United States Patent

Lang

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[54] MAGNETIC COUPLER

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[52] **U.S. Cl.**.....**179/1 PC,** 336/DIG. 2

[51] **Int. Cl.**.....**H01f 27/26**

[58] **Field of Search**.....179/1 PC, 1 C, 82; 200/51.09; 339/12; 336/110, DIG. 2

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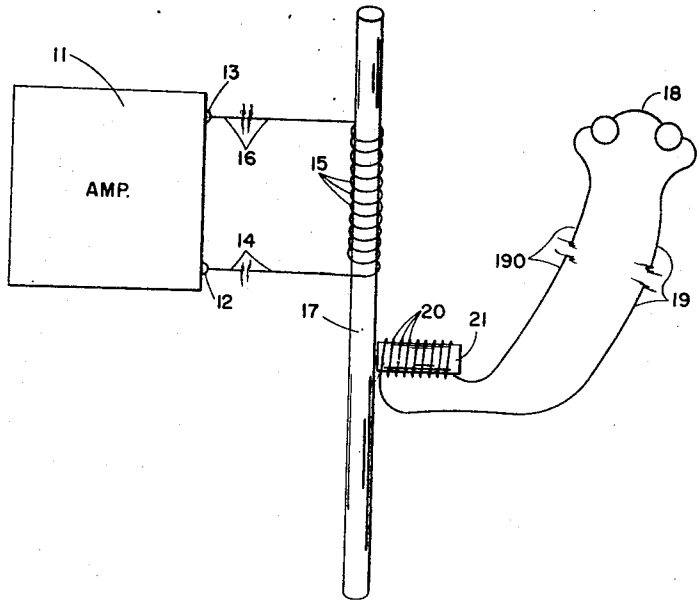
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Attorney—Joseph Zallen

[57] **ABSTRACT**

An easily attachable and detachable coupling for electrical systems, such as earphones to audio amplifiers, comprising a coil on a magnetically soft ferromagnetic body and a second coil mounted on a permanent magnet. The first coil can be connected to an audio signal and the second coil connected to a pair of earphones.

6 Claims, 4 Drawing Figures



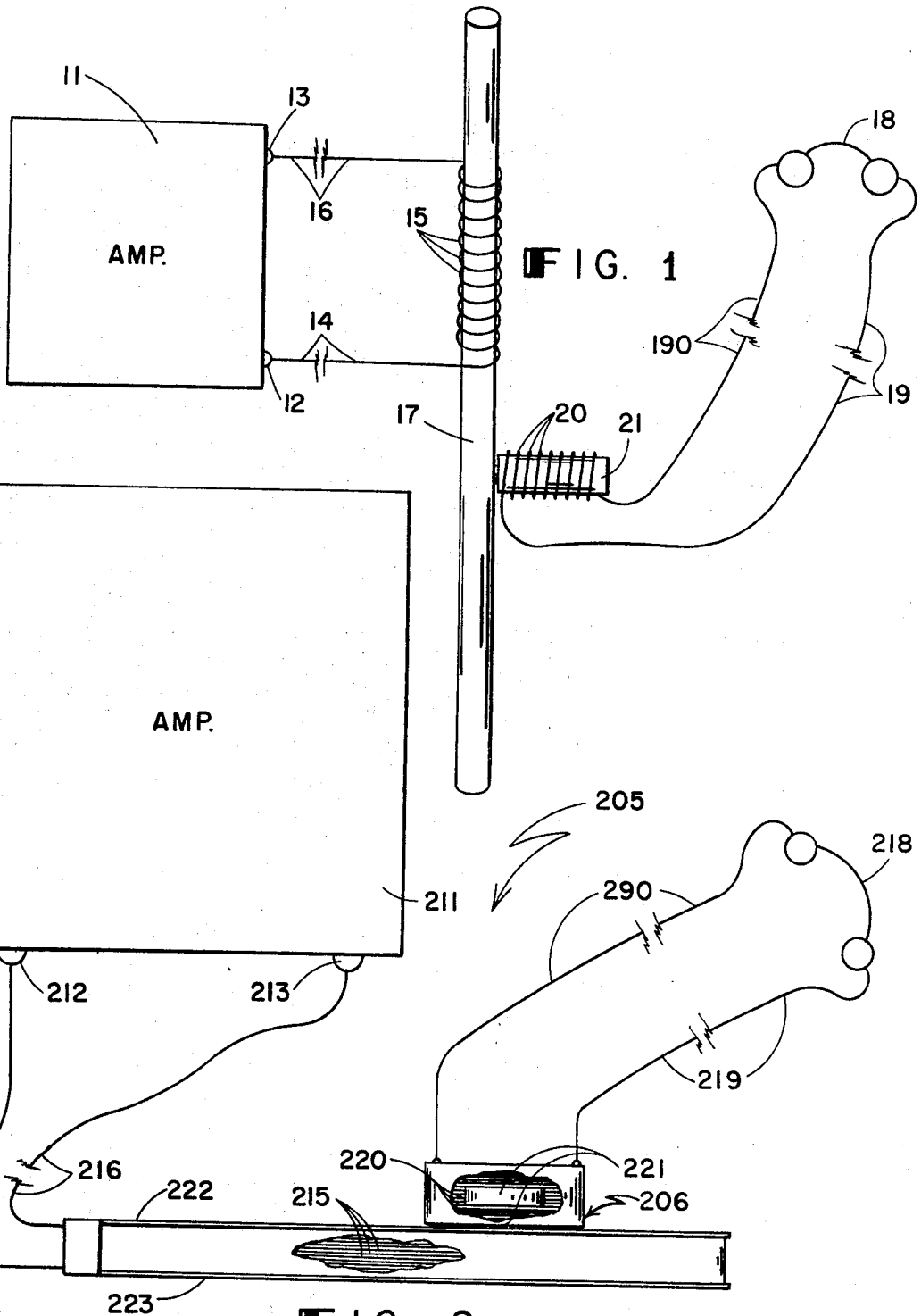

11
13
16
15
AMP.
14
12
18
190
19
17
20
21
AMP.
205
211
218
290
212
213
219
214
216
220
221
222
215
206
223

FIG. 1

FIG. 2

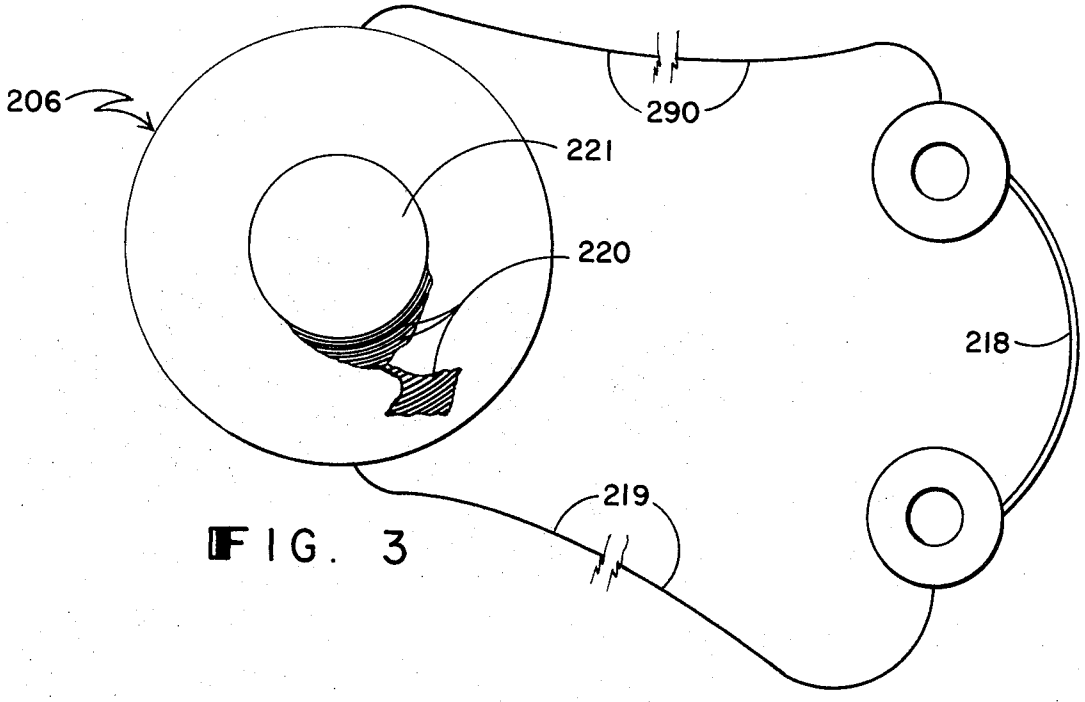

206
290
221
220
218
219

FIG. 3

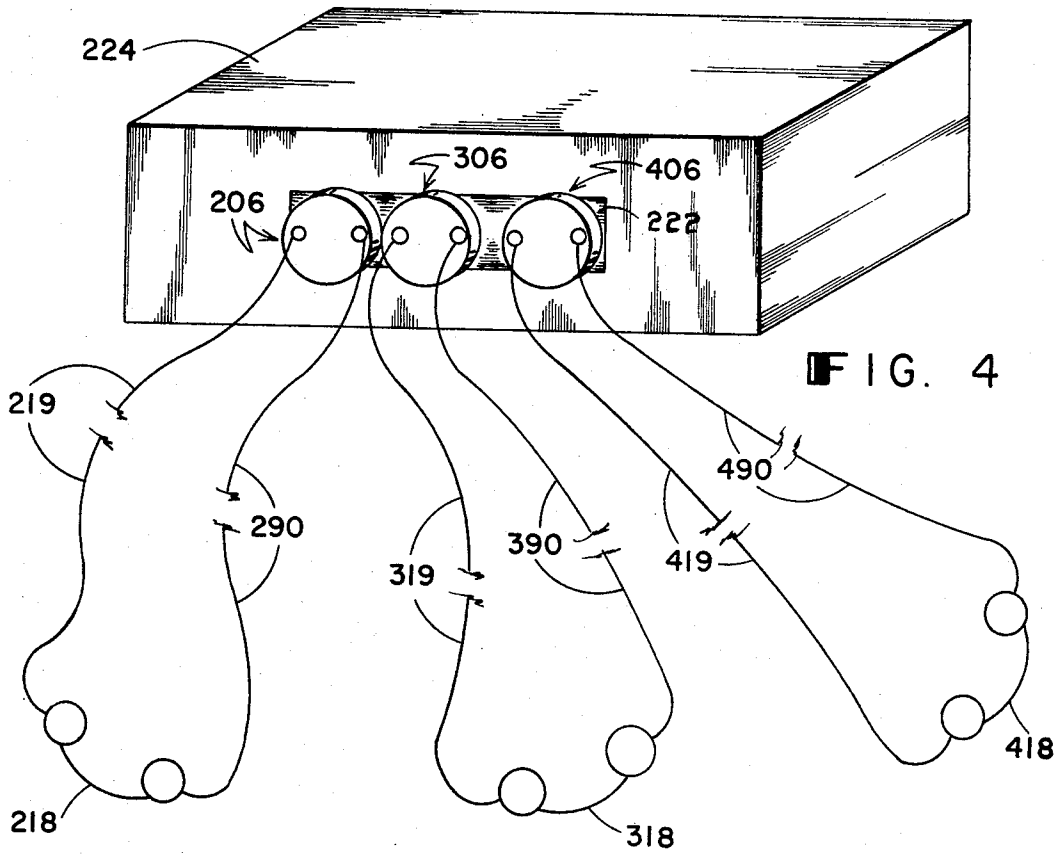

224
306
406
206
222
219
290
319
390
419
490
218
318
418

FIG. 4

MAGNETIC COUPLER

BACKGROUND OF INVENTION

This invention relates to a coupling of electrical systems. In particular it relates to an easily attachable and detachable coupling.

The common method of coupling electrical systems so that they may be easily attachable and detachable is by the use of plugs and jacks. However, plugs and jacks wear or distort from constant use and further require correct orientation for connection.

One object of this invention is to avoid the necessity of plugs and jacks which connect two pieces of electrical apparatus.

A further object of this invention is to provide easily attachable and detachable coupling means which do not require the fixed orientation of plugs and jacks.

Another object of this invention is to provide such a coupling means which can be used to convert earphones to the output of an audio amplifier such as is used in radios, phonographs, and common receivers.

Other objects and advantages of this invention will be apparent from the description and claims which follow taken together with the appended drawings.

SUMMARY OF INVENTION

The invention comprises broadly an easily attachable and detachable coupling for electrical systems in the form of two coils. The first coil is mounted adjacent a magnetically soft ferromagnetic body and is adapted to be connected across the output of an alternating current source. The second coil is mounted adjacent a permanently magnetized body and adapted to be connected across the input of a transducer. When the second coil is positioned adjacent to the first coil there is magnetic attachment and also inductive electrical coupling.

The alternating current source can be a power source or a source of signal of audio frequency. In the former case, the transducer, as for example an electric razor, receives its power from the first coil inductively and is very easily attached and detached.

Where the transducer is a loud speaker or a pair of earphones, the audio output which is inductively transmitted from the first to the second coil, is transformed into sound.

The first coil is preferably wound around the metal core which can be solid or laminated magnetically soft ferromagnetic material. The second coil is preferably around a permanently magnetized body made for example from permanently magnetized alloys such as aluminum, nickel,colbalt (Alnico 5) or magnetic ceramic material.

The degree of efficiency of energy transferred is dependent on the number of turns of wire in the coils. Where the first coil is relatively elongated, a plurality of second coils may be attached to the same first coil. In this case a multiple number of transducers can be separately coupled to the same source of alternating current in a very rapid manner.

The second coil can be made of a small permanent magnet surrounded by the coil, both being molded in plastic or similar insulating material with a plastic cover wire leading to the transducer, as for example, a pair of earphones. This takes the place of the conventional earphone wire and plug combination.

One of the advantages of this invention is that a great number of transducers, as for example, sets of earphones, may be connected to a single metal strip. The metal strip can be part of the design of the source of alternating current, e.g., the amplifier, thus, increasing both its strength and appearance.

In addition, contrary to plugs and jacks, an inadvertent movement of the second coil would not cause any damage but merely pull it off the metal strip.

In addition, I have found it is feasible to have separate metal strips each connected to a different alternating current source mounted in close proximity. With such an arrangement, a plurality of second coils could be used to select different alternating current sources without interference. Where these sources are separately and differently programmed audio amplifiers the array of metal strips and plurality of second coils attached to earphones or loud speakers produces a very compact and extremely flexible audio switching system.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a schematic view showing a pair of earphones coupled to an audio amplifier.

FIG. **2** is a schematic view showing a pair of earphones coupled to an audio amplifier wherein a side view with partial cutaway illustrates a specific coupling structure.

FIG. **3** is a partially schematic view of FIG. **2** showing a greatly enlarged bottom view of component **206**.

FIG. **4** is a partially schematic view showing three earphones coupled to the amplifier.

SPECIFIC EXAMPLES OF INVENTION

Referring now to the drawings, audio amplifier, which acts as an alternating current source, **11** has a wire **14–15–16** connected to its output terminals **12** and **13**. Wire portion **15** is in a form of a coil wound on an elongated magnetically soft, ferromagnetic core **17**. A pair of earphones **18** has its terminals connected to wire **19–20–190**. Portion **20** of said wire is wound in the form of a coil on a permanently magnetized core **21**. When the permanently magnetized core **21** with its coil **20** is brought adjacent to elongated core **17**, core **21** is held in position on core **17** by magnetic attraction. At the same time, coil **20** is inductively coupled with coil **15**. In this manner the earphones **18** are coupled to the amplifier **11** by simply placing the core **21** with its coil **20** in a selected position on core **17**.

The embodiment illustrated in FIGS. **2** and **3** differs slightly in that the corresponding coils have their axes parallel rather than perpendicular as in FIG. **1**. Connected to the terminals **212** and **213** of amplifier **21** is a wire **214–216**. Portion **215** is in a form of a coil whose ends are covered by magnetically soft ferromagnetic plates **222–223**. The terminals of the pair of earphones **218** are connected to wire **219–220–290**. Portion **220** of the wire is in the form of a coil wound on a permanently magnetized core **221** covered by insulation so that the combination of coil **220** and core **221** provides a cylindrical disc **206** having a flat bottom face. Disc **206** can be positioned where desired on plate **222**. When so positioned, it will be held in place by magnetic forces and will also have its coil portion **220** inductively coupled to coil **215**.

The embodiment illustrated in FIG. **4** is essentially a multiple of that illustrated in FIG. **2**. Thus, the exterior plate **222** of the coil plate assembly **215–222–223** is mounted flush in the wall of the housing for amplifier **224**. Earphones **218–318–418** are shown magnetically and inductively coupled to the amplifier **224** by the simple placing of their corresponding coil-cores **206–306–406** on the plate **222**. The earphone assembly **318** and **418** are of similar construction to earphone assembly **218**. Thus, comprising respectfully a wire **319–390** connected to the earphone terminals and including a coil wound on the permanent magnetic core of **306** and a wire **419–490** connected to the earphones and including a coil portion wound on the permanently magnetized core of **406**.

I claim:

1. An easily attachable and detachable coupling for electrical systems comprising:

a. a coil (**15**) mounted adjacent a magnetically soft ferromagnetic body (**17**) and adapted to be connected across the output of an alternating current source (**11**); and

b. a second coil (**20**) mounted adjacent a permanently magnetized body (**21**) and adapted to be connected across the input of a transducer (**18**);

positioning of the second coil (**20**) adjacent the first coil (**15**) providing inductive electrical coupling as well as magnetic attachment.

2. The coupling of claim 1 wherein the alternating current source is a source of signal of audio frequency and the transducer transforms the audio signal into sound.

3. The coupling of claim 1 wherein the magnetically soft ferromagnetic body is a core on which the first coil is wound.

4. The coupling of claim 1 wherein the magnetically soft ferromagnetic body comprises a plate covering the end of the first coil.

5. The coupling of claim 1 wherein the permanently magnetized body is a core on which the second coil is wound.

6. The coupling of claim 1 wherein a plurality of second coils are positioned on first coil.

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