PROCESS AND APPARATUS FOR FRACTIONATED INJECTIONS

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INVENTOR
R. LETAC

by
Adams & Bush

ATTORNEYS
PROCESS AND APPARATUS FOR FRACTIONATED INJECTIONS

Roger Letac, Paris, France

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1 Claim. (Cl. 128—173)

The problem of injecting liquids in living organic tissues without the use of a needle has already been solved by using injectors of the type which, since a long time, is used for internal combustion engines. These injectors operate at a high pressure and are provided with a calibrated port of a very small section. By placing the point of such an insector in intimate contact with the skin, the ejected liquid jet has the strength to penetrate through the skin and to penetrate in the tissues.

In this patent there are all the apparatuses designed for such purpose according to the above principle except the same drawback, since a very small relative shifting of the injector from the place in contact of the skin may easily give rise to a traumatism and a laceration of the tissues and since it is practically impossible to prevent such shifting, particularly on account of the reflex movement of the skin.

The apparatus, object of the present invention, belongs to the above mentioned type, but is designed to cope with the serious drawback which has been pointed out. The device is characterized in that it includes means to carry on the injection in a fractionated manner.

A few embodiments are described hereafter, by way of example and are illustrated in the accompanying drawing in which:

Fig. 1 illustrates the machinery which will impart to the injectable liquid the brief impulses necessary to carry out the above stated inventive principle and feed an injector of a known type, working under an adjustable pressure.

The Figure 2 shows an auxiliary pump which can be substituted for the chief embodiment.

The first embodiment includes see Fig. 1—an electric engine 1, controlled by a pedal 2, which through gears 3 and 4 drives a shaft 5 upon which is set a cam 6. The stem 7 of the piston 8 of the pump is held in contact with the cam by a return spring 9. On the pump barrel 10, which is screwed on the casing 10' of the eccentric, are mounted, on one side an elbow carrying the flask 11 supplying the injectable liquid and on the other side an air cock 12.

A flexible piping 13 resisting to high pressures connects the pump with the injector, said injector having at its end a calibrated port of very small size. A threaded knob 15 at the other end regulates the pressure of a spring 16 on the stem of the regulating valve 17.

The apparatus operates as follows:

The spring 16 is seated in the flask, filled with the liquid to be injected, and fills first the pump by working the air cock 12. He regulates the required injection pressure by adjusting adequately the knob 15 of the injector and brings the point of the injector in contact with the skin: when he presses on the pedal 21, the electric engine 1, driving, through gears 3 and 4 and shaft 5, the cam 6, transmits to the piston 8 a reciprocating motion of a very small amplitude and high frequency. The liquid supplied by the flask 11 is conveyed by the flexible piping 13, the injector wherefrom, at each impulse, it flows through the calibrated port under a pressure depending on the pressure of the spring 16 on the valve 17 and penetrates through the skin in the living tissues.

By operating in such a way, the injection is carried on in a fractionated manner, without any traumatism or laceration of the tissues.

The essential elements of the mechanism, specially the injector, the flexible piping and the pump barrel can easily be disconnected and subjected to sterilization.

The second embodiment of the invention includes a pump shown on Fig. 2.

This auxiliary pump consists of a piston having two heads 19, equipped with a drawback spring 19 and sliding in a pump barrel 20. The flask containing the injectable liquid is fastened by a shoulder 21 on one end of the pump barrel 20. The piston rod 18 bears two cross-heads: one of these 2 is driven by an auxiliary fluid, such as oil, brought under pressure by the main pump (see Fig. 1), and the other cross-head 23 of Figure 2 transmits said pressure to the injectable liquid flowing through a port 24. The subsidiary pump should be arranged as close as possible to the injector. The length of the circuit to be followed by the injectable liquid and the volume of the liquid in charge are reduced by using this subsidiary pump.

According to an alternative of this last embodiment, the flask containing the injectable liquid is designed to take the place of a subsidiary pump.

What I claim is:

An apparatus for injecting a given dose of a liquid product in living tissues, without the use of a hollow needle comprising a pressure responsive injector in combination with a power driven reciprocating pump device including a cylinder having an inlet port and a pressure port, a hollow bracket fixed on said cylinder and registering with said inlet port, a vessel containing the injectable liquid product disposed on said bracket and communicating therewith for supplying the cylinder with said liquid, a piston slidably disposed in said cylinder having a head portion and a tail portion, a spring urging said piston in a direction away from said inlet port, a casing having an aperture within which is engaged the tail portion of the pistons; a shaft rotatablely supported in said casing, a cam on said shaft and on which bears the tail portion of the piston, a switch controlled electrical motor drivingly connected to said shaft, screw means for removable fixing the cylinder on said casing and registering position with the aperture provided therein and a pipe communicating the pressure port of the cylinder to the injector.

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