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(54) APPARATUS FOR CONSTRUCTING A CARRYING
 DEVICE FOR MEDICAL AND VETERINARY USE

(71) We, DONALD ALFRED JORDAN of 53, Bayswater Road, Croydon, Victoria, Australia, and LAURENCE JOHN HARTNETT of "Rubra", Watts Parade, Mt. Eliza, Victoria, Australia, both Australian citizens, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an apparatus for constructing a carrying device, for medical or veterinary use, where the posture of a body to be lifted and carried is not to be disturbed. The invention also relates to a carrying device constructed from such apparatus.

Further injury may be caused to a body during lifting and carrying the body in carrying apparatus such as conventional canvas stretchers, in which the weight of the body is supported at only a few points in the stretcher mainly where the shoulder and buttocks contact the stretcher.

In order to place the accident victim on to a conventional stretcher it is necessary to lift him from the supine position. Several devices have been designed to overcome the need to lift the victim. One of these devices, known in Australia, comprises a stretcher frame combined with battens which can be slid under the patient and clipped onto the frame utilizing a curved lip on the ends of the battens. In practice these battens are difficult to slide under patients and equally difficult to clip onto the frame. Also any upward force from beneath the patient would dislodge the battens from the frame. However the most serious drawback is that this device simply simulated the conventional stretcher once the patient was in position, the body weight being effectively

supported by only a few of the battens, thus causing the body to shift, once it was lifted.

It has been recognized for some time that in moving injured persons equal support should be given to various parts of the body to reduce body movement to a minimum. A very effective manual system called the Rautek lift is used by ambulance officers in the handling of injured persons. In this method a number of persons (the minimum is three) stand laterally astride the prone or supine body and using their hands support the body, primarily at head, shoulders, buttocks and legs, in an even manner so that any injuries are not aggravated.

The Rautek technique is also used for persons injured in the sitting position (as in automobile accidents) whereby the person is lifted in such a way that the sitting posture is maintained, and the vital spinal and pelvic areas supported by the knee of the person lifting the injured person.

Thus the principal object of this invention is to simply mechanise the Rautek lift especially for the handling of persons with spinal or similar injury so that the use of the invention will not only decrease the number of times a person is required to be moved before treatment commences but primarily is concerned with providing adequate support to the injured person so that all parts or vital parts of the body are substantially equally and correctly supported.

According to a first aspect of the present invention there is provided apparatus for constructing a carrying device for medical or veterinary use where the posture of a body to be lifted and carried is not to be disturbed, which apparatus comprises a frame having two spaced-apart elongate members, means for supporting the elongate members above a surface which supports a

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body to be lifted, each elongate member having a plurality of spigots spaced apart therealong, and flexible battens each having at least one aperture adjacent one end thereof and a plurality of apertures spaced apart along the length of the batten adjacent the other end thereof, whereby a carrying device for lifting and carrying a body can be constructed by arranging the frame so that the elongate members are disposed one on either side of the body, sliding each batten under the body and thereafter inserting a spigot on one of the elongate members in the aperture adjacent said one end of respective battens, and inserting a spigot on the other elongate member in any one of the apertures adjacent the other end of the respective battens.

According to a second aspect of the present invention there is provided an apparatus for constructing a carrying device for medical or veterinary use where the posture of a body to be lifted and carried is not to be disturbed, which apparatus comprises a frame having two spaced-apart elongate members, means for supporting the elongate members above a surface which supports a body to be lifted, and flexible battens each of which is attached to one of the elongate members adjacent one end of the batten, each batten having a plurality of apertures spaced apart along the length of the batten adjacent the other end thereof, and the other elongate member having spigots, spaced apart therealong, for insertion in any one of the apertures adjacent the other end of a respective batten, whereby a carrying device for lifting and carrying a body can be constructed by arranging the frame so that the elongate members are disposed one on either side of the body, sliding each batten under the body, and thereafter inserting a spigot on the said other elongate member in any one of the apertures adjacent the other end of a respective batten.

According to a third aspect of the present invention there is provided a carrying device for medical or veterinary use where the posture of a body to be lifted and carried is not to be disturbed, which device comprises a frame having two spaced-apart elongate members, means for supporting the elongate members above a surface which supports a body to be lifted, and flexible battens, each of which is attached to one of the elongate members adjacent one end of the batten, each batten having a plurality of apertures spaced apart along the length of the batten adjacent the other end thereof, and the other elongate member having spigots, spaced apart therealong, each spigot being inserted in any one of the apertures adjacent the other end of a respective batten.

Conveniently the frame may be of any suitable material of sufficient strength to support a body and may be rectangular for use instead of the conventional stretcher in accident cases. However, the frame may be of a different shape for moving patients from chairs or beds either in the sitting or supine positions. Preferably a rectangular frame for accident use has on its underside short legs or other suitable means to raise the frame sufficiently above the level of a surface which supports a body to be lifted or carried so that the battens can be suitable tensioned to accept a portion of the body weight by shortening the effective length of the batten (i.e. the length of the batten between the points of attachment to the elongate members).

Advantageously the frame is supported at least three inches above the surface on which the body rests, i.e. ground level if the patient is on the ground.

The use of apparatus in accordance with this invention simulates the Rautek lift but in a more efficient manner as the flexible battens extending underneath the body are comparable to the hands and knees of the persons supporting and carrying the patient as taught in the Rautek technique.

The tensioning of the battens by inserting a spigot on respective elongate members in an appropriate pair of apertures of each batten ensures that each batten is properly supporting a portion of the body so that the body is supported at as many points as there are flexible battens. The usual tension taken in fixing the flexible battens to the frame is about six pounds.

In the case of lifting a body in a sitting position, the batten to support the main body weight is preferably shaped so that the spinal area is supported by the batten between points at which the batten is fixed to the frame. In this instance, the means for supporting the elongate members extends at least nine inches below the frame. This may also apply with patients lifted from beds in the supine or prone positions.

Another frame in accordance with the present invention may comprise a subsidiary frame, disposed at that end of the frame where the head and shoulders of the patient lie. This subsidiary frame can be raised to form an inclined platform, when the flexible battens are secured, for the head and shoulders. The battens are secured in the normal way and then the subsidiary frame is raised and locked in position to provide an inclined support.

Conveniently the flexible battens may be of any suitable material and are usually long enough to extend laterally across the frame either at right angles to it or obliquely to form a criss-cross pattern depending upon

the use required. The battens must be stiff enough to be slid under a body so that they can be secured to the frame.

When a body is in a supine position the parts of the body requiring support are not in the same plane and some of the flexible battens will require more curvature (that is greater length) than others, depending on which part of the body is supported. Thus when the body is lifted it will have precisely the same posture as that it assumed in the supine position.

Each batten may have only one hole at one end thereof. The series of holes at the other end of the batten may be staggered and not in a straight line to allow for closer spacing and smaller variations in the effective length of the batten.

In order to prevent the battens from easily disengaging the spigots and to also allow easy securing of the battens to the frame, each spigot on each elongate member may be inclined towards a corresponding spigot on the other elongate member, and each spigot may be shouldered or headed. When the battens are in position, the ends thereof curve upwardly towards the elongate members and the spigots are therefore preferably arranged so that they will extend approximately perpendicularly to the adjacent ends of the batten to afford easy attachment. Any force applied under the body forcing the batten upward would alter this angle and because of this the accidental removal of the batten is difficult.

The supporting flexible batten used to carry the head is preferably wider than the other battens and preferably includes an inflatable air cushion to support the head and prevent it rolling while the frame is being moved.

The preferred flexible battens used in the present invention are composed of high density polyethylene or high density P.V.C. The edges of these battens are preferably polished and buffed to eliminate surface deformities as such irregularities can collect undesirable matter which in turn affect the translucency of the battens to x-rays and impose misleading blemishes on the x-ray picture. The flexible battens are selected for their translucency to x-rays as this avoids having to move the patient from the frame while x-ray photographs are taken.

The preferred flexible battens are easily cleansed and sterilized by wiping with alcohol or a sterilization agent prior to use and do not present the sterilization and cleansing problems associated with conventional stretchers or lifting devices.

In order to allow for ease in sliding the flexible battens under the patient's body, towards the leading edge they are tapered and reduced in cross section to decrease resistance.

The battens are usually of approximately rectangular shape (tapered at the leading end) especially when used on stretchers but may be of different design when used for lifting in the sitting position. The batten supporting the patient's back in a carrying device for supporting a patient in the sitting position may for example be of an elongate trapezoidal form; wide in the centre, tapering towards each end.

The batten for use as a seat is preferably of a special design comprising, when in position a U-shaped batten having a pair of apertures adjacent each end of the batten. The perpendicular plane which bisects the line joining the aperture of each pair thereof should normally pass through the line of weight due to the pelvic thrust of the patient. This line of weight is through the buttock bones of the patient's body and as his weight is concentrated there it is difficult to insert the batten. For this reason an approximately half oval section is cut out of the seat portion so that the seat batten is inserted around the buttocks, and so that the above mentioned plane coincides with the vertical plane through the buttock bones of the patient. To aid insertion of the buttock batten a further batten is placed behind the knee which raises the thighs.

The frames encompassed within this invention may be handled manually or by using a lifting apparatus comprising a base, a vertical support arm and a jib arm having at its free end means adapted to secure the frame. This apparatus may be fixed or mobile wherein the base is a wheeled chassis.

The jib arm is preferably adjusted by an hydraulic jacking mechanism. The jib arm preferably has a pivotable frame securing means which secures the frame about its centre of gravity to stabilize it. This mobile lifting apparatus is extremely useful with incapacitated patients who are to be lifted in a sitting position for instance. The jib arm extends across the front of the patient and the frame secured to the jib arm holds the seat batten described above so that the patient's weight acts parallel to the perpendicular plane which bisects the line joining the aperture of each pair thereof. One or more back support battens extend behind the patient's back to maintain the sitting position.

A mobile lifting device of this construction may be used to transport invalids from bed to a vehicle and can insert the seated patient through a vehicle doorway and place them in the seat. The suspended frame is pivotable both horizontally and vertically at the end of the jib arm. Similarly patients who are to be lifted in the supine position off beds for example can be so moved by this unit.

For a better understanding of the present invention and to show how the same may be carried into effect reference will now be made, by way of example, to the accompanying drawings in which:—

Figures 1A and 1B show views of a carrying device constructed from apparatus in accordance with the present invention,

Figure 2 shows a batten forming part of the apparatus of Figure 1A,

Figures 3, 4 and 5 show a batten forming part of another apparatus in accordance with the present invention for supporting the weight of a patient in a seated position,

Figure 6 shows a perspective view of a mobile lifting apparatus for supporting a carrying device in accordance with the present invention and

Figure 7 shows the lifting apparatus of Figure 6 supporting the carrying device.

Referring firstly to figures 1A, 1B and 2, a generally rectangular frame, comprising elongate members 1 which form the longer sides thereof, is formed from one inch tubular steel and weighs approximately six pounds. The frame is coated with P.V.C. An embodiment not illustrated includes a folding frame for easy storage. The frame is supported above a surface which supports a body to be lifted by supports 20 to allow for easy tensioning of the flexible battens during use. P.V.C. or high density polyethylene battens 2 have holes 3 which co-operate with spigots 4 on the elongate members 1. Each spigot on each elongate members 1 is inclined towards a corresponding spigot on the other elongate member to facilitate attachment of the battens to the frame. As is shown a series of holes are provided at one end of each batten so that its effective length is adjustable. The holes may be staggered to provide a finer adjustment to the effective length. The battens may be crossed as shown in Figure 1 if extra support for a particular part of the body is required.

Figures 3 to 5 show a batten for use as a seat on the mobile lifting apparatus shown in Figure 6. Holes 5 are so positioned that the line 6 which bisects lines forming each pair of apertures 5 will normally lie approximately in the plane through which the weight of the body acts on the seat. A cut away section 7 avoids sliding the seat under that part of the body where the weight is concentrated. This construction allows the seat to be positioned under a patient without lifting the patient.

In figure 6 a wheeled chassis or base 8 carries a vertical support arm 9 from which an hydraulically adjustable jib arm 10 extends. The jib arm pivots vertically at 11 and can be raised or lowered by a telescoping arm 12 operated by a fluid line extending from a fluid reservoir 13 and pumped by an operating lever 14.

A vertical pivot 15 allows the frame 16 to be rotated in a horizontal plane while a pivot 17 allows for rotation in a vertical plane.

Spigots 18 are adapted to support battens such as that shown in Figure 2 or that shown in Figures 3 to 5.

If the body is to be supported in a sitting position spigots on arm 19 of the frame 16 are used to support battens extending around the back of the patient.

Figure 7 shows a patient lying on a bed 26 in position to be lifted by the apparatus of Figure 6. The head batten 21 supports the head and it can be seen that this batten and each of the other battens 22 vary in the distance they extend below the frame. A batten is placed under the knees, the thighs, the small of the back and at several points between the small of the back and the shoulders, and a further batten is placed under the upper part of the shoulders at the base of the neck. It can be seen in figure 7 that the effective length of each batten between the sides of the frame varies according to the position of that part of the body which it supports. For a patient in the supine position those parts of the body in which the body weight is concentrated (e.g. buttocks and shoulders) will be lower than other parts such as the knees and the small of the back.

From the foregoing it will be seen that the present invention provides apparatus for constructing a carrying device for moving injured or invalid persons or animals without aggravating their injuries by disturbing the assumed posture.

This prime advantage is supplemented by the cradling effect of the battens due to their extending below the plane of the frame and partially holding the sides of the patient to prevent any lateral movement of the patient's body.

A further advantage is that in certain circumstances such as where stomach injuries have been inflicted, it is desirable to place the patient into an assumed posture (in a partially bent posture) to afford better protection. This can easily be achieved using a carrying device constructed from apparatus according to the invention, the weight of the various parts of the body being substantially equally supported as described above.

A still further advantage, afforded by one aspect of the invention, is that incapacitated persons may be moved with the minimum of disturbance, no change in position being required.

WHAT WE CLAIM IS:—

1. Apparatus for constructing a carrying device for medical or veterinary use where the posture of a body to be lifted and carried is not to be disturbed, which apparatus



For a better understanding of the present invention and to show how the same may be carried into effect reference will now be made, by way of example, to the accompanying drawings in which:—

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Figures 3, 4 and 5 show a batten forming part of another apparatus in accordance with the present invention for supporting the weight of a patient in a seated position,

Figure 6 shows a perspective view of a mobile lifting apparatus for supporting a carrying device in accordance with the present invention and

Figure 7 shows the lifting apparatus of Figure 6 supporting the carrying device.

Referring firstly to figures 1A, 1B and 2, a generally rectangular frame, comprising elongate members 1 which form the longer sides thereof, is formed from one inch tubular steel and weighs approximately six pounds. The frame is coated with P.V.C. An embodiment not illustrated includes a folding frame for easy storage. The frame is supported above a surface which supports a body to be lifted by supports 20 to allow for easy tensioning of the flexible battens during use. P.V.C. or high density polyethylene battens 2 have holes 3 which co-operate with spigots 4 on the elongate members 1. Each spigot on each elongate members 1 is inclined towards a corresponding spigot on the other elongate member to facilitate attachment of the battens to the frame. As is shown a series of holes are provided at one end of each batten so that its effective length is adjustable. The holes may be staggered to provide a finer adjustment to the effective length. The battens may be crossed as shown in Figure 1 if extra support for a particular part of the body is required.

Figures 3 to 5 show a batten for use as a seat on the mobile lifting apparatus shown in Figure 6. Holes 5 are so positioned that the line 6 which bisects lines forming each pair of apertures 5 will normally lie approximately in the plane through which the weight of the body acts on the seat. A cut away section 7 avoids sliding the seat under that part of the body where the weight is concentrated. This construction allows the seat to be positioned under a patient without lifting the patient.

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From the foregoing it will be seen that the present invention provides apparatus for constructing a carrying device for moving injured or invalid persons or animals without aggravating their injuries by disturbing the assumed posture.

This prime advantage is supplemented by the cradling effect of the battens due to their extending below the plane of the frame and partially holding the sides of the patient to prevent any lateral movement of the patient's body.

A further advantage is that in certain circumstances such as where stomach injuries have been inflicted, it is desirable to place the patient into an assumed posture (in a partially bent posture) to afford better protection. This can easily be achieved using a carrying device constructed from apparatus according to the invention, the weight of the various parts of the body being substantially equally supported as described above.

A still further advantage, afforded by one aspect of the invention, is that incapacitated persons may be moved with the minimum of disturbance, no change in position being required.

WHAT WE CLAIM IS:—

1. Apparatus for constructing a carrying device for medical or veterinary use where the posture of a body to be lifted and carried is not to be disturbed, which apparatus



- comprises a frame having two spaced-apart elongate members, means for supporting the elongate members above a surface which supports a body to be lifted, each elongate member having a plurality of spigots spaced apart therealong, and flexible battens each having at least one aperture adjacent one end thereof and a plurality of apertures spaced apart along the length of the batten adjacent the other end thereof, whereby a carrying device for lifting and carrying a body can be constructed by arranging the frame so that the elongate members are disposed one on either side of the body, sliding each batten under the body and thereafter inserting a spigot on one of the elongate members in the aperture adjacent said one end of respective battens, and inserting a spigot on the other elongate member in any one of the apertures adjacent the other end of the respective battens.
2. An apparatus according to Claim 1 wherein the support means comprises legs which are fixed to the elongate members and which extend from the elongate members for supporting the same at least three inches above a surface which supports a body to be lifted.
3. An apparatus according to Claim 1 or 2, wherein the frame comprises substantially U-shaped cross-members which each extend from one elongate member to the other elongate members in planes which are inclined with respect to a plane in which the elongate members lie.
4. An apparatus according to Claim 1, 2 or 3, wherein each spigot on each elongate member is inclined towards a corresponding spigot on the other elongate member and is shouldered or headed to facilitate attachment of the battens to the frame and to prevent accidental detachment of the battens therefrom.
5. A carrying device constructed from the apparatus of any one of the preceding claims, wherein the frame is attached to an adjustable jib arm which is pivotally connected to a vertical support arm which is mounted on a base.
6. A carrying device according to Claim 5, wherein the base is a wheeled chassis and the jib arm is adjustable by means of an hydraulically operated telescoping arm extending from the vertical support arm to the jib arm.
7. A carrying device constructed from the apparatus of any one of claims 1 to 4.
8. A carrying device for medical or veterinary use, substantially as hereinbefore described with reference to, and as shown in, Figures 1 and 2 of the accompanying drawings.
9. A carrying device for medical or veterinary use, substantially as hereinbefore described with reference to and as shown in, Figures 6 and 7 of the accompanying drawings.
10. A carrying-device according to Claim 8 or 9, as modified by reference to Figures 3, 4 and 5 of the accompanying drawings.
11. An apparatus for constructing a carrying device for medical or veterinary use where the posture of a body to be lifted and carried is not to be disturbed, which apparatus comprises a frame having two spaced-apart elongate members, means for supporting the elongate members above a surface which supports a body to be lifted, and flexible battens each of which is attached to one of the elongate members adjacent one end of the batten, each batten having a plurality of apertures spaced apart along the length of the batten adjacent the other end thereof, and the other elongate member having spigots, spaced apart therealong, for insertion in any one of the apertures adjacent the other end of a respective batten, whereby a carrying device for lifting and carrying a body can be constructed by arranging the frame so that the elongate members are disposed one on either side of the body, sliding each batten under the body, and thereafter inserting a spigot on the said other elongate member in any one of the apertures adjacent the other end of a respective batten.
12. A carrying device for medical or veterinary use where the posture of a body to be lifted and carried is not to be disturbed, which device comprises a frame having two spaced-apart elongate members, means for supporting the elongate members above a surface which supports a body to be lifted, and flexible battens, each of which is attached to one of the elongate members adjacent one end of the batten, each batten having a plurality of apertures spaced apart along the length of the batten adjacent the other end thereof, and the other elongate member having spigots, spaced apart therealong, each spigot being inserted in any one of the apertures adjacent the other end of a respective batten.
13. An apparatus for constructing a carrying device for medical or veterinary use, substantially as hereinbefore described with reference to and as shown in Figures 1 and 2 of the accompanying drawings.
14. An apparatus according to Claim 13 as modified by reference to Figures 3, 4, and 5 of the accompanying drawings.



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