May 10, 1966 C. A. DOUTHITT ETAL 3,250,024

PORTABLE PLANETARIUM

Original Filed July 10, 1961

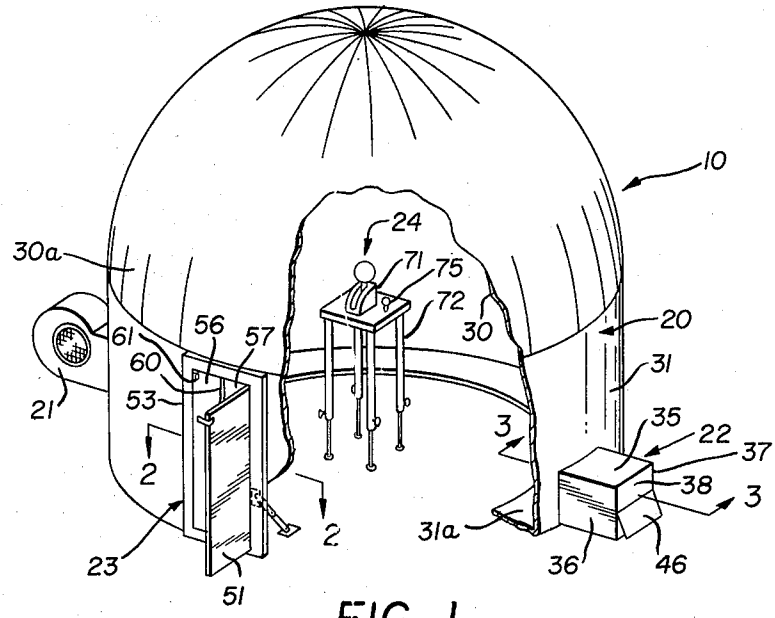


FIG. 1

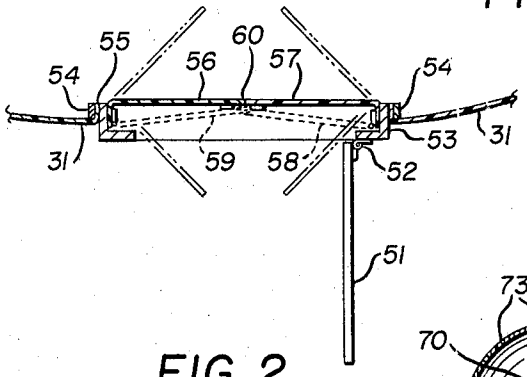


FIG. 2

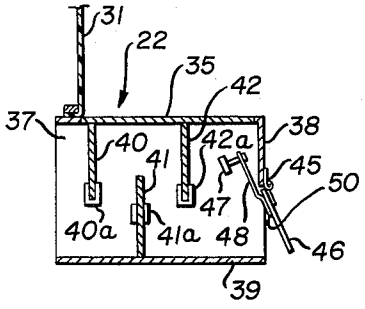


FIG. 3

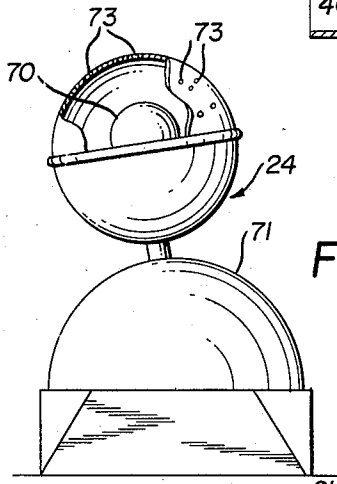
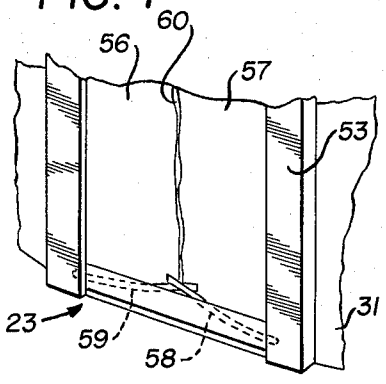


FIG. 5

FIG. 4



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PORTABLE PLANETARIUM

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Continuation of application Ser. No. 122,707, July 10, 1961. This application Nov. 24, 1964, Ser. No. 416,187
6 Claims. (Cl. 35—43)

This invention relates to the art of planetariums, and in particular, relates to an improved type of planetarium that is designed to be portable in nature, so as to be adapted to be employed for educational purposes in schools or like institutions.

While the art of planetarium construction is very old, per se, it has been found that the effective range of teaching via the use of planetariums can be greatly increased if the planetarium is made of such construction as to be readily portable, so that the same can be set up in the auditorium of a school, for example, where continuous classes can be given without the inconvenience of time loss to the students involved.

While certain efforts have been directed to the creation of portable planetariums in the past, it was found in such instances, that the requirements of portability interfered with the accuracy requirements of the planetarium, with the result that while portability was achieved, accuracy, from a teaching standpoint, was sacrificed.

A representative portable planetarium of the type above discussed, is shown in U.S. Patent 2,477,027, issued July 26, 1949, to Edwin H. Wenberg. In the above referred to prior art patent, there was disclosed a hemispherical canopy that was suspended by rope from the ceiling, in overlying relationship to an illuminated globe that had apertures provided therein, so as to cause the emission of light in simulation of the various constellations.

While the device above described would be utilizable for basic astronomy instruction, it will be seen that the use of the same presented many problems.

First, and because of the suspension feature above described, it would be obvious that the canopy would swing, so that the relative positions of the stars would change upon the slightest movement of the canopy.

Secondly, it will be noted that the same did not envision the use of any completely sealed-off type of light-proof housing, with the result that the use of the device would of obvious necessity, be fairly well restricted to use at night, because of the problem that would otherwise exist if it were attempted to use the device in an auditorium, for example, during the daytime.

It has been discovered that the aforementioned disadvantages can be obviated by employing a self-supporting type of fabric structure that includes a hemispherical dome that has its peripheral edge connected with an upright wall that serves to support the dome with respect to the ground or floor surface upon which the unit is set. The unit thus defined, is then inflated with air, so as to be self-supporting, with the air pressure being carefully controlled by various means, so as to maintain a substantially constant contour to the inflated planetarium. In this fashion, the advantages of the portability are obtained, because of the fact that the planetarium can be interiorly darkened in a fully lighted room, and can be easily set up and dismantled, so as to be completely portable and yet accurate in every detail.

Production of an improved planetarium, having the above advantages accordingly becomes the principal object of this invention, with other objects thereof becoming more apparent upon a reading of the following brief specification, considered and interpreted in the light of the accompanying drawings.

Of the drawings:

FIGURE 1 is a perspective view, partly broken away and in section, and showing the improved planetarium in use.

FIGURE 2 is a horizontal section through the door opening, taken on the lines 2—2 of FIGURE 1.

FIGURE 3 is a vertical section taken on the lines 3—3 of FIGURE 1.

FIGURE 4 is a perspective of the lower half of the door unit showing the resilient curtain that prevents air loss.

FIGURE 5 is a detail view of the illuminating globe.

Referring now to the drawings, and in particular to FIGURE 1 thereof, the improved portable planetarium, generally designated by the numeral **10**, includes a one-piece fabric housing **20** that is contoured to the planetarium configuration shown in FIGURE 1, with the planetarium **10** being interiorly inflated to the self-supported position shown in FIGURE 1, by the use of a fan **21**, with a pressure control damper unit **22** being provided for maintaining the appropriate interior pressure, while ingress and egress to the planetarium is through a door unit **23**. In this fashion, the illuminating globe **24** can be positioned in concentricity with the dome portion of the planetarium, so as to project a star pattern on the interior surface of the planetarium dome.

Referring again to FIGURE 1, for a more detailed consideration of the housing **20**, it has been previously indicated that the housing **20** is in fact made up of a dome portion **30** and an upright wall portion **31**, with the members **30** and **31** being joined together as shown in FIGURE 1 to form a planetarium that will assume the configuration of FIGURE 1 upon being inflated. In this regard, it should be noted that the dome portion **31** is preferably made up of a series of arcuate segments **30*a***, **30*a***, stitched or otherwise secured together in adjacency with each other, with these individual panels **30*a***, **30*a***, preferably being longitudinally and transversely inextensible, so as to eliminate distortion of the dome portion **30** out of true hemispherical shape, in the event of over-inflation. With regard to the detail construction of the panel units **30*a***, **30*a***, it is preferred that each panel be in fact made up of two laminated sheets that define the interior and exterior surface of the dome when the panels **30*a***, **30*a***, are assembled as described above. In this regard, air is sealed within the planetarium by the use of a preferably white vinyl plastic material that defines the interior of the dome portion **30** and presents a surface that is both air and light impervious. The outer surface is preferably made up of a fabric sheet bonded in known fashion to the vinyl sheet, and serving to prevent distortion thereof, as above described. Additionally, the white vinyl surface serves to enhance the reflected qualities of the light emitting from the illuminating globe **24**.

With reference to the construction of the upright wall member **31**, it is not necessary that this wall portion **31** be laminated in the manner above described, in connection with the panels **30*a***, **30*a***, in view of the fact that the only requisite of the wall member **31** is that the same be opaque and air impervious, so as to completely darken the interior of the planetarium and prevent air loss when the component parts are assembled as shown in FIGURE 1. It is preferred, however, with regard to the construction of the upright wall member **31**, to include therewith a flange portion **31*a*** that is adapted to lay flat on the floor, as clearly shown in FIGURE 1. This serves two distinct purposes, as follows:

First, it provides a partial floor, with the result that the weight of observers sitting on the panel **31*a***, will prevent the planetarium from separating from the ground in the event of over-inflation.

Secondly, and by using only a partial floor as shown, safety for the occupants is provided, in view of the fact

that emergency exit from the interior of the planetarium can be effectuated by merely crawling under the flange portion 31*a*, which will be easily yieldable for this purpose.

It has been previously indicated that a balanced air pressure is effectuated by the use of fan 21 and a control damper 22, and to this end the fan 21 introduces air under pressure into the interior of the planetarium in known fashion, with this fan 21 preferably being of multi-speed construction for purposes that will be described.

With regard to the construction of the control damper 22, it will be noted that the same is of box-like construction, so as to include a top wall 35, opposed side walls 36 and 37, end wall 38, and a bottom wall 39. In view of the fact that the damper unit 22 must also prevent the entrance of light, a series of baffle panels 40, 41 and 42 are shown in FIGURE 3 as extending transversely between the wall surfaces 36 and 37, with these panels 40, 41 and 42 preferably being painted black, for the purpose of minimizing light passage. In view of the fact that the invention contemplates the use of the damper 22 as a packing box for the entire unit during movement, the panels 40, 41 and 42 are shown removably positioned with respect to the damper unit 22, with such removability being effectuated by the use of guide members 40*a*, 41*a* and 42*a*. With the panels removed the envelope that forms the housing 20 can be stored interiorly within the box that defines the damper unit 22.

For the purpose of controlling the air pressure, the rear wall 38 of damper 22, has hinged thereto, as by hinge 45, a control panel 46 that can pivot between fully closed position and the open position shown in FIGURES 1 and 3. In this regard, the position of the panel 46 is controlled by the use of a counter weight 47 that is attached to one end of an arm 48, with arm 48 being rigidly attached, as at 50, to the panel 46. In this manner, only a small degree of pressure is required to pivot the panel 46, so that the interior pressure of the planetarium 10 can be accurately controlled by the use of the damper 22.

Turning now to FIGURE 2 for a more detailed consideration of the door mechanism 23, it will first be noted that the same includes a rigid door 51 hinged, as at 52, to the jamb member 53 that is provided for this purpose, with the jamb member 53 being releasably secured by clamping members 54, 54 to an opening 55 that is provided in the upright wall member 31. Thus, when assembled, the door unit forms an integral part of the planetarium, so as to permit ingress and egress with respect to the same. It should be noted that it is preferable to provide some form of support to retain the door unit in upright position, and to this end the preferred form of the invention contemplates the use of at least one foldable support bracket that will project inwardly from the door to engage the floor and thus support the door against falling inwardly into the planetarium.

To this end of preventing loss of internal air pressure when the door is opened, a pair of flexible resilient panels 56, 57 are shown secured to the opposed sides of the jamb member 53, with these panels each being provided with elastic straps 58, 59, that serve to normally position the same in covering relationship to the door opening.

In this regard, straps 58, 58 as shown are connected at the top and bottom to the panel 56, and also are attached to an opposed portion of the jamb member 53, so as to tensionally draw the panel or flexible curtain 56 into covering relationship with one-half of the door opening. Likewise, straps 59, 59 are connected to the panel 57 at the top and bottom portions thereof, and draw the panel 57 into covering relationship with the remaining half of the door opening, as clearly shown in FIGURES 1 and 2. Thus, and by this structure, a resilient door or curtain, having a slot 60, is provided even when the rigid door 51 is open. To pass through the door defined by the panels 56 and 57, it is merely necessary to place the user's hands on the adjacent edges and spread the same apart, whereupon the user may pass through the enlarged opening. At such time, it will be noted, however, that there is substantially no air loss due to the fact that the enlarged opening is filled by the person entering or leaving the planetarium.

Notwithstanding the above provisions, there are provided additional means for increasing the air pressure interiorly of the planetarium when the door 51 is in the open position shown in FIGURES 1 and 2. Specifically, a pivoted switch mechanism 61 is shown secured to the distal side of the jamb member 53, so as to be pivoted by the opening of the door to the position of FIGURE 2. Conversely, when the door 51 closes within the jamb member 53, the switch 61 will be moved ninety degrees to effectuate a switching action. In this regard, while the switch operates as above described, it should be noted that the switch actuation is employed for the purpose of increasing the speed of the fan 21. Thus, when the door 51 opens, the fan 21 will be moved at a higher speed, so as to build up the pressure and thus offset any air loss through the open door. Similarly, when the door 51 closes the fan 21 will be automatically switched to its lower operating speed.

With reference now to the illuminating globe 24, it is to be understood that the globe unit 24 in essence, includes an illuminating globe 70 that is supported on a gimbal mechanism 71, with the mechanism 71 being positioned on an adjustable stand 72, as clearly shown in the drawings. In this fashion, the globe can be positioned to simulate various time of the day. and also various latitudes and longitudes.

For the purpose of having the globe provide a projected star pattern on the interior surface of the dome portion 30, the same further includes a series of apertures 73, 73 that are arranged, by size and location, so as to simulate the various constellations. Thus, by positioning a light interiorly of the globe member the rays from the same will pass through the apertures 73, 73, and will thus be projected onto the interior surface of the dome portion 30 in simulation of the stars of the various constellations.

It is to be understood that the arrangement of the constellations may be adapted to suit the level of teaching involved, so that masking panels for a fewer or greater number of holes could be provided for showing just one portion of a constellation, if desired.

It will be noted that the best results are obtained by placing the globe 24 so that its center is substantially coincident with the center of the hemispherical dome 30, and it is for this purpose that the table 72 is made adjustable as to height, as shown in FIGURE 1. Thus, accurate projection will occur, with it being apparent that upright side wall 31 will maintain this concentricity during use, because of the inability of the panel units 30*a*, 30*a* to deform out of true hemispherical condition.

For the purposes of assisting the students to adapt to the light conditions, an auxiliary light 75 is also provided, with this light being controlled by a rheostat, so as to be capable of being progressively dimmed, so as to gradually achieve a condition of total darkness within the planetarium, whereupon the illuminated stars will become more and more visible in actual simulation of conditions that occur at nightfall every evening.

In use or operation of the improved planetarium, it is merely necessary that the housing portion 20 be set up and that the fan unit 21, the damper unit 22, and the door unit 23 be secured to the appropriate openings provided therefor in the housing 20. At this time, it is merely necessary to run the fan 21 until the housing 20 reaches its fully inflated form as shown in FIGURE 1. At this time the stand 72, together with the globe mechanism 70 provided thereon, may be positioned in the center of the inflated dome as shown in FIGURE 1, with the stand 72 being adjusted so that the center of the globe 70 is located approximately in the plane that passes through the

point of connection between the dome portion **30** and the upright wall portion **31.**

At this time, and assuming the appropriate electrical connections are made, the planetarium is ready for use, and the bulb **75** will be set to fully illuminate the interior of the planetarium.

It should be noted that upon entering of the students into the planetarium, that the interior air pressure will be maintained substantially constant, due to the fact that air loss is prevented by the panels **56** and **57**, while any air loss that may occur is substantially compensated for by the increased running speed of the fan **21**, which has been switched to high speed upon opening of the door **51.**

When the students are assembled within the planetarium, with the door closed, the operator will usually give a talk, during which time the auxiliary bulb **75** will be progressively dimmed to thus adjust the students' eyes to the forthcoming projection, and with this adjustment being timed to the illumination of the globe **70** so as to actually simulate the appearance of the stars as they appear in the sky every evening at nightfall. This can be done by use of a pre-recorded tape that may be started by the operator.

When full darkness has been achieved, the operator may begin his lecture on the stars, and this can be augmented by the use of a pointer that comprises a flashlight or pin light that has a small opening in the form of an arrow that can thus be projected to the dome ceiling of the planetarium.

When the lecture is concluded, the auxiliary bulb **75** can then be brought to full illuminating power, and the students can then orderly leave the interior of the planetarium, whereupon the above process can be repeated with a new group of students.

It will be seen that during all of the foregoing period that a constant internal pressure is maintained by the damper means **22**, with such constant internal pressure being achieved by the balance panel **46** that moves in response to slight changes in pressure, as a result of the counter-weight **47.**

It will be seen from the foregoing that there has been provided a new and improved type of planetarium that is accurate from an instructor standpoint, while having the advantages of being completely portable.

While a full and complete description of the invention has been set forth in accordance with the dictates of the patent statutes, it is to be understood that the invention is not intended to be limited to the specific form shown herein. Accordingly, modifications may be resorted to without departing from the spirit hereof or the scope of the appended claims.

This application is a continuation application of the application of Claude A. Douthitt and Myron I. Wilson, Serial No. 122,707, filed July 10, 1961 for Portable Planetarium.

What is claimed is:

1. A self supporting inflatable portable planetarium devoid of rigid structural framework and being adapted for use on floor surfaces, comprising;

(A) a unitary flexible housing including

(1) a hollow hemispherical dome portion of opaque material having an image receiving surface,

(2) a flexible upright wall portion of opaque fabric material constructed to be positioned in cylindrical position with one axial edge of said wall portion being secured to the maximum diameter edge portion of said dome,

(3) a flat flexible ring member integrally carried by the remaining edge of said wall portion and forming said cylinder and hemisphere to planetarium-like configuration during periods of inflation; said ring member frictionally contacting said floor without being connected thereto whereby easy emergency exit is provided around the periphery of said planetarium at the point of contact with said floor;

(B) means for introducing air under pressure greater than atmospheric pressure into the chamber formed by said dome, said wall portion, and said ring member,

(1) whereby the maximum diameter portion of said dome is supported in elevated, substantially parallel relationship to said floor surface.

2. The planetarium of claim **1** further characterized by the fact that said image receiving surface has light reflecting characteristics.

3. The device of claim **1** further characterized by the presence of access means provided in said cylindrical wall portion and permitting access to the interior of said housing.

4. The device of claim **3** further characterized by the fact that said access means include an auxiliary door having at least two flat resilient panels dimensionally held in covering relationship to the opening of said door and being yieldably separable for access purposes.

5. The device of claim **1** further characterized by the fact that said means for introducing air under pressure include a blower mounted in said wall and a light proof exhaust baffle located in said wall at a spaced peripheral distance from said blower.

6. The device of claim **1** further characterized by the presence of means for disposing a star projecting apparatus in substantial concentricity with the axis of said dome whereby star patterns may be projected on the said image receiving surface of said dome.

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