TWO-WAY TELEVISION COMMUNICATION UNIT

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This invention relates to a unitary apparatus for picking up intelligence and translating it into electric signal impulses, as well as visibly reproducing signal impulses representative of intelligence. In particular, the invention relates to a unitary apparatus, for instance of the cabinet or box type which also can be portable, for television two-way communication which permits observation of picked up intelligence on a viewing screen and simultaneously to pick-up intelligence at the place of observation for transmitting it to a distant place and in particular to the one whence the observed televised intelligence comes.

More specifically, the invention is concerned with unitary apparatus for use in combination with telephone communication where a first conversant at one end of the line is enabled to view a screen on which a second conversant talking on the other end of the line is televised, while the image of the first conversant is picked up and transmitted simultaneously to the second conversant on the other end of the line. Such an apparatus for two-way television communication can be physically combined with a sound receiver and transmitter, or hand telephone set, which for instance, when the receiver is lifted, also switches in the television apparatus and switches it out when the receiver is replaced.

It is an object of the invention to enable the person observing the viewing screen of the apparatus to check whether the source or sources of intelligence which emit light rays within the visible, invisible or nearly visible spectral regions of light to be picked up and to be transmitted from his place, are correctly illuminated and/or positioned relative to and focused on the transmission pick-up device of his apparatus.

It is another object of the invention to enable the person observing the viewing screen of his apparatus to check whether the light emitting source or sources of intelligence to be televised from his place, are correctly illuminated and/or positioned relative to and focused on the transmission pick-up device at his place, and to bring about adjustments or changes in the setting and/or optical device for translating that intelligence upon the light-sensitive element or elements of the transmission pick-up device.

It is a further object of the invention to enable the person observing the viewing screen of his unitary transmission and visibly reproducing apparatus to check the setting and particularly the optical and/or electric conditions of operation of the transmission pick-up device of his apparatus by reproducing the electric signal impulses representative of the picked up intelligence on the viewing screen observed by him.

It is a specific object of the invention to secure for persons communicating with one another over a telephone line and who are simultaneously and mutually televised, the natural impression that they are attentive, i.e. that one conversant is looking into the other's eyes, and to this end to also enable the conversant on his viewing screen, to check on his transmission pick-up device whether himself is properly imaged and focused thereon.

These and other objects of the invention will be more clearly understood when the specification proceeds with reference to the drawings in which Fig. 1 exemplifies rather schematically in vertical cross section and partly elevation a two-way communication apparatus according to the invention, and Fig. 2 in a similar manner a modification thereof.

It should be understood at the outset that the invention is not limited to any particular type of apparatus for picking up intelligence and transforming it into electric signal impulses to be transmitted, or to any particular apparatus which visibly reproduces such signal impulses impressed upon it. As a transmission pick-up apparatus any electric device can be used which comprises for instance a light sensitive signal plate, on which the intelligence to be transmitted is being imaged, such as an "iconoscope" apparatus. The electric signal impulses representative of any kind of intelligence can be visibly reproduced, for instance by means of an apparatus operating on supersonic light modulating principles, or on the principles of controlling the optical qualities of a screen, such as a screen the reflecting power, or transparency, or opacity, or refractive index of which is varied locally and temporarily by an impinging modulated cathode ray beam or stream. Apparatus which use a screen of light emitting qualities which are affected by certain radiant energies preferably cathode ray impinging upon it, such as fluorescent material type screens, can also be used to advantage. Whatever may be the type of the apparatus used for picking up and translating the intelligence to be transmitted and for visibly reproducing the signals representative of intelligence, the invention primarily consists in a unit in which such a pick-up transmission device and reproducing apparatus are combined for the purpose of a two-way communication and permitting the realization of the objects of the invention set forth hereinafter and to be gathered from the subsequent specification.

Referring to Fig. 1, it is assumed that the elements of the signals, particularly television signals reproducing and intelligence picking up apparatus are installed in a space enclosed in a box
or cabinet 10 provided with a viewing opening 11 on its front. A suitable illuminating source 12 may be connected with 10, for instance arranged on top of cabinet 10, and emit visible light of adjustable brightness, or not-blinding short wave or long wave invisible or nearly invisible light (ultra violet or infra-red rays, respectively) which affects, however, the correspondingly sensitized signal plate of the pick-up apparatus.

The source of intelligence to be picked up and transmitted is assumed to consist in this exemplification in the face of a person 18 in front of opening 11 who conducts a telephone conversation with another person at the other end of a telephone line. The telephone receiver or its connection with the apparatus or communication lines illustrated are not shown. It is further assumed that the conversant at the other end of the line is the object of the image which is to be visibly reproduced in the apparatus viewed by the person 18 through opening 11.

It should be understood, however, that instead of an image of a conversant any other information can be transmitted and/or visibly reproduced.

In the viewing screen 14 of an electric signal impulses, in particular television picture signals visibly reproducing apparatus 15, for instance of the cathode ray operated fluorescent screen type, is arranged inside cabinet 10 essentially in the axis from the eyes of the conversant 18 talking at the other end of the line. Cathode ray tube 15 comprises a neck 16 in which the cathode ray gun, the deflecting and modulating electrodes for the cathode ray beam are arranged in conventional manner so that the signals representative of intelligence of any kind which are impressed upon the cathode ray beam in tube 15 are reproduced in and can directly be viewed on screen 14. In particular, the signals received produce on the viewing screen a picture of the conversant on the other end of the line.

Across the optical lines of vision of person 18 through opening 11 to tube 22 is translated an image of person 18, for instance a semi-transparent 45° mirror 19, or prism, arranged through which the person 18 can see the image or picture instantly produced on screen 14, whereas an image of that person's face is simultaneously projected by mirror 19 through objective or imaging lens (system) 20 upon the light-sensitive signal plate 21 of a pick-up cathode ray tube 22 of well known type, for instance the "iconoscope" type. The output from the signal plate 21 of transmitting tube 22 is translated through an amplifier 23 and switch 23 upon the outgoing communication line 24. The signals, in particular picture signals incoming over line 25 and to be visibly reproduced, are translated through switch 26, line 27 and amplifier 17 upon the cathode ray beam in tube 15.

The electrical circuits and arrangements for operating the pick-up and/or signals reproducing cathode ray tubes 15, 22 are well known in the art and need no detailed description or showing in the drawings. If the incoming or outgoing signals are respectively demodulated from and modulated upon carrier waves, circuits well known for these purposes can be arranged inside cabinet 10 or in an outside attachment, or in a separate unit connected with the one shown in any suitable way, such as by cable. Similarly the sound may be transmitted and received over lines, or modulated upon carrier waves by methods and arrangements well known in the art. If the pick-up and/or signals reproducing apparatus operate on the line and frame scanning principles synchronising signals for the line and frame scan in the various communicating units can be produced in and transmitted from centralised equipment, or derived from the mains.

Dealing more specifically with the communication between two conversants at the opposite end of the communication line, the natural impression for each of them of looking straight into the other's eyes, can be obtained only if e.g. person 18 looking straight through opening 11 at screen 14, gets the impression that the other conversant whose picture is reproduced on the screen looks straight from it into the eyes of person 18. In other words, in order to obtain the impression of mutual face to face attention, it is necessary that the lines of sight of person 18 to the pick-up tube 22 and from the receiver tube 15 coincide, the reproducing and pick-up tubes would be arranged side by side, or one above the other, the eyes of each conversant would be naturally focused upon the screen of his receiver tube and not on the pick-up tube, whereby the distant conversant to whom the picked up image is transmitted gets the impression that the imaged conversant is looking away from him and is inattentive.

By making the axis 13, along which the person 18 looks toward the viewing screen 14 of his television reproducing apparatus essentially coinciding with the axis along which his picture is projected and imaged upon the signal plate 21 of his pick-up tube, his picked-up and transmitted picture will give the impression to the distant conversant that the latter is looked at directly.

In order that the picture of person 18 or of any other intelligence to be transmitted, is properly focused upon signal plate 21, it is necessary that person 18 looks toward the viewing screen 14 of his television reproducing apparatus at a certain distance from that signal plate. Although the imaging or objective lens system 20 can be adjusted by hand for instance by means of a handle which can be moved over a dial indicating the distance of person or object 18 from, say, the front wall 25 of cabinet 10, there is still the danger that the distance is inaccurately estimated or that other changes have occurred in the projection or operation of the pick-up apparatus which affect the transmission unclear.

In order to properly focus lens system 20, its mount 29 may be screw-threaded on the outside and engage a screw threaded support 30 so that by turning handle 31 in slit 43 in a plane about vertical to that of the drawing, mount 29 is turned within support 30 and lens 20 is raised or lowered and thereby the face of person 18 properly focused on signal plate 21 of the pick-up or transmitter tube 22.

In order to enable person 18 to check on the correct focusing, switches 23, 25 are connected through rods 32, 33 with handle 34 outside front wall 28. By pulling handle 34 toward wall 28, the communication lines 24, 25 for the outgoing and incoming signal impulses are disconnected from the tubes 15, 22 and instead the signal plate 21 is connected through amplifier 35, switch 23 (in its position shown in dotted line), line 36 and amplifier 17 with the reproducing tube 15. Hence the person 18 views on screen 14 his own picture or that of the object to be televised, as it is being viewed upon transmission over communication line 24 by the distant conversant. Person 18 can thus check whether the picked up image or picture shows the desired details, or is blurred or distorted, or sharply focused.
After any correction has been brought about by him, to a position relative to mirror 19, or in the position of lens system 20 by means of handle 31, he pulls handle 34 back, or releases it, into the initial position whereby the pick-up tube 22 is connected again with the outgoing communication line 24 and the reproducing tube 15 with the incoming line 25.

It is understood that the reproducing and pick-up tubes 15, 22 are operated in synchronism, and if there are more than two places or stations interconnected, synchronisation between all the pick-up and reproducing apparatus is then to be maintained by a common synchronising signal generator. The synchronising signals may be transmitted over lines, or modulated on carrier waves transmitted along lines or by wireless the same as used for transmitting the modulating signals, the same or different transmission lines, and in particular different carrier wave lengths may be used for transmitting the sound. While the horizontal and vertical line scanning impulses as well as line and frame scan synchronising impulses can be transmitted upon tubes 15, 22 for instantaneous centralisation of source over the communication lines 24, 25 in the position of switch 23, 26 shown in full lines, these impulses and signals can be transmitted upon both tubes through the branch line 44, switch 25 (both shown in dotted lines) lines 27, 35, respectively, when the transmission lines are switched off, so that the image on signal plate 21 is properly reproduced on screen 14.

Instead of using a semi-transparent mirror 19 or a prism provided with suitably inclined reflection surface, any other suitable ray-dividing means can be used, such as for instance suitable lenses or spherical mirrors with center holes which may be fitted with other optical devices, such as lenses, prisms, etc. Illuminating light is then directed through the optical devices in the center hole upon a reflection-type screen of a cathode ray controlled light valve, and hence transmitted through a "Schmidt-correction aspherical lens" or spherical mirror upon the 45° mirror and the viewing.

In the modification of the invention shown in Fig. 2, the apparatus for visibly reproducing signals, particularly television signals, comprises a cathode ray tube or light valve 35, for instance, provided with a transparency controlled ionic crystal 37, as described in my Patent No. 2,330,171, instead of a self-luminous screen or direct view reflection type screen as exemplified or explained with respect to Fig. 1. A viewing screen 38 is arranged in the axis of sight 13 behind the suitably inclined semi-transparent mirror 19, and a source of visible illuminating light 33 and reflector 40 are arranged on the other side of tube screen 37. The light from source 39 and reflector 40 is projected through condenser lens system 41, transparency controlled screen 37 and projection lens system 42 upon viewing screen 38 which may consist of ground glass. Incoming signals are impressed upon the modulating electrodes in neck 43 of tube 36, for instance, in the manner described in my above patent.

Apart from this modification as to the light valve, the details used and shown in Fig. 2 as well as the uses and advantages of this embodiment of the invention are the same as described hereinbefore with reference to Fig. 1. It should be understood, however, that by turning light valve 35 by 180°, tube screen 37 can be exposed to the unobstructed direct view by the observer or conversely 18 and if properly illuminated, directly viewed by him so that the screen 38 can be omitted.

It should be understood that the invention is not limited to any exemplification hereinbefore described or shown but is to be derived in its broadest aspects from the appended claims. Thus, for instance instead of or in addition to the adjustable arrangement of optical lens 38 the distance of mirror 19 from signal plate 21 or tube 22 can be made adjustable; tube 22 and lens system 29 with its support 30 can also be combined in a unit adjustable relative to mirror 19, both in angular direction as well as regarding its distance theretofrom. The output of tube 22 can be either translated directly or through amplifiers 52, 17 upon the reproducing tube 15, and in the latter case the amplification of the transmitted signals can be adjusted, if desired automatically depending upon the position of switch 23. Similarly, tube 15 with tube screen 14, or tube 36 with tube screen 37 can be arranged at adjustable distance from screen 38, or lens system 42 in Fig. 2 can be adjustable arranged as to position or focal length.

In the claims the term "intelligence" comprises any information capable of being visibly reproduced, including, but not by way of limitation, living or inanimate objects and settings, physical phenomena, pictures, images, writings and printed matter. The term device for visibly reproducing electric signal impulses representative of intelligence includes any apparatus including a screen the self-luminous, or light-reflecting or transmitting optical qualities of which are locally and temporarily changed by suitable radiant energy (such as cathode rays, X-rays) which in turn is controlled by electric signal impulses representative of intelligence. Supernormal light modulating and image reproducing apparatus are also within this term. The term "light rays" includes rays of light within the visible, invisible and nearly visible spectral regions of light, including the visible light spectrum and the short and long wave light ray ranges near the end of that spectrum, such as ultra-violet and infra-red rays, which are capable of being visibly reproduced on a suitable viewing screen or to affect a properly sensitized pick-up signal plate.

What I claim is:

1. A unitary two-way communication apparatus for picking up intelligence to be transmitted to a distant place and for visibly reproducing intelligence received from a distant place, essentially comprising, in combination, a pick-up and transmitting device adapted to transform light rays within the visible and invisible spectral regions and representative of intelligence to be transmitted, into electric signal impulses, means for translating said impulses upon outgoing transmitting means, a device for visibly reproducing electric signal impulses representative of intelligence, means for translating incoming signal impulses upon said reproducing device, and means for operatively connecting said translating means either with outgoing and incoming transmitting means or with one another, so that in the latter case impulses produced in said pick-up device are visibly reproduced by said reproducing device.

2. A unitary two-way communication apparatus for picking up intelligence to be transmitted to a distant place and for visibly reproducing intelligence received from a distant place, essentially comprising, in combination, a pick-up and transmitting device adapted to transform light
rays within the visible and invisible spectral regions and representative of intelligence to be transmitted into electric signal impulses, translating means including amplifying means for said impulses upon outgoing transmitter means, a device for visibly reproducing electric signal impulses representative of intelligence, translating means including amplifying means of incoming signal impulses from incoming receiving means upon said reproducing device, and means for operatively connecting said translating means with one another so that impulses produced in said pick-up device are visibly reproduced in said reproducing device and disconnecting them at least from said incoming receiving means.

3. A unitary apparatus for picking up intelligence to be transmitted to a distant place and for visibly reproducing intelligence received from a distant place, essentially comprising, in combination, a pick-up and transmitting device adapted to transform light rays within the visible and invisible spectral regions and representative of intelligence to be transmitted, into electric signal impulses, means for translating said impulses upon outgoing transmitter means, a device for visibly reproducing electric signal impulses representative of intelligence, means for translating incoming signal impulses upon said reproducing device, adjustable optical means in the path of said light rays for projecting and focusing them in said pick-up device, and means for operatively connecting said pick-up device with said reproducing device so that the impulses produced in the former are visibly reproduced by the latter.

4. A unit comprising a transmission pick-up device of light rays representative of intelligence and a device for visibly reproducing electric signal impulses representative of intelligence, essentially comprising, in combination, said pick-up transmission device, said reproducing device and optical means for dividing light rays as exemplified by a semi-transparent mirror, said pick-up device and reproducing device in angular relation with respect to said optical means so that light rays representative of intelligence projected in one direction upon said optical means are transmitted in opposite direction and the optical axes of said directions essentially coincide, means for translating signal impulses produced in said reproducing device upon said optical means, means for translating impulses representative of intelligence from receiving means upon said reproducing device, and means for operatively connecting said pick-up device and reproducing device with one another and disconnecting at least the latter from said receiving means, so that signals reproduced in said pick-up device are visibly reproduced by said reproducing device.

5. A unit comprising a transmission pick-up device of light rays representative of intelligence and a device for visibly reproducing electric signal impulses representative of intelligence, essentially comprising, in combination, an enclosed space said pick-up transmission device, said reproducing device and optical means for dividing light rays as exemplified by a semi-transparent mirror, an observation aperture in the enclosure of said space, said pick-up device and reproducing device in angular relation with respect to said optical means and the latter arranged with respect to said aperture so that light rays representative of intelligence projected in one direc-

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