March 1, 1938. T. M. GIBSON 2,110,062

CATALYTIC LIGHTER ELEMENT

Filed Jan. 28, 1936

Fig. 1.

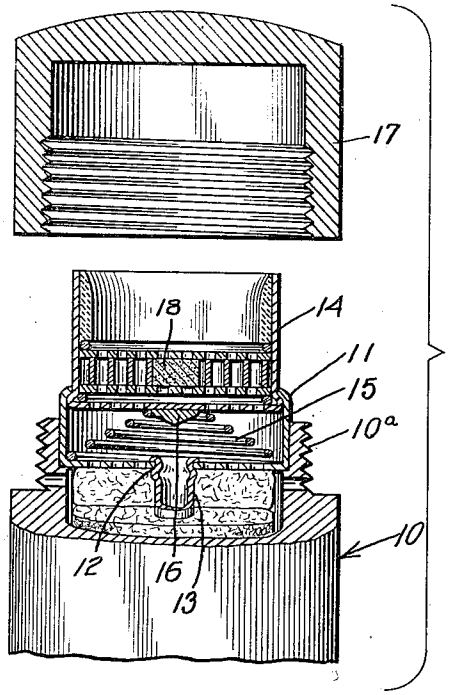


Fig. 2.

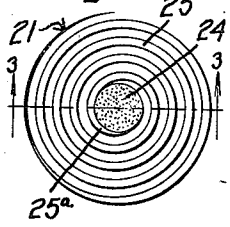


Fig. 4.

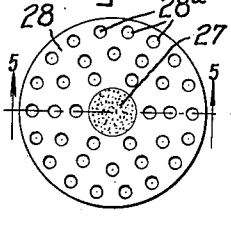


Fig. 6.

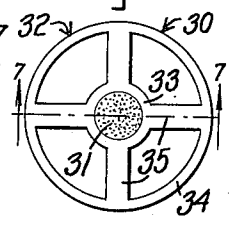


Fig. 8.

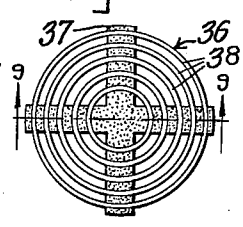


Fig. 3.

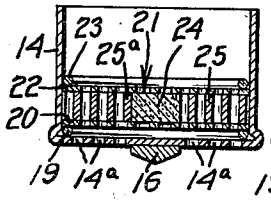


Fig. 5.

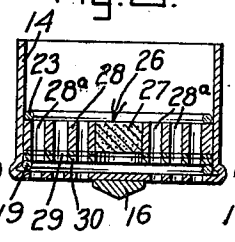


Fig. 7.

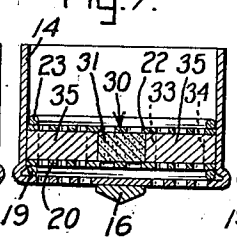
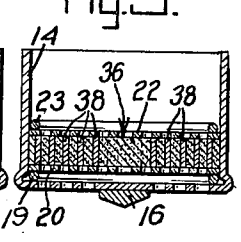


Fig. 9.



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Patented Mar. 1, 1938 2,110,062

UNITED STATES PATENT OFFICE

2,110,062

CATALYTIC LIGHTER ELEMENT

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Application January 28, 1936, Serial No. 61,164

7 Claims. (Cl. 67—7)

This invention relates to catalytic ignition elements, or the like, adapted for use for example in a cigarette lighter.

One of the objects of this invention is to provide a catalytic ignition element which is simple and sturdy in construction and durable under conditions of rigorous use over extended periods of time. Another object of this invention is to provide a catalytic element which is simple and inexpensive to manufacture, and which may readily be installed in a cigarette lighter or the like. Another object is to provide a catalytic element which operates efficiently and reliably, and which rapidly attains a high temperature when subjected to fuel vapors. Other objects will be in part apparent and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which are shown several of the various possible embodiments of the mechanical features of this invention,

Figure 1 is an elevation of a cigarette lighter, partly in section, having my catalytic element disposed therein, a portion of the lighter being broken away, and the cap of the lighter being removed;

Figure 2 is a plan view of one form of my catalytic element;

Figure 3 is a sectional view taken along the lines of 3—3 of Figure 2;

Figure 4 is a plan view of another embodiment of my catalytic element;

Figure 5 is a sectional view taken along the line 5—5 of Figure 4;

Figure 6 is a plan view of another embodiment of my catalytic element;

Figure 7 is a sectional view taken along the line 7—7 of Figure 6;

Figure 8 is a plan view of another embodiment of my invention; and

Figure 9 is a sectional view taken along the line 9—9 of Figure 8.

Similar reference characters refer to similar parts throughout the several views of the drawing.

As conducive to a clearer understanding of certain features of my invention, it might here be pointed out that catalytic elements which have been used in cigarette lighters, or the like, are subject to many inconveniences and disadvantages, both in manufacture and operation. Many of these elements not only fail to operate efficiently, that is they do not attain the desired temperature with sufficient rapidity, but also disintegrate or crumble after a short period of use. These elements are generally characterized by a quantity of platinum black or sponged platinum dispersed through a ceramic material and formed into a pill or pellet. Repeated subjection of these pellets to fuel vapors soon effects disintegration thereof, and I believe that this is due to the repeated expansion and contraction of the ceramic, or perhaps due to the breaking down of the glue or cement which holds the ceramic particles in the form of a pellet. Furthermore, the amount of platinum black which can be dispersed through such a ceramic pellet is relatively small, and this accounts for the inefficient and unsatisfactory operation of the catalytic element. By the same token, assuming that the ceramic does not crumble, the platinum black dispersed therethrough is quite subject to condensation of fuel vapor thereupon, which precludes its catalytic action until the condensed vapor has been driven away. The ceramic, accordingly, in addition to being a vehicle for the platinum black, is also an absorbing vehicle for fuel vapor and accordingly contributes greatly to the inefficiency of the catalytic element. One of the objects of this invention is to provide a catalytic element which obviates the above disadvantages, in addition to many others.

Referring now to the drawing, and to Figure 1 in particular, a casing generally indicated at 10 has secured in the top portion thereof, in any suitable manner, a shell 11, this shell having a hole 12 formed substantially centrally thereof. A fuel vapor conduit 13 is secured in any suitable manner in hole 12, and conducts fuel vapor from the interior of casing 10 into shell 11. A catalyst container 14 is slidably mounted in shell 11, being retained from disassociation therefrom in any suitable manner. A spring 15 is preferably disposed in shell 11 beneath catalyst container 14 and constantly urges the catalyst container upwardly.

Still referring to Figure 1, the bottom of catalyst container 14 is preferably perforate and secured to the bottom of the container is a needle valve, or the like, 16, which when container 14 is in its closed position seats in the top of fuel vapor conduit 13, thus sealing the interior of shell 11 from the interior of casing 10 to preclude the

flow of vapor therefrom. Preferably the top of casing 10 is provided with threads 10a, which threadably receive and retain a cap 17. Cap 17 is preferably so proportioned in relation to container 14 that when the cap is screwed down on casing 10, container 14 is forced into its bottommost position where needle valve 16 closes the vapor exit end of conduit 13.

A catalytic element generally indicated at 18 is disposed in container 14, and is secured therein in a manner that will be more particularly pointed out hereinafter. It may now be seen that when cap 17 is unscrewed from casing 10, spring 15 forces catalyst container 14 upwardly, thus unseating valve 16 from the top of fuel vapor conduit 13. Hence, when a cigarette is introduced into the top of container 14, against catalyst 18, and puffed, fuel vapor is drawn upwardly through conduit 13, shell 11, the holes in the bottom of container 14 and through catalyst 18, which almost immediately glows so that the cigarette may be ignited.

As is more clearly shown in Figure 3, in which is shown one embodiment of my invention, container 14 is substantially cup shaped, and has holes 14a in the bottom. A supporting ring 19 is preferably disposed upon the bottom of container 14 and this ring supports a perforated shield 20, and at the same time spaces it from the bottom of the container. Preferably shield 20 is formed of mica or some similar noninflammable substance. A catalytic element generally indicated at 21 is seated on mica shield 20 and on the top of the catalytic element is another mica shield 22, substantially similar to shield 20. A securing ring 23, substantially similar to ring 19 is disposed upon the top of shield 22 and as this ring is expansible it presses against the inner surface of container 14 to hold shields 20 and 22 and catalytic element 21 in operative position.

With reference to Figure 2, catalytic element 21 is preferably comprised of a pellet 24, preferably of a suitable ceramic material, and containing a dispersion of catalytic material as, for example, platinum black. A metallic coil 25 has its inner end 25a secured to or embedded in ceramic pellet 24, and the convolutions of the coil are concentrically disposed about the pellet. Preferably coil 25 is formed of platinum wire or platinum foil, the thickness of which is preferably on the order of .001 of an inch, and the width of which is preferably on the order of .003 to .004 of an inch. Thus, as is more clearly shown in Figure 3, the cross section of the platinum wire is substantially rectangular. It should also be noted that the thickness of the convolutions of coil 25 are greatly exaggerated in the several views of the drawing, and this to illustrate more clearly the construction of the coil and its relation to the general assembly.

It will be seen, with reference to Figure 3, that fuel vapor drawn through holes 14a, in the bottom of container 14, pass upwardly through the holes in mica shield 20, thence between the convolutions of coil 25 and through ceramic pellet 24, and through the holes in upper mica shield 22. During the passage of the vapor through catalyst 21, the element becomes sufficiently heated to light a cigarette.

I have found that by providing ceramic pellet 24, in which platinum black is dispersed, a rapid heating takes place. Heat is rapidly diffused from pellet 24 and is imparted to convolutions of the platinum coil 25. While pure platinum metal does not become catalytically active until its temperature is approximately 125° F., as soon as this temperature is reached the platinum coil becomes an active catalyzer, more so in fact than the platinum black in pellet 24. After the platinum coil has attained this temperature, it is such an effective catalyzer that the temperature of the entire catalytic element 21 rises to a usable degree with much greater rapidity than if catalyst 24 were comprised entirely of a ceramic having a dispersion of platinum black within it. As the platinum coil is free to expand and contract, and as it does not deteriorate substantially through continued use, the life of catalyst 24 is greatly prolonged. While pellet 24 is of ceramic material, it does not deteriorate or disintegrate rapidly because it is relatively small in size, because it is not subjected to any substantial amount of fuel vapor, and because it is not subjected to prolonged periods of heating.

Referring now to Figures 4 and 5, in which is shown another embodiment of my invention, container 14 (Figure 5) has disposed therein a catalyst generally indicated at 26, disposed between and held in operative positions by rings 19 and 23. Catalyst 26 is comprised of a ceramic pellet 27, containing a dispersion of platinum black, or the like, and disposed about pellet 27 and secured thereto, in any suitable manner, is a disc 28 (Figure 4) preferably formed from a suitable noninflammable substance such as mica. Mica disc 28 has a suitable number of holes 28a extending therethrough, and as is more clearly shown in Figure 5, has applied preferably on the bottom only thereof a noncatalytic metallic coating 29. This coating may conveniently be a mixture of silver oxide and silver acetate, which mutually decompose each other, and by simultaneous reduction of the silver oxide, and oxidation of the silver acetate, yield pure silver as the only nonvolatile residuum. This coating accordingly provides a conductive surface on the bottom of disc 28, which may thereby be readily plated with a platinum coating 30.

Platinum coating 30 (Figure 5) need not be more than .001 of an inch thick as it does not deteriorate substantially upon continued use. Platinum in its pure state is more active as a catalyst after it has been heated, as pointed out above, than is platinum black. Also the only active part of the platinum when employed as a catalyst is the surface thereof. Hence, after pellet 27 has heated, platinum coating 30, as pointed out above with respect to platinum coil 25, catalyst 26 very rapidly attains a usable temperature.

It should also be noted in connection with the embodiment shown in Figures 4 and 5, that instead of using a solid sheet of platinum, or instead of using platinum wire of sufficient bodily strength to provide the required mechanical structure, I am able by applying platinum coating 30 on a nonplatinum material to provide a platinum catalyzer of high activity without using a great amount of platinum. As pointed out above with respect to the platinum coil shown in Figures 2 and 3, the dimensions of pellet 27 (Figure 5) mica disc 28, silver coating 29 and platinum coating 30 are greatly enlarged to illustrate more clearly the construction of my catalytic element.

Referring now to Figures 6 and 7, in which I have shown another embodiment of my catalytic element, container 14 has disposed therein supporting rings 19 and 23 and perforated mica

shields **20** and **22**, between which is disposed a catalytic element generally indicated at **30**. Catalyst **30** is comprised of a ceramic pellet **31**, or the like, (Figure 6) containing a dispersion of platinum black, and has disposed thereabout and secured thereto, in any suitable manner, a substantially wheel shaped catalytic member generally indicated at **32**. Catalytic member **32** is comprised of a hub portion **33**, a rim portion **34** and spoke portions **35** which connect the rim and the hub; hub **33** being secured in any suitable manner to ceramic pellet **31**. Preferably catalytic member **32** is stamped or otherwise formed from platinum foil, the thickness of which preferably does not exceed .003 of an inch. The width of spokes **35**, hub **33** and rim **34** is preferably relatively wide in comparison to the thickness of member **32**, and accordingly present a catalytically active surface of substantial area which becomes active subsequent to preheating by ceramic pellet **31**, as pointed out hereinabove with respect to pellets **24** (Figure 2) and **27** (Figure 4).

With reference to Figures 8 and 9, in which I show another embodiment of my invention, container **14** (Figure 9) has disposed therein a catalyst generally indicated at **36**, this catalyst being supported in the container by rings **19** and **23** and mica shields **20** and **22** substantially, as pointed out hereinabove. Catalyst **36** is preferably comprised of a framework **37** (Figure 8) of ceramic material containing a dispersion of platinum black, or the like. Framework **37** conveniently takes the form of a cross and in this cross or framework I preferably embed rings **38** of a suitable catalytic material, preferably platinum ribbon or wire substantially similar to the wire of which platinum coil **25** (Figure 2) is formed. Platinum rings **38** (Figure 8) being embedded in ceramic framework **37** are accordingly held in substantial concentricity and preferably are so dimensioned as to provide sufficient space between adjacent rings to permit free passage of fuel vapor past and over the surfaces of the rings. Here again the ceramic framework **37** acts as a preheater in bringing the platinum rings **38** up to a temperature where the platinum becomes catalytically active. As pointed out above, after this temperature is reached the platinum rings are so active catalytically that catalyst **36** rapidly attains its operative temperature.

It may now be seen that in each embodiment of my invention I have provided substantial areas of pure platinum which are catalytically more active than a dispersion of platinum black in a ceramic. Furthermore, my catalytic elements permit a freer passage of fuel vapor and a greater catalytically effective surface than would be provided by a ceramic catalytic element of equal over-all dimensions. Hence, I have provided a catalytic element which efficiently attains the objects hereinabove set forth in a thoroughly practical manner.

As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth, or shown in the accompanying drawing, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. As an article of manufacture, a catalytic element comprising a ceramic pellet containing a dispersion of platinum black, and a coil of platinum wire having its inner end secured to said ceramic pellet, said platinum coil being disposed about said pellet.

2. As an article of manufacture, a catalytic element comprising a porous noncombustible pellet containing a dispersion of catalytic material, and a coil secured to and disposed about said pellet, said coil being formed of a metallic catalyzer.

3. As an article of manufacture, a catalytic element comprising a porous noncombustible pellet containing a dispersion of catalytic material, and a coil secured to and disposed about said pellet, said coil being formed of flattened platinum wire.

4. As an article of manufacture, a catalytic element comprising a substantially cylindrical pellet formed of ceramic material, containing a dispersion of platinum black, and a coil of platinum wire secured to and disposed about said pellet, the width of said wire exceeding the thickness thereof.

5. As an article of manufacture, a catalytic element comprising a substantially cylindrical pellet formed of ceramic material, containing a dispersion of platinum black, and a coil of platinum wire secured to and disposed about said pellet, the width of said wire being on the order of .003 to .004 of an inch, and the thickness of said wire being on the order of .001 of an inch.

6. A receptacle having a freely open top of substantially the same cross section as the receptacle and a perforated bottom, a source of supply of fuel below the bottom, an element comprising a body of catalytic material heating quickly upon passage of fuel vapor therethrough, and a second catalytic material in heat absorbing relation to said first catalytic material said second catalytic material having the property of becoming catalytic to fuel vapor upon absorption of heat, and means for retaining said element in the receptacle considerably below its top.

7. As an article of manufacture, a catalytic element comprising a container having a bottom provided with a plurality of perforations extending across substantially its entire area, a pair of perforated non-inflammable shield members disposed in said container and covering its entire cross-section, a catalytic element disposed in said container between said shield members and supported thereby and means for supporting said shield members out of contact with the container bottom.

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