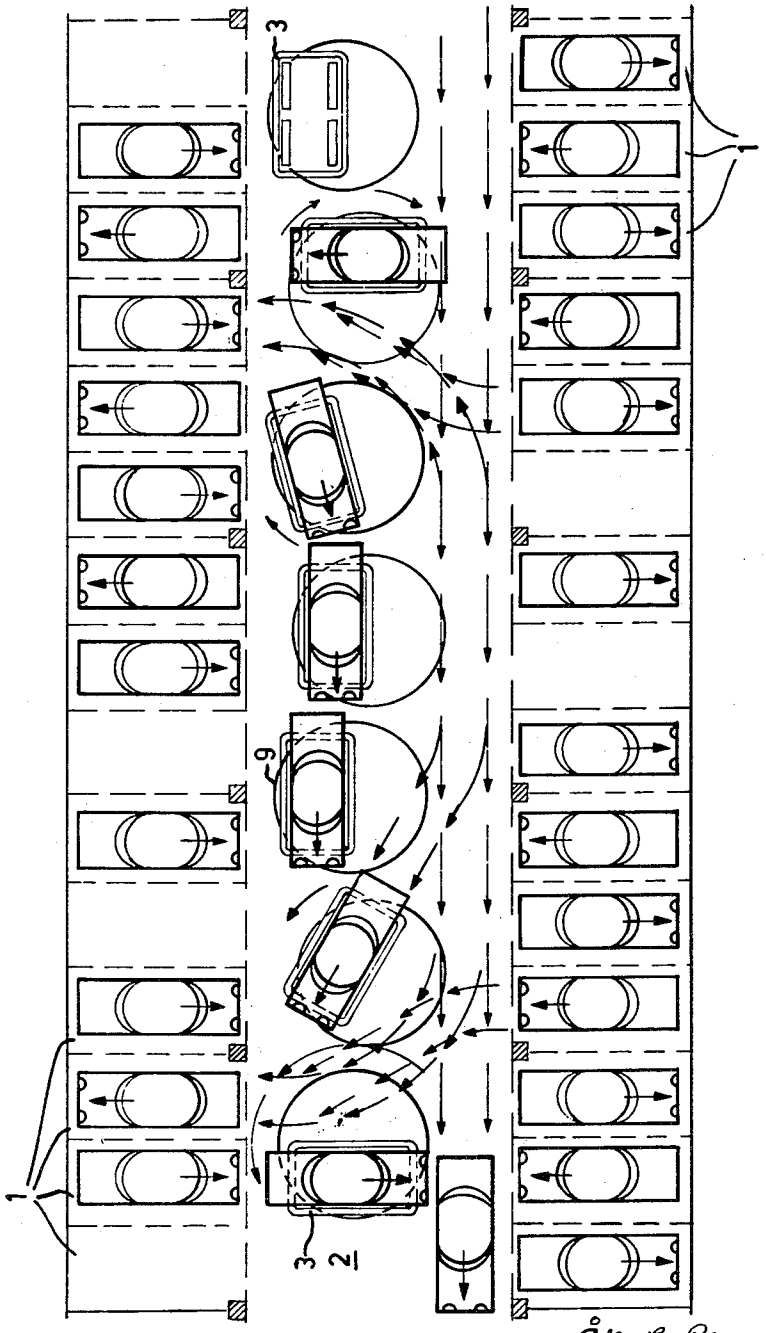
June 29, 1965 ÅKE BERTIL PERNUM 3,191,782

GARAGING MEANS

Filed April 18, 1962 5 Sheets-Sheet 1

FIG. 1



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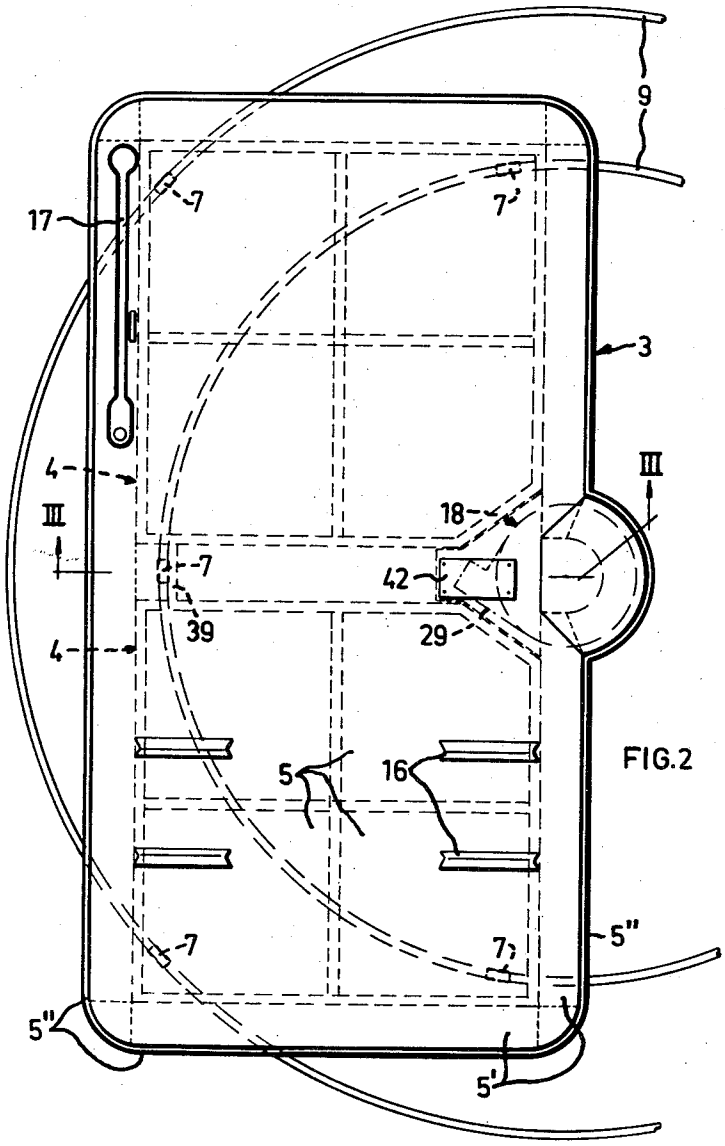


FIG.2

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GARAGING MEANS

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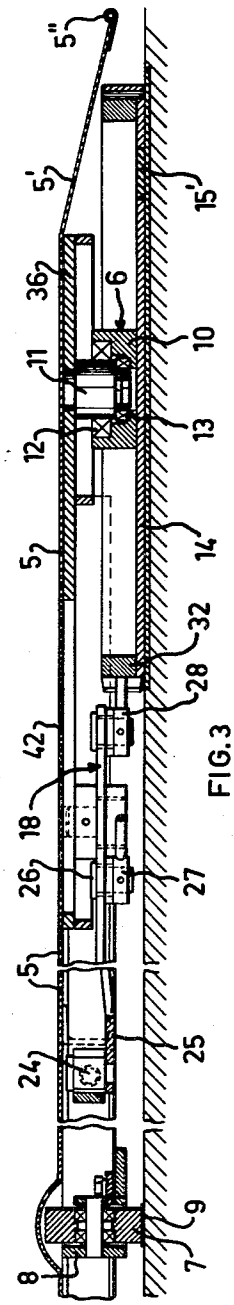


FIG.3

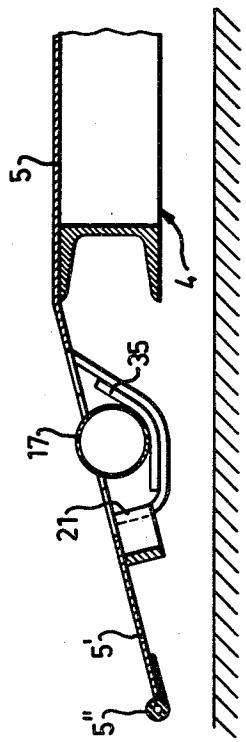


FIG.5

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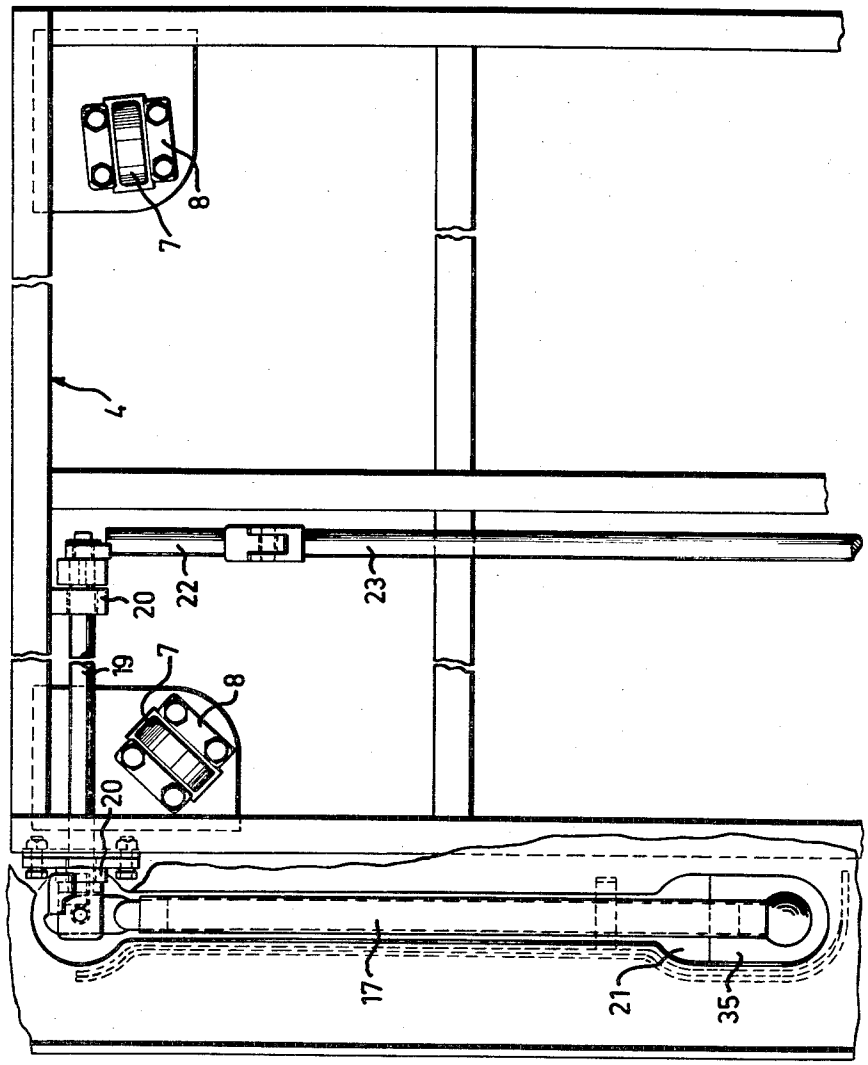
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GARAGING MEANS

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FIG. 4A



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GARAGING MEANS

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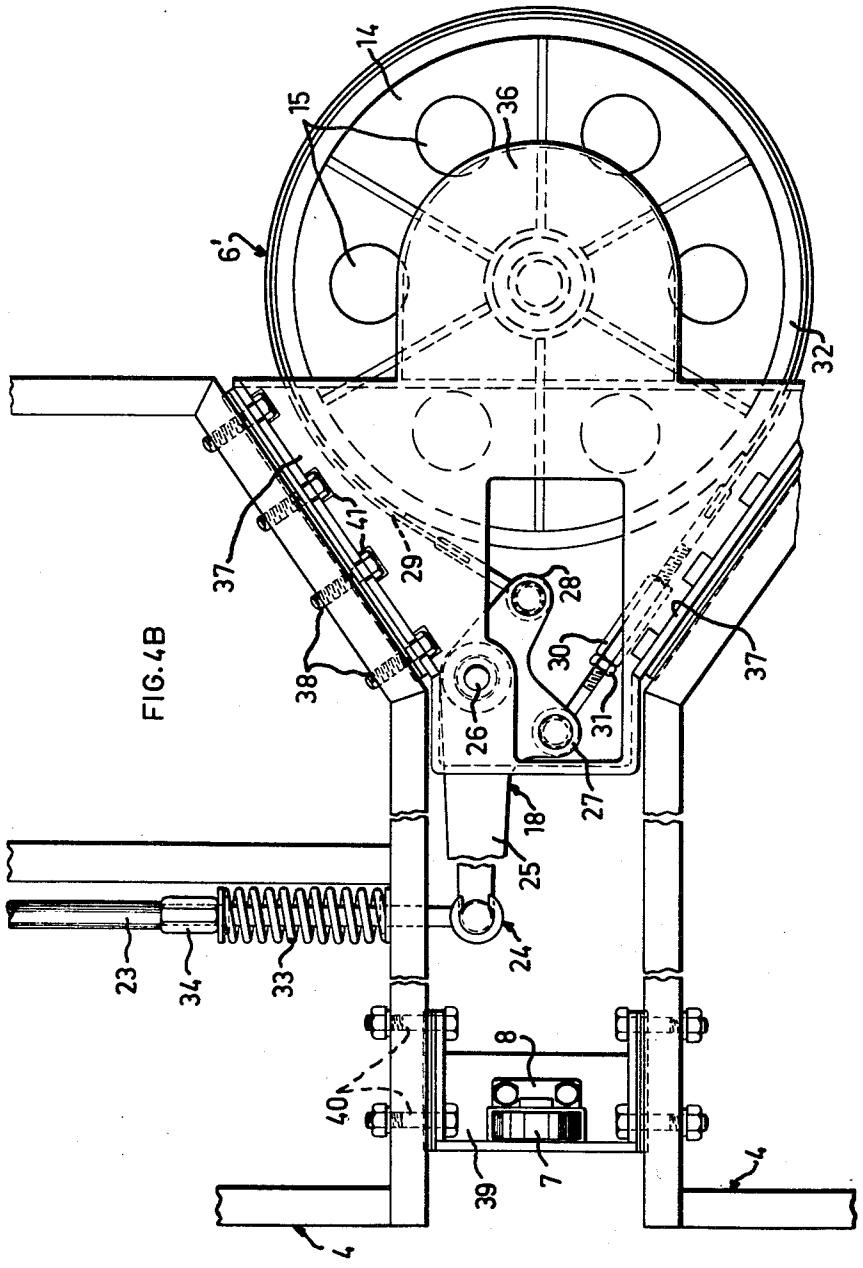


FIG. 4B

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United States Patent Office 3,191,782 Patented June 29, 1965

3,191,782

GARAGING MEANS

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Filed Apr. 18, 1962, Ser. No. 188,358
6 Claims. (Cl. 214—16.1)

This invention relates to garaging means for vehicles comprising a number of parking stalls disposed either in two rows each on one side of a driving aisle of sufficient width to permit the vehicles to make a quarter of a turn when moving into or out of said parking stalls, or in one row on one side of such aisle for parking the vehicles transversely of the respective row, and a plurality of parking platforms placed along said aisle and adapted each to carry at least one vehicle.

A very common type of garage, for instance in basements or underground, includes two rows of parking stalls disposed in the manner indicated above on either side of a driving aisle. This aisle must be of a width sufficient to permit the vehicle to make a 90° turn when moving into or out of the parking stalls. The total area of the driving aisles in a garage therefore constitutes an important part of the floor surface of the garage, and if no special arrangements are taken this important floor surface part will remain unexploited as a parking area.

However, various ways of exploiting the driving aisles for parking vehicles or of reducing the width of said aisles are previously known. To permit a reduction of the width of the driving aisles it has been suggested for instance to employ mechanically driven conveying means to move the vehicles into and out of the parking stalls. Among the drawbacks of garages designed according to this principle there may be mentioned first of all the high building and operating costs and the risk of a greater or smaller portion of the garage being blocked by failure of any of the conveying means. Another solution which is of greater importance as it permits, like the invention, an increase of the useful parking area while retaining the possibility of moving the vehicles into and out of the parking stalls, provides along the driving aisle a plurality of wheeled parking platforms, i.e. carriages, driven e.g. by electric motors on tracks along said aisle, and these parking platforms can be moved apart to leave a gap between any two of said platforms for allowing a vehicle to move into or out of the parking stall. By this arrangement an essential part of the total area of the driving aisle can thus be exploited for parking purposes. However, this garaging means which is excellent in many respects increases the building costs and also the maintenance and operating costs of the garage because of the extensive installation equipment and mechanical means required. Furthermore, the platform carriages movable along the driving aisles involve risks of damages to persons and materials, and upon mechanical or electric failure all or part of the parking stalls may be blocked. Moreover, at least some of the vehicle owners making use of the garage have to apply for help in parking their cars because of their lack of mechanical skill or because they become frightened when, upon depression of a push button, a number of parking platforms suddenly begin to move hither and thither in the garage. In large garages naturally attendants can be employed to help the vehicle owners to park their vehicles but in garages of average and smaller sizes such a procedure will be too expensive.

The invention has for its object to increase the useful parking area in a garage while satisfying the wish for convenient manoeuvering of the vehicles and eliminating the above drawbacks. This is made possible by the

present invention which is primarily characterised in that the parking platforms are mounted for pivotment but otherwise stationarily disposed on a base at predetermined points along one or the other side of the driving aisle.

Each parking platform is preferably carried on said base for pivotment thereon by a bearing mechanism and is peripherally supported by rollers mounted at the underside of said platform in direct rolling application against said base or one or more rails which are secured to the base and extend concentrically with the centre of pivotment of the platform.

The parking platforms suggested according to the present invention are easily installed at a relatively low cost in the driving aisles of garages to serve as parking areas, thereby increasing the capacity of the garage. They require but little space and are flexibly adaptable to various garage types. They can also be installed without disadvantage in garages already in use, and the driving aisles need not be straight. Furtthermore, these parking platforms are easily operated and necessitate practically no maintenance. In garages designed according to the present invention the vehicles on the parking platforms can readily be set in suitable angular positions in the garage by pivoting the platforms so that other vehicles can move unimpededly into and out of the parking stalls. Empty parking platforms may even be employed to facilitate manoeuvring vehicles which are to be moved into or out of the parking stalls, which may be advantageous particularly when the garages are narrow, although the principal task of the platforms naturally is to serve as a parking area and not as a manoeuvering means for the vehicles.

These and further features of the invention and the advantages thereof will now be described more fully in the following with reference to the accompanying drawings, in which:

FIG. 1 is a plan view of a garage equipped with pivotally arranged parking platforms according to the invention;

FIG. 2 is a plan view on a larger scale of a parking platform;

FIG. 3 is a cross sectional view taken on line III—III in FIG. 2 and showing the bearing mechanism and the braking device of the platform and a roller with its bearing;

FIGS. 4*a* and 4*b* are an assembly plan view of the operating mechanism and braking device of the platform, the panels thereof being removed;

FIG. 5 is a fragmentary plan view showing the operating lever of the platform in a position lowered into a countersink along one long side of the platform.

In the embodiment illustrated the garaging means is built into a conventional type garage comprising two rows of parking stalls 1 which are separated by a driving aisle 2 of sufficient width to permit the vehicles to make a quarter of a turn when they move into or out of said parking stalls. Arranged in succession along the driving aisle 2 is a plurality of pivotally mounted but otherwise stationary platforms 3 which are adapted to serve as parking areas for vehicles and are so placed that they can be pivoted, with the vehicles parked thereon and without being hindered by the vehicles in the parking stalls, into such angular positions that vehicles can move past the respective platform or have sufficient manoeuvring room for moving into or out of the parking stalls or that a vehicle can be moved onto or off a platform used as a parking area for that vehicle. The size and shape of the parking platforms and the location of their centres of pivotment can be adapted to the width of the parking stalls, the width of the driving aisle and the

size of the vehicles which the platforms are to accommodate. With the illustrated rectangular type of platforms each platform (the size of which is calculated for a passenger car) has its centre of pivotment disposed at one long side of the platform intermediate the short sides thereof. The platforms can be installed in such a way that their centres of pivotment will be placed in zigzag somewhat offset relative to each other on either side of a line extending along the centre line of the driving aisle but preferably somewhat closer to one row of parking stalls than to the other. When the parking stalls are of standard width it is suitable to place the parking platforms in the manner illustrated so that each platform has its centre of pivotment situated on an imaginary line drawn across the driving aisle from a point midway between two pairs of opposed parking stalls. Associated with each group of four parking stalls is a pivotal parking platform. With the arrangement illustrated this implies an increase of the useful parking area by 25% but it is readily seen that the increase may even amount to 50% when parking platforms are arranged at driving aisle crossings, on other unexploited surfaces or in the driving aisles flanked on one side by a row of parking stalls and on the other side for instance by a wall.

In the embodiment illustrated each platform **3** is of rectangular shape and comprises two frame sections **4** covered with sheet metal panels **5** forming the upper side of the platform **3**. At one side midway between the ends the platform is pivotally supported by a bearing mechanism anchored to the base and generally designated **6**. This mechanism will be more fully described in the following. Except by this bearing mechanism, the platform **3** is supported by a number of rollers **7** which are mounted by means of ball bearings in holders **8** at the underside of the frame sections **4**. The rollers **7** are spaced apart along two concentric arcs of circle, the common centre of which is the centre of pivotment of the platform **3**. The rollers can roll either directly on the base or on rails fixedly connected to the base. Said rails can be constituted by circular or arcuate flat tracks of sheet metal which e.g. are bonded to the base by means of epoxy resin adhesive. In the embodiment illustrated in which the base is a concrete floor the rails consist, however, of two concentric circular tracks **9** of epoxy resin adhesive mixed with sand as a filler. These roller tracks **9** are preferably made in such a way that two concentric annular surfaces on the concrete floor are prepared by grinding and impregnated with dilute epoxy resin adhesive whereupon a top layer of epoxy resin adhesive mixed with sand is applied to the treated surfaces. After hardening, these layers constitute extremely wear-resistant tracks which are fixedly united with the concrete floor and have a great carrying ability.

The bearing mechanism **6** (FIG. 3) includes a bearing housing **10** anchored to the base, and a depending pivot **11** connected to the platform **3**. Said pivot **11** is stepped and mounted in the housing **10** by means of a radial ball bearing **12** at its middle portion and a thrust bearing **13** at its reduced end portion.

The bearing housing **10** may be fixedly connected to the base in any suitable manner whatever. FIG. 3 shows, however, an arrangement which is of particular advantage when parking platforms **3** are to be installed on existing concrete floors in garages or like premises which already can have been taken into use The bearing housing **10** is welded to a bottom plate **14** bonded to the concrete floor by means of epoxy resin adhesive. The fixation of the bottom plate **14** is carried out as follows. An area of the concrete floor corresponding to said bottom plate is prepared by grinding and impregnated with dilute epoxy resin adhesive whereupon a layer of thick epoxy resin adhesive is applied to the treated surface. In the embodiment illustrated the bottom plate **14** is made of sheet steel and the underside thereof has previously been treated and coated with adhesive of the same kind, said adhesive serving as a rust-proofing agent during storage and transport of said plate. The bottom plate **14** is pressed down onto the prepared thick layer of epoxy resin adhesive which as a result is pressed up around the periphery of the plate and also penetrates in an upward direction through holes **15** in said plate, in which holes the glue after hardening forms strong pins **15'** which are fixedly united with the concrete floor and increase the strength of the bond against shearing stresses.

To facilitate moving a vehicle onto and off the parking platform **3** and to eliminate the risk of damages to persons the outer margin **5'** of the platform is downwardly inclined and is preferably provided with a rubber bead **5''**. The platform **3** can be formed in its upper side with suitable guide grooves in the form of countersinks inside its marginal portions. In addition to orienting the wheels of the vehicle when it moves onto and off the platform these countersinks can serve to retain the parked vehicle so that it cannot unintentionally be made to slide or roll off the platform.

In the embodiment shown in FIG. 2 the platform **3**, however, has a substantially plane upper side and is equipped with blocks **16** which are arranged in pairs at one end portion of the platform **3** in such positions as to form stops on either side of the rear wheels of a vehicle driven onto the platform. The blocks **16** are shiftable to permit setting according to the size and location of the vehicle.

The parking platforms **3** are normally placed with their longitudinal axes in parallel with the driving aisle to leave the largest possible width thereof free to allow vehicles to pass on their way to or from the parking stalls. It is true that in this position the platforms block the parking stalls but any one of them can be rapidly released for permitting entrance or exit of a vehicle by a suitable setting of one or at most two of the pivotal platforms. FIG. 1 shows a number of possible angular positions for the platforms **3** with the vehicles parked thereon, and arrows show what possibilities there are to manoeuvre the vehicles for moving them into or out of the parking stalls.

The parking platforms according to the present invention can be equipped if desired with small electric motors which may be placed beneath the respective platforms to actuate these via a suitable gearing, or they may be equipped with a suitable lever or transmission for manual operation. In a simple and practical design the platforms can be manually pivoted by means of a hand lever **17** which may be connected with a latch to permit releasable locking of the platforms in predetermined angular positions. In the embodiment illustrated, however, said hand lever **17** is connected to a braking device **18** which is adapted to lock the platform **3** in any angular position whatever. The lever **17** is placed at one of the two platform corners remote from the centre of pivotment of the platform and is constituted by a bar which is swingably mounted to the platform **3** in that it has one end connected to one end of a horizontal shaft **19** placed at right angles to the bar and extending in under the platform through a hole in one frame section **4** of the platform **3**. Said shaft **19** is rotatably and axially displaceably mounted in a pair of sleeves **20** which are secured to the underside of the platform and which embrace the shaft **19** at the two ends thereof. In inoperative position the hand lever **17** is lowered into a groove **21** in one marginal portion of the platform **3** so as to allow opening a door in the vehicle parked on the platform. From this position the lever **17** can be raised into a vertical or almost vertical position to serve as a handle for pivoting the platform.

The shaft **19** rotatable by means of lever **17** has the outer end connected to the outer arm **22** of a linkage which has an inner arm **23** connected to a lever **25** by means of a fork-shaped joint **24**. The lever **25** is pivoted to the underside of the platform **3** by means of a pin **26**, and the inner end thereof is formed as a double bellcrank lever having two projections **27** and **28** which are hinged-

ly connected each with one end to a brake belt 29 which is adjustable e.g. by means of a stretching screw 30 and lock nut 31 connecting one of the projections 27, 28 to the brake belt 29. The brake belt 29 passes about a brake drum 32 which is constituted by an annular flange secured to the bottom plate 14. In the lowered position of the hand lever 17 the lever 25 is held in a braking position, in which the brake belt 29 is tightened about the brake drum 32, by a coil spring 33 embracing the inner link arm 23 of the linkage and clamped between an adjustable nut 34 on said link arm and one frame section 4 of the platform 3. When the operating lever 17 is swung upwards the spring 33 is compressed and lever 25 is swung in such a direction that the brake belt 29 of the braking device 18 is slackened. When the operating lever 17 is again released it is automatically lowered by the spring 33 and simultaneously the brake belt 29 is engaged with the brake drum 32.

As already mentioned, the brake belt 29 is adjustable by means of the stretching screw 30, and the spring tension can be set by means of the nut 34. Provided in the groove 21 is a rubber buffer 35 which serves to dampen the shock of the hand lever 17 when this is returned to its horizontal position by the action of spring 33. When the platform is swung by means of the operating lever 17 and approaches the desired angular position, the lever 17 is released, whereby the lever 25 of braking device 18 is immediately swung to braking position by spring 33 so that the platform 3 is rapidly, nearly without lost motion but still gently, locked by means of the brake belt 29.

To facilitate transporting the platforms 3 to their location each platform is divided into three main parts which are finally assembled and covered with the sheet metal panels 5 at the installation. Two of these main parts are formed by the two frame sections 4 with rollers 7 mounted thereon; one of the frame sections also has the operating lever 17, the shaft 19 and the linkage with the link arms 22 and 23 already mounted thereon. The third main part is the bearing mechanism 6 including the bearing housing 10 and the bearings 12 and 13 as well as the pivot pin 11, the bottom plate 14 and the braking device 18 with the lever 25. These parts are all assembled to a unit 6' and the interconnecting parts of said unit are constituted by the bottom plate 14, a top plate 36 to which the pivot pin 11 is welded, and connecting elements 37 which connect the bottom plate and the top plate 36 together and serve as fastenings for the frame sections 4. This unit 6' is first mounted in position by bonding the bottom plate 14 to the base, as described in the foregoing. Then the frame sections 4 are connected to the unit 6' by pins or screw bolts 38 (which are secured to the sections 4 in suitable positions) being engaged in slots provided in the connecting elements 37, the inner link arm 23 of the linkage and the lever 25 of the braking device 18 being simultaneously engaged with each other at the corresponding ends which together form the fork-shaped joint 24. The frame sections 4 can be interconnected by connecting elements 39 and bolts 40 and can be locked to the connecting elements 37 by nuts 41, but it is sufficient to use as interconnecting parts the sheet metal panels 5 which after the mounting of the frame sections 4 are arranged as a covering or deck on said sections and on the unit 6'. Suitable fastening means, e.g. screws, are used for securing said sheet metal panels. A suitable large part of the sheet metal panel 5 above the bearing mechanism 6 is in the form of a removable lid designated 42 in FIG. 2. This lid 42 gives access to the braking device 18 for inspection and adjustment.

As already mentioned, the pivot pin 11 is mounted in the bearings of the bearing housing 10 before the unit 6' is mounted on the base. Said pivot pin is exactly perpendicular to the bottom plate 14 whereby the platform 3, also when installed on an inclined base, always occupies a coplanar position relative to the base. To safeguard that after installation the platform 3 does not get in touch with the base when it is swung, it is only necessary to see that the base is plane in the area inside the circle of pivotment described by the corners of the platform 3.

FIG. 3 shows how one of the rollers 7 of the platform 3 is mounted. These rollers are preferably made fom nylon and are of conical shape, their axes coinciding with radii from the centre of pivotment of the platform 3. The conical rollers have their ends of largest diameter facing outwards. This arrangement greatly eliminates the friction between the rollers and the base, in this instance the tracks 9.

As shown in FIG. 1 the centres of pivotment of the parking platforms are placed in zigzag relative to each other along the driving aisle. This location is of particular advantage as it makes it possible to set two adjoining platforms into favourable relative positions to give the vehicles the largest possible space to manoeuvre in. In certain cases, however, it may be more suitable to place the platforms with their centres of pivotment in a row one after the other along or in parallel with the centre line of the driving aisle. Such a location is preferred in narrow driving aisles and/or when it is desired to place all platforms as close as possible to one row of parking stalls (or e.g. a wall). Another possible modification is to place the centres of pivotment of the platforms in other positions relative to the platforms proper. When a platform is disposed close to a wall or a corner it may be suitable to arrange the centre of pivotment of the platform at one end or one corner of the platform. Also the rails or tracks 9 for the rollers 7 of the platform 3 can of course be modified in several ways. It is conceivable for instance to use but one rail, in which case the rollers are placed at mutually like distances from the centre of pivotment of the platform. Furthermore, the rails can be countersunk in the plane of the base or be disposed entirely on top of said base.

It is finally observed that the platforms which in the embodiment illustrated are rectangular and intended to carry but one parked vehicle, can be of another shape e.g. circular and arranged to carry more than one vehicle. Platforms of circular shape are preferably arranged with their upper sides at a level with the base, in which case the marginal portions of the platforms need not be bent downwardly.

What I claim and desire to secure by Letters Patent is:

1. In a garage for vehicles having a floor forming at least one row of parking spaces for parking vehicles transversely of said row, an aisleway running along said row and permitting vehicles to be driven to and from said parking spaces, a driveway on one side of said aisleway, a row of spaced parking platforms in said aisleway between the driveway and the row of parking spaces, each platform being adapted to support at least one vehicle parked thereon, and means pivotally mounting each of said platforms on said floor for movement around a substantially vertical axis disposed eccentrically in relation to the platform adjacent one side thereof, so that when the parking platforms are oriented substantially longitudinally of the aisleway, passage of vehicles between the driveway and the parking spaces is prevented, and when a pivoted platform extends substantially transversely of the aisleway, passage of vehicles between the adjacent parking space and driveway is permitted, passage of vehicles is also permitted between the driveway and another adjacent parking space when the same platform is pivoted 180°.

2. In a garage for vehicles having a floor forming at least one row of parking spaces for parking vehicles transversely of said row, an aisleway running along said row and permitting vehicles to be driven to and from said parking spaces, a driveway on one side of said aisleway, a row of spaced parking platforms in said aisleway between the driveway and the row of parking spaces, each platform being generally of rectangular shape and adapted

to support at least one vehicle parked thereon, and means pivotally mounting each of said platforms on said floor for movement around a substantially vertical axis eccentrically in relation to the platform adjacent one of its long sides midway between its ends, so that when the parking platforms are oriented substantially longitudinally of the aisleway, passage of vehicles between the driveway and the parking spaces is prevented, and when a pivoted platform extends substantially transversely of the aisleway, passage of vehicles between the adjacent parking space and driveway is permitted, passage of vehicles is also permitted between the driveway and another adjacent parking space when the same platform is pivoted 180°.

3. In a garage for vehicles having a floor forming at least one row of parking spaces for parking vehicles transversely of said row, an aisleway running along said row and permitting vehicles to be driven to and from said parking spaces, a driveway on one side of said aisleway, a row of spaced parking platforms in said aisleway between the driveway and the row of parking spaces, each platform being generally of rectangular shape and adapted to support at least one vehicle parked thereon, and means including rollers mounted at the underneath side of each platform and bearing mechanism pivotally mounting each of said platforms on said floor for movement around a substantially vertical axis disposed eccentrically in relation to the platform adjacent one side thereof, so that when the parking platforms are oriented substantially longitudinally of the aisleway, passage of vehicles between the driveway and the parking spaces is prevented, and when a pivoted platform extends substantially transversely of the aisleway, passage of vehicles between the adjacent parking space and driveway is permitted, passage of vehicles is also permitted between the driveway and another adjacent parking space when the same platform is pivoted 180°.

4. In a garage for vehicles having a floor forming at least one row of parking spaces for parking vehicles transversely of said row, an aisleway running along said row and permitting vehicles to be driven to and from said parking spaces, a driveway on one side of said aisleway, a row of spaced parking platforms in said aisleway between the driveway and the row of parking spaces, each platform being generally of rectangular shape and adapted to support at least one vehicle parked thereon, and means pivotally mounting each of said platforms on said floor for movement around a substantially vertical axis eccentrically in relation to the platform adjacent one of its long sides midway between its ends, so that when the parking platforms are oriented substantially longitudinally of the aisleway, passage of vehicles between the driveway and the parking spaces is prevented, and when a pivoted platform extends substantially transversely of the aisleway, passage of vehicles between the adjacent parking space and driveway is permitted, passage of vehicles is also permitted between the driveway and another adjacent parking space when the same platform is pivoted 180°, operating means for moving each of said platforms selectively to any of said angular positions around said axis, and a braking and latching device cooperating with said operating means and said means pivotally mounting each of said platforms for releasably locking the platform in said desired position.

5. In a garage for vehicles having a floor forming at least one row of parking spaces for parking vehicles transversely of said row, an aisleway running along said row and permitting vehicles to be driven to and from said parking spaces, a driveway on one side of said aisleway, a row of spaced parking platforms in said aisleway between the driveway and the row of parking spaces, each platform being generally of rectangular shape and adapted to support at least one vehicle parked thereon, and means pivotally mounting each of said platforms on said floor for movement around a substantially vertical axis eccentrically in relation to the platform adjacent one of its long sides midway between its ends, so that when the parking platforms are oriented substantially longitudinally of the aisleway, passage of vehicles between the driveway and the parking spaces is prevented, and when a pivoted platform extends substantially transversely of the aisleway, passage of vehicles between the adjacent parking space and driveway is permitted, passage of vehicles is also permitted between the driveway and another adjacent parking space when the same platform is pivoted 180°, operating means including a lever for moving each of said platforms to any of said angular positions around said axis, said operating lever in inoperative position being lowered into a countersink in the platform and being connected to a spring-biased linkage which in said position is adapted to hold in engagement a braking and latching device cooperating with said means pivotally mounting each of said platforms and to automatically release said device when the operating lever is raised into operating position.

6. In a garage for vehicles having a floor forming at least one row of parking spaces for parking vehicles transversely of said row, an aisleway running along said row and permitting vehicles to be driven to and from said parking spaces, a driveway on one side of said aisleway, a row of spaced parking platforms in said aisleway between the driveway and the row of parking spaces, each platform being generally of rectangular shape and adapted to support at least one vehicle parked thereon, and means including conical rollers mounted at the underneath side of each platform, tracks in the floor concentrically with said axis, said rollers being adapted to cooperate with said tracks for substantially frictionless rolling engagement with the floor, and a bearing mechanism pivotally mounting each of said platforms on said floor for movement around a substantially vertical axis disposed eccentrically in relation to the platform adjacent one side thereof, so that when the parking platforms are oriented substantially longitudinally of the aisleway, passage of vehicles between the driveway and the parking spaces is prevented, and when a pivoted platform extends substantially transversely of the aisleway, passage of vehicles between the adjacent parking space and driveway is permitted, passage of vehicles is also permitted between the driveway and another adjacent parking space when the same platform is pivoted 180°.

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