[0004]

[PTL 1] US Patent Specification No. 6258063

[PTL 2] US Patent Specification No. 5080648

[Summary ~~of Invention~~]

[0004a] In one aspect of the present disclosure, there is provided a needleless injector comprising:

a syringe unit including a syringe that encapsulates an injection objective substance to be injected into an injection target region, an ignition device that gives, by combustion of an explosive component, energy for ejection to the injection objective substance encapsulated in the syringe, and a piston disposed between the syringe and the ignition device and capable of transmitting the energy given by the ignition device to the syringe side; and

an activating unit activating the ignition device included in the syringe unit, wherein

the syringe unit includes a cylindrical housing in which the ignition device and the piston are incorporated, and the syringe can be installed in a housing space formed in the housing through an opening section provided in a side surface of the housing,

the syringe includes a nozzle formed at a distal end portion of the syringe and injecting the injection objective substance to the injection target region and a plunger disposed in a proximal end portion on a side opposite to the distal end portion, a sealed space for encapsulating the injection objective substance being formed by the plunger and an inner wall of the syringe, and the plunger being capable of being propelled, toward the nozzle, on

the inside of the syringe by energy transmitted from the piston, and

when the syringe is installed in the housing, the syringe is fixed so that the nozzle of the syringe is exposed from the housing and the plunger of the syringe is disposed in a position opposed to the piston incorporated in the housing.

[Technical Problem]

[0005] In an injector, since an injection component is included in a syringe, the syringe needs to be kept sterile until immediately before injection. In particular, when an injection objective substance is injected only once, the injector touches skin (an injection target) once. Therefore, the reproduction of bacteria and the like can be avoided. But, when the syringe is replaced and used every time the injection is performed, a sanitation problem concerning contamination of a replaced new syringe has to be sufficiently taken into account.

[0006] When pressure generated by combustion of an explosive component or the like is used as a driving source of a piston in the injector, since it is easy to adjust the pressure applied to the piston, the pressure is considered to be a useful driving source. However, the residue to the explosive component or the like occurs when the explosive component or the like is burned. Therefore, a component once used is desirably discarded. At this point, a residue component desirably does not leak out to the outside from the viewpoint of sanitation (a place which a hand of a user reaches) to prevent the hand of the user from being stained, when components after use are removed or detached.

[CLAIMS]

[Claim 1] ~~An~~ A needleless injector comprising:

a syringe unit including a syringe that encapsulates an injection objective substance to be injected into an injection target region, an ignition device that gives, by combustion of an explosive component, energy for ejection to the injection objective substance encapsulated in the syringe, and a piston disposed between the syringe and the ignition device and capable of transmitting the energy given by the ignition device to the syringe side; and

an activating unit activating the ignition device included in the syringe unit, wherein

the syringe unit includes a cylindrical housing in which the ignition device and the piston are incorporated, and the syringe can be installed in a housing space formed in the housing through an opening section provided in a side surface of the housing,

the syringe includes a nozzle formed at a distal end portion of the syringe and injecting the injection objective substance to the injection target region and a plunger disposed in a proximal end portion on a side opposite to the distal end portion, a sealed space for encapsulating the injection objective substance being formed by the plunger and an inner wall of the syringe, and the plunger being capable of being propelled, toward the nozzle, on the inside of the syringe by energy transmitted from the piston, and

when the syringe is installed in the housing, the syringe is fixed ~~to dispose~~so that the nozzle of the syringe is exposed from the housing and the plunger of the syringe is disposed in a position opposed to the piston incorporated in the housing.

[Claim 2] The needleless injector according to claim 1, wherein the ignition device is formed to be integrated with the housing.

[Claim 3] The needleless injector according to claim 2, wherein

the housing is formed by injection molding of a resin material, and

the ignition device is integrated with the housing in a state in which the ignition device is embedded in the housing during the injection molding of the housing.

[Claim 4] The needleless injector according to claim 3, wherein, in the housing, heat resistant members are provided between the ignition device and the resin material of the housing and between the piston and the resin material of the housing to cover at least parts of the ignition device and the piston disposed in the housing.

[Claim 5] The needleless injector according to claim 3, wherein, in the housing, a reinforcing member is provided between the syringe and the resin material of the housing to cover at least a part of the syringe installed in the housing.

[Claim 6] The needleless injector according to any one of claims 1 to 5, wherein a lid section capable of opening and closing the opening section is provided in the housing.

~~[Claim 7] The injector according to any one of claims 1 to 6, wherein, in a state in which the syringe is installed in the housing, the nozzle of the syringe is exposed from the housing.~~

[Claim ~~8~~7] The needleless injector according to claim ~~7~~1, wherein

the housing includes a through-hole, which connects an inside and an outside of the housing, in a distal end face, which is an end portion of the housing space, this end portion being on a side opposite to the ignition device, and

when the syringe is installed in the housing, the syringe is fixed to the housing in a state in which the syringe is held in the through-hole, and the nozzle is exposed from the through-hole.