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(54) Self-controlled automotive vehicle parking.

(57) A parking tower (10) comprises a frame (11) which defines cubicles (12a-t) positioned one above the other and an elevator (16) attached to the frame (11) for conveying vehicles (36) vertically between a ground level and vertical positions adjacent to the cubicles (12a-t). Both the elevator (16) and the cubicles (12a-t) include horizontal conveyors for conveying vehicles (36) between the cubicles (12a-t) and the elevator (16). Controlling mechanisms are actuated at, or near, the ground level to cause a motor assembly (26) to move vehicles between the ground level and cubicles. The horizontal conveyors of the elevator (16) and the cubicles are driven by a motor on the elevator and are clutched together to provide driving linkages. Endless conveyors of the elevator (16) and cubicles (12) include rollers which are mounted on non-circular shafts that can be slid out of their U-shaped frames. A selectively-actuated wheel chock prevents rolling of a vehicle after it is placed on the elevator (16). The controlling mechanisms include a selectively-actuated radiation source (28) at each floor and a safety "stop" mechanism (45b).

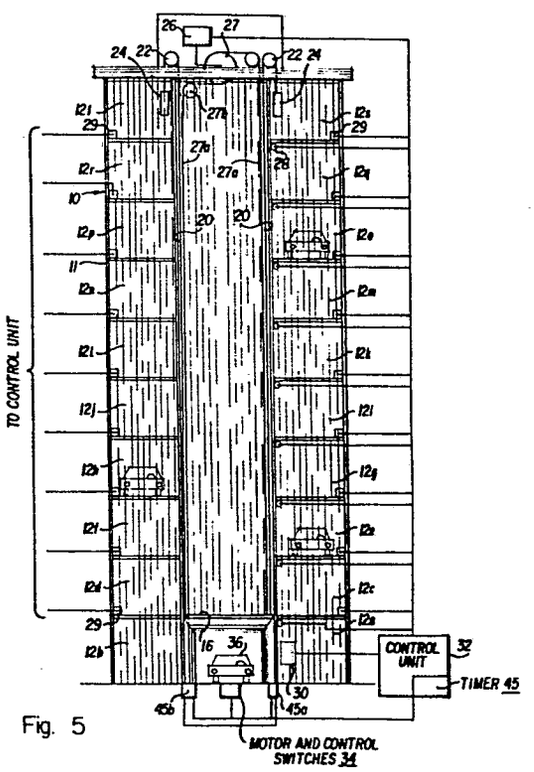

Fig. 5

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SELF-CONTROLLED AUTOMOTIVE VEHICLE PARKING

BACKGROUND OF THE INVENTION

This invention relates broadly to the art of vehicle parking apparatus, and more specifically to vertical vehicle parking structures.

Providing sufficient vehicle parking space has apparently been a problem ever since men started using vehicles. In more recent years, parking structures, or buildings, have been constructed which allow automobiles to be parked on various floors, one above the other. Common difficulties with most such structures is that either they require personnel in addition to an automobile driver to store and retrieve the vehicles or they require that the vehicle operator personally travel to the floor where his vehicle will be parked and then return for it later. In many cases, long spiraling ramps along which a vehicle operator drives are used for traveling between floors of structures. Such ramps are not only costly to construct, but also wasteful of space.

It is an object of this invention to provide a parking tower which does not require extra personnel for moving vehicles between a ground (street) level and a storage level and which does not require that a vehicle operator travel with his vehicle from the ground level to the storage level. It is also an object of this invention to provide a parking tower, or

structure, which makes efficient use of space.

Further, it is an object of this invention to provide a parking tower which is automated to the point that an operator must merely drive into the structure and activate a simple control to park his car.

Several semi-automatic parking towers have been suggested in the prior art. Notable among these are devices described in United States patents to Sumners et al. (2,656,940), Bowser (2,663,436), Maissian (2,705,570), Sinclair (2,746,616) and Thaon de Saint-Andre (2,899,086). However, the devices of these patents require overly heavy, and expensive machinery, and the machinery required is difficult and expensive to service. Thus, it is an object of this invention to provide an automatic parking tower which can be accurately, but relatively inexpensively constructed to be strong and durable but which is also relatively easy and inexpensive to service, having parts which can be readily disassembled and replaced.

Another difficulty with the above described prior art is that the controls therefor are unnecessarily complicated and not accurate to the extent required for a practical automatic parking tower. In this regard, the controls must provide relative freedom from electrical and mechanical malfunctions and should be of a type which are reliable. On the other hand, the controls must not be complicated, because if they are, they would be difficult to service. Thus, it is another object of this invention to provide a control system for an automatic parking tower which is relatively uncomplicated but which provides redundancies as cross checks and is relatively easy to work on.

SUMMARY

According to principles of this invention, a parking tower includes a frame defining vertically

positioned cubicles and an elevator for moving vehicles vertically between a ground (street) level and the cubicles. The elevator and the cubicles include horizontal conveyors for moving the vehicles between the elevator and the cubicles when the elevator is positioned respectively adjacent to the cubicles. The horizontal conveyors include a clutch mechanism for providing linkage between the horizontal conveyors so that only one motor assembly is required for moving the horizontal conveyors. A control system controls an elevator drive motor assembly and the horizontal-conveyor motor assembly to automatically move cars between the ground level and a selected cubicle in response to actuation thereof at or near the ground level.

The horizontal conveyors are endless conveyors which are mounted on easily removable rollers. In this respect, idler roller mounts include non-round shafts which slidably engage openings in U-shaped frames. The rollers include bearings allowing the outer surface of the rollers to revolve about the shafts.

The control system includes automatic lever-type wheel chocks which are activated by a solenoid.

The control system further includes an elevator vertical stopping assembly which has an activated radiation source at a selected floor to inform the elevator when it should stop and a safety stop latch to mechanically latch the elevator to the floor at the correct position and thereby assure engagement of the horizontal-conveyor clutch.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of the preferred embodiment of the invention, as illustrated in the

accompanying drawings in which reference characters refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating principles of the invention in a clear manner.

FIG. 1 is a top, partially cut-away, view of an elevator and cubicle platform forming a part of this invention;

FIG. 2 is a sectional view taken on line 2-2 in Fig. 1;

FIG. 3 is a simplified side view of the platform of Fig. 1;

FIG. 4 is a simplified cross-sectional view of the platform of Fig. 1 depicting particularly clutching assemblies for clutching an elevator endless conveyor to cubicle endless conveyors;

FIG. 5 is a schematic representation of a parking tower of this invention depicting the relationships of control system elements and major structural elements of the parking tower;

FIG. 5A is a top view of the parking tower of Fig. 5;

FIG. 6 is a close-up view of a master control panel of Fig. 5;

FIG. 7 depicts in detail a multiple selection unit which is part of a control unit of Fig. 5;

FIG. 8 is an isometric view of a segmented portion of an elevator platform of this invention;

FIG. 9 is a cross-sectional view taken on line 9-9 in Fig. 8; and

FIG. 10 is a sectional view of a conveyor roller of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to Fig. 5 and 5A, a parking tower 10 includes a frame 11 which defines cubicles

12a-t and an elevator shaft 14. The parking tower 10 also includes a vehicle elevator 16 having an elevator platform 18. The elevator 16 is supported by eight cables 20 which respectively extend about eight pulleys 22 to four counterweights 24. A motor 26 drives the elevator 16 via two grooved pulleys 27 and cables 27a (shown in both solid and dashed lines in Fig. 5A to illustrate positions at different positions of the elevator 16) riding in pulleys 27b.

A multiple selection unit 30 is shown in more detail in Fig. 6. The multiple selection unit 30 is connected to the elevator vertical motor 26 via a control unit 32. The control unit 32 is also coupled to a horizontal-conveyor motor and control switches 34 mounted in the elevator platform 18, as well as to radiation sources 28 at each floor and limit switches, sensors and controls 29 at the horizontal conveyor of each cubicle (all connections not shown in Fig. 5).

Basically, a vehicle operator has a key to a front door of the parking tower 10 and can therefore open the door and drive his vehicle 36 onto the vehicle elevator 16. The operator then looks at the multiple selection unit 30 (shown in detail in Fig. 6) and can see from illuminated red or green lights 38 and 40 which cubicle is free, with the buttons 42 numbered 1 through 20 in Fig. 6 corresponding to cubicles 12a-t in Fig. 5. Once the operator sees which cubicle is free (a cubicle with a green light 40 beside it), he depresses a numbered button 42 corresponding to the cubicle to program the system and a button 44 to activate the system to lift his vehicle 36 and store, or park, it in the chosen cubicle. For the sake of explanation, assume that the operator pushes the button 42 corresponding to cubicle 12k, which is button 11 of Fig. 6, the control unit 32 (Fig. 5) is now programmed and, in preparation for a coming "action" command, the

control unit turns on a radiation source 28 just below the sixth floor (the floor at which the chosen cubicle 12k is located). The operator then depresses the action button 44 on the multiple selection unit 30 and the control unit 32 sends a start signal to the motor 26 which drives the motor 26 to raise the elevator platform 18. A timer 45 in the control unit 32 determines when the platform 18 is nearing the designated sixth floor, at which time, the control unit 32 communicates to the motor 26 to slow down. When the platform 18 is almost at a position adjacent to the selected cubicle 12k a sensor 45a on the platform comes adjacent to the radiation source 28 and senses its presence. This sensing is communicated to the control unit 32 which in turn stops the motor 26 and also activates a latch 45b on the elevator. In this respect, the latch 45b moves to an extended position (not shown) for blocking movement of the platform beyond the designated floor. The platform 18 normally comes to a stop without the latch 45b actually engaging a corresponding stationary member on the frame 11, but the latch 45b is intended as a safety mechanism to insure that the platform 18 does not move beyond the designated floor. In this regard, at this point in the cycle the platform 18 is moving so slowly that even if the latch does come in contact with the blocking member (not shown) the latch is not damaged.

Once the control unit 32 is aware that the elevator is at its desired vertical position, it informs a horizontal-conveyor motor and control switches 34 on the elevator 16 to motivate a horizontal conveyor of the elevator 16 to move the vehicle 36 to the right, as viewed in Fig. 5, toward the cubicle 12k. Once at the cubicle 12k the vehicle 36 is transferred to a horizontal conveyor in the cubicle 12k and continues to be conveyed to the right until the

vehicle 36 is fully in the cubicle 12k. Sensor switches 29 monitor the position of the vehicle and inform the control unit 32 when the vehicle is fully in the cubicle 12k. At this point, the horizontal conveyors are deactivated, the latch 45b is deactivated, and the elevator 16 is returned to ground level. To depark a vehicle, this procedure is reversed with an empty elevator 16 rising to the appropriate level, the vehicle being conveyed horizontally onto the elevator, and the elevator being returned to ground level with the vehicle. To activate this procedure activation button 44a is depressed rather than button 44.

Looking now in more detail at the horizontal conveyors in the cubicles 12a-t and in the elevator platform 18, Fig. 1 is a partially cut-away top view of the elevator platform 18 when it is positioned at the horizontal level of cubicles 12k and 12L. An arrow 48 illustrates the direction from which a vehicle to be parked is driven onto and off of the elevator 16 when the elevator 16 was at the ground level. The elevator platform 18 includes fixed support members 50 and 52, treads 56 and 58, frame members 60, 60a, 62 and 62a (Fig. 2), endless conveyors 64 and 66, and endless conveyor drive mechanisms 68. A vehicle to be parked is driven across the fixed support member 50, the endless conveyor 64, and the treads 56 and 58, until the front wheels of the vehicle are resting on the endless conveyor 66, and the back wheels thereof are resting on the endless conveyor 64. At this point, an automatic chock mechanism 65 (Figs. 1 and 2) is pivoted upwardly to prevent the vehicle from rolling backwardly. The front of the vehicle is also chocked, however, the front-wheel chock 67 is stationary rather than being selectively, automatically operated as with the automatic chock mechanism 65 for the rear wheel.

The automatic chock mechanism 65 includes a wheel contact lever 65a (Fig. 2), a pivot joint 65b, a linkage lever 65c and a solenoid 65d. To bring the wheel contacting lever 65a to an active position, as seen in Fig. 2, the solenoid 65d is energized to pull backwardly on the linkage lever 65c and thereby cause the rigidly attached wheel contact lever 65a to pivot upwardly about the pivot joint 65b. The linkage lever 65c is approximately 40cm long (although it does not appear so in Fig. 2) while the wheel contact lever 65a is approximately 25cm long. The solenoid 65d pulls with a force of 12 pounds, which is sufficient force, with the mechanical advantage, to prevent undriven vehicles from rolling backwardly.

The endless-conveyor drive mechanism 68 (Fig. 1) comprises a motor 70 having a drive shaft 72 with two sprockets 74 and 76 thereon, two chains 78 and 80 which respectively mesh with the sprockets 74 and 76, and sprockets 82 and 84 which are respectively driven by the chains 78 and 80 and which are linked to traction rollers 86,88 and 90,92 via drive shafts 94 and 96. These drive shafts 94 and 96 include rigid couplers 97 which allow the shafts 94 and 96 to be disassembled for removal. The motor 70 is reversible so that it can be ordered by the control unit 32 to drive the endless conveyors 64 and 66 in either direction. With regard to the endless conveyors 64 and 66, they comprise the traction rollers 86, 88, 90 and 92, idler rollers 98, and conveyor belts 100 and 102.

The cubicles 12k and 12L also include endless conveyors 104 and 106 (only the structure for cubicle 12L will be described inasmuch as the structures of cubicle 12L and 12k are identical). Traction rollers 108 and 110 respectively of endless conveyors 104 and 106 are driven by a drive shaft 112 which is, in turn, driven by a gear 114. A chain 116 interconnects the

drive shaft 112 with an opposite drive shaft 118, via sprockets 120, so as to apply power from both ends of the conveyors 104 and 106 to convey in either direction.

The motor 70 is utilized to apply power not only to the elevator-platform endless conveyors 64 and 66, but also to the cubicle endless conveyors 104 and 106. In this respect, when the motor 70 is instructed to drive the endless conveyors 64 and 66 to the left (toward cubicle 12L) a solenoid 122 (shown in detail in Fig. 4) is energized to pull a plunger 122a to the right, as viewed in Fig. 4, and thereby pivot levers 123 about pins on which they are mounted with slots, to move clutch gears 124 and 126 into intermeshing positions between a gear 128 attached to the drive shaft 96 and the gear 114 attached to the drive shaft 112. It should be understood that Fig. 4 is a simplified view and that not all of the guiding mechanism for guiding the pivoting gears is shown. When in the active positions, the clutch gears 124 and 126 transmit power from the gear 128 to the gear 114 to thereby drive the endless conveyors 104 and 106 of the cubicle 121. Once the solenoid 122 is de-energized, a spring 130 returns the clutch gears 124 and 126 to inactive positions depicted in Fig. 4. The latches 45b insure that there is proper alignment between the elevator platform 18 and the associated cubicle so that the clutch mechanism can properly engage.

Describing the structures of the endless conveyors 104 and 106 in more detail, the conveyor belts 100 and 102 are mounted on the traction rollers 86, 88, 90 and 92 and on idler rollers 98. Each of the idler rollers 98 are mounted on U-shaped support frame members 60, 60a, 62 and 62a, as is depicted in Fig. 2A, and in more detail in Figs. 8, 9 and 10. In this regard, the U-shaped support frames 60, 60a, 62 and 62a

have holes 129 through opposite arms thereof to slidably, but snugly, receive roller shafts 131 which are held in position in the U-shaped frames by pins 131a extending through the shafts 131. There is a separate shaft 131 at each end of each roller, with the shaft extending through bearings 131b in the roller. In this respect, an inner race 131c of each of the bearings has an internal bore 131d which has a hexagonal shape to fit the outside shape of the respective shaft 131. In this respect, the shafts 131 are not round so that they will not turn in the snug holes 129 of the U-shaped support frames 60, 60a, 62 and 62a. The purpose of this arrangement is to allow the idler rollers 98 to be easily removable from the frame by simply removing the pins 131a from the shafts 131 and sliding the shafts 131 longitudinally away from the rollers 98. In the preferred embodiment the U-shaped support frames have a width of approximately 8cms and the tolerance between holes through the frame and the shafts are 1/2mm. The U-shaped support frames 60, 60a, 62 and 62a are constructed of 14 gauge steel sheets which are cut in flat blanks, punched to make the hexagonal-shaped, shaft-receiving holes 129, and then bent to the U-shaped configuration depicted in Figs. 8 and 9. The traction rollers 86, 88, 90 and 92 are not mounted in this manner because their shafts 94 and 96 must be driven and, therefore, the shafts 94 and 96 must rotate in support frames. Thus, the shafts 94 and 96 for these rollers are round. In this regard, however, vertical slots 135 are cut in the U-shaped support frames 60 and 60a for allowing the round shafts 94 and 96 to be easily mounted in and dismounted from the support frames 60 and 60a. Bearings 135a are bolted or screwed to the frames 60 and 60a at the slots 135 for rotatably mounting the shafts 94 and 96. The shafts 94 and 96 are removed from the frames 60 and 60a

by unscrewing the bearings 135a from the frames 60 and 60a and disassembling the shafts 94 and 96 at the rigid couplers 97 (Figs. 1 and 2).

Similarly, arrangements for adjustable idler rollers 131e are also somewhat different in that these rollers can be moved laterally for tightening the belts 100 and 102. In this respect, the U-support frame openings for supporting the adjustable idler rollers 131e are slots 133 in which shafts 131f can slide laterally. The shafts 131f are hexagonal in cross-sectional shape throughout most of their length until they reach the outside wall 131g of the U-shaped frame 131a. At this point, the shafts 131f turn into a threaded shaft 131h. A nut 131k can be screwed onto this threaded shaft 131h to clamp the shafts 131f to the outside wall 131g of the U-shaped support frame 60a. This arrangement allows the adjustable shafts 131f to be used to tighten the belts 100, 102 and 106, and also allows the adjustable idler rollers 131e to be easily removable by unscrewing the nuts 131k and sliding the adjustable shafts 131h into the adjustable idler rollers 131e.

With reference to Fig. 7, this drawing depicts a motor-driven contact unit which is part of the control unit 32. In this respect, when the multiple selection unit 30 is activated to energize the control unit 32 a motor 132 is energized to rotate a contact drum 134. The motor 132 continues to rotate the drum 134 until appropriate contacts 136 close with contacts 138 to start the next procedure (for example to order the elevator position sensor and controller 28 to raise the elevator 16 to a certain level). At this point, the contact-unit motor 132 turns off and waits for the appropriate function to take place, after which the motor 132 again turns on until appropriate circuits are closed to begin a new function.

It is not thought necessary to describe the various proximity switches and sensors of Fig. 1 designated by numerals 140, 142, 144, 146, 148, 150 and 152 which sense the positions of vehicles and transmit this information to appropriate controlling mechanisms of control unit 32. It is thought sufficient to say that these proximity switches and sensors are used to stop and start various functions, such as operation of the motor 70.

It will be understood by those skilled in the art that the parking tower of this invention is uncomplicated in structure, but yet highly efficient and useful in operation. It should be noted that the parking tower, although it performs many functions, only requires two motor assemblies, one to drive the elevator 16, and the other to drive all of the horizontal conveyors.

The parking tower of this invention is automated to the point that it can be operated by vehicle drivers themselves without requiring the services of maintenance personnel. In addition, the drivers need not go with their vehicles to the parking places. The parking tower of this invention provides a great deal of parking space although it uses very little ground space.

The structure described in this invention is sturdy, but yet is relatively easy to build. In addition, the conveyor structure allows the horizontal endless conveyor to be relatively easily disassembled for repair.

In addition, the controlling system of this automotive vehicle parking tower has redundant and safety features built in, although the overall system is not unduly complicated.

While the invention has been particularly shown and described with reference to a preferred

embodiment, it will be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention. In the preferred embodiment, the parking tower of Fig. 5 has a 8.50 meter front by 6.50 meter depth. The tower has a 10-level height, with each level being 2.20 meters in height (interior height). However, the tower could also have a depth up to 19.50 meters so as to provide a plurality of cubicles on each side of the elevator shaft 14 at each level. The tower is generally structured in a quadrangular prismatic shape, however it could be constructed in a multiple variety of shapes, measures and thicknesses.

The tower is capable of allowing parking for 20, 40, etc. automobiles, depending on the depth of the tower, without the assistance of service personnel.

Again, a variety of locking switches, light sources, photocells, microswitches, proximity detectors, reflex microswitches, timers and other control mechanisms are used in this invention.

Although the switchboard, or multiple selection unit 30 is normally mounted on the exterior of the tower, adjacent the access gate of the tower, numerous other positions therefor could be used. However, it is desirable that a vehicle operator not have to accompany his vehicle to a parking space, as is set forth above.

In order to guarantee a greater margin of safety, both for vehicles and for a user, an access door to the tower will usually remain closed, only to be opened upon insertion of a corresponding key in the switchboard, or multiple selection unit 30. A control card could also be used.

Red and green lights on the multiple selection unit 30 change accordingly when vehicles

occupy, or vacate, cubicles.

In the preferred embodiment the tower is made of steel beams which are covered by sheet steel.

The embodiments of the invention in which an exclusive property or privilege are claimed are defined as follows:

1. In a parking tower of the type comprising:

a frame defining cubicles positioned one above the other, each for supporting at least one parked vehicle;

an elevator attached to said frame for conveying vehicles vertically between a ground level and vertical positions adjacent to said cubicles, said elevator including a platform for supporting a vehicle, said platform comprising a first horizontal conveyor for conveying vehicles supported by said platform horizontally toward and from an adjacent cubicle;

each of said cubicles including a second horizontal conveyor for conveying vehicles supported in said cubicle to and from said platform when said platform is in a vertical position adjacent to said cubicle;

first drive means attached to said elevator for moving said elevator to a desired vertical position adjacent to a cubicle;

second drive means coupled to said first and second horizontal conveyors for driving said first and second horizontal conveyors to transfer cars between said platform and a cubicle;

a control means controlling said first and second drive means to move a vehicle between said ground level and the cubicle in response to manual actuation of said control means; and,

the improvement wherein said first horizontal conveyor comprises a series of side-by-side rollers mounted on shafts, said rollers including bearings between said shaft and outer surfaces thereof to allow the outer surfaces of said rollers to revolve about said shafts, each of said rollers being mounted on two shafts, one at each end of said roller, and further including a roller-mounting frame at opposite ends of said rollers in which said shafts are slidably,

but tightly mounted, whereby said shafts can be longitudinally slid from said rollers through said frame for dismounting said rollers from said frame.

2. In a parking tower as in claim 1 wherein said shafts are not round in cross-section and fit snugly into holes in said roller-mounting frame.

3. In a parking tower as in claim 1 or claim 2 wherein said frame is U-shaped in cross-section and whose opposite arms include aligned holes through which each of said shafts passes.

4. In a parking tower as in claim 3 wherein said conveyors are endless conveyors of the type in which endless bands ride on said rollers.

5. A conveyor comprising a series of side-by-side rollers mounted on shafts, said rollers including bearings between said shafts and said outer surfaces thereof to allow the outer surfaces of said rollers to revolve about said shafts, each of said rollers being mounted on two shafts, one at each end of said roller, and further including a roller-mounting frame at opposite ends of said rollers in which said shafts are slidably, but snugly, mounted, whereby said shafts can be longitudinally slid through said frame for dismounting said rollers from said frame.

6. In a conveyor as in claim 5 wherein said shafts are not round in cross-section and fit snugly into holes in said roller-mounting frame.

7. In a conveyor as in claim 5 or claim 6 wherein said frame is U-shaped in cross-section and whose opposite arms include aligned holes through which

each of said shafts passes.

8. In a conveyor as in claim 7 wherein said conveyors are endless conveyors of the type in which endless bands ride on said rollers.

9. In a parking tower of the type comprising:

a frame defining cubicles positioned one above the other, each for supporting at least one parked vehicle;

an elevator attached to said frame for conveying vehicles vertically between a ground level and vertical positions adjacent to said cubicles, said elevator including a platform for supporting a vehicle, said platform comprising a first horizontal conveyor for conveying vehicles supported by said platform horizontally toward and from an adjacent cubicle;

each of said cubicles including a second horizontal conveyor for conveying vehicles supported in said cubicle to and from said platform when said platform is in a vertical position adjacent to said cubicle;

first drive means attached to said elevator for moving said elevator to a desired vertical position adjacent to a cubicle;

second drive means coupled to said first and second horizontal conveyors for driving said first and second horizontal conveyors to transfer cars between said platform and a cubicle; and

a control means controlling said first and second drive means to move a vehicle between said ground level and the cubicle in response to manual actuation of said control means;

the improvement of an automatic wheel chock which can be selectively raised to chock wheels of a vehicle mounted on said first horizontal conveyor

of said elevator.

10. In a parking tower as in claim 9 wherein said automatic wheel chock is a lever which is actuated by a solenoid.

11. In a parking tower of the type comprising:

a frame defining cubicles positioned one above the other, each for supporting at least one parked vehicle;

an elevator attached to said frame for conveying vehicles vertically between a ground level and vertical positions adjacent to said cubicles, said elevator including a platform for supporting a vehicle, said platform comprising a first horizontal conveyor for conveying vehicles supported by said platform horizontally toward and from an adjacent cubicle;

each of said cubicles including a second horizontal conveyor for conveying vehicles supported in said cubicle to and from said platform when said platform is in a vertical position adjacent to said cubicle;

first drive means attached to said elevator for moving said elevator to a desired position adjacent to a cubicle;

second drive means coupled to said first and second horizontal conveyors for driving said first and second horizontal conveyors to transfer cars between said platform and a cubicle;

a control means controlling said first and second drive means to move a vehicle between said ground level and the cubicle in response to manual actuation of said control means; and

the improvement wherein said first and second horizontal conveyors are both driven by the same horizontal conveyor motor assembly and are linked

together by a clutch assembly, and wherein is further included a stopping latch for providing positive engagement between the elevator and the frame at a selected cubicle.

12. In a parking tower as in claim 11 wherein said clutch assembly includes at least two gears, each being mounted on a lever, to be moved into position between a gear on the elevator and a gear at the cubicle, each on opposite sides of the elevator and cubicle gears, to provide linkages between the elevater gear and the cubicle gear.

13. In a parking tower as in claim 11 or claim 12 wherein the latching mechanism is activated by a solenoid.

14. In a parking tower as in claim 11 wherein said control means automatically vertically drives the elevator to a selected cubicle by timing the elevator's movements to obtain a gross control and thereafter slowing the elevator and finally stopping the elevator in response to the elevator detecting radiant energy from a radiant energy source adjacent the selected cubicle which was activated by the control means.

15. An elevator control system comprising a plurality of radiation sources, each positioned adjacent to a different floor at which said elevator stops; said control system further including a selection means for selectively energizing a selective radiation source at a designated floor in response to the floor being designated by an operator for the elevator to be stopped thereat; the control system further including a sensing means attached to the elevator for sensing the radiation source when the

sensing means comes in close proximity to the radiation source and thereby indicating that the elevator is in a position to be stopped.

16. An elevator control system of claim 15 which further includes a timer for timing the amount of time an elevator is driven to provide a gross elevator position indication; and a means for slowing said elevator when said timer indicates that said elevator is near a designated floor.

17. An elevator system comprising:

a frame defining floors;

an elevator attached to said frame for conveying items between said floors;

a drive means attached to said elevator for moving said elevator between said floors;

a control means controlling said drive means to move said elevator between said floors; and

a latching means for extending between said frame and said elevator to latch said frame and said elevator together upon said elevator arriving at a selected floor to positively ensure that said elevator is stopped at the designated floor.

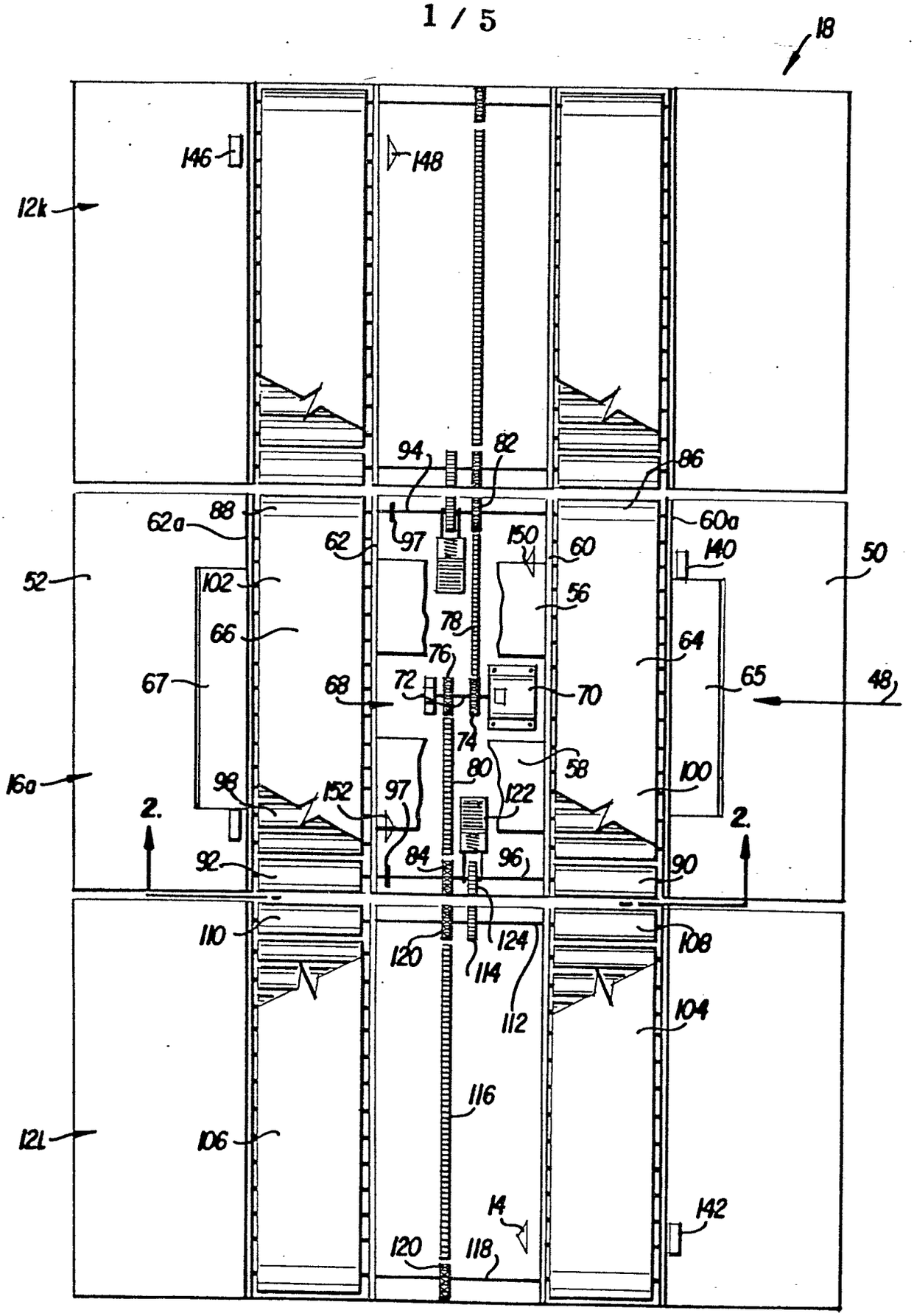
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Fig. 1

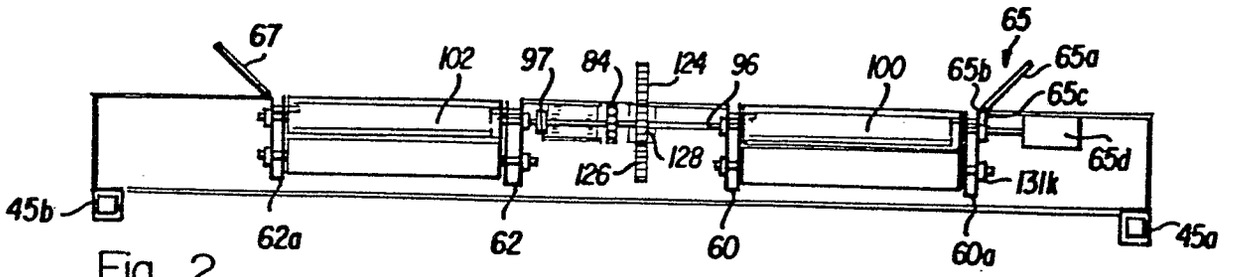


Fig. 2

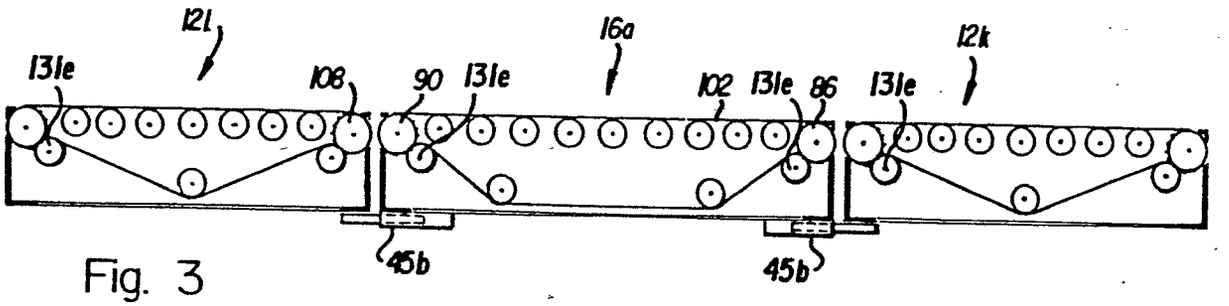


Fig. 3

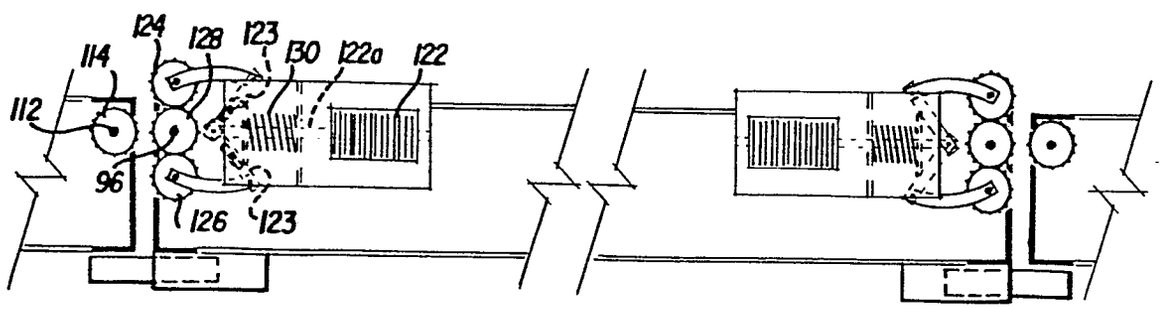
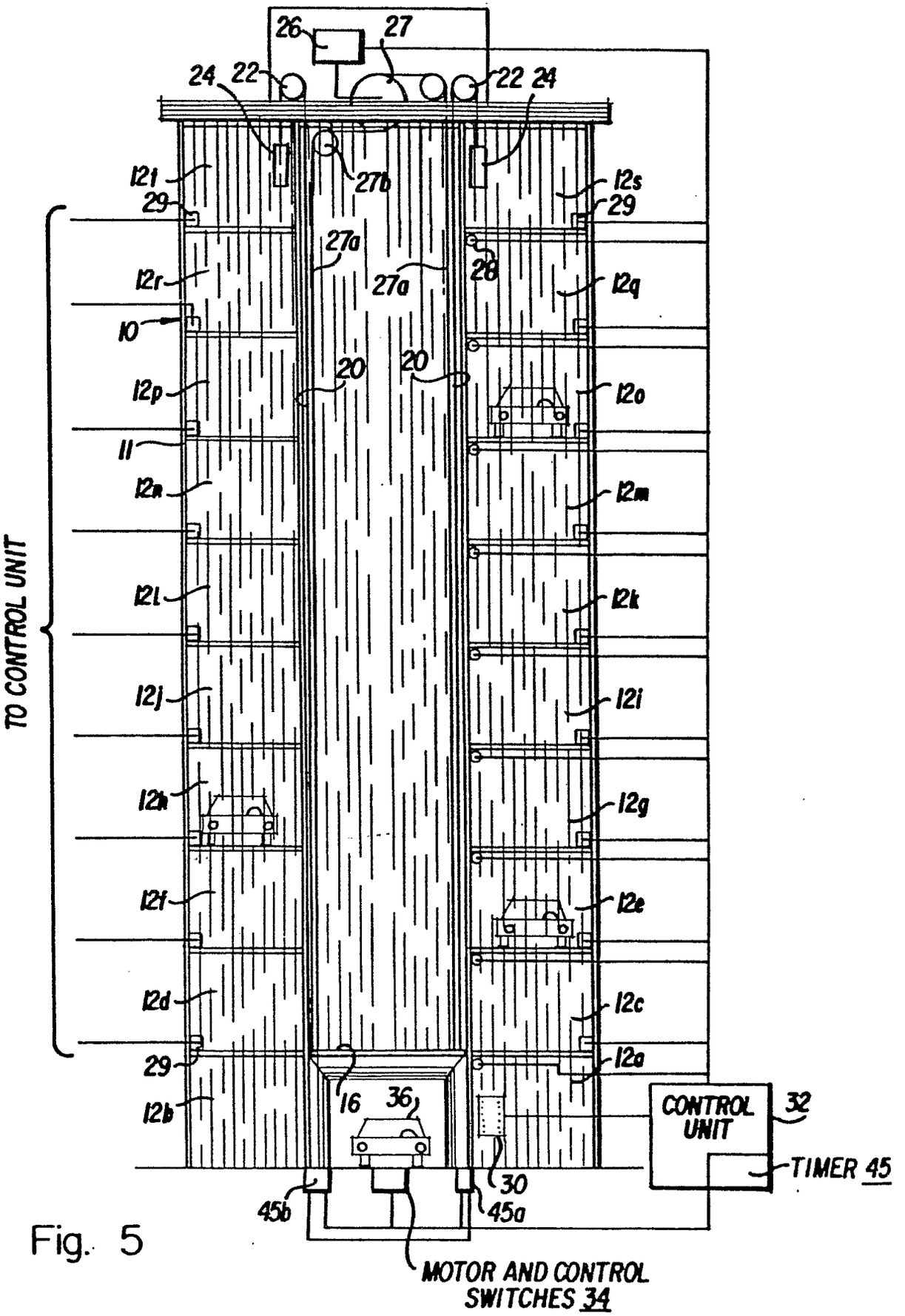


Fig. 4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12p
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12m
12l
12k
12j
12i
12h
12g
12f
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12d
12c
29
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36
12b
CONTROL UNIT
32
TIMER 45
30
45b
45a
TO CONTROL UNIT
MOTOR AND CONTROL SWITCHES 34

Fig. 5

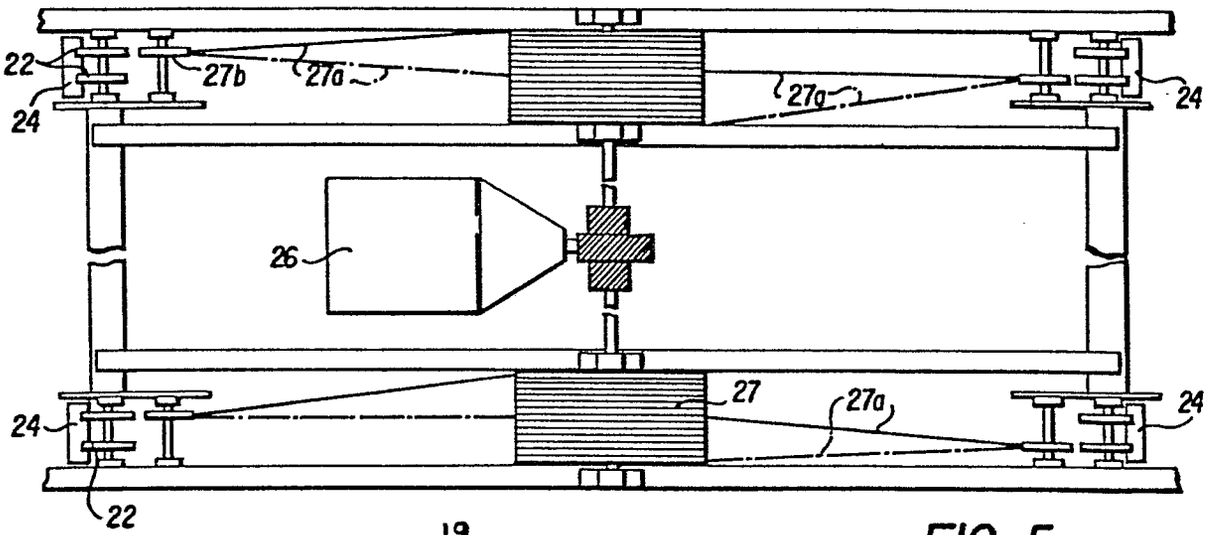

FIG. 5a

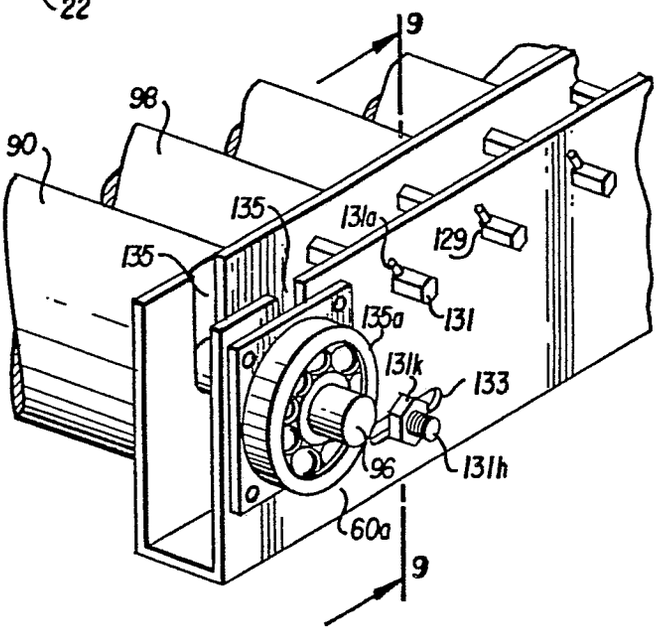

FIG. 8

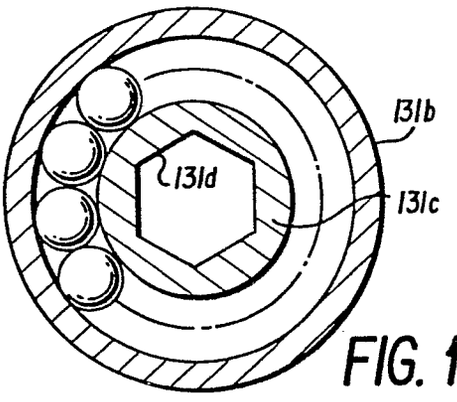

FIG. 10

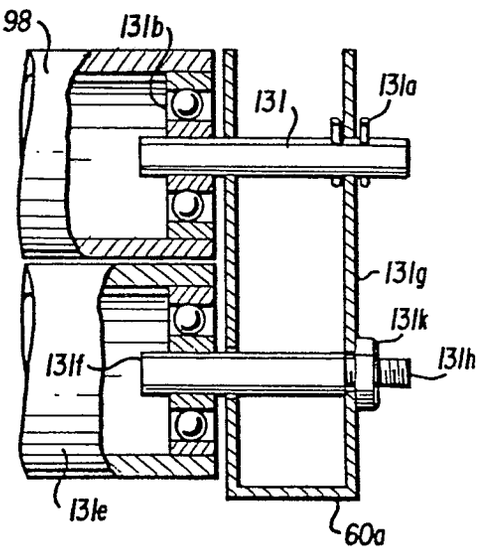

FIG. 9

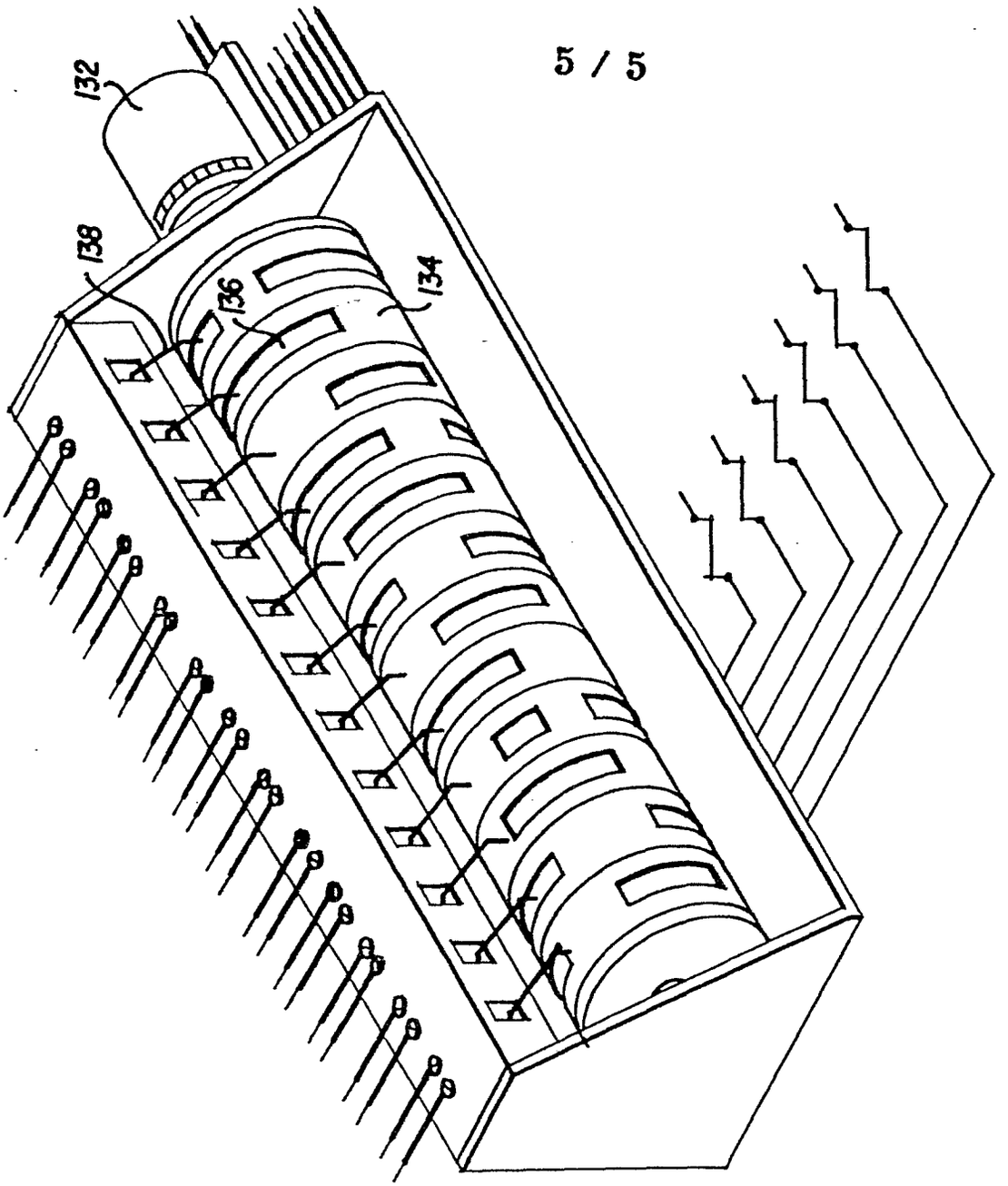
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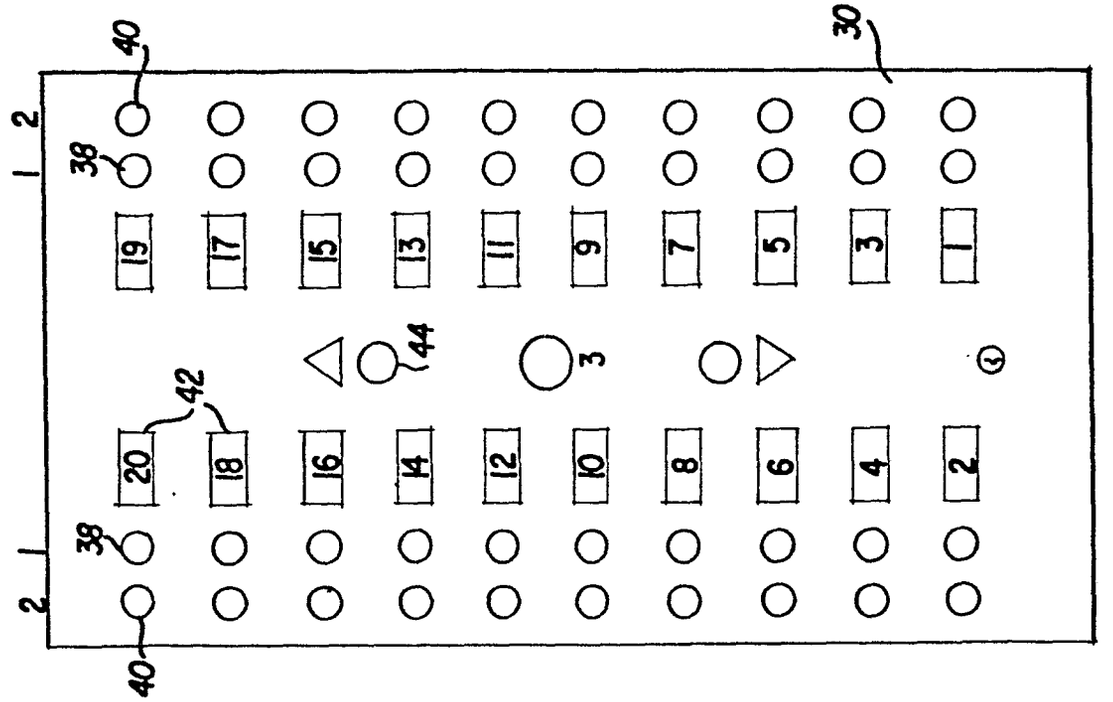
Fig. 7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2
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Fig. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 81 10 4098.9

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	US - A - 3 756 432 (McCREARY) * claims 1 to 3 ; fig. 1 to 10 *	1,4, 8,11
	GB -A - 818 150 (A. THAON) * claims 1 to 5; fig. 1 to 11 *	1,4, 8,11
	DE - A1 - 2 400 061 (B. MILENKO) * pages 1, 2; fig. 1 to 8 *	1
A	US - A - 1 969 002 (M.M. GLEICHMAN) * fig. 1 to 6 *	
A	DE - A - 1 759 865 (ERBA MASCHINENBAU) * whole document *	
A	US - A- 3 157 249 (K.J. LAVERONE et al.) * whole document *	

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

E 04 H 6/18
E 04 H 6/20

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

E 04 H 6/00

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

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	24-08-1981	v.WITTKEN