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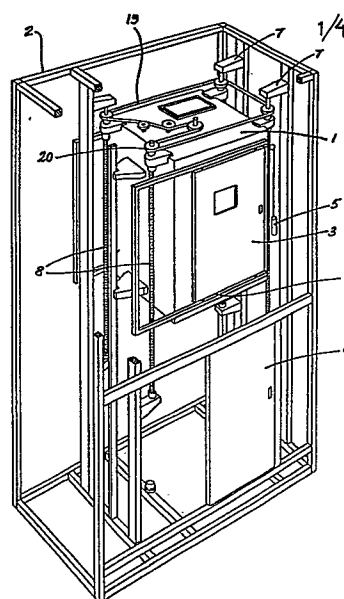
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⑤④ **Apparatus for the transfer of loads from one level to another.**

⑤⑦ This invention concerns an elevator means suitable for the transfer of loads, be such loads in the form either of personnel or other material or goods, from one level to another of a building structure. The invention utilizes rigid guide means for the control of both the speed and direction of movement of the elevator. In the instance of failure of such rigid guide means, further movement of the elevator is precluded. The arrangement of the invention functions without reliance on conventional hoisting means in the form of cables, ropes and the like, thereby effectively precluding the need for the incorporation of sophisticated safety devices adapted to come into operation to stop the elevator in the instance of failure of the earlier-mentioned hoisting means.



EP 0 020 825 A1

"Apparatus for the transfer of loads from one level to another"

THIS INVENTION relates to means for the transfer of loads from one level to another. More particularly the invention relates to means allowing for the transfer of loads between two adjacent floors or storeys of a building
5 structure.

A conventional elevator, of the type suitable for transferring loads from one level to another, depends for its actual operation upon the utilisation of steel cables, hoisting ropes or the like. Such elevators in general may
10 be seen to comprise a power-operated device for lifting and lowering loads and are made up of a so-called car or cage which is arranged so as to run between guide rails extending between the levels under consideration. The car or cage itself is by convention suspended from steel hoisting ropes
15 or cables. The weight of the car and its load is, in practice, approximately counter-balanced by a so-called counterweight. The actual weight to be hoisted by the drive motor may therefore be seen never to equal the total weight of the car and passengers (or load) but rather is equal to
20 merely the relatively small difference which exists between the counterweight and the weight of the loaded car.

By reason of the use of steel hoisting cables, ropes and the like the relevant government authorities require the incorporation of sophisticated and virtually fail-safe
25 safety devices and safe-guards in elevators of this general type. Some elevators, for example, are equipped with a safety rope which runs in an endless loop around pulleys positioned at the top and bottom respectively of the lift well or shaft. This safety rope is then secured to the lift
30 or elevator car. In the event of fracture or failure of the

hoisting rope or cable the car will drop (under the influence of gravity). This drop will cause the pulleys of the safety rope to rotate more rapidly. A centrifugal governor connected to the safety rope pulley positioned at
5 the top of the lift shaft will then serve to actuate a switch which will set the safety devices in operation whereby to arrest the downward motion of the car. In one example this arresting effect is achieved by means of powerful jaws adapted to act on and grip the guide rails.

10 Various other safety devices are also generally provided in modern elevators of this general type. For example, limit switches may be provided to prevent over-travel of the car beyond the desired level, door interlocks may be provided to prevent the car from actually starting
15 until the doors or the like are securely closed, etc.

Further problems arise when an elevator is specifically required, for example, for use and installation in a two-storey building, be that building a private house, flats, offices or perhaps even storage facilities.
20 Modern elevators are particularly designed for usage in multi-storey buildings and, in the result, it is generally extremely difficult and accordingly expensive to obtain a smaller unit for usage in a two-storey situation. As pointed out above such smaller units may be required, for example,
25 by smaller firms for the purposes of transporting loads, in the form of personnel, stationery and/or other material between adjacent floors. Alternatively, in the domestic situation, such small units would be particularly appropriate for the transport of either elderly or other-
30 wise incapacitated people between adjacent floors of a multi-storey home or building. If no such facility for transport is provided, then such elderly or incapacitated people would in essence be virtually confined to a particular storey of the structure, a dreary existence
35 indeed.

The present invention seeks to provide an elevator or load transfer means which is particularly suited for usage

between adjacent levels in a structure. The invention further seeks to provide such a load transfer means or elevator which achieves the desired result in an efficient manner and by the utilisation of apparatus the cost of which
5 brings it within reach of both the business and domestic sections of a community.

The present applicant's arrangement seeks to avoid the need for the use of ropes, cables and the like in elevator or load transfer equipment. Such what may be
10 termed "hoisting means", generally in the form of ropes or cables are, of course, susceptible to breakage. The present arrangement, by eliminating the need for these elements, results in an increase in both the efficiency of the overall system and the degree of safety afforded thereby.
15 Despite the elimination of such elements as hoisting cables, ropes and the like, the present applicant's arrangement has nevertheless been found to comply fully with the requirements of the relevant government authority or instrumentality as regards structural and operational safety.

20 The present invention further seeks to provide an elevator which will not drop in the event of power failure, but will rather automatically stop at the level reached or attained at that particular point of time.

The present invention furthermore seeks to provide an
25 elevator or load transfer means which is adaptable for ready installation into an existing building, or alternatively may be readily fitted to an outer wall of an existing building. In order to achieve this result, an elevator or load transfer means in accordance with the present invention
30 is adapted for assembly prior to transport to the site where installation is required.

In accordance with the present invention there is provided an apparatus for the transfer of loads from one level to another, said apparatus including: platform means
35 for supporting said load or loads; guide means for controlling the path and speed of movement of said platform means between said levels; and drive means operable to move

said platform means between said levels.

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

Figure 1 is a perspective view from above of a load
10 transfer system in accordance with the present invention, showing an appropriate well or shaft and a platform means in the form of a so-called car adapted to move between two levels of a building structure;

Figure 2 is a front elevational view of the transfer
15 system illustrated in Figure 1;

Figure 3 is a partial elevational view, from the side, of the arrangement of Figures 1 and 2, showing the car or platform means in its uppermost position in full lines and in its lowermost position at an adjacent level in broken
20 lines;

Figure 4 is a view from above of the load transfer system of Figure 1 showing in more detail the drive means utilised for purposes of imparting movement to the so-called car or platform means; and

25 Figure 5 is an exploded view of a means incorporated in the arrangement of Figure 1 for the purposes of controlling both the speed and path of movement of the so-called car or platform.

In an especially preferred form of the invention, as
30 illustrated for example in Figure 1, a load transfer means includes a so-called car or cage 1 adapted for location within an outer tower or frame 2 whereby to allow for movement of the car 1 between two floor positions. The transfer means thus arranged may be of a modular construct-
35 ion, whereby to allow for transport in its assembled condition to a site for installation in the interior of a building, or alternatively for ready attachment to the side

of a building.

As illustrated in the drawings the car 1 preferably is made up of a box-like enclosure having sliding doors 3 provided thereon to allow for entry thereinto. In one arrangement in accordance with the invention a sliding door 3 is provided at one side of the box-like enclosure. However, in an alternative arrangement a corresponding sliding door may be provided at both the front and rear sides thereof, whereby to allow for ready access from both front and rear. In other words, the car 1 may be provided either as a walk-through unit having doors to both sides thereof, or as a come-back model, having doors to one side only.

In an especially preferred embodiment the or each door 3 of the car 1 is fabricated from aluminium and mild steel sections as a separate unit to be bolted or otherwise affixed to the car 1. If a hand-operated door 3 is desired, this may be achieved by the provision of an appropriately fire-rated door arranged on a so-called Bangor type track 4 and counter-weighted with a dash-pot arrangement 5, as specifically shown in Figures 1 and 2. However, if self-opening type doors are desired this may be achieved by fitting the or each door 3 with a torque limited drive.

In addition to the aforementioned door or doors 3, there is preferably also provided, at each level or landing of the arrangement in accordance with the invention, an outer or landing door assembly 6. This landing door assembly 6 may be of a somewhat similar construction to the actual car doors 3, although the assembly 6 is adapted to be bolted to the tower or frame 2 and is preferably fitted with an electro-mechanical type lock whereby to prevent opening thereof at any time when the car or cage 1 is not itself present at the landing. This constitutes a further safety precaution. The landing door assembly may also be provided with a technician's lock release assembly whereby to allow for entry for purposes of service and maintenance.

On opposing sides of the car 1 and adjacent the ceiling thereof there are provided upper mounting brackets

7 for receiving and retaining guide means allowing for the control of movement of the car 1. In an especially preferred arrangement the guide means are in the form of four rolled thread ball bearing screw assemblies, as for
5 example of the type known as Saginaw steering gear available from The General Motors Corporation. In such an arrangement use is made of four fixed Saginaw type screws 8 each having a revolving circulating ball nut associated therewith and attached to the car 1. It should be under-
10 stood, however, that whilst the preferred embodiment utilises four such roller thread ball bearing screw assemblies, two such assemblies might well alternatively be employed. Such an arrangement, however, will not prove as efficient as the aforementioned arrangement utilising four
15 such assemblies, by reason of the possibility of sway and twist introduced thereby.

The ball screw 8 of each screw assembly is attached at each end onto the frame 2 whereby to allow for support thereof. The screws 8, located preferably at each corner of
20 the car 1 and with a nut attached to each corner of that car, are supported at each end thereof by angular contact roller races. In other words, and as illustrated in Figure 5 for example, to each corner of the car or cage 1 a mounting bracket and associated hub 7 are attached with
25 tapered roller thrust bearings 9 supporting a hollow shaft 10 to which is attached a Saginaw type nut 11. Also attached to the hollow shaft 10 is a sprocket 12 having a brake disc 13 attached thereto.

The upper mounting brackets 7, as specifically
30 illustrated in Figure 5, are in the form of a fabricated bracket member adapted to be attached to vertical channel members provided on the lift frame 2 whereby to support the Saginaw screws 8. In a preferred arrangement these upper brackets are provided with suitable adjustment means, as for
35 example illustrated at 14 in Figure 5, whereby to allow the screws 8 to be aligned correctly in relation to the frame 2. The brackets 7 provided for housing the lower ends of the

screws 8 may be of a similar construction to the aforementioned upper brackets, or may alternatively be provided or fitted with so-called "floating" attachments to allow for correct relative alignment of the screws 8.

5 In the arrangement illustrated the sprockets 12 attached to the upper ends of the screws 8 are rotated, by means of an appropriate drive system to be described in more detail hereinafter, whereby to cause the car or cage 1 to rise or descend as required dependent upon the direction
10 of rotation. As the four screws 8 must be rotated to either raise or lower the car or cage 1, there is no free fall condition of the type which is known to exist with so-called conventional elevators. As such, a compensating counterweight will not be required.

15 At the top of the outer frame 2, or alternatively at the top of the car or cage 1, there is provided a sub-base 15 (see Figure 4). Located on this sub-base 15 are a drive motor 16, drum coupling and solenoid breaking means 17 and a reducing gearbox 18. In an especially preferred
20 embodiment the drive motor 16 will be in the form of a single phase motor connected, via a suitable power coupling 17, to a 90-degree gear reducer 18 (adapted for example to provide approximately 3:1 transmission ratio). In practice the power coupling 17 ensures the existence of a short period
25 of dwell before the onset of full torque to the gearbox 18, thereby allowing for what may be termed, in layman's language, a "soft" start-stop effect. The output shaft from the reduction gearbox 18 in turn is adapted to drive chains 19 and sprockets 20 in a circular fashion to each of the
30 Saginaw nuts 11, thereby imparting upward or downward motion to the car or carriage.

For domestic usage, a single phase electric motor may preferably be employed. However, when the unit is adapted for use as, for example, a service lift for shops and
35 factories, three phase current may then be employed, with the result that a three phase motor will be appropriate.

For convenience insofar as actual construction, maintenance and servicing is required, the appropriate motor 16, reduction gearbox 18 and associated sprockets 20 are mounted on the top of the car or cage 1.

5 In a preferred embodiment there is provided adequate space between the car 1 and the frame 2 whereby to allow for access therein of personnel. Such space may be utilised either as an emergency exit or for purposes of maintenance. The car 1 may furthermore have a removable panel provided
10 therein whereby to allow for ready access to the space. A ladder or ladders provided on the frame 2 and a door, manually or electrically operated, provided at the bottom of the frame 2 would then complete the arrangements allowing for escape in an emergency or under conditions of
15 power failure.

In order to allow for control of the load transfer system a number of electrical controls may be provided. Such controls would include a demand button at each level and a start-stop button in the car or cage 1 itself.
20 Furthermore the frame 2 may be provided with so-called limit switches at each level thereof, with these switches being operable to de-energise the drive means upon arrival of the car or cage 1 at a respective floor of the overall structure. An appropriate communication system, as for
25 example a telephone, may be installed in the car or cage 1 whereby to allow for communication with persons outside that car 1 in times of emergency.

The foregoing description may be seen to refer in some detail to what may be considered to be the basic
30 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 or cage 1 may be equipped with
35 lighting of any known type. Preferably however, all lighting and controls are of the low voltage type. The car or cage 1 may also be equipped with a battery stand-by for

emergency lighting, as for example for use in the instance of power failure.

Furthermore, the or each entry door may be fitted with electrical solenoid locks which are adapted to lock when
5 de-energised such that, in the instance of power failure, entry cannot be gained unless the car or cage 1 is actually present at the level of entry.

A further preferred feature of the present arrangement resides in the provision of a means for detecting and
10 reacting to fracture of the or each chain of the assembly. In one such arrangement (not shown) a basic frame and pivot pin may be adapted to support two sprockets on spring-loaded arm members whereby to tension the or each drive chain. In the instance of chain breakage or fracture, the relevant
15 arm will revolve under spring pressure whereby to actuate a micro-switch operable to stop the drive motor and hence arrest the motion of the car or cage 1.

In a further preferred embodiment, two buffers are fitted at the base of the frame 2 in order to protect against
20 the possibility of over-run of the car 1.

Caliper type disc brakes 21 (see Figure 4) may also be fitted to alternate Saginaw nuts 11. In the instance of power failure these disc brakes 21 will hold against release until actually released by a service man or alternatively
25 upon resumption of the power supply.

CLAIMS

1. Apparatus for the transfer of loads from one level to another, said apparatus including: platform means for supporting said load; guide means for controlling the path and speed of movement of said platform means between said
5 levels; and drive means operable to move said platform means between said levels.
2. The apparatus as claimed in claim 1, wherein said guide means are in the form of at least two rigid threaded
10 elements extending between said levels.
3. The apparatus as claimed in claim 2, wherein there are provided four rigid threaded elements, one at each corner of said platform means.
- 15 4. The apparatus as claimed in claim 2 or claim 3, wherein said rigid threaded elements are in the form of rolled thread ball bearing screw assemblies.
- 20 5. The apparatus as claimed in any one of the preceding claims, wherein said platform means is adapted to provide access for said load from both the front and rear sides thereof.
- 25 6. The apparatus as claimed in any one of the preceding claims, wherein said platform means is in the form of a box-like cage or enclosure having a sliding-door arrangement provided on the front and/or rear sides thereof.
- 30 7. The apparatus as claimed in any one of the preceding claims, wherein said drive means is adapted to be mounted on the uppermost surface of said platform means.
8. The apparatus as claimed in any one of the preceding
35 claims, wherein said drive means is in the form of a single

phase motor which is adapted to be connected, via power coupling means, to a gear reducer, said gear reducer in turn being in drive connection with said guide means whereby to allow for movement of said platform means
5 therealong.

9. The apparatus as claimed in any one of claims 1 to 5, wherein said drive means is in the form of a three-phase motor which is adapted to be connected, via power coupling
10 means, to a gear reducer, said gear reducer in turn being in drive connection with said guide means whereby to allow for movement of said platform means therealong.

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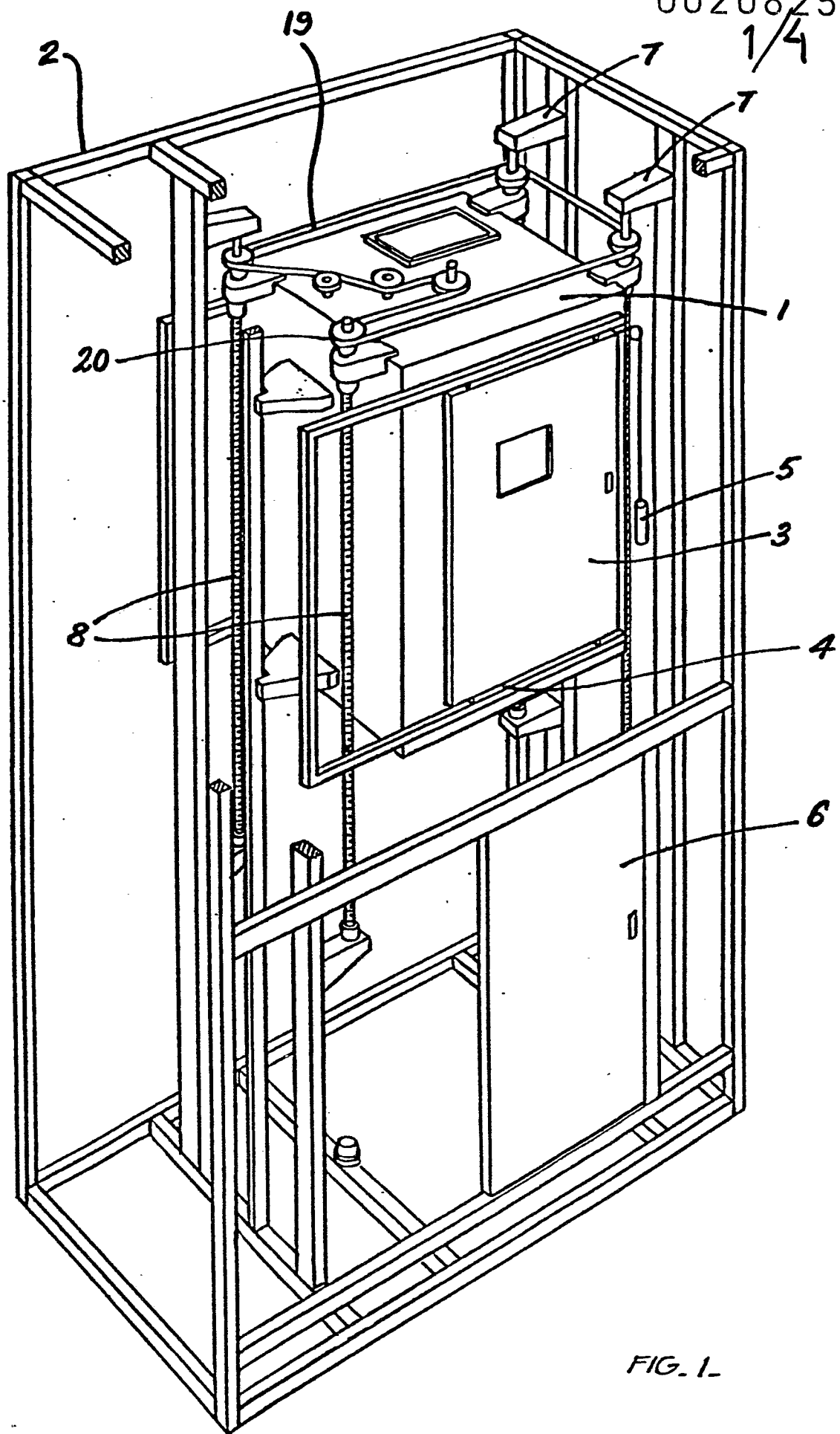


FIG. 1.

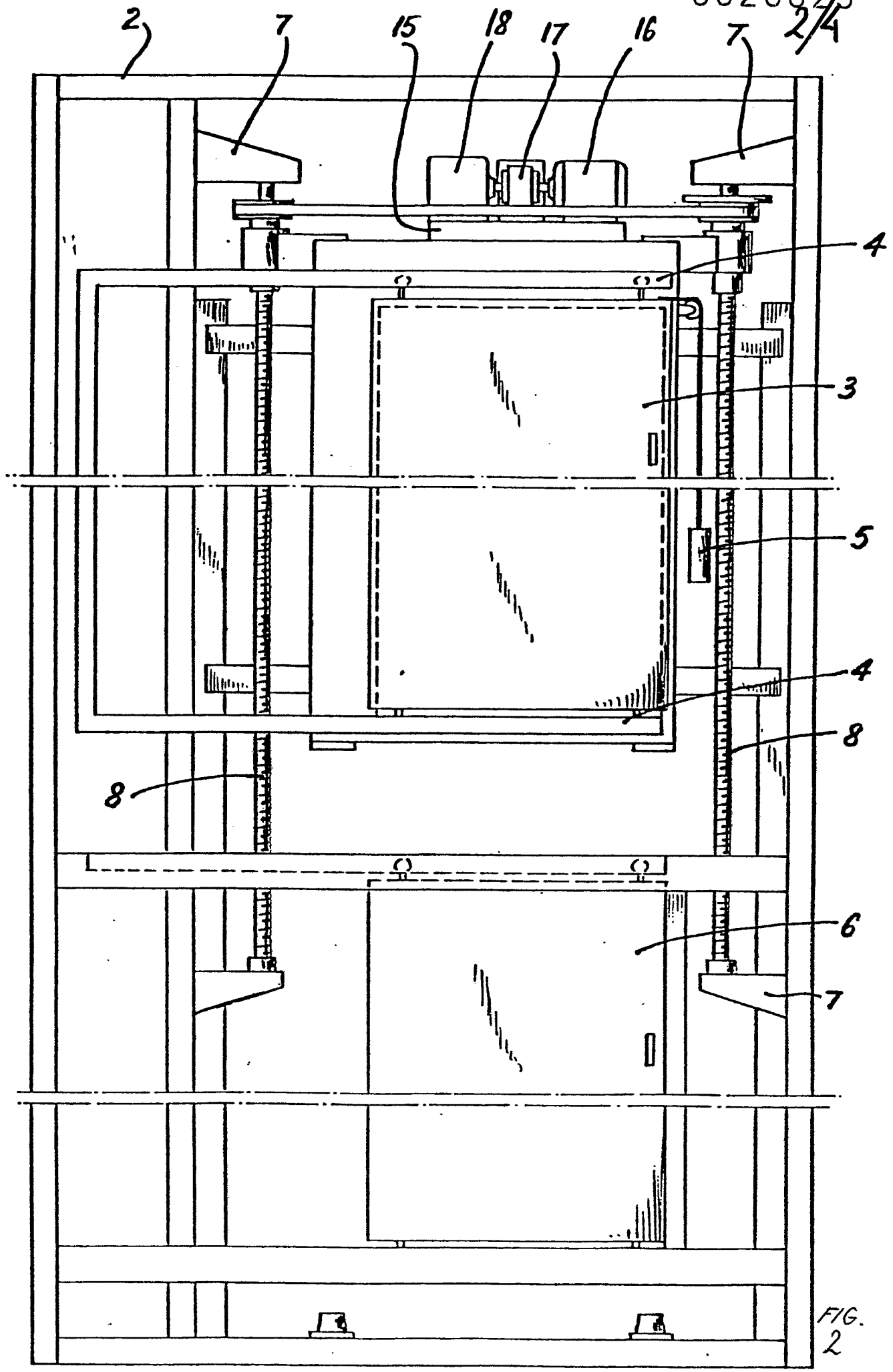
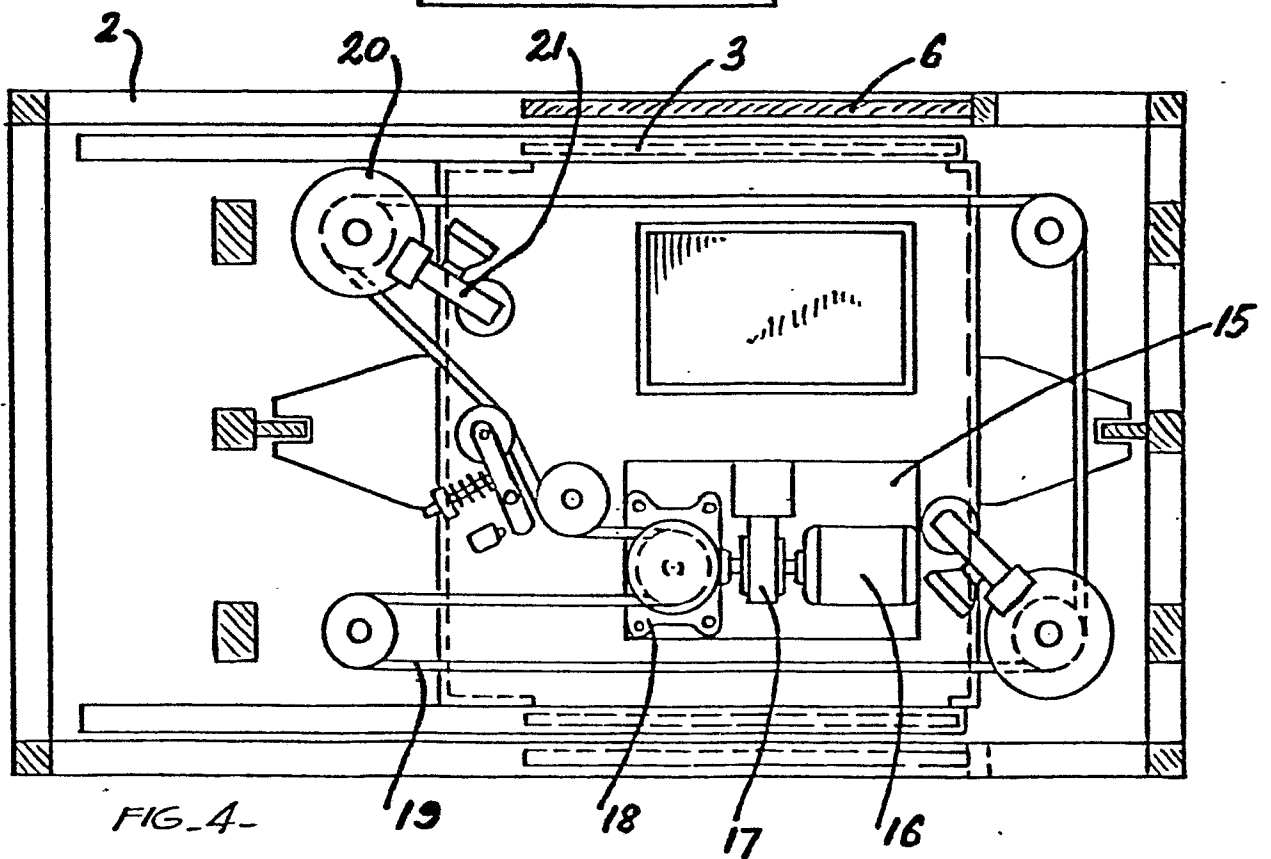
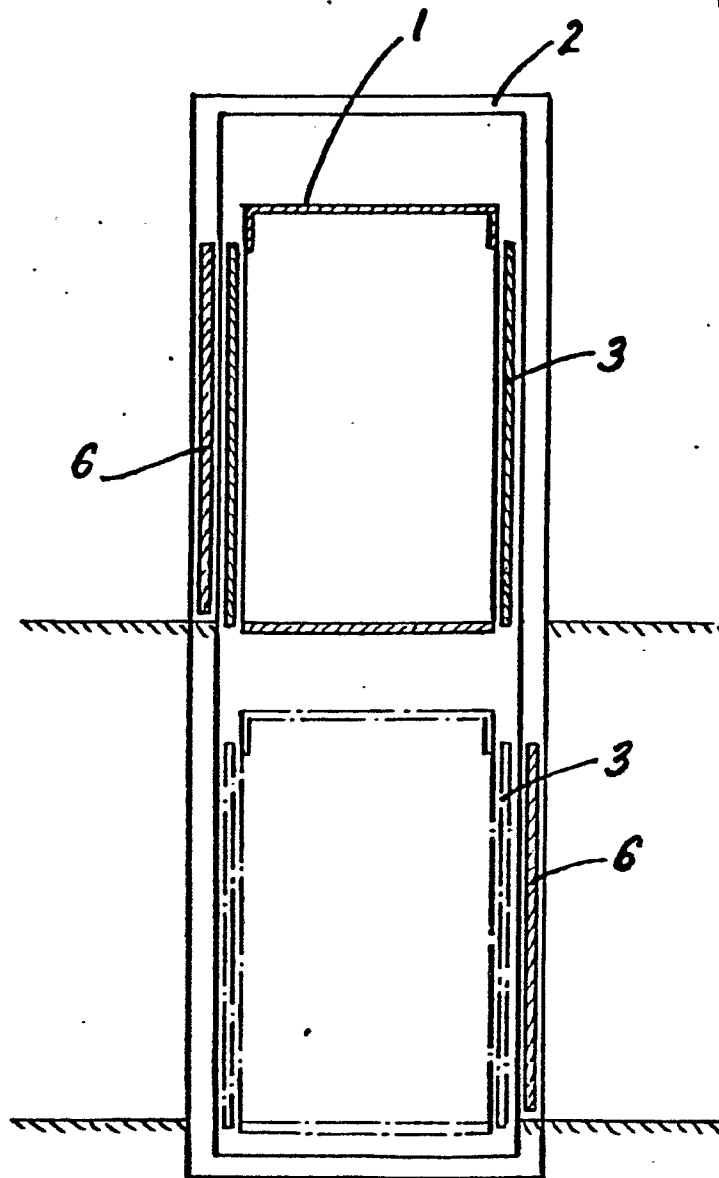


FIG.
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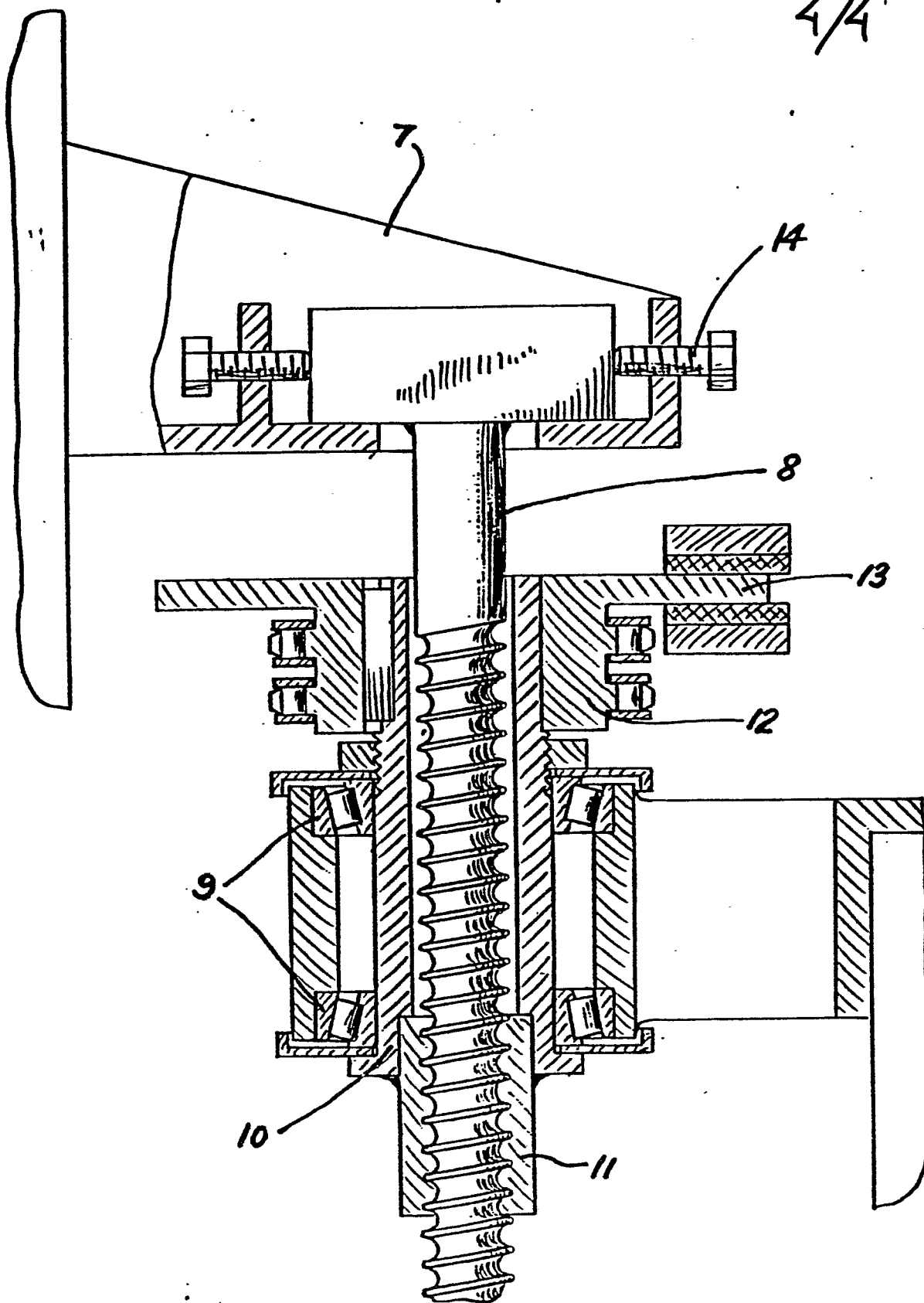


FIG. 5



European Patent
Office

EUROPEAN SEARCH REPORT

0020825

Application number

EP 74 30 1102

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<u>US - A - 2 802 549</u> (F. DE LOS SANTOS IZQUIERDO) * The whole document *	1-3	F 16 H 25/20
	<u>AU - A - 442 061</u> (A. BARBI) * Page 4, line 21 to page 5, line 10; page 7, line 2 to page 9, line 24; figures 1, 2, 5-7 *	1, 2, 6, 7	
	<u>US - A - 3 851 854</u> (P.V. ROYBAL) * Column 1, line 1 to column 2, line 18; figures 1, 2 *	1, 3	TECHNICAL FIELDS SEARCHED (Int.Cl. ³) B 66 B 9/00 9/02
	<u>US - A - 3 215 227</u> (ELLAMAC) * Column 1, lines 1 to 45; Column 2, line 67 to column 5, line 19; figures 4, 5, 6 *	4	
	<u>US - A - 3 924 710</u> (HARSCO) * Column 3, lines 11 to 39; figure 1 *	5, 6	CATEGORY OF CITED DOCUMENTS X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
	<u>US - A - 1 986 620</u> (T.H. BORDEN) * Page 1, line 28 to page 3, line 2; figures 1, 2, 3, 6 *	1, 8	
X	The present search report has been drawn up for all claims		&: member of the same patent family, corresponding document
Place of search The Hague		Date of completion of the search 22-08-1980	Examiner ZAEGEL



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>DE - C - 201 572</u> (G. BENOIT) * The whole document *	1	
A	<u>US - A - 3 468 401</u> (E. LETZ) * Abstract; figures 1,2,4 *	1	
A	<u>FR - A - 2 199 524</u> (G. MILLET) * Page 3, line 21 to page 4, line 9; figures 1,2 *	3	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)