May 16, 1933. H. S. BAIRD 1,908,809

SCANNING APPARATUS FOR TELEVISION

Filed Nov. 15, 1929 2 Sheets-Sheet 1

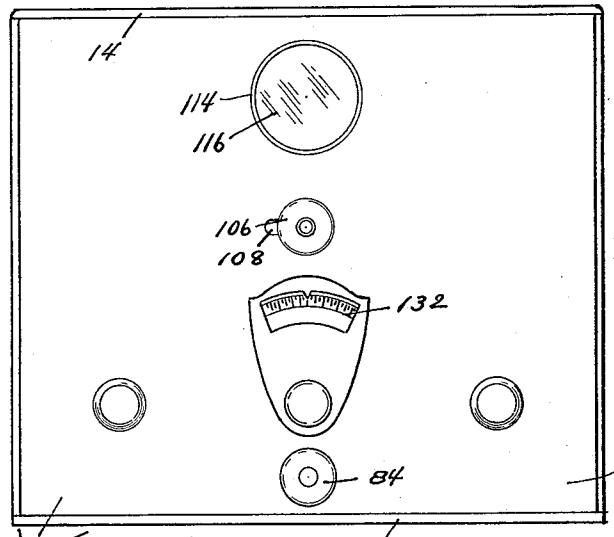

Fig. 1.

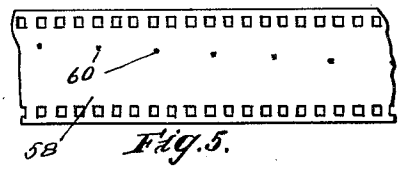

Fig. 5.

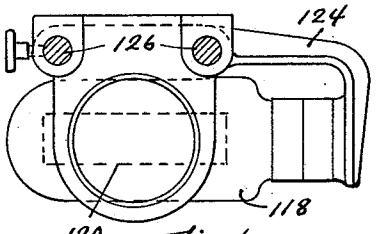

Fig. 6.

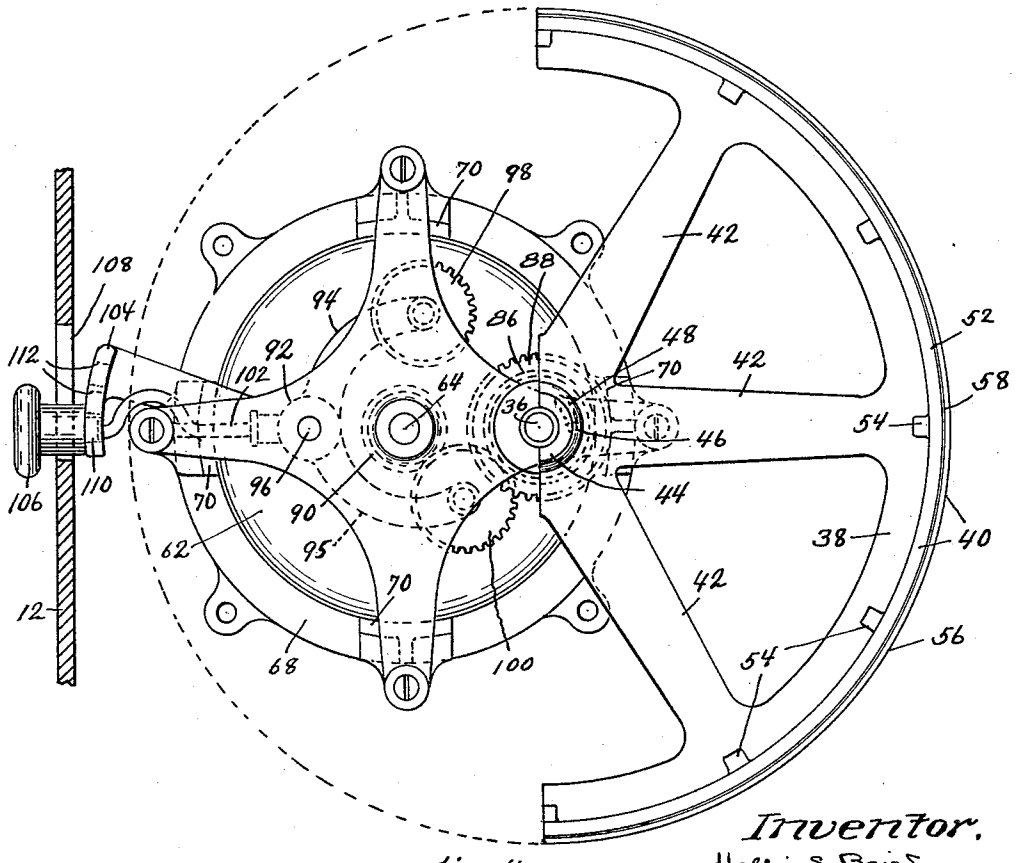

Fig. 4.

Inventor.
Hollis S. Baird
by [illegible]
atty

May 16, 1933. H. S. BAIRD 1,908,809

SCANNING APPARATUS FOR TELEVISION

Filed Nov. 15, 1929 2 Sheets-Sheet 2

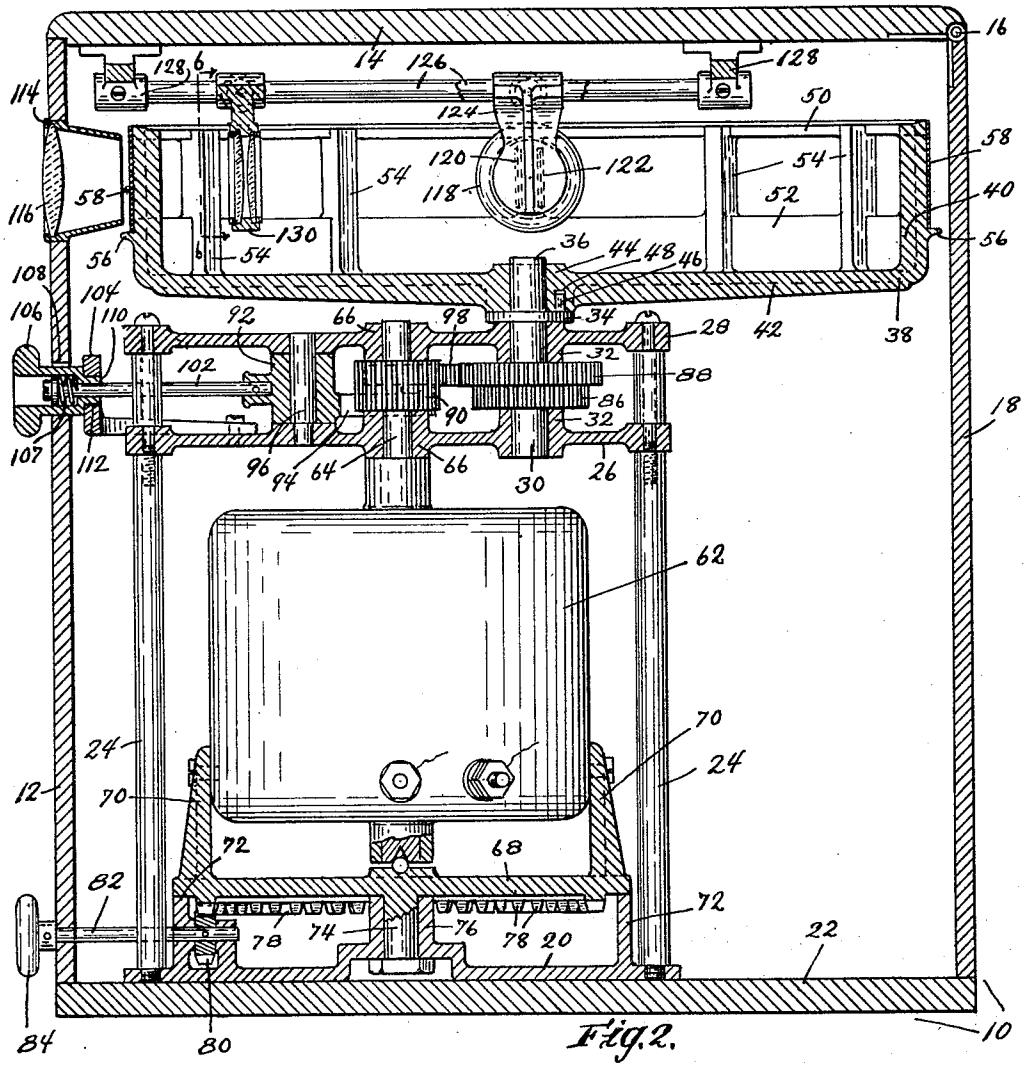

Fig. 2.

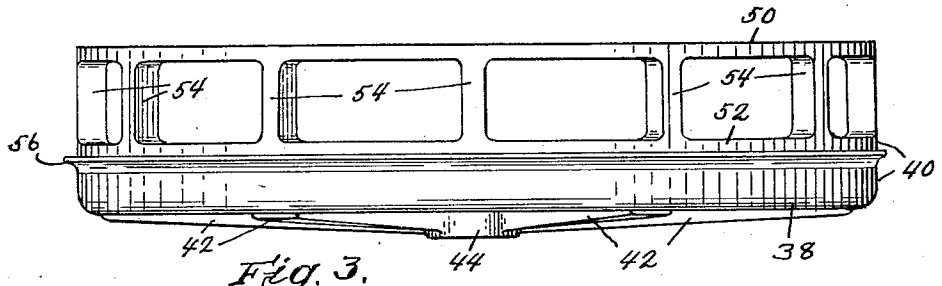

Fig. 3.

Inventor.
Hollis S. Baird
by
atty

Patented May 16, 1933 1,908,809

UNITED STATES PATENT OFFICE

HOLLIS S. BAIRD, OF STONEHAM, MASSACHUSETTS, ASSIGNOR TO SHORTWAVE & TELEVISION CORPORATION, OF BOSTON, MASSACHUSETTS, A CORPORATION OF DELAWARE

SCANNING APPARATUS FOR TELEVISION

Application filed November 15, 1929. Serial No. 407,410.

This invention relates to television and particularly to receiving apparatus therefor having picture re-constituting apparatus which includes a scanning device provided with small and suitably arranged windows which rotate in front of a light emitting source, the intensity of illumination of which is caused to be varied by the transmitted picture signal.

In my copending application Serial No. 366,974, filed May 29, 1929, I have disclosed a scanning device which consists of an opaque endless belt having scanning windows therein and arranged to be driven in synchronism with the scanning device at the transmitting station. The belt preferably is an endless section of a moving picture film and the scanning windows are photographed thereon, the sensitive photographic film being exposed to a strong illumination except at the location of the windows so that when the film is subsequently developed and fixed, the film is opaque except at the windows, where it is transparent.

One of the objects of the present invention is to provide supporting and driving mechanism for such scanning belt that is relatively free from noise when in operation, has few operating parts, and lends itself readily for enclosure within a cabinet which can also contain the signal detecting and amplifying apparatus essential to the television apparatus.

Another object of the invention is the provision of a supporting and driving mechanism for the belt, which mechanism includes a scanning drum on the periphery of which the scanning belt is supported, the drum being perforated, or having openings, at the windows and having imperforate peripheral portions that are located between and beyond the windows.

The drum is driven by a synchronous motor which has a weak starting torque. Consequently, it is an object of the invention to provide means by which the motor can be started in rotation independently of the drum thereby to reduce the load on the motor at the moment of starting. Specifically, this object of the invention comprehends a lost-motion connection between the armature of the motor and the drum so that the motor can begin to rotate prior to its engaging and rotating the drum.

Television signals at present are broadcast by radio by means of scanning apparatus operated at various speeds and having a variable number of scanning windows. Consequently, a scanning belt operated at a certain speed and having a certain number of scanning windows, and adapted for one particular system of scanning signals cannot receive intelligible signals produced by a differently arranged and operated scanning device. Consequently, another object of this invention is to provide a rotatable drum that is adapted to support scanning belts having different numbers of windows, which also may be differently located on the belt, combined with means to rotate the drum at various selected speeds whereby the device can be adjusted to receive different types of broadcast television signals.

While the broadcast and receiving stations may operate in synchronism they yet may be displaced in phase, or out of step, so that the received picture is out of frame. It is an object of the present invention to provide a simple means for bringing the received picture into frame when it is out of frame.

A further object of the invention is the provision of television receiving apparatus having a scanning drum the periphery of which is provided with scanning windows, a viewing frame located without the periphery of the drum, and a variable light source located within the periphery of the drum.

A further object is generally to improve the construction and operation of television apparatus.

Fig. 1 is a front elevation of the cabinet enclosing the apparatus embodying the present invention and, in itself, constituting a part of the invention.

Fig. 2 is a sectional elevation through the cabinet of Fig. 1 and illustrating in detail the construction of the apparatus therein, parts of the apparatus not essential to the present invention being omitted.

Fig. 3 is a front elevation of the scanning drum of Fig. 2.

Fig. 4 is a plan detail of the apparatus of Fig. 2, parts of the drum being broken away.

Fig. 5 is a plan view of a section of the scanning belt associated with the present invention.

Fig. 6 is a sectional detail, taken along line 6—6 of Fig. 2 and illustrates especially the gaseous-conductor lamp and its supporting means.

The apparatus embodying the present invention is contained within the enclosing cabinet 10 having a front wall 12 and a top wall 14 which is hinged at 16 to the rear wall 18, the top wall thus constituting a cover which can be raised to gain access to the mechanism within the cabinet. The movable elements of the television apparatus are supported upon a base 20 which is carried by the bottom wall 22 of the cabinet. Vertical and peripherally spaced standards 24 upstand from said base and support an intermediate plate 26 and, spaced thereabove, an upper plate 28. A vertical shaft 30 is journalled in bearings 32 in said plates and has an enlarged annular flange 34 which overlies the upper plate and also has an end 36 which extends upwardly above said flange. Said shaft constitutes driving means for a horizontally-rotatable scanning drum 38. Said drum is provided with an upstanding cylindrical periphery 40 which is connected at its lower edge by arms 42 to a hub 44 which has a passage therein in which said extended end 36 of the shaft is snugly received to prevent rotation of the drum eccentrically of the shaft although the drum can be removed at will from the shaft, both being free from any positive attaching means. The flange 34 of the shaft is provided with an upstanding driving pin 46 which is received within a peripherally elongated groove 48, see Fig. 4, so that the shaft can have a small amount of initial rotary movement before the pin engages a wall of the groove to drive the drum. With this arrangement, the synchronous driving motor, presently to be described, for the drum can start to rotate freely before it takes on the load of the drum. The hub of the drum is seated on the flange 34 and has sufficient frictional engagement therewith to prevent "hunting" of the drum, or its alternate engagement and disengagement with the pin 46 when the drum and shaft are running at synchronous speed. The drum is provided with upper and lower peripherally continuous portions 50 and 52 respectively which are connected by vertical ribs 54 located within the drum. The periphery of the drum is provided with a continuous outstanding flange or bead 56 located at the lower portion of the drum and which constitutes a stop member that is engaged by the lower edge of the scanning belt to define its operative position on the drum. The outer face of the periphery above the bead is smooth and cylindrical and constitutes a support for the scanning belt 58.

Said scanning belt consists of an endless section of photographic film the internal diameter of which closely conforms to the outer diameter of the drum so that when the belt is on the drum it is a snug, although readily detachable, fit thereon. The belt has such width that its upper and lower marginal portions overlie the upper and lower peripherally continuous portions 50 and 52 of the drum. The body of the scanning belt is opaque except at the scanning windows 60, therein, see Fig. 5, which windows are preferably, although not necessarily, square and are of small area and are spaced lengthwise along the belt and also are spaced in a progressive manner transversely of the belt. The number of scanning windows and their spacing lengthwise of the belt is dependent upon the particular system on which any particular television signal is broadcast and belts having different numbers of scanning windows, which may be differently spaced along the length of the belt, are adapted to be interchangeably supported on the drum to condition the apparatus to receive television signals broadcast under different systems. As specifically described in my above referred to application, the scanning belt herein shown consists of a section of photographic and particularly moving picture film wherein the windows are photographically developed.

The driving mechanism for the disc includes a synchronous motor 62, the shaft 64 of the rotatable armature of which is vertically disposed and is rotatable in bearings 66 of the upper and intermediate plates 28 and 26, respectively. The motor is secured to a supporting plate 68 which has upstanding arms 70 between which the lower portion of the field frame of the motor is located and to which arms it is secured. Said plate is rotatably supported upon the upper face of an upstanding peripheral flange 72 carried by the base plate 20 and has a stud shaft 74 which is rotatable in a bearing 76 of said base plate. Said plate 68 is provided with gear teeth 78 on its lower face which mesh with a pinion gear 80 fixed to a shaft 82 which is journalled in the base plate 20 and extends through the front wall 12 of the cabinet and terminates thereat in a knob 84. When the received pictures are out of frame they can be brought into frame by rotating the shaft 82 and consequently the field frame of the motor 62 a suitable amount. This changes the phase relation of the received picture with respect to the transmitting picture, without effecting the synchronous operation of the device and, with a sufficient degree of rotation will bring the picture into frame. The friction of the motor supporting frame 68 upon the flange 72 is sufficient

to hold the field frame of the motor stationary against the driving torque between it and the armature.

When belts having different scanning characteristics are applied to the drum, it is necessary, usually, to alter the speed of the drum, the speed of the synchronous motor being constant. Consequently, speed-changing means are interposed at the driving connection between the motor shaft 64 and the drum shaft 30. To this end, a small gear 86 and a large gear 88 are fixed in superposed relation on the drum shaft 30 between the intermediate and upper plates 26 and 28. The motor shaft 64 is provided with a driving gear 90 having a driving face the width of which is equal to the combined width of the driving faces of the two gears 86 and 88. A speed-changing frame 92 is pivotally supported on a shaft 96 carried by the intermediate and upper frames and has two arms 94 and 95, see especially Fig. 4, which are located on opposite sides of the driving gear. Idler gears 98 and 100, which preferably are identical, are pivoted to the ends of said arms. When the frame 92 is moved in a counterclockwise direction, Fig. 4, the gear 100 is thereby disposed in mesh with the driving gear 90 and the small gear 86 of the drum shaft whereby to establish a high speed driving connection between the motor and drum. When the gear frame is swung in a clockwise direction, the gear 100 is adapted to be moved out of mesh with its cooperating gears and the gear 98 is adapted to be moved into mesh with the driving gear 90, and the large gear 88 on the drum shaft. A low speed driving connection is thus established between the motor and drum.

The gear frame 92 is provided with an arm 102 which is loosely extended through a horizontally elongated slot in a plate 104 carried by the intermediate plate 26. A knob 106, the outer portion of which is in front of the front wall 12 of the cabinet, is horizontally movable in a slot 108 therein and is slidable on said arm 102 under urge of a spring 107 thereon and has a reduced end 110 which can enter a series of apertures 112 in said plate 104 to lock the gear frame 92 with either one of its idler gears in mesh with the driving and driven gear. It can also lock said frame in an intermediate position wherein the drum and motor are free from a driving connection therebetween.

The front wall 12 of the cabinet is provided with a viewing frame or tube 114 the inner end of which has a preferably square opening which confronts the belt on the drum and in the outer end of which is an enlarging lens 116 located whereby an enlarged image of the received picture can be viewed. A variable source of illumination 118, as a gaseous conductor, or neon lamp, is located within the drum in radial line with the scanning belt and lens 116 and has a pair of electrodes 120 and 122 of which the electrode 120 confronts the belt and lens and constitutes the variable source of illumination. The lamp is carried by a bracket 124 which is slidable on a pair of spaced rods 126 that overlie the top of the drum and are secured in brackets 128 carried by the cover 14 of the cabinet. A condensing lens unit 130 is also slidably carried by said rods and is interposed between windows of the scanning belt and serves to concentrate the light of the lamp on the windows. As thus arranged, when the cover 14 is raised the lamp and lens are automatically removed from operative position within the scanning drum so that the drum can be removed for the purpose of applying different scanning belts thereon.

The mechanism here shown is simple, effective and reliable. It is free from electrical disturbances which would effect the radio receiving and amplifying apparatus associated with the neon lamp and consequently said apparatus can be located in the cabinet herein shown in close proximity to the motor and its associated apparatus and tuned to any desired incoming signal by the tuning device 132. Since the receiving and amplifying apparatus forms no part of the present invention, it is omitted from the present illustrations.

I claim:

1. A scanning device for television including an annular rotatable member having peripherally located alternate supporting surfaces and openings therein and a scanning member separate from and supported and carried by said rotatable member upon said surfaces and extended over said openings and having scanning windows which are located in register with said openings.

2. A scanning device for television including a rotatable drum having a cylindrical periphery provided with openings therein, and an endless scanning band carried removably by and disposed against said cylindrical periphery and overlying said openings and having scanning windows which are located at said openings.

3. A scanning device for television including a rotatable drum having a cylindrical periphery provided with openings therein and a peripheral flange that outstands beyond said periphery and is located below said openings, and an endless flexible scanning belt carried removably by and disposed against said cylindrical periphery over said openings having one edge thereof seated upon said flange and having scanning windows therein which are located at said openings.

4. A scanning device for television including a rotatable drum having a driving hub provided with outstanding driving arms, and a cylindrical periphery which is connected with and upstands above said

arms and hubs, and a flexible endless scanning belt which rotates with said drum and is seated removably upon and is supported against deformation by said cylindrical periphery.

5. A scanning device for television including a rotatable drum having a driving hub provided with outstanding driving arms, and a cylindrical periphery which is connected with and upstands above said arms and hubs and has openings therein, and an endless flexible scanning belt supported against flexing by and seated upon said cylindrical periphery over said openings and having windows which are located at said openings.

6. A scanning device for television including a rotatable drum having light passages and an endless flexible scanning belt carried removably by said drum and having exposed windows therein.

7. Scanning apparatus for television including a horizontally rotatable scanning device having a hub, a vertical driving shaft for said device loosely located in said hub and having an outstanding flange on which said hub is frictionally seated, and a lost-motion positive driving connection between said shaft and scanning device including a pin carried by said flange and located in an arcuate slot in said hub.

8. Scanning apparatus for television including a horizontal rotatable scanning device, and means to adapt said scanning device to receive signals transmitted under different systems including a drive shaft for said device, a plurality of gears of different diameters fixed thereon under said scanning drum, a vertical motor located beneath said scanning device having an upstanding shaft provided with a driving gear, speed-changing mechanism located between and connecting said motor and scanning device including a movable frame having arms which are disposed on opposite sides of said aforesaid gears and have idler gears thereon, and means to move said frame in opposite directions to bring both idler gears separately into mesh with said driving gear and a separate one of said other gears.

9. Scanning apparatus for television including a rotatable scanning device, and means to adapt said scanning device to receive signals transmitted under different systems including a drive shaft for said device, a plurality of gears of different diameters fixed thereon, a supporting frame under said scanning device in which said shaft is journaled, a motor under said frame having a vertical shaft provided with a driving gear arranged in horizontal line with the aforesaid gears, speed-changing mechanism connecting said motor and scanning device including a movable frame pivoted on said supported frame and having arms which are disposed on opposite sides of said aforesaid gears and have idler gears thereon, means to move said movable frame in opposite directions to bring both idler gears separately into mesh with said driving gear and a separate one of said other gears, and means to lock said movable frame in both aforesaid positions, and also in an intermediate position wherein all of its idler gears are free from driving connection with the aforesaid gears.

10. Scanning apparatus for television including a vertical driving motor having a rotatable armature and a stationary field frame, a scanning device having a support on which it is rotatable, means providing a speed-reducing driving connection between said armature and scanning device, and means to vary the framing of the received picture including means to angularly shift the position of said field frame, the speed-reducing driving connection providing a small angular displacement of said scanning device for a large angular displacement of said field frame, said last mentioned means comprising an annular gear attached to the end of said field frame.

11. Scanning apparatus for television including a supporting base, a horizontal plate rotatable on said base, a vertical motor having a rotary armature and a stationary field frame which latter is supported by and is fixed to said rotary plate, a scanning device having a rotatable support on said base above said motor, means providing a driving connection between said scanning device and motor, and means to vary the framing of the received picture including means to rotate said motor supporting plate on said base, said plate and said base having frictionally engaging surfaces which hold said plate and motor field frame against any rotary movement caused by the driving reaction between said field frame and motor armature.

12. Scanning apparatus for television including a base, standards rising thereabove, vertically spaced intermediate and upper plates carried by said standards, a vertical shaft journalled in said plates, a horizontally rotatable scanning drum carried by said shaft above said upper plate and having a removable driving connection therewith, a vertical motor located between said standards and mainly below said intermediate plate having a driving shaft extended into the space between said plates, a gear fixed to said shaft, a second gear fixed to said shaft of said scanning drum, means establishing a driving connection between said aforesaid gears, a plate rotatable on said base providing a support for the field frame of said motor, and means to vary the framing of the received picture including means to rotate said plate and consequently said motor frame.

13. Scanning apparatus for television in-

cluding a base, standards rising thereabove, vertically spaced intermediate and upper plates carried by said standards, a vertical shaft journalled in said plates, a horizontally rotatable scanning drum carried by said shaft above said upper plate and having a removable driving connection therewith, a vertical motor located between said standards and mainly below said intermediate plate having a driving shaft extended into the space between said plates, a gear fixed to said shaft, a second gear fixed to said shaft of said scanning drum, means establishing a driving connection between said aforesaid gears including a gear frame pivotally located between said intermediate and upper plates and pivotally supported by at least one of said plates having a gear which is movable by movements of said frame into mesh with both aforesaid gears, a plate rotatable on said base providing a support for the field frame of said motor, and means to vary the framing of the received picture including means to rotate said plate and consequently said motor frame.

14. Television apparatus including a rotatable scanning drum having a cylindrical periphery provided with scanning windows, a viewing frame located exteriorly of said cylindrical periphery, a variable light source located within said cylindrical periphery, and stationarily-supported means constituting a track which is perpendicular to said cylindrical periphery and to said viewing frame and on which said variable light source is guided for movements toward and away from said viewing frame.

15. Television apparatus including a rotatable scanning drum having a cylindrical periphery provided with scanning windows, a viewing frame located exteriorly of said cylindrical periphery, a variable light source located within said cylindrical periphery, a condensing lens located between said periphery and variable light source, and supporting means for said lens and variable light source constituting a track which is perpendicular to said cylindrical periphery and to said viewing frame on which both are independently movable in the same line toward and away from said viewing frame.

16. Television apparatus including an enclosing cabinet having a fixed viewing frame and a removable cover, scanning mechanism including a rotatable scanning device which is located under said cover and has a removable windowed scanning member, and a variable light source carried by said cover on the side of said scanning device opposite said viewing frame, said variable light source being automatically removable from its aforesaid position when said cover is removed from closing relation with the cabinet so that said removable scanning member is accessible for instant removal.

17. Television apparatus including an enclosing casing having an open top and a cover removably closing said top, a viewing frame located in a side wall of said cabinet beneath said top, scanning apparatus located within said cabinet including a horizontally disposed rotatable scanning drum having on and removably connected with its periphery a scanning band provided with scanning windows and located immediately under said cover in line with said viewing frame, and a variable light source located within said drum in line with said windows and viewing frame having a connection with said cover by means of which it is moved into and out of operative position with said drum upon closing and opening movements of said cover so that said scanning band can be instantly removed from said drum and casing.

In testimony whereof, I have signed my name to this specification.

HOLLIS S. BAIRD.