

PATENT SPECIFICATION

484,003



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COMPLETE SPECIFICATION

Improvements in or relating to Cathode-ray Transmission Apparatus for Direct Television and for the Transmission to a Distance of Films which may be Sound Films

We, ARTURO CASTELLANI, of Viale Maino 20, Milan, Italy, an Italian subject, and SAFAR-S.A. FABBRICAZIONE APPARECCHI RADIOFONICI, whose registered office is situate at Viale Maino 20, Milan, Italy, a body corporate organised under the laws of Italy, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improvements in transmission apparatus for direct television and for the transmission to a distance of films which may be sound films.

The transmission to a distance of scenes which take place in the open air by means of a mechanical analysis meets with considerable difficulties by reason of the very small quantity of light which is available to influence the photoelectric cell after analysis. It has been suggested that this disadvantage can be eliminated by using special cathode ray tubes, provided with a multiple mosaic photoelectric cathode on to which the scene to be transmitted is projected. These multiple cathodes, however, are difficult to manufacture and they wear out rapidly by reason of the almost microscopic smallness of their elements.

The invention has for its object to provide a transmission apparatus which, by reason of the use of a tube arranged in a special manner, enables the disadvantage of short life and all the difficulties of construction to be eliminated.

According to the invention a cathode ray transmission apparatus in which the analysis of the image is effected in a composite manner to produce an image with continuous translation over a single band of photoelectric elements is characterised in that the photoelectric band is provided with elements arranged side by side and relatively long, and is located inside a cathode ray tube having a centring screen and of which the cathode rays are periodically deviated, under the action of lateral plates or coils periodically energised by impulses in the form of saw teeth, to be directly concentrated on the said band and to pass thereover at a

uniform speed, whereby the recoil of the cathode rays towards the beginning of the photoelectric band is effected instantaneously. 55

The invention relates to a known principle of effecting the analysis of the image in an indirectly composite manner, that is to say by effecting an electrical analysis with the assistance of an external cell connected with the cathode ray tube, and in this way effecting the analysis in a line. This method had the disadvantage of necessitating a passage across a photoelectric cell external to the cathode ray tube thereby complicating the system in an impractical manner. In the present invention these disadvantages are eliminated for the analysis of the line is effected directly in a cathode ray tube and not indirectly as explained above. 60 65 70

This expedient produces an image with continuous translation over a single band of photoelectric elements which may be manufactured easily for a long life as their dimension in the direction of the frame analysis may be made as large as necessary. 75 80

In order that the invention may be more clearly understood reference will now be made to the accompanying drawings which show by way of example preferred embodiments thereof. 85

In the drawings: Fig. 1 shows a tube according to the invention arranged in an apparatus for the transmission of images taken directly. 90

Figs. 2 to 4 are the three orthogonal representations of a photoelectric band according to the invention. 95

Fig. 5 is a view similar to Fig. 1 applied to the transmission of a cinematographic film with a sound track. 100

In the drawings like references designate the same of similar parts.

In the tube according to the invention the envelope T encloses a cathode K, heated directly or indirectly, from which emanate cathode rays. An electrode C centres these rays on the photoelectric band L through the anode A of the tube. The said band L is formed of a number of small cells not less than the number of analysis points contained in a line. An 105

electro-static screen  $A^1$  concentrates the rays which may be deviated by means of the plates P.

The construction of the photoelectric band L is of special importance. It has a function similar to the function of a commutator of continuous current dynamo electric machines developed in plan, with which it has numerous analogies in construction. In Figs. 2 to 4 it will be seen that this band L is formed by a number of metal laminae of silver, nickel, molybdenum or the like and their number is not less than the points contained in the line of the analysis. These laminae are separated by insulating laminae, for example of mica,  $m$ , having the thickness of a few hundredths of a millimetre. The whole assembly is effectively clamped in a metal block M with the interposition of sheets of mica  $m_1$  having the same thickness as the separating laminae  $m$ . The sensitive photoelectric layer  $f$  may be applied to the exposed faces  $s$  of the laminae, separately or simultaneously, using for this purpose one of the known processes, such as electrolysis, decomposition, evaporation or distillation, dissolution or otherwise.

The photoelectric band is thus formed of a series of small photoelectric cells of which the dimensions may amount to thousands of times the size of cells producible in multiple mosaic photoelectric cathodes. Its transverse width may be sufficiently large to enable the cathode ray to act thereon some tens of times by moving the ray the distance of one image line as the end of the preceding line is reached to prevent exhaustion of the photoelectric surface as a result of the prolonged operation.

Fig. 1 shows a diagram of the transmitting apparatus according to the invention. The objective O is opposite the mirror drum S which is provided with as many mirrors as there are images per second assuming that it rotates at a speed of one revolution per second. A larger or smaller number of mirrors may be used according as to whether it is desired to reduce or increase the speed. This enables the movable image of the scene which is directly exposed to the objective to be projected on the photoelectric line L of the tube at the rate of 25 images per second.

There is supplied to the deviation plates P a variable potential difference of saw tooth form of which the frequency corresponds with the number of analysis lines which it is desired to obtain. The generator of these oscillations in the form of saw teeth is synchronised with the drum S. When the tube is operating, if the

cathode ray is concentrated on the band L the former, as a result of the potential acting at P, effects correspondingly with each saw tooth a movement along the whole of the band L at a uniform speed followed by a very rapid return to the starting point and so on corresponding with each tooth. As the image moves over the photoelectric band L there corresponds to each saw tooth the point analysis of a line of this image. By reason of the external electrical connection of the electrodes of the tube each point of the line successively releases from each photoelectric element of the band a certain number of electrons proportional to the luminous intensity of the various points of the image. These electrons are collected by the anode A. The elements assume in consequence a certain electric charge; this charge is neutralised by the cathode ray at the moment when the latter meets it during its passage. Consequently there is present in the circuit a photoelectrically generated current which is proportionately modulated by points according to the analysis characteristics. This current, suitably modified for modulating the radio transmitter is received by the receivers and reconverted into luminous points and recomposed by means of cathode ray tubes or other devices so as to reveal the image which the transmitting apparatus described transmits at the same instant.

In order to illustrate this operation better there are shown diagrammatically in Fig. 1 the other essential parts which the apparatus comprises: a synchronous motor  $M^1$  for rotating the drum S; the generator  $L^1$ —Cf for the initiation of impulses, and an amplifier G of any suitable type for multiplying the frequency of these impulses, said amplifier being also associated with a saw-tooth oscillator which converts the impulses to saw-tooth form after multiplication.

The apparatus also includes four batteries  $B_1, B_2, B_3, B_4$  which are respectively adapted for the heating of the tube T, for centring the cathode rays, for supplying the anode of the tube and for biasing of the photoelectric line. At R is indicated a resistance for use in the photoelectric circuit and at V the valve of the first stage of amplification.

In Fig. 5 there are shown diagrammatically in a similar manner the other essential parts of an apparatus which can be used for transmitting sound films when employing a cinematographic projector  $P_r$  which illuminates the objective O, is driven by the synchronous motor  $M^1$  and is associated with a generator  $L^1$ —Cf for producing impulses in the form of saw

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teeth. The other parts are analogous and correspond with those of the apparatus above described.

5 It will be understood that the necessary complementary parts are varied in accordance with the application desired without departing from the scope of the invention.

10 Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

15 1. Cathode ray transmission apparatus in which the analysis of the image is effected in a composite manner to produce an image with continuous translation over a single band of photoelectric elements characterised in that the photoelectric  
20 band is provided with elements arranged side by side and relatively long, and is located inside a cathode ray tube having a centring screen and of which the cathode rays are periodically deviated, under the  
25 action of lateral plates or coils periodically energised by impulses in the form

of saw teeth, to be directly concentrated on the said band and to pass thereover at a uniform speed, whereby the recoil of the cathode rays towards the beginning of the photoelectric band is effected instanta-  
30 neously.

2. Apparatus according to Claim 1 characterised in that the photoelectric band is formed of a plurality of laminae of suitable metal, such as silver, nickel, molybdenum or the like arranged side by side, with the interposition of sheets of an insulator such as mica or the like, the exposed surface of these laminations being  
35 coated in any known manner with sensitive photoelectric substances.

3. Cathode transmission apparatus having its parts constructed, arranged and adapted for co-operation substantially as described or as shown in the accompany-  
45 ing drawings.

Dated this 28th day of October, 1936.  
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Chartered Patent Agents,  
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Agents for the Applicants.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

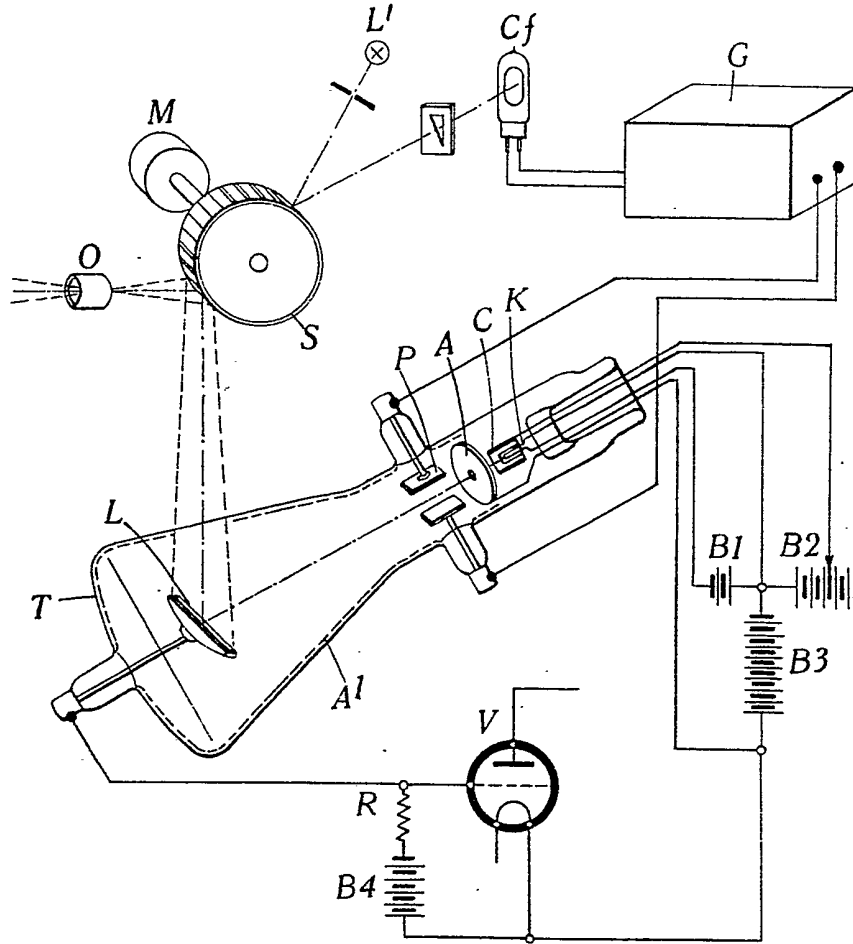


Fig. 2.

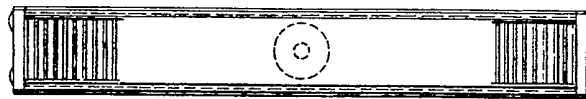


Fig. 3.

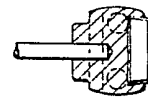
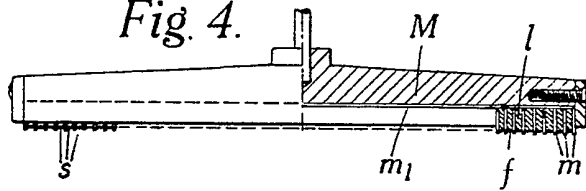
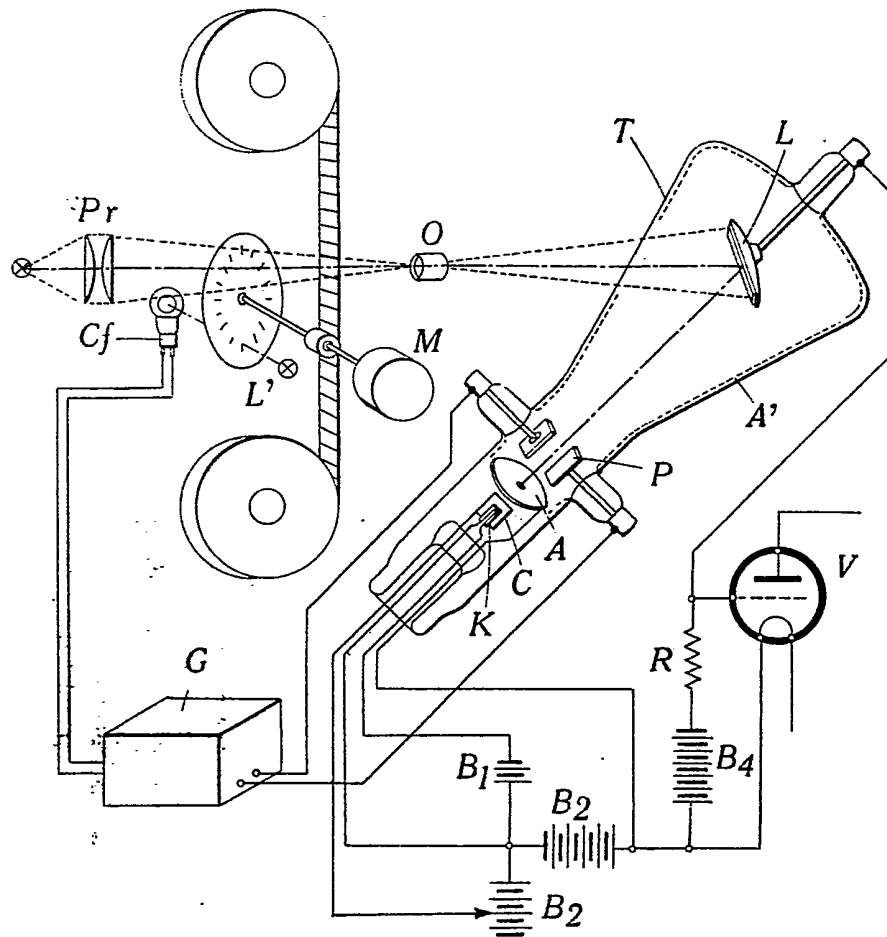


Fig. 4.



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3.

Fig. 5.



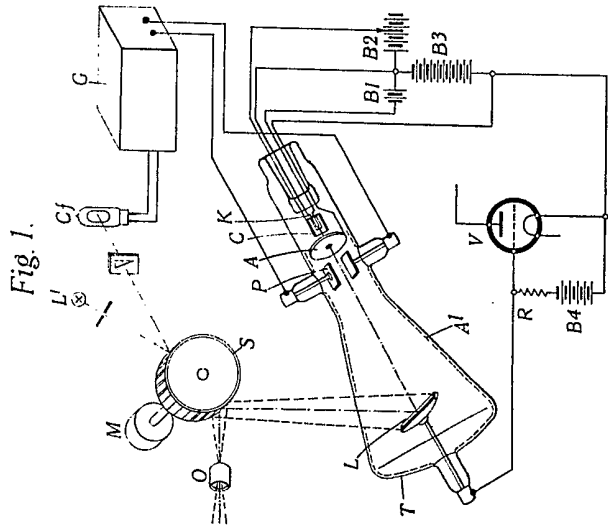


Fig. 1.

Fig. 2.

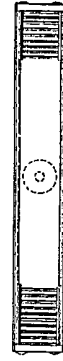


Fig. 3.



Fig. 4.

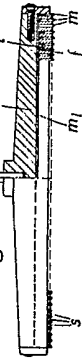
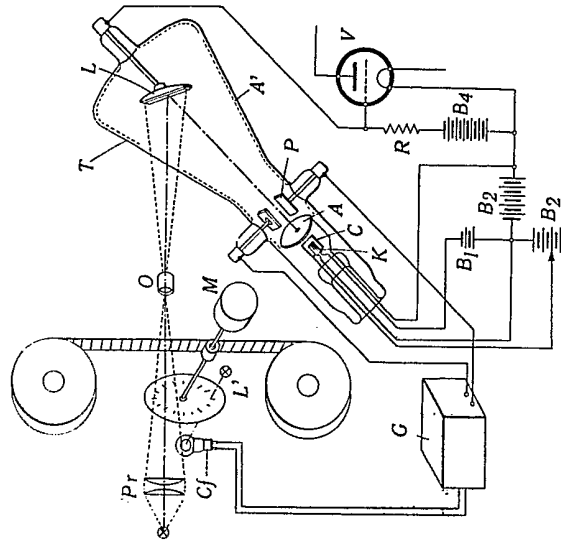


Fig. 5.



[This Drawing is a reproduction of the Original on a reduced scale.]