# United States Patent

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## [54] KEY HEATER FLASHLIGHT


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[51] **Int. Cl.**.....**F21l 7/00**

[58] **Field of Search**.....240/10.6 CH, 10.6 R, 6.4 K; 219/200, 201, 220, 242, 385, 518, 520, 521



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[57] **ABSTRACT**

A key heater flashlight having a conventional flashlight circuit and a rechargeable power source. The flashlight also has a key slot around which a heating coil is deposed and into which the shank of a key can be inserted. Insertion of the key automatically turns on the key heater circuit; the heated key can be used to open a frozen lock such as an automobile lock. An indicating light and the heating coil current turn off automatically when the key is heated to a predetermined temperature. The unit is also provided with two batteries either of which can be selected for use in either the flashlight circuit or the heater circuit. This prevents the entire unit from suddenly becoming inoperative when the battery in use becomes discharged, particularly after a heavy current drain such as that which might be drawn by the heating coil.


**22 Claims, 5 Drawing Figures**

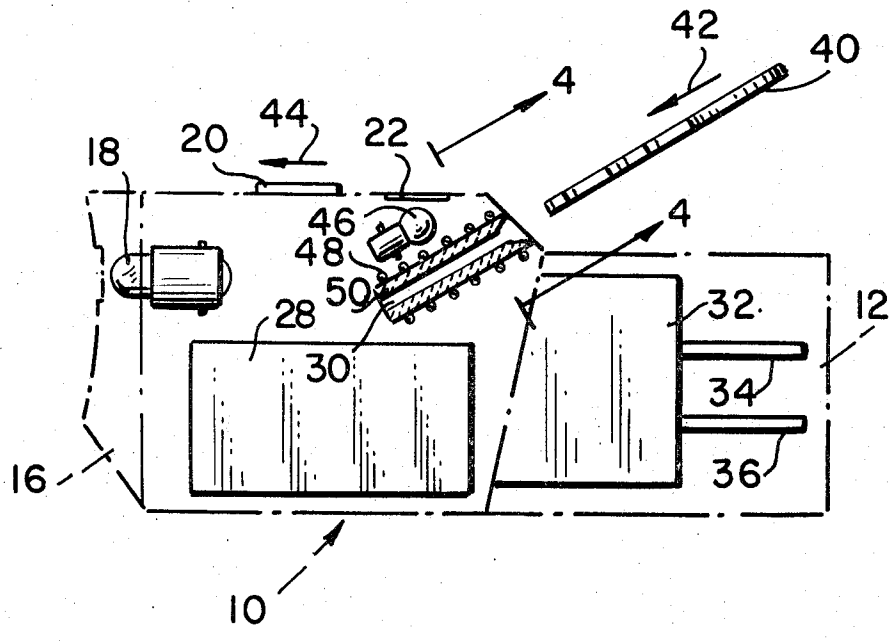


FIG. 1

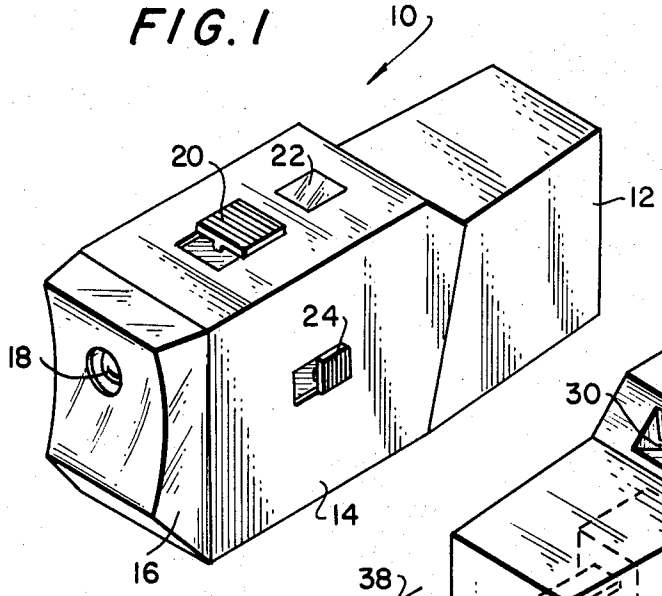



FIG. 2



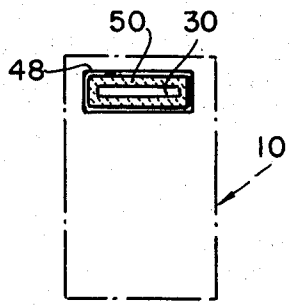




FIG. 4

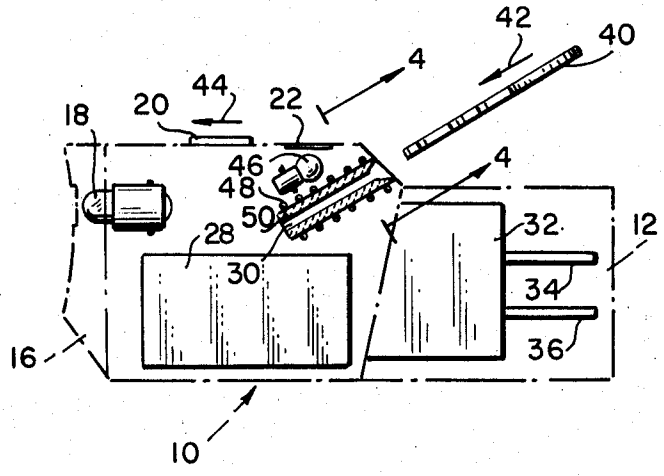



FIG. 3

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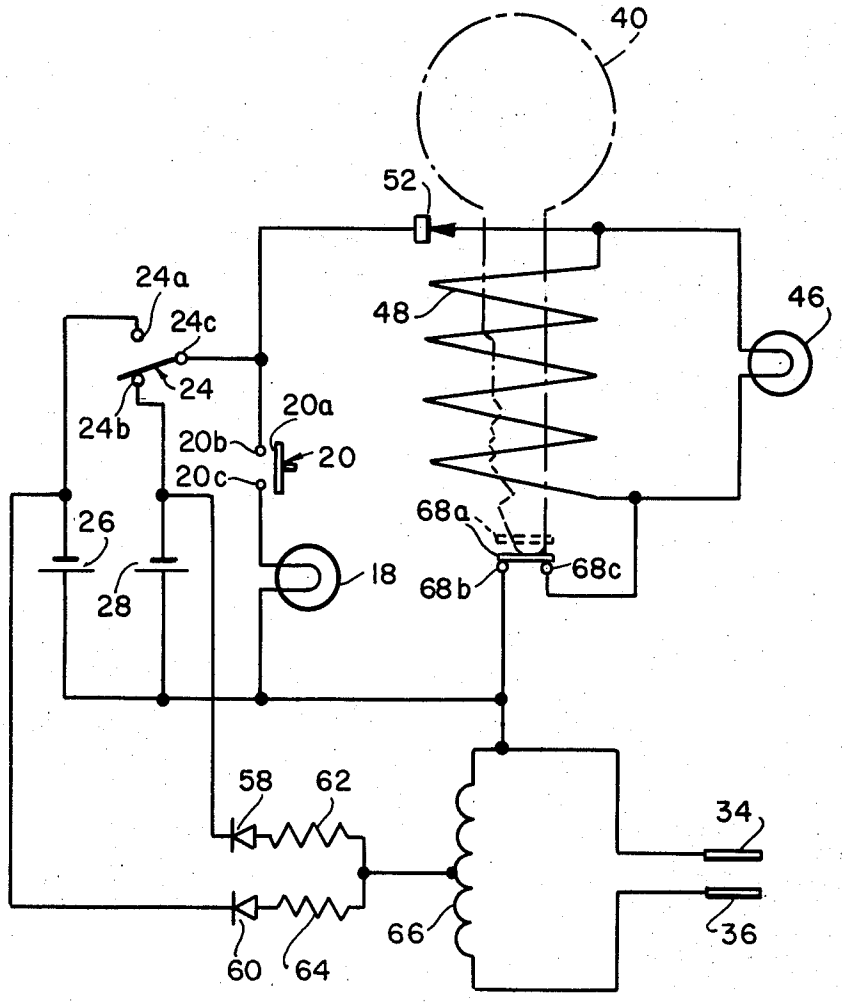



FIG. 5

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# KEY HEATER FLASHLIGHT

This invention relates to key heaters, and more particularly to a flashlight containing a key heater.

Several different types of key heaters have been proposed in the prior art. A key heater functions to heat the shank portion of a key which is then inserted into a frozen lock, such as an automobile lock. The heat of the key defrosts the lock, after which the key may by turned to open the lock.

One of the main problems with prior art key heaters is that the device for heating the key is generally a self-contained unit which must be carried by a person who expects to require it during the course of the day. This may be very bothersome especially if the key heater is bulky. Furthermore, many persons are reluctant to purchase such a device just to have it available on infrequent occasions when it may be useful.

However, there are many persons who carry flashlights on their persons, especially the compact flashlights which have become available commercially in recent years. Such persons could have the benefit of a key heater without increased bulk or excessive cost if the flashlight included a key heater in it.

It is a general object of my invention to provide a flashlight which includes a key heater.

Many of the miniature flashlights which have been produced in recent years contain rechargeable batteries. Whenever the flashlight battery runs down, a housing can be removed from the flashlight and two prongs which are then exposed can be inserted into a wall socket for powering a self-contained battery charger to recharge the battery. However, the user of such a flashlight generally only recharges the battery when it is run down. The battery may "die" quite rapidly as the energy stored in it is used up. The fact that the battery can be recharged is little consolation to a user who finds himself in great need of a flashlight with a dead battery. The problem is aggravated when the battery is also used to heat a key. To generate sufficient heat, a large current may be drained from the battery, which toward the end of the discharge cycle of the battery may effectively deaden the battery in a very short time interval.

It is another object of my invention to prevent a flashlight, and in particular a flashlight having a key heater, from suddenly becoming useless as a result of a dead battery.

In accordance with the principles of my invention, the flashlight, which in many respects is comparable to types commercially available, is provided with a slot into which the shank of a key can be inserted. Surrounding the slot is a heating coil which can be connected electrically across a battery. Although a separate switch can be provided for turning on the heater, in the preferred embodiment of the invention the insertion of the key shank itself closes the circuit and causes a current to flow through the heating coil. The same battery which powers the flashlight also controls the heating of the key. To prevent excessive drain of the battery, I provide an indicating light which goes on when the key is first inserted into the key slot. As soon as the key is heated to the desired temperature, the heating coil circuit is automatically broken so that no further current flows from the battery, and at the same time the indicating lamp turns off. This informs the user that the key should be withdrawn and inserted into the lock while it is still hot.



To prevent the overall unit from becoming inoperative suddenly as the energy stored in a battery is used up, I provide two batteries in the unit. An additional switch is provided to control the selection of either battery for use. In the event the battery in use suddenly goes dead, all that is required is to operate the switch so that the other battery is selected. When the battery charger prongs are plugged into a wall socket, both batteries are recharged (the charging current having little effect on a battery which is fully charged). Whenever a battery in use goes dead, it is an indication to the user that a re-charge is necessary. But until the user has an opportunity to recharge the dead battery, the flashlight and key heater can still be used because a "spare" battery is available.

It is a feature of my invention to provide a key heater circuit as part of a flashlight.

It is another feature of my invention to provide a key heater which is turned on automatically upon insertion of the shank of a key into a key heating slot.

It is another feature of my invention to automatically turn off the key heater when the temperature of the key shank has been raised to a predetermined value.

It is another feature of my invention to provide a visual indication to the user that the key shank has been heated to a predetermined temperature.

It is another feature of my invention to provide two batteries in a flashlight, particularly a flashlight having a key heater, together with a switch for controlling a selected one of the batteries to power the device when it is turned on.

Further objects, features and advantages of my invention will become apparent upon consideration of the following detailed description in conjunction with the drawing, in which:

FIG. 1 is a perspective front view of a key heater flashlight designed in accordance with the principles of my invention;

FIG. 2 is a perspective rear view, shown partially broken away, of the key heater flashlight of FIG. 1;

FIG. 3 is a sectional view taken through the center of the key heater flashlight of FIGS. 1 and 2 and illustrates symbolically the positions of various key elements in the device;

FIG. 4 is a sectional view through line 4—4 of FIG. 3; and

FIG. 5 is a schematic diagram of the circuit included in the key heater flashlight of FIGS. 1 and 2.

Referring to FIGS. 1 and 2, key heater flashlight 10 includes a body 14, a removable plastic housing 12 at the rear of the flashlight, and a transparent plastic housing 16 at the front of the unit which encloses flashlight bulb 18. On top of the unit is a switch 20 (shown in the off position) which when operated turns on the flashlight. Also on top of the unit is a translucent panel 22 which, as will be described below, is illuminated by a separate bulb disposed beneath it when the shank of a key is first inserted into the device and turns off when the shank of the key is heated to a predetermined temperature. On one side of the unit is an additional switch 24 which controls the selection of either one of batteries 26, 28 (preferably, of the nickel-cadmium type) for use in the circuit of FIG. 5.

The unit is provided with a key slot 30 into which the shank of a key can be inserted. As will be described below, when a key is inserted into the key slot, the key

heater turns on automatically and at the same time panel **22** is illuminated.

At the rear of the unit is a plug **32** having two prongs **34, 36**. The plug and prongs are contained within housing **20** which can be removed by pulling it off as shown by arrow **38** in FIG. **2**. To recharge one or both batteries, all that is required is to insert the prongs into a wall socket. Housing **12** is preferably of the snap-on type as found in many of the commercially available rechargeable flashlights.

FIG. **3** shows the positions of various elements in the flashlight. Bulb **18** is situated at the front of the unit and is contained within transparent cover **16**. Switch **20** is shown at the top of the unit; the switch is moved in the direction of arrow **44** to turn on the flashlight. Panel **22** is fixed in a cut-out at the top of the unit and a bulb **46** is disposed beneath the panel. The bulb turns on when a key **40** is inserted into key slot **30** in the direction of arrow **42**. When the panel is illuminated it is an indication that they key heater has been turned on. Bulb **46** turns off automatically, together with the key heater, as soon as the key shank has been heated to a predetermined temperature.

As seen in both FIGS. **3** and **4**, key slot **30** is a slot within a heat-conducting material **50**. Heating coil **48** is wound around heat conducting material **50**. Current flowing through the coil generates heat which is conducted through material **50** to the key within the slot. The heat-conducting material can be of any known types, such as copper. Although not shown in FIG. **3**, at the bottom of the key slot **30** there is a pressure operated switch which is automatically closed when the bottom of a key shank bears against it. The operation and function of the switch will become apparent upon consideration of FIG. **5** which shows the wiring connections between the various elements shown in FIG. **3**.

Switch **24**, switch **20** and bulb **18** are connected in series with batteries **26, 28**. When switch **20** is operated, a metallic contact **20*a*** bridges terminals **20*b***, **20*c***. Depending on the position of switch **24**, current flows from one of batteries **26, 28**, through contact **20*a*** and flashlight bulb **18**. The battery which is used to power bulb **18** depends on the setting of switch **24**. This switch functions to connect terminal **24*c*** to either of terminals **24*a*** or **24*b***. In the position shown, battery **28** is used to power the flashlight (as well as the key heater). Whenever it is discovered that the battery in use cannot supply the power necessary to operate the flashlight or the key heater, switch **24** is moved to its other position so that the other battery can be brought into service. At the first opportunity, prongs **34, 36** should be inserted into a wall socket so that the discharged battery can be charged.

Heater coil **48** is included in a series circuit which includes contacts **68*b***, **68*c***, one of batteries **26, 28** (depending on the position of switch **24**) and bimetallic switch element **52**. The bimetallic switch, as is known in the art, is a form of switch which is normally closed but which opens when it is heated to a predetermined temperature. In the absence of a key in slot **30**, no current flows through the heating coil. Although bimetallic switch **52** is closed, there is no electrical connection between terminals **68*b*** and **68*c***. When the shank of a key **40** is inserted into slot **30**, the bottom of the key bears against metal contact **68*a*** which is biased upward by a spring, not shown. (Terminals **68*b***, **68*c*** and contact **68*a*** may comprise a conventional microswitch element.) As soon as the key is fully inserted into the key slot, current flows through the bimetallic switch and the heating coil, and the temperature of the key shank starts to rise. Indicating bulb **46** is connected in parallel with the heating coil and thus current also flows through it at the same time that it flows through the key heater coil. This is an indication to the user that the key heater has been turned on. Bimetallic switch **52** is positioned in the flashlight relative to the heating coil **48** such that its temperature rises in proportion to the rise in temperature of the key shank within slot **30**. After several seconds, by which time the key shank is heated to a predetermined temperature (for example, 130° F), the bimetallic switch opens and current ceases to flow through the heating coil. At the same time, bulb **46** turns off to indicate to the user that the key shank is now at the final temperature. The key should now be removed immediately and placed into the lock before the key cools.

After the key is removed, metallic element **68a** springs back to the position shown in phantom in FiG. **5** so that even after bimetallic element **52** cools and once again closes, no current flows through the heating coil until the same or another key is placed within slot **30**.

The battery charging circuit includes a step-down autotransformer **66** whose two ends are connected to prongs **34, 36**. A tap on the transformer winding is extended through respective current-limiting resistors **62, 64** and respective diodes **58, 60** to the positive terminals of batteries **26, 28**. One end of the transformer winding is connected to the negative terminals of the two batteries. It is thus apparent that when prongs **34, 36** are inserted into a wall socket, a discharged battery can be recharged. The battery charging circuit itself is of a type well known in the art.

Although the invention has been described with reference to a particular embodiment, it is to be understood that this embodiment is merely illustrative of the application of the principles of the invention. Numerous modifications may be made therein and other arragnements may be devised without departing from the spirit and scope of the invention.

What I claim is:

**1.** A key heater flashlight comprising battery means, bulb means, switch means for connecting said battery means and said bulb means in series to energize said bulb means, means for allowing the insertion therein of the shank of a key to be heated, heating means disposed in heat transmitting relationship with said insertion means for heating an inserted key shank when current flows through the heating means, and means for connecting said heating means across said battery means to control the flow of current through said heating means.

**2.** A key heater flashlight in accordance with claim **1** wherein said connecting means is a normally-open switch disposed such that it is closed by the bottom of the shank of an inserted key, said normally-open switch, when closed, being operative to cause current to flow from said battery means through said heating means.

**3.** A key heater flashlight in accordance with claim **2** further including temperature-responsive means for

causing the current flowing through said heating means to terminate responsive to the temperature of the shank of an inserted key reaching a predetermined value.

4. A key heater flashlight in accordance with claim 3 further including lamp means for indicating when the shank of an inserted key has been heated to said predetermined temperature.

5. A key heater flashlight in accordance with claim 4 wherein said heating means is a heating coil, said lamp means and said heating coil are connected in parallel, said temperature-responsive means is a normally-closed bimetallic switch, and said bimetallic switch, said battery means, said connecting means, and the parallel connection of said heating means and said lamp means are connected in series.

6. A key heater flashlight in accordance with claim 5 wherein said battery means is a pair of batteries and switch means for selecting one of said batteries for use.

7. A key heater flashlight in accordance with claim 6 further including means for recharging said two batteries.

8. A key heater flashlight in accordance with claim 7 wherein said means for allowing the insertion therein of the shank of a key is a heat-conducting material having a slot therein with one end communicating with the atmosphere, said heating means being wrapped around said heat-conducting material.

9. A key heater flashlight in accordance with claim 8 wherein said connecting means is a pressure-sensitive switch disposed at the other end of said slot and closes responsive to the bearing thereagainst of the bottom of a key shank inserted into said slot.

10. A key heater flashlight in accordance with claim 1 further including temperature-responsive means for causing the current flowing through said heating means to terminate responsive to the temperature of the shank of an inserted key reaching a predetermined value.

11. A key heater flashlight in accordance with claim 10 further including lamp means for indicating when the shank of an inserted key has been heated to said predetermined temperature.

12. A key heater flashlight in accordance with claim 11 wherein said heating means is a heating coil, said lamp means and said heating coil are connected in parallel, said temperature-responsive means is a normally-closed bimetallic switch, and said bimetallic switch, said battery means, said connecting means, and the parallel connection of said heating means and said lamp means are connected in series.

13. A key heater flashlight in accordance with claim 1 further including lamp means for indicating when the shank of an inserted key has been heated to a predetermined temperature.

14. A key heater flashlight in accordance with claim 13 wherein said heating means is a heating coil, said lamp means and said heating coil are connected in parallel, and said battery means, said connecting means, and the parallel connection of said heating means and said lamp means are connected in series.

15. A key heater flashlight in accordance with claim 13 wherein said battery means is a pair of batteries and switch means for selecting one of said batteries for use.

16. A key heater flashlight in accordance with claim 15 further including means for recharging said two batteries.

17. A key heater flashlight in accordance with claim 15 wherein said means for allowing the insertion therein of the shank of a key is a heat-conducting material having a slot therein with one end communicating with the atmosphere, said heating means being a heating coil wrapped around said heat-conducting material.

18. A key heater flashlight in accordance with claim 17 wherein said connecting means is a pressure-sensitive switch disposed at the other end of said slot and closes responsive to the bearing thereagainst of the bottom of a key shank inserted into said slot.

19. A key heater flashlight in accordance with claim 1 wherein said battery means is a pair of batteries and switch means for selecting one of said batteries for use.

20. A key heater flashlight in accordance with claim 19 further including means for recharging said two batteries.

21. A key heater flashlight in accordance with claim 1 wherein said means for allowing the insertion therein of the shank of a key is a heat-conducting material having a slot therein with one end communicating with the atmosphere, said heating means being a heating coil wrapped around said heat-conducting material.

22. A key heater flashlight in accordance with claim 21 wherein said connecting means is a pressure-sensitive switch disposed at the other end of said slot and closes responsive to the bearing thereagainst of the bottom of a key shank inserted into said slot.

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