United States Patent [19]

Adams

[11] **3,864,767**

[45] **Feb. 11, 1975**

[54] **AIR MATTRESS SUPPORT SYSTEM**

[75] Inventor: **Larry D. Adams,** Collingswood, N.J.

[73] Assignee: **Metrologic Instruments, Inc.,** Bellmawr, N.J.

[22] Filed: **Feb. 26, 1973**

[21] Appl. No.: **336,028**

[52] **U.S. Cl.** ..... **5/348 R,** 248/350, 248/22

[51] **Int. Cl.** **A47c 27/08**

[58] **Field of Search** ..... 5/348, 348 WB, 349, 350, 5/348 R; 248/22, 350, 358 R; 254/93 HP

[56] **References Cited**

UNITED STATES PATENTS

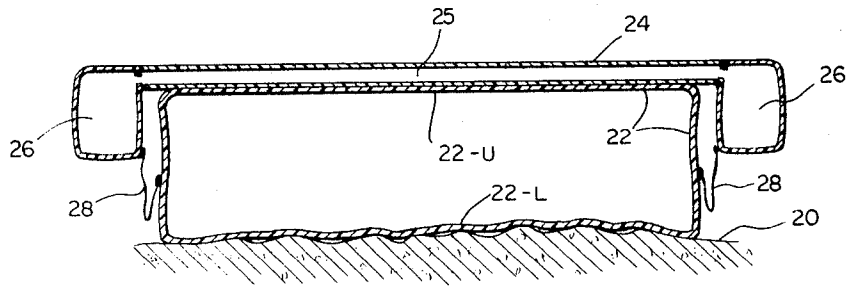
3,393,937	7/1968	Wehmer	5/348 WB
3,456,270	7/1969	Weinstein et al.	5/348 WB
3,591,122	7/1971	Mahaffie	248/350

Primary Examiner—Paul R. Gilliam
Assistant Examiner—Andrew M. Calvert
Attorney, Agent, or Firm—Paul & Paul

[57] **ABSTRACT**

A support bag is positioned on the surface above which the load is to be supported, and inflated with air to a pressure sufficient to support a given load above all portions of said surface, and a thin air cushion inflated to a relatively low air pressure is positioned loosely on top of the support bag such that when a load is placed on the air cushion it maintains an air space between all portions of such load and the support bag.

3 Claims, 3 Drawing Figures



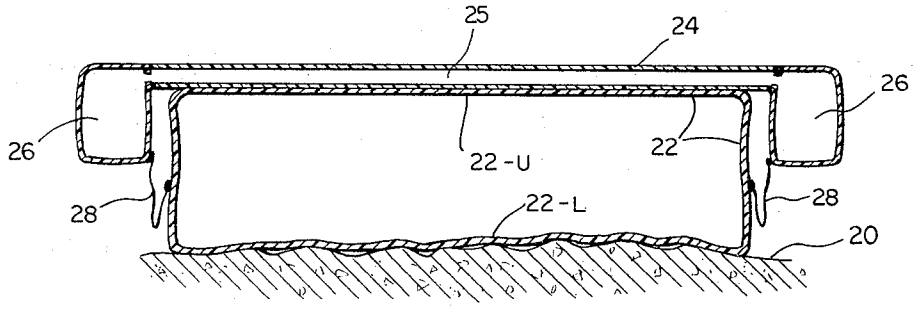


Fig. 1

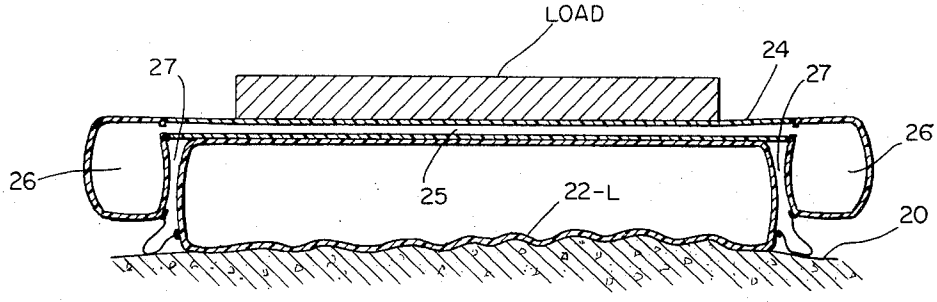


Fig. 2

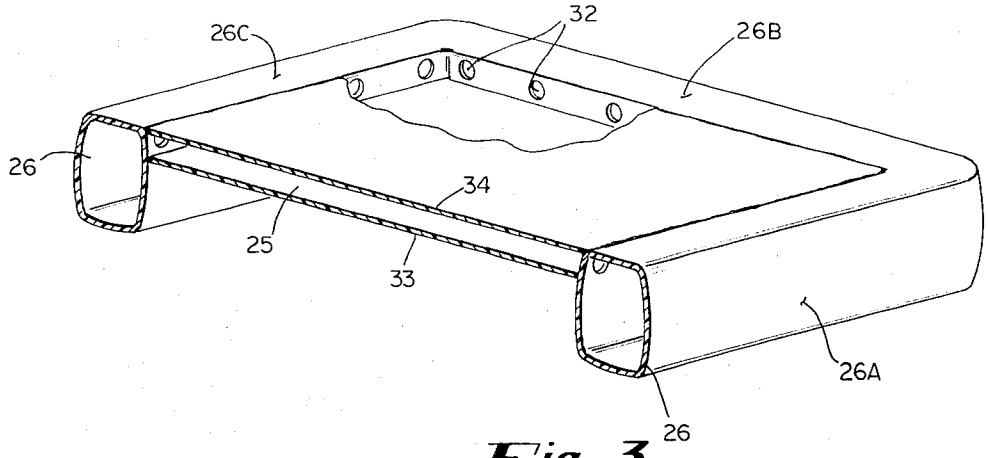


Fig. 3

AIR MATTRESS SUPPORT SYSTEM

BACKGROUND OF THE INVENTION

A. Field of the Invention

This invention lies in the field of air support apparatus and, more particularly, air inflated apparatus for shock-free support of loads.

B. Description of the Prior Art

There presently exist a great number of industrial and consumer needs for simple and reliable support systems for loads ranging from extremely sensitive laser mountings to campers who simply desire a comfortable mattress. With the conventional air mattress, which is placed upon an irregular surface such as the earth, the inflation pressure must be great enough to support the load above the highest irregularity in the surface. This requirement generally necessitates having some sort of air pump or equivalent device for inflating the mattress, and results in the detracting effect of a "hard" support, i.e., a support which has very little give and which easily transmits shock to the object which is being supported.

A number of sleeping bag constructions have been made which attempt to provide soft and comfortable support. Such constructions generally include multiple air chambers and support elements, or stiffeners, which aid in maintaining the load above the ground surface. However, all such designs incorporate at least one, and generally both, of the above-mentioned limitations of excessive firmness and the requirement of providing for the high pressure.

In the more recent development of laser technology, there exists a requirement of supporting loads of lesser weight, but supporting them so that they are extremely well stabilized and essentially insensitive to shock. Also, in transportation of shock-sensitive equipment of material, there is a great need for a simple yet reliable and effective suspension system which is not presently commercially available.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an extremely stable and shock-proof suspension system adaptable for supporting a variety of loads and which can be inflated by the user without the need for accessory air pressure equipment. The suspension system of this invention is adaptable for sleeping, transportation of persons or shock-sensitive equipment or material, and/or support of fixed-position equipment which must be maintained free of external shock.

In accordance with the above objectives, the support system of this invention utilizes a support bag having a sufficient thickness and inflated with air to a sufficient pressure such that it maintains all portions of whatever load is placed on top of it above the surface upon which it is placed, and a thin air cushion positioned on top of the support bag and inflated with air to a low pressure, so as to provide a soft and yielding support for a load placed thereon, but sufficient to maintain such load above the support bag.

The air cushion preferably has a pancake-like center portion and an outer bumper portion with sufficient form to restrain it from gross lateral displacement relative to the support bag, but without transmitting normal shock to a supported load.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. I is an elevation view in section showing the support system of this invention without a load thereon.

FIG. 2 is the same view as seen in FIG. 1, with the load placed on the support system.

FIG. 3 is a perspective view, partly cut away, showing a form of construction of the air cushion portion of the apparatus of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, the apparatus of this invention is shown, without a load applied thereto, resting on a surface 20 which, for purposes of illustration, is shown having accentuated irregularities. A support bag 22 is illustrated as being positioned directly upon surface 20, and having a lower portion 22–L and an upper portion 22–U. The normal depth of bag 22, being the distance between 22–L and 22–U, must be sufficient such that 22–U is maintained above all the irregularities of surface 20 when it is loaded. Consequently, as illustrated in FIG. 1, such depth, in the unloaded state, is substantially greater than the highest peak to valley elevation differential of surface 20. Bag 22 is preferably constructed of a heavy duty rubber, or vinyl, and inflated to a pressure of about 1 atmosphere, so that upper surface 22–U provides an effectively suspended level platform for supporting an upper bag.

Positioned on top of bag 22 is an air cushion, or suspension bag 24, comprised of a flat thin center portion 25, and an outer peripheral portion 26. Air cushion 24 is placed freely on top of support bag 22, with the center portion 25 supported directly by surface 22–U. Cushion 24 may have an outer portion 26, (also referred to as a bumper ring) having a form substantially complementary to that of the support bag. The bumper portion 26, shown also in FIG. 3, is designed so as to be displaced outwardly away from bag 22. As such, it does not transmit shock in the horizontal plane to the supported load, but does perform the function of providing an obstruction to gross lateral movement of the upper bag with respect to the lower bag. Straps 28, loosely connecting the two bags, may be used if it is desired to avoid separation of the bags.

Air cushion 24 is preferably constructed of a light weight rubber or vinyl, and of a thinner depth than bag 22. For very sensitive uses, latex with a thickness of 0.003 – 0.004 inch is suitable. In practice, bag 24 is inflated to a low air pressure, less than 1 atmosphere, such that the thin section provides a very soft air suspension system for the weight which is applied thereto.

Referring now to FIG. 2, there is shown the apparatus of this invention with a load placed thereon. The load is shown as a representative load, with its weight distributed uniformly. While it is recognized that a uniformly distributed load of this nature is easiest to suspend, it is to be understood that the load as illustrated is exemplary only, and that loads which are not uniform in their weight distribution may also be supported by the apparatus of this invention. As illustrated, when the weight of the load is brought to bear on upper bag 24, the two inflated bags are flattened out to varying degrees. Support bag 22 is pressed into tight contact with the surface 20 and is caused to expand laterally with the distance (depth) between 22–L and 22–U being lessened. However, this differential distance remains

sufficient so that 22–U is maintained above the peak irregularity of surface **20.** It is to be noted that under the loaded condition, support bag **22** is relatively "hard." The difference between the unloaded and loaded cases, as seen in FIGS. **1** and **2,** has been slightly accentuated for purposes of comparison.

Looking now at the air cushion **24** when loaded, it is seen that the depth of the center portion **25** has been reduced, but an air space is maintained throughout this portion. The air that has been forced out of center portion **25** by the load is seen to reside in the peripheral portion, or bumper portion **26,** which is in an expanded state, as illustrated. Bumper portion **26** thus acts as a reservoir to allow air to leave the center portion **25,** such that minimal resistance is presented to the load, and a soft support is provided. This is a critical feature of this embodiment, as it is to be understood that, without the bumper portion **26,** the air in center portion **25** would have no place to which to escape, and consequently would be placed under extra pressure in the loaded condition and would present a "hard" surface to the load.

It is further to be noticed, in comparing FIG. **2** to FIG. **1,** that the distance between the sides of support bag **22** and the inner sides of the bumper portion **26** is diminished under the load condition. However, such distance **27** remains large enough so that the bumper portion does not normally inhibit lateral movement of air cushion **24** with respect to support bag **22.** Thus, if a shock is transmitted to support bag **22,** it is free to move with respect to air cushion **24,** such that the shock is not transmitted through to the load. In addition, the load itself is suspended on the soft (low pressure) air in cushion **24,** providing the load with a soft cushiony-like suspension similar to that which is achieved with the well known water bag. However, in this case the apparatus has the substantial advantage that it need only be inflated with air, such that its own dead weight is insignificant, and there is no need to have on hand a supply of the inflating substance.

Referring now to FIG. **3,** there is shown a manner of construction of the air cushion **24.** FIG. **3** shows a perspective view of the air cushion **24,** with a section taken approximately through the middle of same. The bumper portion **26** may be formed from a single hollow, smooth-cornered rectangular tube which is bent around into a rectangle. As seen, sections **26A, 26B** and **26C** are all one integral section, and are bent at successive right angles to form respective sides of the closed four-sided portion **26** (the fourth side, **26D,** not being shown). The four sided piece **26** is constructed by bending the tube around into a rectangular shape, and then sewing it into a closed tube. Holes **32** are provided at an upper portion thereof, for communication with what is to be the center portion **25.** Such center portion **25** may be constructed by bonding a pair of flat portions **33, 34** of substantially rectangular form, to the inner sides of the tube as formed, above and below the row of holes respectively. Flat portions **33, 34** thus form the upper and lower portions of the center, relatively flat portion **25.** The distance between elements **33, 34** is adjusted according to the amount of load which the air cushion is designed to carry. If desired, portion **26** may have sewn into it stiffeners for the purpose of enabling it to assume its desired form when inflated.

In using the apparatus of this invention, the user first inflates the support bag **22** in the same way that a conventional rubber mattress is inflated for use in camping. The support bag **22** is suitably inflated to a pressure of about **1** atmosphere, although slightly greater pressures may be used. For a use such as camping, air cushion **24** is then positioned directly over the top of the support bag, with bumper portion **26** fitting around the outside of the support bag. For uses where there is required a high insensitivity to shock, a powder or other lubricating material may be sprinkled over the top or support bag **22** before placing air cushion **24** thereon.

For camping use, the center portion **25** of air cushion **24** may be of an area approximately 2 feet × 6 feet, and inflated to a pressure of no greater than 1 atmosphere. For support of smaller loads, the center portion may be simply a flat balloon. For support of a load of about 20 lbs., such flat balloon is suitably about 8 inches in diameter and has a thickness of about ⅛ inch with no load, which thickness is reduced to about 1/16 inch under the 20 lb. load.

From the above, it is seen that there is provided apparatus which is easily installed and which provides a very soft and substantially shock-free support, or suspension system. Site selection and the need of auxiliary equipment for filling the support apparatus is rendered unnecessary. The apparatus thus provides an extremely comfortable and easily inflated support surface, elevated from the underlying surface. The cooperation of the support bag and the air cushion provides a suspension system which cannot be obtained with a single bag. Thus, the support bag alone would give a "hard" support, and transmit shock to a load thereon, while a single air cushion bag inflated to a low pressure could not support the load above the surface irregularities and would also transmit shock.

I claim:

1. Support apparatus adapted for supporting a given load upon an irregular surface above the highest irregularity of said surface, comprising:

a. a support bag inflated with air to a first pressure, having a first depth;

b. an air cushion loosely positioned on top of said support bag and inflated with air to a second pressure less than said first pressure;

c. said respective pressures being such that when said load is positioned upon said air cushion, said support bag maintains an air space between said air cushion and the highest irregularity of said irregular surface, and said air cushion maintains an air space between said load and said support bag, said support bag and said air cushion in mutual cooperative combination thereby providing a unitary well stabilized, relatively shock-insensitive suspension system for said load;

d. said second pressure being less than one atmosphere.

e. said air cushion having a pancake-like center portion having a second depth substantially less than said first depth for supporting said load and an outer bumper portion such that said air cushion is restrained from gross lateral displacement relative to said support bag, said bumper portion adapted to act as a reservoir to receive air from said center portion when a load is placed upon said center portion;

f. said support bag being made of a first material having a first thickness and said air cushion being made of a second material of a second thickness less than said first thickness;

g. a lubricant positioned between said support bag and said air cushion;

h. wherein said outer bumper portion of said air cushion has a form complementary to said support bag, and overhangs around said support bag, and

i. straps being connected loosely to said support bag and said air cushion, to insure the non-separation of said support bag and said air cushion.

2. Support apparatus according to claim **1,** wherein said irregular surface is rough terain.

3. A support apparatus according to claim **1,** wherein said support bag and said air cushion are substantially rectangular in shape.

* * * * *