United States Patent

[11] 3,574,502

[72] Inventors **Douglas S. Fuller**
Ockham;
Bruce Lester Reid, London; Arthur T. Theobald, Great Bookham, England;
Leandre A. Guenin, Geneva, Switzerland

[21] Appl. No. **743,870**
[22] Filed **July 10, 1968**
[45] Patented **Apr. 13, 1971**
[73] Assignee **Ronson Corporation**
Woodbridge, N.J.
[32] Priority **July 11, 1967**
[33] **Great Britain**
[31] **31921/67**

[54] **MECHANISM FOR SHIELDING A CARTRIDGE CONTAINING A PYROPHORIC SUBSTANCE**
14 Claims, 11 Drawing Figs.

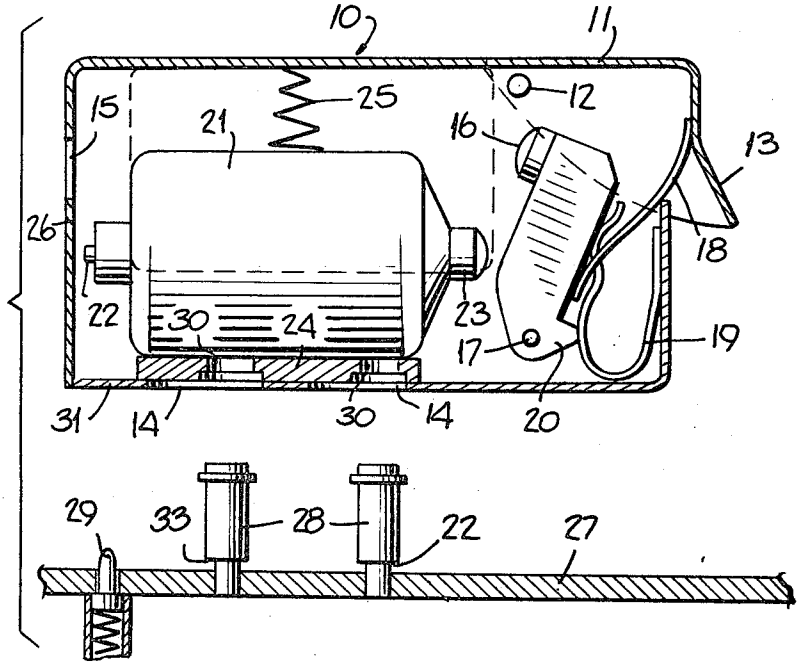
[52] **U.S. Cl.** **431/267**
[51] **Int. Cl.** **F23q 2/00**
[50] **Field of Search** 431/267, 269

[56] **References Cited**
UNITED STATES PATENTS

3,360,965	1/1968	Spreter et al.	431/267
3,411,858	11/1968	Fuller	431/267

Primary Examiner—Edward G. Favors
Attorneys—Albert C. Johnson, Robert E. Isner, Lewis H. Eslinger and Alvin Sinderbrand

ABSTRACT: A mechanism for shielding a cartridge containing a pyrophoric substance in which the cartridge is encapsulated and is placed on an ignition device such as a cigarette lighter. The encapsulated cartridge cannot discharge its flammable contents until it is placed within the confines of the ignition mechanism, thereby rendering the cartridge safe to handle when it si removed from the ignition mechanism.



PATENTED APR 13 1971

3,574,502

SHEET 1 OF 4

Fig. 1.

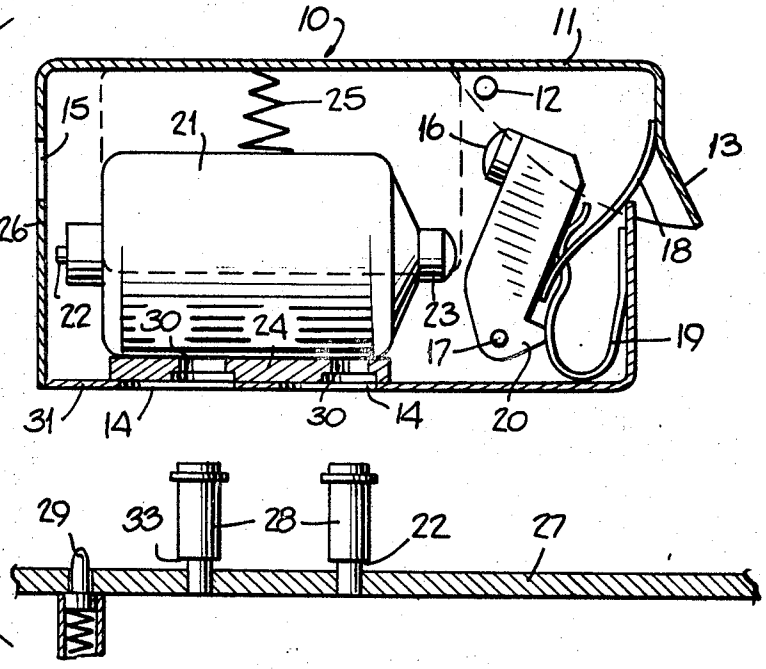


Fig. 2.

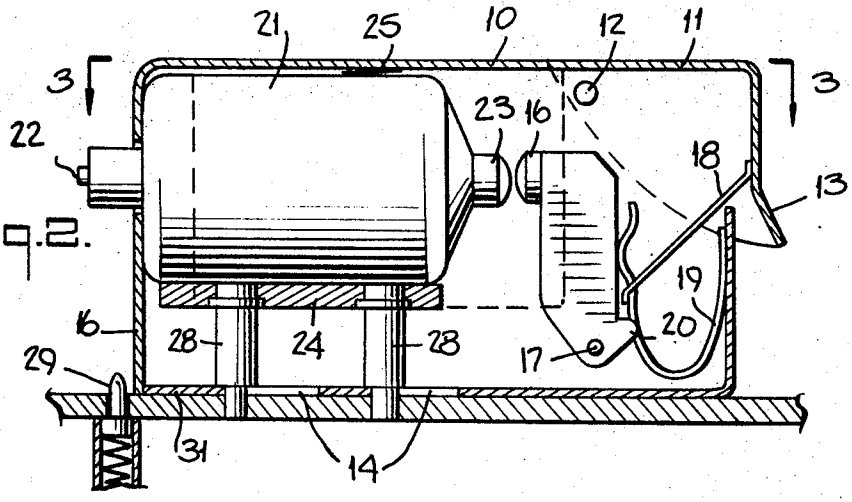
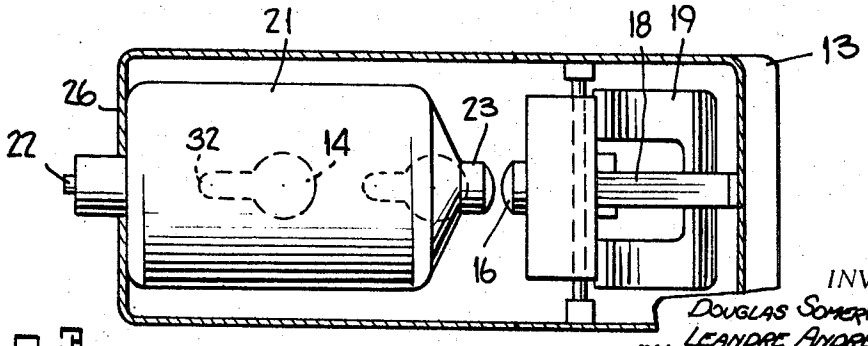


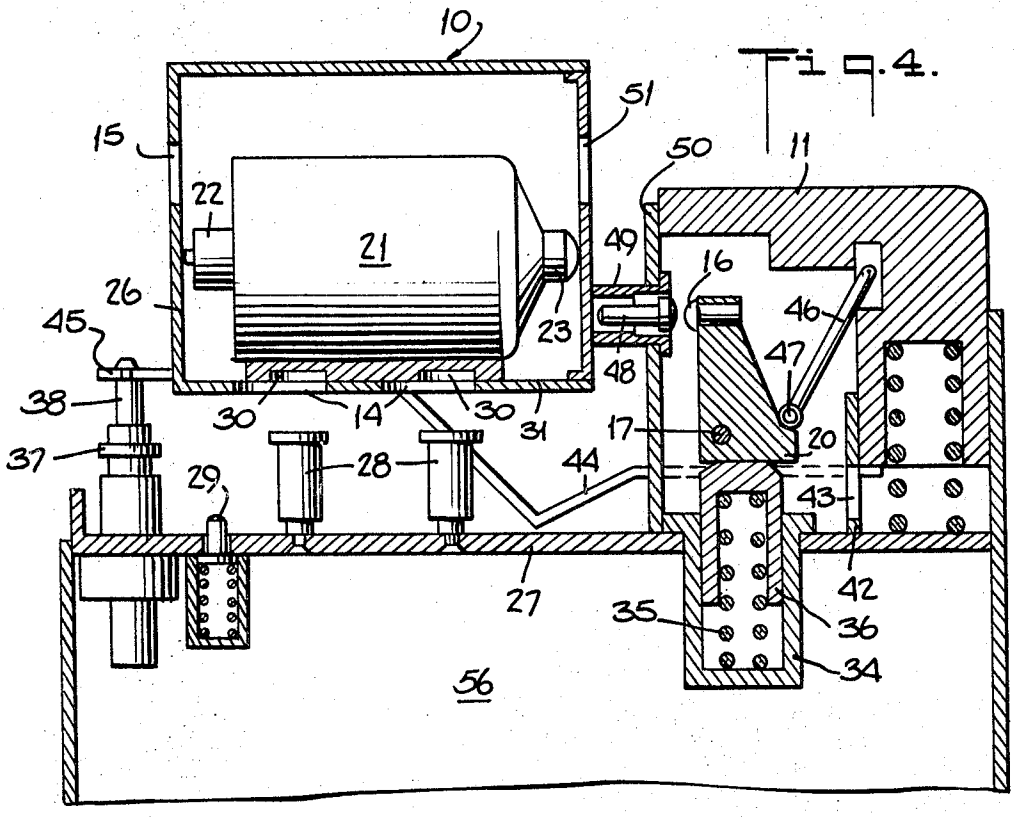
Fig. 3



INVENTORS
DOUGLAS SOMERVILLE FULLER
LEANDRE ANDRE GUENIN
BRUCE LESTOCK REID
ARTHUR TREVOR THEOBALD

BY Louis N. Eslinger
ATTORNEY

Fig. 4.



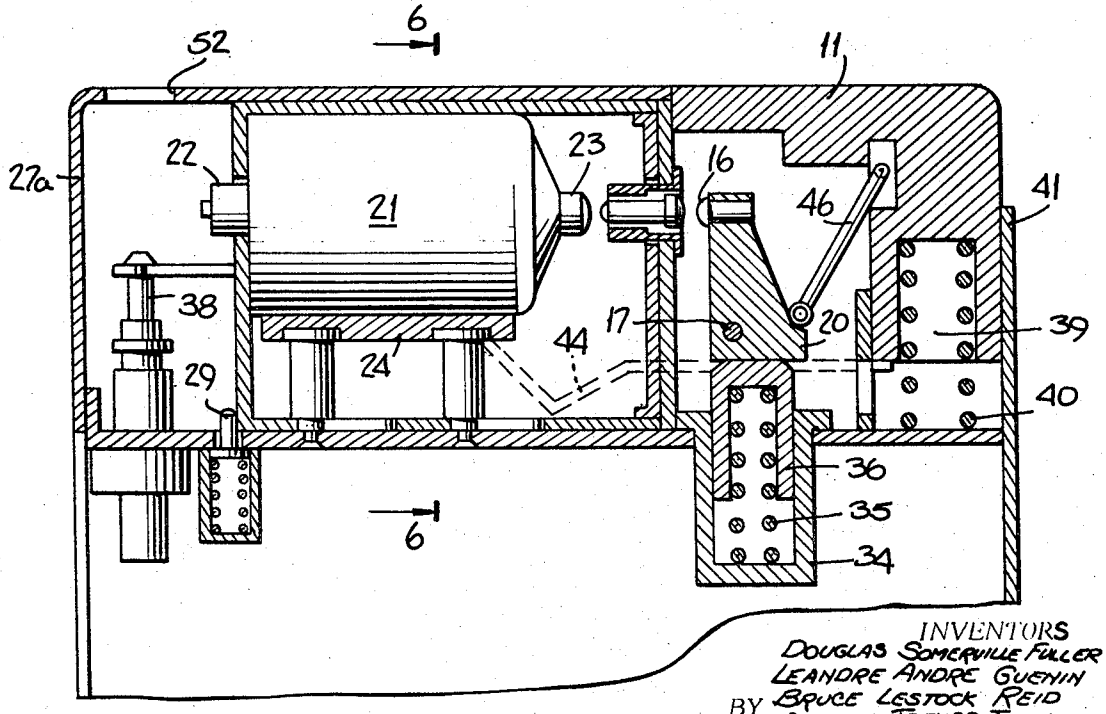


Fig. 5.

INVENTORS
DOUGLAS SOMERVILLE FULLER
LEANDRE ANDRE GUENIN
BY BRUCE LESTOCK REID
ARTHUR TREVOR THEOBALD

Lewis B. Eslinger
ATTORNEY

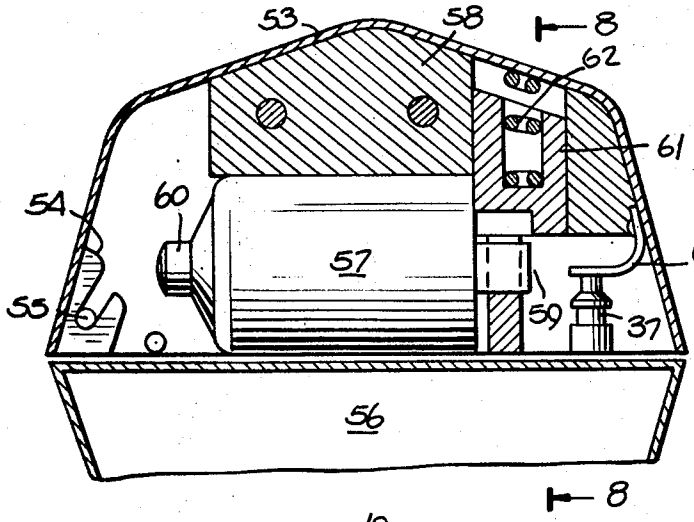


Fig. 7.

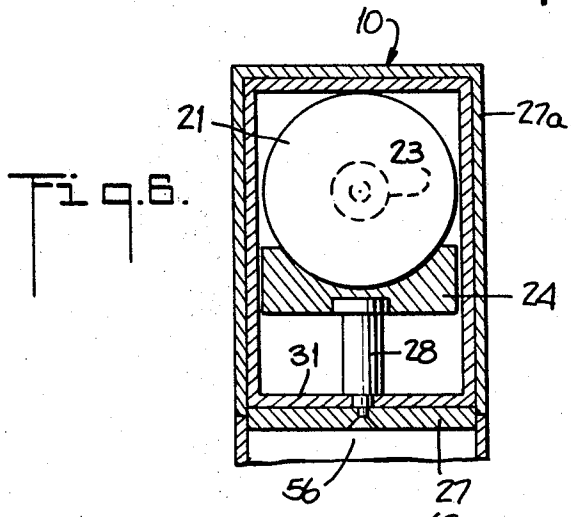


Fig. 6.

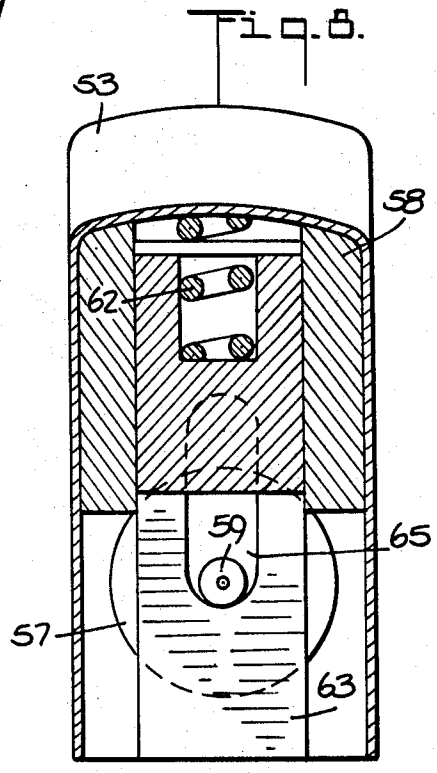


Fig. 8.

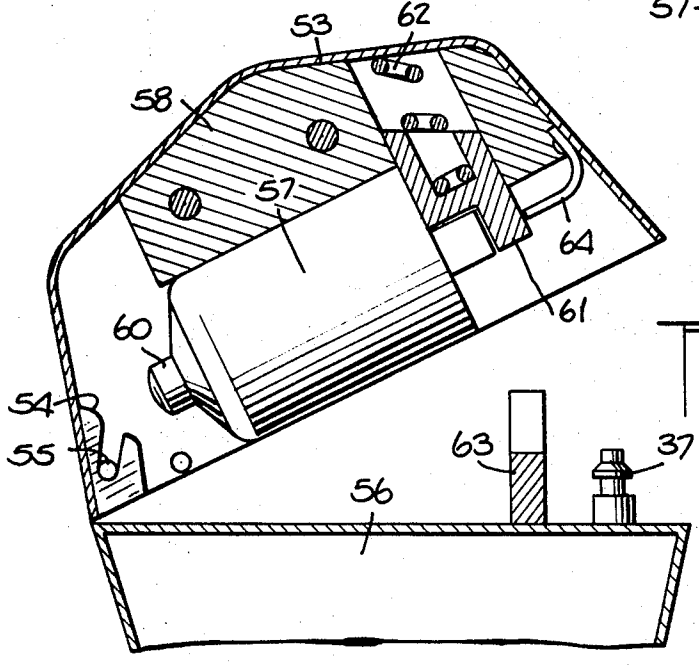


Fig. 9.

INVENTORS
DOUGLAS SOMERVILLE FULLER
LEANDRE ANDRE GUENIN
BY BRUCE LESTOCK REID
ARTHUR TREVOR THEOBALD
Lewis A. Eslinger
ATTORNEY

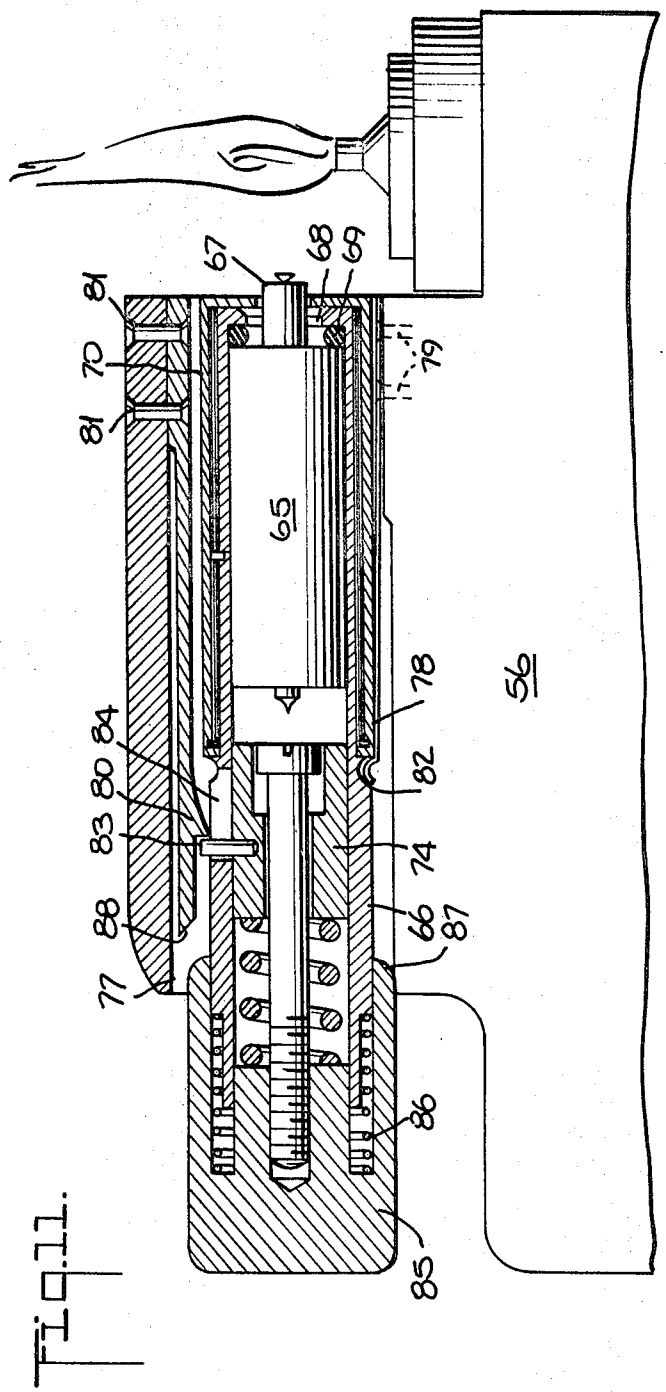


Fig. 11.

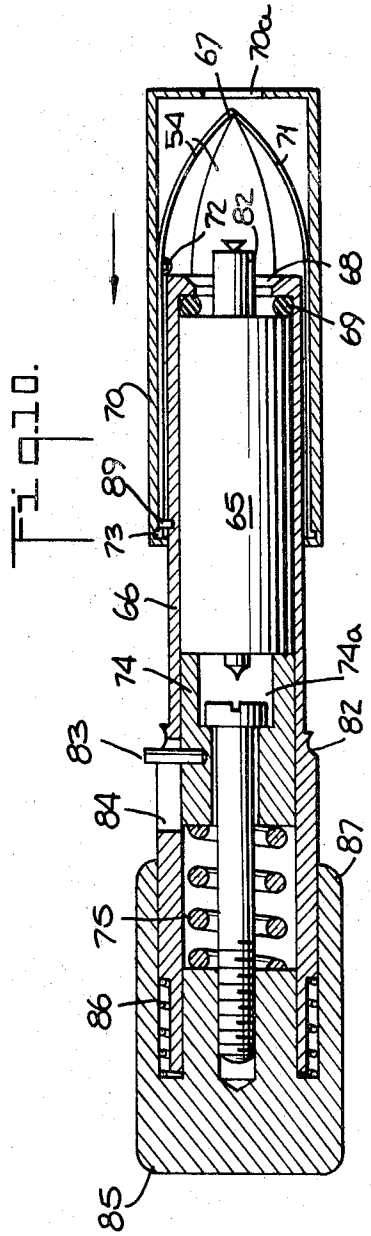


Fig. 10.

INVENTORS
DOUGLAS SOMERVILLE FULLER
LEANDRE ANDRE GUENIN
BY BRUCE LESTOCK REID
ARTHUR TREVOR THEOBALD

Lewis H. Eslinger
ATTORNEY

MECHANISM FOR SHIELDING A CARTRIDGE CONTAINING A PYROPHORIC SUBSTANCE

Background of the Invention

It has been suggested that hypergolic fuels such as aluminum borohydride be used in conjunction with a volatile fuel to effectuate the ignition of the volatile fuel. Hypergolic fuels have the known characteristic of igniting spontaneously upon being brought into contact with air.

By placing a hypergolic substance within a sealed cartridge and placing the cartridge within an ignition device such as a cigarette lighter, the fuel, such as butane, within the cigarette lighter can be ignited by exposing the hypergolic substance to air adjacent a burner valve on a cigarette lighter through which the butane gas or other lighter fuel escapes to the atmosphere. When the hypergolic fuel ignites it causes the butane to ignite and burn thereby permitting the user to light a cigarette or otherwise use the exposed flame

The hypergolic or pyrophoric substances can be dangerous to handle and there is a measure of risk to the public if the cartridges are handled carelessly. For example, an apparently empty cartridge may still contain minute quantities of the pyrophoric substance. Even such a minute quantity is sufficient to cause a bad burn if the substance contacts the user's skin. Generally an ash forms around the exit nozzle of the cartridge. When the ash is disturbed by a slight movement, it can ignite spontaneously in the air. There is also a grave danger of starting fires if a cartridge is discarded unprotected in any manner.

The cartridges containing the pyrophoric substance are provided with an outlet at a nozzle and a spring biased plunger closure mechanism. Upon striking the plunger, a seal is opened at the outlet nozzle of the cartridge and a small quantity of pyrophoric substance is ejected. Thus, there an be danger to the user if, when handling such a cartridge, the mechanism is inadvertently actuated.

SUMMARY OF THE INVENTION

The present invention obviates the inherent dangers in handling pyrophoric cartridges by enclosing the cartridges within a housing. The housing is adapted to be removably mounted on an ignition device such as a cigarette lighter having a separate source of fuel to burn. The cartridge has an outlet mechanism operative when actuated by an actuating mechanism to eject a quantity of pyrophoric substance from the outlet, the arrangement of the housing and cartridge being such that in the unmounted position, the outlet from the cartridge is masked by the housing and the actuating mechanism is prevented from actuating the ejecting mechanism. When the housing is mounted in operative position on an ignition device, however, the outlet is uncovered and the ejecting mechanism is operable by the actuating mechanism.

In one form of the invention, the actuating means is mounted in the housing and the operation of mounting the housing on the ignition device causes the cartridge to be moved to a position in which the ejecting mechanism thereon is aligned with the actuating means.

The masking and unmasking of the outlet may be achieved either by a movement of the cartridge so that its outlet is or is not aligned with an aperture in the housing near a fuel burner valve or by a movable part on the housing which normally masks the outlet or is moved to clear the outlet when the housing is in its operative position on the ignition device.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, wherein like reference characters refer to like parts throughout the several views:

FIG. 1 is a side view partly in section showing an unmounted encapsulated cartridge and the cooperating parts of a combustion device;

FIG. 2 is a side view showing the encapsulated cartridge mounted on the combustion device;

FIG. 3 is a plan view taken along the arrows 3–3 in FIG. 2;

FIG. 4 is a side view, partly in section, showing a second embodiment of the invention;

FIG. 5 is a side view showing the second embodiment mounted on a combustion device;

FIG. 6 is a section taken along the line 6–6 in FIG. 5;

FIG. 7 is a side view, partly in section, of a third embodiment showing an encapsulated cartridge forming the cover of a combustion device;

FIG. 8 is a section taken along the line 8–8 in FIG. 7;

FIG. 9 shows the cover of FIG. 7 in open position;

FIG. 10 shows a fourth embodiment partly in section of an unmounted encapsulated cartridge;

FIG. 11 shows the fourth embodiment mounted on a combustion device.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 to 3, there is shown a housing 10 comprising an enclosure defined by walls. Pivotally mounted on the housing is a fingerpiece 11 which pivots about the horizontal axle 12 extending between the walls forming the housing 10. The fingerpiece 11 has a lip 13 formed thereon which provides a convenient location for the user to bear downwardly with his finger so as to pivot the fingerpiece clockwise around the axle 12. The housing 10 has openings 14 in the bottom wall thereof and an opening 15 in the front wall. A hammer 16 in the form of a lever is pivotally mounted within the housing 10 on the pin 17 extending between opposed walls of the housing 10. A leaf spring 18 is fixed to the fingerpiece 11 and resiliently bears against the hammer 16. A U-shaped spring 19 resiliently biases the hammer 16 toward the front of the housing 10. The hammer 16 is formed with a lip 20 having a rounded cam surface thereon. The arrangement of the elements within the housing 10 is such that as the fingerpiece 11 is depressed by the user, the hammer 16 will be moved clockwise about the pin 17 thereby storing energy in the spring 19 by the engagement of the end of the leaf spring 18 with the cammed lip 20 on the hammer. As the spring 18 slides along the cam surface of the lip 20 it will reach a point near the tip of the lip when it will slip off the lip leaving the hammer free to be moved counterclockwise under the resilient bias of the spring 19.

A cartridge 21 containing a pyrophoric substance sealed therein is loosely mounted within the housing 10. The cartridge has an outlet 22 and a plunger mechanism including a boss 23 connected to the outlet by a rod (not shown) for ejecting a quantity of pyrophoric substance from the outlet 22 when the boss 23 is struck a sudden blow by the hammer 16. The cartridge 21 is secured on a pad 24 and is held in the position shown in FIG. 1, that is when the housing 10 is unmounted, by a spring 25 or other suitable device to maintain the cartridge located with respect to the openings 14 in the housing 10.

As can be clearly seen in FIG. 1, in the unmounted position, the cartridge 21 is positioned so that its boss 23 is out of alignment with the hammer 16 while its outlet 22 is masked by the end wall 26 of the housing 10.

FIG. 1 also shows part of a wall portion 27 of a combustion device such as a cigarette lighter, which portion carries two fixed pins 28 and a spring biased plunger 29.

To mount the housing 10 containing the cartridge 21 on the wall portion 27 of the ignition device, the housing is placed on the pins 28 so that they enter openings 14 in the housing and then lock in the holes 30 in the base 24. The pins 28 bear on the cartridge 21 and lift it upwards in the housing 10. When the base 31 of the housing 10 is in contact with the wall 27 of the combustion device, the housing is slid to the right in FIG. 2 so that the pins 28 enter the slots 32 (FIG. 3) in the openings 14. The shoulders 33 of the pins 28 which are raised above the wall 27 of the ignition device an amount equal to the thickness of the wall 31 of the housing 10, overlie the edge of the base 31 as in a bayonet lock and secure the housing on the wall 27. This sliding movement causes the outlet 22 of the cartridge 21 to extend through the opening 15 in the end wall 26 of the

housing and the boss **23** becomes aligned with the hammer **16** which takes up its normal operative position. The housing **10** is retained in its mounted position by the spring biased detent **29** which prevents the housing from slipping out of the bayonet lock since it precludes movement of the housing **10** to the left as shown in FIG. **2**.

To unmount the ignition means, the detent **29** is first depressed, the housing is moved to the left as shown in FIG. **2** and is lifted off the pins **28**. The spring **25** then urges the cartridge **21** toward the base **31** of the housing **10** which is the FIG. **1** position, and the nozzle **22** is masked by the wall **26** of the housing.

It will be appreciated that means (not shown) may be provided for operating the burner valve of the combustion device as the fingerpiece **11** is depressed. For example, the fingerpiece can be used to depress a lever which is connected to a burner valve on the combustion device and thereby opens the valve upon depression of the fingerpiece.

The embodiment shown in FIGS. **4**, **5** and **6** illustrates a cigarette lighter having a top wall **27**, to which is removably attached a cover plate **27***a*, pins **28** fixed on the top wall and a spring-biased plunger **29**. A socket **34** is formed in the top wall **27** for the reception of a spring **35** and a cover member **36**. A burner valve **37** having a movable stem **38** for opening and closing the valve is fixed on the top wall and serves as the outlet for the fuel, preferably of the gaseous type, which is kept in the sealed combustion device here show as a lighter **56**.

The fingerpiece **11** has a socket **39** bored therein which retains a spring **40** between the socket and the top wall **27**. The spring **40** serves to resiliently bias the fingerpiece in a direction away from the top wall **27**. The fingerpiece **11** is maintained on top of the lighter by the outer casing wall **41** of the lighter and an inner wall **42** having an opening **43** therein. A lever **44** having a bifurcated end **45** surrounding the stem **38** has a fulcrum bearing on the top wall **27**. The lever extends to a point beneath the fingerpiece **11** such that a downward movement of the fingerpiece **11** rocks the lever arm about the fulcrum and lifts the stem **38** to which the bifurcated end of the lever is attached, thereby opening the burner valve, in a known manner, such as described in U.S. Pat. No. 2,571,435, and permitting fuel to escape from the orifice of the valve stem.

A hammer **16** is pivotally mounted on the pin **17** thereby permitting free rotational movement of the hammer. A link **46** which is held captive in the fingerpiece has a roller **47** on the end thereof which bears on the cammed surface **20** of the hammer **16**. When the fingerpiece **11** is depressed, the hammer **16** is moved clockwise around the pin **17** until a point is reached where the roller **47** slides off the cammed surface **20**. Since the fingerpiece **11** bears on the cover member **36** via the link **46**, energy is stored within the spring **35** as it is compressed. When the link **46** slips off the cammed surface **20**, the energy stored in the spring **35** is transmitted to the hammer which is violently urged counterclockwise about the pin **17** so as to strike pin **48** which is mounted in a socket **49** on the wall **50**. The pin and socket fit within the opening **51** in the cartridge housing **10**. The pin has a head which fits within a counterbore in the socket **49**. The housing **10** is similar to that shown in FIGS. **1** to **3** except that it does not contain the fingerpiece and hammer which are apart from the housing. The housing **10** is placed on the pins **28** as in FIGS. **1** to **3** thereby elevating and locating the cartridge **21** within the housing **10**.

To operate the device, when the housing is mounted on the lighter, the fingerpiece **11** is depressed against the force exerted by the spring **40**. The fingerpiece bears on the lever **44** which pivots at the fulcrum and raises the stem **38** of the burner valve **37** thereby opening the valve and permitting fuel to escape to the atmosphere. The link **46** having a roller **47** thereon bears on the cammed surface **20** of the hammer **16** and compresses the spring **36** while rotating the hammer clockwise. The roller **47** slips off the cammed surface after a suitable amount of energy has been stored in the spring **35** and the spring **35** releases its energy against the hammer rotating the hammer in a counterclockwise direction against the pin **48**. The pin **48** strikes the boss **23** which opens a spring-closed valve and a pyrophoric substance is ejected adjacent the fuel issuing from the burner valve **38**. Since the pyrophoric substance ignites spontaneously, it ignites the fuel from the burner valve thereby creating a flame which can emanate through the orifice **52** on the top wall of the lighter. Thus in this embodiment, the cartridge in the unmounted housing **10** is positioned so that both its outlet **22** and the boss **23** are masked by the housing walls whereas when the housing is mounted, the outlet is unmasked and the ejection mechanism including the boss **23** is operable by the actuating means.

In the embodiment depicted in FIGS. **7** to **9**, the ignition mechanism is formed in such manner that it can be detachably and pivotally mounted in a combustion device such as a lighter, the ignition mechanism then acting as a so-called "flip-top" for the lighter. The ignition mechanism comprises a housing **53** having a slotted lug **54** fixed to one end which is detachably engageable with a pivot pin **55** carried on a cigarette lighter **56**.

The housing contains a cartridge **57** which is secured to the housing **53** by using a block **58** attached by rivets or any other known attaching means. The cartridge **57** has an outlet **59** and a boss **60** which, when actuated causes a supply of pyrophoric substance to be expelled from the outlet. In order to mask the outlet when the device is detached from the lighter, a shutter **61** is provided in the housing which is urged by a spring **62** to the position shown in FIG. **9** where the lower part of the shutter **61** lies over the outlet **59**. In order to unmask the outlet when the device is mounted, the lighter body **56** carries a projection **63** which engages the shutter **61** as the hinged housing **53** is moved toward the lighter body but before it is closed thereon, to lift the shutter away from the outlet **59**. The housing **53** also carries a valve closure member **64** which closes the burner valve **37**. The burner valve is of the type having a floating shut off stem as disclosed in U.S. Pat. No. 2,620,643. The valve opens automatically when the hinged housing **53** is lifted away from the lighter **56**. The projection **63** has a U-shaped channel **65** therein in which is received the outlet **59** of the cartridge **57**. The channel permits the outlet **59** to rise with the housing **53** as it is raised above the lighter body **56**. A hammer mechanism (not shown) is arranged to strike the boss **60** as the housing is raised such that the shutter **61** does not mask the outlet until the housing has been raised approximately half of its travel. The hammer is arranged to strike the boss **60** when the housing is part way open and thereby eject the pyrophoric substance adjacent the burner valve which is also open. When the housing moves upwardly because the valve closure member **64** moves away from the burner valve **37**. Further movement of the housing **53** to the full open position causes the shutter **61** to cover the outlet **59** thereby protecting the user from injury.

Referring now to the embodiment depicted in FIGS. **10** and **11**, the ignition mechanism shown in FIG. **10** is intended for mounting in a lighter and is shown so mounted in FIG. **11**. The ignition mechanism comprises a cartridge **65** enclosed within a tubular member **66** which is open at both ends. The outlet nozzle **22** extends through one opening **68** and the cartridge is spaced from the opening by an O-ring **69**. A tubular sleeve **70** having an opening **70***a* therein is slidably mounted on the tubular member **66**. The sleeve **70** carries a plurality of leaf springs **71** which meet to form a closed apex **67** covering the outlet **22** of the cartridge **65**. The sleeve **70** is normally held in the position shown when the ignition means is unmounted by a detent **72** formed on one or more of the leaf springs **71** which engage the end of the cartridge. The leaf springs **71** are connected to the rear portion **73** of the sleeve **70**. Thus when the sleeve is moved in the direction of the arrow, the sleeve **70** carries the leaf springs with it. A slight force permits the detent **72** to be drawn rearwardly between the sleeve **70** and the tubular member **66**. The nozzle **67** of the cartridge **65** is thereby exposed as shown in FIG. **11**.

The actuating means comprises a mass or hammer **74** having a socket **74***a* therein which can be propelled against the base of the cartridge by means of energy stored in the coil spring **75**. In the unmounted position of the ignition means as shown in FIG. **10**, the mass **74** is in contact with the base of the cartridge **65** and cannot be operated so as to strike it while the outlet **22** is masked by the leaf springs **71**. The mass is fixed to the fingerpiece **85** by a screw **76** threadably engaged with the fingerpiece.

The ignition device such as a lighter **56** in which the ignition mechanism is to be mounted is formed with a bore **77** into which the ignition mechanism is inserted, outlet end first, that is from left to right in FIG. **11**.

A leaf spring **78** is held captive within the bore **77** by a number of screws or rivets **79** and the spring is resiliently biased toward the longitudinal axis of the bore **77**. A pawl **80** is similarly mounted by screws or rivets **81** within the bore **77** and is also resiliently biased toward the longitudinal axis of the bore.

As the ignition mechanism is inserted into the bore **77**, the sleeve **70** is slid back in the direction of the arrow on the tubular member **66**. The leaf springs **71** are then pulled rearwardly with the sleeve by the application of a slight force whereby the detent **72** is forced between the sleeve **70** and the tubular member **66**. The outlet **22** of the cartridge **65** is thereby exposed. When the ignition means reaches its mounted position, it is latched in place by the leaf spring **78**, the end of which engages a groove **82** in the tubular member **66**. At the same time a pin **83** fixed to the mass **74** is engaged by the pawl **80** and the mass **74** is moved away from the end of the cartridge **65** against the bias of the spring **75**. The pin moves in the groove **84** in the tubular member **66**.

With the ignition means in its mounted position, the actuating means is operable by applying pressure on a fingerpiece **85**. The application of pressure compresses the spring **75** arranged between the fingerpiece and the mass **74**, the latter being held by the pin **83** and the pawl **80**, and also tensions the return spring **86** which functions to return the fingerpiece to its rest position when the pressure is removed. The fingerpiece **85** has a cam **87** formed on one end thereof such that when the fingerpiece is moved inwardly the cam **87** engages the follower surface **88** on the pawl **80** to lift the pawl to a position which clears the pin **83** whereupon the mass **74** is released to strike the end of the cartridge **65**. The spring **86** then returns the fingerpiece to its rest position. Thus, the actuating means cannot be operated when the ignition means is unmounted since there is then nothing to hold the pin **83**. To remove the ignition mechanism from the bore **77**, the user exerts a pulling force on the fingerpiece **85** sufficient to overcome the locking force exerted by the leaf spring **78** against the groove **82**. The pawl **80** bears against the tubular member **70** upon withdrawal and thereby moves the tubular member to the FIG. **10** position wherein the leaf springs **71** close over the nozzle **22**. The tubular member will move until it reaches the stop **89**.

While the invention has been disclosed as embodied in a cigarette lighter, it should be understood that the invention can be applied to any combustion device and it should also be understood that changes may be made herein without departing from the invention in its broader aspects within the scope of the appended claims.

We claim:

1. An encapsulated cartridge for use with a combustion device comprising:

a. a housing having a first opening therein;

b. means on the housing or removably attaching the housing to the combustion device;

c. a cartridge mounted within the housing;

i. the cartridge having an outlet nozzle and containing a pyrophoric substance therein;

ii means on said cartridge for ejecting the pyrophoric substance therefrom;

d. means for aligning the nozzle on the cartridge with the opening in the housing in response to the location of the housing with respect to the combustion device so as to prevent inadvertent ejection of the pyrophoric substance from the nozzle.

2. An encapsulated cartridge as defined in claim **1** in which the housing has means thereon for masking the outlet nozzle of the cartridge when the cartridge is not mounted on the combustion device.

3. An encapsulated cartridge as defined in claim **2** in which the combustion device has means thereon to remove the means for masking the outlet nozzle.

4. An encapsulated cartridge as defined in clam **1** in which said housing comprises walls surrounding the cartridge.

5. An encapsulated cartridge as defined in claim **1** in which said cartridge has a boss thereon connected to the outlet nozzle, and hammer means adjacent said boss whereby the hammer means actuates the boss so as to eject the pyrophoric substance therefrom.

6. An encapsulated cartridge as defined in claim **5** in which the combustion device has a fingerpiece thereon and a burner valve, means responsive to the actuation of the fingerpiece whereby the valve is operated and the hammer means is actuated.

7. An encapsulated cartridge as defined in claim **5** in which said hammer means comprises a lever pivoted at one end thereof, first spring mans urging the lever to rotate about the pivot and a cam surface on the lever against which the spring means slips, a second spring means which rotates the lever when the first spring means slips off the cam surface.

8. An encapsulated cartridge as defined in claim **1** in which the housing has resilient means fixed thereto which bears against the cartridge and maintains the cartridge in a position spaced from the opening in the housing.

9. An encapsulated cartridge as defined in claim **1** in which the cartridge has a second opening therein, a pin on the combustion device adapted to extend into the second opening, and means on the combustion device adapted to strike said pin.

10. An encapsulated cartridge as defined in claim **2** in which the means for making the outlet comprises a reciprocable shutter and spring means operatively connected to the shutter to urge the shutter in front of the outlet nozzle on the cartridge.

11. An encapsulated cartridge as defined in claim **3** in which the means on the combustion device for removing the masking means comprises a projection having an opening therein to receive the outlet nozzle and a portion thereon which actuates the masking means to remove it from covering the outlet nozzle.

12. An encapsulated cartridge as defined in claim **1** in which the housing comprises a plurality of leaf springs which join to mask the outlet nozzle, the leaf springs having means thereon to open the leaf spring jointure thereby exposing the outlet nozzle.

13. An encapsulated cartridge as defined in claim **1** in which a fingerpiece is reciprocably mounted on the housing, spring means mounted on the fingerpiece to return the fingerpiece from an actuated to a rest position, hammer means mounted in cooperative relationship with the fingerpiece, energy storing means mounted between the fingerpiece and the hammer means such that said energy storing means imparts a force to the hammer means in response to actuation of the fingerpiece.

14. An encapsulated cartridge as defined in claim **13** in which a holding member on the combustion device maintains the hammer means in a cocked position and the fingerpiece has means thereon to release said holding member to thereby actuate the hammer which strikes the cartridge.