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[11] **3,888,583**

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[54] **ILLUMINATING SYSTEM WITH GAS DISCHARGE LAMP USED AT LOW AND HIGH POWER LEVELS**

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[73] Assignee: **Holophane Company Incorporated,** New York, N.Y.

[22] Filed: **July 26, 1973**

[21] Appl. No.: **383,034**

Related U.S. Application Data

[62] Division of Ser. No. 166,034, July 26, 1971, Pat. No. 3,760,226.

[52] **U.S. Cl.** **355/71;** 355/69

[51] **Int. Cl.** **G03b 27/76**

[58] **Field of Search** 355/71, 69; 95/57; 354/241, 234; 315/240, 276, 362

[56] **References Cited**

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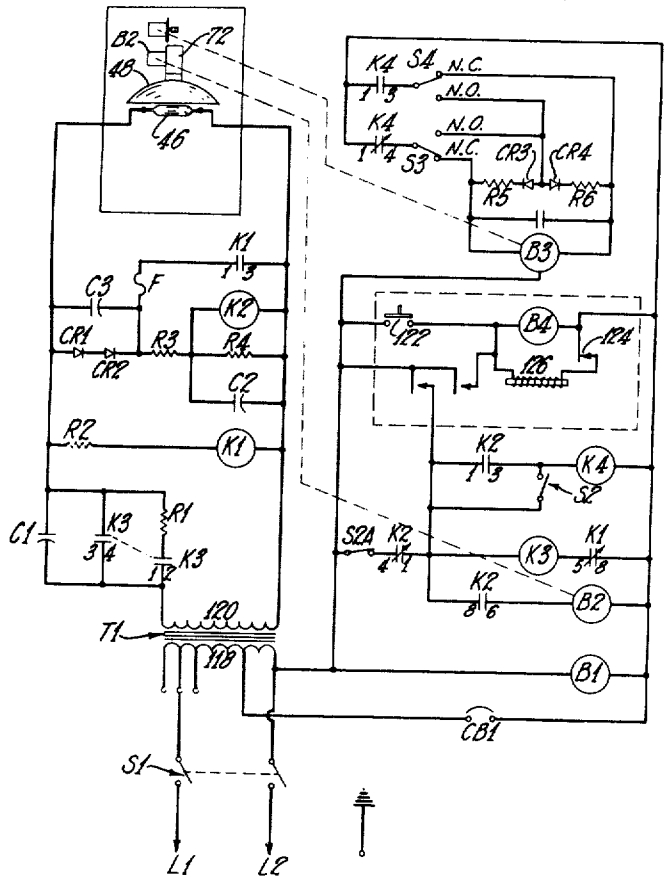
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Assistant Examiner—E. M. O'Connor
Attorney, Agent, or Firm—Harry O. Ernsberger

[57] **ABSTRACT**

The disclosure embraces an electric system including a gas discharge arc lamp construction of a character particularly for use in the graphic arts field and a transformer power circuit for a gas discharge arc lamp wherein an increased voltage for momentarily effecting gas ionization and establishment of the arc is attained through the summation of a peak charge of applied alternating current voltage of a capacitor occurring during one-half cycle applied directly to the lamp in series with the applied voltage from the transformer during the alternate half cycle and thereafter shorting out the capacitor for applying the normal voltage of the transformer to the arc lamp for normal operation.

4 Claims, 6 Drawing Figures



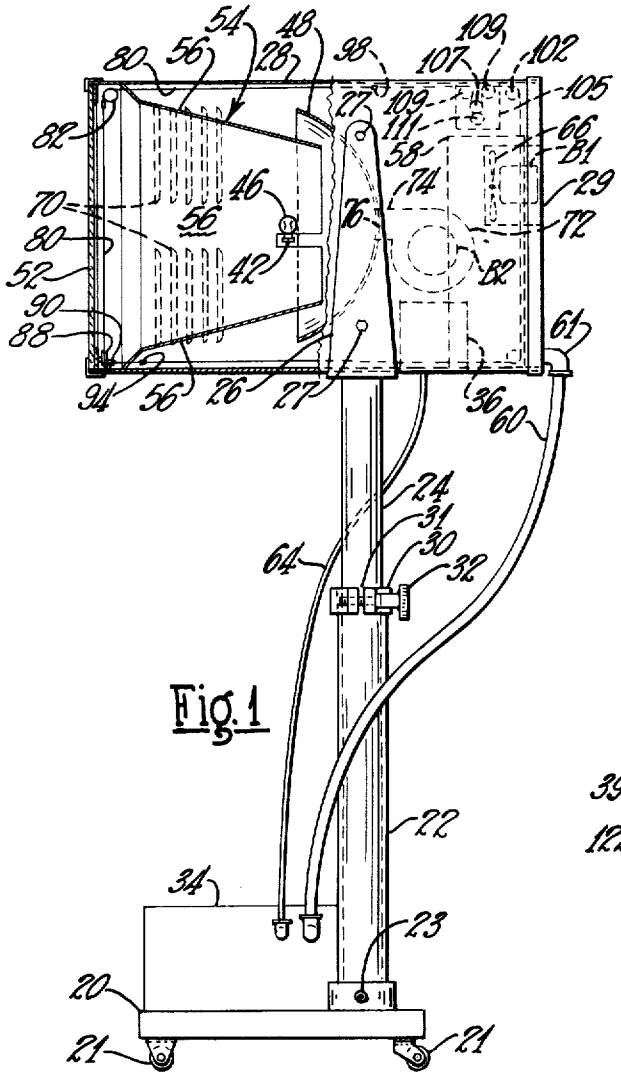


Fig. 1

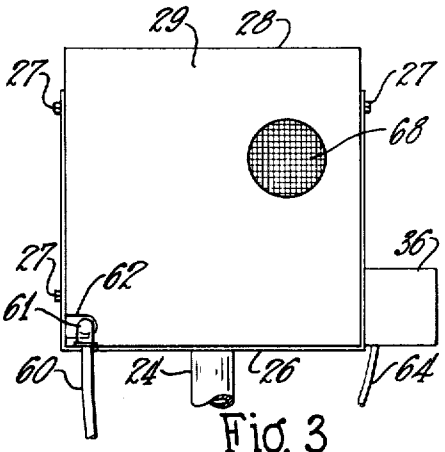


Fig. 3

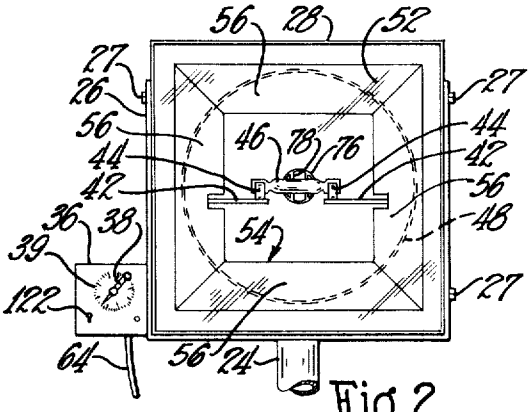


Fig. 2

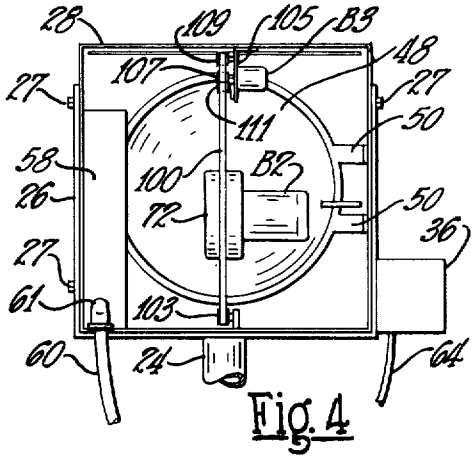


Fig. 4

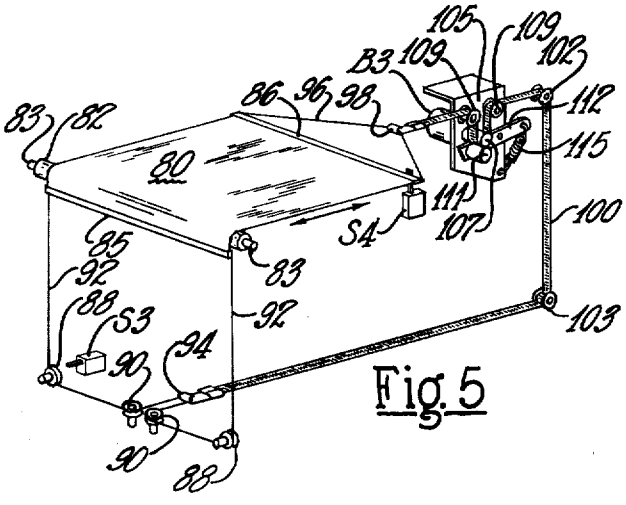


Fig. 5

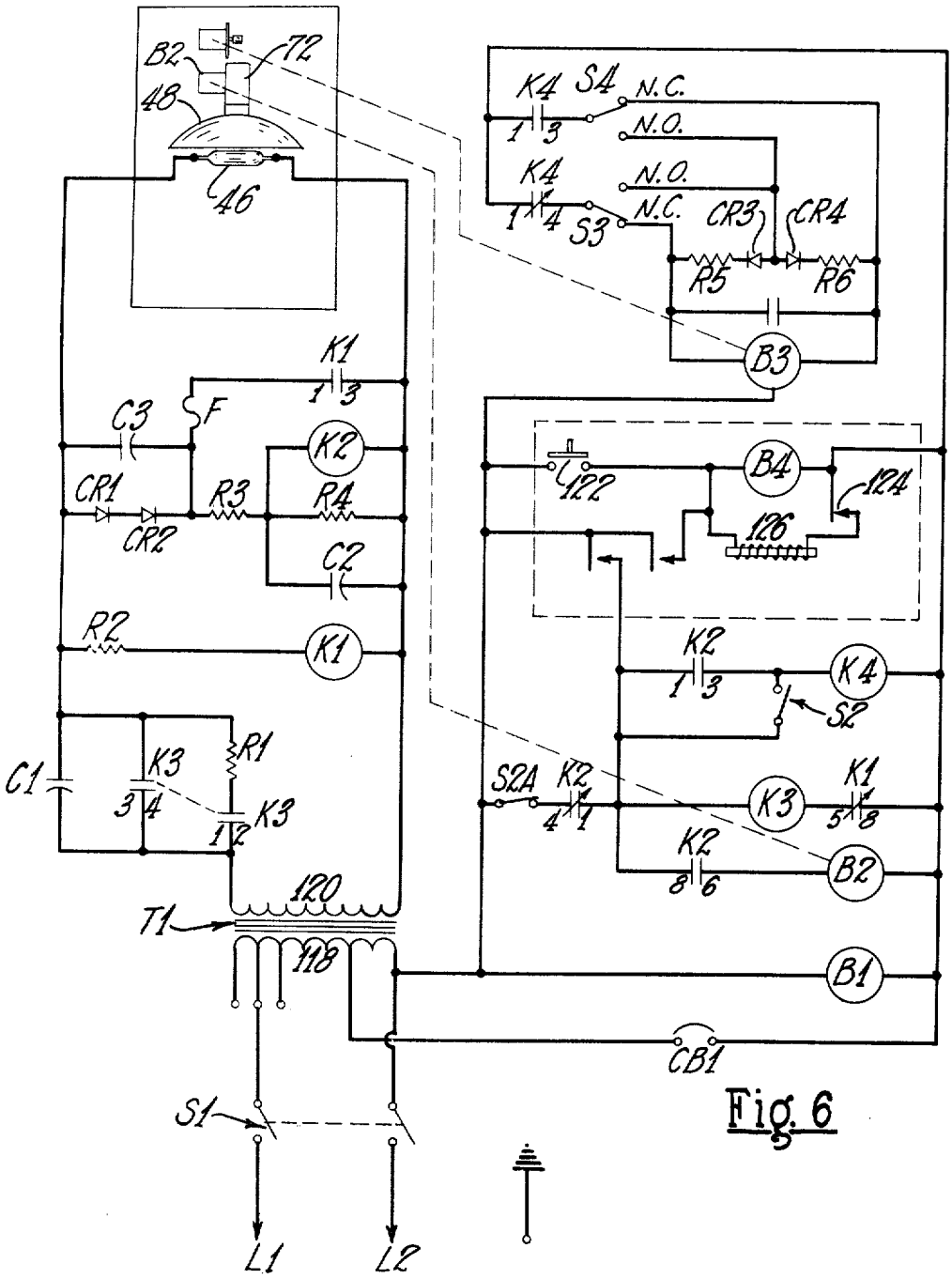

B2
72
48
46
K4
S4
N.C.
N.O.
S3
CR3
CR4
R5
R6
B3
K1
C3
F
K2
CR1
CR2
R3
R4
C2
R2
B4
122
124
126
K2
K4
S2
S2A
K3
K1
C1
R1
120
T1
118
B1
CB1
S1
L1
L2

Fig. 6

ILLUMINATING SYSTEM WITH GAS DISCHARGE LAMP USED AT LOW AND HIGH POWER LEVELS

This is a division of application Ser. No. 166,034, filed July 26, 1971, now issued into U.S. Pat. No. 3,760,226.

This invention relates to an electric system involving a gas discharge arc lamp of a character particularly for use in the graphic arts field, the lamp embodying a power circuit for the gas discharge arc lamp utilizing the voltage of a transformer secondary for normal arc operation and wherein an increased voltage is established through capacitor means sufficient to effect establishment of the arc and wherein alternating current is employed for normal lamp operation.

Lamps of the character heretofore used in the graphic arts field have embodied special ignition transformers and devices to provide high voltage alternating current for ignition of a gas discharge arc lamp and thereafter a reduced voltage direct current utilized for normal lamp operation.

In the use of a gas discharge lamp in the graphic arts field it has been a practice to de-energize the gas discharge lamp after each exposure operation. In making successive short exposures, considerable time is involved in bringing the gas discharge lamp to an operating temperature and cooling the lamp preparatory to a subsequent exposure operation.

The present invention embraces a lamp construction embodying a gas discharge arc lamp and a power circuit or electric system therefor wherein alternating current of high voltage is provided for establishment or ignition of the gas discharge lamp and alternating current voltage of a transformer utilized for normal operation of the lamp, and the power for the lamp reduced during standby periods whereby de-energization of the lamp between successive periods of normal operation of the lamp may be avoided.

An object of the invention embraces a power system or circuit for a gas discharge arc lamp wherein a high alternating current starting voltage for igniting the lamp is attained through the summation of the voltage of a half cycle of applied alternating current of a transformer with the voltage of a capacitor charged to the peak of applied alternating current voltage occurring during the alternate half cycle and whereby the lamp upon ignition operates at a normal alternating current voltage from the transformer.

Another object of the invention resides in the provision of a lamp structure wherein the lamp enclosure is provided with a shutter movable to light exposing and light obstructing positions and a circuit system for a shutter drive motor arranged to provide dynamic electric breaking of the motor for preventing over-travel of the shutter in its movements from one position to the other.

Another object of the invention resides in a lamp construction embodying a gas discharge arc lamp and a power circuit therefor for operating the lamp at a high power level and for operating the lamp at a low power standby level.

Another object of the invention is the provision of a lamp structure including a gas discharge arc lamp and reflector means therefor disposed in a housing and multiple blower means in the housing wherein one blower is effective for venting the lamp housing and another blower supplementing the first blower rendered operative during high power operation of the lamp to effectively cool the arc lamp.

Another object of the invention embraces an electric system or power circuit wherein the summation of alternating current voltage from a transformer and the peak voltage of a capacitor is employed for ignition of a gas discharge lamp and alternating current voltage from the same transformer utilized for normal operation of the lamp in conjunction with control means for continued energization of the lamp at standby low power operation whereby the lamp is maintained at an elevated temperature during low power operation in readiness for high power operation thereby eliminating warm up periods for the lamp.

Further objects and advantages are within the scope of this invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and numerous other features as will be apparent from a consideration of the specification and drawing of a form of the invention, which may be preferred, in which:

FIG. **1** is a side elevational view, partly in section, of a lamp construction embodying a gas discharge arc lamp;

FIG. **2** is a front elevational view of the lamp construction shown in FIG. **1**;

FIG. **3** is a rear elevational view of the lamp construction;

FIG. **4** is a rear elevational view of the lamp construction with the rear cover removed;

FIG. **5** is a semischematic view of a shutter or curtain for the exposure opening of the lamp housing, and

FIG. **6** is a schematic diagram of the power circuit of the invention for the ignition and operation of the gas discharge arc lamp.

While the gas discharge arc lamp construction and power circuit of the invention have particular utility for lighting exposure purposes in the graphic arts field, it is to be understood that the arc lamp construction and power circuit therefor may be used wherever the same may be found to have utility.

Referring to the drawings, the arc lamp construction illustrated is of a character particularly usable in the photocopy and graphic arts field. The lamp construction is inclusive of a base **20** provided with caster wheels **21** and having a hollow boss which receives the lower end of an upwardly extending tubular support member **22** secured in place by a bolt **23**. Telescoped into the tubular member **22** is a second tubular member **24**, at the upper end of which is mounted a bracket **26** supporting a rectangular lamp housing **28** secured to the bracket by screws **27**. The housing **28** is preferably fashioned of sheet metal and is provided with a removable rear cover or closure member **29**.

Surrounding the tubular support member **24** is a circular clamp **30** which is split as at **31** and is equipped with a clamp screw **32**. As shown in FIG. **1**, the clamp member provides an adjustable abutment engageable with the upper end of the tubular member **22**. By manipulating the clamping screw **32**, the position of the support tube **24** may be adjusted relative to the tube **22** for varying the height of the lamp housing **28** with respect to the base **20**. A second housing **34**, mounted upon the base **20**, encloses a transformer and other electrical components of the system.

A housing or casing **36** secured to an exterior wall of the lamp housing **28** encloses a timing means or timer for the lamp. As shown in FIG. **2**, the timer housing **36** supports an adjustable timing member **38** which cooperates with indicia **39** indicating minutes, the member **38** being adjustable to vary the operational periods of the lamp. Disposed within the lamp housing **28** are bus bars or supports **42** connected with a current supply. Each bus bar **42** is equipped with a clip or member **44** for supporting a gas discharge lamp or lamp bulb **46** of elongated shape, the clips engaging end regions of the lamp envelope.

As an example, the hollow region of the lamp envelope may be approximately four inches or more in length providing an arc of desired length. The bulb or lamp **46** is of a conventional type containing mercury and preferably a metal additive such as a halide to concentrate the radiant energy in a desired spectral range. Disposed in the housing **28** is a reflector **48** supported by frame members **50**, shown in FIG. **4**.

The reflector **48** is of curved confguration such as a partial spherical or ellipsoidal shape for reflecting rays of light from the lamp **46** forwardly through a glazed window **52** shown in FIG. **1**. A supplemental light reflecting or guiding means **54** fashioned of sheet metal is disposed in the housing forwardly of the reflector **48**, the reflector **54** being of generally frusto-pyramidal shape provided by four converging walls **56**, shown in FIGS. **1** and **2**.

A casing or supplemental housing **58**, illustrated in FIGS. **1** and **4**, disposed in the lamp housing **28** encloses electrical control components in addition to those contained within the base housing **34**. The power supply is connected with a transformer disposed in the housing **34** as well as other components of the power circuit, the circuit connections for the components disposed in the housing **58** being contained within a sheath or cable **60**, shown in FIG. **1**, connected by a fitting **61** with a housing **58**, a slot **62** in the cover member **29** accommodating the fitting **61**. The timer contained within the housing **36** is connected with components in the housing **34** by connections contained within a sheath **64** shown in FIG. **1**.

Means is provided in the lamp housing **28** for ventilating the lamp housing and for directing a stream of air into the region of the gas discharge lamp **46** for cooling the lamp when the lamp is in high power operation. The housing ventilating means includes a blower or fan **66** driven by a motor B1 preferably supported in the housing **28** adjacent the rear cover member **29**. The rear cover member **29** is provided with a screened opening **68** for admitting air into the lamp housing **28** under the influence of the rotating fan or blower **66**. The side walls of the housing **28** are provided with louvers **70**, shown in broken lines in FIG. **1**, to facilitate circulation of air through the lamp housing.

A second blower or blower means **72** is disposed in the lamp housing rearwardly of the reflector **48**, the air exit tube **74** of the blower being aligned with an opening **76** at the central region of the reflector **48** whereby a stream of air from the blower is delivered through the opening **76** to the region of the gas discharge lamp **46**. The opening **76** is provided with a grid **78** to effect diffusion of the air delivered toward the lamp **46**. The blower **72** is driven by a motor B2 which is energized as hereinafter described through the timer means contained in the housing **36**, the blower **72** being operated only when the gas discharge lamp **46** is operating under full power.

A relatively movable curtain or shutter means is provided for obstructing passage of light from the arc except when an exposure is made for a graphic reproduction. The arrangement is inclusive of a flexible impervious curtain, shutter or light obstructing means **80** illustrated in FIGS. **1** and **5**, the curtain and associated components being shown in detail in FIG. **5**. Disposed at an upper frontal region within the housing **28** is a horizontal roll **82** having tenon portions **83** journaled in openings in the side walls of the lamp housing **28**.

Secured to the lower end of the curtain or shutter **80** is a transversely extending bar **85**, a second bar **86** being secured to the other end of the curtain, the bars being movable with the curtain. Journally supported at the lower frontal corners of the housing **28** are pulleys **88**, a second set of pulleys **90**, shown in FIG. **5**, being disposed adjacent the lower mid-region of the housing. Secured to the respective ends of the bar **85** are cables **92**, each cable being engaged with pulleys **88** and **90** in the manner shown in FIG. **5**. The ends of the cables adjacent the pulleys **90** are secured to a clip or connector **94**.

Connected to the respective ends of the bar **86** is a cable **96**, the cable **96** being connected at its mid-region with a clip or connector **98**. Joined with the connectors **94** and **98** are the end regions of a flexible member, cable or tape **100** which, as shown in FIG. **5**, is engaged with pulleys **102** and **103** disposed at the central upper and lower regions in the housing adjacent the rear cover **29**. Mounted upon a support plate or member **105** mounted within the lamp housing **28** is a motor B3 of a conventional reversible type, the shaft of which is equipped with a drive roll **107**. Idler or tape guiding rolls **109** are journally mounted for rotation on the plate **105**.

As particularly shown in FIG. **5**, the tape or member **100** is engaged with the idler rolls **109** and extends partially around the drive roll **107**. A roll **111**, mounted on an arm or lever **112** pivoted on the plate **105**, is biased into engagement with the tape **100** at the region of the drive roll **107** by means of a contractile spring **115** connected to an end of the lever **112** and the plate **105**. The contractile spring **115** exerts pressure on the roll **111** to assure a drive connection between the driving roll **107** and the tape **100**. The light obstructing means or curtain **80** is shown in open position in FIGS. **1** and **5**, that is, in a position where light from the lamp **46** passes unobstructed through the glass **52**.

With particular reference to FIG. **5**, it will be apparent that upon rotation of the motor B3 in the proper direction, the tape **100** will be moved in a direction to move the curtain **80** into a position obstructing the passage of light from the lamp housing. The movement of the curtain **80** to light obstructing position is determined by a limit switch S3, and the movement of the curtain **80** to open position is determined by limit switch S4. The use of the flexible tape **100** facilitates opening and closing movements of the curtain or light obstructing means **80** without engaging or impinging the bars **85** and **86** against fixed abutments.

The controls for the motor B3 and the controls for the other motors and components are illustrated schematically in FIG. **6**. The operation of the various components will be explained in describing the circuitry illustrated in FIG. **6**. The circuit includes a transformer

T1, the transformer being supplied with alternating current from power lines L1 and L2 through a master switch S1. The timer motor is illustrated at B4.

In order initiate ignition of and form an arc in the gas discharge lamp 46 and prepare the components for automatic lamp operation, the switch S2 is moved to closed position. The switch S1 is closed supplying alternating current, for example, 60 cycle alternating current of 250 volts, to the primary 118 of the transformer T1. The transformer provides alternating current of 115 volts to the control circuit through the circuit breaker CB1. As an example, a voltage of about 350 volts in the secondary 120 of the transformer is supplied to the circuit of the gas discharge lamp 46 through a capacitor C1, but it is to be understood that a transformer providing a higher or lower secondary voltage may be employed depending upon the characteristics of the gas discharge lamp.

The secondary voltage of the transformer is sensed by relay K1 or other switch means through a resistor R2, and the relay or switch means K1 is energized. Energization of the relay K1 opens contacts 5 and 8 of relay K1 preventing operation of relay or switch means K3. Contacts 1 and 3 of relay K1 are closed and such action connects the diodes CR1 and CR2 in series with a fuse F across the gas discharge arc lamp 46 and in series with the capacitor C1 across the secondary 120 of the transformer T1. The closing of contacts 1 and 3 of the relay K1 establishes a shunt of the relay or switch K2 protecting the relay K2 from high voltage. A capacitor C3 is disposed in parallel with the diodes CR1 and CR2 in order to prevent damage to the diodes in event of an excessive voltage surge.

Through the circuitry above described, a high voltage is developed, for example, 990 volts in the circuit of the gas discharge arc lamp 46 which is sufficient to effect current flow through the lamp 46 and ignite or energize the lamp. During one-half cycle of the applied alternating current voltage from the secondary 120 of the transformer T1, the capacitor C1 is charged to the peak of the applied alternating current voltage, viz. 495 volts by current conduction through the diodes CR1 and CR2.

During the alternate half cycle, the diodes CR1 and CR2 do not conduct current, and the peak voltage of the charge of the capacitor C1 is applied directly to the arc lamp 46 in series with the alternate half cycle of the applied voltage from the secondary 120 of the transformer T1. Thus, the peak voltage applied to the gas discharge arc lamp 46 is the sum of the applied peak voltage of the transformer secondary 120 and the voltage of the charged capacitor C1, for example, the summation of the peak voltages being approximately 990 volts. This peak voltage of 990 volts is amply sufficient to establish current flow through the gas discharge lamp 46 and thereby ignite the lamp. This action is repeated every other half cycle until the lamp 46 is ignited. It is to be understood that gas discharge lamps may be employed requiring transformers of different secondary voltages.

After current flow is established by the high voltage through the gas discharge lamp, the voltage across the lamp 46 falls to a low value by reason of the capacitor C1 and the characteristics of the transformer T1. The voltage falls to a sufficiently low value as to de-energize the relay K1. De-energization of the relay K1 opens contacts 1 and 3 of the relay K1 which connects the voltage sensing relay K2 in the circuit in series with the diodes CR1 and CR2.

Contacts 5 and 8 of relay K1 close, this action energizing relay K3 through the switch S2A and contacts 1 and 4 of relay K2. Energizing the relay K3 shorts out the capacitor C1 to place the arc lamp 46 directly across the secondary 120 of the transformer T1. Relay K3 has two sets of contacts K3 1 and 2 and K3 3 and 4. Contacts 1 and 2 of relay K3 close first, placing the resistor R1 in parallel with the capacitor C1. In a very short period of time, contacts 3 and 4 of relay K3 close, this action shorting out the capacitor C1. The momentary preclosing of contacts 1 and 2 of relay K3 reduces arcing of contacts 3 and 4 of the relay K3.

The motor B1, driving the housing ventilating fan 66, is energized continuously when the main switch S1 is in closed position. The motor B3, for operating the shutter or curtain 80, is energized through contacts 1 and 4 of the relay or switch means K4 and the normally closed contacts (N.C.) of limit switch S3 to close the shutter or curtain 80, this is, to move the shutter or curtain to the position covering the open end of the reflector 54.

When the shutter is closed, the motor B3 is de-energized and dynamic electric braking is applied to the fields of the motor B3 by the opening of the normally closed (N.C.) contacts of the switch S3 and the closing of the normally open (N.O.) contacts of the switch S3 to reduce overtravel of the shutter or curtain 80 to a minimum.

As the arc lamp 46 warms up, the voltage across the arc lamp increases. When the voltage reaches a predetermined value, which indicates that the lamp 46 is sufficiently warmed up, relay K2 is energized through the diodes CR1 and CR2 and the resistor R3. A capacitor C2 is provided for the purpose of preventing relay chatter of the relay contacts. A resistor R4 is disposed across the capacitor C2 for preventing a high voltage occurring across the capacitor C2 in event that the coil of relay K2 is open.

As relay K2 is energized, contacts 4 and 1 of relay K2 open and contacts 1 and 3 of relay K2 close. This contact action de-energizes relay K3. The contacts 1, 2 and 3, 4 of relay K3 open, placing the capacitor C1 in series with the arc lamp 46 and reducing the power to the lamp 46 to a standby level. Contacts 8 and 6 of relay K2 close. The foregoing operations occur in warming up the gas discharge lamp 46 and such actions require a period of about one minute, the lamp now being in standby operation in readiness for automatic operation in making exposures or reproductions which require high power for the lamp.

The length of time of an exposure is controlled by a manually adjustable timer motor B4 contained within the timer housing 36. The timer arrangement is shown schematically in FIG. 6 and includes a push button switch 122, a timer switch 124 and a timer relay 126. In making an exposure, the operator manually moves the arm 38 of the timer to a position indicating the time duration of the desired exposure in minutes indicated by the indicia 39.

The operator then closes the push button switch 122 energizing the timer. The relay K3 is energized through the energization of the timer and contacts 5 and 8 of the relay K1. The pairs of contacts of relay K3 close, shorting out the capacitor C1 so that the arc lamp 46 receives the full power from the secondary 120 of the

transformer T1 for making an exposure. The motor B2 is energized through the timer and closed contacts 8 and 6 of the relay K2 rotating the blower 72 to direct a stream of air through the opening 76 in the reflector 48 into the region of the arc lamp 46 to cool the lamp to a nominal operating temperature.

Relay K4 is energized through the timer and through the closed contacts 1 and 3 of the relay K2. Energizing relay K4 opens the contacts 1 and 4 of relay K4 and closes the contacts 1 and 3 of relay K4. This action opens the dynamic braking circuit through the fields of the shutter operating motor B3 and energizes the drive motor B3 through the closed contacts 1 and 3 of relay K4 and the normally closed contacts of the limit switch S4 whereby the operation of the motor B3 opens the shutter 80.

When the shutter is opened, the drive motor B3 is de-energized and dynamic braking is applied through normally open contacts of switch S4, diodes CR3, CR4 and resistors R5 and R6 to the fields of the motor B3, the dynamic braking action preventing over-travel of the shutter at the terminus of its opening movement. At the expiration of the time interval for which the timer has been set, the relay K3 is de-energized and its contacts open, placing the capacitor C1 in series with the arc lamp 46, which action reduces the power supplied to the lamp 46, placing the lamp in a standby condition.

The blower motor B2 is de-energized and relay K4 is de-energized. Contacts 1 and 3 of relay K4 open de-energizing the dynamic braking circuit for the motor B3. Contacts 1 and 4 of the relay K4 close, energizing the drive motor B3 through the normally closed (N.C.) contacts of the switch S3. This action energizes the motor B3 which closes the shutter. When the shutter is closed, the motor B3 is de-energized and dynamic braking applied to the motor B3 through normally open (N.O.) contacts of switch S3, diodes CR3, CR4 and resistors R5 and R6 to the fields of the motor preventing over-travel of the motor when the shutter has been moved to closed position.

This completes a cycle of operations in carrying on an exposure to completion and a closing of the shutter. The circuit and lamp are now in condition for a subsequent automatic operation in making an exposure simply by closing the switch 122.

During standby operation, the lamp 46 is operating under a low power condition at a warm up temperature, the motor B2 for driving the blower 72 is de-energized, but the housing cooling fan 66 continues operation as the motor B1 for operating the ventilating fan 66 is energized as long as power is supplied to the transformer T1. In order to de-energize the gas discharge lamp 46 and the motor B1 driving the ventilating fan 66, it is only necessary to move the main switch S1 to open circuit position.

Through the arrangement above described, the secondary voltage of the single transformer T1 is summated with the peak voltage of the capacitor C1 during the two half cycles of the alternating current frequency providing substantially double the voltage of the secondary 120 of the transformer so that a sufficiently high voltage is established at the lamp 46 to effect ionization and ignition of the gas discharge arc lamp 46 without the necessity of using a special starting transformer or other devices which have heretofore been necessary in establishing the ignition of a gas discharge arc lamp.

Furthermore, the arrangement of blower 72 provides for special cooling of the arc lamp 46 during high power operation of the lamp, the special cooling system for the lamp supplementing the continuously operating ventilating system for the lamp housing. The arrangement of the invention provides normal alternating current for the gas discharge lamp thus eliminating rectifier means heretofore used for powering a gas discharge arc lamp after ignition has been established.

While two diodes CR1 and CR2 are illustrated for establishing, through the capacitor C1, an increased voltage for igniting the arc, it is to be understood that a single diode or diode means of sufficient capacity may be utilized for the purpose.

Through the use of a single transformer for both lamp ignition and normal lamp operation, the energy efficiency of the system is improved over prior systems. The dynamic braking system for the shutter operating motor accomplishes several advantages. It avoids the liability of overtravel of the shutter when the shutter reaches open and closed positions. In the dynamic braking system, the diodes CR3 and CR4 provide a direct current braking effect to all of the fields of the motor, a condition which enables the braking current to be applied and maintained to the motor fields except when the shutter is being moved from one position to the other. By applying braking current to all of the motor fields, a maximum braking effect is obtained, and as the current is apportioned among the several fields, the dynamic braking current may be continued without overheating the motor. With the shutter-operating motor B3 dynamically locked in either open or closed position of the shutter, there is no liability for the shutter to creep as the motor does not operate except through the time delay relay.

It is apparent that, within the scope of the invention, modifications and different arrangements may be made other than as herein disclosed, and the present disclosure is illustrative merely, the invention comprehending all variations thereof.

We claim:

1. An illuminating system comprising a gas discharge lamp, a housing for said lamp, a circuit including a transformer connected with a supply of alternating current for the lamp, a circuit for the lamp including a capacitor in series with the secondary of the transformer and the gas discharge lamp for low power operation of the lamp, a timer adapted to be adjusted to time the duration of high power operation of the lamp, relay means operable through the timer to short out the capacitor to establish high power operation of the lamp during the period for which the timer is adjusted, relatively movable shutter means comprising a sheet of flexible material associated with said housing, flexible cable means connected with the end regions of the sheet of flexible material, a motor having a drive roll engaging the cable means for actuating said sheet of material, said sheet being operable when in open position to pass light from the gas discharge lamp and in closed position to substantially impede the passage of light from the lamp, and second relay means energized through the timer to actuate the motor to move the sheet of material to open position, said second relay means being operable when the time period for high power operation of the lamp expires to connect the capacitor in series with the lamp for low power operation and to energize

the drive motor to move the sheet of material to closed position.

2. An illuminating system comprising a gas discharge lamp, a housing for said lamp, a circuit including a transformer connected with a supply of alternating current for the lamp, a circuit for the lamp including a capacitor in series with the secondary of the transformer and the gas discharge lamp for low power operation of the lamp, a timer adapted to be adjusted to time the duration of high power operation of the lamp, relay means operable through the timer to short out the capacitor to establish high power operation of the lamp during the period for which the timer has been adjusted, relatively movable shutter means comprising a sheet of flexible material associated with said housing, flexible cable means connected with the end regions of the sheet of flexible material, a motor having a drive roll engaging the cable means for actuating said sheet of material, said sheet being operable when in open position to pass light from the gas discharge lamp and in closed position to substantially impede the passage of light from the lamp, relay means energized through the timer to actuate the motor to move the flexible sheet of material to open position, diode means and resistance means associated with the fields of the motor, switch means operable when the sheet of material is moved to open position for applying dynamic braking to said motor through the diode means and the resistance means to prevent over-travel of the sheet of material, second relay means operable when the time period for high power operation of the lamp expires to connect the capacitor in series with the lamp for low power operation and to energize the drive motor to move the sheet of material to closed position, and switch means operable upon closing of the sheet of material to de-energize the motor and apply dynamic braking to the fields of the motor through the diode means and resistance means to prevent over-travel of the sheet of material in closed position.

3. An illuminating system comprising a gas discharge lamp, a housing for the lamp, a circuit including a transformer connected with a supply of alternating current for the lamp, a circuit for the lamp including a capacitor in series with the secondary of the transformer and the gas discharge lamp, diode means, first relay means for connecting the diode means across the gas discharge lamp and in series with the capacitor across the secondary of the transformer whereby the capacitor is charged to peak voltage through the diode means during one-half cycle, the peak voltage of the capacitor summated with the applied voltage from the secondary of the transformer during the alternate half cycle providing increased voltage applied to the gas discharge lamp sufficient to establish the arc in the gas discharge lamp, an adjustable timer for determining the duration of high power operation of the lamp, second relay means operable through the timer to establish high power operation of the lamp during the period for which the timer is adjusted, relatively movable shutter means comprising a sheet of flexible material associated with said housing operable when in open position to pass light from the lamp and in closed position to substantially impede the passage of light from the lamp, a motor operable for moving the sheet of material to open and closed positions, and third relay means energized through the timer to actuate the motor to move the sheet of material to open position, said second relay means being operable when the time period for high power operation of the lamp expires to connect the capacitor in series with the lamp for low power operation, said third relay means being operable when the time period of the timer for high power operation of the lamp expires to energize the drive motor to move the sheet of material to closed position.

4. The system according to claim 3 including second diode means and resistance means associated with the fields of the motor, switch means operable when the sheet of material is moved to open position for applying dynamic braking to the motor through the second diode means and the resistance means to prevent over-travel of the sheet of material, and second switch means operable when the sheet of material is moved to closed position to de-energize the motor and apply dynamic braking to the fields of the motor through the second diode means and resistance means to prevent over-travel of the sheet of material in closed position.

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