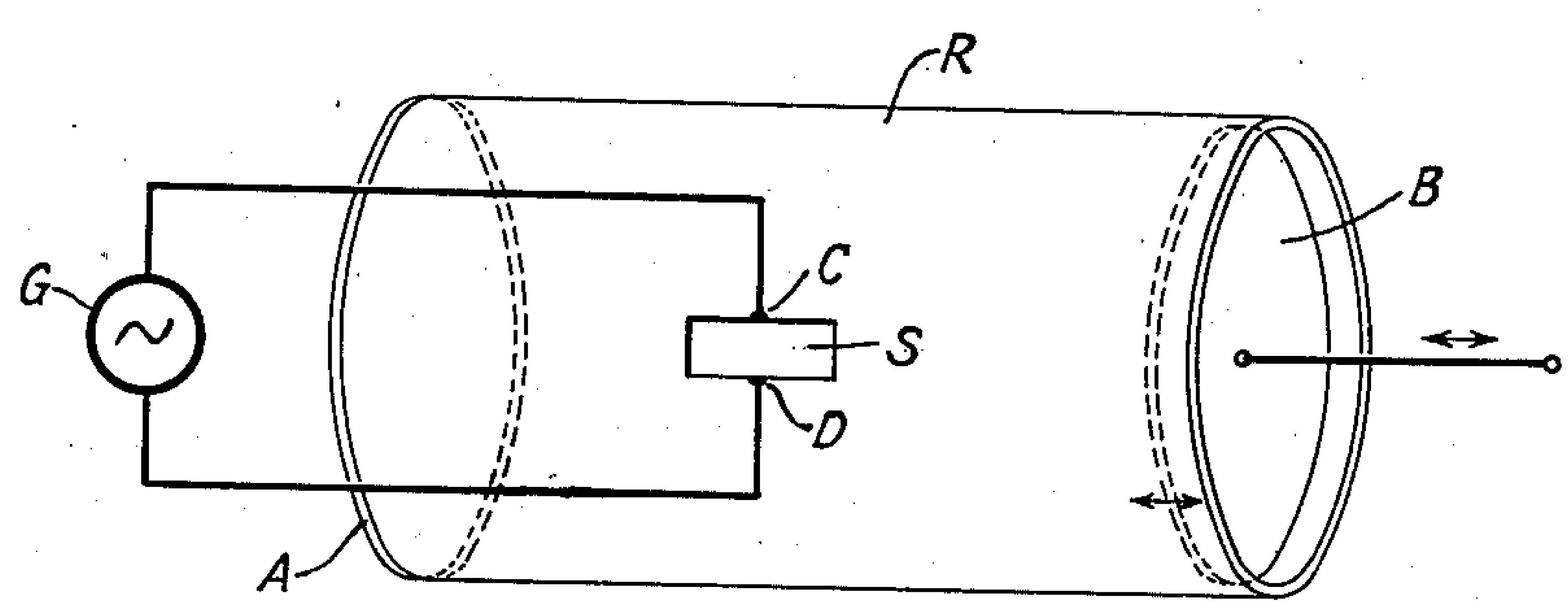
July 22, 1941. W. ENGBERT 2,250,096

RESONANT SYSTEM FOR ULTRA SHORT WAVES

Filed Sept. 14, 1940



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Patented July 22, 1941

2,250,096

UNITED STATES PATENT OFFICE

2,250,096

RESONANT SYSTEM FOR ULTRA SHORT WAVES

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Application September 14, 1940, Serial No. 356,819
In Germany July 5, 1939

6 Claims. (Cl. 178—44)

This invention is concerned with a resonance system adapted to ultra short waves, more particularly to centimeter waves.

The invention is predicated upon the use of so-called hollow or tubular or dielectric lines of the kind utilized for conducting electrical energy in tubes without any inside conductor and disclosed on several occasions in the prior art. Where such lines are employed it is possible to excite electrical waves of ultra high frequency. The transverse dimensions of these tubular lines or dielectric conductors may be comparatively large in contrast with the normal wavelength in air. Indeed, to minimize the attenuation it is even advantageous to make the diameter of such a tubular line greater than the wavelength.

Now, in the generation of ultra short waves, especially in electron oscillating (Barkhausen-Kurz) or magnetron organizations, difficulties arise on the ground that the shorter the wave the smaller become also the resonant structures or systems associated with the oscillator. The result is that the power is reduced as the frequency grows higher. Hence, it is impossible to design a wave generator for centimeter waves and relatively large power by relying upon conventional methods.

According to the invention, the oscillatable resonance system consists of a hollow or tubular line which is excited so as to result in standing waves. This is made possible by shutting both ends of the line, which, for instance, may be tubular, by means of plates.

The structure is excited by providing a slot or a hole at a suitable place in the shell of the tubular line, the length or diameter of which is roughly equal to one-half the operating wave. At two opposite points in the middle of the slot or on the circumference of the circular hole are impressed the exciting potentials. Inasmuch as the distance or path between the points of opposite phase at which the potential is impressed is equal to $\lambda/2$ in both directions around the axis, this path involves a high impedance so that the potential is not short-circuited. The two sides of the slot could preferably be shaped so as to act directly as the segments of a magnetron. According to the tuning of the hollow space or chamber, the ensuing magnetron will become self-excited and oscillate at a certain frequency without any other resonance system than the hollow space or chamber having to be provided.

A preferred plan is directly to connect the resonance space with a chamber or tubular line of the kind known in the prior art by which the ensuing energy may be conducted away.

In the same way, the resonance space according to the invention could, of course, be used also for reception by connecting a rectifier with the opposite points of the opening.

The invention shall now be described in greater detail by reference to the single figure of the accompanying drawing showing schematically one embodiment in which the basic invention is incorporated. In the drawing, R is a tube, one end of which is shut by the plate A. At the other end is mounted a plate B which is slidable inside the tube. By this means the resonance space or chamber is tunable to certain frequencies. The excitation of the resonance space is effected by the aid of a slot S formed in the shell of tube R; that is to say, the two opposite points C and D thereof. Applying to these points C and D the segments of a magnetron or the electrodes of a generator G impressed with alternating potential, these will be caused to be tuned in resonance with the chamber, the length of the wave being a function of the position of disc B. What is thus set up inside the chamber is the so-called "H_o" type of wave, the electrical force lines of which (as known from experience) consist of parallel rings situated in a cross-section of the tube, whereas the lines of magnetic force are positioned at right angles thereto and extend from the tube wall to the axis of the tube.

It will be understood that it is also useful and advantageous to employ hollow spaces or chambers of a shape other than tubular, for instance, the space may be prismatic, spherical, cubic or otherwise formed; and it is feasible, by choosing particular dimensions in the different directions, to establish resonance at various frequencies in one and the same hollow space.

The arrangement as hereinbefore described offers the advantage that for exciting the resonant structure there is by no means any necessity for introducing or engaging an antenna or a probe into the hollow space or chamber; in fact, excitation is accomplished from the surface of the chamber. Another advantage in connection with the generation of ultra short waves is that the resonant space, in comparison with bridge or clip-shaped oscillatory circuits as well as pot-type circuits of well known kind, involves far larger dimensions, for a given wavelength, with the result that, also for ultra short waves, structures result which have fairly acceptable and practicable proportions in which, moreover larger energies may be handled and accommodated than in the arrangements disclosed in the earlier art.

What is claimed is:

1. An ultra short wave system comprising a resonant chamber having an aperture intermediate the ends thereof, and a source of ultra high frequency waves connected to points on opposite sides of said aperture, said points being so chosen that the distance from one point to the other around the periphery of the aperture is approximately one-half wavelength of the operating frequency.

2. An ultra short wave system comprising a resonant chamber having an aperture whose width is approximately one-half the length of the wave to which said chamber is resonant, located intermediate the ends of said chamber, and a source of ultra high frequency waves connected to points on opposite sides of said aperture, said points being so chosen that the distance from one point to the other around the periphery of the aperture is approximately one-half wavelength.

3. An ultra short wave system comprising a resonant chamber having means for changing the resonant frequency thereof, said chamber having an aperture intermediate the ends thereof, and a source of ultra high frequency waves connected to points on opposite sides of said aperture, said points being so chosen that the distance from one point to the other around the periphery of the aperture is approximately one-half wavelength at the operating frequency.

4. An ultra short wave resonant system comprising a resonant chamber having an aperture in one side wall, the widest portion of said aperture being at least one-half the length of the wave to which said chamber is resonant, and a translation circuit coupled to points on opposite sides of said aperture, said points being so chosen that the distance therebetween measured around the periphery of the aperture on either side of said points is approximately one-half wavelength.

5. An ultra short wave resonant system comprising a resonant chamber having an aperture in one side wall, the widest portion of said aperture being at least one-half the length of the wave to which said chamber is resonant, and a translation circuit coupled to points on opposite sides of said aperture, said points being so chosen that the distance therebetween measured around the periphery of the aperture on either side of said points is approximately an odd multiple including unity of one-half wavelength.

6. An ultra short wave resonant system comprising a resonant chamber having means at one end for changing the dimensions thereof, said chamber having an aperture intermediate the ends thereof, the widest portion of said aperture being at least one-half the length of the wave to which said chamber is resonant, and a translation circuit coupled to points on opposite sides of said aperture, said points being so chosen that the distance therebetween measured around the periphery of the aperture on either side of said points is approximately one-half wavelength.

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