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(54) IGNITOR

(57) In an igniter having a locking member for locking an actuating member that is operated to ignite the lighter, the parts composing the locking member provide for outstanding operability over a long period of time, improved reliability, manufacturability and cost-effectiveness. The lighter comprises a slideably mounted actuating member running between a valve means and an piezo-electric spark producing unit, in which the locking member is rotatably mounted in the body of the lighter and propped toward the locked position by a propping means, and when the locking means is rotated to the unlocked position, the ignition operation of the actuating member is permitted.

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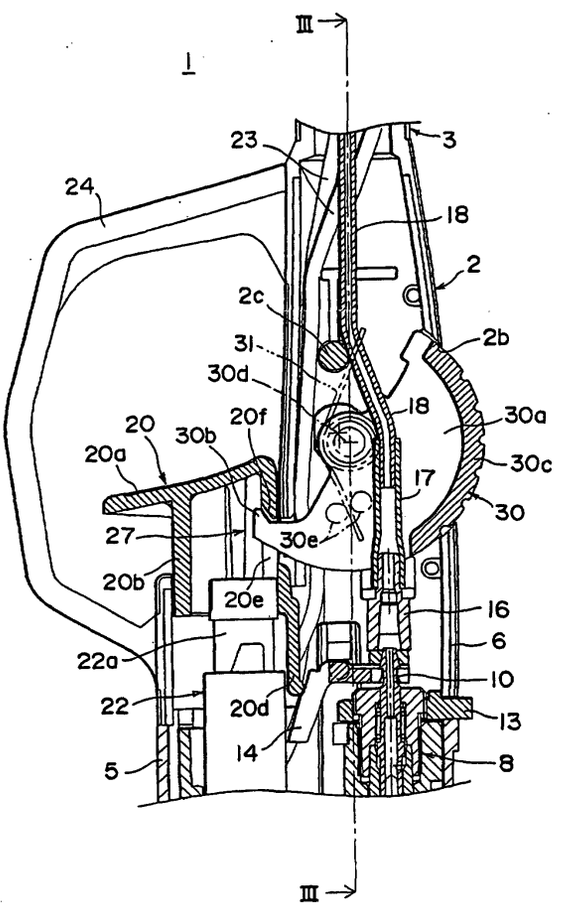

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to igniters, and in particular to an igniter having a safety lock.

Description of the Related Art

[0002] There are known, as in Japanese Unexamined Patent Publication No. 8(1996)-68536, for example, igniters having a push-button type locking means for locking the operation of the actuating member that is operated to actuate ignition to produce a flame, wherein, in the non-operational mode, the locking means locks the ignition operation of the actuating member; on the one hand, when the locking means is pushed in and unlocked, the lighter can be lit, while on the other hand, when aforementioned locking means is released, the locking means recovers automatically to the locked position.

[0003] There are also known, as in Japanese Unexamined Patent Publication No. 11(1999)-63497, for example, igniters in having a lever-type locking means for locking the operational state of the actuating member that is operated to actuate ignition to produce a flame, wherein, in the non-operational mode, the locking means locks the ignition operation of the actuating member; on the one hand, when the locking means is unlocked, the lighter can be lit, and as long as the locking means is maintained in the unlocked state continuous lighting of the lighter can be performed, while on the other hand, when aforementioned locking means is released, the locking means recovers automatically to the locked position.

[0004] However, because lighters such as those described above have a locking means in which a locking member is slideably mounted in the body of the lighter, said locking member being structured so that it slides into the unlocked position when it is unlocked, to ensure that this sliding locking member is durable enough to provide for reliable sliding operation over a long period of time, it is mounted slantedly so as to prevent faulty operation of the ignition actuating member, and therefore high precision manufacturing processes are required, and high costs as well as complicated quality control procedures are incurred in mass production of such lighters.

[0005] In addition, because such lighters have either a push-button locking member, operated by being pushed downward, or a lever-type locking member, operated by being pushed inward, both of which are single actions, there are cases for which a lighter having a locking member more complicated to operate, is called for.

[0006] In view of the above describe points, combining the pushing downward operating action of the push-button type locking member and the pushing inward operating action of the lever-type locking member to perform unlocking, along with coupling these operating actions with a sliding-type actuating member to perform unlocking has been considered. However, such unlocking operations suffer operability problems in that different fingers must be used to perform the operation, and the operation requires two separate actions. Because this is not very practicable, a level of improvement with respect to operability is desirable.

[0007] Which is to say, operation of the actuating member is necessary to produce a flame with the lighter, on top of which multiple fingers are required for unlocking, sliding, pushing inward, etc. to perform a single ignition operation. The difficulty of such operation is disadvantageous for normal usage, and such a lighter itself is an exceedingly complicated device.

SUMMARY OF THE INVENTION

[0008] The present invention has been developed in light of the above described points, and for locking the actuating member, has a locking means whose structural parts provide for good operational performance over a long period of time, and is cost effective as well as more simple to manufacture.

[0009] In addition, operability of the lighters according to the present invention is improved through the elimination of multiple unlocking operations, and the provision in place thereof of the capacity to perform a series of consecutive actions to perform successive ignition operations.

[0010] The igniter of the present invention, which solves the problems described above comprises an expeller nozzle for expelling a combustible gas, a gas tank for storing the gas, an opening and closing valve system for selectively supplying the gas to the expeller nozzle, a piezo-electric spark producing unit, a slideably mounted actuating member running between the valve system and the piezo-electric spark producing unit, wherein a rotatably mounted locking means rotates between a locked position, in which the ignition operation of the actuating member is locked in the locked position, and an unlocked position, in which the ignition operation of the actuating member can be performed, is propped toward the locked position by a propping means.

[0011] Further, another embodiment of the lighter according to the present invention comprises an expeller nozzle for expelling gas, a gas tank, an opening and closing valve system for selectively supplying gas to the gas tank, a piezo-electric spark producing unit, and a slideably mounted actuating member running between the valve system and the piezo-electric spark producing unit for performing the ignition operation, wherein a rotatably mounted locking means rotates between a locked position, in which the actuating member is locked in the locked position, and an unlocked position, in which the ignition operation of the actuating member is permit-

ted, and propped toward the locked position by a propping means, and a restricting means having a restricting member rotatable as a unit with the locking means for engaging said restricting portion with aforementioned engaging portion of the body in the restricted position, whereby rotation of the locking means in the direction of the unlocked position is restricted, and when said restricting means is pushed into the unrestricted position, the restricting portion is disengaged from the engaging portion, whereby the locking means can be rotated toward the unlocked position, and an elastic means is provided for propping said restricting member into the restricted position. When the restricting means is pushed into the unrestricted and the locking means is rotated to the unlocked position, the ignition operation of the actuating member is permitted.

[0012] Said restricting means is formed of an elastic piece that is affixed to said locking means and structured so as to prop said restricting means into the restricted position. Said elastic piece may be provided so that the restricting member is moved from the restricted to the unrestricted position by said elastic means being pushed in and deformed.

[0013] In addition, said restricting means may also be provided slideably mounted in said locking means, and propped into and supported in a direction in which it protrudes by an elastic means, wherein the restricting member is engaged with said body in the restricted position, and in the pushed-in, unrestricted position the restricting member is disengaged from the body.

[0014] Further, it is advantageous to install the restricting member so that it is automatically recovered to the restricted position when said locking means is rotated to the unlocked position.

[0015] On the one hand, it is suitable to install the gas pipe so that it extends through the inside of the locking means.

[0016] Furthermore, it is desirable to design the lighter so that when the locking means is maintained continuously in the unlocked position, the ignition operation of the actuating member can repeatedly be performed.

[0017] It is suitable for the locking means to be provided so that it has a locking member which engages with a portion of the ignition-actuating actuating member for locking the operation of said actuating member into the locked position, which when rotated to the unlocked position moves said locking member into a position in which the locking member is disengaged from the actuating member. In this case, it is also desirable that the rotational center of the locking means be movable.

[0018] According to the lighter of the present invention as described above, a locking means is rotatably supported in the body and propped toward the locked position by a propping means, wherein movement of the unlocking the locking means is accomplished by rotating said locking means, whereby even if the dimensions in the body for supporting locking components therein are not manufactured to exacting precision, operation of said lighter is assured to be stable, manufacture thereof is simplified, and the lighter is advantageously cost-effective.

[0019] In addition, in another embodiment of the lighter of the present invention, on the one hand, when the restricting member is not pushed into the unrestricted position, the locking means cannot be rotated to the unlocked position, and the lighter is locked in the non-operational state in which the ignition operation of the actuating member cannot be performed, and on the other hand, when the restricting means, installed so as to be rotatable as a unit with the locking means, is pushed into the unrestricted position and the locking means is rotated to the unlocked position, the ignition operation of the actuating member becomes possible, and performance of said ignition operation causes gas to be expelled and a flame to be produced by ignition of said gas, whereby operability is improved due to the initiation of flame production by the two continuous actions of pushing in the restricting member and rotating the locking member, good ignition restriction functionality is assured and the structure of the lighter is simplified.

[0020] Further, the actuating member is provided so that successive ignition operations of the actuating member can be performed when the locking member is maintained continuously in the unlocked position, whereby for cases in which a flame is not produced by the first ignition operation, it is easy easy to perform the ignition operation again, providing for excellent operability. Moreover, when the locking means recovers to the unlocked position, the restricting means automatically recovers to the restricted position, whereby the lighter is automatically recovered to the locked state.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

Figure 1 is a front view of the main parts of the first preferred embodiment of the lighter of the present invention,

Figure 2 is a cross-sectional side view of the main parts shown in Fig. 1,

Figure 3 is a sectional view Fig. 2 taken along the line III-III,

Figure 4 is an exploded perspective view of the parts related to ignition restriction component shown in Fig. 1,

Figure 5 is a cross-sectional side view of the main parts shown in Fig. 2 in the operational state,

Figure 6 is a front view of the main parts of the second preferred embodiment of the lighter of the present invention,

Figure 7 is an exploded perspective view of the parts related to ignition restriction component of the second preferred embodiment,

Figure 8 is a cross-sectional side view of the main parts of the second preferred embodiment in the op-

erational state,

Figure 9 is a front view of the main parts of the third preferred embodiment of the lighter of the present invention,

Figure 10 is a cross-sectional side view of the main parts shown in Fig. 9,

Figures 11A and 11B are cross-sectional side views of the main parts shown in Fig. 10 in the operational state,

Figure 12 is a front view of the main parts of the fourth preferred embodiment of the lighter of the present invention,

Figure 13 is a cross-sectional perspective view of the main parts shown in Fig. 12 in the operational state,

Figure 14 is a cross-sectional side view of the main parts of the fifth preferred embodiment of the lighter of the present invention,

Figures 15A and 15B are cross-sectional side view of the main parts shown in Fig. 14 in the operational state,

Figure 16 is a cross-sectional side view of the main parts of the sixth preferred embodiment of the lighter of the present invention,

Figure 17 is a front view of the main parts shown in Fig. 16,

Figure 18 is a sectional view Fig. 17 taken along the line XVIII-XVII, and

Figures 19A and 19B is a cross-sectional side view of the main parts shown in Fig. 16 in the operational state.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] Hereinafter the preferred embodiments of the igniter according to the present invention will be described in detail with reference to the drawings.

[0023] Figures 1-5 depicts an embodiment of the lighter according to the present invention implemented as a lighting rod. Figure 1 depicts a front view of the main part of the lighter of the current embodiment, Fig. 2 a cross-sectional side view of the main part of the lighter of the current embodiment, Fig. 3 a sectional view taken along the line III-III of figure 2, Fig. 4 is an exploded perspective view of the parts related to restricting ignition, and Fig. 5 depicts a cross-sectional side view of the operational state of the igniter of the current embodiment.

[0024] Lighter 1 (lighting rod) is formed of a body 2 and an extension tip 3 extended in a rod shape (not shown) . Said body 2 comprises a lower case 5 formed of synthetic resin, and extending upwards therefrom, a middle case 6 which is vertically divided approximately at the center thereof. Figures 2,4 and 5 depict a view of middle case 6.

[0025] In the section of said body 2 near its base, within lower case 5, there is a gas tank formed of synthetic resin for storing a high pressure gas such as butane, etc., having installed on the upper wall thereof a valve system 8 which opens and closes to supply the gas stored in the gas tank. Valve system 8 is used for sending gas, and installed on the gas passage thereof is a nozzle 10. At the tip of nozzle 10 an edge of a rotatable lever 14 for opening nozzle 10 is engaged therewith. With operation of said lever 14, said nozzle 10 is advanced forward, whereby the gas passage is opened and gas is supplied. The withdrawal of the nozzle caused by the spring installed in valve system 8 closes the gas channel and cuts off the supply of gas. Note that the amount of gas supplied, i.e. the size of the flame, is regulated by rotation of a flame adjusting knob 13 protruding outside of the lighter.

[0026] In addition, above the line extending from the forward-most edge of nozzle 10 there are installed a sleeve 16 and a connector pipe 17, which are connected to a gas pipe 18. Gas pipe 18 extends to the forward edge of extension tip 3 and is connected to nozzle 10 to which it supplies gas.

[0027] An actuating member 20 (lighter button) is mounted in middle of case 6 of body 2 to the side valve means 8 so as to be able to slide parallel along the centerline thereof. In between aforementioned gas tank and said actuating member 20 is installed a piezo-electric spark producing unit 22.

[0028] As depicted in Fig. 4, aforementioned actuating member 20 further comprises a tubular portion 20b which is supported so as to be slideable from the opening of middle case 6 into the interior, and on the forward edge of said tubular portion 20b is provided a slantedly mounted finger depressible surface 20a. Still further, said tubular section 20b is provided with a foot portion 20d extending along the slideable direction adjacent to the side edge of valve means 8. Said foot portion is structured so as to cause said rotatable lever 14 to rotate when the lighter is to be ignited.

[0029] An opening 20e is provided on the back face of the section between said foot portion 20d and said finger depressible surface 20a so a to enable insertion of lock latch 30b of locking member 30 described hereinafter. Lock catch 20f is formed at the edge of said opening 20e on the side of finger depressible actuator 20a.

[0030] Formed in an approximately L-shape, said rotatable lever 14 is rotatably supported at the center point thereof, and is rotated by said foot portion 20d, whereby said valve means 8 is opened by the rotation performed to carry out the ignition operation, and gas is thereby supplied.

[0031] Further, said piezo-electric spark producing unit provides an electric spark, and is structured so that an electric spark is caused to be produce by the plunging movement of expanding and contracting slide 22a, engaged with actuating member 20, that occurs with the withdrawing movement of said actuating member 20. Connected to the electrodes of said piezo-electric spark producing unit 22 are lead wires 23 (2 wires) , which are

connected at the other end to the spark output electrodes and the expeller nozzle (not shown).

[0032] An ignition button guard 24, leaving space for a finger to be inserted for pushing finger-depressible surface 20a, is integrally formed with said middle case six so as to partially enclose actuating member 20.

[0033] Next, an ignition mechanism of the construction described above will be further provided with an ignition-restricting component for restricting the ignition operation of said actuating member 20.

[0034] Said restricting component has a locking means 27 comprising a locking member 30 rotatably supported on the inside of said body 2 (middle case 6) for locking and unlocking the ignition operation of actuating member 20, and is further provided with a propping means 31 having a return spring for propping said locking member 27 toward the locked position. When locking means 27 is rotated from the locked to the unlocked position, operation of the actuating member for ignition is permitted.

[0035] Locking member 30 is comprises side panels 30a, formed approximately as semicircles having an outer circumference oval in shape, on either side thereof (refer to Fig. 3). On the end of one side of said side panels 30a is formed a hook-shaped lock latch 30b, so as to be enabled to be inserted into opening 20e of actuating member 20 and engaged therein with engaging portion 20f. Said side panels 30a are joined by a circumference wall 30c to form an integral unit having an oval-shaped outer circumference and a void inside. Further, an axle 30d is provided, at the center point with respect to the oval-shaped outer circumference, on the outer face of either side panel 30a extending in the lateral direction. Said axle 30d is inserted into an elongated axle hole 2a provided in aforementioned body 2 (middle case 6) so as to be rotatable, is supported so as to be movable in the direction along elongated axle support hole 2a, and can be rotated in the locked position, in which lock latch 30b is engaged with lock catch 20f of actuating member 20, as well the unlocked position, in which lock latch 30b is moved to the inside of body 2. Aforementioned outer circumference wall 30c protrudes from window 2b opened in the wall of the side of body 2 (middle case 6) opposite said ignition button guard 24. Said circumference wall 30c is provided with crosswise grooves in the outer surface thereof for rotatable operation by a finger.

[0036] In addition, two protruding spring stays 30e are provided on the outer face of one side panel 30a. The center coil of return spring 31 is installed around axle 30d as propping means on the side from which said spring stays protrude. One straight portion of said return spring 30 is engaged with said spring stays 30e, the other straight portion of return spring is disposed against a protruding portion 2c of body 2, and said lock latch 30b is propped into the locked position where it is rotated to the side of actuating member 20. Note that commensurate with an increase to the strength of the propping means, the force required for rotation thereof becomes comparatively large.

[0037] On the outer face of the other side panel 30a protrudes a stopper 30f (refer to Fig. 3). When locking member 30 is rotated to the locked position, said stopper 30f is brought into contact with an engaging portion (not shown) of body 2 and is stopped at that position. In addition, when locking member 30 s rotated to the unlocked position, the forward edge of side panel 30a is brought into contact with aforementioned protruding portion 2c of body 2, which is the upper limit of the range of rotation (refer to Fig. 5).

[0038] Note that connector pipe 17 and gas pipe 18 pass through the void between side panels 30a of aforementioned locking member 30 in its assembled state (this is the same for embodiments described hereinafter) . Further, when rotated to the unlocked position depicted in Fig. 5, the forward edge of the outer circumference 30c of said locking member 30 (in the unlocked position) is formed so as not to catch on said gas pipe 18 disposed therein.

[0039] The operation of the ignition-restricting component for the embodiments of the ignition mechanism described above will now be explained. First, in the state depicted in Fig.2, locking member 30 is in the locked position (released state) and actuating member 20 is protruding into the space enclosed by the ignition button guard 24 and is in the non-operational state. In this state, lock latch 30b of locking member 30 projects into said actuating member 20 from opening 20e and is engaged with engaging portion 20f; actuating member 20 cannot be pushed in and the ignition operation cannot be performed.

[0040] Next, when lighter 1 is to be used, if outer circumference 30c of locking member 30 is rotated forward to the unlocked position, lock latch 30b is moved from the "caught" position in opening 20e of actuating member 20 to the inside of body 2 where it is in the unlocked position, whereupon actuating member 20 can be pushed in and the ignition operation can be performed. At that time, the power used in rotating the locking member 30 acts to push forward and push in axle 30d, whereby axle support 2a is moved along the elongated axle hole and the center of rotation is shifted.

[0041] Thus, when the ignition operation is performed with actuating member 20 in the unlocked state described above, the movement of actuating member 20 causes rotatable lever 14 to pull up nozzle 10 and open valve means 8, whereby gas is supplied to the expeller nozzle via gas pipe 18. In addition, accompanying ignition operation of actuating member 20, discharge voltage (AC voltage) is generated by the piezo-electric spark producing unit 22 and is applied between the electrode at the extension tip 3 and expeller nozzle, whereby the expelled gas is ignited.

[0042] Note that when actuating member 20 has been pushed in before aforementioned locking member 30 has been unlocked, lock catch 30f and lock latch 30b of

locking member 30 are securely engaged and it is very difficult to move locking member 30 in the unlock direction, however, because axle 30d of locking member 30 is supported so as to be able to move along elongated axle hole 2a as described above, axle 30d moves forward when locking member 30 is pushed in and rotated, whereby aforementioned lock latch 30b and lock catch 30f become easy to disengage and locking member 30 can be rotated in the unlock direction (this is the same for embodiments described hereinafter).

[0043] While locking member 30 is maintained in the unlocked position (the rotated state), repeated ignition operation of actuation member 20 can be performed, making for easy consecutive ignition operations for cases in which the gas is not ignited on the first ignition operation (this is the same for embodiments described hereinafter).

[0044] If locking member 30 and actuating member 20 are released by the hand to finish using the lighter, actuating member 20 is returned to the initial protruding position by the elastic force of the spring in piezo-electric spark producing unit 22, and locking member 30 is returned to the locked position, in which lock latch 30 protrudes, by the propping force of propping means 31 (the return spring), and the locked state wherein actuating member 20 is prevented from being pushed in is recovered automatically.

[0045] The rotatable support provided in the current embodiment for locking member 30 assures stable ignition control through repeated operation over a long period of time by making it difficult for operational failures due to said locking member 30 getting stuck midway in the rotation to occur. In addition, disposing gas pipe 18 through the space between side panels 30a assures good assembly characteristics as interference between the internal structures of locking member 30 and gas pipe 18 is thereby avoided.

<Preferred embodiment 2>

[0046] The current embodiment is depicted in Figures 6 and 7. The body of the lighter of the current embodiment differs from that of embodiment 1, the ignition-restricting component is formed the same as that of embodiment 1, and shares the same basic functions as those of embodiment 1.

[0047] Body 102 of lighter 100 of the current embodiment is formed of a case 7 having an outer shell whose entire body is divided vertically approximately at the center thereof.

[0048] In addition, one portion of actuating member 120 differs from that of embodiment 1. Said actuating member 120 has a slideably supported tubular portion 120b in case 7, and at the forward edge of said tubular portion 120b is provided slantedly a finger depressible surface 120a. Said finger depressible surface 120a is formed so that it extends sideways into body 102 from said tubular portion 120b, and extending to the rear end of tubular portion 120b is foot portion 120d, which connects with rotatable lever 14. Further, an engaging wall 120e extends, parallel with the back face of tubular portion 120b, to the extended portion of actuating member 120, and said forward edge is formed as a lock catch 120f, which is capable of engaging lock latch 30b of locking member 30.

[0049] Corresponding to the above described actuating member 120, axle support 102a of body 102 and protruding portion 102c are positioned adjacent to the side of window 102b, which is an elongated opening extending in the front and rear directions along the length of the lighter, and ignition button guard 124 differs from that of embodiment 1.

[0050] On the one hand, locking member 30 of locking means 27 is formed the same as that of embodiment 1, and because aforementioned axle support 102a for supporting axle 30d is positioned adjacent to the side of window 102b, the protruding portion of outer circumference 30c exposed to the outside is larger than that of embodiment 1.

[0051] Aside from that, it is the same as embodiment one, and like parts are labeled with the same reference symbols as in embodiment 1.

[0052] Next, Fig. 8 depicts another embodiment of lighter 100 wherein a locking member 130 of locking means 27 has been made smaller in size. Otherwise, it is the same as that depicted in Fig. 6.

[0053] In said locking member 130 of the current embodiment, the oval portion of side panels 130a, that is to say, the radius of the outer circumference, has been made smaller, and because the portion of circumference wall 130c protruding from window 102b (formed to be of the same front and rear length as that of embodiment 1) of body 102 has been reduced, lock latch 130b, spring stays 130e, etc. are formed the same as those of embodiment 1.

[0054] Note that accompanying the reduction in the size of circumference wall 130c, there are cases in which, when locking member 130 is rotated to the unlocked position the forward edge of said reduced-size circumference wall 130c pushes against gas pipe 18, and therefore said forward edge of outer circumference 130c must be trimmed to avoid its catching on and applying pressure to gas pipe 18. When accompanying such trimming the position of the forward edge of circumference wall 130c comes to be at a position separated from the edge of widow 102b, it is possible that a protruding portion that covers the forward edge of outer circumference 130c be formed on one edge of window 102b of case 7 of body102.

<Preferred embodiment 3>

[0055] The current embodiment is depicted in Figures 9-11A/11B, and shows another embodiment of an ignition-restricting component. Body 2 of lighter 200, actuating member 20, etc. are the same as those of embod-

iment 1 (refer to Figs. 1-5) and are labeled with the same reference symbols, and additional explanation thereof is omitted.

[0056] The ignition-restricting component of the current embodiment comprises locking means 27 having rotatably mounted locking member 230 for locking the ignition operation state of actuating member 20, a propping means 31 having a return spring for propping said locking member 27 toward the locked position, restricting portion 32c engaged with aforementioned body 2 and integrally affixed to said locking member 230, having an elastic piece 32a for restricting the rotating motion of aforementioned locking means 27, restricting means 26 composed of restricting member 32 wherein the elastic force of said elastic piece serves as elastic means for propping restricting portion 32c, connected so as to permit performance of the ignition operation of the actuating member when the pushing-in action whereby restricting means 26 is moved from the restricted to the unrestricted position at the same time locking means 27 is rotated from the locked to the unlocked position.

[0057] Locking member 230 is comprises side panels 230a, formed approximately as semicircles having an outer circumference oval in shape, on either side thereof. On the end of one side of said side panels 230a is formed a hook-shaped lock latch 230b, so as to be enabled to be inserted into opening 20e of actuating member 20 and engaged therein with engaging portion 20f. Said side panels 230a are connected by an inside connector 230c to form an integral unit having a void inside. Further, an axle 230d is provided, at the center point with respect to the oval-shaped outer circumference, on the outer face of either side panel 30a extending in the lateral direction. Said axle 230d is rotatably inserted into an elongated axle hole 2a (refer to Fig. 4) provided in aforementioned body 2, is also supported so as to be movable in the direction along elongated axle support hole 2a, and can be rotated in the locked as well as the unlocked position. The outer circumference of said side panels 230a protrude from window 2b opened in the wall of the side of body 2 opposite said ignition button guard 24. Said outer circumference wall 230c is provided with crosswise grooves on the outer surface thereof for rotatable operation by a finger.

[0058] In addition, two protruding spring stays 230e are provided on the outer face of one side panel 230a, with which one straight portion of said return spring 31 is engaged, and said lock latch 230b is propped into the locked position the same as in the above described embodiment.

[0059] On the one hand, aforementioned restricting member 32 and aforementioned locking member 230, for example, are formed of a different resin as a separate parts, having an elastic piece 32a curved in an approximately oval shape and having a width corresponding to the distance between the inside faces of said side panels 230a, extending to the base of said elastic piece 32a is fixing portion 32b, and said fixing portion 32b is fitted onto connector 230c of aforementioned locking member 230 from the rear.

[0060] Restricting portion 32c is formed at the forward edge of aforementioned elastic piece 32a, and at the center portion thereof is formed a protruding finger depressible surface 32d. In the free state (the un-depressed state) , said curve-shaped elastic piece 32a has a larger radius of curvature than the oval portion of side panels 230a of aforementioned locking member 230, forward edge restricting portion 32c protrudes further into the outside than do side panels 230a, and said restricting portion 32c catches onto engaging portion 2d at the front edge of window 2b of body 2. Due to said catching of restricting portion 32c onto engaging portion 2b, rotation of locking member 230 is restricted. In this restricted position, as well as in the non-restricted position, in which the finger depressible surface 32d is pushed in and it is not possible for restricting portion 32c, which has been moved inside the space between side panels 230a and whose radius of curvature has been thereby shortened, to be engaged with engaging portion 2d, elastic piece 32a is elastically deformable.

[0061] Note that at the forward edge of elastic piece 32a of restricting member 32 there is formed a protruding portion 32e, which is even further forward than restricting portion 32c. When locking member 230 has been rotated to the locked position and restricting member 32 is in the restricted position (refer to Fig. 10), aforementioned protruding portion engages the inside of the edge of window 2b of body 2, so that elastic piece 32a does not become separated from window 2b. If, at this point, said protruding portion 32e is rotated to the unlocked position shown in Fig. 11B, said protruding portion 32e is formed at a position so as not to get caught on gas pipe 18.

[0062] Now, operation of the restricting component of lighter 200 of the current embodiment will be explained. First, Figures 9 and 10 depict the restricting member 32 in the restricted position and locking member 230 in the locked position, respectively, wherein actuating member 20 is in the non-operational state in which it is not possible to push in actuating member 20 and the ignition operation cannot be performed. In addition, restricting part 32c of restricting member 32 protrudes and is caught on engaging portion 2d, restricting member 32 is not pushed in, and said locking member 230 cannot be rotated.

[0063] Next, when lighter 200 is to be used, as shown in Fig. 11A, when finger depressible surface 32d of elastic piece 32a of restricting member 32 is pushed against the resistance of the elastic force into the unrestricted position, restricting portion 32 of the forward edge of elastic piece 32 moves from the front of engaging portion 2d of body 2 to a position inside, whereby rotation of locking member 230 in the unlock direction is permitted.

[0064] Continuing, as shown in Fig. 11B, if finger depressible surface 32d is pressed in and held, and the

outer circumference of side plates 230a are rotated forward in the unlock direction, lock latch 230b moves from the position in which it is engaged inside opening 20e of actuating member 20 into the inside of body 2 to the unlocked position, and it becomes possible to push in actuating member 20 and perform the ignition operation.

[0065] If actuating member 20, locking member 230 and restricting member 32 are released by the hand to finish using lighter 200, actuating member 20 juts out and returns to its initial position and locking member 230 is rotated by the propping force of propping means 31 (the return spring). Accompanying this rotation of locking member 230, restricting member 32, too, by the elastic force of elastic piece 32a which causes restricting portion 32b to jut out, is returned to the restricted position, whereby the locked state, in which it is not possible to rotate locking member 230 and pushing in of actuating member 20 prevented, is automatically recovered.

[0066] Because in the current embodiment locking member 230 and restricting member 32 are formed as separate components, each component can be formed of an appropriate resin material having the desired characteristics, whereby it becomes possible to assure for solidity and firmness of locking member 230 as well as good elasticity of restricting member 32. Additionally, as both components are fitted units, they have outstanding assembly characteristics.

<Preferred embodiment 4>

[0067] The current embodiment, lighter 300, is depicted in Figures 12 and 13, in which the body 102 is the same type as that of embodiment 2 (refer to Figs. 6 and 7), and therefore, the ignition restriction component thereof differs from that of embodiment 3, although it shares the same basic functions.

[0068] Lighter 300 of the current embodiment comprises finger depressible surface 120a of actuating member 120 protrudes from the side of body 102, and as described above, axle support 102 a (refer to Fig. 7), protruding portion 102c is formed toward the side of window 102b.

[0069] In this example of an ignition restricting component, locking member 330 of locking means 27 is the same type as that depicted in Fig. 8 described above, wherein side plates 230a are provided a reduced radius, and otherwise, lock latch 330b, connector 330c, axle 330d, etc., though slightly different from their respective counterparts in embodiment 3, are substantially the same. In addition, locking member 330 and restricting means 26 are separately formed components, and in restricting member 132 of said restricting means 26, the base portion of elastic piece 132a is affixed to connector 330c of locking member 330 by fixing portion 132b, and the length of elastic piece 132a of finger depressible surface 132d is shortened. The position of restricting portion 132c of the forward edge of elastic piece 132a is at a position removed from the edge of the opening of window 102b of body 102, and therefore, engaging portion 102d of body 102 for engaging aforementioned restricting portion 132c is provided by protruding portion 102e which juts out in the direction of locking member 330 so as to be adjacent to the aforementioned described restricting portion 132c.

[0070] The operation of the ignition restricting component of the current embodiment is the same as for that of embodiment 3, wherein actuating member 120 cannot be pushed in and the ignition operation is locked, as in the locked state depicted in Fig. 12, and when elastic member 132a of restricting member 132 is pushed into the unrestricted position, locking member 330 can be rotated, and if said locking member 330 is rotated to the unlocked position the unlocked state depicted in Fig. 13 is attained, in which ignition operation of actuating member 120 is enabled.

[0071] In the current embodiment, the space provided for locking member 330 and restricting member 132 is narrow, and to reduce the amount thereof protruding from window 120b they have been reduced in size, and to avert the pushing on gas pipe 18 of the forward edge of restricting portion 132c of elastic piece 132a of restricting member 132 when locking member 330 is rotated to the unlocked position, said elastic piece 132a is formed with a reduced length, whereby a construction assuring that said elastic piece 132a engages with engaging portion 102d of body 102, and said elastic piece 132a is prevented from catching on gas pipe 18 is attained.

<Preferred embodiment 5>

[0072] The current embodiment, lighter 400, is depicted in Figures 14, 15A and 15B, in which body 2 is of the same type as that of embodiment 1 (refer to Figs. 1-5), locking means 27 and restricting member 26 of the ignition restricting component are integrally formed and share the same basic functions as those in embodiment 3.

[0073] The ignition restricting component of the current embodiment comprises locking means 27 having a rotatably mounted locking member 430 for locking the ignition operation of actuating member 20, propping means 31 for propping by a return spring said locking member 430 toward the locked position, restricting means 26 integrally formed with said locking member 430 for engaging with body 2 engaging portion 232c of elastic piece 232a restricting rotation of said locking member, connected so that if restricting member 232 is pushed into the unrestricted position and locking member 430 is rotated to the unlocked position at the same time, or if locking member 430 is maintained continuously in the unlocked position, the ignition operation of actuating member 20 is permitted.

[0074] Aforementioned locking member 430 comprises side panels 430a, formed approximately as semicircles having an outer circumference oval in shape, on

either side thereof, and on one side of said side plates 430a is formed a hook-shaped lock latch 430b that can be inserted into opening 20e of actuating member 20. Said side panels 430a are integrally linked by restricting member 232, and are formed so that there is a void between them. In addition, on either side of side panels 430a there is provided at the rotational center an axle 430d, said axle 430d being inserted into elongated axle hole 2a (refer to Fig. 4) of aforementioned body 2 so as to be rotatable in the locked and unlocked position. Further, on the outer face of one side of side plates 430a are provided two protruding spring stays 430e, with which one straight length of return spring 31 is engaged, as propping means, for propping locking member 430 toward the locked position, as described above.

[0075] On the one hand, aforementioned restricting member 232 is integrally formed with side panels 430a of aforementioned locking member 430, and has an elastic piece 232 curved in an approximately oval shape having a width corresponding to the distance between the outside face of said side panels 430a. Said elastic piece 232a is affixed at its base by fixing portion 232b to both side panels 430a, and side plates 430a are thereby connected. Said elastic piece 232a extends over and covers the outside of both side panels 430a, and restricting portion 232c is formed at the forward edge of said elastic piece 232a. Further, the surface of elastic piece 232a that protrudes outside from window 2b of body 2 serves as a finger depressible surface for pushing in said restricting member and rotating said locking member, and crosswise grooves are provided on the surface thereof.

[0076] In the released state (the un-depressed state), restricting portion 232c of the forward edge of said elastic member 232a catches onto engaging portion 2d of the front edge of window 2b of body 2, whereby rotation of locking member 430 is restricted. In this restricted positions as well as in the unrestricted position, in which elastic piece 232a has is pushed in, elastic transformation of said elastic piece 232a is possible. Elastic member 232a is propped into the restricted position by its own elastic force when released. Note that protruding portion 232e for engaging with the inside edge of window 2b is formed even further forward on the forward edge of elastic piece 232a than is restricting portion 232c.

[0077] The operation of the ignition restricting component of the current embodiment is the same as for that of embodiment 3, wherein actuating member 20 cannot be pushed in and the ignition operation is locked, as in the locked state depicted in Fig. 14, in which when elastic member 232a of restricting member 232 is pushed into the unrestricted position, locking member 330 can be rotated, and if said locking member 430 is rotated to the unlocked position, the unlocked state depicted in Fig. 15 is attained, in which ignition operation of actuating member 20 is enabled.

[0078] Because in the current embodiment, locking member 430 and restricting member 232 are integrally formed, the number of parts is reduced and advantageously, cost-effectiveness and manufacturability are improved.

<Preferred embodiment 6>

[0079] The current embodiment, lighter 500, is depicted in Figures 16-19A, 19B, in which the ignition restricting component is different and body 2 is of the same type as that of embodiment 1 (refer to Figs. 1-5).

[0080] The ignition restricting component of the current embodiment comprises locking means 27 having a rotatably supported locking member 530 for locking the ignition operation of actuating member 20, and restricting means 26 having a push-button type restricting member 332 for restricting the rotation of aforementioned locking member, connected so that when restricting member 332 is pushed in and moved from the restricted to the unrestricted position and locking member 530 is rotated from the locked to the unlocked position, the ignition operation of actuating member 20 is permitted.

[0081] Aforementioned locking member 530 comprises side panels 530a, on either side thereof, formed approximately as semicircles having an oval-shaped outer circumference. On the end of one side of said side panels 530a is formed a hook-shaped lock latch 530b, so as to be enabled to be inserted into opening 20e of actuating member 20 and engaged therein with engaging portion 20f. Said side panels 530a are connected, at the oval-shaped outer circumference, by circumference wall 530c to form an integral unit having a void inside. Further, an axle 530d is provided, at the center point of the rotational center of the oval-shaped outer circumference, on the outer side face of either side panel 530a. Said axle 530d is rotatably inserted into an elongated axle hole 2a (refer to Fig. 4) provided in aforementioned body 2, is also supported so as to be movable in the direction along elongated axle support hole 2a, and can be rotated in the locked as well as the unlocked position. Aforementioned outer circumference wall 530c protrudes from window 2b opened in the wall of the side of body 2, and is provided with crosswise grooves on the outer surface thereof for rotatable operation by a finger. In addition, there is provided a slide 530g in which restricting member 332 (described hereinafter) is installed. In addition, two protruding spring stays 530e are provided on the outer face of one side panel 530a, with which one straight portion of said return spring 31 is engaged, and said lock latch 530b is propped into the locked position.

[0082] On the one hand, as depicted in Fig. 18, aforementioned restricting member 332 is formed as a square tube-shaped push-button and is installed on the outside of slide 530g of locking member 530 so as to be able to slide from the restricted position, in which the front edge of finger depressible surface 332a protrudes,

and the unrestricted position, and the unrestricted position, in which said finger depressible surface is depressed. Inside said restricting means 332, elastic means 33 having a coil spring is compressed and installed between spring support 530h formed on the outer circumference of circumference wall 530c of locking means 530 and the inside circumference of restricting means 332, whereby said restricting member 332 is propped toward the restricted position, and foot portion 332b of restricting member 332 is engaged with circumference wall 530c and stopped in the restricted position.

[0083] In addition, on either side of said restricting member 332 is provided a protruding restricting portion 332c, said restricting portion 332c is inserted and engaged with concave engaging portion 2f (refer to Fig. 17) formed as a notch on the side of window 2b of body 2 and stopped in the restricted position, restricting rotation of locking member 530, and restricting member 332 is formed so that if said restricting member 332 is pushed into the unrestricted position, restricting portion 332c and engaging portion 2f are disengaged.

[0084] Now, the operation of the ignition restricting component described above will be explained. First, in the state depicted in Fig. 16, restricting member 332 s in the restricted position, and locking member 530 is in the locked position (released state), in which actuating member 20 is in the non-operational state. In this state, lock latch 530b of locking member 530 protrudes into the inside of actuating member 20 and is engaged with engaging portion 20f, and it is not possible to perform the ignition operation of actuating member 20. Further, restricting portion 332c of restricting member 332 is engaged with engaging portion 2f of body 2, restricting member 332 is in a state in which it cannot be pushed in, and said locking member 530 cannot be rotated.

[0085] Next, when lighter 500 is to be used, as shown in Fig. 19A, if finger depressible surface 332a of restricting member 332 is pushed against the resistance of coil spring 33 into the unrestricted position, said restricting portion 332c is disengaged from engaging portion 2f of body 2 and moves to a position inside, whereby rotation of locking member 230 in the unlock direction is permitted. Continuing, as shown in Fig. 19B, if finger depressible surface 332a of restricting member 332 is pressed in and held, and outer circumference 530c of locking member 530 is rotated forward in the unlock direction, lock latch 530b moves to the unlocked position, and it becomes possible to push in actuating member 20 and perform the ignition operation.

[0086] If actuating member 20, locking member 230 and restricting member 32 are released by the hand to finish using lighter 500, actuating member 20 to juts out and returns to its initial protruding position, and locking member 530 is moved to the locked position by the propping force of propping means 31 (the return spring) . When locking member 530 returns to the unlocked position, restricting portion 332c of restricting member 332 is inserted into and engaged with engaging part 2f and returned to the restricted position, in which it is not possible to rotate locking member 530, the initial state is automatically recovered.

[0087] Note that the surface of restricting portion 332c is formed as a curved shape, and if securely inserted and engaged with engaging portion 2f restricting portion 332c will move smoothly when sliding in contact with body 2.

[0088] Because restricting member 332 is a push-button type restricting member, the pushing in operation is simplified and can be performed with ease.

Claims

1. An igniter comprising an expeller nozzle for expelling gas, a gas tank, an opening and closing valve means for selectively supplying gas from said gas tank to said expeller nozzle, a piezo-electric spark producing unit for ignition use, and an actuating member running between said valve means and said spark producing unit for performing the ignition operation, wherein

   a locking member is rotatably mounted in the body of said lighter for locking said actuating member in a locked position, said locking member being rotatable to an unlocked position in which the ignition operation is permitted, and a propping means for propping said locking member into the locked position is provided.

2. An igniter comprising an expeller nozzle for expelling gas, a gas tank, an opening and closing valve means for selectively supplying gas from said gas tank to said expeller nozzle, piezo-electric spark producing unit for ignition use, and an actuating member running between said valve means and said piezo-electric spark producing unit for performing the ignition operation, further comprising

   a locking member rotatably mounted in the body of said lighter for locking the operational state of said actuating member in a locked position, said locking member being rotatable to an unlocked position in which the ignition operation is permitted,
   propping means for propping said locking member into the locked position,
   restricting means rotatable as a unit with said locking member for providing a restricted position, in which a restricting portion is engaged with said body, whereby rotation of said locking member to the unlocked position is restricted, and an unrestricted position, in which said restricting portion is disengaged from said body by a pushing-in action, and
   elastic means for propping said restricting portion of said restricting means toward the re-

stricted position;
whereby by pushing in said restricting means from the unrestricted to the restricted position and rotating said locking means from the locked to the unlocked position, the ignition operation of said actuating member is permitted.

3. An igniter according to claim 2, wherein
said restricting means is formed of an elastic piece affixed to said locking means constructed so that the elasticity of said elastic piece props said restricting portion toward the restricted position, and by pushing in and deforming said elastic piece, said restricting portion can be moved from the restricted position to the unrestricted position.

4. An igniter according to claim 3, wherein
said restricting means and said locking means are formed as separate components.

5. An igniter according to claim 3, wherein
said restricting means and said locking means are integrally formed.

6. An igniter according to claim 3, wherein
the engaging portion of said body, and the restricting portion of said restricting means are formed so as to protrude in the direction in which said locking means rotates.

7. An igniter according to claim 2, wherein
said restricting means is slideably mounted in said locking means, and is propped and supported in a protruding position by elastic means, and in the restricted position said restricted portion is engaged with said body, and when pushed into the unrestricted position, said restricting portion is disengaged from said body.

8. An igniter according to claim 2, wherein
accompanying the rotation of said locking means, by which said locking means is recovered to the locked position from the unlocked position, said restricting means automatically recovers to the restricted position from the unrestricted position.

9. An igniter according to claim 1 or 2, wherein
a gas pipe is extends through the said locking means.

10. An igniter according to claim 1 or 2, wherein
when said locking means continues to be in the unlocked position, the ignition operation can repeatedly be performed.

11. An igniter according to claim 1 or 2, wherein
said locking means has a lock latch for catching onto a portion of said actuating member to implement the locked position in which the ignition operational state is locked in the non-operational mode, and when said locking means is rotated to the unlocked position, said lock latch moves to the uncaught position with respect the said actuating member.

12. An igniter according to claim 11, wherein
said locking means is supported so that the rotational center thereof can be moved.

FIG. 1

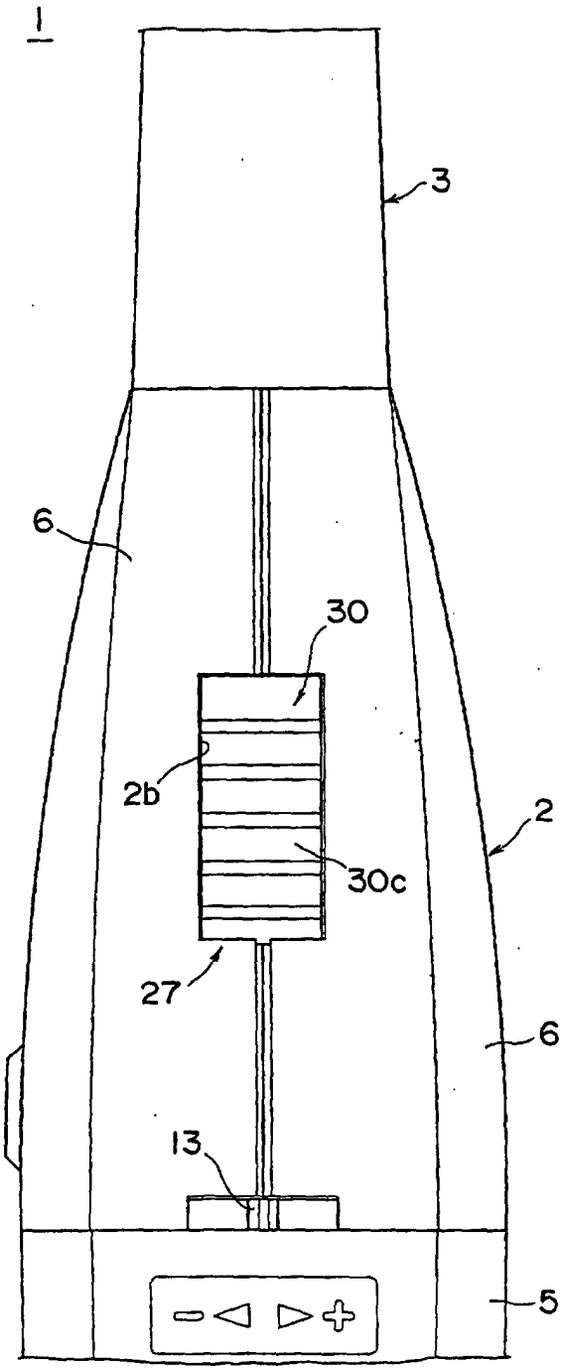
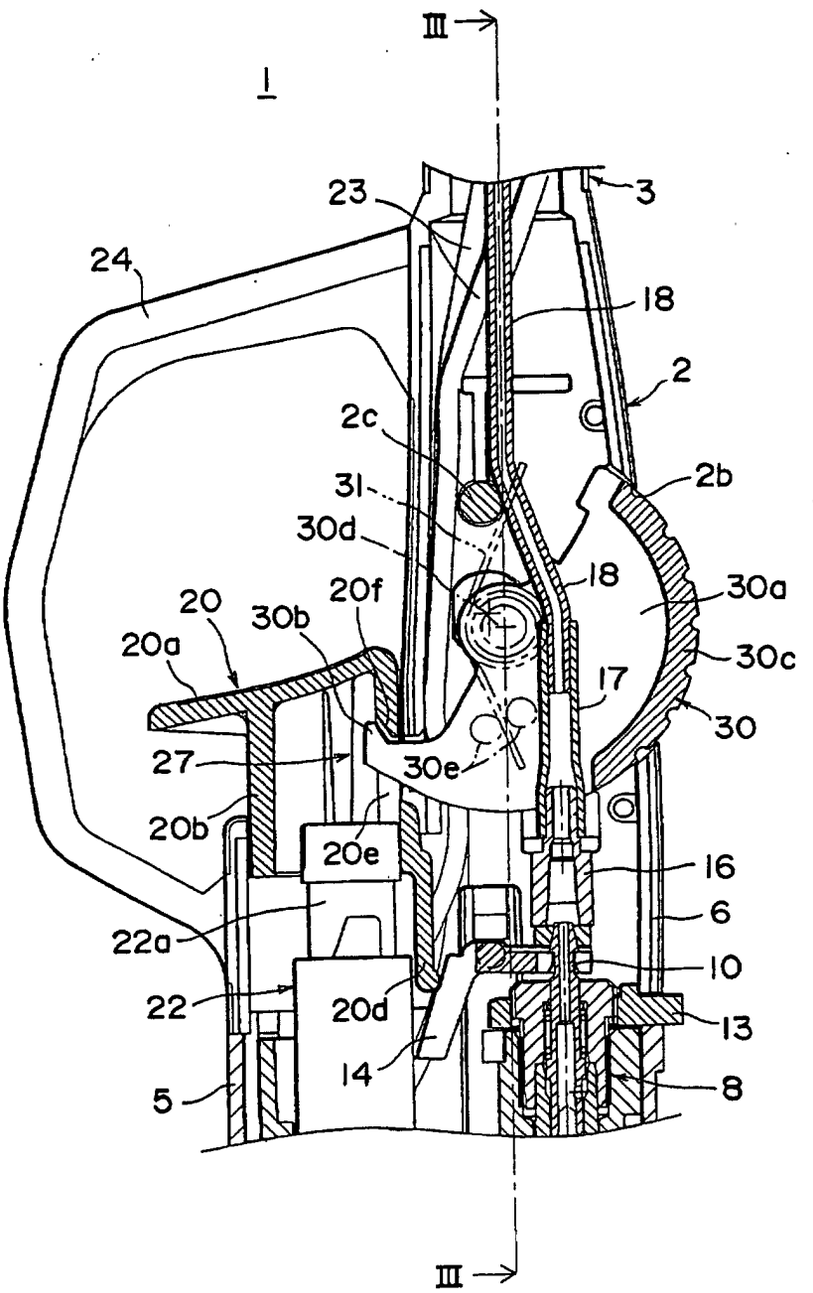


FIG. 2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23
3
24
18
2
2c
2b
31
30d
18
30a
20
20f
30b
20a
30c
17
30
27
30e
20b
20e
16
6
22a
10
22
20d
13
14
5
8
III

FIG. 3

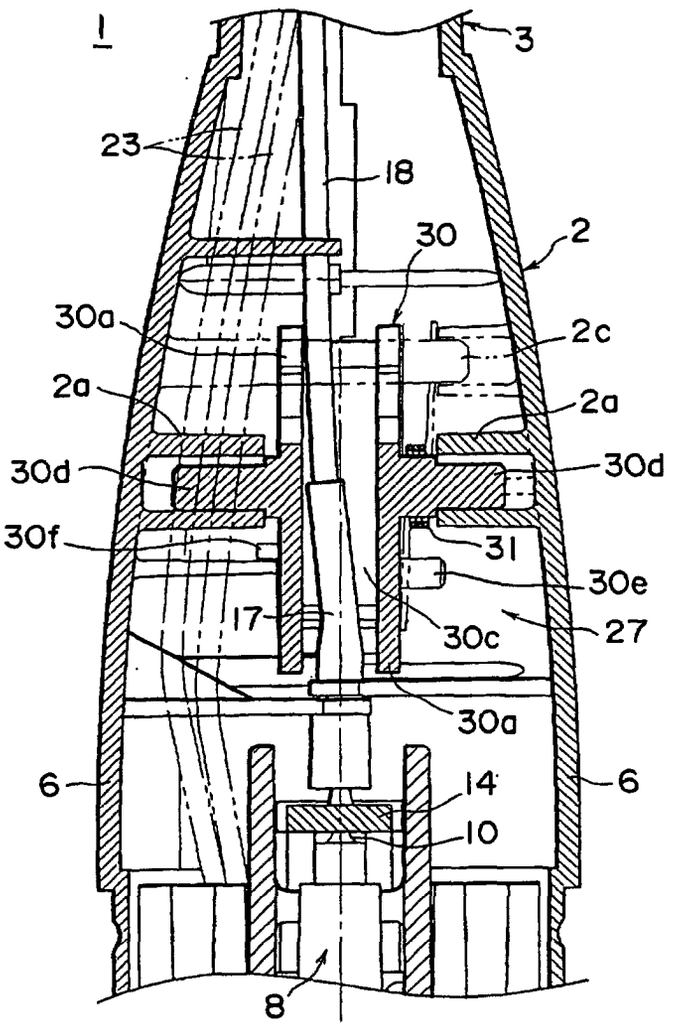


FIG. 4

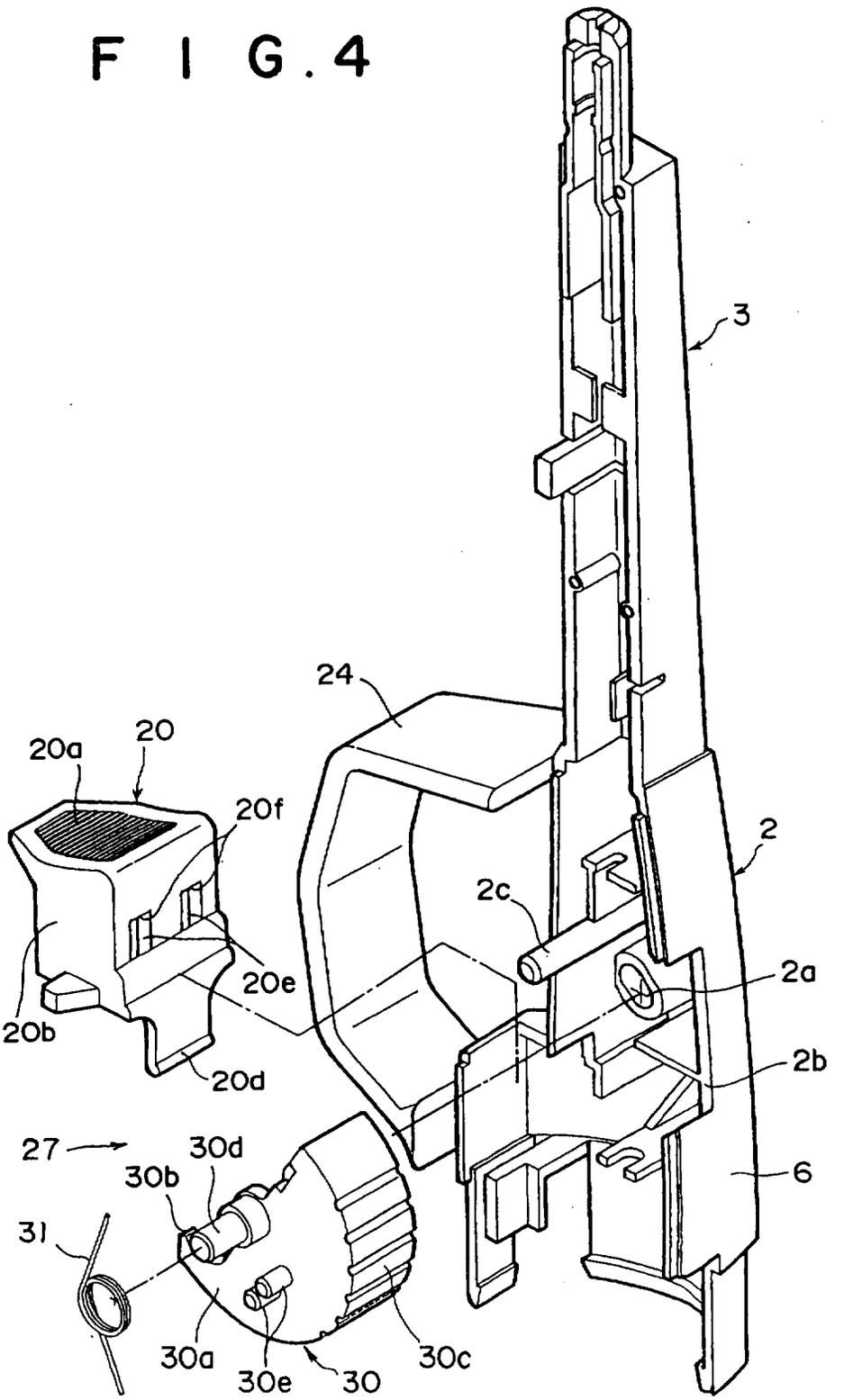
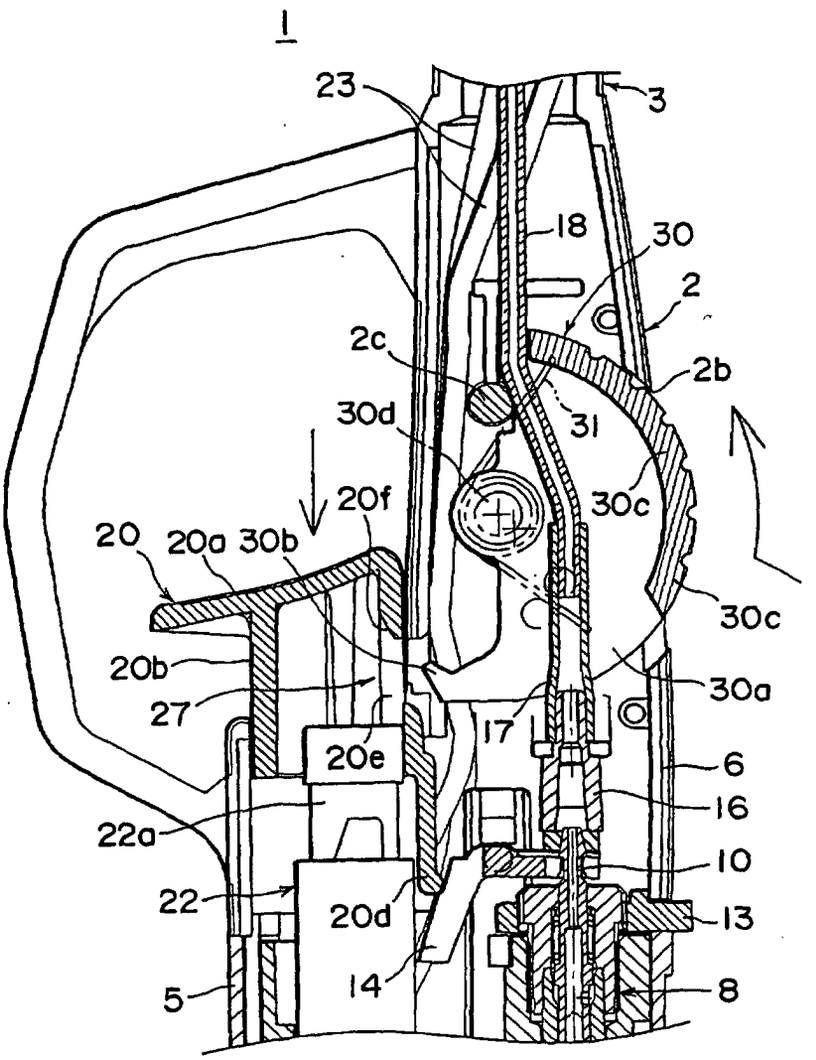


FIG. 5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6
16
22a
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20d
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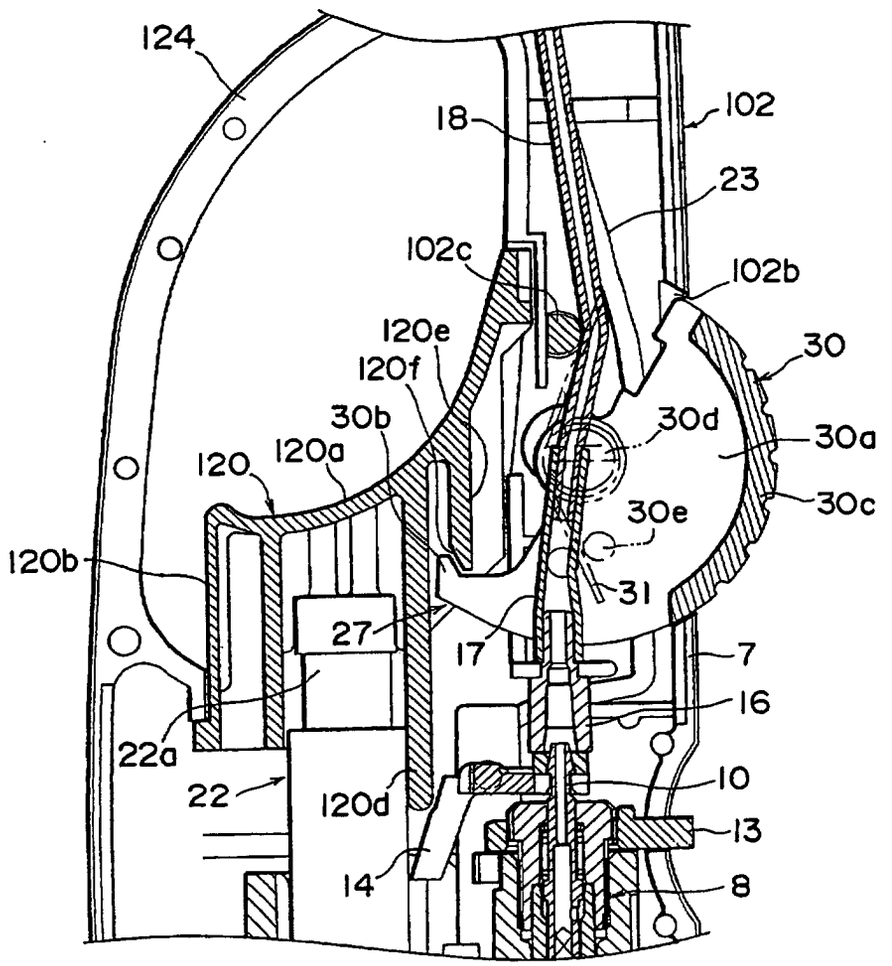
14
5
8

FIG. 6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27
17
7
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22a
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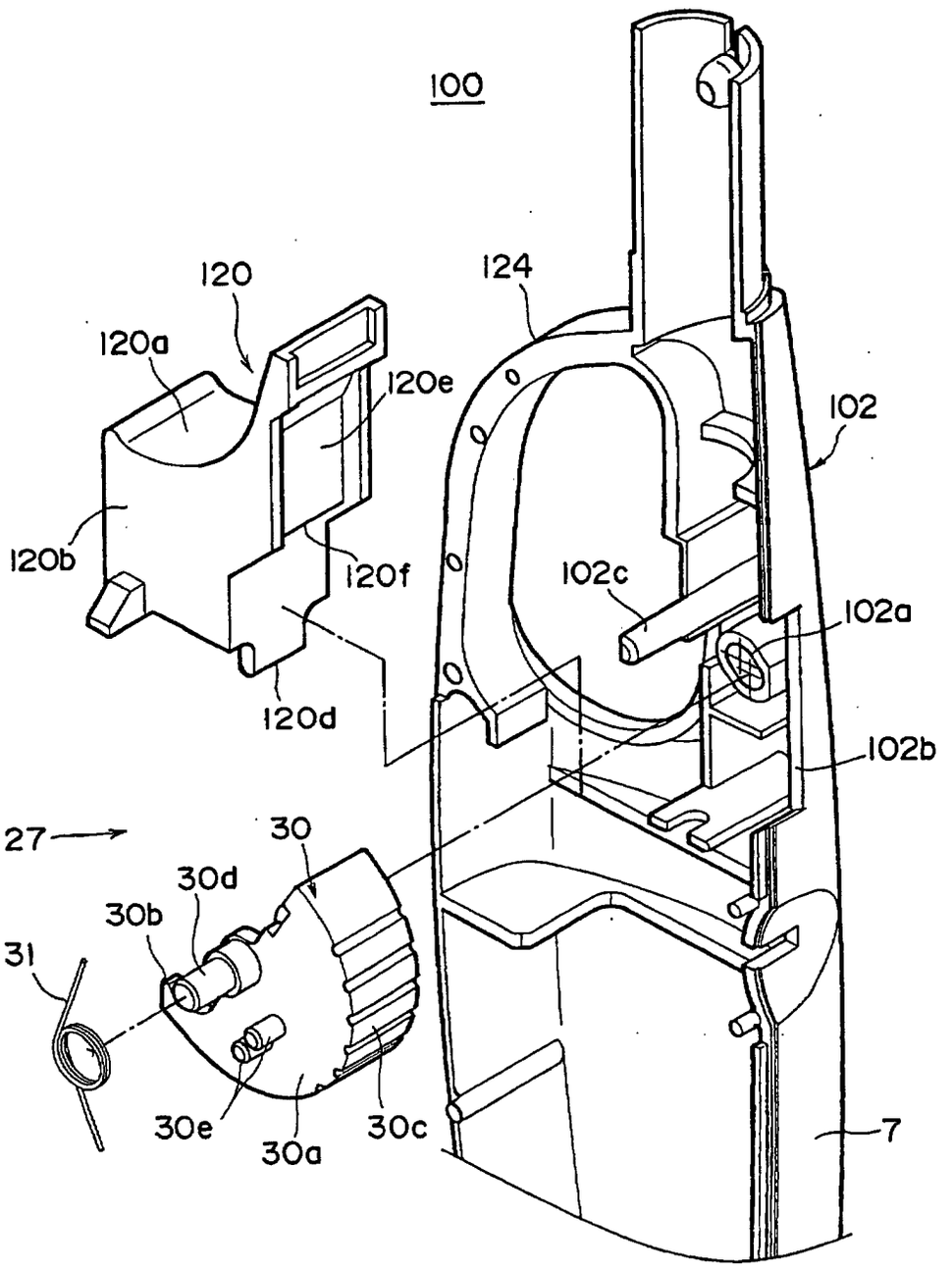
13
14
8

FIG. 7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27
30
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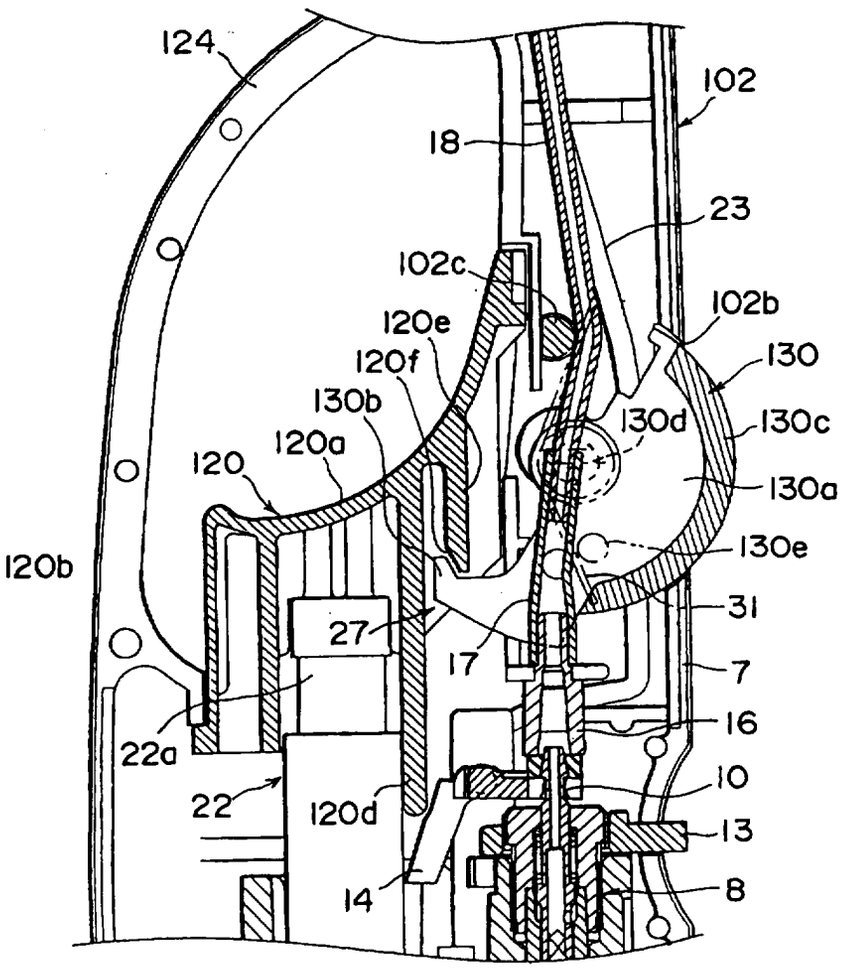
30b
31
30e
30a
30c
7

FIG. 8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124
102
18
23
102c
102b
120e
120f
130
130b
130d
130c
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130e
31
27
17
7
16
22a
10
22
120d
13
14
8

FIG. 9

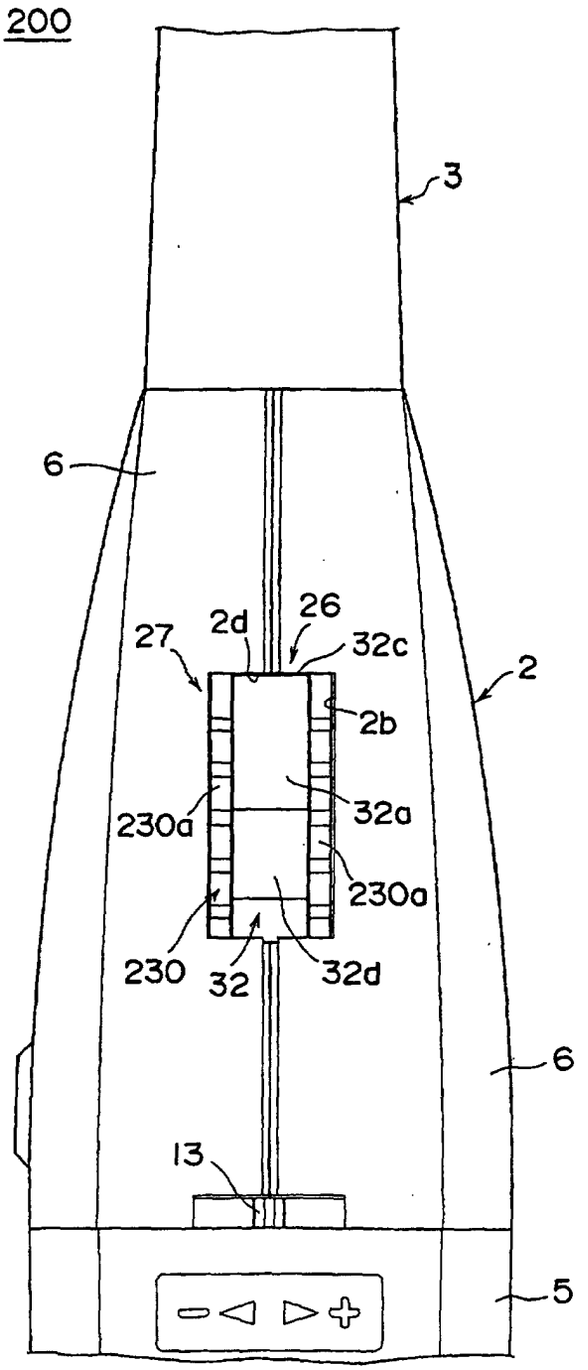
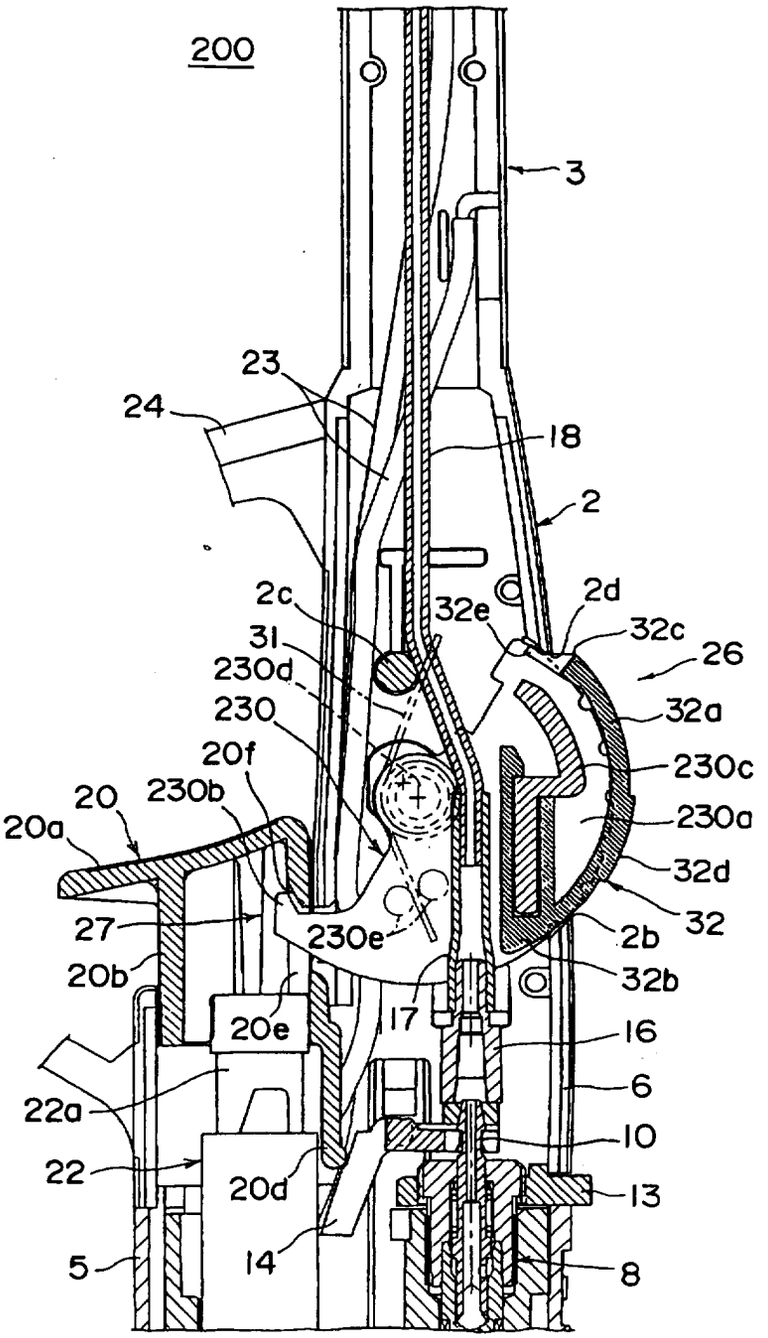


FIG. 10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23
24
18
2
2c
2d
32e
32c
31
26
230d
230
32a
20f
230c
20
230b
20a
230a
32d
27
230e
32
2b
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32b
20e
17
16
22a
6
10
22
20d
13
5
14
8

FIG.11B

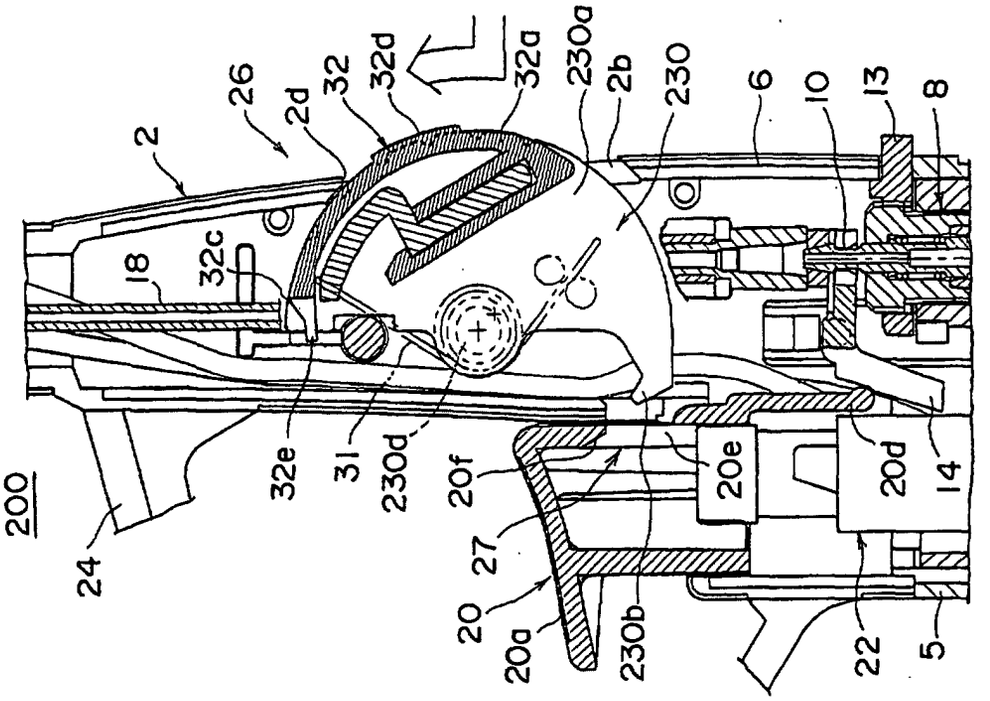


FIG.11A

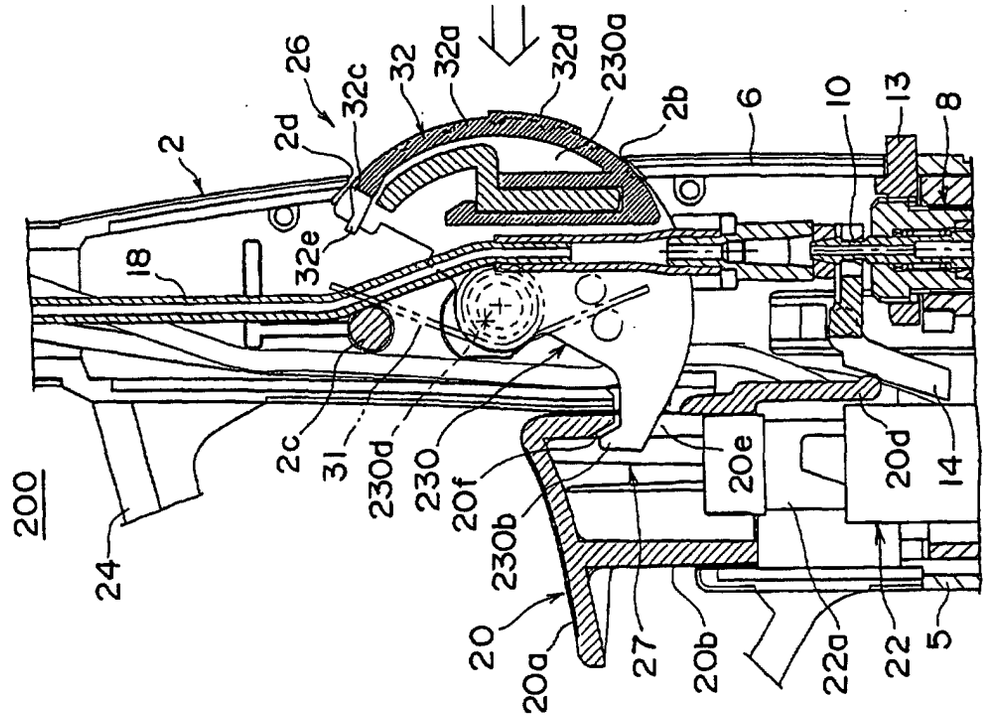
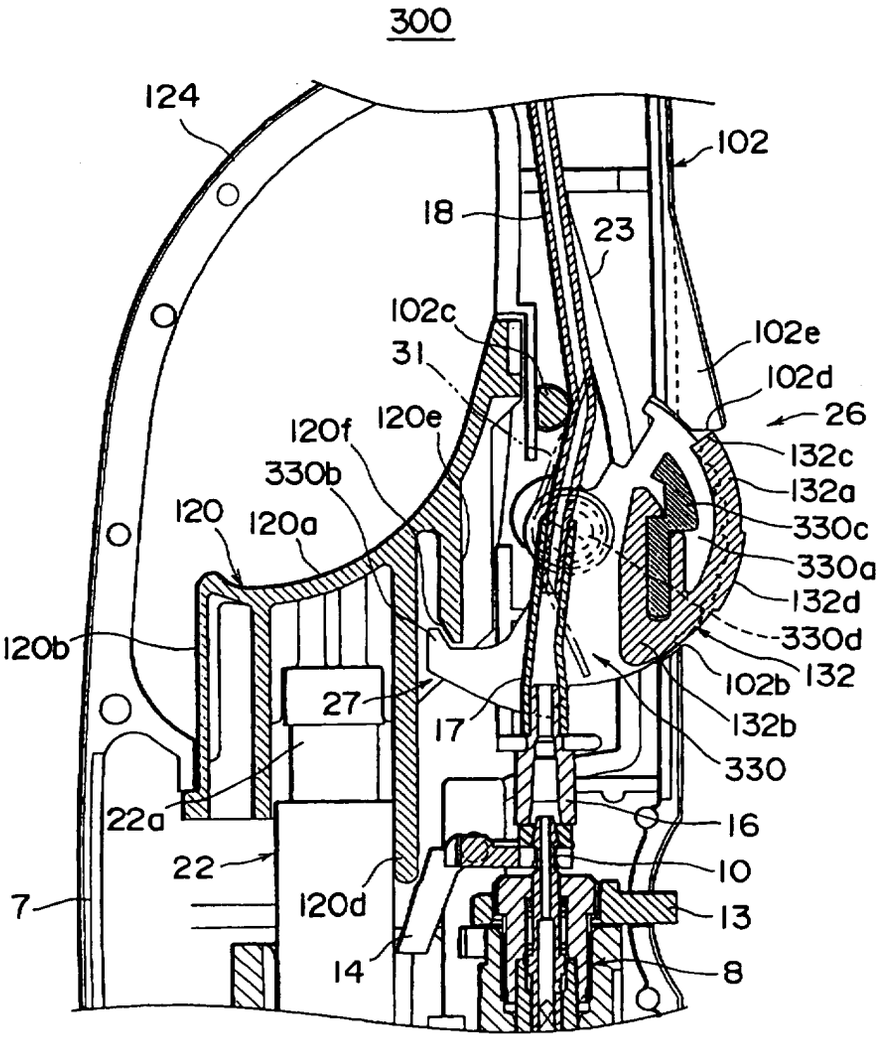


FIG. 12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124
102
18
23
102c
31
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26
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132c
330b
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120
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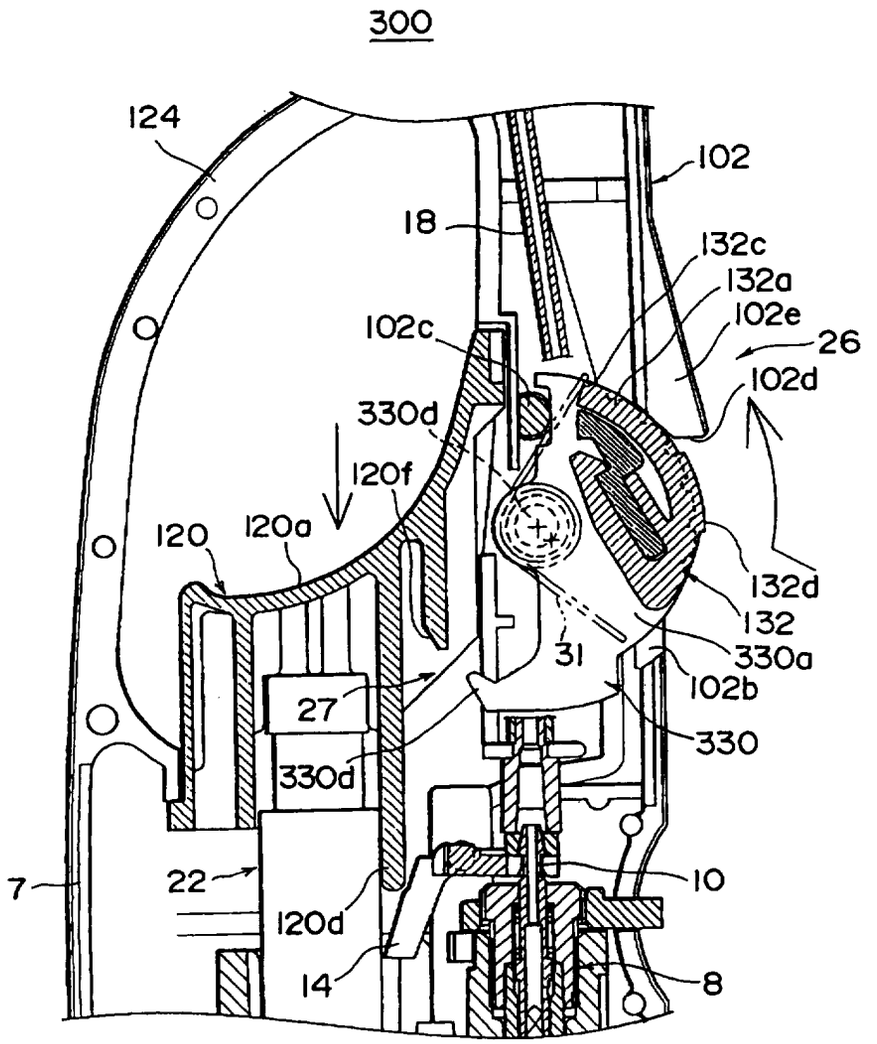
330a
132d
120b
330d
102b
132
27
17
132b
330
22a
16
22
10
7
120d
13
14
8

FIG.13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132c
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102e
26
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102d
330d
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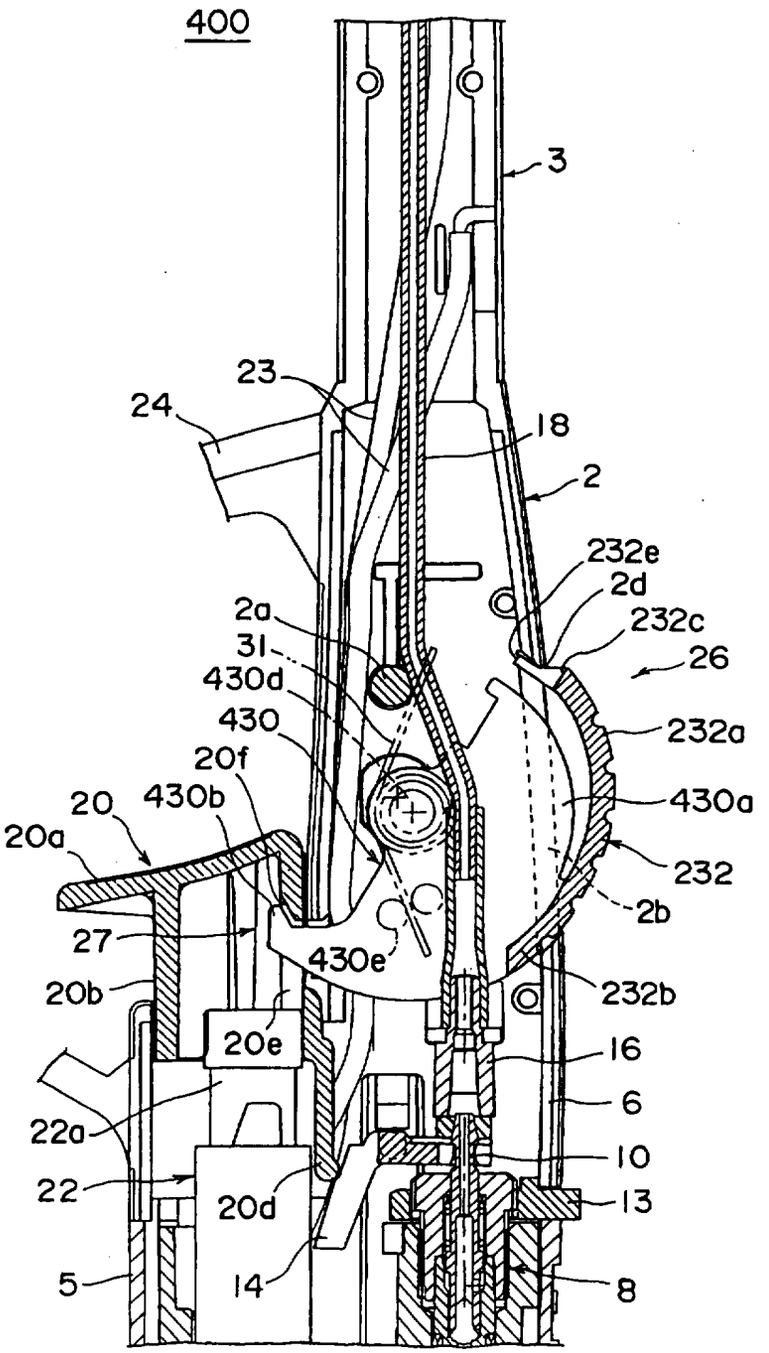
132
31
330a
102b
27
330
330d
7
22
10
120d
14
8

FIG.14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23
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18
2
232e
2d
232c
26
2a
31
430d
430
232a
20f
20
430b
430a
20a
232
2b
27
430e
232b
20b
20e
16
6
22a
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20d
13
5
14
8

FIG.15B

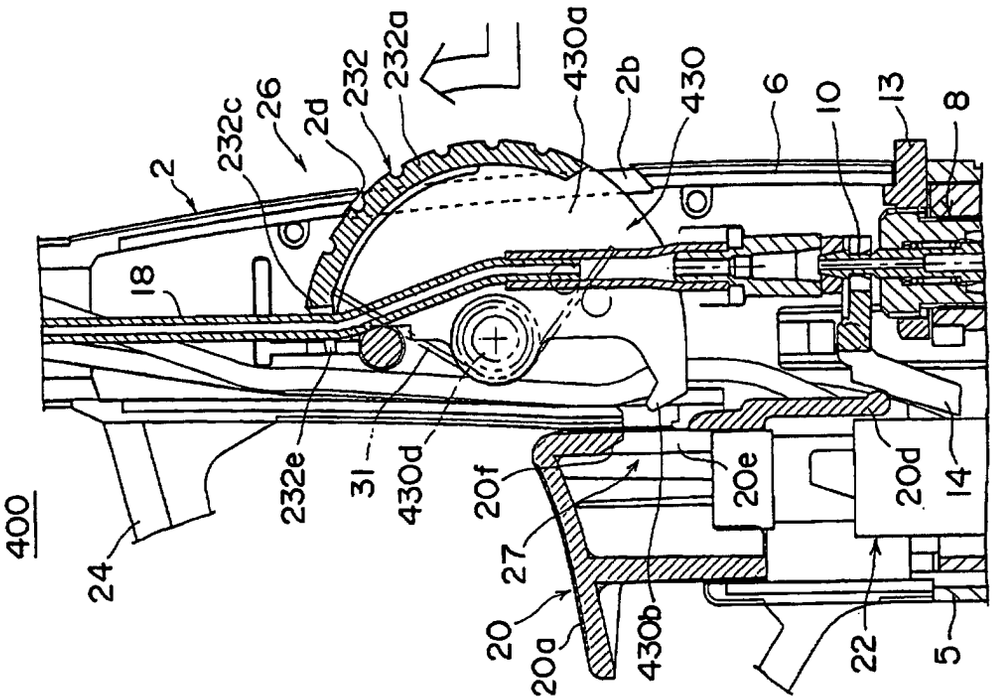


FIG.15A

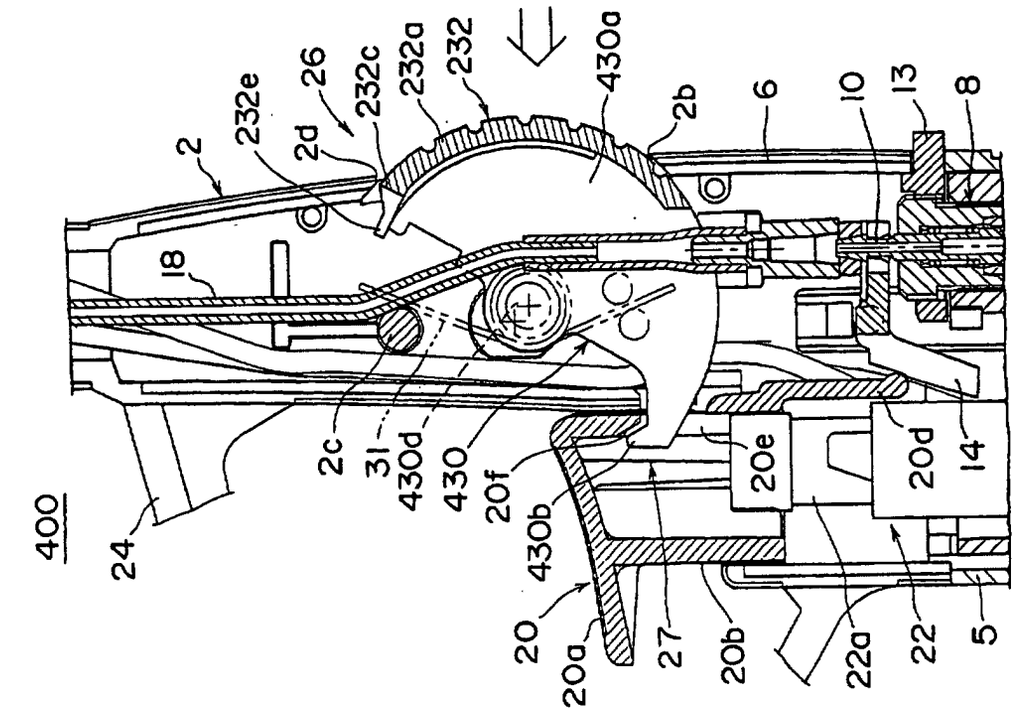
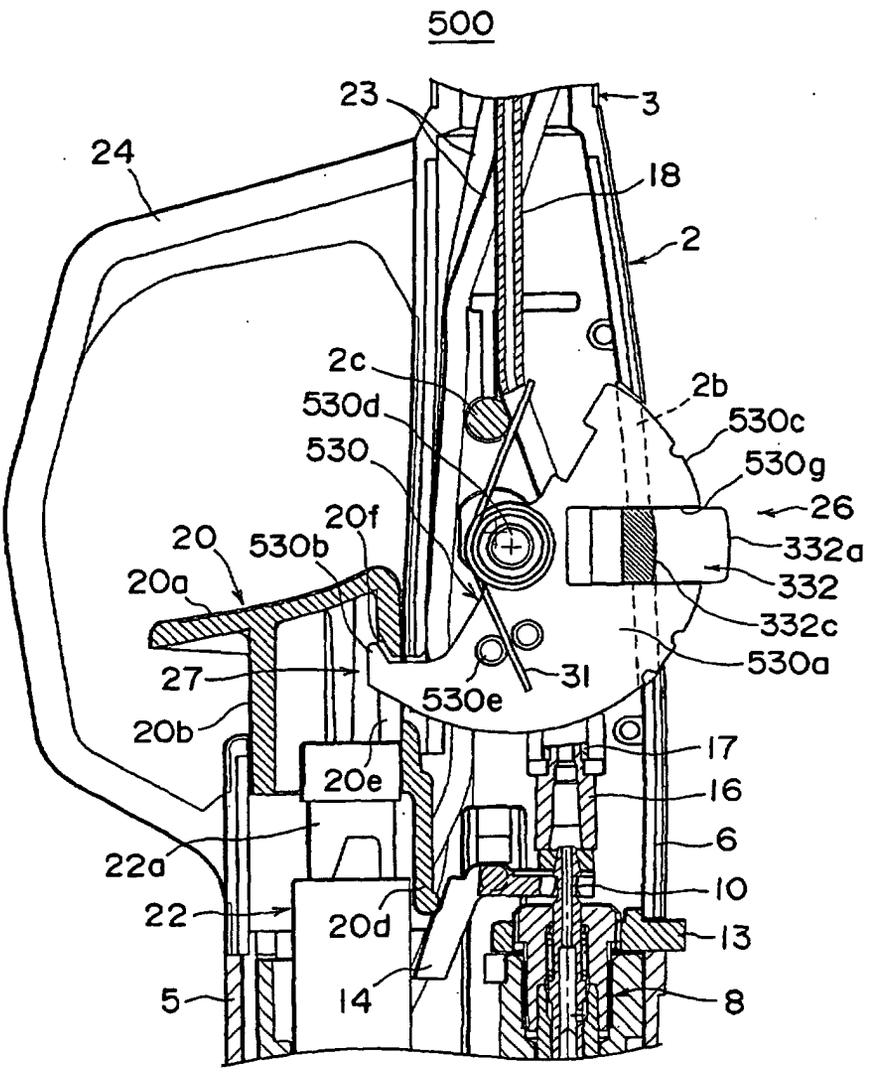


FIG. 16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23
3
24
18
2
2c
2b
530d
530c
530
530g
26
20f
20
530b
332a
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332
332c
530a
27
31
530e
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16
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22a
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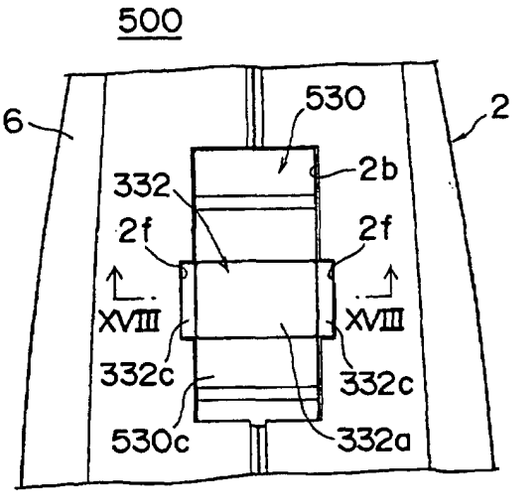
20d
13
5
14
8

FIG. 17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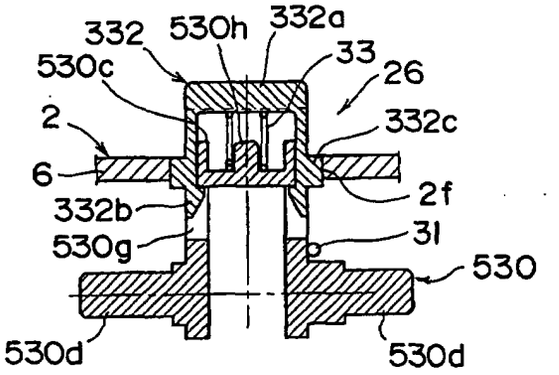
332
2f
2f
XVIII
XVIII
332c
332c
530c
332a

FIG. 18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530g
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530d

FIG.19B

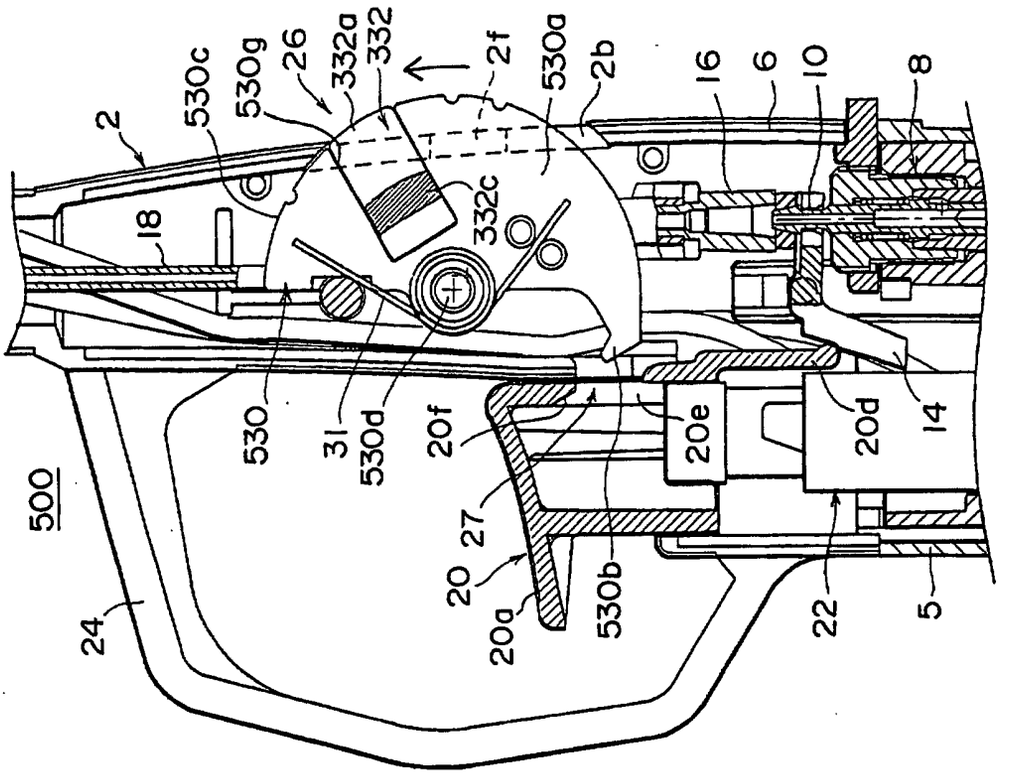
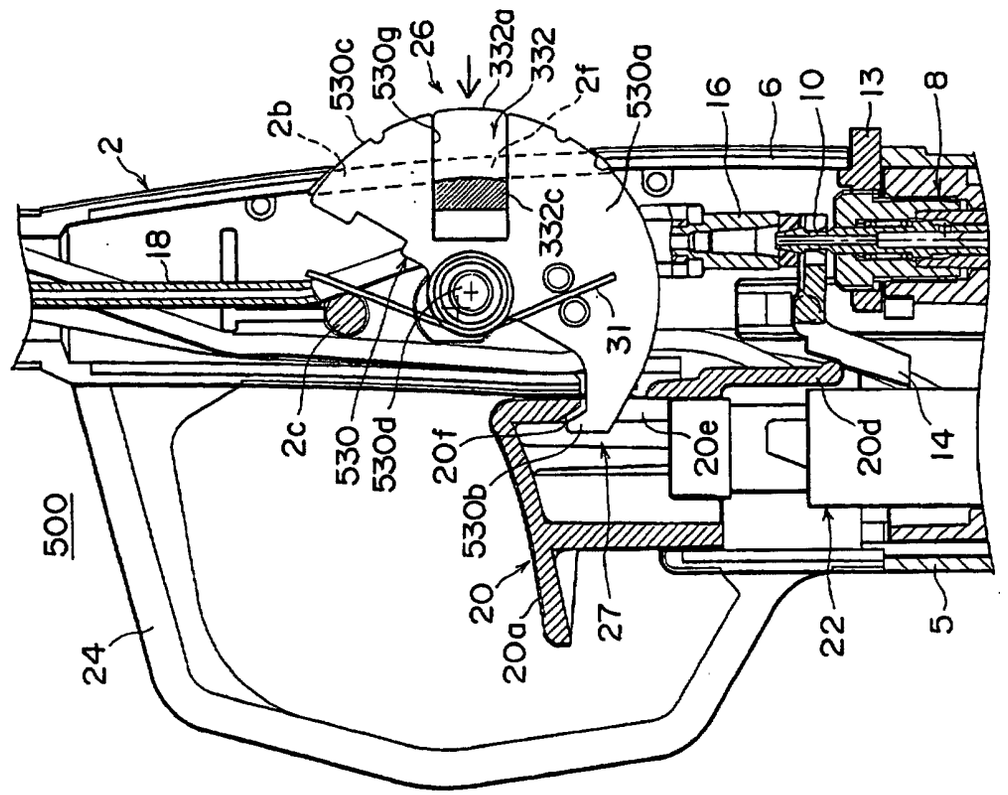


FIG.19A



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP00/03346

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] F23Q 2/28

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] F23Q 2/28

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 1994-2000
Kokai Jitsuyo Shinan Koho 1971-2000 Jitsuyo Shinan Toroku Koho 1996-2000

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.
X Y	JP, 8-110047, A (TOKAI CARBON CO., LTD.), 30 April, 1996 (30.04.96), Full text; Figs. 1 to 5 & GB, 2292448, A & GB, 9517004, A & DE, 19530325, A & GB, 2324140, A & US, 5897308, A	1-11 12
X Y	JP, 11-063497, A (TOKAI CARBON CO., LTD.), 05 March, 1999 (05.03.99), Full text; Figs. 1 to 11 (Family: none)	1-11 12
X Y	JP, 11-125424, A (TOKAI CARBON CO., LTD.), 11 May, 1999 (11.05.99), Full text; Figs. 1 to 9 (Family: none)	1-11 12

☐ 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
22 August, 2000 (22.08.00)	05 September, 2000 (05.09.00)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

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