

Dec. 24, 1968

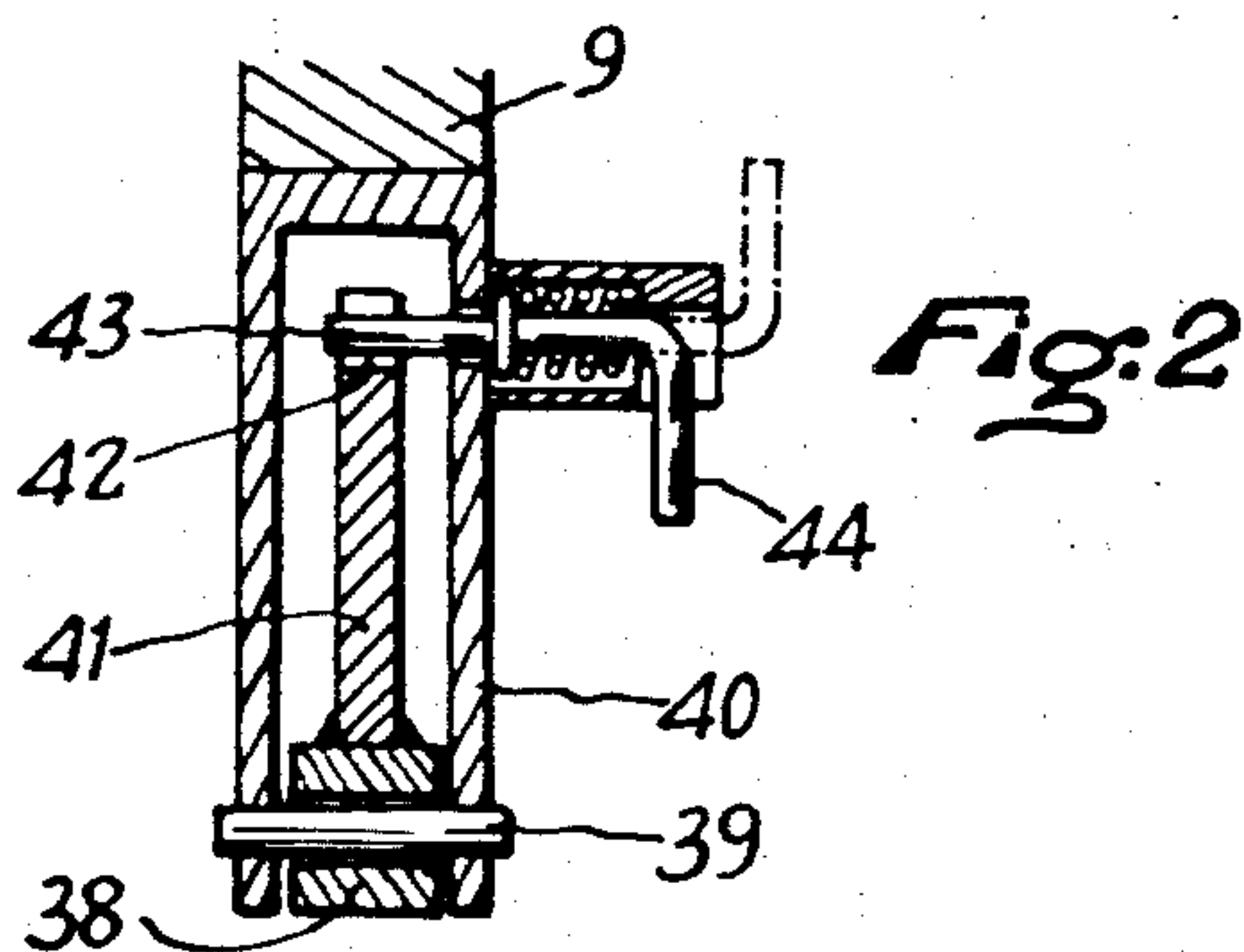
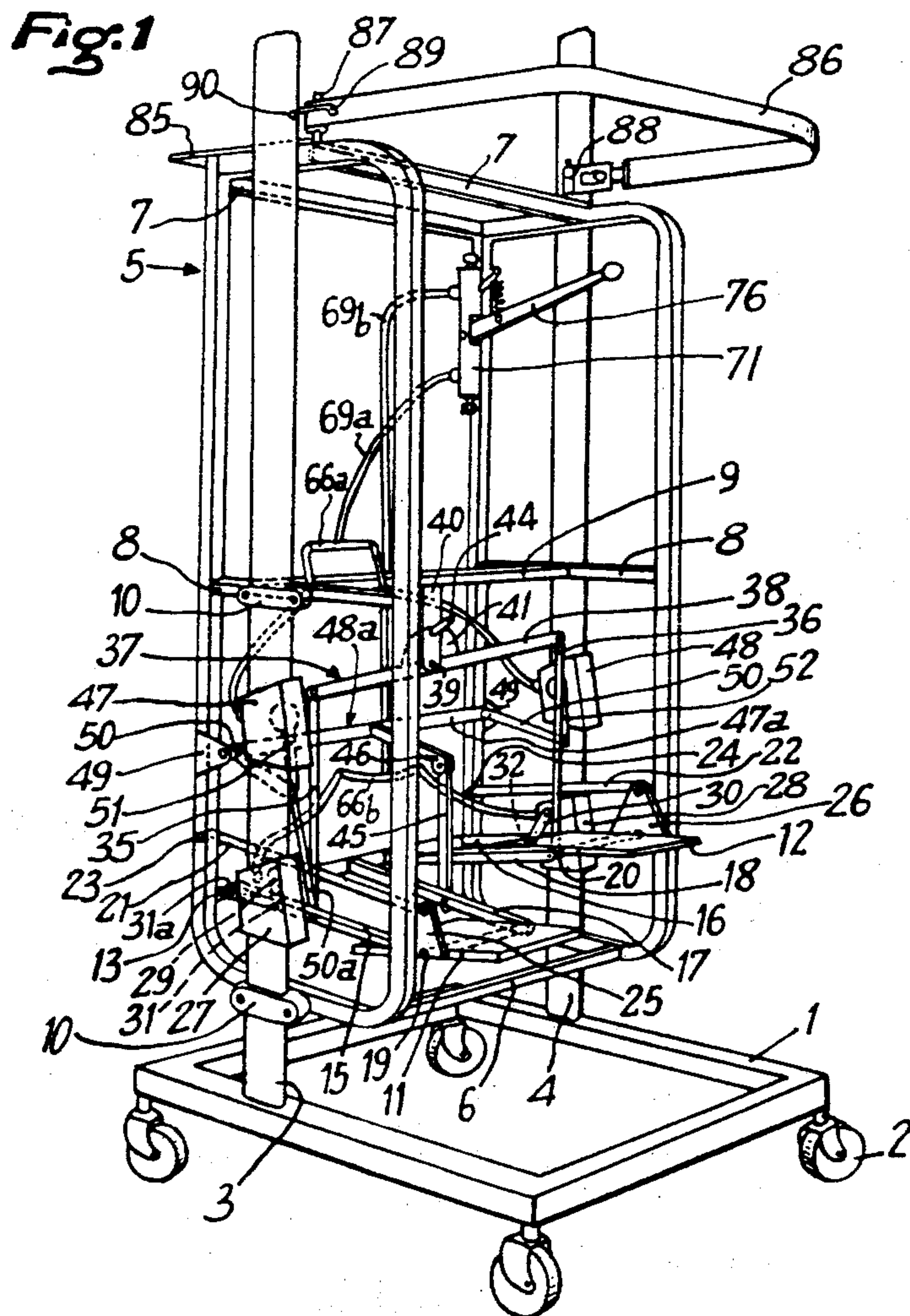
C. J. P. LÈBRE

3,417,841

INDIVIDUAL SAFETY ELEVATOR

Filed July 12, 1967

2 Sheets-Sheet 1



INVENTOR
CHARLES JEAN PIERRE LÈBRE

By *Linton and Linton*
ATTORNEYS

Dec. 24, 1968

C. J. P. LÈBRE

3,417,841

INDIVIDUAL SAFETY ELEVATOR

Filed July 12, 1967

2 Sheets-Sheet 2

Fig. 3

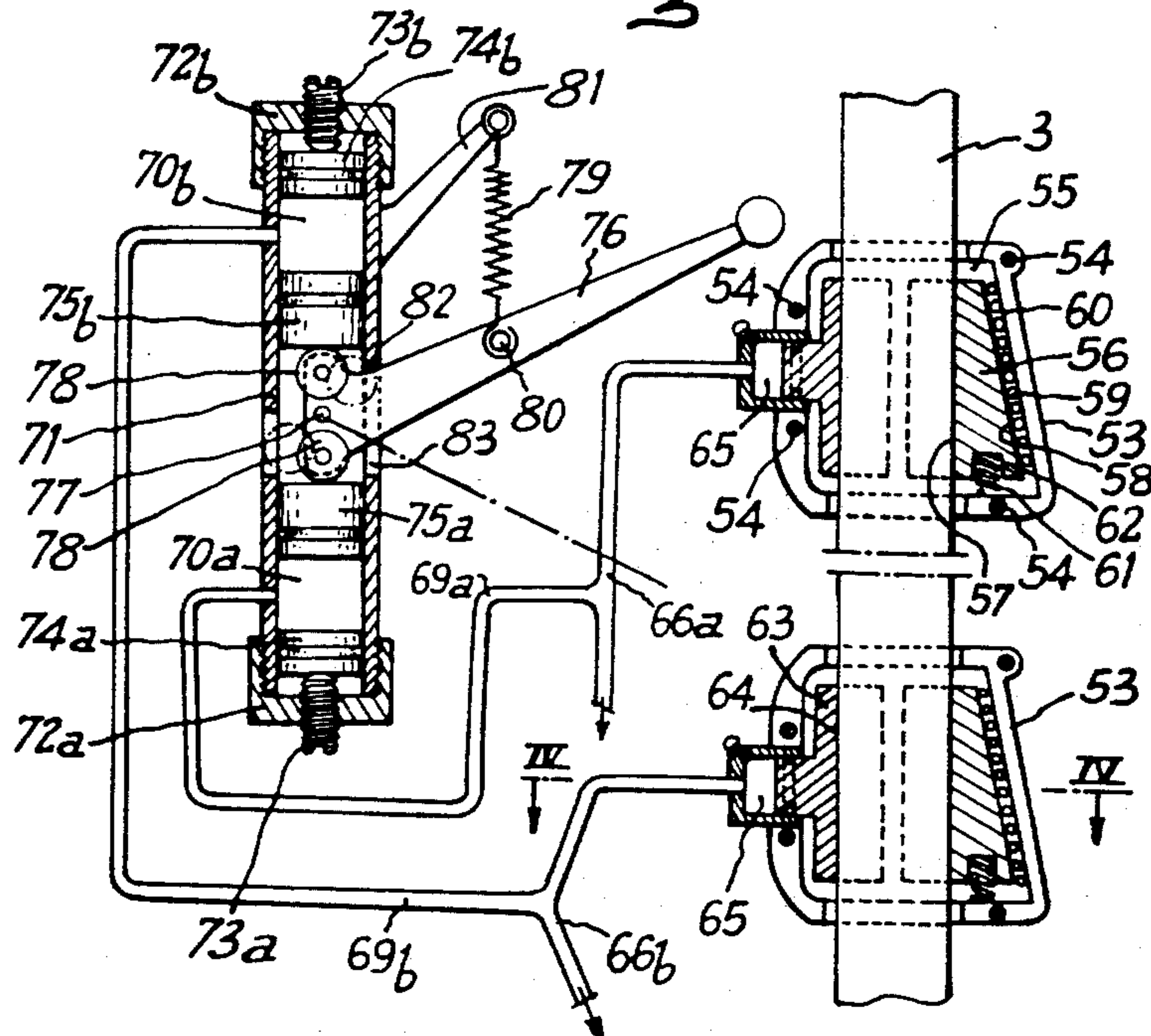
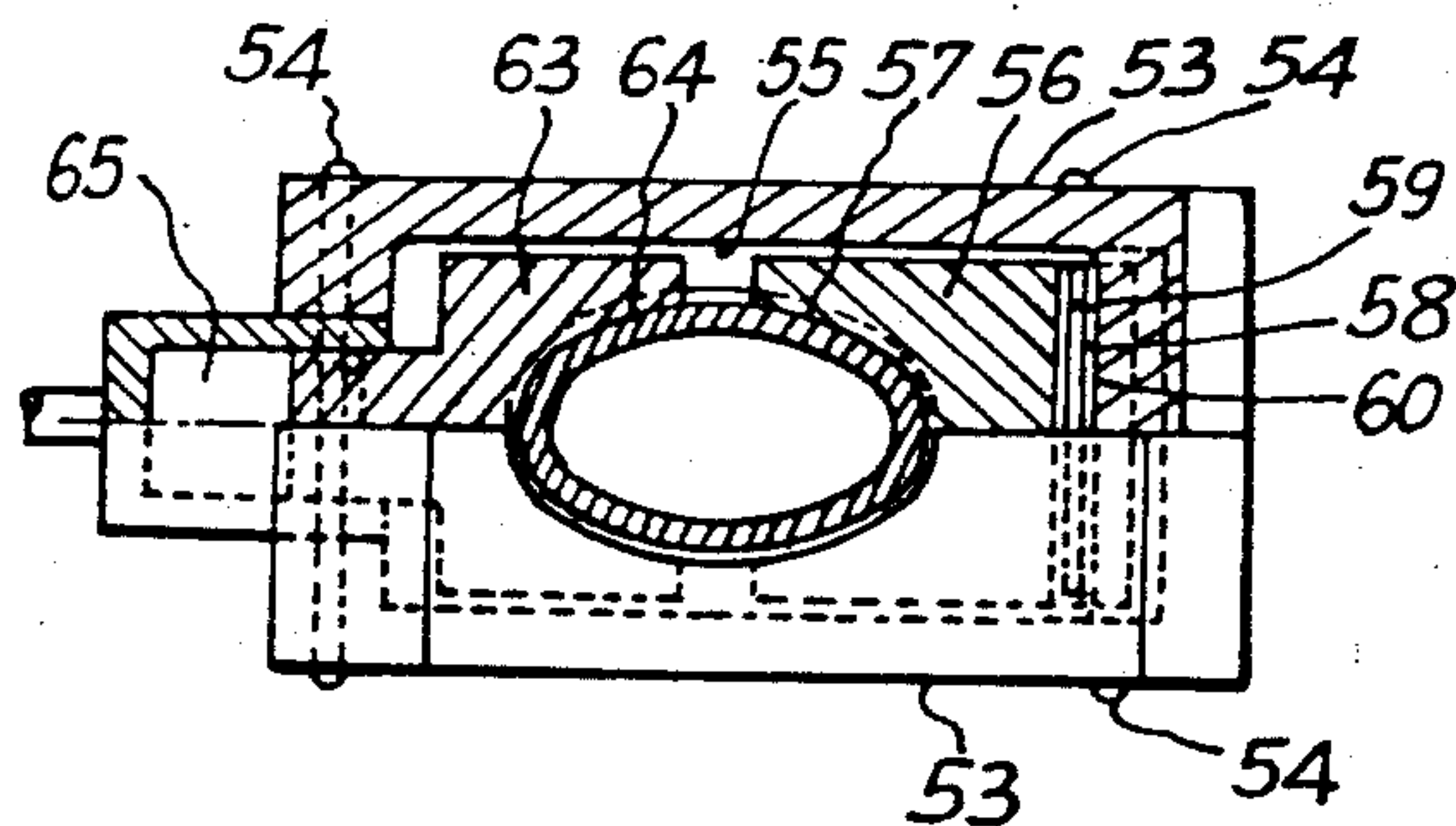


Fig: 4



INVENTOR
CHARLES JEAN PIERRE LEBRE

By *Linton and Linton*
ATTORNEYS

1

3,417,841

INDIVIDUAL SAFETY ELEVATOR

Charles Jean Pierre Lèbre, 35 Ave. de l'Orangerie, 91
Sainte-Genevieve-des-Bois, France

Filed July 12, 1967, Ser. No. 652,935

Claims priority, application France, July 16, 1966,
69,663

9 Claims. (Cl. 187—1)

ABSTRACT OF THE DISCLOSURE

An elevator having two parallel vertical uprights and a movable cage mounted between said uprights. The power necessary for moving the cage on the uprights is obtained by two pedal-gears connected to the cage and to clamping blocks mounted on the uprights, which cause the cage to move or be retained along said uprights.

This invention relates to an apparatus enabling the user to lift him—or herself—and at the same time a load, in a vertical or inclined direction, and to lower him or herself again without using his or her hands.

The apparatus according to this invention consists of a pair of uprights disposed substantially vertically or with a slight inclination, according to the specific use for which the apparatus is contemplated, said uprights being kept at a predetermined relative spacing throughout their length by at least one lower cross member, an upper cross member being provided in case of relatively great lengths, a frame or cage being disposed between said uprights and adapted to slide throughout the length thereof and constituting a support for the user, said cage being further provided with means for controlling the upward movement of the cage and other means for causing the movement of the cage and stopping same at will along said uprights.

The power necessary for lifting the cage may be derived for example from a thermal or electric motor actuating the means for moving the cage along said uprights, but according to an advantageous and economical form of embodiment of the apparatus of this invention the mechanism for controlling the upward movement of the cage is preferably of the type designed for utilizing as a source of power the movement of the mass constituted by the user's weight. More particularly, the apparatus is actuated by a simple reciprocating motion produced by the user, such as a walking motion (the alternating up- and downward movements of each foot) or a motion similar to that obtaining when stepping down the rungs of a ladder. To this end, the control mechanism comprises two pedal-gears, the user standing upon the pedals thereof so that each pedal constitutes a support for one of the user's feet, said pedal-gears having their ends opposite to the pedals pivotally connected to the cage and being operatively connected intermediate their ends to means adapted to cause the cage to move or be retained along said uprights, said means consisting roughly of clamping blocks engaging said uprights. Each pedal-gear is coupled to a pair of clamping blocks sliding simultaneously and respectively on one of the two uprights.

The aforesaid clamping blocks are so designed that when a downward vertical force is applied thereto they tend to become locked relative to the relevant uprights and constitute a support or bearing point about which the corresponding pedal-gear coupled thereto can pivot, whereas a vertical force of opposite or upward direction causes said blocks to be released and permits their sliding movement along the uprights. It is the alternating pivotal motion of the pedal-gears about the bearing points constituted

2

by the clamping blocks that causes the gradual upward movement of the cage along its uprights.

Moreover, the present invention provides means for permitting the downward movement of the cage under perfect safety conditions at the desired speed, so that the user can either lower the cage gradually on very short distances, or alternately produce a non-stop downward movement throughout the height of the apparatus.

To this end, the aforesaid clamping blocks are constantly kept in their locking position on the relevant uprights by a hydraulic fluid pressure providing a self-clamping action of said blocks on the uprights, this pressure being adapted to be reduced gradually for lowering the apparatus in order to reduce the clamping action exerted by the blocks on the uprights and thus permit the sliding movement of the clamping block along the corresponding upright.

During the downward movement a minimum effort should be sufficient to enable the user to reduce the pressure exerted in the blocks and, if desired, restore immediately the maximum pressure necessary for producing an efficient braking action.

To this end, each pair of clamping blocks coupled to a same pedal-gear is caused to communicate with a closed chamber of a device comprising two pressure chambers adapted to supply the automatic self-clamping pressure fluid to the clamping blocks, these blocks being released under the user's control. These two closed chambers are filled with a fluid kept under pressure by a cam device adapted to cause the volume of said chambers and therefore the value of the fluid pressure to vary simultaneously and to the same extent. This cam device is operable manually by means of a lever urged by a spring to a predetermined position corresponding to the lowest possible volume of the chambers and therefore to a maximum fluid pressure. By actuating said lever against the resistance of a spring the cam device recedes and thus permits an increase in the volume of said chambers, whereby a proportional reduction in the pressure exerted by the fluid on the jaws of the clamping blocks is obtained. Discontinuing the effort exerted on said lever will immediately restore the fluid pressure to its maximum value.

Other advantages and features characterising this invention will appear as the following description proceeds with reference to the accompanying drawings illustrating diagrammatically by way of example a preferred form of embodiment of the invention. In the drawings:

FIGURE 1 is a perspective view showing an apparatus constructed according to the teachings of this invention;

FIGURE 2 is a detail view showing on a larger scale the mechanism for locking the pedals in their horizontal position;

FIGURE 3 is a diagrammatic view showing in section a pair of clamping blocks of the lifting device of the apparatus and the hydraulic device for releasing the clamping blocks and therefore permitting the downward movement of the apparatus, and

FIGURE 4 is a plane view showing in its upper half a cross section, taken along the line IV—IV of FIGURE 3, of a clamping block.

Referring to the drawings, the apparatus illustrated therein is movable on a ground or floor due to the provision of a base structure 1 equipped with casters 2. However, it is clear that it would not constitute a departure from the basic principle of this invention to provide a similar base structure without casters, for example in the case of an apparatus installed along a wall and adapted to move therealong by means of rollers engaging suitable fixed rails. Similarly, although the apparatus illustrated comprises vertical guide uprights 3 and 4 supported by a rolling base structure 1, it is clear that these uprights could be inclined and bear with their lower ends on the floor or ground, their upper bearings against a wall like

a conventional ladder. The uprights 3 and 4 may have any desired and suitable cross-sectional contour, such as circular, square, ovoid, elliptic, etc.

Mounted between these uprights 3 and 4 is a cage designated generally by the reference numeral 5, adapted to travel vertically between the uprights 3 and 4, and to be occupied by a user desirous to be lifted at a higher level. This cage consists of a pair of lateral panels made for example of bent tubular sections interconnected by lower and upper cross members 6-7; a central cross member 9 interconnects lateral bracing members 8 rigid with said lateral panels. The cage 5 is guided along the uprights 3 and 4 by collars 10 rigid with the lateral panels constituting the cage.

The upward movement of the cage and if desired of a load carried thereby is obtained by vertically reciprocating a pair of pedals 11, 12 mounted on the front ends of pedal-gears fulcrumed on a common horizontal shaft 13 rigid with the cage 5. These pedal-gears consist respectively of a pair of parallel oscillating levers 15, 17 and 16, 18 interconnected at their free ends by pins 19, 20 on which are pivoted the pedals proper 11, 12 constantly held in a horizontal position by the parallel-motion consisting of said levers 15, 16 and of rods 21, 22 pivotally connected at one end 23, 24 to said cage and at their other end to straps 25, 26 rigid with the pedals 11, 12.

The pedal-gear of pedal 12, hereinafter referred to as the right-hand pedal-gear, is operatively connected to and adapted to operate identical lower clamping blocks 27, 28 mounted respectively on the uprights 3 and 4; this pedal gear is pivotally connected on the one hand to the right-hand block 28 through a link 30 pivotally attached to said right-hand clamping block 28 and to an intermediate point 32 of said lever 16, and on the other hand to the left-hand block 27 through another link 29 pivotally attached to said block 27 and to an intermediate point 31 of an arm 31a mounted on the left-hand side on shaft 13 and rotatably rigid with the pedal-gear of pedal 12 through the medium of a rod (not shown) surrounding the shaft 13. These clamping blocks are adapted to move together, each block constantly remaining at the same level as the other. The clamping blocks to be described more in detail presently tend to become locked, on the upright along which they are caused to travel, when a downward vertical force is exerted thereon, and in this case they constitute a fixed bearing point about which the corresponding pedal-gear can pivot; as contrasted thereto, when an upward vertical thrust is applied to said blocks they are released automatically and can slide along the upright. Thus, it is clear that if for instance the right-hand pedal 12 is depressed, the clamping blocks 28 and 27 will become locked and constitute fixed pivot or bearing points for this right-hand pedal-gear; the shaft 13 and therefore cage 5 will then move upwards. Of course, to prevent the user from being compelled to make an unduly high effort for lifting the cage 5 supporting his or her weight and in certain cases an additional load, gearing-down means, preferably of the adjustable type, are provided. The gearing down is obtained by disposing the pivot pins 31, 32 of the right-hand pedal-gear on the links 29, 30 of the clamping blocks nearer to shaft 13 than to the pedal supporting pins 19, 20. In the example illustrated the pivot pins 31, 32 lie at about one-third of the distance measured between the axis of shaft 13 and pivot pins 19, 20. The gear-down ratio is adjusted by altering accordingly the position of pivot pins 31, 32 relative to shaft 13, a suitable range of holes being formed to this end along the lever 16 and arm 31a for engagement by said pins and therefore the ends of links 29, 30.

To synchronize the upward stroke of one pedal with the downward stroke of the other pedal, the levers 15, 16 of the pedal-gears are interconnected by a U-shaped balance-beam unit 37 having substantially vertical rods 35, 36, the lower ends of these rods being attached substantially to the centre of levers 15, 16; the upper or intermediate beam 38 of said balance unit 37 is fulcrumed

at its centre by a pin 39 on a support 40 rigid with the cross member 9 of cage 5. It will be noted that the pedals can be brought to and locked in a substantially level position so that they constitute a substantially horizontal platform. To this end, the balance unit cross beam 38 carries a semicircular sector 41 having formed in its middle a notch engageable by a spring-loaded lock bolt 43 carried by the support 40 (see FIGURE 2). During the up- and downward movements of the apparatus the bolt 43 is kept out of the notch by an suitable cam device. The bolt 43 is controlled by a two-position lever 44.

The swinging motion of the left-hand pedal 11 is transmitted to upper clamping blocks 47, 48 (similar to the aforesaid clamping blocks 27, 28 and adapted to move simultaneously along the uprights 3, 4) by a linkage system comprising a substantially vertical connecting-rod 45 having one end connected to the lever 17 of the gear-pedal of pedal 11, and the opposite end connected to a central arm 46 rigid with the horizontal rod 47a of a U-shaped frame designated generally by the reference numeral 48a, this frame being pivoted at its corners to lugs 49 rigid with the cage, so as to pivot about the axis of said rod 47a. The side arms 50 of the U-shaped frame 48a are pivoted to the lower ends of thrust links 51, 52 having their upper ends pivoted respectively to the upper clamping blocks 47, 48. Moreover, a rod 50a interconnects the pivoted ends of the left-hand link 51 and the left-hand arm 50 of frame 48a, nearly intermediate the ends of the left-hand lever 15.

The upper clamping blocks 47, 48 are constantly level with each other. They move upward simultaneously under the thrust of the arms 50 of frame 48a which pivot as a consequence of the upward movement of the left-hand pedal 11 when the right-hand pedal 12 is depressed.

A clamping block will now be described in detail with reference to FIGURES 3 and 4 of the drawings. Each clamping block comprises an external case consisting of a pair of symmetrical hollow shells 53 adapted to be assembled by means of rivets 54 so as to surround completely the corresponding upright (for instance upright 3). Each shell has orifices formed at its upper and lower ends to permit the passage of the relevant upright with a certain clearance. These orifices correspond in shape to the cross-sectional contour of the upright, for example a semi-elliptic configuration in the case illustrated, as the uprights have a semi-elliptic cross-sectional contour.

The internal cavities 55 of the shells constituting the aforesaid case are adapted to receive a wedge-shaped clamping shoe 56 formed with an internal groove 57 surrounding the upright 3 on slightly less than its peripheral contour, this groove being in frictional contact with the upright and having its external wall 58 inclined downwards and adapted to co-act through a row of needles 59 with an internal surface 60 of the case, which has a corresponding inclination.

The height of said shoe 56 is inferior to that of said cavity 55, so that the shoe can move somewhat in relation to the case, or vice versa. A return spring 61 is located in a hole 62 formed to this end in the bottom of said shoe and bears against the lower inner surface of the case. The function of this spring 61 is to urge the shoe upwards against the case, whereby said shoe be constantly in contact with the row of needles and the upright, and the internal groove 57 bears against the upright 3 with a predetermined frictional force, irrespective of the degree of wear of the parts in relative engagement. Furthermore, all the links 29, 30 interconnecting the right-hand pedal-gear to the lower clamping blocks, as well as the links 51, 52 connecting the frame 48a to the upper clamping blocks, are pivoted to the case consisting of said shells 53 of the relevant clamping block. Under these conditions, the vertical efforts are exerted on the cases of the clamping blocks. It is therefore clear that an effort tending to lower the right-hand pedal 12 for example will be transmitted to the case 53 of the lower clamping blocks 27, 28 which will tend to move downwards and thus immediately wedge

the shoes 56 against the relevant uprights 3, 4 due to the mutual engagement of the inclined surfaces 58, 60 movable in relation to each other as a consequence of the provision of a row of needles 59.

As contrasted thereto, a force tending to move the cases of clamping blocks upwards will release the shoes 56 and reduce to a minimum their clamping action on the uprights 3, 4. Thus, the clamping blocks can move vertically.

Opposite said shoe, the cavity 55 of the case contains a pressure jaw 63 formed with a groove 64 similar to the groove 57 of the shoe, which surrounds the upright 3 on slightly less than half its peripheral contour. The jaw 63 is kept in frictional contact with the upright by the action of a fluid under pressure contained in a chamber 65 of a cylindrical cap rigid with the case and receiving therein a cylindrical, piston-forming lateral projection of the shoe 63.

This hydraulic system is so arranged that it can release the clamping blocks instantaneously and therefore lower the cage at the desired speed by simply varying more or less the fluid pressure exerted on the jaw 63. To obtain a simultaneous and equal variation in the pressures produced in both chambers 65, the pressure chambers 65 of the upper pair of clamping blocks are interconnected via a pipe line 66a, and the chambers 65 of the lower clamping blocks are interconnected via another pipe line 66b.

The pipe lines 66a and 66b are connected respectively through pipe lines 69a and 69b to said closed chambers 70a, 70b of a compression cylinder 71 supported by the cage 5. It will be noted that the pipe lines must be so disposed that the variations in the fluid pressure cannot alter the cross-sectional passage area available for the fluid which must remain constant. Thus, the cross-sectional passage area of these pipe lines should be as small as possible, and their wall should be relatively thick to prevent any radial distortion.

The cylinder 71 is sealed at either ends by screw caps 72a, 72b engaging the screw-threaded ends of the cylinder. The bottoms of these caps are tapped and provided with adjustment screws 73a, 73b of which the inner ends engage respectively pistons 74a, 74b for adjusting the pressure of the fluid contained in the closed chambers 70a, 70b bounded by the pistons 74a and 74b, and other pistons 75a, 75b controlling the hydraulic release of the clamping blocks. The pistons 75a and 75b are adapted to slide in the bore of cylinder 71 for varying the volume of chambers 70a and 70b and therefore the pressure exerted against the pressure jaws 63.

During the upward movement of cage 5, a constant and maximum fluid pressure is exerted on the jaws, this being permitted by maintaining the pistons 75a, 75b at a constant relative spacing due to the proper positioning of a control lever 76 pivoted at 77 intermediate the ends of, and within the cylinder 71; this lever 76 carries a pair of opposite rollers 78 having their axes aligned with the fixed axis of the pivot pin 77 of lever 76 in a vertical plane, as shown in thick lines in FIGURE 3. The control lever 76 is held in this position, corresponding to the maximum hydraulic fluid pressure, by a traction spring 79 having one end anchored to a pin 80 carried by the lever 76 and the other end attached to the end of a fixed arm 81 rigid with the upper portion of cylinder 71. The lever is prevented from rising to a higher position by engaging the upper edge 82 of the elongated orifice 83 formed in the cylinder wall and through which extends said lever 76.

When it is desired to lower the cage 5 it is only necessary to more or less reduce the pressure exerted by hydraulic fluid on the pressure jaws 63 of the four clamping blocks by vertically lowering the control lever 76 to the desired degree against the resistance of spring 79. The rollers 78 are thus caused to pivot through a certain angle about the fixed axis 77 and assume for example the posi-

tion shown in dash lines in FIGURE 3. Due to the fluid pressure, the movable cylinders 75a, 75b move toward each other, thus causing an increment in the respective volumes of the closed chambers 70a, 70b and reducing proportionally the fluid pressure throughout the hydraulic circuits. When the user discontinues his or her action upon the control lever 76, or release same, this lever is returned by the traction spring 79 to its normal position shown in thick lines and the maximum pressure is restored in all the hydraulic circuits. It is clear that this system is designed for automatically pressurizing the clamping blocks and manually relieving the compression thereof. A very important feature of this hydraulic device for the controlled lowering of the cage 5 lies in the fact that the closed chambers 70a and 70b do not communicate with each other. If a leakage occurs in either of the circuits of the upper clamping blocks or of the lower clamping blocks, a set of clamping blocks will continue to receive the fluid pressure and the cage is thus safely prevented from falling freely. This type of accident could only take place if the two independent hydraulic circuits associated with the clamping blocks were leaking or failed simultaneously, a circumstance definitely precluded.

Moreover, this hydraulic cage lowering device is extremely easy to control and highly sensitive. Very smooth downward movements on very short distances, or on the contrary very rapid downward movements on a relatively great distance, followed by a gradual or sudden stopping, can be obtained. All these possibilities are permitted according to the manner in which the lever 76 is operated.

The apparatus according to this invention operates as follows: When the apparatus is at its lowermost level as shown in FIGURE 1 the user positions him- or herself on the pedals 11, 12 which are then either in a position similar to that shown in the figure, or locked at the same level to constitute a kind of platform. If the user must carry a load with him or her, this load is laid upon a horizontal shelf 85 provided for example at the top of the cage 5. To prevent the user from falling back during the up motion, a safety belt is provided which consists for example of a bow 86 having one end pivotally attached by means of a pin 87 to the platform 85 in the vicinity of the left-hand upright 3, its free end being adapted to be locked for example by means of a hook on a strap formed with a loop 88 rigid with said platform 85 and located in the vicinity of the other upright 4. To make the use of the safety belt compulsory, means are provided whereby the cage 5 cannot be lifted unless the safety belt is duly locked; these means may comprise for example a projection 89 carried by the bow 86 in the vicinity of its hinged mounting 87 and adapted to engage an orifice 90 formed in the adjacent upright 3 when the belt is open, thus preventing any movement of the cage.

Having locked the safety belt 86 around his or her waist, the user can actuate the pedals by causing his or her weight to bear alternately on one and the other pedals.

If for instance the user depresses the right-hand pedal 12, the lower clamping blocks 27, 28 become locked with respect to the uprights 3, 4 and constitute fixed bearing points. The right-hand pedal-gear 12 thus pivots vertically about its pivot pin 32, thus causing the upward movement of shaft 13 and therefore of the cage 5 as the pedal 12 is depressed.

Then, depressing the right-hand pedal-gear of pedal 12 causes the upward movement of the left-hand pedal-gear of pedal 11 through the balance system 37.

At the same time, the upward movement of cage 5 causes the corresponding upward movement of the upper clamping blocks 47-48 due to the combined thrust transmitted on the one hand through the U-shaped frame 48a rigid with the cage 5 and on the other hand through the linkage system 45-46 interconnecting the pedal-gear of pedal 11 and the frame 48a. During this phase the frame 48a receives a movement of translation imparted thereto by the up motion of the cage and also a movement of

rotation (upwards as seen in FIGURE 1 and about the axis of its rod 47a), this movement of rotation being transmitted through the connecting-rod 45 rising bodily with the pedal-gear of pedal 11. These two combined motions of frame 43a add themselves to each other and are transmitted through the thrust links 51, 52 to the upper clamping blocks 47, 48, so that these blocks can move upwards.

At the end of the downward stroke of pedal 12 the upper clamping blocks 47, 48 are locked on the uprights 3 and 4, due to the action exerted by the weight of the apparatus and user, so that these blocks constitute in turn two fixed bearing points. When the user causes his or her weight to bear on the left-hand leg, the left-hand pedal 11 is depressed and causes the corresponding pedal-gear to pivot about the ends of connecting-rod 45 and rod 50a. This downward movement of pedal 11 causes the cage 5 to rise and simultaneously the upward movement of pedal 12 due to the presence of the balance-beam unit 37, so that the clamping blocks 27, 28 rise along the uprights, 3, 4.

It will be noted that the height at which the cage can be lifted is unlimited for this apparatus is free of any frame structure, cables and external cylinder actuators. It is only necessary to provide uprights of adequate cross-sectional dimension and of suitable length. An apparatus of this type may also be designed wherein the uprights have a predetermined length but adapted to receive complementary upright sections as it is desired to increase the height of the apparatus.

What I claim is:

1. A safety elevator apparatus comprising a rigid frame structure having two parallel vertical uprights, a movable cage mounted between said uprights and adapted to carry the user of the apparatus and a load, means adapted to cause said cage to move and be retained along said uprights, a mechanism for controlling the upward movement of the cage and hydraulic means for controlling the downward movement and the braking of the cage during this downward movement, the upward-motion control mechanism and the hydraulic downward-motion control means being adapted to act upon the means causing the movement of said cage, and retaining, said cage, respectively during the cage lifting phase and during the cage lowering phase.

2. A safety elevator apparatus as set forth in claim 1, wherein the means adapted to cause said cage to move and be retained along said uprights consists of two pairs of clamping blocks, each clamping block of a pair co-acting with one of said uprights of the frame structure of the elevator apparatus and being pivotally connected to the mechanism controlling the upward movement of the cage, the clamping blocks of one pair being locked by turns on the relevant uprights to constitute bearing point permitting the lifting of said cage under a vertical thrust imparted by the mechanism controlling the upward movement of the cage, said clamping blocks being adapted to slide along said uprights and the upward movement of the cage taking place continuously.

3. A safety elevator apparatus as set forth in claim 1, wherein said mechanism for controlling the upward movement of the cage consists of a pair of pedal-gears mounted on a horizontal shaft solid with the movable cage for oscillating vertically about said shaft so as to move alternately up and down, one of said pedal-gears being hingedly connected to one of the pairs of clamping blocks, the other pedal-gear being hingedly connected to the other pair of clamping blocks through a balance-beam, said balance-beam being fulcrumed about a fixed axis of the movable cage whereby the oscillating movements of

said pedal-gears take place synchronously, the upward movement of one pedal-gear corresponding to the lowering of the other one.

4. A safety elevator apparatus as set forth in claim 2, wherein each clamping block consists of a case surrounding the upright on which the block is mounted, said case comprising a mechanical wedging shoe and a pre-clamping jaw responsive to a hydraulic fluid pressure, said shoes and jaws being mounted in diametrically opposite positions in relation to the corresponding upright, said mechanical wedging shoe co-acting between said case and said corresponding upright for locking the clamping block on the upright during the upward movement of the movable cage when a vertical downward thrust is exerted on said case, the aforesaid pre-clamping jaw being kept in frictional contact with said upright through a hydraulic distributor, said jaw thus partaking in the locking action during the upward movement of the movable cage, said distributor being actuable for releasing the clamping block with a reduction in the pressure exerted on said jaw and to cause said movable cage to move downwards.

5. A safety elevator apparatus as set forth in claim 3, wherein said oscillating pedal-gears are provided at their ends opposite to their hinged mounting on said horizontal shaft of said movable cage with pedals each adapted to be depressed by one of the user's feet, the pedal-gears being operatively connected through linkage means to their relevant clamping blocks at a point intermediate the hinged mounting of said pedal-gears on said cage and said pedals.

6. A safety elevator apparatus as set forth in claim 4, wherein the pre-clamping jaws of said clamping blocks are subjected to the same constant pressure during the upward movement of the movable cage, the release of said clamping blocks being obtained by applying a vertical upward thrust on said cases, whereby the wedging shoes are released to permit the upward sliding movement of the clamping blocks along the corresponding uprights.

7. A safety elevator apparatus as set forth in claim 6, wherein the pre-clamping jaws of said clamping blocks are subjected to the same fluid pressure through the medium of separate hydraulic circuits connecting respectively the two blocks of a same pair to a separate chamber of a hydraulic distributor.

8. A safety elevator apparatus as set forth in claim 7, wherein said hydraulic distributor comprises two separate fluid-containing chambers isolated from each other, the fluid pressures in these chambers being kept to constantly identical values by a hand-operated cam mechanism.

9. A safety elevator apparatus as set forth in claim 8, wherein the cam mechanism maintain a maximum fluid pressure in the hydraulic circuits in its inoperative condition, during the upward movement of the movable cage, the operation of said cam mechanism causing said pressure to be reduced at will for controlling the downward movement and the braking of said cage.

References Cited

UNITED STATES PATENTS

1,395,346	11/1921	Lux	182—136
1,471,304	10/1923	Young	182—136
3,126,071	3/1964	Basset	187—19

EDWARD A. SROKA, *Primary Examiner*.

H. C. HORNSBY, *Assistant Examiner*.

U.S. Cl. X.R.

187—17, 92, 9; 182—136