Nov. 6, 1956 E. J. NUNLIST 2,769,182

INFLATABLE MATTRESS LIFTERS

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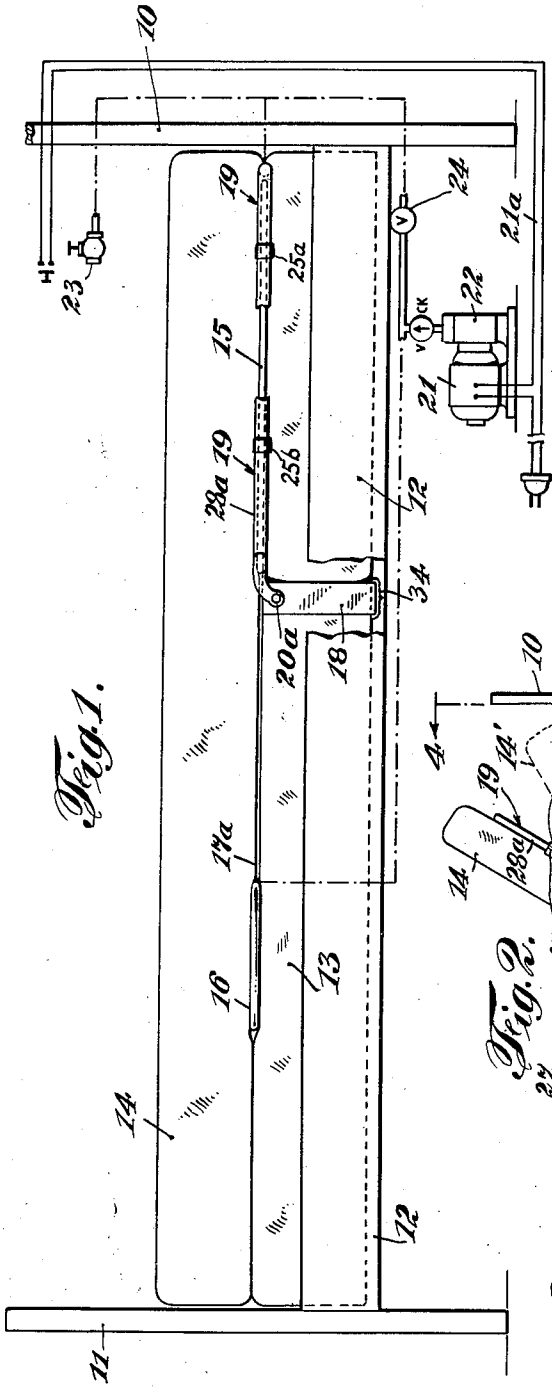


Fig. 1.

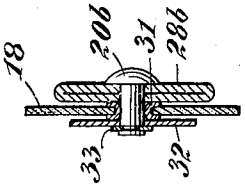


Fig. 5.

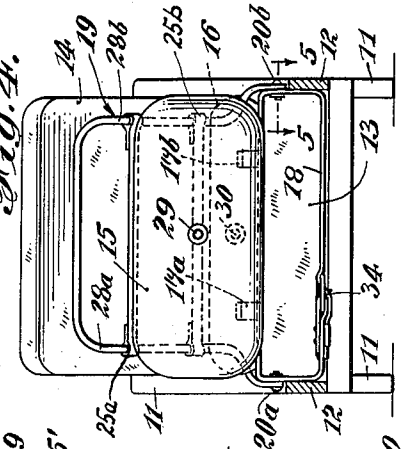


Fig. 4.

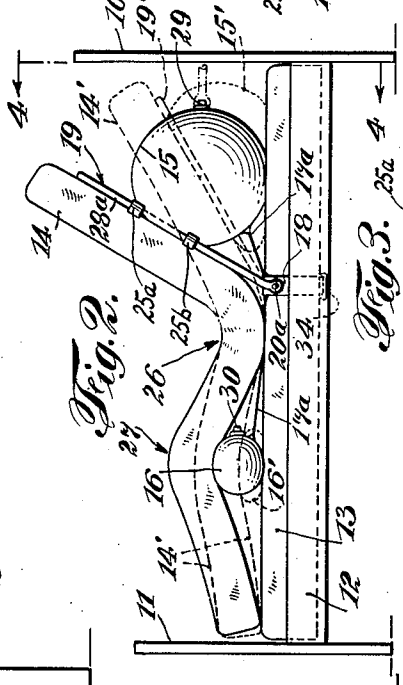


Fig. 2.

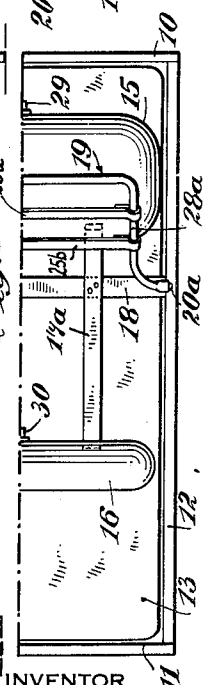


Fig. 3.

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INFLATABLE MATTRESS LIFTERS

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4 Claims. (Cl. 5—68)

This invention relates to apparatus for lifting selected portions of a mattress, and more particularly to an inflatable mattress lifter.

It is well known to employ inflatable bodies to lift whole or only selected portions of mattresses, especially in hospital beds for patients' comfort. These apparatus are more or less permanently attached to the bed and are usually provided with elaborate attachments which render them suitable for a particular size and shape of beds only. Other inflatable bodies have been proposed to be placed onto the mattress in a hospital bed which has proved impractical for sanitary reasons, especially with post-operation patients.

My present invention contemplates the use of one or more elastic inflatable bodies which may be inserted below the mattress in a bed and inflated or deflated by remote control from a pneumatic pump operable by an electric motor. Since the device is suitable for use in any bed frame with mattresses of various sizes, it may advantageously be used as well in hospitals as also in homes to increase the comfort of a person desirous of reading or eating in the bed. When my new device is not in use, i. e. when it is deflated, it may remain below the mattress, which is now lowered onto the bed frame, without causing the slightest discomfort for the person resting on the mattress. Also, when this inflatable attachment is removed from the bed, it occupies very little space since with exception of a stabilizing frame, the whole device may be folded into a very small package, and even this stabilizing frame may be folded together, if desired.

My inflatable device operates with air so that no return lines and reservoirs for gas or liquid are required. Since air is highly compressible, its use as the operating fluid in conventional hydraulic devices is undesirable. The mattress positions would be unstable and the air compressor cumbersome because of the high pressures required. My inflatable device therefore is very large and consequently the operating pressure relatively low. I take advantage of the very characteristic of inflatable cylinders, i. e. that such cylinders, when compressed by two tangential planes, increase their supporting area with the drop in the air pressure therein, whereby the outside force represented by the combined weight of the mattress and of the person resting thereon, and the inside pressure find equilibrium almost instantly. This action is smooth and most comforting and may be compared to the action of an automobile tire which knowingly also absorbs shocks immediately.

As stated above, my inflatable mattress lifter may be used in any size or shape of beds in that it is simply laid between the two mattresses and preferably removably secured to the lower one. However, it is within the scope of this invention to integrate the device with the upper or lower mattress to form a mattress with integral lifter therefor.

Other features and advantages of my invention will become apparent from the following description of a preferred embodiment thereof, taken in conjunction with

the accompanying drawing, and the invention will be finally pointed out in the appended claims.

In the drawing,

Fig. 1 is a side view of a bed showing the deflated mattress lifter of my invention between the upper and the lower mattress, and diagrammatically illustrating the compressor with electric motor, air conduits and control valves;

Fig. 2 is another side view demonstrating on a smaller scale the mattress lifter in operation, i. e. in its inflated position;

Fig. 3 is a partial plan view of Fig. 2 with the upper mattress removed;

Fig. 4 is a partial section, taken along line 4—4 in Fig. 2, as seen in the direction of arrows; and

Fig. 5 is a view illustrating, in section, the pivotal connection between the stabilizing frame and supporting belt.

Similar characters of reference indicate identical parts throughout the various views of the drawing.

Referring now in more detail to Fig. 1, there is shown a bed frame consisting of head **10**, foot **11** and frame **12**, said frame **12** supporting a lower mattress **13** and an upper mattress **14**. Deflated containers or chambers **15** and **16** of light, thin and very flexible plastic or rubber-coated fabric are shown between mattresses **13** and **14**, the larger container **15** being close to the head **10** and the smaller container or air chamber **16** approximately below the mattress portion supporting the knees of a person resting thereon. Preferably two spacing straps **17***a, b* of adjustable length connect the two air cylinders **15** and **16**, and are also secured to a stabilizing belt **18** surrounding the lower mattress **13** in the region below the hip joints of the person resting on the upper mattress. A stabilizing frame **19** of a shape better shown in Fig. 4 is pivotally connected to the belt **18** by a pair of bolts **20***a, b*.

An air compressor **22** is shown driven by an electric motor **21**, and the pipes leading to air chambers **15** and **16** are indicated schematically in dot-dash lines. A pressure relief valve **24** is shown between compressor **22** and chamber **15**, and an air relief valve at **23**. Valve **24** is operated when the chambers **15**, **16** are to be protected from overinflation, and valve **23** serves to deflate the cylinders when the mattress **14** is intended to be lowered onto or closer to mattress **13**. The electric conduit **21***a* for motor **21** may be either integral with the compressed air hose, or it may be an electric cable within said air hose.

Fig. 2 illustrates the mattress lifting arrangement in its operative position, with an intermediate stage of mattress **14** indicated in dash lines at **14'**. It may be seen that the stabilizing frame **19** which is provided with transverse belts **25***a, b* to increase the contacting surface between chamber **15** and said frame **19** on the one hand, and the contact surface with mattress **14** on the other hand, is pivoted around bolts **20***a, b* as the inflation of the chamber **15** progresses and thus lifts mattress **14** to the desired height. The intermediate position **15'** of cylinder **15**, and positions **19'** and **14'** of the stabilizing frame **19** and mattress **14**, respectively, show that the contact surface between frame **19** and chamber **15** diminishes as the inflation of the chamber progresses. As mentioned above, my invention thus utilizes the very characteristic of the inflatable bodies in that the supporting surface increases as the pressure within the inflated body decreases. The mattress is thereby firmly supported at any stage of the pivotal movement of frame **19** and will not yield under the weight of the upper body portion of the person resting thereon.

The operation of the smaller, knee-portion lifting cylinder **16** is identical. Here, too, the intermediate posi-

tions 14' and 16' of mattress 14 and chamber 16, respectively, show the decrease in supporting surface of chamber 16 with progressing inflation thereof. Spacing straps 17*a*, *b* which are adjustable to fit persons of different height, retain chambers 15 and 16 at a desired relative distance. The position of mattress 14 illustrated in full lines in this Fig. 2 shows that my new lifting device can transform a bed into a comfortable upholstered chair providing an ideal rest for the person seated at 26, and having his or her knees resting at 27. Another stabilizing frame may be provided for the smaller cylinder 16 too, if desired.

Fig. 3 is a partial top view of Fig. 2 with the upper mattress 14 removed, showing the strap 17*a* and two belts 25*a*, 25*b* connecting the two arms 28*a*, 28*b* of frame 19. Of course, this frame may be provided with a solid panel or a full-size piece of textile or plastic material to further increase the supporting surface for the mattress 14 and the contact surface with cylinder 15.

Fig. 4 is a view taken along line 4—4 of Fig. 2 and shows the mattress 14 in its raised position. It may be seen in this figure that the frame 19 is preferably shaped in a manner to hide it from view when the mattress lifting device is not in use. Openings 29 and 30 receive the terminals of air supply pipes for chambers 15 and 16, respectively.

Finally, Fig. 5 is an enlarged view illustrating in section one mode of the connection of stabilizing frame 19 to the supporting belt 18. Flattened stabilizer frame tube 28*b* is pivotally mounted on bolt 20*b*, said bolt passing through a reinforcing eye 31 in belt 18. A washer 32 and retaining ring 33 are shown on the other end of bolt 20*b*. The belt 18 is made preferably of canvas, but may also be of any other suitable material, such as plastic or the like. A buckle 34 is shown in Fig. 4 on belt 18 to facilitate the installation and adjustment thereof.

While the relief valve shown in Fig. 1 is desirable in connection with most air compressors, it may be omitted in a centrifugal air compressor built especially for this purpose, since this compressor will only furnish a predetermined maximum pressure. A vacuum cleaner may successfully be employed as a source of compressed air. The pressure relief valve 24 may also be of an adjustable type and serve to limt the mattress inclination for patients that have to be kept below a certain elevation.

While the invention has been described in connection with inflation and deflation of two cylinders 15 and 16 simultaneously, it is understood that various other positions are also within the scope of my invention. For example, only one cylinder may be used. Also, the head cylinder may be inflated and deflated independently in hospital cases where the bed is occupied by a patient with a stiff knee. In such case, a shut-off valve will be provided in the branch line feeding the cylinder 16. Further, the head end assembly may be installed at the foot end for patients that need to elevate the feet and legs. The small cylinder 16 would then be moved toward the head, i. e. the mounting of the mattress support would be turned for 180°. Both cylinders may be equal in size in such cases.

The novel mattress lifting device will find its commonest application in the homes of sick people. However, as stated above, it may become a favorite equipment for any person desirous of reading or eating in bed in a comfortable position. The device may then be operated for use as a back rest only, or if the knee cylinder alone is inflated, a more comfortable leg position may be obtained. A slightly altered device is practical for maternity beds where it is desired to lift the abdominal portion of the patient's body and to keep the legs inclined. Straps 17*a*, *b* will then be shortened to bring one or the other of cylinders 15, 16 below the abdominal portion of the patient.

The remote-control inflating and deflating unit may be operated by the patient's left or right hand, and is preferably mounted on a flexible tube. However, this control may be kept away from the patient at a distance which is out of his reach in cases where a change in the position of his body is undesirable or damaging. If this control is within patient's reach, he is able to adjust the upper mattress for maximum comfort without any assistance.

While I have described one embodiment of my invention, I do not desire to be limited thereto, as obvious modifications may occur to a person skilled in the art within the scope of my invention, as defined in the appended claims.

I claim:

1. A mattress lifting device for a bed comprising in combination a pair of inflatable cylinders, belts connecting said cylinders, a flexible member removably and adjustably securing said belts to a support beneath said mattress, a supporting frame pivotally connected at one end to said flexible member between said cylinders and adapted to be interposed between said mattress and one of said cylinders, and means for controllably inflating and deflating said cylinders.

2. In combination with a mattress having an upper side to support the body of a person resting thereon, and a lower side, an inflatable container, a support beneath said mattress, a flexible member secured to said container, means for releasably and adjustably securing said flexible member to said support, a mattress lifting frame pivotally connected at one end to said means, said mattress lifting frame having an upper surface for supporting a portion of said mattress and a lower surface resting on said container and being of a width no greater than the width of said mattress, and means for controllably inflating and deflating said container, the inflation of said container causing said container to act against the lower surface of said frame to cause said frame to act against said mattress to lift said mattress to a desired position, and the deflation of said container causing said mattress to return to its initial position.

3. In combination with a mattress having an upper side to support the body of a person resting thereon, and a lower side, an inflatable air cylinder extending transversely of said mattress and being of a length no greater than the width of said mattress, a support beneath said mattress, a flexible member secured to said air cylinder, means for releasably and adjustably securing said flexible member to said support, a generally-rectangularly-shaped mattress lifting frame pivotally connected to said means at one end of said frame and having an upper surface for supporting a portion of said mattress and a lower surface resting on said air cylinder, said frame being of a length no greater than half the length of said mattress and being of a width no greater than the width of said mattress, and means for controllably inflating and deflating said air cylinder.

4. In a mattress lifting device of the character described, the combination of a first comparatively large, inflatable cylindrical container of a length substantially corresponding to the width of the mattress, a second comparatively small inflatable cylindrical container substantially corresponding in length to said first container, a plurality of straps connecting said first and second containers, a belt secured to the underside of each of said straps for adjustably securing said containers to a support under said mattress, a generally rectangular-shaped mattress lifting frame pivoted at one end to said belt between said containers for pivotal movement about an axis extending transversely of said mattress, the upper side of said frame supporting said mattress and the lower side of said frame resting on said first container, said frame being of a width not exceeding the width of said mattress, and means for controllably inflating and deflating said cylinders, whereby said frame and said

second container are adapted to independently raise different portions of said mattress when said containers are inflated and to independently lower different portions of said mattress when said containers are deflated.

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