POINTOLITE LAMPS

Introduction

The Siemens Ediswan Pointolite Lamp is the nearest approach that has yet been achieved in the production of a theoretical point source of light, in the form of an incandescent lamp. The light source of the Pointolite Lamp takes the form of a Tungsten bead or plate (according to rating) which acts as the positive electrode of an arc discharge in an atmosphere of inert gas, at a low pressure contained in a glass bulb. This electrode is rendered incandescent by the discharge, and as no adjustment to the arc is necessary, the lamp can be left unattended for any length of time. The Pointolite Lamp has been successfully used for many years in many scientific and industrial laboratories, and its numerous applications include microscopy, metrology, mineralogy, pathology, etc. The steadiness and high intrinsic brilliance make it especially valuable for use in oscillographs and cardiographs.

Types and Ratings

Two distinct types of Pointolite Lamps are manufactured:—

(1) For D.C. operation.

(2) For A.C. operation.

These lamps may be sub-divided into two groups:

Group A—2 electrode lamps comprising the 30 c.p. and 100 c.p. D.C. ratings.

Group B—3 electrode lamps comprising the 500 c.p. and 1000 c.p. D.C. ratings and the 150 c.p. A.C. lamp.

Electrode Systems

The 2 electrode Pointolite Lamp possesses a positive electrode in the form of a tungsten bead mounted on the extremity of a stalk of the same metal, and a negative electrode or "ioniser" in the form of a conical coil of tungsten wire, the extended end of which carries a protective tube composed of a mixture of oxides, these electrodes being suitably mounted and enclosed in a glass bulb filled with inert gas at a relatively low pressure. The positive electrode of the lamp is electrically connected through a resistance of suitable value (according to the supply voltage) to the positive pole of the supply. One end of the ionizer is electrically connected direct to the negative of the supply, and the other end through a "normally off" or push switch, and a resistance of suitable value (according to the supply voltage) to the positive pole of the supply.

Upon temporarily closing the push switch, current flows through the ionizer, causing incandescence of the tungsten coil, thereby ionizing the gas in its vicinity. On the push switch being released, a condition is obtained favourable for the formation of an arc, namely, a pre-heated negative electrode, a positive electrode and an intervening gas path ionized by emission from a hot body.

The arc forms between the ionizer coil and the tungsten bead, and then moves over from the coil to the ionizer tube. It is important that this effect should be definite, and complete in every case, since the coil portion of the ionizer while suitable for starting the arc, is quite unable to withstand the action of the arc for any length of time, while the

ionizer tube being unsuitable for starting the arc, is most efficient as a negative electrode when the arc functions between it and the bead. This can be effected in two different ways:—

(a) By means of a fixed positive electrode, suitably spaced relative to the junction of the ionizer coil and its protective sleeve or tube. (Fixed Focus Type—Available in 100 c.p. rating only).

(b) By means of a moving positive electrode. In this case, a short length of bimetallic strip is incorporated in the stalk carrying the tungsten bead, and the bead is initially set in a position opposite the tungsten coil of the ionizer, where it remains when the lamp is not in operation. Upon striking the arc, the heat conducted from the incandescent bead causes the bimetallic strip to warp, thereby moving the bead (and with it the arc) to a position opposite a part of the protective sleeve of the ionizer, coming to rest approximately in the centre of the bulb.

The 3 electrode lamp resembles the 2 electrode type, but has in addition to the bead and the ionizer a third electrode in the shape of a tungsten plate mounted on a tungsten stalk. At first, an arc is formed between the ionizer (Negative) and the bead (Positive) the plate electrode being dead. Then, by means of a rotary rapid action switch, the ionizer is made dead, the incandescent bead is made negative, and the plate the new positive electrode, the arc being formed between these. The plate electrode then becomes the main source of light. All electrodes in the 3-electrode lamps are fixed, the motion of the arc from the ionizer coil to the ionizer tube in the "starting" stage of the operation being effected in a manner similar to that employed in the fixed focus lamp. (System "A").

The Alternating Current type of Pointolite Lamp is similar to the 3-electrode direct current type, except that, instead of the plate electrode, the lamp has a second bead electrode which is of the same dimensions as the first. The method of operation is the same as that employed in the 3-electrode direct current type. Both beads are equally bright and either or both may be used as the source of light. All electrodes are fixed.

Operating Conditions

All Pointolite Lamps are designed to operate in the vertical cap down position. If operated in any other position the internal structure of the lamp may become deformed, resulting in premature failure accompanied by early bulb discoloration. D.C. Pointolite Lamps will only operate when the correct polarity is applied. If the arc does not readily strike during the normal ionizing period, it is an indication that it is incorrectly connected to the mains. In such cases the connections of the resistance to the supply should be reversed. The 150 c.p. A.C. Lamp is designed to operate on 50 cycle supplies but normal variation of periodicity above and below 50 cycles will not affect satisfactory operation.

Characteristics of Ultimate Failure

During the life of the lamp, tungsten particles are thrown off the positive electrode and adhere to the negative electrode. The positive (light giving electrode thus becomes smaller and the light output falls to a point where it becomes economic to install a new lamp; also during life, bulb discoloration occurs, due to tungsten evaporation, but as this takes place in the upper hemisphere of the lamp, it does not interfere appreciably with its useful light output.

Bases

The 30 c.p. and 100 c.p. lamps are fitted with a special 3-contact bayonet cap, having one large diameter and one small diameter pin. A special bayonet holder suitable for accepting this cap, and having slots of dis-similar width and 3 plungers is necessary, in order to ensure the correct connection of the lamp to the circuit.

The 500 c.p. and 1000 c.p. lamps are fitted with a special 4-contact G.E.S. cap, the centre contact of which is connected to the plate electrode, the shell to the bead and the two concentric rings to the two ends of the ionizer.

The A.C. Lamp is fitted with a 3-contact B.C. cap, the shell of which being used as an ionizer connection on starting the lamp.

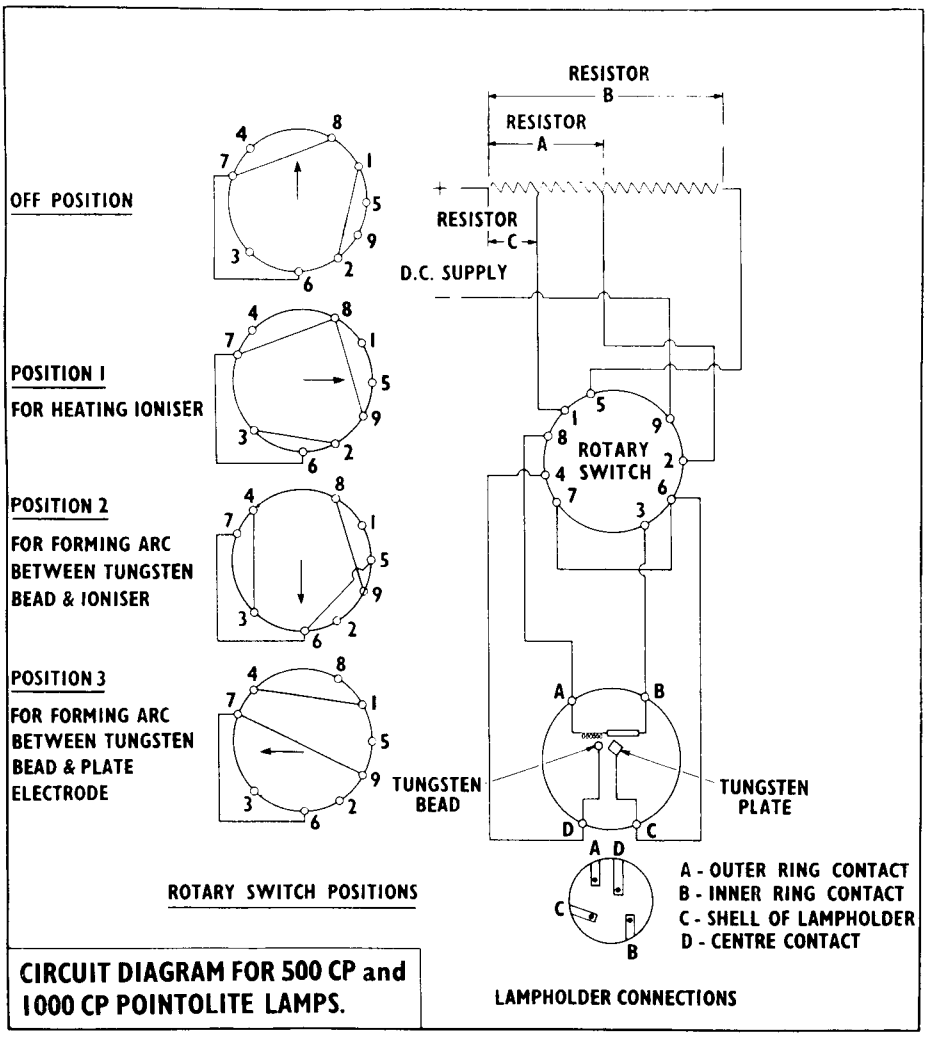
SIEMENS EDISON SWAN LIMITED
(AN A.E.I. COMPANY)
38 & 39 UPPER THAMES ST., LONDON, E.C.4.
Telephone: CENTRAL 2332 (20 lines)

500 c.p. and 1000 c.p. POINTOLITE LAMPS

For operation on D.C. only.

DIRECTIONS FOR USE

These lamps must be operated in conjunction with current limiting resistors connected as shewn in the diagram below:



CIRCUIT DIAGRAM FOR 500 CP and 1000 CP POINTOLITE LAMPS.

The Rotary Switch shewn in the above diagram must be of the rapid action type, as it is imperative that the change from position 2 to position 3 be made instantaneously.

The values of ohmic resistance required for various supply voltages are given in the table below:—

RESISTANCE VALUES FOR 500 cp. LAMP

Supply Voltage	100	110	120	200	210	220	230	240	250
	Ohms.	Ohms.	Ohms.	Ohms.	Ohms.	Ohms.	Ohms.	Ohms.	Ohms.
Ioniser Resistance A. To carry 7 amps.	13.3	14.7	16.1	27.6	29.0	30.4	31.8	33.4	34.7
First Arc Resistance B. To carry 2 amps.	27.5	32.5	37.5	77.5	82.5	87.5	92.5	97.5	102.5
Second Arc Resistance C. To carry 5 amps.	10.0	12.0	14.0	30.0	32.0	34.0	36.0	38.0	40.0

RESISTANCE VALUES FOR 1000 cp. LAMP

Supply Voltage	100	110	120	200	210	220	230	240	250
	Ohms.	Ohms.	Ohms.	Ohms.	Ohms.	Ohms.	Ohms.	Ohms.	Ohms.
Ioniser Resistance A To carry 7 amps.	13.3	14.7	16.1	27.6	29.0	30.4	31.8	33.4	34.7
First Arc Resistance B To carry 3.5 amps	15.7	18.5	21.4	44.3	47.2	50.0	53.0	55.7	58.6
Second Arc Resistance C To carry 8 amps.	6 3	7.5	8 7	18.7	20.0	21.2	22.5	23.8	25.0

For safety purposes it is recommended that connection to the supply be made by means of a three core cable and three pin plug, in order that any exposed metal such as a protective cover over the resistors may be effectively earthed.

The special four contact G.E.S. lampholder should be wired as shewn in the circuit diagram by means of a four core cable, one conductor of which is connected to the shell of the lampholder, and the other three conductors to their appropriate lampholder contacts. The porcelain shroud of the lampholder is provided to effectively insulate the shell of the lampholder, as this is live during one period of the switching cycle.

Directions for Starting and Operating

(1) Set Rotary Switch to "OFF" position

(2) Insert Pointolite lamp in special four contact G.E.S. lampholder.

(3) Connect to supply by means of the three pin plug.

(4) (a) Turn Rotary Switch to Position 1 to heat ioniser.

(b) After three to four seconds, turn switch to Position 2 when an arc will be established between the ioniser and the Tungsten Bead electrode.

(c) After ten to fifteen seconds, turn switch to Position 3 when the arc will be transferred to between the Tungsten bead and the Tungsten plate electrodes.
The lamp will increase in brightness until full light output is attained, after which it will continue to operate continuously without attention.
To extinguish lamp turn switch to "OFF" position.

Warning

The lamp must not be left in circuit except when the switch is in Position 3.
Operate lamp in vertical position with cap below ONLY.

The nine contact Rotary Switch (Cat. No. N.105) is obtainable from
SANTON LTD., NEWPORT, MON.
Resistors of the required ohmic value are obtainable from any manufacturer of this class of material.

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