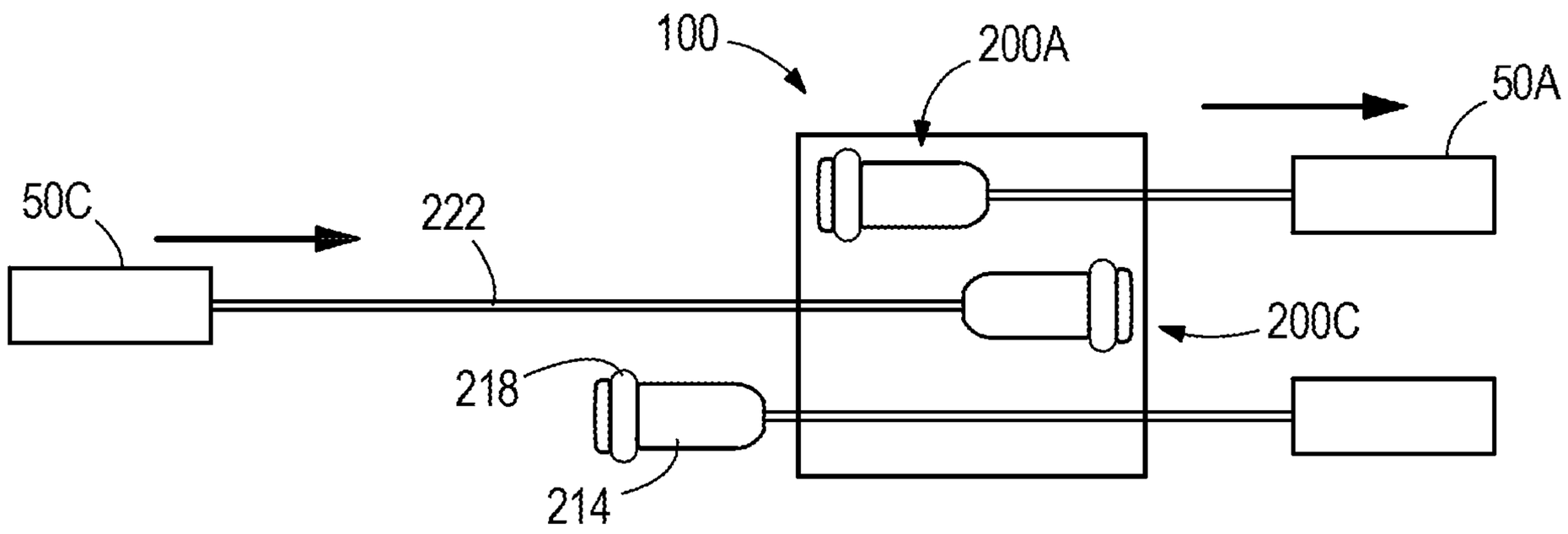


FIG. 9B

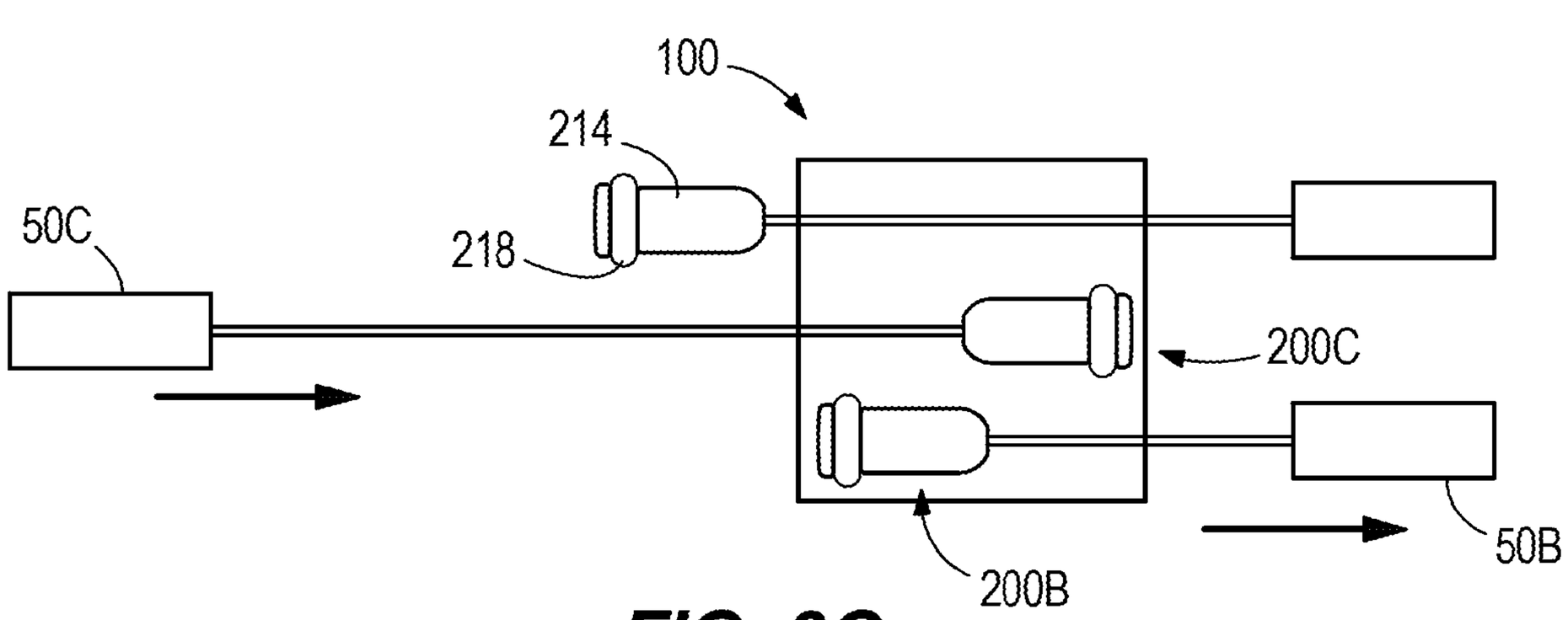


FIG. 9C

NOISE REDUCING CABLE SPLITTER

BACKGROUND

[0001] The present disclosure relates to a multi-cable splitter assembly, such as those used in connection with interior automotive cables.

[0002] Many automotive systems such as door and seat latches use cable splitters to efficiently function. Multi-cable splitter assemblies, however, tend to have components that slide or are otherwise loose within the assembly casing, and in current assemblies this produces objectionable noise like buzz, squeak, and rattle (BSR).

SUMMARY

[0003] A latching system includes a first lever connected to a first cable having a first cable end, a second lever connected to a second cable having a second cable end, a latch connected to a third cable having a third cable end, and a cable splitter assembly. The cable splitter assembly has a housing with a first end and a second end and a body with an interior surface defining an interior chamber. A carriage is configured to translate within the interior chamber. The carriage includes a carriage body with a plurality of cavities arranged to seat the respective first, second, and third cable ends and a plurality of resilient arms integrally formed as one piece with the carriage body.

[0004] A carriage for a cable splitter assembly, in which the assembly includes a housing containing an interior chamber and the carriage is configured to translate within the interior chamber, includes a carriage body with a plurality of recesses. Each recess is arranged to seat a cable terminal end and forms, in conjunction with the carriage body, a resilient arm.

[0005] A cable splitter subassembly includes a housing having a first end and a second end and a body with an interior surface defining a bounded interior chamber. A carriage is configured to translate within the bounded interior chamber and has a carriage body with a plurality of cavities. Each cavity is arranged to seat a cable terminal end and a plurality of resilient arms extend from the carriage body. Each arm includes a contact surface configured to contact a portion of the interior chamber during translation of the carriage within the housing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. **1** is a view of a lever system including a cable splitter assembly.

[0007] FIG. **2** is a perspective view of the cable splitter assembly of FIG. **1**.

[0008] FIG. **3** is a perspective view of the interior of the cable splitter assembly of FIG. **1**.

[0009] FIG. **4** is an exploded view of the cable splitter assembly of FIG. **1**.

[0010] FIG. **5** is a cross-sectional view of the cable splitter taken along line **5-5** of FIG. **2**.

[0011] FIG. **6** is a cross-sectional view of the cable splitter taken along line **6-6** of FIG. **2**.

[0012] FIGS. **7**A and **7**B are perspective views of a carriage member of the cable splitter assembly of FIG. **1**.

[0013] FIG. **8** is a perspective view of a cable sub assembly of the cable splitter assembly of FIG. **1**.

[0014] FIGS. **9**A-**9**C are schematic diagrams of the cable splitter assembly of FIG. **1** in use.

DETAILED DESCRIPTION

[0015] Before any embodiments of the disclosure are explained in detail, it is to be understood that the disclosure is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The disclosure is capable of supporting other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

[0016] FIG. **1** depicts a lever/latch cable system **10** comprising a plurality (three illustrated) of tensioning devices **50**A-**50**C connected by a cable splitter assembly **100**. The devices can be a combination of levers, latches, or other tension driven devices as the application demands. Referring also to FIGS. **2-4**, the cable splitter assembly **100** includes a housing **110**, a cap **140**, a carriage or carrier **170**, and three cable assemblies **200**A-**200**C.

[0017] The housing **110** includes a housing body **112** generally elongated in shape from a first open end **114** to a second open end **118**. In particular, the body **112** "necks" down near the second open end **118** such that the second open end **118** is a generally cylindrical portion of the body **112** having a lesser width than the remainder of the body **112** in at least one direction. The body **112** has an interior surface **122**, which defines an interior chamber **126** therein and includes a stop surface **130** (FIG. **5**) adjacent the second open end **118**. A pair of apertures **134**A, **134**B adjacent the first open end **114** extend through the body **112** to the interior chamber **126**.

[0018] With continued reference to FIGS. **2-4**, the cap **140** includes a first end **144**, a second end **148**, an exterior surface **152**, and a pair of channels **156**A, **156**B therethrough from the first end **144** to the second end **148**. The first end **144** is sized to cover the opening of the first open end **114**. The exterior surface **152** presents an opposing pair of protrusions **168**A, **168**B.

[0019] The carriage **170**, further illustrated in FIGS. **7**A and **7**B, includes a body **174**, a first side **178**, a second side **180**, a first end **182**, and a second end **184**. Integrally formed as one piece with the body **174** and with the first side **178** are resilient or flexible tabs or arms **186**A-**186**C, each with a knob or contact member **190**A-**190**C, respectively, projecting away from the first side **178** and with a contact surface **192**A-**192**C. Alternatively, the body **174** can be described as including resilient or flexible arms **186**A-**186**C extending therefrom and having contact members **190**A-**190**C. Yet alternatively, the body **174** includes cavities or recesses **194**A-**194**C that thereby form resilient arms **186**A-**186**C of the body **174**. In some embodiments, each arm **186**A, **186**B, **186**C is biased directionally away from the body **174**. In some embodiments, each arm **186**A, **186**B, **186**C is formed to at least partially extend away from the body **174**.

[0020] The carriage **170** further includes a first channel **198**A extending from the first cavity **194**A to the second end **184**, a second channel **198**B extending from the second cavity **194**B to the second end **184**, and a third channel **198**C extending from the third cavity **194**C to the first end **182**. In other words, channels **198**A-**198**C in combination with associated cavities **194**A-**194**C extend effectively through the body **174** from the first end **182** to the second end **184**.

[0021] FIG. **8** shows the three cable assemblies **200**A-**200**C. Each cable assembly includes a terminal end or

terminal **214**, a vibration or noise reducing component or bumper or ring **218**, and a cable **222**. The terminal includes a groove or channel **230** near or adjacent a terminal end **234** of each terminal **214**. The bumper **218** is an annular member or toroidal member made of elastomeric or other relatively soft or resilient material and configured to at least partially fit within an associated groove **230** of a terminal **214**. In other embodiments, the bumper **218** may be a rubber or elastomeric cap, an over molded cap, or a collar-like structure about a portion of the terminal **214**. The terminal ends **234** are sized such that they cannot slide within a channel **198**.

[0022] In assembly, the cable **222** of assembly **200**C passes through open end **118** of the housing **110**, through the housing **110**, and through channel **198**C of the carriage **170**, at which point it is joined or coupled to the associated terminal **214** in a conventional manner. The cables **222** of assemblies **200**A and **200**B likewise pass through channels **156**A, **156**B, respectively, of the cap **140** and thereafter through channels **198**A, **198**B, respectively, of the carriage **170**, at which point they are joined to respective terminals **214**. Bumpers **218** can be assemble onto terminals **214** beforehand or afterward. The assemblies **200**A-**200**C and carriage **170** are positioned within the chamber **126** and the cap **140** inserted into the first open end **114**. Specifically, the cap **140** is configured to cover the opening of the first open end **114**. The exterior surface **152** of the cap **140** contacts the interior surface **122** of the housing **110**, and the cap **140** is aligned so that each protrusion **168**A, **168**B on the exterior surface **152** is received by an aperture **134**A, **134**B of the housing **110**, securing the cap **140** in place. In this embodiment, the cap **140** is removably coupled to the housing **110** via a snapping mechanism. In other embodiments, the cap **140** may be press fit to the housing **110**, or hinged, or clasped, or otherwise removably coupled to the housing **110**.

[0023] Once assembled, the carriage **170** is confined between the stop surface **130** and the second end **148** of the cap **140**. The cables **222** may be previously connected to the respective tensioning devices **50**A-**50**C or may be connected at any time during or after assembly of the splitter assembly **100**.

[0024] In operation, the carriage **170** is configured to slide within the interior chamber **126** between the stop surface **130** and the second end **148** of the cap **140** dependent on forces applied to the cables **222**.

[0025] Specifically, referring to FIG. **9**A, tensioning device **50**C is a lever and tensioning devices **50**A and **50**B are latches. In this arrangement, pulling lever **50**C results in cable assembly **200**C pulling splitter assembly **100** leftward (in this reference frame), thereby pulling both of latches **50**A, **50**B. As carriage **170** translates within interior chamber **126**, the contact surfaces **192**A-**192**C of flexible tabs or arms **186**A-**186**C, which are each disposed between a respective arm and the interior surface **122**, lightly contact a portion of interior surface **122** to limit or impede non-translatory movement of the carriage **170** within the housing **110**, i.e., hindering any non-linear or non-translatory movement (movement not aligned with the direction of tension of cable assembly **200**C) or impact between surfaces of the carriage **170** and the interior surface **122**. The flexible arms **186**A-**186**C therefore operate to minimize or eliminate clearance between the carriage **170** and the interior surface **122**.

[0026] Referring to FIGS. **9**B-**9**C, tensioning devices **50**A and **50**B are levers and tensioning device **50**C is a latch. As shown in FIG. **9**B, pulling lever **50**A rightward causes cable assembly **200**A to pull carriage **170** rightward, which brings with it cable assembly **200**C and latch **50**C. The flexible tabs or arms **186**A-**186**C cooperate with the interior surface **122** as previously described. Moreover, cable assembly **200**B, and more precisely associated terminal **214**, releases or slides from its seated position within the carriage **170** (essentially remaining in place) and may thereby be loose within the interior chamber **126**. Bumper **218**, which protrudes from the normal contour of the terminal **214**, reduces the noise or vibration associated with any contact between the terminal **214** and the interior surface **122**. Pulling lever **50**B (FIG. **9**C) results in the same effect between the terminal **214** of cable assembly **200**A and the interior surface **122**.

[0027] In the illustrated embodiment, the cable splitter assembly **100** contains a total of three cable assemblies **200**A-**200**C arranged in a two to one conversion structure. In other embodiments, however, the cable splitter assembly **100** may contain just two cables with a one to one structure, or any other number of cables in a similar conversion structure (for example, six cables, with two on one side and four on the other, three on one side and three on the other, one on one side and five on the other, etc. with all other parts scaled and adapted accordingly, i.e., a carriage with a sufficient number of cavities and resilient arms as previously described.

[0028] Various features of the disclosure are set forth in the following claims.

1. A latching system comprising:

a first lever connected to a first cable having a first cable end;

a second lever connected to a second cable having a second cable end;

a latch connected to a third cable having a third cable end; and

a cable splitter assembly, the assembly including

a housing having a first end and a second end and a body with an interior surface defining an interior chamber;

a carriage configured to translate within the interior chamber, the carriage having a carriage body with a plurality of cavities arranged to seat the respective first, second, and third cable ends and a plurality of resilient arms integrally formed as one piece with the carriage body.

2. The latching system of claim **1**, wherein the carriage body includes a first side and an opposing second side, and wherein the plurality of resilient arms are integrally formed as part of the first side.

3. The latching system of claim **2**, wherein each resilient arm of the plurality of resilient arms includes a contact surface disposed between the respective resilient arm and the interior surface.

4. The latching system of claim **2**, wherein each resilient arm of the plurality of resilient arms includes a contact member extending away from the first side.

5. The latching system of claim **1**, wherein the carriage further includes a first end and an opposing second end, wherein the carriage body further includes a plurality of channels, each channel in communication with one cavity of the plurality of cavities.

6. The latching system of claim **5**, wherein each cavity is formed at one of the first end or the second end, and wherein an associated channel extends from the other of the first end or second end to the cavity.

7. The latching system of claim **1**, further including

a first terminal at the first cable end;

a second terminal at the second cable end; and

a third terminal at the third cable end,

wherein each of the first, second, and third terminals is configured to sit within a respective cavity of the plurality of cavities and includes a vibration-reducing component.

8. The latching system of claim **7**, wherein each vibration-reducing component is in the form of a ring positioned at least partially around a portion of each respective terminal.

9. The latching system of claim **8**, wherein each ring is formed of an elastomeric material.

10. A carriage for a cable splitter assembly, the assembly including a housing containing an interior chamber, the carriage configured to translate within the interior chamber and comprising a carriage body with a plurality of recesses, each recess arranged to seat a cable terminal end and forming, in conjunction with the carriage body, a resilient arm.

11. The carriage of claim **10**, wherein the carriage further includes a first end and an opposing second end, wherein the carriage body further includes a plurality of channels, each channel in communication with one recess of the plurality of recesses.

12. The carriage of claim **11**, wherein each recess is formed at one of the first end or the second end, and wherein an associated channel extends from the other of the first end or second end to the recess.

13. The carriage of claim **10**, wherein each arm is biased away from the one side.

14. The carriage of claim **10**, wherein each arm is formed to at least partially extend away from the carriage body.

15. A cable splitter subassembly comprising:

a housing having a first end and a second end and a body with an interior surface defining a bounded interior chamber; and

a carriage configured to translate within the bounded interior chamber, the carriage having a carriage body with a plurality of cavities, each cavity arranged to seat a cable terminal end, and a plurality of resilient arms extending from the carriage body, each arm including a contact surface configured to contact a portion of the interior chamber during translation of the carriage within the housing.

16. The cable splitter subassembly of claim **15**, wherein the second end includes an opening, the subassembly further including a cap configured to cover the opening, wherein the cap includes a plurality of cap channels extending therethrough such that in an assembled state of the cap with the housing the bounded interior chamber is in communication with an environment external to the housing.

17. The cable splitter subassembly of claim **16**, wherein the carriage further includes a first end and an opposing second end, wherein the carriage body further includes a plurality of channels, each channel in communication with a cavity of the plurality of cavities.

18. The cable splitter subassembly of claim **15**, wherein each contact surface is a portion of a contact member formed at the end of each arm.

* * * * *