July 5, 1960 H. A. HOHMAN 2,943,725

AUTOMOBILE PARKING AND STORAGE TOWERS

Filed Oct. 22, 1958 4 Sheets-Sheet 1

FIG. 1

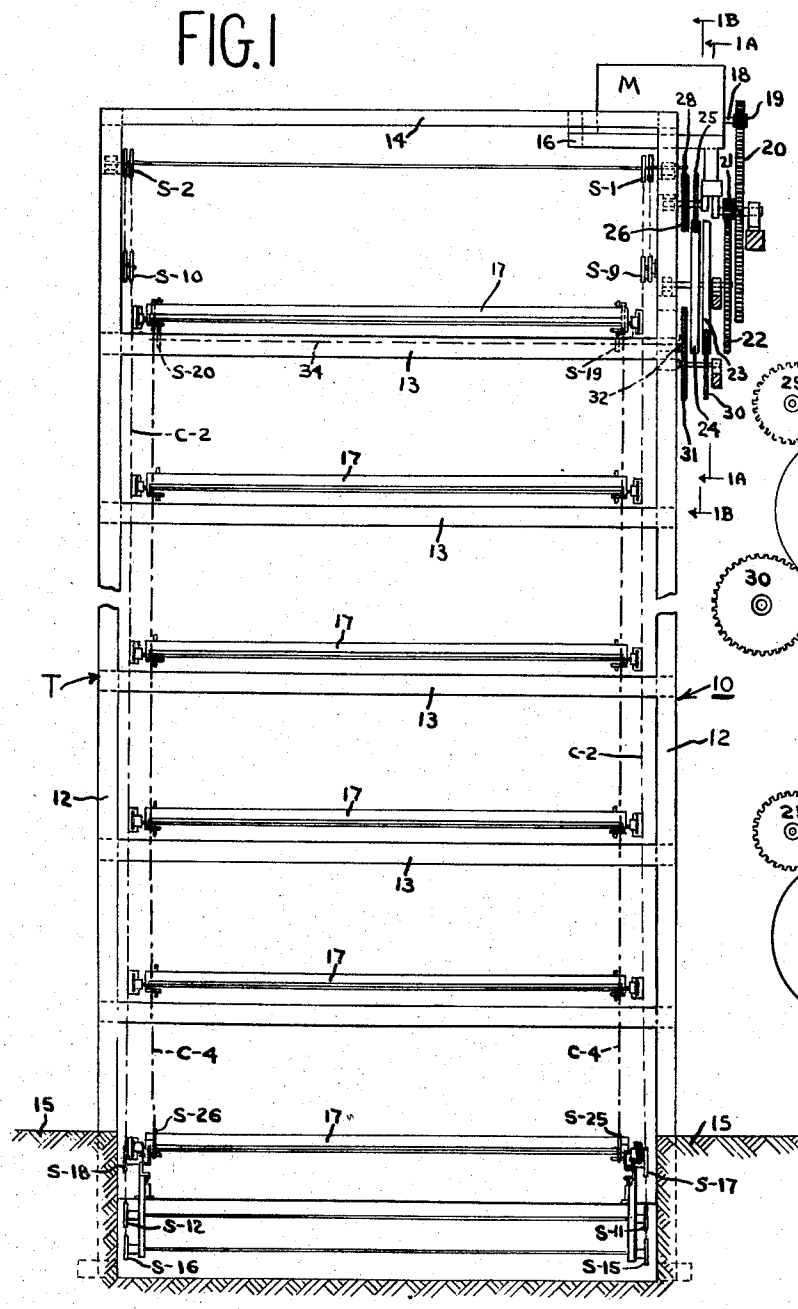


FIG. 1A

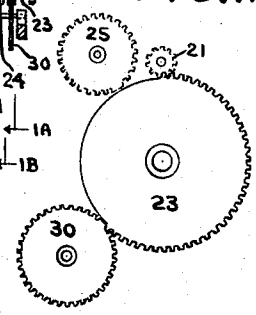
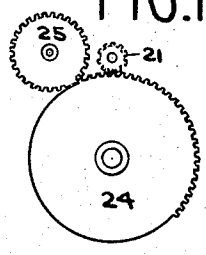


FIG. 1B



INVENTOR.
HARRY A. HOHMAN
BY
W. Russell Greenwood
ATTORNEY

July 5, 1960 H. A. HOHMAN 2,943,725

AUTOMOBILE PARKING AND STORAGE TOWERS

Filed Oct. 22, 1958 4 Sheets-Sheet 2

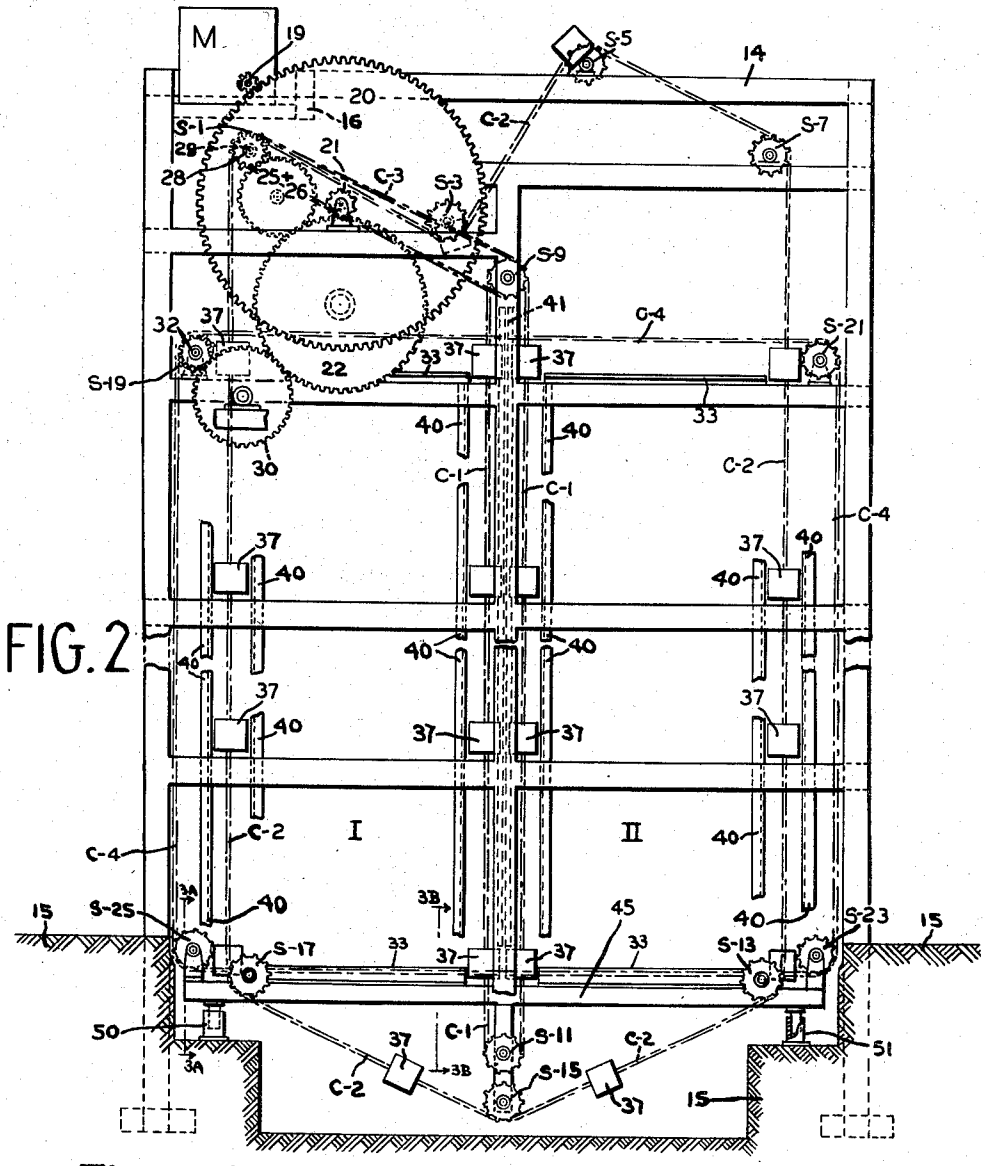


FIG. 2

FIG. 3A

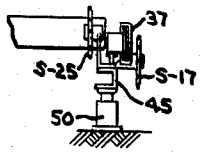
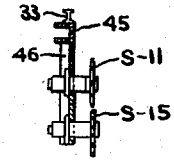


FIG. 3B



INVENTOR.
HARRY A. HOHMAN
BY
W. Russell Greenwood
ATTORNEY

July 5, 1960 H. A. HOHMAN 2,943,725

AUTOMOBILE PARKING AND STORAGE TOWERS

Filed Oct. 22, 1958 4 Sheets-Sheet 3

FIG. 4

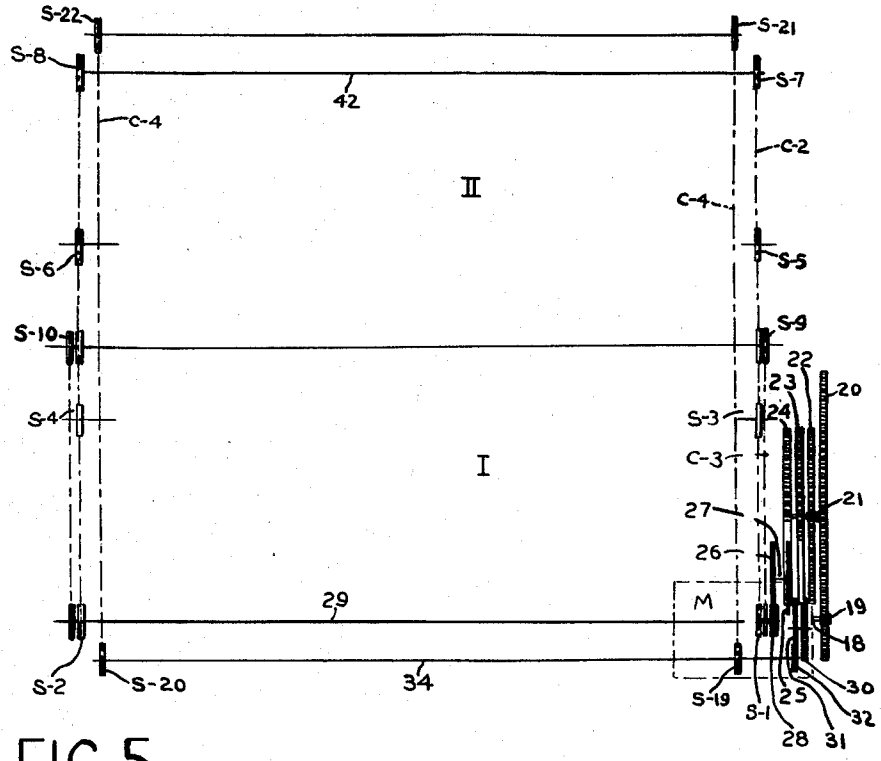


FIG. 5

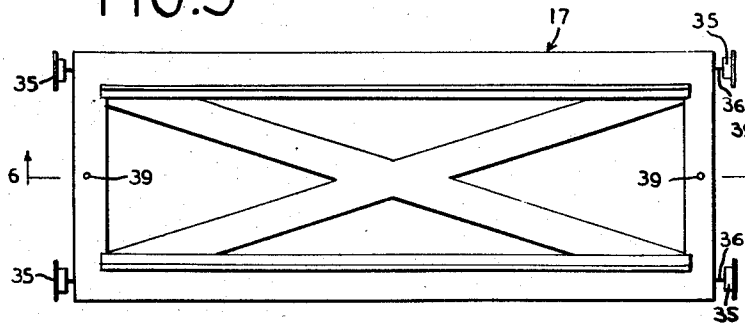


FIG. 8

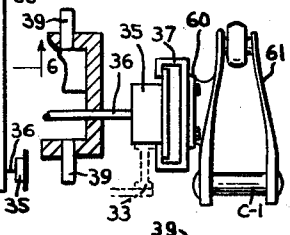


FIG. 6

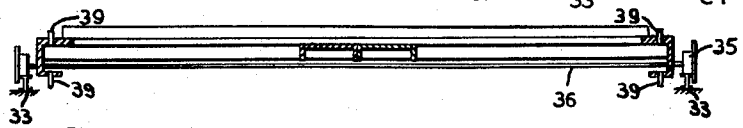
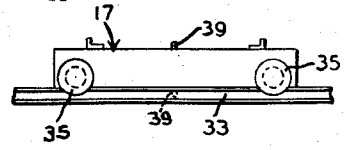


FIG. 7



INVENTOR.
HARRY A. HOHMAN
BY
W Russell Greenwood
ATTORNEY

July 5, 1960 H. A. HOHMAN 2,943,725

AUTOMOBILE PARKING AND STORAGE TOWERS

Filed Oct. 22, 1958 4 Sheets-Sheet 4

FIG 9A FIG. 9B FIG 9C FIG. 9D FIG. 9E

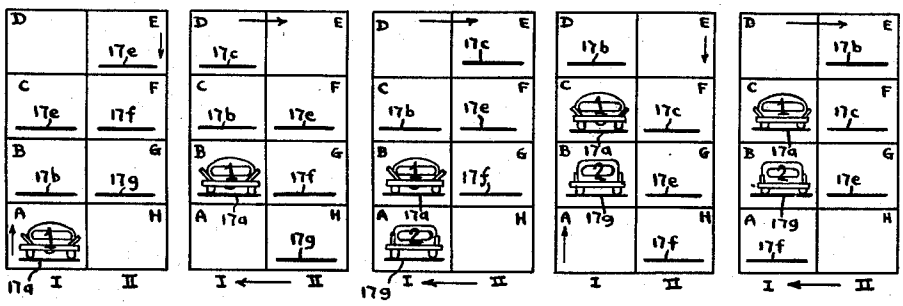


FIG 9F FIG 9G FIG 9H FIG 9I FIG. 9J

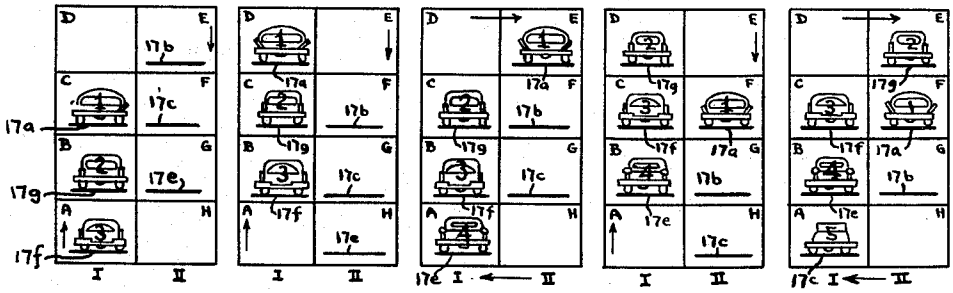


FIG. 9K FIG. 9L

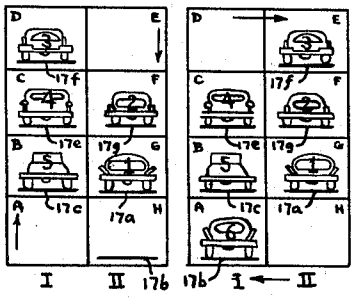
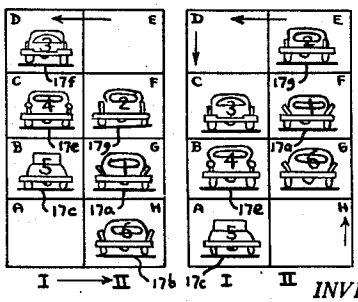


FIG. 10A FIG. 10B



INVENTOR.
HARRY A. HOHMAN
BY
W. Russell Greenwood
ATTORNEY

United States Patent Office 2,943,725 Patented July 5, 1960

2,943,725

AUTOMOBILE PARKING AND STORAGE TOWERS

Harry A. Hohman, 4 Beverly Road, Newton Highlands 61, Mass.

Filed Oct. 22, 1958, Ser. No. 768,868

7 Claims. (Cl. 198—85)

This invention relates generally to tower-type automobile parking and storage machines, known also as elevator storage garages, and particularly to that type of storage garage wherein automobiles are transported vertically upon individual parking platforms by endless elevator or conveyor chains to different elevations in a tower structure and are disposed in storage positions therein in vertical tiers upon such movable parking platforms. More especially, it has particular reference to new and useful improvements in automobile parking and storage tower garages of the type having a pair of spaced vertical shaftways arranged side by side, in each of which there are disposed a plurality of vehicle storage or parking platforms which are detachably connected to endless elevator or conveyor chains and arranged for simultaneous movement in a pair of oppositely moving columns in said shaftways. In such type of tower garage, the uppermost ascending and the lowermost descending vehicle storage platforms, upon reaching the top and the bottom terminal ends respectively of the tower shaftways, are adapted to be horizontally shifted individually from one shaftway laterally thereof into the corresponding terminal end of the adjoining shaftway for subsequent movement either downwards or upwards, as the case may be, in the respective shaftways into which have been transferred such top and bottom platforms

The invention has for one of its objects the provision of novel and improved means which will effect the horizontal shifting of a vehicle storage platform at the top and bottom terminal ends of the vertical shaftway of a tower garage structure into the corresponding terminal ends of an adjoining vertical shaftway thereof intermittently with the step-by-step ascending and descending vertical movements of the two columns of platforms in the respective shaftways.

Another object of the invention is to provide a means for laterally transferring such top and bottom end vehicle storage platforms while succeeding ascending and descending columns of platforms are stopped in their respective vertical shaftways.

A further object of the invention is to provide means to automatically take up normal slack and stretching tendencies in the endless conveyor or elevator chains which vertically move the vehicle storage platforms in the shaftways, and also in the endless chains for laterally transferring a platform upon reaching the top and bottom ends of such vertical shaftways.

Other objects and advantageous features of the invention will be apparent from the following detailed description of a specific embodiment thereof, when taken in conjunction with the accompanying drawings.

In the drawings:

Fig. 1 is a diagrammatic view in side elevation of an automobile parking and storage tower-type garage according to the invention;

Fig. 1A is a section taken on the line 1A—1A of Fig. 1;

Fig. 1B is a section taken on the line 1B—1B of Fig. 1;

Fig. 2 is a view in front elevation, on larger scale, of the top and bottom tower portions of the Fig. 1 vehicle storage machine or tower garage as viewed from the right end of Fig. 1;

Figs. 3A and 3B are detail views taken on lines 3A—3A and 3B—3B respectively of Fig. 2 looking in the direction of the arrows;

Fig. 4 is a top plan view of the Fig. 1 storage machine or garage structure;

Fig. 5 is a top plan view of one of the vehicle storage and supporting platform units;

Fig. 6 is a longitudinal section taken on the line 6—6 of Fig. 5;

Fig. 7 is an end elevational view of the Fig. 5 parking and storing platform as viewed from the right end of Fig. 5;

Fig. 8 is a fragmentary view, partly in section and partly in elevation, showing one of the wheel supporting and housing boxes affixed to an attachment link of one of the elevator or conveyor chains of the Fig. 1 vehicle storage machine, and by which each vehicle storage platform is supported at its four corners, this arrangement being, of course, applicable to all of the corner wheels of the various vehicle supporting platforms for removably connecting them to their respective elevator chains in the vertical shafts of the garage tower;

Figs. 9A–9L are diagrammatic front elevations showing the step-by-step manner in which automobiles are successively placed into loading positions in the tower structure of my storage machine and also when the latter has attained full car storage; and

Figs. 10A and 10B are diagrammatic front elevations showing two sequential steps passed through in unloading an automobile from a particular storage position.

Referring to the drawings, particularly to Figures 1 and 2 thereof, the invention is shown applied to a parking and storage machine or tower garage T having an open framework **10** of reinforced concrete and/or steel construction which may be made up of appropriate upright corner columns **12** and crossbeams **13**, and/or other steel structural members (not shown), all properly designed and braced into an integral rigid frame assembly in accordance with the usual fabrication practice of structural designers. The frame **10** is of generally square cross-section when viewed in a horizontal plane (see Fig. 4) and is arranged, as shown in Figs. 2 and 4, to provide a pair of parallel vertical shaftways I and II disposed side by side, as indicated in these figures of the drawings, and each being of generally rectangular shape. The top end extremities of the corner columns **12** are connected together at the four sides of the tower structure by suitable horizontal bracing members **14**. The lower ends of the corner columns **12** may be appropriately anchored in a suitable concrete foundation **15** as illustrated in Figs. 1 and 2.

The framework **10** may extend vertically upward from the foundation **15** to any desired height, and it may have either an open skeleton form as here-illustrated or, if desired, it may be completely enclosed by side walls and a roof to form a garage building.

Mounted at the top of the tower structure T and located on a suitable crossbrace member **16** is an electric motor M, of reversible type, which operates the movable portion of the vehicle storage machine through gearing and endless chains, hereinafter to be described in detail, to raise and lower in the shaftways I and II a plurality of platforms **17** arranged to support and store parked automobiles. The motor M also provides the motive power for moving the individual vehicle supporting platforms **17** from the shaftway I to the other shaftway II, and vice versa, upon reaching the highest and lowest points of their vertical travel in these respective shaft-

ways. This horizontal shifting and lateral transferring of the topmost platform of one column and the lowermost platform of the other column takes place simultaneously and upon arrival of a descending platform **17** at the bottom end of the shaftway II and an ascending platform **17** at the upper end of shaftway I.

As seen in Figs. 1, 2 and 4, the motor M is provided with an output shaft **18** having secured to its outer end a driving gear **19** which engages and turns a gear **20**. A pinion **21** is rigidly attached to and concentric with gear **20** and turns a gear **22**. The gear **22** is rigidly attached to and concentric with two intermittent gears **23** and **24** (see Fig. 4). As these gears revolve together, the teeth of gear **24** turn gear **25**. A gear **26** having the same diameter as gear **25** and concentric with it, is secured to the same shaft **27** as gear **25**. Gear **26** turns gear **28** which is fast on the shaft **29** carrying the sprockets S–1 and S–2. This motion operates the system of endless chains C–1, C–2 and C–3, sprockets S–1 to **18**, and their respective shafts to raise the column of vehicle storage platforms **17** in shaftway I and at the same time to effect lowering of those of the other column in shaftway II.

Intermittent gear **24** moves the platforms **17** vertically one position at a time. Then the teeth of intermittent gear **23** move gear **30** which, through gear **31** of the same size as gear **30** and fixedly secured to the same shaft as gear **30**, turns gear **32** which is fast on one end of a transmission shaft **34** that carries sprockets S–19 and S–20 over which run chains C–4 and provides the horizontal motion to the platforms at the top and bottom ends of the shaftways I and II. Idler sprockets S–21 through S–26 guide the endless chains C–4 in their lateral and vertical passage around and across the framework **10**.

This motion, through endless chains C–4, sprockets S–19 through **26**, and horizontal tracks **33**, moves the highest platform **17** in shaftway I coplanary across and into the top position in the adjoining shaftway II and, at the same time, transfers the lowest platform **17** in the shaftway II laterally thereof across and into the lower position in the other shaftway I. After this horizontal motion, the teeth of intermittent gear **24** again engage with gear **25** to convey the tiers of platforms vertically in oppositely moving columns in shaftways I and II. This horizontal and vertical motion is intermittent and alternates as the teeth of one intermittent gear **23** and then the other intermittent gear **24** operate the respective gears tangent to it. Only one tangent gear is turned at a time, the other remaining stationary as its intermittent gear continues moving. Gear **26** turns one revolution and stops. The circumference of gears **25** and **26** is equal to the vertical elevation of each vehicle supporting platform **17** from one storage area to the one next above or below, which would be about seven feet between each successive level. The circumference of each of the gears **30** and **31** should be equal to the centerline distance from one shaftway I to the other shaftway II, which is the width of the platforms **17** and may be about ten feet. The circumference of intermittent gears **23** and **24** and spur gear **22** each is equal to the sum of the rise of one vertical position plus one horizontal shifting motion of a platform **17**.

As shown in Figs. 4, 5, and 6, the storage platforms **17** are of rigid X-frame construction and each has four flanged wheels **35** mounted upon suitable axles **36**, two of which wheels are at each end of the platform and disposed near the respective corners thereof (see Fig. 7). While the platforms **17** partake of ascending and descending movements in the shaftways I and II, the platform wheels **35** are housed in and supported by channel boxes **37**, which are fixedly secured to suitable flanges **60** of attachment links **61** in the endless chains C–1 and C–2. To horizontally shift a platform **17** from one shaftway to the other upon reaching the top or bottom end extremities thereof, the wheels **35** are rolled along tracks **33** by the endless chain C–4 by means of upright pins **39** attached to each end of the platforms **17** respectively, and which pins become inserted periodically in certain openings in the link members of chain C–4. During such transfer of the platforms, the wheels **35** move from one set of channel boxes **37** within one shaftway to be received by those within the other shaftway.

The channel boxes **37**, which removably house and individually support each wheel of a vehicle storage platform **17** during the raising and lowering movements thereof in the shaftways I and II, are provided on both pairs of endless chains C–1 and C–2 and disposed at corresponding predetermined spaced positions or intervals thereon for simultaneous movement therewith vertically and in mutual horizontal alignment during raising and lowering movements of the tiers of platforms in the shaftways to maintain the platforms level.

Vertical angle or T guides **40** and **41** hold the channel boxes **37** and wheels **35** from tilting during vertical movements of the platforms **17**.

In the operation of my vehicle storage machine the automobile to be parked or stored first is driven upon a vacant bottom platform at street level of either shaftway I or II. As succeeding vehicles arrive for storage, an empty platform is brought down to the bottom level of the shaftway I or II. Between ascending and descending movements of the platforms **17** in the shaftways I and II respectively, lateral shifting at the top and bottom ends thereof of an individual platform occurs. However, when the garage is being loaded to full capacity as depicted in the diagrammatic elevations in Figs. 9A to 9L inclusive, there always will be one vacant space at the bottom level of shaftway I or II and at the top level of the adjoining shaftway II or I in order to provide for horizontal shifting of the car platforms **17** between these shaftways as the ascending car platforms are brought to the top level of shaftway I or II for selective removal of the cars at the bottom level of shaftway II or I when called for.

Figs. 10A and 10B are diagrammatic elevations depicting the steps of removing a particular car **5** to street level from its storage position in Fig. 10A which corresponds to that assumed in Fig. 9L when the garage is full. Mention is made that in the diagrammatic elevational views in Figs. 9A–9L, and 10A and 10B for the purposes of illustration only eight vehicle storage positions or stations have been depicted and lettered consecutively from A through H, and in which the vehicle storage platform units **17**, in this instance, are designated by suffixed letters, such as **17***a* through **17***g*, to correspond with the storage stations or positions which they initially occupy and with which they are associated at the start of the first loading operation, as indicated in Fig. 9A. The storage areas D and H have no corresponding platforms of their own but are empty spaces into which the top and bottom ascending and descending platforms of the two columns pass for horizontal shifting movement laterally into the adjoining shaftways I or II. The vehicles in these figures are numbered 1 through 6 to correspond with the order in which they enter the tower for storage.

Self-adjusting means are provided to automatically take up slack and stretching tendencies normally occurring in the endless elevator or conveyor chains C–1, C–2 and C–4. To this end, the lower sprockets S–13, S–17, S–23 and S–25 are rotatably mounted at the outer ends of the horizontal portion of a T-structure **45** while the sprocket S–15 is rotatably mounted at the outer end of the depending center arm **46** of this T-structure (see Figs. 2 and 3B). Lower sprocket S–11 for chain C–1 also is mounted on the arm **46** and spaced on an intermediate portion thereof from the sprocket S–15. Likewise, corresponding lower sprockets S–14, S–16, S–18, S–24 and S–26 for the other chains C–2 and C–4, and sprocket S–12 for the other

chain C–1 are mounted in similar fashion on a second T-structure 45 at the opposite side of the framework 10 and within the pit of the concrete foundation 15. As thus arranged, the T-structures 45 are suspended by their associated sprockets from the bottom turns or lower runs of the chains C–1, C–2 and C–4 whereby the inherent weight of the T-structures acts to maintain the chains taut regardless of any stretching tendencies. A pair of lower telescoping guide devices 50 and 51 may be provided at opposite ends of each T-structure 45, as indicated in Figs. 2 and 3, in order to prevent tilting or teetering action of the T-structures 45 thereby insuring their stability at all times during operation of the storage machine.

Safety features of this construction are:

(1) Since both sprockets S–1 and S–2 are attached to a common shaft 29, they move in unison as the endless chains C–1 and C–2 travel over them. If either of these chains should break, the tiers of vehicle platforms 17 in the vertical shaftway below the break would not fall because these platforms are rigidly designed and remain supported in position by the wheels 35 in the channel boxes 37 on the other three corners of these platforms.

(2) The chains C–1 and C–2 will remain in position if they should break and will be held by the wheels 35, and also by the outer top sprockets S–1, S–2, S–7 or S–8 because sprockets S–1 and S–2 are fastened on the same shaft 29, and sprockets S–7 and S–8 are fastened on the same shaft 42.

Advantages of this structural arrangement are:

(1) No floors or ramps which take up useful space.

(2) Entire space of the tower structure, approximately 5/6 of its volume, is available for storage for a ten car unit.

(3) Multiple units of these tower structures containing the vehicle storage machine of this invention may be placed either side-by-side or end-to-end, or both, to suit the lot dimensions.

While a specific embodiment of the invention is disclosed herein, it is to be understood that my invention is not limited thereto since various deviations or modifications can be made therefrom without departing from the spirit and scope thereof, and therefore those modifications that fall within the scope of the appended claims also are intended to be included herein.

What is claimed is:

1. An automobile parking and storage machine comprising a skeleton tower, a plurality of endless vertically arranged chains at two opposite sides of the tower, two vertical columns of wheeled car receiving platforms disposed horizontally and detachably mounted on said chains, horizontally disposed track means permitting the transfer and movement of the platforms laterally from one column to the other at the upper end of the tower, and self-adjusting take-up means at the lower end of each side of the tower at which is disposed said endless chains effective to maintain their vertical runs taut at all times, each of said take-up means comprising a horizontally disposed structure carrying sprockets around which the bottom turns and lower runs of said endless chains at such location are guided and by which the said associated structure is suspended in a floating fashion in the tower, and track means disposed horizontally on each of said floating structures permitting the transfer and movement of the platforms laterally from one column to the other at the lower end of the tower.

2. An automobile parking and storage machine comprising an upright frame structure having two adjoining vertical shaftways, a pair of endless chains located at two opposite sides of said frame structure, each of said chains having a vertical run in each shaftway moving in opposite directions, a second pair of endless chains one of each being disposed on the same end of the frame structure as a chain of the first-named pair and having a vertical run in each shaftway moving in the same direction as the vertical run of the companion chain of the first-named pair of chains, a plurality of wheeled vehicle storage platforms

arranged in vertical tiers to form two oppositely moving disposed columns in said shaftways, said platforms being disposed horizontally in each shaftway and detachably supported therein by the vertical runs of said first and second pairs of endless chains in such shaftway for ascending and descending movement thereof, track members disposed horizontally at the upper and lower ends of the shaftways of said frame structure and arranged to receive the wheels of the highest and lowest platforms of the descending columns in the respective shaftways upon successively reaching the upper and lower end terminus thereof for horizontal shifting movement along said tracks laterally from one shaftway into the other, a third pair of endless chains one of each being disposed on the same side of the frame structure as a chain of the first-named and second-named sets and having a generally rectangular course around the frame structure with vertically disposed runs parallel with and alongside the vertical runs of said second-named pair of chains and having horizontal runs disposed laterally of the frame structure across the upper and lower end portions of both shaftways and in close parallelism with said track members, power-driven means operatively arranged for propelling said endless chains to effect simultaneous ascending and descending movements of said first-named and said second-named pairs of endless chains in the shaftways step-by-step and intermittently with horizontal movements of said third-named set of chains to effect simultaneous transfer of a platform laterally from one shaftway into the other at the upper and lower ends thereof, and a T-structure at said chain located sides of said frame structure carrying sprockets around which the bottom turns and lower runs of said vertically moving chains associated with such side of the frame structure are guided, said T-structure being suspended in a floating fashion by said bottom turns of such chains to maintain their vertical runs taut at all times.

3. An automobile parking and storage machine comprising an upright frame structure having two adjoining vertical shaftways, a pair of endless chains located at two opposite sides of said frame structure, each of said chains having a vertical run in each shaftway moving in opposite directions, a second pair of endless chains one of each being disposed on the same end of the frame structure as a chain of the first-named pair and having a vertical run in each shaftway moving in the same direction as the vertical run of the companion chain of the first-named pair of chains, a plurality of wheeled vehicle storage platforms arranged in vertical tiers to form two oppositely moving disposed columns in said shaftways, said platforms being disposed horizontally in each shaftway and detachably supported therein by the vertical runs of said first and second pairs of endless chains in such shaftway for ascending and descending movement thereof, track members disposed horizontally at the upper and lower ends of the shaftways of said frame structure and arranged to receive the wheels of the highest and lowest platforms of the descending columns in the respective shaftways upon successively reaching the upper and lower end terminus thereof for horizontal shifting movement along said tracks laterally from one shaftway into the other, a third pair of endless chains one of each being disposed on the same side of the frame structure as a chain of the first-named and second-named sets and having a generally rectangular course around the frame structure with vertically disposed runs parallel with and alongside the vertical runs of said second-named pair of chains and having horizontal runs disposed laterally of the frame structure across the upper and lower end portions of both shaftways and in close parallelism with said track members, power-driven means operatively arranged for propelling said endless chains to effect simultaneous ascending and descending movements of said first-named and said second-named pairs of endless chains in the shaftways step-by-step and intermittently with horizontal movements of

said third-named set of chains to effect simultaneous transfer of a platform laterally from one shaftway into the other at the upper and lower ends thereof, and a T-structure disposed at the lower end of each side of the machine frame structure as that occupied by said vertically moving chains, said T-structure carrying sprockets around which are guided the bottom runs of a chain of each pair of the said above-named sets of endless chains and by which the associated T-structure is suspended in a floating fashion in the machine frame structure, each of said T-structures having a horizontal portion and a depending center arm with certain of said sprockets rotatably mounted at the outer ends of the horizontal portion of said T-structure and other of said sprockets rotatably mounted on the depending center arm of the T-structure, the horizontally disposed track members situated at the lower ends of said shaftways being carried by said T-structures.

4. An automobile parking and storage machine comprising a towerlike frame structure having two adjoining vertical shaftways, a pair of endless chains located at two opposite sides of said frame structure, each of said chains having a vertical run in each shaftway moving in opposite directions, a second pair of endless chains one of each being disposed on the same end of the frame structure as a chain of the first-named pair and having a vertical run in each shaftway moving in the same direction as the vertical run of the companion chain of the first-named pair of chains, a plurality of vehicle storage platforms disposed horizontally and arranged in vertical tiers to form two oppositely moving disposed columns in said shaftways, each platform having four wheels of which two are at each end and disposed near the respective corners thereof, means adapted to removably house and individually support each wheel of a platform for raising and lowering movement thereof, said means being provided on both pairs of endless chains and disposed at corresponding predetermined spaced positions thereon for simultaneous movement therewith vertically and in mutual horizontal alignment during raising and lowering movement of the platforms in the shaftways, track members disposed horizontally at the upper and lower ends of the shaftways of said frame structure and arranged to receive the wheels of the highest and lowest platforms of the ascending and descending columns in the respective shaftways upon successively reaching the upper and lower end terminus thereof, said wheel housing means being adapted to permit the wheels of said paltforms to be rolled therefrom onto said tracks for horizontal shifting movement therealong laterally from one shaftway into the other, a third pair of endless chains one of each being disposed on the same side of the frame structure as a chain of the first-named and second-named sets and having a generally rectangular course around the frame structure with vertically disposed runs parallel with and alongside the vertical runs of said second-named pair of chains and having horizontal runs disposed laterally of the frame structure across the upper and lower end portions of both shaftways and in close parallelism with said track members, power-driven means operatively arranged for propelling said endless chains to effect simultaneous ascending and descending movements of said first-named and said second-named pairs of endless chains in the shaftways step-by-step and intermittently with horizontal movements of said third-named set of chains to effect simultaneous transfer of a platform laterally from one shaftway into the other at the upper and lower ends thereof, and a T-structure at said chain located sides of said frame structure carrying sprockets around which the bottom turns and lower runs of said vertically moving chains associated with such side of the frame structure are guided, said T-structure being suspended in a floating fashion by said bottom turns of such chains to maintain their vertical runs taut at all times.

5. An automobile parking and storage machine comprising a towerlike frame structure having two adjoining vertical shaftways, a pair of endless chains located at two opposite sides of said frame structure, each of said chains having a vertical run in each shaftway moving in opposite directions, a second pair of endless chains one of each being disposed on the same end of the frame structure as a chain of the first-named pair and having a vertical run in each shaftway moving in the same direction as the vertical run of the companion chain of the first-named pair of chains, a plurality of vehicle storage platforms disposed horizontally and arranged in vertical tiers to form two oppositely moving disposed columns in said shaftways, each platform having four wheels of which two are at each end and disposed near the respective corners thereof, means adapted to removably house and individually support each wheel of a platform for raising and lowering movement thereof, said means being provided on both pairs of endless chains and disposed at corresponding predetermined spaced positions thereon for simultaneous movement therewith vertically and in mutual horizontal alignment during raising and lowering movement of the platforms in the shaftways, track members disposed horizontally at the upper and lower ends of the shaftways of said frame structure and arranged to receive the wheels of the highest and lowest platforms of the ascending and descending columns in the respective shaftways upon successively reaching the upper and lower end terminus thereof, said wheel housing means being adapted to permit the wheels of said platforms to be rolled therefrom onto said tracks for horizontal shifting movement therealong laterally from one shaftway into the other, a third pair of endless chains one of each being disposed on the same side of the frame structure as a chain of the first-named and second-named sets and having a generally rectangular course around the frame structure with vertically disposed runs parallel with and alongside the vertical runs of said second-named pair of chains and having horizontal runs disposed laterally of the frame structure across the upper and lower end portions of both shaftways and in close parallelism with said track members, power-driven means operatively arranged for propelling said endless chains to effect simultaneous ascending and descending movements of said first-named and said second-named pairs of endless chains in the shaftways step-by-step nad intermittently with horizontal movements of said third-named set of chains to effect simultaneous transfer of a platform laterally from one shaftway into the other at the upper and lower ends thereof, and a T-structure disposed at the lower end of each side of the machine frame structure as that occupied by said vertically moving chains, said T-structure carrying sprockets around which are guided the bottom runs of a chain of each pair of the said above-named sets of endless chains and by which the associated T-structure is suspended in a floating fashion in the machine frame structure, each of said T-structures having a horizontal portion and a depending center arm with certain of said sprockets rotatably mounted at the outer ends of the horizontal portion of said T-structure and other of said sprockets rotatably mounted on the depending center arm of the T-structure, the horizontally disposed track members situated at the lower ends of said shaftways being carried by said T-structures.

6. An automobile parking and storage machine comprising an upright frame structure having two adjoining vertical shaftways, a pair of endless chains located at two opposite sides of said frame structure, each of said chains having a vertical run in each shaftway moving in opposite directions, a second pair of endless chains one of each being disposed on the same end of the frame structure as a chain of the first-named pair and having a vertical run in each shaftway moving in the same direction as the vertical run of the companion chain of the first-named pair of chains, a plurality of wheeled vehicle storage platforms ar-

ranged in vertical tiers to form two oppositely moving disposed columns in said shaftways, said platforms being disposed horizontally in each shaftway and detachably supported therein by the vertical runs of said first and second pairs of endless chains in such shaftway for ascending and descending movement thereof, track members disposed horizontally at the upper and lower ends of the shaftways of said frame structure and arranged to receive the wheels of the highest and lowest platforms of the descending columns in the respective shaftways upon successively reaching the upper and lower end terminus thereof for horizontal shifting movement along said tracks laterally from one shaftway into the other, a third pair of endless chains one of each being disposed on the same side of the frame structure as a chain of the first-named and second-named sets and having a generally rectangular course around the frame structure with vertically disposed runs parallel with and alongside the vertical runs of said second-named pair of chains and having horizontal runs disposed laterally of the frame structure across the upper and lower end portions of both shaftways and in close parallelism with said track members, power-driven means operatively arranged for propelling said endless chains to effect simultaneous ascending and descending movements of said first-named and said second-named pairs of endless chains in the shaftways step-by-step and intermittently with horizontal movements of said third-named set of chains to effect simultaneous transfer of a platform laterally from one shaftway into the other at the upper and lower ends thereof, self-adjusting take-up means provided at each side of the machine frame structure as that occupied by said chains and hanging on the lower runs of all of said chains situated on that side and adapted automatically to maintain said chains taut at all times, and telescoping guide means operatively arranged to cooperate with said take-up means to stabilize the latter and prevent tilting thereof.

7. An automobile parking and storage machine comprising a towerlike frame structure having two adjoining vertical shaftways, a pair of endless chains located at two opposite sides of said frame structure, each of said chains having a vertical run in each shaftway moving in opposite directions, a second pair of endless chains one of each being disposed on the same end of the frame structure as a chain of the first-named pair and having a vertical run in each shaftway moving in the same direction as the vertical run of the companion chain of the first-named pair of chains, a plurality of vehicle storage platforms disposed horizontally and arranged in vertical tiers to form two oppositely moving disposed columns in said shaftways, each platform having four wheels of which two are at each end and disposed near the respective corners thereof, means adapted to removably house and individually support each wheel of a platform for raising and lowering movement thereof, said means being provided on both pairs of endless chains and disposed at corresponding predetermined spaced positions thereon for simultaneous movement therewith vertically and in mutual horizontal alignment during raising and lowering movement of the platforms in the shaftways, track members disposed horizontally at the upper and lower ends of the shaftways of said frame structure and arranged to receive the wheels of the highest and lowest platforms of the ascending and descending columns in the respective shaftways upon successively reaching the upper and lower end terminus thereof, said wheel housing means being adapted to permit the wheels of said platforms to be rolled therefrom onto said tracks for horizontal shifting movement therealong laterally from one shaftway into the other, a third pair of endless chains one of each being disposed on the same side of the frame structure as a chain of the first-named and second-named sets and having a generally rectangular course around the frame structure with vertically disposed runs parallel with and alongside the vertical runs of said second-named pair of chains and having horizontal runs disposed laterally of the frame structure across the upper and lower end portions of both shaftways and in close parallelism with said track members, power-driven means operatively arranged for propelling said endless chains to effect simultaneous ascending and descending movements of said first-named and said second-named pairs of endless chains in the shaftways step-by-step and intermittently with horizontal movements of said third-named set of chains to effect simultaneous transfer of a platform laterally from one shaftway into the other at the upper and lower ends thereof, self-adjusting take-up means provided at each side of the machine frame structure as that occupied by said chains and hanging on the lower runs of all of said chains situated on that side and adapted automatically to maintain said chains taut at all times, and telescoping guide means operatively arranged to cooperate with said take-up means to stabilize the latter and prevent tilting thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

1,564,100	Morton	Dec. 1, 1925
1,871,795	James	Aug. 16, 1932
2,024,190	Sumi et al.	Dec. 17, 1935
2,817,446	Hodous	Dec. 24, 1957
2,874,857	Coursey	Feb. 24, 1959