

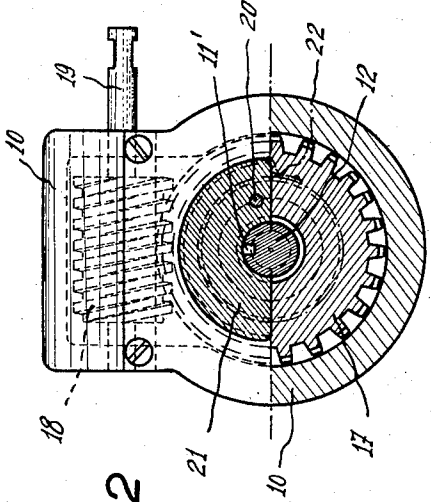
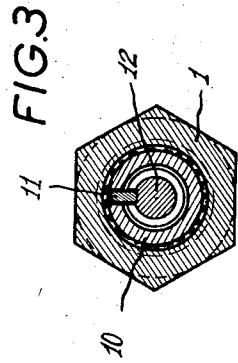
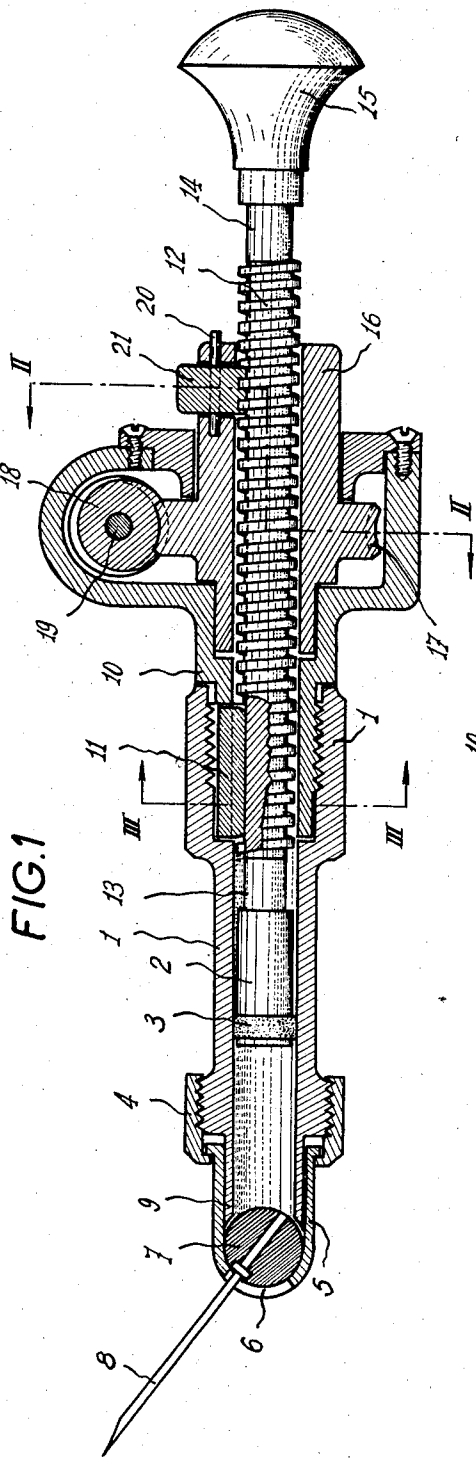
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SYRINGES

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SYRINGES

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This invention relates to hypodermic syringes and similar surgical instruments for injecting liquids and it has for its primary object to provide a syringe which can be manipulated with great precision and with little effort, the movements of the parts of the syringe and especially the advance of the piston, and the direction of advance of the injection needle being finely regulable to an extent which hitherto has not been obtainable.

A principal object of the invention consists in providing a syringe with a piston the movement of which in both directions is not produced by the operator of the syringe, but is mechanically produced and is derived from a rotary movement transmitted from an external source of such movement.

Another principal object of the invention consists in providing an injection needle arrangement permitting adjustment of the angular position of the injection needle relatively to the body of the syringe and relatively to the direction of the piston movement therein, said arrangement also including a resilient connection between the injection needle and the syringe body which simultaneously also acts as a seal of the syringe after adjustment of the needle.

Further objects of the invention and further characteristics of the same will be apparent from the following detailed specification.

The invention is illustrated in the accompanying drawing by way of example. It is however to be understood that the embodiment of the invention which has been illustrated by way of example has been selected with a view of explaining the principle of the invention and the best mode of applying said principle. Other applications of the same principle will readily occur to the expert in this field when following the directions contained in the following specification.

In the drawing:

Fig. 1 is an elevational view in longitudinal section of a syringe according to the invention.

Fig. 2 is an elevational cross sectional view of the syringe illustrated in Fig. 1, the section being taken along line II—II of Fig. 1.

Fig. 3 is an elevational cross sectional view, the section being taken along line III—III of Fig. 1.

As seen in the drawing the body 1 of a hypodermic syringe is provided with a bore in which the piston 2 reciprocates, which piston may or may not be provided with sealing means, such as the piston rings 3. Near the injection needle carrying end the body 1 is provided with a threaded portion, the threads of which are engaged by a retaining sleeve 4 engaging and holding, by means of an inwardly projecting flange, the outwardly projecting flange of a cap 5 with a semi-spherical end portion. The cap fits tightly over the end portion 9 of the body 1. The semi-spherical end portion of the cap is provided with a slot 6. It forms the seat of a spherical injection needle holder 7 which is preferably made of a resilient or elastic material, such as synthetic rubber or a polyethylene plas-

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tic. This ball shaped needle holder is provided with a diametrical bore through which the injection needle passes and in which it is firmly held.

When the needle is in operative position the end 9 of the syringe body is pressed firmly against the needle holder 7 by the retaining sleeve 4, holding the needle holder and the injection needle in the desired angular position, the resilient needle holder forming a sealing element, sealing the bore of the syringe body.

It will be understood that this injection needle carrying arrangement permits orientation of the injection needle in any desired direction over a wide angle, by turning the injection needle within the slot and by turning the body of the syringe around its axis. To produce the angular adjustment of the needle it is only necessary to loosen or to unscrew the retaining sleeve 4, thus relieving the pressure on the ball shaped needle holder 7, which may then be turned in the desired direction. When the retaining sleeve, after adjustment of the needle is again tightened the elastic ball shaped needle holder 7 is firmly applied against the end 9 and seals the end of the bore, of the syringe body, all parts being again firmly held in their selected position.

The other end of the body may be provided with an enlargement of hexagonal cross section (Fig. 3) or any other cross section permitting a firm grip, said enlargement having internal threads which engage corresponding threads provided on a sleeve like projection from a gear housing 10. The said sleeve may hold a key member 11 which projects inwardly and which engages a longitudinal groove of a spindle carrying the piston 2. The spindle is of the type generally used for lead screws and is provided with helical square threads extending over a suitable length, which length depends on the stroke of the piston and on the length of the gear case 10. On both sides of the threaded portion of the spindle a portion of the spindle 13, 14 respectively, of reduced diameter is provided. The end of the spindle carries a knob 15 which permits manual operation of the piston in the conventional manner.

The gear case 10 houses an essentially cylindrical shaft-like rotary member 16 which is provided with an internal bore of a diameter which is substantially equal to the outer diameter of the threads of the spindle 12. This member is integral with or fixedly carries a worm wheel 17. The gear case further houses a worm 18 meshing with the work wheel 17. The worm is mounted on a shaft 19 which projects outwardly (Fig. 2) and which is provided with means for coupling it with the flexible shaft which is driven by an external source of regulable rotary motion, for instance from the turret or equipment stand such as used in connection with a dentist's chair with which the flexible shaft may be connected. With such an equipment the speed of rotation of the drive means of the flexible shaft is finely adjustable by means of a foot pedal which regulates the driving motor of the turret or stand.

The rotary member 16 carries a drive piece in the shape of a half-nut 21 with internal threads engaging the helical square threads of the spindle 12. This drive piece may be mounted on a small longitudinal spindle within a suitable cut-out portion of the member 16.

The spindle 20 around which the drive piece 21 in the shape of a half-nut may be rocked is preferably in an eccentric position relatively to the axis of the half-nut and spindle, as seen in Fig. 2, so that the half-nut may be swung out of engagement with the threads of the spindle 12. When out of engagement with the half-nut the spindle may be manipulated in the conventional manner by forcing the piston down manually towards the needle

carrying end of the body 1, by application of pressure on the knob 15.

When the driving half-nut 21 is in engagement with the threads of the spindle 12, it advances the spindle by its rotation with the member 16 which is journaled within the gear case in suitable bearings. As shown the front bearing may be a removable member fixed on the gear case by means of screws, to permit insertion and withdrawal of the member 16. The spindle 12 will be held against rotation by the key member 11 which is held in its position by the gear case or which is merely a part of the gear case.

It will be clear that when during rotation of the spindle one of the portions with reduced diameter is moved under the half-nut any further movement of the spindle 12 and of the piston is automatically stopped.

If the speed of rotation of the work 18 and shaft 19 can be controlled, it is possible to regulate and control finely and precisely in any desired moment the speed with which the liquid is injected. The control of this speed by variable pressure on knob 15 becomes unnecessary and the operator of the syringe is relieved of the task to pay constant attention to the pressure which he has to exert on the knob. Further, the use of the syringe is greatly simplified and improved by the angular adjustment of the position of the injection needle. In many cases the position of the instrument is prescribed by the available space or by the relative position of the patient and the operator, but does not coincide with the direction in which the needle should penetrate or the liquid should be injected by the resilient needle carrier which permits a very fine and precise adjustment and orientation of the needle relatively to the direction of the piston advance. This disadvantage is completely eliminated.

It is of special importance that a completely regular and gradual movement of the injection needle and discharge of the liquid injected through the needle occurs, as this reduces greatly or eliminates the pain caused by the injection and especially that produced by the sudden piercing of the tissues.

It will be clear that changes of an unessential nature may be made without departing from the essence of the invention as defined in the annexed claims.

Having described the invention, what is claimed is:

1. A surgical syringe for injecting liquids, comprising a hollow syringe body, a piston longitudinally movable therein, an injection needle at one end of said syringe body, means for adjusting the angular position of the needle relatively of the syringe body, means for moving said piston longitudinally within said syringe body, said means including rotary means mounted on the said syringe body, adapted to be coupled with an external rotary drive means, a member connected with the piston mounted for a rectilinear movement within said syringe body and means for converting the movement of said rotary means into a translatory movement of said member.

2. A surgical syringe for injecting liquids, comprising an elongated, hollow syringe body, a piston longitudinally movable therein, a hollow injection needle mounted at the end of the said hollow syringe body, an adjustable

needle carrier, movable angularly relatively to the hollow syringe body to adjust the direction of the needle, means for driving said piston mechanically from an external rotary drive means, rotary means mounted on the syringe body, adapted to be coupled with the said rotary drive means, and means for converting the rotary movement of the rotary means into a rectilinear longitudinal movement of the piston.

3. A surgical syringe as claimed in claim 2 wherein the needle carrier consists of a body of rotation and is rotatably held and adjustable within a slotted cap closing the end of the hollow body of the syringe, and wherein the injection needle, held by said needle carrier, projects through the slot of the cap, within which the angular position of the injection needle relatively to the body of the syringe may be freely adjusted.

4. A surgical syringe as claimed in claim 2 wherein one end of the elongated hollow syringe body is closed by a detachable cap provided with a slot, and means are provided to attach said cap to the syringe body and to draw the cap towards the said body, when attached, and wherein the needle carrier is ball shaped and is provided with a diametrical bore within which the injection needle is held passing through said bore, and projecting outwardly through the slot in the cap, said ball shaped needle carrier being of resilient material and being drawn with the cap towards the end of the hollow syringe body when the cap is attached, said ball shaped needle carrier body forming a sealing means for the hollow syringe body.

5. A surgical syringe for injecting liquids, comprising a hollow syringe body with a piston therein, a spindle driving said piston, provided with threads and held against rotation, rotatable means for advancing said spindle longitudinally within said syringe body adapted to be coupled with an external rotary drive means, said rotatable means including a hollow rotatable sleeve member surrounding said spindle and carrying a half-nut with internal threads engaging the threads of the spindle, said sleeve member further carrying a worm wheel engaged by a worm rotatably mounted on the syringe body and driven by a shaft adapted to be coupled with the external rotary drive means.

6. A surgical syringe as claimed in claim 5 wherein the internally threaded half-nut is mounted on an axle and is adapted to be swung thereon to disengage the internal threads from the spindle threads, thus freeing the spindle, and wherein the said spindle is provided with a knob at its end for manual operation of the piston when disengaged.

7. A surgical syringe as claimed in claim 5 wherein on both sides of the spindle threads the spindle is provided with sections of reduced diameter, to automatically stop the spindle advance at predetermined points.

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