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(54) EQUIPMENT TO INACTIVATE MATRIX AT THE FLUIDIZATION THERAPY

AUSRÜSTUNG ZUM INAKTIVIEREN DER KEIMSCHICHT BEI DER FLUIDISIERUNGSTHERAPIE

EQUIPEMENT SERVANT A INACTIVER UNE MATRICE EN THERAPIE PAR FLUIDIFICATION

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Description

The invention relates to a system for extracting moisture and fluid from one or more bodies, comprising a support basin accommodating moisture absorbing beads, a pressure chamber in air communication with the support basin, an air supply system for supplying air to the pressure chamber, and an evaporator chamber interconnected in the air supply path for extracting moisture from the supplied air.

The inventor has studied the above theme and improve the fluidization therapy as brought on the healthcare market in 1986/1987 and at this moment introduced as "Redactron Fluidized Therapy 002A", in which the teaching of EP-A-0332242 of 29 March 1988 is incorporated. In this way it is already possible to extract moisture from one or more bodies.

The system known from EP-A-0332242 comprises a support basin, in which beads are accommodated. In order to fluidize the beads in said support basin, a pressure is built up in a pressure chamber in communication with said support basin. For this purpose the pressure chamber is connected to an air supply system. The moisture in the supplied air is removed by an evaporated chamber, in which an evaporator is arranged for lowering the temperature of the supplied air such that vapour droplets results. The vapour droplets are collected in a cabinet part provided with a heating member for evaporating the vapour droplets. Then the evaporated droplets are removed into the ambient air.

This invention has the object to provide a system as mentioned above, by which the therapy is completely excessible to all parts of the world, thus also those with a high humidity degree and temperature. Consequently, it is necessary to reach a development, by which a continuous dehydration system will be present, so that under all climato-logical circumstances, a relative humidity degree of the floatation medium of less than 40% is reached.

The system is not being applied to therapeutical purposes only, but can also be used for industrial and/or agrarian products. The principal aim, however, is to treat patients with severe tissue deformation in the gradation from excematic to gangrenous deformation, therapeutically and sterile, without the risk of contamination or cossinfection.

According to the invention the above-mentioned aim is achieved in that the evaporator chamber is in communication with a depression chamber through a reference leak.

The optimum therapeutical depth by means of this system, is reached at indication of burns 1-3 degrees, skin grafts and autografts, intensive and coronary care units, atrophy, geriatrics and many other applications, by which very vulnerable tissue is involved.

The system is based on the principle, by which the entering air, as well as the vapour tension coming from the absorbing microspheres, will extracted from moisture continuously. Owing to this, an air entrance will occur, which is < RH 40% at a temperature adjustable from 26°C (lower than the body temperature) to 38°C (higher than the body temperature), independent from the ambient temperature. The viscosity is, also because of the low sg of the microspheres, 1.2 and brought in a fluidized state that could be compared with dry water with a RH < 40%. The body in its shape, will be covered almost completely by the microspheres, which will benefit the therapy, also because of the subcapillary pressure of ± 8mm/HG and the bubbling effect of the fluidized mass. The dissipated heat from the condensing unit will be utilized at the demand for heating of the flotation medium, so that a recirculation of the dissipated heat will hardly influence the ambient temperature. At the same time, all moisture which will be extracted from the surroundings as well as the contents of the equipment, will be recirculated into the ambient, in this manner making the atmosphere where the patient is being treated, pleasant, as a result of a higher humidity. Also the ambient temperature will hardly increase.

The equipment of the invention could be devided into three main components:

1. An evaporator with a constant temperature of 5°C, connected to a vacuum condensing chamber and atomizer. The evaporator is controlled by a condensing unit consisting of a compressor part with a direct expansion, modulating and a tracking pressure, depending on the ambient temperature of 17°C to a maximum of 45°C. As coolant freon or substitute is applied.
2. The air chamber, supplied with a twostage compressor, to achieve the fluidization pressure (preferential pressure P=500mm/H2O). In the suctionline an airvalve has been adapted, which is controlled by a thermostatic device and is connected to the condensing chamber.
3. Therapeutical basin filled with 550 kg microspheres, in which the patient is treated and which is covered by a loose stretched polycon filtersheet or other comparable material with a permeability of 35 micron. The therapeutical basin can also be filled with microspheres which have a hollow structure and if possible a diameter of 100μ and larger. By means of pressure adjustments with a differential pressure of at least P=200mm/H2O, an equivalent viscosity of the flotation medium will be obtained. The use of the microspheres with a hollow structure has as great benefit that the total weight of the microspheres will be decreased with a factor 5. Owing to this, the fluidization unit can be installed on wooden floors without support, consequently accessible for installation in every imaginable space.

The operation of the invention is based on the fol-

lowing principle: (see figure 1). The ambient air will, after passing the dustfilter F1, pass the evaporator F2. Since the evaporator is brought to a temperature of 5°C, water-particles will be precipitated on the evaporator and will condensate. The evaporator chamber F2 is connected with the vacuum chamber F3 by means of a reference leak. The vacuum chamber F3 is connected to a vacuum pump or other venturi mechanism, in order to reach the desired underpressure. Causing an average vacuum pressure of 0,1mm/H2O, the boilingpoint of the water will be lowered and atomized again into the ambient.

After the air treatment, the air from which the water-particles have been extracted, will be carried to a twostage air compressor F4, where it will reach a pressure of 500mm/H2O under the fluidization compartment as installed in F5. In this fluidization compartment the hygrostat which has been installed, will deactivate the condensing unit and evaporator, after the flotation material (microspheres) has reached the relative humidity degree of 35% (constant dehydration mode). The fluidization pressure of 500mm/H2O is enough to "boil" the mass (± 550 kg microspheres) in the basin F5, with a viscosity of 1.0-1.2.

In case moisture is inserted in the absorbing microspheres, a vapour pressure will be created to the evaporator F2, which has a temperature of 5°C. This as a result of the second law of the thermodynamics. Here the vapour pressure will again condensate in waterparticles and drained into the vacuum chamber. At the demand for heating of the flotation medium, the airstream will be a mixture of the ambient air together with the condensing dissipation by means of airvalve F7, which will be opened. With this a recirculation of the absorbed and dissipated ambient heat is reached.

In order to simplify the nursing actions and to improve the patient's comfort, basin F5 is adjustable in height from 65-85cm or from 80-100cm, measured from the floor surface, by means of an electric- or otherwise applied lifting system.

The therapeutical basin is equipped with a molecular polyethylene fluidization sheet with a surface permeability of 5-20μ and a pressure drop of 20.5mBar (see figure 2 drawing C). Owing to the stiff behaviour of the polyethylene, an equal and smooth fluidization is only possible at an absolute horizontal installation of the unit (see figure 2 drawing B). By modulating the installation of the basin within 4 degrees with regard to the horizontal situation (see figure 2 drawing A), the fluidization will be equally shifted in a varied liquid and solid mass of the microspheres. With this not only an enclosure of the tissue as well as the body is reached, but a petrissage therapy will take effect, which will stimulate the circulation of the blood and reduce the pains, also as a result of the dehydration system.

The modulating rotation system of the basin is connected to the existing lifting system and can be adjusted in time values from 10-60 minutes by means of an electronic control. At a constant fluidization therapy, the basin is held in a horizontal position of 90° (see figure 2 drawing B).

By applying the molecular polyethylene fluidization board with a stiff behaviour, the carrying profile has been provided with a mechanical level adjustment (see figure 3 part A). With this is achieved that the fluidization pressure measured on each part of the body, will remain constant.

The pulse therapy is built in as standard equipment, in order to eliminate sliding forces and traction formation as much as possible.

By reducing the fluidization pressure to the critical value of 250mm/H2O, the flotation material (microspheres) will remain air permeable and "mould" the body of the patient in a firm shape. By reducing the volume of the air compressor to 80M3 per hour, a reduction of the working pressure will be achieved. The temperature control as well as drain of moisture from the body will remain active. The electronic adjustment of the pulse therapy can be controlled in period intervals of 1-10 minutes passive and 1-10 seconds active.

Claims

1. System for extracting moisture and fluid from one or more bodies, comprising a support basin (F5) accommodating moisture absorbing beads, a pressure chamber in air communication with the support basin, an air supply system (F1, F4) for supplying air to the pressure chamber, and an evaporator chamber (F2) interconnected in the air supply path for extracting moisture from the supplied air, **characterized** in that the evaporator chamber (F2) is in communication with a depression chamber (F3) through a reference leak.

2. System according to claim 1, **characterized** in that the depression chamber is connected to a vacuum pump.

3. System according to claim 1, **characterized** in that the depression chamber is connected to a venturi mechanism.

4. System according to claim 1, 2 or 3, wherein the evaporator in the evaporator chamber (F2) is controlled by a condensing unit consisting of a compressor (F8) and a condensor (F9) and wherein the compressor is controlled by a hygrostat arranged in the pressure chamber.

5. System according to claim 4, wherein the condensor is accommodated in a housing connected to the supply system by means of ducts and an air valve (F7) interconnected therein.

6. System according to one of the previous claims,

wherein the beads are hollow microspheres, with a diameter preferable larger than 100μ and a unit specified gravity g/cm^3 comparable to bulk density lower than 2.2 passive (not fluidizing).

7. System according to one of the claims 1-5, wherein the beads are not solid, to achieve a lower unit sg per mass, comparable to bulk density valume increasing 1-1.2 g/cm^3 active (fluidizing).

8. System according to one of the preceding claims, wherein the support basin, covered by a permeable sheet for the body from which moisture should be extracted, is provided with an electric or other lifting system, in order to vary the lying level to the floor surface from 65-85 cm or from 80-100 cm.

9. System according to one of the preceding claims, wherein the application will not only be limited to medical/therapeutical treatments, but will also be applied to bedsystems for domestic use.

10. System according to one of the preceding claims, wherein the support basin can be modulated at an angle of 4° with regard to the horizontal level, in order to achieve an intermittently enclosure of body and tissue.

11. System according to one of the preceding claims, wherein the fluidization pressure in the support basin can be reduced through an electronic a-synchronous multivibrator included in the air supply system (F1, F4) (microprocessing controller), to eliminate sliding forces and to mobilize the patient (pulse therapy mode).

12. System according to one of the preceding claims, wherein the carrying profile of the support basin has been provided with a mechanical level adjustment, in order to keep the smooth fluidization pressure on the body of a patient as constant as possible.

Patentansprüche

1. System zum Entziehen von Feuchtigkeit und Fluid von einem oder mehreren Körpern, umfassend ein feuchtigkeitsabsorbierende Perlen aufnehmendes Haltebecken (F5), eine Druckkammer in Luftverbindung mit dem Haltebecken, ein Luftzufuhrsystem (F1, F4) zur Zufuhr von Luft zu der Druckkammer und eine in den Luftzufuhrweg zwischengeschaltete Verdampfungskammer (F2) zum Entziehen von Feuchtigkeit aus der zugeführten Luft, **dadurch gekennzeichnet,** daß die Verdampfungskammer (F2) mit einer Unterdruckkammer (F3) durch ein Referenzleck in Verbindung steht.

2. System nach Anspruch 1, dadurch gekennzeichnet, daß die Unterdruckkammer mit einer Vakuumpumpe verbunden ist.

3. System nach Anspruch 1, dadurch gekennzeichnet, daß die Unterdruckkammer mit einem Venturimechanismus verbunden ist.

4. System nach Anspruch 1, 2 oder 3, bei dem der Verdampfer in der Verdampfungskammer (F2) durch eine Kondensiereinheit bestehend aus einem Kompressor (F8) und einem Kondensator (F9) gesteuert wird und bei dem der Kompressor durch einen in der Druckkammer angeordneten Hygrostat gesteuert wird.

5. System nach Anspruch 4, bei dem der Kondensator in einem Gehäuse aufgenommen ist, das mit dem Zufuhrsystem mittels Leitungen und eines darin zwischengeschalteten Luftventils (F7) verbunden ist.

6. System nach einem der vorangehenden Ansprüche, bei dem die Perlen hohle Mikrokugeln sind, mit einem Durchmesser bevorzugt größer als 100 μ und einer zur Massendichte vergleichbaren spezifischen Einheitsdichte g/cm^3 kleiner als 2,2 passiv (nicht fluidisierend).

7. System nach einem der Ansprüche 1 - 5, bei dem die Perlen nicht fest sind, um eine niedrigere relative Einheitsdichte pro Masse zu erreichen, und zwar vergleichbar zum Massendichtewert zunehmend 1 - 1,2 g/cm^3 aktiv (fluidisierend).

8. System nach einem der vorangehenden Ansprüche, bei dem das Haltebecken, das durch eine durchlässige Bahn für den Körper, von dem Feuchtigkeit entzogen werden sollte, bedeckt ist, mit einem elektrischen oder einem anderen Hebesystem versehen ist, um das Liegeniveau zur Bodenoberfläche von 65 - 85 cm oder von 80 - 100 cm zu variieren.

9. System nach einem der vorangehenden Ansprüche, bei dem die Anwendung nicht nur auf medizinische/therapeutische Behandlungen beschränkt ist, sondern auch auf Bettsysteme für Heimverwendung angewendet wird.

10. System nach einem der vorangehenden Ansprüche, bei dem das Haltebecken mit einem Winkel von 4° bezüglich des Horizontalniveaus moduliert werden kann, um einen intermittierenden Einschluß des Körpers und des Gewebes zu erreichen.

11. System nach einem der vorangehenden Ansprü-

che, bei dem der Fluidisierungsdruck im Haltebekken durch einen elektronischen asynchronen Multivibrator, der im Luftzufuhrsystem (F1, F4) (Mikroprozessorsteuereinheit) enthalten ist, reduziert werden kann, um Gleitkräfte zu beseitigen und den Patienten zu mobilisieren (Pulstherapiemodus).

12. System nach einem der vorangehenden Ansprüche, bei dem das Trageprofil des Haltebeckens mit einer mechanischen Niveaueinstellung versehen ist, um den sanften Fluidisierungsdruck auf dem Körper eines Patienten so konstant wie möglich zu halten.

Revendications

1. Système pour extraire de l'humidité et un fluide d'un ou plusieurs corps, comprenant un bassin support (F_5) contenant des billes absorbant l'humidité, une chambre de pression en communication pneumatique avec le bassin support, un ensemble d'alimentation (F_1,F_4) pour alimenter en air la chambre de pression et une chambre d'évaporation (F_2) intégrée dans le passage d'air d'alimentation pour extraire l'humidité de l'air d'alimentation, caractérisé en ce que la chambre d'évaporation (F_2) est en communication avec une chambre de dépression (F_3) à travers un écoulement calibré.

2. Système selon la revendication 1, caractérisé en ce que la chambre à dépression est reliée à une pompe à vide.

3. Système selon la revendication 1, caractérisé en ce que la chambre à dépression est reliée à un mécanisme à venturi.

4. Système selon l'une de revendications 1, 2 ou 3, dans lequel l'évaporateur de la chambre d'évaporation (F_2) est contrôlé par une unité de condensation consistant en un compresseur (F_8) et un condensateur (F_9), et dans lequel le compresseur est contrôlé par un hygrostat disposé dans la chambre de pression.

5. Système selon la revendication 4, dans lequel le condenseur est logé dans un boîtier relié à l'ensemble d'alimentation au moyen de conduits et d'une soupape à air (F_7), interconnectés dans celui-ci.

6. Système selon l'une des revendications précédentes dans lequel les billes sont des microsphères creuses, avec un diamètre de préférence supérieur à 100 μ et une masse volumique unitaire en g/cm^3 comparable à une densité apparente inférieure à 2,2 en mode passif (hors fluidification).

7. Système selon l'une des revendications 1 à 5, caractérisé en ce que les billes ne sont pas solides, pour acquérir une masse volumique unitaire plus faible, comparable à une valeur de densité apparente atteignant 1-1,2 g/cm^3 en mode actif (fluidification).

8. Système selon l'une des revendications précédentes, dans lequel le bassin support, du corps duquel l'humidité doit être extraite, est couvert par une feuille perméable, et est pourvu d'un système élévateur électrique ou autre, dans le but de faire varier son niveau par rapport au sol de 65 à 85 cm ou de 80 à 100 cm.

9. Système selon l'une des revendications précédentes dans lequel l'application n'est pas limitée à des traitements médicaux et thérapeutiques, mais étendue à des lits à usage domestique.

10. Système selon l'une des revendications précédentes dans lequel le bassin support peut être incliné d'un angle de 4° par rapport à l'horizontal, dans le but d'obtenir un entourage intermittent du corps et des tissus.

11. Système selon l'une des revendications précédentes dans lequel la pression de fluidification dans le bassin support peut être réduite à travers un multivibrateur électronique asynchrone inclu dans l'ensemble d'alimentation d'air (F_1,F_4) (contrôleur à microprocesseur) pour éliminer les forces de glissement et pour mobiliser le patient (mode thérapeutique).

12. Système selon l'une des revendications précédentes, dans lequel le profil porteur du bassin support a été équipé d'un ajustement de niveau mécanique, dans le but de maintenir la pression de fluidification douce sur le corps du patient de façon aussi constante que possible.

Fig. 1

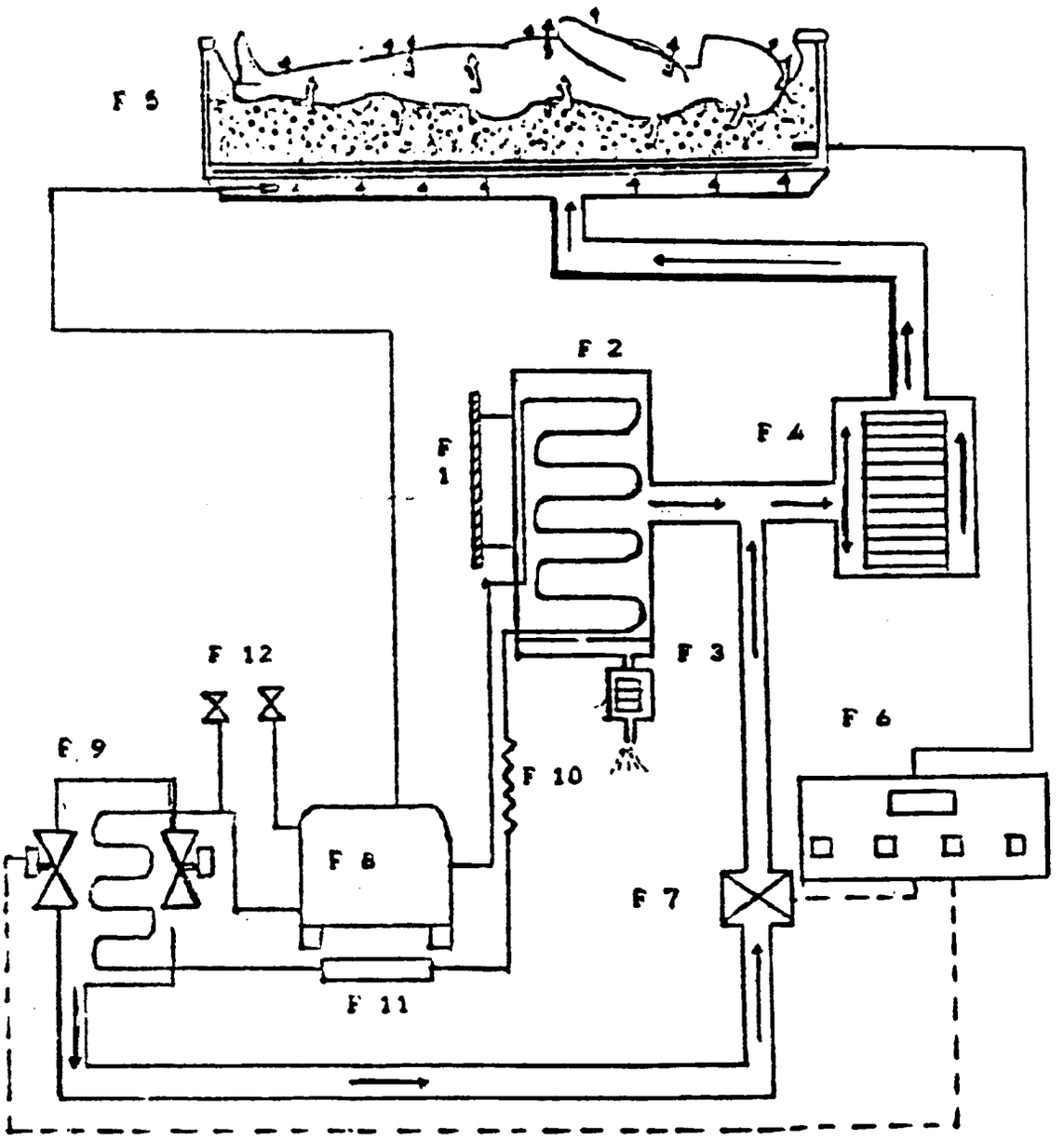

Fig. 2

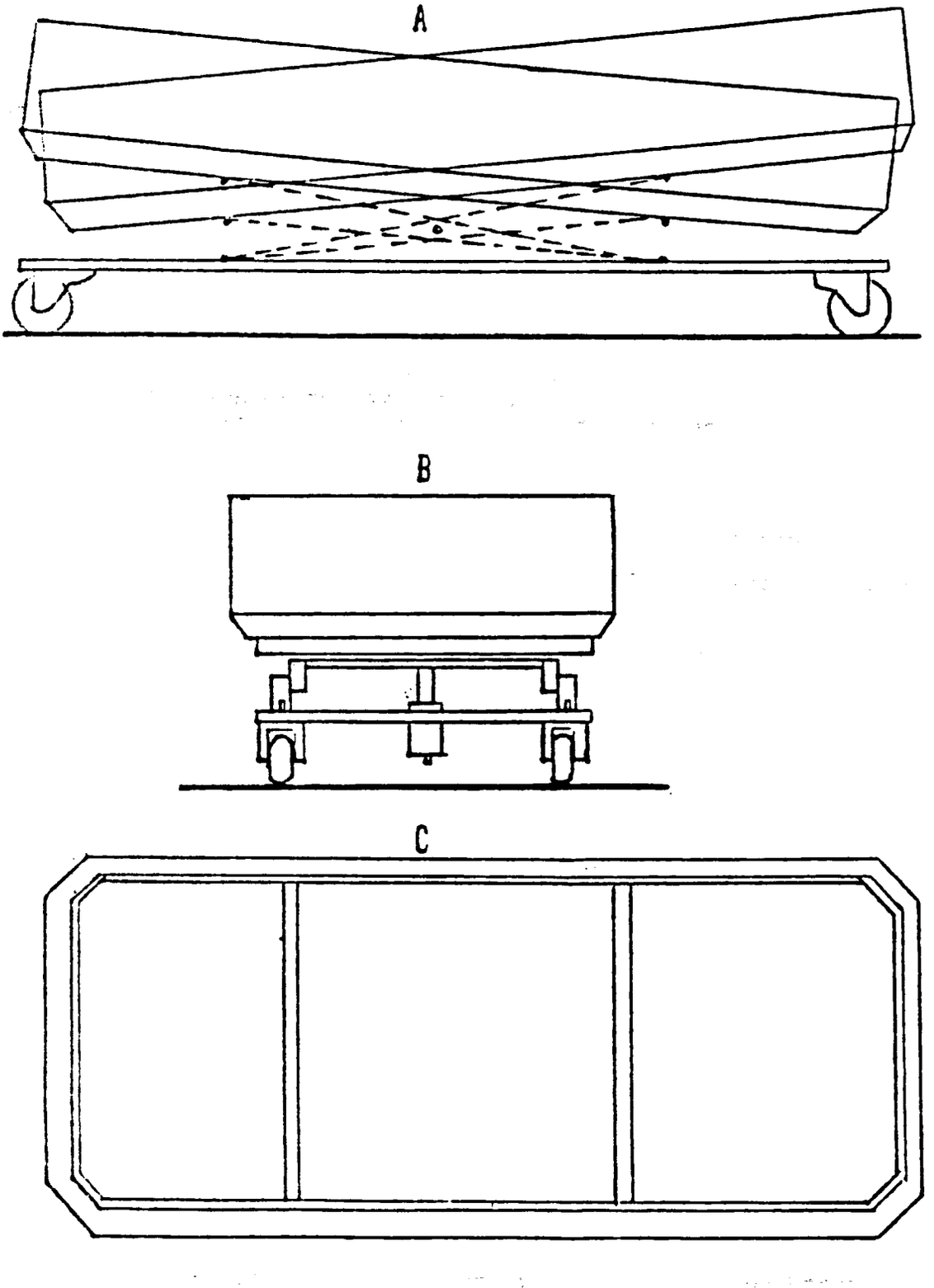

Fig.3