May 22, 1934. W. ROGOWSKI 1,959,500

CATHODE RAY OSCILLOGRAPH

Filed Oct. 29, 1931

Fig. 1

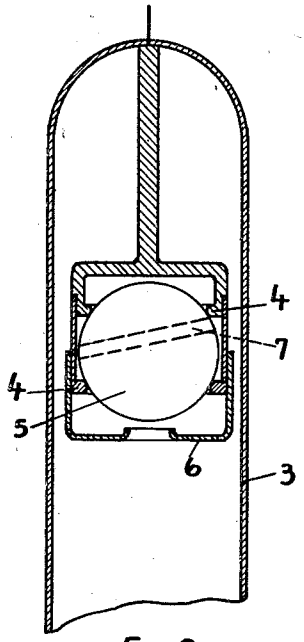
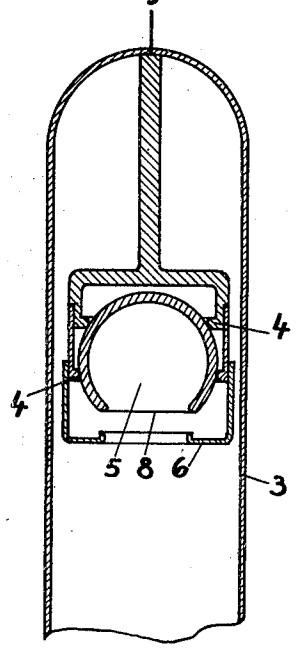


Fig. 2



Inventor
Walter Rogowski
per
Attorney.

Patented May 22, 1934 1,959,500

UNITED STATES PATENT OFFICE

1,959,500

CATHODE RAY OSCILLOGRAPH

Walter Rogowski, Aachen, Germany

Application October 29, 1931, Serial No. 571,904
In Germany November 11, 1930

3 Claims. (Cl. 250—27.5)

The earlier cathode ray oscillographs—Braun's tubes—consisted of hermetically sealed glass tubes and their cathodes of a fixed metal disc. In the use of these tubes, it showed that the cathode was pitted and destructed by the known cathode atomization, whereby the fluorescent spot gradually lost its sharpness so that the graph became bad or even useless. In spite thereof, these earlier tubes had a very long life, because they worked with high vacua and the electron stream emitted by the cathode remained very small. The efficiency of these earlier tubes was accordingly low.

Later on the tubes made of glass or metal were no longer hermetically sealed, but they were used in constant connection with air pumps. One or more pumps had to be used already for the reason that, in the course of the time, the photographing of the fluorescent pictures was not only performed from the exterior by means of lens and camera but also by inserting the photographic plate into the interior of the tube and impressing the electrons directly on the plate. It was thereby made possible to work with lower vacua and to use a higher intensity of the electron stream emanated by the electrode. However, this mode of working had the drawback that the cathode was rapidly pitted at the point of source of the electrons. This drawback although undesirable was not very essential with the respective tubes, because the tubes were not sealed and the cathode could therefore be interchanged.

Lately, oscillographs have become known in which there is effected a preliminary and a main concentration of the electron stream by arranging one concentrating coil between the cathode and anode and another concentrating coil between the anode and fluorescent screen so as to focus the electron both in the aperture of the diaphragm and on the fluorescent screen. This double concentration allows of utilizing practically all electrons emitted by the cathode for the graph. When in the use of such tubes, the fluorescent picture is photographed from the exterior by means of lens and camera, one can attain tracing speeds of 1000 km/sec. on the photographic plate positioned outside the tube, that is to say in the open air. Therefore, the tendency at present is to use again hermetically sealed tubes and to take advantage of the attainable high intensity by exterior photography. However, in connection with this method the strong pitting of the cathode, which in an intensive use of the tube greatly reduces the life thereof, enters into appearance as a very serious drawback. In order to overcome this drawback, it has been proposed to use cathodes having cylindrical or strip-shaped metal parts and to shift the point of source of electrons, if required, to fresh metal by rotating such cylinder or shifting such strip. These arrangements have the disadvantage that they are of a complicated construction and difficult to handle and that only a portion of the cylinder or strip surface can be utilized for forming new starting points for the source of electrons.

The invention has for its object to provide an oscillograph with a cathode by which the disadvantages of the last-said arrangements are avoided, and it essentially resides in providing a cathode comprising a spherical metal body which is mounted movably so that it can be turned about its centre from the outside by knocking at the tube or in another suitable way.

A cathode in the form of a turnable ball has the advantage that every point of its whole surface can be utilized to form the source of the electrons. Besides, owing to its curvature in all directions every part of the ball acts particularly favorable as a point of source of the electrons. Moreover, the bearing for an adjustable ball is exceedingly simple.

Some embodiments of the invention are illustrated in the accompanying drawing in which:

Fig. 1 is a sectional view of a portion of an oscillograph with a cathode formed according to the invention, and

Fig. 2 a similar view of a modified form.

In these figures, 3 denotes the discharge tube, 4 an annular bearing and 5 a metal ball constituting the cathode. The ball 5 is loosely mounted in the bearing 4. 6 is an apertured diaphragm which is preferably conductively connected with the cathode, as shown. It will be understood that by tapping at the tube 3 the ball can be easily turned about its centre for the purpose above indicated. Turning of the ball may also be performed by means of a magnet from the exterior of the tube, causing this magnet to act on an iron core embedded in the ball. Such a core is indicated by dotted lines at 7 in Fig. 1.

The metal balls may either be solid or hollow. In Fig. 1 the ball is assumed to be solid, while Fig. 2 represents a hollow ball. In the latter case, the wall has a recess 8 at the side directed toward the discharge space and the point of source of the electrons is situated on the inner concave surface of the ball. Therefore, with a hollow ball the above-mentioned advantage of allowing the total surface area of the ball to be utilized does not exist, but the hollow ball has the par-

ticular advantage of causing the rays to enter the discharge tube with a certain convergence.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A cathode for a cathode ray oscillograph, comprising a supporting stem having a free end, a cage on the free end of the stem, and a substantially spherical metal body loosely mounted in the said cage so as to allow it to be turned about its center.

2. A cathode for a cathode ray oscillograph, comprising a supporting stem having a free end, a cage on the free end of the stem, a metal ball loosely mounted in the cage, and an iron core in the ball adapted to be acted upon by a magnet for turning the ball.

3. A cathode ray oscillograph comprising a plurality of electrodes having a discharge path therebetween, one of said electrodes being a cathode comprising a supporting stem having a free end, a cage on the free end of said stem, and a hollow metal ball loosely mounted in the cage and having an open recess on the discharge path side.

WALTER ROGOWSKI.