Nov. 13, 1962 S. MYERSON ETAL 3,063,450

SYRINGE

Filed Jan. 2, 1959 2 Sheets-Sheet 1

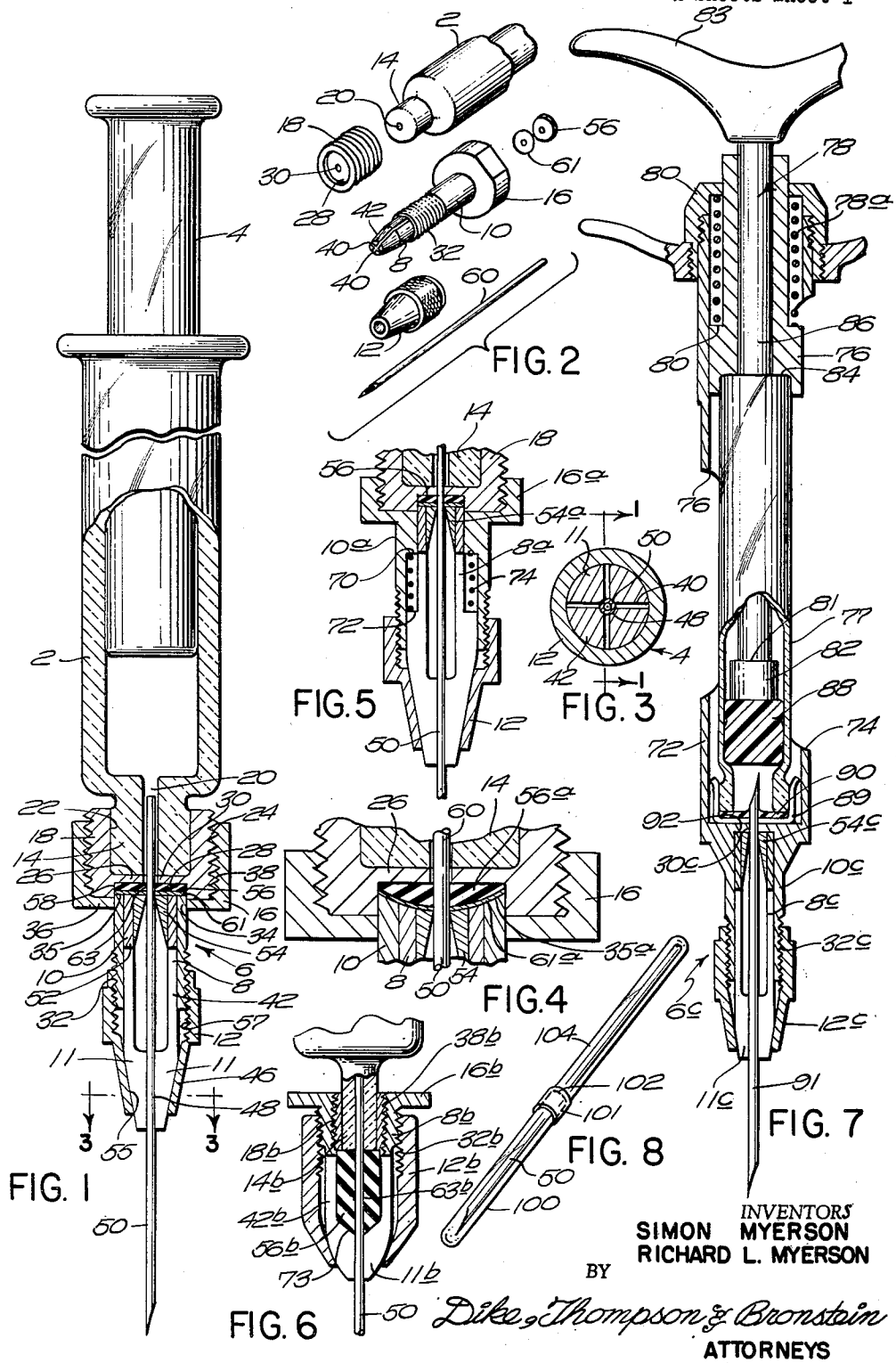

FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6

FIG. 7

FIG. 8

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SYRINGE

Filed Jan. 2, 1959 2 Sheets-Sheet 2

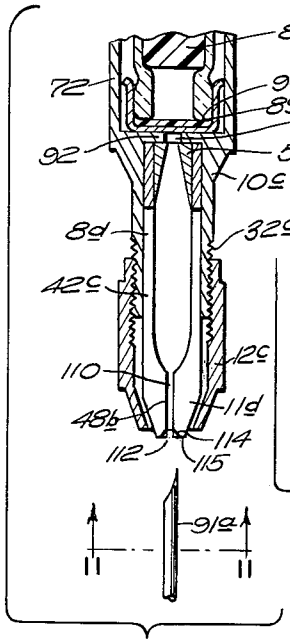

FIG. 9

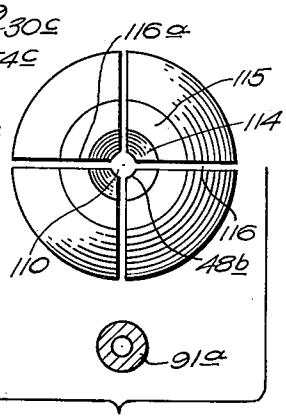

FIG. 11

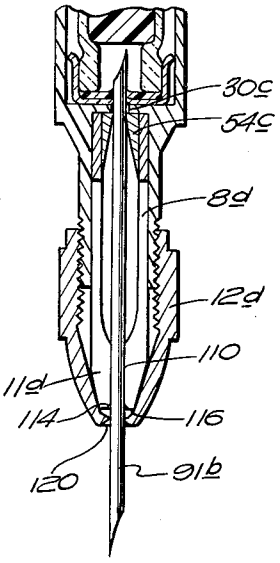

FIG. 13

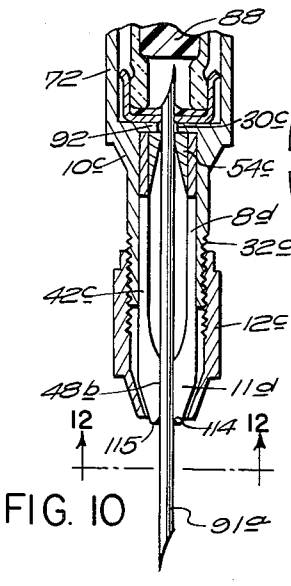

FIG. 10

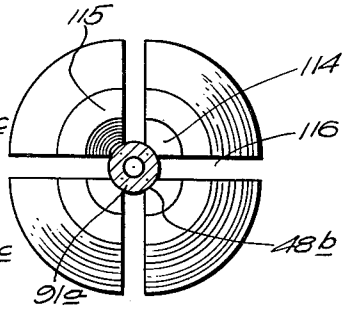

FIG. 12

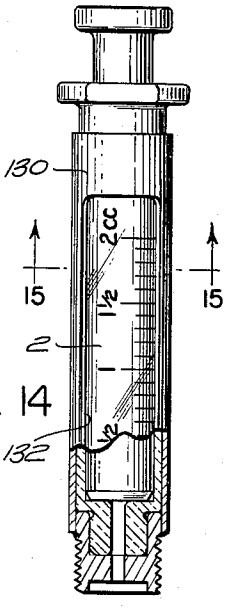

FIG. 14

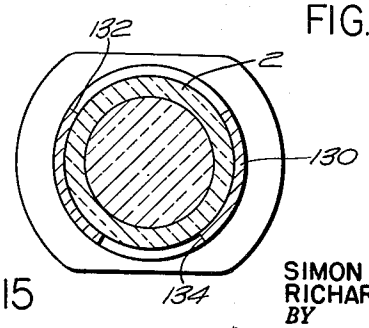

FIG. 15

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SYRINGE

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13 Claims. (Cl. 128—218)

The present invention relates to hypodermic syringes and needles therefor.

In recent years, the various branches of the medical and dental professions have become increasingly aware of the risk of carrying infection from one patent to another by repeated use of a hypodermic needle. This, despite the use of sterilizing methods considered adequate for other surgical instruments. Particularly, the incidence of hepatitis in patients who have been subjected to hypodermic injections has been noted.

For this reason disposable needles have come into use in some of our most advanced and largest hopsitals. Although a number of disposable needles and syringes for use with them have been placed on the market, in each case the means of attachment between the needle and syringe requires a needle of greater cost than most dentists and doctors and many hospitals appear willing to pay for a single use. This has limited the use of these disposable needles.

These disposable needles are attached to the syringe by means of a hub which is inseparably secured to the needle during manufacture and which fits on the receiving end of the syringe.

In certain types of syringes, herein referred to as medical syringes, medication is sucked into the syringe and the needle is pointed and sharp at one end only and carries the hub or attaching means fastened to the other end. In some cases, the receiving end of the syringe is tapered and is provided with a locking means such as a well known Luer lock, the hub of the needle being provided with means to engage the locking means on the syringe to secure the needle in position. In other cases, the hub is threaded and is screwed on a threaded portion of the receiving end of the syringe.

In dentistry, the most common use of the hypodermic syringe and needle is for injection of novocaine or the like for the relief of pain during extraction, or during the preparation of teeth for fillings, bridgework or crowns. Anesthetics for these purposes are usually supplied in "cartridge" form. The cartridge, containing a measured dose of anesthetic, is inserted into the syringe, herein referred to as a dental syringe, through a long length-wise opening in the barrel. The end of the cartridge nearest the needle, which we will designate as its lower end, is constructed so that a double ended needle, sharp at both ends, will penetrate the cartridge at its lower end. The opposite end of the cartridge is equipped with a rubber or other stopper which can be propelled along the inside of the cartridge to its lower end by the plunger of the syringe, thus expelling the contents through the needle. A small hub is firmly secured to this type needle intermediate its ends and co-acts with attaching means on the syringe.

In both the needles used with medical syringes and the needles use with dental cartridge type syringes, the hub or attaching means and the operation of attaching it to the needle during manufacture adds substantially to the cost of the needles, thereby making them unattractive to the medical and dental professions.

An object of the present invention is to provide a syringe having a new and improved needle attaching and holding mechanism by means of which needles of very simple and inexpensive construction can be readily attached to and detached from the syringe, thereby

drastically reducing the cost of disposing of hypodermic needles after a single use and making the use of disposable needles economically attractive to the dental and medical professions.

Another object is to provide such a needle attaching and holding mechanism which can be used with the usual medical type as well as with the dental cartridge type syringe, and which will permit the use of a needle that requires no attaching means attached to it. In fact, a plain piece of tubing, pointed and sharpened at one or both ends, according to the requirements, may be used.

Another object is to provide a medical and cartridge type syringe having a needle attaching and holding mechanism by means of which a hubless needle can be readily attached to and detached from the syringe.

Another object is to provide such a needle attaching and holding mechanism in which leakage of fluid is prevented and which holds the needle firmly and securely.

Another object is to provide such a needle attaching and holding mechanism in which the needle is automatically guided to and held in its proper position when it is inserted to thereby facilitate the attachment and detachment of the needle and to insure that it is properly attached and held in the proper position.

Another object is to provide a syringe having a simple and inexpensive mechanism for detachably attaching and holding a needle.

The above-mentioned objects are accomplished by providing the syringe with a chuck having jaw means for securely and releasably gripping the needle. Where necessary, the connection between the chuck and barrel of the syringe is provided with a releasable sealing mechanism which prevents leakage around the needle but does not interfere with attachment and detachment of the needle to and from the syringe. Preferably, the chuck is provided with means for guiding the needle to and holding it in its proper position between the jaw means when the needle is inserted so that when the jaw means is subsequently tightened the needle will, in substantially every case, be firmly gripped and held in its proper position by the jaw means.

Other objects and features of the invention will be apparent from the following description and the accompanying drawings in which:

FIG. 1 is a vertical section through a medical type syringe embodying an embodiment of the present invention.

FIG. 2 is an exploded view in perpective of the syringe of FIG. 1 with part of the barrel and plunger of the syringe cut away.

FIG. 3 is an enlarged section taken along the line 3—3 of FIG. 1.

FIG. 4 is an enlarged view corresponding to FIG. 1 of another embodiment of the needle attaching and holding mechanism of the present invention applied to a medical type syringe and showing only part of the needle attaching and holding mechanism.

FIG. 5 is an enlarged view corresponding to FIG. 1 of yet another embodiment of the needle attaching and holding mechanism of the present invention applied to a medical type syringe.

FIG. 6 is an enlarged view corresponding to FIG. 1 of another embodiment of the needle attaching and holding mechanism of the present invention applied to a medical type syringe.

FIG. 7 is a vertical section of a cartridge type syringe embodying an embodiment of the present invention.

FIG. 8 is a view in perspective of the disposable needle of FIG. 1 before it is attached to the syringe and packaged in a sheath applied to the needle by the manufacturer to prevent the sterility of the needle.

FIG. 9 is an enlarged view corresponding to FIG. 7 of

another embodiment of the needle attaching and holding mechanism of the present invention applied to a dental type syringe showing only the lower portion of the syringe barrel and with the needle removed and the jaw tightening screw cap loose, i.e., not exerting any radially inwardly directed, needle gripping force on the jaws of the chuck so that the jaws are relaxed.

FIG. 10 is a view like FIG. 9 with the needle inserted between the jaws but with the screw cap still loose, i.e. not exerting any substantial needle gripping force on the jaws.

FIG. 11 is an enlarged view taken along the line 11—11 of FIG. 9 but showing only the jaws of the chuck and the needle.

FIG. 12 is an enlarged view taken along the line 12—12 of FIG. 10 but showing only the jaws of the chuck and the needle.

FIG. 13 is a view like FIG. 9 of yet another embodiment of the needle attaching and holding mechanism of the present invention applied to a dental type syringe.

FIG. 14 is a view like FIG. 1 partially in section with the chuck removed and with the barrel of the syringe encased in a metal sleeve to avoid breakage.

FIG. 15 is a transverse section taken along the line 15—15 of FIG. 14.

With reference to FIG. 1, 2 represents the transparent glass barrel of a conventional medical syringe having a standard plunger 4. In this type of syringe, the medication is sucked into the syringe by putting the needle into the liquid which is being administered and drawing it into the syringe by pulling the plunger up until the desired dose is in the barrel. For this reason, the barrel is usually made of glass or other transparent material and graduated along its length.

A chuck 6 corresponding in construction to a standard drill chuck and comprising a tubular vise 8 having needle gripping jaws 11, a hollow vise receiving tube 10 and a hollow screw cap 12, is connected to the lower needle receiving end 14 of the syringe barrel by means of a nipple fitting 18 fitting over and secured to the end portion 14 and a nut portion 16 which is rigidly attached to or integral with the upper portion of tube 10.

The lower needle receiving end portion 14 of the barrel 2 is narrower than the rest of the barrel, has a needle receiving opening or passage 20 therethrough and is firmly secured by cement or the like in the bore 22 of nipple fitting 18, the periphery of which is threaded at 24.

The fitting 18 has an end wall 26 having a recess 28 centrally located in the outer surface thereof and centrally located needle receiving aperture 30 coaxial with the recess 28 and aligned with the needle receiving opening or passage 20 in the lower end wall 14 of the syringe barrel.

The cement bond between the lower end surface of end portion 14 and the inner surface of wall 26 and between the periphery of end portion 14 and the bore 22 of the nipple fitting prevents any leakage between the end portion and the fitting.

The chuck 6 is attached to the syringe barrel 2 by threading the nut portion 16 of the chuck over the threaded nipple fitting 18 as shown.

The lower end portion of the hollow tubular vise receiving tube 10 has external threads 32 and the upper end portion can be firmly secured to the nut portion 16 by a press fit between such upper portion and an aperture 34 in an end wall 36 of nut portion 16, in which aperture such upper portion of the tube 10 is received with the upper end thereof protruding into the threaded bore 38 of nut portion 16, as shown.

The upper part of the tubular shaped hollow vise 8 may be secured within the tube 10 by a press fit. The lower part of the vise is split longitudinally at 40 into four spring legs 42. The lower ends of the legs 42 protrude from the lower end of tube 10 and are provided with jaws 11 for gripping the needle. The jaws 11 are thicker than the rest of the legs and have an external taper at 46 but the inner edges or surfaces 48 which engage and grip the hollow needle 50 are straight in an axial direction so that they grip the needle along the substantial portion of the length of the needle. The upper end portion 52 of the vise 8 is not split and the upper edge of the vise is flush with the upper edge of tube 10, as shown. The internal bore of the non-split upper end portion 52 is provided with a hollow, tubular plug 54 having a tapered internal bore which guides the needle 50 when it is inserted in the chuck and lower end of the syringe.

The bore of the screw cap 12 has a lower tapered portion 55 for cooperating with the external taper 56 of the jaws 11, and a threaded upper portion 57 for cooperating with the threads 32 of the tube 10 to move the screw cap axially over and with respect to the jaws 11 to tighten and loosen the jaws. The lower ends of jaws 11 extend below the screw cap slightly when the jaws are closed by the cap. The screw cap is preferably made of metal.

A sealing washer 56 of resilient elastic, rubber-like material such as a polymonochlorotrifluoroethylene rubber, sold by Minnesota Mining and Manufacturing Co. under the trade name Kel-F, is located in the recess 28 of the fitting 18 and has a centrally located, needle receiving aperture 63 therein which is axially aligned with the aperture 30 in the wall 26 of the nipple and with the opening 20 at the lower end of the syringe barrel. When the nut portion 16 is threaded tightly on the nipple 18, the upper edges of tube 10, vise 8 and plug 54 form a sealing surface 35 which squeezes or compresses the sealing washer 56 between it and the floor of the recess 28 to cause the washer to expand laterally into intimate and sealing engagement with the confining wall 58 of the recess 28 and the portion of the needle 50 located within the aperture 63 of the resilient washer to provide a tight, liquid-proof seal between the washer and the wall 58, between the wall of the aperture 63 in the sealing washer and the portion of the needle 50 contained therein and between the washer and the floor of the recess. This seal prevents leakage of fluid from the opening 20 and confines the flow of fluid to the bore of the needle.

When the nut portion 16 is loose on the nipple 18 so that the sealing surface 35 does not compress the sealing washer and the washer is relaxed, the washer fits snugly but slidably within the confining wall 58 of the recess 28 and the aperture 63 thereof is about the same size as the needle receiving aperture 30 in wall 26 of the fitting and is large enough for the needle to be easily inserted therethrough.

A chrome steel disk 61 is provided between the resilient washer 56 and the sealing surface 35 to prevent the washer from being chewed up by the turning movement of the sealing surface when it is tightened against the washer by tightening of the nut portion 16. The disk has a needle receiving aperture axially aligned with the aperture of the washer.

The upper end of the tapered bore of guide plug 54 is about the same diameter as the apertures in the steel disk, the relaxed washer and the wall 26 or slightly larger than the largest needle to be used with the syringe. It is axially aligned with the above mentioned apertures and the opening 20 in the lower end 14 of the syringe barrel.

The vise 8 is preferably made of a resilient, rust proof steel or other suitable material. The size of the needle receiving passage between the jaws 11 and formed by edges 48 may be slightly larger or slightly smaller than the size of needle 50 when the jaws 11 are relaxed, i.e. when the screw cap 12 is loose and is not exerting a radially inwardly directed needle gripping force on the jaws. When the size of the passage between the relaxed jaws 11 is larger than the size of the needle, tightening of the screw cap 12 to thereby cause it to move axially and upwardly with respect to the jaws and consequently to apply a radially inwardly directed, needle gripping force on the jaws, forces the jaws radially inwardly into

needle gripping position in which they tightly and positively or non-yieldably grip the needle. Spring legs **42** are bent radially inwardly against the spring force urging them toward their relaxed positions. The resiliency of the legs causes the jaws **11** to automatically spring radially outwardly toward their normal relaxed positions when the screw cap is loosened. When the size of the passage between the relaxed jaws is slightly less than the size of the needle, insertion of the needle into the needle receiving passage between the relaxed jaws forces the jaws slightly apart against the spring force urging them to their normal relaxed positions so that the jaws resiliently and gently grip the needle even before the screw cap is tightened to apply a radially inwardly directed, needle gripping force on the jaws and thereby force them to tightly and positively grip the needle.

The needle **50** is inserted into the chuck and the lower end of the syringe barrel to the position shown while the screw cap is in position on the tube **10** so that jaws **11** are relaxed and while nut portion **16** is fixed on the fitting **18** with the sealing surface **35** in a position in which it is in light contact with the disk **61** but does not compress the sealing washer **56**. Consequently the aperture **63** is large enough for the needle to be inserted therethrough. Plug **54** guides the needle into the aperture **63** of the washer, the aperture **30** of the wall **26** of the nipple and the opening **20**. Thereafter, the screw cap **12** is tightened on the threads **32** of tube **10** to move the cap axially and upwardly (as viewed in FIG. 1) with respect to the jaws **11** and tube **10**, whereby the tapered wall **55** of the bore of the cap cooperates with the external taper **46** of the jaws **11** to apply a radially inwardly directed, needle gripping force on the jaws **11** to force the jaws radially inwardly until the inner edges **48** of the jaws firmly and non-yieldably grip the needle along a substantial portion of its length. Thereafter, the nut portion **16** is tightened on the nipple **18** to move the sealing surface **35** of the chuck toward the floor of recess **28** to compress or squeeze the washer between the sealing surface **35** and the floor of the recess. This forces the washer to expand laterally into sealing engagement with the confining wall **58** of the recess and with the portion of the needle **50** located within the aperture **63** of the washer. In effect, the wall of the aperture is squeezed tightly against the needle to provide a fluid-tight seal therebetween.

The diameter of the recess **28** is slightly larger than the outside diameter of the upper end of tube **10** to permit the upper end of the tube to move into and out of the mouth of the recess.

The needle may be detached by loosening the screw cap **12** whereby the radially inwardly directed, needle gripping force exerted thereby on the jaws is released and the jaws spring radially outwardly to release the needle. Thereafter, by loosening the nut **16**, the sealing surface **35** is moved away from the floor of recess **28** to release the compression force on the sealing washer **56** and permit it to expand to its normal configuration.

The chuck may be provided with means for applying a pin, wrench or other means for exerting more forceful tightening of the vise. Ordinarily, such a mechanism is not necessary except perhaps for large syringes and very large needles such as spinal needles.

The sealing surface of the chuck may be concave as shown in FIG. 4 at **35***a*, in which case the disk **61***a* is concave and the adjacent face of the resilient washer **56***a* is convex as shown in FIG. 4. This arrangement directs the compression forces exerted by the sealing surface **35***a* radially inwardly to ensure a tight seal between the needle and the wall of the aperture in the washer.

Furthermore, the sealing surface of the chuck can be moved toward the floor of the recess to compress the sealing washer by the same screw cap which tightens the jaws, thereby eliminating the necessity of tightening and loosening the nut portion **16** each time a needle is attached and detached respectively. Such an arrangement is shown in FIG. 5 in which the tube **10***a* of the chuck is integral with the nut portion **16***a*, which is tight on nipple **18** at all times except when the sealing washer is replaced, and the lower part of the bore of the tube is enlarged to form a shoulder **70**. The outside diameter of the lower part of the vise **8***a* is also enlarged to form a shoulder **72** and to slidably but snugly fit within the enlarged lower part of the bore of the tube. The vise **8***a* is slidably received in the bore of the tube so that when the screw nut **12** is tightened on the tube **10***a*, the engagement between the tapered portion of the bore of the cap and the external taper of the jaws forces the vise to slide axially upwardly in the tube to cause the upper edge of the vise and the upper edge of the guide plug **54***a* secured in the bore of the vise to compress the sealing washer to form the seal. Thereafter, further tightening of the screw cap applies a radially inwardly directed, needle gripping force on the jaws of the vise to force them to move radially inwardly and grip the needle. The needle can be removed by loosening the screw cap to release the needle gripping force exerted thereby on the jaws and release the axial upward force on the vise and on the sealing washer, whereby the coil spring **74** biased between the shoulders **70** and **72** moves the vise downwardly and permits the washer to expand to its normal configuration.

In FIG. 6, the vise receiving tube is eliminated, the fitting **18***b* does not have any end wall or recess and the sealing washer **63***b* is located in and fills the inside of the split portion of the vise **8***b*. The nut portion **16***b* in this embodiment is integral with the upper non-split portion of vise **8***b* and has internal threads **38***b* which cooperate with the external threads of the nipple **18***b* to attach the vise directly to the syringe barrel. The lower edge of the nipple **18***b* is flush with the lower end surface of the narrow end portion **14***b* of the syringe barrel over which the nipple **18***b* is secured. The upper non-split part of the vise **8***b* has an externally threaded portion **32***b* over which the screw cap **12***b* is threaded.

The sealing washer **56***b* in this embodiment is tubular in shape and is received in and fills the inside of the split portion **42***b* of vise **8***b*, as shown. Consequently, when the screw cap is tightened to move the jaws **11***b* and the legs **42***b* of the vise radially inwardly, the jaws **11***b* are brought into needle gripping relationship with the needle **50** and at the same time the sealing washer is compressed radially inwardly to squeeze the wall of the aperture **63***b* radially inwardly into sealing engagement with the portion of the needle located in the aperture and to expand the washer axially into sealing engagement with the lower end surface of the end portion **14***b* of the syringe barrel. The above mentioned seal is made tighter by tightening the nut **16***b* on the nipple **18***b* to thereby compress or squeeze the washer between the surfaces **73** of the jaws **11***b* and the lower end surface of end portion **14***b*. This causes the washer to expand laterally into tighter sealing engagement with the needle.

When inserting the needle, both the nut and screw cap should be loose to make sure the aperture **63***b* of the sealing washer is large enough for the needle **50** to be inserted therethrough. Thereafter, the screw cap **12***b* is tightened to close the jaws **11***b* and form a seal between the needle and wall of the aperture of the washer, followed by tightening the nut **16***b* to complete the seal.

In FIG. 7, **72** represents the metal barrel or frame of a cartridge type syringe of the type used in administering local anesthetics in dentistry. The barrel or frame **72** has a large window **74**, a small window **76** opposite window **74** and a plunger **78**. A conventional glass cartridge containing a measured dose of novocaine or other medicine is inserted through the large window **74** while the cartridge holding member **76**, slidable in the bore of the barrel, is lifted upwardly to clear the upper edge of window **74** against the force of spring **78***a* biased between cap **80**, screwed on the end of the barrel, and a shoulder **80** of the

cartridge holding member. The holding member **76** is lifted upwardly by engagement of the shoulder **81** of the piston **82** of the plunger with the floor of the cartridge holding recess **84** of the holding member when the plunger is moved upwardly by its handle **83**. The recess **84** of the holding member fits over the top of the cartridge to hold it firmly in place when the plunger is released. The stem **86** of the plunger slides within the holding member.

When the cartridge is located in the barrel, the rubber stopper **88** of the cartridge is adapted to be pushed downwardly into the cartridge by the plunger to expel the medicine through the double ended, hollow needle **91**, which is pointed at both ends and one end of which pierces a soft metal cap **89** over the lower end of the cartridge as shown. The inside of the cap has a layer of flowable material **90** which adheres to the needle and forms a seal. The lower, needle receiving end of the cartridge chamber is narrower than the rest of the chamber so that the stopper **88** cannot be forced thereinto. The above construction is conventional.

The lower end of the metal barrel **72** extends integrally into, or is welded or joined by other means to, the hollow tube **10***c* of a chuck **6***c*. The upper end of the bore of the tube **10***c* and the lower end of the bore of the syringe barrel are separated by a wall **92** having a needle receiving aperture **30***c* therethrough. The tube has external threads **32***c* at its lower portion on which the screw cap **12***c* of the chuck is threaded. The vise **8***c* of the chuck has the same construction as vise **8** in FIG. 1 and the upper end portion thereof is secured in the tube **10***c* by a press fit, as shown. The vise is provided with a needle guide **54***c* at its upper end to guide the needle into the aperture of wall **92**. The upper edges of the vise and guide abut against the wall **92**.

When the screw cap **12***c* is loose, the needle can be inserted in the chuck and pushed through the aperture in wall **92** and through the cap **89** over the lower end of the cartridge to the position shown in FIG. 7, whereafter the screw cap **12***c* is tightened to force the jaws **11***c* of the vise **8***c* radially inwardly to firmly grip and hold the needle.

No special sealing arrangement is required in the embodiment of FIG. 7 because the cap **89** and flowable material **90** of the cartridge form a seal around the needle.

The needle **50** of FIG. 1 or **91** of FIG. 7 is preferably provided by the manufacturer with a rubber or plastic latex sheath **100** (see FIG. 8) over the injection end of the needle, which permits a sterilized needle to be handled to insert it into the syringe without contaminating the needle. The plastic or rubber latex sheath or coating **100** may be applied immediately after sterilization of the needle by dipping the injection end of the needle into the liquid latex. After the sheath **100** has been dried, the other end of the needle can be dipped to form a sheath cap **104**, part of which overlaps the sheath **100** at **101**. Before inserting the needle, the cap **104** is removed, whereafter the uncovered end portion of the needle is inserted while holding the covered end portion. The length of the sheath **100** is selected so that the end shoulder **102** thereof will abut against the lower ends of the jaws of the chuck when the needle has been moved to the desired position. This assures against pushing the needle too far into the syringe or not far enough. After the needle has been attached and immediately before use, the sheath **100** is removed. The sheath **100** may be made from other materials such as plastisols, etc. The sheath cap **104** can be omitted.

The sheath **100** and cap **104** shown in FIG. 8 fit snugly around the needle. However, the inside diameter of sheath **100** and cap **104** may be greater than the diameter of the needle. In such case sheath or case **100** is preferably made of polyethylene or the like and is provided with a pinched-in portion or portion of smaller inside diameter, the inside diameter of such portion fitting snugly around the needle to normally hold it in place in the sheath and to permit it to be firmly gripped by the fingers without touching the needle by pinching or applying pressure to the outside of the flexible pinched-in portion. If desired, the sheath and cap can be rigid except for the gripping portion. In such case, the material of the gripping portion remains flexible to permit the needle to be firmly gripped by the fingers. This flexibility can be provided by making the wall of the gripping portion thinner or by making such wall of a different material. It is not necessary that this gripping portion be pinched in or of reduced diameter. It may be of the same diameter as the rest of the sheath. However, in such case the gripping portion should be more flexible than the remaining portion of the sheath or container. This can be accomplished either by making the gripping portion thinner or of a more flexible material.

The sealing washer can be made of any resilient, elastic, rubber-like material but preferably it is made of a material which can withstand sterilizing conditions. Where the syringe is to be sterilized in an autoclave under high temperatures (usually about 320° F.) and under pressure (usually 75 p.s.i. or more) the material should be able to withstand such temperatures and pressures. In addition to Kel-F, other fluoro carbon rubbers, especially peroxide cured fluoro carbon rubbers such as Viton are presently deemed suitable. Also, other synthetic rubbers such as Neoprene and silicone rubbers can be used. A material should be selected which will withstand the particular sterilizing conditions to be employed. However, the invention is not limited to any particular kind of washer material.

The gripping edges **48** of the jaws can be very lightly threaded, knurled, or the like to achieve a better grip or the gripping edges of one or two of the jaws can be offset with respect to the other edges.

In FIG. 7, the tube of the vise can be eliminated, in which case the upper end of the vise will be integral with the lower end of the barrel and the threads for tightening the screw cap will be on the upper non-slitted portion of the vise.

The upper parts of both the vise and the tube are hollow shafts and the terms "shaft" and "shaft portion," as used in the claims hereof, are intended to cover either or both.

In FIGS. 1 and 6, the nipple fitting can be eliminated by providing the lower end portion of the syringe with threads for tightening the nut. In such case, the washer receiving recess can be in the lower end face of the syringe.

Considering portion **14** of FIG. 1 and portion **14***b* of FIG. 6 as end walls of the syringe barrels, in FIG. 6 the sealing washer is pressed directly against the end wall, whereas in FIG. 1 the washer is pressed against wall **26** of the fitting. However, in both cases the washer may be considered as being squeezed between a sealing surface of the chuck and the end wall of the syringe barrel to force the washer into sealing relationship with the end wall, the needle and the wall confining the periphery of the washer. In FIG 1, the confining wall is the wall **58** of recess **28**. In FIG. 6, the confining wall is the bore of the vise. If the washer is received in a recess in the end wall of the syringe barrel, the wall of such recess is the confining wall.

The jaws of the vise can be closed and opened by means other than a screw cap.

In the embodiment shown in FIGS. 9 to 12, the size or diameter of the needle receiving passage or bore **110** formed by the inner edges or surfaces **48***b* of the jaws **11***d* of vise **8***d* is slightly less than the size or diameter of the needle **91***a* when the screw cap **12***c* of the chuck is loose and the jaws **11***d* are relaxed, i.e. when the cap **12***c* is loose or removed and hence is not exerting a radially inwardly directed, needle gripping force on the jaws. Consequently, when the needle **91***a* is inserted in such passage it forces the spring jaws **11***d* radially outwardly against the spring force exerted by the resiliency of legs **42***c* of vise **8***d* and such resiliency of the legs causes the jaws **11***d* to gently grip the needle even through the screw cap **12***c* is loose or removed entirely. Sub-

sequently, the screw cap **12***c* is tightened to apply a radially inwardly directed, needle gripping force to the jaws **11***d* to thereby force the jaws to grip the needle **91***a* tightly.

The lower end of the needle receiving passage **110** is provided with an enlarged conical or trumpet shaped counter-sunk entrance **112** formed by a conical shaped counter-sunk recess **114** in the lower face of the vise **8***d*, such lower face being formed by the lower end faces **115** of the jaws **11***d*. The diameter of the recess **114** decreases as it extends upwardly from the tip of the chuck to the narrower passage **110** so that the wall thereof is tapered or slopes inwardly as it extends upwardly from the end face of the vise to the narrow passage **110**. The recess is formed by bevels at the lower ends of edges or surfaces **48***b* of the jaws **11***d*, as shown.

This enlarged, conical shaped entrance or trumpet **112** guides the needle into the undersized bore or passage **110** and, together with the undersized passage **110**, the aligned passage **30***c* in wall **92** and the aligned narrow neck of the passage in guide **54***c*, insures that the needle will be automatically moved to, and held in, the proper position between surfaces **48***b* when it is inserted into the chuck and before screw cap **12***c* is tightened so that when the screw cap is subsequently tightened the needle will be tightly and properly gripped by edges **48***b* of the jaws and consequently will be held firmly and rigidly thereby in the proper position regardless of the size of the needle or the skill of the operator. With such an arrangement, the needle will not slip into the spaces **116** between adjacent jaws **11***d* when it is inserted into the chuck because the width of the spaces **116** is smaller than the diameter of the needle and because the needle is at all times held gently but firmly by the edges **48***b*. By the use of an undersized passage **110** with an oversized entrance **112** the width of the spaces **116** when the jaws are relaxed can be made smaller than the diameter of the smallest needles to be used with the syringe. In fact, the lateral sides **116***a* of the relaxed jaws may contact each other to eliminate spaces **116** when the jaws are relaxed. Consequently needles of small diameter can be readily and correctly inserted and removed from the syringe without trouble and undue manipulation.

Preferably the passage **110** is bored or drilled into the jaws by a drill or the like of the proper size.

The rest of the construction shown in FIGS. 9 to 12 is like the construction shown in FIG. 7.

The undersized passage **110** and oversized entrance **112** of FIGS. 9 to 12 can be used in the constructions shown in FIGS 1 to 6 as well as in the construction of FIG. 7.

In the embodiment shown in FIG. 13, the needle receiving passage **110** between the jaws may or may not be undersized as in FIGS. 9 to 12. The passage **110** has an enlarged conical shaped entrance **114** like the embodiment shown in FIGS. 9 to 12.

The lower portion of the screw cap **12***d* extends downwardly and inwardly below the lower ends **115** of the jaws into a conical shaped lower end portion having a conical shaped guide passage **120** therein. The wall of passage **120** tapers inwardly as it extends upwardly and the passage is axially aligned with passage **110**. The smaller, upper end of passage **120** has a diameter which is slightly larger than the diameter of the needle **91***b* and about the same as the diameter of the narrow upper neck of guide **54***c* and aperture **30***c*. Guide passage **120** in the lower end of the screw cap and the enlarged conical shaped entrance **114** of passage **110** guides the needle into the needle receiving passage between the jaws and cooperates with the guide **54***c* and aperture **30***c* to hold the needle in the proper position in the needle receiving passage **110** before and while the jaws **11***d* are tightened by tightening the screw cap so that the needle will not slip laterally into spaces **116** between adajacent jaws. The enlarged entrance **114** can be omitted with the use of a guide passage **120** in the screw cap **12***d*.

Although with the use of a needle receiving passage between the relaxed jaws which is larger in size than the needle, the jaws are forced to move inwardly to grip the needle by upward axial movement of the screw cap and spring outwardly to their relaxed positions when the screw cap is moved axially in an opposite direction, whereas with the use of a needle receiving passage between the relaxed jaws which is smaller in size than the needle the jaws are not moved inwardly and do not spring outwardly by such movement of the screw cap, in both cases the screw cap comprises means for applying a substantially non-yielding needle gripping force to the jaws to force them to substantially positively or non-yielding grip and rigidly hold the needle and for releasing said force so that the needle can be removed. In both cases the screw cap also comprises means for retaining such non-yielding force on the jaws. Any other suitable means for performing the same functions can be used. Also in both cases the chuck comprises jaw means for releasably gripping and thereby rigidly holding the needle.

Since the materials from which the jaws and screw cap are made are relatively rigid and non-compressible, when the screw cap is tightened over the jaws, the needle is held firmly and rigidly by the jaws and cannot move with respect thereto.

In the glass barrel syringe shown in FIG. 1, the metal fitting **18** may be extended upwardly as shown in FIGS. 14 and 15 to form a reinforcing casing or sheath **130** over the barrel of the syringe to reinforce the barrel against breakage. In such case, the casing is provided with windows **132** and **134** to expose the graduations on the barrel. The casing may extend partly or all the way to the top of the barrel and may be integral with or soldered to or otherwise joined to the fitting.

This application is a continuation-in-part of our application Serial No. 768,612, filed October 21, 1958, and now abandoned.

We claim:

1. A hypodermic syringe and hypodermic needle therefor, said syringe comprising a barrel, a plunger and a chuck member associated with said barrel for detachably attaching said needle thereto, said chuck member comprising jaw means for gripping said needle and securing it to said barrel, said jaw means extending toward said barrel into spring legs, said jaw means forming a needle receiving passage, the size of said passage being less than the size of said needle when the needle is removed from said passage, means associated with said jaw means for applying and releasing a needle gripping force to said jaw means, said jaw means being adapted to be forced apart against the force exerted thereon by said spring legs by insertion of said needle into said passage while said needle gripping force is released, whereby said jaw means resiliently grip the needle when said needle gripping force is released.

2. A syringe and needle according to claim 1, said passage having an enlarged entrance, said enlarged entrance having a wall tapering radially inwardly as it extends inwardly from the end of said passage to guide said needle into said passage.

3. A syringe and needle according to claim 1, said jaw means comprising a plurality of jaws, the distance between the lateral sides of adjacent jaws being less than the diameter of the needle when said needle gripping force is released.

4. A syringe and needle according to claim 1, said jaw means comprising a plurality of jaws, the lateral sides of adjacent jaws contacting each other when said needle gripping force is released.

5. A syringe and needle according to claim 1, said spring legs defining a needle receiving passage which is larger than said passage formed by said jaw means.

6. A hypodermic syringe and hypodermic needle therefor, said syringe comprising a barrel, a plunger and a

chuck for detachably attaching said needle to said barrel, said chuck comprising spring jaw means for gripping said needle to secure it to said barrel, said jaws means having a needle receiving passage, said chuck having means for tightening said jaw means on said needle after it has been inserted in said passage, said jaw means comprising means for resiliently gripping said needle when it is inserted in said passage before said tightening means is applied to correctly position said needle in said passage and prevent said needle from slipping out of said passage.

7. A hypodermic syringe having a barrel, a plunger and a chuck for detachably attaching a hypodermic needle to said syringe, said chuck comprising spring jaw means for gripping a hypodermic needle to secure it to said barrel, said jaw means having a needle receiving passage, said chuck having means for tightening said jaw means on said needle after it has been inserted in said passage, said jaw means comprising means for resiliently gripping said needle when it is inserted in said passage before said tightening means is applied to correctly position said needle in said passage.

8. A syringe according to claim 7, said jaw means extending toward said barrel into spring legs of reduced thickness, the entrance to said passage being enlarged to guide said needle into said passage.

9. A syringe according to claim 7, said syringe being a dental syringe for use with a dental hypodermic needle, said passage having a diameter which is smaller than the minimum outside diameter of conventional dental hypodermic needles.

10. A syringe according to claim 8, said spring legs forming a needle receiving passage which is larger than said passage formed by said jaw means, said jaw means being free to be forced radially outwardly against the force exerted thereon by said spring legs before said tightening means is applied.

11. A hypodermic syringe for dispensing a liquid comprising a barrel and a plunger, said barrel having a chuck member associated therewith for detachably attaching a hypodermic needle thereto, said chuck member comprising a threaded portion, jaw means for gripping a needle along its body, said jaw means having a tapered outer periphery, and a threaded member associated with said jaw means and having a surface for engaging said tapered outer periphery of said jaw means, said threaded member being adapted to be threaded on said threaded portion to apply and release a needle gripping force to and from said jaw means through said surface and said tapered outer periphery, said jaw means having substantially parallel needle gripping surfaces forming a needle receiving passage and extending toward the syringe barrel into spring legs of reduced thickness and then into a hollow connecting portion which connects said legs, said legs forming an enlarged needle receiving passage substantially larger than the passage formed by the jaw means, said spring legs extending a substantial distance beyond the end of said threaded portion.

12. A syringe according to claim 11, said barrel having a needle receiving passage axially aligned with said passage formed by said jaw means and said enlarged passage and axially spaced therefrom but of smaller diameter than said enlarged passage, a tapered guide associated with said enlarged passage for guiding the needle into said passage in said barrel from said enlargerd passage.

13. A hypodermic syringe having a barrel and a plunger, a chuck member associated with said barrel for detachably attaching a hypodermic needle thereto, said chuck member having a threaded portion and jaw means for gripping said needle, said jaw means having a tapered outer periphery, a threaded member associated with said jaw means and having a surface for engaging said tapered outer periphery of said jaw means, said threaded member being adapted to be threaded on said threaded portion to apply and release a needle gripping force to and from said jaw means through said surface and said tapered outer periphery, said jaw means forming a needle receiving passage and extending toward the barrel into resilient spring legs of reduced thickness, said legs forming an enlarged needle receiving passage substantially larger than the passage formed by the jaw means and extending into a hollow connecting portion which connects said legs, said spring legs extending a substantial distance beyond the end of said threaded portion, said barrel having an opening in an end wall thereof for receiving said needle, said passages and said opening being axially aligned, means for attaching said chuck member to said end wall, said means for attaching said chuck member including a resilient sealing element having an aperture for receiving said needle, said aperture being axially aligned with said opening and said passages, at least one of said means for attaching said chuck member and said chuck member having a sealing surface movable toward and away from said end wall of said barrel when said chuck member is attached and detached from said end wall by said attaching means, said sealing element being located between said sealing surface and said end wall, said element being pressed between said end wall of said barrel and said sealing surface upon said movement of the said sealing surface toward said end wall of said barrel when said chuck member is attached to said end wall to compress said element and thereby seal against leakage.

References Cited in the file of this patent

UNITED STATES PATENTS

1,526,824	Bock	Feb. 17, 1925
1,574,579	Jones	Feb. 23, 1926
1,607,271	Smith	Nov. 16, 1926
1,687,324	Cook	Oct. 9, 1928
2,091,438	Epstein	Aug. 31, 1937
2,513,139	Burness et al.	June 27, 1950
2,517,689	Lement	Aug. 8, 1950
2,577,556	Williams	Dec. 4, 1951
2,688,967	Huber	Sept. 14, 1954
2,714,888	Williams	Aug. 9, 1955
2,751,907	Hickey	June 26, 1956