(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 408 278 A1

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(43) Date of publication:
14.04.2004 Bulletin 2004/16

(21) Application number: **02746048.4**

(22) Date of filing: **15.07.2002**

(51) Int Cl.[7]: **F23Q 2/28**, F23Q 2/36

(86) International application number:
PCT/JP2002/007157

(87) International publication number:
WO 2003/008868 (30.01.2003 Gazette 2003/05)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR

(30) Priority: **16.07.2001 JP 2001214669**
03.06.2002 JP 2002161121

(71) Applicant: **Tokai Corporation**
Tokyo 151-0073 (JP)

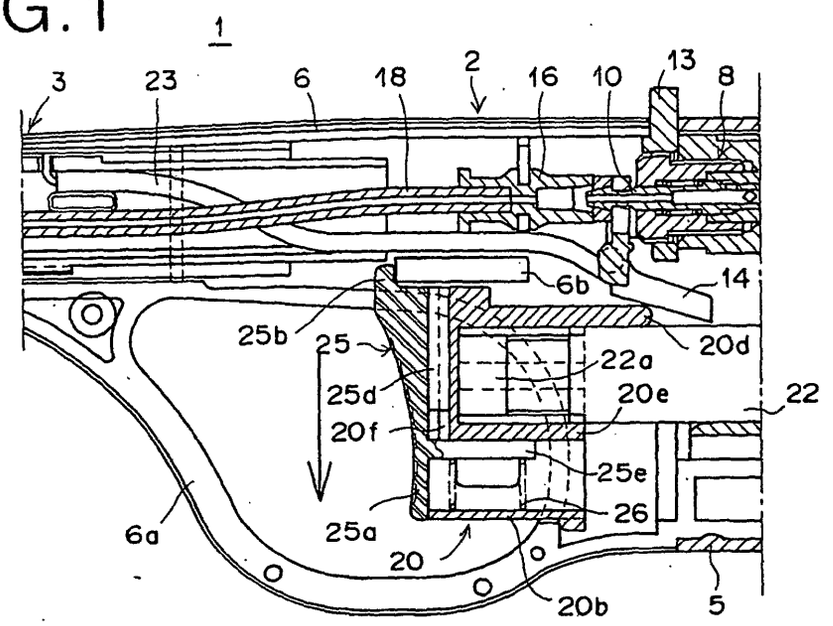
(72) Inventors:
- **NAKAMURA, Yasuaki,**
c/o Main Factory, Tokai Co.
Sunto-gun, Shizuoka 410-1431 (JP)
- **MORISHITA, Toshinori,**
c/o Main Factory, Tokai Co.
Sunto-gun, Shizuoka 410-1431 (JP)

(74) Representative: **Klunker . Schmitt-Nilson . Hirsch**
Winzererstrasse 106
80797 München (DE)

(54) **IGNITOR**

(57) In an igniter (1) which is ignited by operation of an actuator 20 and is provided with a lock member (25) which locks an actuator (20) when the igniter is unused and automatically returns to the locking position after use of the igniter, operability is improved and assembly is simplified. A lock member (25) which is moved in the igniting direction together with the actuator (20) is installed to be movable between a locking position and a lock release position. A lock portion (25b) of the lock member (25) extending in the locking direction interferes with an engagement portion of the igniter body to lock igniting action of the actuator (20). The lock member (25) is urged to the locking position by an urging member (26). With the lock released by operation of the lock member (25), the actuator (20) is slid together with the lock member (25) to ignite the igniter (1).

FIG. 1



EP 1 408 278 A1

Description

Field of the Invention

[0001] This invention relates to an igniter which ejects flame through a gas discharge nozzle in response to operation of an actuator, and more particularly to such an igniter which is normally prevented from igniting by a lock mechanism and is permitted to ignite by releasing the lock mechanism when using the igniter.

Background of the Invention

[0002] An igniter, for instance, an igniting rod can ignite by simply pushing an actuator. However, it is required to provide the igniter with a lock mechanism which prevents the igniter from accidentally or unintentionally igniting, and accordingly, there have been proposed various igniters provided with various lock mechanisms.

[0003] For example, in Japanese Unexamined Patent Publication No. 8(1996)-61673, there is disclosed an igniter in which a lock member which interferes with a part of an actuator to prevent the igniter from igniting is provided to be movable in a direction intersecting the direction of movement of the actuator, an urging member is disposed to urge the lock member toward its locking position, and the lock member has a lock release portion for moving the lock member overcoming the urging member in the vicinity of the actuator.

[0004] In the lock mechanism disclosed in United States Patent No. 6,217,313, a lock member is provided on a part of an actuator for ignition to be slidable, and when the lock member is held in its locking position by an urging member, a tip of an arm portion thereof extending inside the actuator interferes with a part of a piezoelectric unit to prevent the piezoelectric unit from igniting, while when the lock member is slid to its lock release position, the arm portion is retracted away from the piezoelectric unit to permit the piezoelectric unit to ignite.

[0005] However, the former lock mechanism is disadvantageous in assembly in that the lock member and the urging member in the form of a spring for urging the lock member are separately incorporated in the igniter body, which is an obstruction to improvement in mass productivity. Further, since requiring a plurality of operations for ignition, the lock mechanism is disadvantageous in operability.

[0006] That is, it is troublesome to incorporate the two parts, the lock member and the urging member, in the igniter body, separately from the actuator and the urging member must be incorporated in the igniter body in a somewhat deformed state. It is difficult to efficiently incorporate the parts in the igniter body in which other parts have been incorporated. Further, since the lock release portion is in the form of a projection remote from the actuator, the user cannot smoothly shift from the lock release action to the igniting action when the igniter is normally handled and a plurality of stages of operation are required to cause the igniter to ignite, which can result in instable ignition of the igniter.

[0007] Further, the latter lock mechanism is disadvantageous in that since the lock mechanism is arranged so that an arm portion of the lock member interferes with the piezoelectric unit in the actuator, the moving range of the lock member is limited to stably hold the lock member in its locking position and its lock release position when the space inside the actuator is narrow. Further since the interfering area over which the arm portion of the lock member and piezoelectric unit interfere with each other is small, it is difficult to obtain sure locking state and sure lock releasing state and the lock mechanism can fail to accomplish its function when the tip of the arm portion wears after repeated use.

[0008] In view of the foregoing observations and description, the primary object of the present invention is to provide an igniter in which the ignition lock, the ignition lock release and the automatic recovery of the ignition lock can be accomplished without complicating assembly and which is excellent in operability.

Summary of the Invention

[0009] The igniter of the present invention comprises an igniter body, a gas reservoir, a valve mechanism for controlling supply of fuel gas from the gas reservoir to a gas nozzle, a spark mechanism which supplies electric power for igniting fuel gas discharged from the gas nozzle, and an actuator which is slidable to accomplish an igniting action of igniting fuel gas discharged from the gas nozzle, wherein the improvement comprises a lock member which is integrally moved with the actuator when the actuator is moved to accomplish the igniting action and is movable between a locking position and a lock release position, a lock portion formed on the lock member to extend in the direction in which the lock member is moved to the locking position and adapted to be engaged with an engagement portion formed on the igniter body to prevent the actuator from accomplishing the igniting action, and an urging member which urges the lock member in the locking position, so that fuel gas is ignited by sliding the actuator together with the lock member in the direction of the igniting action with the lock portion disengaged from the engagement portion to permit the actuator to accomplish the igniting action by operation of the lock member and the lock member is automatically returned to the locking position in response to the actuator returning to the original position.

[0010] It is preferred that the actuator with the lock member and the urging member incorporated therewith be incorporated with the igniter body.

[0011] It is preferred that the lock member be integrally formed with the actuator to double as an actuating portion of the actuator.

[0012] The lock member and the actuator may be disposed so that a part of the spark mechanism is moved to a position in which the spark mechanism can ignite the fuel gas discharged from the gas nozzle by combining the lock member and the actuator.

[0013] The lock member may be disposed inside the actuator.

[0014] It is preferred that the engagement portion of the igniter body be formed as a member extending in parallel to the direction of the igniting action of the actuator so that the lock portion of the lock member is engaged with a free end of the member.

[0015] It is preferred that the lock portion of the lock member becomes movable in the direction of the igniting action of the actuator with the lock release state held by the engagement portion of the igniter body.

[0016] The engagement portion of the igniter body may comprise a longitudinal slit into which the lock portion of the lock member is inserted.

[0017] It is possible to form the engagement portion inside the igniter body. Further, the lock portion of the lock member may be disposed inside the igniter body.

[0018] The spark mechanism may comprise, for instance, a piezoelectric unit, a battery-powered discharge unit or an electric resistance heater unit, and is supplied with power to ignite gas in response to operation of the actuator.

[0019] In the igniter of the present invention, when the lock member is held in the locking position by the urging member, the lock portion of the lock member is in interference with the engagement portion of the igniter body and the actuator is prevented from being moved, whereby ignition lock is accomplished, whereas when the lock member is moved to the locking position overcoming the urging member, the lock portion of the lock member is moved away from the engagement portion of the igniter body to permit the actuator to be moved and fuel gas discharged from the gas nozzle in response to operation of the actuator is ignited. When the actuator is released, the lock member is automatically returned under the force of the urging member to the locking position where the lock portion of the lock member is interfered with the engagement portion of the igniter body in response to the actuator returning to the original position. In this manner, the igniter is normally enabled from being ignited when the igniter is not used, whereby inadvertent ignition of the igniter can be avoided.

[0020] In the igniter of this invention, by causing it necessary to accomplish a lock release action prior to the igniting action by the actuator, lock release is difficult to accomplish for those who don't know how to suitably use the igniter, whereby inadvertent ignition of the igniter is prevented. At the same time, since when the actuator is released, the igniter is automatically locked, the igniter cannot be left unlocked and is surely locked when it is in the quenched state whereby reliability of the igniter can be improved. Further, since the lock portion of the lock member extends in the direction in which the lock member is moved to the locking position to interfere with the engagement portion of the igniter body, the moving range of the lock member can be long enough to stably hold the lock member in the locking position and at the same time, the operability to move the lock member to the lock release position is excellent. Further, the user can smoothly shift from the lock release action to the igniting action in a series of operation not in a plurality of stages of operation, which can result in stable ignition of the igniter.

[0021] Further, since the lock member and the urging member can be incorporated with the igniter body after the lock member and the urging_member are incorporated with the actuator, the igniter can be efficiently assembled and mass productivity of the igniter can be improved.

Brief Description of the Drawings

[0022]

Figure 1 is a fragmentary cross-sectional view showing an important part of an igniter in the locked state in accordance with a first embodiment of the present invention,

Figure 2 is a fragmentary cross-sectional view showing an important part of the igniter of Figure 1 in the ignited state,

Figure 3A is an exploded perspective view of the lock mechanism employed in the igniter of Figure 1,

Figure 3B is a perspective view showing the assembled state of the lock mechanism employed in the igniter of Figure 1,

Figure 4 is a fragmentary cross-sectional view showing an important part of an igniter in the locked state in accordance with a second embodiment of the present invention,

Figure 5 is a fragmentary cross-sectional view showing an important part of the igniter of Figure 4 in the ignited state,

Figure 6A is an exploded perspective view of the lock mechanism employed in the igniter of Figure 4,

Figure 6B is a perspective view showing the assembled state of the lock mechanism employed in the igniter of Figure 4,

Figure 7 is a fragmentary cross-sectional view showing an important part of an igniter in the locked state in accordance with a third embodiment of the present invention, and

Figure 8 is a fragmentary cross-sectional view showing an important part of the igniter of Figure 7 in the lock released state.

Preferred Embodiments of the Invention

[0023] Embodiments of the present invention will be described in detail with reference to the drawings, hereinbelow.

<First Embodiment>

[0024] An igniting rod, an igniter in accordance with an embodiment of the present invention, is shown in Figures 1 to 3B. Figure 1 is a cross-sectional view showing an important part of the igniting rod, Figure 2 is a cross-sectional view showing the igniting rod in operation, and Figures 3A and 3B are perspective views of the lock mechanism of the igniting rod.

[0025] The igniter (igniting rod) 1 of this embodiment comprises an igniter body 2 and a rod-like extension 3 (the forward end portion is abbreviated) extending forward from the igniter body 2. The igniter body 2 comprises a gas reservoir portion 5 and an intermediate casing 6 which is disposed forward of the gas reservoir portion 5 and is vertically divided into two pieces at substantially the center thereof. In Figures 1 and 2, one of the halves of the intermediate casing 6 is shown.

[0026] The igniter body 2 is provided in the gas reservoir portion 5 at its base end side (the right side in Figures 1 and 2) with a gas reservoir (not shown) which is filled with pressurized gas such as butane and a valve mechanism 8 which controls supply of gas is disposed in the upper wall portion of the gas reservoir. The valve mechanism 8 is provided with a nozzle 10 disposed in a gas passage through which the gas in the gas reservoir is supplied. One end portion of a lever 14 is engaged with a forward end portion of the nozzle 10 so that the nozzle 10 is moved back and forth in response to movement of the lever 14. When moved forward by the lever 14, the nozzle 10 opens the gas passage to supply gas. The nozzle 10 is moved rearward under the force of a spring disposed in the valve mechanism 8 to close the gas passage and to cut gas supply. The valve mechanism 8 is further provided with a flame regulator knob 13 projected outside and the amount of gas supplied or the size of the flame can be adjusted by turning the flame regulator knob 13.

[0027] The nozzle 10 is connected to a gas pipe 18 by way of a connector 16. The gas pipe 18 is connected to a gas nozzle (not shown) disposed in the tip of the extension 3 and fuel gas is supplied to the gas nozzle through the gas nozzle 18.

[0028] An actuator 20 is mounted on the intermediate casing 6 of the igniter body 2 beside the valve mechanism 8 to be slidable in parallel to the center line of the valve mechanism 8. A piezoelectric unit, a spark mechanism, 22 is disposed on the inner side of the actuator 20 between the actuator 20 and the gas reservoir portion 5.

[0029] The actuator 20 has a box-like base portion 20b which is supported for sliding motion from an opening of the intermediate casing 6 into the inside of the same, and a lock member 25 (to be described later) is provided on the front face of the base portion 20b to double as an actuating portion of the actuator 20 (Figure 3B). The base portion 20b is further provided with a leg 20d on its end near to the valve mechanism 8 to extend in the direction of the sliding motion of the actuator 20. When the actuator 20 is moved in igniting operation, the leg 20d rotates the lever 14.

[0030] The lever 14 is substantially L-shaped and is supported for rotation about its intermediate portion. When the actuator 20 is moved in igniting operation, the leg 20d rotates the lever 14 to pull forward the nozzle 10 of the valve mechanism 8 to open the gas passage.

[0031] The piezoelectric unit 22 supplies a discharge voltage and comprises a slide portion 22a which is movable back and forth. The slide portion 22a is disposed on the upper side of an inner wall 20e of the box-like base portion 20b of the actuator 20 so that when the actuator 20 is slid rearward, the slide portion 22a is slid into the body portion of the piezoelectric unit 22 to generate the discharge voltage. One of the poles of the piezoelectric unit 22 is connected to a discharge electrode (not shown) by way of a lead cable 23 and the other pole of the piezoelectric unit 22 is connected to the gas nozzle by way of another electric passage not shown.

[0032] The intermediate casing 6 is provided with a protective frame 6a, which surrounds the actuator 20 with a space for inserting a finger defined in front of the actuator 20, beside a part linearly merged with the extension 3. A pair of plates 6b extending in the direction in which the actuator 20 is moved to ignite the igniting rod 1 project toward each other from the opposite inner sides of the intermediate casing 6 (the igniter body 2) above the front end portion of the actuator 20 in a released state. The inner side faces of the plates 6b are opposed to each other with a gap smaller than the width of a lock portion 25b (to be described later) of the lock member 25 so that the front end faces of the plates 6b are adapted to be engaged with the lock portion 25b.

[0033] The igniting rod 1 is further provided with a lock mechanism for limiting ignition thereof by the actuator 20. The lock mechanism comprises the lock member 25 and an urging member 26 in the form of a coiled spring.

[0034] The lock member 25 is mounted on the front end face of the actuator 20 to be slidable in a direction perpendicular to the direction in which the actuator 20 is moved to ignite the igniting rod 1 and not to be removed from the actuator 20. The lock member 25 doubles as an actuating portion of the actuator 20. As shown in Figure 3A, the lock member 25 comprises a base plate 25a which is substantially rectangular in shape and the lock portion 25b which projects upward (in the locking direction) from the upper end of the base plate 25a. The front face of the base plate 25a is curved and an actuating portion 25c is provided on the front face of the base plate 25a. The actuating portion 25c is embossed for application of a finger. A pair of sliding projections 25d extend up and down on the rear face of the base plate 25a at an upper portion thereof. Each of the sliding projections 25d is provided with a laterally extending stopper projection. A retainer plate 25e projects rearward from the rear face of the base plate 25a below the sliding projections 25d. A cylindrical projection is formed

on the under side of the retainer plate 25e.

[0035] The box-like base portion 20b is provided with a pair of guide grooves 20f which extend up and down on opposite sides of an upper portion of the front face thereof. The sliding projections 25d of the lock member 25 are forced into the guide grooves 20f from the front face of the base portion 20b with the urging member 26 mounted on the cylindrical projection on the under side of the retainer plate 25e to extend downward. The urging member 26 is received in the space of the base portion 20b below the inner wall 20e, and the lock member 25 and the actuator 20 are assembled as shown in Figure 3B.

[0036] Since the lock member 25 is incorporated with the actuator 20 in the manner described above, the lock member 25 can be moved up and down between a lock position (Figure 1) and a lock release position (Figure 2) and urged to the lock position above the lock release position, where the lock portion 25b projects upward beyond the actuator 20, under the force of the urging means 26 which is compressed between the retainer plate 25e of the lock member 25 and the inner surface of the base portion 20b of the actuator 20 opposed to the retainer plate 25e.

[0037] Further, when the actuator 20 with the lock member 25 is incorporated with the intermediate casing 6, the lock member 25 is incorporated in the intermediate casing 6 in the lock position where the lock portion 25b interferes with the engagement portion 6b (the front end faces of the plates 6b), and when the lock member 25 is moved downward to the lock release position, the lock portion 25b is released from the engagement portion 6b to permit the actuator 20 to be pushed in to ignite the igniting rod 1. When the actuator 20 is pushed in, the lock portion 25b is slid along the under side of the plates 6b.

[0038] Operation of the lock mechanism of the igniting rod 1 of this embodiment will be described, hereinbelow. Figure 1 shows a locked state of the igniting rod 1 where the lock member 25 has been moved upward to the locking position. In this state, movement of the actuator 20 for ignition is prevented, that is, pushing of the actuating portion 25c to push in the actuator 20 is prevented by abutment of the lock portion 25b of the lock member 25 against the engagement portion 6b of the igniter body 2, whereby the igniting rod 1 cannot be ignited.

[0039] When the igniting rod 1 is used, the lock member 25 is moved downward (a direction perpendicular to the direction in which the actuator 20 is moved to ignite the igniting rod 1) to the lock release position. When the lock member 25 is moved to the lock release position, the lock portion 25b is moved downward away from the engagement portion 6b and is released from the engagement portion 6b to permit the actuator 20 to be pushed inward. When the actuator 20 is further pushed inward in this state, gas is supplied and a spark is discharged, whereby the igniting rod 1 is ignited.

[0040] When the actuating portion 25c of the lock member 25 is released, the actuator 20 returns to the original position under the force of the spring in the piezoelectric unit 22 and the lock member 25 is moved to the lock position under the force of the urging member 26, whereby the lock portion 25b come to interfere with the engagement portion 6b and the igniting rod 1 automatically returns to the locked state shown in Figure 1.

<Second Embodiment>

[0041] Figure 4 is a fragmentary cross-sectional view showing an important part of an igniter in the locked state in accordance with a second embodiment of the present invention provided with a different lock mechanism, Figure 5 is a fragmentary cross-sectional view showing the same in the ignited state, and Figures 6A 6B are perspective views of the lock mechanism.

[0042] The igniter 11 of this embodiment has a lock mechanism which is substantially the same as that in the first embodiment except the form of the lock member 27 and the engagement portion 6c, and accordingly, the elements analogous to those in the first embodiment are given the same reference numerals and will not be described here.

[0043] The igniter 11 of this embodiment is arranged so that the lock position and the lock release position of the lock member 27 is reverse to those of the lock member 25 in the first embodiment.

[0044] The lock member 27 is mounted on the front end face of the actuator 20 to be slidable in a direction perpendicular to the direction in which the actuator 20 is moved to ignite the igniting rod 1 and not to be removed from the actuator 20. As shown in Figure 6A, the lock member 27 comprises a base plate 27a which is substantially rectangular in shape and the lock portion 27b which projects upward (in the locking direction) from the upper end of the base plate 27a and is substantially T-shaped. The front face of the base plate 27a is curved and an actuating portion 27c is provided on the front face of the base plate 25a. The actuating portion 27c is embossed for application of a finger. A pair of sliding projections 27d extend up and down on the rear face of the base plate 27a at an upper portion thereof. Each of the sliding projections 27d is provided with a laterally extending stopper projection. A retainer plate 27e projects rearward from the rear face of the base plate 27a below the sliding projections 27d. A cylindrical projection is formed on the upper side of the retainer plate 27e. The lock portion 27b is substantially T-shaped and comprises a neck portion which is erected from the upper end of the base plate 27a at the center thereof and is small in width and a lateral bar which is connected to the top of the neck portion to extend horizontally.

[0045] A pair of plates 6c extending in the direction in which the actuator 20 is moved to ignite the igniting rod 1 projects toward each other from the opposite inner sides of the intermediate casing 6 (the igniter body 2) above the front end portion of the actuator 20 in a re-

leased state. The inner side faces of the plates 6c are opposed to each other with a gap 6d larger than the width of the neck portion of the lock portion 27b of the lock member 27. The front end faces of the plates 6c are adapted to be engaged with the lateral bar of the lock portion 27b.

[0046] The sliding projections 27d of the lock member 27 are forced into the guide grooves 20f from the front face of the base portion 20b with the urging member 26 mounted on the cylindrical projection on the upper side of the retainer plate 27e to extend upward. The urging member 26 is received in the space of the base portion 20b above the inner wall 20e, and the lock member 27 and the actuator 20 are assembled as shown in Figure 6B. Since the lock member 27 is incorporated with the actuator 20 in the manner described above, the lock member 27 can be moved up and down between a lock position (Figure 4) and a lock release position (Figure 5) and urged downward to the lock position below the lock release position, where the lock portion 27b comes close to the actuator 20, under the force of the urging means 26 which is compressed between the retainer plate 27e of the lock member 27 and the inner wall 20e of the base portion 20b of the actuator 20.

[0047] Further, when the actuator 20 with the lock member 27 is incorporated with the intermediate casing 6, the lock member 27 is incorporated in the intermediate casing 6 in the lock position where the lateral bar of the lock portion 27b interferes with the engagement portion 6c (the front end faces of the plates 6c), and when the lock member 27 is moved upward to the lock release position, the lock portion 27b is released from the engagement portion 6c to permit the actuator 20 to be pushed in to ignite the igniting rod 1. When the actuator 20 is pushed in, the lateral bar of the lock portion 27b is slid along the upper side of the plates 6c with the neck portion received in the gap 6d.

[0048] Operation of the lock mechanism of the igniting rod 11 of this embodiment will be described, hereinbelow. Figure 4 shows a locked state of the igniting rod 1 where the lock member 27 has been moved downward to the locking position. In this state, movement of the actuator 20 for ignition is prevented, that is, pushing of the actuating portion 25c to push in the actuator 20 is prevented by abutment of the lateral bar of the lock portion 27b of the lock member 25 against the engagement portion 6c of the igniter body 2, whereby the igniting rod 11 cannot be ignited.

[0049] When the igniting rod 11 is used, the lock member 27 is moved upward (a direction perpendicular to the direction in which the actuator 20 is moved to ignite the igniting rod 11) to the lock release position. When the lock member 27 is moved to the lock release position, the lateral bar of the lock portion 27b is moved upward away from the engagement portion 6c and is released from the engagement portion 6b with the neck portion of the lock portion aligned with the gap 6d to permit the actuator 20 to be pushed inward. When the actuator 20 is further pushed inward in this state, gas is supplied and a spark is discharged, whereby the igniting rod 1 is ignited.

[0050] When the actuating portion 27c of the lock member 27 is released, the actuator 20 returns to the original position under the force of the spring in the piezoelectric unit 22 and the lock member 27 is moved to the lock position under the force of the urging member 26, whereby the lateral bar of the lock portion 27b comes to interfere with the engagement portion 6c and the igniting rod 11 automatically returns to the locked state shown in Figure 4.

<Third Embodiment>

[0051] Figure 7 is a fragmentary cross-sectional view showing an important part of an igniter in the locked state in accordance with a third embodiment of the present invention provided with a different lock mechanism and Figure 8 is a fragmentary cross-sectional view showing the same in the lock released state.

[0052] The igniter (igniting rod) 12 of this embodiment comprises an igniter body 4 and a rod-like extension 7 (the forward end portion is abbreviated) extending forward from the center of the igniter body 4. The igniter body 4 comprises a gas reservoir portion 9 formed of synthetic resin and an intermediate casing 60 which is disposed forward of the gas reservoir portion 9 and is vertically divided into two pieces at substantially the center thereof. In Figures 7 and 8, one of the halves of the intermediate casing 60 is shown. The intermediate casing 60 is like a ring provided with a finger insertion window 60a which opens at the center thereof.

[0053] The igniter body 4 is provided in the gas reservoir portion 9 at its base end side (the right side in Figures 7 and 8) with a gas reservoir (not shown) which is filled with pressurized gas such as butane and a valve mechanism 8 which controls supply of gas is disposed in the lower wall portion of the gas reservoir. The valve mechanism 8 is of the same structure as described above and is provided with a nozzle 10 disposed in a gas passage through which the gas in the gas reservoir is supplied, a lever 14 for opening the nozzle 10 and a flame regulator knob 13. The nozzle 10 is connected to a gas pipe 19 by way of a connector 17. The gas pipe 19 is connected to a gas nozzle (not shown) disposed in the tip of the extension 7 and fuel gas is supplied to the gas nozzle through the gas nozzle 19.

[0054] An actuator 30 and a piezoelectric unit, a spark mechanism, 32 are mounted on the intermediate casing 60 of the igniter body 4 beside the valve mechanism 8 to be slidable in parallel to the valve mechanism 8.The actuator 30 has a box-like base portion 30b which is supported for sliding motion from an opening facing the finger insertion window 60a of the intermediate casing 60 into the inside of the same, and a lock member 29 is provided on the front face of the base portion 20b to double as an actuating portion.

[0055] The piezoelectric unit 32 comprises a slide portion 32a. The slide portion 32a is fitted in the upper rear side of the box-like base portion 30b of the actuator 30 and is provided with a projection 32b so that when the actuator 30 is slid rearward, the slide portion 32a is moved rearward to generate the discharge voltage. Further, in response to the rearward movement of the slide portion 32a, the projection 32b abuts against an arm of the substantially L-shaped lever 14 to rotate the lever 14 to move forward the nozzle 10 in the opening direction. One of the poles of the piezoelectric unit 32 is connected to a discharge electrode (not shown) by way of a lead cable 33 and a terminal plate 35 and the other pole of the piezoelectric unit 32 is connected to the gas nozzle by way of the projection 32b, the lever 14, the connector 17 and a lead cable 34 inserted into the gas pipe 19.

[0056] The intermediate casing 60 is provided with an engagement portion 60b in the form of a plate which extends in the direction in which the actuator 30 is moved to ignite the igniting rod 12 and projects from the inner sides of the intermediate casing 60 above the front end portion of the actuator 30 in a released state. The engagement portion 60b is provided in its front end portion with a through hole 60c into which a lock portion 29b of a lock member 29 can be inserted and the front end face of the engagement portion 60b (the rear edge of the through hole 60c) is adapted to be engaged with the lock portion 29b of the lock member 29.

[0057] The lock member 29 for limiting ignition of the igniting rod 12 by the actuator 30 is mounted on the actuator 30 and urged toward the locking position (upward as seen in Figures 7 and 8) by an urging member 26 in the form of a coiled spring.

[0058] The lock member 29 is mounted on the entire area of the front end face of the actuator 30 except the frame of the actuator to be slidable in a direction substantially perpendicular to the direction in which the actuator 30 is moved to ignite the igniting rod 1 and not to be removed from the actuator 30. The lock member 29 doubles as an actuating portion of the actuator 30. The lock member 29 comprises a base plate 29a which is substantially rectangular in shape and a lock portion 29b which projects upward (in the locking direction) like a pin from the upper end of the base plate 29a. The front face of the base plate 29a is curved and an actuating portion 29c is provided on the front face of the base plate 29a. The actuating portion 29c is embossed for application of a finger. A pair of sliding projections 29d extend up and down and project rearward on the rear face of the base plate 29a at an upper portion thereof in the same manner as the preceding embodiment. A retainer plate 29e projects rearward from the upper end of the rear face of the base plate 29a. The upper end of the urging member 26 abuts against the under side of the retainer plate 29e.

[0059] The upper portion of the box-like base portion 30b is formed in a recess 30c and a pair of guide grooves 30f extend up and down on opposite sides of the recess 30c. The sliding projections 29d of the lock member 29 are inserted into the guide grooves 30f with the urging member 26 received between the retainer plate 29e and an inner wall 30e at the bottom of the recess 30c, whereby the lock member 29 and the actuator 30 are assembled together.

[0060] Since the lock member 29 is incorporated with the actuator 30 in the manner described above, the lock member 29 can be moved up and down between a lock position (Figure 7) and a lock release position (Figure 8) and urged to the lock position above the lock release position, where the lock portion 29b projects upward beyond the actuator 30, under the force of the urging means 26 which is compressed between the retainer plate 29e and an inner wall 30e of the recess 30c.

[0061] Further, when the actuator 30 with the lock member 29 is incorporated with the intermediate casing 60, the lock member 29 is incorporated in the intermediate casing 60 in the lock position where the lock portion 29b extends through the through hole 60c of the inner casing 60 and interferes with the engagement portion 60b, and when the lock member 29 is moved downward to the lock release position, the lock portion 29b is moved downward through the through hole 60c to be released from the engagement portion 60b to permit the actuator 30 to be pushed in to ignite the igniting rod 1. When the actuator 30 is pushed in, the lock portion 29b is slid along the under side of the engage portion 60b.

[0062] Operation of the lock mechanism of the igniting rod 12 of this embodiment will be described, hereinbelow. Figure 7 shows a locked state of the igniting rod 12 where the lock member 29 has been moved upward to the locking position. In this state, movement of the actuator 30 for ignition is prevented, that is, pushing of the actuating portion 29c to push in the actuator 30 is prevented by abutment of the lock portion 29b of the lock member 29 against the engagement portion 60b of the igniter body 4, whereby the igniting rod 12 cannot be ignited.

[0063] When the igniting rod 12 is used, the lock member 29 is moved downward (a direction perpendicular to the direction in which the actuator 30 is moved to ignite the igniting rod 12) to the lock release position. When the lock member 29 is moved to the lock release position, the lock portion 29b is moved downward away from the engagement portion 60b and is released from the engagement portion 60b to permit the actuator 30 to be pushed inward. When the actuator 30 is further pushed inward in this state, gas is supplied and a spark is discharged, whereby the igniting rod 12 is ignited.

[0064] When the actuating portion 29c of the lock member 29 is released, the actuator 30 returns to the original position under the force of the spring in the piezoelectric unit 32 and the lock member 29 is moved to the lock position under the force of the urging member 26, whereby the lock portion 29b comes to extend through the through hole 60c to interfere with the en-

gagement portion 60b and the igniting rod 12 automatically returns to the locked state shown in Figure 7.

[0065] Though, in the embodiments described above, the lock member 25, 27 or 29 is integrally provided on the front face of the actuator 20 or 30 to double as the actuating portion, it is possible to provide an actuating portion on the front face of the actuator fixed thereto and to mount the lock member on a part thereof so that the lock member is disposed in the actuator.

[0066] For instance, a battery-powered discharge unit comprising a discharge circuit which generates a discharge voltage powered by a battery or an electric resistance heater unit which energizes a heating wire from a battery can be used as the spark mechanism in place of a piezoelectric unit. In these spark mechanism, a contact is opened and closed in response to movement of the actuator and a spring for returning the actuator to the original position is provided.

Claims

1. A igniter comprising an igniter body, a gas reservoir portion, a valve mechanism for controlling supply of fuel gas from the gas reservoir portion to a gas nozzle, a spark mechanism which supplies electric power for igniting fuel gas discharged from the gas nozzle, and an actuator which is slidable to accomplish an igniting action of igniting fuel gas discharged from the gas nozzle, wherein the improvement comprises

a lock member which is integrally moved with the actuator when the actuator is moved to accomplish the igniting action and is movable between a locking position and a lock release position,
a lock portion formed on the lock member to extend in the direction in which the lock member is moved to the locking position and adapted to be engaged with an engagement portion formed on the igniter body to prevent the actuator from accomplishing the igniting action, and an urging member which urges the lock member in the locking position,
so that fuel gas is ignited by sliding the actuator together with the lock member in the direction of the igniting action with the lock portion disengaged from the engagement portion to permit the actuator to accomplish the igniting action by operation of the lock member and the lock member is automatically returned to the locking position in response to the actuator returning to the original position.

2. An igniter as defined in Claim 1 in which the actuator with the lock member and the urging member incorporated therewith is incorporated with the igniter body.

3. An igniter as defined in Claim 1 or 2 in which the lock member is integrally formed with the actuator to double as an actuating portion of the actuator.

4. An igniter as defined in Claim 1 in which the lock member and the actuator is disposed so that a part of the spark mechanism is moved to a position in which the spark mechanism can ignite the fuel gas discharged from the gas nozzle by combining the lock member and the actuator.

5. An igniter as defined in Claim 1 or 2 in which the lock member is disposed inside the actuator.

6. An igniter as defined in Claim 1 in which the engagement portion of the igniter body is formed by a member extending in parallel to the direction of the igniting action of the actuator so that the lock portion of the lock member is engaged with a free end of the member.

7. An igniter as defined in Claim 6 in which I the lock portion of the lock member becomes movable in the direction of the igniting action of the actuator with the lock release state held by the engagement portion of the igniter body.

8. An igniter as defined in Claim 6 in which the engagement portion of the igniter body is provided with a longitudinal slit into which the lock portion of the lock member is inserted.

9. An igniter as defined in Claim 1 in which the engagement portion of the igniter body is a wall member of the igniter body extending in a direction parallel to the direction in which the actuator is moved to ignite the igniter and the lock portion of the lock member is engaged with a through hole formed in a free end portion of the engagement portion.

10. An igniter as defined in Claim 1 or 2 in which the engagement portion of the igniter body is disposed inside the igniter body.

11. An igniter as defined in Claim 1 in which the engagement portion of the igniter body is a member disposed inside the igniter body to extend in a direction parallel to the direction in which the actuator is moved to ignite the igniter and the lock portion of the lock member is engaged with a free end of the engagement portion.

12. An igniter as defined in Claim 1 or 2 in which the lock portion of the lock member is disposed inside the igniter body.

13. An igniter as defined in Claim 1 or 2 in which the engagement portion of the igniter body is disposed inside the igniter body and the lock portion of the lock member is disposed inside the igniter body.

FIG.1

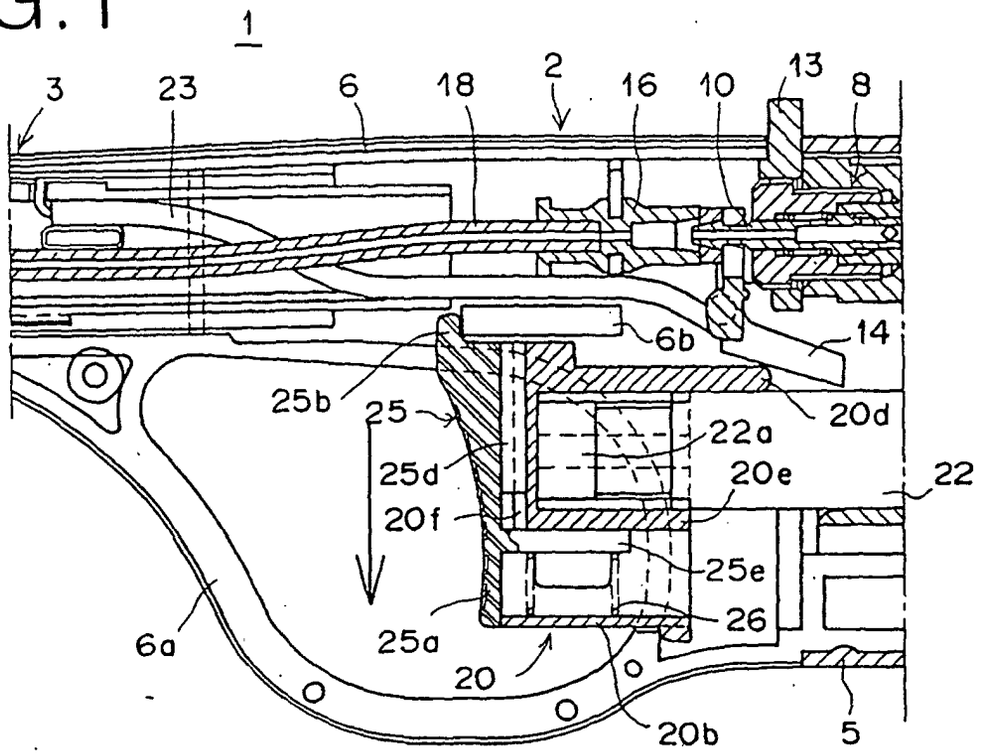

1
3
23
6
18
2
16
10
13
8
14
6b
25b
25
20d
22a
25d
20e
22
20f
25e
26
6a
25a
20
20b
5

FIG.2

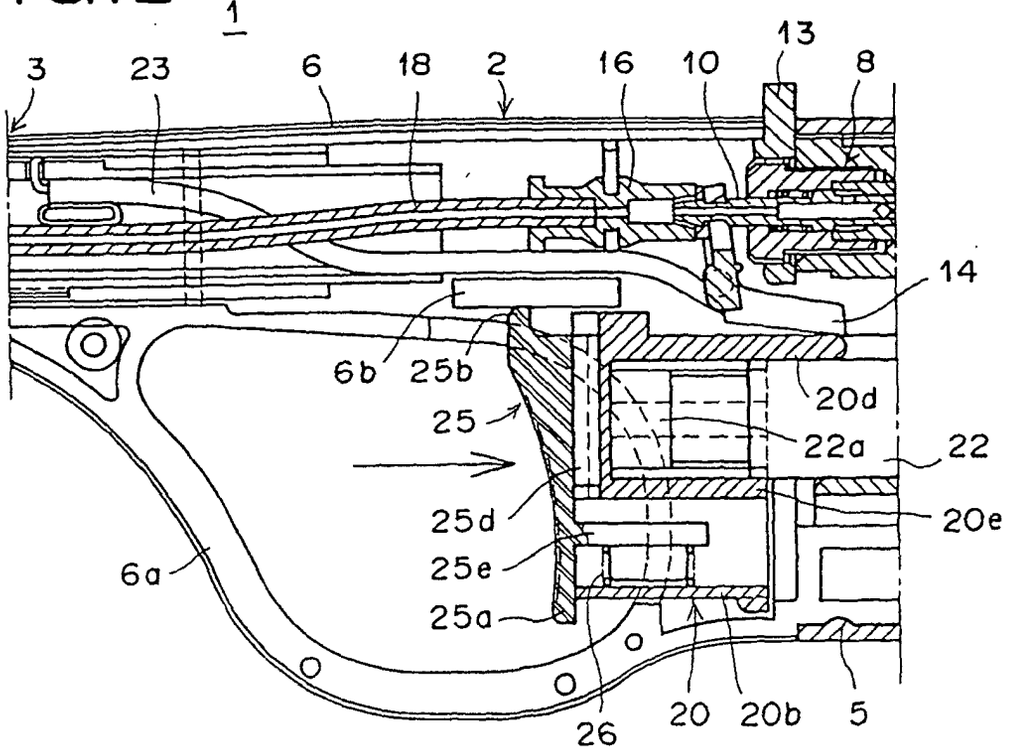

1
3
23
6
18
2
16
10
13
8
14
6b
25b
20d
25
22a
22
25d
20e
25e
6a
25a
26
20
20b
5

FIG.3A

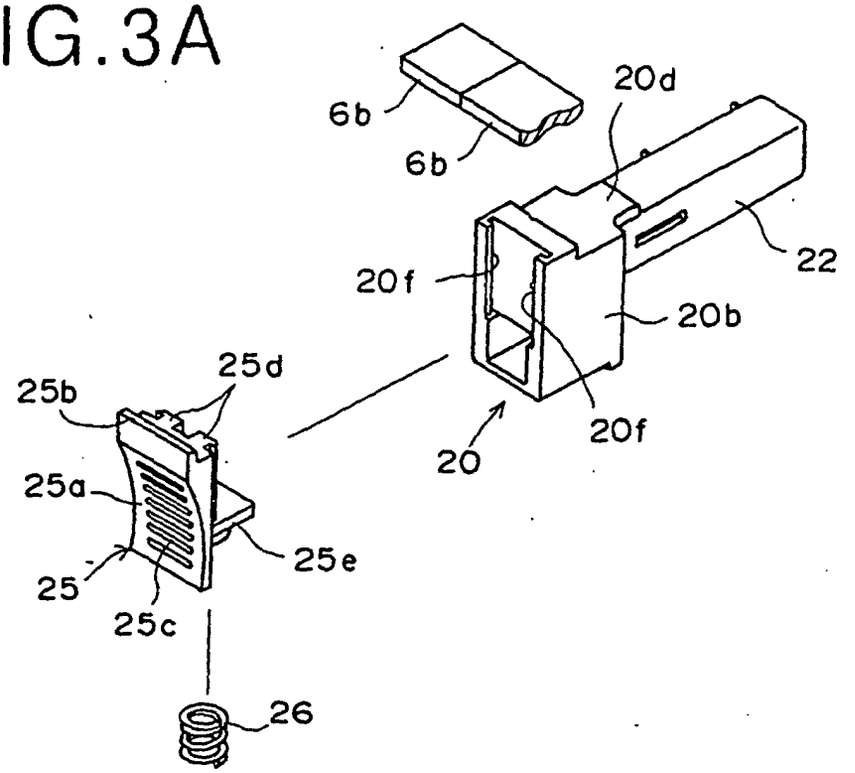

6b
6b
20d
22
20f
20b
25b
25d
25a
25e
25
25c
20
20f
26

FIG.3B

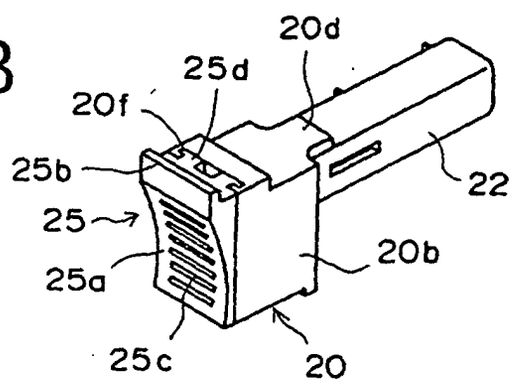

20d
25d
20f
25b
22
25
20b
25a
25c
20

FIG.4

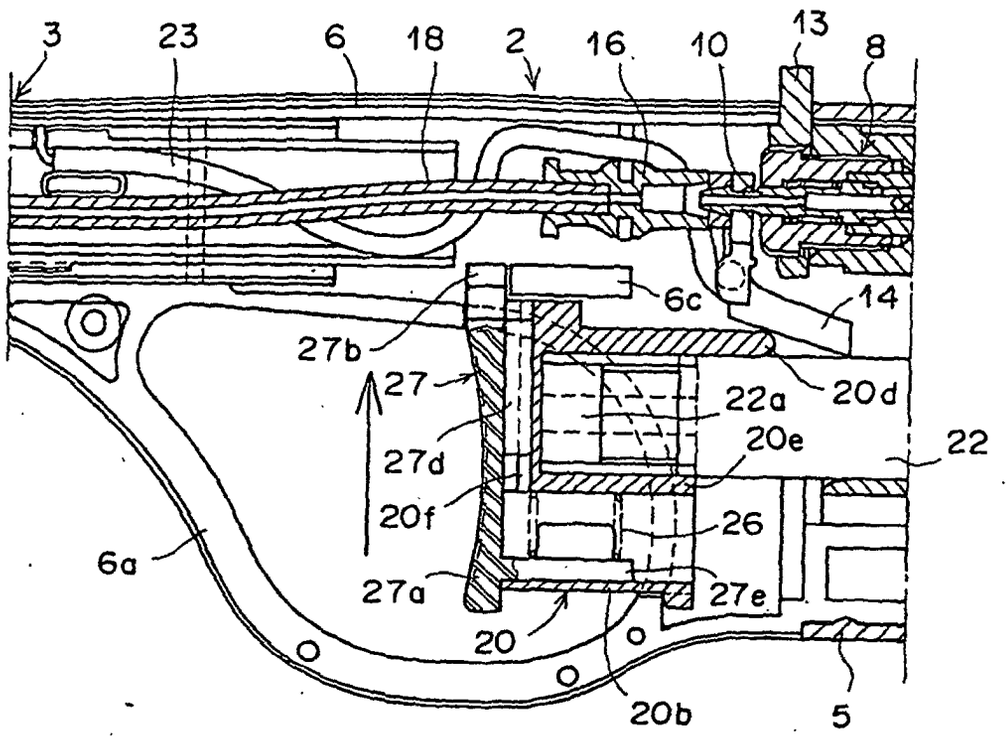

11
3
23
6
18
2
16
10
13
8
6c
14
27b
27
22a
20d
27d
20e
22
20f
26
6a
27a
27e
20
20b
5

FIG.5

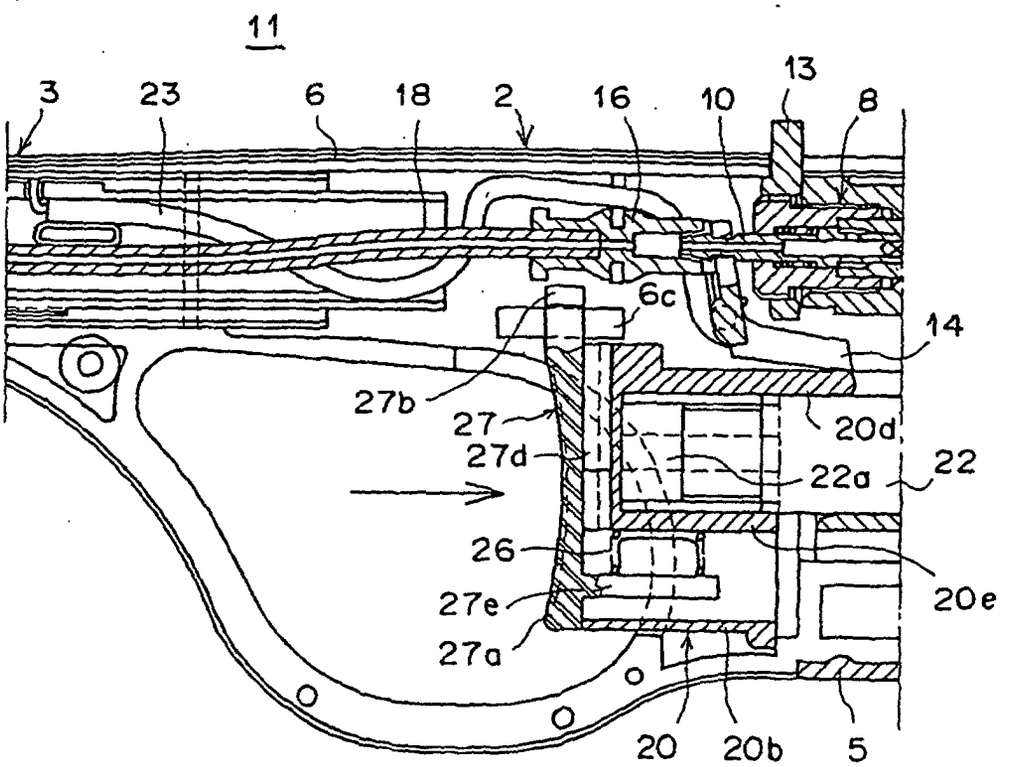

11
3
23
6
18
2
16
10
13
8
6c
14
27b
27
20d
27d
22a
22
26
20e
27e
27a
20
20b
5

FIG.6A

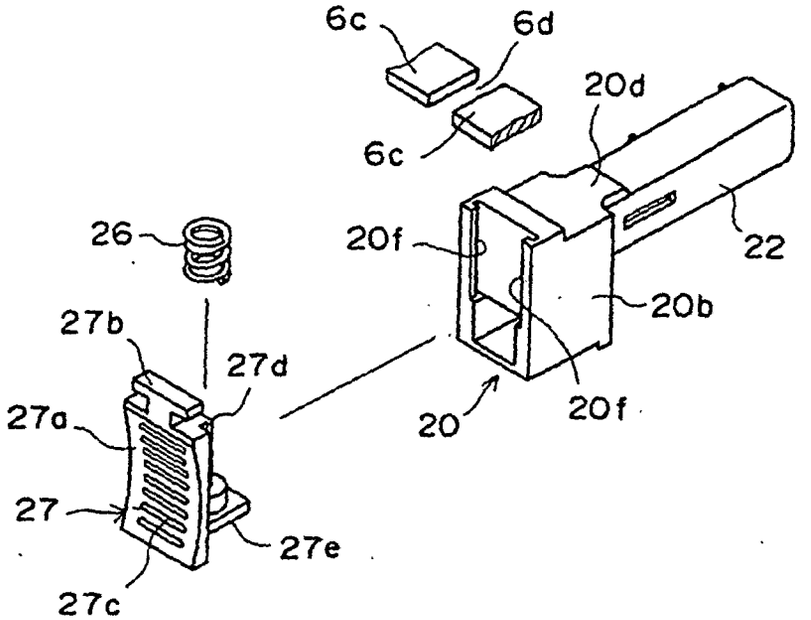

6c
6d
6c
20d
22
26
20f
20b
27b
27d
27a
27
27e
27c
20
20f

FIG.6B

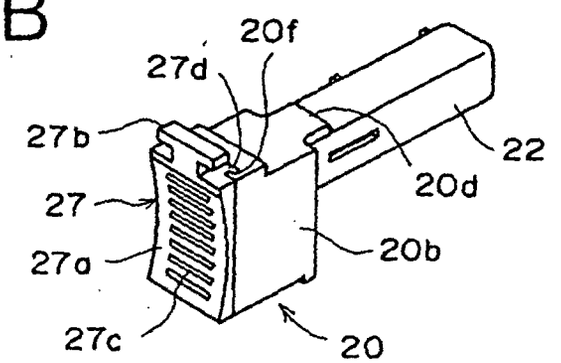

20f
27d
27b
22
20d
27
20b
27a
27c
20

FIG.7

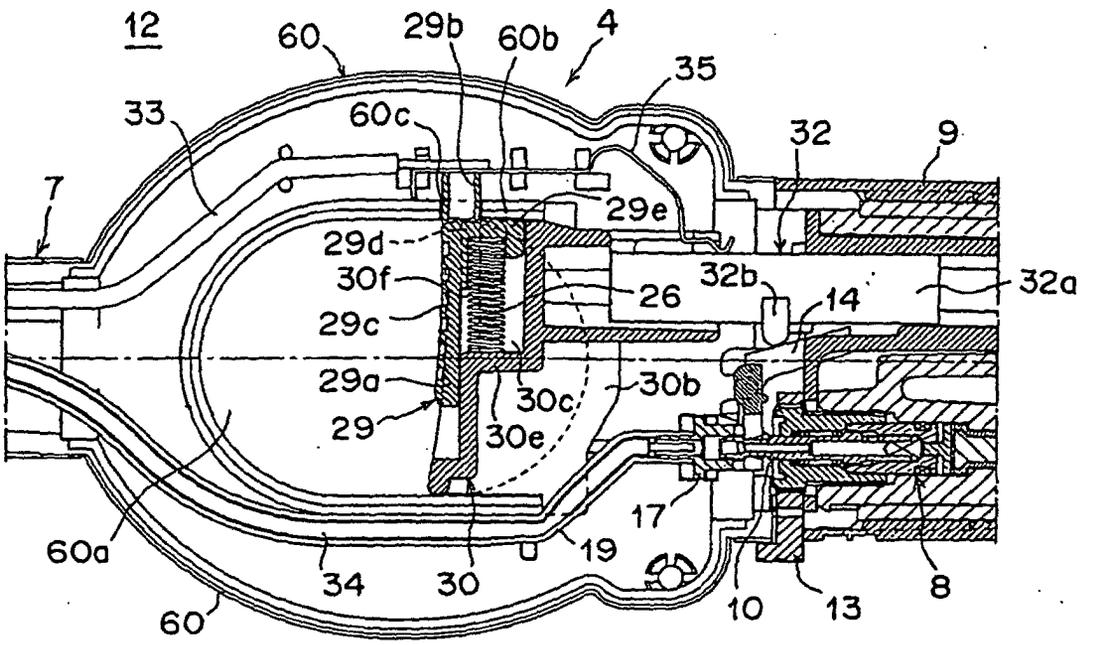
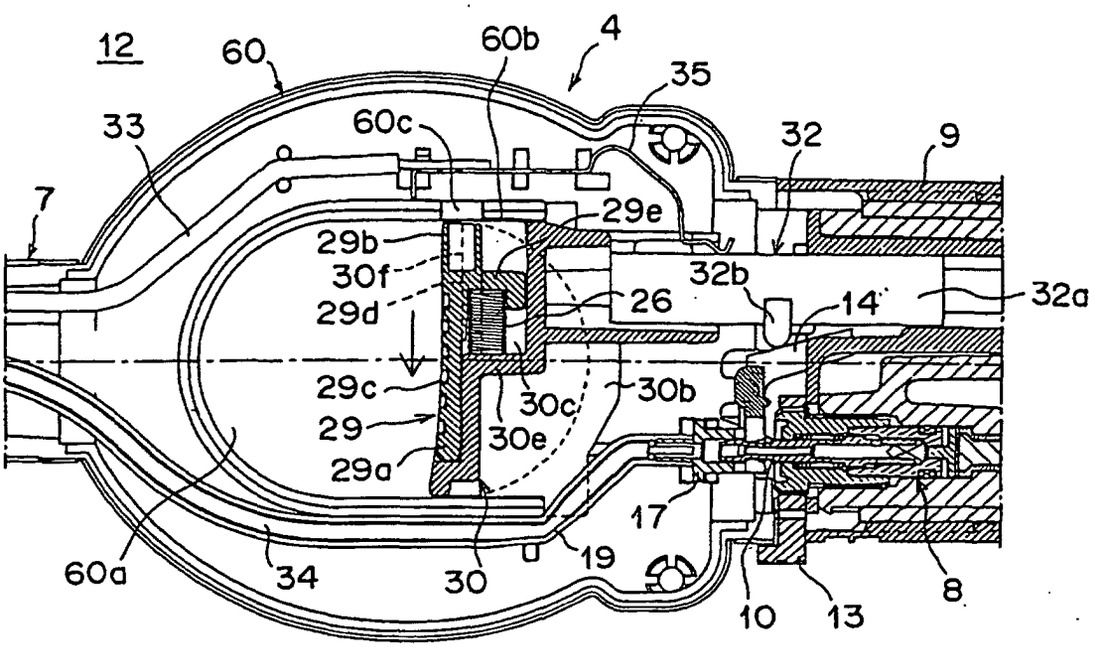

12
60
29b
60b
4
35
33
60c
32
9
7
29e
29d
30f
26
32b
14
32a
29c
29a
30c
30b
29
30e
17
60a
19
34
30
10
13
8
60

FIG.8


12
60
60b
4
35
33
60c
32
9
7
29e
29b
30f
29d
32b
26
14
32a
29c
30c
30b
29
30e
29a
17
19
60a
34
30
10
13
8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/07157

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] F23Q2/28, F23Q2/36

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] F23Q2/28, F23Q2/36

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1940-1996	Toroku Jitsuyo Shinan Koho	1994-2002
Kokai Jitsuyo Shinan Koho	1971-2002	Jitsuyo Shinan Toroku Koho	1996-2002

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5697775 A (Tokai Corp.), 16 December, 1997 (16.12.97), Full text; Figs. 1 to 18 & JP 08-061673 A Full text; Figs. 1 to 4 & JP 08-068536 A Full text; Figs. 1 to 4 & JP 08-110046 A Full text; Figs. 1 to 5 & JP 08-110047 A Full text; Figs. 1 to 5 & US 5897308 A & US 6022212 A & US 6042367 A & US 6093017 A & GB 2292448 A & GB 2324140 A & CA 2156378 A & DE 19530325 A & CN 1126811 A	1-13

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 October, 2002 (21.10.02)	05 November, 2002 (05.11.02)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/07157

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5967768 A (Tokai Corp.), 19 October, 1999 (19.10.99), Full text; Figs. 1 to 27 & JP 11-063497 A Full text; Figs. 1 to 11 & JP 11-125424 A Full text; Figs. 1 to 16	1-13
Y	US 5228849 A (Cricket), 20 July, 1993 (20.07.93), Full text; Figs. 1 to 5 & JP 05-264033 A Full text; Figs. 1 to 5 & CA 2065628 A & FR 2675885 A & EP 514287 A & DE 69200249 C	1-13

Form PCT/ISA/210 (continuation of second sheet) (July 1998)