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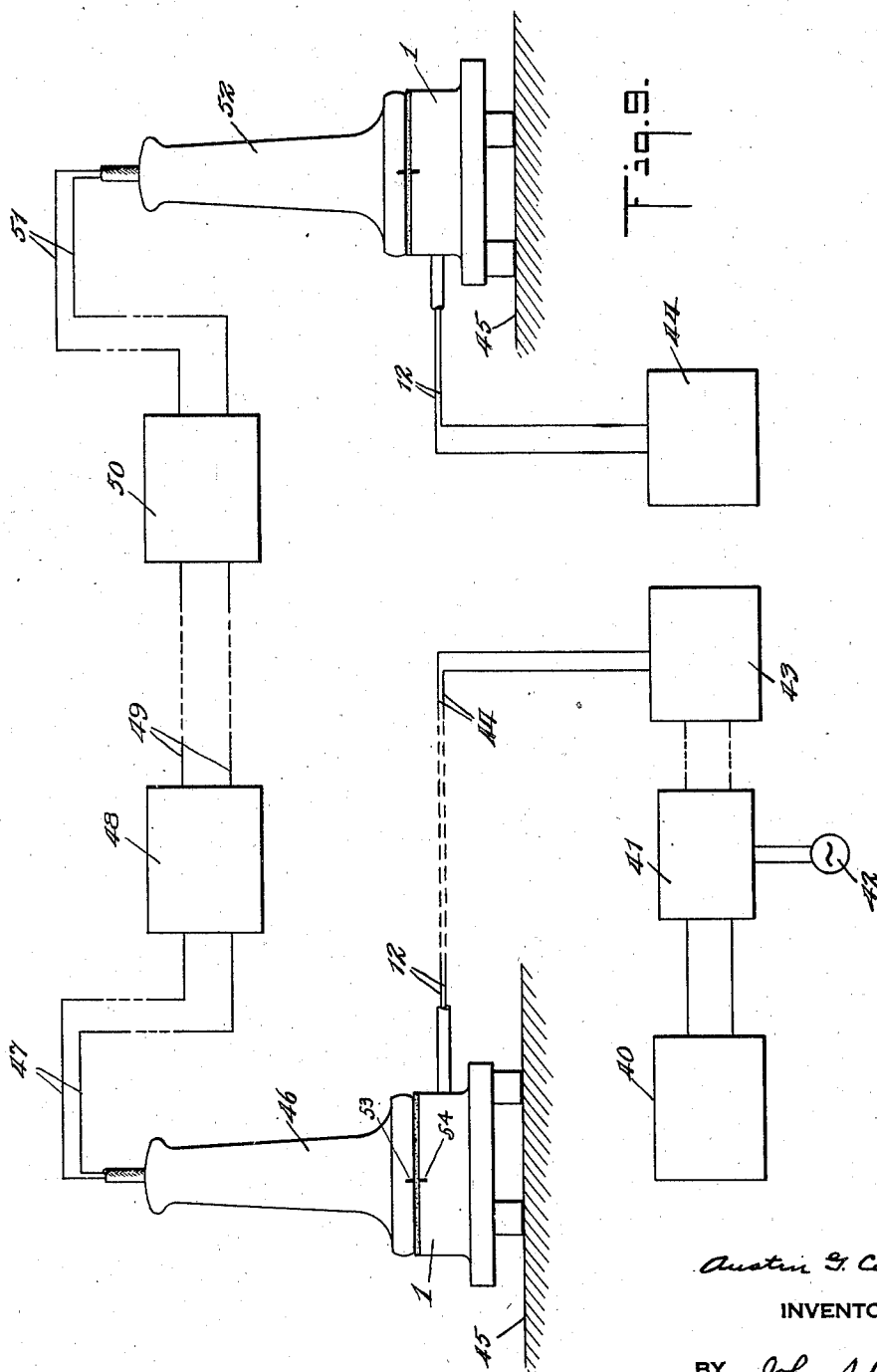
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COUPLING DEVICE FOR SIGNAL TRANSMISSION AND RECEIVING SYSTEMS

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COUPLING DEVICE FOR SIGNAL TRANSMISSION AND RECEIVING SYSTEMS

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This invention relates to electric communication systems and more especially to systems of communication over telephone lines and the like.

A principal object of the invention is to provide an improved apparatus for impressing signals on a telephone line without conductive connection thereto.

Another object is to provide a device for coupling a signal transmitter or a signal receiver electromagnetically to the ear-piece of any well-known form of telephone subscriber's set.

A feature of the invention relates to a coupling device of the type referred to whereby electromagnetic coupling of transmitting and receiving apparatus may be made to existing and well-known telephone terminal equipment without requiring any fastening of the device to the telephone apparatus.

Another feature relates to a simple, efficient and readily assembled coupling unit for electromagnetically coupling signalling transmitting and receiving apparatus to the ear-piece of any well-known form of telephone talking set.

A further feature relates to an improved electromagnetic coupling device of the type referred to whereby it may be easily placed on a table or other support and whereby the ear-piece of a telephone talking set can be readily placed thereon without fastening thereto, the coupling device being provided with a housing to permit incoming signals to be heard without disturbing the ear-piece.

Another feature relates to the novel organization, arrangement and relative location of parts which constitute an improved form of electromagnetic coupling and listening-in device.

Other features and advantages not specifically enumerated will be apparent after a consideration of the following detailed description and the appended claims. While the invention will be disclosed herein in connection with a system of transmitting pictures or facsimiles over a telephone line, it will be understood that the device according to the invention is capable of being used with any kind of signal generator or reproducer. Furthermore, inasmuch as signal generators and reproducers of many types are well-known in the art this part of the disclosure being addressed to those familiar with the art, is illustrated in diagrammatic form. Accordingly in the drawings:

Fig. 1 is a vertical elevational view, partly in section showing the coupling device according to the invention in conjunction with a conventional telephone ear-piece.

Fig. 2 is a side elevational view of Fig. 2, partly in section.

Figs. 3, 4, 5, 6 and 7 are detail views of parts of the coupling device of Figs. 1 and 2.

Fig. 8 is a bottom plan view of Fig. 1.

Fig. 9 is a schematic composite apparatus and circuit diagram to illustrate one application of the invention.

Referring more particularly to Figs. 1 and 2, the coupling device according to the invention comprises a base 1, preferably, although not necessarily of aluminum, hard rubber or other suitable material. Base 1 is provided with a series of channels 2 extending therethrough for purposes to be described. The central part of base 1 is shaped to form a circular recess 3 to receive and enclose the electromagnetic system of the coupling device. The electromagnetic system comprises a core or pile-up of U-shaped laminations 4 which are clamped together at their lower ends by a brass member 5 (Fig. 4) the laminations being spaced from the member 5 by fibre insulator strips 6 of the same shape and size as the laminations. The electromagnetic system also includes a pair of coils or windings 7, 8, each coil being positioned on a corresponding leg of the laminated core 4 and in order to insulate the windings from the member 5 there is interposed a fibre or other insulating washer 9 (Fig. 7). The core and windings are enclosed in a cylindrical brass member 10 having a slot 11 to allow the lead-in wires 12 to pass, it being understood of course that the wires 12 are provided with a suitable insulating sheath or covering 13. If desired the windings of coils 7 and 8 can be connected in series or parallel with the wires 12. The upper end of housing member 10 is provided with a tightly fitted brass cover 14 (Fig. 6) having a pair of slots 15, 16, through which the legs of the core pass. However, it is preferable to slit the portion of member 14 between the slots 15, 16, as indicated by the numeral 17. It will be understood of course that the coils 7, 8, are wound with insulated wire on suitable forms of insulation material as is wellknown in the art, the forms being such as to allow them to be slipped over the legs of the core 4. If desired, the coil forms may be tightly fitted on the core legs or separate fastening means may be employed. After assembly of the core and windings in the housing the latter may be filled with pitch or other suitable insulating material which upon hardening retains the core and windings in fixed relation.

The upper ends of the core laminations are

compressed together by a plug 18 (Fig. 3) of hard rubber or other non-magnetic material which fits tightly over the ends of the laminations. If desired the upwardly projecting ends of the core legs may be curved to correspond with the curvature of member 18 as shown in Fig. 3. For the purpose of fastening the electromagnetic system in place there is provided a brass ring 19 having a central circular opening into which the member 19 is fitted. Ring 19 also has a series of smaller openings 20 equal in number to and arranged to be aligned with the channels 2. Ring 19 is fastened in place against the base shoulder 21 by suitable screws or rivets 22. Preferably the member 10 is a press fit within the recess 3 so that once it is forced into place it is firmly held in place together with brazed elements 4 to 9.

The base 1 is provided with an annular rim 23 to which is fastened an annular sound deadening ring 24 of felt or similar material. In order to support the base in a sound deadening relation to a table or other support, it is provided with three or more soft rubber pedestals 25 fastened by screws 26. The members 25 also serve to space the base 1 away from the table so as to allow sound waves from the telephone ear-piece or receiver 27 to pass downwardly through the openings 20 and channels 2. By this means it is possible to listen in on received signals as reproduced by the telephone receiver, at the same time that signals are being transmitted by electromagnetic induction from the windings 7, 8, to the windings 28 of the telephone receiver.

The dimensions of the coupling device are so chosen as to conform to the dimensions of the conventional ear-piece or receiver of any well-known telephone talking set. Thus as shown in Figs. 1 and 2, the rim 23 is of such a size as to allow the rim 29 of the ear-piece 27 to rest thereon while allowing the portion 30 of the ear-piece cover to project below the rim 23. By this arrangement it is merely necessary in using the device to remove the ear-piece from the telephone switch-hook and place it as shown in Fig. 1 and the windings 28 will be automatically aligned with the windings 7, 8. It is not necessary to fasten the ear-piece to the base 1 and consequently the ear-piece can be turned at any time while it is resting on rim 23 to get the best transfer of electromagnetic energy from the coils 7, 8, to the coils 28. It will be understood that washers 24 of different thickness may be employed in order to achieve the desired spacing between the core 4 and the diaphragm 31 of the telephone ear-piece. Likewise if desired, the rim 23 instead of being integral with base 1 may be threaded on to base 1 so as to be able to adjust the spacing between the core 4 and the diaphragm 31. If desired, suitable marks (53, 54, Fig. 9) can be provided on the ear-piece and on the member 1 which when in alignment indicate that the magnetic poles of the ear-piece are in alignment with the ends of core 4 as shown in Fig. 2.

Referring to Fig. 9, there is shown in block diagrammatic form, a typical signalling system embodying the coupling arrangement shown in Figs. 1 to 8. In this figure, the numeral 40 represents any wellknown form of picture scanning mechanism by means of which the shade characteristics of successive elemental areas of a picture are translated into corresponding current impulses. These picture current impulses are then converted into a modulated carrier current of audio frequency, the audio carrier source

indicated schematically by the numeral 42. The modulated audio frequency carrier current may then be amplified in a suitable amplifier 43 the output of which may be connected by conductors 44 to the lead-in wires 12 of the coupling unit already described. Unit 1 rests upon a table or other support 45 and the telephone ear-piece 46 of the telephone subscriber's set is placed upon the device 1 as already described. When the devices 40, 41, 42 and 43 are set in operation, there is impressed upon the telephone subscriber's loop 47 a modulated alternating carrier current of audio frequency the modulations corresponding to the shade characteristics of the picture being transmitted, the subscriber's loop 47 connects the subscriber's telephone equipment with the telephone exchange 48. At the other end of the telephone line 49 the received currents pass through the local telephone exchange 50 and thence to the local subscriber's loop 51 where they are reproduced by the telephone ear-piece 52. The field magnets of the ear-piece 52 therefore, set up a magnetic field having a carrier frequency determined by the source 42 which is modulated in accordance with the picture being transmitted. The ear-piece 52 is placed on top of a coupling unit 1 as already described whereby there is introduced into the conductors 12 a similar current to that impressed upon the conductors 12 at the transmitter. The currents from conductors 12 at the receiver are then used to operate any wellknown form of picture scanning and reproducing mechanism designated generally by the numeral 44. For a detailed description of typical transmitting and receiving apparatus that may be used to convert the picture into currents and to reconvert the currents into a reproduced picture, reference may be had to Bell System Technical Journal, April 1925, pages 190-211.

It will be understood of course that while Fig. 9 discloses the coupling devices as used in a system of transmitting picture signals that they can be equally well used in transmitting any other kind of signals. Furthermore, it is not necessary that the signals be transmitted in the form of a modulated carrier wave although this is advisable when transmission is effected over normal telephone lines. In using the equipment of Fig. 9 to transmit a picture for example, the telephone user at the transmitting station removes the ear-piece 46 from its switch hook (not shown) and places a call in the usual way for the subscriber at the distant point where the picture is to be received. After the telephone connection has been established in the usual way through the exchanges 48 and 50, the called subscriber answers by removing the telephone ear-piece 52 from its switch hook (not shown) and rests it on the coupling unit 1. The transmitting and receiving picture mechanism is then set in operation and the picture can be transmitted and received without any physical contact with the telephone lines and without requiring any permanent fastening of the ear-pieces 46 and 52 to the coupling units 1.

It will be understood of course that the invention is not limited to the use of the coupling device 1 with a particular type of ear-piece. For example, while Figs. 1, 2 and 9 show an ear-piece of the conventional desk-set type, it will be understood that the devices 1 can likewise be used with so-called hand sets of the "French" type, it being necessary merely to place the hand set

on the table 45 so that the ear-piece of the set rests on the top of unit 1.

Various changes and modifications may be made in the apparatus disclosed without departing from the spirit and scope of the invention.

What I claim is:

1. A device for electro-magnetically coupling a signal generator to the coils of a telephone ear-piece comprising a magnetic core, a winding for said core to be energized by said generator, and a housing for said core and coil, said housing having means to receive and support said ear-piece with the coils of the ear-piece in registry with the said core, said housing having at least one sound channel therethrough to the open air to allow sound waves from the ear-piece diaphragm to be heard while the ear-piece rests on said housing.

2. An arrangement for electro-magnetically coupling a signal generator to the coils of a telephone ear-piece comprising a base having a central recess to receive an electromagnet, a coil for said magnet for connection to said signalling generator, at least one sound channel

through said base to the open air to allow sound waves to pass therethrough, and a rim on said base on which said ear-piece is adapted to rest.

3. An arrangement according to claim 2 in which said base is provided with a plurality of sound deadening pedestals for spacing the base from a table or other support.

4. An arrangement according to claim 2 in which said rim is provided with a layer of sound deadening material on which the rim of the ear-piece rests.

5. A coupling device of the character described comprising a magnetic core consisting of a pile-up of U-shaped laminations, a slotted non-magnetic member for clamping the pile-up at its lower end and non-magnetic means for clamping the upper ends of the laminations together, a non-magnetic housing for said coils and said core with the ends of the core extending through said housing, and a supporting base to receive said housing, said support base having a plurality of sound channels open to the air to allow sound waves to pass therethrough.

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