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AUTOMATIC HYPODERMIC SYRINGE

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Fig.1

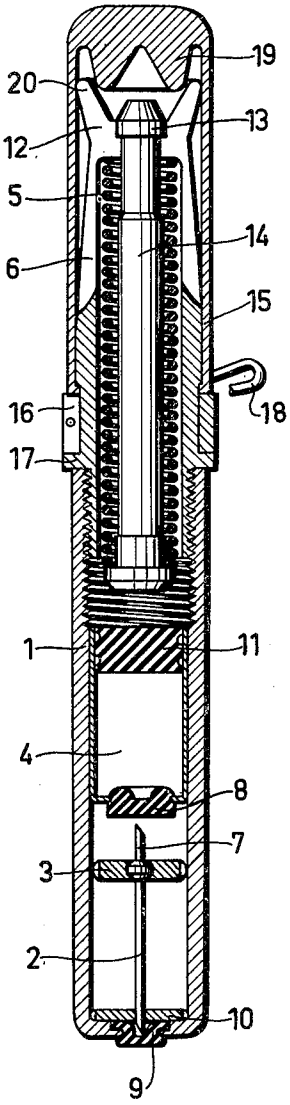
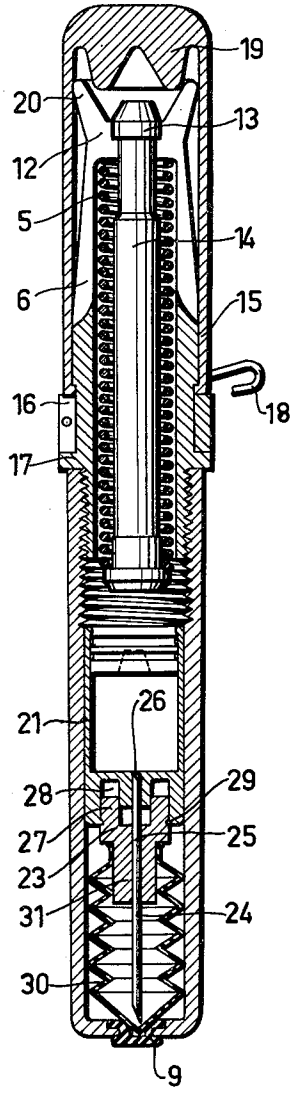


Fig.2



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AUTOMATIC HYPODERMIC SYRINGE

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1 Claim. (Cl. 128—218)

Swedish Patent No. 167,846 deals with a hypodermic syringe which comprises a syringe body, an injection needle, a holder for the injection needle, with the needle with its holder arranged in the body of the syringe so that the front end of the syringe covers and protects the needle when ready for use, an ampoule for a liquid to be injected, a spring arranged so as to force the needle holder with the needle out of its prepared position into an injection position as well as compressing the ampoule so that the liquid is squeezed out through the syringe needle, as well as a retaining catch by which the spring is held taut and released so as to bring about the injection. This hypodermic syringe is characterised by the combination that the needle holder with the hypodermic needle is provided with a backward-pointing perforator and in that the ampoule is compressible and is in its entirety movable in the body of the syringe and is located behind the needle holder, and that its front end has a wall that can be pierced easily by a needle, and that the spring is arranged, when released, to press on the rear end of the ampoule, so as to force the ampoule towards the needle holder, so that the needle is brought into its injection position, the perforator pierces the front wall of the ampoule so that the interior of the ampoule comes into connection with the needle, and the ampoule is compressed so that the injection fluid is forced out through the needle.

A fundamental characteristic of the hypodermic syringe according to said Swedish Patent No. 167,846 is that the ampoule is compressible so that the injection fluid can be expelled from the ampoule by the pressure exerted by the spring. In Patent 167,846, the ampoules shown as examples of the compressible type of ampoule, all have soft walls and can be collapsed so as to squeeze out the contents.

It has now been found that the ampoule can be a so-called cartridge type ampoule. In principle, this type of ampoule consists of a cylinder having rigid walls containing a piston which, when forced along inside the cylinder, squeezes out any liquid present in the cylinder. The compressessibility of the ampoule thus arises out of the fact that its volume is decreased when the piston is forced along inside the cylinder.

The walls of the cartridge type ampoule consists preferably of glass but other materials, such as plastic or metal are also conceivable, though in general one tries to avoid metal containers for the injection fluid because of the risk that metal ions would be dissolved in the liquid.

The piston and the front wall of the cartridge type ampoule may be made of rubber or plastic. In ampoules which may be stored for long periods plastic may be preferred, owing to its lower permeability, which results in a lower rate of evaporation of the injection liquid.

The accompanying drawing shows two embodiments of the hypodermic syringe according to the invention.

The syringe illustrated in FIG. 1 comprises a syringe body 1, the front part of which contains a hollow injection needle 2 and a cartridge ampoule 4. The injection needle is mounted in a needle holder 3 which can

be moved along the body of the syringe. The rear end 7 of the injection needle extends backwards from the needle holder 3 and is sharpened to a point for piercing. The front end of the syringe body 1 is sealed by means of a rubber membrane 9. Inside this membrane there is a plate 10 with a hole through the middle. This plate serves to steer the needle when it is driven forward into the operating position.

The front end of the cartridge type ampoule 4 is sealed by means of a rubber membrane 8, while its rear end is sealed by means of a rubber piston 11 which is arranged to fit tightly during its introduction into the cartridge.

At the rear end of the syringe body there are mounted a number of preferably three or four, flexible fins 6 which are furnished with heels 12 arranged to engage with a flange 13 on a piston rod 14 which is arranged inside the syringe body. This piston rod 14 is actuated by a coil spring 5 which pushes it in the direction of the cartridge ampoule 4.

The rear end of the syringe body is enclosed by a cover 15 which is equipped with projections 19 fixed to the inside of the bottom and arranged to engage with the outer ends 20 of the fins 6 and to force these outwards when the cover 15 is pressed down to its extreme position. To prevent an involuntary release of the mechanism there is a flexible split ring 16 provided with a handle 18, preferably in the shape of a nylon cord, arranged round the body of the syringe so that it is partly against the edge of the cover 15 and partly against a rib 17 fixed to the body of the syringe.

When the syringe is to be used one first pulls out the ring 16 with the aid of the handle 18. Then one grips the cover 15 and pushes the front end of the syringe hard against the part of the body where the injection is to be made. The cover 15 is pressed down over the body of the syringe, and consequently the projections 19 force the fins 6 outwards so tht the heels 12 release the flanges 13 on the piston rod 14. The spring 5 now forces the piston rod down into the body of the syringe so that it presses against the piston 11 of the cartridge type ampoule. At first the rod 14 pushes the whole catridge type ampoule 4 forwards so that the perforator 7 pierces the front wall 8 of the ampoule, thereafter the ampoule pushes the needle holder 3 and the needle 2 forwards so that the needle pierces the rubber membrane 9 and is brought into position for injecting. Thereupon the piston rod 14 pushes the piston 11 into the cartridge type ampoule, causing the injection fluid to be forced out through the needle 2.

FIG. 2 shows an embodiment in which the upper portion of the syringe, containing the automatic operating mechanism, is the same as illustrated in FIG. 1 and is designated by the same reference numerals. The new features are the ampoule and the needle holder.

The cartridge type ampoule 21 of FIG. 2 is preferably made of plastic. Its front wall has a portion 26 of a thickness suitable for being pierced by the rear end 25 of the hypodermic needle 24. The front wall of the ampoule has also protruding portions, forming a ring-shaped groove 28. The hypodermic needle 24 is mounted in a needle-holder 31, which has a cylindrical portion 27 arranged to engage with said groove 28 in the ampoule. A protruding rim 29 on the wall of the groove 28 engages with a corresponding groove on the surface of the cylindrical portion 27 of the needle-holder. Thus, the needle-holder is loosely held by the ampoule.

The needle 24 is enclosed in a protective cover having the shape of a bellows 30. The front end of the bellows, surrounding the needle, is closed, and keeps the needle sterile. The rear end of the bellows is mounted on the

needle-holder 31. The bellows is preferably made of rubber or plastic.

When the operating mechanism of the syringe of FIG. 2 is released, the rod 14 pushes the ampoule-needle assembly downwards, so that the needle 24 pierces the bellows 30 and the rubber membrane 9 and enters into its operative position. When the needle-holdr 31 has reached its extreme bottom position, the ampoule 21 still continues its forward movement, viz. so far that the rim 29 disengages its corresponding groove, and the cylindrical portion 27 engages with the bottom of the ring-shaped groove 28. During this movement the rear end 25 of the needle pierces the thin ampoule wall 26. The rod now pushes the piston into the ampoule, and the liquid is pressed out through the needle.

The loose combination of the ampoule and the needle-holder provides a guarantee that the rear end of the needle does not pierce the ampoule until the needle has reached its operative position. The ampoule and the needle with its holder and its protective cover form an assembly which is easy to handle and which may be sterilized in one operation.

What is claimed is:

An automatic hypodermic syringe comprising a syringe body with an easily pierced front end; a cover enclosing the rear end of the syringe body; an injection needle; a holder for the injection needle, the needle with its holder being arranged in the syringe body so that the easily pierced front end of the syringe body, when prepared for use, completely encloses and protects the needle; a cartridge-type ampoule with rigid side walls, with a movable rear end and with an immovable front wall having an easily pierced thin portion, said ampoule containing an injection liquid and being in its entirety within and movable in the syringe body behind the needle-holder, said needle-holder being separate from and movable relative to said ampoule but said needle-holder and said

ampoule are combined to form an assembly and are loosely secured in a position in which the needle is separated from the interior portion by the thin portion of the immovable front wall of the ampoule that is easily pierced thereby; means for piercing the pierceable front end of the syringe body with the needle before piercing the pierceable thin portion of the front wall of the ampoule; a spring and a cooperating piston rod disposed in the syringe body between the cover and the ampoule to act on the movable rear end of the ampoule; a retaining catch disposed in said cover by which the spring is held taut before it is released so as to bring about the injection, said spring, when released, causes the piston rod to exert pressure on the rear end of the ampoule and thereby forces the ampoule toward the needle holder so that the needle is brought from a prepared position into a position for injection by piercing the front end of the syringe body with the needle piercing the front wall of the ampoule only after it is in injection position so that the interior of the ampoule comes into connection with the needle and the movable rear end of the ampoule pressing so that the injection fluid is subsequently forced out through the needle, the recited elements being joined so as to form a unitary device.

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