March 23, 1943. R. H. HUNTER 2,314,830

TENT

Filed June 25, 1942

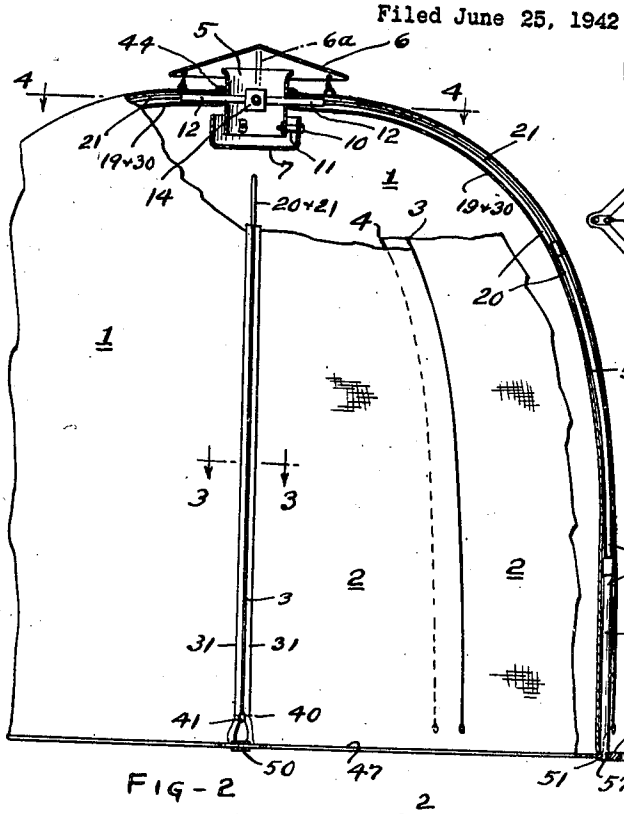

FIG-2

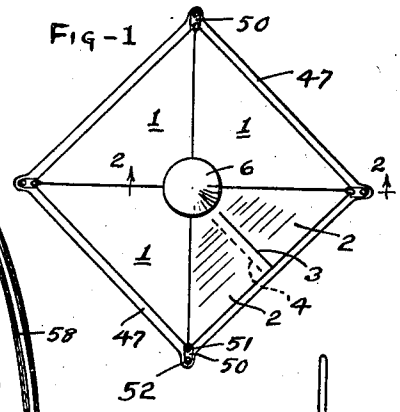

FIG-1

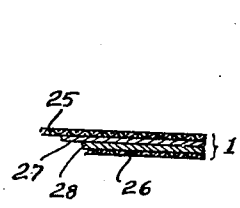

FIG-3a

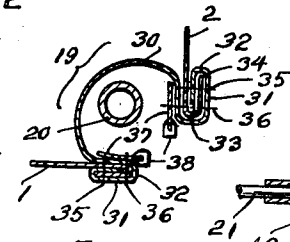

FIG-3

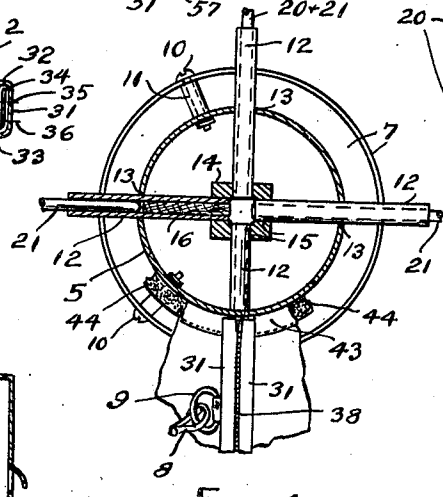

FIG-4

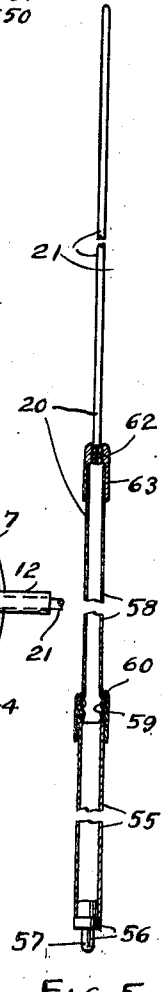

FIG-5

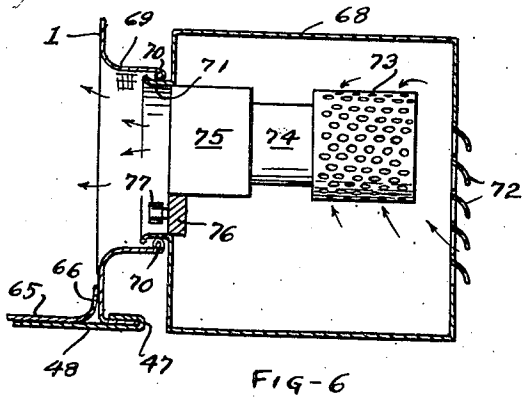

FIG-6

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# UNITED STATES PATENT OFFICE

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## TENT

Robert H. Hunter, Cleveland, Ohio

Application June 25, 1942, Serial No. 448,364

10 Claims. (Cl. 135—1)

This application is a continuation in part of my application Serial No. 372,440, filed December 31, 1940.

The invention hereof relates to a tent which is especially adapted to serve as a portable field dark-room for photographic work. An object is to provide an improved tent construction for uses such as indicated.

Other objects include the provision of: an improved tent frame construction; an improved fabric body construction for a dark-room tent; a novel way of making a light weight flexible tent pole and detachably embodying the same in a tent structure; a gas-tight tent construction; and a new manner of heating and ventilating a tent.

Further objects will become apparent from the following description of the embodiment of the invention shown in the accompanying drawing wherein:

Fig. 1 is a plan view of the tent; Fig. 2 is a fragmentary side elevation thereof partly in central cross section; Fig. 3 is a more or less diagrammatic corner detail cross sectional view; Fig. 3*a* is an enlarged cross sectional view of the preferred tent body fabric; Fig. 4 is a horizontal sectional detail view taken mainly along the line 4—4 on Fig. 2, the lower portion, however, being taken along a slightly higher horizontal plane; Fig. 5 is a fragmentary sectional view of one tent pole member fully assembled; and Fig. 6 is a diagrammatic view showing a heating and ventilating unit located outside the tent but controllable from within the tent.

Figs. 1 and 2 show a tent wall structure comprising imperforate, flexible, generally triangular wall members 1 and an entrance wall 2. The entrance wall, as shown, is made from two flexible panels or sections joined as by two sliding fasteners 3 and 4 shown in closed position. The entrance may embody a light lock vestibule with successively openable and closable parts as shown and claimed in my prior application, or may be otherwise arranged. The two sliding fastener assemblies 3 and 4, shown in Fig. 2, are in offset relation to each other and join together overlapped marginal portions of the panels constituting the wall 2. Both fasteners 3 and 4 are operable from the inside as well as from outside the tent. The entrance 3—4 can be of any suitable height sufficient to admit a person into the tent.

The tent roof portion provided by the members 1 and 2 extends entirely around and snugly embraces a short rigid vertical ventilator tube 5; and outer and inner cap members 6 and 7 respectively cooperate with the tube to exclude light from entering the tent through the ventilator opening of the tube. The outer cap 6 is preferably of flexible opaque material (e. g. similar to that of the tent walls generally) and is secured by detachable means (e. g. harness snaps 8 engaging rings 9) to the top of the tent. The inner cap 7 is a rigid cup (e. g. sheet metal) and is secured as by bolts and spacer sleeves 10 and 11 respectively to the lower open end of the ventilator tube 5 in such manner that the inner end of the tube cannot be accidentally closed. Pressure within the tent, maintained as hereinafter described, lifts the cap 6 if necessary in order to allow air to pass freely out of the ventilator tube 5. The cap 6 is stiff enough so that it ordinarily maintains its shape and the snaps 8 cooperate to some extent in holding the cap raised slightly off the upper end of the ventilator tube. If desired, a prop shown in broken lines at 6*a*, connected to a fixed part of the ventilator tube assembly, may be used to insure that the cap 6 will remain in raised position, or, alternatively, the outer cap can be so mounted as automatically to seal the ventilator tube 5 (as against entrance of gas) at all times except when pressure inside the tent raises the cap to discharge air from the tent.

The ventilator tube 5 is maintained in proper position vertically in the top wall portion of the tent by laterally projecting relatively rigid tubular arms 12 (see Fig. 4) the primary purpose of which is to receive and hold against lateral displacement the upper mutually converging end sections or portions 21 of generally flexible tent supporting pole or rod members, indicated generally at 20. The arms 12 pass through respective radial holes 13 in the tube 5, and the inner ends of the arms are fixed to a central connecting piece 14 in the form of a metal block with crossed bores 15 in which the inner ends of respective arms 12 may, for example, be brazed. Inserts tightly fitting the tubes 12, as at 16, Fig. 4, serve as stops for the end portions 21 of the rods 20. The inserts shown are wooden, but any other form of abutment for the rod ends could be used instead.

The interconnection of the arms 12 within the tube 5 makes a very strong central supporting and connecting unit for the flexible upper rod end portions 21, and prevents the individual arms 12, hence the rod ends 21 of the poles, from tending to pivot in or hinge about the central structure in any direction. If the relatively flex-

ible tent pole members, and particularly the upper end portion or sections 21 thereof, were not definitely restrained from hinging movement about the central structure the tent could not stand and would collapse of its own weight.

The free outer ends of the arms 12 are embraced by longitudinally openable and closable tubed portions 19 of the tent fabric structure—to be described presently—and the rods 20, for substantially the entire length of each, are also contained in the tubed portions. Before describing the manner of forming the rod-containing tubes 19, the fabric structure itself should be considered.

In order to provide a satisfactory dark-room tent the fabric body must be waterproof, lightproof, reasonably flexible, highly wear resistant and of relatively light weight. These qualifications cannot, as a practical matter, be obtained by the use of any single ply woven or other fabricated material suitable for use in a portable tent. The arrangement described below is the result of considerable study and experimentation and is preferred.

Two layers of light weight tightly woven fabric are treated first mainly to render them waterproof, flex resistant and generally stable. The base fabric is preferably grade "A" airplane fabric and the waterproofing (etc.) preferably is done by dipping the fabric into a fairly thin solution of vinyl resin e. g. plasticized polyvinyl chloride, an example of which is sold as "Koroseal," preferably containing some opaque coloring matter. If the resin solution contains a fairly high percentage of solvent, then the individual strands of the fabric become impregnated to a considerable degree which obviously is desirable.

Next, each layer of fabric is spread-coated on one side as with the same kind of vinyl resin which was used for the waterproofing treatment, but definitely opaque and in a sufficiently heavy (viscous) solution so that a continuous entirely opaque film of the resin is intimately bonded with the fabric over the entire area of the latter, fully sealing it against passage of light therethrough at all points.

The sheets, treated as described above, are now placed with the spread-coated surfaces adjacent each other and the films thereof joined preferably homogeneously as may be effected, for example, by heat and pressure in case the resin of the continuous film is thermoplastic. The films can, in some cases, be joined by cement. Other synthetic resins which can be used in place of "Koroseal" are those which are uniformly miscible with opaque coloring matter, pliable and somewhat elastic at high and low weather temperatures, yet which do not become tacky or brittle under extreme weather conditions (heat and cold respectively) and which resist dissolution in water, hydrocarbons and chemicals likely to be used in photographic laboratory work. Reference is directed to "Plastics Catalogue" 1942 for other plastics which may be used.

In Fig. 3*a* the layers 25 and 26 are the outer and inner fabric sheets as described above and the layers 27 and 28 are respective opaque films (e. g. "Koroseal") bonded therewith and bonded to each other. For various reasons a single fabric sheet cannot satisfactorily be uniformly but thinly coated,—as a matter of practical production,—with opaque material such as described above and used as the tent body wall in a dark-room tent. Translucent spots (usually called "pin holes") are too likely to occur, whether from bubbles in the plastic, non-uniformity on part of the fabric, inaccuracy of operation of the spread coating apparatus or from other causes. Thus, if one-layer of fabric is spread coated on both sides, as with opaque Koroseal and a thin spot or incompletely opaque region occurs in the coating at one side of the fabric the coating at the other side is quite apt to exhibit the same local defect and a "pin hole" effect appears. If the cause of the defect is a gas or air bubble in the coating film material and the bubble is adjacent the fabric the bubble frequently lies in an interstice of the fabric itself (as by formation during impregnation of the fabric such as the waterproofing treatment described above) and therefore produces aligned thin spots in the oppositely disposed coatings, with a resulting "pin hole" effect in the finished product. The same result would occur in case of a local enlargement or small bulge on one of the fabric strands or threads, this producing a thin spot on both side coatings of opaque material such as described because the fabric strand itself would not ordinarily be opaque. Furthermore, even if the single fabric core is treated as by special coating with Koroseal on both sides to make it opaque and the opaquing film treatment is adequately light proof to begin with, the films are relatively unprotected against subsequent abrasion and the formation of "pin holes" thereby. On the other hand, by opaque film coating the adjacent surfaces of two layers of fabric and joining the two coatings as shown in Fig. 3*a*, both film coatings (or a single adequately thick film lying between two fabric layers and bonded to both) are (or is) protected by the relatively stronger fabric against abrasion on both sides. The double laminated fabric described above is shown as a single layer in Figs. 2, 3 and 6.

The tubes or tunnels 19 for the tent-supporting poles or rods 20 are formed mainly by separate insert strips 30 (preferably of the same double fabric construction as that described above, but, in any event, of equivalent light tight construction) embracing marginal folds of the adjacent cover panels as shown, for example, in Fig. 3. The folds 31 of the strips 30 (fold shown open at right of Fig. 3) are double folds, providing a finished edge at 32 by reason of the short margin 33 of the fabric of the strip 30 illustrated. The folds 31 interlock with and embrace turned back marginal portions 34 of the panels 1 and 2 as is evident from Fig. 3, and the relatively overlapped portions of each seam are preferably sewed as at two lines of stitches 35 and 36. The line of stitches 36 also fastens the base tapes 37 of respective sides of the sliding fastener 38 to respective interlocking seams described above.

Preferably the fasteners 38 slide open from the tent base portions of the pole-containing tubes or tunnels 19—see 40, Fig. 2—toward the upper limits of said tubes where the latter converge and terminate at respective regions closely adjacent the ventilator tube or sleeve 5 (see Fig. 4, lower part). Thus the fastener-tongue-interlocking or assembling device 41 (slider) of each sliding fastener closes the respective tube or tunnel 19 about the contained pole or rod 20 when said device 41 is moved downwardly to the point 40, and fully opens said tube or tunnel when slid to a region adjacent the ventilator tube 5. The fasteners 38 are of the fully separable type so that when the slider devices 41 are moved to predetermined positions adjacent the ventilator tube 5 the tunnels 19 are then laid open from end to end, affording sufficient slack in the tent body

fabric portion lying adjacent the ventilator tube and rod-receiving arm assembly so as initially to receive said assembly. With the fasteners all disconnected at the central tent top portion said assembly can be lowered into place as a unit and the fasteners then connected to bring the tent body fabric into close relation to the ventilator tube 5 (as illustrated). Once the fasteners are connected it is then no longer necessary to disconnect them again, or in fact to move the slider devices 41 inwardly beyond the ends of the arm 12 in dismantling the tent or in re-erecting it.

The margins of the panels 1 and 2 around the ventilator tube 5 are suitable finished as by folded seams 43, Fig. 4. After the ventilator tube and pole or rod-receiving arm assembly is in place a continuous fairly dense sponge rubber ring 44 is expanded over the upper enlarged end of the ventilator tube 5 and then brought downwardly into abutment with all the arms 12. The top wall structure of the tent lies over and around the endless sponge rubber ring. When the last fastener slide 41 is operated to connect the fastener tongues thereof the fabric material of the tent then is squeezed against the sponge rubber ring 44, compressing it and forming therewith a continuous light lock around the ventilator tube.

At the base of the tent (note flange 47 in Figs. 1 and 6) a fabric floor panel 48 is joined to the various upright panels 1 and 2. At the four corners of the base, grommets 50 are secured to the flange 47 or tab-like extensions thereof, which grommets have eye openings 51 to receive the foot ends of the rods 20 and additional openings 52 for stakes or stake-loops of rope or cord (not shown). The grommet holes 51 are in accurate alignment with the lower open ends of the tubes 19 which receive the tent poles or rods 20.

An important feature of the construction is the increasing flexibility of the tent poles or rods 20 toward their top ends, so that, principally, the curving or mutual arching on part of the tent poles will be at the upper or roof portions of the tent, thus preserving fairly straight and solidly supported side wall portions. The tube and rod portions of the tent poles (described below) are preferably made of high grade steel or other metal which will not, with the amount of bending indicated, nearly approach the elastic limit of the metal.

Referring to Fig. 5, the lowermost main section of the pole or rod 20 is a thin walled steel tube 55, the lower end of which has a plug 56 fastened thereto, as by press fit inside the tube, and a reduced extension 57 of the plug is of proper size to enter the grommet eye 51. Snug fitting of the grommet eye is unnecessary. The top of the tube 55 is screwed to a second but more flexible tube section 58 of the pole or rod 20. The tubes can have screw threads rolled thereinto as at 59. A sleeve 60 on the top end of the tube 55 protects the threads thereof against being carelessly damaged. On the end of the tube 58 opposite the threads 59 is a suitable support for the final still more flexible rod section 21, the latter being of such diameter that the upper end of said section can easily enter one of the crossed tubular arms 12 of the ventilator and spider unit as already described. The lower threaded end 62 of the section 21 is somewhat enlarged and the threads of the enlargement 62 fit internal thread formations in a connector sleeve 63 fast on the tube section 58. For reduction of carrying or packing space, the tube and rod sections may be collapsed viz: rod 21 into tube 58 and the latter into tube 55 as will be obvious from the drawing, Fig. 5.

When erecting the poles, after assembly at the threaded connections, the solid flexible end sections 21 are first inserted into the open ends of the arms 12 of the ventilator unit and then the base inserts or pins 56 are placed in the grommet eyes 51. Afterward all the fastener sliders 41 are pulled downwardly, as into the position of the slider 41 in Fig. 2, thus taking up the horizontal and vertical slack of the tent fabric. The channels 19 enclose each rod or pole 20 in a substantially continuous tunnel as will now be apparent. The cap 6 may be fastened into place by means of the harness snaps 8 as soon as all the fasteners 38 have been connected by their sliders 41 and the sliders moved outwardly along the arm 12 into accessible position, or the cap can be attached at any subsequent time.

Referring again to the floor of the tent, a fragment of which is shown at 48, Fig. 6, said floor is made mildew-proof as well as waterproof and fire resistant by treatment such as now specified by the United States Government as CCC D-746. That treatment has been proven unpalatable to termites and other vermin likely to attack fabric when lying upon bare ground or grass. An inner removable, flexible floor member 65 coextensive with the base of the tent is indicated in Fig. 6. Said floor member is imperforate and is turned up at all margins, as at 66—being larger than the floor 48—so as to form a catch basin for liquids which may be spilled as from containers inside the tent. It should be noted that the floor 48 can, in many cases, be omitted since the flanges at the base of the tent (see Fig. 1) are made strong enough to hold the base of the tent from spreading out of shape.

At the right, Fig. 6, a heating and ventilating unit cabinet is shown diagrammatically at 68. The cabinet is made large enough to receive the tent, when folded, and also the collapsed or disconnected pole or rod sections in a compartment thereof (not specifically indicated). The interior of the tent is connected with the illustrated interior of the cabinet much the same as in my said prior application, 69 being a light proof tube of flexible tent wall material contiguous with one of the panels 1 and having an elastic portion 70 for yieldably but tightly embracing a rigid short tubular extension 71 of the cabinet. Entrance for air into the cabinet 68 may be provided by louvers 72. Air from the space within the cabinet is constrained to pass through a filter unit 73 shown in the form of a more or less conventional air cleaner. Said unit may contain, for example, activated carbon or any other medium for purifying the air or may contain only suitable means for cleaning the air, as desired. A blower is indicated at 74 which draws air through the filter unit and forces the air through an electric heater 75, thence into the tent through the tubes 71 and 69. Controls for the heater, as well as suitable utility electric outlet fixtures (sockets) are mounted as on a panel member 76 adjacent the heater but accessible for operation from within the tent. 77 indicates a control switch for the heater and blower. The blower-heater can be operated to supply warm air for heating the tent or, by appropriate electrical arrangement as well known (not illustrated), the blower may be operated without operating the heater. When the blower operates at low speed it maintains a sufficient

pressure within and flow of air out of the tent so that the tent is gas-proof, all gaseous media being constrained to enter the unit 73 where undesirable constituents thereof can be wholly or partially removed enroute to the interior of the tent.

I claim:

1. In a dark-room tent a flexible cover comprising layers of woven fabric with an opaque synthetic resin film bonding the layers together into a single flexible opaque wear resistant cover unit.

2. The arrangement according to claim 1 wherein the synthetic resin is a plasticised polyvinyl chloride containing a relatively high percentage of opaque material.

3. In a dark-room tent a flexible light proof cover adapted to be supported by a frame, said cover comprising two mutually overlapping layers of waterproofed fabric each having a continuous coating of opaque flexible synthetic resin bonded thereto on the inner face, and means connecting said coatings together so that said layers constitute, in effect, a single fabric unit.

4. In a dark-room tent, a dome-shaped light proof flexible body, a rigid ventilator sleeve extending through the top of the body, means supportingly associating the sleeve with the body so that one can support the other, a cap extending across the top of the sleeve normally in spaced relation thereto, means detachably associating the cap with the body material at circumferentially spaced portions of the cap, and an inner cup-shaped cap with its rim in telescoping spaced relation to the lower end of said ventilator sleeve and fixed to said sleeve.

5. In a tent, a shelter or cover comprising a body of flexible material, means secured to the body material along the same at spaced generally parallel regions and operable to form an intermediate portion of the body into a loop or tunnel adapted to contain an elongated tent-supporting rib or pole while taking up slack in the body.

6. In a tent, a shelter or cover comprising a flexible body, pairs of sliding fastener lug elements secured to said body, adapted to interlock with each other and spaced apart a sufficient distance so that, when said elements are brought together the body material therebetween is formed into a tube for receiving an elongated tent-supporting member, and sliding means arranged to associate said elements.

7. In a tent, a generally dome-shaped hollow flexible shelter body or cover, pairs of rows of interlocking sliding fastener lug elements on the body, the elements of each pair being spaced apart a sufficient distance so that, when the lugs are interlocked, the intermediate body material is formed into a tunnel adapted to receive a supporting pole for the tent, said rows extending in radiating arrangement about a central upper region of the dome-shaped body and downwardly toward the base of said body.

8. In a tent, a hollow shelter body or cover formed of main sections of flexible material and intermediate relatively narrow strips connected at opposite edges to adjacent sections at mutually interfolded margins of the strips and sections, and means connected to the interfolded portions and operable to form the strips into loops for receiving tent supporting members while taking up slack in the body.

9. In a tent, a hollow generally dome-shaped cover member having means for detachably securing supporting ribs thereto substantially continuously along the same, a substantially non-extensible but flexible base member for the tent secured along the lower perimetral edge portions of the dome-shaped body, and eyelets in the base member vertically aligned with the aforesaid means for receiving and holding in position lower end portions of such supporting ribs.

10. In a tent, a generally dome-shaped hollow body of flexible material, a spider element operatively attached to the body at its top central portion and with mutually rigid outwardly radiating arms adapted to telescope with supporting rib or pole elements for the tent to hold said elements in position, and means fixed to the body material in radial alignment with the arms and extending downwardly substantially to the base of the tent for additionally securing such rib or pole elements to the flexible body material substantially continuously along such rib or pole elements.

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