United States Patent

[11] **3,599,809**

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[54] **SELF SERVICE MULTISTORIED ROTATABLE AIRPLANE HANGAR AND OPERATING MEANS THEREFOR**
3 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** ..... **214/16.1 A**
[51] **Int. Cl.** **E04h 6/06**
[50] **Field of Search** ..... 214/16.1, 16.11, 16.16 B

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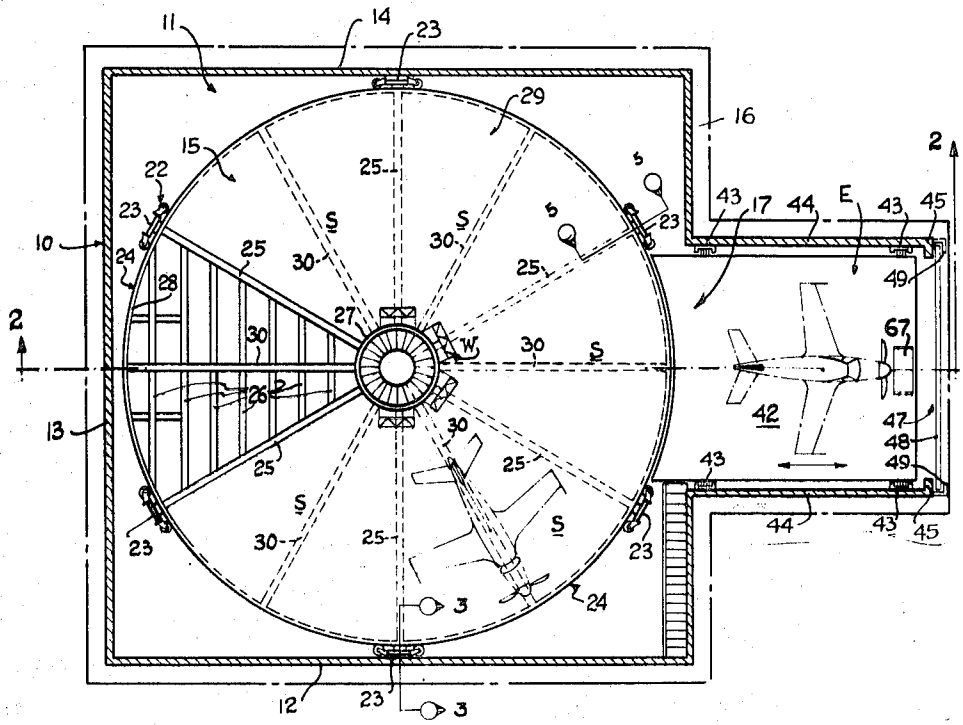
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ABSTRACT: Independently rotatable storage platforms sectored into numbered spaces and having their peripheries arranged for contiguous disposition adjacent an elevator platformed and controlled for operation by an indexer operable upon insertion of a coded card to position a particular storage space for receipt or discharge of an airplane and the like from or to such elevator.



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SHEET 1 OF 3

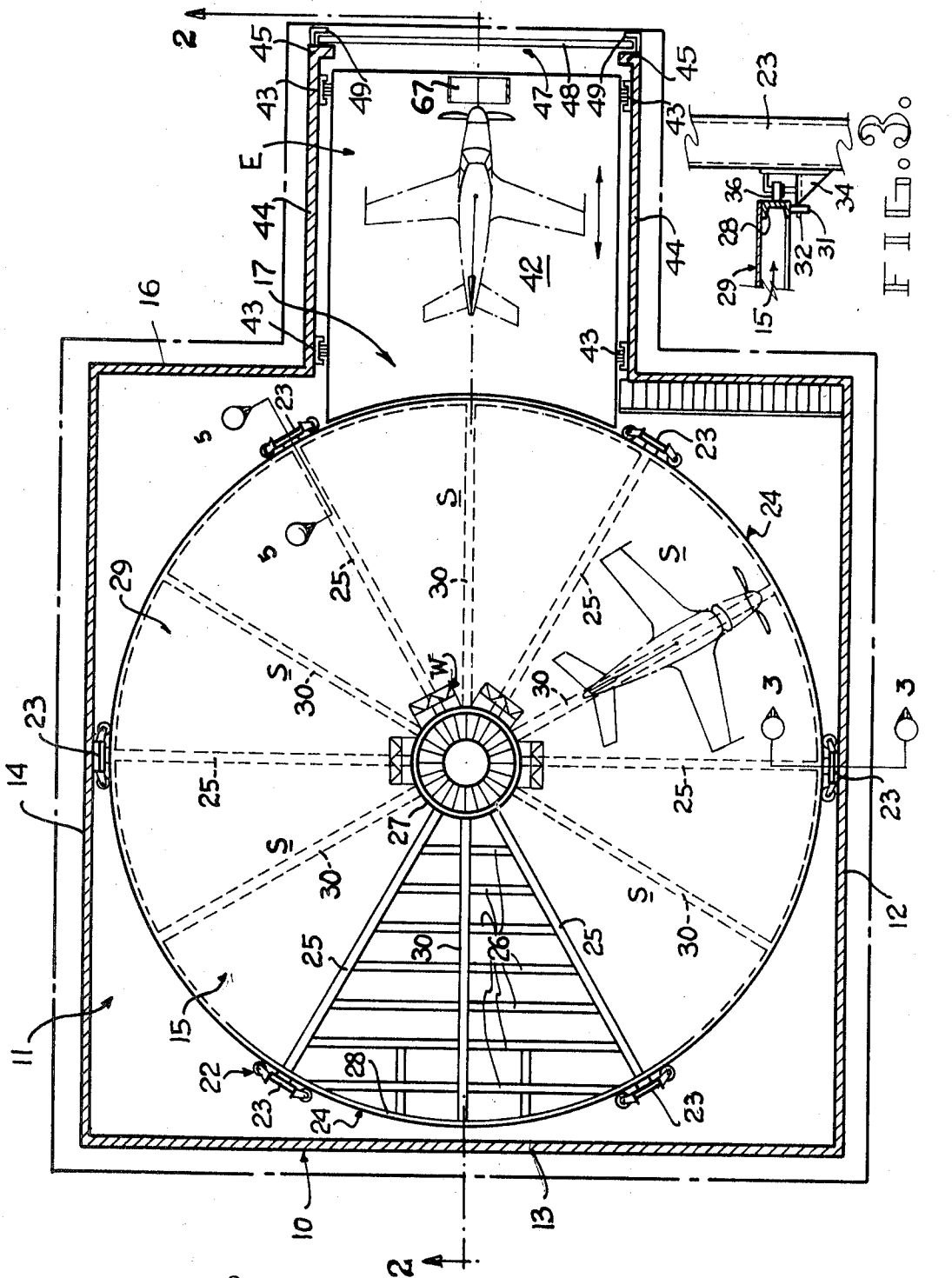


FIG. 1.

FIG. 3.

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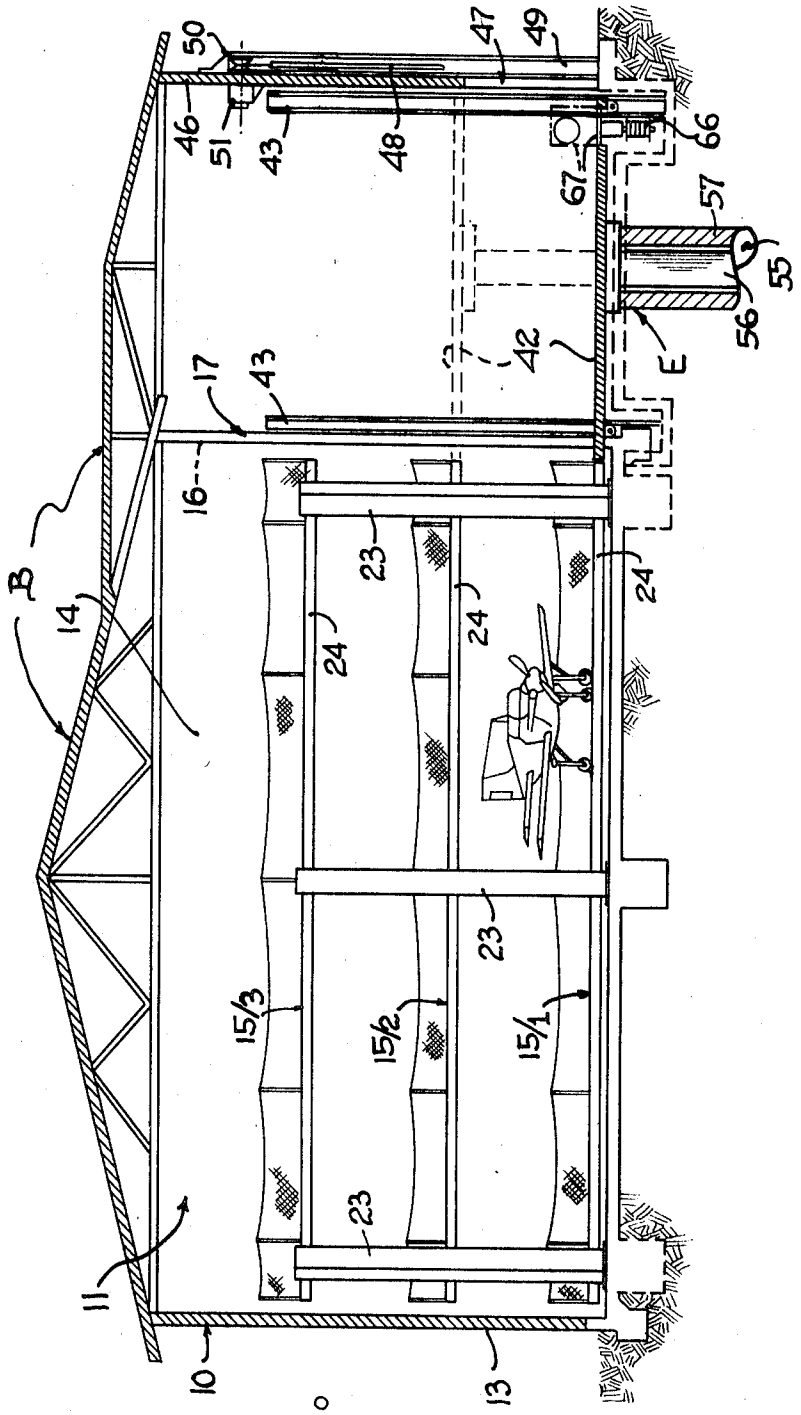


FIG. 2.

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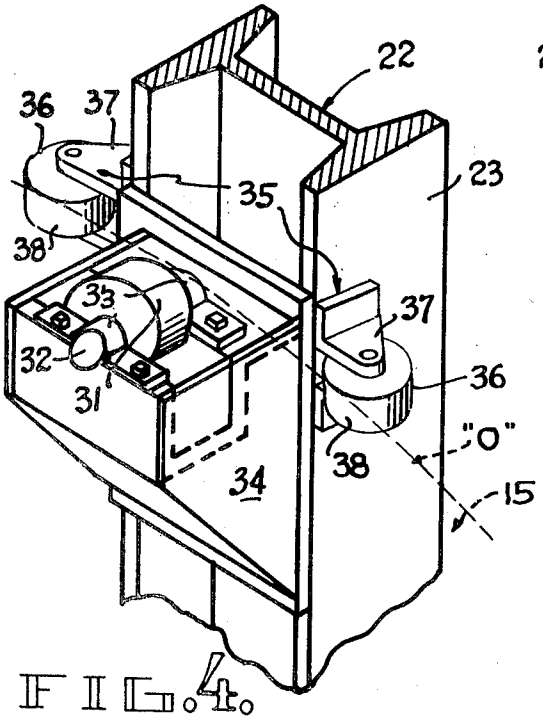


FIG. 4.

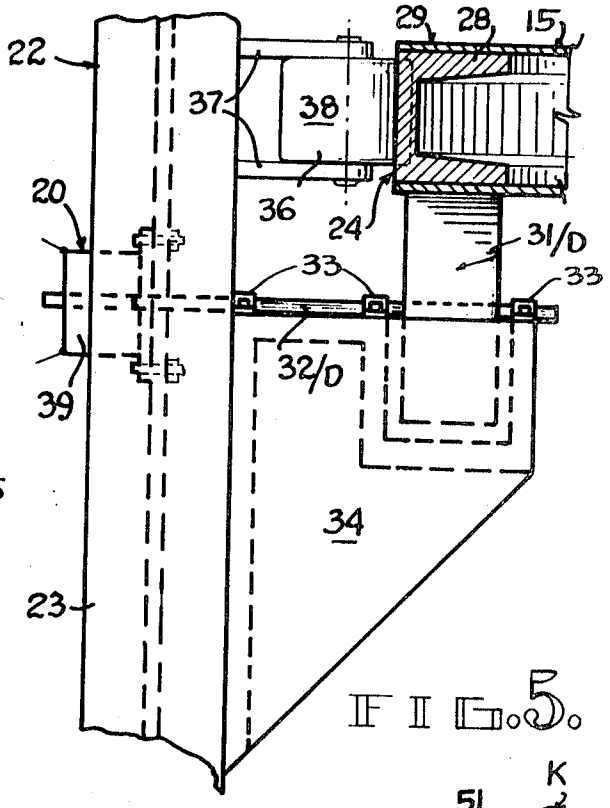


FIG. 5.

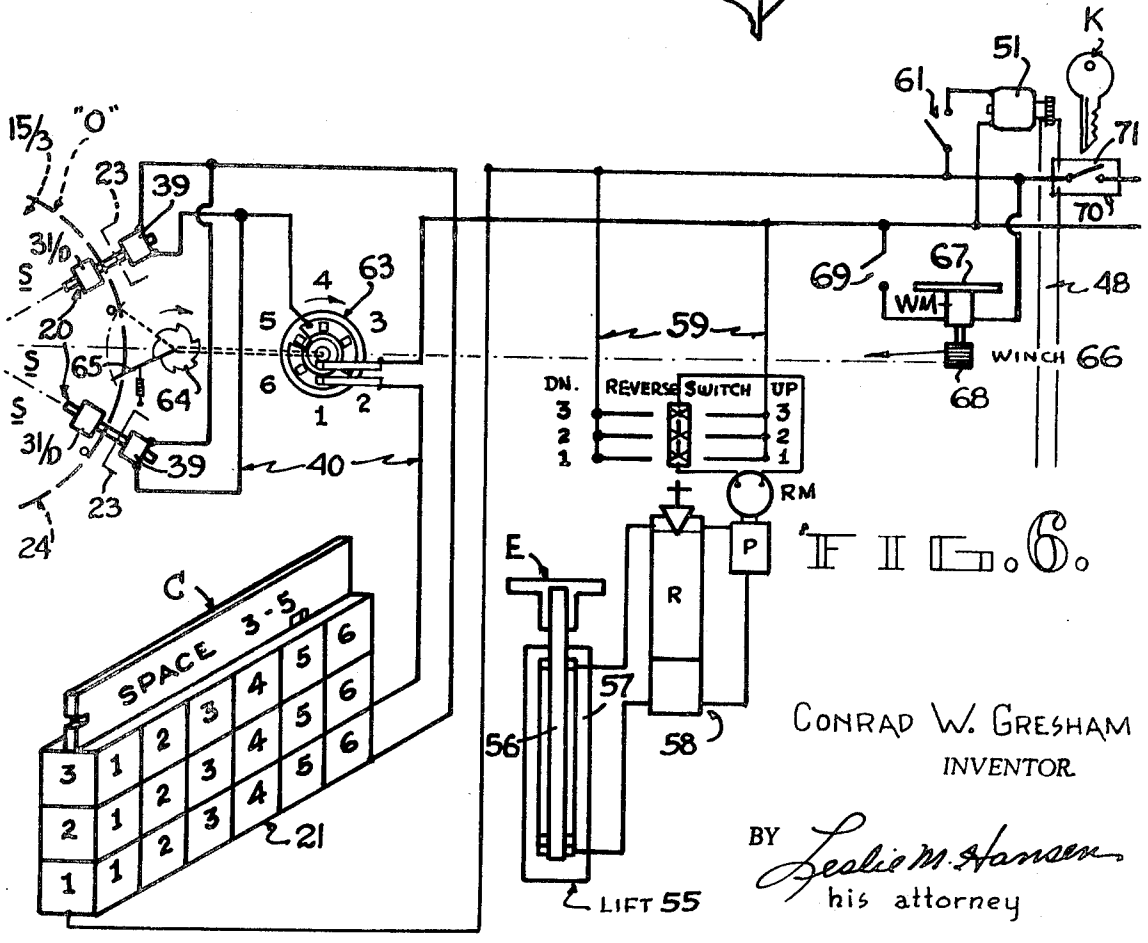


FIG. 6.

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SELF SERVICE MULTISTORIED ROTATABLE AIRPLANE HANGAR AND OPERATING MEANS THEREFOR

BACKGROUND

The present invention relates to airplane hangars of the rotary type and more particularly to a multistoried hangar providing a greater storage area for airplanes in a minimum of ground or surface area. The invention further contemplates a self-service type hangar and coded means for controlling the same.

Rotary hangars as such are not basically new. Various forms of such hangars are shown in prior patents issued over the last three decades. Among those revealed in a patent search are: wailkowski, U.S. Pat. No. 1,773,656, Aug. 19, 1930; Williams, U.S. Pat. No. 1,855,534, Apr. 26, 1932; Marschak, U.S. Pat. No 2,587,353, Feb. 26, 1952; Wheeler, U.S. Pat No. 2,964,144, Dec. 13, 1960; Wheeler, U.S. Pat. No. 3,075,654, Jan. 29, 1963.

In each of these prior patents a number of airplane stalls are provided in segmental areas of a rotary platform confined within a circular or substantially round house closure open at one side for ingress and egress of aircraft from a common ramp or apron.

The storage space thus provided is limited by the number of stalls available at ground level. The number of such structures required to store comparable numbers of aircraft entails the utilization of valuable land. In all airports the ground space available is becoming more and more scarce. In many cities the waiting list for airplane storage space is growing to such a point that the airport can no longer accommodate the need.

THE PRESENT INVENTION

The present invention seeks to alleviate the problem of scarcity of land area by the provision of multistoried hangars and means for elevating aircraft to and from levels of storage.

Whereas single level hangars have heretofore provided space for an appreciable number of airplanes in a relatively small area of ground, the present invention provides an equal amount of storage space in multiple determined by the number of shelves or stories afforded in each installation.

In accordance with the present invention a single elevator provides the necessary ingress and egress of each and every airplane storied on the several rotary platforms. All stalls on any one platform of which are presented or rotated in unison into any desired position to facilitate entrance and/or removal of a particular airplane from its particular stall or storage space and onto the elevator.

A coded indexer is provided for controlling the operation of the platforms, and in accordance with the present invention it is an object to afford each tenant with means for gaining access to the space only to which he is assigned.

These and other objects and advantages of the present invention will become apparent from the following description when read in the light of the accompanying drawings in which:

FIG. 1 is a plan view below roof level of a multistoried hangar embodying the present invention;

FIG. 2 is a vertical section through FIG. 1 taken along line 2—2 thereof;

FIG. 3 is a fragmentary detail section taken substantially along line 3—3 in FIG. 1;

FIG. 4 is a fragmentary perspective view of the detail of FIG. 3;

FIG. 5 is a fragmentary sectional detail partially in elevation of a portion of FIG. 1 taken substantially along line 5—5 therein;

FIG. 6 is a schematic diagram of the mechanism of FIGS. 1 through 5 including a circuit and control means therefor.

GENERAL DESCRIPTION

Referring to FIGS. 1 and 2 a rotary type hangar for airplanes is designated 10 and comprises a building 11 closed on three sides 12, 13 and 14 which are substantially of like dimension to form three sides of a square within which a round platform 15 is arranged for rotation. This form of building enables construction thereof with its backwall 13 contiguous to a lot line or fence or back-to-back with a similarly shaped hangar. Moreover, the sidewalls 12 and 14 may likewise be disposed adjacent a lot line, a fence or contiguous to adjacent hangar units of like kind. The front wall 16 of the building 11 has an opening 17 formed therethrough for ingress and egress of aircraft into and out of the building. As is a common practice the airplanes are stored in the hangar 10 by being placed, tail end first toward center of the round platform 15, the wind spread of each plane occupying a wider zone of each segment of the circular platform.

DETAILED DESCRIPTION

As best illustrated in FIG. 2 the present invention contemplates the provision of a plurality of circular storage platforms 15 at different elevations within such a building 11 and means E at the opening 17 in the front wall 16 thereof for lifting and/or lowering airplanes relative to the several platforms 15.

In accordance with the present invention each platform 15 is mounted for rotation independently of the other such platforms by separate drive mechanisms 20 under the control of a common indexer 21 as illustrated diagrammatically in FIG. 6.

In the present disclosure three rotary platforms of identical construction are designated 15/1, 15/2 and 15/3 and shown at first, second and third story levels, respectively. The number of platforms used may vary according to need to provide the multistoried hangar contemplated by the present invention.

Each platform 15 is mounted for rotation independently of the other by a separate drive mechanism 20 under the control of a common indexer 21 illustrated in FIG. 6.

The means 22 for mounting the several platforms for rotation within the building 11 includes a plurality of upright columns 23 arranged in spaced relation around the periphery 24 of the platforms. The number of columns 23 required is dictated by the number of storage spaces available on each platform. In the present disclosure each platform is divided into six spaces S each comprising a sector of a circular platform. Each such sector S is of a size and shape to receive and support an airplane, tail end toward center and fore end facing the segment of the sector at the periphery 24 of the platform.

Structurally, the platform 15 is constructed with main girders 25 extending radially at the sides of each sector S and joined by joists 26 extending in spaced relation parallel to the chord line at the peripheral segment of each sector. The center 27 of each platform 15 may be a hollow structural ring to which the inner end of each girder is secured. The outer ends of the girders are secured to a ring-shaped structural member 28 which may be of channel shape as shown. This member 28 may be made up of several segments welded together and to the respective girders in a well known manner whereby the member 28 forms the periphery 24 of a platform 15. The girders and joints 25–26 support a flooring 29, which may if necessary be further braced by intermediate beams 30 radially disposed and secured to the joints midway the side girders as illustrated in FIG. 1.

In the case of the foregoing arrangement there are six columns 23 provided around the periphery 24 of the platforms 15. These columns 23 may be I-beams or H-shaped as required such that adjacent edges of opposite flanges thereof will face the periphery of the platforms. The means for mounting the platforms for rotation further includes supporting rollers 31 journaled for rotation on spindle shafts 32 disposed radially of the platforms and supported in suitable bearings 33 on brackets 34 secured to the columns 23. (FIGS. 4 and 5). One such roller 31 at each column at each of the desired floor levels 1, 2 and 3 serves to support the respective platforms

15/1, 15/2 and 15/3 for free rotation within the building. Guide means 35 on each column for maintaining the several platforms coaxially of each other between the several columns 23 is also provided. This guide means 35 consists of a pair of rollers 36 journaled on mounting brackets 37 on each flange of each column. These guide rollers 36 have their peripheries 38 disposed for tangent engagement with the periphery 24 of the respective platform 15 to define a guide orbit 0 for maintaining the platforms centered relative to the center of the building.

Any number or all of the supporting rollers 31 have powered means for turning the same to thereby cause the platform 15 supported thereby to turn within the guide orbit 0 provided. In the present disclosure two of such rollers designated drive rollers 31/D are shown diagrammatically in FIG. 6 and in detail in FIG. 5. These drive rollers 31/D are keyed to a drive shaft 32/D which is drivingly connected to a motor 39 mounted on the respective column 23. This motor 39 may include a gear reduction box of conventional design for turning the roller 31/D associated therewith under sufficient power to turn the platform 15 engaging the same.

As previously pointed out each platform 15/1, 15/2 and 15/3 is mounted for rotation independently of the other, consequently, each set of drive rollers 31/D is in a separate circuit 40 under the control of the common indexer 21. One such circuit is shown in FIG 6, it being understood that similar circuits are provided for each of the rotary platforms at the various levels in the building.

At the entrance opening 17 in the front wall 16 the elevator means E includes an elevator platform 42 which serves, when at ground level, as an approach to the storage area of the hangar. The elevator platform 42 is of a width comparable to the chord defined by any one sector S on the storage platforms 15. The elevator means E may be of any well-known design with suitable guides 43 vertically disposed adjacent the sides of the elevator platform 42 for guiding the latter during up and down movement. These guides 42 also serve as structural columns for sidewalls 44 extending forwardly from the front wall 16 as an entrance vestibule of the building 11. The forward ends of the side walls 44 are provided with inwardly extending door jambs 45 (FIG. 1) and support a skirting wall 46 (FIG. 2) beneath which an opening 47 story high is provided. A closure door 48 for the opening 47 is arranged for up and down movement on channel guides 49 provided at the jambs 45. Suitable pulleys, cables and counterbalance means 50 operatively associated with the door 48 have driving connection with a door operating motor 51 supported on the forward skirting wall 46. The building 11 is completed by roofing B on suitable trusses supported on the walls of the building in a conventional manner of construction.

Referring to FIG. 1 it will be noted that the elevator platform 42 has an arcuate after edge 52 conforming to the peripheral edge 24 of each of the circular platforms 15/1, 15/2 and 15/3. This edge 52 is comparable to a segment of the periphery 24 at the end of any one sector S. The opposite or forward edge 53 of the elevator platform 42 is disposed just inside the opening 47 at the edge of the paving from the airport. The arrangement is such that an airplane backed into the vestibule and onto the elevator platform 42 is in radial alignment with the rotary platforms 15 of the hangar.

In the present disclosure the elevator E is shown to include an hydraulic lift 55 in the form of a ram 56 arranged centrally of an supporting the elevator platform 42. This ram 56 is arranged as a piston in an hydraulic cylinder 57 extending below ground level in a suitable foundation. The hydraulic cylinder 57 is in an hydraulic system 58 including the usual reservoir R and pump P communicated by the usual pipe fittings in the convention manner. The pump P is operated by a reversible motor RM in an electrical circuit 59 connected by flexible wires 60 to reversing switches on a control panel on the elevator platform 42.

OPERATION

All doors are normally closed and the elevator platform 42 at ground level, aligned with the first floor level of platform 15/1. Each person or tenant having a right to possession of a particular storage sector S of the hangar 10 is provided with a key K and a card C (FIG. 6). The key K operates the lock 70 on the door 48 and closes a switch 71 in the main circuit to the source of electrical supply. A switch 61 in a circuit to the door operating motor 51 controls opening and closing of the door 48. Each tenant is assigned a particular space or stall which is numbered according to floor level 1, 2 or 3 and sector 1, 2, 3, 4, 5 or 6 of the particular platform 15 associated with such floor level. Each tenant has a card C coded for his particular space in the hangar.

Assuming now that the tenant has a card C coded for floor 3, space 5 as illustrated in FIG. 6. By inserting this coded card C into the indexer 21 the particular circuit 40 connected to the motors 39 for driving the third floor platform 15/3 will be energized to turn their respective drive rollers 31/D. The indexer 21 is preferably mounted at floor level, just inside the door 48 so that the tenant can insert his card C into the indexer immediately upon entering. This causes the platform 15 thus independently operated to turn relative to the others such that the particular sector S allotted to such tenant will be brought into a position adjacent the elevator E. In the example under explanation the sector space 5 on platform 15/3 will be brought into a position to receive or discharge an airplane relative to the elevator E. Such operation of the platform 15/3 occurs automatically while the tenant is bringing his airplane into the elevator or preparing to remove his airplane from storage.

The indexer 21 is wired to a commutator 63 having a band for each space and mechanically operated by a step-by-step ratchet means 64 the pawl of which is on a lever 65 operatively associated with the platform 15. The ratchet means 64 is timed such that a gap in each space band on the commutator 63 is coordinated with a particular space S and switch means in the indexer 21 operated only by the coded card C. The circuit 40 to the driver motors 31/D is thus cut off when the particular sector space 5, arrives at loading position opposite the elevator.

By this time the tenant having pressed the necessary button to floor level 3 will have caused the lift E to bring the elevator platform 42 to the third floor level in alignment with the storage platform 15/3.

To move the airplane from the elevator platform onto the storage platform a cable and winch arrangement W of conventional design is provided at the center of each platform 15. A similar type winch 66 is provided on the elevator platform 42 for pulling an airplane from storage space onto the elevator.

The winch 66 is preferably arranged beneath a trap door 67 adjacent the fore edge of the elevator platform 42. This winch 66 includes an electric motor W.M. mounted on the underside of the trap door 67 and having the winch drum 68 suspended therefrom such that when the door 67 is raised (opened) the drum 68 will be disposed such that a cable thereon extends substantially centrally of the platform 42 and radially of the storage platforms. A manually operated switch 69 on the elevator electrically connects the motor WM to the source of power.

Having thus described the foregoing self-service multistoried hangar in specific detail it will be appreciated by those skilled in the art that the same may be susceptible to variation, alteration and/or modification without departing from the spirit or scope of the invention therein, I therefore desire to avail myself of all variations, alterations and/or modifications as may fairly come within the purview of the appended claims.

What I claim as new and desire to protect by Letters Patent is:

1. In a self-service multistoried hanger confined within a building having a plurality of circular storage platforms supported therein for independent turning movement in vertically spaced concentric relation adjacent an elevator lift platform; locking means for such building and means for receiving and discharging airplanes to and from selected segmental storage sectors of a selected one of said storage platforms comprising:

a. an electrical drive motor drivingly connected to each of said storage platforms;

b. an electrical circuit connected to one side of each of said electrical drive motors;

c. a coded card indexer connected to the other side of each of said electrical drive motors for controlling the latter to turn a preselected one of said storage platforms and move a selected storage sector thereof into a position for contiguous relation with the elevator platform.

d. a commutator having a storage space band in said electrical circuit between said indexer and each of said drive motors and provided with a gap coded to a particular storage sector for each of said storage platforms;

e. means on said commutator operatively associated with said indexer and the drive motor of a preselected one of said storage platforms for advancing said commutator in timed relation with the turning of said preselected storage platform and for breaking said electrical circuit at said gap upon arrival of the particular selected storage sector into a position for contiguous relation to said elevator platform;

f. a door opening the front wall of such building at ground level adjacent that edge of said elevator platform opposite

the storage platforms;

g. a door mounted on the front wall of such building for closing the door opening therein;

h. a lock on said door for locking the same relative to the opening in said front wall, said lock including a normally open master switch in the main circuit between the source of electrical current and the electrical circuit to said indexer and the drive motors controlled thereby; and

i. key means assigned to each tenant to such hangar for unlocking said lock and closing said master switch.

2. The self-serivce multistoried hangar in accordance with that of claim 1 confined within a building including:

a. a winch at the center of each of said storage platforms including a cable extending radially therefrom toward said elevator platform for connection to an airplane supported thereon and for pulling the latter onto said storage platform.

3. The self-service multistoried hangar in accordance with that of claim 1 confined within a building including;

a. a trap door on that end of said elevator platform opposite the storage platforms; a winch supported on the underside of said trap door for suspension therefrom and movable therewitn into a raised position above the floor of said elevator platform; said winch having a cable thereon extendable radially toward a storage platform and for connection to an airplane in a storage sector contiguous to said elevator platform for pulling such airplane onto said elevator platform.