

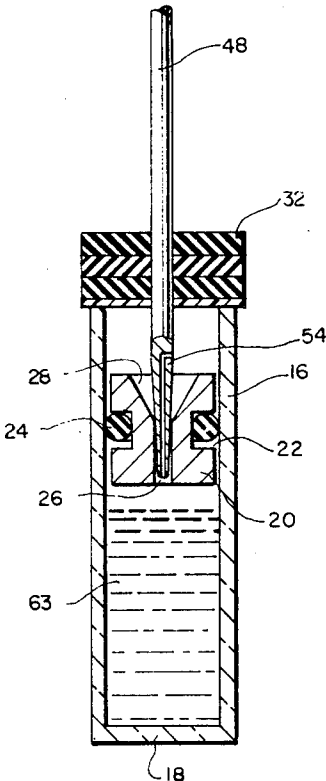
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[54] **INJECTOR FILLING APPARATUS**
5 Claims, 4 Drawing Figs.

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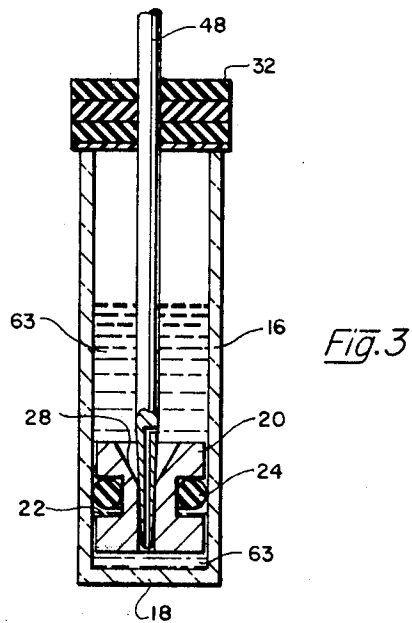
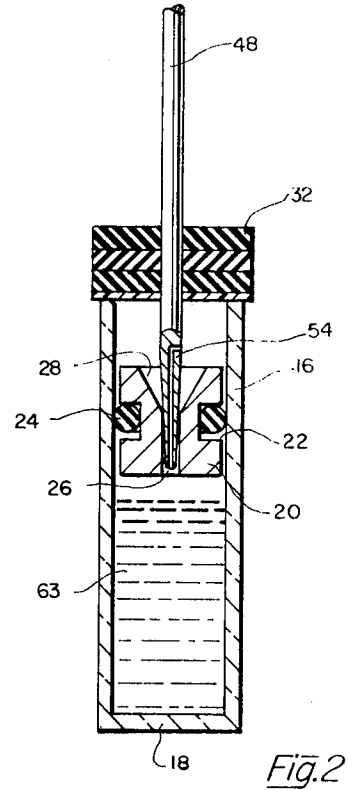
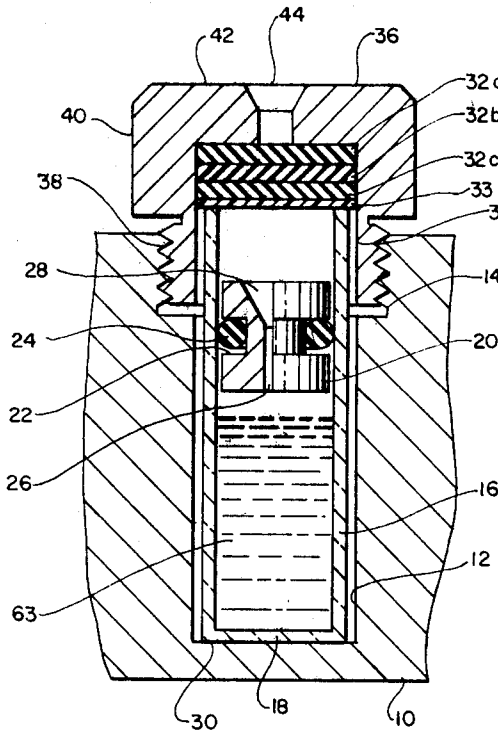
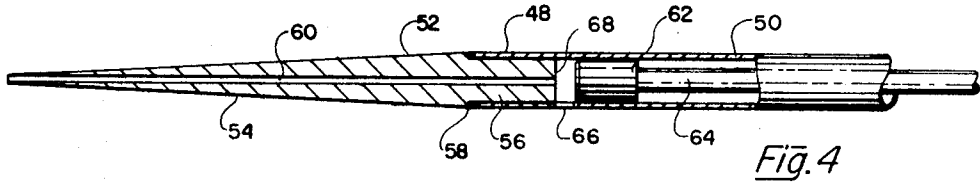
[56] References Cited			
UNITED STATES PATENTS			
2,517,551	8/1950	Eckman	141/357 X
2,601,169	6/1952	Purvis.....	141/357 X
3,067,783	12/1962	Berland	141/27
3,118,306	1/1964	Sanz	73/425.4 (P)
3,141,336	7/1964	Oates	73/425.4 (P)
3,401,692	9/1968	Harris, Jr.....	141/330 X
3,479,880	11/1969	Mutter et al.	73/422 (GC)
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ABSTRACT: Apparatus for filling at least the needles of injector devices or syringes by pressure. A vial having a fluid sample therein has means for putting the sample under substantial pressure for forcing same into an injection device.



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INJECTOR FILLING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to the art of chromatography and relates more particularly to apparatus or means for filling injectors or syringes used for injecting samples in chromatographs and the like.

2. Description of the Prior Art

Heretofore syringes used in chromatography and the like have been filled by vacuum created by retracting the plungers of such syringes.

When filling a syringe by retracting the plunger to create a vacuum, only the pressure difference between atmospheric pressure and the lower pressure within the syringe created by retracting the plunger is available to force such fluid into the syringe. Such differential of pressure is not always sufficient to charge the syringe. For example, should it be desired to charge a syringe with a viscous sample it is practically impossible to draw such viscous sample into the syringe by the vacuum method. However, by applying large pressures to the liquid relative to the syringe space, viscous samples may be forced readily into the syringe.

Another problem often occurs when samples are run and there is not enough time to collect and run them all in one day. With the present invention when samples cannot be run one day, they may be kept under seal without evaporation and run at a later time.

BRIEF SUMMARY OF THE INVENTION

The present invention comprises a vial for a fluid sample to be tested. The upper end of the vial is closed by a septum, diaphragm or seal which when a needle is pushed through it will seal itself when the needle is withdrawn.

When an injection device or syringe is to be charged, the needle thereof is inserted into the vial, through the septum, into the fluid sample, and pressure applied to the sample for forced charging of the injector or syringe with the sample.

OBJECTS AND ADVANTAGES OF THE INVENTION

It is therefore an object of the invention to provide means or apparatus for charging by relatively high-pressure injectors or syringes with fluid samples to be tested.

It is another object of the invention to provide apparatus of this character having containers, such as vials, for the samples to be tested wherein such samples may be kept without impairment or evaporation.

Still another object of the invention is to provide means which will prevent fractionation of samples during storage where such samples have parts or elements of different volatility.

A further object of the invention is to provide apparatus of this character wherein the exterior surface of the needle is wiped off when the syringe has been charged and the needle is withdrawn from the vial or container.

A still further object of the invention is to provide apparatus of this character wherein the vial is provided with a plunger for providing the filling pressure and with certain types of needles said needles are flushed, the flushing fluid being isolated above the plunger.

The characteristics and advantages of the invention are further sufficiently referred to in connection with the following detailed description of the accompanying drawings which represent certain embodiments. After considering these examples, skilled persons will understand that many variations may be made without departing from the principles disclosed and I contemplate the employment of any structures, arrangements or modes of operation that are properly within the scope of the appended claims.

Referring to the drawings, which are for illustrative purposes only:

FIG. 1 is a longitudinal sectional view of apparatus embodying the present invention;

FIG. 2 is a reduced longitudinal sectional view of the same, showing a syringe needle, partly in section, inserted into the plunger of the apparatus and before pressure is applied to the plunger by means of the needle;

FIG. 3 is a view similar to FIG. 2 but showing the plunger after it has been forced downwardly in the vial, flushing fluid being isolated above the plunger; and

FIG. 4 is an enlarged longitudinal section of the injector or injection device shown in FIGS. 2 and 3.

Referring more particularly to FIG. 1, there is shown a housing, indicated generally at 10, having a recess therein, comprising a bore 12 with an enlarged tapered, upper end portion 14. A sample container which is termed herein a vial is indicated at 16 and is of any suitable material, such as glass for example. The vial is cylindrical and is removably disposed in the bore 12, the lower end of the vial is closed by a bottom wall 18, the upper end of said vial being open. While only one vial is shown herein it is to be understood that the housing may have provision for a plurality of vials or separate housings may be used for the vials.

Within the vial is a cylindrical plunger or piston, indicated generally at 20, of any suitable material, such as stainless steel for example, that is unaffected by the sample. The plunger is of somewhat smaller outside diameter than the inside diameter of the vial and said plunger has an external annular groove 22 therein for reception of an O-ring 24 of suitable material such as neoprene or Teflon for example, the O-ring providing a sliding seal between the plunger and the cylindrical wall of the vial.

There is a longitudinally extending axial bore 26 through the plunger 20 which includes a flaring upper end portion 28. Otherwise stated, the upper end portion 28 tapers downwardly and inwardly from the upper end of the plunger.

The bottom 18 of the vial 16 rests on the bottom 30 of the bore 12 and the upper end of said vial is closed by a septum, indicated generally at 32 which is disposed in the upper end of a bore 34 of a cap, indicated generally at 36. Cap 36 has an externally threaded body 38 screwed into the threaded portion 14 of the recess in the housing 10. At the upper end of the body 38 of the cap 36 there is an enlarged head 40 having an outer end wall 42 with an axial opening 44 therethrough which tapers inwardly and downwardly from the top surface of said outer end wall 42.

Septum 32 may be of any suitable character and material. As shown, said septum has three layers 32a, 32b and 32c of rubber and a layer 33 of "Teflon," the latter being at the bottom and exposed to the interior of the vial. An example of this septum is the septum disclosed in the McGuckin application for a SEALING ELEMENT, filed Apr. 25, 1966, Ser. No. 544,950, now U.S. Pat. No. 3,463,339 issued Aug. 26, 1969. "Teflon" is the trademark of the Du Pont Company for their fluorocarbon resins. The advantage of having the "Teflon" facing the contents of the vial is that the "Teflon" is chemically inert and thus the septum presents a chemically inert surface to the contents of the vial and thereby keeps said contents free from contamination.

The above described arrangement, shown in FIGS. 1 to 3, is used to charge an injector or injection device, indicated generally at 48.

The injector 48 is shown enlarged in FIG. 4, and comprises a tubular barrel 50 that is cylindrical and is of suitable material such as stainless steel for example. A tip, indicated generally at 52, is attached to the forward end of the barrel, said tip having a forward end portion 54 which tapers toward the front end and a rear end portion 56 that is cylindrical and is disposed in a forward end portion of the barrel and is secured therein by a suitable well-known adhesive such as, for example, an epoxy cement. The portion 56 is of reduced diameter relative to the rear end of the tapered portion 54 thereby providing a shoulder 58 against which the forward end of the barrel abuts. A passage 60 extends longitudinally throughout the length of the tip.

Slidable within the barrel is a plunger head 62 carried at the forward end of a plunger rod 64 which is longitudinally slidable within the barrel. The plunger head 62 may be of any suitable material such as neoprene, "Teflon" or other plastic. The plunger rod is of stainless steel or other suitable material and is provided with a suitable head, not shown, to facilitate actuation thereof.

Adjacent the inner end of the rear part 56 of the tip the barrel has a side opening or port 66 that is adapted to be closed by the plunger head 62 when at its forward limit of movement whereat it is in abutment with the rear end 68 of said rear part 56. When the plunger head 62 is retracted the port 66 is open.

When it is desired to charge the injector 48 with a fluid sample 63 which is disposed in the vial below the plunger 20 the tip 52 of the injector is forced through the septum 32, it being understood that the injector plunger 62 is in a retracted position so that the side port 66 is uncovered and open. The tip is inserted further through the septum and into the flared portion 28 of the bore 26 in the vial plunger or piston 20, the tip entering into said bore 26 a sufficient distance to sealingly engage the bore, as for example at the junction of the lower portion of said bore 26 and the flared portion 28 thereof. The parts of the apparatus are then positioned as shown in FIG. 2.

Further forcing the injector downwardly moves the vial plunger 20 downwardly. The sample below the vial plunger 20 is thereby forced upwardly into the passage 60 of the injector tip 52, into the barrel and out through the port 66 into the space in the vial above the vial plunger 20.

Thus the injector is flushed to remove therefrom any sample fluid that may have been retained in the injector from a previous sample. In this way the needle becomes essentially free from former samples and cross-contamination of different samples is eliminated.

When the injector has been flushed and filled with only the fresh sample to be tested the injector plunger 62 is moved into engagement with the inner end 68 of the tip portion 56 thereby closing the port 66. The needle or tip 52 is then removed from the vial and as it is removed, sample fluid that may be present on the exterior thereof is wiped therefrom by the septum.

It is to be understood that a septum may be used that does not have the "Teflon" layer 32d but when some chemicals are to be tested and placed in a vial it is necessary to use a septum with such a layer or a comparable layer.

Should it be desired to keep samples for a period of time, say overnight or the like, the septum prevents the sample or the more volatile fractions thereof from evaporating.

I claim:

1. Injector filling apparatus comprising:

- A. a nondeformable container for a fluid sample, said container being closed at one end and open at the other end;
- B. a self-sealing septum positioned for sealing the open end of the container and adaptable to have injector needle means insertable therethrough;
- C. and piston means in said container having a bore therethrough adaptable to receive the injector needle means therein and whereby downward movement thereof places a fluid sample in the container under hydraulic pressure and charges the injector needle means with at least a portion of the sample.

2. Injector filling apparatus, comprising:

A. a container for a fluid sample, said container being closed at one end and open at the other;

B. pierceable seal covering the open end of the container;

C. pressurizing means for putting a fluid sample in the container under pressure for charging an injector with at least a portion of the sample, said pressurizing means comprising a container plunger having a bore extending longitudinally therethrough;

D. a cap for retaining the seal sealingly on the open end of the container, said cap having an outer end wall with an axial bore therethrough flaring upwardly, the bore through the container plunger being axially arranged so that the bore in the cap is in axial alignment with the bore in said container plunger.

3. The invention defined by claim 2, including a housing having a recess therein for reception of the container, said recess being open at one end, said recess having a tapped portion at the open end, said cap having an externally threaded body threadably disposed in said tapped portion of the recess, there being an enlarged head at the outer end of said body.

4. Injector filling apparatus comprising:

A. an injector needle means;

B. a cylindrical container for a fluid sample, said container being closed at one end and open at the other end;

C. a pierceable seal for covering the open end of the container;

D. pressurizing means for putting a fluid sample in the container under pressure for charging said injector needle means with at least a portion of the sample, said pressurizing means comprising a cylindrical container plunger operably movable longitudinally in said container, said plunger having a bore extending longitudinally therethrough for reception of a filling end of the injector needle means insertable through the seal and received into the bore through the plunger and engageable with a part of said container plunger whereby said plunger may be moved longitudinally toward the closed end of said container to create injector filling pressure on sample fluid in the container below the plunger.

5. Injector filling apparatus comprising:

A. a cylindrical container for a fluid sample, said container being closed at one end and open at the other end;

B. a pierceable seal for covering the open end of the container;

C. a container plunger positioned within said container for putting a fluid sample in the container under pressure for charging an injector with at least a portion of the sample, said plunger having an axial bore with its upper end flaring inwardly to receive the injector therein, said plunger further having an external annular groove therein;

D. a housing having a recess therein for the container, said recess having an open end with an enlarged tapped portion at said open end;

E. a cap having an externally threaded body threadably received in said tapped portion of the housing recess, said body having a bore extending from the inner end, the seal for the open end of the container being disposed in the bore in said body, and an enlarged head at the outer end of said body, said head having an outer end wall with an outwardly flaring opening therethrough aligned with the axial bore through the container plunger.