March 18, 1941. R. URTEL 2,235,053

CATHODE RAY CONTROL APPARATUS

Filed July 24, 1937

Fig. 1

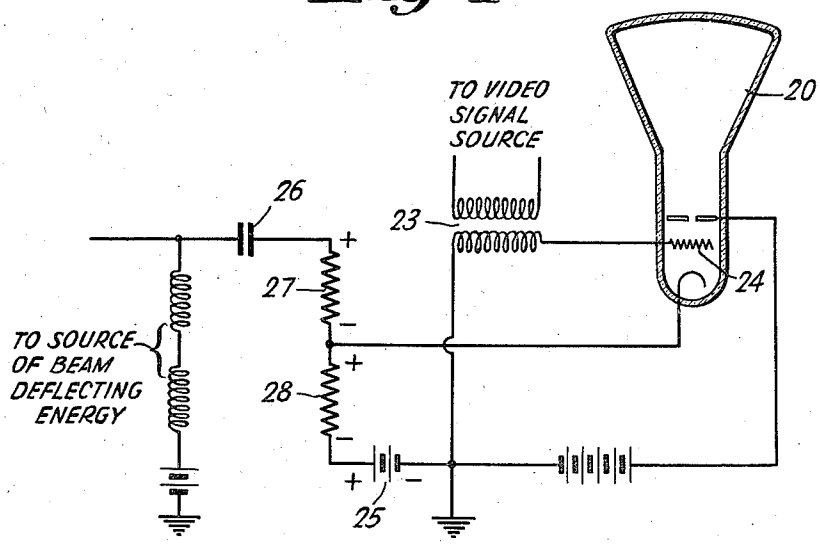
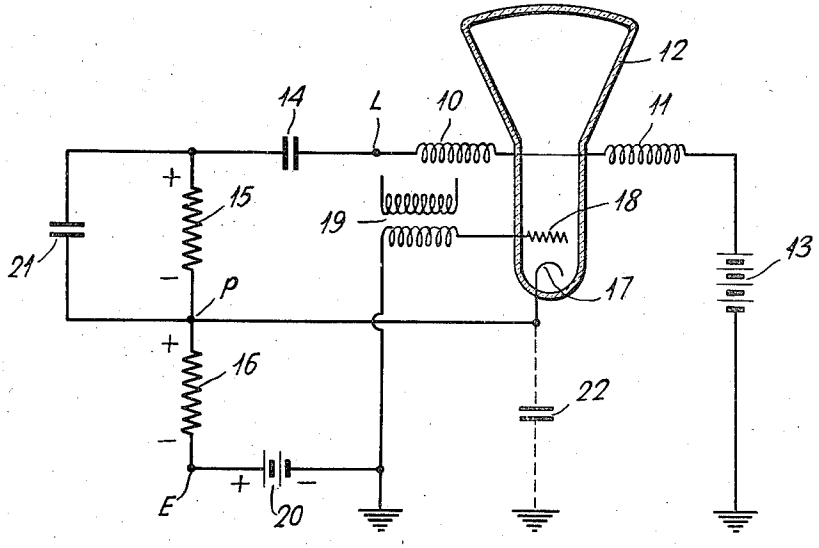


Fig. 2



INVENTOR
RUDOLF URTEL
BY H. G. Grover
ATTORNEY

Patented Mar. 18, 1941 2,235,053

UNITED STATES PATENT OFFICE

2,235,053

CATHODE RAY CONTROL APPARATUS

Rudolf Urtel, Berlin, Germany, assignor to Telefunken Gesellschaft für Drahtlose Telegraphie m. b. H., Berlin, Germany, a corporation of Germany

Application July 24, 1937, Serial No. 155,398
In Germany August 12, 1936

5 Claims. (Cl. 250—27)

My invention relates broadly to cathode ray control apparatus and more particularly to apparatus for blocking the potential of the ray during its return stroke.

In my co-pending application Serial No. 80,984, filed May 21, 1936, Patent No. 2,202,612, dated May 28, 1940, there has been disclosed a circuit arrangement for Braun television receiver tubes operating with deflection coils in which the cathode ray beam after completion of each line and after completion of each frame or each set or series of lines is blocked out as a function of the return or flyback action of the deflection circuit of the receiver. For this purpose, generally speaking, a potentiometer is connected in parallel relation to the deflector coils through a condenser in such a way that a portion of the potential arising across the potentiometer and of a polarity which will block out the cathode ray pencil is impressed on the modulation circuit of the Braun tube. More particularly speaking, the arrangement disclosed in my co-pending application is chosen in such a way that the tap of a potentiometer is united with the cathode of the Braun tube and the intensity or modulation control means is joined to the end of the potentiometer opposite or away from the coupling condenser joining the potentiometer to the deflecting means of the tube. However, the aim of this circuit may under certain circumstances be vitiated by self-capacitance inherent in the assembly, more especially by the capacity to ground of the cathode of the cathode ray tube.

Now, in order to overcome the said difficulty and to thus make the said circuit arrangement useful and suited for any kind of construction of the Braun tube, according to this invention, the potentiometer turned to the deflector coil and/or the part thereof from which the blocking potential is derived has a condenser connected in parallel to it. In this manner conditions are made so that the potential between the brightness control or modulation means of the Braun tube and its cathode, during the flyback or return action of the deflection circuit, will have the same "trend" or polarity as the voltage at the deflection coil itself. In fact, by choosing suitable dimensions for the condenser it may even be feasible to make conditions so that the voltage at the Braun tube as stated, save for a proportionality factor, will be exactly the same as the potential across the coil. However, in order to insure such equality of potentials another condenser may be connected in parallel also to the part of the potential divider from which the blocking potential for the Braun tube is tapped.

My invention will best be understood by reference to the drawing in which

Fig. 1 is one embodiment of the invention contained in my co-pending application hereinbefore referred to, and

Fig. 2 is an embodiment of my invention.

Referring to Fig. 1, a cathode ray tube **20** having a modulating electrode **24** has joined thereto an input transformer **23**. The cathode of this tube is joined to the sliding arm arrangement or center tap of a potentiometer **27, 28** which is grounded at one end through a biasing potential source **25**. The end of the potentiometer remote from that extremity which is grounded is joined through a condenser **26** to the deflecting coils of the tube and at the end of the coils remote from the end joined to the condenser **26**, there is joined a biasing battery **22** one side of which is grounded.

One embodiment of the invention shall be explained in more detail by reference to the accompanying drawing, and it shall also be explained the manner in which the self-capacitances of the circuit arrangements act and how their troublesome effect is preventable. Referring to the drawing, **10, 11** denote a deflector coil, say, for the line deflection means, while **12** is the Braun tube; **13** is a source of D. C. supply which furnishes the coil current. A voltage divider comprising resistances **15, 16** is connected with the coils **10, 11** through a condenser **14**. The tap P of the said potentiometer is connected with the cathode **17** of the Braun tube **12**, while the end thereof indicated at E remote from the condenser **14** is connected with the grid or intensity modulator device **18**. Included in this connection is the secondary winding of a transformer **19** by means of which the brightness control impulses are fed to the intensity control or modulating electrode of the Braun tube. Also included therein optionally is a D. C. source of potential **20** which impresses a negative biasing potential upon the brightness control or modulating electrode. The condenser **21** which is to be provided according to this invention shall be discussed further below.

Among such undesirable capacitances as will arise in a circuit organization as here illustrated, the capacity to ground of the cathode **17** plays the chief part, particularly in the case of indirectly heated tubes. This condition is indicated by condenser **22** and its connection (leads) indicated by the dotted lines. Now, if during the re-

turn action of the deflection circuit, at point L, a high potential to earth is acting, point or tap P of the potentiometer and therefore also the cathode of the tube will fail to partake of the shift of potential in a proportional measure, seeing that the high frequencies which exist in the sudden leap of potential at point L are drained or leak away to ground through condenser 22 and will thus cause no fall of potential across the resistance 16. But if, according to the invention, condenser 21 is connected in parallel relation to the resistance 15, then, if the said condenser is conveniently balanced and proportioned, conditions can be so shaped that the potential arising at point L will be divided by the voltage divider 21, 22 in the same relation as by the resistance 15 and 16. In other words, the shape of potential at point P, even if the balance were not quite accurate, will at any rate come quite close to that at point L, while if the balance is exact, the potential will turn out strictly the same, save for a factor of proportionality.

Unless the self-capacitance of resistance 15 is appreciable, the desired potential relations may be established by connecting a condenser in parallel to the resistance 16. Under certain circumstances it may be found advantageous to dispose a condenser to each of the two resistances 15 and 16.

What I claim is:

1. A return line elimination system for cathode ray tubes comprising a cathode ray tube including modulating and cathode electrodes, said latter electrode having a definite capacity with respect to a reference section, deflecting means for said tube, a series electrical circuit comprising said deflecting means and a potentiometer, said potentiometer being electrically connected to said reference section, means connecting the modulating electrode of said tube to said potentiometer and said reference section, means connecting the cathode of the cathode ray tube to a point on said potentiometer and a condenser shunted across the portion of said potentiometer external to the portion thereof connected in the modulating electrode-cathode circuit of said cathode ray tube to substantially compensate for the capacity of the cathode with respect to the reference section.

2. A return line elimination system for cathode ray tubes comprising a cathode ray tube including modulating and cathode electrodes, said latter electrode having a definite capacity with respect to a reference section, deflecting means for said tube, a series electrical circuit comprising said deflecting means, a condenser, a potentiometer and a source of energy, said series circuit being electrically connected to said reference section, means connecting the modulating electrode of said tube to said potentiometer and said reference section, and a condenser shunted across the portion of said potentiometer external to the portion thereof connected in the modulating electrode-cathode circuit of said cathode ray tube to substantially compensate for the capacity of the cathode with respect to the reference section.

3. A return line elimination system for cathode ray tubes comprising a cathode ray tube including modulating and cathode electrodes, said latter electrode having a definite capacity with respect to a ground, deflecting means for said tube, a series electrical circuit including said deflecting means and a potentiometer, said series circuit being electrically connected to said ground, means connecting the modulating electrode of said tube to said potentiometer and said ground, means connecting the cathode of the cathode ray tube to a point on said potentiometer and a condenser shunted across the portion of said potentiometer external to the portion thereof connected in the modulating electrode-cathode circuit of said cathode ray tube to substantially compensate for the capacity of the cathode with respect to the reference section.

4. A return line elimination system for cathode ray tubes comprising a cathode ray tube including modulating and cathode electrodes, said latter electrode having a definite capacity with respect to a ground, deflecting means for said tube, a series electrical circuit comprising said deflecting means, a condenser, a potentiometer and a source of energy, said series circuit being electrically connected to said ground, means connecting the cathode of the cathode ray tube to a point on said potentiometer, means connecting the modulating electrode of said tube to said potentiometer and said ground, and a condenser shunted across the portion of said potentiometer external to the portion thereof connected in the modulating electrode-cathode circuit of said cathode ray tube to substantially compensate for the capacity of the cathode with respect to the reference section.

5. A return line elimination system for cathode ray tubes comprising a cathode ray tube including modulating and cathode electrodes, said latter electrode having a definite capacity with respect to a reference section, deflecting means for said tube, a series electrical circuit including said deflecting means and a potentiometer, said series circuit being electrically connected to said reference section, means connecting the modulating electrode of said tube to said potentiometer and said reference section, means connecting the cathode of the cathode ray tube to a point on said potentiometer and a condenser shunted across the portion of said potentiometer external to the portion thereof connected in the modulating electrode-cathode circuit of said cathode ray tube to substantially compensate for the capacity of the cathode with respect to the reference section, said latter condenser being of such value whereby the shunting of pulses normally shunted through the capacity between the cathode and reference section is substantially eliminated.

RUDOLF URTEL.