

1 CANALPHONE COUPLER SYSTEM AND METHOD

2 CROSS-REFERENCE TO RELATED APPLICATIONS

3 **[0001]** This application claims the benefit of co-  
4 pending U.S. Provisional Application No. 61/808,996,  
5 filed 5 April 2013 (Agent Docket No. JH08(P)). This  
6 application and the application identified above include  
7 identical inventorship and ownership.

8 BACKGROUND

9 **[0002]** The embodiments relate to the field of  
10 canalphones.

11 **[0003]** There are many different types of personal  
12 listening devices such as headphones, earbuds,  
13 canalphones, and/or the like. Headphones are personal  
14 listening devices that are held in close proximity to  
15 the ear by some support system. Earbuds are small  
16 personal listening devices that are positioned directly  
17 in front of the ear canal and are substantially smaller  
18 than a person's outer ear. Similarly, canalphones are  
19 personal listening devices that are substantially smaller  
20 than a person's outer ear, but they differ from earbuds  
21 in that they are placed directly in one end of the ear  
22 canal. Both earbuds and canalphones are held in  
23 positioned by friction between the ear and the device  
24 rather than the support system found in most headphones.

25 **[0004]** Canalphones are also referred to as in-ear  
26 monitors due to how the canalphone is worn by a listener.  
27 In other words, a canalphone housing is worn in the ear  
28 of the user and not over and/or around the ear of the

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1 user. Some canalphones also serve as earplugs due to the  
2 way the canalphone limits noise external to the  
3 canalphone from entering the ear canal.

4 SUMMARY

5 **[0005]** According to an embodiment, a canalphone system  
6 may include a canalphone coupler, and four connectors  
7 carried by the canalphone coupler of which at least two  
8 of the four connectors carry an acoustical signal. The  
9 system may also include a mechanical joint that joins the  
10 canalphone coupler to a cable where the mechanical joint  
11 is assembled and disassembled by a user.

12 **[0006]** The system may further include a locator  
13 carried by the mechanical joint that properly positions  
14 the four connectors during mating with the cable. One of  
15 the four connectors may comprise a ground connector, one  
16 of the four connectors may comprise a low connector, and  
17 at least two of the four connectors may comprise a mid  
18 connector, a high connector, and a microphone connector.

19 **[0007]** The mid connector may be bonded to the high  
20 connector. The four connectors may be recessed into the  
21 canalphone coupler. The mechanical joint may not rely on  
22 any of the four connectors to join the canalphone coupler  
23 to the cable.

24 **[0008]** The system may additionally include an  
25 attenuator in communication with at least one of the low  
26 connector, the mid connector, and the high connector. The  
27 attenuator may be added or removed by the user.

28 **[0009]** The attenuator may be adjustable by the user.  
29 The attenuator may be adjustable between 0-25 decibels

1 for the low connector, and 0-15 decibels for the mid  
2 connector and the high connector.

3 **[0010]** In an alternative embodiment, the system may  
4 include a canalphone coupler, and four connectors carried  
5 by the canalphone coupler of which at least two of the  
6 four connectors carry an acoustical signal, and where one  
7 of the four connectors comprises a ground connector, one  
8 of the four connectors comprises a low connector, and  
9 where at least two of the four connectors comprise a mid  
10 connector, a high connector, and a microphone connector.  
11 The system may also include a mechanical joint that joins  
12 the canalphone coupler to a cable where the mechanical  
13 joint is assembled and disassembled by a user. The system  
14 may further include an attenuator in communication with  
15 at least one of the low connector, the mid connector, and  
16 the high connector.

17 **[0011]** Another aspect is a method that may include  
18 carrying an acoustical signal with at least two of four  
19 connectors carried by a canalphone coupler. The method  
20 may also include joining the canalphone coupler to a  
21 cable by a mechanical joint that is assembled and  
22 disassembled by a user.

23 **[0012]** The method may further include properly  
24 positioning the four connectors during mating with the  
25 cable via a locator. The method may additionally include  
26 connecting an attenuator to at least one of the four  
27 connectors. The method may also include making the  
28 attenuator adjustable by the user.

29 BRIEF DESCRIPTION OF the DRAWINGS

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1   **[0013]**     FIG. 1 is a schematic block diagram of a system  
2   in accordance with the embodiments.

3   **[0014]**     FIG. 2 is an embodiment of the canalphone  
4   coupler of FIG. 1.

5   **[0015]**     FIG. 3 is an embodiment of the canalphone  
6   coupler of FIG. 1.

7   **[0016]**     FIG. 4 is an embodiment of the canalphone  
8   coupler of FIG. 1.

9   **[0017]**     FIG. 5 is a flowchart illustrating method  
10  aspects according to various embodiments.

11  **[0018]**     FIG. 6 is a flowchart illustrating method  
12  aspects according to the method of FIG. 5.

13  **[0019]**     FIG. 7 is a flowchart illustrating method  
14  aspects according to the method of FIG. 5.

15  **[0020]**     FIG. 8 is a flowchart illustrating method  
16  aspects according to the method of FIG. 7.

17  **[0021]**     FIG. 9 is an embodiment of the canalphone  
18  coupler of FIG. 1.

19  **[0022]**     FIGS. 10-12 are female portions of an  
20  embodiment of the canalphone coupler of FIG. 1.

21  **[0023]**     FIG. 13 is a male portion an embodiment of the  
22  canalphone coupler of FIG. 1.

23  **[0024]**     FIGS. 14-17 are female portions of an  
24  embodiment of the of the canalphone coupler of FIG. 1.

25  **[0025]**     FIG. 18 is an embodiment of the canalphone  
26  coupler of FIG. 1 before the mechanical joint is engaged.

27  **[0026]**     FIGS. 19-21 are male portions of an embodiment  
28  of the canalphone coupler of FIG. 1.

1   **[0027]**     FIG. 22 is a male portion of an embodiment of  
2   the canalphone coupler of FIG. 1.

3   **[0028]**     FIG. 23 is a female portion of an embodiment of  
4   the canalphone coupler of FIG. 1.

5   **[0029]**     FIG. 24 is a female portion of an embodiment of  
6   the canalphone coupler of FIG. 1.

7   **[0030]**     FIGS. 25-28 are female portions of an  
8   embodiment of the canalphone coupler of FIG. 1.

9   **[0031]**     FIG. 29-30 is an embodiment of the collar of  
10  the mechanical joint of the canalphone coupler of FIG. 1.

11  **[0032]**     FIG. 31 is a male portion of an embodiment of  
12  the canalphone coupler of FIG. 1.

13  **[0033]**     FIG. 32-33 is an embodiment of the collar of  
14  the mechanical joint of the canalphone coupler of FIG. 1.

15  DETAILED DESCRIPTION

16  **[0034]**     Embodiments will now be described more fully  
17  hereinafter with reference to the accompanying drawings,  
18  in which preferred embodiments are shown. Like numbers  
19  refer to like elements throughout, like numbers with  
20  letter suffixes are used to identify similar parts in a  
21  single embodiment, and letter suffix lower case n is a  
22  variable that indicates an unlimited number of similar  
23  elements.

24  **[0035]**     With reference now to Fig. 1, a canalphone  
25  system 10 is initially described. In one embodiment, the  
26  system 10 includes a canalphone coupler 12, and four  
27  connectors 14a-14n carried by the canalphone coupler of  
28  which at least two of the four connectors carry an  
29  acoustical signal. The acoustical signal is analog,

1 digital, optical, electrical, and/or the like, for  
2 example. The four connectors 14a-14n comprise electrical  
3 contacts, electrical connectors, optical connectors,  
4 audio connectors, and/or the like, for instance. The  
5 system 10 also includes a mechanical joint 16 that joins  
6 the canalphone coupler 12 to a cable 18 where the  
7 mechanical joint is assembled and/or disassembled by a  
8 user (not shown). The cable 18 is connected to a  
9 canalphone 11 and/or an acoustical signal source 15, for  
10 example.

11 **[0036]** The mechanical joint 16 is temporary, semi-  
12 permanent (needs a tool and/or more effort to undue than  
13 the temporary version), and/or permanent, for instance.  
14 The mechanical joint 16 comprises a screw joint, snap fit  
15 assembly, retaining ring assembly, annular locks, and/or  
16 the like, for example. In one embodiment, the mechanical  
17 joint 16 includes a knurled section to aid user assembly  
18 and/or disassembly.

19 **[0037]** In one embodiment, the system 10 further  
20 includes a locator 20 carried by the mechanical joint 16  
21 that properly positions the four connectors 14a-14n  
22 during mating with the cable 18. For example, the locator  
23 20 comprises a keyed joint, mated splines, a Hirth joint,  
24 and/or the like.

25 **[0038]** In one embodiment, one of the four connectors  
26 14a-14n comprises a ground connector 14a, one of the four  
27 connector comprises a low connector 14b, and at least two  
28 of the fours connector comprise a mid connector 14c, a  
29 high connector 14d, and a microphone connector 14e. In

1 another embodiment, the low connector 14b carries a low  
2 frequency portion of the acoustical signal, the mid  
3 connector 14c carries a mid frequency portion of the  
4 acoustical signal, the high connector 14d carries a high  
5 frequency portion of the acoustical signal, and/or the  
6 microphone connector 14e carries the microphone portion  
7 of the acoustical signal.

8 **[0039]** In one embodiment, the mid connector 14c is  
9 bonded to the high connector 14d. In other words, there  
10 is a ground connector 14a, a low connector 14b, a mid  
11 connector/high connector 14c/14d, and a microphone  
12 connector 14e, for instance. In another embodiment, the  
13 four connectors 14a-14n are recessed into the canalphone  
14 coupler 12 to aid in protecting the four connectors 14a-  
15 14n.

16 **[0040]** In one embodiment, the mechanical joint 16 does  
17 not rely on any of the four connector 14a-14n to join the  
18 canalphone coupler 12 to the cable 18. Stated another  
19 way, the mechanical joint 16 holds the canalphone coupler  
20 12 to the cable 18 without any aid from the four  
21 connectors 14a-14n. In another embodiment, the four  
22 connectors 14a-14n do aid the mechanical joint 16 in  
23 holding the canalphone coupler 12 to the cable 18.

24 **[0041]** In one embodiment, the system 10 additionally  
25 includes an attenuator 22 in communication with at least  
26 one of the low connector 14b, the mid connector 14c, and  
27 the high connector 14d. The attenuator 22 is passive,  
28 active, balanced, unbalanced, and/or the like, for

1 example. In another embodiment, the attenuator 22 is  
2 carried by the canalphone coupler 12 and/or the cable 18.

3 **[0042]** In one embodiment, the attenuator 22 is added  
4 or removed by the user. In other words, system 10 works  
5 with or without the attenuator 22.

6 **[0043]** In one embodiment, the attenuator is adjustable  
7 by the user. For example, the attenuator 22 is adjustable  
8 to provide an attenuation of the acoustical signal  
9 between 0-25 decibels for the low connector 14b, and 0-15  
10 decibels for the mid connector 14c and the high connector  
11 14d.

12 **[0044]** In an alternative embodiment, the system 10  
13 includes a canalphone coupler 12, and four connectors  
14 14a-14n carried by the canalphone coupler of which at  
15 least two of the four connectors carry an acoustical  
16 signal, and where one of the four connectors comprises a  
17 ground connector 14a, one of the four connectors  
18 comprises a low connector 14b, and where at least two of  
19 the four connectors comprise a mid connector 14c, a high  
20 connector 14d, and a microphone connector 14e. The system  
21 10 also includes a mechanical joint 16 that joins the  
22 canalphone coupler 12 to a cable 18 where the mechanical  
23 joint is assembled and disassembled by a user. The system  
24 10 further includes an attenuator 22 in communication  
25 with at least one of the low connector 14b, the mid  
26 connector 14c, and the high connector 14d.

27 **[0045]** Another aspect is a method, which is now  
28 described with reference to flowchart 28 of FIG. 5. The  
29 method begins at Block 30 and may include carrying an

1    acoustical signal with at least two of four connectors  
2    carried by a canalphone coupler at Block 32. The method  
3    may also include joining the canalphone coupler to a  
4    cable by a mechanical joint that is assembled and  
5    disassembled by a user at Block 34. The method ends at  
6    Block 36.

7    **[0046]**     In another method embodiment, which is now  
8    described with reference to flowchart 38 of FIG. 6, the  
9    method begins at Block 40. The method may include the  
10   steps of FIG. 5 at Blocks 32 and 34. The method may  
11   further include properly positioning the four connectors  
12   during mating with the cable via a locator at Block 42.  
13   The method ends at Block 44.

14   **[0047]**     In another method embodiment, which is now  
15   described with reference to flowchart 46 of FIG. 7, the  
16   method begins at Block 48. The method may include the  
17   steps of FIG. 5 at Blocks 32 and 34. The method may  
18   additionally include connecting an attenuator to at least  
19   one of the four connectors at Block 50. The method ends  
20   at Block 52.

21   **[0048]**     In another method embodiment, which is now  
22   described with reference to flowchart 54 of FIG. 8, the  
23   method begins at Block 56. The method may include the  
24   steps of FIG. 7 at Blocks 32, 34 and 50. The method may  
25   also include making the attenuator adjustable by the user  
26   at Block 58. The method ends at Block 60.

27   **[0049]**     FIGS. 9-33 are various embodiments of the  
28   connector. The numbers cited are millimeters. The male

1 and female portions of the connector are shown as well as  
2 such portions joined and/or about to be joined.

3 **[0050]** The terminology used herein is for the purpose  
4 of describing particular embodiments only and is not  
5 intended to be limiting. As used herein, the singular  
6 forms "a", "an" and "the" are intended to include the  
7 plural forms as well, unless the context clearly  
8 indicates otherwise. It will be further understood that  
9 the terms "comprises" and/or "comprising," when used in  
10 this specification, specify the presence of stated  
11 features, integers, steps, operations, elements, and/or  
12 components, but do not preclude the presence or addition  
13 of one or more other features, integers, steps,  
14 operations, elements, components, and/or groups thereof.  
15 It should also be noted that, in some alternative  
16 implementations, the functions noted in the block may  
17 occur out of the order noted in the figures. For example,  
18 two blocks shown in succession may, in fact, be executed  
19 substantially concurrently, or the blocks may sometimes  
20 be executed in the reverse order, depending upon the  
21 functionality involved.

22 **[0051]** The corresponding structures, materials, acts,  
23 and equivalents of all means or step plus function  
24 elements in the claims below are intended to include any  
25 structure, material, or act for performing the function  
26 in combination with other claimed elements as  
27 specifically claimed. The description of the embodiments  
28 has been presented for purposes of illustration and  
29 description, but is not intended to be exhaustive or

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1 limited to the embodiments in the form disclosed. Many  
2 modifications and variations will be apparent to those of  
3 ordinary skill in the art without departing from the  
4 scope and spirit of the embodiments. The embodiment was  
5 chosen and described in order to best explain the  
6 principles of the embodiments and the practical  
7 application, and to enable others of ordinary skill in  
8 the art to understand the various embodiments with  
9 various modifications as are suited to the particular use  
10 contemplated.

11 **[0052]** While the preferred embodiment has been  
12 described, it will be understood that those skilled in  
13 the art, both now and in the future, may make various  
14 improvements and enhancements which fall within the scope  
15 of the claims which follow. These claims should be  
16 construed to maintain the proper protection for the  
17 embodiments first described.

18

What is claimed is:

1. A system comprising:

a canalphone coupler comprising:

four connectors formed in a distal end thereof wherein at least two of the four connectors carry an acoustical signal and one of the four connectors comprises a ground connector, and

a threaded collar movably connected to the distal end of the canalphone coupler;  
a cable comprising:

four connecting portions configured to engage with the four connectors of the canalphone coupler, and

a threaded portion; and  
a mechanical joint that joins the canalphone coupler to the cable where the mechanical joint is assembled and disassembled by a user, the mechanical joint formed by engaging the threaded collar of the canalphone coupler with the threaded portion of the cable.

2. The system of claim 1 wherein one of the four connectors comprises a low connector and at least two of the four connectors comprise a mid connector, a high connector, or a microphone connector.

3. The system of claim 2 wherein at least one of the four connectors comprises a mid connector bonded to a high connector.

4. The system of claim 2 further comprising an attenuator in communication with at least one of the low connector, a mid connector, and a high connector.

5. The system of claim 4 wherein the cable carries the attenuator and at least half of the mechanical joint.

6. The system of claim 5 wherein the attenuator is added or removed by the user.

7. The system of claim 5 wherein the attenuator is adjustable by the user.

8. The system of claim 7 wherein the attenuator is adjustable between 0-25 decibels for the low connector, and 0-15 decibels for mid and high connectors.

9. The system of claim 1 wherein the mechanical joint does not rely on any of the four connectors to join the canalphone coupler to the cable.

10. A system comprising:

a canalphone coupler comprising:

four connectors formed in a distal end thereof wherein at least two of the four connectors carry an acoustical signal, and where one of the four connectors comprises a ground connector, one of the four connectors comprises a low connector, and where at least two of the four connectors comprise a mid connector, a high connector, or a microphone connector, and

a threaded collar movably connected to the distal end of the canalphone coupler;

a cable comprising:

four connecting portions configured to engage with the four connectors of the canalphone coupler, and

a threaded portion;

a mechanical joint that joins the canalphone coupler to the cable where the mechanical joint is assembled and disassembled by a user, the mechanical joint formed by engaging the threaded collar of the canalphone coupler with the threaded portion of the cable; and

an attenuator in communication with at least one of the low connector, a mid connector, and a high connector, wherein the attenuator is carried by the cable.

11. The system of claim 10 wherein at least one of the four connectors comprises a mid connector bonded to a high connector.

12. The system of claim 10 wherein the attenuator is added or removed by the user.

13. The system of claim 10 wherein the attenuator is adjustable by the user.

14. The system of claim 10 wherein the mechanical joint does not rely on any of the four connectors to join the canalphone coupler to the cable.

15. A system comprising:

a canalphone coupler comprising:

four connectors formed in a distal end thereof wherein at least two of the four connectors carry an acoustical signal, where one of four connectors comprises a low connector, and one of the four connectors comprises a ground connector, and

a threaded collar movably connected to the distal end of the canalphone coupler;

a cable comprising:

four connection portions configured to engage with the four connectors of the canalphone coupler, and

a threaded portion;

a mechanical joint that joins the canalphone coupler to the cable where the mechanical joint is assembled and disassembled by a user, the mechanical joint formed by engaging the threaded collar of the canalphone coupler with the threaded portion of the cable, wherein the mechanical joint does not rely on any of the four connectors to join the canalphone coupler to the cable; and

an attenuator in communication with the low connector, wherein the attenuator is carried by the cable.

16. The system of claim 15 wherein the cable carries at least half of the mechanical joint.