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F23Q 2/16

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F4F FDC

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US 5120215 A US 4538983 A

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(54) Safety device in lighting rods

(57) A safety device in a lighting rod comprises a locking member (25) having an engagement section (25b), which interferes with a portion of a sliding operation member (20) and thereby locks the operation member (20). The locking member (25) can move in a direction, that intersects with the operation member (20). A spring (26) urges the locking member (25) into a locking position. The locking member (25) is provided with a lock releasing section (25c), which can be operated in order to move the locking member (25) in a direction, that acts against the spring 26. The lock is released by operating the lock releasing section (25c) of the locking member (25), and the lighting operation is carried out in this state by operating the operating section (20a) of the operation member (20). The locking member (25) automatically returns to the locked state as the operation member (20) returns to its original position.

FIG.1

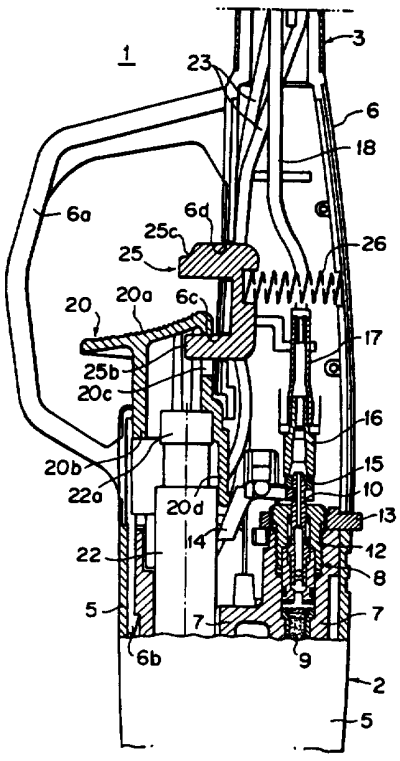

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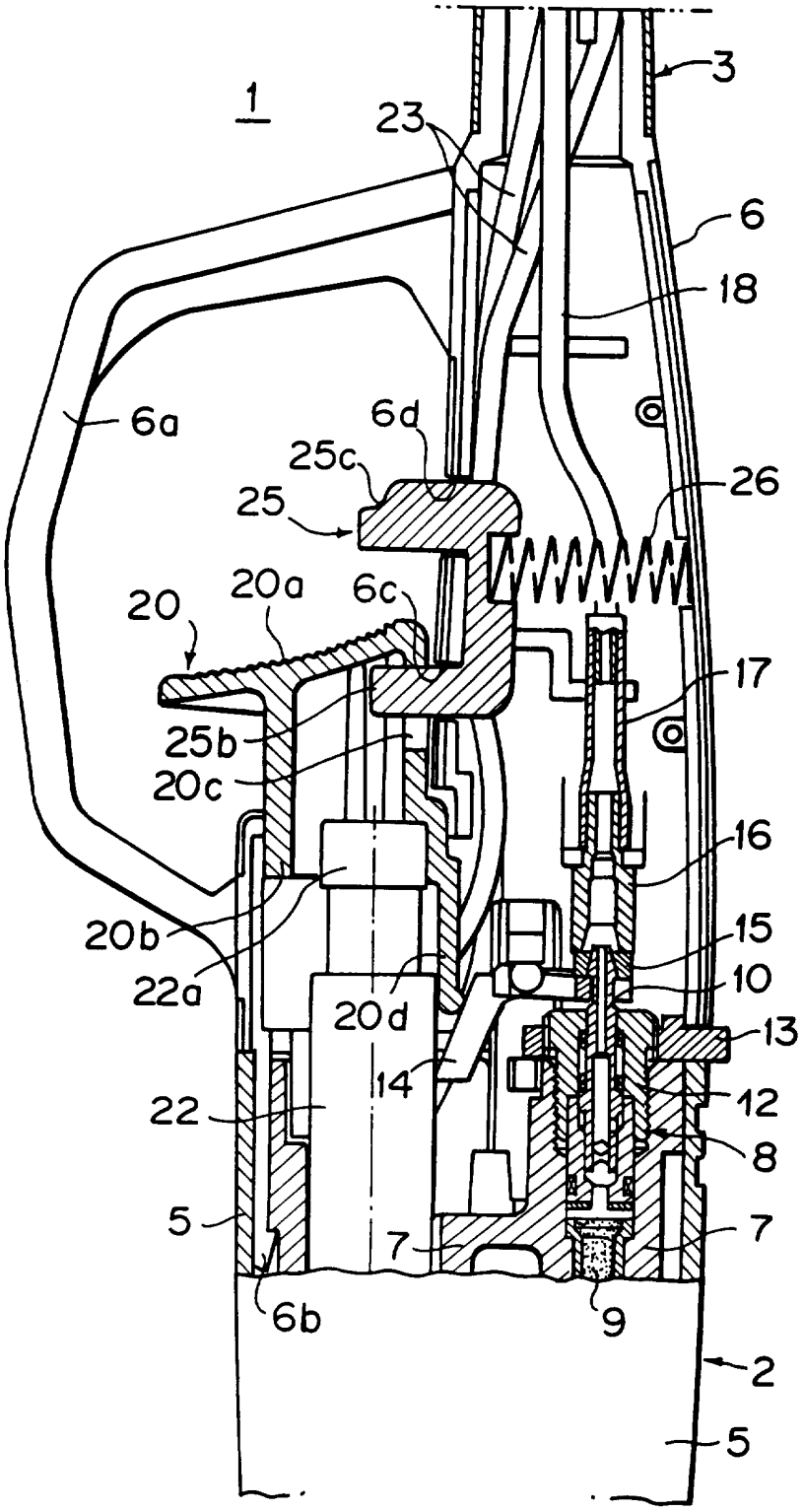
FIG.1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6b
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2
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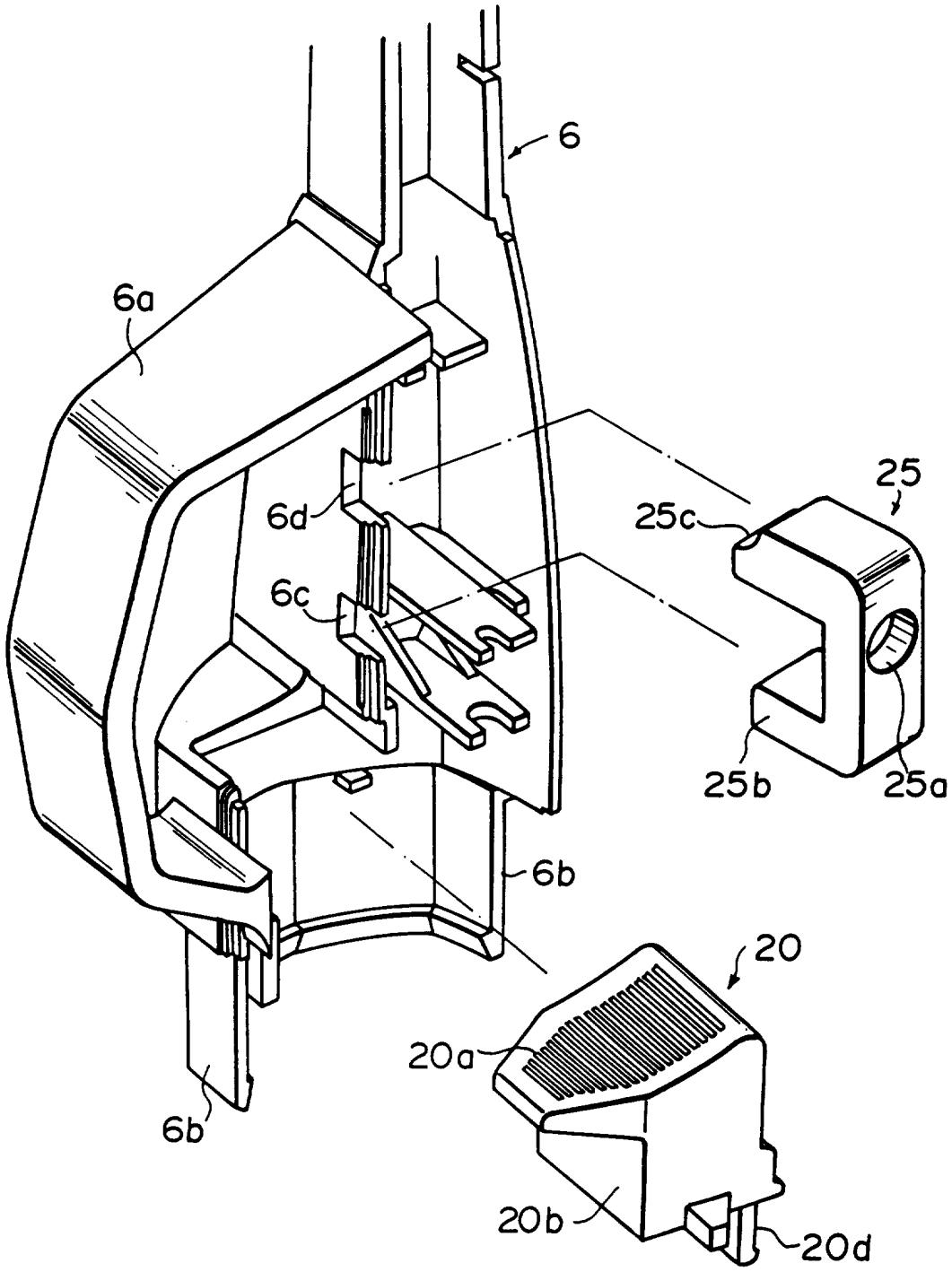
FIG.2



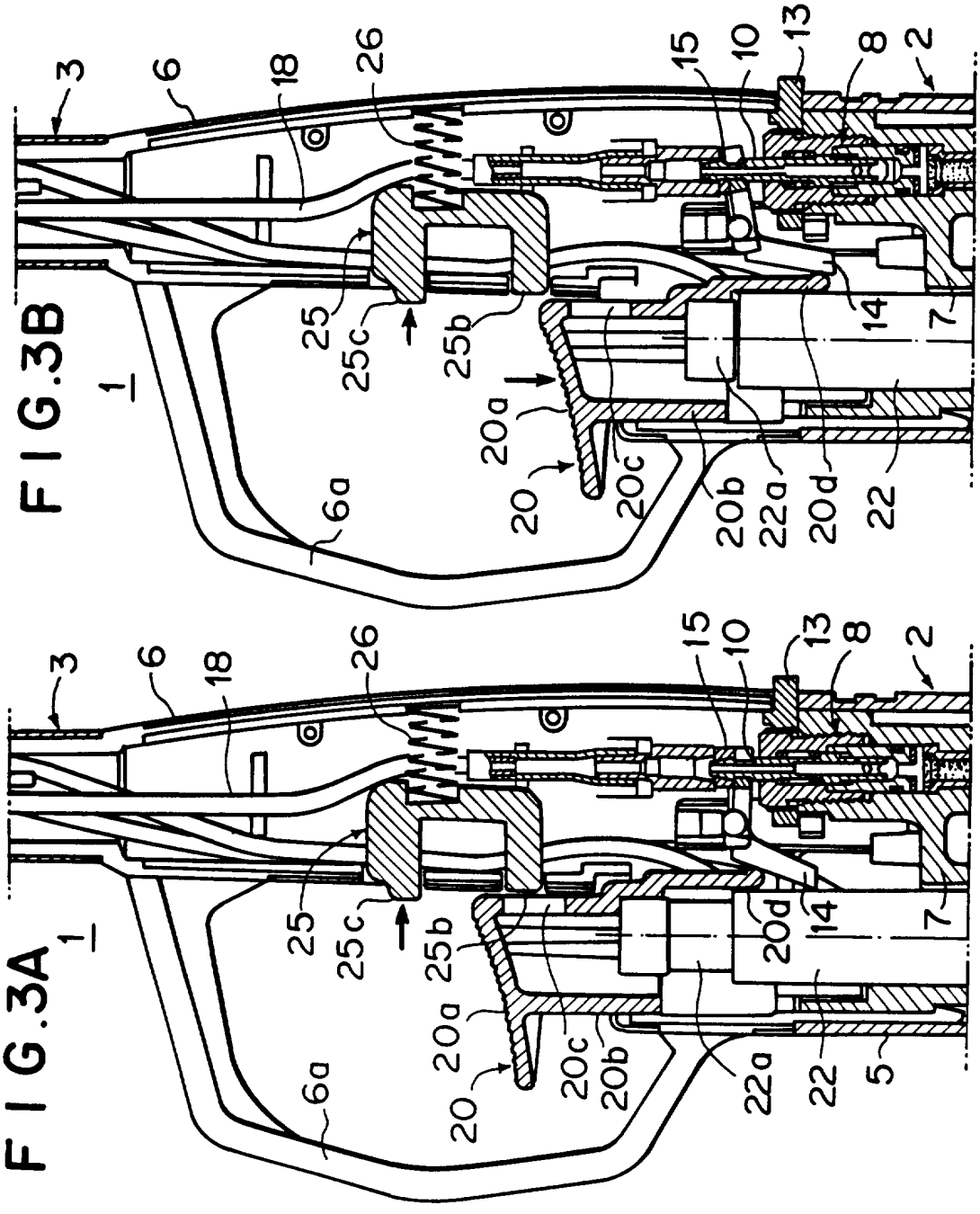


FIG.3A
FIG.3B
1
2
3
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6
6a
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14
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18
20
20a
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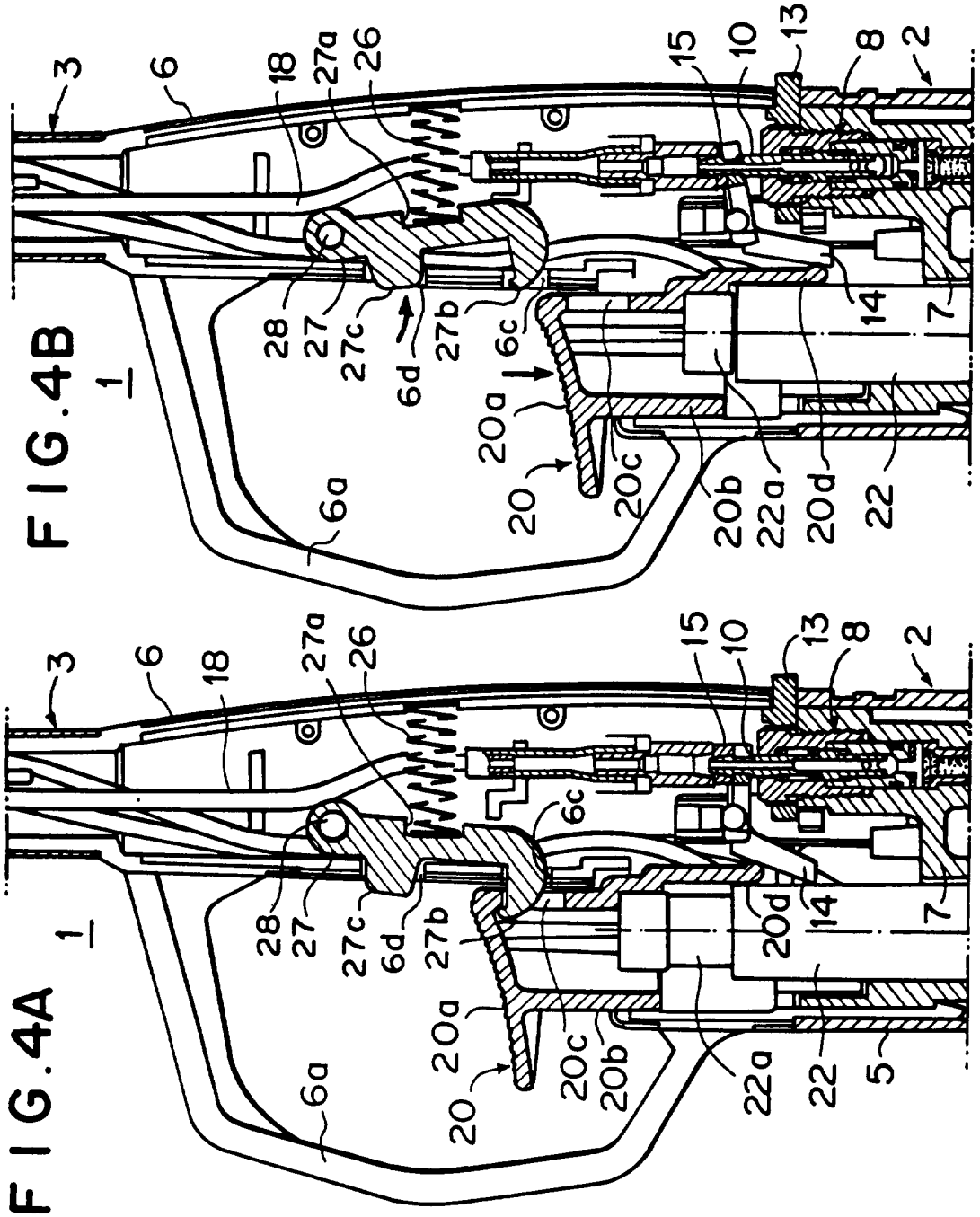
20c
20d
22
22a
25
25b
25c
26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26
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1
28
27
27c
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20b
22a
20d
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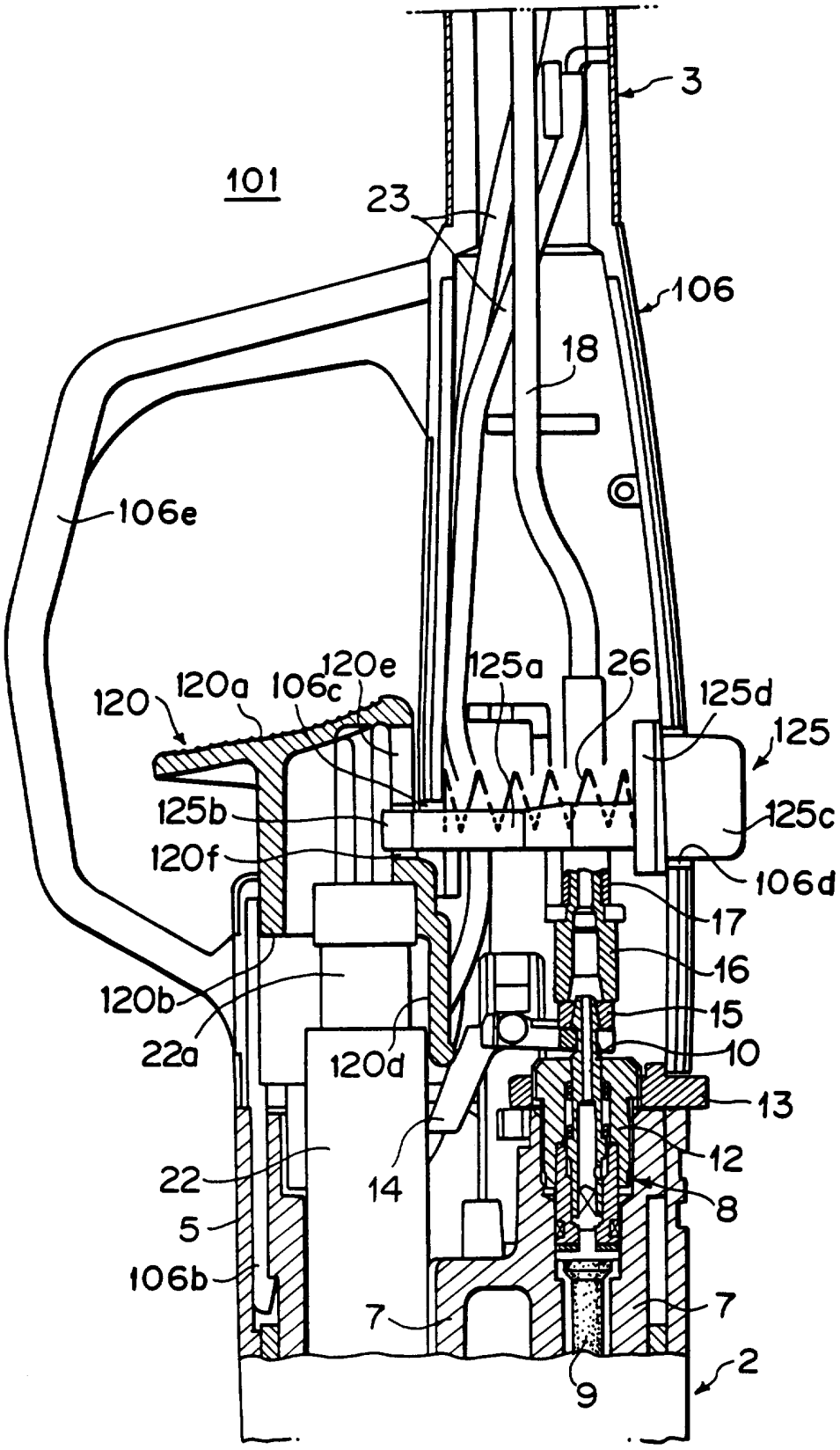
6a
5

FIG.4B

FIG.4A

FIG.5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106b
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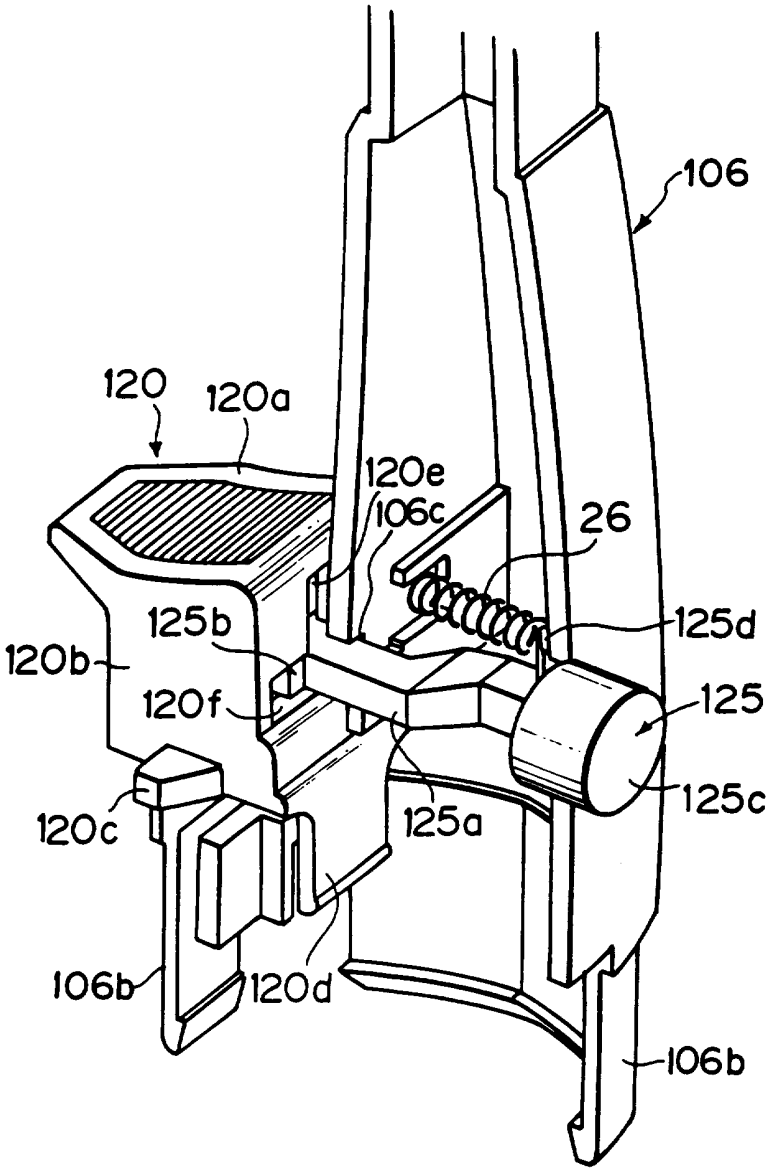
2

FIG.6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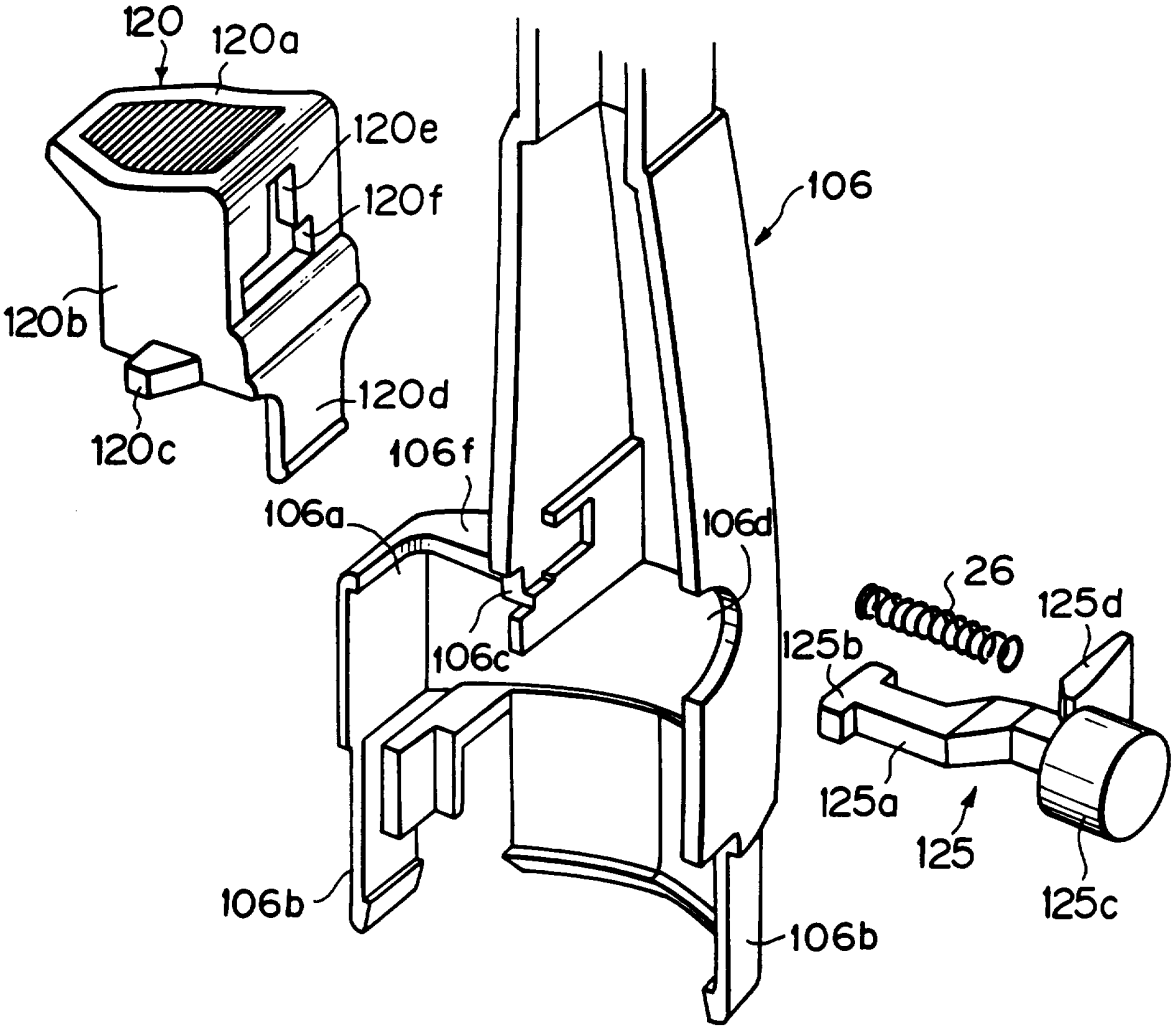
106b
120d
106b

FIG.7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120b
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106c
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125b
125a
125
125c
106b
106b

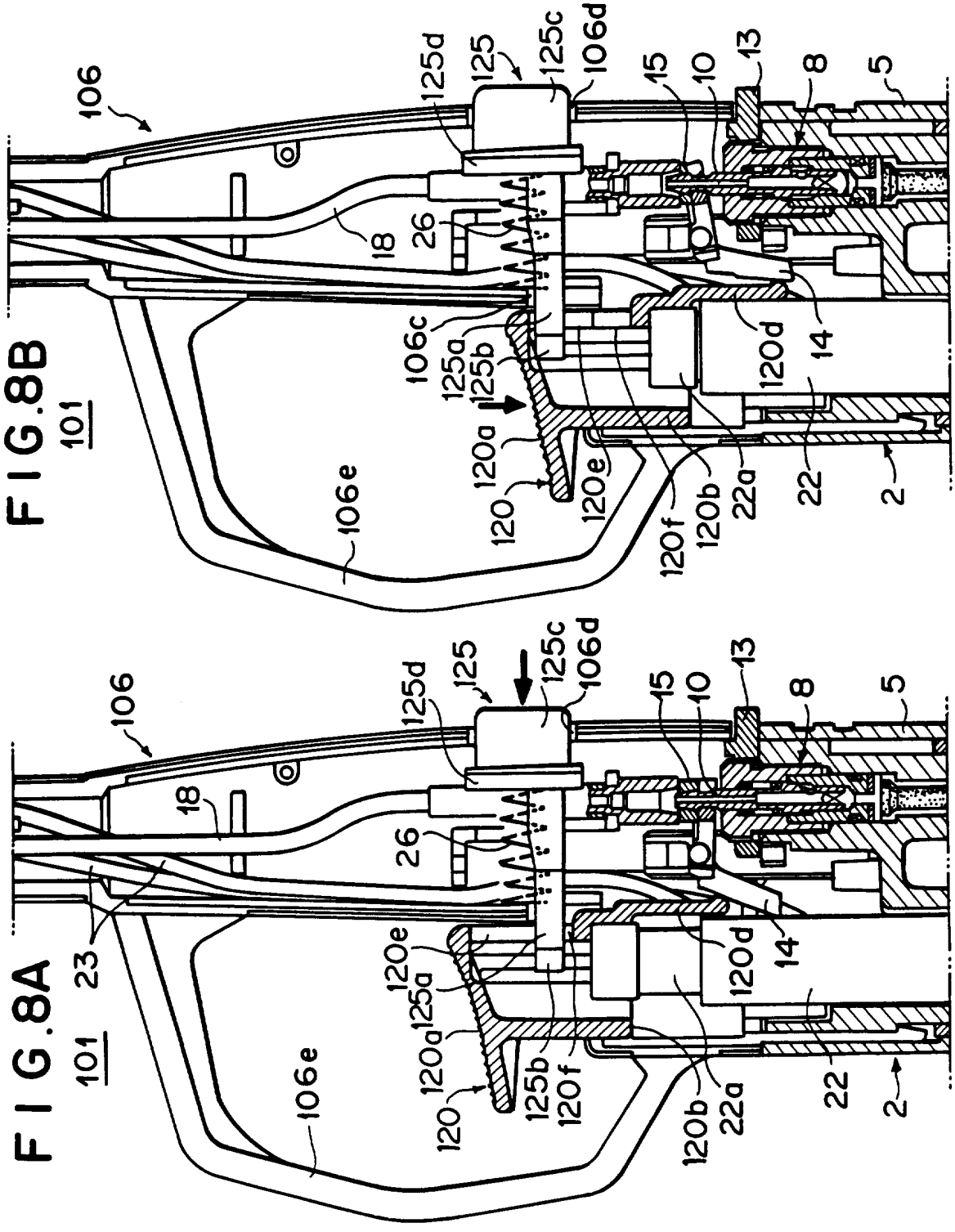
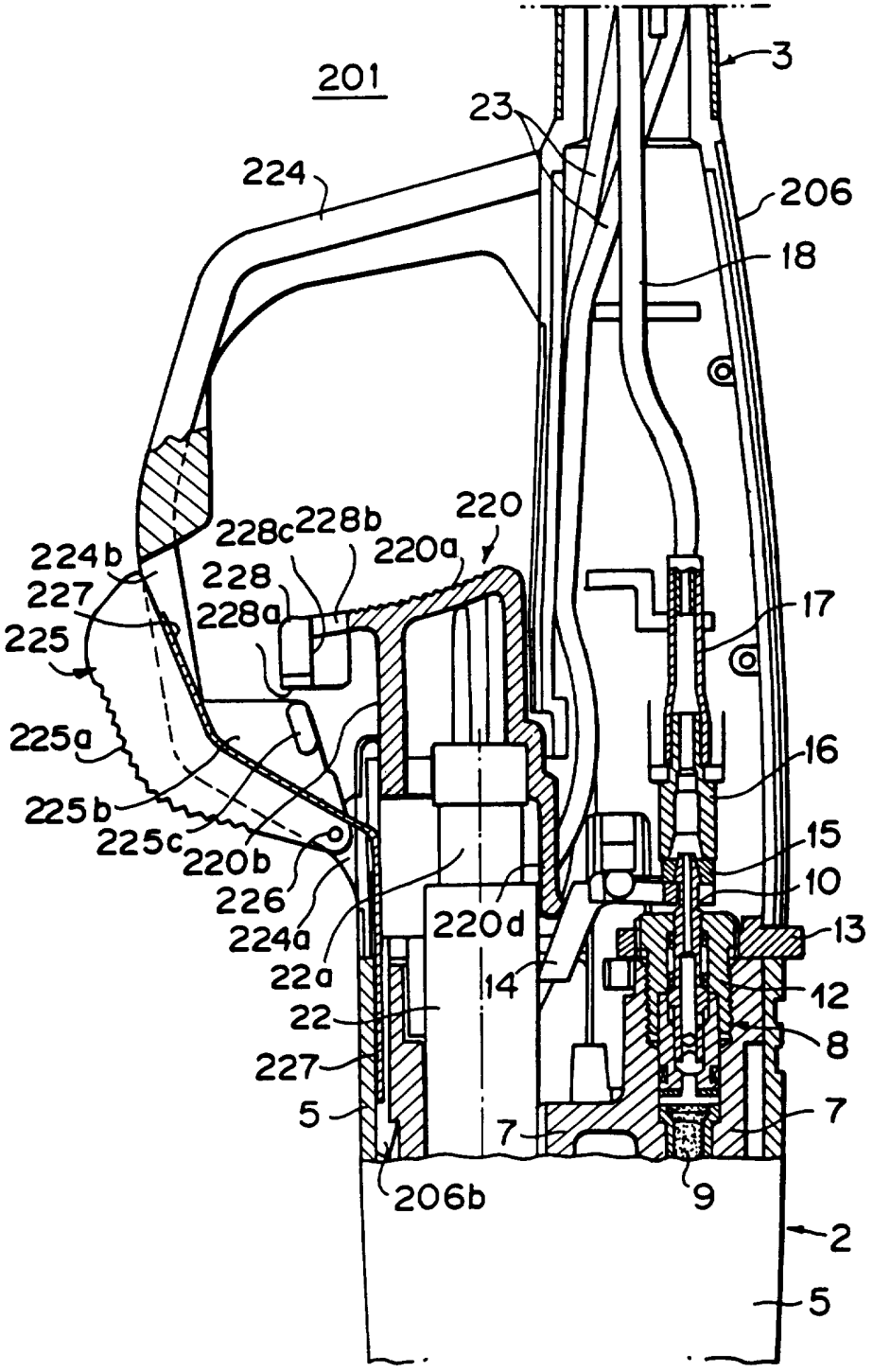


FIG.8B
101

FIG.8A
101

FIG.9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225c
220b
15
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227
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7
7
206b
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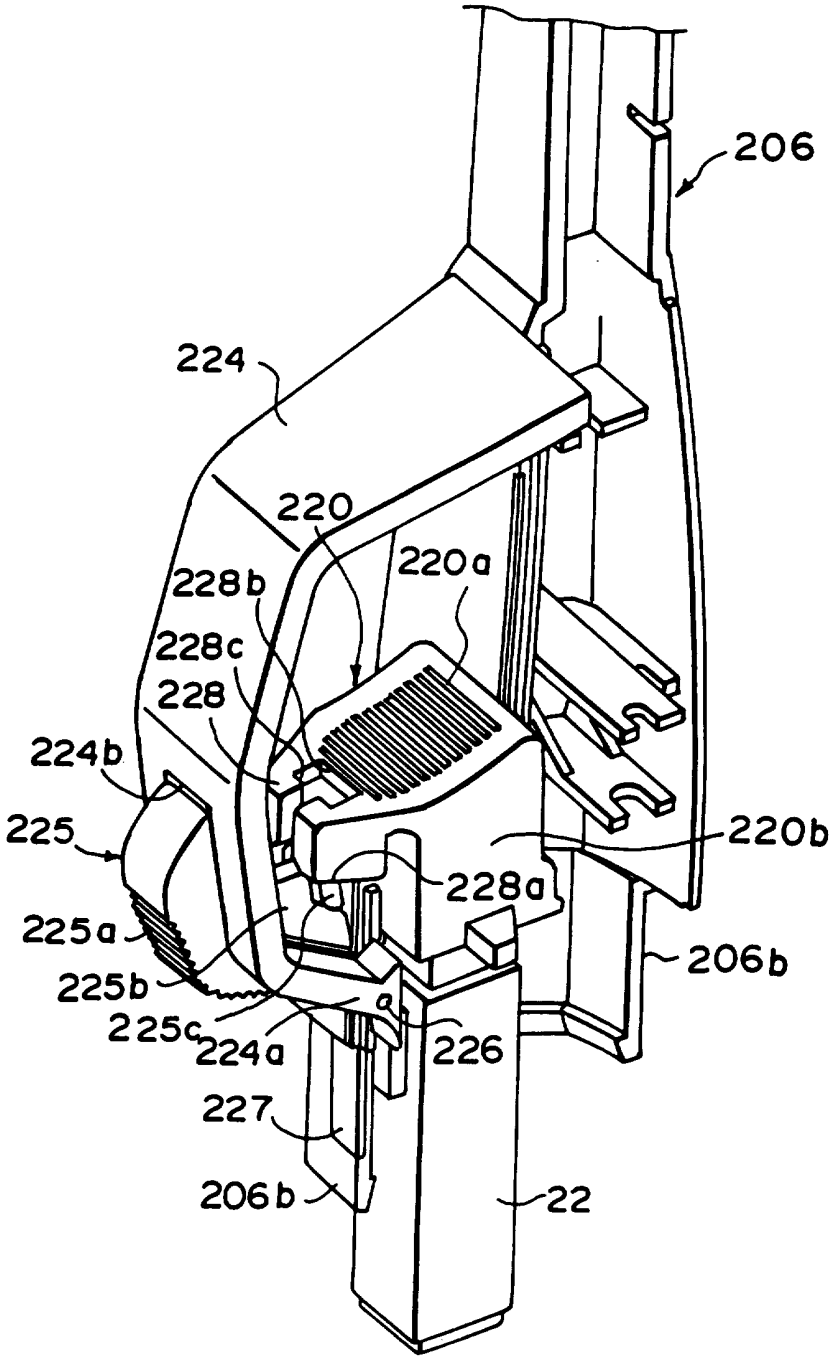
2
5

FIG.10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220a
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225b
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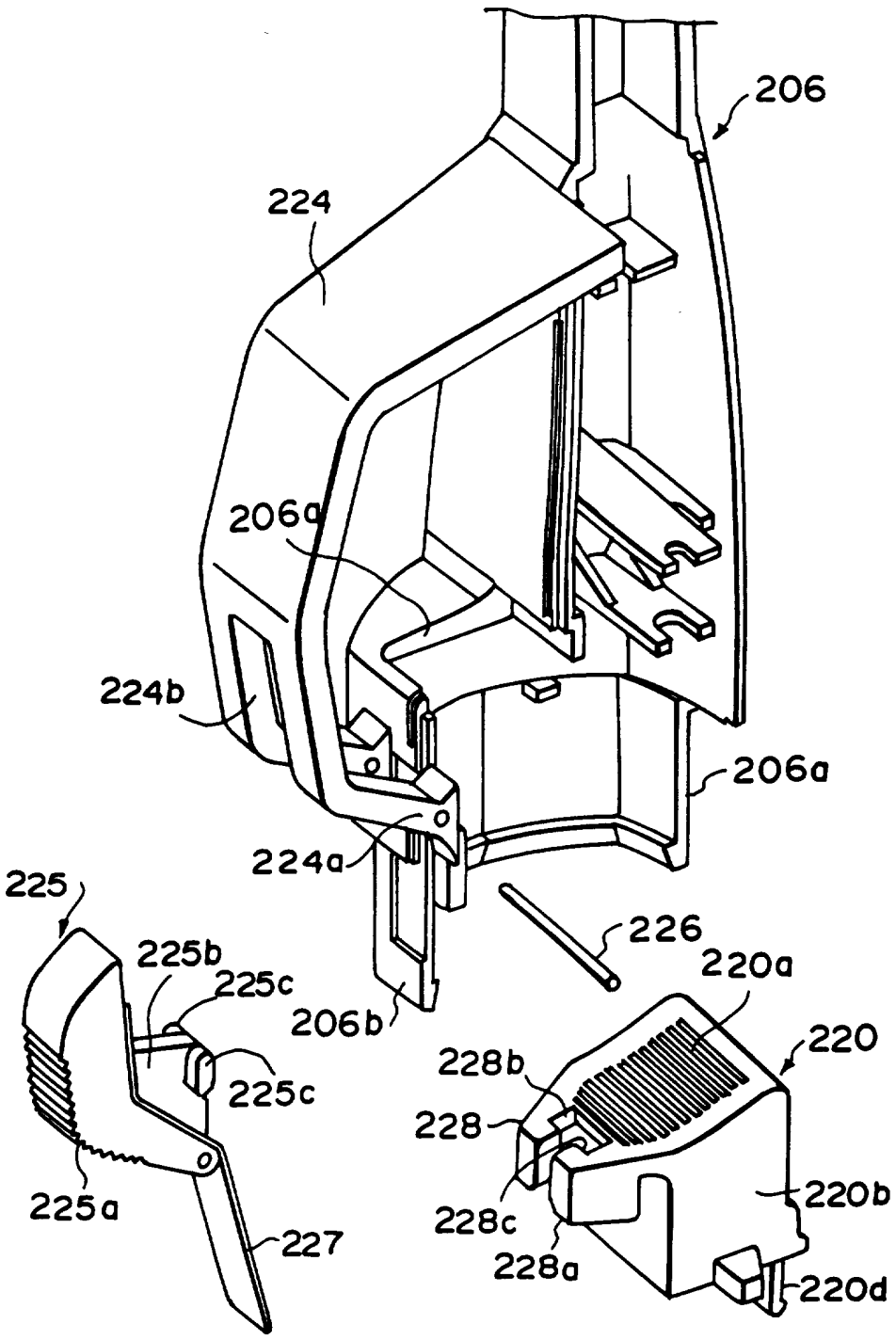
206b
22

FIG.11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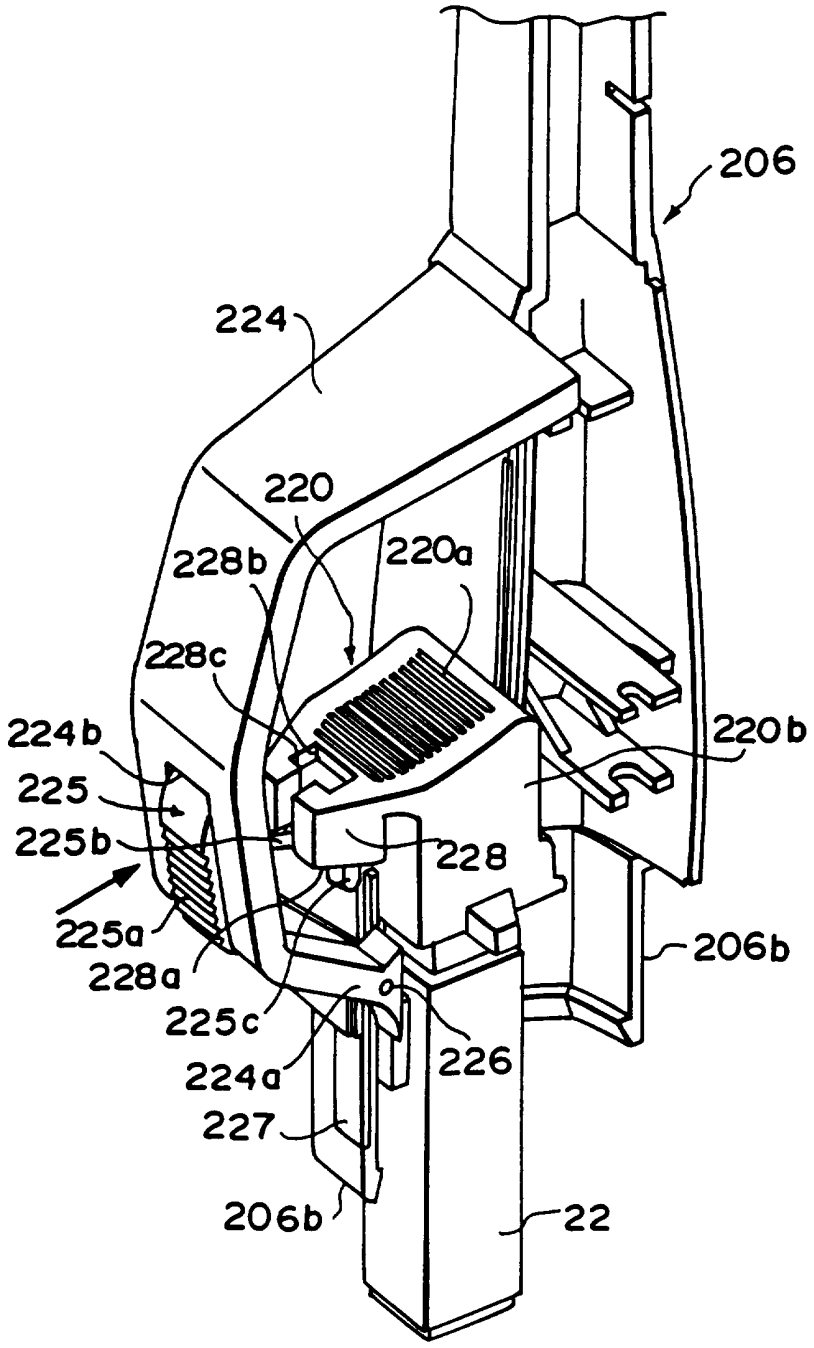
220d

FIG.12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206b
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FIG. 13A

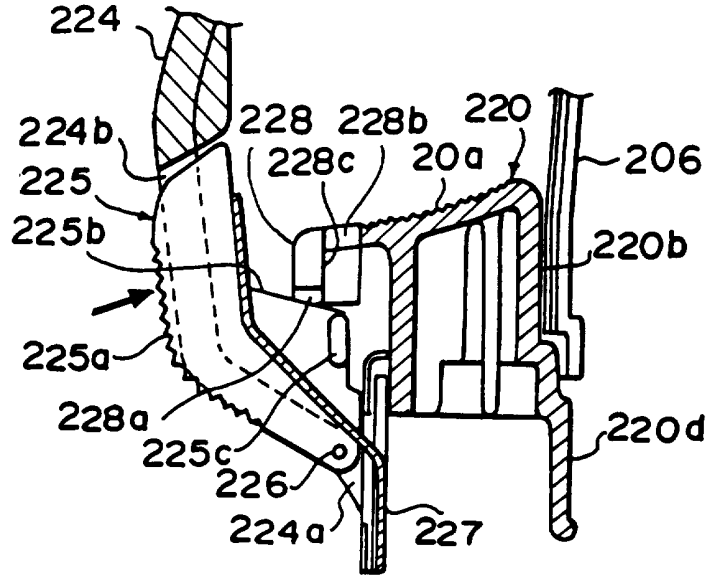


FIG. 13B

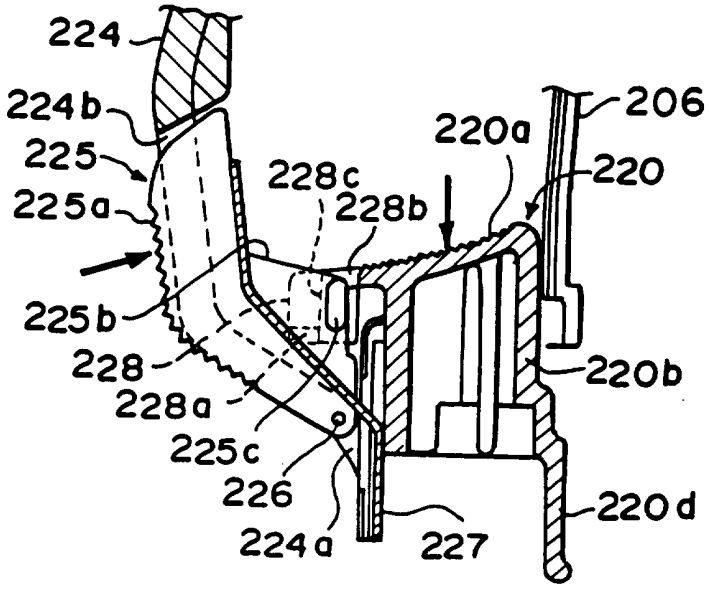
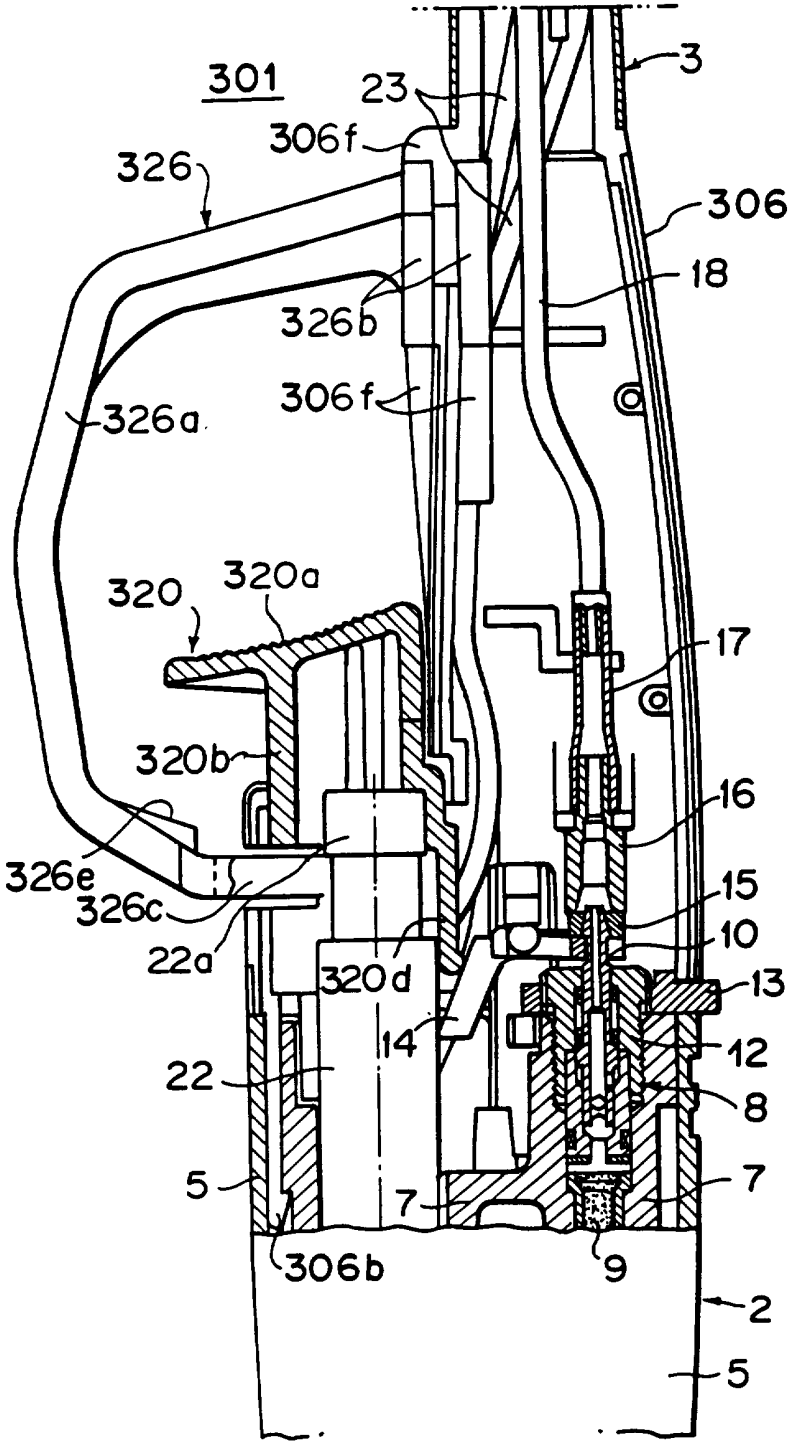


FIG.14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306b
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FIG.15

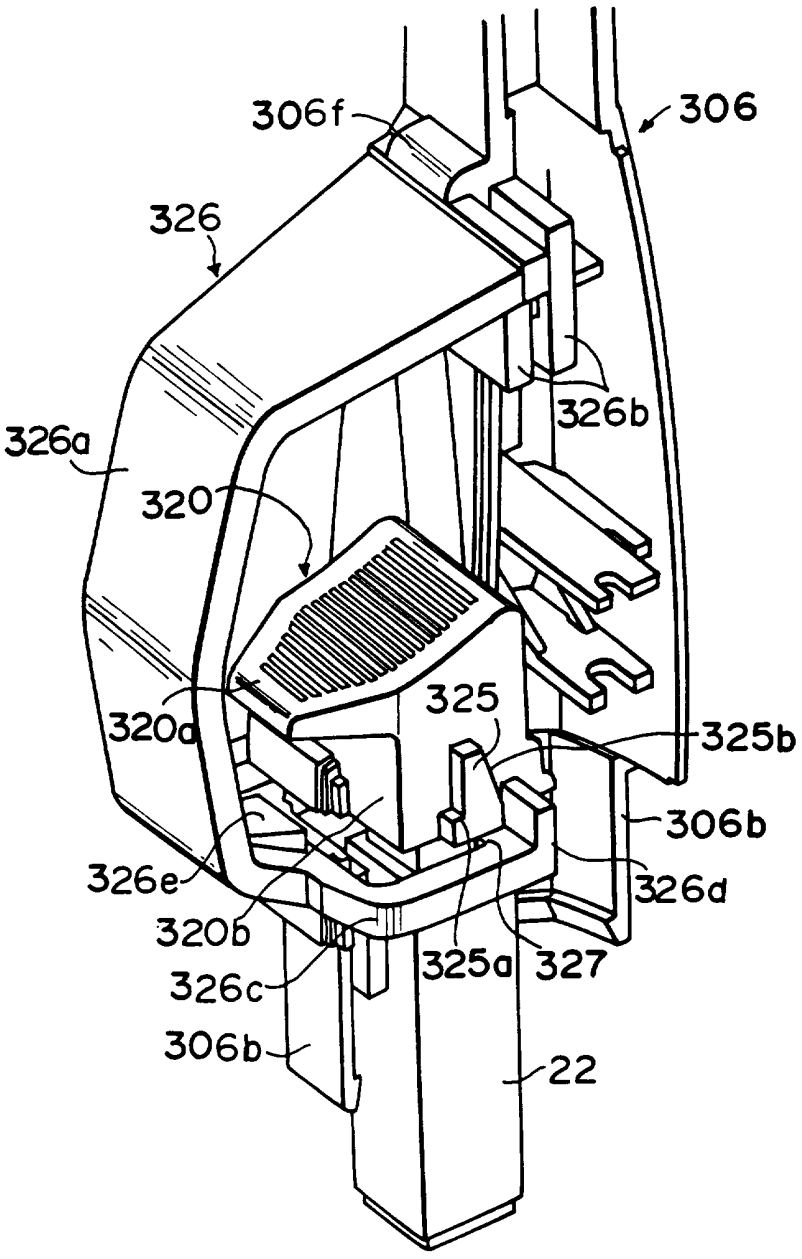
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FIG.16

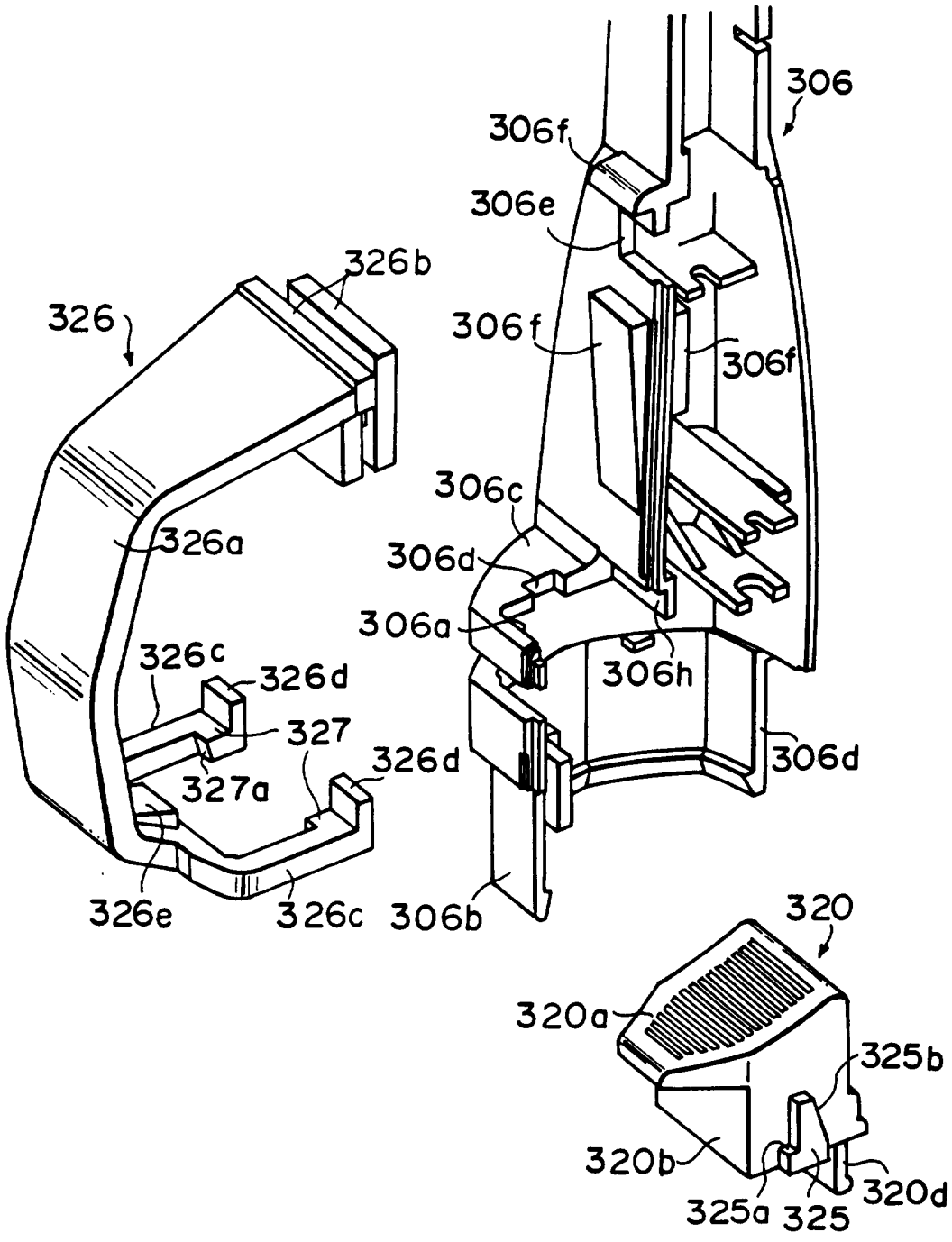
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FIG. 17

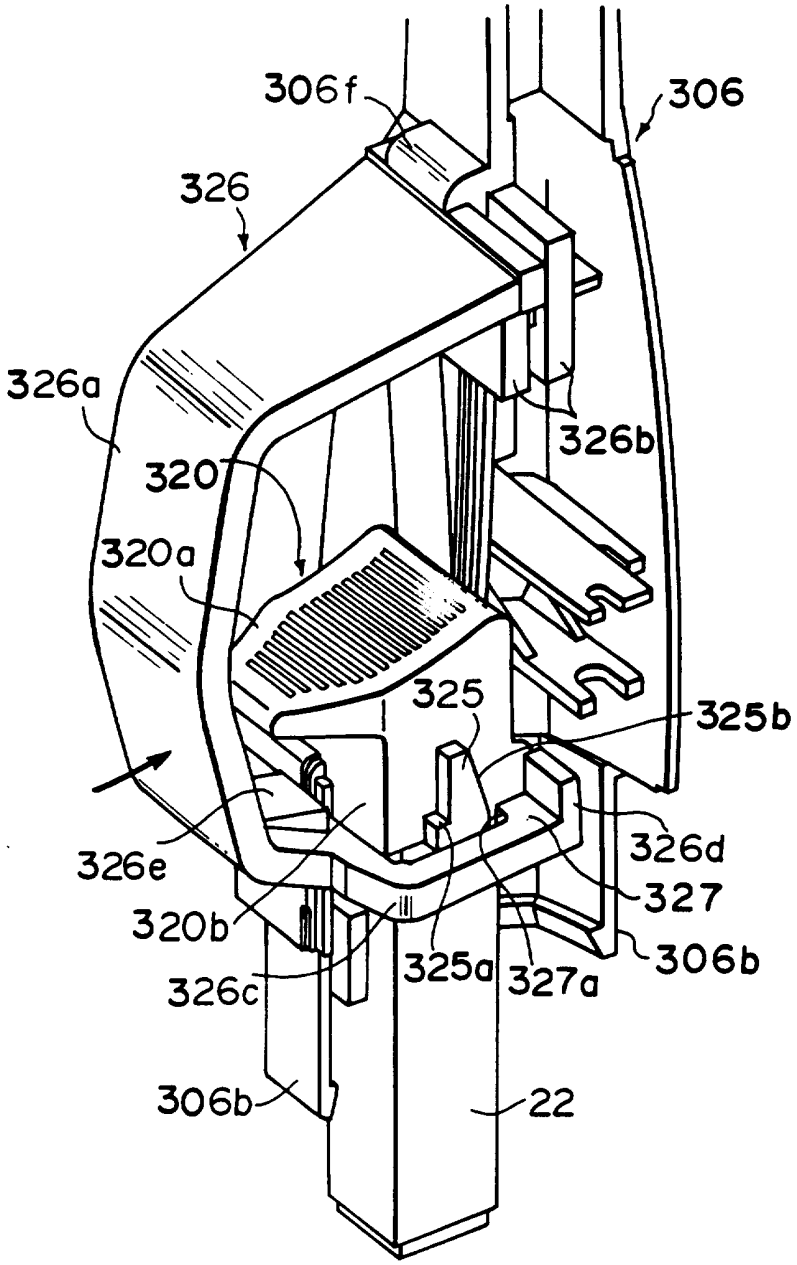
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FIG.18A

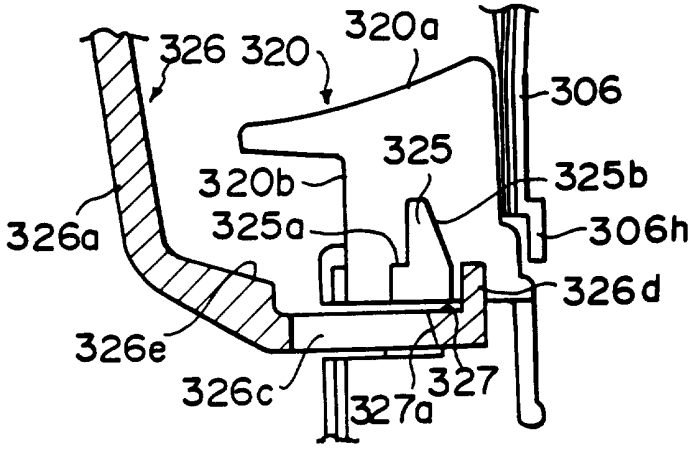


FIG.18B

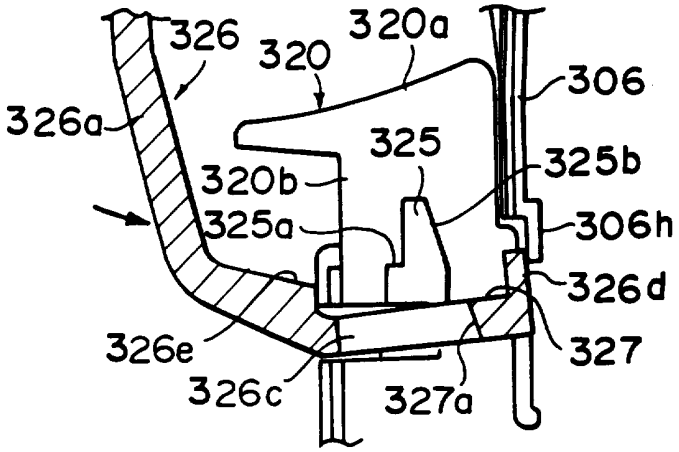
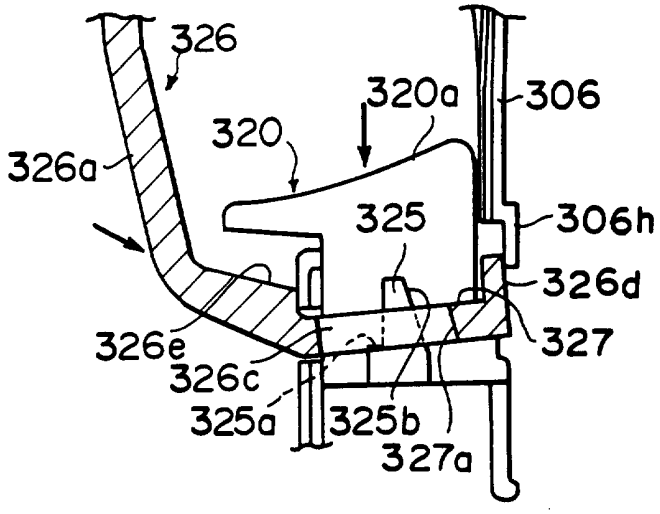


FIG.18C



SAFETY DEVICE IN LIGHTING RODS

This invention relates to an ignition device or lighting rod, and more particularly, but not exclusively, to a safety device in a lighting rod, in which a flame is produced and jetted from a rod-like top end portion by a lighting operation of an operation member, wherein the lighting operation of the operation member is locked to prevent operation when the lighting rod is not used, and wherein the lock is released and the lighting operation is enabled when the lighting rod is used.

Lighting rods are useful apparatuses, which can light a fire easily when trigger-like operation members are pushed down. However, with known lighting rods, persons, such as children, who do not know how to use the lighting rods appropriately, can light a fire carelessly. Therefore, known lighting rods are not favourable from the viewpoint of safety.

Accordingly, a need exists for a lighting rod having enhanced safety characteristics such that persons, who do not know how to use the lighting rod appropriately, cannot light a fire carelessly, or such that accidental lighting may not occur. To satisfy such a need, lighting rods provided with various safety devices have been proposed.

For example, in Japanese Unexamined Utility Model Publication No. 62(1987)-5565, Japanese Patent

Publication No. 60(1985)-122828, and U.S. Patent No. 5,199,865, safety devices in lighting rods have been proposed, wherein a locking member for obstructing the driving operation of an operation member is manually moved between a position for locking and a position for lock release. With the proposed safety devices, after the locking member has been moved from the position for locking to the position for lock release and a fire has been lighted, if the locking member is not returned manually to the position for locking, the safety device is kept in the state in which the lock is released.

With the conventional lighting rods described above, problems occur in that, after the locking member has been moved to the position for lock release and a fire has been lighted, if the user forgets to return the locking member from the position for lock release to the position for locking, and the locking member is thus left to stand at the position for lock release, the locking member does not execute the locking function as the safety device, and therefore the careless lighting described above will occur.

Also, for example, in Japanese Unexamined Patent Publication No. 5(1993)-256448 and U.S. Patent No. 4,832,596, structures for gas lighters have been proposed, wherein a locking member, which can be deformed or can slide, is located at a portion of an actuation lever, which is pushed down when a fire is to be lighted. The locking member disables the actuation

lever from operating. When the locking member is manually operated to a position for lock release and the actuation lever is thereafter pushed down, the lock member moves to a position capable of locking in accordance with the operation for pushing the actuation lever down. Alternatively, when a finger of the user is moved away from the gas lighter, the locking member returns to the state of locking by the force of a spring. In this manner, with these proposed structures for gas lighters, the locking member is not left to stand in the state of the lock being released.

However, the aforesaid safety mechanisms for gas lighters cannot be directly applied to a lighting rod, which has a different structure. Therefore, a need exists for a mechanism suitable for a lighting rod to be achieved with a simple structure in relation to the structure a main body of a lighting rod, the shape of an operation member for carrying out the operation for lighting, a protection frame formed around the operation member, and the like, such that a lighting operation may be locked when the lighting rod is not used, such that the lock of the lighting operation may be released by an operation independent from the operation member and the lighting may thereby be enabled when a fire is to be lighted, and such that, after the lighting, the locked state may be restored automatically, accompanying a returning movement of the operation member.

Viewed from one aspect the present invention provides a lighting rod, which lighting rod is provided

with a rod-like top end portion and a main body, the rod-like top end portion being provided with a jetting nozzle for jetting out a gas, the main body being provided with:

i) a gas tank,

ii) a valve mechanism for opening and closing a path, through which the gas is supplied from the gas tank to the jetting nozzle,

iii) a piezo-electric unit for generating a discharge voltage for lighting the gas,

iv) an operation member, which is capable of sliding, which has an operating section, and which drives the valve mechanism and the piezo-electric unit in order to carry out a lighting operation, the operating section of the operation member being exposed to the exterior of the main body, and

v) a safety device, said safety device comprising:

a) a locking member having an engagement section, which interferes with a portion of the operation member and thereby locks the lighting operation of the operation member, the locking member being capable of moving in a direction, that intersects with the direction along which the operation member moves, and

b) an urging member, which urges the locking member to a locking direction,

the locking member being provided with a lock releasing section, which is capable of being operated in order to move the locking member in a direction, that

acts against the urging force of the urging member, the lock releasing section being projected to a position, which stands facing the operating section of the operation member,

wherein the lock of the lighting operation is released by operating the lock releasing section of the locking member, the lighting operation is carried out in this state by operating the operating section of the operation member, and the locking member automatically returns to the locking state as the operation member returns to its original position.

The safety device in a lighting rod in accordance with the present invention viewed from the first aspect should preferably be constituted such that the locking member may have an approximately U-shaped form, one end portion of the locking member may constitute the engagement section, the other end portion of the locking member may constitute the lock releasing section, and the engagement section may engage with an engagement hole of the operation member and may thereby lock the operation member such that the operation member cannot move.

Viewed from a second aspect the present invention provides a lighting rod, which lighting rod is provided with a rod-like top end portion and a main body, the rod-like top end portion being provided with a jetting nozzle for jetting out a gas, the main body being provided with:

i) a gas tank,

ii) a valve mechanism for opening and closing a path, through which the gas is supplied from the gas tank to the jetting nozzle,

iii) a piezo-electric unit for generating a discharge voltage for lighting the gas,

iv) an operation member, which is capable of sliding, which has an operating section, and which drives the valve mechanism and the piezo-electric unit in order to carry out a lighting operation, the operating section of the operation member being exposed to the exterior of the main body, and

v) a safety device, said safety device comprising:

a) a locking member, which interferes with the operation member and thereby locks the lighting operation of the operation member, the locking member being capable of moving in a direction, that intersects with the direction along which the operation member moves, and

b) an urging member, which urges the locking member to a locking direction,

the locking member being provided with a lock releasing section, which is capable of being operated in order to move the locking member in a direction, that acts against the urging force of the urging member, the lock releasing section being projected to the exterior of the main body on the side opposite to the operation member,

wherein the lock of the lighting operation is

released by operating the lock releasing section of the locking member, the lighting operation is carried out in this state by operating the operating section of the operation member, and the locking member automatically returns to the locking state as the operation member returns to its original position.

The safety device in a lighting rod in accordance with the present invention viewed from the second aspect should preferably be constituted such that the locking member may comprise:

1) a bar-like shaft, which is inserted transversely through the main body,

2) an engagement section, which is located at one end of the bar-like shaft, the engagement section being inserted into an engagement groove of the operation member, interfering with the operation member, and thereby locking the operation member such that the operation member cannot move,

3) the lock releasing section, which is used for a pushing operation and is located at the other end of the bar-like shaft, and

4) an urging member receiver, which receives one end of the urging member,

whereby, when the pushing operation of the lock releasing section is carried out, the engagement section moves inwardly into the operation member and enables the operation member to move for the lighting.

Viewed from a third aspect the present invention provides a lighting rod, which lighting rod is provided

with a rod-like top end portion and a main body, the rod-like top end portion being provided with a jetting nozzle for jetting out a gas, the main body being provided with:

i) a gas tank,

ii) a valve mechanism for opening and closing a path, through which the gas is supplied from the gas tank to the jetting nozzle,

iii) a piezo-electric unit for generating a discharge voltage for lighting the gas,

iv) an operation member, which is capable of sliding, which has an operating section, and which drives the valve mechanism and the piezo-electric unit in order to carry out a lighting operation, the operating section of the operation member being exposed to the exterior of the main body,

v) a guide frame, which is located so as to surround the operating section of the operation member, and

vi) a safety device, said safety device comprising:

a) a locking member, which interferes with the operation member and thereby locks the lighting operation of the operation member, the locking member being associated with the guide frame such that the locking member can rotate, and

b) an urging member, which urges the locking member to a locking direction,

the locking member projecting to the side outward

from the guide frame when the locking member is in the locking state, the locking member being provided with a lock releasing section, which is capable of being operated in order to move the locking member in a direction, that acts against the urging force of the urging member, and in order to thereby release the interference of the locking member with the operation member,

wherein the lock of the lighting operation is released by operating the lock releasing section of the locking member, the lighting operation is carried out in this state by operating the operating section of the operation member, and the locking member automatically returns to the locking state when the operation member returns to its original position in the state in which the lock releasing operation has been released.

The safety device in a lighting rod in accordance with the present invention viewed from the third aspect should preferably be constituted such that the locking member may be provided with a projection, which interferes with a portion of the operation member when the locking member is located at the position for locking, and such that the operation member may be provided with a groove, through which the projection of the locking member is inserted when the locking member has been rotated to the position for lock release.

Also, the groove of the operation member should preferably be provided with an engagement section, which comes into contact with the projection of the locking

member and restricts the rotation of the locking member to the locking state when the projection of the locking member is being inserted through the groove of the operation member.

Viewed from a fourth aspect the present invention provides a lighting rod, which lighting rod is provided with a rod-like top end portion and a main body, the rod-like top end portion being provided with a jetting nozzle for jetting out a gas, the main body being provided with:

i) a gas tank,

ii) a valve mechanism for opening and closing a path, through which the gas is supplied from the gas tank to the jetting nozzle,

iii) a piezo-electric unit for generating a discharge voltage for lighting the gas,

iv) an operation member, which is capable of sliding, which has an operating section, and which drives the valve mechanism and the piezo-electric unit in order to carry out a lighting operation, the operating section of the operation member being exposed to the exterior of the main body,

v) a protection frame, which is located so as to surround the operating section of the operation member, and

vi) a safety device, said safety device comprising a locking means, which is constituted of the protection frame of the main body of the lighting rod,

the protection frame having one end, which serves

as a base point, and the other end capable of undergoing restoration displacement, which other end extends to a side of the operation member and can move, the other end being provided with an engagement section, which interferes with a portion of the operation member and locks the lighting operation of the operation member when the engagement section is in the locking state during the nonoperating condition of the operation member,

wherein the engagement section moves and releases the interference with the operation member in accordance with a lock releasing operation of the protection frame, the lighting operation is carried out in this state by operating the operation member, and the engagement section automatically returns to the locking state in accordance with a returning movement of the operation member to its original position and a restoration movement of the protection frame.

The safety device in a lighting rod in accordance with the present invention viewed from the fourth aspect should preferably be constituted such that a projection may be formed on a side surface of the operation member, such that the engagement section of the protection frame may interfere with the projection of the operation member, and such that the engagement section of the protection frame may move to a position, that does not interfere with the projection of the operation member in accordance with the lock releasing deformation of the protection frame.

Also, the safety device in a lighting rod in accordance with the present invention viewed from the fourth aspect should preferably be constituted such that the other end of the protection frame may be capable of undergoing resilient deformation by taking the one end of the protection frame as the base point and may move with the restoring force, which is due to the resilient deformation, from the state of lock release to the position for locking.

With at least preferred safety devices in lighting rods in accordance with the present invention viewed from the first aspect, when the locking member is projected by the urging member and is thus located at the position for the locking, the engagement section of the locking member is in the state of interference with the operation member. In this state, the engagement section of the locking member obstructs the movement of the operation member and thereby locks the lighting operation. When the lock releasing section of the locking member is operated in the depressing direction in which it is retracted into the main body against the urging force of the urging member and is thereby moved to the position for lock release, the engagement section also moves in the depressing direction and is released from the interference with the operation member. As a result, the movement of the operation member becomes possible. By the operation of the operation member, the fuel gas is jetted from the gas tank and lighted. When the operations of the operation member and the locking

member are released, the operation member returns to its original position, and the engagement section of the locking member is moved by the urging force of the urging member to the position, at which the engagement section of the locking member interferes with a portion of the operation member. In this manner, the engagement section of the locking member automatically returns to the state of locking the lighting operation. Therefore, when the lighting rod is not used, the lighting operation of the operation member is always made impossible, and careless lighting operations can be prevented. Accordingly, a lighting rod, which is very safe, can be obtained.

Also, with at least preferred safety devices in lighting rods in accordance with the present invention viewed from the first aspect, wherein the direction, in which the locking member is operated for the lock release, and the direction, in which the operation member is operated for the lighting, are different from each other, it can be rendered difficult for persons, who do not know how to use the lighting rod appropriately, to release the lock, and careless lighting can thereby be prevented.

With at least preferred safety devices in lighting rods in accordance with the present invention viewed from the second aspect, when the lock releasing section of the locking member is projected from the main body by the urging member, and the locking member is thus located at the position for locking, the locking member

is in the state of interference with the operation member. In this state, the locking member obstructs the movement of the operation member and thereby locks the lighting operation. When the lock releasing section of the locking member is operated in the depressing direction in which it is retracted into the main body against the urging force of the urging member and is thereby moved to the position for lock release, the locking member is released from the interference with the operation member. As a result, the movement of the operation member becomes possible. By the operation of the operation member, the fuel gas is jetted from the gas tank and lighted. When the operations of the operation member and the locking member are released, the operation member returns to its original position, and the locking member is moved by the urging force of the urging member to the position, at which the locking member interferes with a portion of the operation member. In this manner, the locking member automatically returns to the state of locking the lighting operation. Therefore, when the lighting rod is not used, the lighting operation of the operation member is always made impossible, and careless lighting operations can be prevented. Accordingly, a lighting rod, which is very safe, can be obtained.

Also, with at least preferred safety devices in lighting rods in accordance with the present invention viewed from the second aspect, wherein the direction, in which the locking member is operated for the lock

release, and the direction, in which the operation member is operated for the lighting, are different from each other, it can be rendered difficult for persons, who do not know how to use the lighting rod appropriately, to release the lock, and careless lighting can thereby be prevented.

With at least preferred safety devices in lighting rods in accordance with the present invention viewed from the third aspect, when the locking member, which is associated with the guide frame such that it can rotate, is located at the position for locking, a portion of the locking member is located at the position, that interferes with the operation member. In this state, the locking member obstructs the movement of the operation member and thereby locks the lighting operation. When the locking member is operated in the direction for lock release against the urging force of the urging member, the locking member is released from the interference with the operation member. As a result, the movement of the operation member becomes possible. By the operation of the operation member, the fuel gas is jetted from the gas tank and lighted. When the lock releasing operation of the locking member is released at the time at which the operation member has returned to its original position, the operation member and the locking member return to the state of interference. In this manner, the locking member automatically returns to the state of the lock of the lighting operation. Therefore, when the lighting rod is

not used, the lighting operation of the operation member is always made impossible, and careless lighting operations can be prevented. Accordingly, a lighting rod, which is very safe, can be obtained.

Also, with at least preferred safety devices in lighting rods in accordance with the present invention viewed from the third aspect, the locking member may be provided with the projection, which interferes with the operation member, and the operation member may be provided with the groove, through which the projection of the locking member is inserted. In such cases, when the lighting rod is not used, the projection of the locking member interferes with the operation member, and therefore the lighting operation cannot be carried-out. When the locking member is rotated to the position for lock release, the projection of the locking member moves to the position, that coincides with the position of the groove of the operation member. When the operation member is moved for the lighting, the projection of the locking member passes through the groove of the operation member and thus does not interfere with the operation member. In such cases, at the time at which the locking member is being operated to the state of lock release, the operation member is not locked even after having returned to the original position. Further, the lock releasing operation of the locking member is carried out by a finger of the user, which is different from the finger for operating the operation member. Therefore, when the fuel gas is to be lighted

again in cases where it has not been lighted by a single lighting operation of the operation member, it is not necessary for the lock releasing operation to be carried out each time the fuel gas is to be lighted.

Accordingly, safety devices in lighting rods in accordance with at least preferred embodiments of the present invention viewed from the third aspect have good operability.

Further, with at least preferred safety devices in lighting rods in accordance with the present invention viewed from the third aspect, the groove of the operation member may be provided with an engagement section, which comes into contact with the projection of the locking member and restricts the rotation of the locking member to the locking state when the projection of the locking member is being inserted through the groove of the operation member. In such cases, even if the lock releasing operation of the locking member is released before the operation member returns to the original position, the returning of the operation member can be carried out. Also, when the operation member has returned to the original position, it can be locked automatically.

With at least preferred safety devices in lighting rods in accordance with the present invention viewed from the fourth aspect, when the protection frame is in the locking state, the engagement section of the protection frame is located at the position, that interferes with a portion of the operation member. In

this state, the engagement section of the protection frame obstructs the movement of the operation member and thereby locks the lighting operation. When the protection frame is operated in the direction for lock release against the restoring force of the protection frame, the engagement section of the protection frame is released from interference with the operation member. As a result, the movement of the operation member becomes possible. By the operation of the operation member, the fuel gas is jetted from the gas tank and lighted. When the operations of the operation member and the protection frame are released, the portion of the operation member and the engagement section of the protection frame are restored to the state of interference in accordance with the returning movement of the operation member. In this manner, the engagement section of the protection frame automatically returns to the state of locking the lighting operation. Therefore, when the lighting rod is not used, the lighting operation of the operation member is always made impossible, and careless lighting operations can be prevented. Accordingly, a lighting rod, which is very safe, can be obtained.

Also, with at least preferred safety devices in lighting rods in accordance with the present invention viewed from the fourth aspect, the locking of the operation member and the lock release are carried out by utilizing the displacement of the protection frame, which is comparatively large. Therefore, the amount of

displacement in the lock releasing operation can be kept large, the lock releasing operation can be carried out reliably, and good operability can be obtained. In particular, in cases where the resilient deformation of the protection frame is utilized, the returning movement of the protection frame from the state of lock release to the state of locking can be carried out without an additional urging member being provided.

Further, with at least preferred safety devices in lighting rods in accordance with the present invention viewed from the fourth aspect, in the state in which the protection frame is displaced and is thus releasing the lock, the operation member is not locked even after having returned to the original position. Further, the lock releasing operation of the protection frame is carried out by a finger of the user, which is different from the finger for operating the operation member. Therefore, when the fuel gas is to be lighted again in cases where it has not been lighted by a single lighting operation of the operation member, it is not necessary for the lock releasing operation to be carried out each time the fuel gas is to be lighted. Accordingly, safety devices in lighting rods in accordance with at least preferred embodiments of the present invention viewed from the fourth aspect have good operability.

Moreover, with at least preferred safety devices in lighting rods in accordance with the present invention viewed from the fourth aspect, wherein the lock of the lighting operation is released by deforming the

protection frame, which is ordinarily fixed, it can be rendered difficult for persons, who do not know how to use the lighting rod appropriately, to release the lock, and careless lighting can thereby be prevented.

The present invention also extends to safety devices in the aforementioned lighting rods according to first, second, third and fourth aspects of the invention, as well as safety devices for use therein.

Viewed from another broad aspect, the present invention provides an ignition device comprising a gas tank for storing a reservoir of an ignitable gas, a nozzle located in a rod-like end portion for forming a jet of said gas, a valve mechanism for opening and closing a gas flow path from said tank to said nozzle, a piezo-electric unit for generating a discharge voltage for igniting said gas, a slidably mounted operating member which is exposed for manual operation and which operates said valve mechanism and said piezo-electric unit in use to ignite said gas, and a safety device, wherein said safety device comprises a locking means which is capable of interfering with the operation of said slidably mounted operating member to prevent its operation by intersecting with a path along which the operating member moves to operate the valve mechanism and the piezo-electric unit, said locking means being resiliently biased into a locking position in which it intersects with said path to interfere with the operation of said operating member, and releasing means exposed for manual operation for moving said locking

means against said resilient bias out of said locking position, said locking means being returned to said locking position under said resilient bias when the manual operation of both of said operating means and said releasing means is discontinued.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, wherein:

Figure 1 is a vertical sectional side view showing the major part of a lighting rod, in which a first embodiment of the safety device in accordance with the present invention is employed,

Figure 2 is an exploded perspective view showing an intermediate case housing, an operation member, and a locking member in the first embodiment of Figure 1,

Figures 3A and 3B are sectional side views showing the major part of the lighting rod, the views

serving as an aid in explaining how the first embodiment of Figure 1 operates,

Figures 4A and 4B are sectional side views showing the major part of a lighting rod, in which a second embodiment of the safety device in accordance with the present invention is employed,

Figure 5 is a vertical sectional side view showing the major part of a lighting rod, in which a third embodiment of the safety device in accordance with the present invention is employed,

Figure 6 is a perspective view showing the third embodiment of Figure 5 with a portion of an intermediate case housing and a portion of an internal structure being omitted,

Figure 7 is an exploded perspective view showing an intermediate case housing, an operation member, and a locking member in the third embodiment of Figure 5,

Figures 8A and 8B are sectional side views showing the major part of the lighting rod shown in Figure 5, the views serving as an aid in explaining how the lock is released,

Figure 9 is a vertical sectional side view showing the major part of a lighting rod, in which a fourth embodiment of the safety device in accordance with the present invention is employed,

Figure 10 is a perspective view showing the fourth embodiment of Figure 9 with a portion of an intermediate case housing and a portion of an internal structure being omitted,

Figure 11 is an exploded perspective view showing an intermediate case housing, an operation member, and a locking member in the fourth embodiment of Figure 9,

Figure 12 is a perspective view showing the major part of the lighting rod shown in Figure 9, the view serving as an aid in explaining how the lock is released,

Figures 13A and 13B are explanatory views showing how the lock is released,

Figure 14 is a vertical sectional side view showing the major part of a lighting rod, in which a fifth embodiment of the safety device in accordance with the present invention is employed,

Figure 15 is a perspective view showing the fifth embodiment of Figure 14 with a portion of an intermediate case housing and a portion of an internal structure being omitted,

Figure 16 is an exploded perspective view showing an intermediate case housing, an operation member, and a protection frame in the fifth embodiment of Figure 14,

Figure 17 is a perspective view showing the major part of the lighting rod shown in Figure 14, the view

serving as an aid in explaining how the lock is released, and

Figures 18A, 18B, and 18C are explanatory views showing positional relationship between the state of the locking and the state of the lock release in the fifth embodiment of Figure 14.

Preferred embodiments of the present invention will hereinbelow be described in further detail with reference to the accompanying drawings.

A first embodiment of a safety device in a lighting rod in accordance with the present invention will be described hereinbelow.

Figure 1 is a vertical sectional side view showing the major part of a lighting rod, in which the first embodiment of the safety device in accordance with the present invention is employed. Figure 2 is an exploded perspective view showing an intermediate case housing, an operation member, and a locking member in the first embodiment of Figure 1. Figures 3A and 3B are sectional side views showing how the first embodiment of Figure 1 operates.

A lighting rod 1 comprises a main body 2 and an extension 3, which has a rod-like shape and extends from the main body 2. (A top end of the extension 3 is not shown in Figure 1.) The case housing of the main body 2 is

constituted of a tank cover 5, which is located on the base end side of the main body 2, and an intermediate case housing 6, which is located on the side forward from the tank cover 5 (i.e., on the upper end side of the main body 2 in Figure 1). The tank cover 5 is constituted of a synthetic resin such that it may have a case-like shape having a bottom and an open forward end. The intermediate case housing 6 is divided into two parts approximately along a vertical center line. One of the two divided parts is shown in Figure 2.

A gas tank 7 is located on the base end side of the main body 2. The gas tank 7 is formed from a synthetic resin and accommodates a high pressure gas, such as a butane gas. A valve mechanism 8, which opens and closes a gas flow path, is located at an upper wall of the gas tank 7. The gas is fed to the valve mechanism 8 through a core 9, which is inserted into the gas tank 7. A nozzle member 10 is interleaved in the gas flow path. One end of a rotatable lever 14, which operates the nozzle member 10 in order to open and close the gas flow path, is engaged with a portion of the nozzle member 10 adjacent to its top end. When the nozzle member 10 is moved forwardly by the rotatable lever 14, the gas flow path is opened, and the gas is supplied through the gas flow path. When the nozzle member 10 retracts to the original position by the urging force of a spring, which is located in the valve mechanism

8, the gas flow path is closed, and the supply of the gas is ceased. The gas supply rate, i.e. the size of a flame produced, is adjusted by rotating a flame adjusting knob 13, which is associated with an adjustment sleeve 12 of the valve mechanism 8 and is projected to the exterior of the main body 2.

A shield packing 15, which is constituted of an elastic material, is fitted to the top end of the nozzle member 10. A sleeve member 16, which is in contact with the shield packing 15, is located along a line extending from the nozzle member 10. One end of a connector pipe 17 is connected to an upper end of the sleeve member 16, and the other end of the connector pipe 17 is connected to an end of a gas pipe 18. The gas pipe 18 extends to the top end of the extension 3 and is connected to a jetting nozzle (not shown) in order to supply the gas to it.

Also, an operation member (a lighting lever) 20 is located along a side of the valve mechanism 8 in the intermediate case housing 6 of the main body 2. The **operation member 20 can slide parallel to the center line of the** valve mechanism 8. A piezo-electric unit 22 is located between the operation member 20 and the gas tank 7.

The operation member 20 has a box-like section 20b, which is supported by the intermediate case housing 6 such that it can slide. An operating section 20a is obliquely formed at the top end of the box-like section

20b. An engagement hole 20c is formed in the side surface of the box-like section 20b, which side surface is located on the side of the valve mechanism 8. The lower end of the side surface of the box-like section 20b, which side surface is located on the side of the valve mechanism 8, continues into a projection 20d, which extends in the direction, along which the box-like section 20b slides. When the operation member 20 is pushed down in order to light the gas, the projection 20d pushes the end of the rotatable lever 14 down and thereby rotates the rotatable lever 14.

Specifically, the rotatable lever 14 has an approximately L-shaped form and is supported such that it can rotate around a fulcrum, which is located at an intermediate point of the rotatable lever 14. As described above, the rotatable lever 14 is rotated by the projection 20d of the operation member 20. When the operation member 20 is moved for the lighting operation, the rotatable lever 14 is rotated in order to pull out the nozzle member 10 of the valve mechanism 8. As a result, the gas flow path is opened, and the gas is supplied to the jetting nozzle.

The piezo-electric unit 22 supplies a discharge voltage to an electrical discharge electrode. The piezo-electric unit 22 has a slide section 22a for expansion and contraction, which is fitted into the box-like section 20b of the operation member 20. When the

operation member 20 is pushed down, the slide section 22a immerses and causes the piezo-electric unit 22 to generate the discharge voltage. Two lead wires 23, 23 are connected to electrodes of the piezo-electric unit 22 and extend in the extension 3 to the top end of the extension 3. At the top end of the extension 3, the lead wires 23, 23 are connected to the jetting nozzle and the electrical discharge electrode.

The intermediate case housing 6 is provided with a protection frame 6a, which surrounds the side outward from the operating section 20a of the operation member 20 such that a space, into which the fingers of the user are to be inserted, may be formed. The base portion of the intermediate case housing 6 continues into a tubular connecting section 6b. The tubular connecting section 6b is coupled with the gas tank 7, and the tank cover 5 is fitted onto the peripheral portion of the tubular connecting section 6b.

The lighting rod 1 having the structure described above is also provided with a locking member 25 and an urging member 26, which constitute the safety device for locking the lighting operation of the operation member 20 and for releasing the lock.

As illustrated also in Figure 2, the locking member 25 has an approximately U-shaped form. The locking member 25 is fitted to the intermediate case housing 6 such

that it can slide in a direction intersecting approximately perpendicularly to the axial direction of the intermediate case housing 6, i.e. to the direction along which the operation member 20 moves. The locking member 25 has a recess 25a formed at the back portion. One end of the urging member 26 is inserted into the recess 25a, and the other end of the urging member 26 is in contact with the opposing inner wall of the intermediate case housing 6. In this manner, the urging member 26 is located in the contracted state between the recess 25a of the locking member 25 and the opposing inner wall of the intermediate case housing 6. The locking member 25 is urged by the urging force of the urging member 26 towards the direction, which projects from the intermediate case housing 6 to the exterior, i.e. towards the locking direction.

One end of the approximately U-shaped locking member 25 is formed as an engagement section 25b, and the other end is formed as a lock releasing section 25c. The engagement section 25b and the lock releasing section 25c of the locking member 25 can project into and retract from the space defined by the protection frame 6a through windows 6c and 6d, which are formed in the wall of the intermediate case housing 6.

The engagement section 25b can be inserted into and engaged with the engagement hole 20c of the operation member 20 and can thereby interfere with the operation

member 20. When the engagement section 25b is engaged with the engagement hole 20c of the operation member 20 as shown in Figure 1, even if the pushing force for pushing the operation member 20 down for the lighting operation is applied to the operation member 20, the operation member 20 comes into contact with the engagement section 25b, which has been inserted through the window 6c, and cannot be pushed down. The lock releasing section 25c can project to the position, which stands facing the vicinity above the operating section 20a of the operation member 20. When the lock releasing section 25c is pushed into the intermediate case housing 6, the locking member 25 moves to the direction, which depresses against the urging force of the urging member 26.

The operation member 20 and the locking member 25 have the relationship described above. Therefore, when the lock releasing section 25c of the locking member 25 and the operating section 20a of the operation member 20 are simultaneously operated, and the lock of the lighting operation is thereby released, it becomes possible for the operation member 20 to slide in order to carry out the lighting operation. As the operation member 20 returns to the original position, the locking member 25 automatically returns to the state of locking the lighting operation.

How the safety device in the lighting rod 1 operates will be described hereinbelow. First, as illustrated in Figure 1, when the lighting rod 1 is in the ordinary state (i.e., when it is not used), the locking member 25 is projected from the intermediate case housing 6 by the urging member 26 and is thus located in the position for locking. In this ordinary state, the engagement section 25b of the locking member 25 has been inserted into the engagement hole 20c of the operation member 20, and the lock releasing section 25c of the locking member 25 is projected through the window 6d into the space defined by the protection frame 6a. In this state, even if the pushing force is applied to the operation member 20, the operation member 20 cannot be pushed down due to the engagement with the engagement section 25b of the locking member 25, and thus the lighting operation cannot be carried out. Therefore, even if persons, who do not know how to use the lighting rod 1 appropriately, operate the lighting rod 1, the gas is not lighted. Accordingly, careless lighting can be prevented.

When the lighting rod 1 is to be used, as illustrated in Figure 3A, the lock releasing section 25c of the locking member 25 is pushed into the intermediate case housing 6. Thereafter, as illustrated in Figure 3B, the lighting operation is carried out by pushing the operation member 20 down, while the lock releasing section 25c is

being pushed. When the lock releasing section 25c is pushed into the intermediate case housing 6 against the urging force of the urging member 26, the engagement section 25b, which is molded integrally with the lock releasing section 25c, is also depressed into the intermediate case housing 6 and disengaged from the engagement hole 20c of the operation member 20. In this manner, the locking member 25 is set to the state of lock release, and it becomes possible to push the operation member 20 down.

When the operation member 20 is thus pushed down for the lighting operation, the projection 20d of the operation member 20 pushes the end of the rotatable lever 14 and rotates the rotatable lever 14. As a result, the rotatable lever 14 pulls out the nozzle member 10 and opens the gas flow path in the valve mechanism 8. Therefore, the gas is supplied through the gas pipe 18 to the jetting nozzle. Also, as the operation member 20 is operated in this manner, the piezo-electric unit 22 is caused to generate a discharge voltage (an alternating voltage). The discharge voltage is applied across the electrical discharge electrode, which is located at the extension 3, and the jetting nozzle, and the jetted gas is lighted by the discharge voltage.

When the finger of the user is released from the operation member 20 in order to cease the use of the

lighting rod 1, the operation member 20 is returned to the original position by the urging force of a spring, which is located in the piezo-electric unit 22. Also, at the time at which the engagement hole 20c of the operation member 20 has moved to the position of the engagement section 25b of the locking member 25, the locking member 25 is moved by the urging force of the urging member 26 such that the engagement section 25b of the locking member 25 may enter into the engagement hole 20c, and such that the lock releasing section 25c may project to the vicinity above the operating section 20a. In this manner, the locking member 25 automatically returns to the **locking state, in** which the operation member 20 cannot be pushed down.

A second embodiment of the safety device in a lighting rod in accordance with the present invention will be described hereinbelow.

Figures 4A and 4B are sectional side views showing the major part of a lighting rod, in which the second embodiment of the safety device in accordance with the present invention is employed. In the second embodiment, a modified form of a locking member is employed. In this embodiment, the basic structures of the valve mechanism 8, the operation member 20, and the like, of the lighting rod 1 are identical with those in the first embodiment. In Figures 4A and 4B, similar elements are

numbered with the same reference numerals with respect to Figure 1.

In the second embodiment, a locking member 27 has a recess 27a at the back portion. One end of the urging member 26 is inserted into the recess 27a. The locking member 27 is also provided with an engagement section 27b, which can be engaged with the engagement hole 20c of the operation member 20 through the window 6c formed in the wall of the intermediate case housing 6. The locking member 27 is further provided with a lock releasing section 27c, which can project to the vicinity of the operating section 20a of the operation member 20 through the window 6d formed in the wall of the intermediate case housing 6.

A portion of an upper end of the lock releasing section 27c is extended upwardly. The extension of the lock releasing section 27c is supported by a pin 28 such that the locking member 27 can swing with respect to the intermediate case housing 6. The engagement section 27b and the lock releasing section 27c are urged by the urging force of the urging member 26 towards the direction, which projects from the intermediate case housing 6 to the exterior, i.e. towards the locking direction.

In the second embodiment, the locking of the lighting operation and the release of the lock are carried out in the same manner as that in the first embodiment. From the locked state of the lighting operation

shown in Figure 4A, as illustrated in Figure 4B, the lock is released by pushing the lock releasing section 27c of the locking member 27 into the intermediate case housing 6. Thereafter, the operation member 20 is pushed down. In this manner, the lighting operation can be carried out. When the finger of the user is released from the operation member 20 in order to return the operation member 20 to the original position, and thereafter the lock releasing operation of the locking member 27 is released, the locking member 27 automatically returns to the state of locking.

The bottom surface of the engagement section 27b of the locking member 27 has a curved shape. If the lock releasing operation of the locking member 27 is released after the lighting operation has been carried out but before the operation member 20 returns to the original position, the engagement section 27b of the locking member 27 will project to the position for locking. However, in such cases, the top end of the operating section 20a of the operation member 20 comes into contact with the curved bottom surface of the engagement section 27b and causes the engagement section 27b of the locking member 27 to swing and retract into the intermediate case housing 6. In this manner, the operating section 20a of the operation member 20 passes along the engagement section 27b of the locking

member 27, and the locking member 27 automatically returns to the state of locking.

A third embodiment of the safety device in a lighting rod in accordance with the present invention will be described hereinbelow.

Figure 5 is a vertical sectional side view showing the major part of a lighting rod, in which the third embodiment of the safety device in accordance with the present invention is employed. Figure 6 is a perspective view showing the third embodiment of Figure 5 with a portion of an intermediate case housing and a portion of an internal structure being omitted. Figure 7 is an exploded perspective view showing an intermediate case housing, an operation member, and a locking member in the third embodiment of Figure 5. Figures 8A and 8B are sectional side views showing the major part of the lighting rod shown in Figure 5, the views serving as an aid in explaining how the lock is released. In Figure 5 (and in those that follow), similar elements are numbered with the same reference numerals with respect to Figure 1.

An intermediate case housing 106 is divided into two parts approximately along a vertical center line. One of the two divided parts is shown in Figures 6 and 7. An operation member (a lighting lever) 120 is located along a side of the valve mechanism 8 in the intermediate case housing 106 of the main body 2. The operation member 120

can slide parallel to the center line of the valve mechanism 8. The piezo-electric unit 22 is located between the operation member 120 and the gas tank 7.

The operation member 120 has a box-like section 120b, which is supported by the intermediate case housing 106 such that it can slide through an opening 106a of the intermediate case housing 106 (shown in Figure 7) into the intermediate case housing 106. An operating section 120a is obliquely formed at the top end of the box-like section 120b. Projections 120c, 120c project laterally from the two side surfaces of the box-like section 120b. The projections 120c, 120c come into contact with the inner surface of a wall 106f of the intermediate case housing 106, and the position, to which the operation member 120 projects upwardly, is thereby restricted.

The lower end of the side surface of the box-like section 120b, which side surface is located on the side of the valve mechanism 8, continues into a leg 120d, which extends in the direction, along which the box-like section 120b slides. When the operation member 120 is pushed down in order to light the gas, the leg 120d pushes the end of the rotatable lever 14 down and thereby rotates the rotatable lever 14. A vertical groove 120e, which extends along the direction of the movement of the operation member 120, is formed in the side surface of the operation member 120 between the leg 120d and the operating section 120a.

The lower end of the vertical groove 120e continues into an engagement groove 120f, which extends in the direction perpendicularly intersecting with the vertical groove 120e. The rotatable lever 14 is rotated by the leg 120d of the operation member 120.

The slide section 22a of the piezo-electric unit 22 is fitted into the box-like section 120b of the operation member 120. When the operation member 120 is pushed down, the slide section 22a depresses and causes the piezo-electric unit 22 to generate the discharge voltage.

The intermediate case housing 106 is provided with a protection frame 106e, which surrounds the side outward from the operating section 120a of the operation member 120 such that a space, into which the finger of the user is to be inserted, may be formed. The base portion of the intermediate case housing 106 continues into a tubular connecting section 106b. The tubular connecting section 106b is coupled with the gas tank 7, and the tank cover 5 is fitted onto the peripheral portion of the tubular connecting section 106b.

The lighting rod 101 having the structure described above is also provided with a locking member 125 and an urging member 26, which constitute the safety device for locking the lighting operation of the operation member 120 and for releasing the lock.

As illustrated also in Figure 7, the locking member 125 comprises a rod-like shaft 125a, an engagement section 125b, which projects in the form of a hook from two side surfaces of an end of the shaft 125a, and a lock releasing section 125c, which has a cylindrical button-like shape and is located at the other end of the shaft 125a. The portion of the shaft 125a, which is adjacent to the engagement section 125b, and the lock releasing section 125c can respectively project from the intermediate case housing 106 through windows 106c and 106d, which are formed in the wall of the intermediate case housing 106. Also, a portion of the locking member 125, which is located between the lock releasing section 125c and the shaft 125a, continues into a spring receiver 125d, which supports an end of the urging member (a coiled spring) 26.

The other end of the urging member 26 is in contact with the opposing inner wall of the intermediate case housing 106. In this manner, the urging member 26 is located in the contracted state between the spring receiver 125d of the locking member 125 and the opposing inner wall of the intermediate case housing 106. The locking member 125 is urged by the urging force of the urging member 26 towards the direction such that the lock releasing section 125c may be projected from the intermediate case housing 106 to the exterior, i.e. towards the locking direction.

The engagement section 125b of the locking member 125 can be inserted into the window 106c and the engagement groove 120f of the operation member 120 and can thereby interfere with the operation member 120. When the engagement section 125b is engaged with the engagement groove 120f of the operation member 120 as shown in Figure 5, even if the pushing force for pushing the operation member 120 down for the lighting operation is applied to the operation member 120, the box-like section 120b of the operation member 120 comes into contact with the upper surface of the engagement section 125b, and the operation member 120 cannot be pushed down. The lock releasing section 125c can project through the window 106d from the wall of the intermediate case housing 106, which is located on the side opposite to the operating section 120a of the operation member 120. When the lock releasing section 125c is pushed into the intermediate case housing 106, the **locking member 125 moves to the direction, in which it is depressed** against the urging force of the urging member 26.

When the lock releasing section 125c is **depressed** the engagement section 125b, which is located on the side opposite to the lock releasing section 125c, moves from the engagement groove 120f into the operation member 120. The shaft 125a of the locking member 125 can slide along the vertical groove 120e of the operation member 120.

The operation member 120 and the locking member 125 have the relationship described above. Therefore, when the lock releasing section 125c of the locking member 125 and the operating section 120a of the operation member 120 are simultaneously operated, and the lock of the lighting operation is thereby released, it becomes possible for the operation member 120 to slide in order to carry out the lighting operation. As the operation member 120 returns to the original position, the locking member 125 automatically returns to the state of locking the lighting operation.

How the safety device in the lighting rod 101 operates will be described hereinbelow. First, as illustrated in Figure 5, when the lighting rod 101 is in the ordinary state (i.e., when it is not used), the locking member 125 is projected from the intermediate case housing 106 by the urging member 26 and is thus located in the position for locking. In this ordinary state, the engagement section 125b of the locking member 125 has been inserted into the engagement groove 120f of the operation member 120, and the lock releasing section 125c of the locking member 125 is projected to the exterior through the window 106d. In this state, even if the pushing force is applied to the operation member 120, the operation member 120 cannot be pushed down due to the engagement of the engagement groove 120f and the engagement section 125b of

the locking member 125, and thus the lighting operation cannot be carried out. Therefore, even if persons, who do not know how to use the lighting rod 101 appropriately, operate the lighting rod 101, the gas is not lighted. Accordingly, careless lighting can be prevented.

When the lighting rod 101 is to be used, as illustrated in Figure 8A, the lock releasing section 125c of the locking member 125 is pushed into the intermediate case housing 106. Thereafter, as illustrated in Figure 8B, the lighting operation is carried out by pushing the operation member 120 down, while the lock releasing section 125c is being pushed. When the lock releasing section 125c is pushed into the intermediate case housing 106 against the urging force of the urging member 26, the engagement section 125b, which is molded integrally with the lock releasing section 125c, moves from the engagement groove 120f into the operation member 120, and it becomes possible for the shaft 125a to slide along the vertical groove 120e. In this manner, the locking member 125 is set to the state of lock release, and it becomes possible to push the operation member 120 down.

When the finger of the user is released from the operation member 120 in order to cease the use of the lighting rod 101, the operation member 120 is returned to the original position by the urging force of a spring, which is located in the piezo-electric unit 22. At this

time, the shaft 125a slides along the vertical groove 120e of the operation member 120. When the force for pushing the lock releasing section 125c of the locking member 125 is released, the locking member 125 is moved by the urging force of the urging member 26 such that the engagement section 125b may return into the engagement groove 120f. The lock releasing section 125c thus projects from the intermediate case housing 106 to the exterior. In this manner, the locking member 125 automatically returns to the state of the locking, in which the operation member 120 cannot be pushed down.

In cases where the lock releasing operation of the locking member 125 is released before the operation member 120 returns to the original position, the engagement section 125b is in contact with the inner side surface of the operation member 120 on both sides of the vertical groove 120e and does not return to the locking state. At the time at which the engagement groove 120f has moved to the position of the engagement section 125b, the engagement section 125b enters into the engagement groove 120f, and the locking member 125 automatically returns to the state of locking.

When the locking member 125 is being pushed and the lock release is being continued, even if the operation member 120 returns to the original position, the operation member 120 is not locked. Also, the lock releasing

operation of the locking member 125 is carried out with a finger of the user, which is different from the finger for pushing the operation member 120. Therefore, when the fuel gas is to be lighted again in cases where it has not been lighted by a single lighting operation of the operation member, the operation member 120 may be merely pushed down again, and it is not necessary for the lock releasing operation to be carried out each time the fuel gas is to be lighted. Accordingly, the third embodiment has good operability.

A fourth embodiment of the safety device in a lighting rod in accordance with the present invention will be described hereinbelow.

Figure 9 is a vertical sectional side view showing the major part of a lighting rod, in which the fourth embodiment of the safety device in accordance with the present invention is employed. Figure 10 is a perspective view showing the fourth embodiment of Figure 9 with a portion of an intermediate case housing and a portion of an internal structure being omitted. Figure 11 is an exploded perspective view showing an intermediate case housing, an operation member, and a locking member in the fourth embodiment of Figure 9. Figure 12 is a perspective view showing the major part of the lighting rod shown in Figure 9, the view serving as an aid in explaining how the lock is released.

An intermediate case housing 206 is divided into two parts approximately along a vertical center line. One of the two divided parts is shown in Figures 10, 11, and 12. An operation member (a lighting lever) 220 is located along a side of the valve mechanism 8 in the intermediate case housing 206 of the main body 2. The operation member 220 can slide parallel to the center line of the valve mechanism 8. The piezo-electric unit 22 is located between the operation member 220 and the gas tank 7.

The operation member 220 has a box-like section 220b, which is supported by the intermediate case housing 206 such that it can slide through an opening 206a of the intermediate case housing 206 (shown in Figure 11) into the intermediate case housing 206. An operating section 220a is obliquely formed at the top end of the box-like section 220b. An interference section 228a, a groove 228b, and an engagement section 228c, which will be described later, are formed at an end of an extension continuing from the operating section 220a. The lower end of the side surface of the box-like section 220b, which side surface is located on the side of the valve mechanism 8, continues into a leg 220d, which extends in the direction, along which the box-like section 220b slides. When the operation member 220 is pushed down in order to light the gas, the leg 220d pushes the end of the rotatable lever 14 down and thereby

rotates the rotatable lever 14. The rotatable lever 14 is rotated by the leg 220d of the operation member 220.

The slide section 22a of the piezo-electric unit 22 is fitted into the box-like section 220b of the operation member 220. When the operation member 220 is pushed down, the slide section 22a depresses and causes the piezo-electric unit 22 to generate the discharge voltage.

The intermediate case housing 206 is provided with a guide frame 224, which surrounds the side outward from the operating section 220a of the operation member 220 such that a space, into which the finger of the user is to be inserted, may be formed. The intermediate case housing 206 and the guide frame 224 are combined together into an integral body. The base portion of the intermediate case housing 206 continues into a tubular connecting section 206b. The tubular connecting section 206b is coupled with the gas tank 7, and the tank cover 5 is fitted onto the peripheral portion of the tubular connecting section 206b.

The lighting rod 201 having the structure described above is also provided with a safety device for locking the lighting operation of the operation member 220 and for releasing the lock. The safety device is constituted of a locking member 225, which is associated with the guide frame 224, and an extension 228 of the operation member 220.

The guide frame 224 has a base portion 224a, which is coupled with the intermediate case housing 206, and a slit-like window 224b, which is formed from the base portion 224a and is located at a position close to the box-like section 220b of the operation member 220. A fulcrum pin 226 is inserted through the base portion 224a of the window 224b. One end of the locking member 225 is supported by the fulcrum pin 226, and the locking member 225 can rotate within the window 224b.

The locking member 225 extends upwardly from the fulcrum and is bent at an intermediate portion. The outer side end surface of the intermediate portion constitutes a lock releasing section 225a for carrying out the lock releasing operation (a depressing operation). The lock releasing section 225a has approximately the same shape as the outer side shape of the guide frame 224. An urging member 227, which is constituted of a leaf spring, is located along the inner side surface of the locking member 225. The locking member 225 is urged by the urging member 227 towards the projecting direction (the locking direction). The upper half of the urging member 227 is in contact with the inner side surface of the locking member 225. The lower half of the urging member 227 is interleaved between the intermediate case housing 206 and the tank cover 5 and is fixed by them. The original shape

of the urging member 227 is set such that it may urge the locking member 225 outwardly by the resilient force.

When the locking member 225 is in the locking state as shown in Figures 9 and 10, the lock releasing section 225a projects from the guide frame 224 to the exterior. The lock releasing section 225a can be pushed and depressed in a direction against the urging force of the urging member 227.

The inner side surface of the locking member 225 stands facing the operation member 220. A vertical wall 225b projects inwardly from an approximately middle portion of the lower half of the inner side surface of the locking member 225. The vertical wall 225b has an approximately triangular shape, as viewed from a side. Projections 225c, 225c project from the two sides of the vertex of the approximately triangular vertical wall 225b. As illustrated in Figures 12, 13A and 13B, when the locking member 225 is depressed and rotated around the fulcrum pin 226 into the state of lock release, the projections 225c, 225c move inwardly and become parallel to the direction, along which the operation member 220 moves.

The extension 228 is formed at the end of the operating section 220a of the operation member 220. The extension 228 can interfere with the projections 225c, 225c of the locking member 225. The interference section 228a is constituted of the bottom surface of the end of the

extension 228. When the locking member 225 is in the locking state as shown in Figure 9, the interference section 228a is located above the projections 225c, 225c of the locking member 225 and interferes with them, and therefore the operation member 220 cannot be pushed down.

Further, the extension 228 of the operation member 220 is provided with the groove 228b, which is located more inward than the interference section 228a and into which the projections 225c, 225c of the locking member 225 can be inserted. Specifically, the groove 228b extends in parallel with the direction, along which the operation member 220 moves. The groove 228b has an approximately T-shaped form, as viewed from above. When the locking member 225 is moved to the position for the lock release and the operation member 220 is pushed down, the vertical wall 225b and the projections 225c, 225c of the locking member 225 pass through the groove 228b. An engagement section 228c, which is constituted of a vertically extending wall, is formed on the side surface of the groove 228b, which is closer to the locking member 225. When the projections 225c, 225c of the locking member 225 is being inserted into the groove 228b, the engagement section 228c prevents the projections 225c, 225c of the locking member 225 from coming off the groove 228b.

The locking member 225 and the extension 228 of the operation member 220 have the relationship described

above. Therefore, the projections 225c, 225c of the locking member 225 and the interference section 228a interfere with each other, and the lighting operation is thereby locked. Also, when the lock releasing section 225a of the locking member 225 is pushed and the lock of the lighting operation is thereby released, it becomes possible for the operation member 220 to slide in order to carry out the lighting operation. When the operation member 220 returns to the original position and the lock releasing operation of the locking member 225 is released, the projections 225c, 225c of the locking member 225 automatically return to the state of the locking of the lighting operation.

How the safety device in the lighting rod 201 operates will be described hereinbelow. First, as illustrated in Figures 9 and 10, when the lighting rod 201 is in the ordinary state (i.e., when it is not used), the locking member 225 is allowed to stand, and the lock releasing section 225a of the locking member 225 is projected from the guide frame 224 by the urging member 227 and is thus located in the position for the locking. In this ordinary state, the projections 225c, 225c of the locking member 225 are located at the positions, which interfere with the interference section 228a of the extension 228 of the operation member 220. In this state, even if a pushing force is applied to the operation

member 220, the operation member 220 cannot be pushed down due to the interference of the projections 225c, 225c of the locking member 225 and the interference section 228a, and thus the lighting operation cannot be carried out. Therefore, even if persons, who do not know how to use the lighting rod 201 appropriately, operate the lighting rod 201, the gas is not lighted. Accordingly, careless lighting can be prevented.

When the lighting rod 201 is to be used, as illustrated in Figure 12, the lock releasing section 225a of the locking member 225 is pushed into the window 224b against the resilient force of the urging member 227, and the locking member 225 is thereby rotated. While the lock releasing operation is being thus carried out, the lighting operation is carried out by pushing the operation member 220 down. As illustrated in Figure 13A, when the locking member 225 is thus rotated, the projections 225c, 225c of the locking member 225 move inwardly from the positions, which interfere with the interference section 228a of the operation member 220, to the positions that coincide with the groove 228b. In this manner, the projections 225c, 225c of the locking member 225 are set to the state of lock release. Therefore, as illustrated in Figure 13B, it becomes possible for the operation member 220 to be pushed down.

When the finger of the user is released from the operation member 220 in order to cease the use of the lighting rod 201, the operation member 220 is returned to the original position by the urging force of a spring, which is located in the piezo-electric unit 22. Also, when the lock releasing operation of the locking member 225 is released, the locking member 225 is rotated by the resilient force of the urging member 227 such that the lock releasing section 225a of the locking member 225 may be projected outwardly from the window 224b of the guide frame 224. As a result, the projections 225c, 225c of the locking member 225 move to the positions, which interfere with the interference section 228a of the operation member 220. In this manner, the locking member 225 automatically returns to the state of locking, in which the operation member 220 cannot be pushed down.

If the lock releasing operation of the locking member 225 is released before the operation member 220 returns to the original position, the locking member 225 will be urged to rotate and return to the projected position. However, in such cases, the projections 225c, 225c of the locking member 225 come into contact with the engagement section 228c of the groove 228b, and the locking member 225 does not rotate. At the time at which the operation member 220 has returned to the original position, the projections 225c, 225c of the locking member 225 are

disengaged from the groove 228b, and the locking member 225 rotates and returns to the projected position. In this manner, the locking member 225 automatically returns to the state of the locking.

With the fourth embodiment, the lock releasing section 225a of the locking member 225 projects from the guide frame 224. Therefore, it is easy to find the portion to be operated. Also, the lock can be released by the operation for gripping the lighting rod 201, and therefore the lighting rod 201 is easy to operate.

When the lock releasing section 225a of the locking member 225 is being pushed and the lock release is being continued, even if the operation member 220 returns to the original position, the operation member 220 is not locked. Also, the lock releasing operation of the locking member 225 is carried out with a finger of the user, which is different from the finger for pushing the operation member 220. Therefore, when the fuel gas is to be lighted again in cases where it has not been lighted by a single lighting operation of the operation member, the operation member 220 may be merely pushed down again, and it is not necessary for the lock releasing operation to be carried out each time the fuel gas is to be lighted. Accordingly, the fourth embodiment has good operability.

In the fourth embodiment, the locking member 225 is provided with the projections 225c, 225c, and the

operation member 220 is provided with the groove 228. Conversely, the operation member 220 may be provided with projections, and the locking member 225 may be provided with the groove.

A fifth embodiment of the safety device in a lighting rod in accordance with the present invention will be described hereinbelow.

Figure 14 is a vertical sectional side view showing the major part of a lighting rod, in which the fifth embodiment of the safety device in accordance with the present invention is employed. Figure 15 is a perspective view showing the fifth embodiment of Figure 14 with a portion of an intermediate case housing and a portion of an internal structure being omitted. Figure 16 is an exploded perspective view showing an intermediate case housing, an operation member, and a protection frame in the fifth embodiment of Figure 14. Figure 17 is a perspective view showing the major part of the lighting rod shown in Figure 14, the view serving as an aid in explaining how the lock is released.

One end of the rotatable lever 14, which operates the nozzle member 10 in order to open and close the gas flow path, is engaged with a portion of the nozzle member 10 adjacent to its top end. The shield packing 15, which is constituted of an elastic material, is fitted to the top end of the nozzle member 10. The other end of the

rotatable lever 14 is associated with an operation member 320, which will be describe later. The rotatable lever 14 is pivotably supported by extensions on the two sides of the gas tank 7.

An intermediate case housing 306 is divided into two parts approximately along a vertical center line. One of the two divided parts is shown in Figures 15, 16, and 17. The operation member (the lighting lever) 320 is located along a side of the valve mechanism 8 in the intermediate case housing 306 of the main body 2. The operation member 320 can slide parallel to the center line of the valve mechanism 8. The piezo-electric unit 22 is located between the operation member 320 and the gas tank 7.

The operation member 320 has a box-like section 320b, which is supported by the intermediate case housing 306 such that it can slide through an opening 306a of the intermediate case housing 306 (shown in Figure 16) into the intermediate case housing 306. An operating section 320a is obliquely formed at the top end of the box-like section 320b. Projections 325, 325 project laterally from the two side surfaces of the box-like section 320b. The lower end of the side surface of the box-like section 320b, which side surface is located on the side of the valve mechanism 8, continues into a leg 320d, which extends in the direction, along which the box-like section 320b slides. When the operation member 320 is pushed down in order to

light the gas, the leg 320d pushes the end of the rotatable lever 14 down and thereby rotates the rotatable lever 14. The rotatable lever 14 is rotated by the leg 320d of the operation member 320.

The slide section 22a of the piezo-electric unit 22 is fitted into the box-like section 320b of the operation member 320. When the operation member 320 is pushed down, the slide section 22a depresses and causes the piezo-electric unit 22 to generate a discharge voltage.

The intermediate case housing 306 is associated with an independent protection frame 326, which surrounds the side outward from the operating section 320a of the operation member 320 such that a space, into which the finger of the user is to be inserted, may be formed. The base portion of the intermediate case housing 306 continues into a tubular connecting section 306b. The tubular connecting section 306b is coupled with the gas tank 7, and the tank cover 5 is fitted onto the peripheral portion of the tubular connecting section 306b.

The lighting rod 301 having the structure described above is also provided with a safety device for locking the lighting operation of the operation member 320 and for releasing the lock. The safety device is constituted of the protection frame 326 and the projections 325, 325 of the operation member 320.

Each of the projections 325, 325 of the operation member 320 is formed such that the top end closer to the operating section 320a is narrow, and the bottom end remoter from the operating section 320a is wide. A step-like portion 325a is formed near the bottom end of one of the two side surfaces, and a portion of the other side surface, which portion is adjacent to the top end, is formed as a slant surface 325b. The top ends of the projections 325, 325 can be inserted into cutaway portions 306d, 306d (one of them is shown in Figure 16), which are formed in a wall 306c of the intermediate case housing 306. The step-like portions 325a, 325a of the projections 325, 325 come into contact with the lower surface of the wall 306c, and the position, to which the operation member 320 projects, is thereby restricted.

The protection frame 326 comprises a frame body 326a, which has a bent shape, and a fixing section 326b, which is formed at one end of the frame body 326a. The fixing section 326b is inserted into an engagement window 306e of the intermediate case housing 306. The two plates of the fixing section 326b sandwich the wall of the intermediate case housing 306, and are thereby fixed to the intermediate case housing 306. Also, fixing projections 306f, 306f, ... are formed on the surfaces of the intermediate case housing 306 at positions above and below the engagement window 306e. The upper and lower ends of

the two plates of the fixing section 326b of the protection frame 326 come into contact with the fixing projections 306f, 306f, ..., and the fixing section 326b of the protection frame 326 is thereby fixed firmly and reliably to the intermediate case housing 306. The fixing projection 306f, which is located close to the operating section 320a of the operation member 320, is tapered such that the space defined by the protection frame 326 may be formed by a smooth continuous surface.

The protection frame 326 is supported only at the fixing section 326b. The other free end portions 326c, 326c of the frame body 326a are inserted into the intermediate case housing 306 such that they can move due to deformation of the protection frame 326. When the protection frame 326 is deformed for lock release such that the free end portions 326c, 326c may enter into the intermediate case housing 306, the free end portions 326c, 326c move in the direction intersecting approximately perpendicularly to the direction, along which the operation member 320 slides, due to the resilient deformation of the protection frame 326 with the fixing section 326b being taken as a base end. In this state, the free end portions 326c, 326c have a resilient restoring force due to the deformation.

The free end portions 326c, 326c of the protection frame 326 are spread to opposite sides and extend inwardly along the sides of the operation member

320. The operation member 320 is interleaved between the two free end portions 326c, 326c. Stoppers 326d, 326d are formed at the ends of the free end portions 326c, 326c. The stoppers 326d, 326d come into contact with the projections 325, 325 of the operation member 320 from the inward sides of the projections 325, 325, and the positions, to which the free end portions 326c, 326c project outwardly, are thereby restricted. Also, when the protection frame 326 is deformed for the lock release, and the free end portions 326c, 326c are thereby pushed into the intermediate case housing 306, the stoppers 326d, 326d come into contact with an opening edge 306h of the intermediate case housing 306, and the positions, to which the free end portions 326c, 326c can be pushed inwardly, are thereby restricted.

Engagement sections 327, 327, which project towards each other, are formed at the inner sides of the free end portions 326c, 326c and at positions adjacent to the stoppers 326d, 326d. As illustrated in Figures 18A, 18B, and 18C, the end faces of the engagement sections 327, 327 are formed as approximately parallel slant surfaces 327a, 327a so as to stand facing the slant surfaces 325b, 325b of the projections 325, 325 of the operation member 320. The distance between the inner sides of the free end portions 326c, 326c corresponds to the width of the operation member 320, including the projections 325, 325.

Therefore, the projections 325, 325 can pass through the space defined by the inner sides of the free end portions 326c, 326c. Also, the distance between the inner sides of the engagement sections 327, 327 corresponds to the width of the operation member 320, excluding the projections 325, 325. Therefore, the projections 325, 325 cannot pass between the inner sides of the engagement sections 327, 327. Thus the engagement sections 327, 327 can interfere with the projections 325, 325. A projection 326e is formed at the base portion of the frame body 326a, from which the free end portions 326c, 326c are branched. As in the stoppers 326d, 326d, when the protection frame 326 is deformed for the lock release, and the free end portions 326c, 326c are thereby pushed into the intermediate case housing 306, the projection 326e comes into contact with the front surface of the intermediate case housing 306 and thereby restricts the deformation of the protection frame 326.

The operation member 320 and the protection frame 326 have the relationship described above. Therefore, the projections 325, 325 and the engagement sections 327, 327 interfere with each other, and the lighting operation is thereby locked. Also, when the other end portions 326c, 326c of the protection frame 326 are pushed and the lock of the lighting operation is thereby released, it becomes possible for the operation member 320 to slide in order to

carry out the lighting operation. When the operation member 320 returns to the original position and the lock releasing operation of the protection frame 326 is released, the engagement sections 327, 327 automatically return to the state of locking the lighting operation.

How the safety device in the lighting rod 301 operates will be described hereinbelow. First, as illustrated in Figures 14 and 15, when the lighting rod 301 is in the ordinary state (i.e., when it is not used), the protection frame 326 is allowed to stand, and the free end portions 326c, 326c of the protection frame 326 are projected from the intermediate case housing 306 and is thus located in the position for the locking. In this ordinary state, as illustrated in Figure 18A, the engagement sections 327, 327 of the protection frame 326 are located at the positions, which interfere with the projections 325, 325 of the operation member 320. In this state, even if a pushing force is applied to the operation member 320, the operation member 320 cannot be pushed down due to the interference of the projections 325, 325 and the engagement sections 327, 327, and thus the lighting operation cannot be carried out. Therefore, even if persons, who do not know how to use the lighting rod 301 appropriately, operate the lighting rod 301, the gas is not lighted. Accordingly, careless lighting can be prevented.

When the lighting rod 301 is to be used, as illustrated in Figure 17, the protection frame 326 is pushed and deformed such that the free end portions 326c, 326c of the protection frame 326 may enter into the intermediate case housing 306. While the lock releasing operation is being thus carried out, the lighting operation is carried out by pushing the operation member 320 down. As illustrated in Figure 18B, when the free end portions 326c, 326c are thus pushed into the intermediate case housing 306, the engagement sections 327, 327 move inwardly from the positions, which interfere with the projections 325, 325 of the operation member 320. In this manner, the projections 325, 325 of the operation member 320 are set to the state of lock release. Therefore, as illustrated in Figure 18C, it becomes possible for the operation member 320 to be pushed down.

When the finger of the user is released from the operation member 320 in order to extinguish the fire, the operation member 320 is returned to the original position by the urging force of a spring, which is located in the piezo-electric unit 22. Also, when the lock releasing operation of the protection frame 326 is released, the free end portions 326c, 326c are moved to the projecting direction by the resilient restoring force of the protection frame 326. As a result, the engagement sections 327, 327 move to the positions, which interfere with the projections 325, 325. In this manner, the engagement

sections 327, 327 automatically return to the state of locking, in which the operation member 320 cannot be pushed down.

If the lock releasing operation of the protection frame 326 is released before the operation member 320 returns to the original position, the engagement sections 327, 327 of the protection frame 326 will move to the positions for locking. However, in such cases, the slant surfaces 325b, 325b of the projections 325, 325 of the operation member 320 come into contact with the slant surfaces 327a, 327a of the engagement sections 327, 327. The projections 325, 325 of the operation member 320 pass along the slant surfaces 327a, 327a of the engagement sections 327, 327 by causing the engagement sections 327, 327 to move such that the protection frame 326 may be deformed. In this manner, the engagement sections 327, 327 automatically return to the locking state.

With the fifth embodiment, a metal spring is not used to obtain the force for restoring the protection frame 326 from the state of lock release to the state of locking. Therefore, the production cost can be kept low, the assembly work can be kept simple, and the working efficiency can be kept high. Also, because the entire protection frame 326 deforms resiliently with respect to the fixing section 326b taken as the base point, the amount of displacement operation during the lock releasing

operation becomes large, and the operation can be carried out reliably. Further, it is easy to carry out the lock releasing operation. Furthermore, the dimensional accuracy required can be kept comparatively low, and therefore it becomes easy to produce the lighting rod 301.

When the protection frame 326 is being pushed and the lock release is being continued, even if the operation member 320 returns to the original position, the operation member 320 is not locked. Also, the lock releasing operation of the protection frame 326 is carried out with a finger of the user, which is different from the finger for pushing the operation member 320. Therefore, when the fuel gas is to be lighted again in cases where it has not been lighted by a single lighting operation of the operation member, the operation member 320 may be merely pushed down again, and it is not necessary for the lock releasing operation to be carried out each time the fuel gas is to be lighted. Accordingly, the fifth embodiment has good operability.

In the fifth embodiment, the force for restoring from the state of lock release to the state of locking is obtained by utilizing the resilient deformation of the protection frame 326. Alternatively, the free end portions 326c, 326c of the protection frame 326 may be located such that they can be displaced by taking the one end as the base point, and urging members for urging the

free end portions 326c, 326c to the projecting direction may be located.

Thus in at least preferred embodiments, there is provided a safety device, which is applied to a lighting rod for carrying out the lighting by an operation of an operation member, and which enables the locking of a lighting operation, the release of the lock, and automatic return to the state of the locking; and there is provided a safety device in a lighting rod, wherein it is difficult for persons, who do not know how to use the lighting rod appropriately, to release the lock, and careless lighting is thereby prevented.

CLAIMS

1. A lighting rod, which lighting rod is provided with a rod-like top end portion and a main body, the rod-like top end portion being provided with a jetting nozzle for jetting out a gas, the main body being provided with:

i) a gas tank,

ii) a valve mechanism for opening and closing a path, through which the gas is supplied from the gas tank to the jetting nozzle,

iii) a piezo-electric unit for generating a discharge voltage for lighting the gas,

iv) an operation member, which is capable of sliding, which has an operating section, and which drives the valve mechanism and the piezo-electric unit in order to carry out a lighting operation, the operating section of the operation member being exposed to the exterior of the main body, and

v) a safety device, said safety device comprising:

a) a locking member having an engagement section, which interferes with a portion of the operation member and thereby locks the lighting operation of the operation member, said locking member being capable of moving in a direction, that intersects with the direction along which the operation member moves, and

b) an urging member, which urges said locking member to a locking direction,

said locking member being provided with a lock

releasing section, which is capable of being operated in order to move said locking member in a direction, that acts against the urging force of said urging member, said lock releasing section being projected to a position, which stands facing the operating section of the operation member,

wherein the lock of the lighting operation is released by operating said lock releasing section of said locking member, the lighting operation is carried out in this state by operating the operating section of the operation member, and said locking member automatically returns to the locking state as the operation member returns to its original position.

2. A lighting rod as defined in claim 1 wherein said locking member has an approximately U-shaped form, one end portion of said locking member constitutes said engagement section, the other end portion of said locking member constitutes said lock-releasing section, and said engagement section engages with an engagement hole of the operation member and thereby locks the operation member such that the operation member cannot move.

3. A lighting rod, which lighting rod is provided with a rod-like top end portion and a main body, the rod-like top end portion being provided with a jetting nozzle for jetting out a gas, the main body being provided with:

i) a gas tank,

ii) a valve mechanism for opening and closing a path, through which the gas is supplied from the gas tank to the jetting nozzle,

iii) a piezo-electric unit for generating a discharge voltage for lighting the gas,

iv) an operation member, which is capable of sliding, which has an operating section, and which drives the valve mechanism and the piezo-electric unit in order to carry out a lighting operation, the operating section of the operation member being exposed to the exterior of the main body, and

v) a safety device, said safety device comprising:

a) a locking member, which interferes with the operation member and thereby locks the lighting operation of the operation member, said locking member being capable of moving in a direction, that intersects with the direction along which the operation member moves, and

b) an urging member, which urges said locking member to a locking direction,

said locking member being provided with a lock releasing section, which is capable of being operated in order to move said locking member in a direction, that acts against the urging force of said urging member, said lock releasing section being projected to the exterior of the main body on the side opposite to the operation member,

wherein the lock of the lighting operation is

released by operating said lock releasing section of said locking member, the lighting operation is carried out in this state by operating the operating section of the operation member, and said locking member automatically returns to the locking state as the operation member returns to its original position.

4. A lighting rod as defined in claim 3 wherein said locking member comprises:

1) a bar-like shaft, which is inserted transversely through the main body,

2) an engagement section, which is located at one end of said bar-like shaft, said engagement section being inserted into an engagement groove of the operation member, interfering with the operation member, and thereby locking the operation member such that the operation member cannot move,

3) said lock releasing section, which is used for a pushing operation and is located at the other end of said bar-like shaft, and

4) an urging member receiver, which receives one end of said urging member,

whereby, when the pushing operation of said lock releasing section is carried out, said engagement section moves inwardly into the operation member and enables the operation member to move for the lighting.

5. A lighting rod, which lighting rod is provided with a rod-like top end portion and a main body, the rod-like

top end portion being provided with a jetting nozzle for jetting out a gas, the main body being provided with:

i) a gas tank,

ii) a valve mechanism for opening and closing a path, through which the gas is supplied from the gas tank to the jetting nozzle,

iii) a piezo-electric unit for generating a discharge voltage for lighting the gas,

iv) an operation member, which is capable of sliding, which has an operating section, and which drives the valve mechanism and the piezo-electric unit in order to carry out a lighting operation, the operating section of the operation member being exposed to the exterior of the main body,

v) a guide frame, which is located so as to surround the operating section of the operation member, and

vi) a safety device, said safety device comprising:

a) a locking member, which interferes with the operation member and thereby locks the lighting operation of the operation member, said locking member being associated with the guide frame such that said locking member can rotate, and

b) an urging member, which urges said locking member to a locking direction,

said locking member projecting to the side outward from said guide frame when said locking member is in the locking state, said locking member being provided with a

lock releasing section, which is capable of being operated in order to move said locking member in a direction, that acts against the urging force of said urging member, and in order to thereby release said interference of said locking member with the operation member,

wherein the lock of the lighting operation is released by operating said lock releasing section of said locking member, the lighting operation is carried out in this state by operating the operating section of the operation member, and said locking member automatically returns to the locking state when the operation member returns to its original position in the state in which the lock releasing operation has been released.

6. A lighting rod as defined in claim 5 wherein said locking member is provided with a projection, which interferes with a portion of the operation member when said locking member is located at the position for locking, and the operation member is provided with a groove, through which said projection of said locking member is inserted when said locking member has been rotated to the position for lock release.

7. A lighting rod as defined in claim 6 wherein said groove of the operation member is provided with an engagement section, which comes into contact with said projection of said locking member and restricts the

rotation of said locking member to the locking state when said projection of said locking member is being inserted through said groove of the operation member.

8. A lighting rod, which lighting rod is provided with a rod-like top end portion and a main body, the rod-like top end portion being provided with a jetting nozzle for jetting out a gas, the main body being provided with:

i) a gas tank,

ii) a valve mechanism for opening and closing a path, through which the gas is supplied from the gas tank to the jetting nozzle,

iii) a piezo-electric unit for generating a discharge voltage for lighting the gas,

iv) an operation member, which is capable of sliding, which has an operating section, and which drives the valve mechanism and the piezo-electric unit in order to carry out a lighting operation, the operating section of the operation member being exposed to the exterior of the main body,

v) a protection frame, which is located so as to surround the operating section of the operation member, and

vi) a safety device, said safety device comprising a locking means, which is constituted of the protection frame of the main body of the lighting rod,

the protection frame having one end, which serves as a base point, and the other end capable of undergoing restoration displacement, which other end extends to a

side of the operation member and can move, said other end being provided with an engagement section, which interferes with a portion of the operation member and locks the lighting operation of the operation member when said engagement section is in the locking state during the nonoperating condition of the operation member,

wherein said engagement section moves and releases the interference with the operation member in accordance with a lock releasing operation of the protection frame, the lighting operation is carried out in this state by operating the operation member, and said engagement section automatically returns to the locking state in accordance with a returning movement of the operation member to its original position and a restoration movement of the protection frame.

9. A lighting rod as defined in claim 8 wherein a projection is formed on a side surface of the operation member, said engagement section of the protection frame interferes with said projection of the operation member, and said engagement section of the protection frame moves to a position, that does not interfere with said projection of the operation member in accordance with the lock releasing deformation of the protection frame.

10. A lighting rod as defined in claim 8 wherein said other end of the protection frame is capable of undergoing resilient deformation by taking said one end

of the protection frame as the base point and moves with the restoring force, which is due to the resilient deformation, from the state of the lock release to the position for the locking.

11. An ignition device comprising a gas tank for storing a reservoir of an ignitable gas, a nozzle located in a rod-like end portion for forming a jet of said gas, a valve mechanism for opening and closing a gas flow path from said tank to said nozzle, a piezo-electric unit for generating a discharge voltage for igniting said gas, a slidably mounted operating member which is exposed for manual operation and which operates said valve mechanism and said piezo-electric unit in use to ignite said gas, and a safety device, wherein said safety device comprises a locking means which is capable of interfering with the operation of said slidably mounted operating member to prevent its operation by intersecting with a path along which the operating member moves to operate the valve mechanism and the piezo-electric unit, said locking means being resiliently biased into a locking position in which it intersects with said path to interfere with the operation of said operating member, and releasing means exposed for manual operation for moving said locking means against said resilient bias out of said locking position, said locking means being returned to said locking position under said resilient bias when the manual operation of both of said operating means and

said releasing means is discontinued.

12. An ignition device as claimed in claim 11, wherein said releasing means is arranged to be manually operated simultaneously with manual operation of said operating means, said locking means being returned to said locking position when operation of said operating means is discontinued.

13. An ignition device as claimed in claim 11, wherein said operating means and said releasing means are separately manually operable, said locking means being returned to said locking position only when operation of both said operating means and said locking means are independently discontinued.

14. An ignition device as claimed in any of claims 11 to 13, wherein said locking means comprises a locking member housed within a main body portion of said ignition device, and said releasing means comprises a releasing portion of said locking member which is adapted to project from said main body portion in a locking state into a position in which it is exposed for manual operation, and wherein an urging member within said main body portion resiliently biases said locking member in a direction in which an engagement portion thereof intersects with the path of said operating member.

15. An ignition device as claimed in claim 14 wherein said releasing portion is adapted to project from said main body portion facing said operating member.

16. An ignition device as claimed in claim 14 or 15 wherein said locking member has a substantially U-shaped form, one end portion of said locking member constituting said engagement portion and the other end portion constituting said releasing portion, the releasing portion being adapted to project from said main body portion of the ignition device adjacent the operating member, and the engagement portion being adapted to engage with an engagement hole in the operating member.

17. An ignition device as claimed in claim 14, wherein said releasing portion is adapted to project from said main body on a side opposite to the operating member.

18. An ignition device as claimed in claim 14 or 17, wherein said locking member comprises a bar-like shaft inserted transversely through said main body, said releasing portion being located at one end of said shaft and an engagement portion for engagement with said operating member being located at the opposite end thereof.

19. An ignition device as claimed in any of claims 11 to 13, which further comprises a guard member which

partially surrounds said operating member, said locking means being associated with said guard member.

20. An ignition device as claimed in claim 19, wherein said locking means comprises a locking member mounted on said guard member.

21. An ignition device as claimed in claim 19 or 20, wherein said locking means comprises a locking member which is rotatably mounted and which has a releasing portion adapted to project outwardly from said guard member when said locating means is resiliently biased into said locking position, said releasing portion being manually operable against said resilient bias to release said locking member from said locking position.

22. An ignition device as claimed in claim 21, wherein said locking member has an engagement portion comprising a projection which interferes with a portion of the operating member when in a locking position, and wherein said operating member has a groove in which said projection can slide when said locking means is rotated into a position in which the locking is released.

23. An ignition device as claimed in claim 22, wherein said groove restricts rotation of said locking member to a locking position when said projection is retained therein.

24. An ignition device as claimed in claim 19 or 20, wherein said locking means comprises an engagement portion at a free end of said guard member, which engagement portion is adapted to interfere with a portion of said operating member, said free end portion being resiliently displaceable about a base end portion mounted to a main body portion of said ignition device.

25. An ignition device as claimed in claim 24, wherein said guard member is resiliently deformable.

26. An ignition device as claimed in claim 24 or 25, wherein said engagement portion interferes with said operating member when said guard member is in a locking position, and said engagement portion is moved inwardly, out of interference with said operating member when said guard member is displaced.

27. An ignition device substantially as hereinbefore described with reference to any of Figures 1 to 3B, Figures 1 to 3B as modified with reference to Figures 4A and 4B, Figures 5 to 8B, Figures 9 to 13B or Figures 14 to 18C.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report)	Application number GB 9517004.9
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Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE: WPI	Documents considered relevant following a search in respect of Claims :- 1 & 2, 11-27

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Category	Identity of document and relevant passages		Relevant to claim(s)
Y	EP 0488158 A2	(TOKAI CORP) see column 7, lines 15 to 51	1, 11, 12, 13, 14, 15
Y	EP 0345729 A2	(TOKAI CORP) see column 3 line 58 to column 4 line 22	1, 11, 12, 13, 14, 15
Y	US 5199865	(CHUNG-HO LIANG) see Figure 1	1, 11, 12, 13, 14, 15
Y	US 5120215	(LAGOREST SA) see column 3 lines 45 to 64	1, 11, 12, 13, 14, 15
Y	US 4538983	(NOEL E. ZELLER) see Figure 1	1, 11, 12, 13, 14, 15

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