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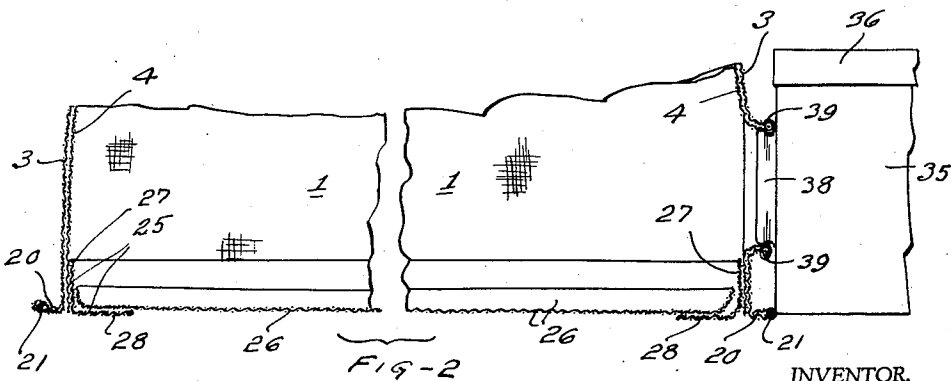
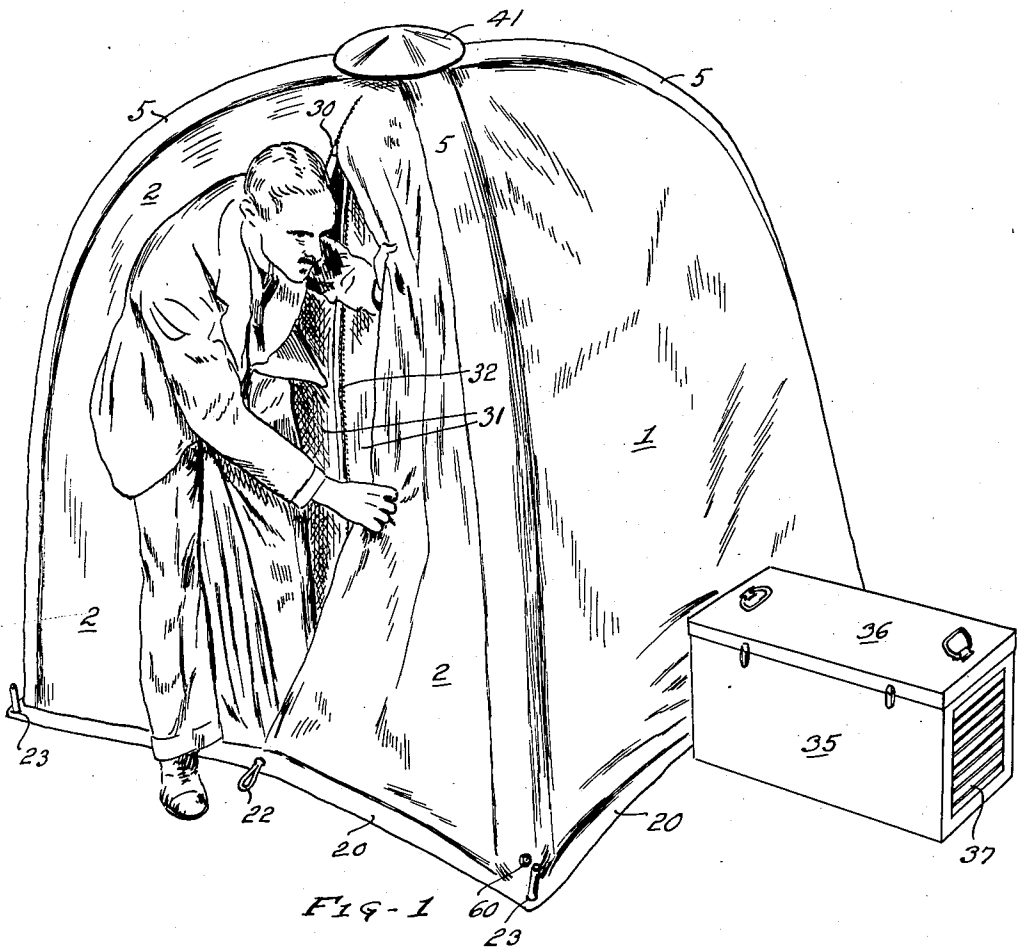
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2,297,150

TENT

Filed Dec. 31, 1940

2 Sheets-Sheet 1



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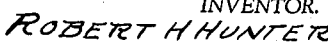
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## UNITED STATES PATENT OFFICE

2,297,150

TENT

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9 Claims. (Cl. 135—1)

This invention relates to a tent construction which does not require rigid poles in order to erect it; to a light proof tent which is of small weight in proportion to its size and capable of being packed for carrying in a small space; to a complete tent all essential parts of which are or can be made flexible whereby to minimize space requirements for packing and carrying; to a portable field dark room for photographic laboratory equipment, and to improvements in tent construction generally. The above indicates the principal objects of the invention. Other objects will become apparent from the following description of a preferred form.

In the drawings, Fig. 1 is a perspective view of an erected tent embodying the invention in the form of a dark room and equipped with an air conditioning unit, shown at the right; Fig. 2 is a fragmentary vertical sectional view taken in the plane of the air conditioning unit and showing the base or floor portions of the tent and connection to such unit; Fig. 3 is a horizontal sectional, more or less diagrammatic view looking upwardly from inside the tent; Figs. 4 and 5 are detail views, Fig. 4 being taken along the line 4—4 on Fig. 3; Fig. 6 is a view of a flexible inflatable tube constituting one of a plurality of similar supporting elements for the tent; Figs. 8 and 9 are sectional views of the tube as indicated on Fig. 6 and Fig. 7 is a relatively enlarged corner portion of the tent including one of the tubes and adjacent fabric wall and corner portions of the tent.

As shown in Figs. 1, 2 and 3 the tent has side walls and a rear wall all similarly constructed and designated 1 and a front or entrance wall 2. The walls curve inwardly and are joined together at the top to form a roof but for convenience they will be referred to simply as side walls. The tent may be rectangular in form or other desirable shape.

Preferably each of the walls comprises an outer duck or canvas sheet 3 and an inner lining sheet 4 of material which is impervious to light. Either or both sheets can be waterproofed. A suitably light weight material for the inner sheet or lining is opaque processed fabric on the order of balloon cloth e. g. Koroseal (trade-mark). The material just mentioned is resistant to damage by all chemicals commonly used for photographic work and other chemicals. The sheets are held together by the tent corner construction to be described presently but can if desired be otherwise fastened to each other by adhesive. At the four corners and running from the base

substantially to the center of the top are fabric tubes comprising for instance outer and inner strips 5 and 6 respectively of canvas or duck.

As shown in Fig. 7 the strips 5 and 6 have their adjacent marginal portions overlapped and joined in flange effects 7 which are relatively at right angles and joined also to adjacent edge portions of both wall sheets 3 and 4 as by stitching through all the relatively overlapping portions as will be obvious from Fig. 7. The corner fabric tubes thus formed receive air tight inflatable tubes 10 (see Figs. 6 and 7 particularly) and these tubes are so made that, when properly inflated, they will sustain the weight of the tent and definitely maintain the desired shape thereof. The fabric tubes constituted by the strips 5 and 6 are joined together at the top in vertically spaced relationship (see Fig. 4) in a manner to provide a central top vertical opening shown as occupied by rigid sleeve 11 as of metal. The outer tent fabric around the opening for the sleeve (principally strip material 5) is folded and stitched or otherwise secured in the manner indicated at 12, Fig. 4, so as to retain a flexible resilient grommet 13 (e. g. ring of elastic rubber) which can be stretched over the upper outwardly flared end 14 of the sleeve 11. Margins of the inner tent fabric adjacent the opening for the sleeve 11 (mainly margins of the tube forming strips 6) are folded and secured as at 16 to retain an elastic grommet 17 adapted to be stretched over the lower flared end of the sleeve 11. The fabric around the sleeve 11 is of course more or less gathered at the folds 12 and 16 so that the fabric will permit stretching of the elastic grommets as required in order to slip over the ends of the sleeve. The sleeve 11, and parts associated therewith as will be hereinafter described, forms a ventilating chimney for the tent, and the chimney is held definitely in place by the tent fabric and grommets 13 and 17.

The bottom of the tent (Fig. 2) has a continuous flange 20 extending outwardly from the lower margins of the upright walls and this may be reinforced as much as needed as by employing a plurality of thicknesses of fabric for the flange. A marginal fold of the fabric of the flange retains cord or rope 21 which may be endless so as to extend entirely around the base of the tent. Loops of the cord as at 22 (Fig. 1 only) extend out of the flange at suitable intervals for engagement by pins or stakes adapted to be driven into the ground. Eyelets may also be provided in the flange 20 for such stakes or pins

as at 23 (Fig. 1). The inner and outer fabric of the tent walls is of course secured together at the base of the tent.

To provide a floor, special heavy fabric sill strips 25, retained in L shape by securing the different elements of the sill together at the corners of the tent, form an inwardly extending frame for supporting a flexible floor sheet 26. The upright portions 27 of the strip 25 are secured as by stitching to the lower margins of the tent walls, all around the tent, and the horizontal portions 28 lie on the ground. The floor sheet can be flat or formed into box shape as desired. The floor sheet is fairly heavy fabric processed to make it water tight and resistant to chemicals. It can also be rubber. A flat floor sheet will take substantially the form shown in Fig. 2 if fairly flexible and made somewhat larger in area than the inside of the tent at the base.

The entrance to the tent is through the front wall 2 which is made in two panels joined together by sliding fasteners 30 connected to the outer fabric 3 and the liner 4 and extending substantially from the base to a point near the top of the tent as shown best in Fig. 1. To provide a light lock, an inner curtain 31 of suitable opaque fabric extends from side to side of the tent, preferably fairly loosely as indicated in Fig. 3, and from near the top (joined thereto along the upper edge of the curtain) to ground level. The curtain is also divided near the center and the edges adjacent the division joined by a sliding fastener 32. The side edges of the curtain can be continuously secured to respective opposite walls 1 of the tent. The looseness of the curtain enables a person to enter the tent and slide the fastener 30 substantially into tent closing position and then to slide the fastener 32 to open position for entrance into the main interior of the tent. When a light lock entrance is not required by the operations to be performed inside the tent the two sections of the curtain can be fully detached from each other (separable type slide fastener) and the two sections then hung out of the way of the occupants against the side walls to which said sections are secured.

The air conditioning unit is contained in a box 35 which has a movable cover 36 and enough inside space to house the tent when folded. The box has an air entrance grill 37 in one end wall and a tubular air discharge device 38 in the opposite end wall. The device 38 is enlarged as indicated in Fig. 2 in spaced relation to the adjacent wall of the box so that the tent wall can be attached to said device by an elastic grommet 39 sewn into the tent wall around an opening in said wall. The box 35 can contain for instance a blower and filter unit and air tempering and humidifying means, being as complete in respect to air conditioning as required or desired. The used air delivered into the tent is exhausted, as indicated above, at the ventilator exhaust sleeve 11.

Inside the sleeve 11 (Fig. 4) and spaced from its inner wall surface is a block 40 the primary purpose of which is to form a suitable connector for the various inflatable tubes 10 as will be more fully described later. The block is maintained in place by the air connections and serves also to support a cap 41 to cover the top opening of the sleeve 11. A stud 42, threaded into the block 40, holds the cap centrally over the sleeve and spaced above the upper wall of the tent. Aligned with the lower end of the sleeve 11 is a ventilator cap 43 which is adjustable on a supporting stud

44 also carried by the block 40. A wing nut 45 on the lower end of the stud abuts the ventilator cap and can be raised or lowered to adjust the exit, for air through the sleeve 11. In cold or wet weather it is desirable to restrict the air outlet for obvious reasons.

An important feature of the invention is the manner in which the tubes 10 are constructed. A simple cylindrical tube even though originally made in proper curved form will tend to straighten upon inflation and cause the tent walls to sag. Ordinary fabric reinforcement built into the walls of the tube is of little or no assistance in maintaining the desired shape for a fabric reinforced tube will writhe and twist and get out of position. I have found that by reinforcing rubber tubing by cord fabric running only annularly about the axis of the tubing and providing non-stretching tape or equivalent form-directing members on or in the tube walls as shown in Figs. 6, 7 and 8 such tubing construction fully solves the problem and holds the tent walls taut and in shape at all times upon inflation of the tubing. Moreover the tubing can be made very light in weight and properly serve the purpose.

Assuming the tube 10 of Fig. 6 is closed at both ends and has its walls reinforced with annular built-in cord fabric (cords running strictly circumferentially about the tubing) such tube will upon inflation elongate somewhat but will not, after being filled with air, expand in diameter. I utilize this elongation characteristic in causing the tubing to take the desired form by preventing the elongation along certain portions of the tube walls. For example by securing non-stretching tape 50 symmetrically on opposite sides of the tube slightly off center as at 50a (see Fig. 8) from the closed lower end of the tube for about half the length of the tube, that half, upon inflation, will curve gradually so that its axis is along the curved line L. Then if the tape for the other half of the tube is secured symmetrically farther off center, as at 50b (see Fig. 9), the upper half of the tube will curve as at L' on a shorter radius. Where the tube overhangs the center of the tent, any tendency for the same to bend downwardly under the weight (e. g.) of the ventilator etc., can be checked by applying a non-stretching strip as at 51 for the required distance along the tube. This "check rein" strip can be applied after the tube is inflated or otherwise caused to assume the desired curved form.

The placement of the non-stretching elements can be varied to obtain almost any tent shape that could be desired, and said elements can of course be built into the tube walls when originally made instead of being fastened on afterward. The interconnection of the tubes 50 at the top of the tent serves to keep the tubes 50, when deflated, in proper turned position in the fabric tube effects 5-6 of the tent proper; but any other suitable means which will serve the purpose can be used instead.

The reason for interconnecting the tubes 50 is so that inflation of one will inflate the others. Thus only one tube needs a filler valve, and said valve is preferably located at the lower end of one tube, as at 60. The upper end of each tube has a threaded hollow stem, 61 vulcanized or otherwise secured therein in peripherally sealed relation thereto. The stems have suitable recesses at their outer ends for supporting compressible gaskets 62 (Fig. 5). The ventilator sleeve has a series of openings 63, one for each

inflatable tube, in position to permit connection of the tube stems to be made with the block 40 through said openings. The connections may be made at crossed holes 64 of the block by short pipes or nipples 65, one only of which is illustrated in position in the block. The pipe 65 (Fig. 5) has a clamping sleeve 66 slidable on it with a shoulder 69 outwardly abutting an enlarged portion 67 of the pipe. Additionally the pipe has a reduced portion outwardly beyond the shoulder 67 adapted to enter the bore of the stem 60 to compress the gasket 62. Sealing pressure is secured by threaded engagement at 68 of the sleeve 66 and the stem of the inflatable tube 10. The edges of the ventilator tube wall around the openings 63 therein lie sufficiently close to the air connections of the inflatable tubes 10 and block 40 so that, when the tubes 10 are inflated, the parts constituting the assembly shown by Fig. 4 are maintained in proper position.

It will be seen that no light can get into the ventilator, and that, when the front entrance of the tent is closed, no light can enter the tent at any place. The ventilator and the air connections between the inflatable tubes can be flexible instead of rigid but these parts are so small in proportion to the whole tent that they do not take up enough space to require the modification. The light lock afforded by the curtain 31 can be outside the main entrance opening if desired, as an outer more or less loose wall portion with the outer margins of the two sections of which it is comprised secured to the outer wall fabric in suitable fashion.

I claim:

1. A tent comprising a plurality of flexible wall panels which converge upwardly and are joined by flexible tubular wall portions, inflatable air-tight flexible stretchable tubes in said tubular wall portions adapted to hold the tent erect, the tubes having limited stretch longitudinally, and means connected to the tubes and extending longitudinally along the same to localize such stretch whereby to maintain the tubes in definite curved form when inflated.

2. A tent comprising a generally dome shaped hollow flexible body and tubular inflatable flexible stretchable supporting members wherein said members have limited stretch longitudinally and means on said members localizing said stretch, when inflated, whereby to hold the members definitely in position to maintain the walls of the tent taut.

3. A tent according to claim 3 wherein the supporting members are rubber tubes with annular transverse cord-type reinforcement only and with

stretch resisting elements connected to and extending longitudinally of and generally on one side of each tube whereby to constrain the tubes to take definite curved form upon being inflated.

4. A tent comprising a flexible body of generally dome shaped form, elongated inflatable tubes incorporated in said body and capable of limited stretching longitudinally thereof, and pairs of non-stretching elements on opposite sides of said tubes generally off center toward the central portion of the tent.

5. A portable dark room tent having an outer weather resistant fabric cover, flexible inflatable supports secured thereto and extending upwardly and then inwardly in spaced relation to each other about the tent, and a light proof inner liner adjacent the fabric cover and substantially coextensive therewith.

6. A portable dark room tent having a flexible opaque body one main wall portion of which has panels secured together by a sliding fastener to provide an entrance and closure for the tent, and a flexible wall in superposition to the entrance wall and comprising separate panels joined by a sliding fastener, whereby the two walls constitute a light lock entrance for the tent.

7. A tent comprising a flexible body, a plurality of inflatable tubular members incorporated in the body in a manner to support the same erect, said tubular members converging toward the top of the tent, means on one of the inflatable members to enable inflation thereof, means interconnecting the tubular members at the region of convergence thereof whereby all the tubular members will be inflated from such one, a ventilator sleeve extending vertically through the top wall of the tent, said interconnecting means lying within the sleeve.

8. A dark room tent having a hollow flexible light proof body which is open at the base, inflatable members incorporated with and arranged to support said body, a self sustaining frame of flexible material at the base and extending around the tent interior, and a water proof flexible floor sheet marginally overlying the frame inside the tent.

9. A tent comprising a generally dome shaped body of flexible material, upright inflatable tubes of elastic material in the tent structure and curving into overhanging relation to the central region of the tent, and non-elastic means connected with upwardly disposed portions of the overhanging portions of the tubes and extending along the same to prevent sagging of the central top portion of the tent.

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