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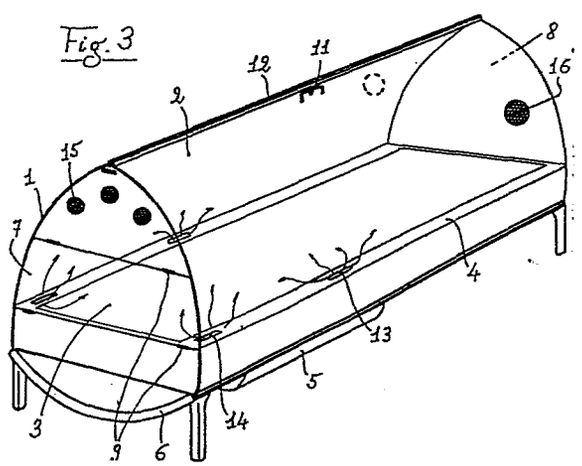
(54) **Self-controlled system of screening and climatization for beds.**

(57) This invention generally consists of the creation of a structure around a bed of transparent material which provides a confined space within which certain conditions (temperature, humidity, ionization of air, etc.) can be amply controlled by the subject, uninfluenced by the variability of external conditions.

Fig. 3



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SELF-CONTROLLED SYSTEM OF SCREENING AND CLIMATIZATION FOR BEDS

This invention is concerned with an original system that allows the screening of the external environment from a bed while maintaining sensory contact of the user with that environment. Inside the contained space so created, desired conditions can be regulated at will according to a certain number of variable parameters. Although in the following description the term "bed" is used, it should be made clear that the system is applicable to any other piece of furniture suitable to repose or extension, for example, lounge chairs, divans and so on.

The concept of limiting the space is an obvious one, continually applied; a confined space consumes less for its control and permits more precise results. Actually, the rooms of a normal house can be considered as confined spaces. However, when the confined space is reduced to a few cubic yards, intervening psychological resistance limits its use to those cases in which, for various reasons, there are no valid alternatives. This is the case with incubators, isolation beds for highly contagious diseases, oxygen tents and decompression chambers.

The principle of the screened bed according to this invention can be considered simply as a more liberal extension of the confined space principle and of its

advantages, and so it must overcome the psychological resistance of the possible users with a whole series of requisites which in the case of the incubator, for example, have no importance. Therefore the isolating structure should be as transparent as possible and will be harmonious with the bed underneath, in order to create an aesthetically valid whole. It will be possible knocking down or even separating the structure from the bed or anyway it will be possible to place the structure in such a position as to leave free access to the bed and not to disturb when not in use, so that the facultative use of the screened bed is possible. But the new problems that this bed must deal with are not only psychological in nature; in fact it was created for private use, without any particular external control.

For this reason its isolating structure would have a series of holes to allow besides removing vitiated air in normal use, a continuous exchange of internal air with external air, especially if there is a lack of electricity preventing use of the ventilator while the user is sleeping.

The importance that the user does not feel any sense of suffocation makes it advisable that the total dimension of the holes made in the structure be established taking into account this possibility. It is to be pointed out that this problem and its solution were totally ignored by other systems using the confined space, just because the therapeutical objects oblige to a continuous external control and prevent untreated air to enter inside the structure.

Secondly, the lack of external control means that the user of the screened bed remains an active subject and therefore he should be able to keep a good sensory communication with the outside.

In this respect it is to be noted that the holes allow perception of external sound by the person within, and at the same time the transmission of his or her voice to the outside. This, together with the transparency of the structure, completes sensory contact

with the external environment, taking also into account that the air suction filter does not hinder the passage of odours.

This active position of the user has also other possible consequences such as the location of the control panel, which will be preferably arranged inside the structure, so that it is possible to change the set conditions without coming out from said structure as well as to switch on and off the room light directly from inside the structure. From another point of view, the fact that the screened bed is of common use, provides for its application also to double beds.

The screened bed has original solutions also for controlling the climatic factors. Indeed, in the field of the systems using the bed confined space, totally enclosing the user's body, provides not only for heating and humidification like the incubator, but also cooling and dehumidification of air inside it.

These features make the screened bed a competitor of the air cooling systems applied to bed-rooms, as it has a lower energy consumption and attains more precise results. Finally, it is also interesting to note that the screened bed may be used either to make up for the absence of a normal air conditioning system or to help it by operating together with it, and this is a demonstration of the versatility of use of the present invention.

In order to obtain a more precise view of the novel features of the screened bed according to the present invention it may be useful to make a comparision with some similar systems.

For instance, in case of the incubator for neonatal use, all the solutions are strictly aiming at a precise therapy for the patient, and therefore measures, maintenances and uses are required, which are totally absent in the screened bed. In this respect it is sufficient to consider the fundamental role played by the sterility of the space in case of

the incubator, while this problem is on the contrary irrelevant for the screened bed, whose structure may be easily knocked down at any time, and on the contrary is provided with holes in order to constantly keep an acoustic communication with the outside. Furthermore, as the incubator has to operate in an already conditioned medical environment, it has to function in only one direction, i.e. it simply heats and humidifies the air inside it, thus not being equipped with the capacity to cool and dehumidify the air, contrary to the screened bed which takes into account these factors and acts upon them.

Similar considerations may be applied to the system disclosed in FR-A-782 578 (Waly); also in this case one can note that the closed system is clearly finalized to therapeutical objects, as for instance the hermetic closure of the structure is required. This prevents to solve the problem of the acoustical isolation in the easy way devised for the screened bed of the present invention, that is with holes in the structure, thus obliging to use for said therapeutic bed a telephone or microphone in order to obtain a communication with the outside. It seems also that the system may be used only in presence of a physician: no control is indeed provided for the incoming and outgoing flow of the treating gas for the patient inside the structure, and in case he falls asleep or swoons, in absence of an external control, a serious risk for his health or life could arise (too much to the treating gas, gas saturation inside the structure). Finally, in the above cited patent no air conditioning system at all is considered, with the relevant problems, while the structure cannot be knocked down completely, as the two end sides corresponding to the bed head and foot cannot be moved.

Another system employing the confined space at a bed place is disclosed in U.S. Patent 2 191 024 (Matheny). Although this system appears to be of a more general, i.e. not strictly therapeutic, use and in addition to heating provides also for cooling air inside it, it has to be pointed out that the structure creates a closed space excluding the user's head.

In this way the system has not to solve any problems of respiration and sensory isolation but it results of limited functionality: it is sufficient to consider the doubts arising about the user's health, having his body at a certain temperature while his face and the air breathed by him are at another temperature, and these doubts are increasing together with the increase of the difference between one temperature and the other. It is also to be pointed out that the user's face remains also exposed to insects and agents contained in the environmental air. Nor the system is thermostatic because, apart from the absence of an electronic control in view of the age in which this patent was filed, the structure has no particular outlet holes, so that one can deduce that air is coming out from the structure edge leaning on the user's neck, and this causes a higher or lower leakage of air according to the position taken by the user in the bed. Finally, although the covering structure of the above patent can be totally knocked down, it is quite different from the structure of the screened bed enclosing the entire user's body and bed area.

To sum up, after having compared the present invention with the prior art, it may be stated that the screened bed according to the present invention is the only system in the field of those using a confined space for the bed, enclosing the whole body of the user and creating a protected and conditioned space, which is not finalized for therapeutic purposes and is of common, private use, with all the relevant problems arising from these objects and the consequent measures taken to solve them and set forth in the foregoing paragraphs.

The system according to this invention is composed substantially of two principal parts; that is, a covering and screening structure and a system of climatization and air conditioning. The latter of these can possibly be excluded (or not activated) if it is sufficient for the subject to be simply screened from the external environment.

The covering structure made of transparent material, which can be either

flexible or rigid, functions in isolating the inner environment so created from the external one. It is equipped with holes for communication and air exchange, emitting the vitiated air and filtering and conditioning the entering air by way of a special noiseless ventilator; in this way an unperceptible inner pressure, encouraging air exchange, is created. Thus, the structure isolates, yet at the same time permits perception of sounds and odors. A fundamental characteristic of the structure is its ability to be knocked down or positioned in other way when desired, allowing the screened bed's alternative use.

This screened bed, moreover, has an electrically run conditioning system which is automatically controlled and may be regulated by the user. The principal factors subject to regulation are temperature and humidity, which once set up, will not change with external variations thanks to a control which monitors the system (through sensors placed inside the structure) and adjusts it accordingly. The smallness of the space created for the structure also allows for air ionization control.

It is clear that once it is put on the market, the air-conditioning unit for the screened bed may also exclude one or more of its components, such as the humidifier, according to the user's requirements as well as to the conditions and places of use.

It is important to note that the ventilator's intake filter would prevent access to the interior by insects, dust and other possible polluting agents.

Therefore, with the system of the present invention two basic objectives are realized, namely:

1) The ability to obtain subjectively ideal climatic conditions and control of all factors which determine it; and

2) The economic advantage of conditioning an environment decisively inferior in size to a normal room.

The use of the screened bed of the present invention is intuitively quite ample;

however a greater application is seen wherever and whenever the surrounding climatic factors fall short of the optimal standard. Moreover it is certainly possible to use it with advantage where there is an anomalous situation on the subject's part who is sensitive to non optimal climatic conditions (hayfever, asthma, the common cold, arthritis, rheumatism etc.).

It is sufficient to cite here, among the still more numerous possibilities of use, those of tents, campsites in general, bungalows, military barracks, boarding schools, settlements, monasteries and convents; not to mention hospitals themselves, homes without heat, temporary construction offices, guardhouses for industrial plants; ad infinitum.

Finally, the use of this screened bed may be especially efficacious during a child's first years, because the isolating structure could avoid an eventual fall from bed; also because a small child ignores the psychological resistance determined by living in a limited space; and finally because the small child is particularly sensitive to less than optimal climatic conditions.

In conclusion it can be said that from the idea of developing the advantages of a screened bed to be used by the widest range of people for the most varied gamut of situations, an entirely original system is realized, with its own set of requisites, characteristics and possibilities of use.

The objectives, characteristics and advantages of the system of this invention will be even more apparent from the following detailed description of some of its preferred embodiments, given to illustrate but not to limit the possibilities of the invention. References are made to the annexed sheets of schematic and purely illustrative drawings; these drawings do not intend to limit any way the scope of the invention, and in which:

Fig. 1 is a cross-sectional view of a first embodiment of the bed with the screening structure made of two half-covers;

Fig. 2 is a lateral view of the same structure;

Fig. 3 is an isometric view of the same structure;

Fig. 4 is a lateral view of a second embodiment with a fan-shaped screening structure;

Fig. 5 is a lateral view, on a reduced scale, analogous to Fig. 4, but showing a variation of the structure erected around the bed rather than mounted upon it;

Fig. 6 is a plan view of the structure as seen in Fig. 4; and

Fig. 7 is a cross-sectional view of the structure shown in Fig. 4, with the variation of Fig. 5 shown in dotted lines.

Now, referring to the various figures of the accompanying drawings, it will first be described the embodiment illustrated by Figures 1-3, in which the form of the screening structure is like a shell.

This version consists of two "half-shells" 1 and 2, made of a transparent material and mounted upon a normal bed 3, which has two lateral interstices 4, for the distribution of conditioned air that arrives from a module 5, mounted under the bed. The two "half-shells" can be knocked down and placed into special guides 6, provided for their containment under the bed.

The two ends 7 and 8 of the screening structure are equipped with hinges 9, for their disassembly so that with the bed open the entire screening structure is knocked down and does not create an obstacle to movement and the preparation of the bed.

For the opening and closing of the "half-shells" 1 and 2, there are internal handles 10 and external handles 11. The lips of the half-shells can be joined by a magnetic closure or any other suitable fastening device.

The conditioned air circulating in the interstices 4, is diffused within the enclosed space through passage holes 13 placed at the bed side center, and holes 14 at the foot of the bed. The ends 7 and/or 8 have screened holes 15, for air exchange, while other symmetrical screened holes 16 are provided on the half-shells 1 and 2 at pillow height in order to facilitate acoustical communication. These latter holes 16 may be provided with a mechanism such as a little gate, in order that the user may close them partially or totally, with a consequent reduction of sound transmission.

Now referring to Figures 4, 6 and 7, the embodiment with the fan-shaped screening structure will be described.

It consists of two covers 20 and 21, each in the shape of a half open fan. They are made of a flexible material supported by a ribbed framework 22 and 23, and mounted here as well upon a normal bed 24, which has two interstices 25 along its sides for the distribution of conditioned air coming from a module 26, mounted under the bed. The two covers 20 and 21, can be closed precisely like a fan and when in folded position they remain below the level of the mattress.

For the opening and closing of the covers 20 and 21, handles 27 are provided, and these can be fastened with any convenient method.

The conditioned air circulating in the interstices 25, is diffused within the enclosed space through passage holes 28, placed at the bed side center and holes 29 at the foot of the bed. The covers 20 and 21, have upper screened holes 30, for air exchange, as well as other screened holes 31, placed on the bed sides at pillow height to facilitate acoustic communication with the outside.

Referring again to Figure 7, but this time together with Figure 5, a possible variant of this system consists of a screening structure e.g. formed by covers 20A and 21A, but it could also have a different profile, erected around the bed rather than

mounted upon it. Another variation is represented by the air conditioning module 26A, placed outside of the entire structure, which could be used to serve different beds contemporaneously.

Another useful variant that could be applied to each of the embodiments so far illustrated, consists of a curved tube 33, to be inserted into the air passage holes 14 or 29 (those located at the foot of the bed). The tube, in turn, has its own air outlet holes 34, on its upper part. This allows the use of blankets, although they are not necessary due to the climatic controls included in the structure, because in this way said blankets cannot cover the outlet holes for the conditioned air. In place of the curved tube, short pieces of tube shaped like the wind-sail of a ship could be provided.

From the foregoing, the extreme versatility and advantage obtained with the system of this invention becomes evident. However, it must be made clear that all description and illustration of details are just exemplifications of the numerous modifications, variants, additions and substitutions possible with this system, all without departing from the spirit of the invention, or its scope, nor even leaving its ambit of protection, as it is defined by the appended claims.

CLAIMS

1) Autonomous screening and climatization system for beds including a screening structure made of transparent material and adapted to create an internal protected space which is not sterile and not hermetically closed, said structure being mounted upon or around the bed so as to enclose entirely the user without hindering however a complete sensory communication with external environment, characterized by the fact of having holes which, besides allowing exit of vitiated air during use, avoid acoustical isolation of the user and prevent any sense of suffocation in case of failure of the fan from which forced air circulation is dependent.

2) System according to Claim 1, characterized by the fact that at least two of the holes of the structure are symmetrically arranged at the both sides of the structure at pillow height, to facilitate acoustical communication with the outside.

3) System according Claim 2, characterized by the fact that the holes to facilitate acoustical communication are provided with mechanisms, such as little gates, to allow their partial or total closure.

4) System according to Claim 1, characterized by the fact that all the holes of the structure are screened to prevent insects to enter inside it.

5) System according to Claim 1, characterized by the fact that the structure can be knocked down, totally or partially, or positioned in a different way, in order to leave free access to the bed.

6) System according to Claim 1, characterized by the fact that the whole structure or part of it can be detached from the bed so as to be stored or used on a different bed.

7) System according to Claim 1, characterized by the fact that the structure is applied to the frame of the bed or other piece of furniture enclosed in it.

8) System according to Claim 1, characterized by the fact that the structure is placed on the ground around the bed or other piece of furniture to be enclosed in it, with or without attachment connections to said bed or piece of furniture.

9) System according to one or more of the preceding claims, characterized by the fact of further comprising a conditioning unit, adapted to heat, cool, humidify and dehumidify the air to be used.

10) System according to Claim 9, characterized by the fact of being provided with a control panel for the air conditioning unit and other possible auxiliary controls, preferably placed inside the structure in a suitable position for an easy operation by the user.

11) System according to Claim 1, characterized by the fact that at least on the air passage holes arranged at the bed foot there is applied an air delivery tube, which is directed upwardly and is provided with delivery holes in its upper part, so as to avoid that said holes are covered by blankets or other accidental reasons.

Fig. 1

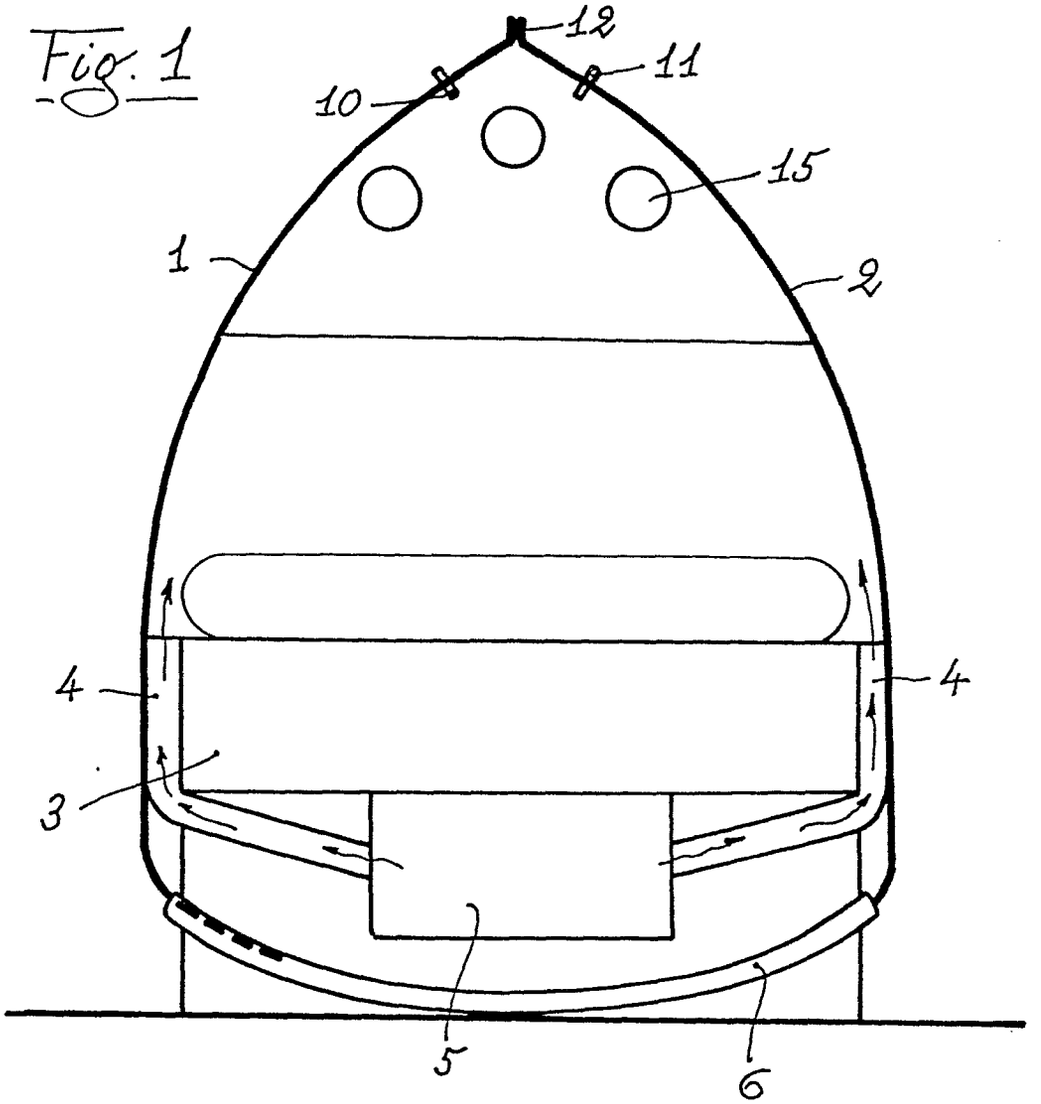

Fig. 2

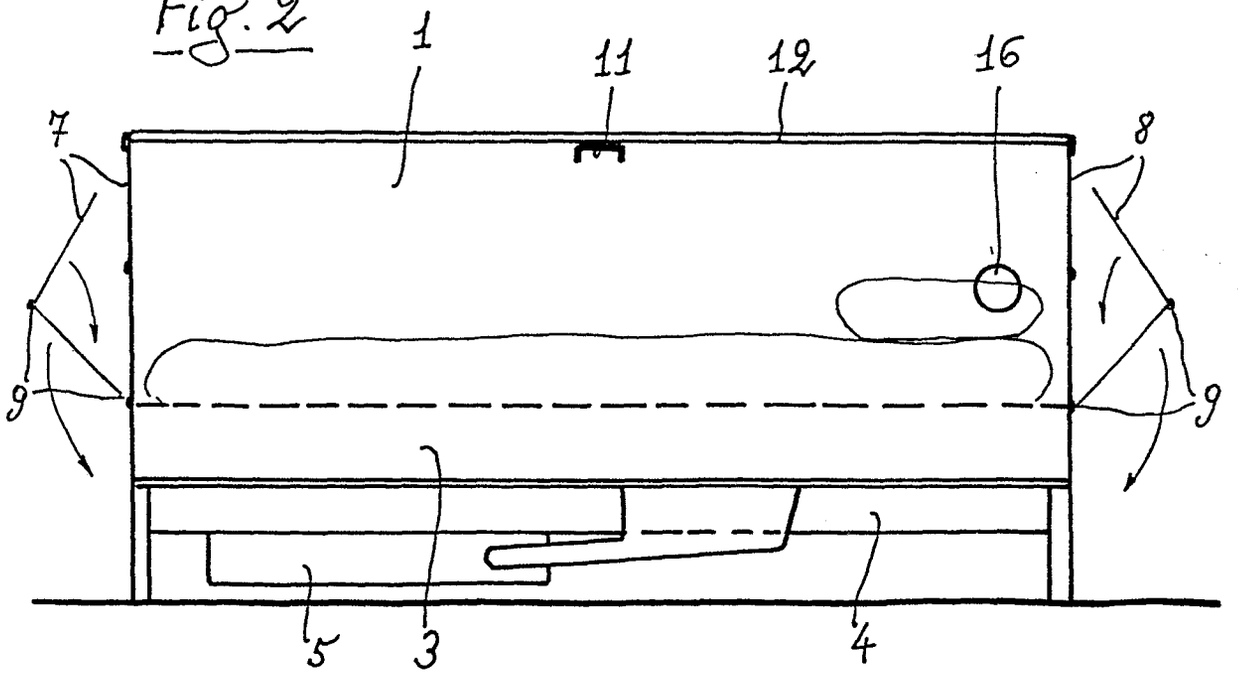

Fig. 3

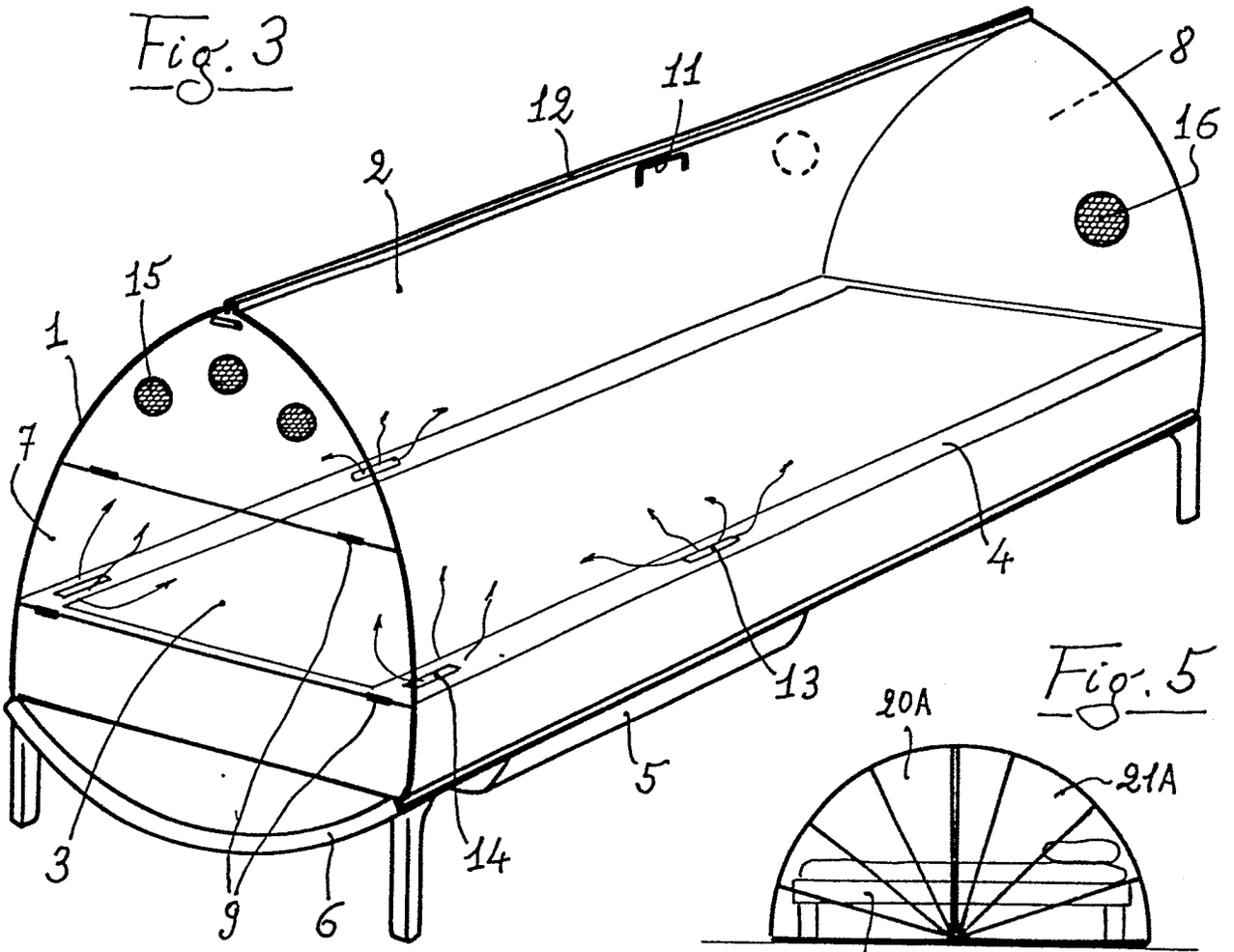

Fig. 5

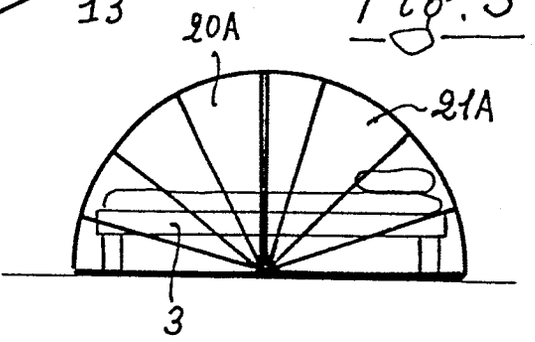

Fig. 4

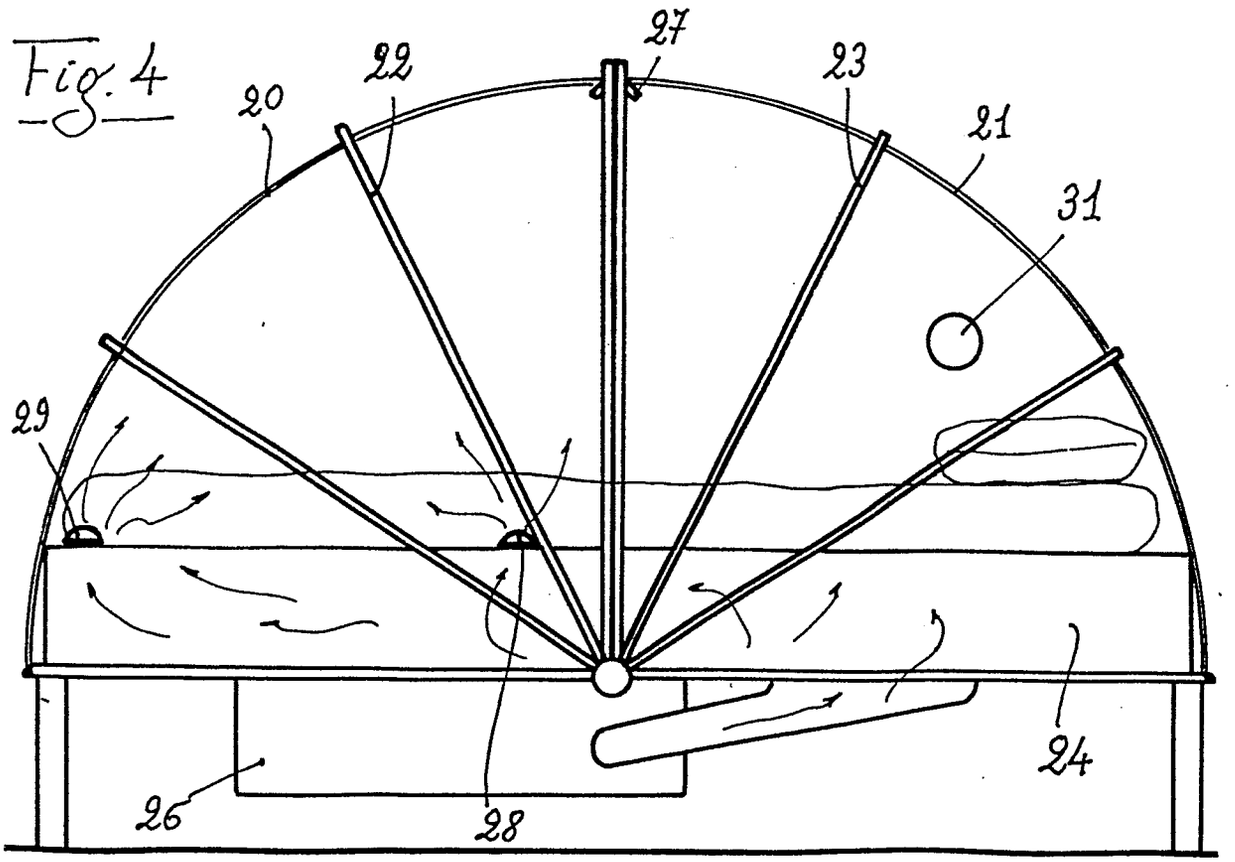

Fig. 6

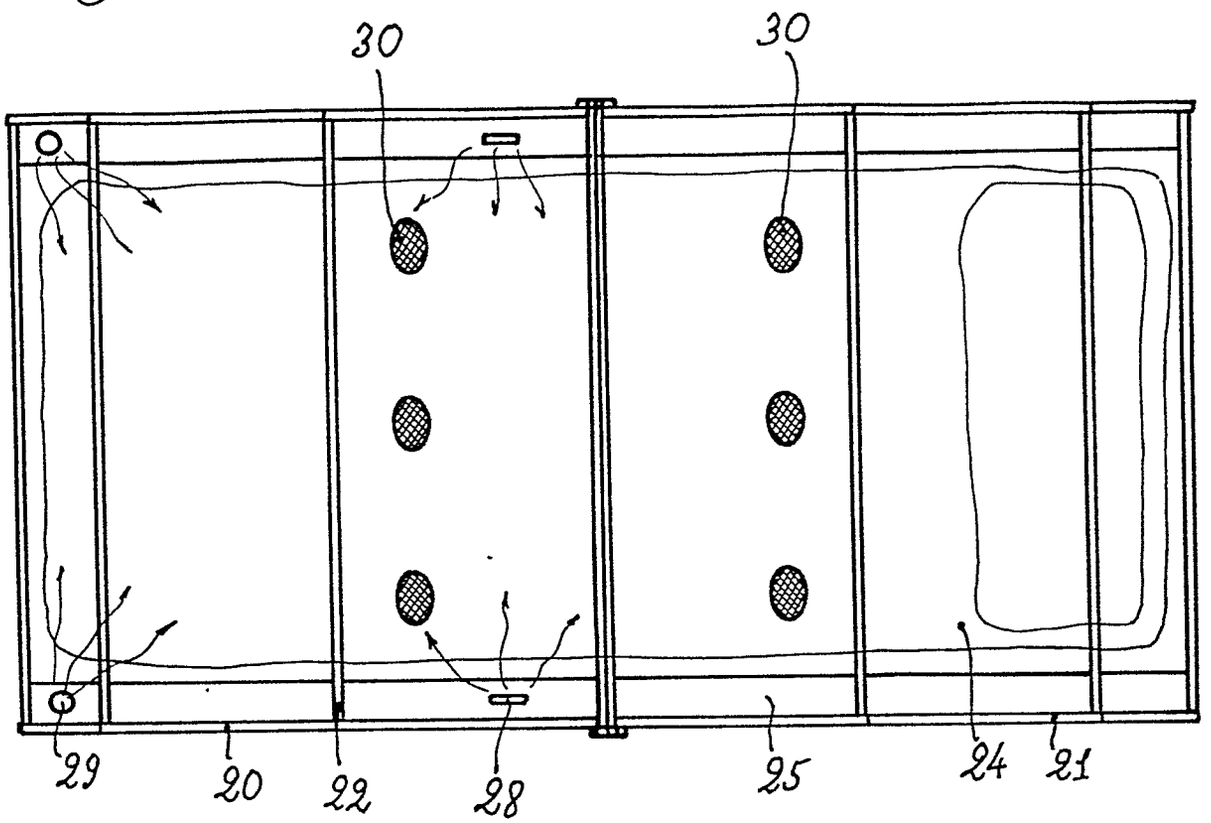

Fig. 7