

March 26, 1957

A. H. TAYLOR ET AL
SPECIAL ATMOSPHERE DEVICE

2,786,740

Filed July 9, 1954

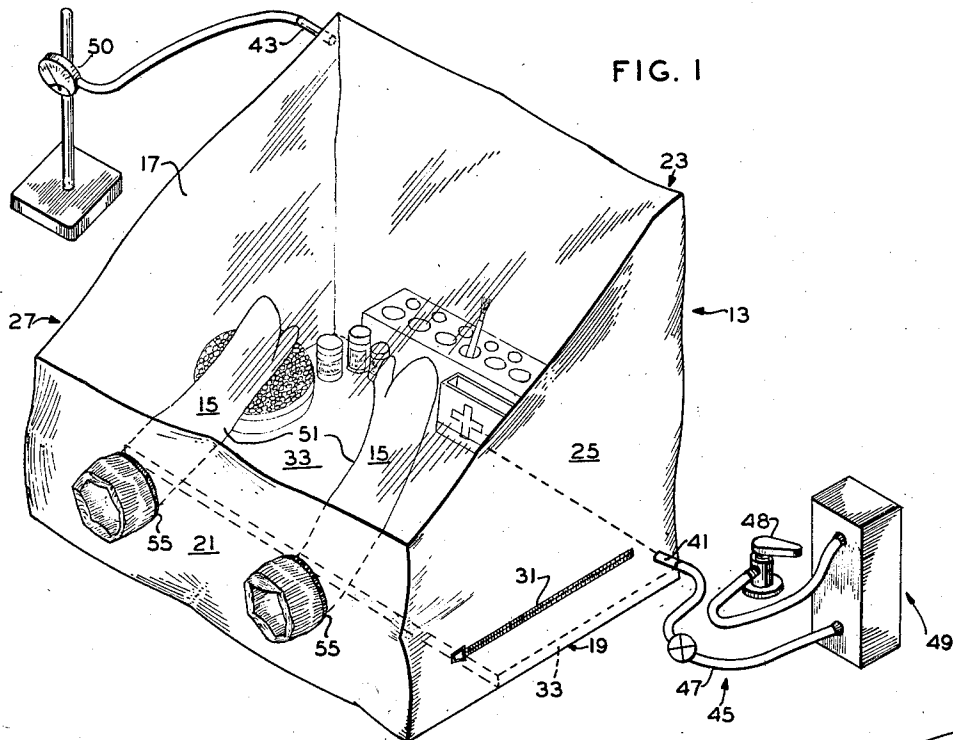


FIG. 1

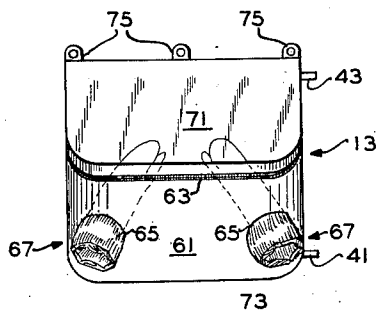


FIG. 4

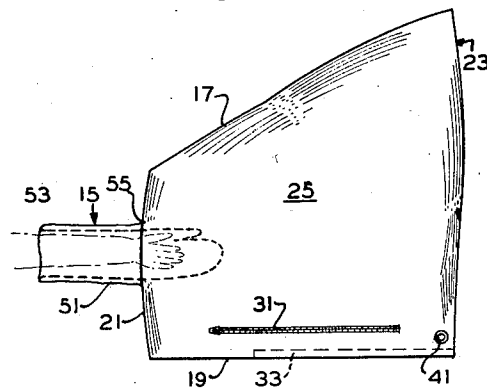


FIG. 2

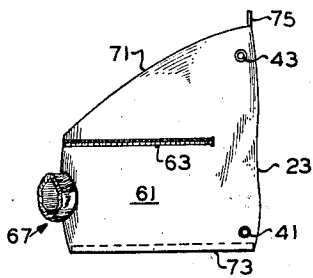


FIG. 5

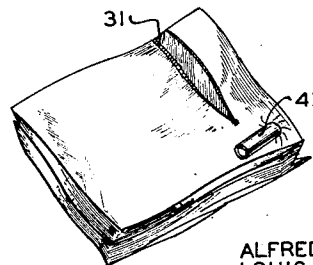


FIG. 3

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SPECIAL ATMOSPHERE DEVICE

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Application July 9, 1954, Serial No. 442,314

4 Claims. (Cl. 23—259)

This invention relates to the chemical handling or treating of small quantities of special materials and is more particularly related to the handling, testing, analyzing, storing or reacting of materials during which a normal atmosphere would interfere with these operations, such as by reacting with, decomposing or deteriorating the materials.

It is believed that, prior to the instant invention, the only practical commercial device which provided a special atmosphere for dealing with special materials constituted a large, heavy, metallic box-like device which was quite expensive and within which it was difficult to operate. This box, commonly known as a "dry box," had a small opening for inserting materials such as calcium, heavy rubber gloves for reaching inside, and a peep hole for observing the interior of the box. Many disadvantages exist in such a cumbersome device. It is not readily portable within a laboratory or available for field use. There is limited visibility and poor lighting. The expense of this prior box greatly limits the number available for use. The rigid walls of this box hinder the handling and manipulations within the box.

It is the primary object of the instant invention to eliminate many of the above-mentioned disadvantages by providing an improved "dry box" which is relatively inexpensive, is readily portable, provides greatly improved visibility, permits improved manipulation within the interior and results in other advantages hereinafter apparent.

The accomplishment of the foregoing object and others, along with the features and advantages of the invention will be readily apparent from the following detailed description of the preferred embodiments of the invention and the accompanying drawing, in which:

Fig. 1 is a perspective showing of the preferred rectangular form of the invention and shows how special materials are handled within the instant device, as if an operator's hands were in the mittens;

Fig. 2 is a side elevation view of the Fig. 1 device on a reduced scale and shows part of the mittens partially extended out from the interior of the device, as occurs during normal use;

Fig. 3 shows the Fig. 1 device when collapsed and readied for storage or for moving;

Fig. 4 is a front view, on a reduced scale, of another preferred form of the invention in which rounded front corners are provided and in which no attempt has been made to show the slight bulging due to inflation; and,

Fig. 5 is a side elevation of the Fig. 4 embodiment with the slight bulging of the casing from the seams being shown.

By reference to the drawing, it can be seen that the preferred embodiments comprise a collapsible casing which has a transparent top segment. The casing maintains its shape without interior or exterior rigid structure by having confined within the casing the desired atmosphere under pressure of a fraction of an inch of water.

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An inlet and an outlet provide for such pressurization as well as flushing the interior or chamber of the casing. Means such as sleeved-mittens, are provided for handling the special materials within the casing. A zipper in one or more of the translucent sides constitutes the means for inserting the chemicals and other items and a relatively large anchoring workboard on which the chemicals and tools are placed. Other features and details will be described with reference to the particular figures of the drawing.

In Fig. 1, the casing 13 is shown in the form it assumes when it contains a special atmosphere under a slight pressure, preferably 0.1 of an inch of water, and when chemicals therein are being handled by means of the sleeved-mittens 15. This operation is observed through the top, clear-plastic panel 17. The large bottom panel 19, the small front panel 21, the back panel 23, and the two trapezoidal side panels 25, 27 are made from a translucent plastic material which normally permits an appreciable amount of light to pass therethrough.

A substantially gas-tight plastic zipper 31 in the right side wall 25 permits the introduction of the large workboard 33 (shown by dashed-lines) on which the chemicals, weight balance, tools or other items are placed so that adequate protection of the plastic bottom panel 19 and means for continuous level anchoring of the casing 13 are provided. It is to be noted that the width of the workboard 33 is about the same as the length of the zipper 31. The workboard can be made in two narrower pieces in order to cover the entire bottom.

The gas for providing a controlled atmosphere within the casing, if lighter than air, is admitted through the upper outlet 43 at the upper left rear corner and the gaseous discharge escapes through lower inlet 41 at the lower right rear corner. Both inlet tube 41 and outlet tube 43 are made from flexible plastic tubing sealed to the respective plastic walls. Means for providing the desired gas or atmosphere are shown schematically at 45 and is connected by valved tubing 47 to the inlet 41. Means 45 is comprised of a valved gas outlet 48, such as for nitrogen, and treating means 49 for a gas or atmosphere, as may be required, such as any well-known dehydrating means. Outlet 43 is shown connected to a pressure gauge 50 which serves to indicate the slight pressure required to inflate suitably the casing. It is to be understood that a small continuous flow-through can be maintained if desired and that excessive pressure is not desirable.

In Fig. 2 certain previously-mentioned features and structures are more readily observed. The slight bulging outwardly from the seams due to the few ounces of pressure is more readily apparent. The sleeve-mittens 15 are shown partially extended outwardly from the casing due to the pressure, as normally occurs, and thus realization of the manner in which the hands are easily inserted can be better appreciated. The loose-fitting feature of the gloves is emphasized by the outline showing how a smaller-than-average-size hand compares to the size of the gloves. It is to be appreciated that when the hand is in normal position within the glove (as shown in Fig. 1) the slight pressure within the casing will urge the thin plastic material tightly against the hand and so give improved finger touch and control. The sleeves are about 5 inches in diameter. It is to be appreciated that the mitten and adjacent part of the sleeve will be collapsed when the hand is not extended into the mitten, but that it is still easy to initially insert the hand into the remainder of the partially extended sleeve.

Fig. 3 serves to illustrate how the instant device is collapsed and hence easily stored or moved about. Valuable space is thus not permanently set aside and tests and

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other operations can be made in different locations within one laboratory or many laboratories or in the field.

The means for permitting manipulation of chemicals within the casing, such as sleeved-mittens 15, are made with long sleeves or gauntlets 51 extending between the mittens 53 or other hand casing and the front panel 21. The open ends or cuffs of the gauntlets are attached circumferentially at 55 to the edges of circular openings in the front panel. It is to be noted that, since the sleeved-mittens are attached to a flexible panel, the operator has a degree of freedom and ease of manipulation which previously did not exist with the known conventional-type of a "dry box." It is also to be noted that since the mittens are made of thin plastic material, and since there is a positive pressure of a few ounces within the casing, extremely sensitive manipulation is possible. A condition which approaches skin-touch is achieved. Furthermore, the rapid deterioration which occurs with conventional relatively-heavy rubber gloves is avoided because the plastic material does not so react. It is also to be noted that the mittens are not, and do not need to be, close-fitting and so the hands can be readily inserted.

The Fig. 4 modification differs from the Fig. 1 device principally only in the shape of the top and bottom panels, in the use of a single front-sides panel 61, in the location and length of the plastic zipper 63, and in the location of the attachment of the cuffs of gauntlets 65 of the mittens 67. The same reference numerals have been applied to like parts and a description of these parts will not be made. It is to be noted that the transparent top panel 71 has a front part which has rounded front corners, as has the bottom panel 73. At the front of the casing, a part of the front-sides panel 61 extends between these rounded front corner parts of panels 71, 73. It is to be noted that the left and right rear side parts of panel 61 will be of increasing height in order to provide the rear work space having a higher elevation than the front part. Thus, this longer, continuous panel 61 will have two inclined top side edges. In this manner, the separate trapezoidal side panels 25, 27 of the Fig. 1 casing are avoided. As was the case with the Fig. 1 casing, the cuffs of the gauntlets are easily attached to the panel 61 since they are both made of the same material and hence easily sealed together. It is to be noted that the gloves 67 of the Fig. 4 dry box are inclined towards each other, due to being attached at the rounded corners, and thus the manipulation within the casing is facilitated. It is also apparent that it is advantageous to have the longer zipper 63 at the front in the top front edge part of the translucent panel 61 since insertion of the workboard, tools and materials is facilitated. Back panel 23 is provided with tabs 75 for hanging up the box when not in use.

With reference to Fig. 5 and Fig. 4, it is to be noted that zipper 63 is much longer than zipper 31 and hence a larger workboard, covering substantially all of the bottom panel 73, can be used. Furthermore, the box opens wide for the ready insertion of materials and the arrangement of work. It is apparent that the zipper is longer than the major horizontal dimension of the casing which is the length of panel 23 on the front part of panel 61. Fabrication of the Fig. 4 casing is facilitated by having the zipper horizontally disposed or parallel to the bottom of the casing. This arrangement avoids crimping the zipper at the corners, as might occur if the side parts of the zipper were equally spaced from the edges of the top panel 71. It is to be understood that the Fig. 4 casing has all of the advantages which were mentioned in connection with the Fig. 1 casing. Thus, the plastic mittens cling to the operator's hands due to the slight positive pressure, and the hands are readily inserted into the plastic sleeves and mittens. As was the case with the Fig. 1 casing, all joints are electronically heat welded and gas tight and are capable of withstanding at least one p. s. i. g. of pressure. The sloping top panel is

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made of flexible clear vinyl plastic film which is .005 inch thick. All sides and the bottom are made of frosted vinyl film .012 inch thick. The mittens and sleeves are made of frosted vinyl film which is .005 inch thick. The sleeves are 5 inches in diameter and the axial center thereof is about 5 inches from the bottom of the casing. The casing is about 12 inches high in front, about 22 inches high in back, about 19 inches in depth and about 24 inches in width. A $\frac{3}{8}$ of an inch thick polyethylene workboard is preferred, although glass and aluminum boards could be used. It is to be understood that the Fig. 1 device is made from the same material and has comparable dimensions.

The mode of utilization of both casings is believed apparent to one skilled in the art from the foregoing description. For instance, after placing a sealed container of a material on the workboard, the dry box is flushed out, usually by admitting the desired gas, such as nitrogen, at the lower level through 41 and removing the water-laden atmosphere from a higher level through 43. The reverse procedure would be used with the lighter gases such as helium. Thereafter, a slight pressure is maintained. Inflation of the box requires a gas pressure, as measured on gauge 50, of less than 0.1 inch of water above atmospheric pressure. The hands are easily inserted into the gloves, which cling to the hands due to the slight positive pressure, and the desired operation, such as weighing, etc., is performed within the casing with sensitive manipulation. Since all of the upper panels will admit light, it is apparent that the prior expensive necessity of providing internal lighting is avoided. Since the gloves are attached to flexible panels, the advantage of greater maneuverability is provided. The flexibility of the plastic front-wall-glove combination allows unusual operator freedom in typical laboratory operations. Manipulation with the Fig. 4 casing is further facilitated by the fact that the sleeved-mittens are inclined inwardly toward each other. It is to be understood that the front half of the casing could be made so as to have a vertical semi-circular front wall and a sloping top panel covering the front half.

From the foregoing, it is apparent that the Fig. 1 and Fig. 4 embodiments of the invention constitute improved devices for providing a controlled or special atmosphere for chemical operations and the like. Both of these inflatable devices include a collapsible casing which does not require any rigid support structure. The transparent segment provides the means for observing the operations in the interior of the casing chamber, which operations are performed by using the sleeved-mittens or other sleeve-like members. The translucent panels or side walls result in improved lighting of the interior of the casing, which preferably has a trapezoidal cross-section. Since the sleeve hand coverings are attached to a flexible wall or side section, the operator does not experience restraint, due to a rigid wall, on his upper arms. It is also apparent that, with the preferred degree of pressurization and the use of thin plastic material for the sleeved members which are closed at one end, only a major portion of the sleeve part of the sleeved members extends outside of the casing. Too much pressurization would result in extending these members too far outwardly. Too little pressurization would not result in the partially-extended sleeve into which an operator can easily insert his hand. By regulating the pressurization, this condition of having the sleeve partially extended so as to permit easy insertion of the hands therein results.

It will be understood that a plastic air-lock can also be provided in the Fig. 1 dry box by sealing another small casing to casing 13 at a location removed from the large zipper, such as in the lower rear corner of the left panel 27, and providing two smaller zippers, one in the smaller casing and one in panel 27. A similar arrangement can be made with the Fig. 4 dry box. If desired, it is also possible to attach treating means, such as a

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dehydrator, to the exit tube 43 so that, when the casing is collapsed, no undesirable atmosphere enters the casing.

It is to be understood that changes, additions, and omissions can be made in, to and from the preferred, disclosed embodiments without departing from the invention as defined in the following claims.

We claim:

1. A portable device for providing an inflatable work chamber containing a controlled gaseous medium and adapted for safely manipulating materials, comprising a flexible, collapsible and totally enclosed housing made of thin plastic sheets, at least one of said sheets being transparent, said sheets being joined at the edges thereof to provide a gas-tight container, two sleeved glove-like members made of thin plastic material attached respectively to the edges of two openings in said housing whereby a person can easily work materials within said housing with both hands, said housing containing a gaseous medium at a pressure slightly in excess of the pressure of the surrounding atmosphere to form said work chamber, said gaseous medium being the sole means for maintaining said housing extended so as to form said chamber, said gaseous medium being practically inert with respect to said plastic materials and to substances contained in said chamber, inlet means associated with said housing for inflating said housing, and outlet means

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associated with said housing for exhausting the gaseous medium within said housing.

2. The device according to claim 1 and further characterized in said housing having a front wall, a back wall opposite said front wall which is higher than said front wall, and a top wall which is completely transparent, and said glove-like members being attached to portions of said front wall.

3. The device according to claim 1 and further characterized in said housing being formed with an opening for inserting materials therein, and means for closing said opening in a gas-tight manner and said opening being closed by said means.

4. The device according to claim 3 and further characterized in that said means for closing the opening in said casing comprises a zipper, and that said transparent segment constitutes the top of said housing.

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