

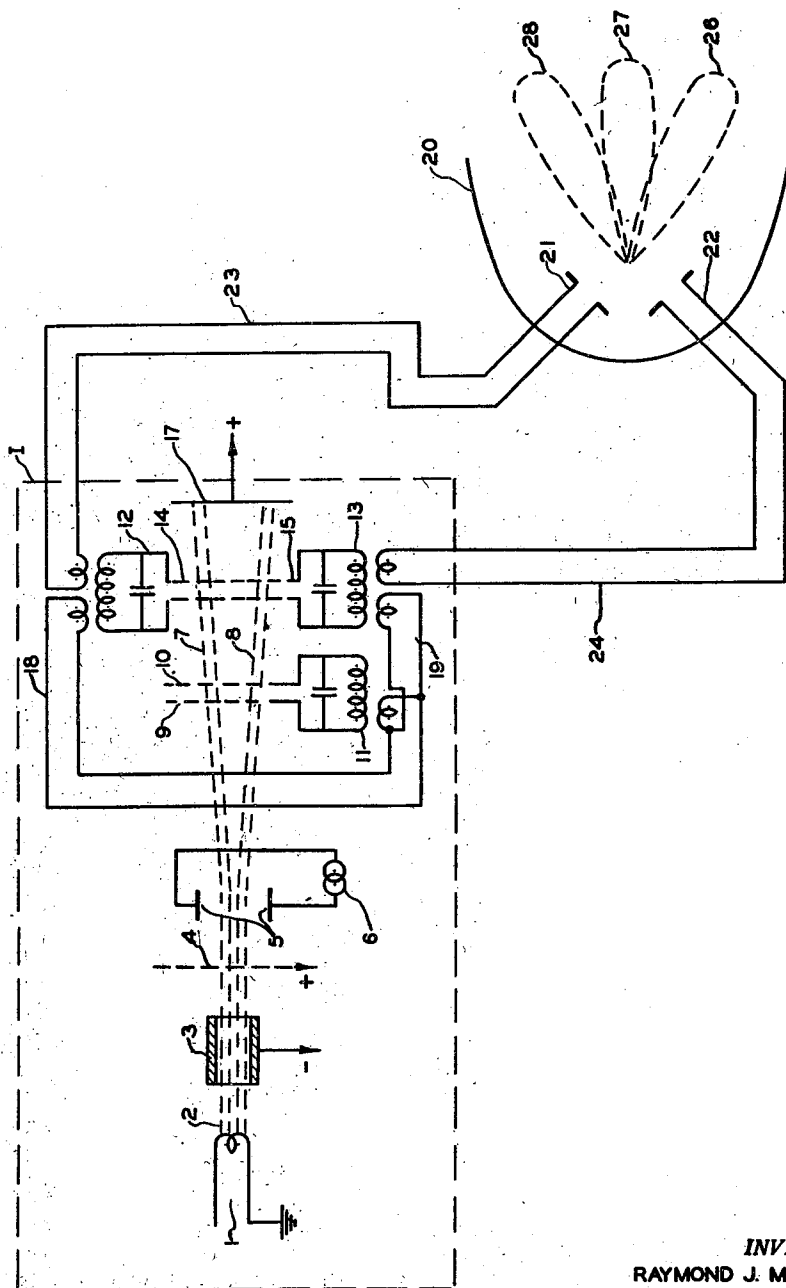
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RADIO SCANNING SYSTEM

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RADIO SCANNING SYSTEM

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1 Claim. (Cl. 250—11)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention pertains to scanning systems for radio waves, for directing a radio beam to successive points of an area to be scanned. This invention finds application among others to radio pulse and echo detection systems, commonly termed "radar" systems.

In accordance with a novel feature of the invention scanning is effected by purely electrical means involving no mechanical movements or change in frequency for accomplishing the scan.

The invention employs for operation the velocity modulated type of oscillator such as the Klystron.

In the annexed drawing the single figure shows in schematic form a preferred modification of the invention.

Referring to the drawing the rectangle 1 encloses a velocity modulated oscillator of special construction comprising a heated cathode for emitting a stream of electrons 2, focused by a tubular focusing element 3 maintained negative with respect to the cathode, the electron stream passing thence through accelerator grid 4, maintained at a positive potential with respect to the cathode for rendering the oscillator operative. The focused electron beam passes thence between a pair of electrostatic deflecting plates 5 between which a source of oscillations 6 is connected for deflecting the electron beam between limiting positions 7, 8 at a desired scanning frequency. The electron beam passes thence successively between spaced grids 9, 10 of a "buncher" circuit including a resonant circuit 11 connected therebetween. Spaced from the buncher circuit are a pair of resonant "catcher" circuits 12, 13, the spaced grids 14 one of which are aligned respectively with the spaced grids 15 of the other. Beyond the catcher circuits is a collector plate 17 maintained positive with respect to the cathode. For establishing and maintaining sustained oscillations, feed-back circuits 18, 19 couple the resonant catcher circuits 12, 13 to the buncher circuit 11.

20 is a metal parabolic reflector maintained stationary and mounting off-center a pair of dipole radiators 21, 22 inclined at an angle to one

another as shown. The output of resonant circuit 12 is coupled to dipole 21 over a circuit 23; while the output of resonant circuit 13 is similarly coupled to dipole 22 over a circuit 24.

In the operation of the device, progressive deflection of the electron beam between limiting positions 7, 8, by action of the deflecting plates 5 and associated oscillator 6, causes the electron beam to pass alternately through catcher grids 14, 15, thence in varying degree between both catcher grids 14, 15 and thence only through catcher grids 15, the entire cycle described being thus reversed. This in turn causes radio frequency energy to be radiated first only from dipole 21 to direct the transmitted radio beam in the direction 26; thence shifting to the position 27 as dipole 22 becomes increasingly energized with corresponding decreasing energization of dipole 21; ending in the other limiting direction 28 of the radio beam when only dipole 22 is energized; whereupon this cycle of operations is repeated in reverse, and so on.

The circuit may be arranged for reflex Klystron operation by applying a suitable negative potential to plate 17, and omitting the buncher circuit 11 and associated grids 9, 10 in which case circuits 12, 13 would operate concurrently as both "buncher" and "catcher" elements.

To provide pulse type operation for pulse and echo detection, a keying circuit may be interposed between the cathode 1 and the accelerator grid 4.

In order to minimize coupling effect between grids 14 and 15, circuit 13 may be shifted longitudinally with respect to circuit 12, for example one wavelength.

I claim:

Apparatus for variably deflecting radio waves, comprising: a velocity modulated oscillator including a pair of catcher circuits, means for producing a velocity modulated cathode beam, and means for variably deflecting said cathode beam to variably excite said catcher circuits concurrently in opposite relation, directive antenna means energized by said catcher circuits and arranged to variably direct radiation therefrom in accordance with said variable energization of said catcher circuits.

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