July 5, 1949. N. B. WALES 2,475,534

ELECTRIC CIGARETTE LIGHTER

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Fig. 1.

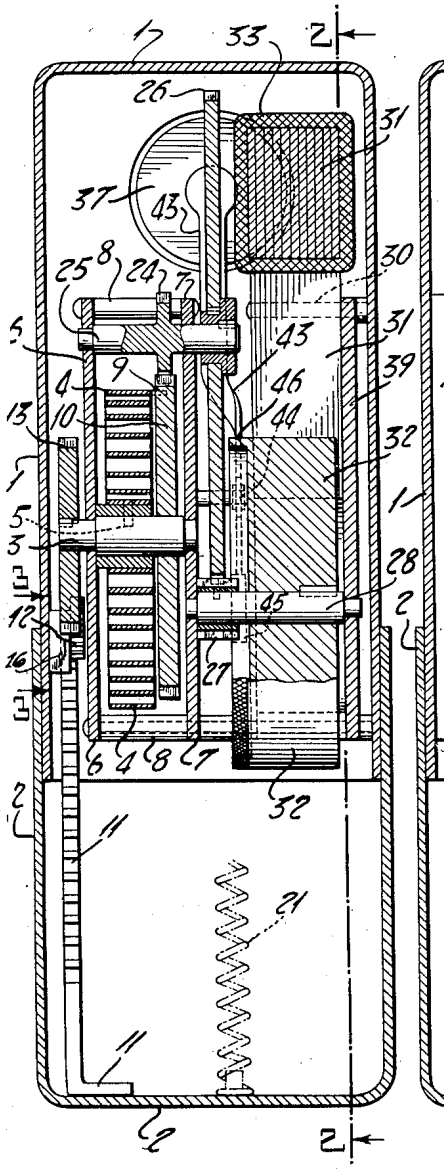
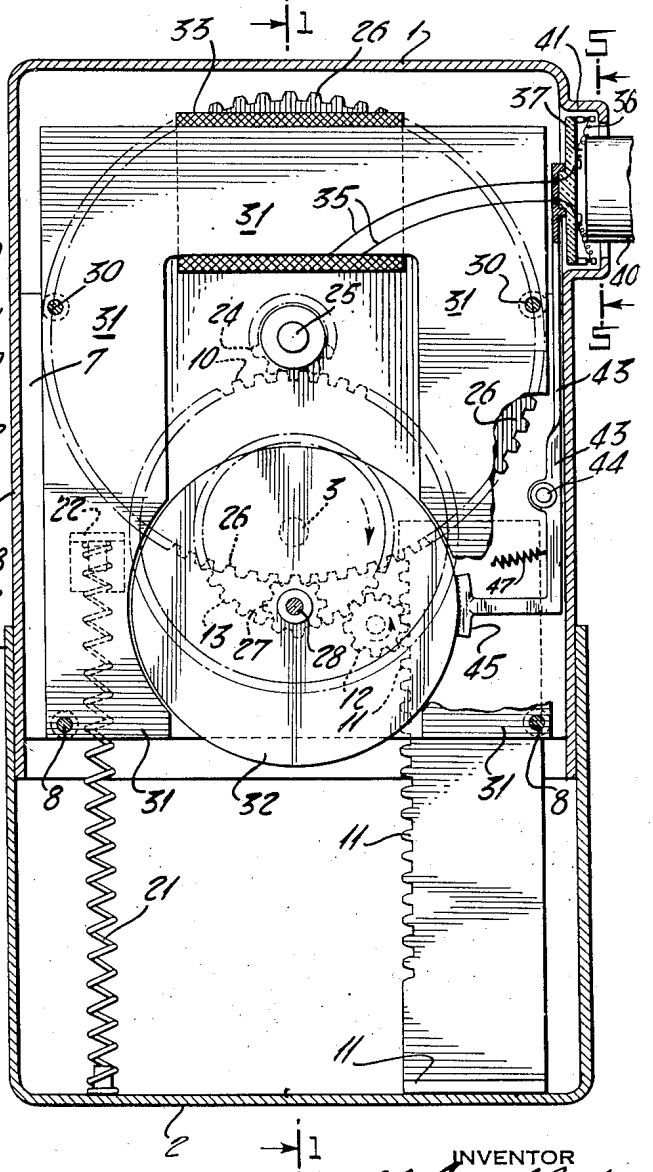


Fig. 2.



INVENTOR

Nathaniel B. Wales

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Fig. 3.

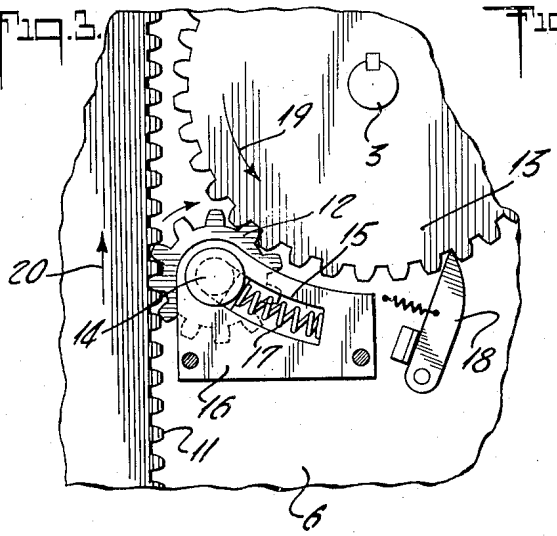


Fig. 4.

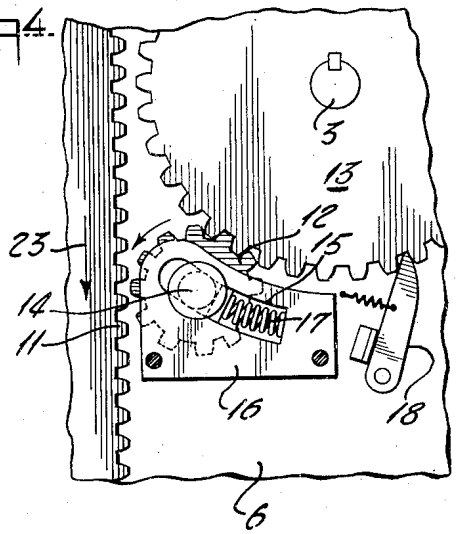


Fig. 5.

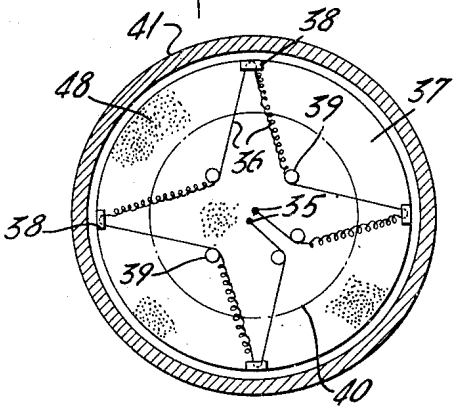
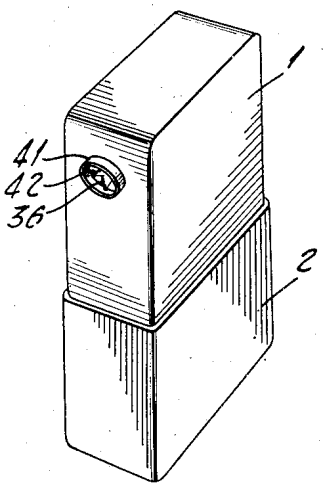


Fig. 6.



INVENTOR.

Nathaniel B. Wales

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UNITED STATES PATENT OFFICE

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ELECTRIC CIGARETTE LIGHTER

Nathaniel B. Wales, New York, N. Y., assignor to Industrial Patent Corporation, New York, N. Y.

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5 Claims. (Cl. 219—32)

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This invention relates to cigarette lighters and its explicit object is to provide means for storing the necessary operative energy for an indeterminate period in the form of a spring prior to the lighter's use.

To light a cigarette, the end of the cigarette is lightly pressed against the resistance grid of the lighter, the stored energy in the spring or its equivalent is thereby automatically released by suitable trip mechanism actuated by a slight displacement of the grid element and the grid is energized by the stored energy operating an electric generator. In this manner, the stored energy is released at the precise instant when energization of the grid is required with the important provision that the cigarette is coincidently in physical contact with the ignition grid for its lighting.

It has been found by much experimentation that it is difficult and awkward to actuate a lever or otherwise forcibly manipulate actuating mechanism necessary for operating the electric generator while at the same time guiding the end of a cigarette onto a relatively small resistance grid.

Another object is to utilize the normal and relatively great gripping force of the hand and not any one finger thereof to compress the case of the lighter which is made telescopic across its major geometric dimension. It is well known that the average person can easily exert a twenty-five pound force in a grip of the hand. The case of the lighter is therefore dimensioned so as to take advantage of this gripping power of the hand to transfer and to store up energy thereby within the actuating spring in the lighter. By experimentation it has been found that the resistance grid requires three watts electric energization over an approximate period of two seconds to readily light a cigarette. If the electric generator has an overall efficiency of 70%, and taking into account the loss inherent in the gear train between the spring and the armature of the generator and the maximum distance through which the case may be compressed by the gripping action of the average-sized hand, which is approximately one inch, while under a force of twenty-five pounds, it requires at least two grippings of the case to store up sufficient energy to be translated into the required wattage. For this reason it is all the more evident that this energy must be generated by successive winding operations which accumulatively store energy due to a plurality of winding actuations and stored prior to the actual lighting of the cigarette and furthermore that an assured grid contact be made coincidently with the limited period of grid energization.

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The reason why the major dimension of the case is compressed by a manual gripping thereof is to increase the available stroke or distance through which the energy of the grip is absorbed without increasing the overall size of the case. All of these factors must be taken advantage of to attain a practical lighter and one which the public will accept.

Another object of this invention is to devise a hot electric resistance grid wherein as the end of the cigarette makes contact therewith, the hot grid will be certain to touch one or more points of the paper wrapper of the cigarette. Cigarette paper has a lower ignition point than tobacco and this important detail facilitates the lighting of the cigarette.

A further object is to recess the resistance grid in a protective housing whereby air currents are minimized and wherein the heat insulative plate which supports the resistance wire is designed to have the smallest thermal contacting surface with the wire so as to conserve the high temperature of the resistance wire for the lighting of the cigarette.

A further object is to facilitate the lighting of a cigarette in the darkness by coating the interior of the grid housing with a glow coat of phosphorescent substance so that the cigarette can be readily directed within the relatively small orifice leading to the grid housing.

This invention also consists in certain other features of construction and in the combination and arrangement of the several parts, to be hereinafter fully described and illustrated in the accompanying drawings and specifically pointed out in the appended claims.

In describing the invention in detail, reference will be had to the accompanying drawings wherein like characters denote like or corresponding parts throughout the several views, and in which:

Figure 1 is an enlarged end section in elevation taken on line 1—1 in Figure 2.

Figure 2 is an enlarged frontal section taken on line 2—2 in Figure 1 with a portion of the generator field laminations broken away to more clearly show the release or trip mechanism contacting the armature of the generator.

Figure 3 is an enlarged view in elevation looking in the direction of arrows 3—3 in Figure 1 to show in detail the ratchet-acting pinion engaging the rack element on its up or case-compression stroke.

Figure 4 is the same as Figure 3 but shows the

disengaging position the ratchet-acting pinion assumes on the down stroke of the rack element.

Figure 5 is an enlarged view taken on line 5—5 in Figure 2 to show the inverted conic form of resistance wire in the ignition element so formed to contact the perifery of a cigarette in contact therewith.

Figure 6 is an approximate actual scaled view in perspective of the electric lighter.

Referring to the drawings, in Figure 1 the exterior case of the lighter is composed of two telescopic case portions, the upper one designated as 1 and the lower as 2. Advantage is taken to permit a long compression stroke, as will be explained in detail later, by telescoping case portions 1 and 2 along the major dimension of the normal contour of the case, see Figure 6. This major dimension of the case being such that it can be encompassed by a gripping of the hand.

Numeral 3 is the shaft for main spring 4, the inner scroll of which is suitably secured thereto by pin 5. Shaft 3 is journaled in bearings formed in parallel bearing plates 6 and 7 secured to each other by studs and spacers 8. The outer scroll of main spring 4 is secured by pin 9 to gear 10, freely journaled on shaft 3. A rack member 11 is suitably secured to lower case 2. Rack 11 is normally in engagement with pinion 12, which in turn is in mesh with gear 13 secured to shaft 3; see Figures 3 and 4. Pinion 12 is journaled in stub shaft 14 which in turn is cradled in arcuate slot 15 in mounting plate 16 therefor, secured to case 1. A spring member 17 secured in slot 15 presses against stub shaft 14 and maintains it in the position in arcuate slot 15 as is seen in Figure 3, so that when the lighter casings 1—2 are manually compressed, the rack 11, see arrow 20, engages pinion 12 which in turn meshes with gear 13 secured to shaft 3 and thereby winds main spring 4. The pawl member 18 overrides the teeth on gear 13 which has been rotated in the direction of arrow 19. When the stroke in the direction of arrow 20 is completed, a relatively weak compression spring 21 positioned between the inner wall of case 2 and a foot support member 22 secured to case 1 having been compressed during the telescoping of cases 1 and 2 now exerts sufficient pressure on the manual release of cases 1 and 2 to return cases 1 and 2 to the position as is seen in Figures 1 and 2. Now as rack member 11 starts to move with case portion 2 in the direction as is seen by arrow 23 in Figure 4, the initial meshing of the rack 11 with pinion 12 carries pinion 12, movably journaled in stub shaft 14, along slot 15 by the continued meshing of pinion 12 with the now stationary gear 13 locked by pawl 18, thus operating as a sun gear thereto, so that spring 17 is compressed, see Figure 4, and any one tooth of rack 11 temporarily passes out of mesh with pinion 12 and thereby permits rack 11 to move in the direction of arrow 23 under the urging of spring 21 in Figure 1. In this manner spring 4 can be progressively wound by the repeated telescopic action, manually induced, by cases 1 and 2.

Returning to Figure 1, the gear 10 meshes with pinion 24 shown integral with shaft 25 which is journaled in bearing plates 6 and 7. Large gear 26 secured to shaft 25 in turn meshes with pinion 27 keyed to shaft 28 journaled in bearing plates 7 and 29. Plate 39 is in spaced relation with plate 7 and is secured to case 1 by suitable stud means 30 and which means likewise secure the laminated field member 31 to case 1. Armature 32 is broken away in Figure 1 to show the armature 32 secured to shaft 28.

A field winding 33 is conventionally wound over the horseshoe-shaped field member 31. The armature 32 is preferably made of Alnico, a permanent magnetic alloy. Suitable electric connections 35 connect the electrical output of field winding 33 with the resistance grid wire 36, see the enlarged view in Figure 5. Grid wire 36 is supported by a Larvite cup 37 which preferably has periferial fingers 38 and inner shorter bosses 39 to which and around which the grid wire 36 is suitably secured to form an inverted conic contour, so that when a cigarette 40, see Figure 2, is contacted therewith, the contact is first made along the perifery of the cigarette to assure a lighting of the cigarette paper, which is less hydroscopic than the tobacco and more easily ignited and which in turn when lighted, forms a temperature ignition feeder to the tobacco. A suitable housing 41 protects the grid wire 36. An orifice 42, see Figure 6, gives accessibility to the cigarette 40 to make contact with the grid wires 36.

One of the important mechanical considerations which becomes an object of the invention and which dominates the lighter's operation is the fact that approximately 4–5 ft. lbs. of energy representing a considerable torque at the main spring's axis, shaft 3, is stored up by the accumulative windings of spring 4. In order to trip or release this torque for generator excitation, for instance by the slight pressure which can be exerted by the end of a cigarette bearing against the resistance grid element 36, it is very necessary to have a sensitive trip mechanism. Therefore, it is preferable to take advantage of the approximately 900 to 1 gear train step-up in R. P. M. between the spring and the armature 32, which greatly reduces this existing torque. I, therefore, take advantage of this torque reduction factor by positioning the trip or release mechanism on the armature of the generator. In this manner I obtain a sensitive acting manual trip release which will be practical and can be maintained in operative condition for thousands of lightings.

In this manner the Larvite cup 37 is suitably secured to a lever 43 which is supported in a fulcrum bearing 44 suitably supported in case 1. The lower end of the lever 43 terminates in a brake shoe or its equivalent 45 bearing against the circumference of the armature 32 which is shown slightly extended at 46, see Figure 1. A light spring 47 biases the lever 43 so that the armature 32 will not revolve during or after winding of main spring 4 unless the shoe 45 is manually relieved of the bias of spring 47 by the pressing of a cigarette end or its equivalent against the grid wire 36 which is displaced inwardly thereby and is coincidently energized by the rotation of armature 32.

From the descriptive operational subject matter already fully described in detail, it is evident that stored energy transferred into the spring 4 by its manual winding is available at any indeterminate time thereafter by the simple and normal operation of contacting a cigarette to the grid element 36 sufficiently to displace it and release brake shoe 45, and while the cigarette contacts the grid 36, the stored energy is thereby released and transferred into wattage which energizes the grid 36 and ignites the cigarette.

To facilitate the lighting of a cigarette by the lighter in the darkness, the interior surface of housing 41 may be coated with a phosphorescent substance 48 in order to guide a cigarette to the

grid **36** by its glow or the Larvite cup **37** may be so coated with substance **48**.

What I desire to protect by United States Letters Patent is encompassed in the following claims:

1. An electric cigarette lighter comprising a case, a main spring therein, an electric generator, a gear train connecting said main spring with said generator, an electric resistance grid displaceably mounted in said case and accessible to the end of a cigarette, electric circuit connections between said grid and said generator, manually actuated means for repeatedly winding said main spring in order to store energy therein and means actuated by the displacement of said grid to release the stored energy in said spring to rotate said generator and thereby energize said resistance grid.

2. An electric cigarette lighter comprising a telescopic case, a main spring therein, an electric generator, a gear train connecting said main spring with said generator, an electric resistance element displaceably mounted in said case and accessible to the end of a cigarette, electric circuit connections between said resistance element and said generator, means to accumulatively wind said main spring by the manual compressions of said telescopic case in order to store up energy therein and means actuated by the displacement of said resistance element by the end of a cigarette in contact therewith to release the stored energy in said main spring to rotate said generator and thereby energize said resistance element.

3. A cigarette lighter comprising a case, a main spring therein, an electric generator, a gear train connecting said main spring with said generator, an electric resistance ignition element pivotally mounted in said case and accessible to the end of a cigarette, electric circuit connections between said ignition element and said electric generator, manually actuated means for accumulatively winding said main spring in order to store energy therein and means through the displacement of said ignition element by the instrumentality of a cigarette to release said stored energy in said main spring to energize said ignition element by the rotation of said generator.

4. An electric cigarette lighter comprising a case, a spring motor, an electric generator, an armature for said generator, a gear train connecting said spring motor with the armature of said generator, an electric resistance grid accessible to a cigarette and pivotally mounted in said case, a brake shoe operatively mounted to contact said armature and means connecting said

pivoted resistance grid with said brake shoe, spring means to normally bias said brake shoe against said armature to prevent said armature from rotation, electric circuit connections between said grid and said generator, manually actuated means for winding said spring motor in order to store energy therein whereby when said grid is moved on its pivot by the pressure of a cigarette in contact therewith, said spring bias is overcome to permit said armature to revolve by the stored energy in said spring motor to energize said grid and ignite said cigarette.

5. An electric cigarette lighter comprising a case, a spring motor, an electric generator, a gear train connecting said spring motor with said generator, brake means to prevent the operation of said generator, an electric resistance grid accessible to a cigarette and piovtally mounted in said case, means connecting said pivoted grid with said brake means, electric circuit connections between said generator and said grid, manually actuated means for winding said spring motor in order to store energy therein whereby when said grid is moved on its pivot by the pressure of a cigarette in contact therewith, said brake means is released to permit said generator to be operated by the stored energy in said spring motor to energize said grid and ignite said cigarette.

NATHANIEL B. WALES.

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