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(58) Field of search
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H2H
Selected US specifications from IPC sub-classes
H04B H05B

(54) Transmission of power and/or data

(57) A system in which power or data is transmitted across a panel/bulkhead (14) by means of a low frequency magnetic coupling between a pair of transmission and receiving coils (12,16) disposed on the two sides of the panel/bulkhead (14), respectively. The system can include a panel mounting lamp unit (22) comprising the receiving coil (16) in series with a diode (18) and an LED (20), the latter components being mounted together in or on a common housing which is adapted to be fitted to the panel/bulkhead (14) at a position opposite to the transmission coil (12). Data from a computer (28, Fig 5) may be coupled to a transmitter (38) via a modulator (32) for reception by a receiver (42).

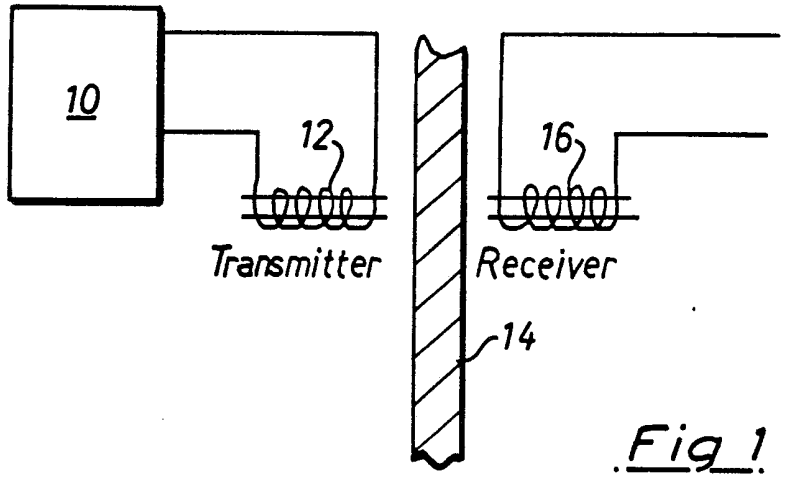

Fig 1

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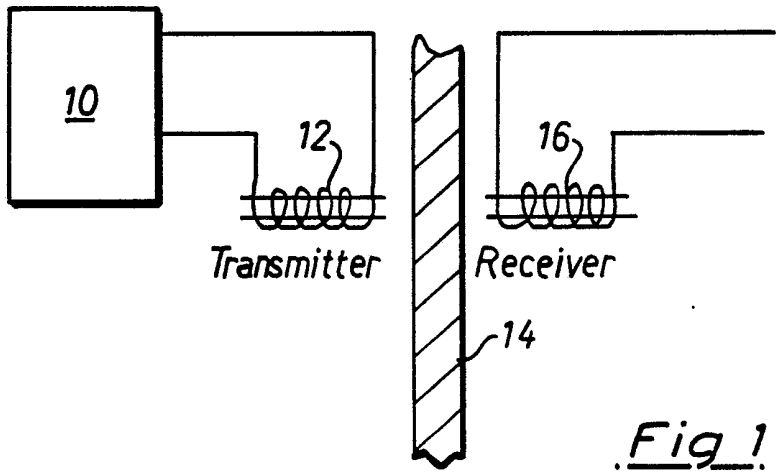


Fig 1

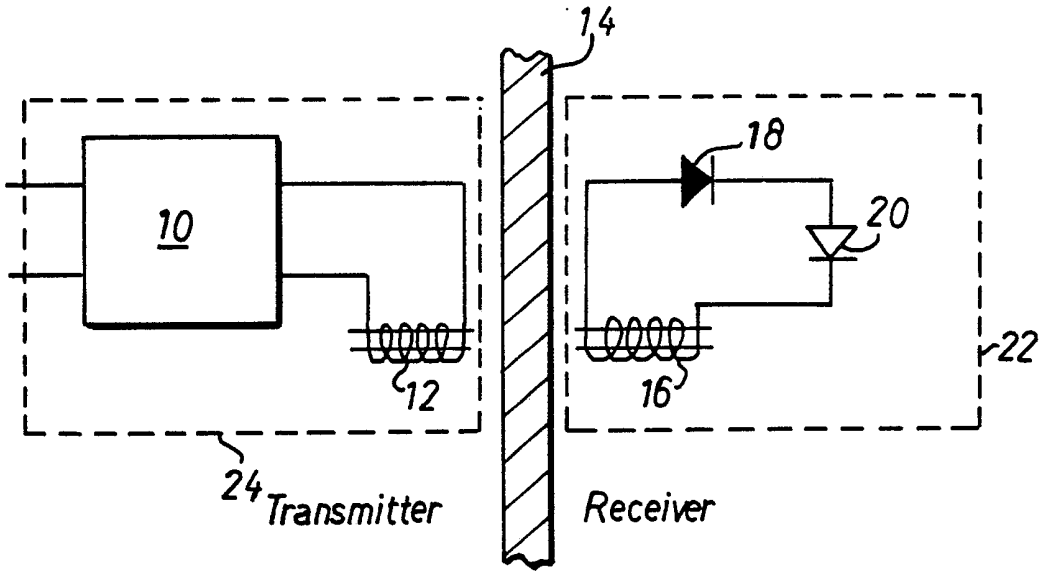
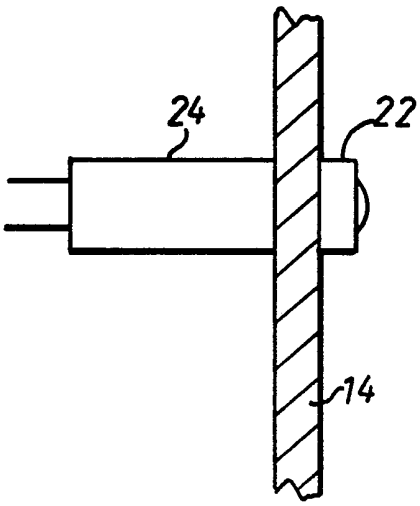


Fig 2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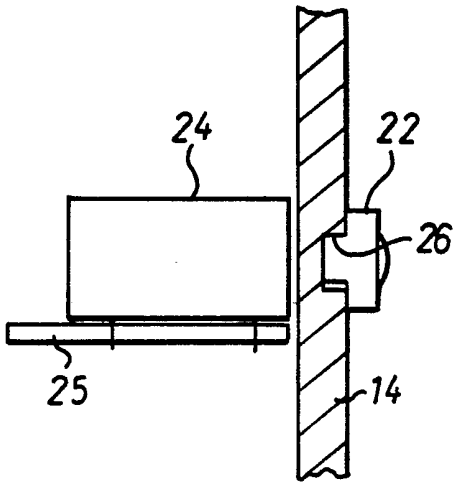
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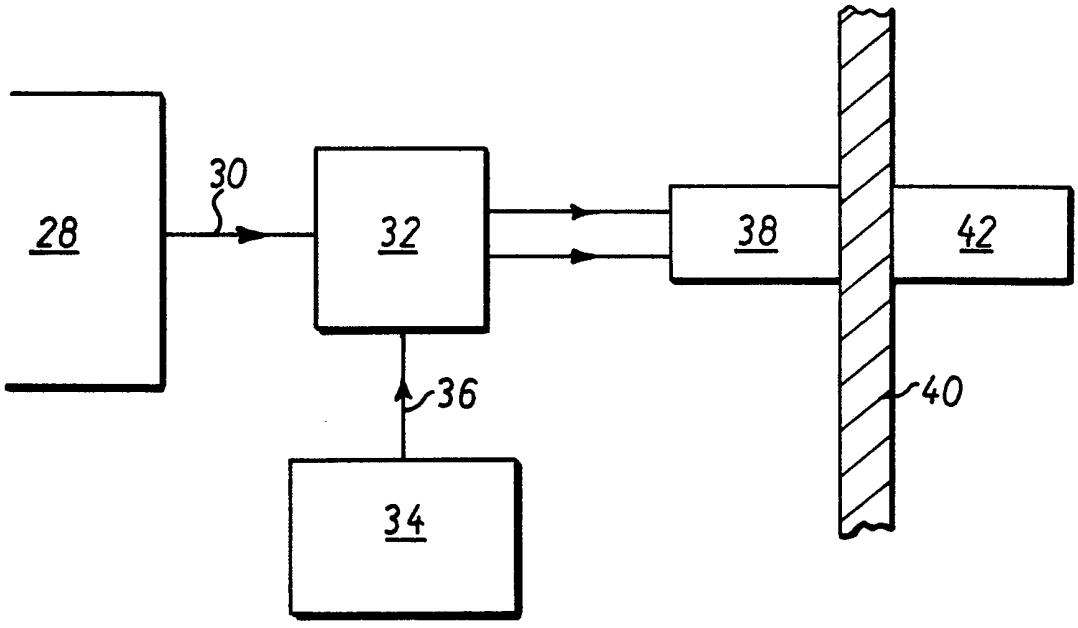
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Transmission of power and/or data

The present invention is concerned with a means of transmitting power and/or data through a solid member, such as an instrument panel or bulkhead.

There exist many engineering situations where it would be very advantageous if power and/or data could be transmitted locally between two adjacent positions which are separated by a solid wall, such as a metal plate forming an instrument panel or bulkhead. It is, of course, known in principle to transmit power and data using radio waves. However, where a number of transmissions are to be made in closely adjacent positions, radio transmissions have the disadvantage that interference between separate transmission is virtually impossible to avoid with very costly and complex filtering circuitry.

It is one object of the present invention to provide a system which avoids the above-discussed disadvantage of radio waves and which enables large numbers of individual transmitter/receiver pairs to be positioned in relatively close proximity to each other without mutual interference between adjacent channels.

It is another object of the present invention to provide a panel mountable indicator lamp which can be energised from within a housing structure without requiring any wiring connection through the housing wall.

In accordance with the present invention in its broadest aspect, there is provided a system in which power or data is transmitted across a panel/bulkhead by means of a low frequency magnetic coupling between a pair of transmission and receiving coils disposed on the two sides of the panel/bulkhead, respectively.

Preferably, the coils are iron-cored so as to produce a concentrated magnetic field. A typical operating frequency is of the order of 200 Hz.

In one type of embodiment, the receiving coil is mounted in series with a rectifier and an LED lamp to form a lamp unit. Preferably, the latter components are encapsulated to form said lamp unit.

Such a lamp unit can be mounted on a panel/bulkhead by any convenient means, e.g. by adhesive or by the use of a blind, screw-threaded hole in the panel/bulkhead.

In accordance with a second aspect of this invention, there is provided a panel mounting lamp unit comprising a magnetic pick-up coil in series with a diode and an LED, the latter components being mounted together in or on a common housing which is adapted to be fitted to a panel/bulkhead at a position opposite to a magnetic transmission coil disposed on the other side of the panel/bulkhead and capable of emitting a low-frequency magnetic field.

By arranging for the lamp unit to be fitted to the panel/bulkhead without penetrating right through

it, the lamp unit can be powered and controlled from the transmission coil side of the panel/bulkhead without requiring any mechanical through-connection.

The invention is described further hereinafter, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a circuit diagram of a basic arrangement in accordance with the present invention;

Fig. 2 is a circuit diagram of a second arrangement in accordance with the present invention for transmitting power through a panel;

Figs. 3 and 4 show diagrammatically two possible forms of panel-mounted indicator lamps incorporating the present invention; and

Fig. 5 is a block circuit diagram of an arrangement in accordance with the present invention for the transmission of both power and data through a panel or bulkhead.

Referring first to Fig. 1, there is shown an osullator 10 energising a transmitter coil 12 to create an alternating electromagnetic flux. This flux penetrates through a panel/bulkhead 14 and induces an E.M.F. in a receiver coil 16.

The transmitter current may be modulated in order to convey information to a demodulator in the receiver. Alternatively, a basic sinusoidal transmitter could convey power to the receiver, which may be rectified (see below).

Such systems can operate with a wide variety of panel/bulkhead materials. For example, aluminium and its alloys, plastics and stainless steel are all suitable. Ferrous materials will also function, although with limitations on maximum panel thickness.

Panel mounted components, such as indicator lamps, of conventional design require a through mounting hole which must then be sealed to prevent the ingress of dust, liquids, gasses etc. In some instances the seal must be hermetic, which may be difficult to maintain in the event of bulb changing, rewiring etc.

In the arrangement of Fig. 2, the receiver includes a diode 18 in series with an indicator LED 20 and the receiver coil 16. The elements 16, 18 and 20 can be encapsulated to form a unitary component 22 which requires no through mounting hole. Panel sealing integrity is therefore maintained even if any of the elements of the component 22 or the component 22 itself, have to be changed. A zero leakage characteristic for the housing is therefore inherent in this system. The transmitter components can be similarly encapsulated in a transmitter unit 24.

The receiver unit 22 can be mounted by any convenient means, two examples being shown in Figures 3 and 4. In the example of Fig. 3, the transmitter and lamp/receiver units 24, 22 are mounted on the panel/bulkhead 14 by means of a suitable adhesive. In the example of Fig. 4, the lamp/receiver unit 22 is mounted

in a blind threaded hole 26 and the transmitter unit 24 is mounted on a printed circuit board 25. Typical panel thicknesses may be in the range of 3mm to 6mm but the invention is not limited to this range.

Using the aforegoing system, it will be appreciated that the following advantages can be obtained :-

1. Lamps may be replaced (either for repair or colour change) without breaking the panel seal. This can be of particular use in applications where the equipment is exposed to hazardous materials, e.g. in the chemical industry.

2. A lamp/receiver unit 22 can be used to interrogate an instrument's output state and then removed for security reasons.

3. Panel drilling is unnecessary and allows a manufacturer to change panel designs by moving the mounting position of lamps.

In further applications, data can be superimposed on a carrier and transmitted through a panel. This possiblity is illustrated in Fig. 5 where a data system 28, such as a computer, supplies a control signal on a line 30 to a modulator 32 in which a carrier signal (e.g. 200 Hz), provided by an oscillator 34 on a line 36, can be modified to form a modulated signal to a transmitter 38. Data superimposed on the carrier can thereby be transmitted through the panel 40. Carrier can then be demodulated to power and control a receiver

unit. Two-way transmission is possible with such a system.

It is preferred to use iron-cored transmission and pick-up coils 12, 16 in the present system so as to produce a concentrated magnetic field. Due to the concentrated and localised nature of the field, indicator lamps can be densely packed without interference problems arising since cross-talk between lamps sharing the same panel will not provide sufficient coil voltage to overcome the LED forward voltage of other receiver devices.

Preferably, the transmitted electromagnetic signal is of sinusoidal form but any other suitable waveshape may be used within the ambit of the invention.

CLAIMS

1. A system in which power or data is transmitted across a panel/bulkhead by means of a low frequency magnetic coupling between a pair of transmission and receiving coils disposed on the two sides of the panel/bulkhead, respectively.

2. A system as claimed in claim 1, wherein the coils are iron-cored so as to produce a concentrated magnetic field.

3. A system as claimed in claim 1 or 2, wherein the receiving coil is mounted in series with a rectifier and an LED lamp to form a lamp unit.

4. A system as claimed in claim 3, wherein the receiving coil, the rectifier and the LED are encapsulated to form said lamp unit.

5. A system as claimed in claim 3 or 4, wherein the lamp unit is adapted to be mounted on the panel/bulkhead by an adhesive or by the use of a blind, screw-threaded recess in the panel/bulkhead.

6. A system as claimed in any of claims 1 to 5, wherein, in order to transmit data through the panel/bulkhead, the low frequency electromagnetic field transmitted by the transmission coil is modulated by a data signal, the corresponding signal generated in the receiving coil being correspondingly demodulated to recover the data.

7. A system as claimed in any of claims 1 to 5, wherein the transmission coil produces an alternating or electromagnetic field having a frequency of the order of 200Hz.

8. A panel mounting lamp unit comprising a magnetic pick-up coil in series with a diode and an LED, the latter components being mounted together in or on a common housing which is adapted to be fitted to a panel/bulkhead at a position opposite to a magnetic transmission coil disposed on the other side of the panel/bulkhead and capable of emitting a low-frequency magnetic field.

9. A panel mounting lamp unit as claimed in claim 6, wherein the pick-up coil, the diode and the LED are encapsulated to form said lamp unit.

10. A panel mounting lamp unit as claimed in claim 6 or 7, wherein the lamp unit is adapted to be mounted on the panel/bulkhead by an adhesive or by the use of a blind, screw-threaded recess in the panel/bulkhead.

11. A system for transmitting power or data across a panel/bulkhead, substantially as hereinbefore described with reference to the accompanying drawings.

12. A panel mounting lamp unit substantially as hereinbefore described with reference to and as illustrated in Fig. 2, 3 or 4 of the accompanying drawings.

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