Jan. 19, 1954 T. S. TAYLOR 2,666,327

TEST MATTRESS

Filed Sept. 26, 1951 2 Sheets-Sheet 1

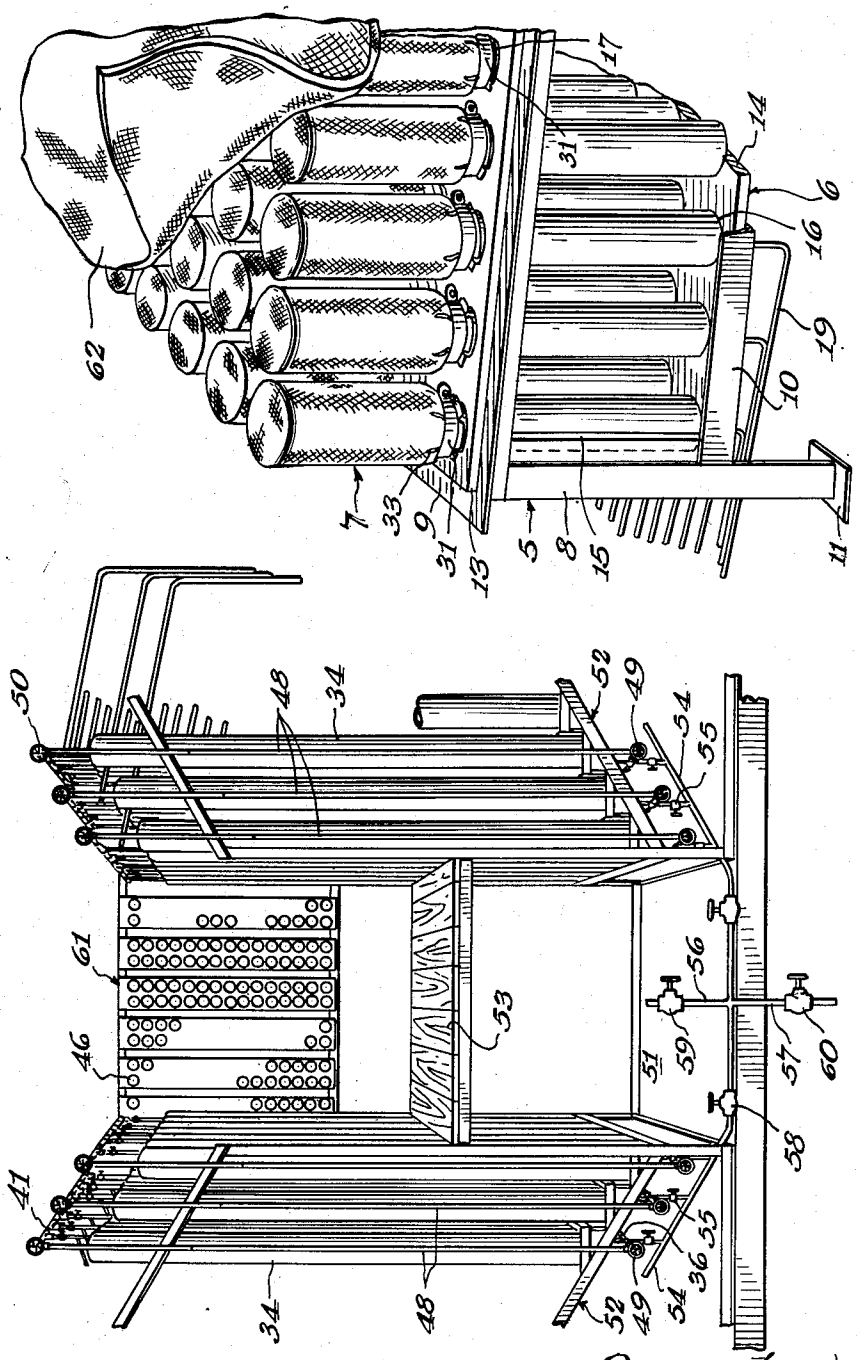


Fig. 1.

Inventor
Thomas Smith Taylor
By Loans, Glaister & Anderson
Attorneys

Jan. 19, 1954 T. S. TAYLOR 2,666,327

TEST MATTRESS

Filed Sept. 26, 1951 2 Sheets-Sheet 2

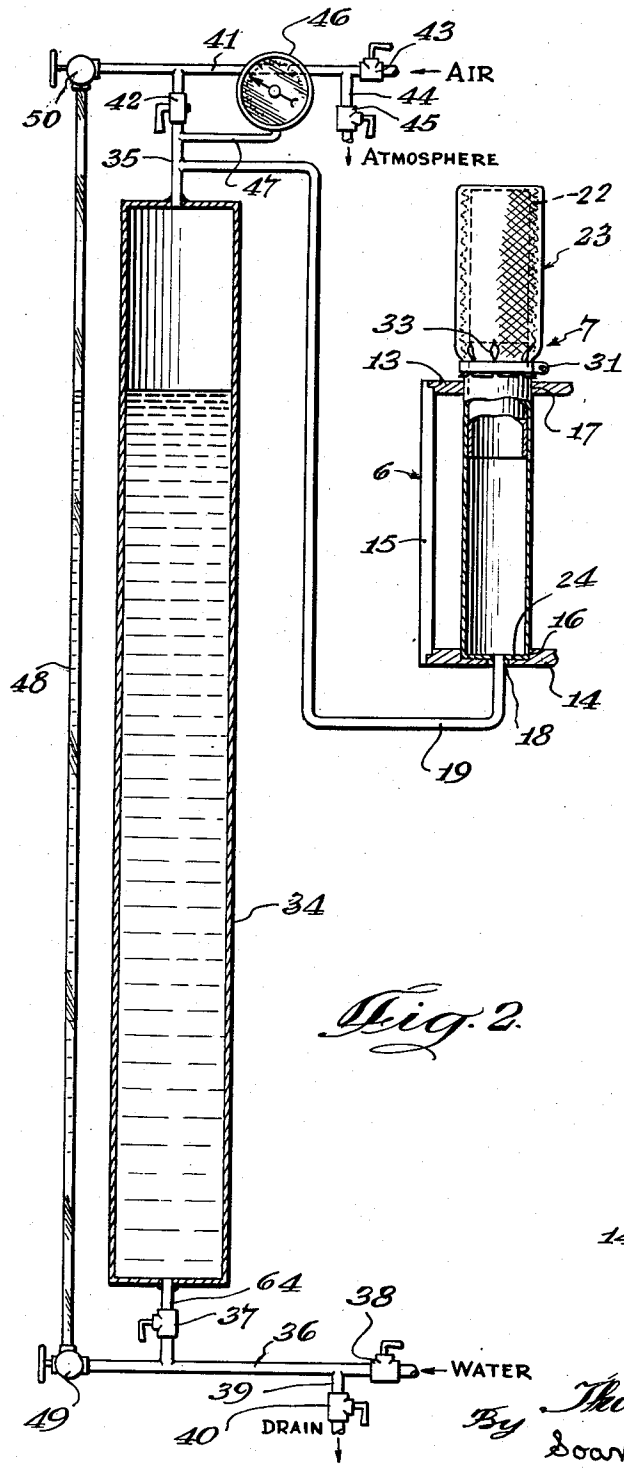
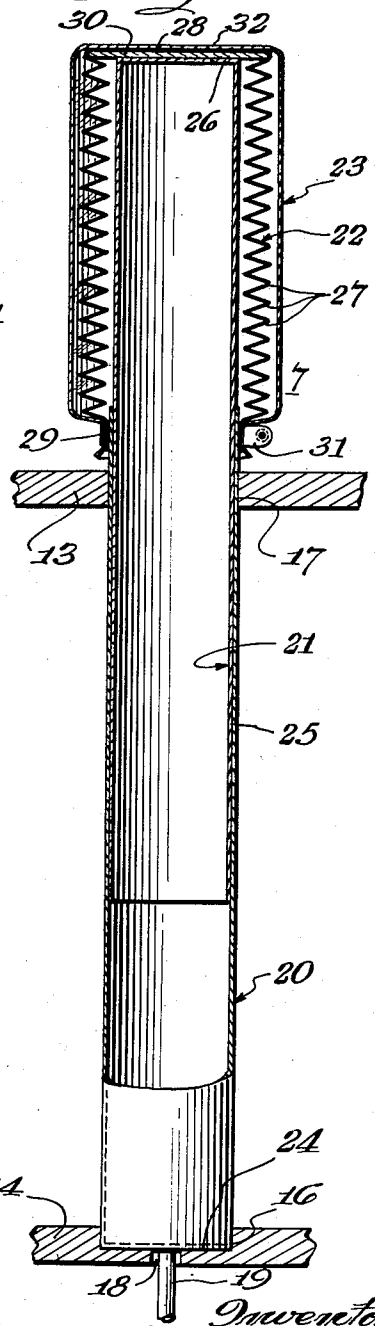


Fig. 2.

Fig. 3.



Inventor
Thomas Smith Taylor
By Soans Glaister & Anderson
Attorneys

Patented Jan. 19, 1954 2,666,327

UNITED STATES PATENT OFFICE

2,666,327

TEST MATTRESS

Thomas Smith Taylor, Caldwell, N. J., assignor to Simmons Company, New York, N. Y., a corporation of Delaware

Application September 26, 1951, Serial No. 248,390

7 Claims. (Cl. 73—172)

1

The present invention relates to a mattress and, more particularly, to a test mattress having certain variable, and controllable properties.

In order to design a mattress to meet the individual requirements of various persons or to provide the greatest benefit for a selected group of persons, it would be desirable to be able to determine the combination of mattress characteristics which are most conducive to complete relaxation in the individual or individuals for whom the mattress is to be constructed. For this purpose it would be desirable to have a mattress in which the resilience of various elements or sections of the mattress could be controlled, and in which one could measure the actual support supplied by each of those sections to the different parts of the body of the individual lying on the mattress.

The objects of the present invention are to provide a mattress in which the distribution of support supplied by the mattress to the body of an individual lying on the mattress can be varied; to provide a mattress in which the resiliency of the individual mattress sections can be adjusted; to provide a mattress with a means for measuring the actual support supplied by the mattress sections to the various parts of the body of the individual lying on the mattress; and to provide a simple easily adjustable and infinitely variable test mattress construction.

In the drawings:

Fig. 1 is a partial perspective view of the various portions of a test mattress constructed in accordance with the present invention;

Fig. 2 is a diagrammatic view, partly in section, showing an individual mattress section of the test mattress and the means for adjusting the resiliency and measuring the deflection of an individual mattress section; and

Fig. 3 is an enlarged sectional view of an individual mattress section of the test mattress.

The test mattress shown in the drawings includes a bed frame 5, a mattress frame 6 set within the bed frame 5, and a plurality of vertically extending mattress sections 7 which are arranged in and supported by the mattress frame 6. The arrangement also includes means for varying the resiliency of each of the mattress sections 7, and means for measuring the downward force exerted on each of the mattress sections 7.

As shown in Fig. 1, the bed frame 5 is suitably fabricated out of angle iron or the like and includes vertical leg members 8, horizontal top members 9, and intermediate horizontal supporting members 10. Flat horizontal plate members 11 are suitably attached to the bottom of the leg members 8 so as to permit the bed frame 5 to rest securely in a horizontal position. Each of the intermediate angle iron supporting members 10 is positioned with one of its flange members extending vertically and upwardly and the other of its flange members extending horizontally and inwardly of the bed frame 5 so as to provide a seat for supporting the mattress frame 6, and each of the angle iron top members 9 is positioned with one of its flanges extending horizontally and outwardly of the bed frame 5 and the other of its flanges lying in the plane of the vertically extending flange of the intermediate supporting member 10 so that the inner-face of its vertically extending flange acts as a guide for the mattress frame 6.

2

The mattress frame 6 may be constructed out of any suitable material, for example, plywood, and includes a top member 13, a bottom member 14, and side members 15 which extend between, and are connected to, the top and bottom members 13 and 14. The mattress frame 6 is proportioned so as to fit within the bed frame 5 with the bottom member 14 seated on the inwardly facing horizontal flange of the supporting member 10 of the bed frame 5, and with the side members 15 of the mattress frame engaging the vertically extending flanges of the top and supporting members 9 and 10 of the bed frame 5. The bottom member 14 of the mattress frame includes appropriately positioned circular recesses 16 and the top member of the mattress frame has superposed circular holes 17, for positioning and suitably supporting the mattress sections 7 within the mattress frame 6. A centrally located passageway 18 extends through each of the circular recesses 16 in order to permit the lower end of the mattress sections 7 to be connected to suitable conduits 19. (See Fig. 3.)

As seen in Fig. 3, an individual mattress section includes an external cylinder 20, a piston 21 which is slidable within the cylinder 20, a resilient bellows 22 which is closed at its upper end and which is fastened adjacent its lower edge to the upper end of the external cylinder 20, a flat insert or disc 30 which is positioned between the upper end of the piston 21 and the upper end of the bellows 22, and a restraining jacket 23 which surrounds the bellows 22 and which is attached to the lower end thereof. Since the mattress is composed of a plurality of substantially identical mattress sections 7 the following detailed description is made with ref-

erence to the construction of just one of the mattress sections 7.

The external cylinder 20 of the mattress section 7 is fabricated of metal or the like and has a closed bottom end 24 which is seated in a recess 16 in the bottom member 14 of the mattress frame. The conduit 19, which extends through the passageway 18 in the bottom member 14 of the mattress frame 6 is connected to the external cylinder by welding to the bottom end 24. The upper end of the cylinder 20 extends a slight distance above the upper member 13 of the mattress frame 6 to facilitate the attachment to the cylinder of the bellows 22 and restraining jacket 23.

Each cylinder 20 is provided with a piston 21 which is constructed out of light material such as plastic or the like and is preferably in the form of a hollow vertical tube 25 with a closed upper end 26. The outer diameter of the tube 25 is such as to permit the piston 21 to slide freely within the external cylinder 20 and the piston 21 is suitably enclosed by a vertically extending resilient bellows 22 so as to prevent gas from escaping from the upper end of the mattress section 7.

The bellows 22 is made of a resilient material such as rubber or the like and is proportioned to fit over the cylinder 20 and the piston 21 as shown in Fig. 3. The bellows 22 has a series of circumferential convolutions 27 which permits vertical extension of the bellows 22. The bellows has a closed upper end 28 and a downwardly extending collar section 29 at its base for connection to the external cylinder 20. A flat inflexible disc 30 made of a light material such as aluminum, is attached to the inside of the bellows 22 at its upper end 28 by means of cement or the like, in order to prevent the upper end 28 of the bellows 22 from bulging outwardly. The bellows 22 is positioned over the upper end of the piston 21 by attaching the inner-face of disc 30 to the upper end 26 of the piston 21 by means such as screws, rivets, or cement. The collar section 29 at the base of the bellows 22 is attached to the upper end of the external cylinder 20 by suitable means such as a hose clamp 31 and rubber-to-metal cement. This construction provides an air tight joint between the bellows 22 and external cylinder 20.

In order to limit the upward extension of the bellows 22 the bellows is enclosed with a tubular restraining jacket 23 which is made of light flexible material such as cloth and has a closed upper end 32 which is engaged by the upper surface 28 of the bellows 22. The lower end of the cylindrical restraining jacket 23 has slits 33 which permit the restraining jacket 23 to be anchored along with the bellows 22 to the external cylinder 20 by the hose clamp 31 without bunching-up. The restraining jacket 23 is light enough so that it does not hinder the movement of the bellows 22 when the bellows 22 is below its upper limiting position.

The means for adjusting the resiliency in an individual mattress section 7 is diagrammatically illustrated in Fig. 2. Since all of the mattress sections 7 are adjusted in a similar manner, the adjusting means for only one of the mattress sections 7 will be described in detail.

The mattress section 7 is connected by the conduits or tubing 19 and 35 to a vertically extending cylindrical expansion tank 34. By filling this tank 34 with different amounts of water, the volume of air in the system is changed, which in turn alters the amount of force required to depress the piston 21 a given distance. The expansion tank 34 is connected to a source of water (not shown) through the conduit 64, manifold 36, and the valves 37 and 38. In order to drain the water from the expansion tank 34 the manifold 36 also connects to a conduit 39 and drain valve 40. The conduit 64 connects to the expansion tank 34 adjacent its lower end so that the water can be completely drained from the expansion tank 34.

The expansion tank 34 may be connected to a source of pressure gas (not shown) through the conduit 35, manifold 41, and valves 42 and 43, or to the atmosphere through the conduit 35, manifold 41, conduit 44, and valves 42 and 45. The conduit 35 is preferably connected to the expansion tank adjacent its upper end so as to permit the maximum amount of water to enter the expansion tank without having water enter the mattress section 7.

In order to indicate the gas pressure within the system the conduit 35 is connected to a pressure gage 46 through an interconnecting conduit 47. Since there are no valves in that portion of the conduits 47, 35, and 19 which connect the pressure gage 46 with the expansion tank 34 and the mattress section 7, the pressure gage 46 will at all times register the gas pressure within the system.

A glass sight gage 48 parallels the expansion tank 34 and connects to the manifolds 36 and 41 through the valves 49 and 50 so as to provide a simple method of indicating the amount of water within the expansion tank 34. When the valves 50 and 42 at the upper ends of the sight gage 48 and the expansion tank 34, and the valves 49 and 37 at the lower ends of the sight gage 48 and the expansion tank 34 are in open position the height of the water within the sight gage 48 will indicate the water level in the expansion tank 34.

The mattress section 7 may be adjusted in the following manner. Starting with all of the valves closed the valves 42, 50, and 45 are opened so as to connect the expansion tank 34 and sight gage 48 to the atmosphere, the valve 37 is then opened connecting the expansion tank to the manifold and, finally, the valve 38 is opened allowing water to run into the expansion tank 34. During this operation the valve 49 at the bottom of the sight gage 48 should remain closed otherwise the water might rise more rapidly within the sight gage 48 than within the expansion tank 34 and might enter the conduits 35, 47, and 19 which are connected to the pressure gage 46 and mattress section 7. When a volume or water height reading is desired, the water entering the expansion tank 34 is stopped by closing valve 38 and the valve 49 at the bottom of the sight gage 48 is opened. Since the valves 42, 45, and 50 are open, gas escapes from the top of the expansion tank 34 and sight gage 48 to atmosphere as water enters the expansion tank 34 and sight gage 48. The amount of water within the expansion tank 34 will determine the resiliency of the mattress section 7.

When the proper amount of water has run into the expansion tank 34 the valve 38 is closed. The gas pressure within the system is then raised by closing the valve 45 which connects the system to the atmosphere and opening the valve 43 which connects the manifold 41 to the source of gas pressure. As air pressure enters the system the bellows 22 will be extended until its upper end

encounters the top of the outermost position of the restraining jacket 23. The purpose of the air pressure is to produce a given extension of the bellows 22. When the desired bellows extension is reached, the valve 43 is closed.

The buoyancy of the mattress section 7 may be determined by placing known weights on the upper surface of the mattress section 7 and noting the deflection or compression of the mattress section 7. It is desirable to plot curves of gage pressure vs. bellows deflection and gage pressure vs. force for various amounts of water in the expansion tank 34 so that one can read the pressure gage 46 and convert to deflection and force by the use of the appropriate curves.

The individual expansion tanks 34 which connect to the mattress sections 7 of the test mattress are assembled in a convenient frame-work 51 which permits an operator to gain ready access to the operating valves in the system. In the embodiment of the invention illustrated in Figure 1, the frame-work is fabricated out of angle-iron and is comprised of banks 52 separated by a wooden cat-walk 53 which is located at a convenient height so as to permit an operator to reach the valves at the upper end of the expansion tanks 34. Each bank 52 is constructed in tiered form so that the operator can easily manipulate the valves in the various tiers.

In placing the individual expansion tanks 34 within the frame-work it is desirable to place the expansion tanks 34 which connect to a single row of mattress sections 7 of the test mattress in the same tier, since it is often desirable to have a similar degree of resiliency within the mattress sections 7 in the same row. The lower ends of the expansion tanks 34 within the same tier of a bank are connected to a common manifold 36 and a single sight gage 48. The single sight gage 48 can be used to provide an indication of the water level either in all of the expansion tanks 34 in the tier or in a particular expansion tank 34 within the tier. As previously noted, each of the expansion tanks 34 includes a valve 42 which provide a means of closing off that particular expansion tank 34 from the tier manifold 36. The tier manifolds 36 at the bottom of the expansion tanks 34 are connected to the bank manifolds 54 through the valves 55. Each of the bank manifolds are connected either to the source of water or to the drain through the conduits 56 and 57 and the valves 58, 59, and 60. The tier manifolds 41 at the upper end of the expansion tanks 34 are connected in a similar manner to bank manifolds and thence either to a source of pressure gas or to the atmosphere through appropriate conduits and valves (not shown).

In adjusting the system the desired bank manifold valve is opened and then the appropriate tier manifold valves are opened. By opening or closing the valves which connect to the individual expansion tanks 34 either one or all of the expansion tanks in a particular tier may be adjusted.

The gages 46 are suitably positioned within a gage panel 61 behind the framework 51 so as to be easily read by an operator as he stands on the cat-walk 53. In this position the operator can manipulate the valves which regulate the gas pressure within the expansion tanks 34 and/or read the pressures of the gages 46.

During operation the resiliency of each of the mattress sections 7 are appropriately adjusted by regulating the water levels within the expansion tanks 34. The mattress sections 7 are covered by a suitable light pad 62 of any suitable material such as foam rubber, felting, or the like. When a person lies down on the mattress, the deflections of the mattress sections 7 can be obtained by noting the pressure readings of the gages 46 and converting these to deflections by the use of the appropriate pressure-deflection curves. If the force exerted on each of the mattress sections 7 is desired, these may be obtained in a similar manner from appropriate pressure vs. force curves.

It should be realized that the manner of varying the resiliency of the mattress sections 7 might be accomplished in other ways than that described above without departing from the scope of this invention. For example, the gas volume within each of the expansion tanks might be kept constant and the amount of gas within the system varied, or the amount of gas within the system could be kept constant and the gas volume within each of the expansion tanks varied.

The test mattress described above is simple in construction and operation and provides a mattress in which the resiliency of the mattress sections is adjustable. In addition, each of the mattress sections is connected to individual gages which provide a means for indicating the actual support supplied by the individual mattress sections to any object resting on the mattress.

Various features of the invention which are believed to be new are set forth in the appended claims.

I claim:

1. An apparatus of the type described including a frame, a plurality of vertically extending inflatable resilient members arranged in and supported by said frame, each of said resilient members being connected through conduit means to an expansion tank, means including said expansion tank for varying the resiliency of each of said members, and means communicating with each of said members for measuring the force exerted on each of said members.

2. An apparatus of the type described including a frame, a plurality of vertically extending hollow resilient members arranged in and supported by said frame, the interior of each of said resilient members being connected through conduit means to an individual expansion tank, means for varying the effective volume in each of said expansion tanks, means for varying the quantity of gas in each of said expansion tanks, conduits, and members, thereby permitting an adjustment of the resiliency of each of said members, and means communicating with each of said members for measuring the force exerted on each of said members.

3. An apparatus of the type described including a frame, a plurality of vertically extending resilient members arranged in and supported by said frame, each of said resilient members including an enclosed compressible volume of gas, each of said enclosed volumes of gas being connected through conduit means to a separate expansion tank, means for filling each of said expansion tanks with a predetermined quantity of liquid so as to change the effective volume within said tanks, means for varying the quantity of gas in each of said expansion tanks, connecting conduits, and compressible volumes, thereby permitting an adjustment of the resiliency of each of said members, and means communicating with

each of said members for measuring the force exerted on each of said members.

4. An apparatus of the type described including a frame, a plurality of vertically extending resilient mattress sections arranged in and supported by said frame, each of said resilient mattress sections including an enclosed compressible volume of gas, each of said enclosed volumes of gas being connected through conduit means to a separate expansion tank, means for filling each of said expansion tanks with a predetermined quantity of liquid so as to change the effective volume within said tanks, each of said expansion tanks being connected through conduit means to a sight gage for indicating the amount of liquid in each of said tanks, means for varying the quantity of gas in each of said connecting expansion tanks, conduits, and compressible volumes, thereby permitting an adjustment of the resiliency of each of said mattress sections and means communicating with each of said mattress sections for measuring the force exerted on each of said mattress sections.

5. An apparatus of the type described including a frame, a plurality of vertically extending resilient mattress sections arranged in and supported by said frame, each of said resilient mattress sections including an enclosed compressible volume of gas, each of said enclosed volumes of gas being connected through conduit means to a separate expansion tank, means for filling each of said expansion tanks with a predetermined quantity of liquid so as to change the effective volume within said tanks, means for varying the quantity of gas in each of said connecting expansion tanks, conduits, and compressible volumes, thereby permitting an adjustment of the resiliency of each of said mattress sections, means attached to each of said mattress sections for measuring the force exerted on each of said mattress sections, and a pressure gage communicating with each of said mattress sections for measuring the pressure in said mattress sections.

6. An apparatus of the type described including a frame, a plurality of vertically extending resilient mattress sections arranged in and supported by said frame, each of said mattress sections comprised of a vertically extending cylinder, a piston slidable within said cylinder, the upper end of said piston extending upwardly of said cylinder, a resilient bellows enclosing the upper end of said cylinder and that portion of said piston which extends above said cylinder, said bellows being attached to the outer face of said cylinder adjacent the upper edge thereof, the upper end of said bellows being closed, said closed end having its interior side attached to the upper end of said piston for vertical movement therewith, means for limiting the upward extension of said bellows, each of said resilient mattress sections including an enclosed compressible volume of gas, each of said enclosed volumes of gas being connected through conduit means to a separate expansion tank, means for varying the resiliency of each of said mattress sections and means communicating with each of said mattress sections for measuring the force exerted on each of said mattress sections.

7. An apparatus of the type described including a frame, a plurality of vertically extending resilient mattress sections arranged in and supported by said frame, each of said mattress sections comprised of a vertically extending cylinder, a piston slidable within said cylinder, the upper end of said piston extending upwardly of said cylinder, a resilient bellows enclosing the upper end of said cylinder and that portion of said piston which extends above said cylinder, said bellows being attached to the outer face of said cylinder adjacent the upper edge thereof, the upper end of said bellows being closed, said closed end having its interior side attached to the upper end of said piston for vertical movement therewith, a restraining jacket which surrounds said bellows and limits the upward extension of said bellows, each of said resilient mattress sections including an enclosed compressible volume of gas, each of said enclosed volumes of gas being connected through conduit means to a separate expansion tank, means for filling each of said expansion tanks with a predetermined quantity of liquid so as to change the effective volume within said tanks, each of said expansion tanks being connected through conduit means to a sight gage for indicating the amount of liquid in each of said tanks, means for varying the quantity of gas in each of said connecting expansion tanks, conduits, and compressible volumes, thereby permitting an adjustment of the resiliency of each of said mattress sections, means attached to each of said mattress sections for measuring the force exerted on each of said mattress sections, and a pressure gage communicating with each of said mattress sections for measuring the pressure in each of said mattress sections.

THOMAS SMITH TAYLOR.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,095,268	Roberts	Oct. 12, 1937
2,378,039	Schenker	June 12, 1945

FOREIGN PATENTS

Number	Country	Date
475,000	Germany	Apr. 18, 1929