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TELEVISION SIGNAL-TRANSLATING
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tine Corporation, a corporation of Delaware

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13 Claims. (Cl. 178--5.8)

This invention relates to television signal-translating systems and, particularly, to such systems of a type in which a time-modulated television signal, derived by scanning the tele-
vised object at a predetermined field-scanning
frequency, is translated at one point of the sys-
tem and from which there is derived, at a subse-
quent point of the system, another time-modu-
lated television signal, the field-scanning fre-
quency corresponding to which is different than
that corresponding to the first time-modulated
television signal.

As used throughout this specification and the
appended claims, the term "time-modulated tele-
vision signal" refers to a conventional television
signal representative of successive elements of a
picture and comprising a single-valued electric
signal which varies with time.

In conventional television systems it is cus-
tomary to scan the object televised in two scan-
ning directions and at frequencies which are suf-
ficiently high to obtain satisfactory fidelity in the
reproduced image. The band width of the fre-
quency spectrum required for translating any
television signal varies with the product of the
scanning speeds utilized in developing the signal.
Ordinarily, the minimum acceptable scan-
ning speeds in a television system, neglecting the
flicker phenomenon, are limited by the speed of
motion of the object being televised. However,
in some cases, there is relatively little motion in
the subject to be televised and the scanning
speeds can be materially reduced while still ob-
taining satisfactory fidelity in the reproduced
image. This results in a material saving due to
the fact that it is necessary to provide signal-
translating stages adequate only to translate the
signal of the reduced band width. Furthermore,
the number of television programs which can be
transmitted over the air in a given frequency
range is dependent upon the average frequency
band required for the individual programs and
thus, if the average frequency band can be re-
duced, a larger number of programs can be trans-
mitted within the given frequency range.

However, even though there is very little mo-
tion in the object being televised, there is a limit
to the minimum field-scanning frequency which
can be used to translate and reproduce the image
satisfactorily. This limitation is due to the so-
called "flicker effect" in image reproduction
caused by the ability of the eye to discern similar
repeated impressions if the frequency of repeti-
tion is below a critical frequency. If the fre-
quency of repetition of illumination of a part

of the retina of the eye is above a critical fre-
quency, the visual sensation equals that given by
the same quantity of luminous flux averaged
over the total period. It is, therefore, possible
to reduce or eliminate flicker effect in a repro-
duced image by increasing field-scanning or
frame-scanning frequency above a critical value.

It is, therefore, desirable to provide a tele-
vision system in which, in one part of the sys-
tem, a television signal corresponding to a low
field-scanning frequency is translated and in
which, in another and subsequent part of the
system, a related television signal is translated
which has associated therewith a field-scanning
frequency sufficiently high to eliminate flicker
effects in the reproduced image.

It is an object of the present invention, there-
fore, to provide an improved television system in
which one or more of the above-mentioned dis-
advantages of prior art television systems are
eliminated.

It is still another object of the invention to
provide a television system in which the band
width required in one portion of the system for
translating the television signal is minimized and
in which, in a subsequent portion of the system,
there is derived a related television signal which
can be translated and reproduced without ob-
jectionable flicker.

In accordance with a feature of the present in-
vention, a television signal-translating system
comprises means for translating a time-modu-
lated first television signal, derived by scanning
a televised object at a predetermined field-scanning
frequency, and energy-storage means re-
sponsive to the translated signal for developing
a space-modulated second television signal. The
system also comprises means for commutating the
energy-storage means at a finite frequency differ-
ent than the field-scanning frequency electrically
to derive a time-modulated third television sig-
nal.

Also in accordance with a feature of the in-
vention, the method of translating a television
signal comprises first translating a time-modu-
lated television signal, derived by scanning a tele-
vised object at a predetermined field-scanning
frequency, storing energy from the time-modu-
lated first television signal to develop a space-
modulated second television signal, and extract-
ing the stored energy at a finite frequency higher
than the field-scanning frequency electrically to
derive a time-modulated third television signal.

For a better understanding of the invention,
together with other and further objects thereof,

reference is had to the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

The single figure of the drawing is a schematic diagram of a complete television signal-translating system in accordance with the invention including a television signal transmitter and a television signal receiver.

Referring now more particularly to the drawing, the television signal-translating system illustrated comprises a transmitter 7 including an antenna system 8, 9. The transmitter 7 is of conventional form except that the scanning frequencies of its image-analyzing device are considerably lower than customary, for example, its line-scanning frequency may be approximately 2500 lines per second and its field-scanning frequency 10 lines per second resulting in a signal of a band width of approximately 0.75 megacycle. The television signal-translating system also comprises a receiver of the superheterodyne type for receiving the television signal from transmitter 7. This receiver comprises an antenna system 10, 11 connected to a radio-frequency amplifier 12 to which are connected in cascade, in the order named, an oscillator-modulator 13, an intermediate-frequency amplifier 14, a detector 15, a video-frequency amplifier 16, and an image-reproducing device 17. A line-frequency generator 18 and a field-frequency generator 19, each having an input circuit coupled to detector 15 through a synchronizing-signal separator 20, are coupled to line-scanning windings 21' and field-scanning windings 21, respectively, which are associated with image-reproducing device 17. An automatic amplification control or A. V. C. bias is derived from detector 15 and applied to one or more of the tubes of radio-frequency amplifier 12, oscillator-modulator 13, and intermediate-frequency amplifier 14, in order to maintain the signal input to detector 15 within a relatively narrow amplitude range for a wide range of received signal amplitudes. A sound-signal reproducer 6 is coupled to intermediate-frequency amplifier 14 in order to reproduce sound signals accompanying the received television program. The stages or units 6-16, inclusive, 18, 19, and 20 may all be of conventional well-known construction, except that they are designed to pass a signal-modulation band of only approximately 0.75 megacycle rather than approximately 4 megacycles, as is customary, so that a detailed illustration and description thereof are deemed unnecessary herein.

Referring briefly, however, to the operation of the system described above, television signals radiated by antenna circuit 8, 9 and intercepted by antenna circuit 10, 11 are selected and amplified in radio-frequency amplifier 12 and coupled to the oscillator-modulator 13 wherein they are converted into intermediate-frequency signals which, in turn, are selected and amplified in intermediate-frequency amplifier 14 and delivered to the detector 15. The modulation components of the signal are derived by the detector 15 and the video-frequency components thereof are supplied to the video-frequency amplifier 16 wherein they are amplified and from which they are supplied in the usual manner to a brilliancy-control electrode 22 of image-reproducing device 17. The intensity of a scanning ray of device 17 is thus modulated or controlled in accordance with the video-frequency voltages impressed upon the control electrode 22 in the usual manner. The synchronizing-component output of detector 15 is sup-

plied through synchronizing-signal separator 20 to generators 18 and 19. Scanning waves are generated in the line-frequency and field-frequency scanning generators 18 and 19, respectively, which are controlled by synchronizing-voltage pulses from separator 20, and are applied to the scanning elements 21, 21' of image-reproducing device 17 to produce scanning fields, thereby to deflect the scanning ray thereof in two directions normal to each other, so as to trace a rectilinear scanning pattern within tube 17 in a manner to be hereinafter fully explained. The control voltage derived from detector 15 and applied to one or more of the tubes of stages 12, 13, and 14 serves to control the amplification therein to maintain the amplitude of the signal input to detector 15 within relatively narrow limits for a wide range of received signal amplitudes. Sound signals accompanying the received television program are reproduced in sound-signal reproducer 6.

Referring now more particularly to the portion of the system of the drawing embodying the present invention, there is provided in the cathode-ray reproducing unit 17 a control grid 25 of the image-grid type which, per se, is known in the art, one such grid being described in the United States Letters Patent No. 2,280,191 to R. C. Hergenrother, granted April 21, 1942. The image grid 25 of tube 17 constitutes an energy-storage means responsive to the signal translated by video-frequency amplifier 16, which is a time-modulated first television signal derived by scanning the televised object at transmitter 7 at a predetermined field-scanning frequency, and is utilized to develop from the time-modulated signal a space-modulated second television signal. The image grid 25 consists of a perforated or reticulated disc, one surface of which is made up of a thin dielectric charge film or plate 26 coated on a conductive sheet or backing plate 27 and capable of holding a surface distribution of electron charges corresponding to a television image which is formed thereon by facing it towards the source of the scanning beam modulated by electrode 22. Projections on the backing plate 27 of the image-grid structure are provided for blocking the direct paths through the grid for the high-velocity electrons of the scanning beam. The tube 17 is provided with an electron gun for developing a second television signal comprising a space-modulated charge image on the image grid 25, this electron gun including a cathode 28, a control electrode 22, focusing and accelerating anodes 29, 30, and a collector electrode 31.

Cathode-ray tube 17 also comprises an electron gun for commutating the energy-storage means or image grid 25 at a frequency higher than the field-scanning frequency of the signal transmitted by transmitter 7, electrically to derive a time-modulated third television signal. This electron gun includes a cathode 32, a control electrode 33, and an anode 34 for projecting a beam of electrons on image grid 25. In order to cause this last-named beam to scan or commute the target electrode 25 at a frequency higher than the field frequency used for scanning the televised object at the transmitter, there are provided a line-scanning generator 50 and field-scanning generator 51 coupled respectively to line-scanning windings 52 and field-scanning windings 53. A timer 54 is provided for supplying synchronizing pulses to generators 50 and 51. The structure of tube 17 is such that the beam from cathode 32 is incident on backing plate 27 and is effective to develop low-

velocity secondary electrons in the vicinity of the point at which the beam is incident. The passage of these low-velocity electrons through the image grid 25 is controlled by the charge image on image grid 25, electrically to derive a time-modulated third television signal. The electrons comprising this time-modulated third television signal are directed to fluorescent screen 38 by means of focusing plates 39 in order to reproduce a visible image on the screen.

For most successful operation of a reproducing unit of the type under discussion, the charge image on the image grid 25 must be substantially discharged during each field-scanning cycle of the transmitter 7. The charge image on the image grid may be discharged between successive image scans by any one of several arrangements, an arrangement hereinafter called a "chasing-beam scanning apparatus" being illustrated in the drawing. The chasing-beam scanning apparatus includes an electron gun comprising a cathode 40 and focusing anodes 41 and 42, for directing a stream of relatively low-velocity biasing electrons upon surface 26 of image grid 25, and a chasing-beam scanning generator 44, having an input circuit coupled to synchronizing-signal separator 20 and output circuits coupled to scanning windings 45 and 46, for causing the beam generated by the chasing-beam gun to scan the surface 26 of image grid 25 in a way to be described more fully hereinafter. Suitable operating potentials are provided for the cathode-ray tube 17 in a manner which is well understood in the art.

Before describing in detail the operation of the image-grid tube 17, it may be helpful first to consider some of the operating characteristics of the particular elements of tube 17 and particularly the secondary electron-emission characteristic of the surface 26 of image grid 25. The secondary electron-emitting target of electron gun 22, 28, 29, 30 of cathode-ray tube 17 is effectively the insulating film 26 of image grid 25 which forms one plate of a condenser, the other plate of which is conducting plate 27 connected to the collector electrode 31 so that it is maintained at a proper operating potential. The grid 25 may take a variety of forms. For example, the grid may consist of a conductive surface on a dielectric or insulator, which surface is not continuous but is broken up into a number of minute elements to form a mosaic. For such an image grid any electrical charge produced thereon by the primary electron beam from cathode 28 is localized at the region where the beam strikes the target and is not appreciably dissipated over the surface of the target. Alternatively, the target may consist simply of a dielectric sheet or film. A primary electron beam incident on such a target releases secondary electrons from the outer layer of the target and behaves in much the same way as does the conductive mosaic target described above; that is, any electrical charge produced by the incident primary electron beam remains localized where the beam strikes. The target of the mosaic type and the dielectric target are thus similar in electrical behavior and the following discussion of the electrical charging properties of the dielectric target is valid for the target of mosaic type.

In considering in detail the electrical properties of dielectric film 26, it will first be assumed that the beam current from cathode 28 is unmodulated and unscanned. The current to the backing plate 27 is zero after a steady beam cur-

rent from cathode 28 has been supplied for an appreciable time and the current surge has died out so that an equilibrium condition has been reached. For equilibrium, the beam current must be equal to the collector-electrode current. It is also assumed that the dielectric surface 26 was initially uncharged so that its surface potential was the same as that of the backing plate 27. The arrangement may be so proportioned that the primary electron beam striking the dielectric surface 26 has a secondary-emission ratio less than unity which simply means that fewer electrons are released as secondaries than arrive as primaries. These secondary electrons go to the collector electrode 31. The portion of the surface of dielectric 26 upon which the electron beam is incident, therefore, becomes increasingly negatively charged and the potential rises negatively with respect to the potential of collector electrode 31 and the backing plate 27. This negative potential will rise until the dielectric surface 26 reaches the potential of the cathode 28 when the electron beam current will no longer be able to reach dielectric surface 26 and equilibrium will have been established. The potential of the dielectric surface under these conditions has a negative value relative to the collector electrode 31.

If, on the other hand, the voltage of the primary electron beam from cathode 28 is such that the surface of dielectric 26 loses more electrons as secondaries than it gains as primaries when it is at the potential of collector electrode 31 so that it has a secondary electron-emission ratio greater than unity, it becomes positively charged relative to the backing plate 27 and the collector electrode 31. Assuming, for example, that the dielectric 26 is initially uncharged and the primary beam from cathode 28 is turned on, the building up of a positive electrical charge on the surface of dielectric 26 has the effect of opposing the secondary electrons which leave the dielectric to go to the collector electrode 31. This opposing field tends to suppress the secondary emission current to the collector electrode 31, turning back to the dielectric surface 26 those electrons having an initial velocity of emission insufficient to overcome the electrical field. As the charge on the dielectric becomes more positive, a greater portion of the secondary emission current is thus suppressed until a point of equilibrium is reached. This occurs when the secondary emission current is suppressed to the extent that the part of the secondary emission current which reaches the collector electrode 31 is exactly equal to the primary beam current from cathode 28. The value of the limiting positive potential of dielectric 26 depends upon the velocity distribution, that is, upon the voltage distribution of secondary electrons. These characteristics of an image-grid tube are explained in more detail in the above-mentioned patent and element of the present arrangement which are similar to those of the patent have identical reference numerals.

Considering now the operation of tube 17 in the system of the invention, it is seen that the electron gun structure comprising cathode 28 and the image grid 25 is similar to that of a conventional reproducing tube except that the fluorescent screen of the conventional tube is replaced by the thin sheet of dielectric 26 attached to the conductive backing plate 27. It is seen that the control grid 22 of this electron gun structure is connected, as in a conventional reproducing

tube, to a television receiver and its operation will be considered during the scanning of one field of a television image starting with the dielectric 26 uncharged. It will be assumed that the arrangement is so designed that dielectric surface 26 has a secondary electron-emission ratio greater than unity so that the number of secondary electrons from dielectric 26 is greater than the number of electrons incident thereon from cathode 28. The dielectric 26 under these conditions is charged positively by the electron beam, as set forth in detail above, from element to element in accordance with the modulated television signal. This results in a distribution of positive charge over the dielectric surface 26, that is, in the production of a second television signal comprising a space-modulated charge image on the image grid 25 of the tube 17, which charge image is an electrical replica of the transmitted television image. This charge image remains on the dielectric surface 26 for an appreciable length of time. During this time the electron beam from cathode 32 is effective to commutate the energy-storage means formed by the elements of image grid 25 due to the fact that it is scanned over the surface of the backing plate 27 at a frequency higher than the frequency of scanning associated with the electron beam from cathode 28. The beam from cathode 32 is effective to develop low-velocity electrons in the vicinity of the point at which the beam is incident on the energy-storage means 25. These low-velocity electrons are developed by secondary electron emission from the plate 27. The projections on backing plate 27 comprise means for preventing the direct passage of high-velocity electrons from the cathode 32 through the image grid 25. The passage of the low-velocity electrons, which are developed at the backing plate 27, through the image grid 25 is controlled by the charge image upon dielectric 26. The electrons which pass through the grid are accelerated and focused on fluorescent screen 38 to produce a visible television image by focusing plates 39. The electron stream which passes through the image grid thus comprises a time-modulated third television signal.

In the operation of signal-reproducing device 17 for transmitting successive pictures or fields it is necessary to provide some biasing arrangement for bringing the surface of dielectric 26 to a reference potential between successive picture scans by the electron beam from cathode 28. If this is not done, the charge over the entire dielectric surface approaches a maximum constant value and the image disappears. This biasing may be effected either by electrical leakage of the charge through the dielectric or by bombarding the dielectric 26 with electrons of sufficiently low velocity that the secondary electron-emission ratio is considerably less than unity, causing the charge on a dielectric to fall approximately to the cathode potential of the bombarding beam. This cathode potential may have any convenient value. For this purpose the electron gun structure 40, 41, 42 is provided for supplying electrons which are sharply focused to a scanning beam and scanned over the surface of dielectric 26. This beam is scanned in the same manner and with the same scanning frequencies as the beam from cathode 28 is scanned, but the phase of the saw-tooth field-scanning waves is retarded by nearly a full cycle or advanced by a relatively small angle so that the beam from cathode 40 follows or chases the signal beam from

cathode 28 with a delay of almost a full field-scanning period. Therefore, the charge image on image grid 25 is retained at full intensity for almost the entire field-scanning period of the beam from cathode 28.

Since it is impracticable to utilize an arrangement in which the biasing beam from cathode 40 is focused as sharply as that of the image-forming beam from cathode 28, it is necessary to have a gap of appreciable width, for example, 20 lines, between the image-forming beam from cathode 28 and the biasing beam from cathode 40. This phase relation can be obtained by advancing the phase of the field-scanning wave for the bias beam developed by the chasing-beam scanning generator 44 by the equivalent of 20 lines relative to the field-scanning wave developed by the generator 19.

In summary, therefore, it is seen that the television signal-translating system described comprises a transmitter 7 and the stages 12-16, inclusive, of a receiver for translating a time-modulated first television signal, derived in the transmitter 7 by scanning the televised object at a predetermined field-scanning frequency. The image grid 25 of image-grid tube 17 comprises a capacitive energy-storage means, responsive to this translated time-modulated television signal, for developing a second television signal comprising a space-modulated charge image on the dielectric 26. The electron gun structure comprising cathode 32 and deflecting windings 52, 53 comprises a means for commutating the image grid 25 at a finite frequency higher than the frequency of field scanning at the transmitter 7, while the backing plate 27 comprises a means for developing low-velocity electrons in the vicinity of the point at which the beam from cathode 32 is incident on the image grid 25, electrically to derive a time-modulated third television signal by the passage of the low-velocity electrons through the image grid.

It will be understood that the present invention is not limited to an arrangement in which this last-mentioned time-modulated television signal is directly reproduced as by the action of screen 38, but also includes arrangements in which an electrical signal is derived from the time-modulated electron stream passing through target 25 and further translated in the system.

It is seen that, in the arrangement of the invention, the field-scanning frequency associated with the reproduced image is unrelated to, and is preferably materially higher than, that associated with the television signal translated by transmitter 7 and for this reason the flicker effects can be substantially eliminated, as described above. It is also seen that the band width of the signal translated through the air from antenna system 8, 9 to antenna system 10, 11 is materially less than would ordinarily be required to reproduce a television image in a conventional system with the same flicker properties as the image reproduced by fluorescent screen 38.

It will also be understood that various known modifications of an image-grid tube, some of which are described in detail in the above-mentioned copending application, can also be incorporated in an arrangement in accordance with the present invention.

While there has been described what is at present considered to be the preferred embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing

from the invention and, it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A television signal-translating system comprising, means for translating a time-modulated first television signal derived by scanning the televised object at a predetermined field-scanning frequency, energy-storage means responsive to said translated signal for developing a space-modulated second television signal, and means for commutating said last-named means at a finite frequency higher than said field-scanning frequency electrically to derive a time-modulated third television signal.

2. A television signal received comprising, means for translating a time-modulated first television signal derived by scanning a televised object at a predetermined field-scanning frequency, energy-storage means responsive to said translated signal for developing a space-modulated second television signal, and means for commutating said last-named means at a finite frequency higher than said field-scanning frequency electrically to derive a time-modulated third television signal.

3. A television signal-translating system comprising, means for translating a time-modulated first television signal derived by scanning the televised object at a predetermined field-scanning frequency, capacitive energy-storage means, means responsive to said translated signal for developing in said energy-storage means a space-modulated second television signal, and means for commutating said energy-storage means at a finite frequency higher than said field-scanning frequency electrically to derive a time-modulated third television signal.

4. A television signal-translating system comprising, means for translating a time-modulated first television signal derived by scanning the televised object at a predetermined field-scanning frequency, energy-storage means responsive to said translated signal for developing a space-modulated second television signal, means for commutating said last-named means at a finite frequency higher than said field-scanning frequency electrically to derive a time-modulated third television signal, and means for reproducing from said third television signal a visible image of said object.

5. A television signal-translating system comprising, means for translating a time-modulated first television signal derived by scanning the televised object at a predetermined field-scanning frequency, an image-grid tube, means for applying said translated signal to said image-grid tube to develop a second television signal comprising a space-modulated charge image on the image grid of said tube, and means for commutating the image grid of said tube at a finite frequency higher than said field-scanning frequency electrically to derive a time-modulated third television signal.

6. A television signal-translating system comprising, means for translating a time-modulated first television signal derived by scanning the televised object at a predetermined field-scanning frequency, an image-grid tube, means for applying said translated signal to said image-grid tube to develop a second television signal comprising a space-modulated charge image on the image grid of said tube, and means for

scanning the image grid of said tube with an electron beam at a finite frequency higher than said field-scanning frequency electrically to derive a time-modulated third television signal.

7. A television signal-translating system comprising, means for translating a time-modulated first television signal derived by scanning the televised object at a predetermined field-scanning frequency, an image-grid tube, means for scanning the image grid of said tube with an electron beam modulated in accordance with said first television signal to develop a second television signal comprising a space-modulated charge image on said image grid, means in said tube for developing a chasing beam synchronized with but phase-displaced from said first-mentioned beam for biasing the image grid of said tube to a predetermined reference potential after each scanning by said first-mentioned beam, and means for commutating said image grid at a finite frequency higher than said field-scanning frequency electrically to derive a time-modulated third television signal.

8. A television signal-translating system comprising, means for translating a time-modulated first television signal derived by scanning the televised object at a predetermined field-scanning frequency, an image-grid tube, means responsive to said translated signal for developing a second television signal comprising a space-modulated charge image on the image grid of said tube, means for scanning said image grid with an electron beam at a finite frequency higher than said field-scanning frequency, and means responsive to said beam for developing low-velocity electrons in the vicinity of the point at which said beam is incident on said image grid electrically to derive a time-modulated third television signal by the passage of said low-velocity electrons through said image grid.

9. A television signal-translating system comprising, means for translating a time-modulated first television signal derived by scanning the televised object at a predetermined field-scanning frequency, an image-grid tube, means responsive to said translated signal for developing a second television signal comprising a space-modulated charge image on the image grid of said tube, means for scanning said image grid with an electron beam at a finite frequency higher than said field-scanning frequency, and means responsive to said beam for developing secondary electrons in the vicinity of the point at which said beam is incident on said image grid electrically to derive a time-modulated third television signal by the passage of said secondary electrons through said image grid.

10. A television signal-translating system comprising, means for translating a time-modulated first television signal derived by scanning the televised object at a predetermined field-scanning frequency, an image-grid tube, means responsive to said translated signal for developing a second television signal comprising a space-modulated charge image on the image grid of said tube, means for scanning said image grid with an electron beam at a finite frequency higher than said field-scanning frequency, means responsive to said beam for developing secondary electrons in the vicinity of the point at which said beam is incident on said image grid electrically to derive a time-modulated third television signal by the passage of said secondary electrons through said image grid, a fluorescent screen, and

means for accelerating and focusing the electrons comprising said third television signal onto said screen to produce a visible image.

11. A television signal-translating system comprising, means for translating a time-modulated first television signal derived by scanning the televised object at a predetermined field-scanning frequency, an image-grid tube, means responsive to said translated signal for developing a second television signal comprising a space-modulated charge image on the image grid of said tube, means for scanning said image grid with an electron beam at a finite frequency higher than said field-scanning frequency, means responsive to said beam for developing low-velocity electrons in the vicinity of the point at which said beam is incident on said image grid electrically to derive a time-modulated third television signal by the passage of said low-velocity electrons through said image grid, and means for preventing the direct passage of electrons from said beam through said image grid.

12. The method of translating a television sig-

nal which comprises, translating a time-modulated first television signal derived by scanning the televised object at a predetermined field-scanning frequency, storing energy from said time-modulated first television signal to develop a space-modulated second television signal, and extracting the stored energy at a finite frequency higher than said field-scanning frequency electrically to derive a time-modulated third television signal.

13. A television signal-translating system comprising, means for translating a time-modulated first television signal derived by scanning the televised object at a predetermined field-scanning frequency, energy storage means responsive to said translated signal for developing a space-modulated second television signal, and means for commutating said last-named means at a finite frequency different than said field-scanning frequency electrically to derive a time-modulated third television signal.

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