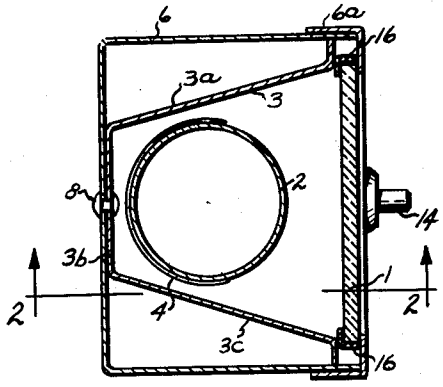
June 9, 1964 H. C. WAIN 3,136,890

BROAD SPECTRUM PROSPECTOR

Filed July 12, 1961

Fig-1



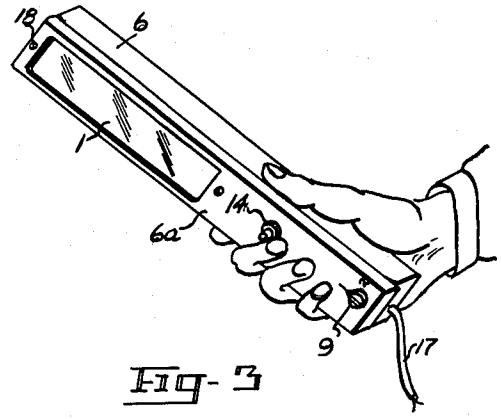


Fig-3

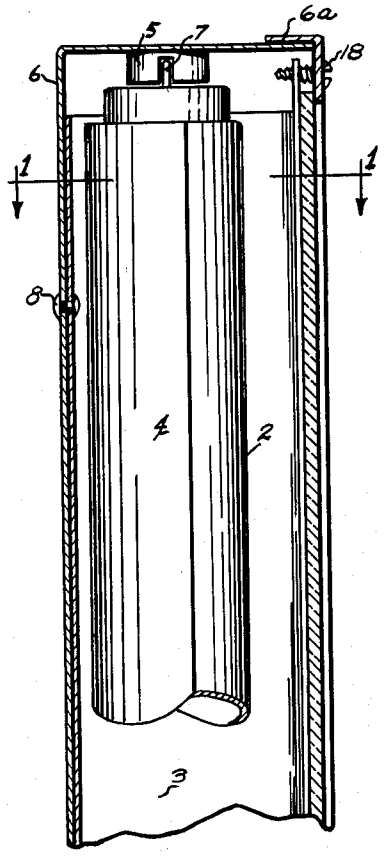


Fig-2

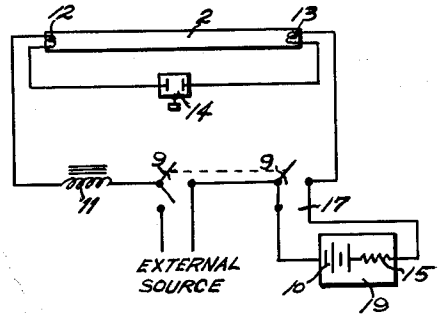


Fig-4

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BROAD SPECTRUM PROSPECTOR

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This invention is concerned with lamps and particularly that type of lamp that transmits ultra-violet rays which have been filtered so as to remove visible light.

There is available for use two types of ultra-violet rays which may hereinafter be referred to as the short wave lengths and the long wave lengths, both being in the ultra-violet spectrum. The short waves are at 2537 A., and the long waves from 3300–3900 A. In order to have the use of both of these wave lengths heretofore it has been necessary to have two separate lamps, one for the short and the other for the long wave length.

It is a primary object of the within invention to provide a single lamp which will simultaneously produce radiations having both short and long wave lengths of invisible light in the ultra-violet spectrum.

A particular purpose for the use of ultra-violet light having both short and long wave lengths is in the technology known as prospecting, and the location, discovery and identification of various types of minerals and biological compounds which have fluorescent characteristics under ultra-violet radiation. It is well known that some minerals and compounds fluoresce more brilliantly under short wave lengths, and others more so under long wave lengths. Others will not fluoresce at all under the short wave lengths but will fluoresce exclusively under the long wave lengths and vice versa, making a need for a lamp or source of ultra-violet having both short and long wave lengths.

It is an object of the within invention to provide a source of ultra-violet light that is housed in a container that is of light weight and simple in construction.

It is a further object of the within invention to provide a lamp in a lightweight container that will, upon energization, transmit simultaneously ultra-violet light both in the short and long wave spectrum.

It is another object of the within invention to provide a lamp within a light weight container for producing ultra-violet light but yet without producing visible light.

It is a further object of the within invention to provide a portable self-contained ultra-violet lamp within a housing for producing simultaneously both long and short waves of ultra-violet light.

It is still a further object of the within invention to provide an ultra-violet lamp that will transmit both short and long waves of ultra-violet light simultaneously and that has means for obtaining energy for activating the said ultra-violet light, either from within or without the container.

The above objects are obtained by the use of a simple housing which has mounted therein a low pressure mercury vapor arc tube. Circumscribing a portion of the rear circumference of the tube is a coating of a phosphor of the type used to convert short waves of ultra-violet to long waves. Behind the phosphor is a reflector which will reflect ultra-violet rays. In front of the tube, forward of the area which is coated with the phosphor and of course forward of the reflector is a glass filter. When the lamp is energized, the ultra-violet rays of the short wave spectrum pass from the front of the tube through the filter. Because of the phosphor coating on the rear of the tube, waves being emitted from the rear of the tube are converted into long waves of ultra-violet light. These long waves strike the reflector, which in turn redirects the long waves of ultra-violet light back through the tube and out through the filter so that there are both

long and short wave lengths of ultra-violet light passing through the filter towards the object under surveillance.

For a more detailed description of the invention, reference is made to the accompanying drawing, in which:

FIGURE 1 is a side elevation schematic view of the arrangement within the housing, along line 1—1 of FIGURE 2.

FIGURE 2 is a top plan view of the view shown in FIGURE 1.

FIGURE 3 is a perspective view of entire device showing it in use.

FIGURE 4 is the electrical schematic circuit of the components of the device.

The tube 2 of this embodiment is of the elongated unilateral type but could be of a different shape. It is mounted by fluorescent sockets 5 at each end of the container 6. The sockets 5 are of the conventional type and the pin 7 of the tube 2 are of the conventional type and make electrical contact within the socket 5.

Painted or coated on the rear of the tube 2 is the phosphor 4. The phosphor 4 is coated on the circumference of the tube and to the rear of the tube covering slightly more than half of the rear circumference as shown in the view of FIGURE 1. The design of the coating of phosphor 4 is best or optimum when the phosphor coating 4 is at a point on the surface of the tube 2 from which reflected radiation would re-enter the mercury arc tube 2 rather than pass directly through the filter 1. The reason for this is that any short wave energy which is redirected into the tube is absorbed by the ionized mercury in the tube 2. By taking the radiations in this area and converting them to long wave ultra-violet radiations, they can be transmitted back through the tube 2 through the filter 1, and are in addition to the other useful radiations being emitted from the lamp, making for a more efficient transmission of ultra-violet light, rather than having the light from the rear of the tube 2 absorbed and dissipated.

The filter 1 which is mounted in the front housing 6*a* on rubber cushioned metal mounts 16 in the usual manner that glass is mounted, is a Corning filter glass which is known as #9863. It is a flat sheet of glass that has been designed by Corning to transmit ultra-violet light. It is transparent both to the short wave lengths of ultra-violet light and also to the long waves of ultra-violet light. It also acts as a filter in absorbing almost all visible radiation.

The reflector 3 is preferably made of a polished aluminum, which is effective in reflective ultra-violet radiations. The embodiment shown discloses a three sided reflector having an upper plate 3*a*, a lower plate 3*c*, and a rear plate 3*b*. The reflector 3 is mounted on its rear plate 3*b* by rivets 8 in a conventional manner, but could be bolted or fastened in some other equivalent way without departing from the spirit and scope of this invention.

FIGURE 4 is a schematic diagram of the conventional electrical circuit. In order to operate the device a switch 9 which is shown in FIGURE 3 and in FIGURE 4 must be closed in order to allow the electricity from the battery 10 or the electrical source (which can be an external source) to pass in the circuit. Switch 9 has two positions, one for the battery 15, and one for the external source. The circuit consists of a ballast 11 which is connected in series with each side of the filaments 12 and 13 respectively in the tube 2. Connected between the filaments 12 and 13 is a starter switch 14. The starter switch 14 can be operated either manually or thermally. A resistor 15 is connected in series with the direct current source 12 to provide a resistance to the current flow in order to protect the battery after ionization in the tube 2.

The following explanation is the theory of the passing of the various wave lengths of the ultra-violet light and

the generating of same. When the switch 9 is closed to permit the electrical source to pass energy through the ballast 11 and also through the starter 14, the filaments 12 and 13 are preheated and energized to a sufficient voltage so that there is an ionization of the gasses, particularly the mercury gases within the tube 2.

Immediately short wave lengths of ultra-violet light will be transmitted from the tube 2 through the filter 1 which absorbs all other light radiations, and out from the front of the housing 6*a*.

The short ultra-violet waves passing through the phosphor 3 to the rear of the tube 2 become long wave ultra-violet light. The long waves then will reflect on the aluminum reflector 3 and will be passed back into the tube 2 and also out from the front of the tube through the filter 1. This ultra-violet light, because of passing through the phosphor, will be of the longer wave length than the light that does not pass through the phosphor. This light, being emitted from the rear, is generally lost because the short waves are absorbed by the mercury vapor after being redirected at the tube. By the novel arrangement of the phosphor coating and the reflectors, the long waves of ultra-violet now converted from short waves of ultra-violet are put to work and there is no longer a loss of the full use of the light waves. It should be understood that both short and long waves of ultra-violet light are now emitted simultaneously and not separately.

The reflector 3 is not essential to the operation of the device. The phosphor 4 acts as a long wave source of ultra-violet light and radiates in all directions so that some of the long waves of ultra-violet will be transmitted from the front of the tube 2. However, this is not as efficient as the embodiment herein disclosed as is employed with the reflector 3.

The cord 17 extends from the bottom of the casing 6 and is connected to a battery or external source in accordance with the circuit of FIGURE 4. The battery 10 may be carried in a separate pack 19.

I claim:

1. An ultraviolet radiation generator for detecting and analyzing the fluorescent condition of minerals and like substances and efficiently producing both shortwave ultraviolet radiation and longwave ultraviolet radiations comprising: a housing provided with an opening, a gaseous discharge tube for producing shortwave ultraviolet radiations disposed within the housing and having a portion

confronting said opening, a filter disposed in said opening to remove any visible wave lengths from the radiations produced by said tube, a phosphor supported with respect to said tube and said opening to receive a large portion of the shortwave radiations from the tube that are not emanated directly through said opening, said phosphor being responsive to said received shortwave radiations to produce longwave radiations, the gases in said gaseous discharge tube being characterized as absorptive of said shortwave radiations and substantially nonabsorptive of longwave radiations whereby some of the long wave radiations produced by said phosphor are directed through said tube to said opening, and means for collecting other of said produced longwave radiations and directing said radiations to said opening, whereby a portion of said longwave radiations directed through said opening are obtained from shortwave radiations that would otherwise not be directed to said opening.

2. In the generator of claim 1, the shortwave ultraviolet radiation being at 2537 A. wavelength and said longwave ultraviolet radiation being from 3300 to 3900 A. wavelength.

3. In the generator of claim 1, said gaseous discharge tube comprising a low pressure mercury discharge tube having walls pervious to both said longwave and shortwave radiations, and said filter comprising a glass plate pervious to both wavelengths of ultraviolet radiation and substantially impervious to visible light.

4. In the generator of claim 1, said discharge tube confronting said opening, said phosphor being coated only on the rear portion of said tube whereby shortwave radiations from the front of the tube may pass directly from the front of the tube to said filter, and an ultraviolet radiation reflector supported within said housing and disposed near said coating to reflect said ultraviolet radiation to said filter.

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