

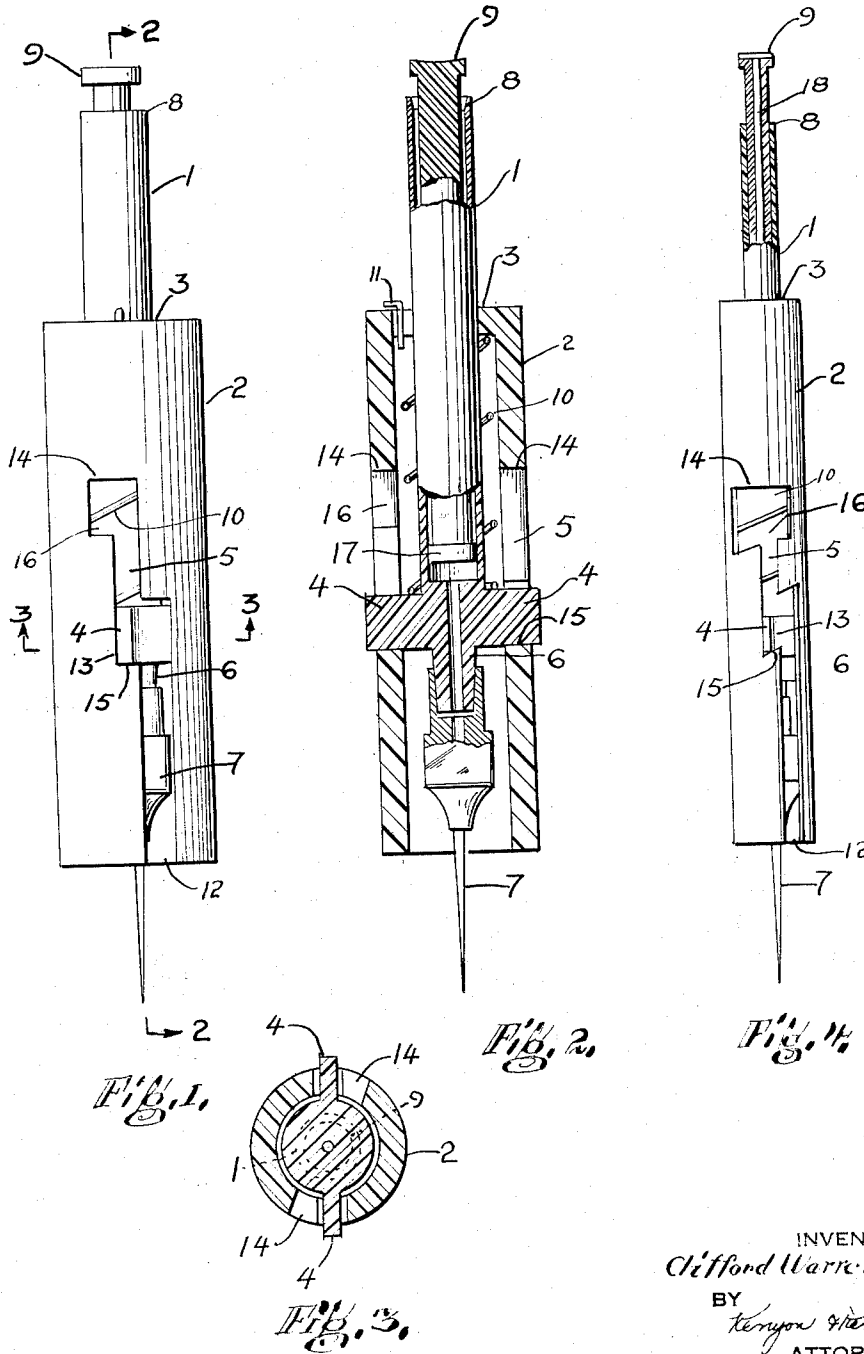
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AUTOMATIC INJECTOR HYPODERMIC SYRINGE

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AUTOMATIC INJECTOR HYPODERMIC SYRINGE

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11 Claims. (Cl. 128—218)

This invention relates to a hypodermic syringe and more particularly to a hypodermic syringe which can, in conjunction with a hypodermic needle, be used to inject the needle into the patient's body automatically. This application is a continuation-in-part of my copending U. S. patent application Serial No. 396,593, filed December 7, 1953, entitled "Automatic Injector With Detachable Syringe."

Prior to the present invention there has been a long existing need for an inexpensive hypodermic syringe which can be removably mounted in a housing and having an inexpensive means therein to automatically propel the needle (attached to the needle mounting end thereof) into the patient's body.

It is recognized that many patients, such as diabetics, wish to or must self-administer the required medications, such as insulin, by means of a hypodermic. It is also well known that a removable syringe or cartridge of medicament is desirable so that the patient can readily remove and insert a new syringe and either dispose of or refill the used syringe or cartridge. Further, the present hypodermic syringes which are adapted to provide these advantages are rather complex and likewise expensive.

It is a principal object of the present invention to provide an inexpensive syringe which can be readily removed from the apparatus which propels the syringe toward the patient's body.

It is a further object of the present invention to provide an automatic syringe and propelling means having a simple construction and which is readily and simply manufactured with a resultant low cost.

It is a further object of this invention to provide an automatic hypodermic syringe which is absolutely safe to use and easily used by anyone regardless of mechanical aptitude.

Other advantages of this invention will be apparent from reading the following detailed description which refers to the accompanying drawings, wherein:

Fig. 1 is a perspective view of an embodiment of my invention;

Fig. 2 is a cross sectional view taken on lines 2—2 of Figure 1;

Fig. 3 is a cross sectional view taken on lines 3—3 of Figure 1; and

Fig. 4 is a perspective view, partially in cross section, of another embodiment of my invention.

When the syringe barrel 1 and tubular housing 2 are assembled the barrel is located reciprocally in the housing. The upper end of the barrel 1 extends through an aperture 3 in the upper end of the housing. The barrel has one or more laterally extending portions 4 integrally attached thereto and adapted to extend laterally through a passage or passages 5 in the housing to guide the barrel in its generally longitudinal movements with respect to the housing.

The barrel 1 has a needle-mounting end 6 which is adapted to attach to the base of a removable needle 7.

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The other end of the barrel is the plunger-receiving end 8 adapted to receive a plunger 9.

In use the barrel 1 would ordinarily be filled with the medicament and sealed at both ends or with a plunger 9 and needle 7 inserted and attached to the ends respectively. To assemble the injector a helical spring 10, having an inner diameter slightly greater than the external diameter of the barrel 1 and an outer diameter less than the inner diameter of the housing, is inserted in the forward open end of the housing and may be attached at 11 to the upper end of the housing. Next the upper end of the barrel is inserted up through the lower end of the housing 2 and through the helical spring 10 until the laterally extending portions 4 thereof are adjacent the lower end of the housing. The barrel is then rotated in the housing until the portions 4 are longitudinally aligned with the lower end 12 of the passage 5. The barrel 1 is then pushed longitudinally upward with the portion or portions 4 sliding in passage or passages 5 until the portion or portions 4 are disposed adjacent the jog or jogs 13. The barrel is then rotated in the jog 13 and with a plunger and needle is now ready for use by the patient.

With the lateral portions 4 resting in the jog 13 the upper or plunger-receiving end 8 of the barrel will extend through the aperture 3 of the housing so that the patient may grasp this end to cock the syringe.

The injection procedure is very simple. The patient grasps the plunger-receiving end 8 and pulls it longitudinally upward, with relation to the housing, against the downward pressure of the spring 10. This upward movement of the barrel compresses the spring a predetermined amount depending on the length of the passage 5 above the jog 13. When the portions 4 come in contact with the end 14 of the passage 5, which is intermediate the ends of the housing, the patient may place the bottom of the housing against his arm, or other part of the body, and let go of the portion or portions 4. The spring forces the portions 4 against the lower edge 15 of the jog 13 and the needle 7 is injected into the body of the patient a distance, depending on the length of the needle, as illustrated in Figure 2.

For the convenience of the patient a second jog 16 in passage 5 may be disposed at the upper end of this passage so that the barrel can be temporarily locked in cocked position while the patient is positioning the housing with respect to his body. It will be evident that the patient, when this embodiment is used, can merely rotate the portion 4 out of the jog 16 to inject the needle when and where desired. The jog 16 may extend circumferentially in both directions from the passages as shown in Figure 4, so that a right or left handed person can easily fire or inject the needle by rotating the portions 4 out of the jog.

Once the needle is injected into the patient the plunger 9 can be pushed downwardly into the barrel to force the medicament through the needle into the patient. The forward or lower end 17 of the plunger is formed of a material that is relatively elastic and easily deformable so that the plunger will slide in the barrel easily and yet in a fluid-tight manner so that the medicament will be forced out of the barrel when the plunger is telescoped into the barrel. It may be desirable to form the lower end 17 of the plunger with an annular ring of easily deformable resilient material or, depending on the material of the plunger, to position an O-ring adjacent the lower end. The plunger may be formed of an elastic material such as rubber with an annular ring formed adjacent the forward end 17. When so constructed the plunger may tend to bend, especially during the first part of its downward movement and when an individual is attempting to inject medicament into an arm by using his free hand. A means for stiffening the plunger 9 longi-

tudinally may therefore be desirable as illustrated in Figure 4 where a central tube of relatively harder material 18 may run longitudinally through the center of the plunger to stiffen it. In ordinary use the patient will remove the needle by grasping the housing 2 and it is desirable that the portions 4 remain in the jog 13 so that the needle will be readily removed. Further referring to the embodiment shown Figure 4 the lower edge 15 of the jog 13 is inclined slightly with respect to the longitudinal axis of the housing so that the portions 4 must be moved up a slight positive incline to remove the barrel from housing. It has been found that without this slight incline there is some tendency for the portions 4 to jump through the jog 13 when the injector is fired with the result that the portions 4 are not disposed in the jog 13 when the patient attempts to remove the needle from his body.

In using this syringe there is one further step in the procedure that has not been set forth. In almost all instances after the needle has been injected into the patient it is essential that the patient pull the plunger 9 out of the barrel 1 slightly to determine whether or not the needle has entered a blood vein or artery (if this has happened a slight amount of blood will be drawn into the barrel). In order to perform this essential step a portion of the needle-mounting end 6 of the barrel must be visible to the patient while the needle remains in injected position. The injector described herein provides such visual access through the passage 5 if the barrel is formed of an opaque material such as aluminum or a ferrous material. If a wider range of visual access is desired the housing may be formed of substantially transparent material such as a transparent plastic material.

It will be seen that due to the simplicity of this injector the barrel, the housing and the plunger (fitted with an O-ring) may be molded, by well known methods, from plastic or resinous material as long as the material chosen is relatively shock resistant and when desired transparent. It will be readily appreciated that each of these parts will be very inexpensive to mold with a resultant saving in labor and that the barrel portion or all of the parts may well be disposed of rather than reused. As compared to the cost of the medicaments that are most likely to be used in this type of injector the parts as described, when molded from plastic materials, are a very small percentage of the total cost of the injector and the medicament. The advantages of having a removable and disposable barrel portion will be obvious and depending on the material used to form the barrel and plunger it may be advantageous to the user to dispose of these also.

It has been determined that the automatic injector described and illustrated is a very inexpensive and feasible injector that can be easily used to self-administer medicaments, such as insulin. There has been a long felt want for a simple, inexpensive and workable automatic injector which is fulfilled by the injector described herein.

I claim:

1. An automatic injection hypodermic syringe device including a syringe barrel having a laterally extending portion and having needle-mounting and plunger-receiving ends, a tubular housing within which said barrel is reciprocally located, said housing having ends and an inside diameter greater than the outside diameter of said barrel but less than the lateral dimension of said barrel plus said laterally extending portion and a passage being formed in said housing so as to slidably pass said laterally extending portion, said passage extending longitudinally with respect to said housing from one of said housing's ends to a location spaced between both of said housing's ends so that said syringe is removable through this first-named one of said housing's ends and said passage having at least one jog portion extending substantially circumferentially with respect to said housing and said barrel being rotative within said housing

so that said laterally extending portion may pass through said jog portion, and a spring located between the inside of said housing and the outside of said barrel and urging said barrel to move in the direction of its said needle-mounting end towards said jog portion of said passage, the relative lengths of said housing and its said passage and said barrel being proportioned so that a portion of said barrel adjacent to the latter's plunger-receiving end projects through and beyond the relatively adjacent one of said housing's ends when said barrel's laterally extending portion is located within said passage's jog portion.

2. An automatic injection hypodermic syringe device including a syringe barrel having a laterally extending portion and having needle-mounting and plunger-receiving ends, a tubular housing within which said barrel is reciprocally located, said housing having ends and an inside diameter greater than the outside diameter of said barrel but less than the lateral dimension of said barrel plus said laterally extending portion and a passage being formed in said housing so as to slidably pass said laterally extending portion, said passage extending longitudinally with respect to said housing from one of said housing's ends to a location spaced between both of said housing's ends so that said syringe is removable through this first-named one of said housing's ends and said passage having at least one jog portion extending substantially circumferentially with respect to said housing and said barrel being rotative within said housing so that said laterally extending portion may pass through said jog portion, and a spring located between the inside of said housing and the outside of said barrel and urging said barrel to move in the direction of its said needle-mounting end towards said jog portion of said passage, the relative lengths of said housing and its said passage and said barrel being proportioned so that a portion of said barrel adjacent to the latter's plunger-receiving end projects through and beyond the relatively adjacent one of said housing's ends when said barrel's laterally extending portion is located within said passage's jog portion, said barrel and said laterally extending portion being formed integrally from shock-resistant transparent material and said housing being constructed so as to make visible at least the portion of said barrel adjacent to said barrel's needle-mounting end.

3. An automatic injection hypodermic syringe device including a syringe barrel having a laterally extending portion and having needle-mounting and plunger-receiving ends, a tubular housing within which said barrel is reciprocally located, said housing having ends and an inside diameter greater than the outside diameter of said barrel but less than the lateral dimension of said barrel plus said laterally extending portion and a passage being formed in said housing so as to slidably pass said laterally extending portion, said passage extending longitudinally with respect to said housing from one of said housing's ends to a location spaced between both of said housing's ends so that said syringe is removable through this first-named one of said housing's ends and said passage having at least one jog portion extending substantially circumferentially with respect to said housing and said barrel being rotative within said housing so that said laterally extending portion may pass through said jog portion, and a spring located between the inside of said housing and the outside of said barrel and urging said barrel to move in the direction of its said needle-mounting end towards said jog portion of said passage, the relative lengths of said housing and its said passage and said barrel being proportioned so that a portion of said barrel adjacent to the latter's plunger-receiving end projects through and beyond the relatively adjacent one of said housing's ends when said barrel's laterally extending portion is located within said passage's jog portion, said barrel and said laterally extending portion being formed integrally from shock-resistant transparent material and said housing

being constructed integrally from shock-resistant transparent material.

4. An automatic injection hypodermic syringe device including a syringe barrel having a laterally extending portion and having needle-mounting and plunger-receiving ends, a tubular housing within which said barrel is reciprocatively located, said housing having ends and an inside diameter greater than the outside diameter of said barrel but less than the lateral dimension of said barrel plus said laterally extending portion and a passage being formed in said housing so as to slidably pass said laterally extending portion, said passage extending longitudinally with respect to said housing from one of said housing's ends to a location spaced between both of said housing's ends so that said syringe is removable through this first-named one of said housing's ends and said passage having at least one jog portion extending substantially circumferentially with respect to said housing and said barrel being rotative within said housing so that said laterally extending portion may pass through said jog portion, and a spring located between the inside of said housing and the outside of said barrel and urging said barrel to move in the direction of its said needle-mounting end towards said jog portion of said passage, the relative lengths of said housing and its said passage and said barrel being proportioned so that a portion of said barrel adjacent to the latter's plunger-receiving end projects through and beyond the relatively adjacent one of said housing's ends when said barrel's laterally extending portion is located within said passage's jog portion, said barrel and said laterally extending portion being formed integrally from shock-resistant transparent material and said housing being constructed so as to make visible at least the portion of said barrel adjacent to said barrel's needle-mounting end, and a plunger slidably located in said barrel and extending from said barrel's plunger-receiving end, said plunger having a forward end made of material of relatively easy elastic deformability and which slides in said barrel in a fluidtight manner.

5. An automatic injection hypodermic syringe device including a syringe barrel having a laterally extending portion and having needle-mounting and plunger-receiving ends, a tubular housing within which said barrel is reciprocatively located, said housing having ends and an inside diameter greater than the outside diameter of said barrel but less than the lateral dimension of said barrel plus said laterally extending portion and a passage being formed in said housing so as to slidably pass said laterally extending portion, said passage extending longitudinally with respect to said housing from one of said housing's ends to a location spaced between both of said housing's ends so that said syringe is removable through this first-named one of said housing's ends and said passage having at least one jog portion extending substantially circumferentially with respect to said housing and said barrel being rotative within said housing so that said laterally extending portion may pass through said jog portion, and a spring located between the inside of said housing and the outside of said barrel and urging said barrel to move in the direction of its said needle-mounting ends towards said jog portion of said passage, the relative lengths of said housing and its said passage and said barrel being proportioned so that a portion of said barrel adjacent to the latter's plunger-receiving end projects through and beyond the relatively adjacent one of said housing's ends when said barrel's laterally extending portion is located within said passage's jog portion, said barrel and said laterally extending portion being formed integrally from shock-resistant transparent material and said housing being constructed so as to make visible at least the portion of said barrel adjacent to said barrel's needle-mounting end, and a plunger slidably located in said barrel and extending from said barrel's plunger-receiving end, said plunger having a forward end made of material of relatively easy elastic deformability and which slides in said barrel in a fluid-tight manner, said

plunger having means for stiffening it longitudinally against deflection when receiving thrusting force.

6. An automatic injection hypodermic syringe device comprising an integral molding of plastic forming a solid base having laterally extending projections and a needle-mounting forward end and a duct formed longitudinally through said base and a cylinder extending rearwardly from said base and having an open plunger-receiving rear end, a tubular housing within which said molding is reciprocatively located and said housing having ends and an inside diameter which is greater than the outside diameter of said molding's cylinder but less than the lateral dimension of said base plus said projections and said housing having passages formed therein so as to slidably pass said projections and said passages extending longitudinally from one of said housing's ends to a location spaced between both of said ends so that said molding is removable through this first-named one of said ends and said passage having laterally registered jog portions extending substantially circumferentially with respect to said housing and said molding being rotative therewithin so that said projections may pass through said jog portions, and a spring located between the inside of said housing and the outside of said molding's cylinder and urging said molding to move forwardly towards said passages' jog portions, the relative lengths of said molding's cylinder and said housing being proportioned so that a portion of said cylinder projects through and beyond the relatively adjacent one of said housing's ends when said molding's projections are located within said passages' jog portions.

7. An automatic injection hypodermic syringe device comprising an integral molding of plastic forming a solid base having laterally extending projections and a needle-mounting forward end and a duct formed longitudinally through said base and a cylinder extending rearwardly from said base and having an open plunger-receiving rear end, a tubular housing within which said molding is reciprocatively located and said housing having ends and an inside diameter which is greater than the outside diameter of said molding's cylinder but less than the lateral dimension of said base plus said projections and said housing having passages formed therein so as to slidably pass said projections and said passages extending longitudinally from one of said housing's ends to a location spaced between both of said ends so that said molding is removable through this first-named one of said ends and said passage having laterally registered jog portions extending substantially circumferentially with respect to said housing and said molding being rotative therewithin so that said projections may pass through said jog portions, and a spring located between the inside of said housing and the outside of said molding's cylinder and urging said molding to move forwardly towards said passages' jog portions, the relative lengths of said molding's cylinder and said housing being proportioned so that a portion of said cylinder projects through and beyond the relatively adjacent one of said housing's ends when said molding's projections are located within said passages' jog portions, said passages terminating with jog portions into which said projections may be turned to cock said molding against the force of said spring and released therefrom, said molding's solid base and projections sustaining the shock when said projections are halted by the first-named jog portions.

8. An automatic injection hypodermic syringe device comprising an integral molding of plastic forming a solid base having laterally extending projections and a needle-mounting forward end and a duct formed longitudinally through said base and a cylinder extending rearwardly from said base and having an open plunger-receiving rear end, a tubular housing within which said molding is reciprocatively located and said housing having ends and an inside diameter which is greater than the outside diameter of said molding's cylinder but less than the lateral dimension of said base plus said projections and said housing having passages formed therein so as to slidably pass said

projections and said passages extending longitudinally from one of said housing's ends to a location spaced between both of said ends so that said molding is removable through this first-named one of said ends and said passage having laterally registered jog portions extending substantially circumferentially with respect to said housing and said molding being rotative therewithin so that said projections may pass through said jog portions, and a spring located between the inside of said housing and the outside of said molding's cylinder and urging said molding to move forwardly towards said passages' jog portions, the relative lengths of said molding's cylinder and said housing being proportioned so that a portion of said cylinder projects through and beyond the relatively adjacent one of said housing's ends when said molding's projections are located within said passages' jog portions, said passages terminating with jog portions into which said projections may be turned to cock said molding against the force of said spring and released therefrom, said molding's solid base and projections sustaining the shock when said projections are halted by the first-named jog portions, said housing comprising an integral plastic molding, and a plunger inserted in said cylinder through its plunger-receiving end and having an elastically deformable surface conforming to the inside of said cylinder and slidably sealing therewith.

9. An automatic injection hypodermic syringe comprising a syringe barrel having an integral laterally extending projection and an extrusion plunger, a tubular housing within which said barrel is reciprocally located and having a passage for said laterally extending portion, said passage having a jog portion located so as to form a positive stop for said laterally extending portion and permitting passage thereof when said barrel and housing are turned relative to each other, so that these parts may be separated, and a spring located in said housing for driving said barrel towards said passage's jog portion.

10. An automatic injection hypodermic syringe comprising a syringe barrel having an integral laterally extending projection and an extrusion plunger, a tubular housing within which said barrel is reciprocally located and having a passage for said laterally extending portion, said passage having a jog portion located so as to form a positive stop for said laterally extending portion and permitting passage thereof when said barrel and housing are turned relative to each other, so that these parts may be separated, and a spring located in said housing for driving said barrel towards said passage's jog portion, said passage being formed with a second jog portion spaced from the first jog portion and located to cock said barrel against the force of said spring in a releasable manner when said barrel and housing are turned relative to each other.

11. An automatic injection hypodermic syringe device comprising an integral molding of plastic forming a solid base having laterally extending projections and a needle-mounting forward end and a duct formed longitudinally through said base and a cylinder extending rearwardly from said base and having an open plunger-receiving rear end, a tubular housing within which said molding is reciprocally located and said housing having ends and an inside diameter which is greater than the outside diameter of said molding's cylinder but less than the lateral dimension of said base plus said projections and said housing having passages formed therein so as to slidably pass said projections and said passages extending longitudinally from one of said housing's ends to a location spaced between both of said ends so that said molding is removable through this first-named one of said ends and said passage having laterally registered jog portions extending substantially circumferentially with respect to said housing and said molding being rotative therewithin so that said projections may pass through said jog portions; said jog portions extending at a slight incline with respect to the longitudinal axis of said housing to define a slight positive incline when said projections are passed through said jog portions in the removal direction, and a spring located between the inside of said housing and the outside of said molding's cylinder and urging said molding to move forwardly towards said passages' jog portions, the relative lengths of said molding's cylinder and said housing being proportioned so that a portion of said cylinder projects through and beyond the relatively adjacent one of said housing's ends when said molding's projections are located within said passages' jog portions, said passages terminating with jog portions into which said projections may be turned to cock said molding against the force of said spring and released therefrom, said molding's solid base and projections sustaining the shock when said projections are halted by the first-named jog portions, said housing comprising an integral plastic molding, and a plunger inserted in said cylinder through its plunger-receiving end and having an elastically deformable surface conforming to the inside of said cylinder and slidably sealing therewith.

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