

[54] **MULTIPLE DOSE INJECTION PEN**  
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 [73] **Assignee:** Eli Lilly and Company, Indianapolis, Ind.  
 [21] **Appl. No.:** 960,314  
 [22] **Filed:** Oct. 13, 1992

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**Related U.S. Application Data**

[63] Continuation of Ser. No. 361,132, Jun. 5, 1989, abandoned.  
 [51] **Int. Cl.<sup>5</sup>** ..... **A61M 5/00**  
 [52] **U.S. Cl.** ..... **604/208; 604/211; 604/218**  
 [58] **Field of Search** ..... **604/192, 193, 201, 203, 604/207-211, 218, 224, 246**

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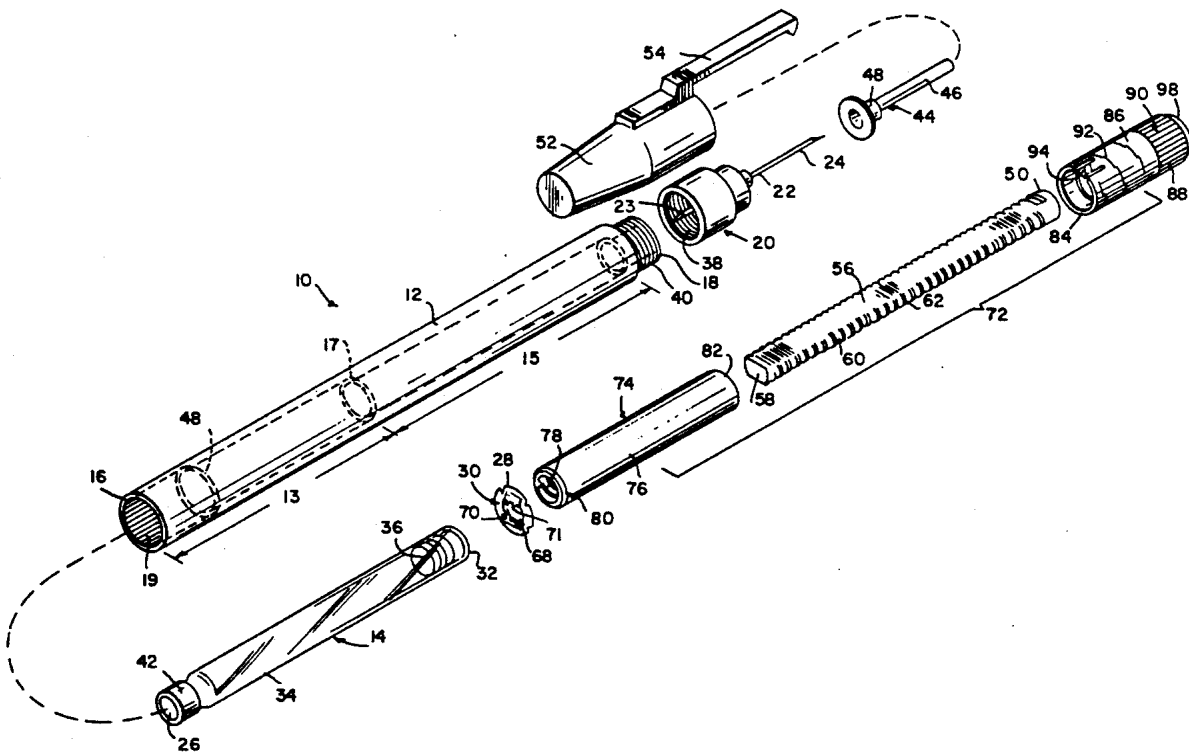
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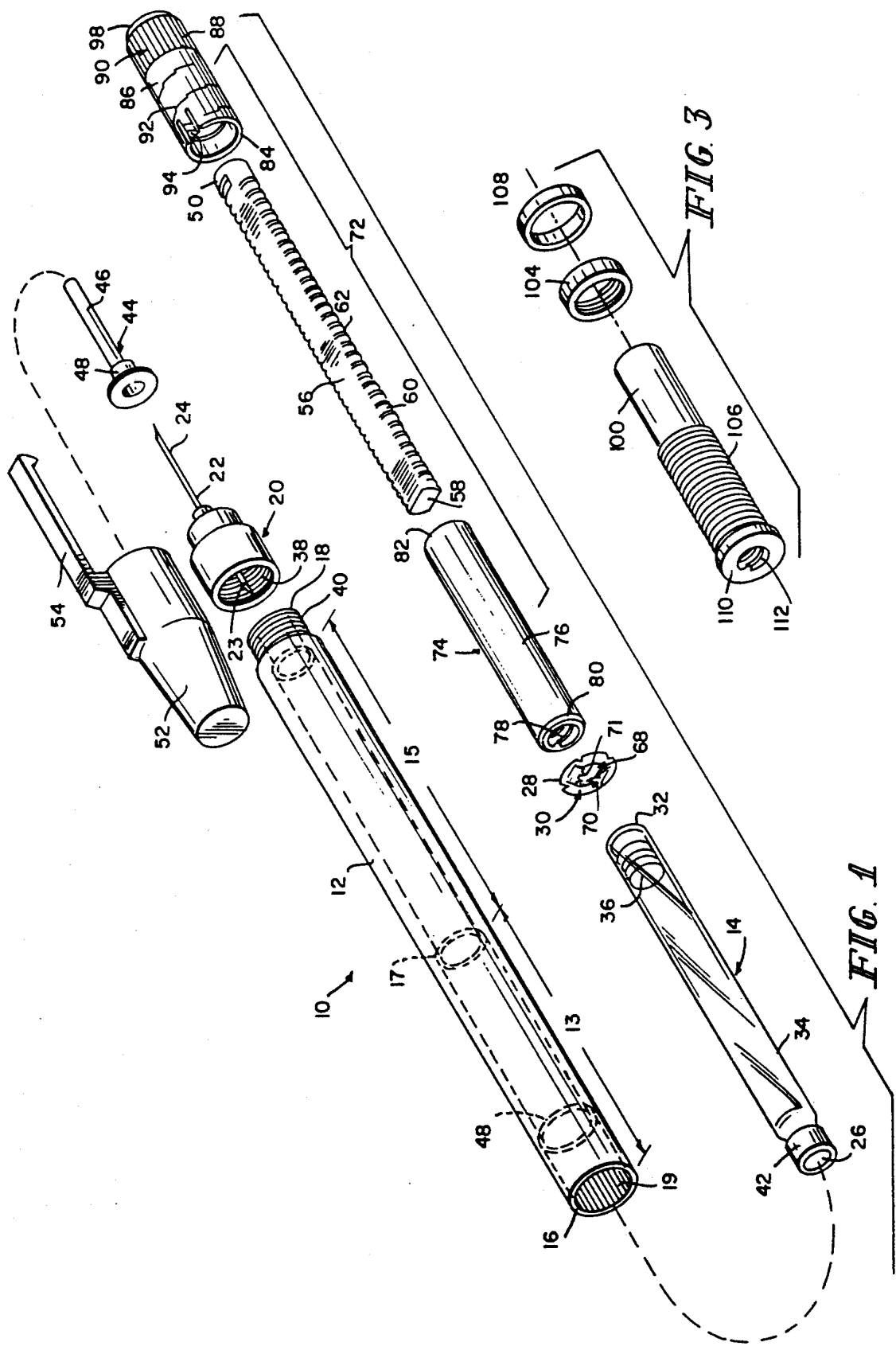
*Primary Examiner*—Michael H. Thaler  
*Assistant Examiner*—C. Maglione  
*Attorney, Agent, or Firm*—Douglas J. Taylor; Leroy Whitaker

[57] **ABSTRACT**

The present invention relates to a hypodermic syringe having the same general appearance as a pen which is specifically adapted to provide for multiple measured injections of materials such as insulin or human growth hormone.

**17 Claims, 3 Drawing Sheets**





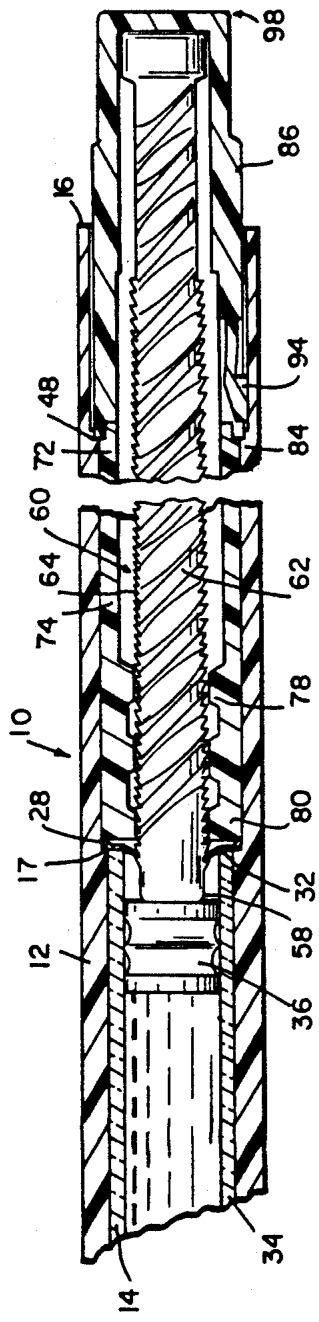


FIG. 2

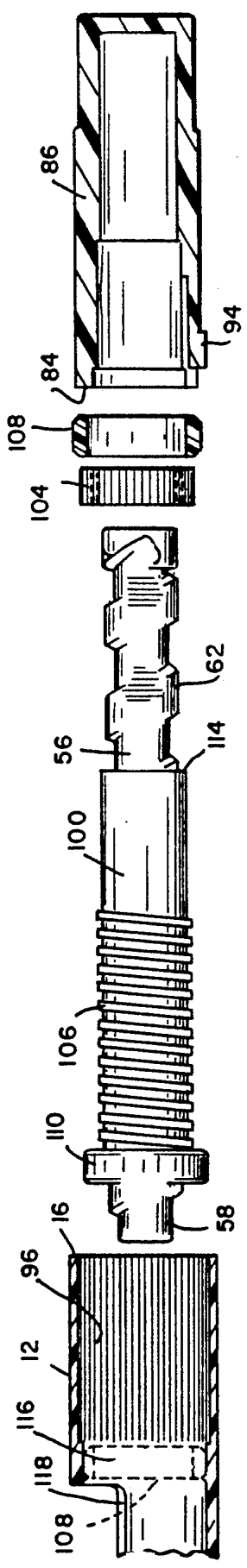


FIG. 4

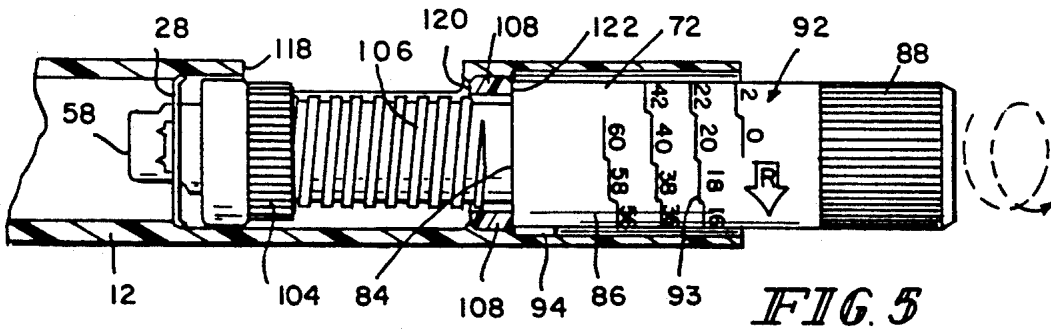


FIG. 5

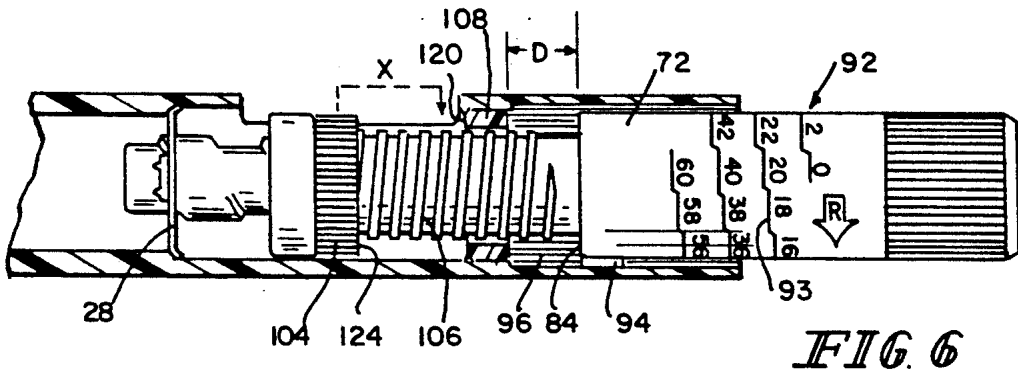


FIG. 6

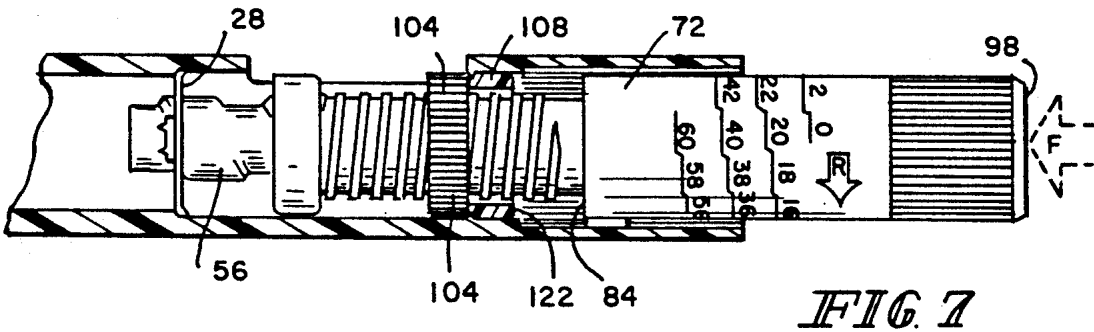


FIG. 7

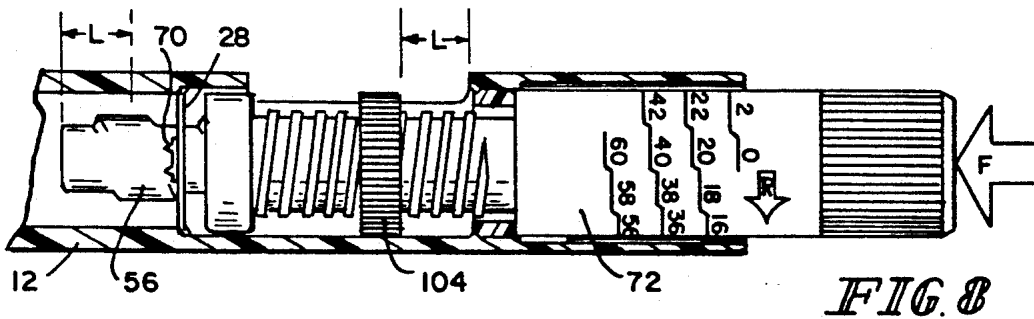


FIG. 8

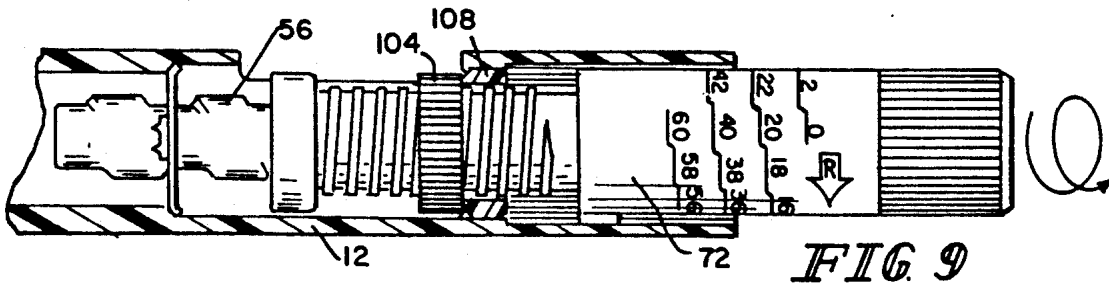


FIG. 9

## MULTIPLE DOSE INJECTION PEN

The present application is a continuation application of copending application Ser. No. 07/361,132, filed Jun. 5, 1989, now abandoned.

### BACKGROUND OF THE INVENTION

The present invention relates generally to devices suitable for use in dispensing a measured amount of liquid material from a container. The invention particularly relates to a hypodermic syringe having the same general appearance as a pen which is specifically adapted to provide for multiple measured injections of materials such as insulin or human growth hormone.

Diabetics and others frequently find themselves in situations where the assistance of a health professional to administer the subcutaneous or intramuscular injection of measured amount of a liquid agent is generally not available. In such situations such persons need to have a low cost syringe which does not require the assistance of a health professional to achieve the desired measure of accuracy. It is often the case that such persons require more than one dose per day, each dose being of a somewhat different volume. Dispensers of this general type are known which have the general appearance of a pen or mechanical pencil. The dispenser is typically large enough to hold several such doses, yet it is small enough to fit conveniently in one's pocket or purse. Examples of such devices are to be found in U.S. Pat. Nos. 4,413,760; 4,498,904; and 4,592,745. Additional examples are shown in PCT International Publications WO 87/02895 and WO 88/07874.

In devices of this class, a container of the liquid is provided having a closed first end adapted to be penetrated by a needle assembly so as to permit the liquid in the container to pass out the closed first end for subcutaneous or intramuscular injection. The second end of the container is generally closed by a piston. To prevent tampering or reuse of the liquid container, the piston is generally designed such that a pushing force can be applied to the piston to reduce the liquid-holding volume of the container, but no feature is presented which would be suitable for pulling on the piston so as to enlarge the liquid-holding volume of the container.

An elongated member in the nature of a plunger rod is received within the housing for exerting a force on the piston closing the second end of the container. A means is provided for measuring the distance which the plunger rod travels to determine the decrease in volume of the liquid container which causes the dispensing of the liquid within the container. It has generally been recognized that the dispenser should have some feature which would allow the rod to only travel in a single direction toward the piston thereby preventing any action on the part of the rod which might permit an enhancement of the volume of the liquid container. A safety cover is generally provided over a needle assembly attached to the closed end of the container.

While the prior art pen-style syringes have met with some success, certain shortcomings have also been observed. In some prior art pens, the adjustment of the dose to be injected, once made, cannot be accurately diminished to a smaller value. This results in an unnecessary waste of the medicating liquid within the syringe. In some prior art pens, the indication of dose is difficult to read. Prior art pens have sometimes required the patient to read two scales and/or to do some computa-

tions in order to determine the dosage delivered. Further, most prior art devices are specifically intended for repeated use generally by substitution of containers within the syringe which can contribute to the unethical use of the syringe in connection with non-prescribed substances.

### SUMMARY OF THE INVENTION

In order to overcome these and other shortcomings of the prior art, a syringe constructed in accordance with the present invention includes a housing for holding a container of liquid similar to that known in the prior art. A plunger rod is received within the housing for exerting a force on a piston closing a second end of the container. The plunger rod has a non-cylindrical cross-section with a first surface including threads and a second surface which can, optionally, include a line of ratchet teeth. A collar is received within the housing adjacent to the container second end for permanently retaining the container of liquid within the housing. The collar has a non-cylindrical opening corresponding generally to the cross-section of the plunger rod. The plunger rod passes through the non-cylindrical opening and is prevented from rotating with respect to the housing by the collar. A means on the collar engages the second surface of the plunger rod for restricting movement of the plunger rod away from the container of liquid.

A hollow cap envelops the plunger rod end opposite the container of liquid. A skirt of the hollow cap extends inside the housing. The cap includes a threaded interior surface which movably engages the plunger rod for calibrated adjustment relative thereto. The calibrated adjustment permits one to both increase and decrease the amount of liquid sought to be injected from the pen. A stop is provided within the housing and a distal facing surface is provided on the hollow cap for contacting the stop upon linear movement of the cap and plunger rod as a unit toward the container to dispense liquid therefrom.

The apparatus as a whole is constructed from inexpensive materials and is adapted for machine assembly which contributes directly to a very low manufacturing cost thereby permitting the apparatus as a whole to be disposable. As indicated previously, the adjustment of the dose can be increased and decreased thereby diminishing any waste of the medicating liquid. The dose indication feature is simply and directly read thereby providing for a more accurate and cost effective use of the medicating liquid dispensed from the apparatus. Additional features and advantages will become apparent to those skilled in the art from the following detailed discussion of preferred embodiments exemplifying the best mode of carrying out the invention as presently perceived. The detailed description particularly refers to the accompanying figures.

### BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is an exploded perspective view of one embodiment of a syringe in accordance with the present invention.

FIG. 2 is a sectional detail view of the syringe shown in FIG. 1 showing the dosage adjustment features.

FIG. 3 is an exploded perspective view of an alternative embodiment for a portion of the hollow cap including a maximum dosage restriction feature.

FIG. 4 is an elevation view of the alternative embodiment shown in FIG. 3 partially assembled.

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