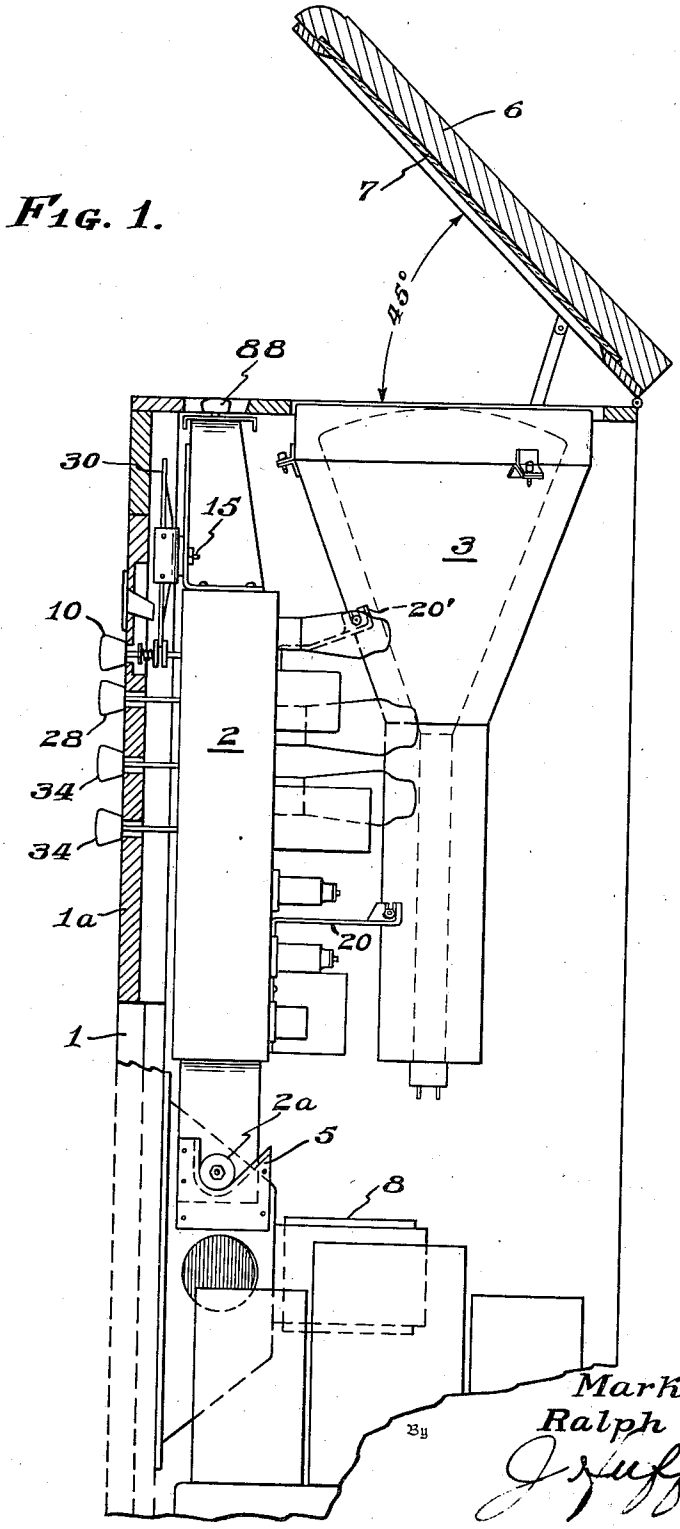
July 9, 1940. M. FLAHERTY ET AL 2,207,510

TELEVISION RECEIVER

Filed Dec. 15, 1936 4 Sheets-Sheet 1

FIG. 1.



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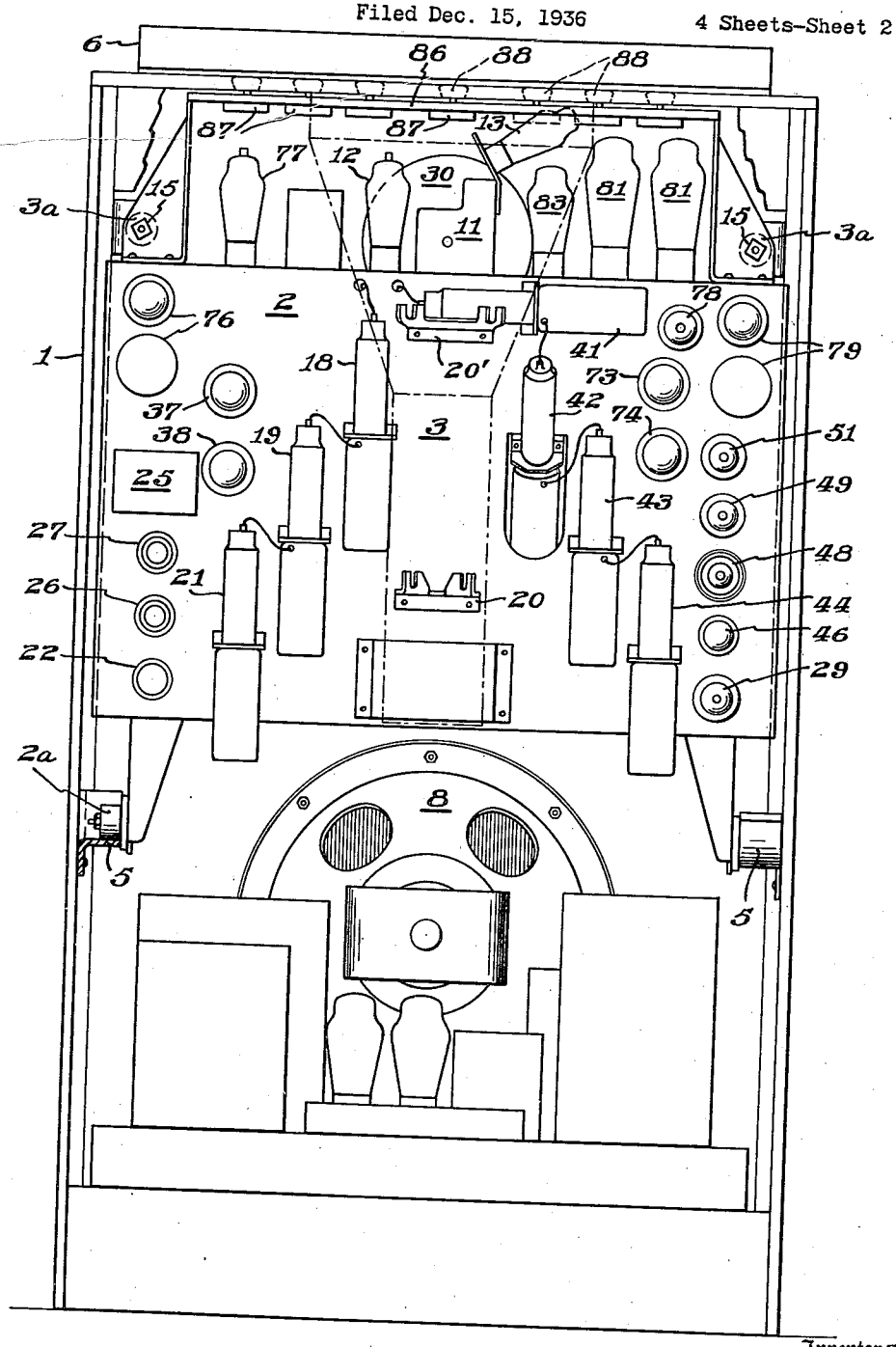


FIG. 2.

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TELEVISION RECEIVER

Filed Dec. 15, 1936 4 Sheets-Sheet 3

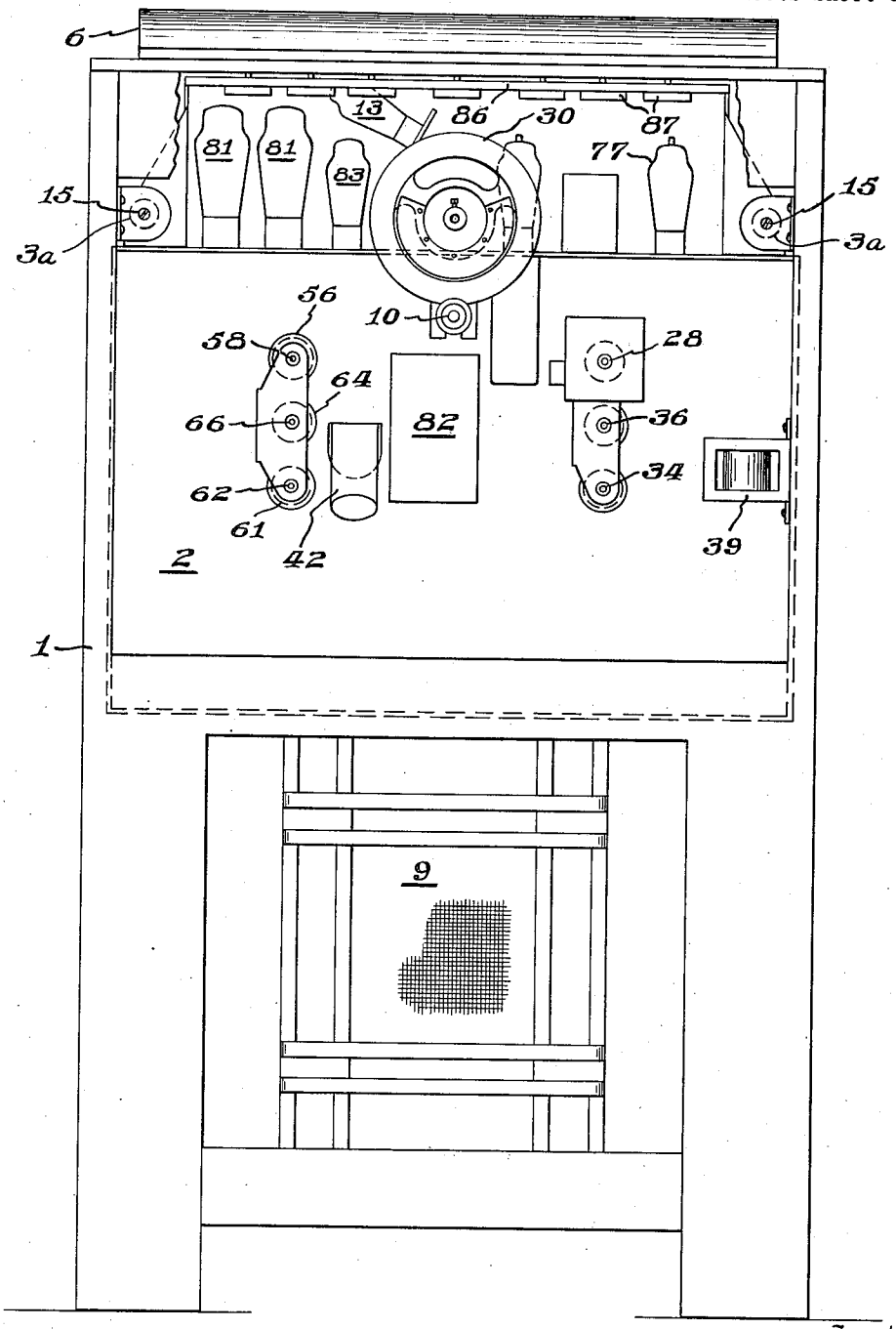


FIG. 3.

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TELEVISION RECEIVER

Filed Dec. 15, 1936 4 Sheets-Sheet 4

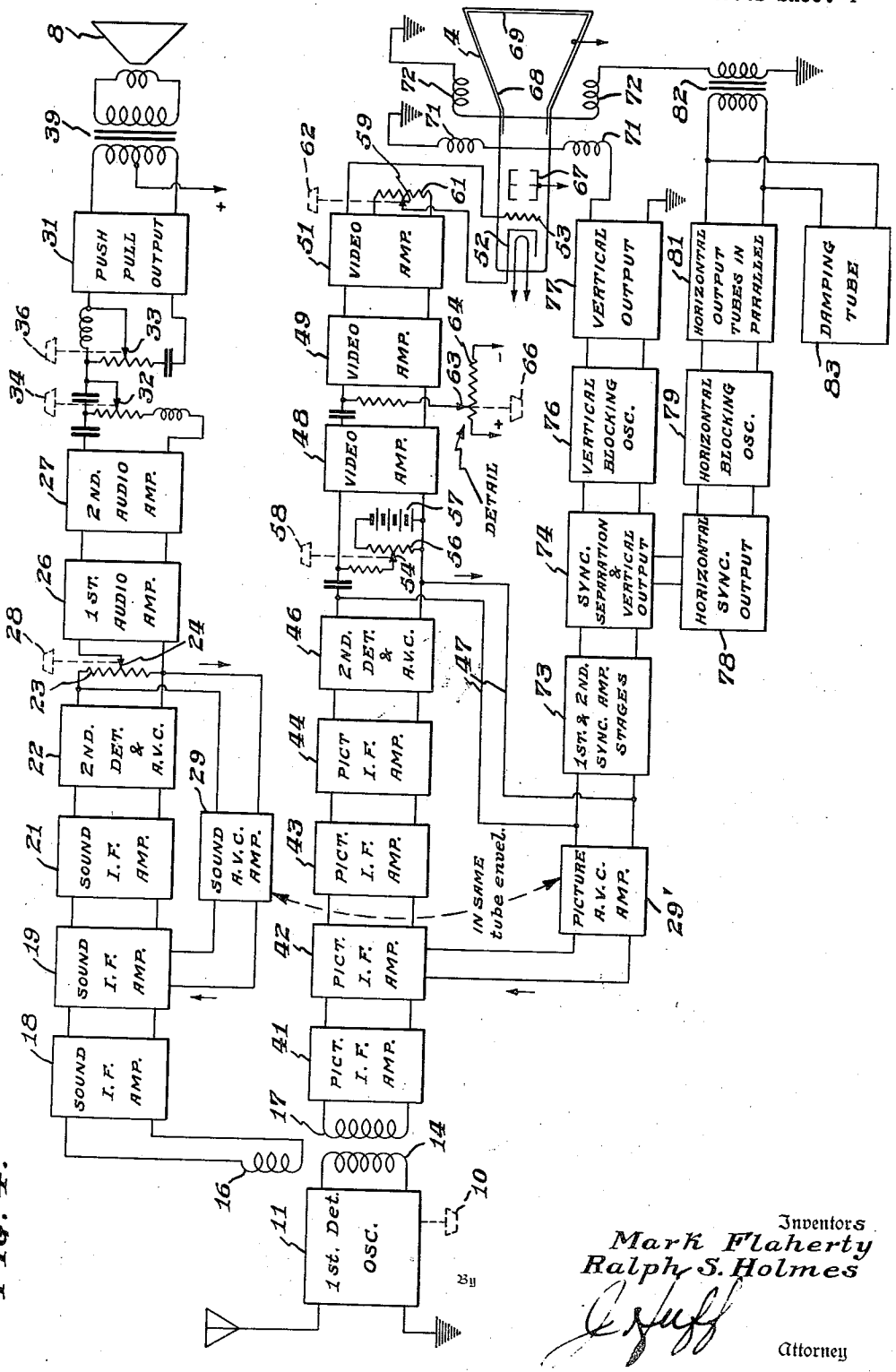


FIG. 4.

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Patented July 9, 1940 2,207,510

UNITED STATES PATENT OFFICE

2,207,510

TELEVISION RECEIVER

Mark Flaherty and Ralph S. Holmes, Haddonfield, N. J., assignors to Radio Corporation of America, a corporation of Delaware

Application December 15, 1936, Serial No. 115,910

5 Claims. (Cl. 178—7.5)

Our invention relates to television receivers and particularly to television receivers of the type employing cathode ray tubes.

One of the objects of our invention is to provide an improved television receiver of the above-mentioned type which is compact in design.

Another object of our invention is to provide an improved television receiver in which the various parts are readily accessible for servicing.

Another object of our invention is to provide a television receiver in which the vacuum tubes are well spaced while providing short leads going to the control knobs.

Still another object of our invention is to provide an improved combined television and sound receiver.

In a preferred embodiment of our invention, the video amplifier, the sound amplifier, the deflecting circuits, etc., are mounted on a single chassis which is positioned vertically in the receiver cabinet at the front thereof, and certain receiver units are mounted on the top edge of the chassis. At the rear of the cabinet a cathode ray tube is positioned vertically with the fluorescent screen near the top of the cabinet whereby it may be viewed in a mirror set at 45 degrees to the screen.

Other objects, features and advantages of our invention will appear from the following description taken in connection with the accompanying drawings in which

Figure 1 is a side view in elevation of a receiver embodying our invention, the side of the cabinet being removed and certain amplifier units and the like being omitted for the purpose of simplifying the drawings;

Figure 2 is a rear view of the receiver shown in Fig. 1, all amplifier units and the like being shown;

Figure 3 is a front view of the receiver shown in Fig. 1, with the front panel removed, many elements such as resistors, condensers, etc., and the connections being omitted to simplify the drawings; and

Figure 4 is a block diagram of the receiver shown in Fig. 1.

Referring to Figs. 1, 2 and 3, the receiver is of the console type comprising a cabinet 1, a combined television and sound chassis 2 mounted vertically at the front of the cabinet behind a removable front panel 1a, and a casing or shield 3 in which a cathode ray tube 4 is mounted vertically. As shown in Fig. 1, the cabinet 1 is provided with a hinged cover 6 having a mirror 7 on the under side. When the mirror is raised to a position where it makes approximately 45° to the horizontal, a picture appearing on the fluorescent screen of the cathode ray tube 4 may be viewed in the mirror.

At the bottom of the cabinet 1 there is located the power supply apparatus, such as high voltage and low voltage rectifiers and filters, and the loud speaker 8, the loud speaker being located behind a grille 9 (Fig. 3).

The chassis 2 is pivotally supported at its lower edge on brackets 5 whereby the chassis and cathode ray tube may be swung to the rear of the cabinet by removing the bolts 15 extending through brackets at the top of the chassis. The cathode ray tube shield is supported from brackets 20 and 20' mounted on the back of the chassis 2. Preferably, the chassis 2 is insulated from the cabinet by means of rubber discs 2a and rubber washers 3a (Fig. 2) to protect it from mechanical shocks.

Before describing the mechanical layout of our receiver further, the receiver circuit will be described with reference to Fig. 4. The receiver is of the general type described and claimed in Carlson patent, 1,975,056. It comprises a superheterodyne receiver unit 11 including a first detector 12 (Fig. 2) and a tunable oscillator 13 (Fig. 2), a sound channel shown at the top of the drawings, and a picture channel shown in the center of the drawings. The unit 11 is tuned to the desired station by the tuning knob 10 indicated in dotted lines.

The unit 11 tunes broadly enough to receive both a picture modulated carrier and its accompanying sound modulated carrier. The corresponding intermediate frequency signals appear in the transformer primary 14 and the sound modulated I. F. signal is supplied to the sound channel through the secondary winding 16 while the picture modulated I. F. signal is supplied to the picture channel through the secondary winding 17.

The sound channel includes I. F. amplifier stages 18, 19 and 21 which feed the sound signal to a second detector unit 22 which includes a suitable automatic volume control circuit. The audio signal appears across a potentiometer 23 and is fed through a variable tap 24 to the first and second audio amplifier stages 26 and 27. The variable tap 24 is actuated by a volume control knob 28 as indicated in dotted lines. The volume control signal is fed back to one or more I. F. amplifiers through a suitable amplifier indicated at 29.

The audio signal is supplied from the second

audio stage 27 to the output stage 31 through a suitable tone control network having variable taps 32 and 33 for low frequency tone control and high frequency tone control, respectively, these variable taps being operated by control knobs 34 and 36 as indicated in dotted lines. The output stage 31 is of the push-pull type including tubes 37 and 38 (Fig. 2) connected in push-pull. The final audio signal is supplied through an output transformer 39 to the loud speaker 8.

Referring now to the picture channel, it comprises I. F. amplifiers 41, 42, 43 and 44 which supply the I. F. picture signal to the second detector 46, the second detector including a suitable automatic volume control circuit. The volume control signal is supplied through conductors 47 and through a suitable amplifier 29' to one or more I. F. amplifiers. As indicated on the drawings, the tube elements for the audio and video volume control amplifiers 29 and 29' are located inside the same tube envelope.

The video signal appearing in the output circuit of the second detector 46 is supplied through video amplifiers 48, 49 and 51 to the cathode 52 and control grid 53 of the cathode ray tube 4.

In the input circuit of the video amplifier 48 a variable tap 54 on a potentiometer 56 shunting a battery 57 may be provided for varying the gain of the amplifier 49 and thereby controlling the amplitude of the picture signal supplied to the cathode ray tube 4 to determine the picture contrast. The variable tap 54 is varied by means of a control knob 58 indicated in dotted lines. The background of the picture may be controlled manually by changing the position of a variable tap 59 on a suitable potentiometer 61 whereby the bias on the control grid is changed. The position of variable tap 59 is controlled by means of a control knob 62 indicated in dotted lines.

It is generally desirable to provide means for varying the high frequency content of a picture signal for controlling the picture detail. Such detail control may be accomplished as described in application Serial No. 71,364, filed March 28, 1936, in the name of Waldemar J. Poch, and assigned to Radio Corporation of America.

In Fig. 1 the detail control element is shown as a variable tap 63 which may be moved along a potentiometer 64 for changing a tube bias, the position of the variable tap 63 being varied by means of a control knob 66 indicated in dotted lines.

Referring more specifically to the cathode ray receiver tube 4, it may be of conventional construction comprising an evacuated envelope having therein the indirectly heated cathode 52, the control grid 53, a first anode 67, a second anode 68, and a fluorescent screen 69. Preferably, the cathode ray is electrostatically focused. For causing the cathode ray to scan the fluorescent screen 69, vertical deflecting coils 71 and horizontal deflecting coils 72 are provided.

Scanning at the receiver is maintained in synchronism with scanning at the transmitter by transmitting horizontal synchronizing impulses at the end of each scanning line and vertical synchronizing impulses at the end of each picture frame as is well known in the art. These synchronizing impulses appear in the output circuit of the second detector 46 together with the picture signals and this composite signal is supplied through the conductors 47 to two amplifier stages indicated at 73, the amplifier tube electrodes for these two amplifier stages being included in a single envelope. The amplified composite signal is supplied to a suitable separating circuit 74 which separates the picture signal from the synchronizing impulses and which also separates the horizontal and vertical synchronizing impulses from each other. The vertical synchronizing impulses are impressed upon a blocking oscillator 76 to hold it in synchronism with the transmitter frame frequency. The blocking oscillator 76 has a suitable circuit or network associated therewith to supply a wave of such wave shape to the vertical output stage 77 that a saw-tooth current is produced through the vertical deflecting coils 71.

Horizontal synchronizing impulses are amplified in a suitable amplifier stage 78 and impressed upon the comparatively high frequency horizontal blocking oscillator 79 for maintaining it in synchronism with the horizontal scanning at the transmitter. The horizontal blocking oscillator 79 also has associated with it a network of such character as to supply to an output amplifier stage 81 a signal of the proper wave form to produce saw-tooth current through the horizontal deflecting coils 72. In the particular receiver illustrated, the output stage 81 comprises two amplifier tubes connected in parallel and the saw-tooth current is supplied to the deflecting coils through a suitable step-down transformer 82. A suitable damping circuit 83 including a damping tube 83' is effectively connected across the deflecting coils 72 by being connected across the primary of transformer 82. This damping circuit is for the purpose of suppressing transients at the end of a return line period and is described and claimed in application Serial No. 61,499, filed January 30, 1936, in the name of Robert Andrien and assigned to Radio Corporation of America.

Reference will now be made to the other figures and particularly to Fig. 2 for a more complete description of the mechanical layout of the receiver. In the several figures, like parts are indicated by the same reference numerals, most of the amplifier and other tubes being indicated by the same reference numerals as their corresponding amplifier stages or circuits. As shown in Fig. 3, the superheterodyne unit 11 is mounted on the top edge of the chassis whereby the tuning dial 30 and tuning knob 10 are at the front of the receiver. This unit is the same as the one described in application Serial No. 708,547, filed January 27, 1934, in the name of Ralph S. Holmes and assigned to Radio Corporation of America.

It will be noted that the oscillator tube 13 is mounted on the frame of a gang condenser while the first detector tube 12 is mounted on the upper edge of the chassis close to the gang condenser.

As viewed in Fig. 2, the sound channel units are on the left side of the chassis, the I. F. amplifier units 18, 19 and 21 being mounted in staggered relation to each other, as described and claimed in application Serial No. 86,906, filed June 24, 1936, in the name of Ralph S. Holmes and assigned to Radio Corporation of America. The construction of each I. F. unit itself is also as described in said last-mentioned Holmes application. It will be seen that the sound signal is fed from first detector 12 at the top of the chassis to the second detector 22 at the bottom of the chassis through the I. F. units 18, 19 and 21. The audio signal is then fed upward on the chassis through the audio amplifiers 26 and 27 and through a push-pull input transformer 25 (included in block 31 in Fig. 1) to the

two push-pull output tubes 37 and 38 which supply the loud speaker 8.

The units for the picture channel are on the right hand side of the chassis as viewed in Fig. 2. The picture signal is supplied from the first detector 12 to I. F. picture amplifiers 41, 42, 43 and 44, the first I. F. unit being mounted horizontally at the top of the chassis and the other three I. F. units being positioned below the first unit in staggered vertical relation. Thus it will be seen that the I. F. picture signal is first conveyed horizontally along the chassis through the unit 41 and then from the top of the chassis to the second detector 46 at the bottom of the chassis through the units 42, 43 and 44. The video signal appearing in the output circuit of the second detector 46 is then fed upward on the chassis through the video frequency amplifiers 48, 49 and 51. The output of the video amplifier 51 is supplied directly to the electrodes 52 and 53 of the cathode ray tube 4.

It will be seen that by mounting the I. F. unit 41 horizontally, it is possible to have all the leads short and still have the sound and picture I. F. amplifier units spaced apart to provide room for the cathode ray tube even though the sound and picture units are fed from a common first detector. The I. F. unit 42 is mounted at an angle to the chassis base as shown to avoid interference with the unit 41 and to provide shorter grid leads.

The vacuum tubes for the synchronizing signal amplifier 73 and separating circuit 74 are in the upper right hand corner of the chassis as indicated. In this same part of the chassis are located the amplifier 78 for the horizontal synchronizing impulses and the horizontal blocking oscillator 79 and its associated network for producing a saw-tooth wave. The two parallel connected output tubes 81 for the horizontal deflecting circuit are mounted on the top edge of the chassis, the damping tube 83' for the horizontal deflecting circuit also being mounted on this edge of the chassis.

The vertical synchronizing impulses are fed from the separating circuit 74 over to the left hand side of the chassis as viewed in Fig. 2 to the vertical blocking oscillator 76 and associated network located in the upper left hand corner of the chassis. The output tube 77 for the vertical deflecting circuit is mounted on the top edge of the chassis.

Referring to Fig. 3, the shafts for the several main control knobs are indicated by same reference numerals as those applied to the corresponding knobs in the other figures. Two transformers have been shown on the front side of the chassis although the smaller elements and the wiring are not shown, these transformers being the output transformer 82 for the horizontal deflecting circuit and the audio output transformer 39.

From the foregoing description it will be apparent that we have provided a construction wherein a single chassis for the picture and sound apparatus may be employed with a vertically mounted cathode ray tube to produce a compact receiver. Furthermore, the picture as viewed in the mirror 7 will appear reasonably close to the front of the cabinet 1 since the cathode ray tube 4 is not at the rear of a deep cabinet.

It will also be apparent that the various control resistors may be placed on the front of the chassis in the proper position for operation by a control knob (as shown in Fig. 3) with short leads running to them while, at the same time, the I. F. units, etc., of the sound and picture channels are properly spaced on the chassis base for short leads. Obviously, the proper location of the tuning dial and tuning knob is obtained by mounting the unit 11 on the top edge of the chassis 2. There is obtained a saving in space by mounting the output tubes of the deflecting circuits on the top edge of the chassis on either side of the unit 11.

At the top of the chassis 2 there is a panel 86 which supports a plurality of variable resistors 87 which may be varied by control knobs 88. The center knob 88 controls the focus of the cathode ray. The knobs 88 at the left, as viewed in Fig. 2, are for controlling the frequency of the vertical blocking oscillator, for vertical centering of the scanning pattern, and for varying the vertical dimension of the scanning pattern. The knobs 88 at the right, as viewed in Fig. 2, are for varying the frequency of the horizontal blocking oscillator, for horizontal centering of the scanning pattern, and for varying the horizontal dimension of the scanning pattern. After the receiver is once properly adjusted, there should be no occasion to adjust the knobs 88 until some change is made in the receiver such as replacing a tube.

Our improved receiver may be easily serviced by removing the panel 1a (first pulling off the tuning knobs) whereby the wiring and various circuit elements may be inspected and tested while the service man is looking at the received picture.

We claim as our invention:

1. A television receiver comprising a cabinet, a television chassis mounted vertically in said cabinet, said chassis including a base panel having a top edge of substantial width, a superheterodyne unit mounted on said top edge, said unit comprising tunable selecting circuits, a first detector and a tunable oscillator, and intermediate frequency amplifier units, a second detector and an audio amplifier mounted on the back side of said base panel.

2. A combined television and sound receiver comprising a cabinet, a combined television and sound chassis mounted vertically in the front of said cabinet, said chassis including a base panel having a top edge of substantial width, a superheterodyne unit mounted on said top edge, said unit comprising a tunable selecting circuit, a first detector and a tunable oscillator, a plurality of tubular intermediate frequency amplifier units mounted vertically on the back and on one side of said base panel, means for feeding sound signals from said first detector through said amplifier units toward the bottom of said chassis, a tubular intermediate frequency amplifier unit mounted horizontally near the top of said chassis, a plurality of tubular intermediate frequency amplifier units mounted vertically on the back and on the other side of said base panel, means for feeding intermediate frequency signals from said first detector through said horizontally mounted amplifier unit to said last-mentioned vertically mounted amplifier units and through said last-mentioned units toward the bottom of said chassis, and a cathode ray tube mounted vertically in the rear of said cabinet.

3. A television receiver comprising a cabinet, a television chassis mounted vertically in the front thereof, a superheterodyne unit including a tunable selecting circuit and an oscillator mounted on the top edge of said chassis, picture channel units mounted on the back side of said chassis,

said units including intermediate frequency amplifiers, a second detector and a plurality of video amplifiers, and control units and control knobs therefor mounted on the front side of said chassis, one of said control units being connected to a video amplifier to control the amplification of the picture signal, and another of said control units being connected to another of said video amplifiers to control the picture detail, said control units being positioned substantially opposite the respective picture channel units to which they are connected.

4. A television receiver of the console type comprising a cabinet, a television chassis pivotally mounted in a vertical position in the front of said cabinet, a cathode ray tube supported by said chassis and mounted in a vertical position, said pivotal mounting being at the bottom of said chassis whereby said chassis and said cathode ray tube may be swung to the rear of the cabinet for removal therefrom or for servicing, said tube including a fluorescent screen at the upper end thereof, and a mirror at the top of said cabinet for viewing a picture produced on said screen.

5. The invention according to claim 4 characterized in that the side of the chassis having the circuit wiring thereon faces toward the outside of the cabinet whereby the wiring is accessible from the outside of the cabinet after a panel or grille is removed.

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