

Aug. 17, 1965

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3,200,813

ASPIRATING SYRINGES

Filed Dec. 24, 1962

Fig. 1.

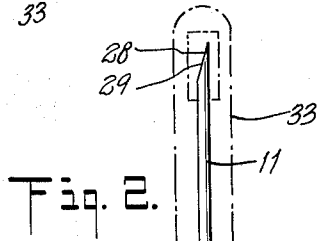
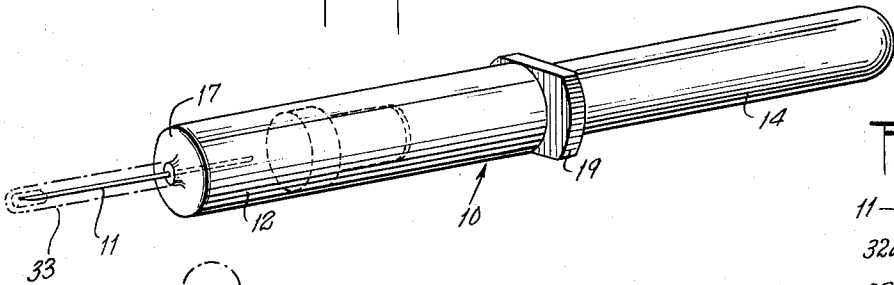


Fig. 2.

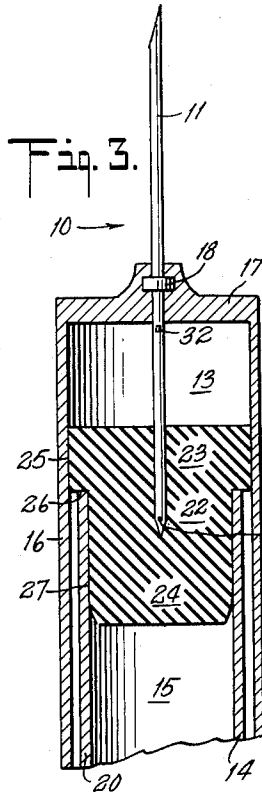


Fig. 3.

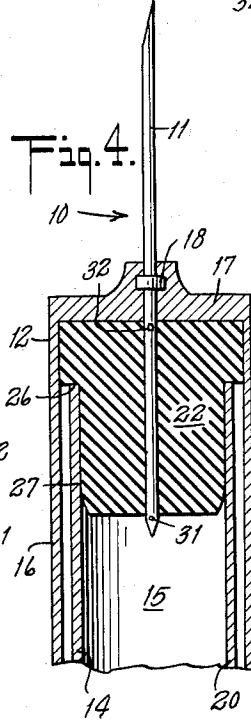
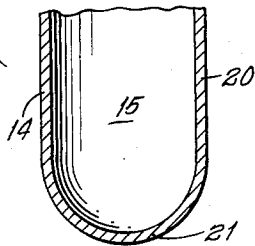
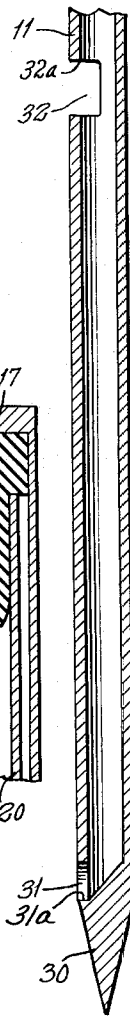


Fig. 4.

Fig. 5.



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3,200,813

ASPIRATING SYRINGES

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 Filed Dec. 24, 1962, Ser. No. 246,742  
 8 Claims. (Cl. 128—2)

My invention relates in general to syringes and more particularly to a type of aspirating syringe suitable for obtaining a sample of fat globules and other body tissues and to a method of obtaining such a sample, and also to aspirating non-living matter.

Terminology: In this application the term distal end means that end of the needle which is inserted beneath the skin and proximal end means the opposite end of the needle. The term saline or saline solution means the usual isotonic physiological solution commonly used in the practice of medicine.

A sample of fat globules, at the present time, is obtained from a living body by a process involving the following steps: (1) inserting a sterile needle into a vial of sterile saline solution, (2) injecting the saline into the body, and (3) then retracting the syringe plunger, (it should be noted that the syringe, to obtain enough negative pressure to dislodge the fat, must be of a 50 cubic centimeter size or larger), (4) removing the needle from the body, and disconnecting it from the syringe, and (5) emptying the saline content of the syringe barrel with its fat globules into a chemically clean sample collection bottle, (6) removing the plunger of the syringe, and washing the plunger and barrel with an appropriate solvent, preferably chloroform-methanol mixture, the washings being deposited in the collection bottle, and (7) carefully rewashing the barrel in order to wash out and dissolve any fat globules which may have adhered to the barrel, which solvent and globules enter the collection bottle. It should be noted that this procedure requires (1) an independent source of saline, (2) a sterile syringe of 50 cubic centimeters or larger, (3) and a collection bottle. It should be further noted that the process of obtaining the sample consists of seven individual and separate steps, which require unusual skill and strength since the operator must grasp the syringe barrel with one hand, grasp the syringe plunger in the other and exert no small measure of strength to withdraw the syringe plunger and obtain the necessary 50 cubic centimeters of negative pressure to dislodge the fat. All of this must be done without dislodging the needle from the body, the tip of which normally rests only a quarter of an inch under the skin. Further this methodology is not suitable for field research use where conditions are primitive and where large numbers of fat aspiration samples are required.

To simplify the procedure in current use and described above and make it more amenable to field usage, I have devised the present syringe instrument which, in and of itself, is used to inject a solution or fluid, withdraw the sample fat globules or other media to be tested, and further acts as the sample collection container.

An object of the invention is to produce a device suitable for obtaining fat aspiration samples by designing the syringe so that it contains the saline solution to be injected, injects it, withdraws the sample of fat and tissue and further acts as its collection container.

Another object is to produce a simply operated syringe device which is provided with both the saline solution and the negative pressure to withdraw the fat and tissue sample.

A further object is to produce a single unit syringe for effecting the efficient storing and easy obtaining of fat and tissue sample.

Another object is to produce a completely presterilized

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and portable unit which can be used to obtain a fat and tissue sample.

A further object is to construct a syringe device which provides an initial maximum negative pressure with a smaller instrument and a smaller total amount of negative pressure.

Another object is to produce a device for obtaining a fat sample at a minimum of cost by simplifying and integrating the steps of the procedure.

A further object is to produce a device for obtaining a fat sample by exerting an initial maximum negative pressure decreasing to a minimum negative pressure contrary to the present method of exerting a minimum negative pressure and increasing to a maximum negative pressure and thus producing an increased yield of fat in the sample.

A further object is to produce a device, which can be used to obtain and retain a fat and tissue sample, which is comprised of a minimum number of parts, all of which function together in one unit.

A further object is to produce a hollow needle, having openings at its distal and proximal ends and an opening intermediate thereto, whereby the distal, intermediate and the proximal end openings are used as a portal of exit for the saline and the proximal and distal end openings are used for the withdrawing of the fat sample.

Another object is to produce a device for obtaining a fat and tissue sample which obviates the transfer of the sample to a container and the numerous washings of the syringe, plunger and barrel.

A further object is to obtain a fat and tissue sample which is never exposed to air and is obtained in a vacuum.

Another object is to deliver the fat and tissue sample directly from the donor site via the needle to the permanent storage container thus obviating the requirement of transferring and washing the sample.

A further object is to produce a sampling device which can be used to sample the interior of any penetrable mass by the use of an appropriate solvent, fluid, gas or solution in the forward compartment of the syringe.

A further object is to form an aspirating syringe and collection device in which the plunger's forward motion injects the solution, releases the vacuum and causes the aspiration of the sample thus entailing a minimum of discomfort to the patient and a maximum recovery of the saline since the operation time is a minimum.

I accomplish these objects by forming my aspirating syringe and storage device of two tubes, oppositely positioned, the lesser diametered tube fitting into the larger diametered tube, the larger tube carrying a hollow needle having a distal end opening, a proximal end opening and an intermediate opening, said intermediate opening being situated within the tube adjacent its end wall, said lesser diametered tube having a puncturable stopper and said stopper being the slidable closure for the larger diametered tube and said stopper being of the same length as the distance between the intermediate opening and the proximal end opening of the needle, the space within the larger diametered tube and the stopper being filled with saline or other appropriate solution, solvent, fluid or gas, and the space within the smaller diametered tube and the stopper containing a vacuum, whereby when the needle is inserted beneath the skin of the sample donor or other mass to be sampled and the smaller tube is advanced until the stopper closes the intermediate opening of the needle, the saline solution, solvent, fluid or gas is completely injected through the needle to the donor's body or other mass and at the same time the proximal end opening of the needle enters into the vacuum space of the smaller diametered tube and permits its vacuum to aspirate and

recover the injected saline admixed with fat globules and tissue or other solution, solvent, fluid or gas admixed with the recovered sample.

For further comprehension of the invention and of the objects and advantages thereof, reference will be had to the following description, the accompanying drawing and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

FIG. 1 is a perspective view of a syringe embodying my invention and showing its saline or fluid injecting and sample aspirating, collecting and storage means.

FIG. 2 is an enlarged sectional view of the device shown in FIG. 1 with the smaller tube or plunger in a retracted position prior to use.

FIG. 3 is a partial sectional view of the device shown in FIGS. 1 and 2 with the smaller tube partially advanced and in a position in which the saline or fluid solution is being injected into the sample donor's body, or mass being sampled.

FIG. 4 is a partial sectional view of the device shown in FIGS. 1, 2 and 3 with the smaller tube completely advanced and in a position in which the proximal end of the needle has entered the vacuum space of the smaller diametered tube and the vacuum therein is aspirating the recovered saline with its fat and tissue sample or retrieving the fluid and its sample, and

FIG. 5 is a sectional detail showing the portion of the needle within the syringe.

In the drawings herein and the specification, in which like numerals indicate similar elements, 10 denotes my vacuum aspirating syringe which is comprised of three components, to wit, a hollow, multi-opening, double-pointed needle 11, an outer tube 12, containing a compartment or chamber 13 filled with the solution or fluid to be injected and an inner tube 14 containing a compartment or chamber 15 in which the air has been evacuated. The inner tube fits slidably into the outer tube and together with its stopper or closure forms the plunger section of the syringe.

The outer tube 12 is formed with the side wall 16 and a forward end closure wall 17. The needle passes through this end wall and is secured thereto by a flange 18. However, any other means of firmly securing the needle in place could be used. At the rear of the outer tube removed from the end wall is a flange 19 which can be used for gripping and manipulating the syringe when in operation.

The inner tube 14 is formed with side walls 20 and a rear end closure 21. The mouth of the inner tube 14 is provided with a penetrable stopper or closure 22 which is formed with an enlarged forward end portion 23 and a rear end portion 24. The side walls 25 of the forward end portion of the stopper fit slidably against the inside walls of the outer tube and form a rear closure for said outer tube, thus forming the compartment 13 which as previously stated contains the saline solution or other fluids. The under end 26 of this enlarged portion of the stopper rests upon and abuts the lip of the inner tube 14. The rear end portion 24 of the stopper extends into the inner tube and its sides 27 fit securely against the side walls of the inner tube forming a closure for said tube. It should be noted that the shouldered seat of the stopper on the inner tube prevents atmospheric pressure from forcing the stopper into the tube and also from permitting the needle to likewise force the stopper into the inner tube when the inner tube functions as a plunger. The inner tube is evacuated of air resulting in a vacuum sufficient to aspirate the desired tissue and fat sample or sample desired.

As the vacuum is mechanically obtained by machine before the syringe is assembled it can be quite close to a perfect vacuum, thus when the vacuum is released an

immediate and maximal aspirating effect is produced which is more effective than the gradual development of the vacuum obtained by the manual retraction of the standard syringe plunger. This results in the use of a much smaller and more conveniently operated aspiration syringe than would otherwise be required if the heretofore standard procedure were followed, and in the obtaining of a greater recovery of fluid and sample.

The distal end of the needle 11 is provided with a bevelled end 23 for piercing the tissue and an opening 29 for injecting the saline solution and recovering the sample. The proximal end is comprised of a pointed tip 30 for easily penetrating the stopper (without cutting a core which could contaminate the sample) and immediately above the tip there is provided an opening 31 into the needle bore. In addition to the opening 29 and 31 there is provided an opening 32 intermediately spaced between the other two openings. The hollow bore or passageway of the needle extends axially through the needle and joins the openings 29, 31 and 32. The needle is so positioned in the outer tube that the opening 32 is adjacent to the inner wall of the outer tube end closure 17. The distance between the openings 31 and 32 is the same as the length of the stopper so that when the inner tube or plunger is advanced to the point where its stopper closes the openings 32 the opening 31 has passed beyond the stopper and entered the vacuum contained portion of the inner tube (see FIG. 4).

It can thus be seen that the stopper as it finishes injecting the saline solution and closes the opening 32, concurrently exposes the opening 31 of the needle into the vacuum. An uppermost orifice rim portion 32a of the opening 32 and a lowermost orifice rim portion 31a of the opening 31 are spaced apart a distance slightly greater than the thickness of the stopper.

A needle sheath or cover of any conventional type 33 is provided to keep the needle sterile and the saline solution within the syringe prior to operation.

The syringe is operated by (1) removing the sheath 33, (2) inserting the bevelled distal end of the hollow needle into the tissue or other material to be aspirated, (3) advancing the inner tube acting in the capacity of a plunger toward the forward end closure 17 of the outer tube and thus discharging the saline solution or other fluid from its compartment 13 through the intermediate opening 32 and out through the bevelled distal end opening 29 into the tissue or other material to be aspirated (it should be realized that when the stopper of the inner tube has closed the port 32, the opening 31 resting exposed within the evacuated tube automatically effects the aspiration of the injected fluid or saline admixed with tissue or other material), and (4) withdrawing the needle from the tissue or other material to be sampled, and then (5) separating the inner tube from the outer tube.

Thus the inner tube contains a tissue sample or other material in a saline solution or fluid which has been obtained entirely free from exposure to air or other contamination by a simple easily operated procedure. This is of extreme importance, since air may alter the chemical composition of the sample. Furthermore the present single procedure combines the heretofore multi-step separate procedure of (1) injecting the saline, (2) the manual aspirating of the tissue or other material, and (3) the washing and collecting of the sample from the syringe.

It should be understood that while I have illustrated and described the preferred embodiment of my invention, I do not limit myself to the precise construction herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in any of the appended claims.

Having thus described my invention, what I claim is new and desire to secure by United States Letters Patent is:

1. In a two chambered syringe for injecting a first substance and subsequently withdrawing a second sub-

stance, the improvement comprising in combination a hollow elongated needle defining along the length of the needle a first end opening, a second end opening and a third opening spaced between said first and second openings all said openings extending into the hollow portion of the needle, and a puncturable closure, said puncturable closure having a portion axially aligned with said needle, said portion having a thickness substantially equal to the spacing between said second and third needle opening whereby said puncturable closure can cover either of said openings but not both at the same time.

2. In a syringe comprising a first chamber and a second chamber with said first chamber comprising a movable wall spaced from and movable with respect to said second chamber, the improvement comprising a hollow elongated needle mounted on said wall and defining a first open end spaced outside said first chamber and said needle also defining second and third longitudinally aligned spaced openings normally positioned within said first chamber all said openings extending into the hollow portions of the needle, a puncturable stopper separating said first and second chambers and having a portion aligned with said needle, and means for repositioning said needle with respect to said puncturable stopper to move said third opening into said second chamber.

3. In a two-chambered syringe having a first liquid containing chamber and a second vacuum containing chamber, the improvement comprising in combination an elongated needle having a passageway therethrough, said needle defining along the length of the needle a first end opening, a first orifice rim portion adjacent a second end of the needle and a second orifice rim portion spaced between said first orifice rim portion and said first end opening, said first end opening and said first and second orifice rim portions being connected by said passageway, and a puncturable closure, said puncturable closure having a portion axially aligned with said needle, said closure portion having a thickness slightly less than the spacing between said first orifice rim portion and said second orifice rim portion.

4. A syringe comprised of a hollow needle defining an elongated passageway, two tubes and a puncturable stopper, each of said tubes having an end closure and an end defining an opening, said tubes being opposingly positioned and one of said tubes fitting into the other so that the opening of one tube is positioned within and beyond the opening of the other tube, said stopper having lesser and greater diametered portions and said lesser diametered portions fitting securely into the smaller diametered tube and said larger diametered portion fitting slidably in the larger tube in fluid tight relation therewith and said hollow needle being secured intermediate the ends of the needle in the end closure of the larger diametered tube with one of the needle ends extending into the larger diametered tube, and said needle having means comprising openings in the proximity of its ends for injecting the

contents of the larger diametered tube on the advancement of the smaller tube, and said openings being interconnected with said passageway and on the passing of the stopper beyond a needle opening said means cause the contents of the smaller diametered tube to pass through the hollow needle.

5. A syringe as defined in claim 4 and in addition said larger diametered tube containing isotonic saline solution and said smaller diametered tube containing a vacuum.

6. A syringe, as defined in claim 4, and the hollow needle having said opening means comprising in addition an other opening interconnected with said passageway intermediate said end openings and within the larger tube whereby when the stopper is advanced closing an end opening of the needle the intermediate opening permits exit of the contents of the larger tube and when the intermediate opening is closed by the stopper an end opening becomes exposed in the smaller tube permitting its contents to function.

7. A syringe, as defined in claim 4, and said opening means comprising in addition a third opening interconnected with said passageway and intermediate said needle ends and the distance between the intermediate opening and one end opening in the needle being the same as the length of the stopper so that when the stopper is advanced to close the intermediate opening, it exposes said one end opening.

8. A method of obtaining an aspirated fatty containing tissue sample using the syringe of claim 7, by (1) inserting the distal end opening of the needle into a fat containing tissue of a body to be sampled, (2) advancing the smaller diametered tube in a plunger action discharging a saline fluid provided in the larger diametered tube through an intermediate opening provided in the needle and into the fat tissue of the object to be sampled and exposing the proximal end opening of the needle into a vacuum provided in the smaller diametered tube thus effecting the aspiration of a fat sample into the smaller diametered tube, (3) withdrawing the syringe needle from the object sampled, and (4) separating the smaller diametered tube with the fat sample from the larger diametered tube, whereby the smaller diametered tube becomes a collecting device and sample container.

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