CLAIMS

1. A method of constructing a syringe for injecting an injection objective substance into an injection target of a living body without using any injection needle, the method including:

providing, within the syringe, an enclosing unit which encloses the injection objective substance;

providing, within the syringe, an ignition unit which includes an ignition charge capable of generating a plasma having a high temperature and a high pressure during combustion immediately after the ignition, and suddenly lowering the high pressure generated such that no gas component is contained when an ordinary temperature is provided and a combustion product is condensed;

providing, within the syringe, a combustion chamber into which the condensed combustion product is allowed to flow and which accommodates a gas generating agent that is to be combusted by the combustion product to produce a predetermined gas;

providing, within the syringe, a pressurizing unit which pressurizes the injection objective substance enclosed in the enclosing unit; and

providing, within the syringe, a flow passage unit which defined a flow passage so that the injection objective substance, which is pressurized by the pressurizing unit, is allowed to inject to the injection target area,

wherein the pressurizing unit is capable of providing,

a first pressurizing mode in which a pressure applied to the injection objective substance in the pressurizing unit is raised to a first peak pressure in order to allow the injection objective substance to penetrate through a surface of the injection target area,

and then the pressure applied to the injection objective substance is lowered to a waiting pressure; and

a second pressuring mode in which the injection objective substance having the waiting pressure is pressurized so that the pressure applied to the injection objective substance is raised to a second peak pressure to inject a predetermined injection amount of the injection objective substance,

characterized in that

the pressurizing unit uses,

an increase in pressure generated by the combustion of the ignition charge in the ignition unit as a pressurization transition until arrival at the first peak pressure in the first pressurizing mode, and

an increase in pressure brought about by the predetermined gas produced by the gas generating agent as a pressurization transition until arrival at the second peak pressure in the second pressurizing mode.

2. The method of constructing a syringe according to claim 1, wherein providing the waiting pressure not more than 50 % of the first peak pressure.

3. The method of constructing a syringe according to 1 or 2, further comprising:

adjusting a rate of pressure increase, which is provided from the waiting pressure to arrival at the second peak pressure in the second pressurizing mode, lower than a rate of pressure increase which is provided from start of pressurization to arrival at the first peak pressure in the first pressurizing mode.

4. The method of constructing a syringe according to any

one of claims 1 to 3, further comprising;

injecting a larger amount of the injection objective substance in the second pressuring mode than an amount of the injection objective substance in the first pressurizing mode.

5. The method of constructing a syringe according to any one of claims 1 to 4 further comprising:

completing a combustion of the ignition charge earlier than a combustion of the gas generating agent; and

increasing a velocity of production of the gas from the gas generating agent at a stage at which the combustion of the ignition charge is completed and the pressure applied to the injection objective substance is decreased from the first peak pressure to the waiting pressure.

6. The method of constructing a syringe according to any one of claims 1 to 5 further comprising:

providing, as the ignition charge, any one of explosive charges of an explosive charge containing zirconium and potassium perchlorate, and explosive charge containing titanium hydride and potassium perchlorate, an explosive charge containing titanium and potassium perchlorate, an explosive charge containing aluminum and potassium perchlorate, and explosive charge containing aluminum and bismuth oxide, an explosive charge containing aluminum and molybdenum oxide, an explosive charge containing aluminum and copper oxide, and a explosive charge containing aluminum and iron oxide or an explosive charge composed of a combination of a plurality of the foregoing explosive charge.

7. A method of constructing a syringe having an adjustable

injection depth in an injection objective substance into an injection target of a living body without using any injection needle, the method including:

providing, within the syringe, an enclosing unit which encloses the injection objective substance;

providing, within the syringe, an ignition unit which includes an ignition charge capable of generating a plasma having a high temperature and a high pressure during combustion immediately after the ignition, and suddenly lowering the high pressure generated such that no gas component is contained when an ordinary temperature is provided and a combustion product is condensed;

providing, within the syringe, a combustion chamber into which the condensed combustion product is allowed to flow and which accommodates a gas generating agent that is to be combusted by the combustion product to produce a predetermined gas;

providing, within the syringe, a pressurizing unit which pressurizes the injection objective substance enclosed in the enclosing unit; and

providing, within the syringe, a Sow passage unit which defined a flow passage so that the injection objective substance, which is pressurized by the pressurizing unit, is allowed to inject to the injection target area,

wherein the pressurizing unit is capable of providing,

a first pressurizing mode in which a pressure applied to the injection objective substance in the pressurizing unit is raised to a first peak pressure in order to allow the injection objective substance to penetrate through a surface of the injection target area, and then the pressure applied to the injection objective substance is lowered to a waiting pressure; and

a second pressuring mode in which the injection

objective substance having the waiting pressure is pressurized so that the pressure applied to the injection objective substance is raised to a second peak pressure to inject a predetermined injection amount of the injection objective substance,

characterized in that

the pressurizing unit uses,

an increase in pressure generated by the combustion of the ignition charge in the ignition unit as a pressurization transition until arrival at the first peak pressure in the first pressurizing mode, and

an increase in pressure brought about by the predetermined gas produced by the gas generating agent as a pressurization transition until arrival at the second peak pressure in the second pressurizing mode.

8. The method of constructing a syringe according to claim 7, wherein providing the waiting pressure not more than 50 % of the first peak pressure.

9. The method of constructing a syringe according to 7 or 8, further comprising:

adjusting a rate of pressure increase, which is provided from the waiting pressure to arrival at the second peak pressure in the second pressurizing mode, lower than a rate of pressure increase which is provided from start of pressurization to arrival at the first peak pressure in the first pressurizing mode.

10. The method of constructing a syringe according to any one of claims 7 to 9, further comprising:

injecting a larger amount of the injection objective substance in the second pressuring mode than an amount of

the injection objective substance in the first pressurizing mode.

11. The method of constructing a syringe according to any one of claims 7 to 10 further comprising:

completing a combustion of the ignition charge earlier than a combustion of the gas generating agent; and

increasing a velocity of production of the gas from the gas generating agent at a stage at which the combustion of the ignition charge is completed and the pressure applied to the injection objective substance is decreased from the first peak pressure to the waiting pressure.

12. The method of constructing a syringe according to any one of claims 7 to 11 further comprising:

providing, as the ignition charge, any one of explosive charges of an explosive charge containing zirconium and potassium perchlorate, and explosive charge containing titanium hydride and potassium perchlorate, an explosive charge containing titanium and potassium perchlorate, an explosive charge containing aluminum and potassium perchlorate, and explosive charge containing aluminum and bismuth oxide, an explosive charge containing aluminum and molybdenum oxide, an explosive charge containing aluminum and copper oxide, and a explosive charge containing aluminum and iron oxide or an explosive charge composed of a combination of a plurality of the foregoing explosive charge.