

Coupling Part

The invention concerns a coupling part which a counterpart fits into and to which a cable with at least one conductor and at least one layer of insulation can be connected.

Examples of coupling parts of this type are plugs and sockets to which a cable can be connected. A plug and a socket can be used to connect two cables together or a cable to a piece of equipment. In the communication field both electric cables and optical cables are utilised. For each of these two types of cable a corresponding coupling part is necessary.

From DE-OS 3338232 there is known a plug element to which is connected an electrical cable with a plurality of insulated conductors. In addition to the electrical conductors there is provided an optical indicating line, which at its first end is connected to an optical transmitter and at its other end to an optical receiver. The optical transmitter and the optical receiver are each located in a plug element. The plug elements however are only equipped with electrical contacts. Accordingly it is not possible to transmit optical signals by means of two inter-connected plug elements.

From EP-A 0164993 there is known a coupling part for an optical conductor which is additionally equipped with an electrical contact for an electrical conductor. In order to be able to transmit optical as well as electrical signals, an optical conductor and additionally an electrical cable are to be connected to this coupling part.

The object of the invention is to construct a coupling

part such that upon connection to a cable with at least one conductor and one optically-transparent insulating layer, it can transfer electrical and also optical signals.

The invention achieves this object in that at the location where the insulating layer of the cable adjoins, the coupling part is constructed to be optically transparent for optical coupling purposes.

Figure 1 shows an embodiment of a coupling part according to the invention;

Figure 2 shows a counterpart fitting the embodiment;

Figure 3 shows an interconnection of the coupling parts of Figures 2 and 3;

Figure 4 shows an information transmission system comprising a video-recorder and a television set.

The invention will now be explained with reference to the figures.

In a combination comprising a video-recorder V and a television set S the video signals are transferred via a coaxial cable. The control signals which are also to be transferred in addition to the video signals can, for example, be transferred in an optical path if the insulating layer serving as a dielectric between the inner and outer conductors of the coaxial cable is manufactured of optically conducting material. In other consumer electronics appliances, for example between a CD-player and an amplifier, information is transferred via a simple cable. In this case also further information channels can be created if the

insulating layer of the cable consists of optically conducting material. Thus apart from the electrical signals or the mains voltage in the case of a mains cable optical signals can also be transferred if the insulating layer of the cable is manufactured from optically conducting material. In order to connect such cables to each other or to an appliance, special coupling parts are necessary however.

In Fig.1 there is shown a coupling part VS constructed as a plug to which a single conductor cable K is connected.

The plug VS is closed outwardly by a tubular sleeve H, which is positioned partly over the cable K. In the interior of the sleeve H there is centrally arranged a pin S, which is electrically conductively connected with the conductor A of the cable K. Between the pin S and the tubular sleeve H a tubular optical coupling L is embedded, for which is preferably selected the same cross-section as for the insulating layer I of the cable. The insulating layer I of the cable K can adjoin the optical coupling L, however it does not have to because the optical connection is at most attenuated by an empty space between the insulating layer I and the optical coupling L, but is in no way interrupted. The light indicated by arrows radiates from the insulating layer I into the optical coupling L, at the front end of which it emerges and for example radiates into the optical coupling of a socket VB which fits the plug and which is illustrated in longitudinal section in Fig.2.

The outside of the socket VB in Figure 2 terminates in a sleeve H which is located partly over the cable K. A tubular opening R is arranged centrally in the sleeve H for accommodating the pin S on the plug VS and is

electrically connected to the conductor A of cable K. Embedded between the tubular opening R for accommodating the pin S in plug VS is an also cylindrical optical coupling L, for which preferably the same cross-section is selected as for the insulating layer I of the cable K. As with the plug VS in Figure 1, the insulating layer I of the cable K can adjoin the optical coupling L but need not do so, because the optical connection is not interrupted by a space between the insulating layer I and the optical coupling L. The light, indicated by arrows, leaves the optical coupling L of the plug VS illustrated in Figure 1 and enters the optical coupling L in socket VB, from the end of which it radiates into the insulating layer I of the cable K.

The cable K can be secured in the plug VS or the socket VB by known threaded, crimped, or soldered connections. The pin S of the plug VS is secured in the tubular opening R of the socket VB by a resilient or wiping contact, and this establishes the electrical connection between the pin S and the tubular opening R.

When, as illustrated in Figure 1 for example, the light radiates from the transparent insulating layer I into the optical coupling L, it is of advantage for the cross-section of the optical coupling L to be larger than that of the insulating layer I to ensure that all the light leaving the insulating layer is intercepted by the optical coupling.

If on the other hand as illustrated in figure 2 the light radiates from the optical coupling L into the optically conductive insulating layer I of the cable K, it is of advantage for the cross-section of the optical coupling L to be selected smaller than the cross-section of the insulating layer I to ensure that all the light

leaving the optical coupling L is intercepted by the insulating layer I of the cable K.

If light is to be transmitted alternately in both directions, however, it will be more effective to select the same cross-section for the optical coupling L and the insulating layer I.

The socket VB can, however, also be mounted as illustrated in Figure 3 in the housing G of a piece of equipment. The cable K is connected to the socket VB by the plug VS. At the equipment end an optical transmitter OS and/or receiver OE can be connected to the optical coupling L of the socket VB for example.

With reference to the information-transmission system illustrated in Figure 4 one way of employing the coupling part in accordance with the invention will now be described.

A video recorder V is connected to a television set F by a coaxial cable KA with an insulating layer which serves as a dielectric and which is made of highly optically conductive material. The ends of the coaxial cable KA are secured in plugs VS for example, as illustrated in Figure 1. Mounted on the appliances, the video recorder V and the television set F, are sockets VB that match the plugs VS, and at the location where the optical coupling of the plug VS adjoins, are also provided with an optical coupling with an optical transmitter and/or receiver connected to its end remote from the plug VS. The light from the optical transmitter in whichever appliance is transmitting travels through the optical coupling of the socket to the optical coupling of the plug, thence through the coaxial cable, and via the optical coupling of the plug

and the socket to the optical receiver of whichever appliance is receiving.

Both the video recorder V and the television set F can be provided with an optical transmitter, an infrared-emitting diode for example, and an optical receiver to allow the transmission of information in both transmission directions.

Since the video signals are transmitted electrically and the control signals optically they have no effect on each other and moreover need not be separated from each other in the video recorder and the television set. Finally, there is no need for two different cables to transmit information, nor two connecting sockets at the video recorder and at the television for the two cables.

The coupling part in accordance with the invention, however, is not limited to the application described. The coupling part in accordance with the invention can be employed to simultaneously transmit information of any type both electrically and optically between any two devices, e.g. repeaters, terminal units, data banks, etc.

As already mentioned the coupling part in accordance with the invention is suitable for all cables with at least one conductor and at least one optically conductive layer of insulation, e.g. coaxial cable, power-transmission cable, ribbon cable, etc.

Claims

1. A coupling part (VS), onto which a counterpart (VB) fits and onto which a cable (K) with at least one conductor (A) and at least one insulating layer (I) can be connected, the coupling part (VS, VB) being equipped with at least one electrical and one optical contact, characterised in that at the point where the insulating layer (I) of the cable (K) adjoins, the coupling part (VS, VB) is designed to allow light to pass through for the optical coupling.
2. A coupling part according to claim 1, characterised in that at the point where the insulating layer (I) of the cable (K) adjoins, an optical coupling (L) made from optically conductive material is provided in the coupling part (VS, VB).
3. A coupling part according to claim 2, characterised in that the optical coupling (L) is built in tubular form.
4. A coupling part according to claim 2 or 3, characterised in that the same cross-section is chosen for the optical coupling (L) as for the insulating layer (I) of the cable (K).
5. A coupling part according to claim 2 or 3, characterised in that the cross-section of the optical coupling (L) is chosen to be smaller on the side facing the cable (K) than the cross-section of the insulating layer (I) of the cable (K).
6. A coupling part according to claim 2 or 3, characterised in that the cross-section of the optical coupling (L) is chosen to be larger on the side facing



the cable (K) than the cross-section of the insulating layer (I) of the cable (K).

7. A coupling part according to claim 2 to 6, characterised in that the front face of the optical coupling (L) facing the cable (K) is built in the form of a lens.

8. A coupling part according to claim 2 to 7, characterised in that an optical transmitter and/or receiver can be connected to the optical coupling (L).

9. A coupling part according to claim 2 to 8, characterised in that the coupling part (VS, VB) is fitted on the housing (G) of a device.

10. A coupling part according to claim 9, characterised in that the matching counterpart (VS) is connected to the coupling part (VB) fitted onto the housing (G) of the device, and that a cable (K) with an optically conductive insulating layer (I) is connected to said counterpart.

11. A coupling part according to claim 2 to 10, characterised in that the coupling part (VS) is realized as a plug.

12. A coupling part according to claim 2 to 11, characterised in that the coupling part (VB) is realized as a socket.

