connective tissue region of a patient have been described, there is a need at times to provide adequate local anesthetics and other drugs to these tissues without limiting the ability to inject a therapeutic drug such as local anesthetic for the purpose of producing superficial soft-tissue anesthesia prior to attempting to identify a fluid-filled tissue space such as the epidural or intra-articular or other fluid-filled spaces of the body. Hence, an instrument with two drives achieves these objectives.

[0041a] In another embodiment, the apparatus of this invention is used to administer fluid into a fluid-filled anatomic space capable of receiving fluid at a lower pressure than tissues surrounding the anatomic space. The apparatus contains a disposables assembly including: a syringe having a body for containing a fluid to be injected into the anatomic space, the syringe having a plunger movable in one end of the body for dispensing fluid from an opposite end of the body, tubing permanently connected to the opposite end of the body, a needle connected to the tubing and having a point insertable into a subject and movable through tissues surrounding the anatomic space, for seeking the anatomic space, and an in-line pressure transducer for generating a signal corresponding to an instantaneous pressure at the point of the needle.

[0041b] The apparatus further contains a drive unit mechanically connected to the syringe and electrically connected to the pressure transducer, the drive unit including a controller with a computer, a memory for storing a first selected pressure (P1) that is selected to be compatible with injecting fluid into the fluid-filled anatomic space, a motor connected to and controlled by the computer, and a syringe armature connected to the motor and mechanically connected to the syringe for moving the plunder into and out of the body for respectively injecting and aspirating fluid at the point of the needle for injecting and

aspirating fluid into and out of the subject.

[0041c] The computer is programmed to control the motor to move the plunger for a non-continuous fluid flow into the subject until the first selected pressure (P1) is detected by the pressure transducer at which time the motor is to stop a flow of additional fluid to the subject until the instantaneous pressure at the point of the needle drops below the first selected pressure, at which time the program resumes operation of the motor to resume fluid flow to the subject, so that as the needle is moved in tissues of the subject surrounding the fluid-filled anatomic space, fluid flow to the tissues stops at instantaneous pressures above the first selected pressure (P1) and resumes when the instantaneous pressure falls below the first selected pressure, to indicate the point of the needle is in the anatomic space and to then resume injecting fluid into the anatomic space.

[0042] The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its uses, reference is made to the accompanying drawings and descriptive matter in which a preferred embodiment of the invention is illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0043] In the drawings:

[0044] Fig. 1 is a view of an authorized disposables assembly of the invention;

[0045] Fig. 1A is a view of one embodiment of a proprietary connector of the invention;

[0046] Fig. 1B is a view of second embodiment of the proprietary connector of the invention;

[0047] Fig. 2 is a top view of a computer-controlled drug delivery unit

mechanically connected between the pressure transducer and the controller for allowing operation of the controller only if an authorized a disposables assembly is connected to the pressure transducer.

13. The apparatus of claim 1, wherein said needle point is adapted for insertion into one of: an epidural tissue space; an intra-articular space; an intra-occular fluid of a globe of an eye; an vessel of the body; and a tissue space comprised primarily of bodily fluids.

14. The apparatus of claim 13, wherein said needle is a catheter needle.

15. The apparatus of claim 1, wherein said injection fluid comprises a drug.

16. The apparatus of claim 1, wherein said apparatus further comprises a visual signal, under the control of said controller, wherein said visual signal indicates each time said flow rate starts or stops.

17. The apparatus of claim 1, wherein said controller further comprises an audible signal generator under the control of said controller, wherein said audible signal generator generates an audible indication each time the fluid flow starts or stops.

18. The apparatus of claim 1, wherein said disposables assembly includes a rigid and elongated handle permanently connected to the tubing, and for connection to the needle, the handle having a length of about 10 to 20 cm.

~~19. A method for administering an injection into a fluid filled tissue space, said method comprising:~~

~~providing a testing fluid, an injection fluid, a pumping mechanism, and an end adapted for insertion into said patient, pumping said testing fluid into said patient,~~

calculating the fluid pressure of said testing fluid at an interface between said end and the fluid filled tissue of said patient, controlling the flow rate of said injection fluid such that said fluid flow initiates once measured pressure drops below pre-set fluid pressure, identifying the loss-of-pressure associated with the entry of said end into said fluid filled tissue space, and pumping said injection fluid into said fluid filled tissue space.

20. The method of claim 19, wherein said testing fluid is selected from the group consisting of physiological saline, phosphate-buffered saline, artificial cerebral spinal fluid, Ringers, 5% dextrose, and filtered air.