Dec. 13, 1949 J. H. TOWNSHEND 2,491,342

STROBOSCOPE

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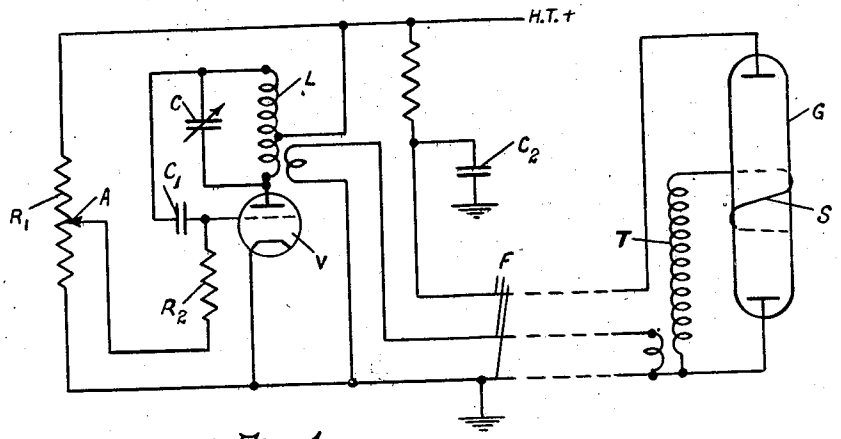


Fig. 1.

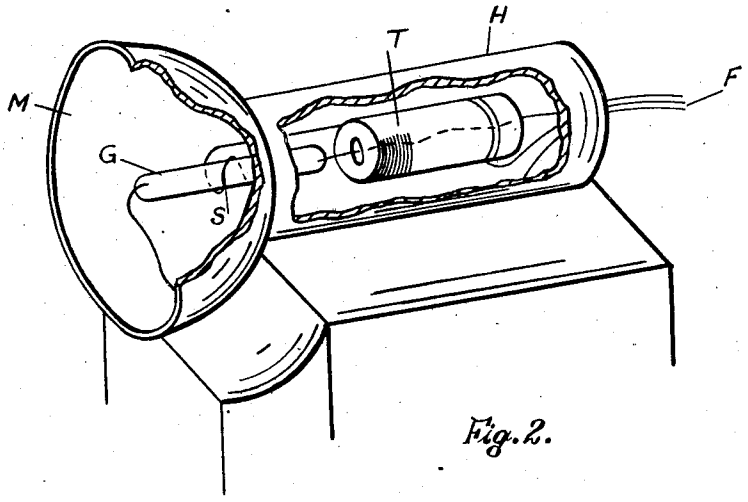


Fig. 2.

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STROBOSCOPE

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2 Claims. (Cl. 315—241)

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This invention relates to stroboscopes of the type in which a glow discharge lamp is operated by electrical pulses of suitable, and usually variable, frequency to permit rotating or vibrating members to be observed stroboscopically.

One device of this type for operation at a high light output has become known in which the lamp is triggered by means including an iron-cored step-up transformer the primary of which is fed with heavy current pulses (of several amperes), these pulses being obtained from a second, smaller, discharge lamp which may be used as the final output lamp when only a low light intensity is required. The smaller discharge lamp is triggered by a suitable circuit.

This arrangement is unnecessarily cumbersome in normal cases where a high and a low intensity source are not required to be used simultaneously in that two discharge lamps are in operation at the same time, the smaller merely serving to trigger the larger.

It is an object of the present invention to provide a stroboscope of high light output in which only one discharge lamp need be used.

It is a further object of the invention to provide a stroboscope of high light output in which the discharge lamp can be triggered by means of pulses of relatively low current intensity.

A further object of the invention is the provision of a stroboscope of high light output which may be accommodated in a compact instrument suitable for general use.

Other objects and advantages of the present invention will appear hereinafter.

According to the present invention, in a stroboscope of the type set forth means are provided for generating, and applying the discharge lamp to initiate a discharge therein from a D. C. source, short duration pulses of current of high frequency.

In referring to a D. C. source, it should, of course, be understood that the ultimate current source for the device may well be, and in fact quite frequently is, an A. C. mains from which the mentioned D. C. is derived in the ordinary way by rectification and smoothing.

High frequency, in this specification and appended claims, is intended to mean a frequency of a higher order of magnitude than the repetition frequency of the pulses. The latter, in stroboscopes as envisaged, may be anything from, say, 1 cycle/sec. to, say, 2 kilocycles/sec., and the high frequency to be used may be anything of the order of magnitude of, say, 1 to 5 megacycles/sec.

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The said pulses of high frequency current, hereinafter for shortness referred to as high frequency pulses may, according to a further feature of the invention, be comparatively quite low current pulses, say, of the order of 200 ma.

The said high frequency pulses may be applied to an external or internal electrode of the discharge lamp and serve to cause a breakdown between the cathode and anodes of the lamp thereby discharging a previously charged capacitor through the lamp in known manner.

According to a feature of the invention the means for applying the high frequency pulses to the lamp comprises a high frequency transformer, or Tesla coil, mounted adjacent the lamp, for example in a handle thereof, the secondary winding of the said transformer being connected to the said external or internal electrode and means being provided for applying high frequency pulses to the primary winding of the transformer.

According to a further feature of the invention the said high frequency pulses are generated by means of a circuit of the kind known as a squegging oscillator which may comprise but a single valve. Other circuits employing one or more valves may however be employed. The generator of the said high frequency pulses may be located at some distance from the lamp and may be coupled thereto by a suitable lead.

The invention will be described by way of example with reference to the accompanying drawing in which Fig. 1 is a circuit diagram of a stroboscope according to the invention embodying a squegging oscillator employing only one valve and Fig. 2 is a part sectional view of a form of lamp housing that may be used in carrying out this invention.

Referring to Fig. 1 a valve V is arranged in an oscillator circuit of the Hartley type adapted to generate short bursts of oscillation at a high frequency determined by the constants of the tuned circuit L C, these oscillations being blocked automatically by their action in developing a negative charge on the control grid of the valve. The control grid is biased positively by means of a potentiometer R_1 having an adjustable tapping A. The operation of the oscillator is as follows:

Assuming a point in the operation cycle where the valve V is in an oscillating condition and assuming a given fixed potential at point A, the grid capacitor C_1 will rapidly charge due to grid current making the grid more and more negative until oscillations cease. This charge will leak

away at a rate governed by the value of the resistance R_2 until the grid reaches a potential at which anode current again commences to flow when the cycle will be repeated. At the potentiometer R_1 the point A is set at the value at which grid current commences and this potentiometer therefore determines the time taken for the grid condenser, when fully charged, to reach this potential and hence the repetition rate of the pulses. Each pulse cycle therefore consists of a short period of high frequency oscillation, and a long period of quiescence during which the anode current is cut off. The pulse duration is determined by the size of the grid capacitor C_1, the charging rate of which is a function of this capacity and the input resistance of the valve.

The high frequency pulses are fed through two conductors of a three wire, low impedance cable F to the primary of a high frequency transformer T having its secondary connected between one main electrode of a glow discharge lamp G and an external starting electrode S. The third lead of the cable F is connected to the other main electrode of the lamp G. When a high frequency pulse reaches the starting electrode S, it initiates a discharge between the main electrodes of the lamp which discharges the capacitor C2.

Referring to Fig. 2, in which like parts have the same reference as in Fig. 1, the glow lamp G is mounted in a housing having a reflector M and a handle H within which is mounted the transformer T. The cable F connecting the lamp with the oscillator circuit may be many feet in length.

The lamp with its housing and contents may therefore be separated from the remainder of the equipment by a substantial distance thus permitting the investigation of parts inaccessible to most known stroboscopic devices.

I claim:

1. In a stroboscope, a glow discharge lamp operable by electrical pulses of short duration, said lamp including two main electrodes for conveying said glow discharge and a triggering electrode for initiating a discharge between said main electrodes, a source of direct current, a source of pulses of high frequency alternating current, an impedance, a capacitor connected between said main electrodes and connected to be charged from said source of direct current through said impedance, and a voltage step-up transformer,

the primary winding of said transformer being connected to said source of pulses of high frequency alternating current and the secondary winding of said transformer being connected to said triggering electrode.

2. In a stroboscopic apparatus, a direct current source, a potentiometer connected across said source, a vacuum tube amplifier having at least a plate, a grid and a cathode, said plate being connected to the high side of said direct current source, said cathode being connected to the low side of said direct current source, and said grid being connected to said potentiometer, a tuned circuit in the plate circuit of said amplifier, one end of said tuned circuit being connected to the plate of said amplifier, the other end of said tuned circuit being connected by means of a condensor to the grid of said amplifier, a resistor and condensor connected in series between the high side of said direct current source and the low side, a gaseous tube having two plate electrodes and a control electrode, one of said plate electrodes being connected to the junction between said resistor and condensor in series, the other of said plate electrodes being connected to the low side of said direct current source, said control electrode being connected to the low side of said direct current source in series with an inductance, two parallel windings having a common side connected to the low side of said direct current source, one of said windings being inductively coupled to the tuned circuit, the other of said windings being inductively coupled to said inductance.

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