Sept. 9, 1969 G. L. HEIN 3,465,717

IMMERSION MEANS INCLUDING WORK HOLDER

Filed March 4, 1965 3 Sheets-Sheet 1

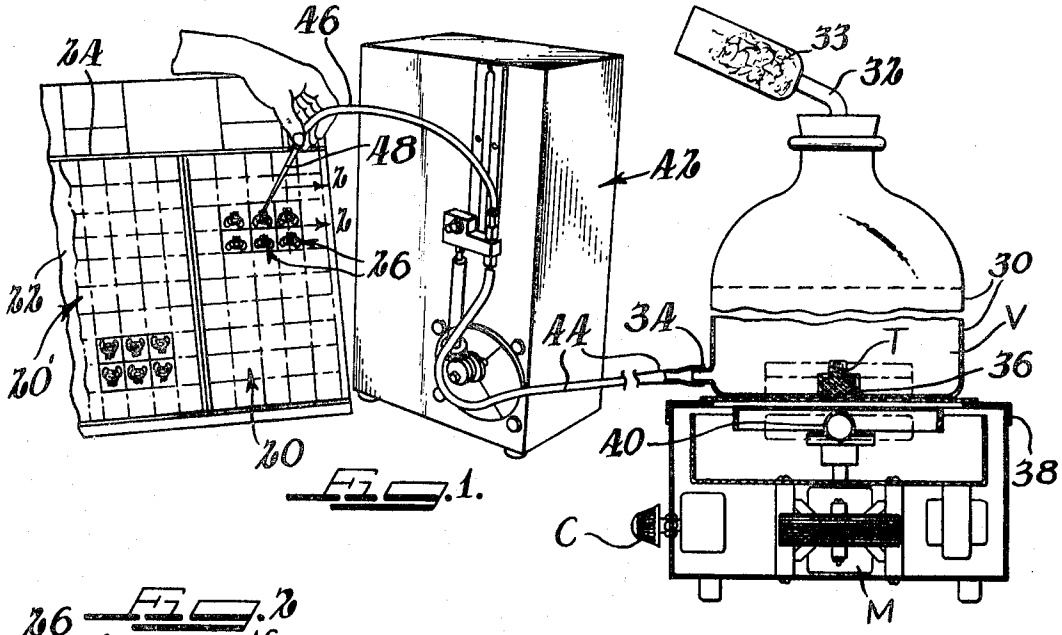


FIG. 1.

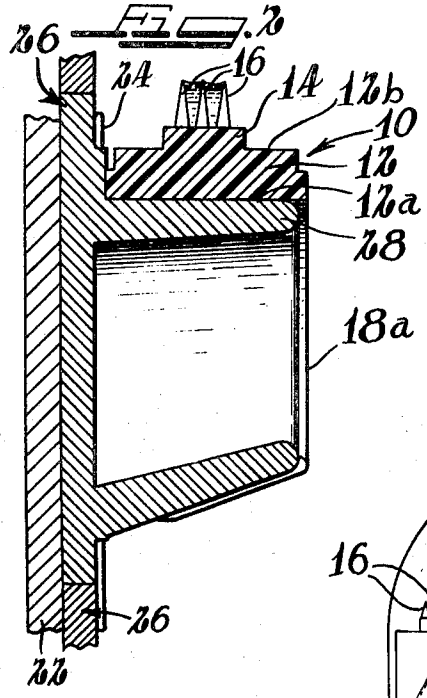


FIG. 2.

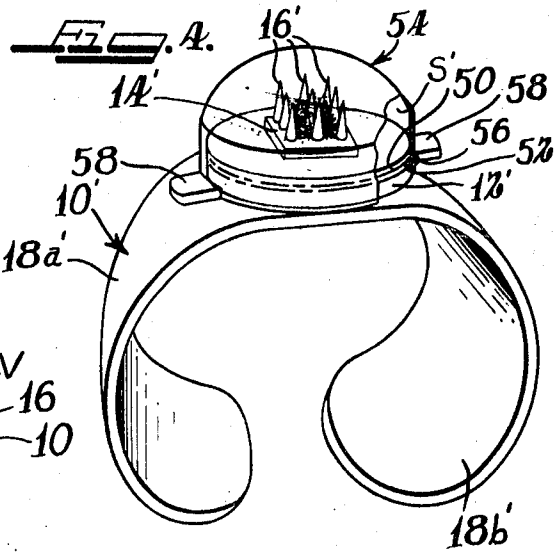


FIG. 4.

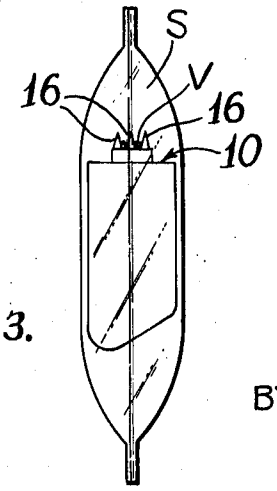


FIG. 3.

INVENTOR
GARY L. HEIN

BY Bair, Freeman & Molinare Attys.

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FIG. 5.

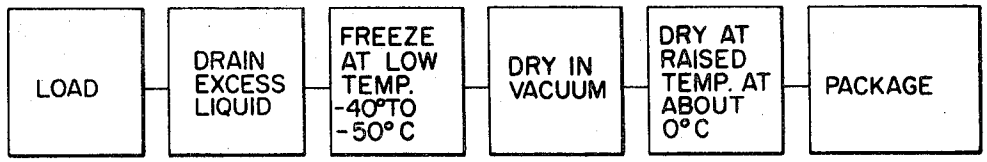


FIG. 6.

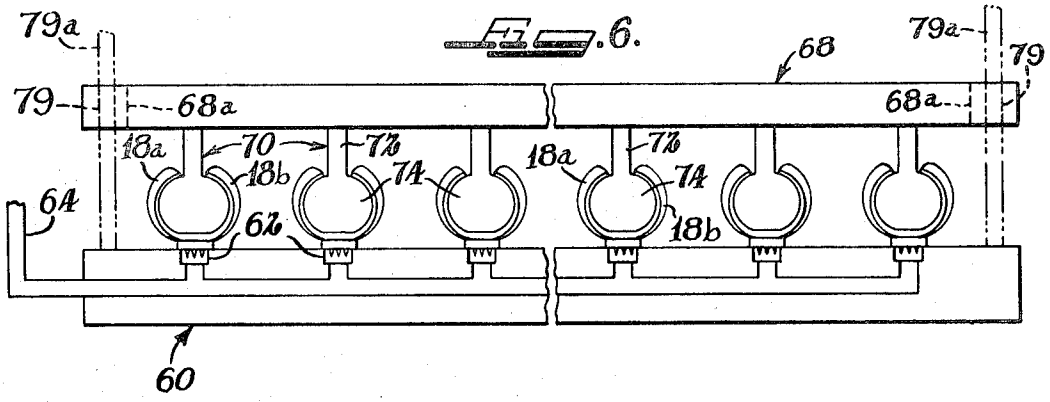
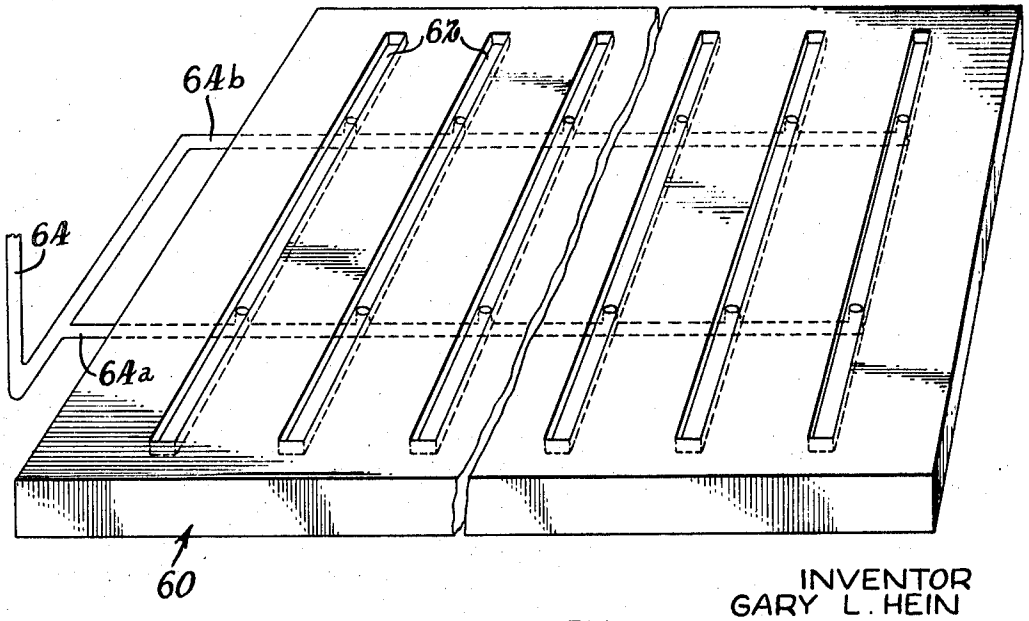


FIG. 7.



INVENTOR
GARY L. HEIN

BY Baer, Freeman & Molinare Attys.

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FIG. 8.

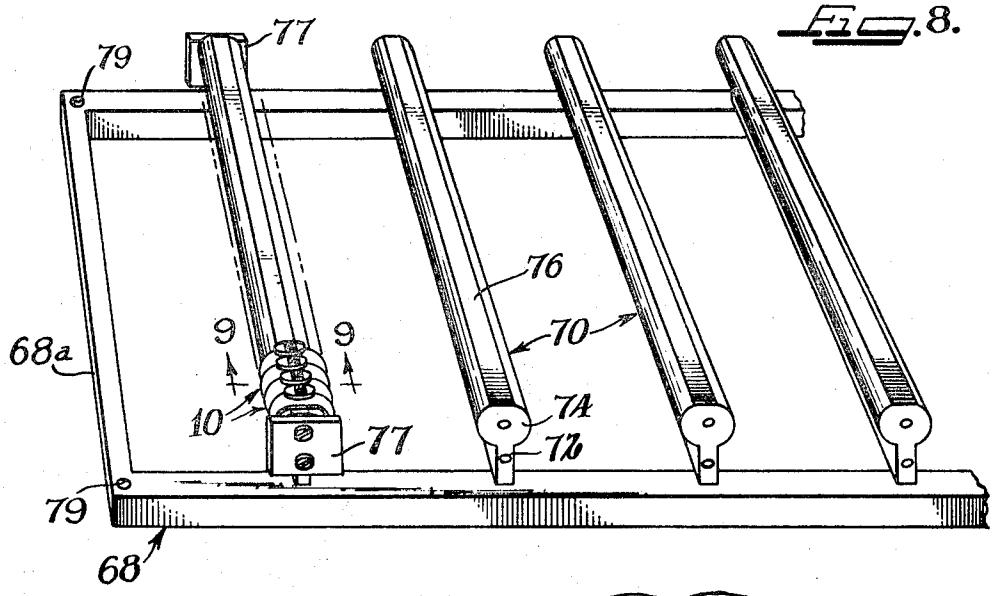
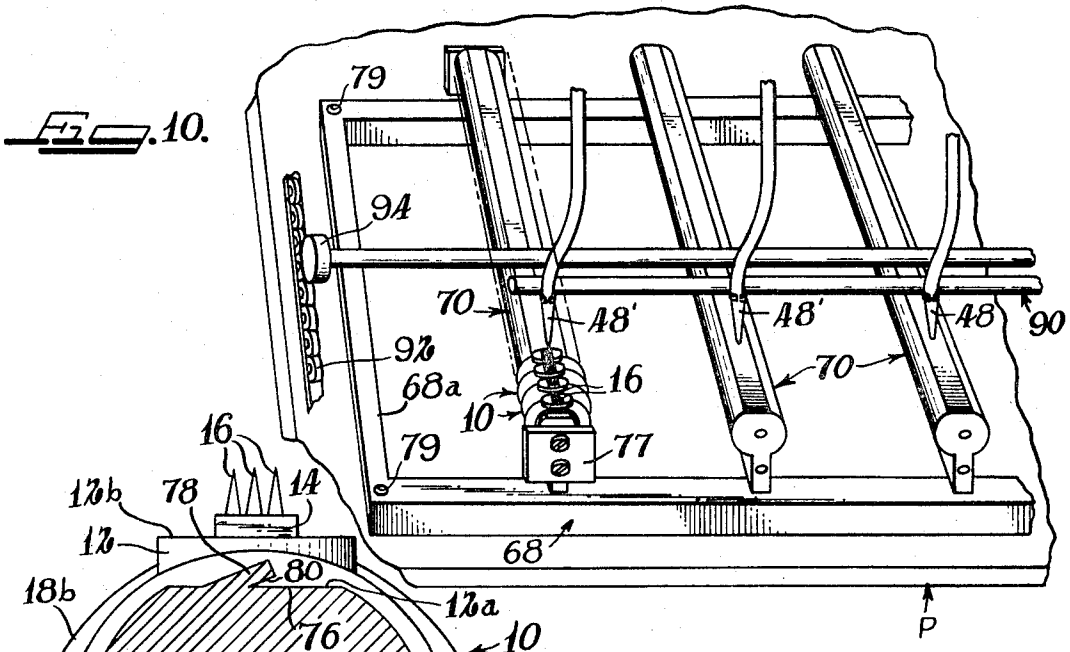


FIG. 10.



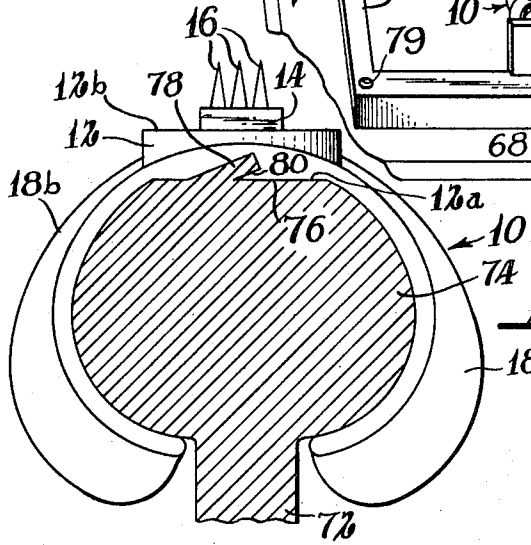


FIG. 9.

INVENTOR
GARY L. HEIN

BY Bair, Freeman & Molinare Attys.

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IMMERSION MEANS INCLUDING WORK HOLDER

Gary L. Hein, Decatur, Ill., assignor to Lincoln Laboratories, Inc., Decatur, Ill., a corporation of Illinois

Filed Mar. 4, 1965, Ser. No. 437,206

Int. Cl. B05c *3/00, 11/14;* B23q *1/00*

U.S. Cl. 118—429 5 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus, to dip multiple-point intradermal inoculators to effect uniform loading thereon, includes a plurality of elongated immersion tanks associated with means to circulate biological coating material and in combination with a work holder comprising bar means to slidingly receive the inoculators thereon and said bar means including rail elements to angularly retain said inoculators.

This invention relates to new and improved apparatus for loading a biological substance on a multiple-point applicator of the type used in introducing biologicals intradermally through multiple pressure-punctures. More particularly, this invention relates to apparatus for making a single-stable-dose biological application wherein the biological is lyophilized in situ on an effective multiple-point intradermal applicator instrument.

Multiple-point instruments for effecting introduction of biologicals intradermally through multiple pressure-punctures are well known, such as, for example disclosed in U.S. Patent No. 2,817,336. The said patent discloses, in one form thereof, the combination of a multiple-point intradermal pressure-puncture instrument, or scarifier, and biological carried thereby to be applied to a selected skin area from the exterior of the multiple points of the instrument. A later U.S. Patent No. 3,136,314 discloses an improved multi-point instrument wherein the points thereof are clustered very closely together, so that a biological may be loaded onto the cluster of points to be retained thereon by surface tension prior to the instrument being used to effect intradermal inoculation by scarification and simultaneous application of the biological to the scarified skin site.

It has been proposed to provide, as a further improved form of multiple-point biological applicator, for intradermal inoculation, an applicator of the type in Patent No. 3,136,314 which carries thereon a single-stable-dose of biological lyophilized in situ, so that the resultant combination provides a unitary device of increased shelf life, with the biological in dried form located in the space between pairs of adjacent points and precisely where it is to be used, so that upon reconstitution of the dried biological, it will be possible to effect application of the biological simultaneously with the effecting of the intradermal scarification. Such an improved device is disclosed in a co-pending application of Harvey Kravitz, Ser. No. 371,918, filed June 2, 1964 and now Patent No. 3,351,059.

It has been found however, that effective economical production of such an intradermal applicator which carries thereon a lyophilized single-stable-dose of biological is not a simple task. It was discovered to be impractical with existing techniques to merely attempt to press on, or cause the biological in dried form to be made to adhere to the points of a multiple-pressure instrument of

Patent No. 3,136,314. Furthermore, it is extremely important in the mass production of such devices for administration of biologicals to be able to predict, or obtain, uniformity of dosage of the biological substance that is to be lyophilized on the scarifying instrument, and the said mechanical methods of loading, which would ordinarily suggest themselves for solution of the problem, appear, at present, to yield random size loadings and thus to be incapable of providing the requisite uniformity of dosage.

It has also been heretofore proposed in a multiple-point intradermal inoculator to provide a plurality of relatively widely spaced metal points or prongs wherein the surface of the prongs have had to be treated to provide thereon a plurality of very small openings, scratches, or roughening which afford retention on each individual prong of a greater amount of liquid biological that is later applied by dipping of the points, cataphoresis or electrophoresis. However, the random nature suggested of providing openings, scratches or roughening fails to provide a precisely uniform configuration which would insure effecting the loading of a precise dose of liquid biological, nor does it appear from such prior suggestion that a dip-type loading would insure an accurate and automatic loading of a precise dosage of liquid on a multiple-point intradermal inoculator.

Thus, the object of this invention is to provide improved apparatus for production of an intradermal inoculator carrying a lyophilized single-stable-dose of biological thereon, whereby there is obtained substantial uniformity of dosage of the biological on the inoculator, in the preparation of the final product.

The above and other objects and features of the invention will be more readily apparent from the following description when read in connection with the accompanying drawings, in which:

FIG. 1 is an illustrative fragmentary view of one type of apparatus for carrying out one method of loading of liquid onto the points of multiple-point pressure-puncture applicators, as part of the invention disclosed herein;

FIG. 2 is an enlarged fragmentary cross-section view taken on line 2—2 of FIG. 1 and showing the individual amount for each inoculator;

FIG. 3 is a fragmentary cross-section view of one form of the final packaged product;

FIG. 4 shows another form of the final packaged product with a portion broken away to show details;

FIG. 5 is an illustrative flow chart showing major steps of the process embodying the invention herein;

FIG. 6 is an illustrative cross-section view of another device for carrying out the method of loading of liquid onto a plurality of multiple-point applicators;

FIG. 7 is a perspective view of the bath portion of the apparatus of FIG. 6;

FIG. 8 is a perspective view of the rack portion of the apparatus of FIG. 6, but shown in inverted position;

FIG. 9 is an enlarged fragmentary cross-section view taken on line 9—9 of FIG. 8; and

FIG. 10 illustrates a modified form of apparatus, using the rack structure of FIG. 8 but showing its adaptation for use with a drop-loading pipette system.

Referring now to the drawings, the figures illustrate generally different forms of apparatus for use in producing an intradermal inoculator of the type which carries thereon a single-stable-dose of biological. Basically, a supply

of multiple-point, pressure-puncture-type inoculators with clustered points of the type disclosed in Patent No. 3,136,314, are provided and similarly disposed so that each is at an attitude such that, with a liquid disposed, or deposited, on the multiple points of the inoculator, gravity forces on the liquid normally tend to cause the liquid to run off the multiple points. Thus, the inoculators may be arranged in inclined attitude, as in FIG. 1, or in inverted attitudes as in FIG. 6. Then, a pre-selected amount of inoculant biological substance in liquid suspension in a media or solvent, and constituting a single dose, is loaded onto the multiple points of each inoculator so that the pre-selected amount of liquid suspension is retained on the exterior surfaces of the points and in the spaces between the points. This may be accomplished by pipetting as in FIG. 1 or by dipping as in FIG. 6. With such an arrangement, the resultant of the capillary forces, or surface tension, generated by the clustered points acting against the forces of gravity, provides a fairly precise control means for insuring that the clustered points are not over-loaded and that they will each retain thereon a substantially precise amount of biological substance in liquid suspension. After the inoculators each have been substantially precisely loaded with a uniform dosage of liquid substance, then they are subjected to a process of lyophilization so as to lyophilize the inoculant biological substance in situ on the inoculators.

The lyophilization process is generally well established, and in the specific processing involved herein it includes taking the supply of inoculators that are uniformly loaded with inoculant material in liquid suspension and placing them under aseptic conditions into a refrigerated lyophilization chamber that is then closed and maintained initially at −40° C. to −50° C. at atmospheric pressure in order to freeze the liquid on the inoculators. The inoculators are kept at this temperature for a time sufficient to effect complete freezing of all liquid and to insure a uniform temperature in the inoculators and the frozen substance thereon. A period of 24 hours has been found to be adequate, although lesser time periods probably would be equally satisfactory. The freezing chamber is then evacuated of the air or gas therein, and the frozen substance on the inoculators then dries from the frozen state in vacuo, thereby giving up its liquid content and leaving the dried biological substance in situ tightly adhering to the exterior surfaces of the points and firmly retained in the spaces between the points. The chamber temperature is gradually raised to 0° C. by the gentle means of an infrared heat source directed to the interior of the chamber. This heating serves additionally to drive off any residual moisture and completes the drying operation. The chamber is finally vented with sterile dry nitrogen or other inert gas, and finally the inoculators, each carrying thereon a single-stable-dose of dried inoculant material, are packaged individually in the absence of air so that the pressure-points with lyophilized biological thereon are maintained, for purposes of achieving long shelf life, in an enclosed space from which air is caused to be absent and preferably in the presence of sterile dry nitrogen. This procedure will yield a lyophilized material in which the residual moisture content is no more than 1%, which is a desirable and attainable specification for purposes of producing a reliable instrument having extended shelf life.

While the foregoing description broadly describes the general method employed in effecting mass production of multiple-point pressure-puncture type intradermal inoculators which would serve as reliable single-stable-dose inoculators, certain additional steps are preferred in order to achieve desirable quality of production. First of all, the biological substance in liquid suspension is the form in which the inoculant is to be loaded onto the points of the inoculators. Desirably a relatively large supply of liquid is provided for continuous production technique and the liquid suspension is desirably chilled in a liquid reservoir at a temperature maintained at about −10° C., so as to inhibit undesirable aging, reaction, or activity of the biological substance. Furthermore, desirably the liquid suspension is agitated, by stirring or the like, to maintain uniformity of concentration of the suspension. In the preferred form, as hereinafter described, the chilled liquid is located in an aspirated container that contains therein a magnetic mixer that is driven by a motor driven magnet positioned outside the container. The chilled and agitated liquid is then delivered for loading onto the points of the inoculator.

While the loading of inoculators may take place in a variety of manners as indicated, for example in FIGS. 1, 6 and 10, the concept of utilizing gravity forces as a control for effecting substantially precise and uniform loading of the inoculators prior to lyophilization is considered to be of substantial significance. It will be understood that the inoculators, since they are made of plastic that may be precisely molded, themselves provide a clustering of points that generate substantially uniform retentive forces of surface tension and/or capillarity. However, when a plurality of such inoculators are inverted and immersed in a bath and then withdrawn, the act of separation of the inoculator points from the bath would normally tend to cause some variations in the excess of liquid retained on the points, but with the inoculators maintained inverted, the gravity forces soon correct any such variations and stabilize the dosages retained by the inoculators. In the practice of the procedure with the apparatus of FIG. 1, the same corrections are effected by the procedure of first loading the rack of inoculators on the right whose points face upwardly but at an incline to limit overloading, and then inverting the rack as shown on the left prior to the rack being moved to the lyophilization chamber.

In any event, it is also preferred that the racks be inverted, that is with the inoculator points pointing downwardly, when delivered into the lyophilization chamber and maintained there.

In the examples shown in the drawings, the apparatus is for loading multiple-point inoculators of the type disclosed in U.S. Patent No. 3,136,314 with smallpox vaccine. The inoculators **10** (FIG. 2) are molded of a plastic material preferably methyl methacrylate resin, and defines both a scarifier portion and a split ring of frusto-conical cross-section adapted for thumb mounting as disclosed in Patent No. 3,062,212. The base portion **12** of the scarifier portion of the inoculator has flat inner and outer sides **12***a* and **12***b*, with a platform **14** of regular shape, such as circular or square, located centrally on base **12** and projecting abruptly from said base portion **12**. A group of nine (9) needles, or points **16** project from platform **14** and are closely clustered in a regular pattern of 3 x 3 needles. The volume of vaccine that can be held in the spaces between the needles when the needles are pointing downwardly is in the range of about 0.01+ ml. of smallpox vaccine. The split ring portion of the inoculator includes arcuate thumb-embracing elements **18***a* and **18***b*.

The smallpox vaccine used is a glycerin-free, bacteria-free liquid smallpox vaccine containing a preservative such as 0.5% phenol; or a combination of 0.27 mcg. neomycin sulfate, 0.5 units polymycin B. Sulfate, and 0.03 mcg. tetracycline may be added to the liquid vaccine. Any one of several liquid smallpox vaccinal preparations suitable for lyophilization may be employed, such as that obtained from the chick chorio-allantois, as described by Jackson et al., J. Immunol. 77, 332–9 (1956), or that derived from a purified elementary body suspension derived from sheep pulp, described by Collier, J. Hyg. 53, 76–101 (1955). While the examples herein disclose use of smallpox vaccine it will be understood that the processes and apparatus may also be satisfactorily employed with other vaccines or inocula, such as tuberculin, which are effected by intradermal administration and which are susceptible of being lyophilized.

In FIG. 1, a rack **20** is provided in the form of a base **22** with a peripheral flange retainer **24** for positioning on the base a plurality of mounts **26** each of which has a shaped stud **28** for receiving thereon one of said inoculators **10**. The rack **20** with a plurality of inoculators **10** thereon is positioned upright but inclined, as seen in FIG. 1, with the inoculator points **16** facing upwardly.

A supply of chilled liquid smallpox vaccine V is provided in aspirator bottle **30**, from whose upper end extends an aspirator tube **32** filled with a cotton filter, and from whose lower end extends tubular discharge stud **34** through which the liquid is withdrawn. A magnetic steel stirrer bar **36**, encased in a plastic T, such as Teflon, to prevent reaction with the liquid, is within the bottle **30**. The bottle **30** rests on a casing **38** which encloses therein a drive magnet **40** that is driven by a motor M controlled by controller C. The rotating magnet **40** causes bar **36** to rotate within bottle **30** and to agitate the liquid V. The liquid contents V of bottle **30** are cooled in any known way, such as by locating the entire bottle **30** and its stirring drive in a refrigerated chamber. The bottle **30** and its agitating drive are shown enlarged relative to other elements in FIG. 1 for purposes of clarity.

A motor driven pipetting machine, generally indicated at **42** is provided for drawing liquid from bottle **30** through tubular stud **34** into tubing **44**, and thence through a controllable tubular hand dispenser **46** for discharge through a minutely orificed dispensing tip **48**, the said pipetting machine being well known in the art. The pipetting machine, as is shown, is adjustable to measure out a single drop of desired size for each stroke.

After each inoculator **10** has been loaded to its capacity with liquid vaccine, as shown, for example in FIG. 2, the rack **20** is moved from the position in the right-hand side of the stand in FIG. 1 to a position as shown to the left-hand side in FIG. 1 with the rack **20** and inoculators therein inverted. The previous left-hand tray may be moved to the lyophilization chamber that is described hereinabove. During the time period when the next tray **20** on the right is being loaded with the pipetting apparatus, the forces of gravity acting on the inverted inoculators on left-hand tray **20** are operative to effect the necessary draining of excess vaccine so as to obtain uniform liquid loading of the inoculators.

After loading and then draining of excess liquid, the other process steps are successive as shown in FIG. 5 where the process runs from left to right. The trays of inoculators are moved into a lyophilization chamber where the liquid is lyophilized, then dried in a vacuum, and then dried at a raised temperature. The last step of packaging is, as indicated earlier, carried out in the absence of air, and in the presence of inert gas, preferably such as dry nitrogen. The final product may be in the form of FIG. 3 where the inoculator **10** with lyophilized vaccine V thereon is completely packaged in a sealed air-tight plastic envelope containing dry nitrogen in the space S. Alternatively, as shown in FIG. 4 the inoculator **10** is provided with a circular base portion **12** having a peripheral groove **50** for receiving therein an O-ring type seal **52**, and a cover **54** may be slip-fit onto circular base portion **12** so as to enclose the points **16** with lyophilized vaccine V thereon. The cover **54** has an inner peripheral groove **56** for receiving seal **52** thereinto so as to be air tight, and dry, sterile, nitrogen gas fills space S'. Cover **54** is provided with outwardly extending flanges **58** for purposes of manipulating cover **54** onto and off the circular base portion **12'**.

A preferred form of apparatus for effecting both loading of the liquid on the points of the inoculators and for effecting draining, under gravity, of excess of liquid is shown in FIGS. 6–8. Here a metal base **60**, preferably aluminum or stainless steel, is shaped to define a plurality of parallel channels, or troughs **62**, that are to be maintained and filled with liquid vaccine. The aluminum base **60** permits of cooling of the liquid in channels **62** if desired, or necessary. Otherwise, liquid is pumped or fed under pre-selected pressure from a supply such as aspirator bottle **30** with discharge stud **34** through a feed tube **64** which branches at **64***a* and **64***b* and connects to the bottom of each trough **62** for supplying liquid thereinto.

A peripherally framed tray **68** is provided which carries thereon a plurality of spaced, elongated, inoculator holders, or mount bars **70**. Each mount bar **70** is shaped to define a stem, or neck, **72**, and an enlarged head **74**. The width of the neck **72** is such as to be slidably received between the spaced edges of the thumb-embracing elements **18***a* and **18***b*, as seen in FIG. 9. The shape or cross section, of the enlarged head **74** is generally oval and is so selected as to approximate the smallest enclosed inner area of the split ring thumb mounting, so as to permit a sliding of the split ring mounting onto and along the neck and head of the mount bar **70**. A portion of head **74** provides a flat surface **76** for abutting cooperation with the flat inner surface **12***a* of the inoculator. Removable end plate brackets **77** are provided which connect, by set screws, to the free ends of mount bars **70** and which engage the outer edges of the outer inoculators after each bar is entirely loaded with inoculators **10**. While the latter arrangement which maintains the inoculators in tight edge-to-edge engagement operates to maintain the inoculators properly positioned at a set attitude on the mount bars **70** even when a tray **68** is inverted, it is proposed to provide alternative means that will insure that the inoculators will be maintained at the selected attitude. To this end, each mount bar **70** is provided with a track means in the form of an inclined tang, or rail, **78** projecting at an incline from the said flat surface **76**, and the inoculators **10** are formed with a cooperating element in the form of an elongated groove **80** inclined inwardly of surface **12***a*, thereby providing a slot for receiving the tang **78** therein as the inoculators **10** are slid endwise onto the mount bars **70**, as best seen in FIG. 9. The latter arrangement insures that the inoculators **10** are maintained at a selected attitude relative to bars **70** for all attitudes of the tray **68**. The four corners of tray **68** are apertured as at **79** to provide means for suspending the tray **68** from a hoist. Alternatively, the apertures **79** may serve as guideways for slidably receiving therein guide rods **79***a* that are fixedly secured to base **60**.

Large numbers of inoculators may be loaded upon tray, or rack **68** and thereby efficiently handled for each step throughout the entire process. Specifically the mount bars **70** are of aluminum, which may be conveniently extruded to obtain the specific shape desired, and the bars are appropriately secured to the frame of tray **68** by any of several mechanical means, such as screws, welding or the like. The total size and capacity of tray **68** may be varied for coordination with other equipment used in the process. A typical rack providing ten mount bars **70**, each 60 inches long and spaced 1½ inches apart on center lines, will hold 1500 inoculators of the type disclosed. The oval shape of head **74** is defined with a ⅝ inch large diameter and 7/16 inch small diameter, thereby closely approximating the smallest inside size and shape of the inoculator **10**. The two sides runs **68***a* of tray **68** serve as support bars or legs for sliding engagement on shelf type supports that are normally provided in sterilization and lyophilization chambers.

The base **60** provides parallel channels **62** that are, for example, 3/16 inch deep by 3/16 inch wide and spaced 1½ inches apart on centers. The number and length of channels correspond with the number and length of mount bars **70** on tray **68**.

The construction of the base **60** and the tray **68** is such that when arranged in cooperative relation as best seen in FIG. 6, the inoculators **10** carried by mount bars **70** are positioned to be disposed vertically above the channels **62** in which the liquid inoculant is disposed. The width of the channels **62** are relatively small as compared to the channels' length, but the width is of an order to permit entrance

thereinto of the points **16** on one inoculator **10**. In the process of loading the inoculators **10**, the tray **68** is lowered to the position as seen in FIG. 6 with the points **16** projecting downwardly into the liquid in the channels **62**. The top wall of the base **60** engages surface portions **12***b* of the inoculators **10** so as to permit only the points **16** to dip into the liquid vaccine. The rack **68** is maintained in the position of FIG. 6 for a few minutes permitting the surface tension and capillarity of the closely clustered points **16** to act upon the liquid to draw same up into the spaces between the points **16** and to thereby load the points with vaccine. The tray **68** is then moved vertically upwardly away from base **60**, and such vertical movement is preferred, as it operates to prevent smearing of the vaccine and further the loading of liquid is thereby better controlled in response to the resultant force attained between the capillarity forces acting against the forces of gravity.

Within a very short time after the points **16** have been withdrawn from the vaccine bath, the excess vaccine will have drained off the points **16**, thereby leaving on each inoculator a substantially identical loading of liquid, which in the case of smallpox vaccine is in a desired amount of about 0.01+ ml. The steps of loading and draining of excess vaccine takes about five minutes. The loaded inoculators **10** are then moved to a lyophilizing chamber where the remaining steps of the process are initiated as described hereinabove.

After inoculators are loaded onto rack tray **68** and locked in position, and before the loading process herein described is initiated, the loaded trays **68** are sterilized in a gas sterilizer for 4 hours with an appropriate and well known ethylene oxide gas mixture at 136° F., at 55% relative humidity and 18 p.s.i. sterilization chamber pressure.

After the lyophilization procedure herein described, the loaded trays **68** are transferred to a packaging chamber filled with dry nitrogen gas. The inoculators with lyophilized material thereon are then sterile packaged under aseptic conditions in the presence of said dry nitrogen gas, in a well known manner, as by sealing each inoculator in its own envelope as in FIG. 3, or by capping each inoculator with a sterilized cap **54**. In packing the inoculator in its own envelope, the inoculator is first removed from tray **68**; while capping may be effected when the inoculators are still mounted on rack **68**, and after capping, the capped inoculators are removed from tray **68**.

An alternative inoculator loading operation is disclosed in FIG. 10 wherein liquid drops are dispensed downwardly from pipetting dispensers onto points **16** of inoculators. This process is conducted in a chamber maintained at 0° C. Liquid is fed from a refrigerated reservoir (not shown) maintained at −10° C. into a bank of automatic pipetting machines each similar to that shown in FIG. 1, and whose number corresponds with the number of mount bars **70** on rack tray **68**. The tray **68** is disposed on a platform P with pipette dispensers **48'** carried by frame means **90** and located directly above the points **16** on the first inoculator on each bar **70**. The platform P with tray **68** thereon is moved by a linear indexing conveyor (of any well known type) which is timed or otherwise appropriately actuated, to automatically advance platform P a distance of ⅜ inch (spacing between centers of adjacent clusters of points **16**) at the end of each cycle. The pipettes **48'** are arranged to automatically dispense a precise amount of fluid in timed sequence after the platform P has advanced each step of ⅜ inch. The regulation and control of the cycle may, for example, be controlled by means of a cam strip **92** carried on platform P with low dwell points located at ⅜ inch spacing to correspond with the advancing of platform P, and with a roller type feeler **94** arranged to enter the low dwell points to initiate the cycle of dispensing from the pipettes followed by another advance of platform P.

While there has been disclosed herein the various steps of a process for efficiently producing single-stable-dose inoculators and apparatus for carrying out such process, it is to be understood that this disclosure is merely by way of example and it is contemplated that equivalent steps and machines may be substituted.

What I claim as new, and desire to secure by Letters Patent of the United States is:

1. An apparatus for effecting loading of a biological substance in a liquid suspension onto the multiple-point portions of multiple-point type intradermal inoculators, said apparatus comprising, in combination: means defining a base having a plurality of elongated channels therein, in which biological substance in a liquid suspension is to be maintained, the width of each channel being relatively small as compared to the channel's length but of a width size in the order to afford entrance thereinto of the points of a single multiple-point inocculator, a supply of biological substance in a liquid suspension carried in the channels in said base, an inoculator-carrying rack defining spaced, elongated, inoculator holders including means operatively associated with cooperating means on said base for registering said holders with the elongated channels in said base, so that the multiple points of all inoculators carried on said holders may be simultaneously immersed with the points pointing downwardly into the liquid in said channels and said rack means comprising a frame, a plurality of spaced bar means thereon, each of said bar means being coextensive with and corresponding to a separate one of said channels, each bar means in cross-section defining a support portion with an enlarged head, and said enlarged head including a rail element along the longitudinal extent thereof whereby said inoculators mounted on said elongated heads may be angularly retained.

2. An apparatus for effecting loading of a biological substance in a liquid suspension onto the multiple-point portions of multiple-point type intradermal inoculators, said apparatus comprising, in combination: means defining a base having a plurality of elongated spaced channels therein which biological substance in a liquid suspension is to be maintained, the width of each channel being relatively small as compared to the channel's length but of a width size in the order to afford entrance thereinto of the points of a single multiple-point inoculator, a supply of biological substance in a liquid suspension, conduit means connected to each channel for feeding the biological substance in liquid suspension from said supply to each of said channels, means for agitating the supply of biological substance in liquid suspension delivered to said conduit means, an inoculator-carrying rack arranged to carry a plurality of inoculators with the points of the inoculators pointing downwardly and to simultaneously immerse and withdraw the downwardly facing points of said inoculators from the said liquid suspension in said channels, said base means including means to align said rack therewith and said rack means comprising a frame, a plurality of spaced bar means thereon, each of said bar means being coextensive with and corresponding to a separate one of said channels, each bar means in cross-section defining a support portion with an enlarged head, and said enlarged head including a rail element along the longitudinal extent thereof whereby said inoculators mounted on said elongated heads may be angularly retained.

3. An apparatus as in claim **1** wherein said inoculators are of the type that is provided with a split-ring type mounting that defines a frusto-conical ring recess for wedging application upon a thumb and said support portion comprises a neck whose width is smaller than the spacing of the adjacent segments of the split-ring type mounting.

4. An apparatus as in claim **3** wherein said enlarged head has a shape in cross-sectional area that approximates the smallest enclosed inner area of said split-ring

type mounting, so as to permit of sliding of the split-ring type mounting onto and along said neck and enlarged head.

5. An apparatus as in claim 2 wherein said rail element comprises an inclined tang extending from said bar means.

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MORRIS KAPLAN, Primary Examiner

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