

[72] Inventors **Hans Prinz  
Munich;  
Johannes Wiesinger, Rohrmoos; Rudolf  
König, Neumarkt Upper Palatinate,  
Germany**

[21] Appl. No. **751,416**

[22] Filed **Aug. 9, 1968**

[45] Patented **Dec. 15, 1970**

[73] Assignee **Dehn & Söhne,  
Nurnberg, Germany**

[32] Priority **Aug. 12, 1967, Feb. 7, 1968**

[33] **Germany**

[31] **Nos. 1,557,383 and 1,632,485**

[56] **References Cited**

**UNITED STATES PATENTS**

315,679	4/1885	Upton .....	174/2
3,058,480	10/1962	Blanchard .....	135/1
3,139,948	7/1964	Rorden .....	182/46X
3,390,491	7/1968	Hayden et al. ....	52/2
1,553,087	9/1925	Lehmann .....	174/2

**FOREIGN PATENTS**

683,630	3/1930	France .....	174/2
---------	--------	--------------	-------

*Primary Examiner—Peter M. Caun*  
*Attorney—Robert H. Jacob*

[54] **EMERGENCY SHELTER IN THE FORM OF A TENT  
OR THE LIKE**  
8 Claims, 6 Drawing Figs.

[52] U.S. Cl. .... 135/1

[51] Int. Cl. .... A45f01/00;  
E04b 01/347

[50] Field of Search ..... 135/1; 52/2;  
182/46; 174/2, 35.4

**ABSTRACT:** A tent, or a shelter similar to a tent, where means are provided to protect the occupant, or occupants, against lightning bolts, which tent is in the form of a Faraday cage and the components constituting the cage are conductively connected to ground, or adapted to be connected to ground, and which generally comprises a metal frame and a cover that is preferably conductive for electricity and a metallic base or floor.

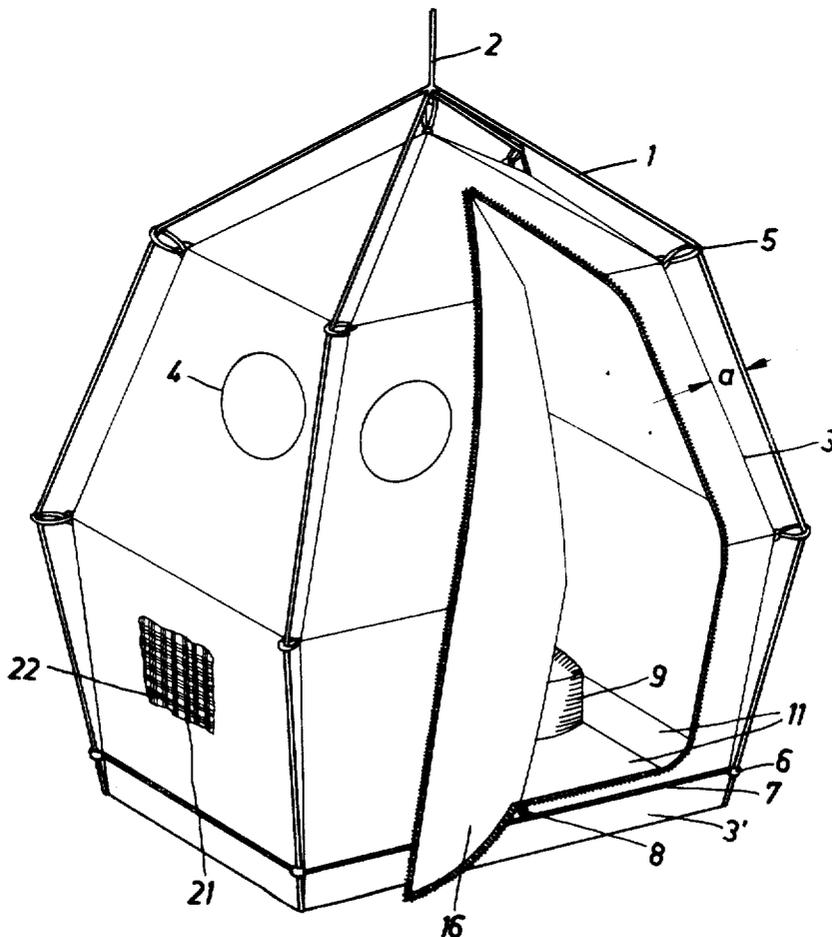
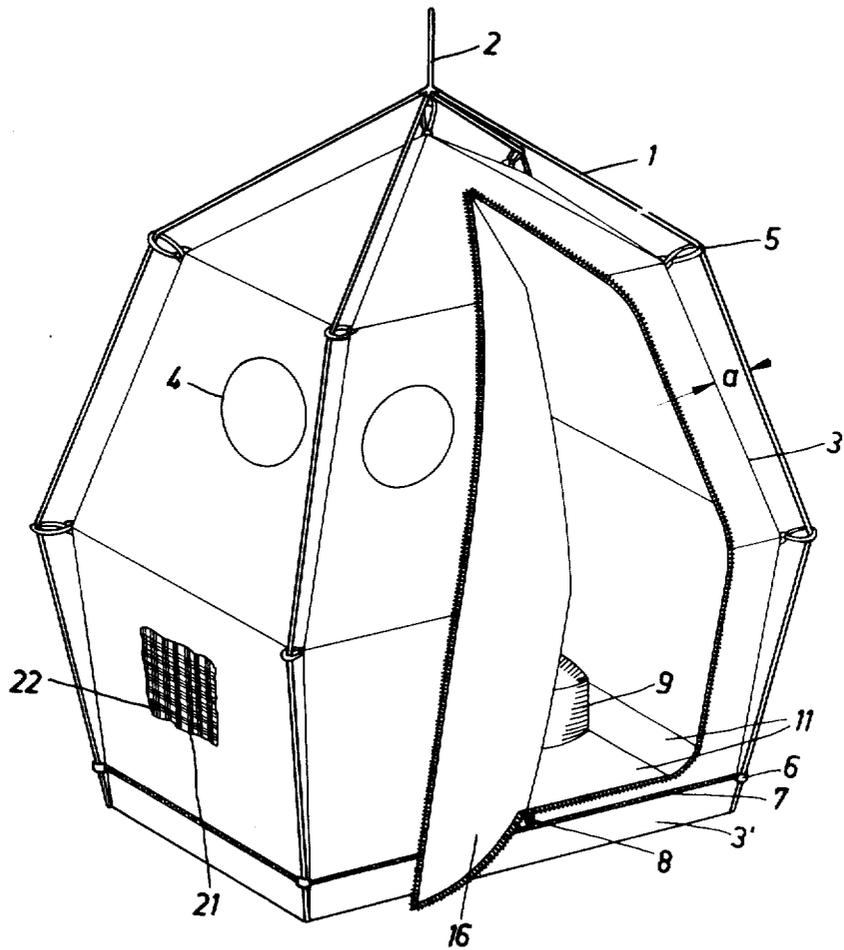
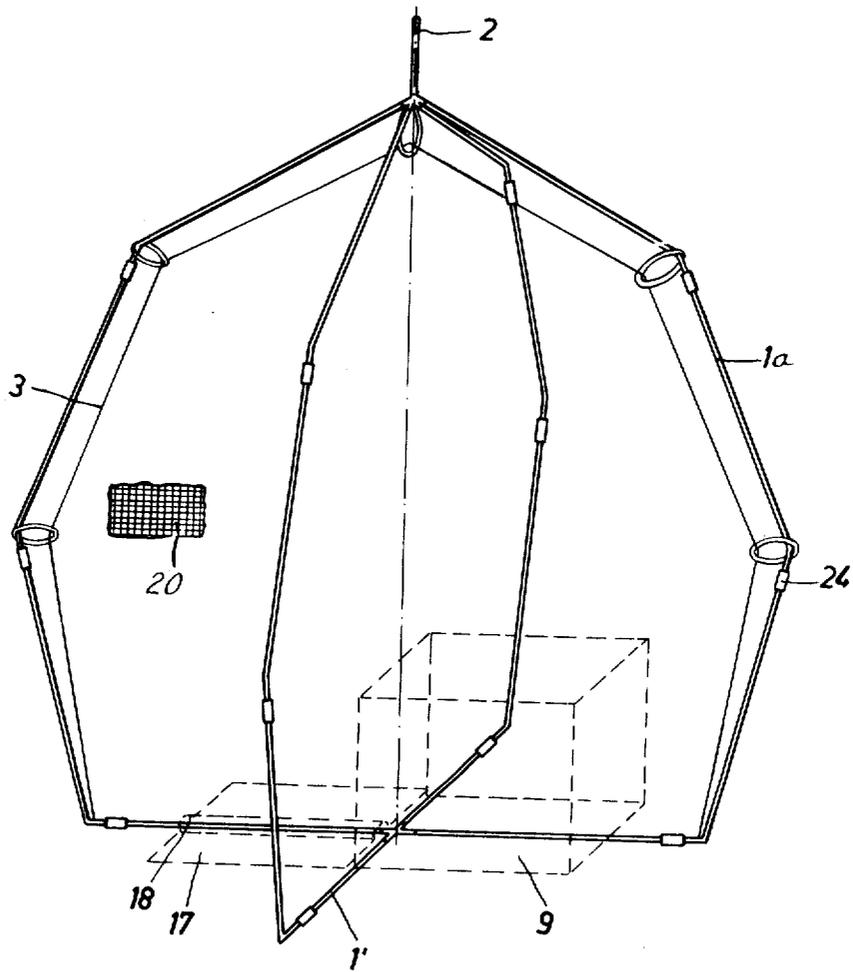


Fig.1



Inventors:  
HANS PRINZ, JOHANNES  
WIESINGER & RUDOLF KÖNIG  
BY Robert Jacob  
AGT.

Fig.2



Inventors:  
HANS PRINZ, JOHANNES  
WIESINGER & RUDOLF KÖNIG  
BY *Robert H. Jacob*  
AGT.

Fig.3

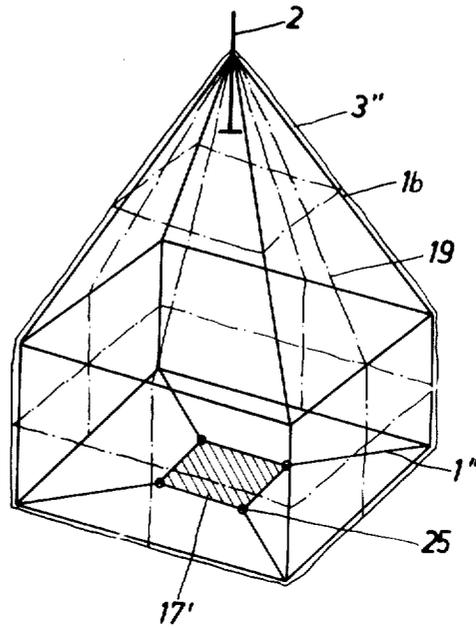
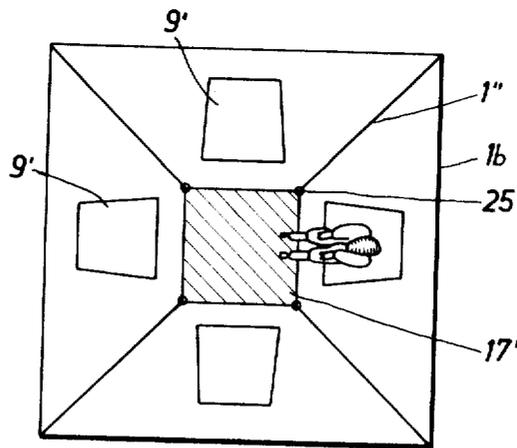


Fig.4



Inventors:  
HANS PRINZ, JOHANNES  
WIESINGER & RUDOLF KÖNIG  
BY *Robert A. Falot*  
AGT.

Fig.5

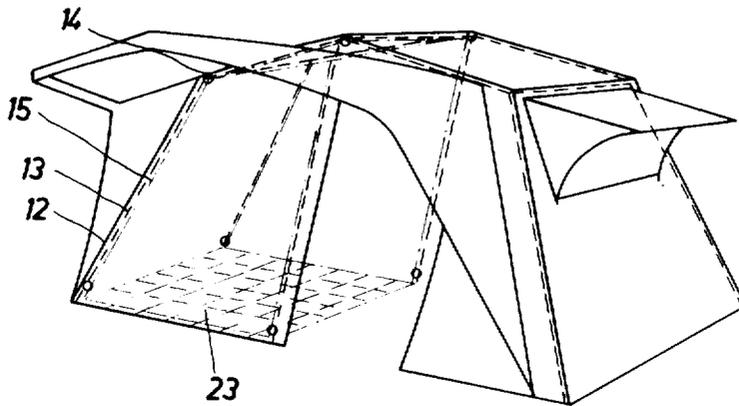
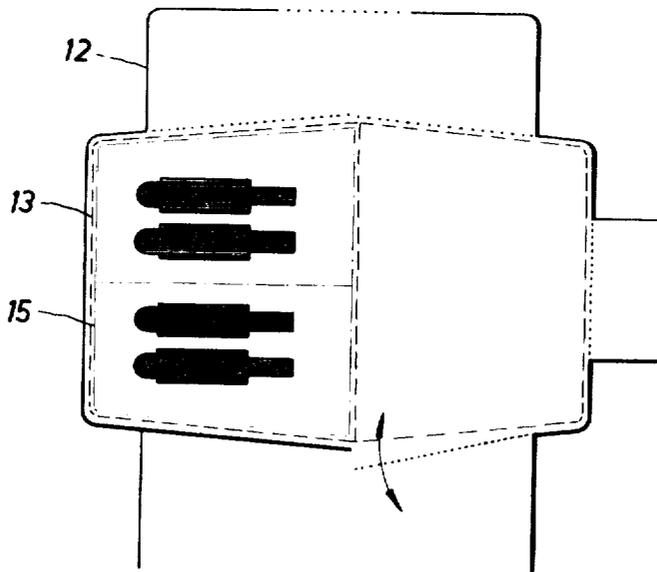


Fig.6



Inventors:  
HANS PRINZ, JOHANNES  
WIESINGER & RUDOLF KÖNIG  
BY *Robert H. Jacob*  
AGT.

## EMERGENCY SHELTER IN THE FORM OF A TENT OR THE LIKE

### BACKGROUND OF THE INVENTION

The present invention relates to tents or tent like emergency shelters. More in particular, this invention concerns a tent or tent like emergency shelter (for convenience only the expression tent will be used hereinafter), with means of protection against lightning strokes for the people using the tent. For reduction of the step voltage gradient (the potential difference over the length of an average human step), it has already been proposed, to make the base of the shelter entirely or partly out of an electrically conductive material. However, with this preventive measure no adequate protection is given the people which are in the shelter, as it lacks protection against a lightning strike directly in the tent.

### SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide by simple means, a tent that protects the people who are inside not only against the effect of a direct lightning stroke, but also reliably prevents the pickup of a dangerous step-voltage gradient. The protective devices against lightning should not however result in a substantial increase in the production cost, nor cause any marked complications while setting up or dismantling the tent, as well as not be too unwieldy or heavy.

Therefore in accordance with the invention, the tent is formed like Faraday's cage (an electrostatic screen) and the cage-like portions are in a conductive connection with or are connectable with the earth. This contact requirement can be accomplished by means of extending the tent poles or frame to the ground, and/or a metallic grounding plate or also with metal litz wire and the like, so that the passage of the lightning bolt to ground at a definite point is insured.

The Faraday's cage can be formed in a simple manner by the tent frame, for example suitable metal parts or tubes and/or by the covering fabric. For this the combination of a tent frame with an electrically conductive tent cover has been found to be especially satisfactory. To this end it is proposed for an especially preferred embodiment of the invention, that a safety tent forming the Faraday cage is located inside the frame and disposed at a distance therefrom, which is electrically connected in at least one place with the frame. Several advantages are thus obtained. The frame, which may also be in the form of a cage, serves alone as the conductor of the lightning bolt, which accordingly is not led over the tent cover. The safety tent completely shields the user electrically and has the same electrical potential at all points. Thus the user in the interior can not receive a dangerous step voltage nor be endangered by contact with the tent cover.

The tent, according to the invention can be built to shelter one or more persons. For this production in the form of a hemisphere or the so-called igloo is recommended as electrically especially favorable, but the invention is not limited thereto. A tent of low structural height like the aforementioned igloo form, has the advantage that with it the danger of a lightning bolt as well as the danger of being crushed or turned over by a storm is diminished.

The invention can be utilized to advantage not only for camping tents but also for other purposes. Such simple and easily assembled tents or emergency shelters can serve above all as protection against weather and lightning for those working or active in the open, as railroad personnel, telephone or electrical linemen, lumberjacks, farmers, fishermen, hunters, the military, border guards, mountain rangers, and so on.

A one man tent made according to the invention weighs only a few kilograms and is storable in a handy carrying case, so that it can be readily carried by one person over long distances. Thus lightning protected emergency shelters, or so-called bivouac shelters can also be produced for hikers or mountain climbers caught in stormy weather. It is evident that emergency shelters of this type must not necessarily be adapted to be dismantled, as they may also be provided with a unitary frame to be set up in situ.

Further advantages and details of the invention will become apparent by reference to the embodiments illustrated in the accompanying drawings in which:

FIG. 1 is a perspective view of a first embodiment of a one man tent in accordance with the invention;

FIG. 2 shows a second embodiment of the invention with the tent cover omitted also in perspective;

FIG. 3 shows schematically and also in perspective a third embodiment of the invention;

FIG. 4 shows schematically a plan view of a tent corresponding to the embodiment in accordance with FIG. 3, but with the upper tent and frame parts omitted;

FIG. 5 shows in a perspective view of a portion of a camping house tent with a suspended tent unit, and

FIG. 6 shows in a schematic plan view of FIG. 5 with the tent roof and other details not of interest omitted.

The frame 1a comprising assemblable metal tubes (see FIG. 2) for example steel or aluminum tubes, is provided with a lightning rod 2 suitably on its highest point, and in use rests upon the ground with its ground struts. Fundamentally other means for establishing a connection between the frame or tent and the ground would also be possible.

In this embodiment the frame 1a has the task of intercepting and conducting directly striking bolts of lightning and conducts their current immediately to ground so that the tent will not be touched thereby. Moreover, the frame 1a can also take on the function of a Faraday cage for lightning bolts striking in the proximity.

In the frame 1 as illustrated in FIG. 1, the tent 3 is so arranged, preferably hung in, that it is spaced a distance a therefrom to safeguard against jumping of a lightning bolt. Taking into consideration the strength of the usual lightning bolt, it will generally be sufficient, if this distance is a few centimeters. It is however to be understood that the invention is not limited thereto as evidenced by the other embodiments illustrated.

The frame is suitably made of metal tubes or rods that are connected together by sockets or sleeves 24 as illustrated in FIG. 2 at 1a.

The transverse struts 1'' of the frame are hingedly connected at 25 to the ground plate 17' as seen in FIGS. 3 and 4.

As seen in FIG. 2 the tent cover 3 is below the frame 1a, although it can also rest on the frame.

The safety tent in the form of a Faraday cage comprises, for example, a metallized fabric, for which a cloth can be utilized, that has metal thread 21, 22 woven into the weft and also into the warp as in FIG. 1. Metal litz wires 19 sewn on may also be as shown in FIG. 3.

The tent covering fabric can also be formed to be entirely electrically conductive by other means, for example, by production from a material which is conductive per se, applied with a brush, spraying on a metal coating, or covering with a layer of metal 20 as indicated in FIG. 2.

According to the embodiment of FIG. 1, the tent 3 is fastened to frame 1 by releasable loops 5, which consist of an insulating material like rubber or plastic. The material of this suspending means can be rigid or elastic. On or in floor 3' of the safety tent a conductive floor covering such as, one provided with litz wire can be disposed. Especially appropriate is the use of a metallized rubber mat 11. By these means, the relatively delicate tent cloth is protected there against stepping through or other mechanical damage. Simultaneously the penetration into the interior of the tent of moisture and rainwater collected on the ground is prevented. In order to give the tent 3 a definite electrical potential, it is connected with the frame at any place. As FIG. 1 illustrates, this connection 6 can consist of metal litz 7 sewn on the tent and fastened of the frame 1 near the ground. The metallized tent cover, which is conductively connected to the frame 1 and surrounds the occupants, prevents that any displacement currents due to the increase in potential of the frame 1 with respect to the environment can flow over the occupants, especially through any contact points between the occupants and the tent frame, and can seriously endanger the people. Additionally it should

be pointed out that the conductive tent cover protects the occupants also against vagabond currents which possibly occur if the tent is set up under trees having branches hanging down or in bushes.

The embodiments of FIGS. 1 and 2 each show a tent for accommodating one person. This tent is suitably in the approximate shaped of a semisphere or an igloo where the seating cushion 9 for the occupant can be in one corner and the windows 4 to the left and the right of the opposite corner. The seat 9 is suitably made of an insulating material, for example, a cushion of rubber or plastic that can be blown up. On a side wall the entrance flap 16 is provided with a zipper 8 which can be closed from the inside as well as from the outside. It is, of course, also possible to make larger tent units in this manner. Furthermore, the invention is not limited to the illustrated form and configuration of the frame.

Moreover, as shown in FIG. 2 a ground plate 17 can be provided which is located in the interior of the tent and there constitutes a standing or locating surface for the feet of the tent occupant or occupants. Size and arrangement of the tent, as well as of the chosen plate 17 and of the seat 9 may be chosen in such a manner in relation to the tent interior, that the occupant or occupants can assume a definite position in the tent and place the feet upon the ground plate (see FIG. 2 and the schematic drawing of FIG. 4). Thus the user is prevented from picking up a step voltage, while the Faraday cage affords a safeguard against direct lightning strokes. It is advisable not to make the ground plate too large, so that there is only room for the feet of the person or persons that can be accommodated in the interior of the tent.

The electrical connection of the ground plate with the earth can be optional, for example, by way of the base or ground struts 1' of the frame 1a, which may simultaneously serve for grounding the frame or the Faraday cage. The ground plate 17 can be releasably connected with the struts 1'. For this purpose the plate 17 may be arcuated as indicated in FIG. 2 at 18 and resilient.

In the possibilities of embodiments for multiple occupancy tents illustrated in FIGS. 3 and 4, on the other hand, the differently shaped transverse struts 1'' of the frame 1b are linked to the plates 17' and can be turned over downwardly or upwardly into a position perpendicular to the plate for transportation purposes.

In the embodiment in accordance with FIG. 2 the tent cover 3 is directly below the frame 1a and may be a Faraday cage. If the frame, as well as also the tent cover are designed as a Faraday cage, it is advisable to connect them conductively at several places. It would also be possible to provide the tent cover on the outside of the frame 1b as indicated at 3'' in FIG. 3. In that event the cover must have the properties of a Faraday cage.

Fundamentally the mesh width of the Faraday cage should be so narrow that no dangerous potential difference can arise between the person and the cage. Since the tent has merely a contact ground, it is under some conditions raised to several million volts when a lightning bolt strikes. A suitably narrow meshed cage safeguards against the person being "taken along" to this voltage, i.e., a sufficient coupling is provided between person and tent. In that event (see also the embodiment of FIG. 1) there is no necessity for electrical reasons to provide a ground plate or the like in the tent that is conductively connected to ground so that the tent can also be closed entirely at the bottom and thus be satisfactorily sealed against the penetration of wind and dampness.

It is furthermore accomplished with a strut arrangement in accordance with FIGS. 1—4 that the tent is safely held on the ground by the weight of the occupant or occupants seated therein, i.e., it need not be separately anchored. This is essential because in the event of a suddenly arising storm the time is

usually not available to establish such an anchorage. Frequently there is not even the possibility for this at the location, for example rocky ground. A tent of this type including the frame, possibly the ground plate and the cover can be readily accommodated and taken along in a portable container such as a knapsack, a bag or the like.

The embodiment in accordance with FIGS. 5 and 6 illustrates the application of the invention, to a tent generally referred to as a house tent for camping purposes. In the outer camping tent 12 the supporting frame 13 is indicated in interrupted lines. Onto this frame a living or sleeping unit 15 is tied by means of loops 14 which are only schematically illustrated (dash and dot lines), which unit is in the sense of the above explanations in the form of a Faraday cage made, for example, out of metallized fabric. The inner tent part 15 may be made either as a separate living or sleeping unit and hung into camping tents that are already in existence. However, it is also possible to provide such a camping tent from the beginning with a tent portion in the form of a Faraday cage hung into its frame. Particularly in the tent embodiments described above, it is advantageous to place a mesh screen 23 below the rubber bottom of the tent. In general, the features described in connection with the embodiments of FIGS. 1—4 may be applied in the same sense also to the embodiments of FIGS. 5 and 6 and vice versa.

The dimensional proportions of the mesh screen should be such that it can conduct the lightning current which flows over the frame into ground. Only by way of example a mesh screen is mentioned made of copper litzten that is 5mm<sup>2</sup> in cross section and of a mesh width of 30—50cm.; the invention is not limited thereto. By means of the mesh screen dangerous step potentials are simultaneously avoided.

Having now described our invention with reference to the embodiments illustrated in the drawings, what we desire to protect by letters patent of the United States is set forth in the appended claims.

We claim:

1. Shelter in the form of a tent providing protection for the occupant or occupants against lightning strokes, said shelter comprising a supporting frame, a conductive floor including metal capable of conducting lightning currents conductively connected to said frame, a shelter cover, insulating members such as loops of rubber or plastic material supporting said shelter cover on said frame at a distance to safeguard against jumping of lightning bolts, said frame and said floor forming a Faraday cage adapted to be conductively connected to ground.
2. Shelter in accordance with claim 1, where said shelter cover is made of an electrically conductive material.
3. Shelter in accordance with claim 1, where the distance between said shelter cover and said frame is a few centimeters.
4. Shelter in accordance with claim 1 wherein said metal in said conductive floor is in the form of a ground plate or the like in the interior of said shelter which serves as a supporting surface for the feet of the occupant or occupants of said shelter.
5. Shelter in accordance with claim 4 comprising conductor means such as metallic struts conductively connecting said ground plate to said frame.
6. Shelter in accordance with claim 4 including an inflatable seat for each occupant arranged proximate said ground plate in a manner permitting the occupant of each seat to place his feet on said ground plate.
7. Shelter in accordance with claim 1, where said safety shelter is incorporated in a camping tent unit to form a room and includes means for supporting said shelter on said frame.
8. Shelter in accordance with claim 1 wherein said conductive floor is in the form of a mesh screen connected with said frame.