Oct. 8, 1957 L. K. DAVIS 2,809,266

ELECTRIC CIGARETTE LIGHTER

Filed April 6, 1953 3 Sheets-Sheet 1

Fig. 1.

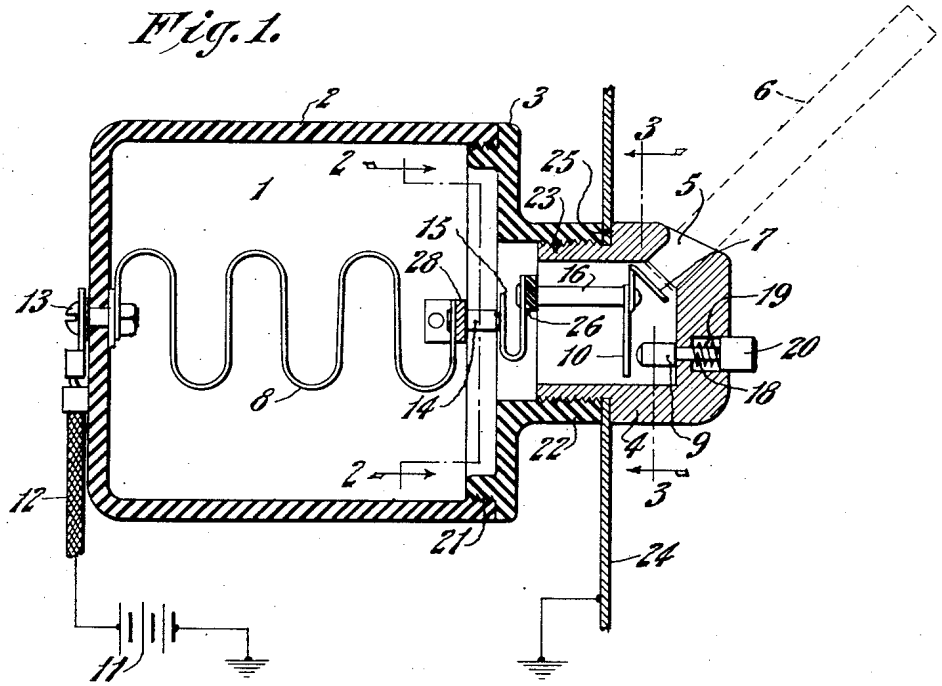


Fig. 2.

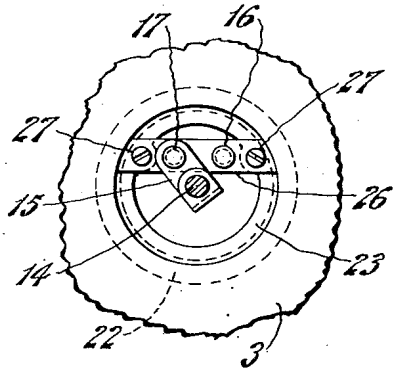
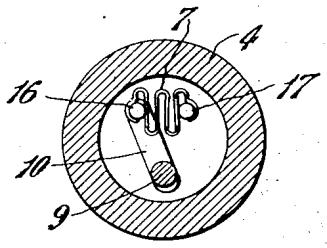


Fig. 3.



INVENTOR
Lincoln K. Davis,
BY Chapin & Neal
ATTORNEYS

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ELECTRIC CIGARETTE LIGHTER

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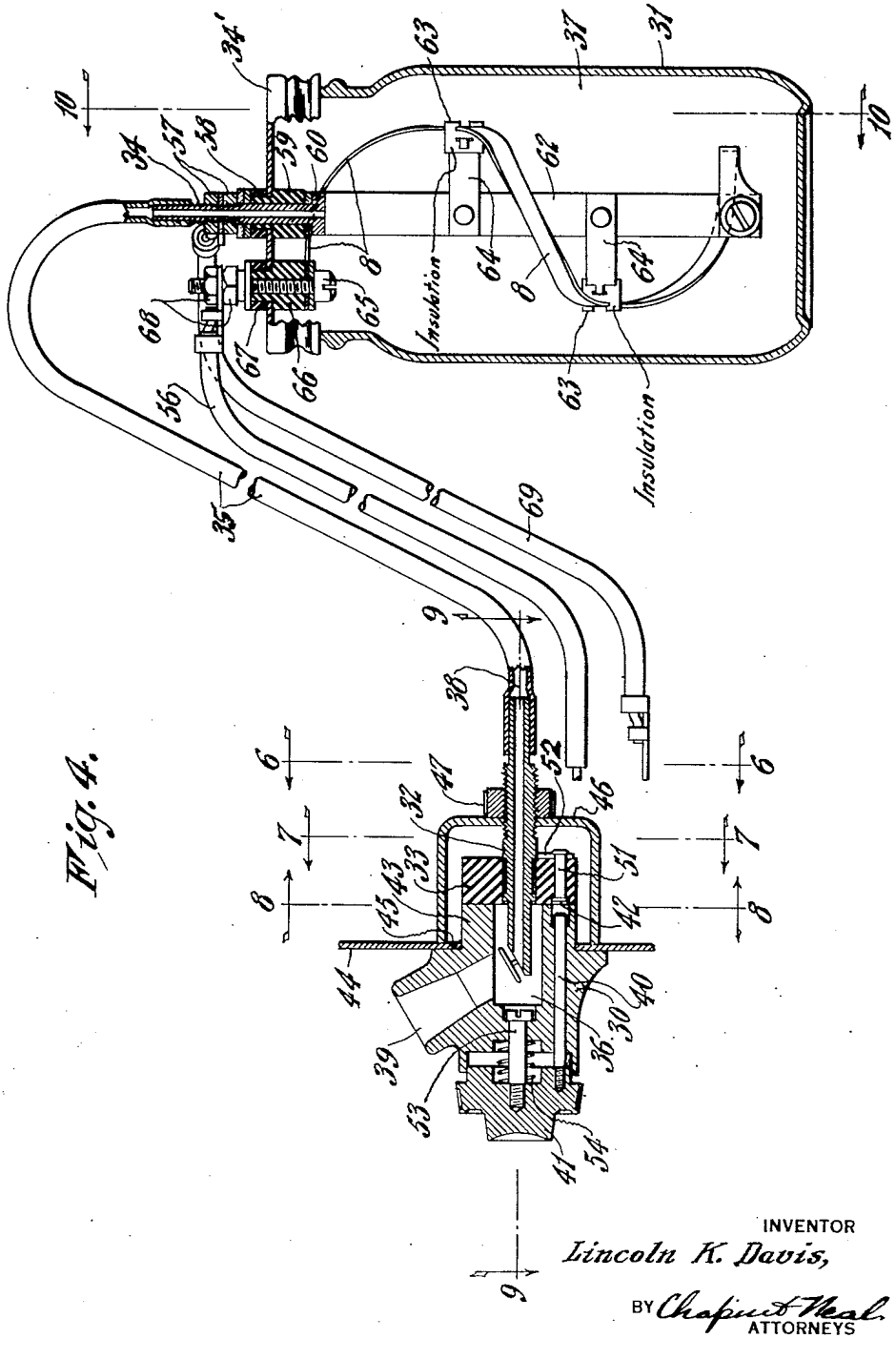

Fig. 4.

INVENTOR
Lincoln K. Davis,
BY Chapin & Neal
ATTORNEYS

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Fig. 5.

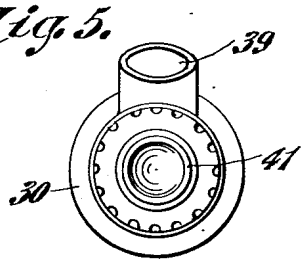


Fig. 6.

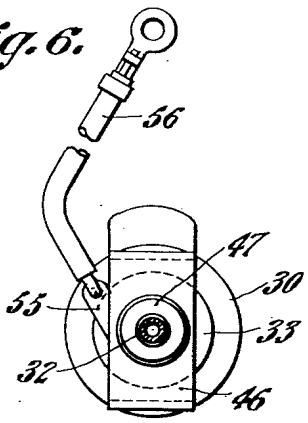


Fig. 7.

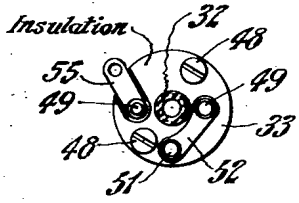


Fig. 10.

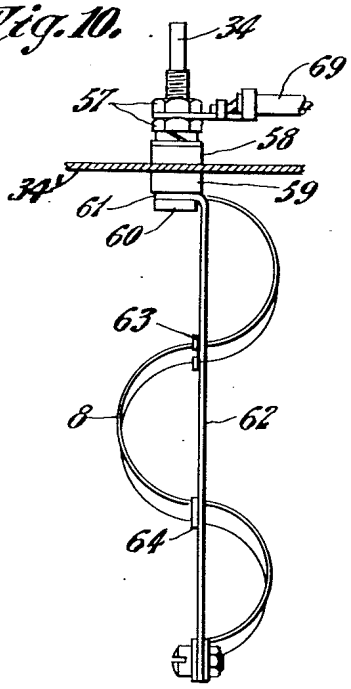


Fig. 8.

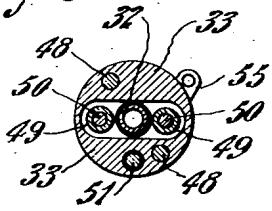
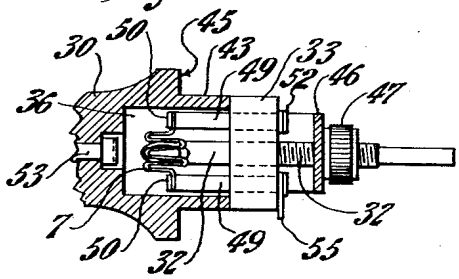


Fig. 9.



INVENTOR
Lincoln K. Davis,
BY Chapin & Neal
ATTORNEYS

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ELECTRIC CIGARETTE LIGHTER

Lincoln K. Davis, Brockton, Mass.

Application April 6, 1953, Serial No. 347,016

3 Claims. (Cl. 219—32)

This invention relates to improvements in electric cigarette lighters, such for example as are adapted to be mounted on the instrument panel of an automobile for operation at the relatively low and often variable voltage available from the storage battery of the automobile.

The invention is of that class in which ignition of a cigarette is effected by an electrical resistor, rendered incandescent for the purpose, and combustion is stimulated by forcing air through the cigarette, flow of air being effected by expanding air within a confined space by means of heat derived from an electrical resistor aided by the igniting resistor, the arrangement being such that the cigarette, while being ignited, forms the only exit from the air space. The air flow through the cigarette is thus effected without the use of mechanical pumping means.

One prior art example of this class of lighter will be found in my Patent No. 1,983,738, granted December 11, 1934. The lighter of this patent was intended primarily for table use in the home and the time required for lighting the cigarette was not a particularly important factor. Current in the two resistors was substantially constant and had to be kept within low limits in order to prevent the resistors from burning out in case the circuit was kept closed longer than necessary for ignition of the cigarette. The igniting resistor was relatively slow in becoming incandescent and the air flow had to be delayed until the igniting resistor was hot enough to function. The time delay was secured by thermal inertia, the slowness in expanding the air in the air chamber with the amount of heat applied. The volume of the air space was relatively small, providing outflow of air through the cigarette for only a short interval of time.

For automobile use, time is of the essence and the lighting of the cigarette must be effected as quickly as possible, in two or three seconds, and with a minimum of effort on the part of the operator so as to detract as little as possible from his attention to the work of driving the automobile. At the same time, provision must be made to prevent the igniting resistor from burning out, when the operator does not immediately withdraw the cigarette immediately after it is lighted and maintains the circuit closed longer than necessary.

This invention has for its general object the improvement of a cigarette lighter of the class described to provide faster ignition, longer flow of air through the cigarette and better timing of the air flow with relation to the action of the igniting resistor.

More particularly, it is an object of this invention to provide in a cigarette lighter of the class described an air-heating resistor which has a higher temperature coefficient of resistance and which is connected in series circuit with the igniting resistor, the arrangement being such as to allow initially and for a brief interval current in the circuit of a value that is higher than would be safe for prolonged operation, whereby the igniter may be rendered incandescent almost instantaneously and made to deliver for a brief interval much more heat than would otherwise be possible, whereby to heat the relatively large volume of air that is necessary in order to secure air flow over the relatively long time interval desired and do so quickly enough so that the air flow through the cigarette will commence immediately following ignition of the latter.

These and other objects will more particularly appear from the following description of the invention with reference to the accompanying drawings, in which,

Fig. 1 is a sectional elevational view of a cigarette lighter embodying the invention;

Fig. 2 is a cross sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a cross sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a sectional elevational view of a second form of cigarette lighter embodying the invention;

Fig. 5 is an exterior front elevational view of the cigarette holding casing of the lighter;

Fig. 6 is a cross sectional view taken on the line 6—6 of Fig. 4;

Fig. 7 is a cross sectional view taken on the line 7—7 of Fig. 4;

Fig. 8 is a cross sectional view taken on the line 8—8 of Fig. 4;

Fig. 9 is a fragmentary sectional plan view taken on the line 9—9 of Fig. 4; and

Fig. 10 is a fragmentary cross sectional view taken on the line 10—10 of Fig. 4.

Referring to these drawings, the cigarette lighter in general utilizes two electrical resistors, located within and adapted for heating the air within a confined space and by expansion of the air causing an outflow of air through a single passage, which forms the only outlet from such space. In this passage, the cigarette to be ignited is inserted so that it closely fits the walls of the passage, thereby forcing the outflow of air to pass through the cigarette, while the latter is ignited by one of the resistors, which becomes incandescent for that purpose. This air space may be formed within a housing-means of any suitable form, composed of one or more chambered casing elements, the hollow interiors of which are interconnected to form the air space.

In the example shown in Fig. 1, the air space 1 is formed within the casing elements 2, 3 and 4, which enclose the space except for a single passage 5, which is of a size to receive and closely fit a cigarette, indicated by dotted lines at 6, the inner end of which lies adjacent to the inner end of passage 5 and closely adjacent to a first electrical resistor 7. This resistor is suitably connected in series with a second electrical resistor 8 in an electrical circuit which includes a suitable control switch, such as the elements 9 and 10, and which is adapted to be connected to a suitable source of electrical supply, such as the storage battery, indicated diagrammatically at 11, of an automobile.

Referring next to the details of the exemplary apparatus shown in Fig. 1, the described electrical circuit includes ground, battery 11, wire 12, metal bolt 13, ballast resistor 8, metal post 14, metal leaf spring 15, metal post 17, igniter resistor 7, metal post 16, switch blade 10, grounded switch element 9. It will be understood that switch element 9 is integral with the rod slidably mounted in, and in electrical connection with, the metallic grounded casing element 4, and adapted, when manually pressed inwardly, to engage the spring switch blade 10 and close the described circuit. A spring 19 coiled around rod 18 and acting between casing element 4 and pushbutton 20 affixed, as by screw threads, to rod 18, yieldably holds the switch elements 9 and 10 disengaged when the circuit is open. The casing 2 is of non-conducting material.

As to the particular housing-means shown, the casing element 2 is of hollow cylindrical form, preferably of heat-insulating and electrical-insulating material and having one integral end wall. The element 3 has a part 21 screw-threaded into the other end of cylinder 2 and an interiorly threaded tubular part 22 receiving the exteriorly-threaded tubular part 23 of casing element 4. The part 23 is adapted to pass through a hole in the metallic instrument panel 24 of an automobile until a shoulder 25 on the casing 4 abuts the outer face of the panel. The part 22 serves as a nut to clamp the shoulder 25 against the panel 24. The posts 16 and 17 are fixed to a cross bar 26 of insulating material, which is fixed at its ends by screws 27 (Fig. 2) to the inner end face of tubular part 23. The post 14 is fixed to a cross bar 28, the ends of which are secured, as indicated, to the peripheral wall of casing element 2.

This invention is characterized in that the resistor 8 has a high temperature coefficient of resistance, whereby its resistance increases with its temperature from a relatively low value at the low limit of its operating range of temperature, to a relatively high value at the high limit of such range. The increase in resistance which occurs during the temperature rise of the resistor 8 within these limits, is several hundred percent and, in this particular example, about 550 percent. The resistor 7, on the other hand, does not change materially with the rise in its temperature throughout its operating range, varying for example no more than 10 percent. The effect of the arrangement described is to produce initially a flow of current in the circuit which is of a value greater than would be safe to use for more than a very short time. This high current, which lasts but a moment, is checked by the increase in resistance of resistor 8, as its temperature rises, until the current falls to a minimum value which is safe for prolonged operation. For example, in the present example, the current is initially about 17 amperes and decreases in about two seconds to 7.5 amperes. The result is the production quickly of a high initial heat, whereby the igniting resistor 7 is instantly rendered incandescent and very hot to quickly heat up the inner end of a cigarette and ignite the same and also to quickly heat the air confined in the air space 1. Both resistors serve to heat such air. As the air is heated, its pressure increases, until it becomes great enough to cause air flow through the cigarette. There is always a certain amount of delay in building up pressure in this manner because of thermal lag. The extent of such delay will vary according to the volume of the air space, the mass of resistor 8, and the amount of heat applied to heat the air in such space. By reducing the volume of the air space, the delay in producing the outflow of air through the cigarette can be reduced for any given amount of heat applied. However, it is essential to have enough volume of air space to secure outflow of air through the cigarette for a long enough time and also to supply sufficient oxygen for combustion. Flow of air starts only when the air has been heated enough to build up the pressure to the value necessary to force air through the cigarette and it continues only while the pressure is at or above such value. Usually, a pressure, corresponding to 9 or 10 inches of water, will suffice for the purpose. After the air in the space has been heated to the maximum degree possible, the air will flow through the cigarette only until the pressure in the air space has been reduced below such value. The time of air flow through the cigarette depends on the volume of the air space and it is therefore necessary to maintain a certain minimum volume. A volume of from 10 to 15 cubic inches is considered adequate. The volume of the air space in the present example is about half a pint.

The invention enables the use of the relatively large air space, which is necessary to maintain outflow of air for the relatively long interval necessary, and offsets the

increase in delay, due to thermal lag, by the large increase in heat obtained by the use of the resistor 8, which allows for a short interval, a much higher heat than would be possible to obtain with an ordinary resistor and the current available for the purpose. The outflow of air is to timed that it starts only after the current flow has decreased somewhat from its high initial value. Therefore, the resistor 7 will not be subjected to the cooling effect of the flow of air past it until it has had time to heat and ignite the cigarette. The temperature of the air, when it flows outwardly is considerably less than that of the temperature of resistor 7, when the maximum current passes through it, and hence there would be a substantial heat exchange between resistor 7 and the air, which exchange would result in lowering the temperature of resistor 7 from the high maximum value desired for the short time. While the outflow of air should not occur until after this high initial current flow, it should not be delayed long and should commence before the current flow has decreased to its minimum value. The desired condition is to blow air through the cigarette as soon as it is ignited by the high initial heat. With the described arrangement, the air will flow through the cigarette in about one second after the switch 9, 10 is closed and the cigarette will be fully lighted and ready to be withdrawn in about two seconds. If the operator does not then withdraw the cigarette, the air flow will continue for five or six seconds and the igniting resistor 7 will be maintained at its minimum safe temperature so that the cigarette will be kept lighted.

One illustrative example of values which have been found suitable for the electrical elements of a six-volt cigarette lighter will be given. The resistor 7 is made of ordinary resistance wire and has a resistance of .21 ohm, which increases with the rise in temperature that occurs, only about 9 percent. The resistor 8 is made of ordinary shim stock (soft steel), having a thickness of .002 inch, a width of .14 inch and an effective length of 7¾ inches. The resistor 8 has a temperature coefficient of resistance of .0016 percent per degree centigrade. Its resistance will vary from a low value of .12 ohm to a high value of .66 ohm during the temperature rise that normally occurs. The increase in resistance of resistor 8 is thus 550 percent. The volume of the air space is approximately 15 cubic inches. With these values, the current in the circuit is initially 17 amperes and decreases to 7.5 amperes in 2 or 3 seconds. Initially, 102 watts is dissipated in heat for quickly expanding the air to the pressure necessary to start flow through the cigarette and is reduced more than one-half to 45 watts in the 2 to 3 second interval. Outflow of air through the cigarette starts in about one second after closure of the switch and continues for 5 to 6 seconds. In about one second after the switch is closed, smoke will commence to issue from the cigarette and in another second or two the cigarette will be fully lighted and may be withdrawn. On the other hand, if the cigarette is not then withdrawn, the current flow will be held to a safe value to prevent the resistor 7 from burning out. The resistor 8, therefore, acts as a ballast for the igniting resistor 7.

In the embodiment of the invention shown in Figs. 4 to 10, the housing means (Fig. 4) includes separate chambered casing elements 30 and 31, the hollow interiors of which are interconnected by a conduit, including a tube 32 fixed to the cap 33 of casing 30, a tube 34 fixed to the cap 34' of casing 31 and a flexible hose 35 which interconnects these tubes. The air space comprises the space within the chambers 36 and 37 of casings 30 and 31 and the space 38 within the described conduit. The only exit from this air space is by way of a passage 39, in which the cigarette is adapted to be placed in closely-fitting engagement with the walls of such passage. The igniting resistor 7 is located in the chamber 36 near the inner end of passage 39 and the ballast resistor 8 is located in the

chamber 37. This chamber has about the same volume as the air space 1. As shown it is formed within a half-pint Mason jar, such as is used for canning preserves. The resistors are identical in construction, material and electrical values with the corresponding resistors shown in Fig. 1. These resistors, as before, are connected in series in a circuit adapted to be supplied by a six-volt storage battery of an automobile and controlled by a switch consisting of a rod 40, operable by a push button 41, and a contact 42. The operation of the lighter shown in Fig. 4 is identical with that shown in Fig. 1.

Referring next to the details of the exempiary apparatus shown in Fig. 4; the casing 30 is metallic; has a cylindrical part 43 which passes through a hole in the instrument panel 44 of an automobile; and a shoulder 45 adapted to be drawn against the front face of such panel by means of a U-shaped clamp 46, through the cross bar portion of which the tube 32 passes and the legs of which abut the back face of panel 44, and a nut 47 threaded on tube 32. This cap, which is of insulating material and fixed to casing 30 by two screws 48, as shown in Fig. 7, has fixed thereto two metal posts 49 (Fig. 9), which extend forwardly in chamber 36, one on each side of tube 32, and have fixed to their inner ends, as by screws 50, the ends of the resistor 7. The outlet of tube 32 (Fig. 4) is positioned beneath the igniting resistor 7 in order to direct air through it and through a cigarette when positioned as described in the passage 39. The switch contact 42 is located on the inner face of cap 33 and is fixed thereto by a metal rivet 51, which extends through the cap and has its outer end connected by a conducting strip 52 (Fig. 7) to the outer end of one of the posts 49. The switch rod 40, the inner end of which is adapted to engage contact 42, is slidably mounted in the metallic casing 30 and thus electrically connected by the latter to the metal panel 44 which is grounded to the frame of the automobile. The push button 41, which is of insulating material and is fixed to the outer end of rod 40, has fixed to its inner face a stud 53, which projects through an end wall of chamber 36 and has a head on its inner end adapted to engage such wall to limit the outward movement of the push button under the force of a spring 54. The other post 49 (Fig. 7) has fixed thereto a clip 55, to which is connected one end of a wire 56 (Fig. 6), the other end of which is clamped between two nuts 68, threaded on the outer end of a bolt 65 which clamps the metallic cap 34' of casing 31, as indicated in Fig. 4, between the insulating washers 66 and 67 and clamps one end of resistor 8 between its head and washer 66. This casing 31 is preferably of heat-insulating and electrical-insulating material. The tube 34, which has a head 60 on its lower end, passes upwardly through cap 34' and insulating washers 58 and 59 arranged on opposite sides of the cap and is held in place by one of a pair of nuts 57. Clamped between head 60 and washer 59 is the right-angularly bent upper end 61 of a metallic strip 62, which extends downwardly nearly to the bottom of chamber 37 and has fixed to its lower end the other end of the resistor 8. This resistor is bent in spiral form and supported at locations intermediate its ends by insulators 63, mounted on arms 64, fixed to and projecting outwardly from member 62. Clamped between the nuts 57 is one end of a wire 69, the other end of which is adapted for connection to the ungrounded terminal of the storage battery.

Each form of the invention includes the same essential elements, having the same values and characteristics and functioning in the same way. The second described form of the invention may be more suitable, as a practical matter, for the modern automobile because of the use of a casing such, as 31, which provides within it most of the air space necessary and which may be located at a distance from the instrument panel where more space is available.

This second form of cigarette lighter is disclosed in a copending application for patent, filed December 11, 1952, by Glen A. Guernsey and Arthur H. Green, under Serial No. 325,366, now Patent 2,731,540. In this application are claimed certain features relating to the air nozzle and the construction and mounting of the casing 30.

The invention provides an electric cigarette lighter which is especially adapted for use in automobiles because it affords fast ignition with little effort on the part of the operator. He simply positions a cigarette in the receiving passage, such as 5 or 39, and presses a button, such as 20 or 41, for two or three seconds and the cigarette is lighted. The lighted condition of the cigarette will be manifested by a substantial outflow of smoke from the outer end of the cigarette and then the cigarette should be removed. However, if the cigarette is not immediately removed and the switch button is kept pressed in, no harm will be done because the current in the circuit will have been reduced by the increased resistance of resistor 8 to a value which is safe for prolonged operation. The flow of air is obtained solely by expansion of air due to heat from electrical resistors and occurs automatically in proper timed relation with the ignition, eliminating the need for mechanical pumping means and valves for controlling the timing.

The lighter provides the large volume of air space that is necessary to provide, with the heat available, for the desired air flow through the cigarette for the relatively long time interval necessary. The use of such a large volume of air would, if heated by ordinary resistors, result in increased delay in the commencement of the air flow because of thermal lag. The special type of resistor used, because of its characteristics, provides initially for much higher current in the circuit than could be used continuously, and therefore provides much more heat. This increased heat offsets the thermal delay and enables the desired timing of air flow with relation to ignition. The igniting resistor becomes incandescent instantaneously on closing of the circuit and quickly cooks the inner end of the cigarette, causing ignition thereof, and the air flow to stimulate combustion follows almost immediately after the momentary period of high current in the circuit. The cigarette will be thoroughly lighted in substantially the same time required to heat the igniting resistor of the apparatus of my patent to incandescence, namely in from two to three seconds.

What is claimed is:

1. In a lighter for cigarettes and the like, an airtight casing constituting an air pressure generator having a single opening to the outside, an electric igniter resistor adjacent said opening, said casing being of operatively fixed volume, a holder for snugly holding a cigarette in said opening adjacent said igniter resistor, an electric air-heater resistor within said casing and connected in series with said igniter resistor, characterized in that the air-heater resistor constitutes a ballast resistor having a high temperature coefficient of such value that its resistance at maximum operating temperature during use is at least several times its resistance when cold, whereby, when the electric circuit is first completed through said resistors, the initially large electric current caused by the high temperature coefficient ballast resistor flash-heats the igniter resistor and quickly heats the ballast resistor which generates a puff of fast moving air in timed sequence to light the cigarette.

2. A cigarette lighter according to claim 1 further characterized by the fact that the ballast resistor is in the form of a ribbon to facilitate heat transfer to the surrounding air and to minimize mass of the resistor.

3. A cigarette lighter according to claim 1 further characterized by the fact that said casing is multi-sectional and comprises a relatively small section and a relatively large section, said relatively small section being adapted to be mounted on the instrument panel of an automobile and to support the igniter resistor, said rela-

tively large section being located remotely from the first section and containing the ballast resistor, and a tube section interconnecting said sections.

References Cited in the file of this patent

UNITED STATES PATENTS

1,362,227	Clark	Dec. 14, 1920
1,609,042	Trapet	Nov. 30, 1926
1,983,738	Davis	Dec. 11, 1934
2,052,016	Davis	Aug. 25, 1936
2,135,270	Ashton et al.	Nov. 1, 1938
2,381,726	Davis	Aug. 7, 1945
2,605,380	Bauman et al.	July 29, 1952
2,731,540	Guernsey et al.	Jan. 17, 1956