May 20, 1958 E. A. MAY ET AL 2,835,377

STERILE HYPRODERMIC NEEDLE AND SYRINGE HOLDER

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Fig. 1

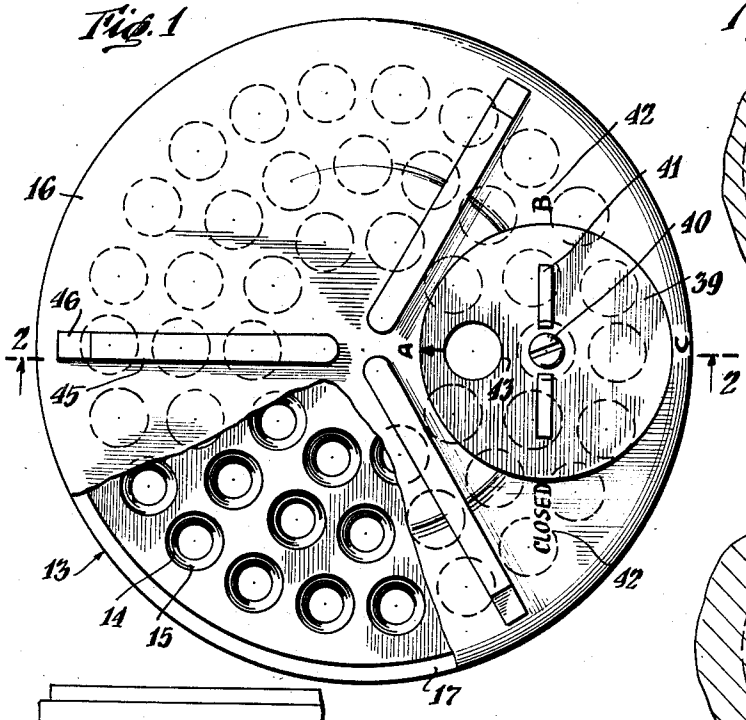


Fig. 3

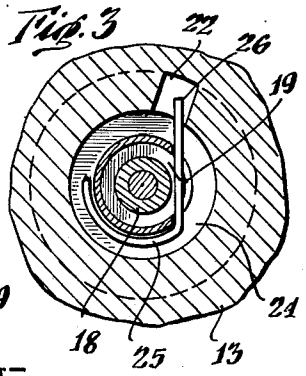


Fig. 4

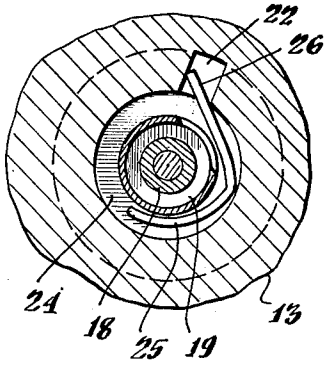
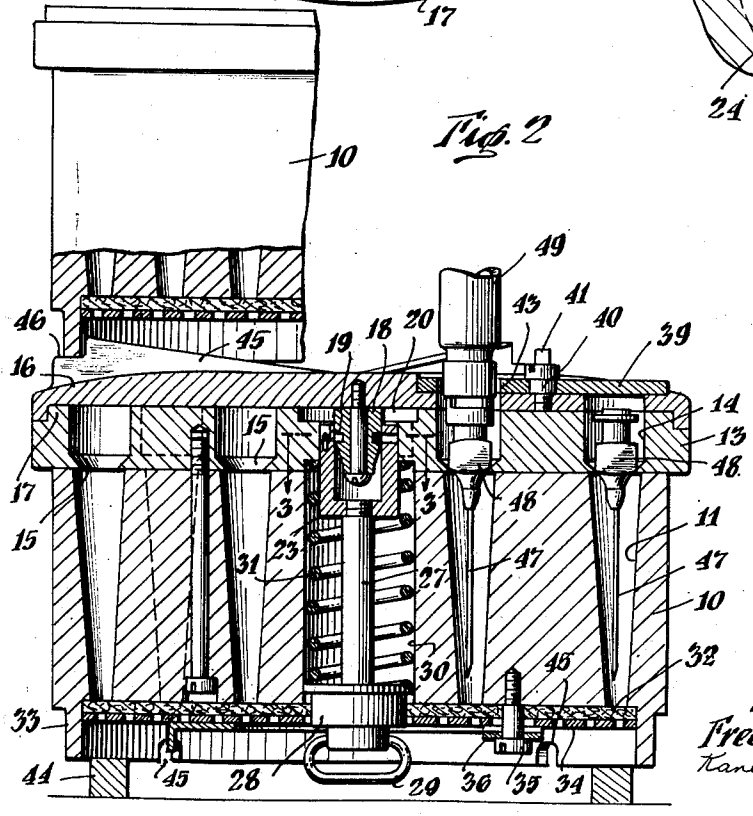


Fig. 2



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Fig. 5

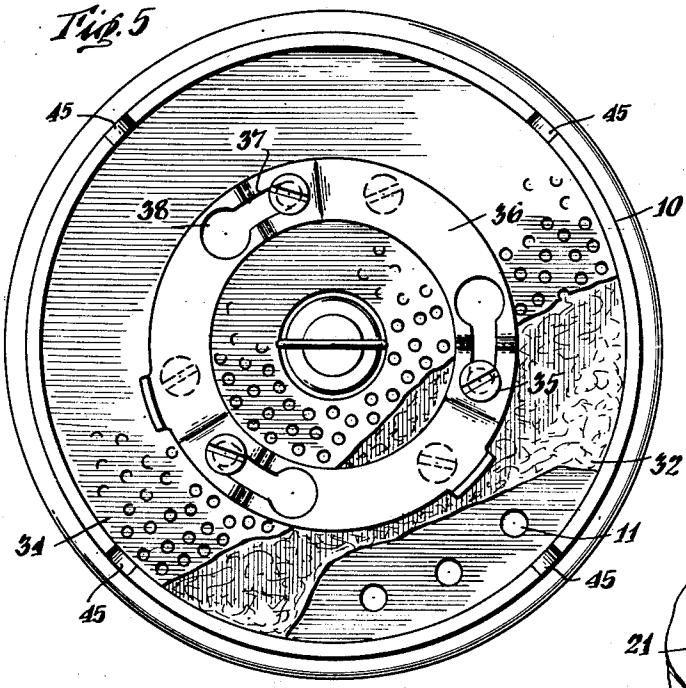


Fig. 7

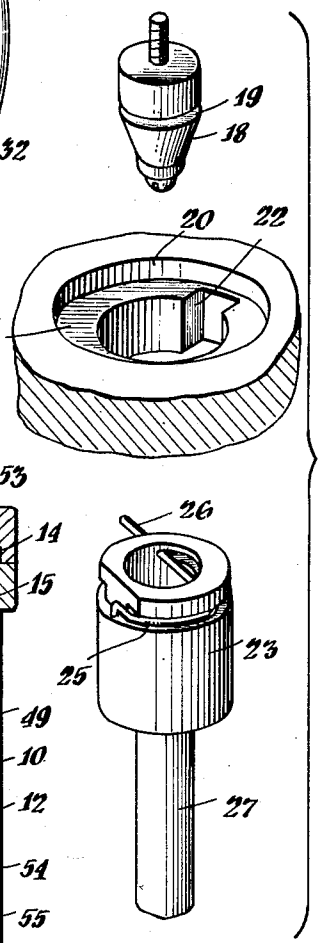
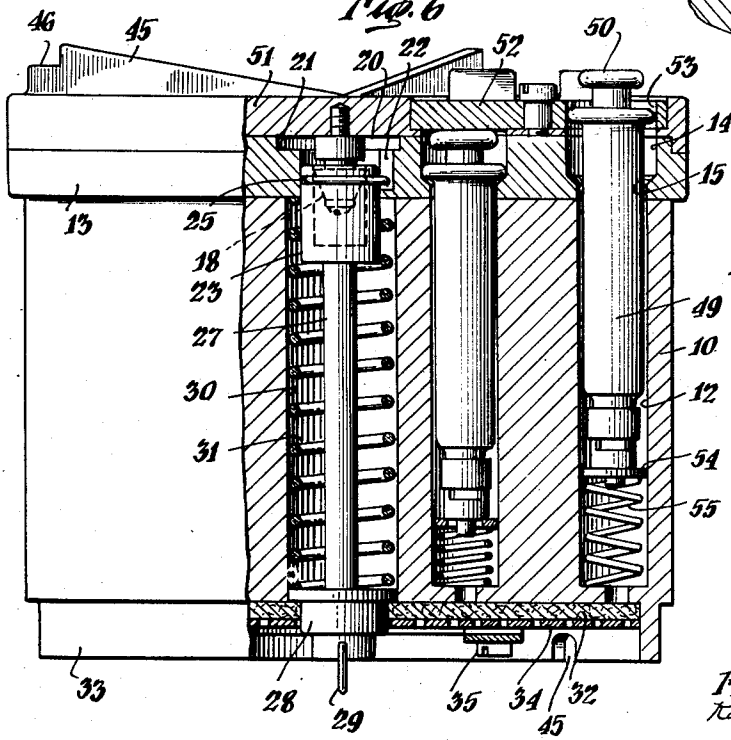


Fig. 6



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Fig. 8

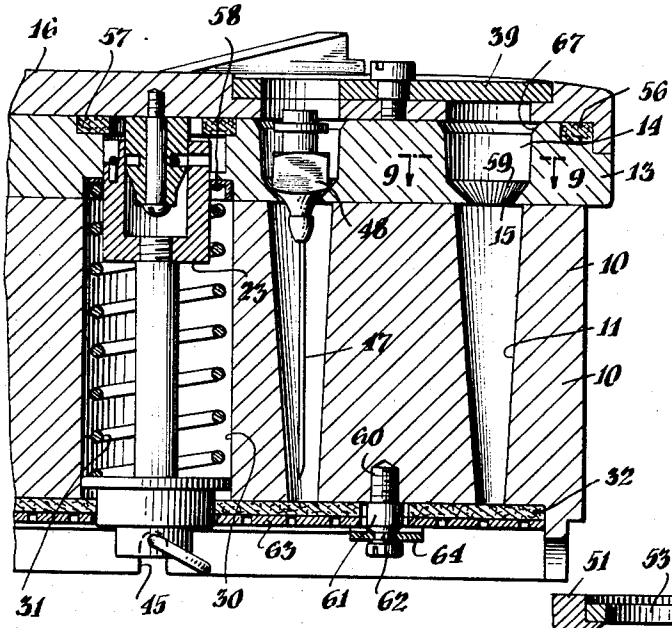


Fig. 9

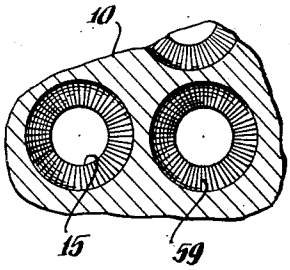


Fig. 12

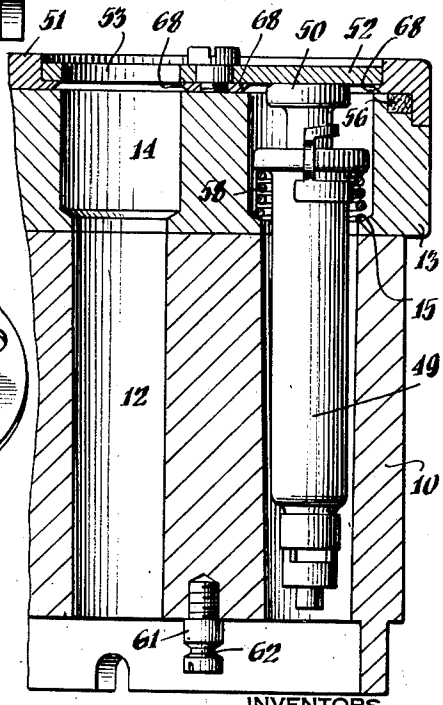


Fig. 10

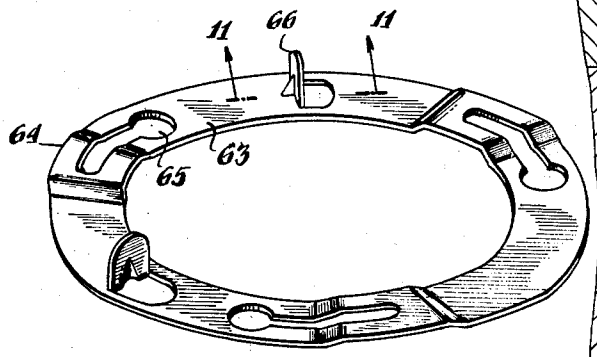
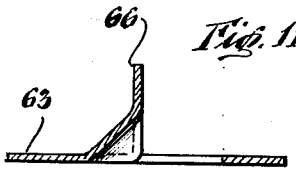


Fig. 11



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STERILE HYPODERMIC NEEDLE AND SYRINGE HOLDER

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Application December 30, 1954, Serial No. 478,786

7 Claims. (Cl. 206—17.5)

This invention relates to a functionally and structurally improved apparatus to be disposed within a suitable receptacle or autoclave for the purpose of rendering articles sterile and thereafter maintaining them in this condition; such articles especially including hypodermic needles and syringe assemblies.

It is the primary object to furnish an improved unit which is to receive articles of the aforementioned types and within which such articles are rendered sterile for use by physicians and technicians. Moreover, by following the teachings of the present invention the thus treated articles, housed within the unit and removed from the autoclave, will be maintained in sterile condition against all probability of contamination until the ultimate user removes them from the sterilizer unit.

Also, by means of this invention the articles will be sequentially rendered available for use; there being substantially no danger of contaminating the units or assemblies remaining within the sterilizer when withdrawing a given unit therefrom. Additionally, the structure of the sterilizer will be such that all units may be sequentially withdrawn without danger of overlooking or by-passing a unit which is in proper condition for use by the physician or technician.

Still another object is that of designing an apparatus, the parts of which may readily be separated for the purpose of cleaning and also to receive the units or assemblies to be sterilized. Additionally when the assembly has been completed, subjected to action by the autoclave or its equivalent, withdrawn therefrom and placed in use, there will be practically no danger of the parts of the sterilizer unit becoming accidentally separated and thus impairing the sterility of the contained needle units or syringe parts.

An additional object is that of providing a sterilizer including relatively few parts, each individually simple and rugged in construction, such parts being capable of ready manufacture and assembly to furnish a mechanism operating over long periods of time, with freedom from all difficulties.

With these and other objects in mind reference is had to the attached sheets of drawings illustrating practical embodiments of the invention and in which:

Fig. 1 is a plan view of a hypodermic needle receiving sterilizer with certain of the parts broken away to disclose underlying construction;

Fig. 2 is a sectional sideview taken along the line 2—2 in the direction of the arrows as indicated in Fig. 1 and showing a second sterilizer superposed thereon;

Fig. 3 is a transverse sectional view in enlarged scale taken along the line 3—3 in the direction of the arrows as indicated in Fig. 2;

Fig. 4 is a view similar to Fig. 3 but showing the parts shifted to a position different from that shown in the earlier figures;

Fig. 5 is a bottom plan view of the assembly with certain of the parts broken away to disclose construction above the same;

Fig. 6 is a fragmentary sectional sideview of a sterilizer assembly of the type which is to receive syringe barrels and plungers;

Fig. 7 is an exploded perspective view showing fragments of the locking assembly which is preferably included in the sterilizer;

Fig. 8 is a fragmentary sectional side view showing structural details which are preferably embraced in the unit of Fig. 2;

Fig. 9 is a fragmentary sectional plan view taken along the line 9—9 in the direction of the arrows as in Fig. 8;

Fig. 10 is a perspective view of a preferred type of locking ring;

Fig. 11 is an enlarged sectional view taken along line 11—11 in the direction of the arrows of Fig. 10; and

Fig. 12 is a view similar to Fig. 8 showing details of structure and alternative designs preferably embraced in the unit illustrated in Fig. 6.

In these views the reference numeral 10 indicates the body of the sterilizer unit which is to be placed in an autoclave or main sterilizer. This unit is formed with a desired number of annular rows of perforations or bores 11. As in Figs. 2 and 8 these bores may be downwardly tapered. In Fig. 6 the bores 12 are substantially cylindrical.

Providing a part of the body assembly and secured against movement with respect thereto is a plate 13 provided with perforations or bores 14 which are aligned with the bores 11 or 12. The base parts of bores 14 are preferably defined by inwardly extending flanges or supporting portions 15. A cover 16 is supported for rotation upon the plate. Cooperating flanges 17 are provided as parts of these elements to furnish an overlapping structure.

To permit of rotation of the cover with respect to the body of the sterilizer, while at the same time normally retaining that cover against accidental detachment, a latch or lock structure is employed. While this may take one of several different forms it is preferred that it include a tapered plug 18 as in Fig. 7, which plug is formed with an annular groove 19 and is suitably secured to cover 16 at a point centrally of the latter. Centrally of plate 13 an opening 20 is furnished. A flange 21 extends inwardly of the bore defined by this opening and is interrupted as at 22. An actuator and bolt element is provided by employing a cylindrical head 23 having a diameter such that it may be accommodated within the space defined by the inner edge of flange 21. This head is formed with an annular groove 24 and one end of a wire or rod 25 is anchored within this groove; its body extending along the groove and thence substantially transversely of the latter to project beyond body 23 as indicated at 26. A stem 27 is secured to body 23 and conveniently terminates in a knob 28 and a bail or similar portion 29.

The actuator is disposed within the central bore 30 of body 10 at the time plate 13 is associated therewith. A spring 31 has one of its ends bearing against the under face of plate 13 while its opposite end bears against portion 28 of the actuator assembly. Therefore, it is apparent that the entire actuator assembly will normally be subject to a downward thrust exerted by the spring which will tend to maintain cylindrical portion 23 in a lowered position. In that position it will normally lie adjacent the lower end of plug 18.

Also in that position the extension 26 of the wire or rod 25 will ride within groove 22. That rod or wire embraces resilient characteristics. Under the position of the parts as aforedescribed there will be no interlock between the cover 16 and plate 13 such as would prevent a separation of that cover from the plate. However, if an operator, while maintaining body 10 in a stationary

position, exerts an inward thrust upon stem 27, cylindrical portion 23 will be shifted towards the cover. That cylindrical portion may not be turned to any appreciable extent because the extended end part 26 is riding within groove 22. The portion of the rod or wire which extends across the bore of part 23 will ride in contact with the tapered lower portion 18 of the plug. Therefore, it will cam against the surface of the latter until it reaches a position adjacent the groove 19. At that instant, it will ride into that groove thereby preventing a lifting of the cover from the body and plate of the sterilizer assembly.

This, however, will not prevent a rotation of the cover because the transversely extending portion of wire 25 can ride within groove 19. Also, the tapered plug may be rotatable with respect to the cover. If the operator desires to release the latch, then by simply turning the head portion 28 by means of the knob or bail 29, the parts are shifted from the position shown in Fig. 3 to that illustrated in Fig. 4. In the latter view the end portion 26 of the wire or rod cooperates with groove 22 to assure a swinging of the wire end as relative rotation occurs. Such swinging causes the parts of the rod adjacent end part 26 to shift out of groove 19. Therefore, under the urging of spring 31 cylindrical portion 23, its stem 27 and head 28 are all moved downwardly. There being now no restraint to cover 16 being moved in an axial direction away from the body of the sterilizer, it follows that the cover may be lifted to expose the various bores 11 or 12. The locked position of the cover has been shown in Fig. 2 whereas the unlocked position of the parts has been illustrated in Fig. 6.

Contrary to conventional structure and operation the present sterilizing unit permits the entrance of the steam or other gas to occur by an upward flow within its body. Therefore, the lower ends of bores 11 and 12 are not closed by any sealing plate. Rather, according to the present teachings, a layer 32 of material is disposed adjacent the lower ends of these bores and is encircled by a flange 33 which conveniently forms an integral part of body 10 as in Figs. 2, 5 and 6. This material may, for example, be a layer of asbestos. It will be porous to air and steam, but not to dirt or air-borne bacteria. This layer is conveniently retained in position by having a perforate plate 34 extending in contact with its lower face. That plate is formed with a suitable number of enlarged openings through which the heads of retaining screws 35 may pass. The latter serve, as in Fig. 5, to mount a strip 36 in the form of a ring and which strip is provided with arcuate slots 37 terminating in enlarged end portions 38. The diameter of the latter is such that they will permit of the passage of the heads of screws or bolts 35.

Therefore, with the ring in position, that ring will be supported by these bolts. The ring bearing against plate 34, that element will be retained as in Figs. 2 and 6. So retained it follows that layer 32 will also be maintained in position. When it is desired to renew layer 32 or for other purposes to expose the lower face of body 10, this is achieved by simply rotating ring 36 until the enlarged openings 38 align with the bolt heads. Under these circumstances the ring may be withdrawn over these heads. Likewise, plate 34 may be dismounted. If layer 32 has openings of sufficient area it may also be dropped into a position at which it clears the bolts. If the openings are of reduced diameter then by simply dismounting the bolts the layer may be removed from association with the lower face of body 10.

That body may be formed with any desirable number of bores 11 or 12. These bores are disposed in the form of annular series and in rows concentric with respect to each other. As illustrated, three of these rows exist. A greater or lesser number might be employed. However, in the interest of not having the apparatus too unwieldy it is preferred that three rows be provided as shown.

The cover 16 is formed with any suitable number of openings. If a single opening is employed then it will take one configuration. Otherwise, different configurations will be resorted to. In any event the area of the opening or openings encompasses the width of body 10 within which the rows of bores are formed. The cover opening is closed by a plate 39 which is rotatably supported on its surface by, for example, a bolt 40. A protrusion 41, serving as a knob, conveniently extends upwardly from this plate. Therefore, it may readily be turned with respect to the cover 16. Indicia such as 42 is associated with the cover and adjacent surface of the plate. According to the registration of this indicia an opening 43 in that plate will register with either the innermost, outermost or intermediate row of bores. Therefore, as cover 16 is rotated around its axis that opening 43 will sequentially align with all of the bores of a given row. After it has once traversed one of these rows, then plate 39 may be rotated so that its opening 43 will align with the next row and lastly with the final row. The operations will be repeated until that opening has passed over all bores. If desired different size needles might be disposed in the different rows and the indicia could be modified accordingly.

It is preferred that a sterilizer unit constructed in accordance with present teachings be capable of being "stacked" on top of other units. The lowermost unit, as shown in Fig. 2, may be supported upon bars 44 disposed within an autoclave so that vapor or gas will freely pass into contact with the lower face of that unit. Otherwise, notches 45 may be formed in flange 33 to provide passages. For the purpose of rotating cover 16 the latter is conveniently formed with ribs 45 extending radially of its body and provided with outer shoulder portions 46. These shoulder portions, as in Fig. 2, serve to support in spaced relationship and stabilize flange 33 of a superposed unit. Accordingly, the heated gas or vapor will freely pass into contact with the surface of plates 34 of each unit. It will flow through the perforations of these plates and layers 32 into bores 11 and 12. Within those bores it will rise and completely displace air therein in a downward direction. Therefore, the articles within the bores will be properly sterilized.

Those articles, as in Fig. 2, conveniently embrace hypodermic needle assemblies including shanks 47 and hub portions 48. The bores are of a length adequate to accommodate all usual lengths of needles. The latter will, of course, have been cleaned before they are placed in the sterilizer. Access to the interior of the latter is achieved by releasing the latch and removing the cover 16 from the body of the unit. No damage will occur to the sharp ends of the needle points because hubs 48 rest against flanges 15 to properly support the needles. As the cover is rotated with the opening 43 of plate 39 in registry with one selected row of bores the needles will be successively rendered visible to the ultimate user. That user, by plunging the outer end of a syringe barrel 49 through the opening 43 and effecting relative rotation of the barrel with respect to the needle, will couple these units against displacement without having to manually grasp the needle. That coupling may be assured by using a structure such as is well known and embodied in, for example, a "Luer" type of assembly. So coupled the needle attached to the syringe barrel may be withdrawn from body 10. Upon desiring a further needle, cover 16 is simply indexed to cause opening 43 to align with the next bore. Thereupon the entire operation is repeated until the needles within one row have been exhausted. Then the operator by simply rotating plate 39 will register its opening with the second row which therefore has not been exposed to room air. The operation is continued until all needles have been withdrawn. At this time, the sterilizer unit may be cleaned, after removing its cover, and it may be charged with a fresh supply of needles which are to be sterilized.

The structure shown in Fig. 6 is primarily intended for

the sterilization of syringe assemblies including barrels 49 and plungers 50. Both of these units of each assembly will, of course, have been cleaned in accordance with conventional technique before they are associated with one of the bores of the sterilizer unit. The cover 51 rotatably mounted by the body 10 preferably in the manner aforedescribed, in this instance is formed with a recess accommodating a rotatable plate 52 corresponding to plate 39. A layer of air porous material underlain by a plate 34 is provided as has also been described in connection with the earlier figures. Having in mind that the assembly which is being sterilized in this instance is to be directly grasped by the fingers of the operator a delivery means is furnished. This preferably takes the form of springs 55 individual to each of the bores 12 and acting against plates 54 which are notched, perforated or otherwise proportioned so as to not interfere with the passage of heated gases or vapors passing through the bodies of units 34 and 32. As will be apparent the syringe assemblies will normally be retained in depressed condition by either contacting the underface of cover 51 or else the similar face of plate 52. However, when the opening 53 of that plate (which corresponds to the opening 43 of plate 39) is in line with one of the assemblies, the latter under the influence of the delivery spring 53, will be projected. This has been shown in Fig. 6. With such projection plunger 50 may be grasped and due to the frictional contact existing between that plunger and barrel 49 the entire assembly may be withdrawn. Even if the fingers of the ultimate user are employed no contaminating of the interior surfaces will occur.

In both of the embodiments shown in Figs. 2 and 6, it will be understood that the units to be sterilized are primarily cleaned by the use of suitable implements, detergents, etc. By rotating the lower portion 28 of stem 27 the latch structure is released from the position shown in Fig. 2 and shifts to the position shown in Fig. 6. In the latter position the cover of the body may be lifted. Thereupon each of the bores 11 or 12 receives one of the units to be sterilized. Inward movement of that unit beyond a predetermined point is prevented by means of the supporting portion 15 or its equivalent. Now with the cover applied to the body the upper ends of bores 11 and 12 are sealed. This sealing will occur in a manner such that a proper connection is furnished by means of the overlapping flanges 17 or any suitable structure which furnishes a duplicate thereof. In the case of needles the latter—under the influence of gravity—will assume positions such as have been shown in Fig. 2. The cover 52 bearing against the outer end of plunger 50 will have forced the barrel assemblies into fully housed positions if a structure such as had been shown in Fig. 6 is employed.

In either event, by simply bringing pressure to bear against the operating head 28 to thrust stem 27 inwardly the latch structure is engaged. This will prevent a separation of the cover from body 10. However, it will allow a rotation of that cover with respect to the body. Thereupon, with plates 39 or 52 closed the assembly may be disposed in an autoclave in the manner shown in Fig. 2. In lieu of an autoclave any suitable heat expedient of proper character may be employed. The apparatus is subjected to a sufficiently high temperature for an adequate period of time. Therefore, the gases or vapors which embody that temperature will pass into the lower ends of bores 11 or 12 and flow in contact with the articles to be sterilized. After the completion of this operation the apparatus is available for the ultimate user. With plate 39 or 52 in positions at which no registration of their openings occurs with respect to any of the bores, the articles within the latter will be maintained in sterile condition. This is true despite the fact that the exterior of the assembly may be subjected to contaminating influences. Such result is to be attributed to the fact that layer 32 will act as a filter to prevent foreign materials within the air from entering through the lower ends of the bores after the mechanism has been removed from the sterilizer. Even when the plate 39 or 52 is shifted to a position aligning with one of the bores only the interior of that bore will receive entering air. All adjacent bores will be maintained in sealed and sterile condition.

As afore brought out the operator, by for example employing the indicia 42, will be able to select any given row of bores and sequentially remove the sterilized articles from within the same. In the case of syringe assemblies these are simply lifted by the operator's fingers incident to grasping the knob 50 of an assembly and exerting a withdrawing pull thereon. In the case of needles the latter are presented in a manner such that without being engaged by the fingers of the operator they may be coupled under conditions of sterility with the forward portion of a syringe assembly. Upon elevating the latter the needle is likewise elevated. After having traversed the bores or recesses of one row, cover plates 39 or 52 may be shifted to align with an adjacent row. Thereupon by continuing to rotate the covers 16 or 51 the bores of the second row are traversed to permit the removal of articles therefrom. By again shifting plates 39 or 52 a traversal of the bores of a final row is achieved.

While the flange coupling indicated at 17 in Fig. 2 may in most instances provide an adequately tight seal, a substantially air-impervious connection may be furnished at this point as indicated in Fig. 8. As will be seen in that figure the edge of plate 13 has been conveniently recessed in the zone of its contact with cover 16. Within this space a ring or gasket 56 is disposed. This element is formed of any proper material such as natural or synthetic rubber. As also shown in this figure a similar gasket or ring 57 may be positioned adjacent the upper end of bore 30 in order to engage the inner face of the cover. Likewise, a gasket 58 may bear against the reduced upper end portion of this bore and furnish a seat for the adjacent end of the spring 31. The inner edge of this washer may have sliding engagement with head 23.

As afore brought out it is intended to withdraw the needles 47 as shown in Fig. 2 from the bores 11 by engaging the hub portions of the same with the outer end of a syringe barrel. Such engagement or coupling will ordinarily involve a rotation of the barrel with respect to the needle hub in order to engage the parts of the assembly. Therefore, the needles should not be susceptible to rotating within the bores 11. It is not desirable to contour bore portions 14 so as to correspond to the outline of hubs 48 in that such procedure will necessitate a precise positioning of the needles. Therefore, as shown in Fig. 9, the upper faces of the supporting portions or flanges 15 may be serrated or roughened as indicated in 59. In this manner the hub portions which rest on these surfaces will be less susceptible to turning. Accordingly, with the introduction of a syringe tip into the hub 48 of the needle, the barrel may be turned with assurance that the needle will remain substantially stationary. This will cause an operative coupling of the parts such that with the withdrawal of the barrel the needle will be similarly withdrawn.

In many instances it may be desirable to not have springs such as 55 disposed adjacent the lower ends of bores 12 as illustrated in Fig. 6. Rather to leave these bores unobstructed and so that they may be readily cleaned aside from the fact that they will have less tendency to accumulate foreign materials a structure such as is illustrated in Fig. 12 may be utilized. As shown in that view springs 58 may have their lower ends resting upon the flange or supporting portions 15. As such the upper ends of these springs will engage against the lower surfaces of the flanges ordinarily providing parts of the syringe barrels. Therefore, and in common with the showing in Fig. 6, these barrels will normally tend to

rise to a position above the plate 52. Accordingly, when a syringe assembly is aligned with the opening 53 of that plate the outer end 50 of its plunger, as well as the adjacent end of the barrel, will be projected to a position at which the fingers of the user may readily grasp the parts for the purpose of withdrawing the same from the bore 12. As is also shown in this figure the syringe assemblies may in the customary manner mount a suitable clip element. This will additionally prevent any accidental separating tendencies between the plunger and a barrel of an assembly so that withdrawal of the latter may be effected without fear that the parts will separate.

In the instance of a unit serving to hold syringe assemblies during their sterilization period and involving structure such as has been shown in Fig. 6, a camming action may be depended upon to assure that the assemblies will not function as bolts when aligned with the opening or openings obstructed by cover plate 52. In other words, the parts may be so proportioned that the outer end of plunger 50 and its knob surfaces will cam against the inner faces of plate 52 as cover 51 is rotated. Thus they will be retracted against the action of springs 55 during this movement of the parts and as they project into and are retracted within the space thus aligning with them. To further assure such a co-action of the parts and as shown in Fig. 12, the adjacent edge surfaces of cover 51 may be undercut as indicated at 68. So formed it is obvious that as the cover is rotated these surfaces will engage with the adjacent surfaces of plunger 50 and act as cams to assure a retraction of the same against the urging of spring 58. Therefore, the cover may be freely rotated with respect to the body 10, and superposed plate 13.

To permit of a ready separation of layer 32 and plate 34 from the base of the assembly, bolts different than those indicated at 35 may be employed. This has been shown in Fig. 8. In that view the numeral 61 indicates the body of a bolt provided with a head portion 62 connected by a reduced neck to that body. The opening through layer 32 as well as plate 34 in line with a given bolt is such that these elements may be dropped clear of the same without dismounting the bolt. A retainer ring (Fig. 10) including a body 63 may be employed which is formed with upstruck and preferably resilient portions 64. The body of this ring is provided with keyhole openings 65. The heads 62 of the bolts may pass through the enlarged parts of these openings. A suitable number of upstruck portions 66 may be included in the ring 63 and furnish actuators to be engaged by the fingers of the operator in order to turn that ring with respect to the remainder of the assembly. In one extreme position of the ring the latter will be mounted by the bolts 61 and thrust against the head portions of the same in order to firmly retain plate 34 and layer 32 in the desired positions. In the opposite extreme position of that ring the keyhole portions of the slots will align with heads 62. Accordingly the ring may be dropped clear of the assembly. This will permit the layer and plate to likewise clear the same. Under these circumstances the parts may be cleaned and renewed whenever desired and with the expenditure of minimum time and effort.

As will be appreciated in connection with seals such as 56 and 58, any material which will withstand the heat of repeated sterilization may be employed in lieu of rubber. For example, a layer of asbestos or asbestos compound might be utilized. Likewise, while for the purpose of economical manufacturing plate 13 might be formed separately of body 10 and secured to the same against movement these parts could be made integral. The degree of tapering of bores 11 and 12 might be minimized in accordance with any acceptable manufacturing technique which still would permit of economical production of the assembly. With the present arrangement of parts the steam or hot gas can readily enter through the bottom of the unit when the latter is disposed within an autoclave. So entering it can reach all surfaces of the bores without trapping any air at the top of the latter. The disc 52 or its equivalent would, of course, be closed after the device is once loaded and prior to its being placed in a sterilizer. After the latter operation is completed the unit may be removed from that sterilizer and will maintain the needles or barrel assemblies contained within it in sterile condition for indefinite periods of time. After a needle or barrel assembly is once used it will, of course, not be replaced within the sterile container. Rather it will be suitably disposed to be subsequently cleaned. Only thereafter will it be loaded or placed in a container which is to be disposed in an autoclave. Any suitable detent means (not shown) could be employed in association with the cover in order to assure that the latter will normally be retained in a position where its opening 43, as defined by the plate, is aligned with a desired bore. Finally, and as shown at 67 in Fig. 8, the upper surfaces of bores 14 may be flared. In this manner no ledge or retaining portion is present on which wet contaminates may settle and be subsequently displaced by movement of the cover with respect to the body 10.

Thus, among others, the several objects of the invention as specifically aforenoted are achieved. Obviously, numerous changes in construction and rearrangements of the parts might be resorted to without departing from the spirit of the invention as defined by the claims:

What is claimed is:

1. A sterile hypodermic needle and syringe holder including in combination a body assembly formed with a series of transverse bores extending completely through it from its upper to its lower face, a cover rotatably supported by said assembly, being common to all of the bores and obstructing the upper ends thereof, said cover being formed with an opening alignable with said bores—under rotation of said cover with respect to said assembly—whereby articles supported in individual bores are selectively withdrawable through the cover opening, a layer of filtering material disposed adjacent the lower face of said assembly and also common to all said bores, and means securing said layer against detachment from said assembly.

2. In a holder as defined in claim 1, said bores being disposed in the form of a plurality of annular rows, a plate common to a number of said bores and rotatably carried by said cover to close its opening and said plate being also formed with an opening of an area substantially equal to that of one bore.

3. In a holder as defined in claim 1, said securing means comprising a ring underlying said layer and means providing a quick-detachable connection between said ring and assembly.

4. In a holder as defined in claim 1, a latch structure within said assembly and cooperating with said cover to retain the latter against detachment therefrom, and actuating means for said structure extending adjacent the lower face of said assembly.

5. In a holder as defined in claim 1, rotating means secured to said cover and extending to one side of the axis of said holder whereby said cover may be manually rotated with respect to said assembly.

6. In a holder as defined in claim 1, means forming parts of said holder adjacent the lower face of the assembly and the upper face of the cover to furnish a retaining structure stabilizing said holder when a plurality of such holders are stacked one above the other.

7. In a holder as defined in claim 1, means associated with said bores to urge an article housed therein to a projected position and said cover being formed with a cam surface for cooperation with a face of an article so projected to retract that article within a bore.

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