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SIGNAL AMPLIFYING SYSTEM

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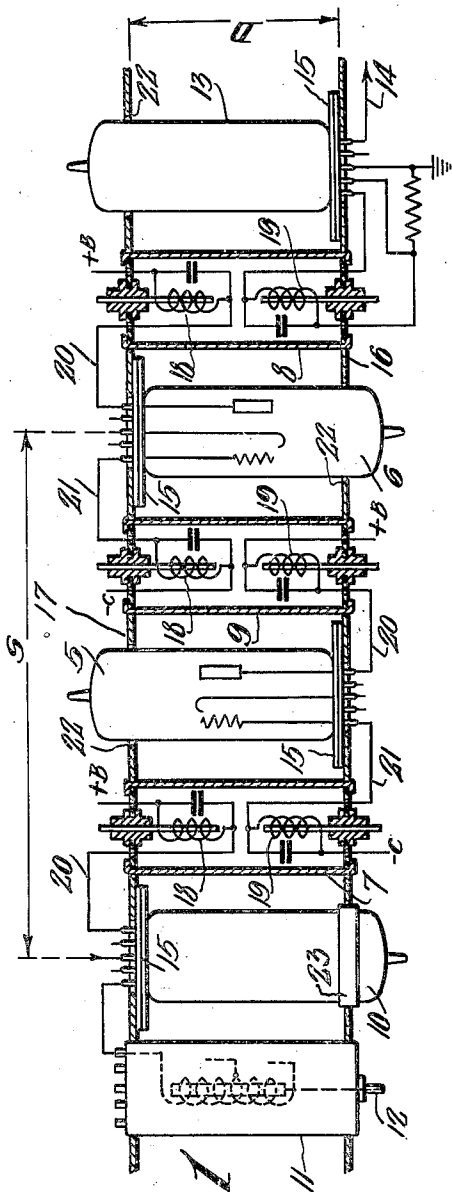


Fig. 1

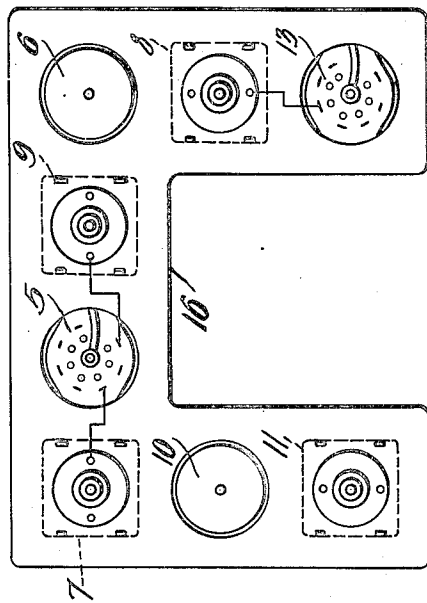


Fig. 2

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SIGNAL AMPLIFYING SYSTEM

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3 Claims. (Cl. 179—171)

This invention relates to signal amplifying systems for radio receiving apparatus and the like, wherein a plurality of amplifier tubes and associated interstage coupling devices are assembled in a unitary chassis.

With the advent of relatively small radio signal amplifying tubes, the trend in design of amplifying apparatus calls for minimum space and maximum shielding between the various circuit elements, since terminals and circuits are brought inherently into closer relation. It is, therefore, an object of the present invention to provide a signal amplifier requiring a minimum of space and providing substantially a maximum degree of shielding between the various circuits and circuit elements and the terminals thereof.

The trend in tube design is toward single-ended tubes, that is, tubes with all of the terminals at the base. In the more recent developments, the grid and plate terminals of the relatively small battery tubes, for example, are included among a plurality of pins extending directly from the glass container or bead at the base of the tube. Because of the relatively small size of such tubes, for example, those now appearing on the commercial market as RCA 1R5, 1T4, 1S4 and 1S5, the base or socket connections for such tubes in an amplifying apparatus are relatively close together, normally tending to introduce stray coupling and undesired operating effects including oscillation at certain frequencies. This is true particularly when the interstage coupling means, such as tuned interstage coupling transformers, are provided with terminals at a single end for mounting with the tubes on a common chassis plate or member.

Therefore, it is a further object of the present invention to provide a compact amplifier with maximum separation of apparatus terminals and circuit leads and to provide an improved arrangement of the tubes and interstage coupling means thereof, whereby the latter serve as shields between the tubes within a chassis providing a double shield wall and supporting means.

It is also a further object of the present invention to provide an improved arrangement of amplifier tubes and interstage coupling means therefor providing a construction which is adapted for use as a unit in a relatively small receiver with maximum shielding between the terminal elements of the tubes and interstage coupling means.

The invention will, however, be further understood from the following description when con-

sidered in connection with the accompanying drawing, and its scope is pointed out in the appended claims.

In the drawing, Figure 1 is a schematic circuit diagram including apparatus partly in cross-section showing a signal amplifier embodying the invention and which, in the present example, may be considered as the intermediate frequency amplifier portion of a superheterodyne receiving system, the remainder of the system being not shown for the reason that it does not concern the invention, and Figure 2 is a plan view of a preferred arrangement of the apparatus of Figure 1.

Referring to the drawing, the intermediate frequency amplifier comprises a first stage amplifier tube 5, a second stage amplifier tube 6 and suitable interstage coupling elements comprising an input transformer 7, an output transformer 8 and a coupling transformer 9 between the tubes 5 and 6.

In the present example, signals are supplied to the amplifier from a combined detector oscillator tube 10, the oscillator tuning elements for which are included in a unit 11 tunable by means of a movable control element 12 and including any suitable tuning means for varying the frequency of the oscillator portion of the detector oscillator.

Likewise, the output from the amplifier is applied to a second detector 13 from which rectified signals are taken through an output lead 14. This may be of the diode-pentode type provided by an RCA 1S5 tube, while the tubes 5 and 6 may be of the RCA 1T4 type and the detector oscillator 10 may be of the RCA 1R5 type.

The tubes referred to are shown substantially full size in the drawing and they are removably mounted in suitable socket elements indicated at 15 secured to one of the faces of two chassis members comprising metallic plates 16 and 17 held in spaced relation to each other at a distance D by the transformers 7, 8 and 9. The latter are also indicated substantially full size and comprise metallic shield cans pressed into the chassis members at each end between the tube locations to form a double wall shield between the tubes.

The transformers each comprise a primary 18 and a secondary 19 of the movable core type tunable by movement of the core elements and are connected with the plate circuits 20 and grid circuits 21 of the tubes to provide a cascade am-

plifier arrangement between the oscillator detector 10 and the second detector 13.

For this purpose, in accordance with the invention, the transformers are of the double-ended type, that is, having terminals at each end, the primary terminals being at one end and the secondary terminals at the other and being so arranged that, by inverting every other tube as shown, the connection leads are of minimum length for the successive plate and grid circuits between the tubes and the transformer elements.

Furthermore, it will be seen that the distance S between the terminal members or socket connections for two tubes on the same side of the chassis includes a span of substantially two tube elements and two transformer elements. This wide degree of separation between terminal connection for the tube is effected by providing socket terminals for the successive tubes along the chassis alternately on one and then the other of the two opposed shield plates, with the tubes projecting through openings 22 in the opposite chassis plates sufficiently to be grasped in inserting and removing them from the socket connections. This may be substantially the length of the casing of the several interstage coupling elements, thereby providing a compact and effective amplifier arrangement.

Furthermore, the use of a double base chassis with the tubes mounted alternately on one and then the other of the double base plates, together with double-ended interstage coupling elements permits a minimum space requirement and maximum shielding and spacing of the high signal potential terminals and leads. Thus, it will be seen that between the plate circuit and input terminals of the tube 10, for example, and the terminals of the tubes 5, a double shield wall is provided comprising the chassis elements 16 and 17, which are likewise interposed between the terminals of the tube 5 and those of the tube 6 and the successive adjacent tubes throughout the amplifier.

With the arrangement shown, it may be desirable in certain types of apparatus, particularly in portable receivers and amplifiers, to grip each tube not only at the base but at the normally unsupported end as shown in connection with the tube 10 of Fig. 1, where a band 23 of rubber or other suitable material is pressed into the opening about the tube, thereby to support it against vibration, and preventing loosening in the socket, although ordinarily the socket connections are sufficiently tight to hold the tube in place.

The linear arrangement of the apparatus shown in Fig. 1 may be provided in any suitable ampli-

fier where a straight chassis arrangement is desirable or the apparatus may be arranged as shown in Fig. 2 in the form of an open rectangle to permit the grouping of the chassis about tuning apparatus, not shown. Obviously, other forms of the arrangement shown in Fig. 1 may be provided, although that shown in Fig. 2 is at present preferred.

I claim as my invention:

1. In a signal amplifier, the combination of a pair of spaced substantially parallel chassis plates, a series of tube socket members, a series of double-ended coupling devices arranged in spaced relation alternately with said tube socket members between said plates, said socket members being mounted alternately on one and on the other of said plates, and said coupling devices comprising shield means providing shield walls between said socket members, whereby the terminals of said devices and socket members are separated by a plurality of shield walls and by a distance on the same side of the chassis of the order of the combined width of two of said devices.

2. In a signal amplifier, the combination of a chassis comprising shield plates arranged in opposed spaced relation to each other, means providing successive amplifier tube locations in and along said chassis, comprising tube socket elements located successively on opposite shield plates, and means providing tube openings in each shield plate, the tube socket elements on one plate aligning with the opening means on the other plate, and interstage coupling means for said amplifier comprising metallic shield casings extending between and secured to said chassis plates in the space between said plates and successively between the tube locations to provide minimum space requirements and maximum shielding between the circuit elements of said chassis.

3. A signal amplifier comprising in combination a pair of metallic chassis plates, means for holding said plates in predetermined substantially parallel spaced relation to each other comprising a series of spaced shield members extending between and engaging said plates, said shield members being spaced to provide tube locations alternately therewith along the chassis on opposite plates, means providing tube terminal connections in said locations spaced on each side of the chassis by a distance of the order of the combined width of two tubes and two shield members, the terminals on opposite sides of the chassis being separated and isolated by the shielding provided by said spaced chassis plates.

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