

Aug. 27, 1940.

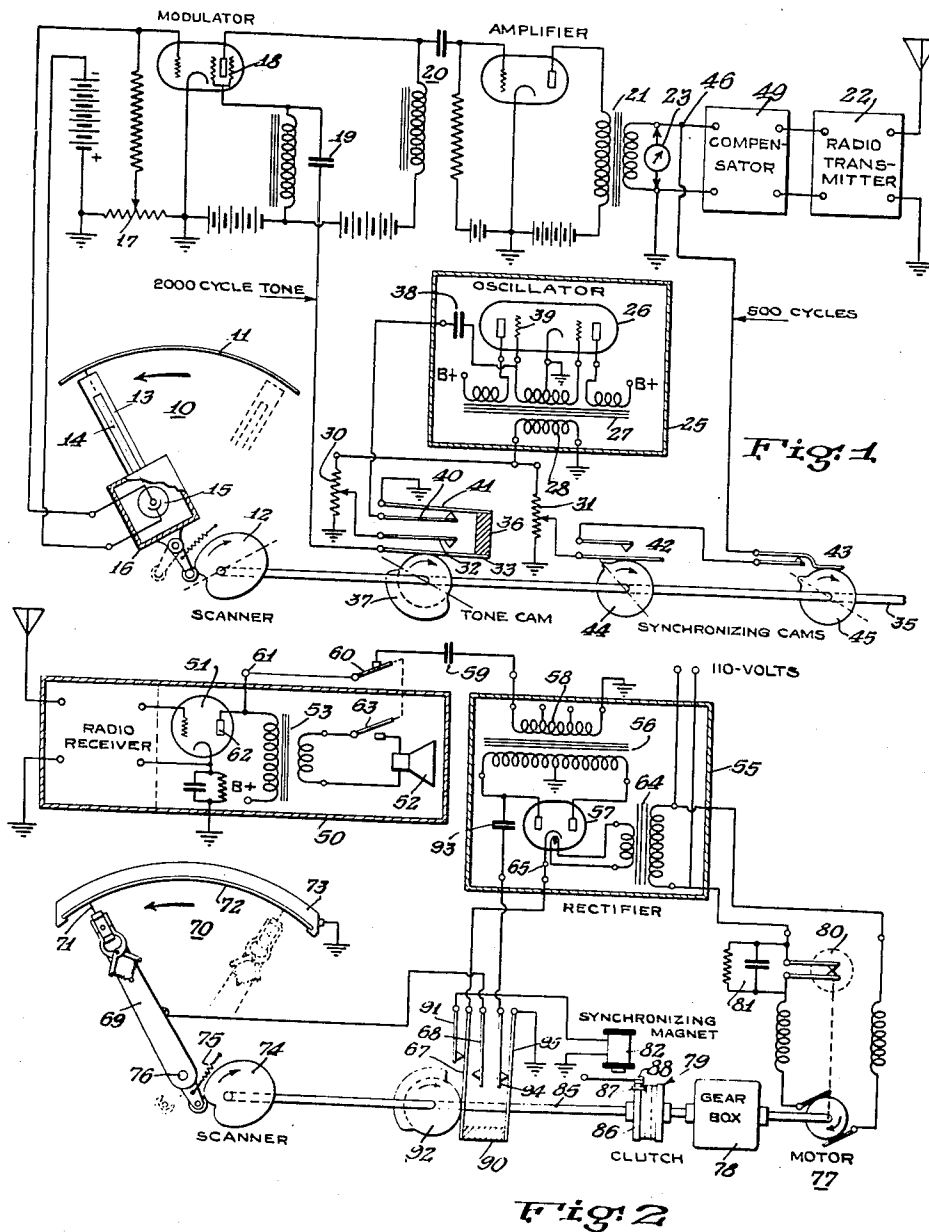
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2,212,969

CONTINUOUS FACSIMILE RADIO RECORDER

Filed April 23, 1938

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

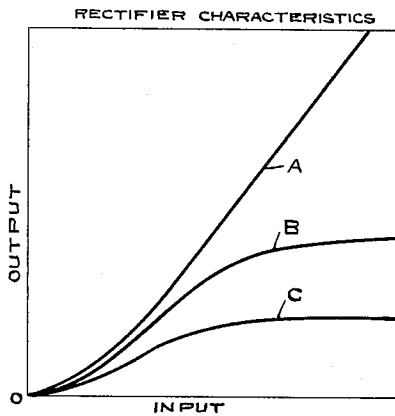


Fig. 3

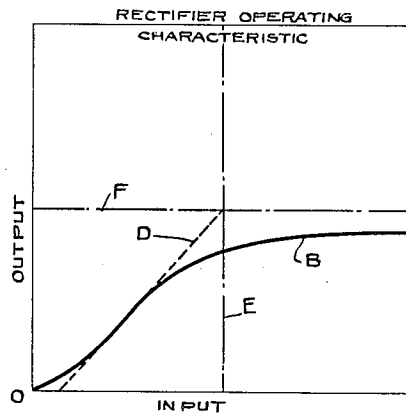


Fig. 4

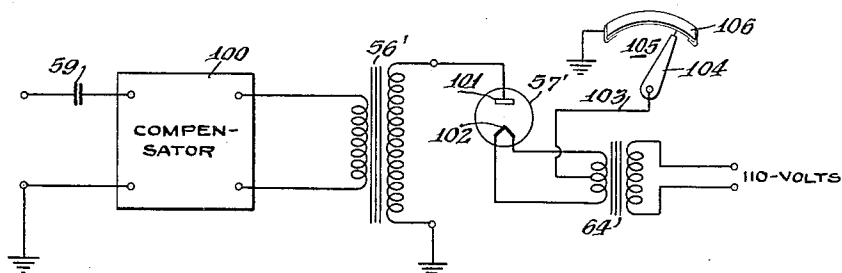


Fig. 5

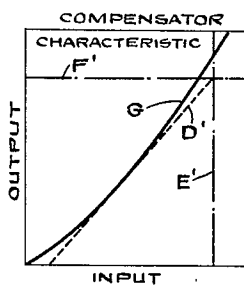


Fig. 6

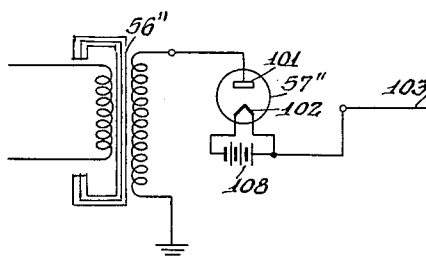


Fig. 7

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UNITED STATES PATENT OFFICE

2,212,969

CONTINUOUS FACSIMILE RADIO RECORDER

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Application April 23, 1938, Serial No. 203,851

2 Claims. (Cl. 178—6.6)

This invention relates to radio facsimile recording systems and more particularly relates to novel methods of and means for preventing injury to a burning of the recording sheet due to signal surges or static.

In a simplification of design of facsimile recorders for widespread home use, efforts have been directed towards providing a fool-proof and automatic unit. Vagaries of radio transmission have limited the widespread adoption of dry paper recorders. Electrical scanning of a dry sensitive recording paper generally requires signal intensities of the order of several hundred volts to obtain sharply detailed results. Unexpected surges in the recording signal level presents the hazard of record sheet burning. In order to meet Fire Underwriters' requirements, it is essential that the apparatus be fool-proof to the extent of eliminating any possibility of fire by burning of the record sheet. The radio transmission vagaries tending towards the overloading is due to fading where the signal level is unduly increased, by surges of static, and other radio disturbances.

Dry type recording paper has a break-down or burning voltage value depending upon its type and the thickness of the surface chemical coating. Thus, a sheet saturated with carbon to render it conductive may have a coating of mercurous oxide, titanium oxide or the like, which coating is discolored by the picture signals. A normally prepared sheet is employed with a signal level varying to a peak of 200 to 300 volts. A paper with a thicker coating for example, could still render selective marking characteristics up to a value of about 400 volts. By controlling the preparation of the paper, a uniform signal intensity-marking characteristic can be insured.

During reception the signal may increase above the three or four hundred volt peak level with which the paper was designed to operate. The markings upon the sheet become excessively dark and the stylus tends to dig in and tear the paper at an excess signal level. Aside from disfiguring the recording and perhaps interfering with the normal operation of the unit, a more important danger arises from the possibility of the paper itself starting to burn at the high signal level.

In accordance with my present invention I contemplate a method of limiting the peak signal which may possibly be applied directly to the recording sheet. A peak signal limiter is used in conjunction with the facsimile signals before they are applied to the sheet. In the preferred embodiment of my present invention, I employ a rectifier tube which is used in conjunction with carrier frequency currents modulated by the picture signals to rectify the picture signals to their original unidirectional character

and apply them to the recording sheet through the stylus. I employ a rectifier tube operated between zero output and the saturation level for the full recording signal intensity range.

Should the signal increase beyond the predetermined maximum level, it is prevented from increasing beyond the maximum value by the saturated rectifier. The output of the rectifier is directly connected to the mechanical stylus applied to the recording sheet. The intensity level of the facsimile signals before being applied to the rectifier tube are preferably modified by a compensator unit so that the signals near the peak level for recording are modified to insure a linear recording characteristic for the record sheet despite the saturation bend of the rectifier characteristic.

It is accordingly an object of my present invention to provide a novel method of receiving facsimile signals and applying them to a dry sheet recorder unit.

Another object of my present invention is to provide a novel method of radio facsimile recording to avoid burning of a record sheet.

A further object of my present invention is to provide novel methods of and means for limiting the peak facsimile signal current applied to a recorder unit.

These and further objects of my invention will become apparent in the following description taken in connection with the drawings, in which:

Figure 1 is a schematic diagram of a preferred facsimile transmitter incorporating the principles of my present invention.

Figure 2 is a schematic diagram of a preferred facsimile recorder operated in accordance with the principles of my present invention.

Figures 3 and 4 are rectifier characteristic curves used to illustrate the principles of my present invention.

Figure 5 is a schematic diagram of the facsimile receiver circuit.

Figure 6 is a preferred characteristic curve for the compensator unit.

Figure 7 is a modified form of the rectifier arrangement in the receiver circuit.

Referring now to Figure 1, a facsimile scanner unit 10 is oscillated across an arcuately held record sheet 11 by a modified heart-shaped cam 12. The transmitter scanner schematically here represented may well be the unit such as disclosed in my co-pending application S. N. 123,770 filed February 3, 1937, entitled "Continuous sheet facsimile system," although other well-known scanning units may be used. The transmitter scanner unit consists essentially of a source of light, generating a beam focused upon sheet 11 through element 13. This illustrated facsimile

system is similar to that disclosed in my Patent No. 2,141,975, issued Dec. 27, 1938.

The beam or pencil of light is reflected from the record sheet and focused through tubular lens element 14 upon a photoelectric cell 15 contained within the scanner housing 16. As is well known in the facsimile art, variations in the shading of the recording sheet 11 along the scanning region correspondingly variably affect the intensity of light impinged upon photoelectric cell 15. The photoelectric cell is connected in circuit with the modulator stage for producing electrical signals varying in accordance with the elemental shading of the scanned record sheet.

The modulator stage is preferably a screen-grid vacuum tube, the control grid of which is connected to the anode of the photoelectric cell 15. A biasing control potentiometer 17 is employed to control the intensity level of the photoelectric cell variations upon the output of the modulator. A carrier frequency current is connected to the screen-grid electrode 18 of the modulator stage through a coupling condenser unit 19. The combination of electrical actions in the modulator stage generate a picture modulated carrier frequency current which is coupled to the amplifier stage through coupling impedance elements 20.

The output of the amplifier stage is coupled to a suitable transformer 21 to a compensator 49. Compensator 49 is a unit for changing the amplitude characteristic of the modulated picture carrier signal and will be described in detail hereinafter. The compensator may be dispensed with in one form of the invention. The output of compensator 49 is connected to a schematically indicated transmitter 22 for radio transmission of the signals to a remote receiver stage. It is to be understood that different communication channels than radio may be employed. The output impedance of transformer 21 may, for example, be 500 ohms to match the standard coupling impedance of speech input circuits employed in radio broadcast stages. A high impedance level indicator 23 such as a D. B. meter, is connected across the output of transformer 21 for assisting in the initial adjustments of the transmitter unit.

An electronic oscillator 25 is employed to generate and supply the 2000 cycle carrier frequency or tone to the modulator stage. Oscillator 25 essentially comprises a double triode electronic tube 26 coupled through transformer element 27 to generate the sustained current oscillations at the required frequency. The output winding 28 of the oscillator has one terminal connected to ground potential and the other terminal connected to two potentiometer element units 30 and 31. Potentiometer 30 is connected to the coupling condenser 19 for the modulator stage through cam-switch member 32—33. When switch 32—33 is closed the output of oscillator 25 is directly applied to the screen grid 18. This connection occurs preferably during one hundred and eighty mechanical degrees of each rotation cycle of control shaft 35. Actuation of cam switch 36 is through cam 37 secured on control shaft 35.

Scanner 10 generates picture signals in its excursion from left to right corresponding to a 180° rotation of the control shaft 35. The scanner is returned to its left end position during the remaining 180° rotation of shaft 35 during which time no picture carrier signals are transmitted in the preferred arrangement. Carrier tone

switch 32—33 is opened by suitable design of cam 37 at this point.

During the return stroke (to the left) of the scanner 10, the frequency of the generated current of oscillator 25 is changed to that of the synchronizing frequency. In a preferred example, a 500 cycle synchronizing current is used. The frequency of oscillator 25 may be changed by shunting a condenser element 38 between grid element 39 and ground. This switching is effected by elements 40—41 of cam-switch 36 and occurs alternately with the removal of carrier current from screen grid 18. By properly proportioning the value of the capacitance of condenser 38, an accurate value of the 500 cycle generation is effected. It is to be understood that other known expedients for changing an oscillator frequency may be employed for changing the normal picture carrier frequency of oscillator 25 during the return stroke of scanner 10 and that this frequency might be an increased value rather than a decreased one.

Potentiometer 31, being in circuit with the output of oscillator 25, is directly connected to the secondary side of the output transformer 21 at point 46 through an arrangement for accurately predetermining the duration of the connection of the synchronizing signal across this point. I provide an arrangement using two switches 42 and 43 connected in series, respectively actuated by cams 44 and 45. Switch 43 is in normally closed circuit relation; switch 44, in normally open circuit relation. No synchronizing current accordingly flows from potentiometer 31 to 46 during the return stroke period of scanner 10 until switch 43 is opened.

Cams 44 and 45 are designed with short projecting nibs for actuating the associated switches 42 and 43. Cam 44 is arranged on shaft 35 to close switch 42 at the predetermined instant the synchronizing signal is to be started for transmission during each cycle. A cam can be depended upon to accurately perform this closing function. The closure of switch 42 completes the circuit between potentiometer 31 and point 46. Closure of switch 42 is made to preferably occur when scanner 10 has practically completed its return stroke.

It will be recalled that during this interval, switch 40—41 is closed and the output of oscillator 25 is at the synchronizing signal frequency, namely 500 cycles in the present example. The end point of the synchronizing signal transmission is accurately determined by cam 45 which is adjusted to actuate normally-closed switch 43 to open the switch at the proper instant. It will now be evident that an accurate control of the starting and stopping point of the synchronizing signal in each cycle can be accurately prearranged by this means.

The synchronizing signal is ended just before the scanner 10 approaches its extreme left position in readiness for its picture scanning excursion. At this time, cam 37 alters the position of cam switch 36, opening blades 40—41 to cause a picture tone of 2000 cycles to be generated, and closing plates 32—33 to connect the 200 cycle tone to the screen grid 18 of the modulator stage. Control shaft 35 is rotated at a predetermined speed such as by a synchronous motor through reduction gearing. In the given example, shaft 35 rotates at 60 revolutions per minute, effecting sixty scanning operations and corresponding synchronizing signal transmissions per minute. The picture modulated carrier and synchronizing sig-

nals are accordingly alternately transmitted across radio transmitter channel 22 to the remote receiving stage.

Figure 2 is a diagrammatic representation of a preferred system for recording the transmitted facsimile signals. A standard broadcast radio receiver is indicated at 50. The output stage 51 represents the conventional audio-frequency output amplifier stage coupled to loud speaker 52 through step-down transformer 53.

Coupling unit 55 couples the facsimile recorder 70 to the radio receiver. Coupling unit 55 essentially comprises a step-up transformer 56 and a thermionic rectifier unit 57. Primary 58 of transformer 56 has one terminal connected to ground and the other terminal connected to the radio receiver through a coupling condenser 59. Switch 60 connects transformer 56 to terminal 61 of the radio receiver. A preferred coupling point to the radio receiver is to the anode 62 of the output stage 57 thereof. This connection insures the maximum voltage signal output from the radio receiver to the facsimile coupling unit 55.

Connecting-switch 60 may be manually operated when facsimile reception is to commence. However, it is at present usual to connect the facsimile receiver at the earliest morning hours since the broadcasting of facsimile programs occur at that time. Accordingly, switch 61 together with the associated switches for starting both the radio receiver 50 and the facsimile system in operation may be time-clock controlled in a manner well known in the art. A second switch 63 is shown mechanically ganged with switch 60 to open the circuit connection to the loud speaker 52 to prevent the facsimile signals from causing a sound disturbance. It is entirely feasible to maintain the loud speaker 52 in circuit to aurally determine the quality and nature of the signals.

In accordance with my present invention, I provide means for limiting the peak facsimile recording current as applied to the facsimile recording sheet to prevent overloading, charring or burning of the paper. In the preferred embodiment, I employ a specially designed rectifier tube 57 to perform the signal limiting action. Broadly, the rectifier is designed to normally operate up to its saturation level in a manner to be fully described hereinafter. Any unexpected increase or surge in signal level is absorbed by this modulated operation at the saturation level at the rectifier. A step-down power transformer 64 may be used to energize the heater element of rectifier 57. Rectifier 57 is illustrated as of the duo-diode type with both anodes connected to the outer ends of the secondary of coupling transformer 56.

The 2000 cycle modulated carrier picture signal currents received by unit 50 are further amplified in magnitude by transformer 56 and then rectified at 57. The signal energy output is represented between the cathode 65 and ground. Cathode 65 is connected to the scanner 70 through switch blades 67—68 through the oscillating scanner arm 69. Arm 69 is electrically connected to the pivotally mounted stylus point 71 which bears against record sheet 72. Sheet 72 is secured in position against a metallic platen 73. Platen 73 is electrically connected to ground to complete the picture signal circuit to rectifier 57.

In accordance with my present invention, the maximum value of the signal current impinging

upon the record sheet 72 is limited to the predetermined peak value with the advantages and reasons to be hereinafter more fully described. However, before describing the features of my present invention I shall complete the description of the illustrated exemplification of a facsimile system embodying my invention, which system is otherwise similar, for example to that disclosed in my Patent No. 2,141,975, hereinabove referred to. The diagrammatically illustrated recorder is similar to that described in my co-pending application Serial No. 156,625, filed July 31, 1937 entitled "Facsimile recorder." Record sheet 72 is maintained in position to establish contact with platen 73 and cooperate with the oscillating stylus 71. Record sheet 72 is a conducting paper which is electrically sensitized in accordance with the picture signals to build up a facsimile reproduction corresponding to that transmitted from scanner 10. Heart-shaped cam 74, in cooperation with spring 75, produces an oscillating movement of arm 69 about pivot 76.

A non-synchronous motor 77 is preferably employed to drive cam 74 through a reduction gear box 78 and a friction clutch 79. Motor 77 may be an A. C. induction motor, or a motor of the A. C.—D. C. type. An electrical governor 80 is mechanically connected to the rotor of motor 77, and employed to maintain motor 77 at a predetermined speed of rotation. Governor 80 electrically opens and closes the 110 volt power leads to the motor 77 to drive it at proper speed. A spark filter 81 is connected across governor 80 to minimize sparking.

Synchronous scanning movement of oscillating arm 69 is effected by means of the governor controlled motor 77 and the start-stop synchronous actuation of the clutch 79. Synchronizing magnet 82 is controlled by the short duration synchronizing signal in a manner to be described. I have found that by operating the recorder control shaft 35 at a speed about five per cent greater than that of control shaft 35 of the transmitter, the scanner arm 69 will arrive at its initial left-end position in readiness for its recording stroke, in sufficient time before reception of the synchronizing impulse to start it off again for most operating conditions. Driven plate 86 of clutch 79 contains a projection 87 which abuts armature 88 to stop the rotation of shaft 85 until the synchronizing impulse is received to release armature 88.

Cam switch 90 is maintained in the position illustrated during the return stroke of oscillator 69. Signal plate 67 is connected to the synchronizing magnet 82 through contact 91. Normally no signal is impressed upon magnet 82 until a synchronizing impulse is received. I have found that the synchronizing impulse should be of very short duration to initiate the scanning excursion at recorder 70 at the predetermined starting position. I have further found that the time lag for the operation of the synchronizing magnet through its armature 88 to release the clutch 79 is, for recorders of the type described, of the order of about .02 second, and that the synchronizing pulse duration should be made with this figure as a minimum for best operation.

In other words, while a synchronizing impulse of the shortest duration is preferable, the minimum limit is that of the time lag for the synchronizing mechanism to function. At the instant the synchronizing magnet is energized, cam 92 operates cam switch 90 to the right to open the

synchronizing magnet circuit and close signal blade 67 upon contact 68, thereby impressing the rectified picture signals upon the stylus for recording on sheet 72 in a manner already described. The recording stroke occurs during 180 mechanical degrees of rotation of control shaft 85 at which time the cam switch 90 is released to the illustrated position to repeat the cycle of operations described.

Means are provided for selectively controlling the impression of the synchronizing impulse upon magnet 32 to avoid conflict between the synchronizing signal and picture signal at the output of the rectifier. I provide a filtering means embodied by condenser 93 to by-pass essentially all the signal frequencies above the synchronizing frequency of 500 cycles. The 2000 cycle carrier together with its side bands of picture signal modulations are well above the 500 cycle value so that the by-pass condenser 93 connected to one side of the secondary of the coupling transformer 56 is usually sufficient for such cases. Condenser 93 by-passes the higher frequencies from transformer 56 to ground through switch elements 94-95. More involved filtering means actuated by the cam switch 90 may be used if more selective signal separation is required.

The preferable signal level for operating the recorder 70 is in the order of 100 to 300 volts. The expedient of the filtering condenser 93 has been found to readily reduce the 2000 cycle signal level to a value of 15% of the original and thereby insure the prevention of interference with the 500 cycle tone passing through to the rectifier 57 substantially unattenuated. The 500 cycle synchronizing impulse is rectified at 57 and is applied to the synchronizing magnet through switch 67-91 as a unidirectional current impulse of short duration.

My invention is primarily directed to the prevention of injury and burning of the facsimile recording sheet. Signal overloadings due to vagaries of radio transmission, for example, are dangerous in unattended automatic facsimile recorders, particularly those employing dry record paper. A static surge, or undue signal intensity increase due to fading and the like impresses a voltage intensity beyond that which the paper can primarily stand, and breaks down the paper surface. The fire hazard is naturally more dangerous than destruction of portions of the recording. In accordance with my invention I provide a signal limiting means which prevents the signal intensity from becoming excessive at the recording paper, and avoids destroying portions of the reproduction due to overloading or burning of the paper due to static disturbances and surges. I provide an electronic rectifier carefully designed and adjusted to prevent the increased power or level input upon the record sheet.

In Figure 3 a group of rectifier characteristic curves is represented. Such curves are well known in the art. The ordinates represent the relative signal output intensities; the abscissa, the relative input intensities therefor. Curve A in Figure 3 shows the characteristic of an electronic rectifier over a predetermined input range of operation wherein the emission characteristics of the rectifier does not reach the saturation point. Curve B illustrates the effect of saturation by the levelling off of the output. An increase in input above the bend of curve B provides relatively small incremental output as is well known in the electronic art. Curve B is ob-

tained by operating the same rectifier tube at a lower temperature level, for example. By further decreasing the temperature level of the rectifier emission surface, a curve such as C is obtained wherein the saturation level is at a lower output value than the other curves.

The physical reason for the bend and saturation effects on the characteristic curves lies in the fact that electron emission from the cathode or heater reaches a predetermined maximum amount for the operating voltage range and that electrons are attracted to the anode with increasing difficulty. The electron emission of a cathode or filament of a rectifier depends upon the temperature of the filament or heater thereof, the surface area of emission, and the type of emission surface. Thus, an oxide-coated filament or thoriated filament has a greater emission factor than a pure tungsten filament. For a given voltage or signal peak condition we must select a rectifier tube which will deliver the proper signal output at a point in the bend of its saturation characteristic preferably just prior to the final levelling off due to the saturation in the rectifier. After a tube is selected to give the proper characteristic, the temperature condition of the heater or filament element thereof is the only one which must be more or less carefully controlled. This is effected by maintaining the current value applied to the heater or filament as will be further pointed out.

Figure 4 represents a preferred rectifier operating characteristic curve at B, being the same as curve B in Figure 3. The signal operating range for the rectifier is preferably between zero and position E. Thus, the maximum signal applied to the paper is normally a few per cent below the peak range indicated as the output of curve B. The signal level at which the paper will burn or be injured should preferably be at least 15 per-cent above the saturation output level of curve B. Position F represents the output level at which the commercially produced recording paper employed with the home facsimile outfits for direct recording will burn.

Whereas signals greater than that indicated at the horizontal range of B will cause marking upon the paper until the burning level F is reached, it is to be noted that the marking appearing upon the paper in this range will be unduly dark and tend to char or tear the paper. This effect while not a fire hazard is generally to be avoided. The current limiting features of my present invention is directed towards this end.

The recording sheet may be made fire resistant by incorporating well known de-inflammability agents in its content. One or more of such agents as ammonium sulphate, ammonium phosphate, ammonium chloride, borax or tri-cresyl phosphate may be incorporated in the paper together with the carbon particles to produce a fire resistant yet conductive sheet. These agents may be applied to the coating alone of the sensitive sheet, or in combination with its application to the paper body. It is to be understood that my present invention is generally applicable for any type of recording sheet, such as the dry and wet types, or even a fire resistant type.

Figure 5 is a schematic diagram of a modified arrangement for carrying out my present invention. Thus in place of the compensator 49 at the transmitter to generally alter the transmitted characteristic of the signals for all the remote receivers, the compensator may be applied locally to the particular receivers embodying my pres-

ent invention. Thus compensator 100 may be used in the recorder as shown in Figure 5. Compensator 100 is connected between the signal coupling condenser 59 and ground potential similar to the coupling connection shown in Figure 2. The output of the compensator 100 is connected to a step-up transformer 56' the output of which is connected in series with an electronic rectifier stage 57'.

Rectifier 57' contains an anode 101 and a filament 102 differing from the cathode type of rectifier shown in Figure 2. Better control of the saturation characteristic can be effected by a filamentary element as compared to a cathode element. The filament transformer 64' reduces the 110 volts alternating current supply to the proper operating value. The rectifier output is represented by the mid-tap on the secondary of the power transformer 64 connected to the filament 102. Lead 103 extends from the mid-point tap to the arm 104 of the facsimile recorder shown diagrammatically at 105. The recording paper is mounted between the arm 104 and platen 106 of the facsimile recorder unit 105. Platen 106 is connected to ground to complete the rectified facsimile limiting circuit. The proper selection of the rectifier tube and operating voltage of the filament 102, an operating characteristic similar to curve B of Figure 4, may be obtained for the non-operating range represented by limits E and F of the recorder 105 as will now be evident to those skilled in the art.

It will be noted in curve B that about the highest 20 to 25% of the signal output slopes off from the otherwise linear characteristic represented by the curve D. I have found that the highest 25% signal level is most important in defining the resultant detail in the dry-type facsimile recorder. I have accordingly provided a compensator unit (100 in Figure 5 or 49 in Figure 1) to vary the amplification at some point in the facsimile system so as to retain essentially a linear resultant recording characteristic on the record sheet despite the leveling off due to the surge limiting feature of my invention.

In Figure 6 I have illustrated a preferred compensator characteristic input-output curve G used for compensating for the effects produced by a rectifier characteristic such as B in Figure 4. Curve D' represents the linear slope corresponding to curve D of Figure 4. Curve E' represents the preferred peak signal input value to the rectifier unit, whereas curve F' represents the preferred signal output value upon the facsimile recorder paper for marking thereon. By imparting a compensator characteristic such as G at some point in the facsimile system, the tapering off characteristics in the highest 25% range of recording level is rendered linear as curve E' indicates. Thus, we obtain the benefit of linear recording characteristics as well as the surge or peak limiting features represented by the saturated rectifier tube stage. The compensator unit 49 or 100 is preferably of the electronic type wherein an electronic tube is operated over the portion of its output characteristic corresponding to the required compensator characteristic illustrated. The compensator unit is similar to the well known volume expander unit employed in sound broadcasting.

Figure 7 is a modified arrangement for limiting the peak current input to the recording sheet. 56'' is a current limiting transformer. The position in the circuit of transformer 56'' corresponds to that of transformer 56' in Figure 5. Trans-

former 56'' has a current limiting feature and is of the saturated reactance type well known in the general electrical art. The input-output characteristic of a saturated type transformer is somewhat similar to that shown by curve B in Figure 4, and is designed in accordance to the requirements already defined.

The mode of operation and use of circuits in conjunction with transformer 56'', as for example, with a compensator unit is similar to that already hereinabove described in the mode of operation of the rectifier tube 57 or 57'. In the modification of Figure 7, the rectifier tube 57'' need not be operated at saturated condition since limiting transformer 56'' accomplishes this feature. Nevertheless, as a more safe arrangement both the transformer 56'' and rectifier 57'' may be of the saturated type.

A further modified feature in Figure 7 lies in the battery operation of the filament 102 to insure proper operating characteristic if the rectifier is to be used in its saturation mode of operation. Lead 103 corresponds to that in Figure 5 connected to the recording circuit.

It is to be understood that my present invention is not limited in its application to any particular type of recording unit or type of recording sheet nor to the particular type of current limiting units herein illustrated. While I have described and illustrated preferred embodiments for carrying out the principles of my present invention, it is to be understood that modifications are feasible which fall within the broader spirit and scope of my invention and accordingly, I do not intend to be limited except as set forth in the following claims.

What I claim is:

1. A radio facsimile recording system comprising means for receiving and amplifying radio transmitted facsimile signals, a recording sheet comprising an electrolytic conducting composition through which the received facsimile signals pass for producing a record of the received signals; and means for preventing burning of the recording sheet by the facsimile signals comprising current limiting means conductively passing a predetermined range of signal intensities and suppressing signal intensities above the predetermined range only during the period while the signal intensity is above said range; and means for altering the signal amplification characteristics increasing the signal amplification in the range near the predetermined maximum level to a degree greater than normal linear amplification whereby the resultant signal intensity characteristic impressed on said recording sheet is substantially linear to preserve recording detail.

2. A radio facsimile recording system comprising means for receiving and amplifying radio transmitted facsimile signals, a recording sheet comprising an electrolytic conducting composition through which the received facsimile signals pass for producing a record of the received signals; and means for preventing overloading at the recording sheet by the facsimile signals during recording thereof on the sheet comprising a saturated rectifier stage for conductively passing therethrough all of a predetermined range of signal intensities and suppressing only that portion of the signal intensities above the predetermined range while permitting the signal intensities at maximum to continue to flow, the output of said rectifier stage being in circuit with the recording sheet.

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