

Feb. 13, 1968

L. R. LOVERCHECK

3,369,104

HEAT PRODUCING DEVICE

Filed April 8, 1965

2 Sheets-Sheet 1

Fig. 1

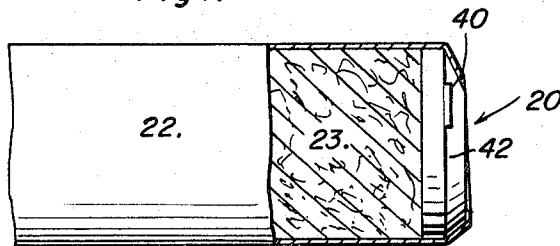


Fig. 2

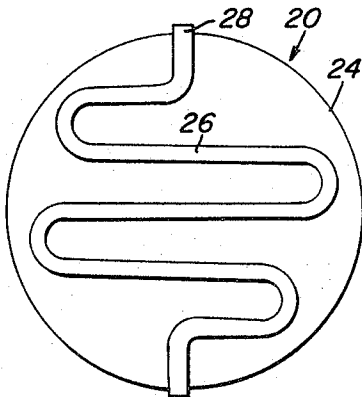


Fig. 3

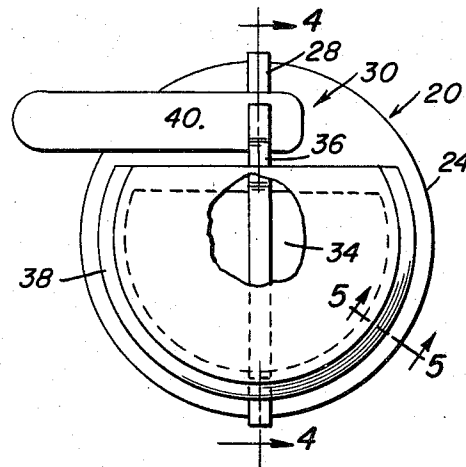


Fig. 4

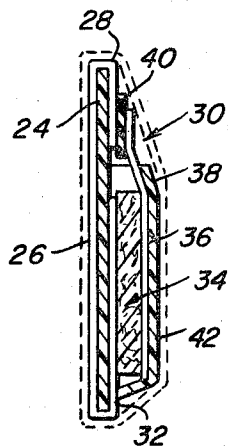
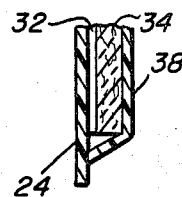


Fig. 5



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Fig. 6

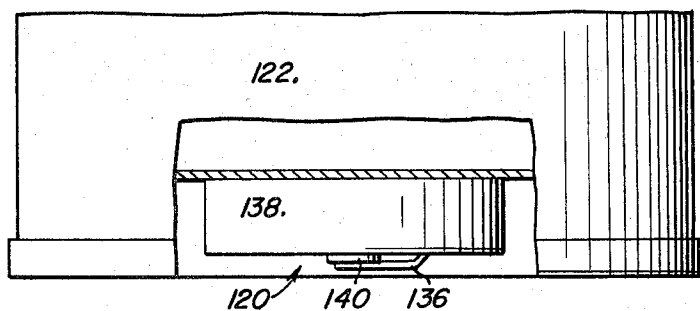


Fig. 7

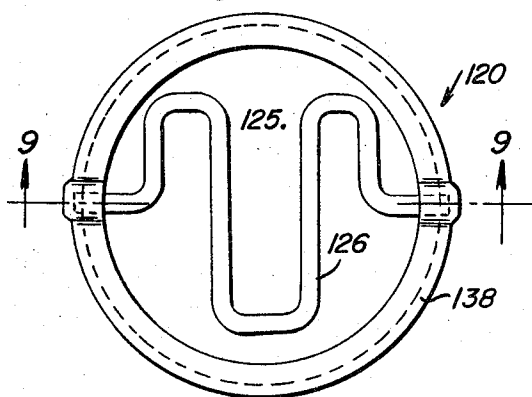


Fig. 8

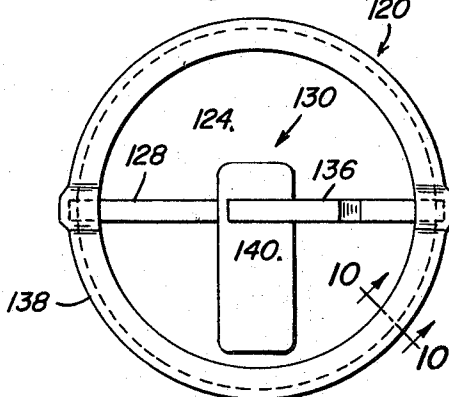


Fig. 9

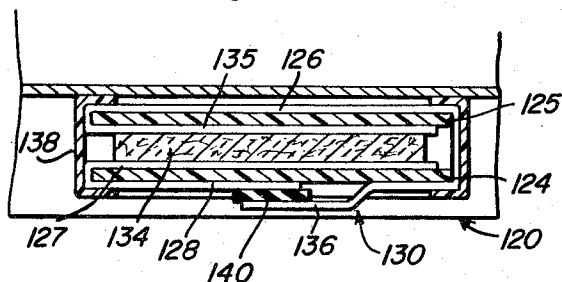
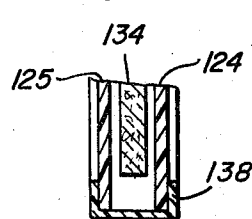


Fig. 10



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3,369,104

HEAT PRODUCING DEVICE

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ABSTRACT OF THE DISCLOSURE

A compact single-service disposable electrically operated heat producing device including a battery having a generally circular flattened configuration wherein one of the battery terminals is integral with an electrical resistance heating element which heating element is provided with one integral contact member of a switch means, the other terminal of the battery being provided with an integral switch contact member and wherein the contact members are normally maintained out of electrical contact by means of a removable strip of electrically nonconductive material interposed therebetween.

The present invention relates to a heat producing device, and more particularly, it relates to a novel device which may be utilized to perform various heating or lighting functions.

Heretofore, various heat producing devices have been provided in an attempt to facilitate the lighting, or heating of such diverse articles, as cigarettes, and metallic containers.

Some of the prior art devices use the energy stored within a battery to produce an electrical current which is subsequently utilized to heat an electrical resistance element to provide the necessary heat for lighting a cigarette, or heating a metallic container for example. While satisfactory in some respects, these devices are generally not suitable for single service use due to the fact that they are generally too complex in construction, therefore precluding the possibility of manufacturing a heat producing service which may be economically utilized for single service use. By a single service use it is meant that the chemical battery providing the electrical energy for the resistance heating element would have stored therein only sufficient energy to activate the heat producing device for a sufficient length of time to light one cigarette, for example, after which time the heat producing device would be discarded along with the initial ash produced.

Accordingly, it is an object of this invention to provide a heat producing device of improved construction which utilizes the energy stored in a chemical battery to incandescently heat an electrical resistance element.

It is another object of this invention to provide an electrically operated heat producing device which is of such simple design so as to make single service use of the device economically feasible.

Still another object of this invention is to provide an electrically operated heat producing device which may be secured adjacent the end of a cigarette, or the like, to provide the necessary heat to ignite the cigarette, or the like.

Still a further object of this invention is to provide an electrically operated heat producing device which may be secured to a metallic container for heating the contents of the container, which device may be discarded with the empty container.

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Briefly the present invention provides a heat producing device which incorporates a relatively thin battery, and includes an electrical resistant heating element which derives its electrical energy from the battery through a relatively simple, inexpensive electrical switching means. A portion of the device supporting the several elements thereon cooperates to provide a substantial portion of the support for the battery electrolytes. This construction facilitates the manufacture of a single service disposable heat producing device which may be economically incorporated in a variety of articles requiring heat as an adjunct to their utilization.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a fragmentary side elevational view of a portion of a cigarette showing portions broken away to reveal one embodiment of the heat producing device of this invention secured thereto;

FIGURE 2 is a top plan view of the embodiment of the heat producing device utilized in FIGURE 1, further showing the sinuous electrical resistance heat element;

FIGURE 3 is a bottom plan view of the device of FIGURE 2 with portions broken away to show interior details, and further showing a plan view of the electrical switching means utilized in the present invention;

FIGURE 4 is a cross sectional view taken substantially along the plane of the line 4-4 of FIGURE 3 further showing in broken lines, the device encased in a combustible overwrap.

FIGURE 5 is a fragmentary radial sectional view of a portion of the device of FIGURE 3 taken substantially along the plane of the line 5-5 of FIGURE 3;

FIGURE 6 is a side elevational view of another embodiment of a heat producing device embodying the present invention, further showing a portion of a metallic receptacle with portions broken away to reveal the heat producing device secured thereto;

FIGURE 7 is a top plan view of the embodiment of the heat producing device which may be utilized to heat the contents of the metallic container such as illustrated in FIGURE 6.

FIGURE 8 is a bottom plan view of the device of FIGURE 7, further showing the electrical switching means utilized;

FIGURE 9 is a cross sectional view of the device of FIGURE 7 taken substantially along the plane of the line 9-9 of FIGURE 7; and

FIGURE 10 is a fragmentary radial sectional view of a portion of the device of FIGURE 8 taken substantially along the plane of the line 10-10 of FIGURE 8.

Referring now to the drawings and FIGURES 1 through 5 in particular, one embodiment of the heat producing device in accordance with this invention is indicated generally at 20. The embodiment 20 may be utilized to light a combustible article such as a cigarette, or the like, indicated generally at 22. The heat producing device 20 includes a generally circular substantially flat disk 24 formed of a relatively rigid non-electrically conductive material which has a reasonably high thermal resistance. The generally circular flat disk 24 may be formed

of any suitable non-conductive thermosetting resin, for example.

An electrical resistance heating element 26 is secured to one side of the generally circular substantially flat disk 24 as seen best in FIGURE 2. The electrical resistance element 26 passes sinuously across the surface of the disk 24 so as to substantially cover the transverse width of the flat disk 24. The electrical resistance element 26 may be formed of a suitable metallic electrically conductive resistance element which glows incandescently upon energization and which is secured to the disk 24 by suitable means such as a thermosetting adhesive, or the like. Alternatively, the electrical resistance heating element 26 may be formed directly on the circular disk 24 by suitable means such as electro-deposition, gaseous metallic deposition or the like, thereby precluding the necessity of fabricating the resistance element 26 separately and securing it to the disk 24.

The electrical resistance heating element 26 is provided with an integral portion 28 which extends from one end of the sinuous element 26 around the radial periphery of the disk 24 and is secured to the disk 24 by any suitable means such as adhesive for example as seen best in FIGURES 3 and 4. The integral portion 28 of the electrical resistance heating element 26 cooperates to function as one portion of an electrical switching means indicated generally at 30 which will be described in detail later.

The end of the electrical resistance heating element 26 opposite the integral portion 28 is provided with an integral enlarged generally circular flat metallic disk 32 which is secured to the disk 24 by suitable means, such as adhesive, and functions as one terminal of a battery means indicated generally at 34. The electrical resistance of the portions 28 and 32 of the electrical resistance heating element 26 is preferably of a low enough value to substantially preclude the portions 28 and 32 from glowing incandescently when an electrical current is passed through the electrical resistance heating element 26, from the battery means 34.

The battery means 34 includes a suitable electrolyte, such as one of a dilute hydroxide type which is absorbed on a relatively inert porous material such as unoriented glass fiber, or the like. Alternatively, the battery 34 may be formed of suitable electrolyte of a paste-like consistency in which case the electrolyte comprising a battery means 34 will be self-supporting and accordingly it will not require the use of a porous material such as may be necessary with a more fluid electrolyte. Battery means 34 is in contiguous electrically conductive contact to the portion 32 of the electrical resistance element 26 as seen best in FIGURES 4 and 5. Accordingly, it may be seen that the portion 32 of the electrical resistance element 26 cooperates to function as one terminal of the battery means 34.

The other terminal 36 of the battery means 34 is secured to the battery as seen best in FIGURES 3 and 4. The terminal 36 is in contiguous electrically conductive contact with the battery means 34 in spaced apart relation to the terminal portion 32 of the electrical resistance element 26.

The battery means 34 and its integral terminal portions 32 and 36 are protected against dehydration of the electrolyte, and short-circuiting between the terminals 32 and 36, by means of being encapsulated to the disk 24 by means of a suitable synthetic resinous layer 38. As seen best in FIGURES 3 and 4, the resinous layer 38 is applied with a generally circular configuration with a portion of the radius omitted so as not to cover the switch means 30. The resinous layer 38 is preferably formed of a synthetic resin such as silicone rubber of the type which is somewhat resilient upon curing so as to permit a reasonable amount of expansion of the resinous layer 38 to preclude rupturing of the resinous layer 38 due to expansion of any gaseous matter contained within the battery 34. A suitable silicone rubber is marketed

under the trademark of "Silastic" by the Dow Chemical Corporation.

As seen best in FIGURES 3 and 4 the portion of the terminal 36 adjacent the portion 28 of the electrical resistance element 26 is formed in a manner so as to normally be biased into electrically conductive contact with the member 28. Accordingly, it may be seen that the portion 28 is of the electrical resistance element 26 and the terminal 36 of the battery means 34 cooperate to form the two contacts of the switch means 30.

The switch means 30 further includes a non-conductive element 40 which is normally interposed between the contacts 28 and 36 as seen best in FIGURES 3 and 4. The non-conductive element, or tab 40 is held in the position shown in FIGURES 3 and 4 by virtue of the fact that the bias on the terminal 36 retains it in this position until such time as it is manually withdrawn by grasping the free end of the tab 40 and withdrawing the same. When the tab 40 is withdrawn a circuit will be completed from the battery 34 to the electrical resistance heating element 26 and the element 26 will glow incandescently.

As seen in FIGURE 4 the heat producing device 20 may be wrapped in a suitable combustible material, such as paper, for example with the tab 40 projecting there-through. The outer wrapping 42 merely facilitates securing the heat producing device 20 to the cigarette 22 as seen best in FIGURE 1. It will be understood of course, that the outer wrapping 42 does not form a part of the present invention but merely facilitates in illustrating one manner in which the heat producing device 20 may be adapted to be secured to a cigarette, or the like, with the electrical resistance heating element 26 adjacent the tobacco 23 of the cigarette 22, or the like.

Referring now to FIGURES 6 through 10 there is illustrated another embodiment of the heat producing device which may be utilized to heat the contents of containers, or the like. The various elements of the heat producing device illustrated in FIGURES 6 through 10 are analogous to the elements of the heat producing device 20 and accordingly, have been designated by putting a prefix of 1 to their analogous counterparts in the heat producing device 20.

The heat producing device indicated generally at 120 is intended primarily for heating contents of metallic containers, or the like. The heat producing device 120 includes a pair of generally circular flat disks 124 and 125 which are formed of a suitable electrically non-conductive plastic material of a reasonably high thermal resistance, such as thermosetting plastic, for example.

As seen best in FIGURES 7 and 9, electrical resistance heating element 126 is secured to, or formed upon, the generally circular disk 125 by suitable means, such as electro-deposition. As seen best in FIGURE 9 the electrical resistance heating element 126 has an integral portion 135 which is secured to the generally circular disk 125 in opposed relationship to the electrical resistance heating element 126. The portion 135 functions as one terminal of the battery means 134. The electrical resistance heating element 126 is further provided with an integral portion 136 which functions as one contact of the switching means indicated generally at 130.

The battery means 134 is of similar construction to that of battery means 34 in that a suitable inert sponge-like material, such as unoriented glass fibers serve as a sponge for retaining a suitable electrolyte such as a weak hydroxide, for example. Alternatively, the battery means 134 may be formed of a self-supporting relatively rigid paste-like battery electrolyte. The battery means 134 is made with a generally circular configuration which is substantially as large as the disks 124 and 125. The opposite terminal 127 of the battery 134 is formed by a suitable electrically conductive strip or disk which is secured to one side of the disk 124, and assembled in contiguous relationship with the electrolyte of the bat-

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tery means 134 as seen best in FIGURE 9. The terminal 127 is provided with an integral electrically conductive portion 128 which functions as an electrical contact member which is in opposed normally spaced apart relationship to the contact member 136 of the switch means 130. In a manner similar to the switch means 30 of the device 20 the device 120 and its switch means 130 is provided with an electrically non-conductive tab 140 which is normally, that is during non-use of the device 120, interposed between the contacts 128 and 136 of the switch means 130.

The internal elements of the heating device, and particularly the battery means 134, are maintained in sealed relationship by a resilient seal member 138 which is formed of a suitable material such as a silicone rubber for example. The resilient layer 138 is preferably a U-shaped layer which may be provided, for example, by dipping the pre-assembled device 120 in a bath of silicone rubber and rotating the device 120 to suitably seal the edges thereof or adhesively securing a suitable sealing strip around the edge of the device.

The battery means 134 incorporated in the container heating embodiment 120 should preferably have enough energy stored therein to operate the electrical resistance heating element 126 for approximately 10 minutes for example to facilitate heating the contents of the container 122.

In use the container heating embodiment 120 would be secured to the underside of the container by a suitable means, such as a thermally resistant, or thermosetting resin, with the electrical resistance heating element 126 in contiguous relationship with the underside of the container. To heat the contents of the container 122 it would merely be necessary to partially or completely open the top of the container to permit venting of any pressure developed during heating, after which the non-conductive tab 140 would be withdrawn from between the switch contacts 128 and 136 of the switching means 130 allowing them to move into electrically conductive relationship thereby causing an electrical current to flow from the battery means 134 through the electrical resistance heating element 126 thereby causing the electrical resistance heating element 126 to glow incandescently and consequently heat the contents of the container 122. While shown secured to the container 122, it will be understood that the device 120 may be supplied individually, apart from a container in which event it may be provided with a suitable adhesive which may be placed on the upper side of the resilient member 138 adjacent the electrical heating element 126.

While the present device has been illustrated and described as preferably having a generally circular and planar disk-like, or wafer, configuration it will be understood that the device may be of a geometrical configuration other than circular, such as triangular, square, rectangular, etc., for example.

In addition, the device may be constructed or subsequently formed in such a manner so as to conform to the configuration of the device with which it is utilized, i.e., the wafer-like device could be bent to conform to the corner of a rectangular container for example, in which case the device per se would be planar but utilized in a non-planar configuration.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. In a portable electrically operated heat producing device having a disk-like configuration, the combination of a battery means, said battery means having a generally circular flattened configuration, a pair of battery terminals positioned contiguous with the flat faces of the battery, a pair of generally circular electrically non-conductive thermally resistant members in overlying contiguous relationship to said battery terminals, an electrical resistance heating element carried by one of said non-conductive members exteriorly of said terminal member, said electrical resistance heating element being conductively connected to said terminal member, means conductively connecting said electrical resistance heating element to the other terminal of said battery means, a switch means interposed in said circuit means, said switch means being secured exteriorly of said second electrically non-conductive thermally resistant member in axially opposed relationship to said electrical resistance heating element.

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2. The structure of claim 1 wherein said switch means includes a pair of contact members, one of said contact members being integral with said electric heating element connected to one of said battery terminals, said other contact member being integral with said other battery terminal, said switch means further including an electrically non-conductive member normally interposed between said opposed switch contact members, said electrically non-conductive member of said switch means being selectively removable thereby permitting said switch contact members to come into electrically conductive relationship to energize said electrical resistance heating element.

3. In a portable electrically operated heat producing device having a disk-like configuration, the combination of a battery means, said battery means having a generally circular flattened configuration, a pair of battery terminals positioned contiguous with the flat faces of the battery, a pair of generally circular electrically non-conductive thermally resistant members in overlying contiguous relationship to said battery terminals, an electrical resistance heating element carried by one of said non-conductive members exteriorly of said terminal member, said electrical resistance heating element being conductively connected to said terminal member, means conductively connecting said electrical resistance heating element to the other terminal of said battery means, a switch means interposed in said circuit means, said switch means being secured exteriorly of said second electrically non-conductive thermally resistant member in axially opposed relationship to said electrical resistance heating element.

4. In a portable electrically operated heat producing device having a disk-like configuration, the combination of a battery means, said battery means having a generally circular flattened configuration, a pair of battery terminals positioned contiguous with the flat faces of the battery, at least one generally circular electrically non-conductive thermally resistant member in overlying contiguous relationship to one of said battery terminals, an electrical resistance heating element carried by said non-conductive member exteriorly of said terminal member, said electrical resistance heating element being conductively connected to said terminal member, means conductively connecting said electrical resistance heating element to the other terminal of said battery means, a switch means interposed in said circuit means, said switch means being secured to one of said battery terminals in opposed relationship to said electrical resistance heating element, and a seal member adapted to maintain the battery means in an operative condition for a reasonable period of time.

5. The structure of claim 4 wherein said switch means includes a pair of contact members, one of said contact members being integral with said electric heating element connected to one of said battery terminals, said other contact member being integral with said other battery terminal, said switch means further including an electrically non-conductive member normally interposed between said opposed switch contact members, said electrically non-conductive member of said switch means being selectively removable thereby permitting said switch contact

members to come into electrically conductive relationship to energize said electrical resistance heating element.

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