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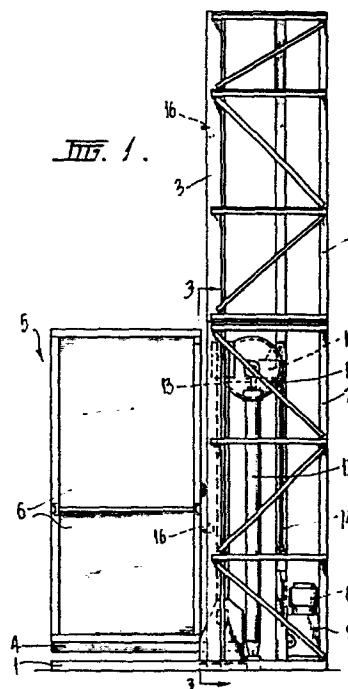
(71) Applicant: **SANSCORD AUSTRALIA PTY. LIMITED**
3 Arnold Grove
Doncaster West 3108 Victoria(AU)

(72) Inventor: **Perkins, Rex Henry**
3 Arnold Grove
Doncaster West, 3108 Victoria(AU)

(74) Representative: **Meddle, Alan Leonard et al;**
FORRESTER & BOEHMERT Widenmayerstrasse 4/I
D-8000 München 22(DE)

(54) **Improvements in load transfer apparatus.**

(57) The invention relates to an apparatus allowing for controlled transfer of loads between spaced-apart levels of a building or the like structure. The apparatus is self-contained and self-supporting and includes a member (4) extending laterally from a support frame (2) and having a load-support means (5) disposed thereon. Motion is imparted to the member (4) by a pneumatically-operated drive arrangement sited laterally of said member (4) and preferably within the frame (2).



The present invention relates in general to means allowing for the transfer of loads between vertically spaced-apart levels of a building or the like structure. The invention relates particularly, but not exclusively, to a means for use on the domestic front.

Lifts and the like equipment nowadays are enjoying usage on an ever-increasing scale in buildings and the like structures. As at the present time, however, usage of lifts and the like equipment on or in relatively small structures, as for example on the domestic front (in for example a two-storey house), or alternatively in relatively small factory, business or commercial structures, has been precluded generally by reason of the sizing, complexity and overall cost of the equipment available for purchase and use. Indeed, and in practical terms, whilst lifts, elevators and the like structures have been particularly designed for what might be termed large-scale usage, no real effort has been made in the past to adapt even existing lift or elevator designs or develop new designs or configurations for usage in the home, or perhaps more correctly for usage either in structures involving only a small number of separate storeys or alternatively in situations wherein the loads likely to be carried are relatively small. As a result thereof, a significant number of potential purchasers for such lifts, elevators, etc. have been largely ignored, as explained in more detail hereunder.

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In multi- (meaning very many) storey structures, lifts, elevators and the like are by necessity built to a rather large scale, to allow for the carriage of reasonably large loads (whether by way of dead weight or personnel) over substantial distances of travel at any one time. Such large-scale lifts are by their very nature somewhat complicated in their structure and, accordingly, expensive in terms of manufacture, installation, etc.

In smaller-scale buildings, and more particularly in two- or perhaps three-storey structures, the requirements as regards frequency of usage, likely load, and hence sizing of elevators and the like equipment are, of course, somewhat different. Nonetheless, in accordance with the known prior art no real attempt has been in the past made to "scale-down", so to speak, existing lift designs with a view to arriving at a product which is compatible, in terms of sizing, cost etc., with a smaller building structure. The most obvious usage of such "scaled-down" lifts or elevators would be in the family home, for example, to allow for transfer of disabled or incapacitated people from one level to another.

Another possible usage for the "scaled-down" elevator in accordance with the present invention would be in retirement villages, holiday villages, housing units and the like. Nowadays, a significant amount of time, effort and expense is being expended in the design and manufacture of retirement villages, etc. Generally speaking, however, such

structures are limited to a single storey by reason of the fact that, in perhaps a large number of instances, the people resident therein will be in some respects incapacitated and hence would find it extremely difficult to move between vertically spaced-apart levels or storeys. This limitation to single storey structures, when coupled with obvious restrictions insofar as available land is concerned, imparts severe restrictions on the designers or architects as regards the overall capacity (occupancy) of such buildings or the like. Clearly the capability of having the structure extend to two or perhaps three storeys would markedly increase the tenancy potential and hence of course make such retirement villages and the like a much more feasible and economic proposition.

The present invention therefore seeks to satisfy an existing demand by providing a lift or the like structure which is eminently suited for use in smaller-scale building structures, whilst at the same time being of such a design as to allow for manufacture, installation etc. at a greatly reduced expense (as compared to conventional larger-scale lifts, elevators and the like).

In accordance with the present invention there is provided an apparatus allowing for controlled transfer of loads between vertically spaced-apart levels of a building structure, said apparatus including: a car or carriage assembly adapted for selective and controlled upward or downward movement, said assembly being adapted to be located

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in a well or tower provided in said building structure; and means for imparting said controlled upward or downward movement to said car or carriage assembly, said means preferably being located laterally of said well or tower and furthermore preferably being pneumatically actuated or operated.

In order that the invention may be more clearly understood and put into practical effect there shall now be described in detail a preferred construction of an elevator in accordance with the invention. The description is given by way of non-limitative example only and is with reference to the accompanying drawings, wherein:

Figure 1 is a side elevational view of an elevator structure or assembly in accordance with the present invention, with the car or cage located at effective ground level;

Figure 2 is a view similar to Figure 1, with the car or cage moved upwardly to a first level or landing;

Figure 3 is an elevational view taken along the line 3-3 of Figure 1; and

Figure 4 is a view taken along the line 4-4 of Figure 3.

Throughout the ensuing description the word "pneumatic" is employed in relation to the mode of operation of the "motion-imparting means". It should be understood, however, that any suitable fluid-actuated apparatus may be employed to achieve the desired result, with the word "pneumatic" therefore being intended to include within its

scope the situation wherein the "motion-imparting means" is hydraulically (or otherwise) operated or actuated.

In the preferred embodiment illustrated in Fig. 1 the lift structure in accordance with the invention includes a base 1 and associated tower structure, generally designated as 2. The base 1 may be located on any suitable flat surface within a lift-well provided in a building structure. Preferably the flat surface will be in the form of a cement or concrete slab of a suitable size. However, such a slab is by no means essential, and the base and associated tower structure may in fact simply be appropriately located on the ground. The tower structure 2 can take a variety of forms, but in the preferred embodiment illustrated is in the form of a lattice-work of upright members, cross-members, supporting struts etc. Preferably, the tower structure will be of a modular construction with individual units of a length substantially the same as the height of the car or cage of the lift. It should be understood, however, that the actual length of travel of the lift may be varied dependent upon the spatial requirements of the building in which the lift is to be installed. In other words, additional unit lengths of tower may be adapted for ready positioning (installation) as desired - dependent upon the number of storeys in the building, for example. In the drawings, a suitable modular unit extension to the tower structure 2 is illustrated at 3.

Associated with the tower structure 2 there is provided a car support means. In the especially preferred embodiment illustrated the support means takes the form of a support sling 4 adapted to extend laterally from the tower structure 2, in a cantilever-type manner. It should be understood, however, that other means are possible for suspending a lift car or cage 5 in the desired position.

Located in any known manner on the car sling 4 is a car frame 5, having a number of panels 6 associated therewith and constituting the walls thereof. It should be understood, however, that it would be possible for the car frame 5 not to include any such walls, nor even a roof, but merely to involve a floor. Means in the form of a guide assembly are also provided for controlling the direction of movement of the car assembly (sling 4, frame 5 and associated panels 6). In an especially preferred embodiment the direction controlling means may be in the form of one or more shaped rail(s) extending along substantially the entire vertical length (height) of the tower structure 2 and adapted to co-operate with complementary shaped protrusions - in the form perhaps of rail(s), roller(s), wheel(s) - located appropriately on the car assembly.

In order to impart motion to the car assembly, whereby to allow for selective vertical upward or downward movement as required, a pneumatically-actuated drive system is provided. In the preferred embodiment illustrated the

drive system includes a motor 8, a so-called power pack 9, a cross-head 10 having associated therewith at least one sprocket wheel 11, a pneumatic cylinder 12 and associated ram 13 (of an appropriate size), and one or more chains, cables or the like 14. In the preferred embodiment illustrated the arrangement is such that, in use, for each unit extension (or retraction) of the pneumatic ram 13, the car assembly will travel through two similar units (in the appropriate direction, that is upwardly or downwardly). It should be understood, however, that the ratio of ram extension to car assembly travel may be readily varied. By the same token, however, it should be understood that any variation in the aforesaid ratio will give rise to substantial variations in the stresses existing at or imparted to the cross-head 10. In an especially preferred embodiment (not illustrated), the cylinder 12 may be telescoping in form (or any known type).

In the preferred embodiment a clevis-mounted hydraulic cylinder 12, housed on the base 1 within the tower structure 2, supports a cross-head 10 having pulley(s), sprocket wheel(s) or the like associated therewith. The ropes or chains extending around and from said pulleys, sprocket wheels or the like attach on one side to the car sling 4 and to the base 1 on the other side of centre. When energized by the power pack 9, preferably a hydraulic power pack and fitted with solenoid valves, restrictor, non-

return valves and pressure gauge, the cylinder 12 will operate at a predetermined ram speed, for example 20 ft. per minute. By reason of what might be termed the mechanical advantage of reeving attributable to the pulley/sprocket system employed, such a ram speed could be responsible for a correspondingly increased car travel speed, for example 40 ft. per minute.

Preferably a single-phase motor may be employed as the drive motor 8. However, and dependent on intended usage, three-phase current may be employed, with the result that a three-phase motor may be more appropriate in certain circumstances. Braking means of any known type, as for example solenoid braking means, may also be provided.

In order to allow for control of the overall system a number of control means, preferably electrical, may be provided. Such control means may include a demand button at each level of the building structure and a start-stop button in the car assembly itself. In addition the tower structure 2 may be provided with so-called limit switches 16 at each level or landing thereof, with such limit switches 16 being operable to effectively de-energize the drive motor 8 upon arrival of the car or cage 5 at a respective or desired level or landing of the overall structure. Furthermore, an appropriate communication system, as for example a telephone or the like, may be installed in the car or cage 5 whereby to allow for communication with

persons outside the car 5, as for example in times of emergency.

The foregoing description may be seen to refer in some detail to what may be considered to be the basic features of the present applicant's arrangement. However it should be noted that a number of additional features may be included as desired, for purposes of overall safety and the comfort of the user.

For example the car 5 may be equipped with lighting of any known type. Preferably, however, all lighting and controls are of low-voltage type. The car 5 may also be equipped with a battery to operate as a stand-by to provide emergency lighting, as for example in the instance of power failure.

At each level or landing of the tower structure 2 there may be provided a landing door assembly of any suitable type. Preferably the or each landing door is adapted to be affixed to the tower or building in any known manner, as for example by bolting, and may be fitted with a lock of the so-called electro-mechanical type whereby to prevent unauthorized opening of that door at any time when the car or cage 5 is not itself present at the particular level or landing concerned. The or each landing door may also be provided with a technician's lock release assembly (not shown), whereby to allow ready access thereto, and to the interior of the tower, for purposes of service, repair and/or maintenance. Doors or the like need not be provided on the car or



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cage 5 itself. In an especially preferred embodiment, not illustrated, the car or cage 5 will have associated therewith means allowing for ready access thereto, such means taking the form of a door sill and frame assembly and an associated sliding door arrangement.

Preferably the or each landing door will be appropriated hinged and fitted "flush" with the well lining of the overall lift structure. These doors need not be fire-rated, but will generally be fitted with an automatic closing means, an electrical interlocking means and preferably electrically and/or mechanically actuated locks.

The arrangement in accordance with the present invention is in itself responsible for a number of practical advantages, as will be explained in more detail hereunder.

Firstly, it should be noted that in conventional elevators of the general type under consideration the pneumatic (hydraulic) cylinder and associated equipment are sited beneath the car assembly, preferably centrally thereof. Such a configuration requires the cylinder etc. to be located below what might be termed "ground" level, generally in a blind bore or the like of a depth substantially equivalent to the projected length of extension of the cylinder. With the present applicant's arrangement, on the other hand, the cylinder etc. are located effectively at "ground" level, laterally of the car assembly. There is

therefore no need for the provision of any blind bore or the equivalent.

Secondly, the potential for extension of the tower structure 2 to suit different spatial requirements gives the applicant's arrangement a flexibility not evident in the prior art arrangements.

Thirdly, the applicant's arrangement is so designed as to allow for ready installation (location) in a "well" provided in a building structure. Preferably, the car assembly is so dimensioned as to allow a minimum of clearance with the walls of the "well". Such a configuration will generally speaking obviate the need for separate doors on the car assembly, although it will of course be necessary to provide appropriate doors (of any known type) at each landing. Furthermore the lift pit, motor and overhead space required will be kept to a minimum, an important factor in situations where available space is at a premium.

Finally, it is to be understood that the foregoing description refers merely to preferred embodiments of the present invention, and that variations and modifications are possible without departing from the spirit and scope of the invention, the ambit of which is to be determined from the following claims.

CLAIMS

1. An apparatus allowing for the controlled transfer of loads between spaced-apart levels of a building or the like structure, said apparatus including: support frame means; means for supporting a load, said load support means being adapted for selective and controlled directional movement (preferably upwardly or downwardly); and means for imparting said controlled directional movement to said load support means.
2. The apparatus as claimed in Claim 1, wherein said support frame means is self-supporting and self-contained and is capable of being pre-assembled and placed into an existing well or space provided for said apparatus in said building or the like structure.
3. The apparatus as claimed in Claim 2, wherein said load support means is located laterally of said support frame means within said well or space, in a cantilevered relationship to said support frame means.
4. The apparatus as claimed in any one of Claims 1 to 3, wherein said support frame means includes guide means allowing for movement of said load support means upwardly or downwardly relative thereto within said well or space.
5. The apparatus as claimed in Claim 4, wherein said guide means include at least one channel-form track rigidly affixed to said support frame means, and a co-operating or complementary means provided on said load support means.

6. The apparatus as claimed in Claim 5, wherein said load support means includes at least one roller or the like adapted to co-operate with said at least one channel-form track whereby to control the direction of movement of said load support means relative to said support frame means and to prevent unwanted sideways movement of said load support means within said well or space of said building or like structure.

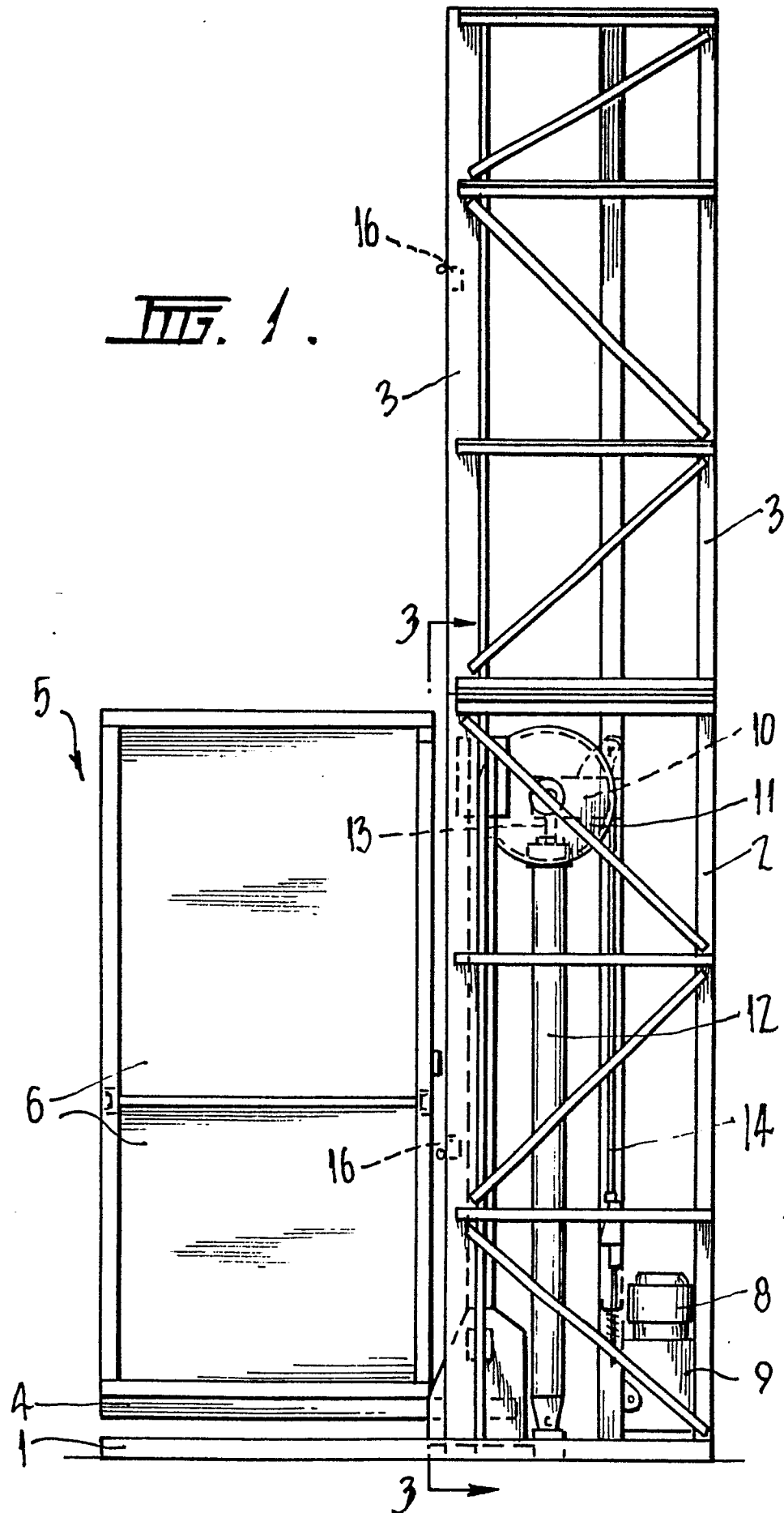
7. The apparatus as claimed in any one of the preceding claims, wherein said motion imparting means is located laterally of the path of movement of said load support means, and preferably within said support frame means.

8. The apparatus as claimed in any one of the preceding claims, wherein said motion imparting means includes a drive means in mechanical connection with a pneumatic cylinder and associated ram, the arrangement being such that the length of travel of said load support means is proportional to the length of stroke of said ram.

9. The apparatus as claimed in any one of the preceding claims, wherein said load support means is in the form of a platform adapted for movement within said well or space of said building structure.

10. The apparatus as claimed in any one of Claims 1 to 8, wherein said load support means is in the form of a box-like cage or enclosure, said enclosure preferably having a sliding-door assembly provided on one side thereof.

FIG. 1.



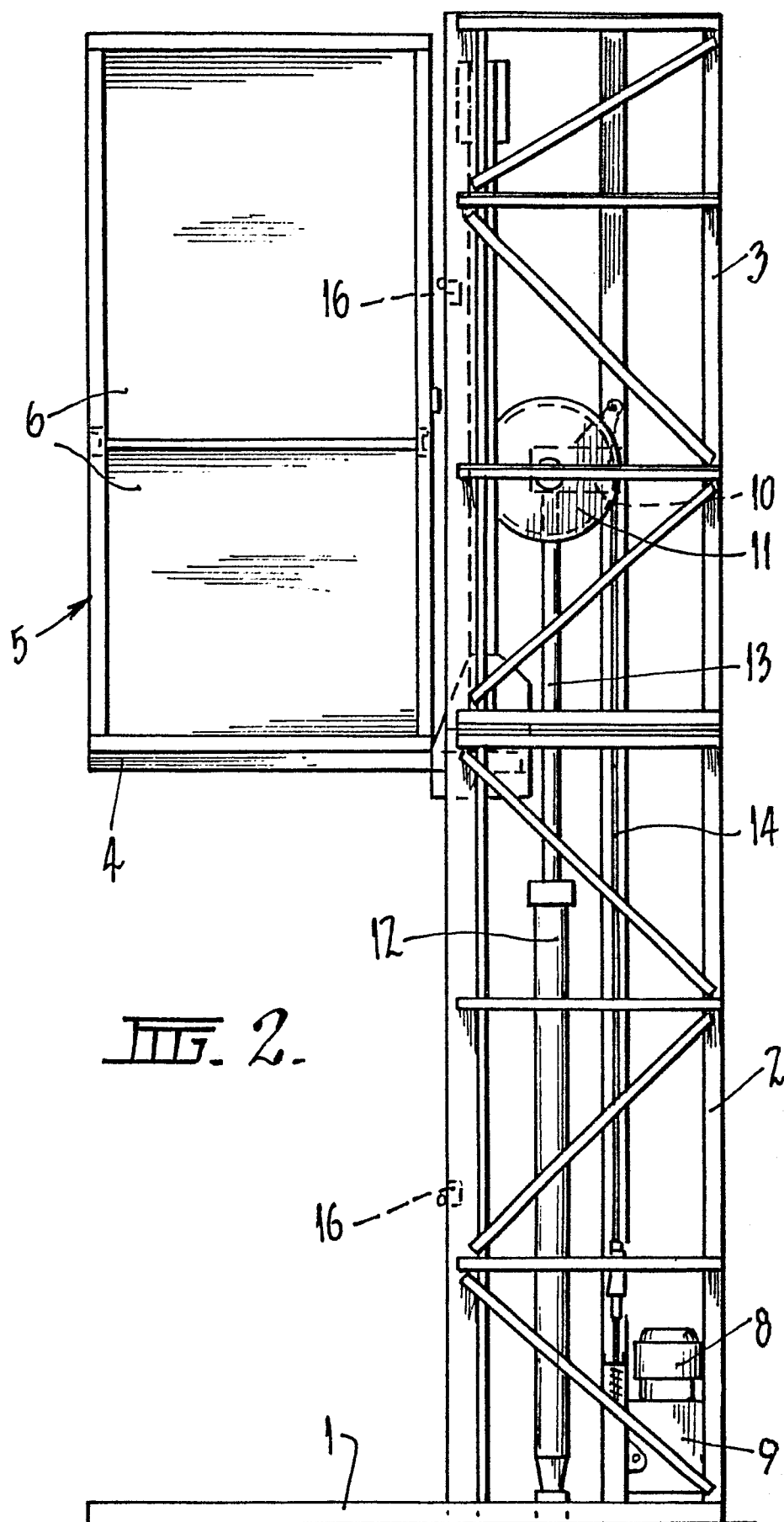
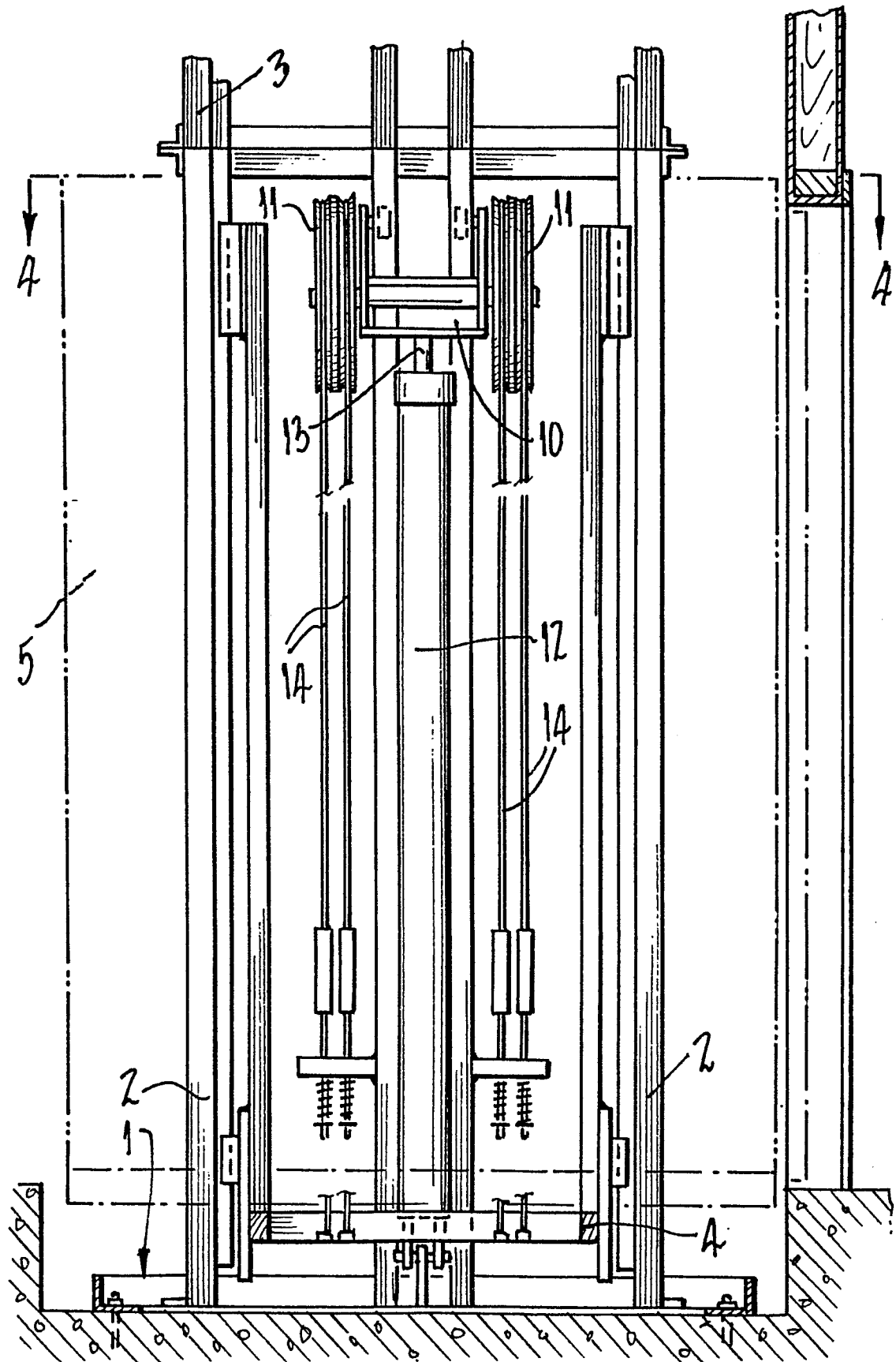


FIG. 3.

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