March 29, 1932. R. P. MAY 1,851,830

EXCITER LAMP FOR PHOTO ELECTRIC APPARATUS

Filed April 8, 1931

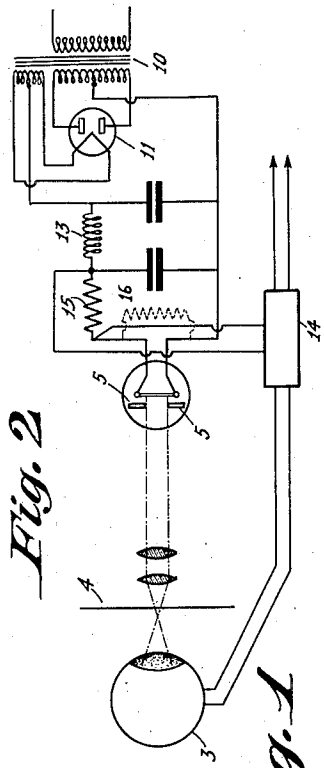

Fig. 2

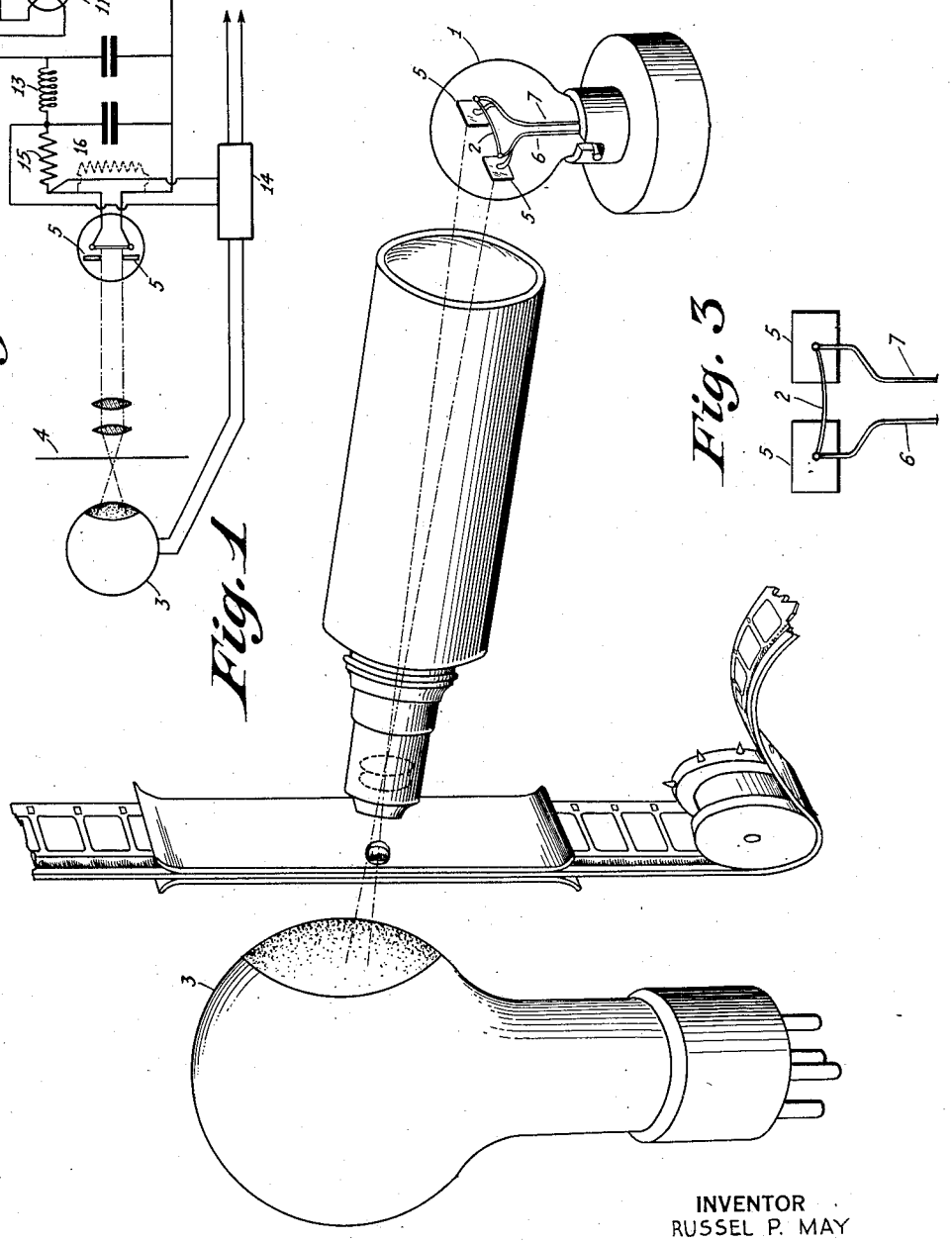

Fig. 1

Fig. 3

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EXCITER LAMP FOR PHOTO ELECTRIC APPARATUS

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In photo-electric apparatus and particularly in talking motion picture apparatus of the sound-on-film type and analogous film phonographs, it is necessary to produce a fine and intense line of light upon the film record. This is customarily accomplished either by producing a linear image by an appropriate optical system, by forming an image by an illuminated slit upon the film, by the use of a slit adjacent to the film or by forming an image of a filament upon the film.

In the last of these four ways, the filament image is ordinarily subject to certain defects due to the inherent nature of the filament, and this method of mounting which ordinarily requires that the filament be stretched very tightly and be heated to an unduly high temperature, both of which tend to shorten the life thereof, in order to secure an accurately linear image with a sharp cut-off at each end.

It is the purpose of this invention to provide a lamp of such a nature that the available area of the filament may be imaged directly upon the film without the usual attendant disadvantages thereof referred to, and I accomplish this result by masking off the end portions of the filament within the bulb and fairly close to the film, thereby using only the central portion of the filament for the reasons and in the manner more specifically described and claimed in application Serial Number 528,533 of W. L. Douden and Russell P. May, of which the present application is a continuation in part.

One object of this invention is to provide an exciter lamp having a filament which can be imaged directly upon the film without the interposition of a slit or its equivalent to provide a straight-line image and at the same time to avoid placing the filament under tension to keep it straight.

Another object of this invention is to provide an exciter lamp having an available filament area such that the image thereof will have very sharply defined edges and ends.

Another object of this invention is to provide means for masking off the relatively cool end portions of the filament which tend to produce non-uniform reproduction of available area sound records.

My invention and the objects thereof will be better understood from the following description when considered in connection with the accompanying drawings and its scope will be pointed out in the appended claims.

Figure 1 is a perspective view of the optical system.

Figure 2 is a diagrammatic illustration of a form of circuit which may be used therewith.

Figure 3 is a more detailed illustration of the filament and mounting means therefor.

As shown in all of the figures, the exciter lamp 1 is provided with a filament 2 which is appreciably longer than the portion thereof which is imaged on the record 4. This filament is not specifically provided with any means for keeping it straight or taut, but is merely mounted in a reasonably straight position in the ordinary or usual manner of mounting such filaments in incandescent lamps.

As is well known, a cord or filament suspended in a horizontal position will assume a curve known as the "catenary". It appears, however, that if such curve is relatively flat, as in the case of the filament referred to, the central portion thereof is relatively straight, and of course the more nearly the entire curve approaches the form of a straight line, the more nearly straight this central portion will be.

Further, the ends of a filament attached to the supports are relatively cold and there is a portion near such ends where the filament temperature and brightness gradually falls off due to conduction of heat to such relatively cold ends. If these portions of non-uniform brightness are imaged on a sound-track, the reproduction will be faulty at the corresponding portions of the sound-track width.

For these reasons, I image only the central portion of the relatively long filament upon the sound-track or other record area, and thereby secure a substantially linear image of uniform brightness.

I mask off the undesired portions of the filament image by a mask adjacent to the light-emitting element as indicated at 5 in Fig. 1. This mask may consist of two small rectangular pieces of material such, for example, as nickel, which are supported in the proper relation to each other and to the filament by the filament supports 6 and 7 but it will be obvious that a single mask may be used and that this may be of another and opaque material, and may be supported in any desired manner within the bulb, such, for example, as from a single one of the filament supports or from independent supports attached to the "press" in the base of the bulb.

This mask should be spaced a sufficient distance from the filament to avoid undue local cooling of the filament, and at the same time be so closed to the filament that the separation is relatively small compared to the distance of the filament from the objective lens of the optical system.

I preferably provide a filament of the exciter lamp with direct current by connecting it in series with the amplifier plate-current supply, as shown in Fig. 2.

In this figure, 10 indicates the usual transformer which is provided with A. C., 11 indicates the usual rectifier and 12 indicates the filter with its attendant choke, condensers, and resistor. The filament 2 of the exciter lamp 1 is connected in series relation with one of the leads from this rectifier unit to the amplifier 14.

In the preferred form of the invention, the exciter lamp and the amplifier are so matched to each other that the current drawn by the amplifier is just sufficient to light the filament of the exciter lamp to the proper temperature. In case the amplifiers are required to be of such size and power that the filament would become of unduly large diameter if matched thereto, I may provide a shunt, as indicated in dotted lines at 16 in Fig. 2, to carry a portion of the current and thereby keep the current through the lamp within convenient limits, or, reversely, the resistor 15 may function to increase the current through the lamp.

It will be obvious that the amplifier 14 may be that which amplifies the current from a photo-cell 3 in reproduction and delivers it to a loudspeaker, or it may amplify the output from a microphone and deliver it to a light-control means for recording, or it may be used for any other of the related purposes referred to above and none of which forms specifically a part of this invention. The rectifier might even transmit its output to the pot-magnet of an electrodynamic speaker and the connection of the exciter lamp in series therewith would still fall within the scope of this invention.

One advantage of inserting the exciter lamp in the amplifier circuit is that by locating it in appropriate relation to the filtering means any desired quantity of "regeneration" or its equivalent may be secured.

By the term "optically effective point" in the following claims we refer to the place where the image of the filament cooperates with the record-surface to produce a record thereon or to be affected by a record already thereon, whether it be for sound recording or reproduction or for any equivalent purpose; and we apply the term "photo-electric apparatus" in its broadest sense, i. e. we do not necessarily refer to apparatus including a photo-electric cell, but rather to any apparatus wherein the modulation of electrical energy is converted into the modulation of optical energy or vice versa.

Having now described my invention, its operation and the method of adjustment thereof, I claim:

1. Photo-electric apparatus including an exciter lamp having a linear filament and spaced masking means adjacent the ends of said filament whereby the central portion only of said filament may be imaged at an optically effective point.

2. An exciter lamp for photo-electric apparatus including a filament and means integral therewith for masking off all but an effectively straight portion thereof.

3. An exciter lamp for photo-electric apparatus including a filament and means integral therewith for masking off all but a portion thereof isothermal when in operation.

4. An exciter lamp for photo-electric apparatus including a filament and means integral therewith for masking off all but an effectively straight portion thereof isothermal when in operation.

5. An exciter lamp for photo-electric apparatus including a light-emitting filament and means integral therewith for masking off all but an effectively straight portion thereof isothermal when in operation.

RUSSELL P. MAY.