This invention relates generally to mechanical, multiple story car parking systems employing traveling cranes and more particularly to a traverse carried by the crane of such a system for moving the car onto or off the crane both at the ground level and at a selected stall of any upper story of the system.

Car parking systems of the type to which this invention generally pertains comprise in substance, a plurality of stalls arranged in rows on each of the upper stories of a parking structure, and between any selected one of which and street level entrance and exit ways cars are transported by a suitable crane. The crane carries a so-called traverse device, which is selectively operable to move cars on and off the lift platform of the crane when the platform is positioned at the street level entrance or exit way, or in alignment with a selected upper story stall.

In operation of such a parking system, a car delivered by an owner is positioned in a loading area opposite the crane-way, whereupon the operator of the parking facility controls the crane mechanism to bring the lift platform to its ground floor loading position in line with the car. The traverse device is then operated to move the unoccupied car onto the crane platform, the crane is elevated and translated to a position of alignment with a selected stall of the system, and the traverse is then again operated to move the car from the crane platform into the selected stall. The operation of the system is substantially reversed when a car is redelivered to its owner.

A depending application of Carlisle F. Manaugh, Serial No. 376,152, filed August 24, 1953, now Patent No. 2,714,456, and entitled Car Parking System discloses one form of the above described system, and to which the present traverse device is illustratively applicable.

One of the primary deficiencies of prior traverse devices, for use in such mechanical parking systems, has been their inability to function satisfactorily with all makes of cars owing to the differences in tread width, length and underframe formations of the various makes of cars.

These prior traverse devices generally were of two types, one of which types functioned to push or pull the car from one point to another with the car moving on its own wheels, while in the other type, the car was elevated, carried from one point to another and then deposited.

It will be apparent that in the former type of traverse device, means for guiding the vehicle are required, which means generally consisted of treads for receiving the wheels of the vehicle. Obviously, such an arrangement is not adapted for use with cars of varying tread widths.

In the latter of the above mentioned types of traverse devices, the traverse generally comprised a wheeled vehicle which carried power operated lift means for engaging the underframe of the car to lift the latter off its wheels. Suitable drive mechanism was provided for propelling the vehicle.

The lift means in such traverse devices generally consisted of either a platform for indiscriminately engaging several points of the underframe or a plurality of simultaneously operable lift devices or supports for engaging certain predetermined points on the underframe.

A platform type lift mechanism is unsatisfactory since the platform must be of a width to permit vertical movement thereof between the wheels of a car of minimum tread width while providing adequate support for a car of maximum tread width. Owing to relatively great difference in tread widths of present day vehicles, those of maximum tread width cannot be stably supported on platforms designed, for example, to support sports cars. Moreover, since the platform engaged the underframe of the car indiscriminately, damage was often caused to the latter due to bearing of the platform against grease fittings and other fragile elements not designed as pressure points.

While traverse devices incorporating lift mechanisms designed to engage selected points of the underframe were generally satisfactory from the standpoint of not causing damage to the car inasmuch as bearing points were selected that were capable of sustaining the weight of the car, such traverses functioned properly only with cars which incorporate such points. Since the underframes of cars differ greatly in size and arrangement of parts, the use of such a traverse device was severely restricted. Moreover, the use of such traverse arrangements necessitated extremely careful alignment of the car and traverse device.

Further, while the points on the underframe of the car that were selected as pressure points for bearing against the lift mechanism were theoretically capable of sustaining the weight of the car, such points were not, in the manufacture of the car, designed specifically as pressure points so that frequently the structure constituting said bearing points would become deformed or misaligned under the weight of the car.

Accordingly, it may be stated as a general object of the present invention the provision of a traverse device for mechanical parking systems which avoids the foregoing and other deficiencies of existing traverse devices.

Another object of the invention is the provision of a traverse device which is capable of functioning in a completely satisfactory manner with substantially all existing makes of cars.

Still another object of the invention is the provision of a traverse device which is operable to elevate and transport a car from one point to another and wherein the lift mechanism for elevating the car contacts the latter at points which are specifically designed as pressure points for sustaining the weight of the car.

A further object of the invention is the provision of a traverse device which incorporates lift mechanism engageable under the wheels of the car so that the weight of the latter is supported without the possibility of damage to the car and which is designed to accommodate substantially all existing makes of cars.

Still a further object is the provision of an improved self-propelled traverse device for mechanical parking systems.

Yet a further object of the invention is the provision of a traverse device as in the foregoing which is relatively simple in construction, inexpensive to manufacture, easy to operate, and requires a minimum of service and maintenance.

The traverse of this invention in a present preferred illustrative embodiment thereof, comprises a self-propelled vehicle consisting of forward and after lift sections and a
hydraulic lines carried thereby omitted for the sake of clarity;

Fig. 18 is a side elevation of the tractor section of

Fig. 17;

Fig. 19 is a section taken along line 19—19 of Fig. 17;

Fig. 20 is a section taken along line 20—20 of Fig. 17;

Fig. 21 is a section taken along line 21—21 of Fig. 17;

Fig. 22 is a section taken along line 22—22 of Fig. 17;

Fig. 23 is a section taken along line 23—23 of Fig. 17;

Fig. 24 is a side elevation of the traverse of Fig. 23;

Fig. 25 is a section taken along line 25—25 of Fig. 24; and

Fig. 26 is a section taken along line 26—26 of Fig. 24.

Referring first to Figs. 1–5 of the drawings, there is illustrated a section of a mechanical parking system incorporating the traverse device of this invention. While this parking system is preferably of the type disclosed in the aforementioned copending application Serial No. 376,152, it will, of course, be understood that the present traverse device may be employed, as well, in other types of parking systems, and, in fact, the present traverse device may be considered as having general utility for transporting cars or other similar objects from one point to another.

The illustrated parking system comprises a crane mechanism 30 which is movably supported on tracks, not shown, for horizontal movement in the directions indicated by the arrow A in a craneway B between two multiple storage units, in a conventional arrangement, only a fragmentary portion of one story or tier of one such unit being illustrated. Each upper story tier of each such storage unit has a row of open front parking stalls 31 opening to the craneway. Crane mechanism 30 carries a vertically movable lift platform 32, the crane mechanism and lift platform being operated by suitable drive mechanism, not shown, and controlled from a control panel 33 of one side of the lift platform.

In operation of the parking system, the crane mechanism and lift platform are adapted to be controlled from panel 33, for vertical and horizontal movement of the platform between loading and unloading positions at the street level and a loading and unloading position, illustrated in Fig. 1, in alignment with a selected one of the parking stalls 31.

Generally indicated at 34 is the traverse device of this invention, consisting generally of a forward lift section 35, an intermediate propulsion or tractor section 36, and an after lift section 37, the forward and after lift sections being provided with wheels 38 and the tractor section being provided with treads 39. Each of the forward and after lift sections incorporate fork-type lift devices generally indicated at 40, 41, 42, and 43 and equipped with wheel engaging fork members 83 which may be laterally extended and vertically moved through the operation of certain mechanism, preferably hydraulic, not shown in Fig. 1, as will be presently more fully described. These fork lift devices are, in Fig. 1, shown in their laterally extended, elevated positions.

Tractor section 36 incorporates drive means, preferably in the form of a hydraulic motor, not shown in Fig. 1, for driving the treads 39 so as to propel the traverse in opposite directions, as will be presently more fully described.

The above mentioned hydraulic mechanism for operating the fork lift devices on the forward and after sections of the traverse are supplied with operating fluid through a pair of flexible conduits 95 and 96 and one or more conduits serving as the supply line and the other as the exhaust line when the fork lifts are to be extended, and said one conduit serving as the exhaust line and said other conduit serving as the supply line when the fork lifts are to be retracted.

The hydraulic motor for propelling the traverse is...
likewise supplied with operating fluid through a pair of flexible conduits 46 and 47 each of which serves either as a supply line or an exhaust line depending upon the desired direction of motion of the traverse.

Conduits 46 and 47 similarly pass between pairs of spaced, coplanar sheaves 48 rotatably mounted below and accessible through openings in the lift platform 32, as shown, and are wound on a pair of drums 49 journeled on vertical axes and enclosed within cylindrical, stationary housings 49, the sheaves being substantially tangent to the planes of the upper surface of the lift platform, as illustrated.

Conduits 46 and 47 similarly pass between pairs of spaced, coplanar sheaves 50 and are wound on a pair of drums journeled on vertical axes and enclosed within stationary housings 51 in the same manner as drums 49, the spacing between the pairs of sheaves 50 being somewhat less than the spacing between the pairs of sheaves 48, as shown. The drums are spring tensioned, as shown in Fig. 3, in a direction to rewind the conduits thereon. The spring tension is equalized on the several drums so that the equal tension in the conduits 44, 45, 46, and 47 will tend to maintain straight line movement of the traverse.

Fluid for operating the traverse is received from a source 52 through piping 53 connecting the source to the conduits 44, 45, 46, and 47 through rotary fluid couplings at the drums 49 and 51 as shown in Fig. 3. Operation of the traverse, and also the crane mechanism, is controlled, as previously mentioned, by an operator located at the control panel 33.

The parking stalls 31 are each formed with a floor which includes a central runway 54 and raised front and rear side portions 55, each of the latter being transverse groove 56 so as to form rib 56 and form grooves 57 extending normal to the way 54. The spacing between the elevated side portions 55 on opposite sides of way 54 is less than the tread width of the smallest car made while the width of the stall is sufficient to accommodate the largest car. A car C when parked in the stall is disposed with its wheels W resting on the raised side portions 55, as shown in Figs. 4 and 5.

The forward end of the traverse mounts bumpers 58 for engagement with the rear end wall 59 of the stall, the arrangement being such that when bumpers 58 are engaged with end wall 59, the fork members 83 of the fork lift devices 40, 41, 42, and 43 will be aligned with the grooves 57 in side portions 55 of the stall floor, the spacing between the forks being the same as the spacing between the grooves.

Similar bumpers 58 are mounted on the after end of the traverse for engagement with the end wall of a stall (not shown) on the opposite side of the crane way, the traverse being adapted to move off the lift platform in either direction into a parking stall.

In the operation of the traverse, as described, to remove a parked car from a stall, and assuming the crane mechanism has been operated to raise its lift platform with a selected one of the stalls 31 from which a car C is to be withdrawn, the operator on the platform controls the traverse, by the manipulation of suitable controls, not shown, on control panel 33 to propel it off the lift platform and into the parking stall to the position of Fig. 1. Suitable means, not shown, such as conventional overload relief valves may be incorporated in the hydraulic system for bypassing fluid around the propulsion motor upon the increase in line pressure occasioned by engagement of bumpers 57 with wall 58.

During the previous operation of depositing the car in the stall, the car will have been positioned with its wheels on the fork lift devices 40, 41, 42, and 43 and the traverse when the latter has its bumpers 58 engaged with the end wall 59 of the stall, the position of Fig. 1.

The operator now actuates the controls for the hydraulic mechanism of the lift devices 40, 41, 42, and 43 to cause the latter to first move from their retracted position (solid lines Fig. 4) to their laterally extended positions (phantom lines Fig. 4), with their fork members 83 extending into the grooves 57 under the wheels of the car, and then to their opposed positions (Figs. 1 and 5) so as to elevate the car and fork members above the ribs 56. The traverse is now controlled to move, with the car supported in elevated position thereon, onto the lift platform and the latter is lowered to its unloading position at ground level.

The traverse is then moved off the lift platform, and the fork lift devices are lowered and retracted so as to deposit the car on the floor at ground level, the latter being provided with suitable means to permit the fork lifts to be so retracted. A grooved floor structure generally similar to that used in the stalls may be employed.

Packing of a car is accomplished by a reversal of the above described procedure for returning a car from a parking stall to its owner.

The traverse will now be described in greater detail by reference to Figs. 6 through 26 of the drawings. Referring first to Figs. 6 through 14, the forward lift section 55 comprises a main frame 60, of generally channel construction, to oppose sides at a joint opposite ends of which are fixed pairs of brackets 61 bridged by bearing plates 62 between which are journeled the wheels 38 for supporting the front lift section.

The central portion of frame 60 is recessed, as at 63, and fixed to the underside of the rear plate 64 of the frame 60, adjacent to and on opposite sides of this recessed portion are parallel, transversely extending guides 65.

As shown more clearly in Figs. 8 and 9, each of these guides comprises a center, i-beam section 66 which is bolted, or otherwise secured to the underside of the rear plate 64. Plates 67 are bolted to the flanges at opposite sides of the beam to form, in each beam, a pair of guideways 68 and 69.

Extending through and normal to plates 67 and the web of beam 66, adjacent the flanges of the latter, are pairs of shafts 70 each having journeled thereon, at opposite sides of said shafts, a pair of rollers 71.

Mounted in each pair of guideways 68 and 69, between the rollers 71 thereof, for movement laterally of the frame 60, are pairs of guide bars 72 and 73 which support the fork lift devices 40 and 41 on the frame 60.

The ends of the pair of guide bars 72 at one side of frame 60 are secured to and bridged by a cross frame 74 and the ends of the pair of guide bars 73, at the other side of frame 60, are secured to and bridged by a cross frame 75. Cross frames 74 and 75 are similar in construction, the latter frame, however, being somewhat longer owing to the greater spacing between guide bars 73.

Referring now to Figs. 10 and 11, cross frame 74 comprises a bottom cross tie 76 fixed at opposite ends to the guide bars 72 and a pair of top cross ties 77 and 78 each having one end fixed to the guide bars 72 and terminating in spaced relation, as shown. Extending between and fixed at opposite ends to cross ties 76 and 77 are a vertical guide 79, a reinforcing bar 80, and a toggle support bar 81 having an enlarged lower portion 81, as shown. Extending between and fixed at opposite ends to cross ties 76 and 78 are a second toggle support bar 81, also having an enlarged lower portion 81', and a second vertical guide 79.

As indicated in Figs. 6 and 7 cross frame 75 is similar in construction to cross frame 74 except that its lower cross tie 76' and upper cross ties 77' and 78' are somewhat longer than those of cross frame 74 to accommodate the increased spacing of guide bars 73.

Guided for vertical movement on the cross frames are the fork lift devices 40 and 41 each having a fork lift frame including a vertical fork support plate 82 to the lower edge of which are secured three fork members 83, heretofore mentioned, the intermediate one of which is disposed somewhat lower than the other two so as to
form, in effect, a depression for receiving the wheels of the car.

Mounted on the inner sides of support plates 82, adjacent to the lower edges thereof, are pairs of guide blocks 84 each including pairs of rollers 85 bearing on opposite sides of the vertical guides 79 for guiding support plates 82 in their vertical movement on the cross frames.

Also mounted on the inner sides of support plates 82, adjacent the upper edges thereof, and in vertical alignment with the spaces between the enlarged lower portions 81' of the toggle support bars 81 are toggle support blocks 86.

A toggle link assembly 87 is associated with each fork lift device, each assembly comprising a pair of pivotally connected toggle links 88 and 89. Toggle links 88 have their free ends pivoted to toggle support blocks 86, as shown, while the free ends of toggle links 89 are pivotally connected to and between the lower enlarged portions 81' of the toggle support bars 81 as by journal pins 90 extending through said enlarged portions and the links 89, as shown.

Indicated at 91 are a pair of hydraulic cylinder assemblies for operating the fork lift devices between their raised extended and retracted positions. Each of these cylinder assemblies comprises a hydraulic cylinder 92 provided intermediate its ends with oppositely extending, coaxial lugs 93 which are journaled in upstanding journal blocks 94 fixed to the recessed central portion 63 of frame 60. The outer end of the cylinder extends through the adjacent cross frame and through a clearance opening in the adjacent fork lift support plate 82, as shown.

The piston rods 95 of the hydraulic cylinder assemblies 91 are pivoted to their adjacent toggle link assemblies 87 as by the pin 96 which joins the toggle links of each toggle link assembly, passing through the piston rod, as shown.

Operation of the hydraulic cylinder and toggle link assemblies is as follows. When the fork and lift devices are in their retracted position the fork lift support plates 82 are in their lowestmost position on the cross frames 74 and 75 and the latter about the sides of frame 60, as shown in Figs. 6 and 12. With the parts in this position the piston rods 95 are withdrawn into the cylinders 92 and the toggle links of the toggle link assemblies are angulated as shown in Fig. 12.

Injection of hydraulic fluid to the outer end of cylinders 92, from the aforementioned fluid conduits 44 and 45 (only the cylinder ports have, for clarity, been shown in Fig. 6, the piping connecting said ports to conduits 44 and 45 to be presently described) causes the piston rods 95 to move out of the cylinders. Owing to the relatively free movement of the guide rods 72 and 73 in their guides 65, the toggle linkage assemblies will remain in the positions shown in Fig. 12 and the fork lift devices will be moved to their laterally extended position shown in phantom lines in Figs. 4 and 12 wherein enlarged heads 96 (Fig. 6) secured to the ends of guide rods 72 and 73 abut the sides of the frame 60. The pistons in cylinders 92 will now have completed only a portion of their strokes.

Continued admission of fluid to the cylinders with resultant further outward movement of the piston rods 95 from the cylinders will cause straightening out of the toggle linkages 87 with resultant elevating of the fork lift support plates 82 and forks 83 carried thereby to the position of Figs. 5 and 13. The pivotal mounting 93, 94 of cylinders 92 on frame 60 accommodates the slight tilting of the cylinders which occurs during straightening out of the toggle linkages.

Introduction of hydraulic fluid to the opposite ends of cylinders 92 results first in lowering of the fork lift support plates and then retraction of the fork lift devices to the position of Fig. 12.

The after fork lift section 37, as shown in Figs. 15 and 16, is similar to the forward section and differs from the latter only in the greater lengths of the after section frame 60, cross frames 74' and 75', and fork lift support plates 82 and in the fact that two hydraulic cylinder assemblies 91 are employed to operate each fork lift device 42 and 43 rather than one as in the case of the forward fork lift section. Also four guide bars 72 and 73 rather than two, are employed in each fork lift device, the guides 65 for the after section guide bars being identical to the guides for the forward section guide bars. The construction of the after cross frames 74' and 75' is generally similar to that of the forward cross frames, four vertical guides 79 being provided on each frame for cooperation with four guide blocks 84 on each fork lift support plate 82.

The number of fork members 83 carried by the after section fork lift support plates 82 is made greater than the number of fork members 83 carried by the forward section fork lift support plates in order to accommodate the varying wheel bases of the different makes of cars. Thus the distance between the center ones of the fork members 83 of the forward section and the forward ones of the fork members 83 on the after section is made less than the minimum wheel base of any existing car while the distance between the center ones of the forward fork members and the after ones of the after fork members is made greater than the maximum wheel base of any car.

The remainder of the after section and operation of its fork lift devices is identical to the forward section, the cylinders associated with the after fork lift devices 42 and 43 operating simultaneously to first laterally extend the later and then elevate the fork support plates 82 and fork members 83 carried thereby. Further description of this after section is, therefore, deemed unnecessary.

Referring now to Figs. 17–22, the center tractor section comprises a channel frame 97 provided at opposite ends with tongues 98 which are bridged adjacent their free ends by bearing sleeves 99, for bingly connecting the tractor section to the forward and after lift sections, as will presently be seen.

Joined to opposite sides of frame 97 are angle sections 100 having upper horizontal flanges substantially coplanar with the upper surface of frame 97. Extending through the side flanges of frame 97 and the vertical flanges of the angle sections 100 are a pair of drive shafts 101, fixedly mounting sprockets 102, and a pair of idler shafts 103.

Drive shafts 101 are each journaled in a pair of bearings 104 (Fig. 20) carried at the ends of a pair of arms 105 which have their outer ends pivoted at 106 about a horizontal axis between pairs of brackets 107 depending from the underside of the horizontal flanges of angle sections 100. Adjustable spring suspension means 108, extending between the horizontal flanges of the angle sections 100 and the arms 105, serve to resiliently bias the arms and drive shafts 101 journaled therein downwardly about the pivotal connection 107.

Idler shafts 103 are journaled in pairs of bearing blocks 109 which are slidably mounted for vertical movement in guides 110, bearing blocks 109 being resiliently supported by adjustable spring suspension means 111 (Fig. 20).

Drive shafts 101 mount caged wheels 112 at their outer ends and idler shafts 103 mount bogey wheels 113 at their ends, the wheels 112 and 113 having trained thereabout the internally caged endless belt treads 39 the lower run of which extends slightly below the bottom of frame 97, as shown in Figs. 18 and 20, so that the tractor section is supported on the treads.

The tension in the treads may be adjusted by adjustment of the spring suspension means 108 for the drive shafts, the bogey wheels 113 acting as idlers to maintain the lower run of the treads in contact with the floor over substantially the entire lower run.

Indicated at 115 is a reversible hydraulic motor, sup-
ported on the underside of frame 97, which is supplied with operating fluid for reversed directions of operation through the flexible conduits 46 and 47 (Fig. 1) and subsequently described piping, not shown in Fig. 17, on the section 116. The driven shaft 116 of the motor mounts a pair of sprockets 117 around which and the sprockets 102 on drive shafts 101 are trained a pair of drive chains 118, the latter passing over idler sprockets 119. It will be seen that treads 39 are positively driven at the same speed, by virtue of the cogs on the treads and drive wheels 112 so that there is no tendency for the tractor section to turn as might occur if the treads could slip on the drive wheels.

The tractor section is connected to the forward and after lift sections by means of hinge pins 120 which, in the connected condition of the sections pass through the bearing sleeves 99 and side flanges of the frames 60' of the forward and after lift sections, as shown in Figs. 17 and 22. The sections are articulated in this fashion to accommodate any slight inclines to which the floors of the parking stalls may conform to provide for runoff of any rain water that may enter the stalls.

As shown in Figs. 23–26, hydraulic fluid is conveyed to the hydraulic cylinders 92 of the forward and after lift sections 35 and 37 through a pair of conduits 121 and 122 carried by the traverse, suitable flexible sections 123 being provided in said conduits where they bridge the sections of the traverse. Conduit 121 has branches connected to the inner ends of the cylinders 92 while conduit 122 has branches connected to the outer ends of the cylinders. Conduits 121 and 122 terminate at the forward end of the traverse in angle sections 124 each having an extension extending below the frame 60 of the forward lift stall. These latter extensions terminate in swivel couplings 125 to which are connected the flexible conduits 44 and 45 of Fig. 1.

Hydraulic fluid for drive motor 115 is supplied through a pair of rearwardly extending conduits 126 and 127, the latter having flexible sections 128 where they bridge the traverse and after lift sections. These latter conduits terminate in U-sections 129 each having an arm extending below the frame 60' of the after section, said arms terminating in swivel couplings 130 to which the conduits 46 and 47 of Fig. 1 are connected.

The spacing between swivel couplings 130 is somewhat less than the spacing between swivel couplings 125 so that conduits 46 and 47 will lie within conduits 44 and 45 as illustrated in Fig. 1.

Reiterating the operation of the present traverse, and assuming the traverse and crane to be in the positions illustrated in Fig. 1, the centering rod 33 is actuated to supply fluid through conduits 45 and 122 to the cylinders 92 of the fork lift devices of the forward and after lift sections to first cause the latter to be laterally extended to the phantom line position of Figs. 4 and 12 wherein the fork members 83 of the forward and after sections extend into the grooves 57 in the raised side portions 55 of the stall floor. As previously indicated, the fork members will be positioned below the wheels of the car C. When the devices have thus been extended, heads 96 on the guide rods 72 and 73 of the devices abut the sides of the frames 69 and 60' of the forward and after sections so as to prevent further outward travel of the rods. Continued admission of fluid to the cylinders results in the aforementioned straightening out of the toggle linkages 87 with a resultant elevating of the fork support plates 82 and 82' and fork members 83 carried thereby, the latter engaging the wheels of the car C to elevate the latter to the position of Figs. 1, 5, and 13.

Hydraulic fluid is now supplied to drive motor 115 of the tractor section 36, through conduits 46 and 127, to actuate the motor in a direction to propel the traverse, with the car supported in elevated position thereon, onto the lift platform.

The crane mechanism 30 is translated to a position of vertical alinement with the ground floor loading position of the parking system while lift platform 32 is lowered to the ground floor level. Hydraulic fluid is again supplied to motor 115 through conduits 47 and 126 to move the traverse off the lift platform onto the loading and unloading area whereat fluid in conduit 89 causes cylinders 92 through conduits 44 and 121 to cause the fork lift support plates 82 and 82' and fork members 83 to be lowered to deposit the car on suitable spaced elements, not shown, which allow retraction of the forks from beneath the wheels. Continued admission of fluid to the cylinders through conduits 44 and 121 causes movement of the fork lift devices to their laterally retracted position (position shown in solid lines in Figs. 4 and 12).

The operation of the traverse during parking of cars is similar to that described above except that the car is transported from the loading area at the ground floor level onto the lift platform, the latter is elevated to a position of alinement with a selected parking stall, and the car is carried and deposited therein by the traverse, the latter being movable off the lift platform in either direction to deposit the car in a stall at either side of the platform. As previously mentioned, the fork members 83 of the forward and after lift sections will be lowered into the grooves in the floor of the selected stall when one or the other of the bumpers 57 abut the end walls of the stalls. Suitable means such as overload relief valves may be incorporated in the hydraulic system of the drive motor 115 to discontinue the supply of fluid to the latter when the traverse so engages the end wall of the stall.

Obviously many modifications in the design and arrangement of parts of the invention are possible in the light of the foregoing teachings. It is to be understood, therefore, that within the scope of the following claims the invention may be practiced otherwise than is specifically described herein.

We claim:
1. A traverse device for use in mechanical car parking systems, comprising: an elongated movable vehicle, means carried by the vehicle for propelling the latter in opposite directions, pairs of frame means at opposite ends of the vehicle with the frame means of each pair of frame means disposed at opposite sides of the vehicle, means mounting said frame means on the vehicle for horizontal movement between laterally extended and retracted positions relative to the vehicle, vertically movable lift means carried by each of said frame means, toggle linkage means connected between each of said lift means and its associated frame means for causing elevating of the lift means when the toggle means are operated in one direction and lowering of the lift means when the toggle means are operated in the other direction, and means for operating said toggle means, said last mentioned means also actuating extend and retract said frame means when said lift means are lowered.
2. The subject matter of claim 1 wherein said last mentioned means comprises fluid operated means connected to each of said toggle means.
3. A traverse device for use in mechanical car parking systems, comprising: an elongated movable vehicle including a plurality of hinged sections, means carried by an intermediate one of said sections for propelling the vehicle in opposite directions, pairs of frame means associated with sections at opposite sides of said intermediate section, the frame means of each pair of frame means being disposed at opposite sides of the vehicle, means mounting said frame means on the vehicle for horizontal movement of the frame means, each pair of frame means between laterally extended and retracted positions, vertically movable lift means carried by each of said frame means and including spaced members for engaging under the wheels of a car, a pair of pivotally connected, vertically movable, toggle links associated with each frame and lift means, one link of each pair of links being pivotally connected to respective frame means and the other link being pivotally connected to the respective lift means and fluid operated
piston means carried by the vehicle associated with each pair of toggle links and including a piston rod pivotally connected to the center of each pair of links for moving the frame means between retracted and extended positions and for elevating and lowering the lift means.

4. In a traverse of the class described, a movable vehicle, a plurality of guide bars mounted for horizontal, lateral movement on the vehicle, frame means bridging corresponding ends of the bars at one side of the vehicle for movement with the bars between laterally extended and retracted positions, and a piston means carried by the vehicle associated with each pair of toggle links and including a piston rod pivotally connected to the center of each pair of links for moving the frame means between retracted and extended positions and for elevating and lowering the lift means.

5. The subject matter of claim 4 wherein said toggle linkage means comprises a pair of vertically disposed pivotally connected toggle links, one of said links being pivotally connected to said frame means and the other of said links being pivotally connected to said fork means and said pivotally operated means comprises fluid operated piston means carried by said vehicle and having a piston rod pivotally connected to the pivoted connection of said toggle links, said bars including stop means engageable with the vehicle for limiting laterally extendable movement thereof.

6. In a mechanical car parking system, a floor for receiving a car and including supporting means for the wheels of the car, said supporting means comprising means spaced longitudinally of the car for supporting each wheel of the car, the wheel supporting means at one side of the car being spaced from the wheel supporting means at the other side of the car, the last mentioned spacing being small enough to accommodate cars of minimum tread width and said wheel supporting means being wide enough to accommodate cars of maximum tread width, and a traverse device for transporting a car to and from said floor, said device comprising an elongated vehicle movable between said wheel supporting means at opposite sides of the car, means for moving the vehicle, horizontally extendable and retractable means at opposite ends of the vehicle, vertically movable lift means at opposite sides of the vehicle carried by said extendable and retractable means, lift means including spaced apart members horizontally clear said said wheel supporting means, and said extendable and retractable means being retractable to a position wherein said spaced-apart members horizontally clear said said wheel supporting means, and reversible means operable in one direction of operation to first extend said extendable and retractable means and then elevate said lift means and operable in the other direction of operation to first lower said lift means and then retract said extendable and retractable means, said reversible means comprising fluid operated means and toggle linkage means carried by the vehicle and includes means for elevating and retracting said vehicle and including retracted and extendable and retractable means and connected between said lift means and extendable and retractable means.

8. In a traverse device for use in a mechanical car parking system, an elongated, movable vehicle including forward and after sections and a center section, said sections being hinged together, vertically movable and horizontally extendable means and retractable lift means carried by the vehicle associated with each pair of toggle links and including a piston rod pivotally connected to the center of each pair of links for moving the frame means between retracted and extended positions and for elevating and lowering the lift means, and power operated means connected between the vehicle and said toggle linkage means for moving said guide bars and frame means between extended and retracted positions and for operating said toggle linkage means to raise and lower the lift device.

9. A traverse for use in mechanical car parking systems, comprising: a movable vehicle, frame means supported on the vehicle for horizontal extension and retraction relative to the vehicle, lift means supported on the frame means for vertical movement relative to the frame means, and reversible power means connected to said frame means and to said lift means and operable to horizontally extend and retract said frame means relative to the vehicle and to vertically raise and lower said lift means relative to said frame means when the latter means are in extended position, said power means comprising toggle link means connected between said frame means and lift means, and a power operated device anchored to the chassis of said vehicle and operatively connected to said toggle link means, said device being operative to exert a force on said toggle link means to extend and retract said frame means and to operate said toggle link means to raise and lower said lift means when the frame means are in extended position.

10. The subject matter of claim 9 wherein said device comprises a hydraulic cylinder having a piston connected to the center pivot of said toggle link means.

11. In combination, in a mechanical car parking system, a traverse including a movable vehicle, a traverse mechanism including an elevator platform onto and off of which said Traverse is adapted to move to and from, a plurality of hydraulic conduits extending between said platform and traverse, said platform having a pair of openings therein, a pair of sheaves rotatably mounted in each of said openings and coplanarily disposed parallel to the direction of movement of the traverse, each of said conduits extending between one pair of said sheaves, said spring biased drums below said platform on which said conduits are wound, said pairs of sheaves being disposed in substantially parallel planes spaced laterally of the direction of movement of said vehicle and said conduits being secured to the traverse so as to extend substantially parallel to said direction whereby said traverse is adapted to move off the platform in opposite directions, the tension imposed on said conduits by said spring biased drums aid-
ing and guiding said traverse during movement thereof on and off the platform.

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<th>Patent Number</th>
<th>Inventor(s)</th>
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