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(54) **House structure with pneumatic support and impermeable walls permitting ventilation**

Tragluftkonstruktion mit undurchlässigen Wänden, die die Ventilation ermöglichen

Abri gonflable portant avec des parois imperméables en permettant la ventilation

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Description**Technical Field**

5 **[0001]** The present invention concerns the technical sector relating to the industrial production of big and medium tents with pneumatic support. Such a kind of tent is mainly suitable in emergency situations when it's necessary to immediately provide covered structures in very short times. This invention is a perfect solution in case of emergency for the safeguard of people or however in every case it's necessary to quickly install shelters as first aid points, refectories, dormitories, etc.

Background Art

15 **[0002]** Camping or emergency tents are used, different in shape and size, principally characterized by a collapsible structure made of plastic or metal poles, which support a canvas covering the structure so as to permit to stay inside. Usually, we open the tent, spread it on the ground and erect inside the structural support, while the tent is fixed to the ground by pegs. This kind of tents has the relevant drawback to be difficult to erect and above all it doesn't insulate the inside from the outside, so that it's impossible to have a change of air inside the tent, except for the openings on it, therefore any air-conditioning or heating inside the tent is only possible thanks to relevant sources of energy, however often with poor results.

20 **[0003]** As a matter of fact, the traditional tents have the clear drawback to be uncomfortable, since only one cloth divides them from the outside, which means the total inability to prevent the inevitable greenhouse effect, with the consequent great difficulty of air-conditioning the internal temperature, both in summer and winter, with high consumption of energy. Furthermore, the absence of a forced effect of ventilation and change of air often increases humidity until the condensation on the inner surfaces of the cloth and the relative drip. This fact obviously prevents the use of the tent in many situations, for example as camp hospital, or for the installation of an outpost equipped with computers that need electronic equipments to operate. In addition, the current solutions, also relating to the covers normally employed, do not use fireproof materials.

30 **[0004]** Another kind of tent is used, which is supported thanks to a continuous jet of air and is formed by a double wall in transpiring material. This double wall in transpiring material would involve great difficulties in the industrial production, because a fireproof treatment of such a cloth, as experts of this field know, is very difficult and however not cheap. In addition, even if the air chamber is a valid insulation from the outside, as the internal wall is however transpiring, it generates inside the tent, for inevitable exchange of heat, either air heated by the greenhouse effect or cool air in winter.

35 **[0005]** The document DE 2042114 describes a structure with pneumatic support wherein air generators are used to regulate the temperature of the air which is contained between the inner and outer parts of a double walled covering, while bags of water or sand should oppose a thermal upthrust that can be caused by the pressurized air contained within the structure.

Disclosure of invention

40 **[0006]** This invention aims at eliminating the above-mentioned and other drawbacks, supplying a safe house structure, both for emergency situations and all the other situations when we need to erect safe and comfortable covered places in a short time. In addition, the present invention can be easily produced on a large scale, i.e. at industrial level, following the current rules relative to the environmental respect and also inclined to a greater energy saving. The current invention has substantial differences compared with the existing projects, above all as regards the industrial applicability, the ecological respect and the energy saving, as well as the quality of the product and the advantages of use.

45 **[0007]** We reached this result adopting the technical solution described in the main claims. Other characteristics of this invention are the object of dependent claims.

50 **[0008]** The advantages resulting from the present invention essentially consist of the fact that it's possible to erect a camp mobile house structure in a very short time and without any need of technical skills or physical effort; that this structure results insulated from the outside, considerably reducing the influence of the external environmental conditions; that it has impermeable walls, so that it can be made fireproof and not suffering from climatic influences; that thanks to ventilation, the air inside the house structure is constantly changed and purified; that it's possible to have warm or cool air, according to the desired conditioning.

55 **[0009]** The main characteristic of the present invention, regardless of its aim and size, is to be formed by a single body, of any shape and size, with the walls and the ceiling constituted by an air chamber that acts as inner tube around the liveable space. This chamber, suitably calculated according to the liveable volume of the tent, is regularly filled with compressed air at limited and controlled pressure, by means of common electropneumatic instruments, using one or more electric compressors or ventilators, of a suitable prefixed size and power. The air filled in allows the structure to

raise and stand, so taking the projected shape, thanks to the continuous jet of air that allows the structure to stand even in the case of leaks due to holes or small tears, as the quantity of air filled in the unity of time is also function of possible leaks.

[0010] Another important advantage of the present invention is that part of the air filled in flows, in regular quantity, through suitable grids located in one or more section of the air chamber; in this way, we obtain a continuous change of air, eliminating therefore from the air chamber the air heated by the sun radiation, replaced with normal temperature or even cool air. The air ejected through the grids can flow either towards the outside, if we want to keep cool the inside of the house, or towards the inside, in the opposite case, so getting an absolute natural ecological and cheap source of heat. The principal result is a sort of self-conditioning of the internal temperature of the structure, without any need of supplemental or additional sources of energy, so getting a significant energy saving and, at the same time, a great improvement in the comfort of the structure, so as to be suitable for any particular and delicate purpose, e.g. like camp hospital or however first aid place. A consequent not secondary effect of this invention comprises the benefits deriving from the constant exchange of oxygen and the reduction of humidity inside the house structure. These characteristics make this house structure suitable for hosting people, laboratories, equipments, etc.

[0011] Reduced to its essential structure and with reference to the figures of the enclosed drawings, a house structure with pneumatic support, according to the invention, comprises:

- means to erect a house structure, with a tent made of a single body, equipped with double walls forming, in the front, back, side and top part, an air chamber (2) into which a continuous jet of air is directly filled in order to support the same structure;
- means to generate and channel the air inside said air chamber, consisting of one or more electro-ventilators or electric compressors, in proportion to the volume of the tent to support, connected with the inside of the air chamber (2);
- means to air-condition the liveable space, with holes made on the walls of the tent, which channel part of the air heated by the sun rays in the air chamber, towards either outside or inside, according to the desired temperature;
- means to air-condition the liveable space in the case of extreme environmental temperatures ($<16^{\circ}\text{C}$ or $>28^{\circ}\text{C}$), consisting of heating pumps that, connected with the inside of the tent through holes or passing the air chamber, directly act on the inner temperature.

[0012] Conveniently, the house structure is made of a single canvas in impermeable cloth, of first quality, in warp, with single or double coating in PVC, or other materials technologically appropriate, in any case impermeable, mould-proof, fireproof and non-toxic.

[0013] Conveniently, the walls forming the structure - side (10) and (11), top (12), bottom (13), doors and windows (14) and (15) - are joint each other by thermo-welding (16), or electro-welding, pasting (17), or sewing (18), so that the structure (19) results a single body. The seams must be reduced to the minimum compared with the total operations of union between the various portions (max 15%), so as to considerably reduce the risks of water infiltration or air leak through the micro-holes. Going beyond this percentage would involve a costly increase of the quantity of air filled in the chamber.

[0014] Conveniently, the air is filled in by means of one or more electric ventilators (20) connected with the air chamber (2) of the tent. This operation makes the structure (21) raise and stand stable compared both with its own weight (Q), with the pressure exerted on the structure by the wind (V) and with the weight of a possible snowfall (QH).

[0015] Conveniently, the pressure (KW/cm^2) exerted inside the chamber (2) is however greater than the one exerted on the structure by the above-mentioned external agents. Everything will be possible, setting the ventilator in proportion to the volume of the air chamber, regardless of the size and shape of the structure. Inside, an insulated cavity will be created, precisely the air chamber (2). It will ensure a perfect thermal and acoustic insulation of the liveable part of the structure, considerably reducing the greenhouse effect typical of the traditional tents nowadays on the market.

[0016] Conveniently, the air filled in allows the structure to raise and stand, so taking the projected shape, even in the case of leaks due to holes or small tears, as the quantity of air filled in the unity of time for the support is also function of possible leaks.

[0017] Conveniently, the air is filled in and flows into or from the inside of the air chamber, through suitable openings covered by grids that make the air flow outside (V1) or inside (V2), according to the desired effect.

[0018] Conveniently, part of the air will flow through one or more sections of the air chamber, in a smaller portion than the one filled in by the electric ventilator(s) (20), so that inside the chamber (2) always there is pressure (p) enough to support the structure and make it steady (theoretically estimated between 60 and 180 pa). The air that flows through the grids can be ejected out of the cavity (V1) or inside (V2), so as to create a natural air-conditioning of the house structure.

[0019] Considering that the air itself is a perfect insulator and however the air inside the chamber will be heated by the sun radiation (+t), its flow and the consequent cooler air coming from outside, will reduce the diffusion of undesired heat towards the inside of the structure. Therefore, during summer, the air circulated in the air chamber (2) and heated by the sun radiation (+t) (+Q), will flow outside the structure (\rightarrow out), so that the air chamber receives cooler air. In this way, the greenhouse effect will be considerably reduced and inside the structure the temperature will be cooler. During

winter periods, but with sun, (Fig. 7), the air circulated in the air chamber and heated by the sun radiation, will flow inside the structure, so as to create a pleasant natural heating of the inside. This system will guarantee a perfect level of comfort inside the house structure with estimated external temperatures between +16° and +28° C, everything without any supplemental source of energy, with consequent energy and environmental saving. In addition, the air circulation inside the cavity will prevent the creation of excessive humidity and possible condensation during cooling, leaving the environment dry, even in the case of many persons or equipments accommodated inside, which, in their natural life cycle, generate steam. For temperatures greater than the values previously described, in order to get however a comfortable temperature inside the structure, this invention may be provided with supplemental air-conditioning sources.

[0020] Conveniently, the house structure is so built that it's possible to directly and easily install heating pumps having both heating and cooling capabilities. To this aim, it's sufficient to make some amendments to the heating pumps nowadays on the market, so as to make them always easy to be installed without the aid of expert technicians. In the case of very low external temperatures (<5°C), it's possible to use directly inside the structure special catalytic liquid fuel stoves without chimney stack; in this case, it's sufficient to take out the steam produced, by means of the dehumidification process of the pump and activate the slow change of air by letting the air coming from the air chamber into the house structure.

[0021] Conveniently, the stability of the structure is also safer thanks to the insertion of an internal frame in arches made of flexible plastic material, ensuring its stability even in the case of accidental drops of pressure or extraordinary external agents. This structure however will be steadier in the case of extraordinary atmospheric agents, such as snow, wind, etc. and will be a valid support for the accommodation of electric equipments or other use.

[0022] Conveniently, this invention has an extremely small bulk for its transportation, in function of its liveability, and it's particularly practical and quick to erect, as it essentially consists of a single structure.

[0023] Conveniently, in the case of extreme environmental temperatures, this system may provide for the internal air-conditioning of the environment, by means of holes passing the air chamber and common air-conditioning equipments connected from the outside.

[0024] Conveniently, this system may be air-conditioned directly inside by means of heating pumps.

[0025] Conveniently, thanks to its easy and quick installation, and to the internal thermoregulation, this system is particularly suitable for: first aid points, due to earthquakes, floods, exodus, etc; hospital service and/or operating theatre, social service such as refectory, school, church, etc.; nerve-centre for emergencies, researches, etc; accommodation for voluntary or military services; medium-term house, camping and spare time accommodations, stands for fairs, exhibitions of any kind, mobile office and other uses.

Brief description of drawings

[0026] These and further advantages and characteristics of the invention can be better understood by every expert in this field by reading the following description and referring to the enclosed drawings.

- Fig. 1 shows the complex structure (1);
- Fig. 2 shows the structure in details, essentially consisting of an air chamber (2), formed by an internal wall (3) and an external wall (4) in cloth. In order to make the invention perfectly work, this air chamber must be at least 200 mm thick (5), and the two walls in cloth forming it are joint each other by laces (6), ties and/or stripes one about 400 mm (7) far from the other.
- Fig. 3, like Fig. 2, shows that the air chamber covers all the surfaces of the structure, front (8), back (9), side (10) and (11), and top (12), except for floor (13), doors (14) and windows (15).
- Fig. 4 shows the walls forming the structure - sides (10) and (11), top (12), bottom (13), doors and windows (14) and (15) - joint together by thermo-welding (16), or electro-welding, pasting (17), or sewing (18), so that the structure (19) results a single body.
- Fig. 5 shows the system the air is filled in, by means of one or more electric ventilators (20) connected with the air chamber (2) of the tent; this operation makes the structure (21) raise and stand stable compared both with its own weight (Q), with the pressure exerted on the structure by the wind (V) and with the weight of a possible snowfall (QH).
- Figs. 6 and 7 show the schematic functioning of this system, depicting the system for letting the air in and its flow by means of suitable openings sending the air outside (V1) or inside (V2) the tent, according to the desired effect.
- Fig. 8 shows that the structure can be equipped with holes passing the air chamber (24), so as to be able to easily and directly install heating pumps (26) with heating and/or cooling capabilities.
- Fig. 9 shows that, in order to make the structure safer after it has been raised thanks to the effect of the pressure of the air filled in the chamber (2), it's possible to insert a supporting frame in arches (25) made of flexible plastic material.

Claims

1. House structure with pneumatic support, comprising :

- means to erect a house structure, consisting of a tent made of a single body, equipped with double walls forming, in the front, back, side and top part, an air chamber (2),

characterized in that a continuous jet of air is directly filed into the air chamber (2) in order to support the house structure, the structure further comprising:

- means to generate and channel the air inside said air chamber, consisting of one or more electro-ventilators or electric compressors, in proportion to the volume of the tent to support, connected with the inside of the air chamber (2);

- means to air-condition the liveable space, with holes made on the walls of the tent, which channel part of the air heated by the sun rays in the air chamber, towards either outside or inside, according to the desired temperature;

- means to air-condition the liveable space in the case of extreme environmental temperatures of $<16^{\circ}\text{C}$ or $>28^{\circ}\text{C}$, consisting of heating pumps that, connected with the inside of the tent through holes or passing the air chamber, directly act on the inner temperature.

2. Structure as claimed in claim 1, **characterized in that** it is made of a single canvas in impermeable cloth, in warp, with single or double coating in PVC, or other materials impermeable, mould-proof, fireproof and non-toxic.

3. Structure as claimed in claim 1, **characterized in that** the walls forming the structure - side (10) and (11), top (12), bottom (13), doors and windows (14) and (15) - are joint each other by thermo-welding (16), or electro-welding, pasting (17), or sewing (18), so that the structure (19) results a single body.

4. Structure as claimed in claim 1, **characterized in that** it comprises one or more electric ventilators (20) connected with the air chamber (2) of the tent, so as the structure (21) raise and stand stable compared both with its own weight (Q), with the pressure exerted on the structure by the wind (V) and with the weight of a possible snowfall (OH).

5. Structure as claimed in claim 1, **characterized in that** it comprises at least a ventilator in proportion to the volume of the air chamber, regardless of the size and shape of the structure, so as the pressure exerted inside the chamber (2) is however greater than the one exerted on the structure by the above-mentioned external agents.

6. Structure as claimed in claim 1, **characterized in that** the ventilators introduce a quantity of air in the unity of time for the support that is also function of possible leaks.

7. Structure as claimed in claim 1, **characterized in that** the air is filled in and flows into or from the inside of the air chamber, through suitable openings covered by grids that make the air flow outside (V1) or inside (V2), according to the desired effect.

8. Structure as claimed in claim 1, **characterized in that** it comprises one or more sections of the air chamber, through its part of the air will flow in a smaller portion than the one filled in by the electric ventilators (20), so that inside the chamber (2) always there is pressure (p) to support the structure and make it steady theoretically estimated as being between 60 and 180 pa.

9. Structure as claimed in claim 1, **characterized in that** it comprises heating pumps having both heating and cooling capabilities.

10. Structure as claimed in claim 1, **characterized in that** it comprises an internal frame in arches made of flexible plastic material, ensuring its stability even in the case of accidental drops of pressure or extraordinary external agents.

11. Structure as claimed in claim 1, **characterized in that** it may provide for the internal air-conditioning of the environment, by means of holes passing the air chamber and common air-conditioning equipments connected from the outside.

Patentansprüche

1. Tragluftkonstruktion, die Folgendes umfasst:

- 5 - Mittel, um eine Konstruktion zu errichten, die aus einem Zelt besteht, das aus einem einzelnen Korpus besteht und mit doppelten Wänden ausgestattet ist, die im vorderen, hinteren, seitlichen und oberen Teil eine Luftkammer (2) bilden, **gekennzeichnet dadurch, dass** ein ständiger Luftstrom direkt in die Luftkammer (2) eingeführt wird, um die Konstruktion zu tragen, wobei die Konstruktion auch noch Folgendes umfasst:
10 - Mittel, um die Luft innerhalb der besagten Luftkammer zu erzeugen und zu kanalisieren, bestehend aus einem oder mehreren elektrischen Ventilatoren oder elektrischen Kompressoren, im Verhältnis zu dem Volumen des Zelts, das getragen werden muss, und die mit dem Innenraum der Luftkammer (2) verbunden sind.
 - Mittel zur Klimatisierung des Aufenthaltsraums durch Löcher, die in den Wänden des Zelts angebracht sind und die einen Teil der Luft in der Luftkammer, die durch die Sonneneinstrahlung erhitzt wurde, entweder nach innen oder nach außen leiten - je nach der gewünschten Temperatur.
15 - Mittel zur Klimatisierung des Aufenthaltsraums im Fall von extremen Umgebungstemperaturen von $< 16^{\circ} \text{C}$ oder $> 28^{\circ} \text{C}$, die aus Heizpumpen bestehen, die durch Löcher mit dem Innenraum des Zelts verbunden sind oder durch die Luftkammer hindurch führen und direkt auf die Innentemperatur einwirken.
- 20 2. Konstruktion wie im Anspruch 1 beansprucht, **gekennzeichnet dadurch, dass** sie aus einem einzelnen Gewebe aus undurchlässigem Stoff, aus Kettengewebe mit einfacher oder doppelter PVC-Beschichtung oder aus sonstigen Materialien besteht, die undurchlässig, vor Schimmel geschützt, feuerfest und ungiftig sind.
- 25 3. Konstruktion wie im Anspruch 1 beansprucht, **gekennzeichnet dadurch, dass** die Wände, die die Konstruktion bilden - die Seiten (10) und (12), das Dach (12), der Boden (13), Türen und Fenster (14) und (15) - miteinander durch Heißverschweißung (16) oder elektrische Verschweißung, Verkleben (17) oder Zusammennähen (18) verbunden sind, sodass die Konstruktion (19) ein einzelner Korpus ist.
- 30 4. Konstruktion wie im Anspruch 1 beansprucht, **gekennzeichnet dadurch, dass** sie einen oder mehrere elektrische Ventilatoren (20) umfasst, die mit der Luftkammer (2) des Zelts verbunden sind, um die Konstruktion (21) aufzurichten und ihren stabilen Stand zu erhalten - sowohl in Hinsicht auf ihr Eigengewicht (Q), als auch auf den Druck, den der Wind auf die Konstruktion ausübt (V), und das Gewicht durch möglichen Schneefall (QE).
- 35 5. Konstruktion wie im Anspruch 1 beansprucht, **gekennzeichnet dadurch, dass** sie proportional zum Volumen der Luftkammer und unabhängig von der Größe und Form der Konstruktion mindestens einen Ventilator umfasst, sodass der Druck, der innerhalb der Kammer (2) herrscht, auf jeden Fall größer ist als der, der durch die oben genannten äußeren Einflüsse auf die Konstruktion ausgeübt wird.
- 40 6. Konstruktion wie im Anspruch 1 beansprucht, **gekennzeichnet dadurch, dass** die Ventilatoren eine gewisse Menge an Luft einführen, die von der Dauer der Tragfunktion und auch von möglichen Lecks abhängt.
- 45 7. Konstruktion wie im Anspruch 1 beansprucht, **gekennzeichnet dadurch, dass** die Luft in die Luftkammer oder aus ihrem Inneren ein- oder ausströmt; dies erfolgt über geeignete Öffnungen, die mit Gittern bedeckt sind, welche die Luft nach außen (V1) oder in das Innere des Zelts (V2) leiten, je nach der gewünschten Wirkung.
- 50 8. Konstruktion wie im Anspruch 1 beansprucht, **gekennzeichnet dadurch, dass** sie einen oder mehrere Abschnitte der Luftkammer umfasst, durch die ein Teil der Luft in einem geringeren Anteil strömt als die Luft, welche durch die elektrischen Ventilatoren (20) eingeführt wird, sodass innerhalb der Kammer (2) ständig ein Druck (p) herrscht, der die Konstruktion trägt und sie stabil macht; mit einer theoretisch geschätzten Stärke zwischen 60 und 180 pa.
- 55 9. Konstruktion wie im Anspruch 1 beansprucht, **gekennzeichnet dadurch, dass** sie Heizpumpen umfasst, die sowohl Heiz- als auch Kühlfähigkeit haben.
10. Konstruktion wie im Anspruch 1 beansprucht, **gekennzeichnet dadurch, dass** sie einen inneren Rahmen aus Bögen umfasst, die aus biegsamem Kunststoffmaterial hergestellt sind, was auch im Fall eines unvorhergesehenen Druckabfalls oder außergewöhnlicher äußerer Einwirkungen die Stabilität der Konstruktion gewährleistet.
11. Konstruktion wie im Anspruch 1 beansprucht, **gekennzeichnet dadurch, dass** sie die Klimatisierung der Innenumgebung durch Löcher bieten kann, die durch die Luftkammer hindurch führen, und durch gewöhnliche Klimati-

siereinrichtungen, die von außen angeschlossen sind.

Revendications

1. Abri gonflable portant, comprenant

- des moyens pour monter un abri, comprenant une tente constituée d'un corps unique, équipée d'une double paroi formant, à l'avant, à l'arrière, sur le côté et dans la partie supérieure, une chambre à air (2), **caractérisé en ce qu'un jet d'air continu est envoyé directement à l'intérieur de la chambre à air (2), de façon à supporter l'abri, la structure comprenant également:**
- des moyens pour générer et canaliser l'air à l'intérieur de ladite chambre à air, consistant en un ou plusieurs ventilateurs électriques ou compresseurs électriques, proportionnellement au volume de la tente à supporter, reliés à l'intérieur de la chambre à air (2);
- des moyens pour climatiser l'espace habitable, avec des orifices pratiqués dans les parois de la tente, canalisant une partie de l'air chauffé par les rayons du soleil à l'intérieur la chambre à air, soit vers l'extérieur, soit vers l'intérieur, selon la température souhaitée;
- des moyens pour climatiser l'espace habitable en cas de températures extérieures extrêmes de $< 16^{\circ} \text{C}$ ou $> 28^{\circ} \text{C}$, consistant dans des pompes à chaleur qui, reliées avec l'intérieur de la tente par des orifices ou traversant la chambre à air, agissent directement sur la température interne.

2. Un abri tel que revendiqué à la revendication 1, **caractérisé en ce qu'il est fait d'une simple toile en tissu imperméable, en chaîne avec simple ou double enduction en PVC, ou autres matériaux imperméables, anti-moisissure, ignifuges et atoxiques.**

3. Un abri tel que revendiqué à la revendication 1, **caractérisé en ce** les parois formant la structure - côté (10) et (11), haut (12), fond (13), portes et fenêtres (14) et (15) - sont unies les unes aux autres par thermosoudure (16) ou électrosoudure, collage (17) ou couture (18), de telle sorte que la structure (19) constitue un seul corps.

4. Un abri tel que revendiqué à la revendication 1, **caractérisé en ce qu'elle comprend un ou plusieurs ventilateurs électriques (20) reliés avec la chambre à air (2) de la tente, de telle sorte que la structure (21) se soulève et reste stable par rapport à son propre poids (O), à la pression exercée sur la structure par le vent (V) et au poids de chutes de neige possibles (OE).**

5. Un abri tel que revendiqué à la revendication 1, **caractérisé en ce qu'il comprend au moins un ventilateur proportionnellement au volume de la chambre à air, indépendamment de la taille et de la forme de la structure, de telle sorte que la pression exercée à l'intérieur de la chambre (2) soit de toute façon supérieure à la pression exercée sur la structure par les agents externes susmentionnés.**

6. Un abri tel que revendiqué à la revendication 1, **caractérisé en ce que** les ventilateurs introduisent une quantité d'air dans l'unité de temps pour le support qui est aussi fonction de fuites possibles.

7. Un abri tel que revendiqué à la revendication 1, **caractérisé en ce que** l'air est envoyé et s'écoule à l'intérieur ou de l'intérieur de la chambre à air, par des ouvertures appropriées couvertes par des grilles qui orientent le flux d'air vers l'extérieur (V1) ou l'intérieur (V2), selon l'effet souhaité.

8. Un abri tel que revendiqué à la revendication 1, **caractérisé en ce qu'il comprend une ou plusieurs sections de la chambre à air par lesquelles l'air s'écoule dans une proportion inférieure à celle qui est envoyée par les ventilateurs électriques (20), de telle sorte qu'à l'intérieur de la chambre (2) il y ait toujours une pression (p) pour supporter la structure et la rendre stable, estimée théoriquement entre 60 et 180 pa.**

9. Un abri tel que revendiqué à la revendication 1, **caractérisé en ce qu'il comprend des pompes à chaleur ayant toutes deux des capacités de chauffage et de refroidissement.**

10. Un abri tel que revendiqué à la revendication 1, **caractérisé en ce qu'il comprend un cadre interne en arches réalisé dans une matière plastique souple, assurant sa stabilité même en cas de chutes de pression accidentelles ou d'agents externes exceptionnels.**

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11. Un abri tel que revendiqué à la revendication 1, **caractérisé en ce qu'il** peut assurer la climatisation interne de l'environnement, au moyen d'orifices traversant la chambre à air et d'équipements de climatisation communs reliés depuis l'extérieur.

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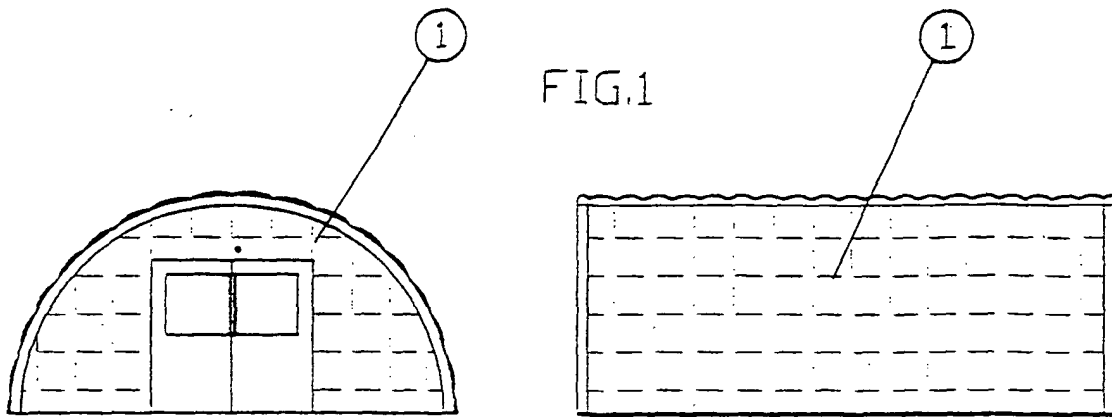


FIG.2

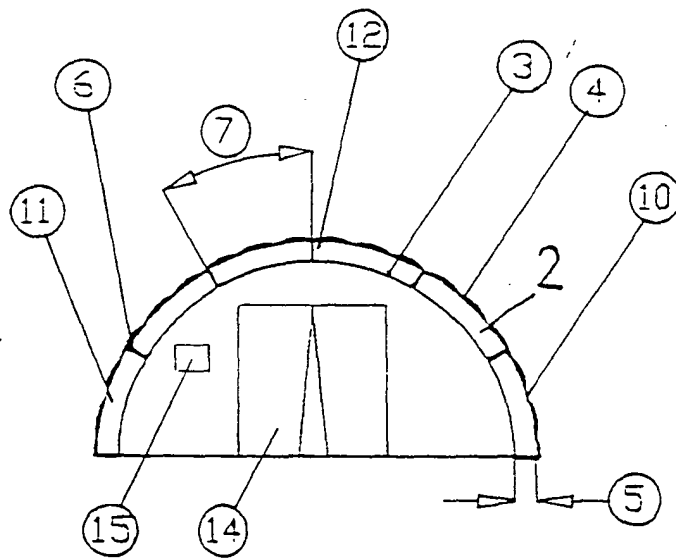


FIG.3

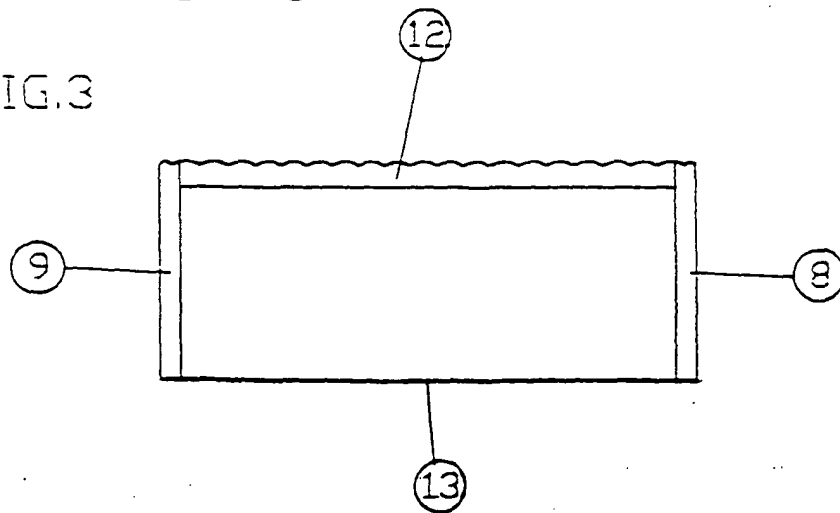


FIG.4

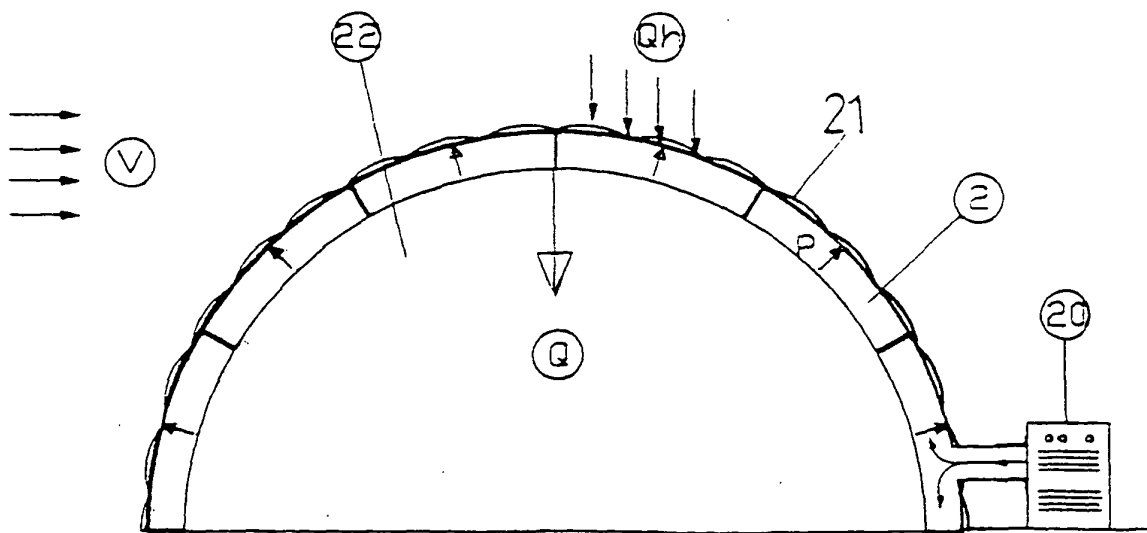
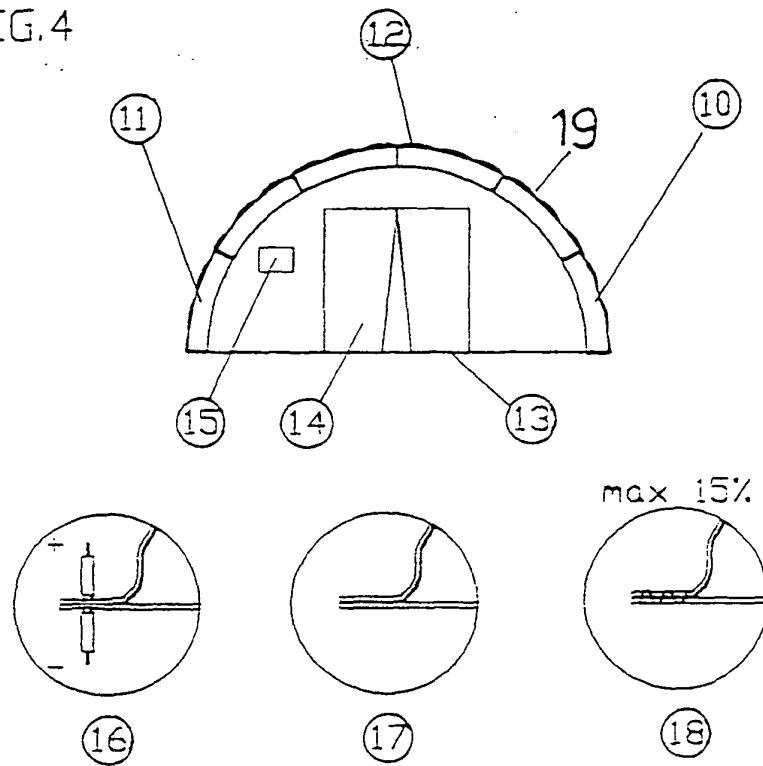


FIG.5

FIG. 6

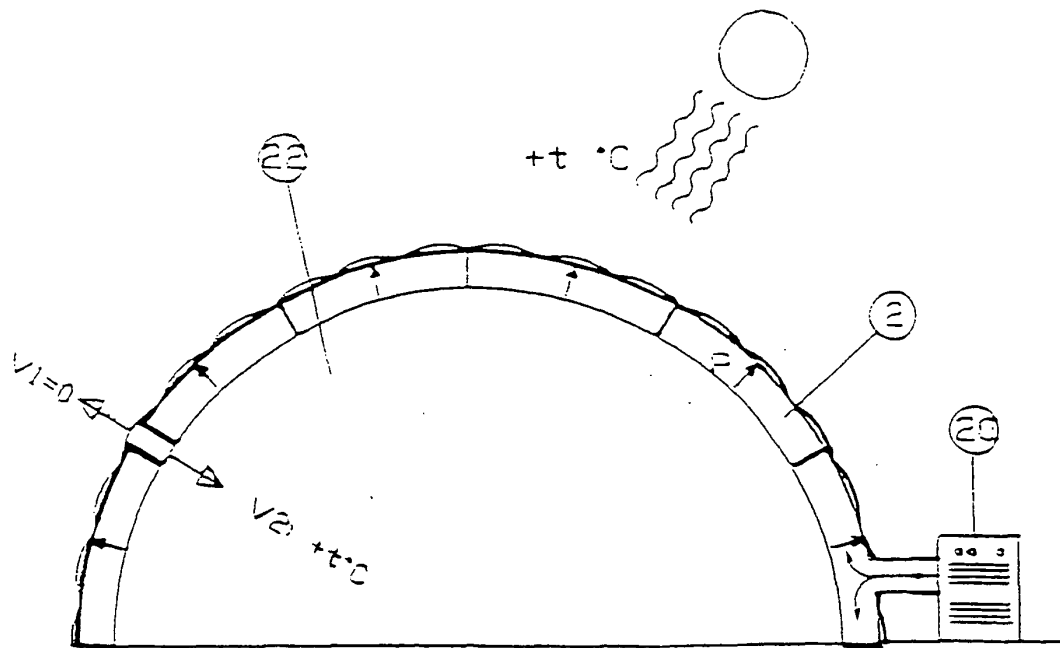
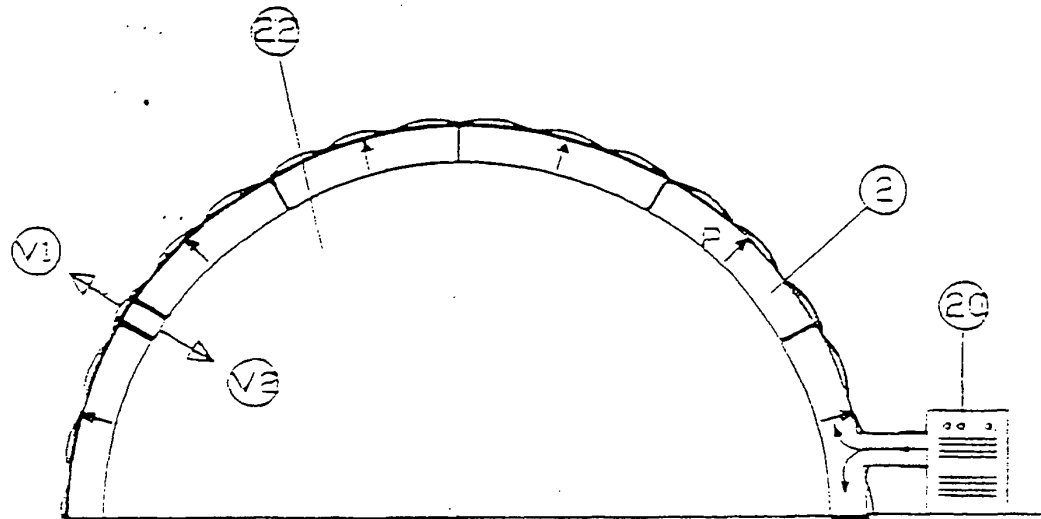


FIG. 7

FIG.8

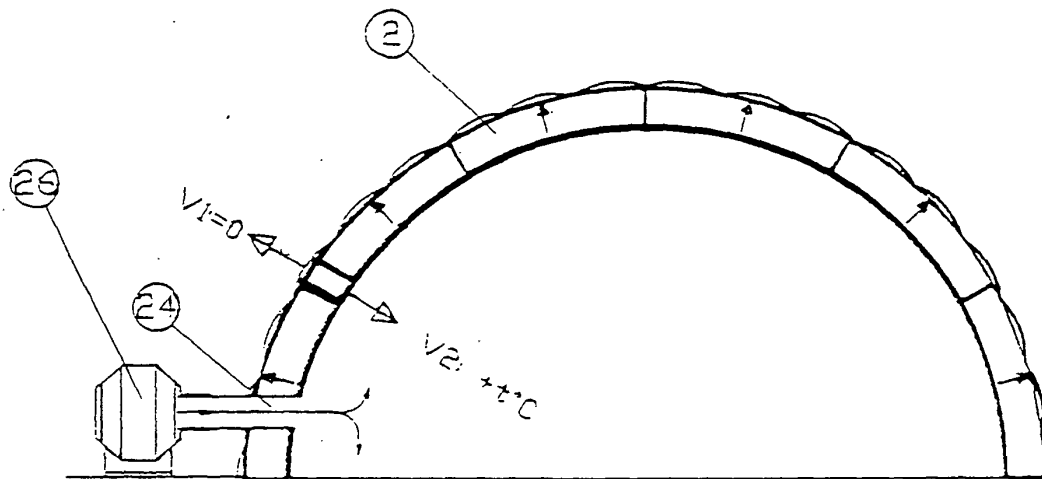


FIG.9

