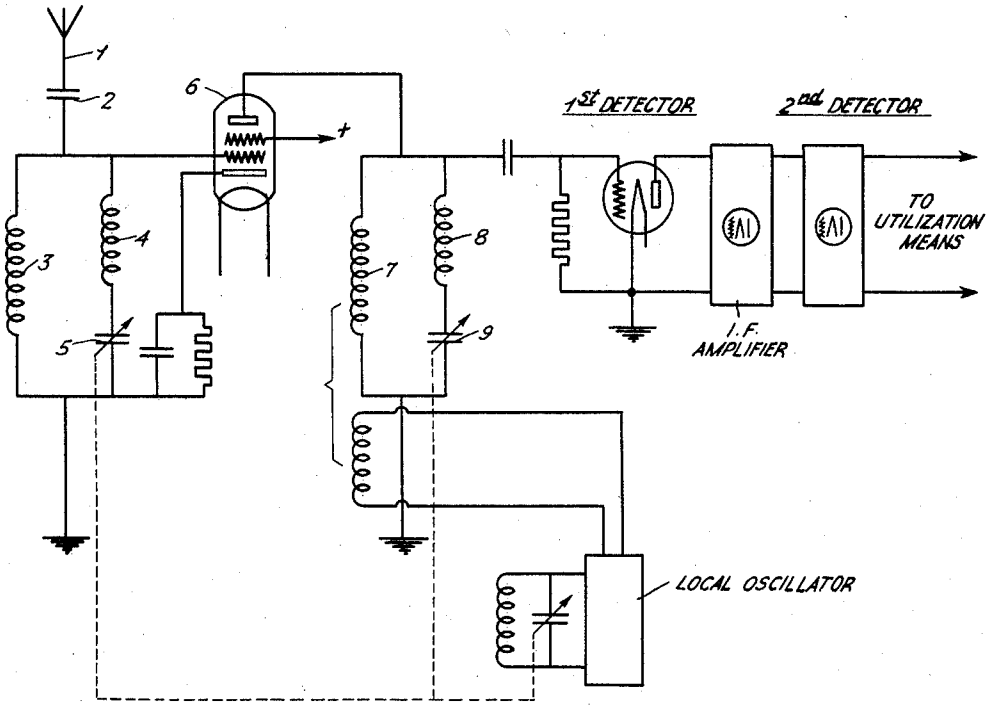
June 5, 1934. B. VAN DER POL ET AL 1,961,720

SUPERHETERODYNE RECEIVER

Filed Oct. 26, 1932



INVENTOR
BALTHASAR VAN DER POL
THEODORUS J. WEYERS
BY H. G. Grower
ATTORNEY

Patented June 5, 1934

1,961,720

UNITED STATES PATENT OFFICE

1,961,720

SUPERHETERODYNE RECEIVER

Balthasar van der Pol and Theodorus Josephus Weyers, Eindhoven, Netherlands, assignors to Radio Corporation of America, a corporation of Delaware

Application October 26, 1932, Serial No. 639,554
In Germany November 19, 1931

3 Claims. (Cl. 250—20)

With superheterodyne reception it must be avoided that oscillations generated by the image station penetrate to the point at which the oscillations received (if desired after being amplified) are caused to interfere with the locally generated oscillations. Consequently, in all cases in which there is a risk that in addition to the desired oscillations also (among others) the undesired image frequency is received by the antenna, efforts are made for suppressing this undesired frequency as much as possible.

A means proposed already for this purpose consists in providing a separate short circuit path for this frequency, this path consisting of a series connection of inductance and capacity which may be tuned to this frequency. In this case the tuning of this short circuit must preferably coincide in a constrained manner with the tuning of the other tuning means of the set.

However, this arrangement has the drawback that the apparatus is very complicated thus inevitably increasing the damping of the tuning circuit to which the said short circuit path is connected in parallel.

The present invention has for its purpose to provide a device in which the suppression of the image frequency is effected in a similar manner, but by means of the tuning means already present and without increase of the damping.

According to the invention this may be obtained by tapping in at least one of the high frequency tuning circuits the coil in such a point that one or both coil parts in series with the tuning condenser substantially constitutes a short circuit path for the image frequency.

When using the invention for one tuning circuit only the said tapping point is preferably so chosen that the condition referred to is completely satisfied when tuning to a frequency of the upper half of the frequency range covered by the tuning circuit.

When using the invention in two or more circuits it is advisable to choose the taps of the different coils at different points of the latter.

The invention will be more clearly understood by reference to the accompanying drawing, representing, by way of example, a form of construction thereof, and in which the invention is used in two high frequency circuits of a superheterodyne receiver.

In the circuit of an antenna 1 is inserted an antenna condenser 2 and a tuning circuit 3, 4, 5, the latter being connected between the grid and the cathode of a high frequency screen grid tube 6. The size of the coils 3 and 4 is such that if the circuit 3, 4, 5 is tuned to the frequency of the desired station, the branch 4, 5 per se is tuned at least approximately to the image frequency. In fact, this may be accurately obtained only for a frequency of the range covered by the circuit, since the circuit arrangement chosen gives, it is true, a constant ratio, but no constant difference between the natural frequency of the circuit 3, 4, 5 and that of the circuit 4, 5. Consequently, for all other frequencies of the range covered the suppression of the image frequency is more or less imperfect, but in most cases it will practically be sufficient. Since with the high frequencies one is more hindered by image stations than with the low frequencies, it is advisable that the dimensions be such that the image station is entirely suppressed with one of said high frequencies.

When using other high frequency selection means, for instance, the tuning circuit 7, 8, 9 of the form of construction illustrated, the ratio therein between the coil parts 7 and 8 may be different from that existing between the coil parts 3 and 4 in such a manner that there occurs a complete suppression of the image station through the short circuit path 8, 9 for a frequency of the lower part of the covered range. In this manner the undesired image frequencies are suppressed substantially uniformly and at any rate sufficiently over this whole range.

What is claimed is:

1. In a signal selecting and amplifying means for radio receivers and the like of the superheterodyne type adapted to be utilized for the reception of signal energy of any frequency lying within a predetermined band of frequencies and which includes a circuit tunable to the frequency of the energy it is desired to receive, a second circuit tunable to the same frequency, said two circuits being tunable throughout the band simultaneously by a single operating device, an electronic relay interposed between said two circuits and, in effect, adapted to act as a path for transferring energy from the first of said circuits to the other thereof, means for rejecting the "image" frequency which comprises utilizing a portion of each of said tunable circuits to form a path of low impedance to ground for each of the image frequencies throughout the band to be received, the impedance of each of the paths so formed to the "image" frequencies throughout the band being arranged so that one of said paths presents a minimum impedance to the "image" frequency when the tunable circuits are tuned to a frequency on one side of the center

of said band while the other of said paths presents a minimum impedance to the "image" frequency when the tunable circuits are tuned to a frequency on the other side of the center of said band.

2. In a signal selecting and amplifying arrangement for radio receivers and the like of the superheterodyne type adapted to be utilized for the reception of signal energy of any frequency lying within a predetermined band of frequencies and which includes a circuit tunable by a variable element to the frequency of the energy it is desired to receive, a second circuit tunable by another variable element adapted to be tuned to the same frequency said two circuits being tunable throughout the band by simultaneous variations of the tunable elements thereof by a single operating device said two tunable circuits being, so to speak, coupled so that energy in the first thereof is, in effect, transferred to the second tunable circuit, means for rejecting the "image" frequency which comprises, utilizing a portion of each of said tunable circuits to form a path of low impedance to ground for each of the various "image" frequencies throughout the band to be received, each of the portions of said tunable circuits utilized having included therein the respective variable element of the tunable circuits whereby variations in the tuning of the respective tunable circuits by said single means also varies the tuning of the low impedance path so as to correspond at least approximately to the "image" frequency at each particular frequency to which the tunable circuits are tuned throughout the band, said low impedance paths being arranged so that one of said paths presents a minimum impedance to the "image" frequency when the tunable circuits are tuned to a frequency near one end of the band while the other of said paths presents a minimum impedance to the "image" frequency when the tunable circuits are tuned to a frequency near the other end of said band.

3. The system described in the next preceding claim in combination with a local oscillator device having its output coupled to the second named tunable circuit, said oscillator including a variable element adapted to vary the frequency of the oscillations generated, said variable element being tied up with said single operating device so as to be varied simultaneously with the tuning of the two tunable circuits.

BALTHASAR VAN DER POL.
THEODORUS JOSEPHUS WEYERS.