



Publication number : **0 640 795 A2**

EUROPEAN PATENT APPLICATION

Application number : **94306105.1**

Int. Cl.⁶ : **F23Q 2/16**

Date of filing : **18.08.94**

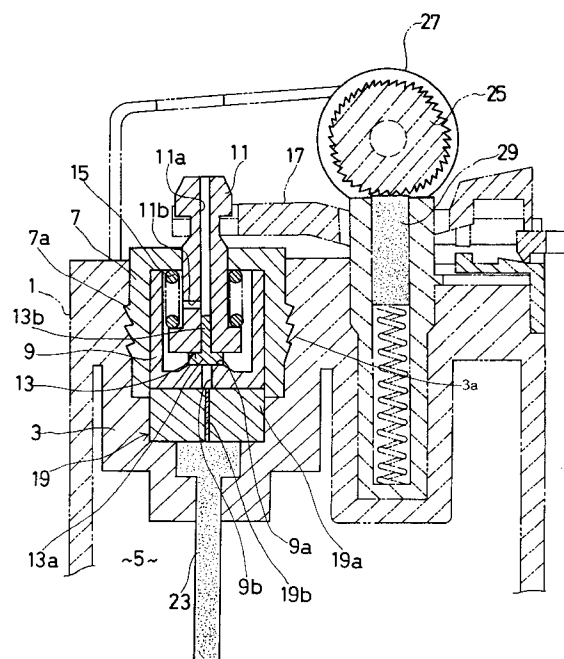
Priority : **19.08.93 JP 226515/93**
22.10.93 JP 287556/93
24.03.94 JP 79957/94
 Date of publication of application :
01.03.95 Bulletin 95/09
 Designated Contracting States :
AT BE CH DE DK ES FR GB GR IE IT LI NL PT
SE
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Combustion apparatus.

A combustion apparatus comprising a nozzle (11) for ejecting flammable fuel retained in a fuel container (5) through a valve (13), and a flow rate control means (19) upstream of said valve (13), said means (19) having a thread (19b) comprising a plurality of fibers (22) and/or a plurality of capillaries (24) and a fuel impenetrable member (19a) arranged around the thread (19b), whereby in use fuel from the fuel container (5) is supplied to the valve (13) by the capillarity of and/or clearances between the fibres (22) and/or capillaries (24) of the thread (19b), and wherein said fibers (22) and capillaries (24) are selected from one or more types of the group consisting of synthesized fibers, metal fibers, carbon fibers, glass fibers and hollow threads or fibers is described.

FIG. 1



BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a combustion apparatus which burns flammable fuel, such as a gas lighter, and is equipped with flow rate regulating means for regulating the flow rate of the flammable fuel, and, more particularly, to a combustion apparatus whose assumability and workability are improved and which can ensure stable combustion.

Description of the Related Art

Combustion apparatuses which burn flammable fuel include a lighter, various types of ignition devices, a portable hot plate and a lamp, for example. Among them is a lighter equipped with flow rate regulating means for regulating the flow rate of ejected flammable fuel, and lighters of this type are disclosed in, for example, Japanese Examined Patent Publication Nos. 50613/1988 and 21092/1988 and Japanese Examined Utility Model Publication Nos. 18852/1991 and 35969/1991. The lighter in the Japanese Examined Patent Publication No. 21092/1988 is illustrated in FIG. 12. This lighter has a lighter body 101 with a cylindrical pocket portion 103 formed in the lighter body 101. The interior of the lighter body 101 around the outer surface of the pocket portion 103 serves as a fuel tank 105. This fuel tank 105 is filled with flammable fuel.

A valve body portion 107 of is securely retained in the pocket portion 103 by means of a hinge structure. A valve burner 109 is attached inside this body portion 107 in such a way as to be movable in the up and down direction in the diagram. A packing 111 is located at the bottom end portion of this valve burner 109. Those valve burner 109 and packing 111 are normally urged downward in the diagram by a coil spring 113, the packing 111 pressed against a valve seat 115. The valve seat 115 is formed at the top end of a cylindrical member 117. A passage 119 is formed in the center portion of this cylindrical member 117, and its lower end defining space 121.

A support member 123 is located under the cylindrical member 117, with depressurizing means 125 intervening between the cylindrical member 117 and the support member 123. This depressurizing means 125 is the so-called flow rate regulating means which comprises a semi-porous film 125a and a porous film 125b closely placed on the semi-porous film 125a.

The semi-porous film 125a has holes with a radius of 20 to 500 angstroms, and is made from, for example, stretchable polyolefin, particularly, polypropylene or polyethylene.

The flammable fuel in the fuel tank 105 flows into the space 121 and the passage 119 while being depressurized by or under the flow-rate control of this

depressurizing means 125. As the valve burner 109 moves upward against the spring force of the coil spring 113, the flammable fuel flows into the valve burner 109 via a hole 109a in the valve burner 109 and is ejected from the distal end of the valve burner 109.

Besides the lighter shown in FIG. 12, an apparatus which controls the flow rate of flammable fuel by film type flow rate regulating means that is constituted utilizing the porous property of ceramics is disclosed in, for example, Japanese Examined Patent Publication No. 19448/1992.

The above conventional structures have the following shortcomings. With regard to the flow rate regulating means of the type shown in FIG. 12, since the thickness of the filter or each of the films 125a and 125b of the depressurizing means 125 is very thin (about 25 μm and about 100 μm even with a non-woven fabric stuck on the film), the filter must be handled very carefully. Further, the edge portion of the effective area portion is sandwiched between the upper and lower members (the cylindrical member 117 and support member 123 in the structure shown in FIG. 12), or the edge portion is secured and sealed on the resin member by thermal melting or similar means in some cases. Even with the filter attached in the above manner, the flow rate regulating means or filter itself is very thin, so that it has low mechanical strength and low thermal strength. The flow rate regulating means may therefore damaged be carelessly at the time of assembling or processing it, or may be damaged with the passage of time. In other words, since the individual films 125a and 125b of the depressurizing means 125 are so thin, it is very difficult to handle the depressurizing means and to continuously meet the safety requirements.

In addition to these problems, the conventional lighter lacks safe combustibility. Generally speaking, the effective area of the gas lighter used at the time of ignition has a small diameter of about 2 mm. Since the diameter of the through holes in the film 125a shown in FIG. 12 may vary from as small as 20 to 500 angstroms, the flow rate of the gas may change considerably depending on the diameter of holes, causing a variation in the size of the produced flame. That is, when the diameters of the through holes vary within the range of 20 to 500 angstroms for a very narrow effective area with a diameter of 2 mm, the flow rate of the gas passing the holes and thus the produced flame may vary accordingly.

The second method of regulating the flow rate using the porous property of ceramics again needs control of the holes and, like the structure shown in Fig. 12 this can cause a large variation in gas flow rate. With the ceramic filter of e.g. 3 mm in diameter and 2 mm in thickness, liquid gas stays inside the ceramic filter so that when the valve is open, this liquid gas is suddenly transformed into gas whose volume is about

220 times that of the liquid fuel. The burning flame is therefore considerably larger than expected, which is very dangerous to the user.

Solutions to the aforementioned problems are disclosed in Japanese Unexamined Utility Model Publication Nos. 151666/1979, 162762/1980, 72069/1981, 66264/1983, 61659/1993 and 117635/1994. Of the conventional apparatuses, those disclosed in Japanese Unexamined Utility Model Publication Nos. 151666/1979, 162762/1980, 72069/1981, 66264/1983 and 61659/1993 are designed in such a way that an adjusting member having a wick member formed of natural fibers, such as cotton threads, covered with a gas impenetrable coat, is provided between the fuel tank portion and the combustion portion to control the amount of gas flowing out to a constant level. The solution disclosed in Japanese Unexamined Utility Model Publication No. 117635/1994 is designed in such a way that an adjusting member having a wick member formed by several soft copper lines covered with a gas impenetrable coat is provided between the fuel tank portion and the combustion portion to ensure the steady amount of gas flow.

However, those disclosed in Japanese Unexamined Utility Model Publication Nos. 151666/1979, 162762/1980, 72069/1981, 66264/1983 and 61659/1993 use, as the wick member, cotton threads formed of natural fibers whose thicknesses vary greatly thus making it difficult to always provide a steady gas flow rate. The apparatus disclosed in Japanese Unexamined Utility Model Publication No. 117635/1994 is designed to adjust to a large amount of gas flow, and is thus inappropriate for the adjustment of the gas flow rate for a disposable gas lighter, for example. That is, if this conventional apparatus is used directly as the flow rate regulating means for a disposable gas lighter and no other member is provided to regulate the flow rate, a considerable amount of liquid gas flows out without being properly vaporized.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a combustion apparatus equipped with flow rate regulating means which can ensure stable combustion while meeting the safety requirements over a long period of time.

Thus according to one aspect of the present invention, there is provided a combustion apparatus comprising a nozzle for ejecting flammable fuel retained in a fuel container through a valve, and a flow rate control means upstream of said valve, said means having a thread comprising a plurality of fibers and/or a plurality of capillaries and a fuel impenetrable member arranged around the thread, whereby in use fuel from the fuel container is supplied to the valve by the capillarity of and/or clearances between

the fibres and/or capillaries of the thread, and wherein said fibers and capillaries are selected from one or more types of the group consisting of synthesized fibers, metal fibers, carbon fibers, glass fibers and hollow threads or fibers.

Preferably, the flow rate control means provides a regular and even flow rate of flammable fuel, thereby controlling it. The amount of fuel going through the flow rate control means can be altered by varying the dimensions and types of fibers and/or capillaries used.

Also, the types of fibre of the invention may be manufactured more precisely than cotton fibres, thus reducing the inherent variation of prior art wicks. Moreover, by making the fuel impenetrable member of sufficient thickness, it will be easier to handle it and the complete flow rate control means during manufacture.

The fuel impenetrable member may be formed integrally with the thread, e.g. by extrusion molding. Alternatively, the thread is inserted into a hole in the fuel impenetrable member.

Each of the fibers may have a thickness of 0.2 to 100 deniers (gramme per 9000 metres) or 0.1 μm to 50 μm .

The fibers or capillaries may be of one type. Alternatively, the fibers or capillaries may consist of two or more types of fibers.

The thread may be formed by bundling a plurality of fibers or capillaries together. The thread and/or capillaries may also be twisted together to form a strand. The thread may also comprise one or more strands of stranded fibres or capillaries.

An insert, eg of metal wire, of a size of 10 μm to 500 μm may be placed in the thread, preferably the center portion of the thread.

The combustion apparatus may further be provided with adjusting means for adjusting a flame size.

Embodiments of the present invention will now be described by way of example with reference to the following drawings:-

Fig. 1 is a cross-sectional view showing a part of a lighter according to a first embodiment of the present invention;

Fig. 2 is a cross-sectional view showing an elastic member of a fuel flow rate control means according to the first embodiment of this invention;

Fig. 3 is a cross-sectional view showing a thread of a fuel flow rate control means according to the first embodiment of this invention;

Fig. 4 is a cross-sectional view showing the thread and a portion of the elastic member around the thread according to the first embodiment of this invention;

Fig. 5 is a cross-sectional view showing the thread and a portion of an elastic member around the thread according to a second embodiment of this invention;

Fig. 6 is a cross-sectional view showing a part of a lighter according to a fifth embodiment of this invention;

Fig. 7 is a cross-sectional view of a fuel flow rate control means according to a sixth embodiment of this invention;

Fig. 8 is a diagram for explaining the fabrication process of the fuel flow rate control means according to the sixth embodiment of this invention;

Fig. 9 is a cross-sectional view of fuel flow rate control means according to an seventh embodiment of this invention;

Fig. 10 is a cross-sectional view of fuel flow rate control means according to a eighth embodiment of this invention;

Fig. 11 is a cross-sectional view showing a part of a lighter according to a ninth embodiment of this invention; and

Fig. 12 is a cross-sectional view showing a part of a lighter according to prior art.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A first preferred embodiment of the present invention will now be described with reference to FIGS. 1 through 4. In this embodiment, the present invention is adapted for use with a gas lighter which uses flammable fuel. The gas lighter has a lighter body 1 with a pocket portion 3 formed in the lighter body 1. The interior of the lighter body 1 around the outer surface of the pocket portion 3 serves as a fuel tank 5 where the flammable fuel is reserved. The flammable fuel in use is liquid petroleum gas which essentially consists of commercial butane and commercial propane (commercial butane: 90% and commercial propane: 10%).

Besides liquid petroleum gas, other flammable fuels may also be used, such as hexanoic liquid fuel and alcoholic liquid fuel. Attached to the pocket portion 3 is a nozzle case 7 which has an almost cylindrical shape with an internal thread portion 7a formed on its outer surface. The pocket portion 3 is provided with an internal thread portion 3a, which engages with the internal thread portion 7a. With the internal thread portion 7a engaging with the internal thread portion 3a, the nozzle case 7 is secured to the pocket portion 3. A nozzle valve seat 9 is disposed inside the nozzle case 7.

A nozzle 11 is disposed through and inside the nozzle case 7, and is movable vertically in Fig. 1.

A gas passage 11a and a gas intake hole 11b are formed in the center portion of the nozzle 11. A valve assembly (of, e.g., rubber) 13 is attached to the lower end of the nozzle 11. More specifically, the valve assembly 13 comprises a projection 13b protruding from the center portion of a disk 13a. The projection 13b is inserted into the gas passage 11a of the nozzle 11 from the lower end. A valve seat 9a is formed at the

center portion of the nozzle valve seat 9, with the valve assembly 13 seating on the valve seat 9a.

The nozzle 11 and the valve assembly 13 are normally urged downward by a coil spring 15, so that the valve assembly 13 is seated on the valve seat 9a. When an actuator 17 indicated by an imaginary line in FIG. 1 is rotated clockwise in FIG. 1 to shift the nozzle 11 upward against the force of the coil spring 15, the valve assembly 13 moves away from the valve seat 9a to allow the gas to flow in via the gas passage 9b of the nozzle valve seat 9, and the gas is thus ejected through the gas intake hole 11b and gas passage 11a of the nozzle 11.

Fuel flow rate control means 19 is provided in the pocket portion 3 below the nozzle valve seat 9. This fuel flow rate control means 19 has a cylindrical elastic member 19a as a fuel impenetrable member, and a thread 19b inserted in the center portion of the elastic member 19a. The elastic member 19a is made of, for example, nitrile butadiene rubber (NBR) which has a strength of 70 degrees. As shown in FIG. 2, the elastic member 19a has a length (L) of 2.5 mm in the axial direction. Bored in the axial center position of the elastic member 19a is a hole 21 in which the thread 19b is inserted. The boring of the hole 21 may be carried out by using a needle-like member, for example, and the diameter (D1) of the hole 21 is preferably slightly smaller than the outside diameter (D2) of the thread 19b to reduce the space between the thread 19b and diameter (D1), and thus any gas leak there-through. It is not desirable that the hole diameter (D1) is larger than the outside diameter (D2).

Instead of using a needle-like member to bore the hole 21, a crack may be formed.

The thread 19b has a strand structure having a plurality of synthesized fibers like polyester fibers 22 (shown in Fig. 4) stranded.

Other possible synthesized fibers for use in the present invention include vinylidene chloride, acrylic and nylon, for example.

Each fiber 22 is a long fiber having a size of 1.3 deniers, and in the present embodiment there are 630 fibers 22 in thread 19a. (It is to be noted that Fig. 4 et al only exemplify cross sections of threads, and that the number of the fibers shown in the figures herewith are merely illustrative and may not match the preferred quantities quoted herein.) The thread 19b with such a structure is inserted into the hole 21 of the elastic member 19a and is set as illustrated in Fig. 4. The gas flows through the clearances between the stranded fibers while its flow rate is regulated, as shown in Fig. 4.

According to the experiments, a flame from the apparatus of the present embodiment rose to a height of about 30 mm at the measured room temperature of 23°C.

As shown in Fig. 1, a wick 23 is placed below the fuel flow rate control means 19 so that the flammable

fuel in the fuel tank 5 is sucked up through this wick 23 while its flow rate is regulated by the fuel flow rate control means 19 having the above-described structure.

In Fig. 1, reference number "25" denotes a rotary file, reference number "27" is a guide member located on either side of the rotary file 25, and reference numeral "29" is a flint.

The action of the gas lighter with the above-described structure will now be discussed. First, a user places the thumb on the pair of guide members 27 and rotates the guide members 27 clockwise in FIG. 1 and thus rotates the actuator 17 also clockwise in the successive action. As a result, the nozzle 11 is lifted upward against the force of the coil spring 15. Accordingly, the valve assembly 13 lifts upward due to the gas pressure acting from below, and is thus opened. The gas flows through the gas passage 9b and into the gas passage 11a via the gas intake hole 11b of the nozzle 11. The gas is then ejected from the distal end of the nozzle 11. As the guide members 27 rotate, the rotary file 25 rotates, causing the flint 29 to produce sparks. The sparks ignite the gas ejected from the nozzle 11. In this sequential action, the flammable fuel in the fuel tank 5 flows toward the valve with its flow rate regulated by the fuel flow rate control means 19.

This embodiment has the following advantages. First, the fuel flow rate control means 19 has a certain thickness, unlike the conventional type which is a thin film type, so that this control means 19 is easier to handle at the time it is worked or the gas lighter is assembled. That is, as the elastic member 19a, the outer portion of the fuel flow rate control means 19, has a sufficient thickness as compared with the conventional thin film type, to allow the handling thereof.

The elastic member 19a also improves the mechanical strength and the thermal strength of the fuel flow rate control means 19, allowing the control means 19 to perform a stable function over a long period of time. Further, the fuel flow rate control means 19 is less likely to be carelessly damaged at the time it is worked or the gas lighter is assembled or due to a change with time. The proper flow rate regulating characteristic can be obtained by altering the structure of the thread 19b (e.g., the type, the number and the length of the fibers, and the like) as needed. This contributes to eliminating a variation in the thread 19b, thus improving the stable combustibility. In addition, unlike in the prior art, natural fibers are not used, also eliminating a variation in characteristic and ensuring highly accurate flow rate control.

A second embodiment will now be explained with reference to FIG. 5. Although the thread 19b has a strand of polyester fibers as synthesized fibers in the first embodiment, vinylidene chloride hollow threads of synthesized fibers may be used as shown in FIG. 5. For example, eight hollow threads 24 each consist-

ing of long fibers of 50 deniers are stranded. In this case, it was confirmed through experiment that a flame therefrom rose to a height of about 30 mm at the measured room temperature of 23°C. The thread 19b consisting of the hollow threads 24 may be dipped in the fuel tank 5 so that the flammable fuel runs up through a hollow portion 24a of each hollow thread 24, thus regulating the gas flow rate. In this case, the thread 19b also serves as the wick 23 shown in FIG. 1.

A third embodiment will now be explained with reference to FIG. 4. While the thread 19b is constituted of synthesized fibers in the first and second embodiments, the thread 19b is formed of carbon fibers in this embodiment. More specifically, about 100 fibers 22 each consisting of elongated fibers having a size of about 15 μm (diameter of the fibers 22) were stranded. Accordingly, it was confirmed that a flame therefrom rose to a height of about 25 mm at the measured room temperature of 23°C.

A fourth embodiment will be described below with reference to FIG. 4. In this embodiment, the thread 19b is formed of metal fibers (copper in this embodiment). More specifically, about 12 fibers each consisting of elongated fibers having a size of about 60 μm were stranded. Accordingly, it was confirmed that a flame therefrom rose to a height of about 35 mm at the measured room temperature of 23°C.

A fifth embodiment will now be explained with reference to FIG. 6. This embodiment has the structure of the first embodiment in FIG. 1 from which the wick 23 is eliminated. When liquid petroleum gas is used as flammable fuel, for example, the wick 23 may not be necessary and may be omitted as shown in FIG. 6.

A sixth embodiment will now be described with reference to FIGS. 7 and 8. In the first through fifth embodiments, the thread 19b is fitted in the through hole 21 of the elastic member 19a as a support, thus constituting the fuel flow rate control means 19. In the sixth embodiment, however, the support member 19a and the thread 19b are formed integrally in advance. More specifically, as shown in FIG. 8, thermal plastic resin, thermal hardening resin, rubber or the like may be extruded from an extrusion molding around the thread 19b (although not illustrated, an extrusion molding machine and predetermined molds are used at the time of extrusion molding), thus forming an article indicated by an imaginary lines in FIG. 8. This article is to be cut to the desired length to provide the fuel flow rate control means 19 (Fig 7 and the solid lines in FIG. 8). In this case, the fuel impenetrable member 19a need not be an elastic member. Where the thread 19b is to be put through the fuel impenetrable member 19a later, the member 19a should be an elastic member to keep the airtightness between the thread 19a and the fuel impenetrable member 19b. When the thread 19b and the fuel impenetrable

member 19b are formed integrally, no consideration need to be given to the air-tightness. The fuel impenetrable member 19b need not therefore be an elastic member. This structure can also produce the same advantages as described above.

A seventh embodiment of the present invention will now be described with reference to FIG. 9. In this embodiment, the thread 19b of the fuel flow rate control means 19 has a different structure. A single (or more) metal wire 31 is placed in the center portion, and fibers 33, selected from among synthesized fibers, regenerated fibers, metal fibers, carbon fibers and glass fibers, are placed around the metal wire 31. The thread 19b having this structure can have the same advantages as those above.

This structure will be described in more detail. The metal wire 31 is a soft copper wire plated with tin, for example, and has an outside diameter of 0.18 mm (180 μ m) and has a length of 3.5 mm. This metal wire 31 imparts heat to the liquid gas that flows along this wire 31 and vaporizes the gas, thus ensuring efficient vaporization. That is, the latent heat the metal wire 31 has is given to the liquid gas. The thread 19b is a bundle of 1600 glass fibers. More specifically, 400 glass fibers of 6 μ m are bundled and stranded, and four such strands are stranded in the opposite direction to the stranding direction of each strand.

The fabrication process will be described step by step. First, 400 glass fibers of 6 μ m are made into a single bundle while being stranded. Four such bundles are then stranded around the metal wire 31 in the opposite direction to the stranding direction of each strand to be a single fiber bundle. The resultant bundle of fibers is placed in a feedable manner at the center of the nozzle of the extrusion molding machine, molten polyethylene is supplied, and all are integrated by the extrusion molding machine.

In this case, the passage where the liquid fuel passes runs mainly through the clearances between the thread 19b and the metal wire 31, and the clearances in the thread 19b itself (clearances between the individual glass fibers) can also serve as a gas passage, though slightly. A polyethylene resin comes between the thread 19b and the support member 19a at the time of extrusion molding, shielding the clearances so that only a few clearances serve as the passage. The clearances between the thread 19b and the metal wire 31 are allowed to serve as the main passage because the heat to vaporize the liquid gas can efficiently be applied to the gas traveling along the metal wire 31.

An eighth embodiment of this invention will now be explained with reference to FIG. 10. In this embodiment, the structure of the thread 19b of the fuel flow rate control means 19 is also modified. A single (or more) metal wire 31 is placed in the center portion, and hollow threads 33 are placed around this metal wire 31. The thread 19b having this structure can

have the same advantages as those discussed above.

A ninth embodiment of this invention will now be explained with reference to FIG. 11. This embodiment is designed to be able to adjust the flame height as needed. An internal thread portion 7a is provided at the outer surface portion of the nozzle case 7, and an internal thread portion 3a is formed on the pocket portion 3 of the lighter body 1. The nozzle case 7 is attached to the pocket portion 3 by the engagement of the internal thread portion 7a with the internal thread portion 3a. The structure up to this point is the same as that of the first embodiment (shown in FIG. 1). A rotary actuator 41 is attached to the top end of the nozzle case 7. As the user turns this rotary actuator 41 with the thumb, for example, in the proper direction, the nozzle case 7 rotates, so that the nozzle case 7 and nozzle valve seat 9 can be lifted up. The upward movement of the nozzle case 7 and nozzle valve seat 9 adjusts the space between the nozzle valve seat 9 and the fuel flow rate control means 19. A porous member 43 is provided between the nozzle valve seat 9 and the fuel flow rate control means 19. This porous member 43 may be formed of urethane foam.

With the above structure, when one wants to increase the flame height, the user should turn the rotary actuator 41 in one direction. This moves the nozzle case 7 up, increasing the space between the nozzle valve seat 9 and the fuel flow rate control means 19. The porous member 43 therefore expands accordingly, and the bubble density in the porous member 43 is thus increased. Therefore, the amount of the fuel passing therethrough increases and the flame height rises eventually. To reduce the flame height, on the other hand, the user should turn the rotary actuator 41 in the other direction. This moves the nozzle case 7 downward, narrowing the space between the nozzle valve seat 9 and the fuel flow rate control means 19. The porous member 43 is compressed accordingly, reducing the bubble density in the porous member 43. Therefore, the amount of the fuel passing therethrough decreases, lowering the flame height.

The provision of the porous member 43 can change the flow rate of the flammable fuel. By setting the height of the porous member 43 to a predetermined amount, therefore, the flame height can be restricted to a given height. Further, the porous member 43 when properly expanded or compressed can adjust the flame height to the desired level.

The present invention is not limited to the above-described embodiments. First, although a gas lighter has been explained as a combustion apparatus for flammable fuel in the foregoing description of those embodiments, this invention can be applied to various types of ignition devices beside the gas lighter, a portable hot plate, a lamp, etc. The fibers constituting the thread 19b of the fuel flow rate control means 19 may be surface-treated glass fibers or the like beside the

aforementioned types, regenerated fibers, carbon fibers or glass fibers whose surfaces are plated with gold. Any two types of fibers among the synthesized fibers, metal fibers, carbon fibers and glass fibers may be combined. Alternatively, ordinary fibers may be combined with a hollow thread. Although the thread has a strand structure in the above-described embodiments, the thread is not limited to this particular type, but may be formed by bundling raw threads. The specific values given in the description of the individual embodiments are to be considered as just illustrative and not restrictive.

Claims

1. A combustion apparatus comprising a nozzle (11) for ejecting flammable fuel retained in a fuel container (5) through a valve (13), and a flow rate control means (19) upstream of said valve (13), said means (19) having a thread (19b) comprising a plurality of fibers (22) and/or a plurality of capillaries (24) and a fuel impenetrable member (19a) arranged around the thread (19b), whereby in use fuel from the fuel container (5) is supplied to the valve (13) by the capillarity of and/or clearances between the fibres (22) and/or capillaries (24) of the thread (19b), and wherein said fibers (22) and capillaries (24) are selected from one or more types of the group consisting of synthesized fibers, metal fibers, carbon fibers, glass fibers and hollow threads or fibers.
2. A combustion apparatus as claimed in Claim 1, wherein the fuel impenetrable member (19a) is formed integrally with the thread (19b).
3. A combustion apparatus as claimed in Claim 1, wherein the thread (19b) is inserted into a hole in the fuel impenetrable member (19a).
4. A combustion apparatus as claimed in any one of Claims 1 to 3, wherein the fibers (22) and/or capillaries (24) have a thickness of 0.2 to 100 deniers or 0.1 μm to 50 μm .
5. A combustion apparatus as claimed in any of Claims 1 to 4, wherein the fibers (22) and/or capillaries (24) are of one type.
6. A combustion apparatus as claimed in any one of Claims 1 to 4 wherein the fibers (22) and/or capillaries (24) are two or more types.
7. A combustion apparatus as claimed in any one of the preceding Claims, wherein the thread (19b) is a plurality of fibers (22) and/or capillaries (24) twisted together to form a strand.

8. A combustion apparatus as claimed in any one of Claims 1 to 6, wherein the thread (19b) comprises a plurality of strands of fibres (22) stranded together.
9. A combustion apparatus as claimed in any one of Claims 1 to 8, wherein the thread (19b) further comprises an insert (31) of a size of 10 μm to 500 μm .
10. A combustion apparatus as claimed in any one of Claims 1 to 9, wherein the combustion apparatus further comprises a flame size adjusting means (41).

FIG. 1

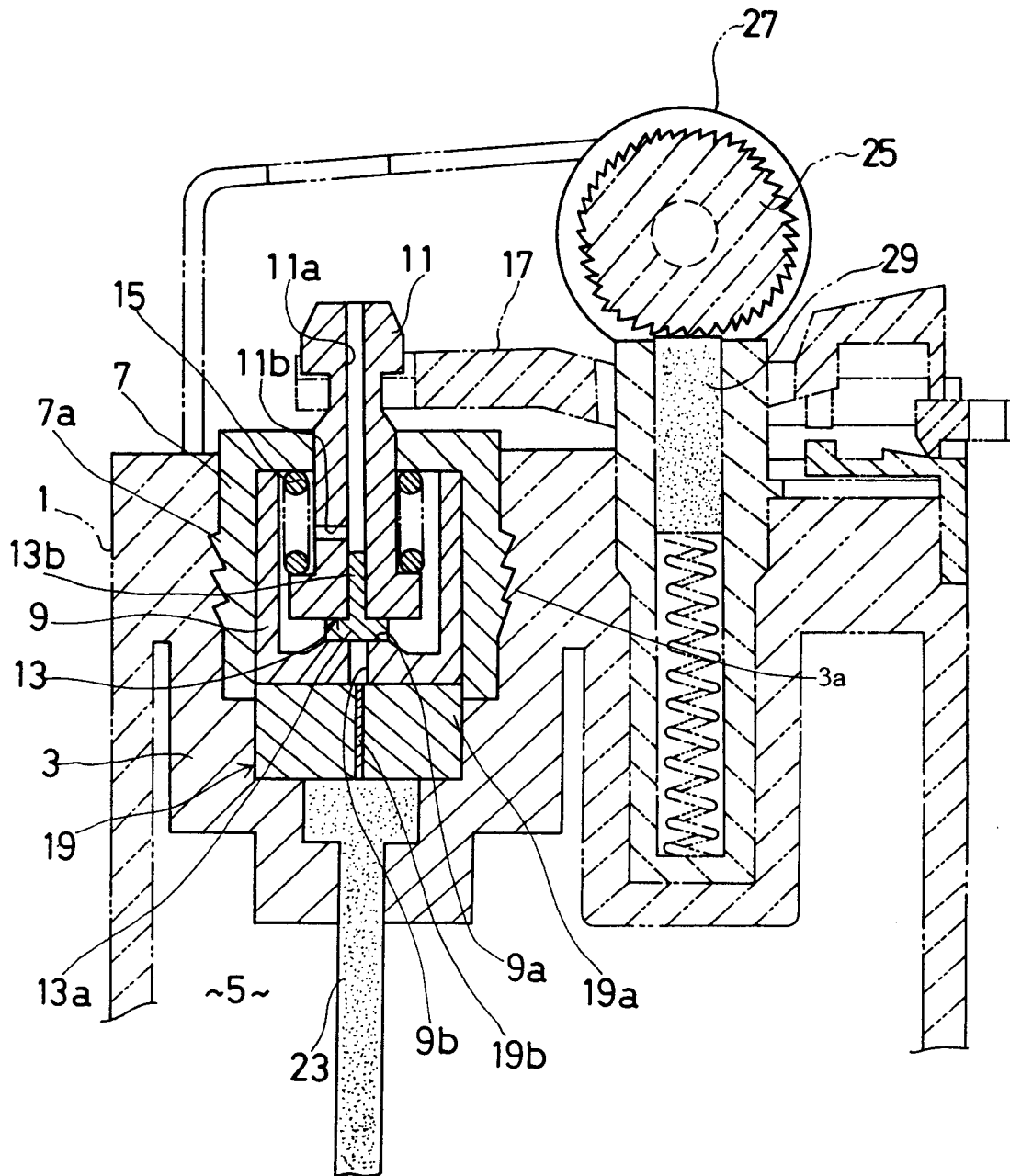


FIG. 2

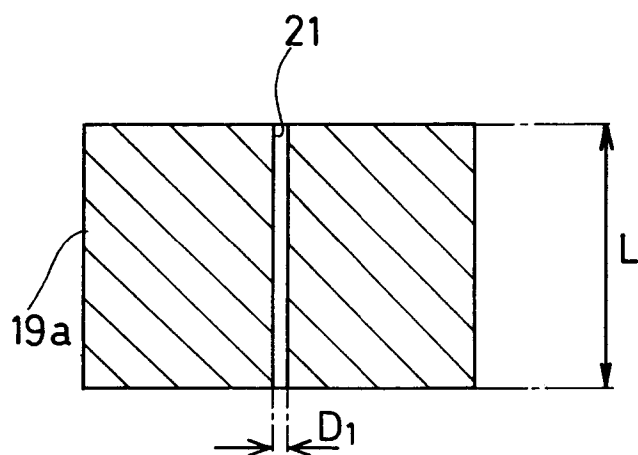


FIG. 3

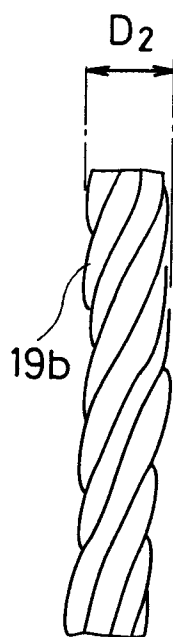


FIG. 4

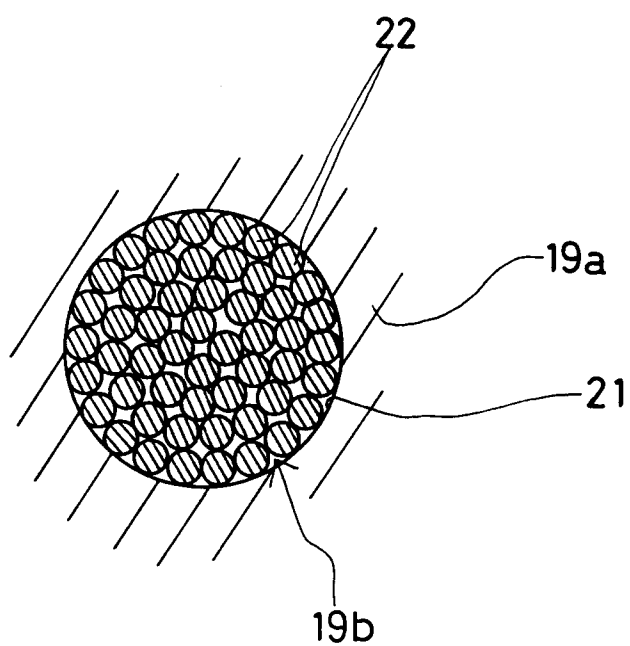


FIG. 5

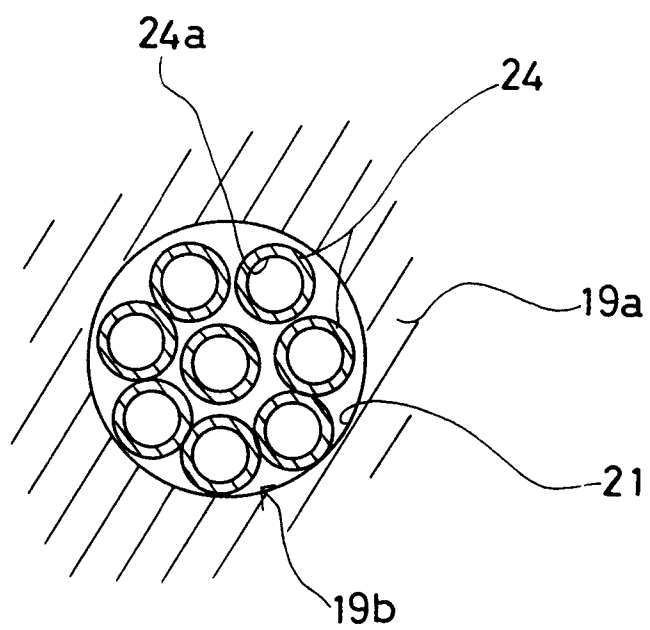


FIG.6

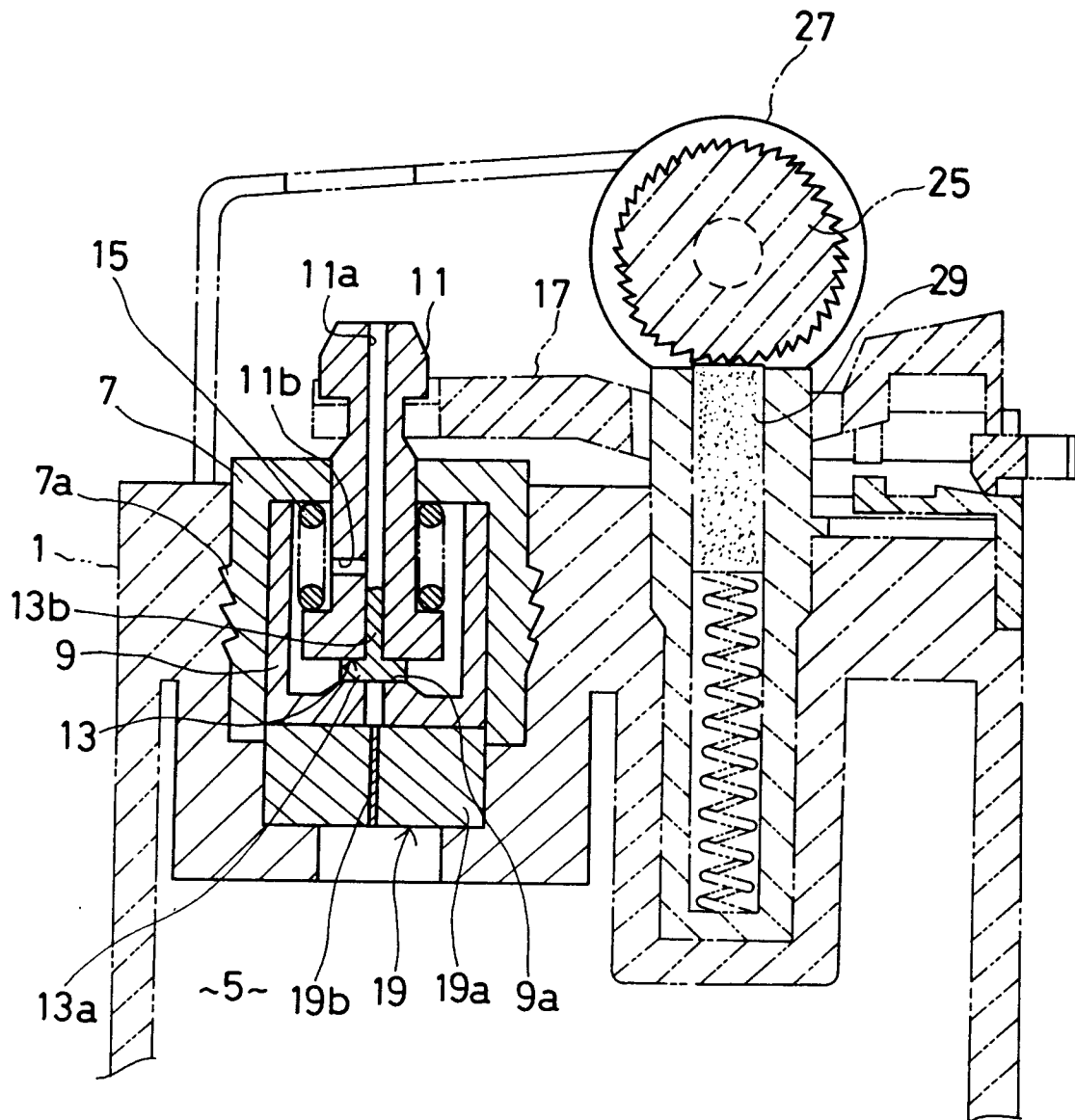


FIG.7

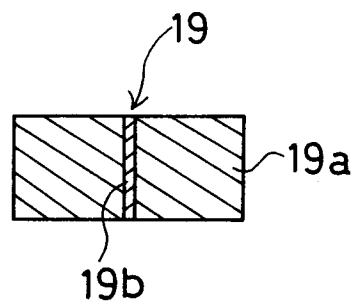


FIG.8

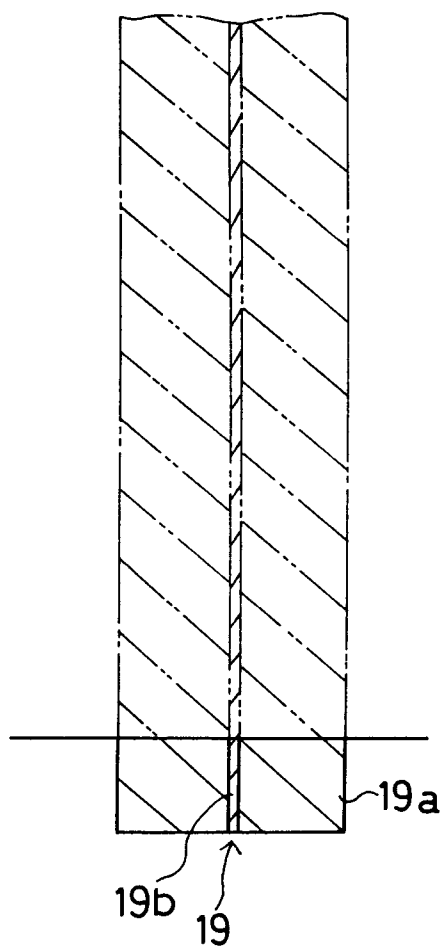


FIG.9

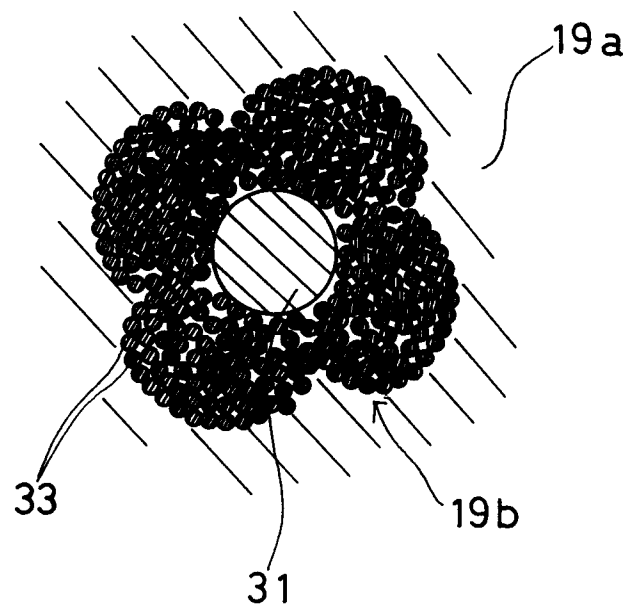


FIG.10

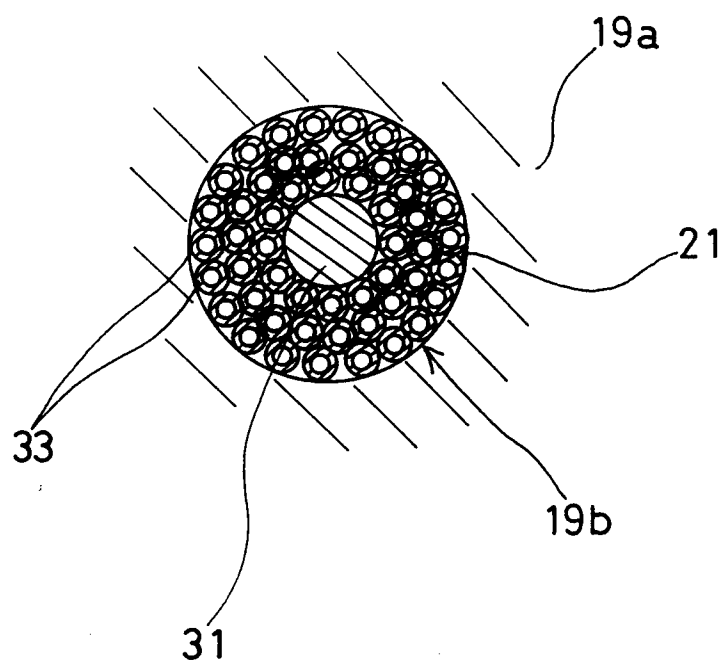


FIG.11

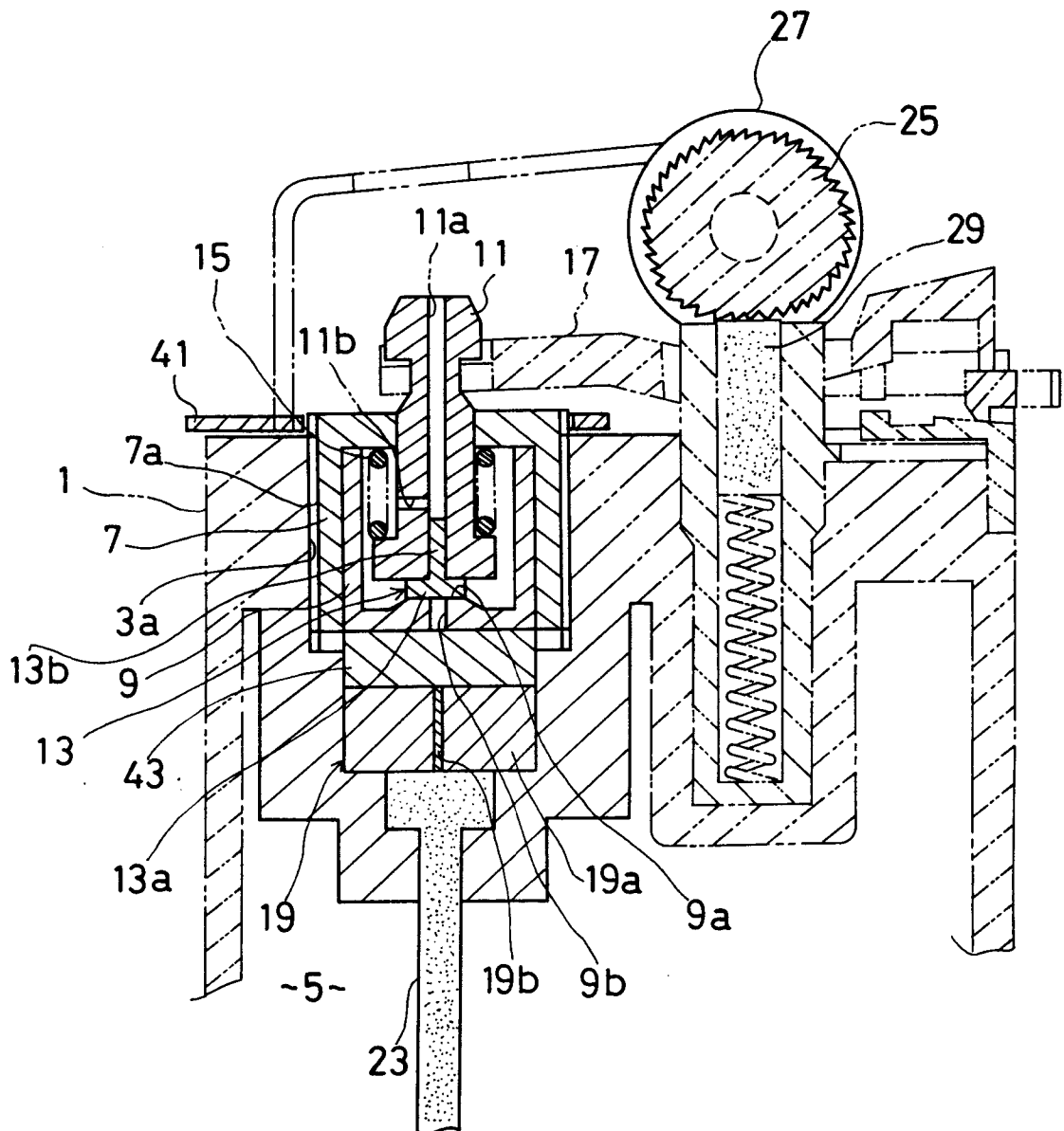


FIG.12

