

EUROPEAN PATENT APPLICATION


 Application number: **90305696.8**


 Int. Cl.⁵: **A61G 7/10**


 Date of filing: **25.05.90**


 Priority: **21.03.90 GB 9006385**
25.05.89 GB 8912044


 Date of publication of application:
28.11.90 Bulletin 90/48


 Designated Contracting States:
BE DE FR GB NL SE


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Lifting device.


 A mobile lifting device for handling incapacitated, injured or infirm comprises a column mounted on a chassis supported by ground engaging wheels incorporating a chassis comprising: a box section member; a panel or panels forming a substantial part of at least one wall of the member, the or each panel being removable to provide access to the interior of the member the, or each, panel when secured in place serving as a stressable part of the member and contributing to the torsional rigidity of the member; and a pair of legs on which are mounted the ground engaging wheels linked by the box section; the column being secured at its lower end to, for load bearing support by, the box section member; and a crane arm supported by the column at or near the one end of the arm by the column and being adapted at or near the other end to the one end to receive a carrier whereby the device supports a load to be lifted. The use of a box section chassis enables heavy components of the device to be housed at the lowest position in the device so providing for a low centre of gravity while enabling the components to be readily accessed.

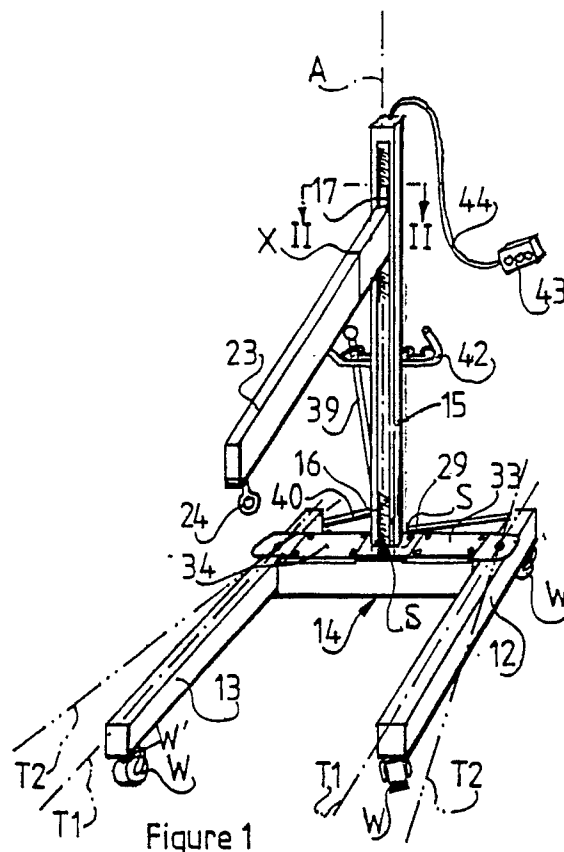


Figure 1

LIFTING DEVICE

This invention is concerned with a lifting device. It is particularly concerned with a mobile lifting device for lifting an incapacitated, injured or infirm person.

The design and development of such a device involves overcoming a number of problems and providing a number of facilities. The device must be readily moved and maneuverable in a limited space when loaded with a person. It should move and be operable in a way which does not engender alarm in a person supported by it. It must be capable of lifting a person over a reasonable vertical height such as from floor level to above bed height to enable a person lifted by the device to be raised from floor level and lowered onto a bed. It needs to be transportable and capable of assembly and use by well meaning but not necessarily skilled staff. It is likely to be used for an extended period without systematic, or indeed any, maintenance. In addition any resulting device should be readily and cheaply produced.

According to the present invention there is provided a lifting device comprising a column mounted on a chassis supported by ground engaging means such as wheels characterised in that the chassis comprises: a box section member and including a panel or panels forming a substantial part of at least one wall of the member, the or each panel being removable to provide access to the interior of the member; the, or each, panel when secured in place serving as a stressable part of the member and contributing to the torsional rigidity of the member.

According to a first preferred form of the present invention the lifting device is characterised in that the column is permanently or demountably secured at its lower end to, for load bearing support by, the box section member; and a crane arm is supported by the column at or near the one end of the arm by the column; the crane arm being adapted at or near the other end to the one end to receive a carrier whereby the device supports a load to be lifted.

According to a second preferred form of the present invention or the first preferred form thereof the lifting device is characterised by a pair of legs joined by the box section; the legs serving to locate the ground engaging means.

According to a third preferred form of the first or second preferred forms the device is characterised in that one leg of the pair thereof is pivotably connected to one end of the box section and the other leg of the pair is pivotably connected to the other end of the box section to the one end. Typically the legs are connected by a linkage op-

erable by a lever to enable the legs to be moved between, or retained in one of, a number of positions, at least one of the positions being such that the pair of wheels on one leg are on an axis which is parallel to a corresponding axis for the pair of wheels on the other leg.

According to a fourth preferred form of the present invention or of any preceding preferred form thereof the device is characterised in that: the column incorporates a slot extending over a major part of the length of the column; the column incorporates a threaded shaft mounted for rotation relative to the rest of the column and extending substantially co-extensively with the slot; a motor is mounted within the load bearing member having an output shaft demountably coupled to one end of the threaded shaft; and the crane arm incorporates a carriage disposed at least in part within the housing and in part extending out of the housing by way of the slot; the part within the housing engaging the shaft being thereby enabled for linear motion in a direction depending on the direction of rotation of the shaft; that part of the carriage extending out of the housing being either integral with, or adapted to demountably receive, the remainder of the arm.

According to a fifth preferred form of the present invention or the first, second or third preferred forms thereof a lifting device is characterised in that the crane arm is pivotable about the one end of the arm on the column and there is provided a longitudinally extendible and retractable strut having one end located on the crane arm intermediate the ends of the crane arm and the other end to the one end located on the column. Typically the strut is caused to extend or retract by way of an electric motor.

Two exemplary embodiments of the invention will now be described with reference to the accompanying drawings of a patient lifting device (hereafter referred to as a 'lift') of which:

Figure 1 is a perspective front view of a first embodiment

Figure 2 is a cross-section taken on section II - II' of Figure 1;

Figure 3 is a plan view of a part of Figure 1;

Figure 4 is a section on cross-section IV - IV of Figure 3; and

Figure 5 is a side view of a second embodiment.

A component appearing in more than one figure is given the same reference numeral in each figure in which it appears.

FIRST EMBODIMENT (Figures 1 to 3)

The lifting device is made up of a chassis 11 comprising a box section member 14 which serves to space, and has pivotably secured to its extremities, legs 12, 13 equipped with pivoted wheels W on trailing arms W'.

The box section member 14 has mounted at its centre a column 15 which is demountably secured to integral centre panel 29 of the member 14 by way of three bolts S so that bending and twisting loads applied to the column 15 are fed into and resisted by the completely assembled box section member 14.

The column 15 (Figure 3) is made up of two discrete longitudinal sections C1, C2.

Section C1 has positioned within it a screw threaded shaft 16 on which is mounted a complementarily threaded vertical carriage 17. The shaft 16 is coupled (Figure 3) to a motor 18 located in the box member 14 beneath the column 15. The direction of rotation of the shaft 16 by the motor 18 governs whether the carriage 17 is raised or lowered. The carriage 17 is equipped with pairs of top rollers R1 and bottom rollers R2 which are adapted for rotation about a horizontal axis H lying transverse axis A of the shaft 16.

The pairs of rollers are spaced apart to distribute any bending load fed into the carriage 17. The upper pair of rollers R1 contact the rear faces of flanges 19 of the column 15. The lower pair of rollers R2 contact the rear inner face 9 of the column 15. The carriage 17 projects forwardly out of the column 15 through slot 20 to provide a demountable coupling X which in this case is to an end mounting 22 of crane arm 23 whose other end incorporates a bracket 24 by means of which an invalid chair can be carried. The demountable coupling X allows the crane arm to be replaced by alternative arms with end fittings, for example, for a plain or wheeled chair which needs to be carried by the device in a particular attitude.

Section C2 serves as a conduit for electrical cable 8 whereby control signals are conveyed to electrical components located at the base of the column 15 in the member 14 as will be described hereafter from a hand control 43 linked to the remainder of the device by a cable 44. By housing the cable 8 in this way it is protected from damage by moving parts or mishandling when the device is in use.

The box section member 14 is a sheet steel fabrication of 16 gauge material. The member 14 includes U shaped channel 25 having its ends closed by angled end plates 25A, 25B; a central bridge section 29; and removable top plates 33, 34 (shown only in Figures 1 and 4 but omitted in Figure 3 for the sake of clarity). The interior of the

member 14 is divided up into compartments L, M, N by parallel transverse walls 50, 51, 52, 53. In addition compartment N is divided into two parts by wall 54.

Top plates 27, 28 are welded to the member 14 (plate 28 being shown in ghosted outline) and extend laterally. The underside of the member 14 is a continuous plate 30 provided with laterally extending end plates 31, 32. The upper and lower end plates serve as demountable attachment points for pivots P, P' for, respectively, the legs 12, 13.

Access to the interior of the member 14 is provided by way of the two top plates 33, 34. Plate 33 is secured to the rest of the member 14 by way of four shouldered bolts which are secured in a combined plain and threaded location mountings 36 welded to the member 14 in the vicinity of the joins between the walls 50, 51 and the side walls of the member 14. Likewise plate 34 is secured to a combined plain and threaded location mounting 35 welded to the member 14 in the vicinity of the joins between the walls 52, 53 and the side walls of the member 14. The shouldered bolts are made up of a lower threaded portion and a plain upper portion of larger outside diameter than the threaded portion. On being secured in their corresponding location mounting the plain portion of the bolt acts as a close fitting dowel in a complementary plain part X (Figure 4) of the location mounting and the threaded portion of the bolt engages with the threaded portion of the location Y mounting. By dowelling the securing bolts in this way the plates 33, 34 when secured in position contribute to the overall structural integrity, strength and torsional stiffness of the box section member 14.

The box section member 14 houses electric motor 18 (immediately beneath column 15) powered by way of batteries such as battery 37 housed within the box section. The top plates 33, 34 being removable allow of ready access for servicing or removal and replacement of batteries 37, motor 18 and any circuit control components. The motor 18 has an output shaft which engages the lower end of the shaft 16 by way of a clutch to allow the ready separation of the column 15 and shaft 16 from the box member 14. Likewise the cable 8 in compartment C2 is connected at its point of entry into the box member 14 by way of a plug so that the cable 8 is readily disconnected from components within the box member on separation of the column 15 from the box member 14.

The relative angular alignment of the legs 12, 13 when the device is being rolled along on its wheels can be adjusted by way of lever 39 acting through linkage 40. The top of the lever 39 is pushed to seat in one of three possible detents on a retaining rack 41 mounted on the column 15 by way of a pair of handles 42 in the form of cow

horns which enable the trolley to be readily moved or manoeuvred. The ability to vary the alignment of the legs 12, 13 enables the device to be manoeuvred in as convenient and as stable a manner as possible. In normal forward travel the legs 12, 13 are aligned parallel as shown by chain dotted lines T1. When it becomes necessary to position the device close to an installation such as a bed, bath, basin or lavatory the legs 12, 13 can be readily realigned to promote ease of access and provide for maximum lateral stability while raising or lowering an occupant carried by way of the crane arm. Double chain dotted lines T2 show a spaced form of alignment for this purpose.

The raising and lowering operation of the device is regulated by way of control button panel 43 on a trailing lead 44 which is fed into the column to pass (Figure 2) by way of cable 8 in section C2 to the base of the column 15. In this way the major part of the wiring for the device is enclosed within, and so shielded by, the column 15 and the member 14. The use of a panel 43 on a trailing lead enables an operator of the device to locate themselves close to a person being lifted so that they can reassure the person and communicate readily with the person while maintaining control of the device.

SECOND EMBODIMENT

Figure 5 shows a further lift device with a similar chassis and leg arrangement to that described in connection with Figure 1 but incorporating a different type of column, crane arm and lifting arrangement. The lift is made up of a chassis 51 comprising legs 52, 53 equipped with pivoted wheels W on trailing arms W' at their extremities. The leg 52 is pivotably retained on the ends of a box section member 54 to pivot about vertical axis V. In a corresponding way leg 53 is mounted at the opposite end of the member 54. The relative angular alignment of the legs 52, 53 is controlled in the same way as that described in connection with Figures 1 - 3 with relation to legs 12, 13. Effectively the member 54 is identical to the member 14 described in connection with Figures 1 to 3 saving that member 54 only houses batteries.

The member 54 has mounted at its centre a column 55 which is demountably secured to a centre, integral, panel of the member 54 by way of three bolts S.

Seen from the side the column 55 is raked backwardly relative to the vertical and is equipped at its upper end with end plates 56 in which is mounted a pivot pin 57. A mounting bracket 58 is welded to the column 55.

A cranked crane arm 59 with inner section 60

and outer section 61 is pivotably mounted by its inner end 62 on the pivot pin 57. Outer end 63 of the arm 59 incorporates a lifting eye 60 for a conventional lifting sling. Other lifting components can be used in place of eye 60. The use of a cranked crane arm 59 reduces the overall working height of the device as against that of a device utilising an un-cranked arm while providing for a greater vertical working range than heretofore. That is to say the embodiment can be operated so as to lower the eye 60 very close to the floor to facilitate the recovery of a person lying on the floor while being able to raise the eye to a height well above a bed.

The arm 59 is raised and lowered by way of an extendible and retractable strut 64. One end of the strut 64 is attached by pivot pin 65 to mounting bracket 58. The other end of the strut 64 is attached by pivot pin 66 to the inner section 60 of the arm 59. The strut 64 is a telescopic screw unit incorporating an electric motor assembly 67 by means of which the length of the strut between pivot pins 65, 66, and so the height of the eye 60, can be controllably varied. The motor assembly 67 is energised by means of the batteries housed in the member 51. Operation of the motor, and so control of the raising and lowering of the lifting eye 60 is governed by a push button pad 68 on a trailing lead 69.

ADVANTAGES

Among other benefits of the lifting device described in the exemplary embodiments is the use of a demountable but rigidly connected box section member and column to resist loads fed into the device by way of a crane arm during operation of the device. The use of member with removable plates enables advantage to be taken of the available space within the member for motor and batteries while allowing access to them by way the plates which when secured in position contribute structural strength and stiffness to the assembled device.

In this way the structural function of the member is achieved by way of a relatively light beam (weighing of the order of half the weight of a conventional girder chassis). Not only is the box member light but it serves as a housing for the effective protection of at least the batteries, motor and control unit (as described in the first embodiment) and the batteries in the second embodiment. The location of the member and its contents at the lowest part of the device provides a low centre of gravity for, and so contributes to the stability of, the device. A further advantage of using the member both as a structural member and as a housing for

operational components such as batteries and motor lies in the overall weight of the device being kept to a minimum.

To provide protection to persons being raised by mean of the lift the lower part of the device, in particular the box section member 14, is shrouded by a padded and/or smooth material to ensure that when a person who is being lifted by means of the device contacts or slides over the shrouded area to a greater or lesser extent they will not be liable to injury from an edge or projection on the device.

Claims

1 A lifting device comprising a column mounted on a chassis supported by ground engaging means such as wheels characterised in that the chassis comprises: a box section member made including a panel or panels forming a substantial part of at least one wall of the member, the or each panel being removable to provide access to the interior of the member; the, or each, panel when secured in place serving as a stressable part of the member and contributing to the torsional rigidity of the member.

2 A lifting device as claimed in Claim 1 characterised in that the column is secured at its lower end to, for load bearing support by, the box section member; and a crane arm is supported by the column at or near the one end of the arm by the column: the crane arm being adapted at or near the other end to the one end to receive a carrier whereby the device supports a load to be lifted.

3 A lifting device as claimed in any preceding claim characterised by a pair of legs joined by the box section; the legs serving to locate the ground engaging means.

4 A lifting device as claimed in Claim 3 characterised in that one leg of the pair thereof is pivotably connected to one end of the box section and the other leg of the pair is pivotably connected to the other end of the box section to the one end.

5 A lifting device as claimed in Claim 4 wherein the legs are connected by a linkage to enable the legs to be moved between, or retained in one of, a number of positions, at least one of the positions being such that the pair of wheels on one leg are on an axis which is parallel to a corresponding axis for the pair of wheels on the other leg.

6 A lifting device as claimed in any preceding claim characterised in that:

a) the column is demountably secured at its lower end to the chassis,

b) the column incorporates a slot extending over a major part of the length of the column;

c) the column incorporates a threaded shaft

mounted for rotation relative to the rest of the column and extending substantially coextensively with the slot;

d) a motor is mounted within the load bearing member having an output shaft demountably coupled to one end of the threaded shaft; and

e) the crane arm incorporates a carriage disposed at least in part within the housing and in part extending out of the housing by way of the slot; the part within the housing engaging the shaft being thereby enabled for linear motion in a direction depending on the direction of rotation of the shaft; that part of the carriage extending out of the housing being adapted to demountably receive the remainder of the arm.

7 A lifting device as claimed in any of Claims 1 to 5 characterised in that the crane arm is pivotable about the one end of the arm on the column and there is provided a longitudinally extendible and retractable strut having one end located on the crane arm intermediate the ends of the crane arm and the other end to the one end located on the column.

8 A lifting device as claimed in Claim 7 characterised in that the strut is caused to extend or retract by way of an electric motor.

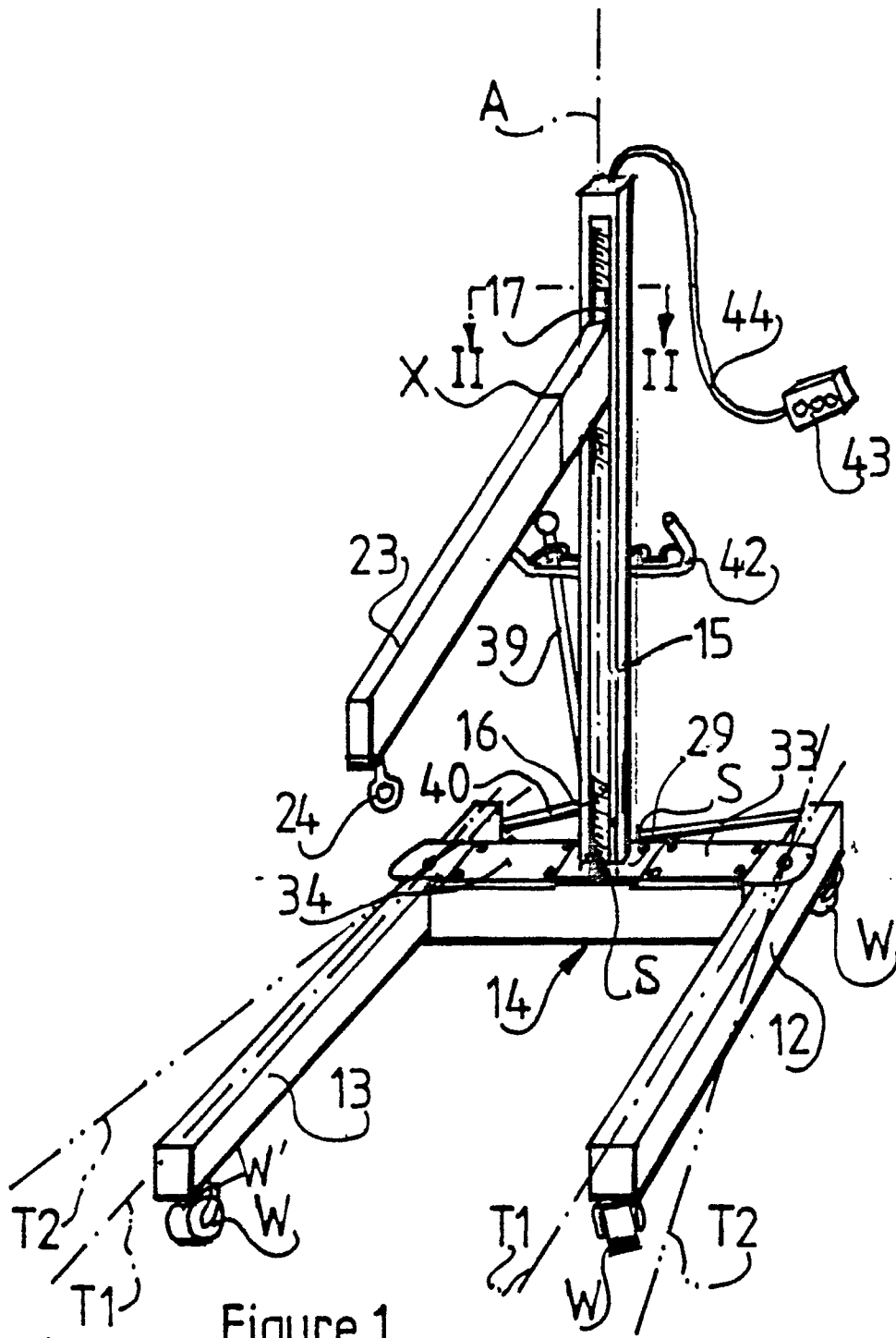
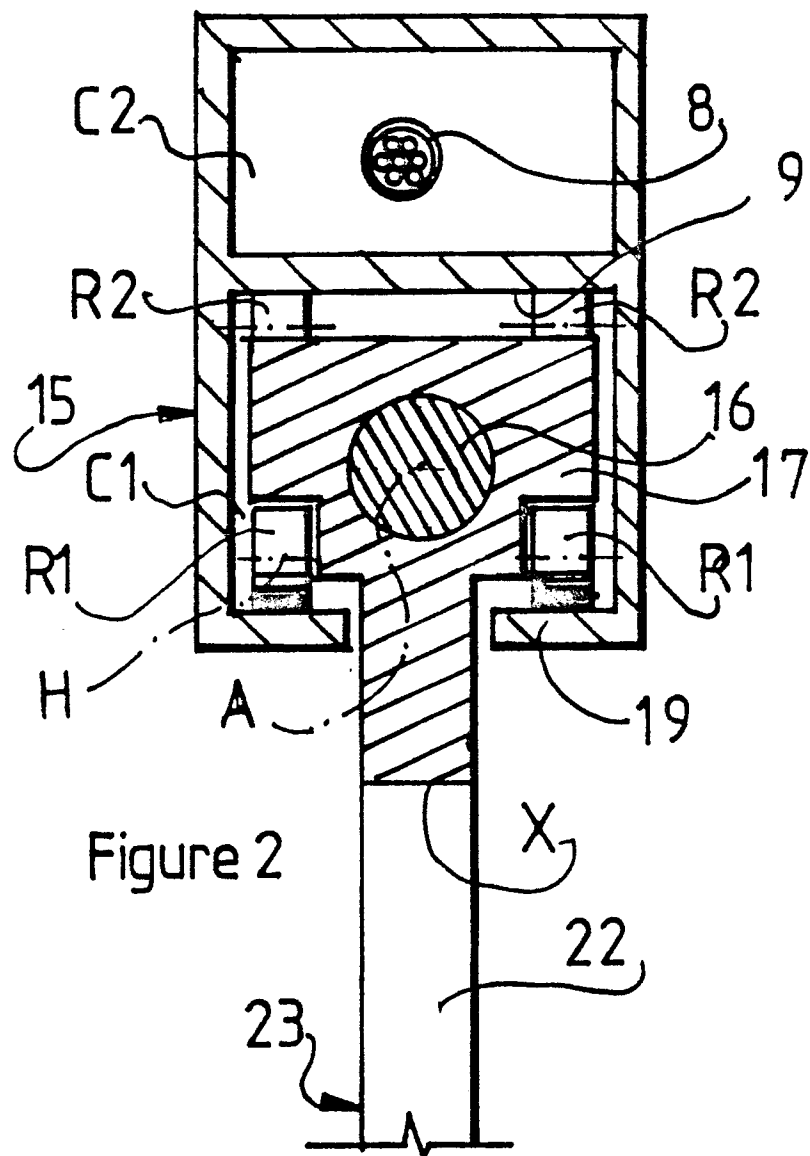
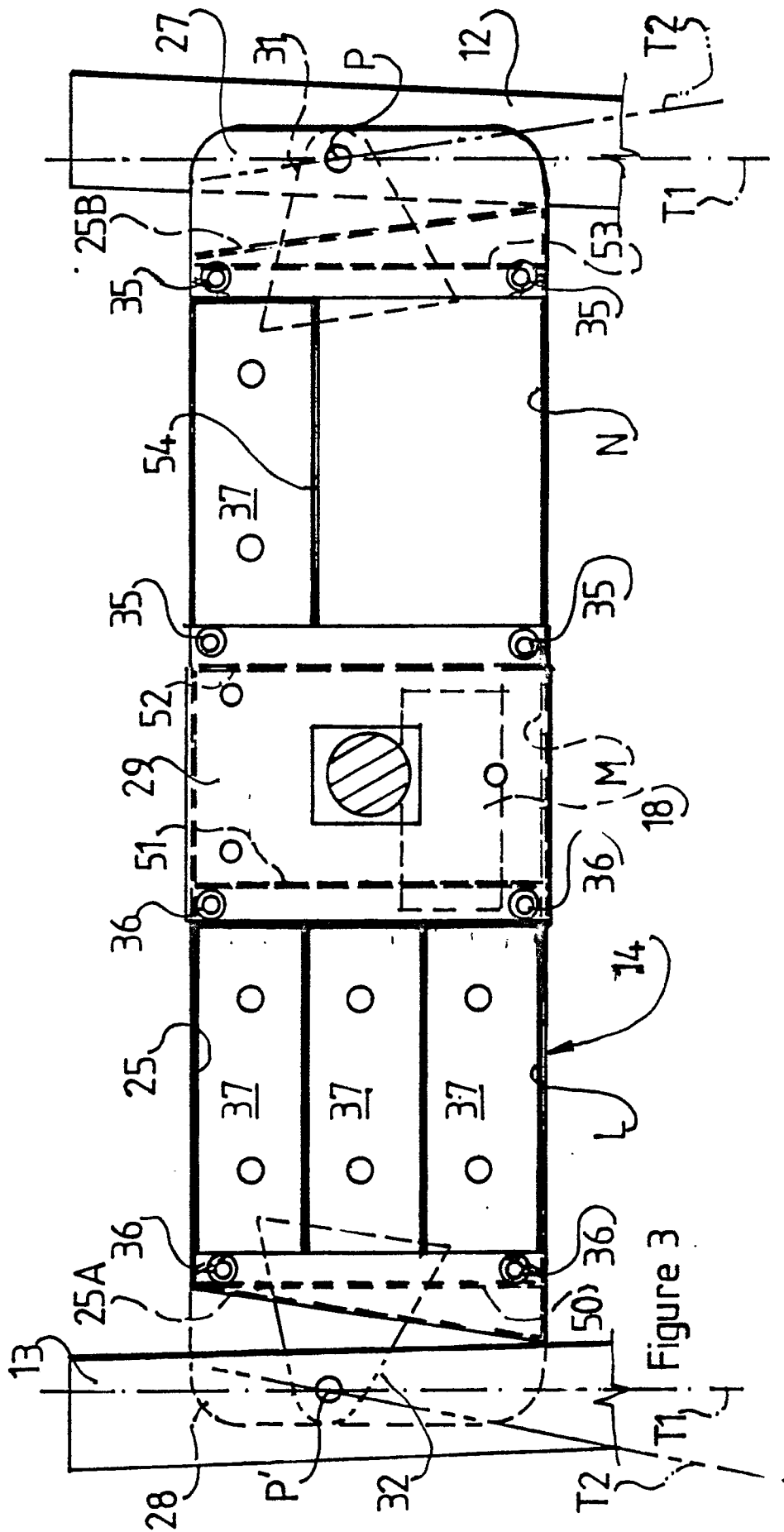


Figure 1





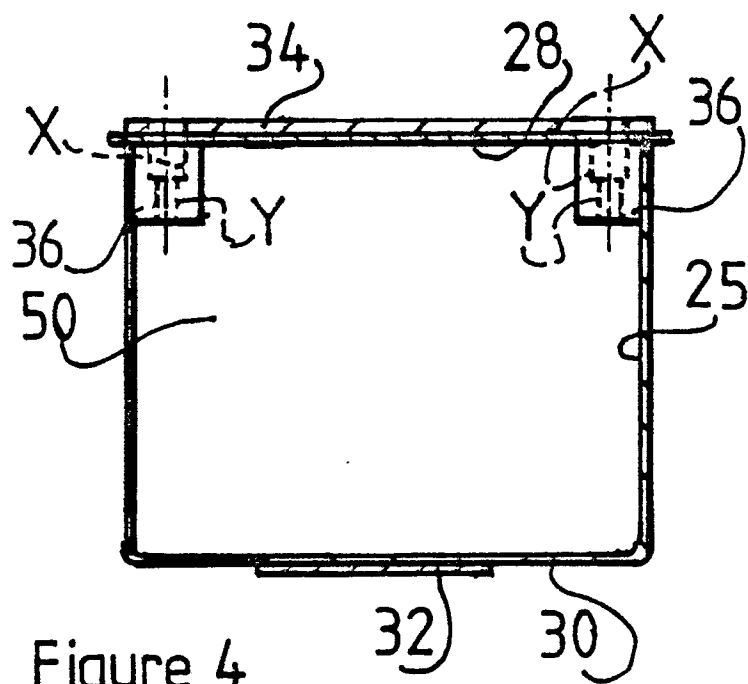


Figure 4

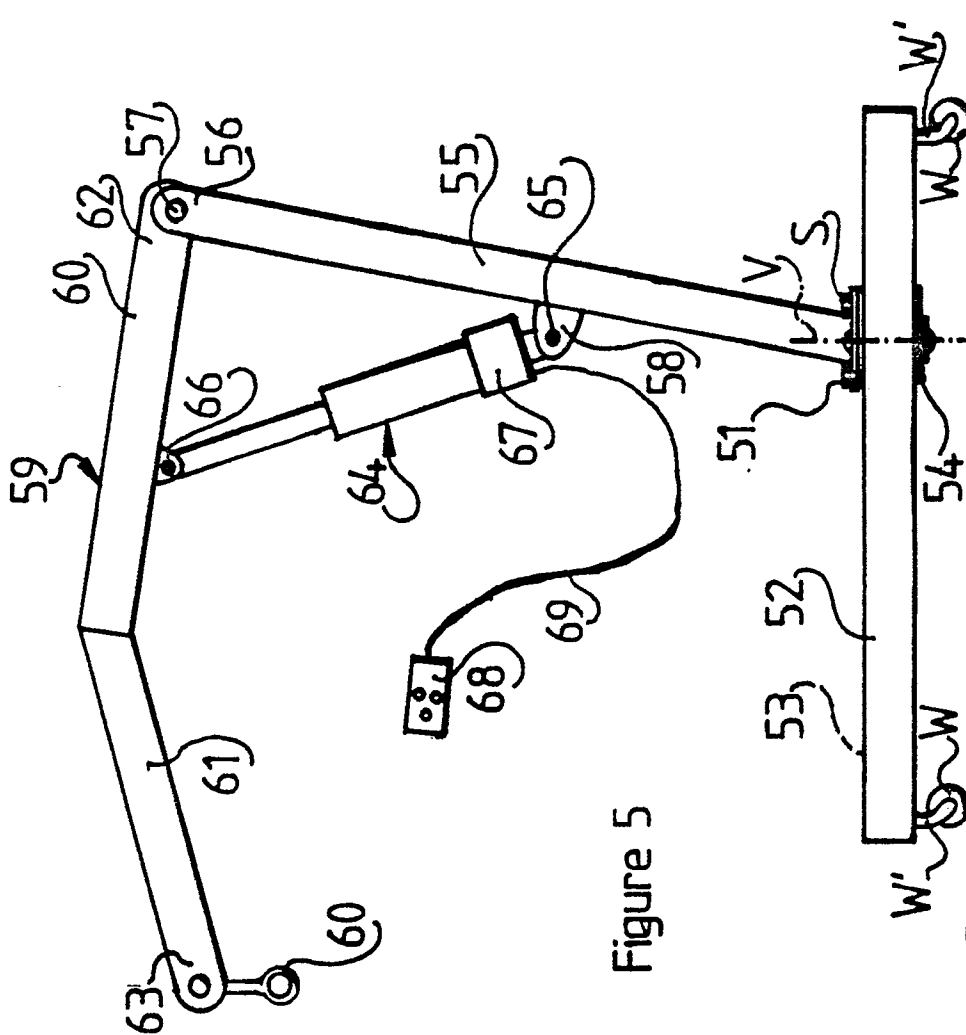


Figure 5