

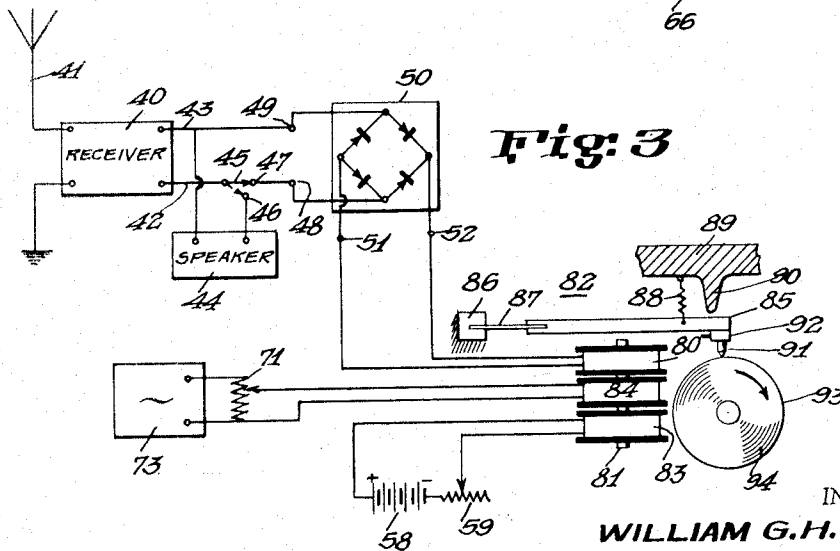
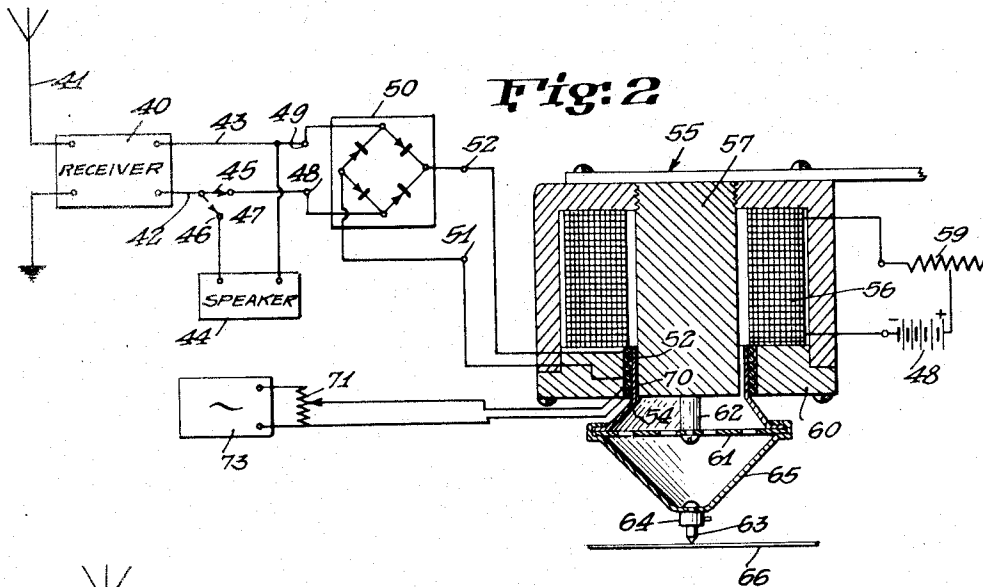
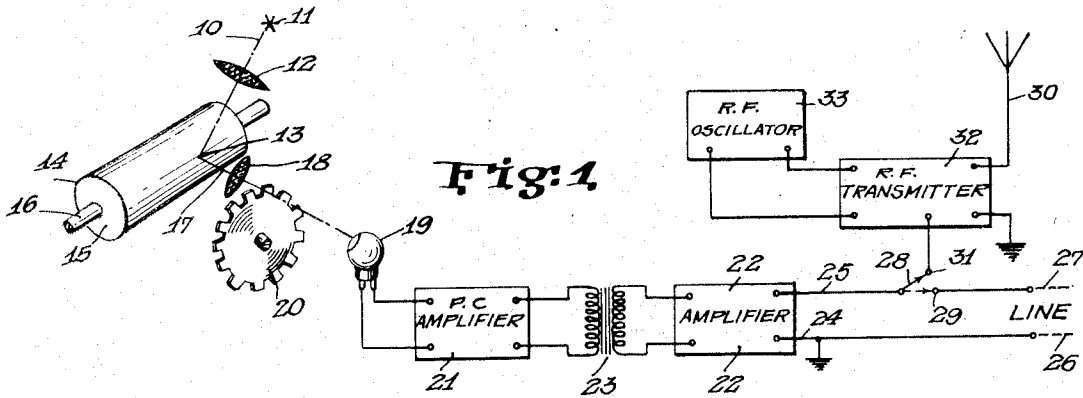
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FACSIMILE RECEIVING SYSTEM

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FACSIMILE RECEIVING SYSTEM

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8 Claims. (Cl. 178-5)

This invention relates to facsimile systems and more particularly relates to facsimile receivers utilizing local energization for picture recording controllable by the facsimile signals, and is a division of my co-pending application Serial No. 49,222, filed November 11, 1935, now Patent No. 2,060,778, issued Nov. 10, 1936.

Facsimile signals generally comprise amplitude modulated currents varying in accordance with the elemental shading of the picture being transmitted. In black-and-white picture transmission, varying intensity facsimile signals are dispensed with but make-and-break signals or signals of maximum and zero intensity corresponding to black-and-white picture portions respectively are transmitted as is well known by those skilled in the art.

Recording or translating picture systems heretofore have depended upon the energy of the amplified received signals to actuate the recording stylus. I contemplate local energization of the facsimile reproducer at a predetermined frequency to compose the reproduction by markings caused by the local energy, and adjust parameters so that the received facsimile signals are sufficient to electromagnetically prevent the recording stylus from marking the record sheet for the white picture elements.

The frequency of the local energization produces a plurality of adjacent discrete dot impulses to build up the facsimile reproduction by the discrete dots. A half-tone reproduction results from such an arrangement. Pictures for newspapers are of the half-tone variety to facilitate printing. My present invention reproduces pictures having a half-tone effect. A further modification of my present invention resides in the direct etching of a zinc plate by the facsimile recording stylus to yield a metallic picture record suitable for newspaper mat reproduction, dispensing with intermediate photographic steps.

It is accordingly an object of my present invention to provide novel facsimile reproducing means utilizing local energization for reproduction power controlled by the incoming signals for improving translation efficiency.

Another object of my invention is to provide novel facsimile reproduction means whereby half-tone reproductions are effected from otherwise normal picture transmissions.

A further object of my present invention is to provide a novel facsimile reproducer for directly recording a half-tone picture on a sheet or mechanically etching a metallic plate.

These and other objects of my invention will

become apparent in the following description taken in connection with the drawing in which:

Figure 1 is a schematic illustration of a commonly used "chopper" amplitude modulated facsimile signal system.

Figure 2 is a preferred modification of an electrodynamic facsimile reproducing system utilizing local signal energization.

Figure 3 is an electromechanical reproducer modification of Figure 2.

Referring to Figure 1, a beam of light 10 generated by light source 11 is focused by lens system 12 to a point 13 on a picture record 14 secured to the drum 15 rotated in a predetermined manner by shaft 16. The picture 14 is also moved axially so that the light point 13 will in turn continuously scan the picture. The refracted light beam 17 is focused by lens system 18 to photoelectric cell 19. A chopper wheel 20 is interposed between the light beam 17 and photo-cell 19 in order to break up otherwise slowly varying picture currents to produce a predetermined audio carrier frequency so that an ordinary instead of direct current photo-cell amplifier 21 connected to the output of photo-cell 19 may be employed.

The output of photo-cell amplifier 21 is coupled to a power amplifier 22 by coupling transformer 23. The output 24-25 of audio amplifier 22 represents the facsimile signals to be transmitted either over wire line 26-27 when switch 28 is closed on contact 29; or radiated by antenna 30 when switch 28 is closed on contact 31 connecting audio amplifier 22 to the radio frequency transmitter 32 modulating the carrier wave generated by the radio frequency oscillator 33 in a manner well known in the art.

The picture record 14 of my present invention preferably contains a black-and-white picture for transmission so that the facsimile signals represent a maximum signal intensity for white and a minimum signal intensity for black picture segments.

When transmission of the facsimile signals is by radio frequency carrier wave, the corresponding radio receiver 40 is utilized in conjunction with receiver antenna 41. If the radio frequency oscillator 33 generates a carrier wave in the ordinary radio broadcast band, an ordinary broadcast receiver 40 may be used. The output 42-43 of receiver 40 is normally connected to a loud speaker unit 44 when the switch 45 is closed on contact 46. However, for facsimile reproduction according to my system, it is only necessary to turn the switch 45 on contact 47 to introduce the

facsimile signals to the input 48—49 of rectifier unit 50.

The rectifier unit 50 is represented as a copper oxide unit connected in a well known manner to convert the alternating current signals due to the chopper action of wheel 20 or other audio carrier means to the original black-and-white signals of the picture 14 at the output 51—52 thereof. Rectifier 50 although illustrated as a copper oxide rectifier may be of the electronic type but a copper oxide unit is preferable for simplicity and ruggedness.

The output 51—52 of rectifier 50 is connected to a movable coil 53 wound on coil form 54 floatable in the air gap of the electrodynamic unit 55. The construction of unit 55 is similar to that of the present type electrodynamic loud speaker and comprises a direct current winding 56 about a central core 57 energized by a direct current source 58 through a series connecting rheostat 59. A circular rim 60 forms an annular air-gap with the circular central core 57. Coil form 54 is compliantly supported upon the core 57 by resilient member 61 mounted on post 62 secured to core 57. A stylus 63 held in retainer 64 is mechanically connected to the suspended movable coil form 54 by the conical extension 65.

The record sheet 66 is moved with respect to stylus 63 in synchronism with the transmitted picture 14 in order to properly compose the facsimile reproduction thereof. I have not illustrated synchronizing methods since they form no part of my present invention.

A second coil 70 is mounted on the coil form 54 and acts in the common air-gap of an electrodynamic unit together with coil 53. Coil 70 is connected to a potentiometer 71 in turn connected to the output of a local audio frequency oscillator 73. Field coil rheostat 59 and potentiometer 71 are adjusted with no facsimile signal input to units 55 so as to produce facsimile impulses upon record sheet 66 of predetermined intensity. The frequency of oscillator 73 is adjusted to a value dependent upon the half-tone effect desired. A higher local frequency will result in a greater number of impulses per unit area and resulting in a correspondingly darker half-tone representation for "black" picture reproductions.

The alternating current locally produced in the movable coil 70 reacts with the steady magnetic field in the air-gap of unit 55 to vibrate the stylus 63. When no signal current flows through coil 53 the marking impulses upon sheet 66 proceed at a predetermined frequency, for example 3000 cycles and produce a plurality of successive closely spaced dots corresponding to a black signal of the transmitted picture.

When a "white" picture signal is being transmitted, a corresponding facsimile signal will result in the direct current output of rectifier 50 flowing in coil 53. The polarity of direct current signal flow through coil 53 is connected so that the action of coil 53 is to decrease or buck the strength of the downward or marking impulse due to the local oscillating action by coil 70, to a degree sufficient to avoid an actual mark upon the record sheet 66. A corresponding white portion results upon the record sheet 66 during a signal-on condition. The dark picture section is a plurality of discrete dots or closely spaced marks. The facsimile signals are accordingly superimposed on a local "marking" circuit to act as an interrupter of the local marking action.

The translation efficiency of the reproducer is

greatly increased by using the electromagnetic bucking action on local facsimile reproduction means of my present invention.

By converting marking stylus 63 to a sharp etching tool and record sheet 66 to a zinc plate, a direct photo-engraving action results with a half-tone representation upon the plate avoiding intermediate photographic steps for newspaper plants.

Figure 3 represents a modification of the local energization facsimile reproduction system hereinabove represented by the electrodynamic unit 55 of Figure 2, wherein an electromechanical reproducing unit is employed. The receiver 40, antenna 41, speaker 44, switch 45 and rectifier unit 50 are similar to the correspondingly numbered components of Figure 2. The output 51—52 of rectifier 50 is connected to solenoid 80 mounted on a common soft iron core 81 of the electromechanical reproducer 82. Another coil 83 is connected to a direct current source 58 through rheostat 59. The attraction for the armature 85 by the electromagnetic action of coil 83 on core 81 is adjustable by varying biasing currents by means of rheostat 59.

The local oscillator 73 passes alternating current of a predetermined frequency through the winding 84 on the core 81 of amplitude controllable potentiometer 71.

The armature 85 is compliantly mounted on supporting post 86 by leaf spring 87. A spring 88 fixed at one end to member 89 mechanically biases the armature 85 away from the electromagnetic core 81. A projection 90 in member 89 limits the upward excursion of the armature 85. A marker 91 is secured to receptacle 92 attached to one end of armature 85. A sheet 93 is mounted on drum 94 which is maintained in synchronism with the transmitter drum 15 in order to correctly compose facsimile reproduction.

The action of the local oscillator 73 is to cause a varying attraction on the armature 85 and to produce marking impulses of the stylus 91 on the sheet 93 at the predetermined frequency of the oscillator 73. As the sheet 93 moves with respect to the vibrating marking system, a succession of closely spaced marking dots or impulses are formed thereon. The strength of the marking impulses is adjusted by varying the direct current biasing action of coil 83 with rheostat 59 or by controlling potentiometer 71 of oscillator 73 or both. The rectifier facsimile signal current flowing through winding 80 is polarized so that it bucks the armature 85 attraction due to the local direct current biasing action of winding 83. When a "white" facsimile signal occurs it will buck or react against the direct current biasing attraction upon armature 85 sufficient to result in a "no marking" action by the stylus 91 on sheet 93.

The major portion of the reproducer energy is locally generated in accordance with the facsimile reproducers of my present invention. The facsimile signals are utilized to differentially act upon the "dot printing" stylus of the reproducer mechanism to a degree merely sufficient to avoid marking impressions by the stylus.

The marking energy of the stylus oscillating at a predetermined amplitude and frequency is supplied locally in amounts sufficient to produce the record markings or the metallic etching operations. The signal impulses counteract to some degree the impression excursion of the

stylus and limit its excursion to prevent the marking actions.

I claim:

1. In a picture receiving system, a local source
5 of alternating current; an electrodynamic recording unit comprising a movable unit containing a stylus, a first coil connected to said source for operating the stylus on a record sheet and a second coil responsive to incoming picture
10 signals for rendering the operation of said stylus on said sheet ineffectual by electromagnetically affecting the action of said first coil.

2. In a picture receiving system, a local source of alternating current; means for rectifying picture signals; an electrodynamic recording unit
15 comprising a stationary, substantially uniform magnetic field, a unit movable in said field containing a stylus, a first coil mounted on said unit within the magnetic field, said coil being connected to said source for operating the stylus
20 on a record sheet and a second coil mounted on said unit responsive to the rectified picture signals for preventing marking impulses of said stylus on said sheet by electromagnetically affecting the action of said first coil.

3. In a picture receiving system, a local source of alternating current; means for rectifying picture signals; an electrodynamic recording unit
30 comprising a stationary, substantially uniform magnetic field, a unit movable in said field containing a stylus, a first coil mounted on said unit within the magnetic field, said coil being connected to said source for operating the stylus on a record sheet, a second coil mounted on said
35 unit responsive to the rectified picture signals for preventing marking impulses of said stylus on said sheet by electromagnetically affecting the action of said first coil, and means for controlling the intensity of the marking impulses comprising a potentiometer connected between said
40 second coil and said source.

4. In a picture receiving system, a local source of alternating current; means for rectifying picture signals comprising a copper-oxide rectifier; an electrodynamic recording unit comprising
45 a stationary substantially uniform magnetic field, a unit movable in said field containing a stylus, a coil mounted on said unit within the magnetic field, said coil being connected to said source for operating the stylus on a record sheet at a predetermined frequency, a second coil
50 mounted on said unit responsive to the rectified picture signals for preventing marking impulses of said stylus on said sheet by electromagnetically affecting the action of said first coil and means for controlling the intensity of the marking impulses comprising a potentiometer
55

connected between said second coil and said source.

5. In a picture receiving system, a local source of alternating current; a recording unit comprising a vibratory armature containing a stylus,
5 a coil having a magnetic core in operative relation with said armature, said coil being connected to said source for operating the stylus on a record sheet at a predetermined frequency; and a second coil responsive to incoming picture signals for rendering the operation of said stylus
10 on said sheet ineffectual by electromagnetically affecting the action of the first coil.

6. In a picture receiving system, a local source of alternating current; means for rectifying picture signals comprising a copper-oxide rectifier;
15 an electromechanical recording unit comprising a vibratory armature containing a stylus, a coil having a magnetic core in operative relation with said armature, said coil being connected to said source for operating the stylus on a record sheet at a predetermined frequency, and a second coil
20 responsive to the rectified picture signals for preventing marking impulses of said stylus on said sheet by electromagnetically affecting the action of the first coil.

7. In a picture receiving system, a local source of alternating current; means for rectifying picture signals; an electromechanical recording unit
30 comprising an armature containing a stylus, a solenoid having a magnetic core in operative relation with said armature, said solenoid being connected to said source for operating the stylus on a record sheet and a second solenoid on said core responsive to the rectified picture signals
35 for preventing marking impulses of said stylus on said sheet by electromagnetically affecting the action of the first solenoid.

8. In a picture receiving system, a local source of alternating current; means for rectifying picture signals comprising a copper-oxide rectifier;
40 an electromechanical recording unit comprising a vibratory armature containing a stylus, a coil having a magnetic core in operative relation with said armature, said coil being connected to said source for operating the stylus on a record sheet at a predetermined frequency, a second coil on
45 said core responsive to the rectified picture signals for preventing marking impulses of said stylus on said sheet by electromagnetically affecting the action of the first coil and means for controlling the intensity of the marking impulses comprising a third coil on said core, a
50 source of direct current and a rheostat connected in series.

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