

Aug. 27, 1935.

M. G. CROSBY

2,012,710

VARIABLE CONDENSER

Original Filed Oct. 16, 1931

Fig. 2

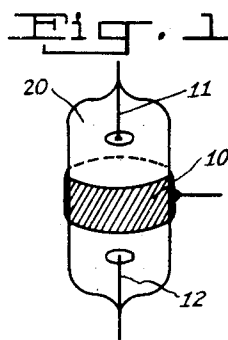
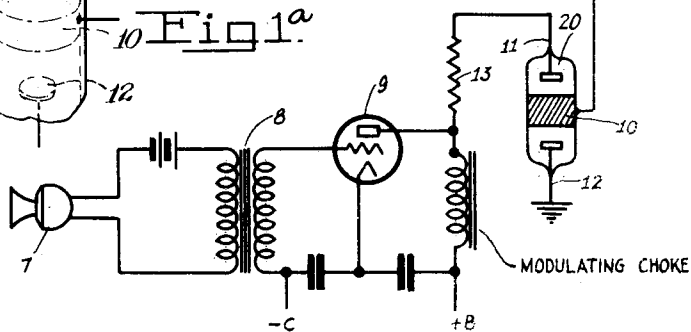
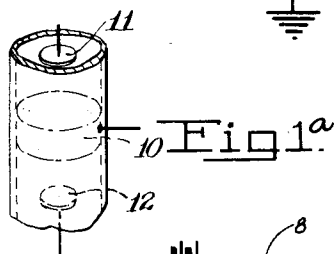
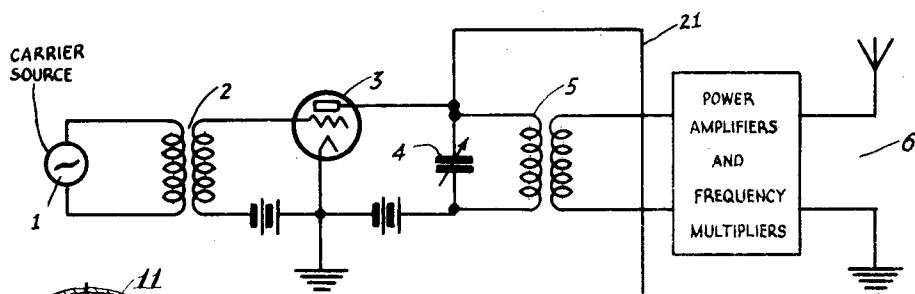
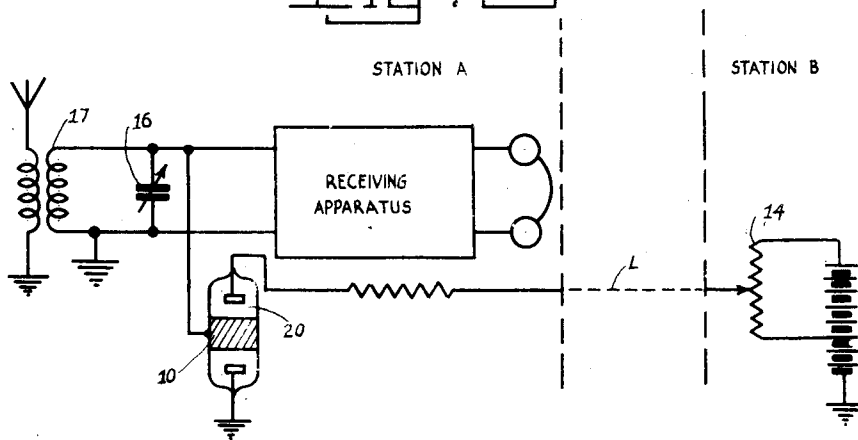


Fig. 3



INVENTOR
MURRAY G. CROSBY

BY

H. B. Swer
ATTORNEY

UNITED STATES PATENT OFFICE

2,012,710

VARIABLE CONDENSER

Murray G. Crosby, Riverhead, N. Y., assignor to
Radio Corporation of America, a corporation of
Delaware

Application October 16, 1931, Serial No. 569,144
Renewed January 18, 1935

3 Claims. (Cl. 250—27.5)

This invention relates to improvements in electrical condensers and more particularly to condensers of the variable type which are adapted for use in communication circuits.

5 An object of this invention is to provide a variable condenser which is simple in construction, reliable in operation and highly efficient.

10 A more specific object is to provide a condenser which is more easily adaptable to remote and electronic control than those heretofore employed.

15 In general, this invention contemplates the use of an inertialess variable condenser characterized by the absence of mechanical working parts. This characteristic of the invention is achieved by utilizing a glow discharge tube having a plurality of electrodes between which a stream of electrons is arranged to flow. Encircling the tube and separated from the electrodes there is provided an electrical conducting plate which forms one of the capacitive elements of the glow tube. As potential is applied to the electrodes of the tube, the glow in the tube is arranged to strike and to act, in turn, as one of the plates of the condenser, the capacity of which is varied as the current through the tube is effectively varied.

20 One advantage of this arrangement is that, due to the absence of mechanical working parts in the condenser, the capacity of the glow tube varies instantaneously and at high speeds in accordance with the variation in potential across the electrodes.

25 Referring to the drawing, Figures 1 and 1a illustrate, in perspective, a variable condenser of the glow tube type constructed in accordance with the principles of this invention; and Figs. 2 and 3 illustrate, diagrammatically, typical circuit arrangements wherein such glow tube may be employed.

30 In Fig. 1 is shown a glow tube 20 comprising a sealed glass envelope within which are located two electrodes 11 and 12. This tube, it is to be understood, is only illustrative of any type of glow discharge tube which may be employed and may comprise a neon tube, cathode ray tube or any other suitable electron tube. Encircling the outside of the envelope or bulb is an electrical conducting plate 10 made of tinfoil or other suitable material. This plate, if desired, may be mounted within the envelope as shown in Figure 1a. The spacing of the elements of the tube is so arranged that plate 10 and each of the electrodes 11 and 12 form capacitive elements of condenser circuits wherein a capacity exists between plate 10 and each of the electrodes. Normally,

when there is no current flowing through the tube between the electrodes 11 and 12, this capacity is fixed. The application of a potential across electrodes 11 and 12, however, starts a glow and varies the capacity between the elements, the glow discharge in such case acting as a conducting plate. The variation of this glow, due to potential variations between the electrodes causing effective changes in the size of the electronic stream, produces a variation in capacity between plate 10 and the electrodes 11 and 12.

35 In Fig. 2 is shown a complete transmitting circuit adapted for phase modulation wherein a glow tube is advantageously employed to vary the tuned output circuit of an amplifier. In this arrangement conductor 6 represents a suitable antenna circuit connected to the transmitting system by suitable power amplifiers and frequency multipliers. The waves to be transmitted by antenna circuit 6 are generated by carrier frequency source 1 which is connected by means of a transformer 2 to an amplifier tube 3. The usual tuned circuit in the amplifier arrangement comprises a condenser 4 and an inductance 5 connected in shunt relation to the condenser. The output circuit of this arrangement is associated with the usual power amplifiers and frequency multipliers which are indicated in conventional form by the rectangular box. Directly connected to the anode of the amplifier tube 3 by means of conductor 21 is the variable condenser or glow tube 20, one electrode 11 of which is connected to the anode of modulating tube 9 through resistance 13, and the other electrode 12 of which is connected directly to ground. A modulating choke coil connects the plate voltage with the anode of tube 9. A transmitter 7 which may comprise any suitable input device is employed to produce signal waves which are fed through transformer 8 to the modulator tube 9.

40 The variable condenser or glow tube, it is to be noted, is connected in series with the plate impedance of the modulator tube 9 but effectively connected in parallel with condenser 4. Consequently, any variation of the plate impedance of tube 9, such as may be caused by message waves impinging on the diaphragm of transmitter 7, will cause a variation of the effective capacity of the glow tube. This variation of the effective capacity of the glow tube will vary the resultant capacity of the tuned circuit 4, 5 in such manner that the output of the amplifier is phase modulated in accordance with the signal wave.

45 To those who are skilled in the art it will be obvious that a variable capacity as described 55

herein may be employed to vary the tuning of an oscillator circuit to obtain frequency modulation in a manner similar to that used to obtain phase modulation.

5 Fig. 3 illustrates a remote control system wherein the glow tube 20 is employed to vary the tuning of the receiving circuit at station A. In this circuit a movement of the potentiometer 14 at station B will vary the voltage applied
10 distant glow tube at station A over transmission line L. This tube is adapted to vary the resultant capacity of tuned circuit 17, 18 in response to a variation in potential caused by a movement of potentiometer 14.

15 A particular advantage of the glow discharge tube described herein is that it is much simpler and more positive in action than the usual type of variable condenser which employs a condenser shaft and suitable driving means.

20 It is to be understood that the circuits illustrated and described herein have been selected only for the purpose of clearly setting forth the principles involved and that the invention is susceptible of being modified to meet different
25 conditions encountered in its use without departing from the spirit and scope of the invention.

What is claimed is:

30 1. A variable substantially inertialess condenser comprising, a gaseous discharge tube having spaced electrodes immersed in a gas between which electrodes an electronic stream is designed to pass, and a cylindrical member plate

located between said spaced electrodes with its axis lying in the path of said stream to form therewith the plates of a condenser, the capacity of which is measured by the intensity of said electron stream.

5 2. A variable condenser comprising, a gaseous discharge tube having spaced electrodes immersed in a gas between which electrodes an electronic stream is designed to pass, a conducting member located between said electrodes and
10 enclosing the path of said stream to form therewith the plates of a condenser, the capacity of which is measured by the intensity of said electron stream, leads passing through the walls of said tube to said spaced electrodes to apply
15 thereto varying potentials which in turn vary the intensity of said electron stream, and leads connected to one of said electrodes and to said plate for applying the capacity variations produced between said stream and said plate to a utilization circuit.

3. A variable substantially inertialess condenser comprising, a gaseous discharge tube having spaced electrodes immersed in a gas between which electrodes an electronic stream is designed to pass, and a conducting plate located
25 on the outside of said tube adjacent the path of said stream to form therewith the plates of a condenser, the capacity of which is measured by the intensity of said electronic stream. 30

MURRAY G. CROSBY.

CERTIFICATE OF CORRECTION.

Patent No. 2,012,710.

August 27, 1935.

MURRAY G. CROSBY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 33, claim 1, strike out the word "plate"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 19th day May, A. D. 1936.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.

CERTIFICATE OF CORRECTION.

Patent No. 2,012,710.

August 27, 1935.

MURRAY G. CROSBY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 33, claim 1, strike out the word "plate"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 19th day May, A. D. 1936.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.