April 9, 1968 W. H. ENGLE 3,377,505

EMERGENCY LIGHTING SYSTEM WITH LOW, MEDIUM AND HIGH VOLTAGE OUTPUTS

Original Filed April 24, 1962 2 Sheets-Sheet 1

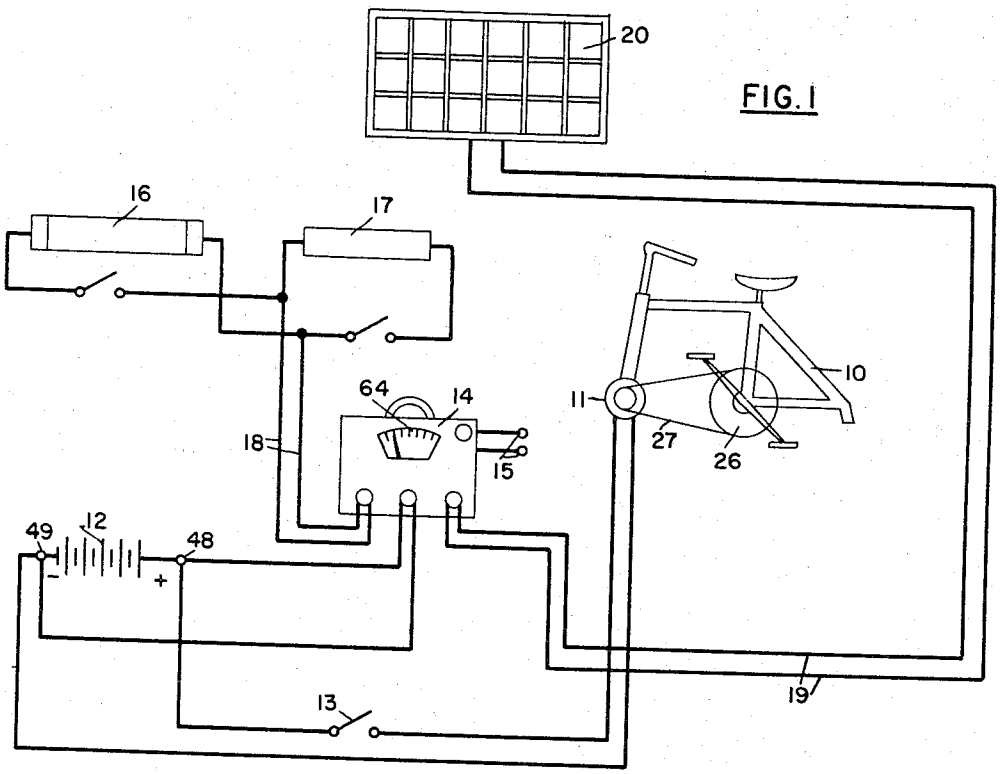


FIG. 1

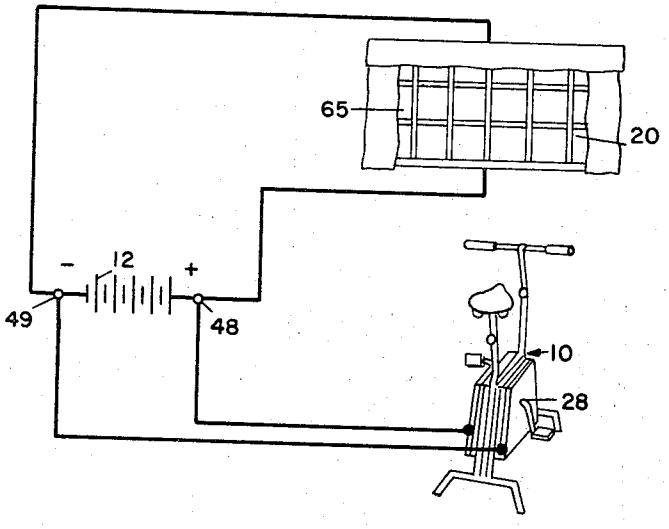


FIG. 2

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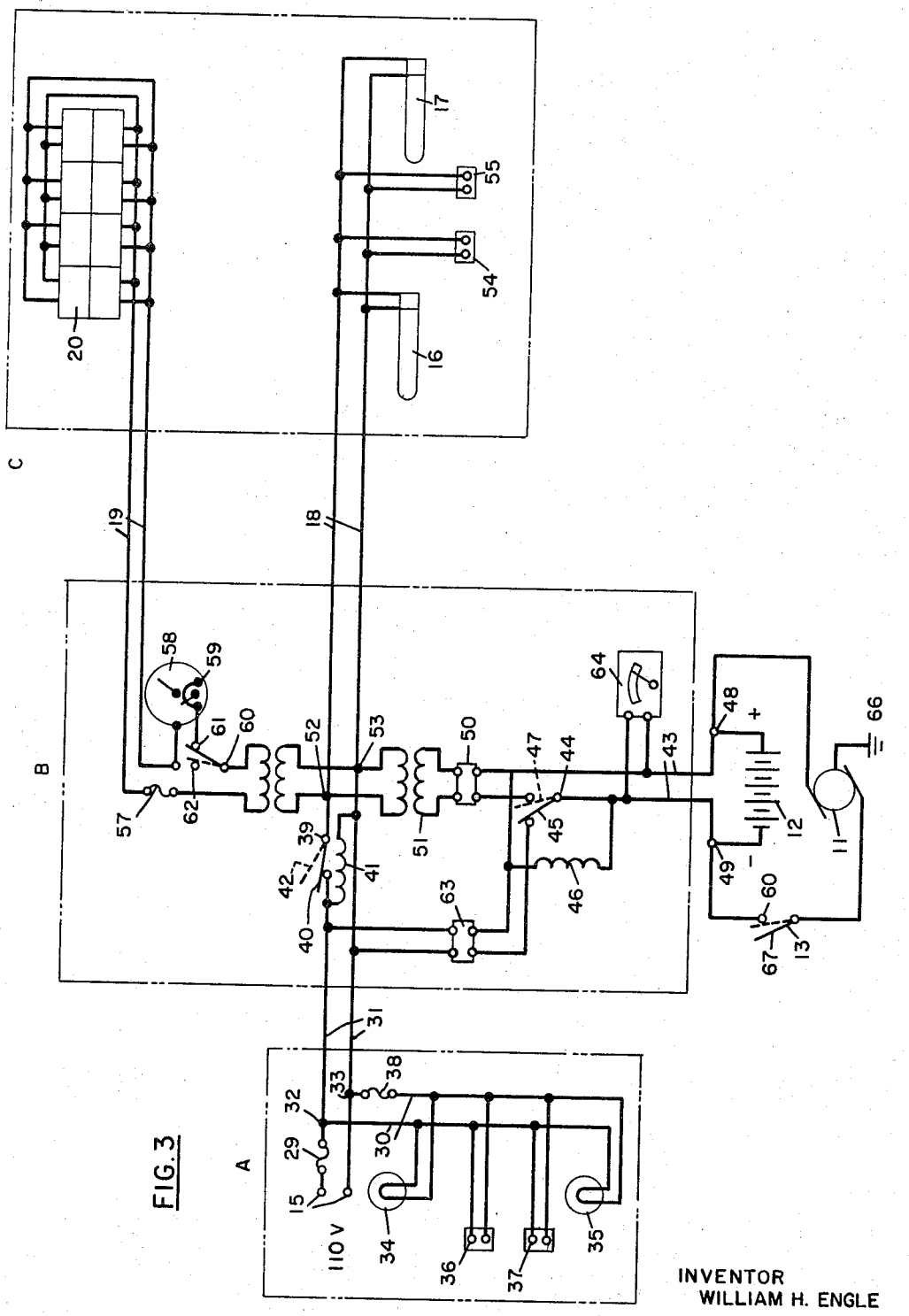


FIG. 3

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EMERGENCY LIGHTING SYSTEM WITH LOW, MEDIUM AND HIGH VOLTAGE OUTPUTS

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Continuation of application Ser. No. 189,728, Apr. 24, 1962. This application Apr. 8, 1966, Ser. No. 541,214
2 Claims. (Cl. 315—86)

This is a continuation of my co-pending application Ser. No. 189,728, filed Apr. 24, 1962, for an Emergency Lighting Circuit.

This invention relates generally to the type of automatic changeover apparatus designed to cause the shift of a load from one source to another and more particularly to an emergency lighting circuit fed from either a conventional source of alternating current or from a direct current source capable of being recharged.

The instant invention is intended primarily for use in fall out shelters and other areas to provide a convenient supply of suitable current to operate minimum lighting and power loads for survival purposes in times of emergency. There has been considerable recent activity in the field of design and installation of fall out shelters in view of the current tense international situation. Provisions for adequate and satisfactory electric current supply must be included in the basic plan of any successful fall out shelter to provide for electrical needs with utmost dependability. While under normal conditions, the conventional municipal generating stations provide an uninterrupted supply of electrical current, such a source cannot be trusted under war-time emergency conditions and so individual electrical generating means must be provided.

Devices presently available for use in fall out shelter construction consist generally of well known motor-generator sets utilizing internal combustion engines employing either liquid or gaseous fuels such as gasoline or propane. Such systems may be more or less elaborate depending on size and type of auxiliary equipment included and all have the common shortcoming of being relatively expensive in comparison to the total cost of shelter construction. The motor-generator systems are further deficient in that they require the storage of a quantity of gasoline or propane for operating purposes, and it may be impossible to replenish fuel supplies in an emergency, thereby definitely limiting the period of operation. Further, both gasoline and propane are well known for their hazardous qualities in that both are highly flammable and can readily form explosive compounds when mixed with air. It is indeed within the realm of possibility that the storage of a hydrocarbon fuel for operation of an internal combustion motor in the vicinity of a fall out shelter could materially increase the danger to those seeking protection within the shelter.

It is therefore an object of this invention to provide an alternating current source that is always readily available for operation.

It is a further object of this invention to provide an electric current generating system free from the storage or use of potentially dangerous materials.

It is a further object of this invention to provide a unique, manually operated, battery charging arrangement.

It is a further object of this invention to provide an electric circuit operating at a plurality of potentials.

It is a further object of this invention to provide an electric circuit capable of ordinary operation with house current and emergency operation using a battery as a current source.

It is a further object of this invention to provide an electric circuit capable of automatically generating alternating current from a direct current source upon failure of normal current supply.

It is a further object of this invention to provide combined battery charging and exercising facilities.

It is a further object of this invention to provide a pedal operated alternator capable of providing current for lights, motors, etc. and at the same time offering a convenient exercise device.

It is a further object of this invention to provide a device that is simple in operation, rugged in construction and relatively inexpensive in manufacture.

Other objects and a fuller understanding of the invention will be had by referring to the following description and claims of a preferred embodiment thereof, taken in conjunction with the accompanying drawing, in which:

FIG. 1 is a schematic representation of an electrical circuit showing respective arrangement of components.

FIG. 2 is a perspective view of the invention with partial schematic circuit.

FIG. 3 is a schematic wiring diagram of my invention.

Although specific terms are used in the following description for the sake of clarity, these terms are intended to refer only to the particular structure of my invention selected for illustration in the drawings and are not intended to define or limit the scope of the invention.

In FIG. 1, I show a stationary exercise machine **10** driving a generator **11** which feeds a twelve volt, wet cell battery **12** through a battery control switch **13**. The battery **12** is wired into control panel **14** and is connected into the circuit as hereinafter described. The control panel **14** is wired to a conventional source of 110 volt alternating current **15** and supplies the 110 volt alternating current circuit **18** to fluorescent lighting fixtures **16**, **17** and the 600 volt alternating current circuit **19** to energize a plurality of electroluminescent panels **20**.

The stationary exercise machine **10** drives the generator **11** either through a gear **26** and chain **27** arrangement as shown in FIG. 1 or by direct drive arrangement **28** as shown in FIG. 2.

In the interest of keeping current demand to a minimum throughout the entire circuit, I use a 110 volt A.C. fluorescent fixture **16** in the kitchen having a rating of approximately 15 watts and a 110 volt A.C. fluorescent fixture **17** in the bathroom having a rating of approximately 7 watts. In the living room, I use a plurality of electroluminescent panels **20** similar to Westinghouse Electric Corporation "Rayescent" panels, each panel drawing only one-tenth of a milliampere of current at 600 volt A.C. potential. It is thus seen that 8 panels will require eight-tenths ma., 10 panels one ma., etc., depending upon the number of panels employed. In no case however, will there ever be a great current demand from the plurality of panels **20**.

In FIG. 3, I show a schematic circuit arrangement indicating in detail the location and arrangement of operating switches, holding coils, circuits and major operating components. The portion of the circuit operating only when conventional 110 volt alternating current is available in the usual manner is generally designated as A; the internal wiring arrangement of control panel **14** is generally designated as B; and the portion of the circuit operating either from the conventional 110 volt alternating current source during normal operation or from the 12 volt direct current source during emergency periods is generally designated as C.

Circuit portion A includes an incoming two wire, 110 volt alternating current source **15** which is fused in the usual manner at **29** to protect the entire operating circuit **31**. The high current capacity circuit **30** is tapped from operating circuit **31** at junctions **32, 33** in the usual way to supply the incandescent fixtures **34, 35** and duplex wall receptacles **36, 37** through protecting a fuse **38**. As can readily be appreciated, the circuit **30** and connected

lighting fixtures and wall receptacles are shown in representative form only and additional circuits or additional fixtures may be similarly added and still be within the scope of my invention. So long as there is a normal current supply from the municipal generating stations, the high current circuit **30** will always be available and may be used for such current demanding devices as irons, toasters, washing machines, and power tools.

The control panel portion B receives normal current supply at 110 volts alternating current from operating circuit **31** through an automatic throwover switch **39** which is maintained in its normally closed position **40** by holding coil **41**. Should the alternating current source **15** fail and thereby cause an interruption of current in the operating circuit **31**, the holding coil **41** will become de-energized and the switch **39** will automatically shift to its open position **42**. As soon as the operating circuit **31** fails, the emergency circuit **43** is maintained in its normally open position **45** by the holding coil **46**. Upon failure of the operating circuit **31**, the holding coil **46** will be de-energized and the switch **44** automatically turns to its closed position **47**, thereby placing emergency circuit **43** into operation.

The emergency circuit **43** receives twelve volts, direct current from the battery **12** and is connected respectively at the positive terminal **48** and negative terminal **49** in the usual manner. The twelve volt direct current supply from the battery **12** passes through the switch **44** (once it is closed by failure of the current source **15**) and is modified to twelve volt alternating current in any well known manner such as by a vibrator **50**. A first transformer **51** which is wired for 12 volt to 110 volt transformation supplies 110 volt alternating current to terminals **52, 53** thereby energizing circuit **18** which operates the fluorescent lighting fixtures **16, 17** and the duplex wall receptacles **54, 55**. It should be noted that terminals **52, 53** provide common connection between the operating circuit **31** and the emergency circuit **43** thereby providing an uninterrupted current supply for circuit **18**. A failure of circuit **31** will immediately and automatically cause circuit **43** to come on the line and take up the load.

The high voltage circuit **19** is also supplied from common terminals **52, 53** and is similarly always energized either by the operating circuit **31** or the emergency circuit **43**. A step-up transformer **56** which is wound for 110 volt–600 volt operation supplies the high voltage required for operation of the electroluminescent panels **20** which are conected in parallel across circuit **19** and protected from possible current surges by the fuse **57**.

In designing my fall out shelter, I have found it desirable to simulate the daylight and evening by means of electroluminescent panels **20** arranged to imitate conventional windows **65**. A clock timer **58** with integral rheostat **59** is wired in series with the circuit **19** through a two position, manual switch **60**. When the switch **60** is thrown to the operating position **61**, the clock timer and rheostat **59** control the circuit **19**. If desired the clock timer and rheostat can readily be cut out of the circuit by moving the switch **60** to its by-pass position **62**. I propose to set the clock timer and rheostat to maintain the following sequence of operation. At 6 o'clock a.m., the clock timer will start the cycle and 110 volt current will be supplied to circuit **19**. From 6 o'clock to 7 o'clock, the rheostat will gradually increase the voltage to the circuit to the maximum of 600 volts. The electroluminescent panels will then gradually pass from complete darkness to complete designed luminescence in one hour thereby simulating the dawn. The 600 volt current will be supplied for ten hours to simulate the daylight and then the rheostat can again be brought into operation to decrease the voltage from 600 volts to 110 volts in a period of one hour, at which time the clock timer would close the circuit until 6 o'clock a.m. the next day for a repetition of the process, thus simulating the sunset and evening hours.

A conventional trickle charger **63** with an automatic cut-out to prevent battery overcharge is wired across the operating circuit **31** to the switch **44** which is maintained in position to direct charging current to the positive and negative terminals **48, 49** of battery **12** by means of a holding coil **46**. The current indicator **64** is connected across battery terminals **48, 49** and gives a continuous, accurate reading of the condition of battery **12**. The indicater is so positioned in the circuit as to be operative under either normal or emergency conditions.

The generator **11** is rotated by the exercise machine **10**, is wired to the positive and negative terminals **48, 49** of battery and is grounded at **66**. The manual switch **13** may be conveniently moved to its open position **67** or its closed position **68** as desired by the operator. It is my intention to keep the switch **13** in normally open position **67** during the period when operating circuit **31** supplies current to the system. Under these circumstances, the battery **12** is maintained fully charged by operation of trickle charger **63** and the exercise machine **10** may be used purely for recreational and exercise purposes. When the emergency circuit **43** supplies current to the system, the switch **13** is normally in its closed position **68** so that when battery recharging is required as disclosed by indicator **64** the generator **11** may be rotated to supply the required recharging current. Should the battery become fully charged and further use of the exercise machine is desired, the switch **13** may be moved to its open position **67** to prevent possible battery damage and at the same time provide the necessary exercise facilities.

Although I have described my invention with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

What is claimed is:

1. In a lighting circuit incorporating a manually operated generator charging a wet cell storage battery, the combination of a vibrator receiving low voltage, direct current from said storage battery, said vibrator modifying said direct current to low voltage alternating current; a first transformer having low voltage and medium voltage windings, said transformer receiving said low voltage alternating current from said vibrator and increasing the voltage of said current to medium voltage; a medium potential lighting circuit connected to said medium voltage winding of said first transformer; a second transformer having a medium voltage winding and a high voltage winding, said medium voltage winding of said second transformer being connected to the medium voltage winding of said first transformer, said second transformer increasing the voltage of said medium voltage current to high voltage; a high potential circuit connected to said high voltage winding of second transformer; an external source of medium voltage, alternating current connected into the circuit between the medium voltage winding of said first transformer and the medium voltage winding of said second transformer; an automatic, two position throwover switch connected into the circuit between said first and second transformers, said switch directing said external source of alternating current to the lower voltage winding of said second transformer, said switch at the same time removing said first transformer and said battery from the circuit; and an automatic, two-position switch connecting said batttery to the circuit to feed said low voltage winding of said first transformer through said vibrator upon failure of said external source of alternating current.

2. In a lighting circuit, the combination of a manually operated electrical generator charging a wet cell battery,

said battery having positive and negative terminals; a foot operated, bicycle, exercising machine driving said generator; a vibrator receiving direct current from said positive and negative terminals, said vibrator modifying said direct current to alternating current; a first transformer having low voltage and medium voltage windings, said transformer receiving said alternating current from the vibrator and increasing the voltage of same; a medium potential lighting circuit connected to said medium voltage winding; a second transformer having a medium voltage and a high voltage winding, said second transformer being connected to said medium voltage winding of said first transformer; a high potential lighting circuit connected to said high voltage winding of the said second transformer; an internal source of alternating current joined to the circuit between medium voltage winding of first transformer and medium voltage winding of second transformer; a medium voltage lighting circuit fed by said external source of alternating current; an automatic, two position throwover switch connected between said transformer and said switch introducing said external source of alternating current to low voltage winding of said second transformer and removing said battery and said first transformer from the circuit; whereby battery current may be fed to said low voltage winding of said first transformer through said vibrator when said external current source fails and whereby said battery may be manually recharged under emergency conditions.

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