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(54) Self load bearing lift system and arrangement for mounting the main motor thereof

(57) A lift system wherein lift-car guides and/or counter-weight guides, both placed at a single plain, provide a self load bearing, modular supporting frame with its loads discharged directly into the pit. Further, the proper positioning of the driving members allows an optimum use of both the space inside the lift well and outside it. An arrangement for mounting the main motor in electric lift systems in which the motor is connected to a shelf in turn transversely fixed to at least one of the two pairs of guides by shaped sheets. Using such an arrangement it is possible to place the motor anywhere along the lift-car well.

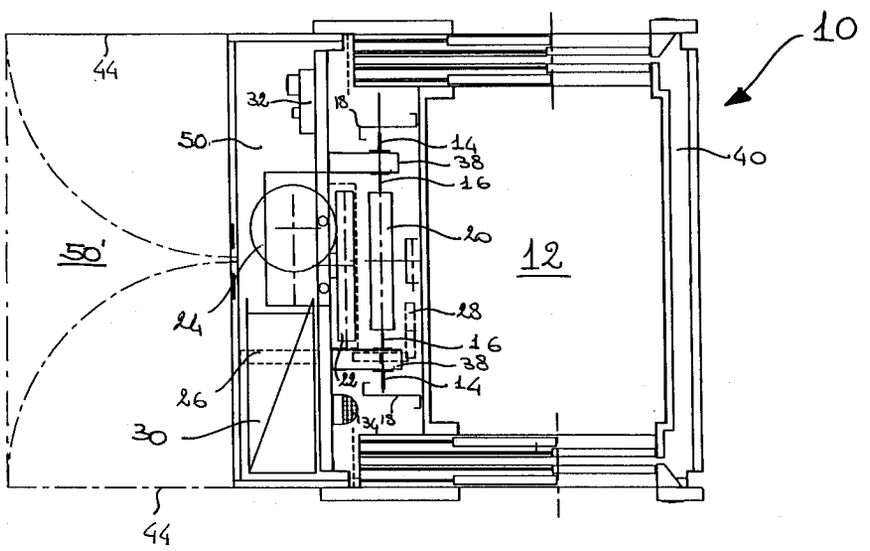

Fig. 1

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The present invention relates to elevators, lifts or hoists of the electric or rope type and with self load bearing aspects, and further a new arrangement for mounting the main motor in lift systems and the like.

Several systems of this type are known, which basically could be divided into conventional electric lifts and pneumatic lifts. At present the pneumatic type systems, because of their less space requirement, the fact that loads are discharged directly into the pit, and they do not require an engine room placed upon the lift well, are often used instead of conventional or rope lift systems. Electric type lifts require a complex and bulky assembly of ropes, pulleys, lift-car guides and counterweight guides. Further the transmission pulleys are necessarily connected, and thus hung up, to the roof of the tower or well in which the lift moves, thus causing structural problems often relevant when dealing with old buildings.

In the art of electric lift systems, as said above, motors are generally placed into a "motor or engine room" in turn placed upon, or above the runway well. However in both these cases said motors are connected to the building structure or to a metallic support frame in turn connected to the building structure.

From the above further considerable disadvantages and difficulties for mounting the lift system to existing building structures in which a lift plant had not been expected follow. In fact the positioning of the motor upon the runway well requires to have space enough for building an engine room in such a position, and said engine room must have a load bearing slab or truss assembly able to bearing and taking up reaction, static and dynamic forces when the motor is running for moving the lift-car and the counter-weight.

Positioning the motor under the runway well requires the spatial availability for building an engine room in such a position, sometimes denied by the existence of accessible rooms such as garages and cellars, and also requires to have cement reaction plinths of large dimensions, their mass having to be much larger than the sum of the suspended system loads and its capacity load.

Finally, positioning along the runway well, while it is a possible solution to the above problems, however requires that the side walls of the building structure or the metallic supporting frame in which the supporting beam is buried are load bearing.

The main object of the present invention thus is to provide a lift system which is self load bearing, not of the hung up type but of the "abutting" type, namely able to discharge loads into the pit, and thus not acting on the upper slab.

A further object of the present invention is to provide a lift system which allows a maximum and complete use of the available space as pneumatic lift systems.

A further object of the invention is to notably reduce the engine room dimension and not having to place it upon the runway well of the lift-car.

A further object of the present invention is to provide a lift system able to use a power which is about half the power used by conventional pneumatic lift systems.

A further object of the present invention is to provide a modular manufacture of the whole system as to obtain the certification "in factory" without requiring a certification in the field when the system is mounted.

A further object of this invention is to provide an arrangement for mounting motors in electric lift apparatuses which overcomes the above said problems of the prior art, allowing to place the engine room anywhere along the runway well of the lift-car even without load bearing walls.

The lift, elevator, hoist and the same system according to the invention has the aspects set forth in the characterizing part of claim 1. The inventive arrangement for mounting lift motors has the aspects set forth in the characterizing part of claim 6. Further advantageous aspects of the invention are claimed in the dependent claims.

These and other objects of the invention will be clear to a man skilled in the art after reading the following disclosure which has to be read with reference to the annexed drawing in which the various figures show:

- Fig. 1 is a plant diagrammatic view of the lift system according to the present invention shown and applied to a lift-car having two opposed entrances;
- Fig. 2 is a view similar to Fig. 1 but in this case the car has only one entrance;
- Fig. 3 is a partial section side view of the well in which the lift-car and counter-weight move or travel which shows the self load bearing structure of the present invention;
- Fig. 4 is a side view of the system according to the invention mounted to a lift with its car placed upon a shelf structure showing the possibility of placing the engine room at any position with respect to the runway of the lift-car;
- Fig. 5A, 5B are a plant view and a side partial section view, respectively, of a prior art electric or rope system in which the need of an upper load loading slab is clear; and
- Fig. 6 shows an embodiment of the motor support in an arrangement for mounting motors in electric lift systems according to the present invention.

It must be clear that a similar, or the same, character in the various figures means the same

part or an equivalent part.

Figures 5A and 5B show a conventional embodiment of a prior art electric lift system. In this embodiment, car 100 has a dimension notably lower than the lift well 112. Guides 114 of counterweight 116 are placed along the side of the lift-car and at different planes with respect to the plane whereat guides 118 of the lift-car lie. It is also shown, upon the end runway position in the well in which the lift moves, an engine room 120 where a winch and a deflection pulley 122 are placed in a hung up to the slab relationship.

In Figure 1 a plant view of a lift system 10 according to the present invention is shown, said system being mounted to a lift-car 12 of the two opposed entrances type. Similarly, in Figure 2, such a system has been mounted to a lift-car 12 having just one entrance, but it will be understood that those lift-cars have been shown as not limitative embodiments only.

The first new feature consists, as it will be clear to a man skilled in the art, in placing the lift-car guides 14 and the counter-weight guides 16 at a single plain: which thus allows to obtain a notable space saving with respect to what hitherto done.

In Figures 1 and 2, for description completeness, frame uprights 18, counter-weight 20, traction pulley 22, traction winch with flywheel 24, speed limiting device 26, its transmission pulley 28, the maneuver electric panel 30, board 32 with principal buttons and well 40 lighting device 34 are also shown.

System 10 according to the invention further is self loading because guides 14, 16 provide a support frame which is completely autonomous under the structural point of view, with loads discharged directly into pit 42 (Fig.3) as in pneumatic systems. Thus, guides behave as tip loaded beams because upon them some transmission pulleys 36 are placed in an "abutting" relationship (Fig. 3). Thus it is clear that, under the structural point of view, neither change nor stiffening of the upper pre existing slabs is required. By proper sizing pulleys 36 and ropes, it is also possible not to provide an engine room upon the lift well 40 (as in pneumatic systems). This of course gives more versatility to the inventive device and allows its installation to buildings in which a lift system had not been provided hitherto and thus without a proper space to use as an engine room. This engine room will be comparable to a "box" or "cabinet" 50 with doors 44 that can be opened and allowing an easy maintenance; when the doors are in their opened position they provide an engine room 50' meeting the dimension requirements imposed by rules. As an example, in this embodiment said engine room has an only about 350 mm minimum width.

The engine room 50,50', with the arrangement shown in the various figures of the drawing, has the new feature of being placed at any height along the runway well of the lift-car (Fig.4). This feature as well makes absolutely easy and inexpensive its installation in preexisting buildings. As an example, the believed structurally and space-saving optimum diameter of transmission pulleys 36 is 360mm and 400mm with four ropes in turn having a 9mm diameter for capacities up to 630Kg.

Such a system as the inventive one further provides, in a more advantageous way with respect to a common pneumatic system, the possibility of being used for any lift-car runway length and using powers that are halved with respect to said pneumatic system. The only building work which is necessary for mounting the system according to the present invention is to fix the guides to the well walls by proper brackets 38 if a specific metal frame is not used.

As it will be understood by a man skilled in the art, the possible modular "preengineered" construction of the whole system allows notable money and store managing savings in addition to the possibility of obtaining an homologation and a certification "in factory" and not necessarily when the system is mounted.

In Figure 6 a pair of guides 60 is shown, said guides representing both counter-weight guides or lift-car guides, respectively, on which a supporting shelf 62 is transversely mounted for supporting the motor with its relative traction pulley, not shown for a better comprehension of the drawings, through shaped sheets 64.

The particular construction of shelf 62 will not be further described being dependent from the particular motor used, and being derived by the motor frame usually used for the particular motor in a very well known way for a man skilled in the art.

Advantageously, said shaped sheets 64 are mounted at one of the joints 66 between the section bars forming guides 60, which section bars, as it is known, are necessary in all the lift systems. This represents an important advantage in that said joints 66 are generally obtained by a plate 68 provided with holes 70 in which screw and bolt assemblies passing through holes 72, said holes 72 being correspondingly arranged on the end portions of section bars forming the guides, are inserted. Thus, by arranging sheets 64 at one of the joints, between section bars forming the guides 60 and plates 68, it is possible to use the same fasteners having only to provide additional holes 74 only on the sheets 64. Further, such an arrangement of sheets 64 at one of joints 66 provides a convenient stiffening of joint 66 itself being possible to add fasteners of sheets 64 to guides 60 at a distance from joint 66 larger than plate 68 dimen-

sions.

It will be very advantageous providing sheets 64 with a plurality of holes 74, said plurality corresponding to a repetition of the holes 70 set of plate 68. In this way it will be obtained a large tolerance for the mounting position of sheets 64, and as a consequence the shelf 62 and finally the motor.

By fixing the motor to the guides as previously described, the drawbacks pointed out with regard to the prior art embodiments are overcome. In fact the motor can be placed in any position along the runway well of the lift-car, irrespective of the strength of the walls and the supporting frame. The reaction forces will be conveyed on guides 60 through shelf 62 and thus they will be self compensated by opposed forces due to the load on the upper pulleys, as above said, discharging said loads into the pit or connecting them to a beam which can laterally discharge its loads at a distance from the runway well, which is particularly useful when there is an usable sole under the runway well.

Finally it will be clear to a man skilled in the art that the present invention is particularly convenient when is used with the teachings above described in connection with Fig. 1-5. In fact, in this case guides 60 will be compression stressed, causing the building structure is free from absorbing vertical loads, the building structure having only to react to the orizontal loads on the guides, as in pneumatic systems.

Further, in this embodiment, being provided the coplanarity of counter-weight guide plain and lift-car guide plain, the shelf 12 could be connected as above pointed out to both the guide pairs, resulting in a very advantageous distribution of loads.

It is contemplated and will be apparent to those skilled in the art from the preceding description and accompanying drawings, that modifications and/or changes may be made in the illustrate embodiments without departure from the present invention. Accordingly, it is expressly intended that the foregoing description and accompanying drawings are illustrative of preferred embodiments only, not limiting, and that the true spirit and scope of the present invention be determinated by reference to the appended claims.

Claims

1. Lift system comprising: a lift-car (12) movable in a translatory manner within a proper well (40); a pair of lift-car guides (14); frame uprights (18); a counter-weight (20); a pair of counter-weight guides (16); a traction winch with flywheel (24); transmission pulleys (36) in which proper ropes slide, characterized in that the axes of said pairs of counter-weight guides (16) and lift-car guides (14) are arranged on a single plain parallel to one of the lift-car (12) side, and in that at least one of the two pairs of guides (14,16) is compression loaded by the load brought by the transmission pulleys (36) abutted or whatever structurally upwardly connected to at least one of the two pairs of guides (14,16).

2. Lift system according to claim 1, characterized in that the engine room (50) is placed in a side position with respect to the lift well.

3. Lift system according to claim 1 or 2, characterized in that the engine room is placed at any level with respect to the lift runway.

4. Lift system according to claim 1, 2 or 3 characterized in that said lift system is self load bearing and it is comprised of at least a pair of tip loaded guides (14,16) and it discharges the loads in the pit directly.

5. Lift system according to any of the preceding claims, characterized in that there are provided only fasteners or connection brackets (38) able to connect the pairs of guides (14,16) to the walls of the lift well (40).

6. Arrangement for mounting main motors in electric lift systems comprising a pair of lift-car guides and a pair of counter-weight guides, characterized in that the motor is connected to a shelf (62) in turn transversely connected to at least one (60) of the two pairs of counter-weight and lift-car guides by interplaced shaped sheets (14).

7. Arrangement for mounting main motors according to claim 6, wherein said guides (60) are each formed by a plurality of section bars fixed from time to time through a connecting plate (68), characterized in that said shelf is connect at a joint (66), said shaped sheets being interplaced between said connecting plate (68) and the ends of said section bars of said guides (10).

8. Arrangement for mounting main motors in electric lift systems according to claim 7, wherein joint (66) of said section bars of said guides (60) by said connecting plate (68) is carried out by fasteners as screw and bolt assemblies inserted into arrays of corresponding holes (70,72) of said plate (68) and said section bars of said guides (60), characterized

in that a wing part of said shaped sheets (64) has a plurality of holes (74) corresponding to repetitions of said arrays of corresponding holes (20,22) of said plate (68) and of said section bars of said guides (60), said fasteners being inserted into corresponding holes of said plate, of said shaped sheet and section bars.

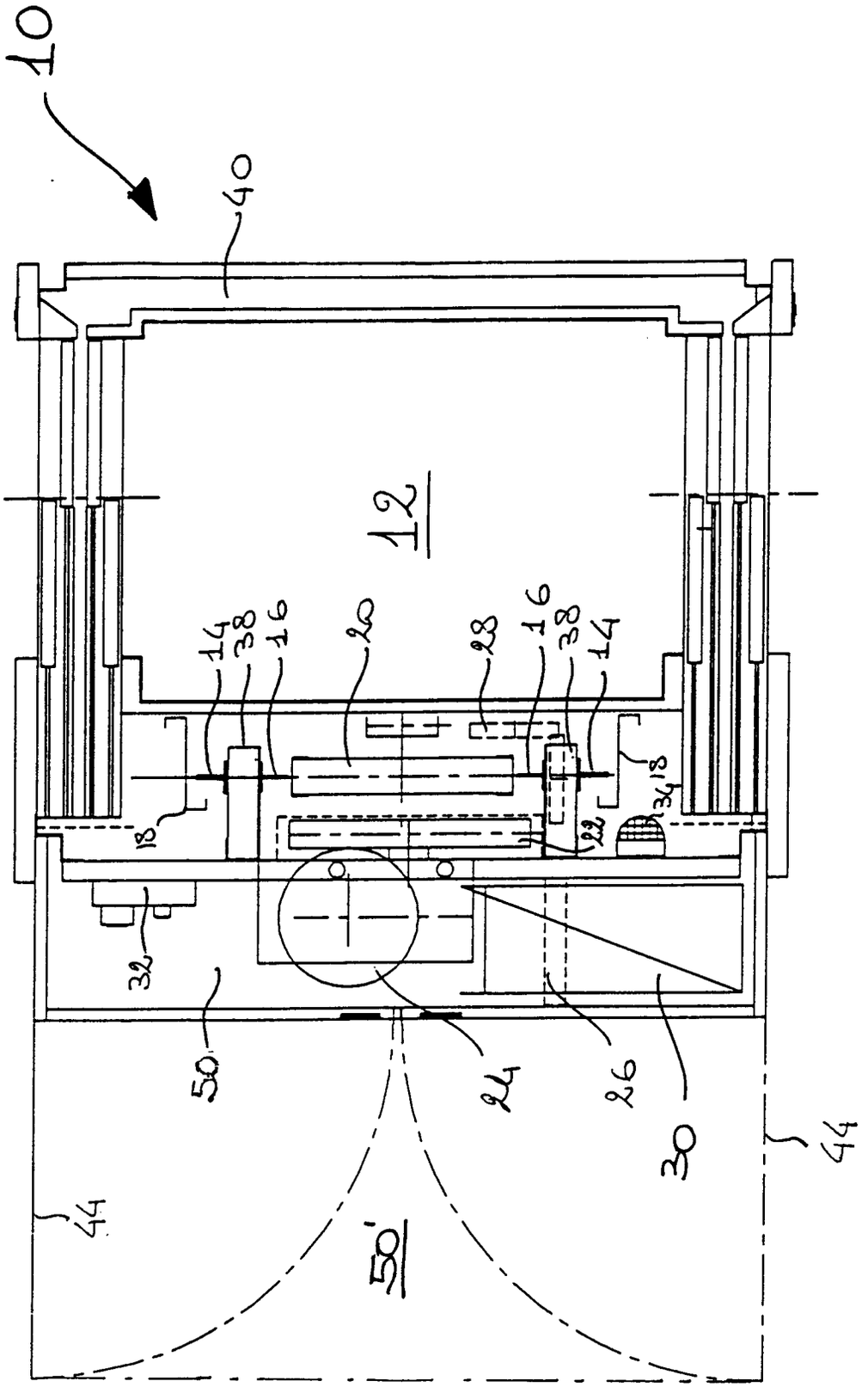

Fig. 1

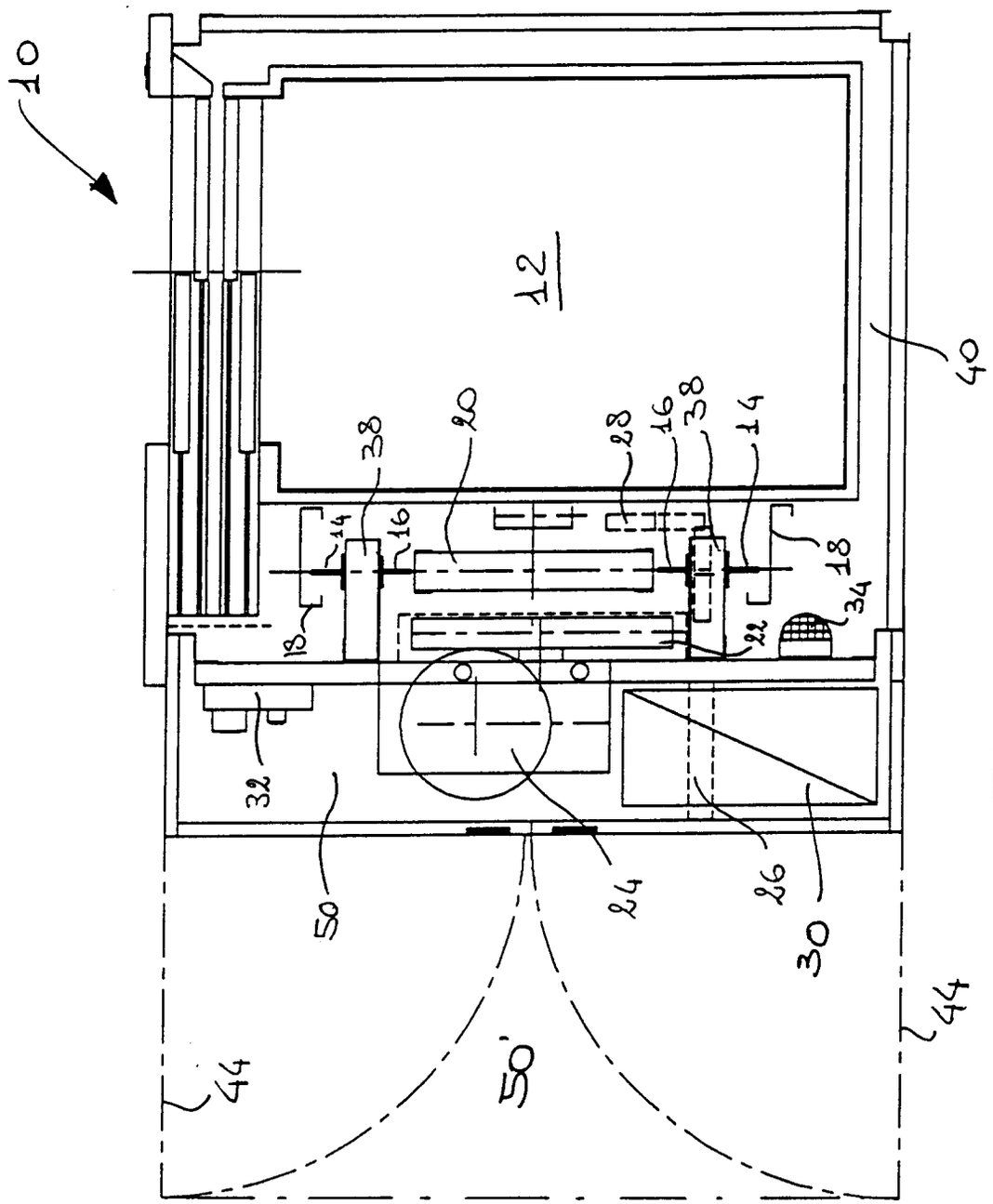

Fig. 2

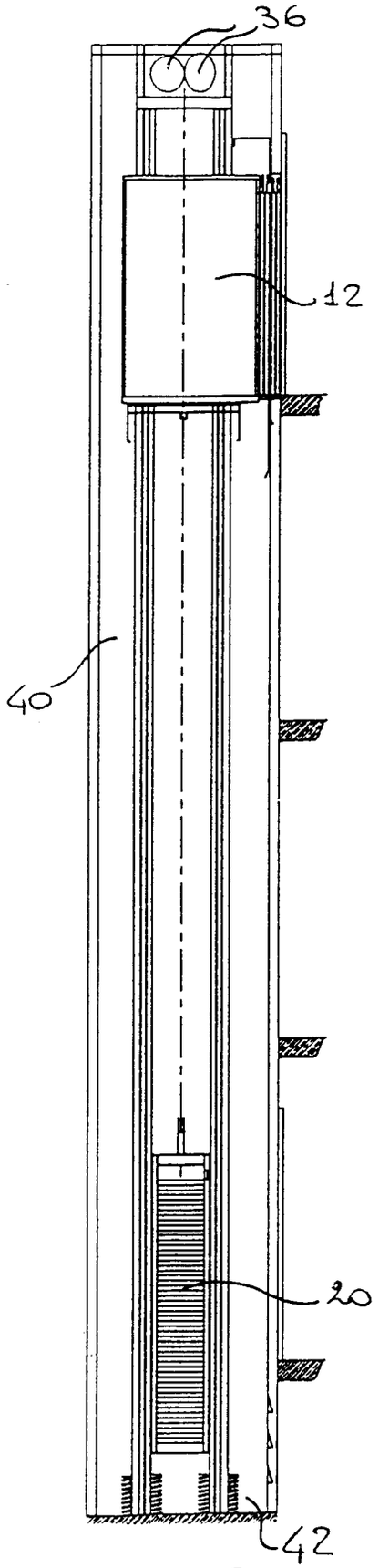

Fig.3

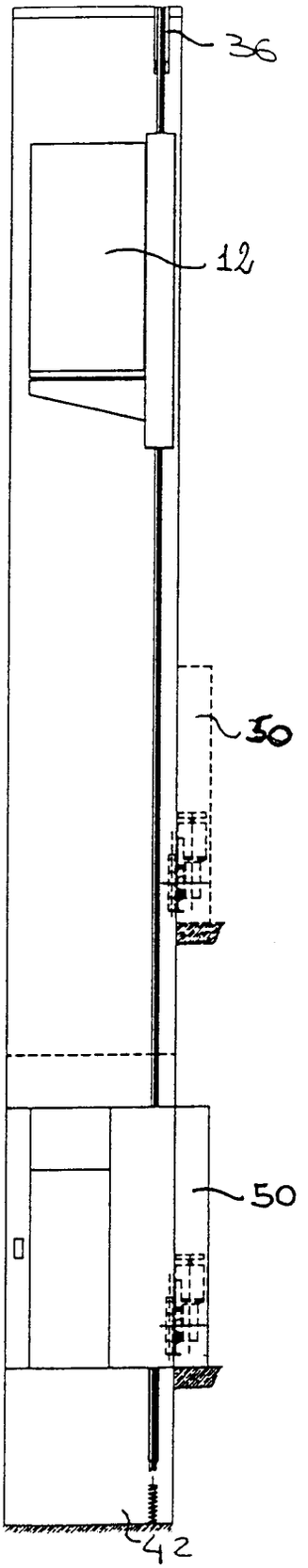

Fig.4

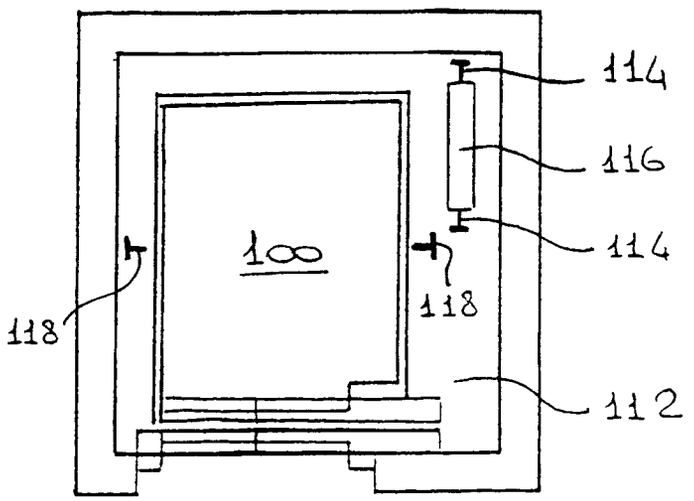

Fig. 5A

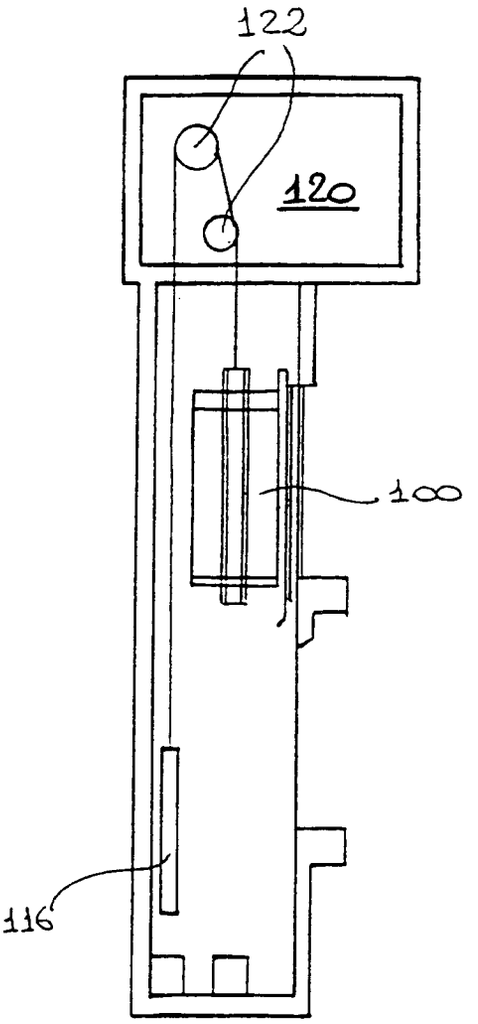

Fig. 5B

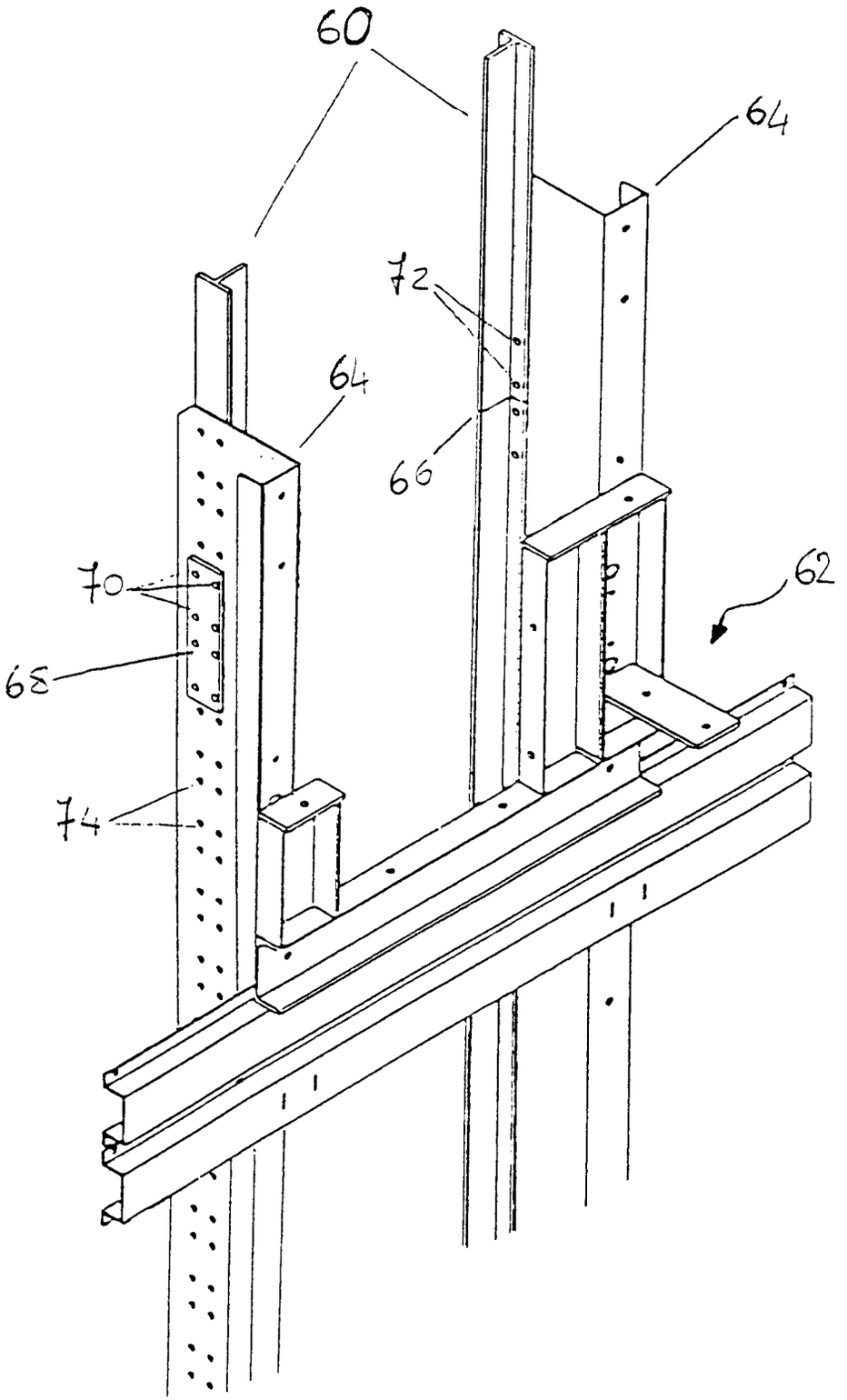

Fig.6