United States Patent [19]

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[11] **3,828,221**

[45] **Aug. 6, 1974**

[54] **BALLAST CIRCUIT FOR A PLURALITY OF LAMPS**

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[22] Filed: **Aug. 29, 1972**

[21] Appl. No.: **284,568**

[52] **U.S. Cl.** **315/161,** 315/317, 315/320, 315/322

[51] **Int. Cl.** **H05b 37/00**

[58] **Field of Search** 315/DIG. 5, 160, 161, 313, 315/317, 320, 321, 322

[56] **References Cited**

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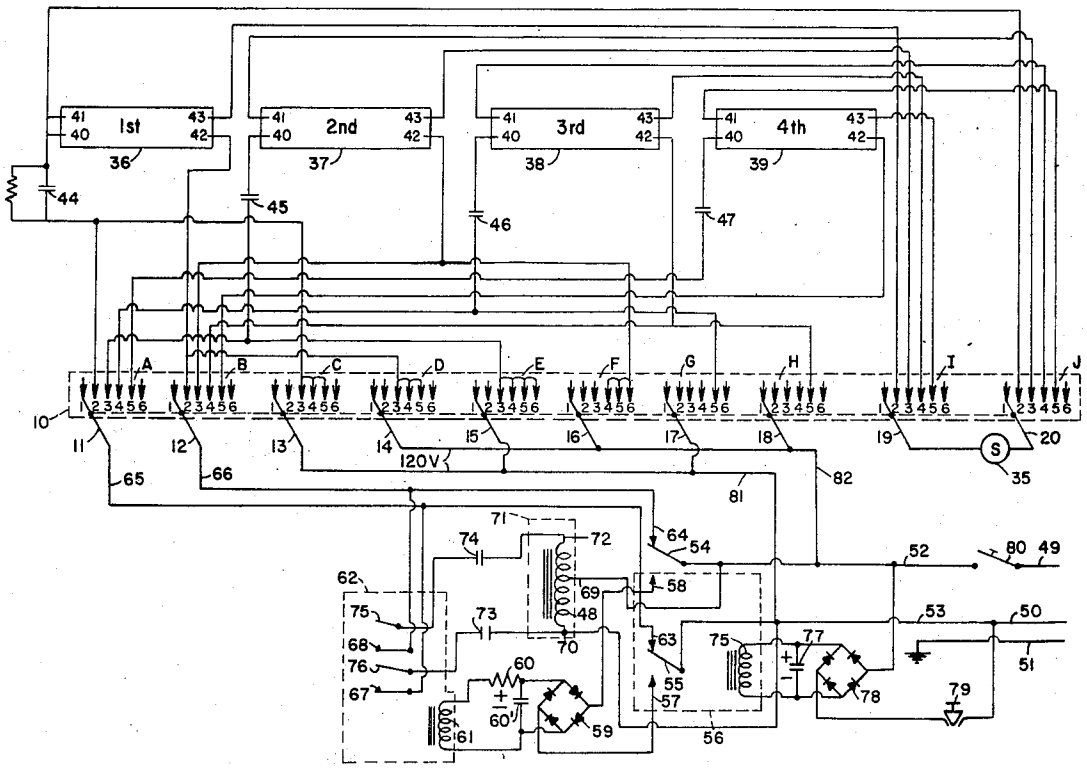
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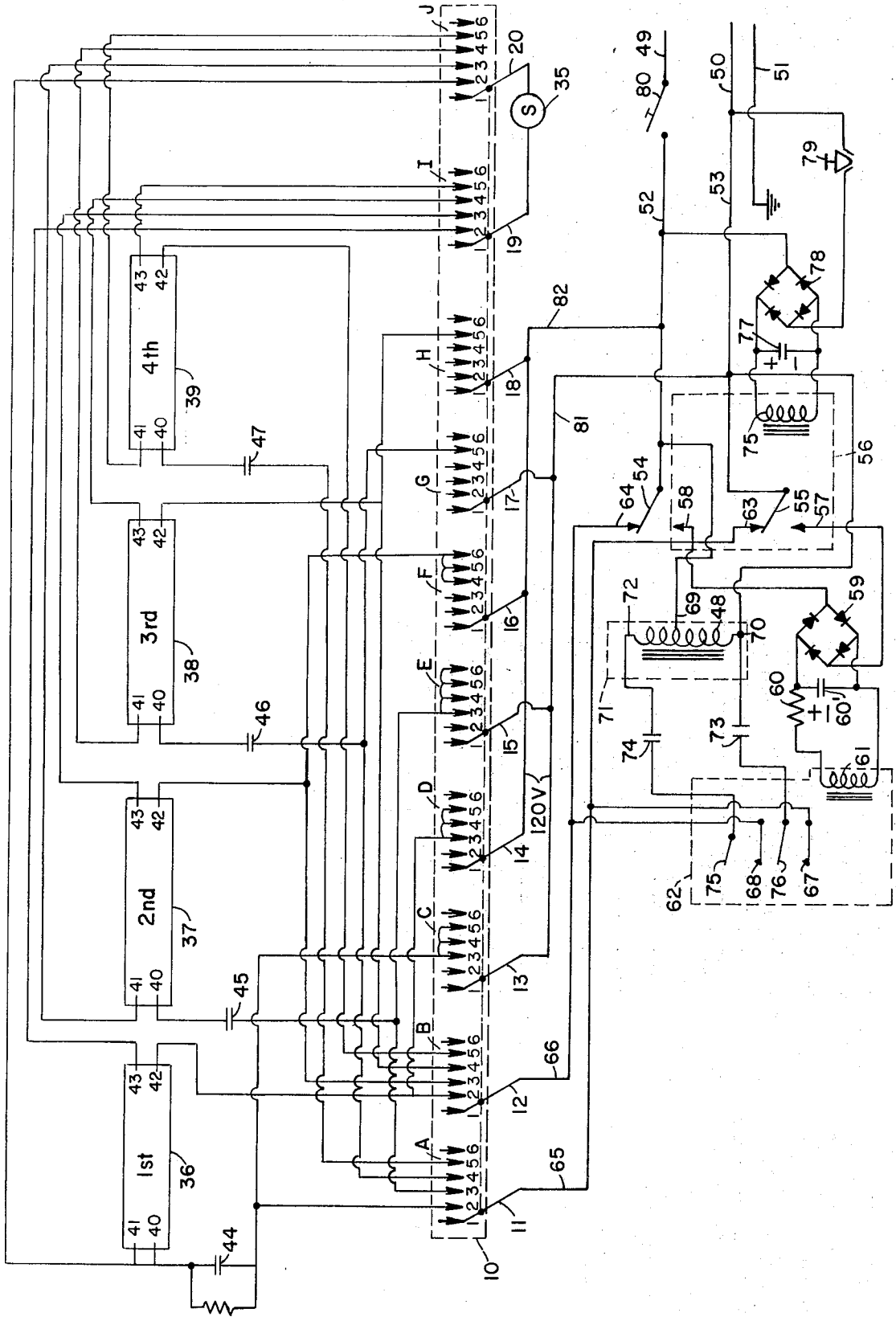
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[57] **ABSTRACT**

A circuit for lighting a plurality of lamps requiring a temporary starting voltage and an operating voltage of a different value than the starting voltage. The starting voltage source is switched completely out of the line during operation. An impedance device is provided in series with the lamps which is preferably a capacitor. Since the starting voltage is turned on for only a short period of time, the starting voltage source may be of a small power output requirement compared with the main power source.

6 Claims, 1 Drawing Figure




1st
2nd
3rd
4th
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BALLAST CIRCUIT FOR A PLURALITY OF LAMPS

OBJECTS OF THE INVENTION

It is an object of the invention to provide a starting circuit which is economical to manufacture, light weight, and economical to operate and maintain.

Another object of the invention is to provide a fluorescent light circuit that operates directly on line voltage without a starting ballast, as commonly known.

Another object of the invention is to provide an improved ballast arrangement for a plurality of flourescent tubes.

Another object of the invention is to provide a fluorescent light circuit with a capacitor impedance member.

With the above and other objects in view, the present invention consists of the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawing and more particularly pointed out in the appended claims, it being understood that changes may be made in the form, size, proportions, and minor details of construction without departing from the spirit or sacrificing any of the advantages of the invention.

GENERAL DESCRIPTION OF THE DRAWING

The drawing shows a schematic drawing of the circuit according to the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

The circuit is made up generally of the selector switch **10,** two relays **56** and **62,** and an autotransformer **71** which provides a high voltage for starting the lamps. The autotransformer **71** has primaries **69** and **72** which are connected to lines **52** and **53.** The secondary terminals which include the terminals **70** and **72** are connected through capacitors **73** and **74** to the movable contacts **75** and **76** of relay **62.** The selector switch **10** has 10 banks of fixed contacts, each bank having five fixed contacts distributed around the banks and 10 movable contacts. Each bank of fixed contacts has a movable contact. The movable contacts are all connected together so that they move in unison from position **1** to positions **2–6.**

The banks of fixed contacts, each having a movable contact, are indicated at A through J.

The movable contacts **11** and **12** are connected to wires **65** and **66.** When the on-off switch **80** is closed, the line power from **49** and **50** is connected through lines **81** and **82** to the movable contacts **13, 15** and **17** which are connected in parallel with each other and the movable contacts **14, 16** and **18** which are connected in parallel with each other. The movable contacts **19** and **20** are connected in series with the starter **35** so that when the switch **10** is moved from position **1** through positions **2, 3, 4,** and **5,** the starter is selectively connected to the starters **41** and **43** of each of the tubes **36, 37, 38** and **39** in sequence. Thus a single starter performs the function previously performed by an individual starter for each lamp. The contact **2** of stage A of selector switch **10** is connected to fixed contacts **3, 4** and **5** of stage C. Fixed contact **3** of stage A is connected to fixed contacts **3, 4, 5** and **6** of stage E. Contact **4** of stage A is connected to terminal **40** of tube **38** and fixed contact **5** of stage G. Contact **6** of stages A, B, C, D, G, H, I and J are not connected to anything. Fixed contact **2** of stage B is connected to terminal **42** of tube **36** and to fixed contacts **3, 4** and **5** of stage D. Fixed contact **3** of stage B is connected to terminal **42** of tube **37** and to terminals **4, 5** and **6** of stage F. Fixed contact **4** of stage B is connected to terminal **42** of tube **38** and to fixed contact **5** of stage H. Fixed contact **5** of stage B is connected to terminal **42** of tube **39.**

The lamps **36, 37, 38** and **39** are all of a type of fluorescent lamp that is common to those skilled in the art. These fluorescent lamps have terminals **40, 41, 42** and **43.** The terminals **41** and **43** of each of the tubes is connected to the heater of the tube and terminals **40** and **42** of each tube is connected to the cathode in a conventional manner. The capacity of reactance units, which are a form of capacitors **44, 45, 46** and **47,** are capacitors of a size suitable to limit the current through the fluorescent lamp when the tube fires. Capacitors **44, 45, 46** and **47** also introduce a time delay at starting.

When the movable contacts of switch **10** are in the number **1** position, none of the movable contacts are connected to any source of power connected to the fixed contacts. Thus when starting switch **80** is closed, 120 volt A.C. power connected to the lines **49** and **50** will provide a first voltage which will flow through the lines **52** and **53.** Line **51** is connected to ground. The first voltage of 120 volts A.C. will flow through the movable relay **56.** The transformer **71** at coil **48** provides a second voltage. Contacts **54** and **55** of relay **56** will be connected through lines **65** and **66** to the movable contacts **2** of stage A and stage B. When the movable contacts are moved to the number **2** position of switch **10,** 120 volts A.C. will be connected to the terminals **40** and **42** of fluorescent lamp **36** and likewise to terminals **3, 4,** and **5** of stage C and also terminals **3, 4,** and **5** of stage D. The solenoid **75** and relay **56** is connected in parallel with capacitor **77** and full wave rectifier circuit **78.** The solenoid **75** is connected through the push button switch **79** to line **53** and connected directly to line **52.** When the starting switch **79** is pushed, the **120** volts A.C. will be connected to the coil **75** of relay **56** which will cause the movable contacts **54** and **55** to disengage the normally closed contacts **63** and **64** and to engage the normally open contacts **57** and **58** of relay **56.** This will connect 120 volts A.C. to the bridge circuit **59** and A.C. will flow through the resistor **60** to the relay coil **61** and energize it. Thus the movable contacts **75** and **76** of relay **62** will engage the fixed contacts **67** and **68** of relay **62** and connect a high voltage from transformer **71** through capacitors **73** and **74** to the lines **65** and **66** respectively. This high voltage will be connected across the terminals **40** and **42** of tube **36** through capacitor **44** and will start the tube.

When the tube **36** is started, then the switch **10** will be moved to the number **3** position. In this position, the transformer **71** will start tube **3.** The switch **10** is then moved to the number **4** position. This will connect the power from the autotransformer terminals **70** and **72** to terminals **40** and **42** of tube **38.**

It will be seen that when the selector switch **10** is moved to the number **4** position, the high voltage from the transformer **71** will be connected to the terminals **40** and **42** of the fluorescent lamp **38.**

In the fifth position of switch **10,** high voltage from terminals **70** and **72** of the autotransformer **71** are connected across the terminals **40** and **42** of the fluores-

cent lamp **39.** Thus it will be noted that for each position of the selector switch **10,** the high voltage from terminals **70** and **72** of relay **71** is impressed on one of the fluorescent lamps **36, 37, 38** and **39** successively. The resistor condenser circuit **60** in connection with full wave rectifier circuit **59** introduces a time delay between the time relay **56** closes and the time that relay **62** closes.

The stages I and J of the switch **10** successively close the heater circuits of heater **35** through the heaters of the tubes **36, 37, 38** and **39.** These heaters are connected across the terminals **40** and **41** and across the terminals **42** and **53** in a conventional manner.

When a conventional **40** inch fluorescent tube is used, the value of the capacitance of capacitors **44, 45, 46** and **47** should be approximately 12 microfarads (MFD). The capacitors are connected in series with the terminals **40** of lamps **36, 37, 38** and **39** respectively and the A.C. line. After the fluorescent lamps start, the ballast transformer **71** is switched out of the circuit. The circuit is designed for preheat instant start and rapid start fluorescent lamps.

The starting ballast is very small in comparison with that normally used because it only has power connected to it a very short time and thereafter the tube is switched onto 120 volts A.C. very quickly. The relay **56** and its time constant components capacitor **77** and rectifier circuit **78;** relay **62** with its time constant components rectifier **59,** capacitor **60** and resistor **60'** are held closed for the starting pulse voltage that is passed through capacitor **44** when the switch **10** is in the number **2** position. The heaters of lamp **36** are connected to starter **35.**

When the selector switch **10** is in the number **3** position, the tube **36** is turned on, and when it is moved to the number **3** position, the filaments in tube **37** heat through heater **35,** and so on. The ballast transformer **71** switches out of the circuit successively as the switch **10** is moved successively through its positions. The capacitors **44, 45, 46** and **47** can be built into the fluorescent tubes themselves thereby further simplifying the circuit and the multi-fluorescent tube ballast can be used.

The foregoing specification sets forth the invention in its preferred practical forms but the structure shown is capable of modification within a range of equivalents without departing from the invention which is to be understood is broadly novel as is commensurate with the appended claims.

The embodiments of the invention in which an exlusive property or privilege is claimed are defined as follows:

1. A circuit for starting lamps requiring an initial voltage and an operating voltage of a different voltage than the initial voltage comprising

at least a first fluorescent lamp having heater terminals and cathode terminals and a second fluorescent lamp having heater terminals and cathode terminals,

a first source of starting voltage,

a second source of operating voltage,

means for temporarily connecting said first source of starting voltage to said cathode terminals,

and means for temporarily connecting said heater terminals together,

and means for connecting said second source of operating voltage to said cathode terminals of said first lamp and for disconnecting said first source of starting voltage from said cathode terminals,

and means for connecting said first source of starting voltage to said cathode terminals of said second fluorescent lamp and means for connecting said heater terminals of said second fluorescent lamp together whereby said first source of starting voltage directs a current through said heater terminals of said fluorescent lamps,

and means for disconnecting said first source of starting voltage from said cathode terminals and for connecting said second source of operating voltage to said cathode terminals of said second fluorescent lamp.

2. The circuit recited in claim **1** wherein an impedance is connected in series with each said lamp.

3. The circuit recited in claim **2** wherein said impedance is a capacitor.

4. The circuit recited in claim **1** wherein said first voltage source and said second voltage source are connected to said lamps through a first selector switch and a second selector switch having common terminals,

said first source of power is connected to the common terminals of said selector switches and said second source of voltage is connected to said first selector switch common terminal.

5. The circuit recited in claim **1** wherein said first voltage source comprises an autotransformer.

6. The circuit recited in claim **1** wherein said first source of starting voltage comprises an autotransformer,

said autotransformer has primary windings connected to said second source of operating voltage through a first relay.

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