Feb. 8, 1966 H. C. GODBE ETAL 3,233,433

FLINT CARTRIDGE AND FLINTS AND FLINT FEEDING MECHANISM FOR CIGARETTE LIGHTERS AND THE LIKE

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Fig. 1.

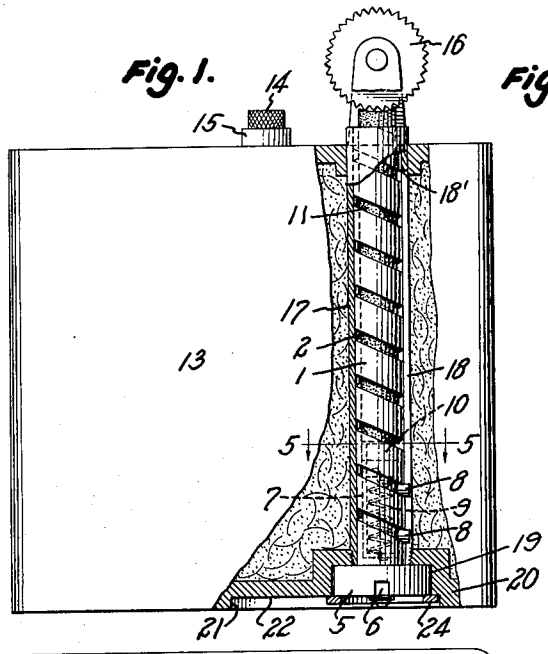


Fig. 3.

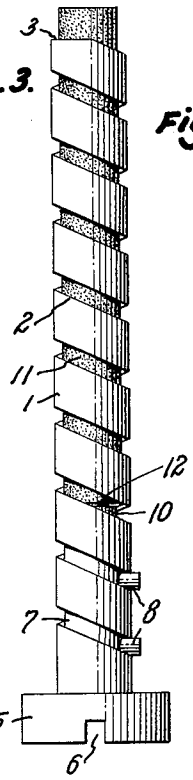
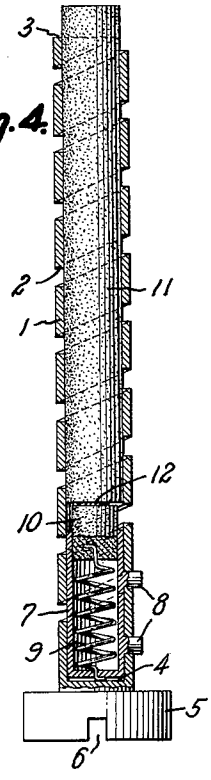


Fig. 4.



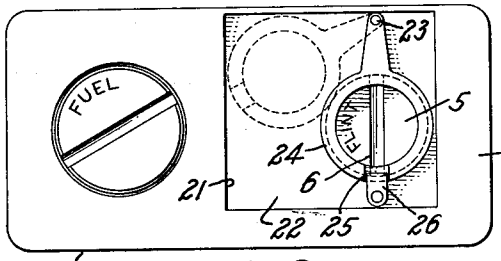


Fig. 2.

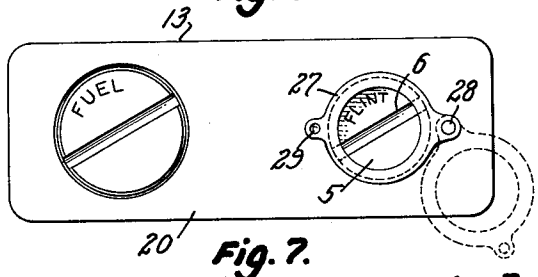


Fig. 7.

Fig. 8.

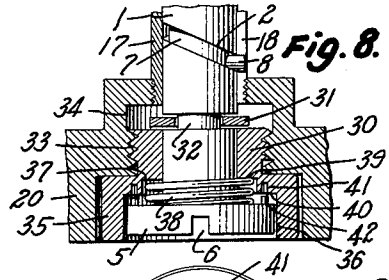


Fig. 9.

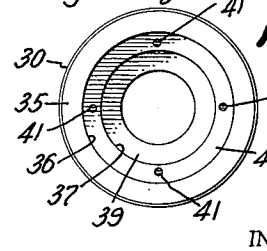
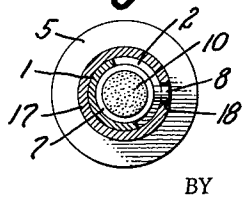


Fig. 5.



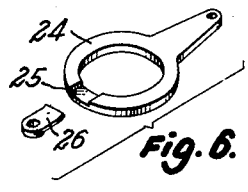


Fig. 6.

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Fig. 10.

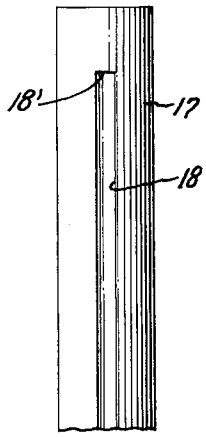


Fig. 11.

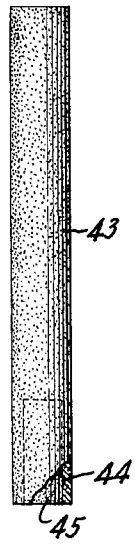


Fig. 12.

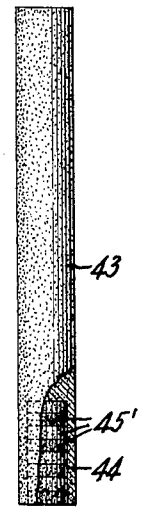


Fig. 13.

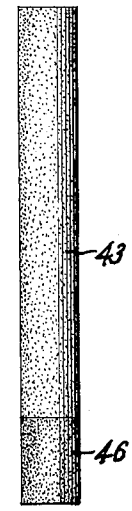


Fig. 14.

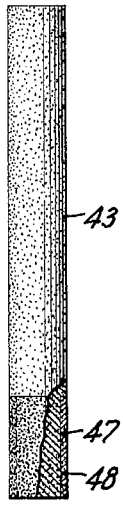


Fig. 15.

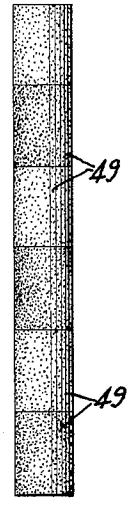


Fig. 16.

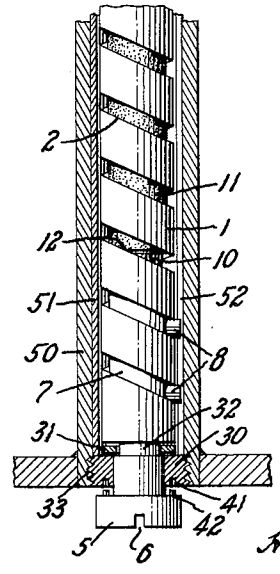
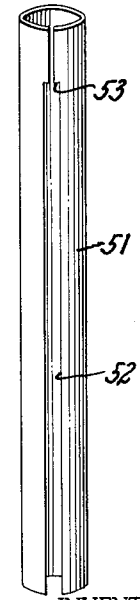


Fig. 17.



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FLINT CARTRIDGE AND FLINTS AND FLINT FEEDING MECHANISM FOR CIGARETTE LIGHTERS AND THE LIKE

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Filed Feb. 8, 1963, Ser. No. 257,270
6 Claims. (Cl. 67—7.1)

This invention relates to pyrophoric so-called flints or spark-producing media and to flint mechanisms for flame-producing devices, such as cigarette lighters and the like which will be referred to generically, hereinafter, as cigarette lighters, or broadly as lighters, and it has special reference to a flint supplying and feeding mechanism in the form of a self-contained, removable, discardable and replaceable cartridge comprising the flint, means for yieldably forcing the flint into sparking engagement with the usual serrated or toothed striking wheel of the lighter, and manually operable means for progressively feeding the flint toward the striking wheel as its length decreases due to use of the lighter.

In conventional lighters a flint of approximately 3/16" to 1/4" in length only, can be accommodated and this flint is forced into spraking engagement with the striking wheel by a relatively long pressure-applying coiled wire spring having at one end a metal pusher member to bear against the inner end of the flint, and at its other end it is usually connected with, or at least bears against, a retainer cap having a seating, screw-threaded connection with the lighter body interiorly of the flint-receiving bore. The relative shortness of the flint makes frequent replacement necessary, and such replacement is a tedious, bothersome and challenging operation with occasional loss of parts, such as the spring or screw cap, and attendant exasperation. Also, the permanent small parts may suffer damage such, particularly, as kinking, bending or stretching of the wire coil spring, or the stripping of screw threads on other parts.

This replacement task has been found by some lighter users to be so annoying that a great many avoid the problem by using matches rather than lighters, and to the palsied, digitally-afflicted arthritics and other partial cripples such as the maimed having but one hand or arm, such replacement task is impossible without assistance.

Moreover, the user does not always have replacement flints available, and this may therefore be a further nuisance. Also, as the flint is worn away during use, the pressure of the spring against it decreases and malfunction is apt to, and often does, occur.

The prior patented art discloses a variety of means for employing long flints in cigarette lighters, but it appears that such devices have not met with public acceptance.

The apparent commercial failure of prior art long-flint devices is probably due to many factors, such as almost incredible intricacy of design or operation and inordinately high cost of manufacture, but most importantly, and without exception, to the fact that renewal of the flint supply in such devices becomes even more of a frustrating, vexatious and exacting process than is presently the case with conventional short-flint lighters. The hazards of loss of,

or damage to, complicated parts and mechanisms and even to the cigarette lighter itself are by far greater, and disassembly and reassembly are much more baffling and confusing for many persons and, of course, totally impossible for the crippled, the maimed or the inept who must perforce have the assistance of another. Furthermore, even after a new flint supply has been successfully installed, no attendant benefits of any kind accrue, as they do from the device of the present invention.

With the deficiencies of known flint mechanism particularly in mind, one object of the present invention is to provide a flint mechanism in which provision is made for much longer use of a lighter without the need for replacement of the flint, and which comprises, in a unitary replacement cartridge, the flint and a sheath or sleeve embracing the flint and providing a manually adjustable feeding mechanism including pusher means resiliently actuated and so operatively associated with the sheath or sleeve, and contained thereby, as to maintain a relatively constant yielding sparking pressure of the flint against the striking wheel, thus making possible discarding of a complete cartridge when its flint complement is exhausted and the substitution of a fresh cartridge. Moreover, in such a unitary cartridge the flint may be of substantially the full length of the cartridge, as determined by the dimensions of the lighter body, or it may comprise a plurality of the conventional short flints disposed end to end within the sleeve.

Another objection to conventional flint feeding mechanisms is that the user often does not realize that a flint has been used up and still attempts to produce sparks by turning the striking wheel against the metal pusher member, with the result that the serrations or teeth on the wheel become worn and inefficient. Thus, the effective life of the striking wheel is shortened and, furthermore, since the teeth or serrations of the striking wheel tend in any event to become dull under ordinary use, and also flint-debris tends to accumulate between such teeth or serrations and is seldom removed by users because its removal is a vexatious and time-consuming operation, the production of a proper spark soon requires exertion of greater pressure against the flint than the usual coil spring pressure means is designed to exert even when new, and since such required added pressure can seldom be applied, the user generally resorts to purchase of a new lighter or sending the disabled one back to the factory for repairs, both of which recourses are nuisances involving expense.

Another object of the invention, is therefore, to guard against this objection by providing a pusher member which will not cause damage to the striking wheel and which when engaged by such wheel, will give off distinctive, such as colored, sparks to thus apprise the user of the fact that the flint is used up.

A further object is, optionally, to utilize a variety of pyrophoric, pyrotechnic or other spark-forming materials of a nature different from those generally used as the sparking media of such devices, either as a substitute therefor in whole or in part, or as an additive thereto, or for purposes independent of mere spark production, or as a complement thereto, as hereinafter explained, and whether such unusual materials are supplied in the so-called flint within a cartridge as their container, as hereinafter particularly described, or in combination with

such flints independently for use in conventional lighters, and which, upon being abrasively struck by the striking wheel of the lighter will emit distinctive, such, primarily, as colored, sparks, either for novelty effect or for the utilitarian purpose, hereinbefore noted, or providing a warning signal to the user of the lighter that the normal flint supply is either exhausted or is nearing exhaustion and is therefore in need of early replenishment.

A still further object of the invention is to provide in a cartridge of the type described and concurrently with its other features, a means for appreciably increasing the operating efficiency and substantially lengthening the service life of such lighters by eliminating a major cause of undue wear and dulling of their spark-inducer striking wheels and through the production of more efficient and, in some instances, of hotter sparks than are produced by conventional means.

Other objects and advantages of the invention will become apparent from the following description.

In its primary aspect, the invention comprises a flint cartridge for operative association with, and removal from, the body of a cigarette lighter, or the like, as a unitary assembly, thus providing a trouble-free and easily replaceable flint supply preferably of greater than usual capacity; and, more specifically, a removable, discardable and replaceable flint cartridge including a sheath or sleeve for embracingly guiding a flint supply disposed axially thereof and provided with a helical slot, a socketed follower member disposed within said sheath or sleeve at the inner end of said flint supply and provided with lug means extending radially through said slot, and resilient means bearing at one of its ends in said socket and at its other end against said inner end of the flint supply, said cartridge adapted to be inserted in a lighter body and held therein against axial movement, with the lug means of said follower member restrained against rotation but axially guided, whereby upon rotation of said sheath or sleeve in a predetermined direction said lug means will travel in said helical slot to move said follower member axially upwardly in said sheath or sleeve and thereby axially advance said flint supply so that the outer end thereof will be maintained in operative engagement with said striking wheel as the flint supply is shortened by use; and the invention includes, also, various embodiments and combinations of flint and flint-feeding means, and means for their assembly within a cigarette lighter or the like, and a pusher member made, preferably, of pyrophoric material, interposed between the adjacent ends of the flint supply and the resilient means and serving, upon exhaustion of said flint supply, to give off colored, or otherwise distinctive, sparks when said striking wheel is rotated against it, all as will be explained hereinafter more particularly and finally claimed.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated,

FIG. 1 is a side elevational view of a conventional form of cigarette lighter, or the like, so modified as to accommodate the removable, replaceable flint cartridge of the invention, parts being shown broken away and in section to illustrate a preferred disposition of such cartridge,

FIG. 2 is a bottom plan view of the lighter of FIG. 1 showing one optional means for operatively retaining the flint cartridge assembled with the lighter body,

FIG. 3 is an enlarged side elevational view of the cartridge of the invention depicting its unitary nature,

FIG. 4 is an enlarged diametrical sectional elevational view of the parts shown in FIG. 3,

FIG. 5 is an enlarged sectional elevational view of the cartridge parts in association with the guide tube of the lighter body, taken, in part, on the line 5—5 of FIG. 1, but showing structure not lying fully in the plane of such section line 5—5,

FIG. 6 is a composite perspective view of the cartridge retaining parts shown in FIG. 2,

FIG. 7 is a view similar to FIG. 2, but showing a modified form of means for retaining the cartridge within the lighter body.

FIG. 8 shows, in enlarged fragmentary diametrical sectional side elevation, modifications of the cartridge sheath or sleeve and the means for removably assembling it with the lighter body.

FIG. 9 is a bottom plan view of the retaining nut of the means shown in FIG. 8,

FIG. 10 is an enlarged side elevational view of the upper end portion of the guide tube shown in FIGS. 1, 5 and 8,

FIGS. 11 to 15 show, in side elevation, a number of many alternative ways in which pyrophoric or pyrotechnic materials, or both, having relatively different properties of spark production may be combined in so-called flints,

FIG. 16 is a greatly enlarged fragmentary sectional side elevational view showing a manner in which lighters of existing types may be made to accommodate the cartridge of the invention, and

FIG. 17 is a perspective view, on a reduced scale, of the guide tube shown in FIG. 16.

Having reference particularly to FIGS. 1 to 6, it will be seen that the flint cartridge (FIGS. 3 and 4) comprises a cylindrical sheath or sleeve **1** having, substantially throughout its full length, a helical slot **2**, the ultimate top or outer end **3** of this sheath or sleeve being open and its ultimate bottom or inner end **4** being closed and provided with a preferably integral head **5** having a kerf **6** for the reception of the edge of a coin or other implement to thereby provide an optional means (as hereinafter explained) whereby it and the sheath or sleeve **1** may be rotated.

Assembled within the sheath or sleeve **1**, through the open end **3** thereof, is, first, a follower member **7** having radial lug means **8**, preferably two as shown, which are engaged in the helical slot **2** and extend therethrough exteriorly of the periphery of the sleeve **1**, this follower member **7** being socketed to receive and confine resilient pressure means, shown as a spring **9** and, optionally, a pusher member **10**, and, last, the flint supply **11**, shown as a single long flint but which may be a short flint, or a plurality of short flints arranged in end to end abutting relation and which may be either permanently or temporarily joined to each other by a suitable means, such as by adhesive, to maintain them within sleeve **1** by means of permanent or temporary joining to the pusher member **10** or, optionally, directly to the resilient means. Such permanent or semi-permanent joining is essential to maintain the unity of the cartridge prior to its insertion and use in the cigarette lighter and to prevent the escape of such flints and operating parts from the sleeve **1**. After insertion and affixing of the cartridge within the body of the cigarette lighter it is immaterial whether such semi-permanent bonding remains intact or is disrupted in the course of use.

Similarly, and for the similar purpose of maintaining unity and preventing escape of the cartridge parts prior to use, the resilient pressure means, shown as a spring **9**, has its ends secured to the follower member **7** and to the optional pusher member **10**, respectively, by bent ends engaged with these parts, and the flint supply **11** is shown as semi-permanently attached to the pusher member **10** by a dab of cement **12**, all as shown in FIG. 4. Thus, the flint supply **11**, the pusher member **10** and the resilient pressure means **9** are all semi-permaently or permanently connected together and to the follower member **7**, and this assembly cannot escape inadvertently from the sheath or sleeve **1** because of the engagement of the lug means **8** with the helical slot **2** of the sheath **1**.

For operative association of the flint supply cartridge with a cigarette lighter or the like, and as shown in FIG.

1, the cigarette lighter body **13** will be provided, in conventional proximity to the wick **14** and wick guide **15** (in gas-fueled lighters the wick **14** is unnecessary and the wick guide **15** is replaced by the gas-emission orifice), and in vertical alignment with the striking wheel **16**, with a guide tube **17** (FIGS. 1, 5 and 8) provided in its wall with a longitudinal slit **18** of appropriate length, and the cartridge is inserted axially of this tube with the lug means **8** of its follower **7** engaged in said slit **18** and slidable longitudinally thereof, thereby restraining the follower member **7** against rotation so that rotation of said sheath or sleeve **1** in a predetermined direction will cause the lug means **8** to travel in the helical slot **2**, in turn causing corresponding travel by the follower member **7**.

Insertion of the cartridge in the tube **17** is arrested by abutment of the head **5** of the sheath or sleeve **1** against the base of a recess **19** formed in the bottom wall **20** of the lighter body, all as shown in FIG. 1.

Various means may be provided for maintaining this assembly of the cartridge within the cigarette lighter body while at the same time making possible rotation of the sheath or sleeve **1** through engagement of the edge of a coin, or other implement, or by a thumb-and-forefinger method, and for freeing such head to enable removal of a spent cartridge and its replacement with a new one. Three such means are shown in FIGS. 1, 2 and 6, FIG. 7, and FIGS. 8 and 9, respectively. These means will be described in detail hereinafter.

As hereinbefore indicated, the optional pusher member **10** need not necessarily be of hard metal, but may be made of relatively soft, non-metallic material, or it may be made of a pyrophoric material which, like the material of the flint supply is non-abrasive to metal and will not cause undue wear on the serrations, or teeth, of the striking wheel when contacted therewith upon exhaustion of the flint supply, and such pyrophoric material may be of such a nature that upon its striking, it will emit colored, or otherwise distinctive, sparks. The use of relatively soft, non-metallic material in such pusher member, if such member is used, is made a practical possibility because the interchangeable, replaceable cartridge is intended only for one-time use in a lighter, thereafter to be discarded and replaced by a new one, so that the working parts of a cartridge need have only that durability required for limited, rather than extensive, usage.

With the use of a pusher member **10** having the distinctive spark-producing capability as aforesaid, as shown particularly in FIG. 4, when the normal flint supply has been exhausted such pusher member **10** will then be resiliently pressed against the striking wheel **16**, and upon rotation of the wheel the resultant distinctive sparks will alert the user to the fact that this normal flint supply has been exhausted and therefore should be replaced without undue delay. Nevertheless, and while the user procrastinates or is awaiting opportunity to effect such replenishment of supply, the lighter will continue to remain uesful and spark-productive for a fairly substantial length of time, but with the distinctive sparks providing continual reminder, on each use, of the need unsatisfied. The user will find that he has an additional reminder also, because upon exhaustion of the normal flint supply the follower member **7** will have reached the limit of its upward travel in the helical slot **2**, by reason of the lug means **8** having reached a pre-determined abutment or ending point stop **18'**, FIGS. 1 and 10, of the longitudinal slit **18** in the guide tube **17**, and, hence, the sleeve **1** can no longer be rotated to gain added resilient pressure. If the user attempts to use great force to compel such rotation no damage will result because the lug means **8** will become, in effect, shear pins which will be severed from the follower member **7**. With the follower member **7** now at its upward limit, and as the pyrophoric material of the pusher **10** is consumed under the striking, compression power of the resilient means **9** will steadily decrease in proportion until, with only a tiny bit of the pyrophoric substance remaining, no spark whatever can be produced and the contact of anything metallic against the striker wheel will be totally obviated. As before recited, undue dulling of the striker wheel by metal-to-metal contact becomes impossible and efforts to produce a spark become fruitless. If the pusher member **10** is eliminated and a metallic spring is used as the resilient means **9** with one end embedded in the pyrophoric material of the flint, such end of the metallic spring will be prevented from contacting the striker wheel by the same preventive controlling means as above described. It will be obvious, therefore, that by preventing deliberate or accidental dulling of the teeth or serrations of the striker wheel, the useful life of the wheel and hence of the lighter will be prolonged to a considerable degree over that now possible with conventional flint feeding systems. Also, if the pusher member **10** is eliminated, the distinctive spark feature may nevertheless be preserved as will be explained in further detail hereinafter.

Again referring to FIGS. 1, 2 and 3, FIG. 7, and FIGS. 8 and 9, it will be seen that certain attractive and useful features are embodied in the means for retaining the cartridge within the body of the cigarette lighter and for enabling its rapid and easy removal and replacement.

In the form shown in FIGS. 1, 2 and 6 the bottom wall **20** of the lighter body is countersunk at **21** to provide a recessed surface **22** with which the outer face of the head **5** of the sheath or sleeve **1** is coplanar. Bearing against this surface **22** and pivoted at **23** is a ring-shaped retainer plate **24** having at its outer face, and preferably diametrically opposite the pivot **23**, a shallow recess **25** for the reception of the end of a resilient latch member **26**. Obviously, when the plate **24** is in the position shown in full lines (FIG. 2), it overlies the periphery of the head **5** and will prevent withdrawal of the flint cartridge, but a coin edge may be inserted in the kerf **6** through the open center of the ring. When the latch member **26** is raised, and the plate **24** swung to the broken line position, the head **5** is cleared for withdrawal of the cartridge.

In general functioning, the means shown in the modification of FIG. 7 are essentially similar to those of FIGS. 1, 2 and 6, but the retainer plate **27**, which is springy, is quite thin and is applied by the pivot **28** to the bottom surface of the lighter body. It is held in retaining position over the head **5** of the sheath or sleeve **1** by a boss **29** snap-engaged in a complemental recess or dimple in the lighter bottom. As in the embodiment of FIG. 2, the bottom of the lighter body of FIG. 7 may be recessed in a manner and area appropriate to receive the retainer plate **27**.

In the embodiment shown in FIGS. 8 and 9 a nut **30** is rotatably carried by the sheath or sleeve **1** adjacent to the head **5** thereof and is locked thereon against inward axial movement by a snap ring **31** engaged in a necked-in portion **32** of the sheath or sleeve **1**. The nut **30** is screwthreaded at **33** into a counterbore **34** in the bottom wall **20** of the lighter and has an enlarged head **35** counterbored to provide a recess **36** for the head **5** of the sheath or sleeve **1** and a recess **37** for a compression spring **38** having its ends seating against the sleeve head **5** and a shoulder **39** in the nut. A second shoulder **40** of the counter bore of the nut is provided with one or more sockets **41** complemental to and for engagement with one or more pins **42** carried at the inner face of the sleeve head **5**.

Conceivably, the nut **30**, snap ring **31** and compression spring **39** may be furnished either as parts of the lighter proper or in assembly with the replaceable flint cartridge. If they are furnished as parts of the lighter proper, they may be disassembled from an exhausted flint cartridge before it is discarded and reassembled upon a replacement cartridge which is necked-in at **32** and the sleeve head **5** of which is furnished with the pin means **42**.

It will be apparent that when this type of connection is employed for maintaining assembly of the flint cart-

ridge within the tube 17 of the lighter body its engagement with the body is made by inserting the edge of a coin, or other implement, in the kerf 6 of the sleeve head 5, applying sufficient axial pressure to compress the spring 38 so that the socket and pin means 41, 42 will be interengaged and then turning the head 5 and with it the nut 30 until the nut is seated by its screwthreaded engagement with the body wall.

When axial pressure against the sleeve head 5 is released, the spring 38 will effect disengagement of the socket and pin means and the head 5 may then be turned to rotate and adjust the sleeve 1 to feed the flint assembly 11, it being understood that the spring 38 is preferably strong enough to withstand the slight pressure incident to rotative adjustment of the sleeve.

Referring to FIGS. 1, 3 and 4, it will be noted that the overall axial length of the flint cartridge is preferably such that, upon its initial full insertion in the tube 17 of the lighter body, the outer end of the flint supply 11 will be engaged with the striking wheel 16 and the resilient means, spring 9, will be sufficiently compressed to exert sparking pressure of such end against the said wheel.

Also, as consumptive use diminishes the length of the flint supply 11, axial adjustment of the follower 7 and hence of the flint supply can be effected by clockwise rotation of the sheath or sleeve 1 by means of the head 5 thereof, because the engagement of such follower member's lug means 8 with the slot 18 of the guide tube 17 prevents rotation of the follower 7, compelling vertical travel accordingly by the follower 7 by reason of the lug means co-engagement in slot 2 of sleeve 1, while pressure of the resilient means 9 against the flint supply 11 remains substantially constant.

Having further reference to the cartridge retainer ring plates 24 and 27, shown respectively in FIGS. 2 and 7, beneath which the head 5 of the sheath or sleeve 1 of the flint cartridge is retained, it will be noted that the resilient means, spring 9, has a double function in that it serves not only to urge the flint supply into effective striking engagement with wheel 16 but also, by reaction, holds the head 5 in such frictional engagement with the retainer plate as to preclude the possibility of accidental or inadvertent turning of the head 5 and its unitarily attached sheath or sleeve 1.

Similarly, in the cartridge retainer means of FIGS. 8 and 9, the spring 38 will afford friction against the head 5 sufficient to preclude its accidental or inadvertent rotation.

The basic-design mechanism, their methods of operation and their purposes and accomplishments now having been disclosed, there will now be described in some detail, the manner in which an appropriate variety of pyrophoric, pyrotechnic and other materials capable of producing colored, or otherwise distinctive and attention engaging, sparks may be produced; to define for purposes of example, modifications of the basic lighter design for use of the cartridge system of the invention in lighters of new manufacture; means for the rapid, inexpensive adaptation of many types of existing, conventional lighters to adapt them to the use of the said cartridge system of the invention and of ways to modify the cartridges to fit, and be operatively secured in, such modified conventional lighters; modes by which the manufacturing costs related to machining, materials and labor may be substantially lowered; an explanation of the procedure by which the head 5 as shown in FIGS. 1 and 2 and in FIG. 7, may be manually rotated without the use of a coin or other implement; and, to further emphasize the superiority of the features of the present invention over the prior art, to explain how it is possible for even a person having but one hand to successfully, and unaided, install a cartridge in, or remove it from, a cigarette lighter, and to successfully, and unaided, adjust the resilient means of the flint feeding system as required from time to time during use.

Thus, for convenience in evaluating further advantages inherent in the invention, reference is made to the following:

(A) *Distinctive sparks*

A variety of pyrophoric, pyrotechnic and other materials and chemicals for producing, or enabling the production of, distinctive sparks are known and are readily available, and many of them have relatively low melting points and are capable, either when used alone or in combination, of the production of colored sparks or sparks of relatively high heat intensity, or both. Such substances may be substituted for conventional type flints in whole or in part, or may be integrally combined therewith in the course of manufacture, or may be added to such conventional types in several ways both for novelty and utilitarian purposes.

As examples, and without limitation thereto because of the great variety available, these materials include, either in solid form or in solution prior to their incorporation in the so-called flints, such pyrotechnic substances as magnesium, which is well known for its relatively high heat intensity and the white brightness of its combustion, and white phosphorous, or the less-toxic phosphorus sesqui-sulphide, as commonly used in "strike-anywhere" matches, both of which possess properties of low combustion points with relatively high heat intensities. These and other pyrotechnic substances may be used alone or in combination with metallic salts such as chlorates or nitrates which serve as oxidizers, as in the manufacture of fireworks, and charcoal, sulphur, antimony sulphide and various powdered metals such as zinc, iron or aluminum, or their filings, may be added as fuels. These materials may, when necessary or desirable, be bonded together by a glue or cement.

Also, for the production of distinctively colored sparks, there may be added to the pyrophoric or pyrotechnic composition of the so-called flints such substances, from a wide variety thereof, considered both singly and in combination, as a calcium salt (nitrate or chlorate) which, on combustion, would produce a red color; similar strontium salts, a scarlet hue; barium salts, green; copper salts and nitrates, bluish-green, etc. Moreover organic, analine, and other dyes could be used.

As an alternative to the production of distinctive sparks, such as those of chosen colors or flame and heat intensities, or in combination therewith, the composition of the butt ends of the flints, or the pusher members, could include in minor pockets, for example in voids in the molded composition, explosives such as gun powder or nitroglycerin which, when a spark is struck, would give a crackling sound, or miniature explosions, to apprise the user of near exhaustion of the flint supply.

Also, either alone or in combination with the other signal producing media, the flint or pusher member, or both, might be impregnated with, or contain pockets of, a scent or perfume, or a flavor such as methol or peppermint, which would be released during spark production. In the case of a flavor, moreover, the operation of the sparking wheel could serve to spray the flavor medium onto the wick or into the flame, so that the user would be conscious of its at the first puff on his cigarette.

Thus, as a warning to the user of the lighter that his flint supply is nearly exhausted, any one, or all, of four senses, sight hearing, smell and taste may be alerted.

It will be appreciated, also, that gaseous, as well as solid and liquid, substances may be incorporated in the flint material, and retained therein, in the tiny voids in such material.

One means for incorporating such distinctive spark producing materials (FIG. 11), is to provide a usual-type flint 43 having within it for part or all of its longitudinal dimension a cavity 44, or hollow, which cavity is filled as desired with distinctive spark-producing material 45. For novelty effect, the cavity filling may be in layers of such material with the several layers 45'

(FIG. 12) having relatively different sparking characteristics, or the distinctive spark material may be liimted (FIG. 13) to the portion 45 of the usula flint last to be consumed in a cigarette lighter, its distinctive sparks then serving to alert the user to the exhaustion, or near exhaustion, of his flint supply and thus eliminating need of a distinctive-spark producing pusher member 10 as in FIGS. 1, 3 and 4. The layer arrangement of FIG. 12 can also be employed in the embodiment of FIG. 13. It is noteworthy, also, that while some distinctive spark producing materials, once ignited, tend to continue in combustion, they are restrained from so doing in this application, particularly as shown in FIGS. 11 and 12, because, being entirely contained within the usual-type flint, the oxygen supply requisite for such continued combustion is not available.

Another such means (FIG. 14), for example, is to slightly reduce the usual outside or peripheral dimension of a fllint, as shown at 47, and thereafter restore such usual diameter by applying a coating 48 of distinctive spark producing material in selected areas and of successively selective differing materials for novelty effect, or utilitarian warning purpose as aforesaid.

Still another exemplary method is, instead of supplying one extra-long flint, to supply a series of short flints 49 (FIG. 15) each of a separate distinctive spark nature, which may be fed to the striking wheel in predetermined order, and may be permanently or semipermanently connected to each other or may have no such connection.

Also, sparkling materials of distinctive spark producing quality as aforesaid may be supplied for use in conventional type lighters, without any alteration whatever of such lighters, as well as being supplied, as hereinbefore indicated, as a part or parts of the flint supply contained in the interchangeable, discardable cartridges according to the present invention.

As has already been indicated, the distinctive substances may be molded, or entrapped, in the material of the flints or pusher members.

Furthermore, it will be apparent that the flint modifications of FIGS. 11 to 15 can be made to accommodate the materials for sensory perception other than sight hereinbefore referred to.

(B) *Modification of new-manufacture lighters*

The particular method for modification of cigarette lighters and the like of new manufacture will depend upon the type, or design, of the lighter to be so modified and the type of replaceable cartridge to be used in it.

In every instance, however, the conventional type of flint guide tube must be replaced by, or otherwise provided with, a slitted member such as one of the type shown in FIGS. 1, 5, 8 and 10 as member 17, of appropriate diameter and containing a slit 18 of predetermined length, to accommodate the lug means 8 of the follower 7 of the flint feeding mechanism of the cartridge.

If the lighter is of a type best suited for use of a cartridge and securing means such as those shown in FIGS. 1, 2, 3, 4, 6 and 7, the flint receiving bore and bottom of the lighter would be modified accordingly, thus eliminating present need for screw-threading of the flint receiving bore and provision of its matching screw, and simplifying the manual assembly operations, all attaining, moreover, a substantial reduction in manufacturing costs.

If the lighter is of a type wherein all of its operating parts are contained within and protected by a separately removeable case, then the modification may be accomplished in the manner as aforesaid, or it may be adapted to accommodate the cartridge mechanism as shown in FIG. 8, or a cartridge having such FIG. 8 mechanism in much more simplified and hence less costly form.

In such a simplified embodiment the retainer ring, or snap-ring, 31 would be of a diameter to fit rotatably within the flint guide tube; that portion of the sleeve 1 situated between the snap-ring 31 and the head 5 would be of appropriately less diameter as would its accommodating bore in the nut 30; the spring 38 would be dispensed with since the reverse-thrust pressure of the resilient means 9 (FIGS. 1 and 4) would suffice for the operation of the socket and pin means 41 and 42, respectively, as a clutch, and such socket and pin means would be relocated nearer to the center of the nut 30 and head 5, and the shoulders 39 and 40 of nut 30, FIGS. 8 and 9, eliminated, with the threads 33 of the nut 30 mated to the threading already being used in the flint receiving bore of such lighter, from which, after insertion of the modified cartridge therein, the head 5 will protrude sufficiently for its manual rotation, and manual insertion and removal, by means of the clutch action. Hence, the sole change necessary to modify such an existing type of lighter to accommodation of the cartridge device is the provision, as a replacement, of a slitted guide tube to receive the lug means 8 of the follower 7 as aforesaid, and the expense thereof is trivial, and the production cost of the modified cartridge is substantially reduced. The modification of the parts 5, 30 to 33, 41 and 42 as just described will be understood from the showing of FIG. 16 later referred to in detail.

Furthermore, it should be remembered that irrespective of modifications and adaptations, additional substantial savings may be realized due to the fact that, since an interchangeable, replaceable cartridge of any design is intended only for one-time use, any or all of its working parts may be of non-metallic materials produceable by cheap casting, extrusion, or other low-cost manufacturing means.

(C) *Adaptation of existing, individually-owned lighters*

Many types of existing lighters are susceptible to rapid, inexpensive conversion for accommodation of the cartridge flint supply system of the present invention.

The first requirement is to equip the lighter body with a longitudinally slitted flint guide tube having the functions of the tube 17 shown in FIGS. 1, 5, 8 and 10. The existing giude tube 50 (FIG. 16) may be replaced by a slitted member, or a slit may be machined into it, but the simplest, and preferably the quickest and cheapest method is to utilize, by insertion, a springy, outwardly expanding, cylindrical shim 51, FIGS. 16 and 17, of desired length and so separated longitudinally, as shown at 52 (see particularly FIG. 17), that upon outward expansion after insertion into the existing flint receiving bore or guide tube 50 the required longitudinal slit is formed, such shim being frictionally held in place by its own outwardly expanding force with a firmness sufficient for the purpose. To control the travel limit of the follower 7 and its lug means 8 (FIG. 16) such shim would be so formed that upon expanding after its insertion into the existing flint guide tube the ends of such shim adjacent to the striking wheel terminus of such guide tube would touch, or almost touch, each other (see FIG. 17) to close off the slit 52 and provide a stop shoulder 53 similar in function to the shoulder 18' of FIGS. 1 and 10, and thus so limit travel of the lug means 8 and follower 7 as to protect the striking wheel against undue wear from possible metal-to-metal contact, as aforesaid. The cartridges for use in such thus-adapted conventional lighter would be of a diameter appropriate thereto; and any lost flint life resulting from reduced diameter would be more than offset by the extraordinary ampleness of the flint supply furnished by the cartridge.

In cigarette lighters having working parts which are protectively enclosed by a separately removeable case, the cartridge for use therein may utilize the attachment means shown in FIG. 8 in the modified form thereof, shown in FIG. 16, wherein the spring 38 and other parts are eliminated, and with the threads 33 of the nut 30 made to match the threading of the existing flint receiving tube or bore of the lighter.

If the flint receiving bore is in the bottom, or other wall, of a unitary-assembled lighter, the cartridge retention means may be of substantially the forms shown in FIGS. 2 and 7, with or without recessing, with cartridges of the type shown in FIGS. 1, 3 and 4 to be utilized, and the head 5 of the sheath or sleeve 1 of such cartridge may be supplied in a diameter and thickness to fit within the existing screw-threaded portion of said flint receiving bore, or such bore may be reamed out to accommodate a head 5 of relatively larger dimensions.

The above described methods of adaptation must be considered as representative only, it being obvious that other methods are available and may be employed, according to the type of lighter to be thus converted.

For distinctive-sprak features alone, existing lighters need not be altered in any manner whatever since they need only to utilize flints of the distinctive-spark material hereinbefore described in place of the usual types of flints.

(D) *Manual method of rotating the head 5*

It has been noted hereinbefore that the head 5 as shown in FIGS. 1, 2, 3, 4, 7 and 16 may be rotated manually, as desired, without recourse to a coin or other implement edged into the kerf 6. Using, as an example, the cartridge retention means shown in FIG. 7, the cigarette lighter is held upside down and the boss-engaged plate 27 flicked to open position. Reverse-thrust of the resilient means 9 (FIGS. 1 and 4) will cause the head 5 to protrude slightly above the bottom of the lighter, whereupon it may be rotated as desired by thumb and forefinger, after which it is depressed back into place and the retainer plate 27 flicked back into closed position. Obviously, such adjustment operation may be quickly accomplished.

(E) *Uses possible for the crippled or maimed*

In a cigarette lighter using cartridge retention means as shown in FIG. 7, the cigarette lighter is grasped in one hand and the plate 27 is moved to open position by sliding it against the edge of a table or desk, for example, thus releasing retention of the cartridge by its head 5. Then upon turning the cigarette lighter right-side-up over a wastebasket or other receptacle, the entire cartridge will fall out of its own weight. The thus emptied lighter, with the retainer plate 27 still in open position, is placed on its side with its bottom part at the edge of a flat surface, such as a table or desk, whereupon the replacement cartridge may be maneuvered into the lighter with but one hand, and, the lighter now being held upside down, such one-handed user depresses the head 5 into place with a finger and restores plate 27 to its closed position by means of a table or desk edge, as aforesaid. Similarly, the plate 27 may be flicked open whenever required to allow the head 5 to protrude slightly, as aforesaid, such head 5 rotated as desired digitally either while the cigarette lighter is being one-handedly held or while it rests on its side near a table edge, as mentioned, and thereafter the plate 27 is restored to closed position, also as just described.

Accordingly, the invention as hereinbefore disclosed provides, in a replaceable, interchangeable, unitary, discardable cartridge intended for one-time use only in spark-induced flaming devices such as cigarette lighters, a flint supply of ordinary or extraordinary quantity, and of ordinary or extraordinary nature such as the ability to alert the user by sensory perception, such as the production of distinctive sparks, for purposes of novelty effect or as a warning signal or signals of exhaustion or near-exhaustion of the normal flint supply, together with a flint supply feeding system, all permanently or semi-permanently connected to each other and to said interchangeable cartridge.

Also, the entire cartridge and its materials are such as to notably and materially reduce the costs of its manufacture below those of any flint supply and feeding system hitherto known through elimination of such costly production processes as machine screw-threading and reducing the amount of time and the degree of labor skill required for manual asembly operations, and enabling the use in whole or in part of castable, extrudable or otherwise cheaply processed low-cost materials, and which flint supply feeding system, in one of its preferred forms, may consist of only four parts, namely, with reference to FIGS. 3 and 4, the flint supply 11, the sheath or sleeve 1 with its helical slot 2; the follower member 7 with its lug means 8 engaged in the said slot 2; and resilient pressure means 9 which may be connected directly to the flint supply rather than to the optionally-used pusher member 10, all four such parts being operatively assembled as a saleable unit, pre-tested and pre-adjusted by the manufacturer for trouble-free performance and service life.

Still further, the invention provides a means of producing more efficient, and in some instances hotter, sparks, and of controlling such sparking during useage; a means of totally eliminating a major and serious cause of undue wear on the striking wheel of a cigarette lighter and the like, thus prolonging the efficiency and service life of such wheel; a means for supplying, with each replacement of a spent or worn-out cartridge, completely new working parts as well as a new flint supply, and especially including a fresh, new resilient pressure means; various means for affixing such cartridges within lighters, which means at the same time allow required operational rotation of certain parts thereof, such affixation means including types of low production cost, and so simplified as to be susceptible of one-handed operation for insertion, removal and periodic adjustment of such cartridges, as aforesaid, thus eliminating the tedious, vexatious, risky and sometimes almost unattainable methods of the prior art.

Still further, the said invention affords various means providing for the production of distinctive-spark producing materials for use within such an interchangable discardable cartridge as aforesaid, or which may be supplied independently thereof in proper dimensions for use in existing conventional type lighters, and for novelty effect or for utilitarian warning-signal purposes as aforesaid.

Also, the nature of the invention is such that cigarette lighters of new manufacture may be readily and inexpensively adapted to the accommodation of such cartridges, with resultant substantial savings in manufacturing costs, and, similarly, for the use of which cartridges numerous types of existing lighters may be adapted in an easy, rapid, inexpensive manner.

Accordingly, the invention as hereinbefore disclosed, provides a flint, and flint feeding mechanism of unitary, discardable, replaceable cartridge form for cigarette lighters, and the like, which has advantages over prior art flint mechanisms in that it eliminates the bothersome frequent replacement of flints and the exasperation of handling, and assembly with the lighter, of a plurality of relatively tiny parts, and sometimes the misassembly, misplacement and loss of such parts, all of which inconveniences can be well appreciated by the users of lighters who undertake to service them personally.

Furthermore, as hereinbefore explained, the flint supply cartridge of the invention may be rapidly and efficiently installed in, or removed from, a lighter in such an easy manner as to be readily accomplished even by those who are mechanically inept or clumsy, and also by maimed or partially crippled persons, thus overcoming and eliminating a major and serious deficiency of all such spark-induced lighters or flaming devices heretofore known.

Furthermore, the device of the invention is of such a nature and design that nearly all existing types of conventional spark-induced lighting devices may readily and inexpensively be adapted to accommodate it, this feature

being especially attractive to those possessing cigarette lighters having sentimental or intrinsic value, but who desire to enjoy the many attractive benefits of the device of the invention.

Also, since a spent cartridge is to be discarded in its entirety and replaced by a new one, none of its working parts need necessarily be made of metal or have the durability of metallic construction, and its resilient means may be formed from flexible plastics, spongy rubber or other such material, and hence all of its working parts may, if desired, be of non-metallic construction and may be formed by such processes as casting or extrusion, thus contributing substantially to low-cost manufacture. Also, in some modified forms, the usual pusher head or cap at the flint end of the usual coil spring pressure means may be eliminated, one end of such spring being embedded in non-metallic material and the other embedded, if such embedding is desired, directly into the flint supply without any sacrifice of distinctive-sparking qualities or of striker wheel protective control, and, of course, reducing manufacturing costs accordingly.

Various changes and modifications including, and in addition to, those hereinbefore particularly referred to, are considered to be within the principle of the invention and the scope of the following claims.

What we claim is:

1. A discardable, replaceable, interchangeable flint cartridge for a cigarette lighter or other spark-induced flaming device, which lighter or device has an integral part thereof an elongated flint guide tube fitted therein; said flint cartridge comprising, as a pre-packaged salable article, a sleeve member provided with means for imparting rotation to it about its longitudinal axis, a flint supply disposed in said sleeve member and embraced thereby for feeding movement axially thereof, flint follower means carried within and embraced by said sleeve member and arranged adjacent to one end of said flint supply, resilient means interposed between said flint supply and flint follower means, and cooperating means on said sleeve member, said guide tube and said flint follower means functioning upon relative rotation of said sleeve member and flint follower means to adjust said flint supply axially of said sleeve member, the cooperating means of said guide tube including means providing a predetermined stopping point for the flint follower means; said flint supply, resilient means and flint follower means being interconnected in a unitary assembly confined within said sleeve member as a carrier therefor for insertion into, and removal at will from, the said guide tube of a cigarette lighter or the like, whereby when the flint supply of a cartridge in use is exhausted that cartridge may be removed from said guide tube, in toto, and discarded and replaced with a new, complete, pre-packaged cartridge, thereby avoiding the necessity for the user to handle a number of small and relatively delicate parts as in the case of present flint-replacement practices, with the possibility of loss, displacement or injury of such parts.

2. A discardable, replaceable, interchangeable flint cartridge for a cigarette lighter or other spark-induced flaming device, which lighter or device has as an integral part thereof an elongated flint guide tube fitted therein; and flint cartridge comprising, as a pre-packaged salable article, a sleeve member the wall of which provides a helical slot, said sleeve member being provided with means for imparting rotation to it about its longitudinal axis, a flint supply disposed in said sleeve member and embraced thereby for feeding movement axially thereof, flint follower means carried within and embraced by said sleeve member and arranged adjacent to one end of said flint supply, resilient means interposed between said flint supply and flint follower means, said flint follower means and said guide tube being provided with means complemental to and in engagement with the slot of said sleeve member and capable of travel in said slot upon relative rotation of said sleeve member and flint follower means to accomplish adjustment of said flint supply axially of said sleeve member, the cooperating means of said guide tube including means providing a predetermined stopping point for the flint follower means; said flint supply, resilient means and flint follower means being interconnected in a unitary assembly confined within said sleeve member as a carrier therefor for insertion into, and removal at will from, the guide tube of the cigarette lighter or the like, whereby when the flint supply of a cartridge in use is exhausted that cartridge may be removed from said guide tube, in toto, and discarded and replaced with a new, complete, pre-packaged cartridge, thereby avoiding the necessity for the user to handle a number of small parts of relatively delicate nature as in the case of present flint-replacement practices, with the possibility of loss, displacement or injury of such parts.

3. A discardable, replaceable, interchangeable flint cartridge for a cigarette lighter or other spark-induced flaming device, which lighter or device has as an integral part thereof an elongated flint guide tube fitted therein and provided with a longitudinal slot having a predetermined stopping point, said guide tube being disposed substantially in axial alignment with the striking wheel of the lighter or device; said flint cartridge comprising, as a pre-packaged salable article, a helically slotted sleeve member for disposition axially of said flint guide tube and having an open end facing the striking wheel and a closed end terminating in a rotatable adjusting head for disposition in a wall of the body of the lighter or other device, a flint supply disposed in said sleeve member and embraced thereby for feeding movement axially thereof, flint follower means carried within and embraced by said sleeve member, and resilient means interposed between said flint supply and flint follower means, said flint follower means being provided with lug means for operative engagement with the helical slot of said sleeve member and with the longitudinal slot of said flint guide tube, whereby when said head is rotated said sleeve member will be rotated and the lug means of said flint follower means will be held together against rotation by engagement in the slot of said flint guide tube and will travel axially of said sleeve member in the helical slot thereof and in the slot of the flint guide tube to thus cause the flint follower means to travel axially of said sleeve member; said flint supply, resilient means and flint follower means being interconnected in a unitary assembly confined within said sleeve member as a carrier therefor for insertion into, and removal at will from, said flint guide tube of the cigarette lighter or the like, whereby when the flint supply of a cartridge in use is exhausted that cartridge may be removed from said tube, in toto, and discarded and replaced with a new, complete pre-packaged cartridge, thereby avoiding the necessity for the user to handle a number of small and relatively delicate parts as in the case of present flint-replacement practices, with the possibility of loss, displacement or injury of such parts.

4. Flint feeding mechanism as defined in claim 3, wherein the longitudinal slot of said tube terminates at its striker-wheel adjacent end in stop means serving to limit travel of the lug means of said flint follower member and hence of said flint follower means toward said striking wheel.

5. Means for adapting a cigarette lighter and the like having a flint guide tube for reception of flint feeding mechanism as defiined in claim 2, including an insertable, removable, radially expanding substantially cylindrical shim having adjacent longitudinal edges in normally spaced relation, said shim being radially compressible and insertable in said giude tube and being outwardly expandable so as to be firmly contained therein, such expansion serving to separate said longitudinal edges to form a slit for the accommodation of the lug means of said flint follower means.

6. Adapting means as defined in claim 5, in which said expanding shim is provided on its longitudinal edges with stop means which, when the shim is inserted in said guide tube, substantially close together to thus terminate the longitudinal travel of said lug means in said slit.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,233,433 February 8, 1966

Hampton C. Godbe et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 11, line 15, for "distinctive-sprak" read -- distinctive-spark --; column 13, line 29, after "has" insert -- as --; column 14, line 41, strike out "together".

Signed and sealed this 10th day of January 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents