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(54) **CAR PARK WITH A VERTICAL DEVELOPMENT ON SEVERAL LEVELS**

SICH VERTIKAL ÜBER MEHRERE STOCKWERKE ERSTRECKENDE  
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**Description**

## FIELD OF THE INVENTION

**[0001]** The present invention concerns a car park, intended as a space, open or closed, where a plurality of vehicles are able to park, for a short or long time, advantageously but not restrictively of the multi-story type intended for public or private use, preferably of the type without prior allocation of parking places to the users, nor mechanical systems for positioning the cars.

**[0002]** In particular, the present invention concerns a temporary-stay car park able to serve residential estates, urban areas, districts or service centers such as airports, stations, hospitals, green areas, hotels or other where no fixed allocation of places is provided, given the entity and nature of the foreseeable streams of vehicles.

## BACKGROUND OF THE INVENTION

**[0003]** Known car parks on several levels, or multi-story, are mainly of the type with a plane-type distribution of the vehicles, that is, on horizontal planes with comb-type parking, orthogonal to the route, or in some cases in a herringbone pattern, with stalls or parking places disposed obliquely with respect to the direction of travel, in order to improve accessibility. Access to such car parks generally occurs with inclined or helical ramps by means of which drivers progressively access the different levels of the car park, or garage, looking for the first place available.

**[0004]** DE 25 41 834 A1, DE 14 34720 A1, FR 2.211.963 A, GB 2.347.942 A and FR 2.850.417 A disclose examples of car parks of the prior art.

**[0005]** In particular, document DE1434720 discloses, in terms of claim 1, a car park with a vertical development on several levels, comprising a compartment in which at least an access lane is provided, an exit lane distinct from said access lane, and a plurality of parking places, whereby said two lanes are separate to each other, one-way, and have a helical development at least partly with an inclined plane, and a helical parking segment is provided, in an adjacent position to which said parking places are made in sequence and disposed for parking in an herringbone pattern and co-planar to the parking segment, said parking places are disposed on each level on both sides of the parking segment oriented in the practicable direction of travel of said access lane.

**[0006]** A known problem of these car parks is the difficulty of finding a free place in the busiest times of use of the car park, that is, when it is working at full capacity. The most evolved car parks, with a certain degree of automated management, have signaling systems that indicate to the user the availability of free places and possibly also the levels where said places are available. In this case too, however, it is necessary to search for the place, driving along the lanes of the stories of the car park in order to identify the free place. The classic struc-

ture requires pillars situated at the sides of the stalls, which are an impediment to the parking maneuvers, condition the disposition of the parking and also entail a visual difficulty for identifying the car parked at the side, and also for the vehicles arriving when the car is leaving the stall.

**[0007]** This type of classical car park can function well enough in the case of fixed places assigned with a season ticket, or when it is owned. On the contrary, in the case of public car parks with an hourly rotation, the problem of looking for the free place, even if assisted by a partly automated management, often entails long times for searching along the lanes, but above all it does not prevent the user who has entered the car park later from finding the free place before a user who is already inside the car park.

**[0008]** One consequence of the problem described is the frequent occurrence, in these circumstances, of incorrect behavior by the user who, in order to occupy a place that has suddenly become free, is induced to drive along the lane in the wrong direction, or in reverse, or at a speed higher than safe.

**[0009]** Apart from creating potentially dangerous situations, not respecting criteria of fairness may generate in the users reactions of annoyance and estrangement. In brief, the classical structures of plane-type multi-story car parks described in the literature of this field, technical texts and design manuals, include problems of improper driving, considerable time required to look for a free place, difficulties in identifying and memorizing the place where the vehicle has been left, constructional and structural constraints, and the impossibility of guaranteeing priorities with respect to the order users have entered the structure.

**[0010]** A first purpose of the present invention is to achieve a car park in which respect for the order of entrance is guaranteed in assigning, or in easily identifying, a free place or stall.

**[0011]** Another purpose is to prevent, by making them practically impossible, the most common types of incorrect behavior that occur inside conventional public multi-story car parks, or accessible to the public.

**[0012]** Another purpose is to reduce not only the time spent searching for a free place, but also the time spent to reach the exit, preventing the formation of long queues for payment at exit, even at peak hours.

**[0013]** Another purpose is to facilitate the identification of the free place during the search for it, and also a rapid finding of one's vehicle when one has to collect it.

**[0014]** Another purpose is to optimize the ratio between the surface occupied and the number of parking places, achieving structures that are simple in construction, of limited cost and adaptable substantially to every urban context.

**[0015]** The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

## SUMMARY OF THE INVENTION

**[0016]** The present invention is set forth and characterized in the independent claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

**[0017]** According to the present invention, the car park comprises the features of claim 1, such as a compartment with access lanes having a helical structure at least partly with an inclined plane comprising two routes, or lanes, one entrance and one exit, one-way, where the helical lane for access to the different levels can also be suitable to be the distribution center for the parking places. The entrance lane and the exit lane are separate from each other, and are one-way, so that they are practicable only in the respective direction, in one case directed to look for the first free place available and, in the other case, in order to exit the car park.

**[0018]** According to a characteristic of the present invention, the entrance lane, helical in shape with an inclined plane, advantageously with a circular, oval or composite design, serves the parking of the cars on at least one side, advantageously on both, with the disposition of the parking places in sequence and in a herringbone pattern, directly adjacent to at least one segment of the entrance lane, directed in the direction said lane is practicable, so as to facilitate the entrance and exit maneuvers into/from the stall. The parking places are disposed on the sides of at least a segment of said entrance lane at the various heights of the structure, which can be either of the underground type or above ground. The levels are served by stairs, for the safety exits, and elevator, to overcome the architectural barriers.

**[0019]** According to another characteristic of the present invention, the exit lane from the structure is internal with respect to the entrance lane.

**[0020]** According to the invention, the center for distributing places lies on one or more substantially horizontal planes. According to this variant, different groups of stalls are grouped together and each lies on a common substantially horizontal plane, and the entrance lane comprises at least a helical inclined practicable segment which allows the user to pass between different planes or levels, and a substantially horizontal helical parking segment, in an adjacent position to which the stalls are made, in sequence.

**[0021]** According to another variant, each stall lies on a relative substantially horizontal plane, at the side of the respective segment of the access lane.

**[0022]** According to a variant, the exit lane is accessible only from the end plane of the structure, the highest or lowest.

**[0023]** In an advantageous preferential embodiment, the entrance lane and the exit lane are connected on every level by means of at least an access made by giving over the space of a few parking places to the connection lane between the two lanes, entrance and exit.

**[0024]** According to the invention, the entrance lane

and the exit lane are both housed internally with respect to the center for distributing the parking places.

**[0025]** In another preferential solution, apart from providing the possibility of exiting from the structure at each level, the exit lane has bars or other means for stopping vehicles, and relative devices for making payment, in correspondence with each connection lane between entrance lane and exit lane.

**[0026]** One advantage of this last preferential solution is that it avoids queues for making payment, concentrated in a single exit lane, and the fluidity of parking and exit from the structure is facilitated.

**[0027]** One advantage of the present invention is that parking takes place in an orderly and quick manner, since the user will certainly occupy the first stall nearest the entrance and in any case in the order in which the stalls already occupied become free, until the car park is totally full, since the stalls are disposed in order and only along the same access path to the various levels.

**[0028]** Another advantage is given by the fact that the helical/circular structure of the space ensures a very wide and open field of vision, which allows the user to identify his car immediately when he takes it from the stall, and to easily identify the vertical exit routes after parking.

**[0029]** Larger size variants of the structure may be provided, for the purposes of collective use, where it is necessary to facilitate the rapid movement of large numbers of vehicles. Smaller size variants of the structure equally and advantageously satisfy requirements of a mainly private use, which occur for example in condominium areas.

**[0030]** According to the present invention the system of construction may be made in a traditional type structure using beams and pillars and floors made of reinforced concrete and pre-stressed reinforced concrete, or with pre-fabricated components, both normal or pre-stressed reinforced concrete, and also iron (steel or other building materials).

**[0031]** One advantage of the present invention is also that in any case it provides gaps and sizes such that it does not require pillars interposed between the different stalls which, in classical plane-type car parks, cause the disadvantages and difficulties in parking we described above, and also a reduction in the space available and the visibility. In other words, we obtain an optimization of the ratio between the surface occupied and the number of parking places and a rationalization of the use of the parking space.

**[0032]** Another advantage from the architectural point of view, in the case of embodiments above ground, is that it is possible to study the covering, harmonizing it with the characteristics of the place and the urban context.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0033]** These and other characteristics of the present invention will become apparent from the following description of some preferential forms of embodiment, giv-

en as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a three-dimensional schematic view of a multi-story car park that is not part of the present invention;
- fig. 2 is a plane view of the entrance level of the car park in fig. 1, at road level;
- fig. 3 is a lateral schematic view of the car park in fig. 1;
- fig. 4 is a lateral schematic view of an embodiment of the car park according to the present invention;
- fig. 5 is a plane view of the entrance level of the car park in fig. 4, at road level;
- fig. 6 is a plane view of an upper/lower level with respect to the level of fig. 5;
- fig. 7 is a lateral schematic view of an embodiment of the car park that is not part of the present invention.

#### DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

**[0034]** With reference to figs. 1, 2 and 3, a car park 10 not according to the present invention consists of a helical structure, shown schematically in fig. 1, which develops in different floor levels above or below ground. Fig. 2 reproduces in plane the entrance level (road level) of said car park 10, while fig. 3 shows schematically the levels provided with the relative access and exit lanes.

**[0035]** Each level is equipped with parking places 11 for cars 25, at least an access route or lane 12 (line of dashes), with one-way traffic, and at least an exit route or lane 13 (dotted line), with one-way traffic. Moreover, on each level there are pedestrian footpaths 14, vertical passages 15 able to house stairs, elevators and/or emergency exits, and also connection lanes 16 between the access lane 12 and exit lane 13.

**[0036]** In the form of embodiment shown in figs. 1, 2 and 3, the parking places 11 are disposed on the two sides of the access lane 12 with an inclined orientation, with respect to the radial direction of the structure, in the practicable direction of travel of said entrance lane, so as to facilitate the parking maneuvers of the cars 25 arriving.

**[0037]** In this case, each floor level is sloping with an inclination of the ground which is at its maximum around a central bearing structure 17, and at its minimum along the external perimeter of the structure. Consequently, according to the invention, the access lane 12 and the exit lane 13 have different slopes of the respective maneuvering floors. To give a non-restrictive example, for a structure of 4500 cm in external diameter and a usable width of the helical plane of 1975 cm, the slope in axis of the access lane 12 can vary from 2.8% to 3.2%; the slope of the exit lane 13, measured on the external edge of the radius curve as 700 cm, can vary from 6.2% to 7.0%.

**[0038]** In fig. 2, the vertical passages 15, able to house

stairs, elevators and/or emergency exits, are located externally with respect to the helical structure of the car park 10.

**[0039]** According to a variant, the vertical passages 15 are located internally instead of externally to the structure. This solution can be practiced conveniently where required by particular limits or constructional requirements; for example to serve the underground stories for which, in this way, it is not necessary to excavate further shafts for the natural ventilation of underground structures, apart from that necessary for the central base structure.

**[0040]** Fig. 2 shows, with lines of dashes, to give an example, a possible location of said vertical passages 115, able to house stairs, elevators and/or emergency exits, according to the variant suggested.

**[0041]** In the form of embodiment described here, in proximity to the transverse connection lanes 16 between the access lane 12 and the exit lane 13, means for stopping the car 25 and payment means 18, automatically controlled or other type, are located. The transverse connection lanes 16 and said means for stopping the cars 25 guarantee a quicker outflow from the structure, distributing to the various levels the procedures for releasing the cars 25 and leaving to the exit lane 13 only the function of fast exit lane to the outside.

**[0042]** In the form of embodiment described here, the limits of the access lane 12, the transverse connection lanes 16, the pedestrian footpaths 14 and the parking places 11 are advantageously identified, in the only helical plane of the structure, by means of horizontal road signs marked out on the floor or also luminous.

**[0043]** The limits of the exit lane 13, instead, are identified internally by said central structure 17, and externally by a lateral barrier 19 (such as a balustrade, wall or guardrail), or consisting of a bearing structure, of a height sufficient to physically separate the access lane 12 from the rapid exit lane 13 but without creating an obstacle to the overall visibility in the helical space of the structure.

**[0044]** The lateral barrier 19 has suitable interruptions in correspondence with the transverse connection lanes 16, to allow the cars 25 to exit from the floor levels and to prevent them, in any case, from returning to the entrance and parking zone once they have entered into the exit routes.

**[0045]** The lateral barrier 19 can also become a structural support element for flooring, in order to reduce the gap between the floors to the width of the access lane 12 and the parking places 11.

**[0046]** It is clear that, with reference to fig. 1, the upper or lower levels with respect to the entrance level do not have access from the road level 20, nor exit to the road level 21.

**[0047]** According to figs. 4, 5 and 6, the car park 110 according to the present invention comprises, for each level, a plurality of parking places 11 disposed on the same substantially horizontal plane.

**[0048]** In this case, the access lane 112 and the exit

lane 113 are disposed internally with respect to the substantially horizontal zone of each level, on which the parking places 11 are made.

**[0049]** In particular, the access lane 112 in figs. 4, 5 and 6 comprises a practicable segment 118, helical with an inclined plane, which allows access to the various levels, and for each level, a horizontal helical parking segment 114, at the sides of which the parking places 11 are made, in sequence and in a herringbone pattern.

**[0050]** The parking segment 114 is disposed co-planar to the parking places 11 and is connected, both at entrance and at exit, with relative practicable segments 118 of the access lane 112, by means of relative connection lanes 116.

**[0051]** According to the form of embodiment shown in fig. 7, not part of the present invention, a car park 210 is shown schematically, and is the result of the combination of the car park 10 shown in figs. 1, 2 and 3, and the car park 110 shown in figs. 4 and 5. In this embodiment, two access lanes 12, 112 are provided, and a common exit lane 13.

**[0052]** It is clear that modifications and/or additions of parts may be made to the structure 10 as described heretofore, without departing from the scope of the present invention, as defined by claim 1. For example, by providing at the entrance floor a widening of the lane in proximity with the access from the road level 20, the access of users is divided into two lanes, one for paying users obliged to pick up an access ticket, and subscriber users or users who have an electronic payment system or other rapid access detection system. Different solutions can be imagined equivalently for the control and payment zones, in the transverse connection lanes 16, at exit from the various floor levels.

**[0053]** It is also clear that, although the invention has been described with reference to specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of car park. For example, all the possible solutions of structures intended for parking, having a design with a centered symmetry and a helical vertical development, even with a perimeter other than circular, shall come within the field of protection of the present invention.

## Claims

1. Car park with a vertical development on several levels, comprising a compartment in which at least an access lane (112) is provided, an exit lane (113) distinct from said access lane (112), and a plurality of parking places (11), wherein said two lanes (112, 113) are separate to each other, one-way, and have a helical development at least partly with an inclined plane, and a horizontal helical parking segment (114) is provided, in an adjacent position to which said parking places (11) are made in sequence and disposed for parking in an herringbone pattern and co-

planar to the parking segment (114), said parking places (11) are disposed on each level on both sides of the parking segment (114) oriented in the practicable direction of travel of said access lane (112) and lie on respective substantially horizontal planes, the parking segment (114) is connected, both at entrance and at exit, with relative practicable segments (118) of the access and exit lanes (112, 113) by means of relative connection lanes (116), said two lanes (112, 113) are both housed internally to the substantially horizontal zone of each level, on which said parking places (11) are made, and in that said two lanes (112, 113) are concentric with respect to each other, said access lane (112) being external and said exit lane (113) internal.

2. Car park as in claim 1, **characterized in that** each parking place (11) lies on a relative horizontal plane.
3. Car park as in claim 1 or 2, **characterized in that** said parking places (11) are divided into groups, and every group lies on a relative common horizontal plane.
4. Car park as in claim 1, **characterized in that** said access lane (112) comprises at least an inclined helical practicable segment (118), able to allow access to said substantially horizontal planes.
5. Car park as in any claim hereinbefore, **characterized in that** said exit lane (113) has one-way traffic with the opposite direction to that of said access lane (112).
6. Car park as in claim 1, **characterized in that** said connection lanes (116), for each of said levels, are provided with means for stopping the cars (25) and/or payment means (18).
7. Car park as in any claim hereinbefore, **characterized in that** on each of said levels pedestrian footpaths (14) and/or accesses to vertical passages (15) are disposed, able to house stairs, elevators and/or emergency exits, located externally or internally to said helical structure.

## Patentansprüche

1. Parkhaus mit einer vertikalen Erstreckung auf mehrere Etagen, umfassend einen Raum, in welchem zumindest eine Einfahrtspur (112) vorgesehen ist, eine von der Einfahrtspur (112) verschiedene Ausfahrtspur (113), und eine Mehrzahl von Stellplätzen (11), wobei die beiden Spuren (112, 113) voneinander getrennt sind, einbahnig sind, und eine spiralförmige Erstreckung zumindest teil-

weise mit einer geneigten Ebene aufweisen, und wobei ein horizontales Parksegment (114) vorgesehen ist, wobei in einer angrenzenden Position die Stellplätzen (11) in Reihe ausgebildet sind und für ein Parken in einem Fischgrätenmuster und koplanar zum Parksegment (114) angeordnet sind, wobei die Stellplätze (11) auf jeder Etage auf beiden Seiten des Parksegments (114) in Fahrtrichtung der Einfahrtspur (112) orientiert angeordnet sind und auf jeweiligen im Wesentlichen horizontalen Ebenen liegen, wobei das Parksegment (114) am Eingang und am Ausgang, mit entsprechenden befahrbaren Segmenten (118) der Einfahrt- und Ausfahrtspuren (112, 113) mittels entsprechender Verbindungsspuren (116) verbunden sind, wobei die beiden Spuren (112, 113) beide zur im Wesentlichen horizontalen Zone jeder Etage, auf welcher die Stellplätze (11) angeordnet sind, innenliegend sind, und dadurch, dass die beiden Spuren (112, 113) zueinander konzentrisch sind, wobei die Einfahrtspur (112) außen gelegen und die Ausfahrtspur (113) innen gelegen ist.

2. Parkhaus gemäß Anspruch 1, **dadurch gekennzeichnet, dass** jeder Stellplatz (11) auf einer entsprechenden horizontalen Ebene liegt.
3. Parkhaus gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Stellplätze (11) in Gruppen unterteilt sind, und jede Gruppe auf einer entsprechenden gemeinsamen horizontalen Ebene liegt.
4. Parkhaus gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Einfahrtspur (112) zumindest ein geneigtes spiralförmiges befahrbares Segment (118) aufweist, welches Zugang zu den im Wesentlichen horizontalen Ebenen ermöglicht.
5. Parkhaus gemäß einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Ausfahrtspur (113) einen Einbahnverkehr in entgegengesetzter Richtung zur Einfahrtspur (112) aufweist.
6. Parkhaus gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Verbindungsspuren (116) für jede der Etagen mit Mitteln zum Anhalten der Fahrzeuge (25) und/oder Bezahlmitteln (18) versehen sind.
7. Parkhaus gemäß einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** auf jeder der Etagen Gehwege (14) und/oder Zugänge zu vertikalen Durchgängen (15) gelegen sind, welche dazu eingerichtet sind Treppenhäuser, Aufzüge und/oder Notausgänge aufzunehmen, welche außerhalb oder innerhalb der spiralförmigen Struktur gelegen sind.

## Revendications

1. Parc de stationnement avec un développement vertical sur plusieurs niveaux, comportant un compartiment dans lequel au moins une voie d'accès (112) est prévue, une voie de sortie (113) distincte de ladite voie d'accès (112), et une pluralité de places de stationnement (11), dans lequel lesdites deux voies (112, 113) sont séparées l'une de l'autre, sont en sens unique et ont un développement hélicoïdal au moins partiellement avec un plan incliné, et un segment de stationnement hélicoïdal horizontal (114) est prévu, dans une position adjacente à celle dans laquelle lesdites places de stationnement (11) sont réalisées les unes à la suite des autres et disposées de manière à stationner selon un motif à chevrons et coplanaires au segment de stationnement (114), lesdites places de stationnement (11) sont disposées sur chaque niveau des deux côtés du segment de stationnement (114) orientés dans la direction de déplacement applicable de ladite voie d'accès (112) et se situent sur des plans sensiblement horizontaux respectifs, le segment de stationnement (114) est relié, à la fois à l'entrée et à la sortie, à des segments praticables relatifs (118) des voies d'accès et de sortie (112, 113) au moyen de voies de liaison relatives (116), desdites deux voies (112, 113) sont toutes deux reçues à l'intérieur de la zone sensiblement horizontale de chaque niveau, sur laquelle lesdites places de stationnement (11) sont réalisées, et en ce que lesdites deux voies (112, 113) sont concentriques l'une par rapport à l'autre, ladite voie d'accès (112) étant externe et ladite voie de sortie (113) interne.
2. Parc de stationnement selon la revendication 1, **caractérisé en ce que** chaque place de stationnement (11) se situe sur un plan horizontal relatif.
3. Parc de stationnement selon la revendication 1 ou 2, **caractérisé en ce que** lesdites places de stationnements (11) sont divisées en groupes, et chaque groupe se situe sur un plan horizontal commun relatif.
4. Parc de stationnement selon la revendication 1, **caractérisé en ce que** ladite voie d'accès (112) comporte au moins un segment praticable hélicoïdal incliné (118), pouvant permettre l'accès auxdits plans sensiblement horizontaux.
5. Parc de stationnement selon l'une quelconque des revendications ci-dessus, **caractérisé en ce que** ladite voie de sortie (113) a un trafic à sens unique dans la direction opposée à celle de ladite voie d'accès (112).
6. Parc de stationnement selon la revendication 1, **ca-**

**ractérisé en ce que** lesdites voies de liaison (116), pour chacun desdits niveaux, sont pourvues de moyens pour arrêter les voitures (25) et/ou de moyens de paiement (18).

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7. Parc de stationnement selon l'une quelconque des revendications ci-dessus, **caractérisé en ce que** sur chacun desdits niveaux, des voies piétonnes (14) et/ou des accès à des passages verticaux (15) sont disposés, pouvant recevoir des escaliers, des ascenseurs et/ou des issues de secours, situés à l'extérieur ou à l'intérieur de ladite structure hélicoïdale.

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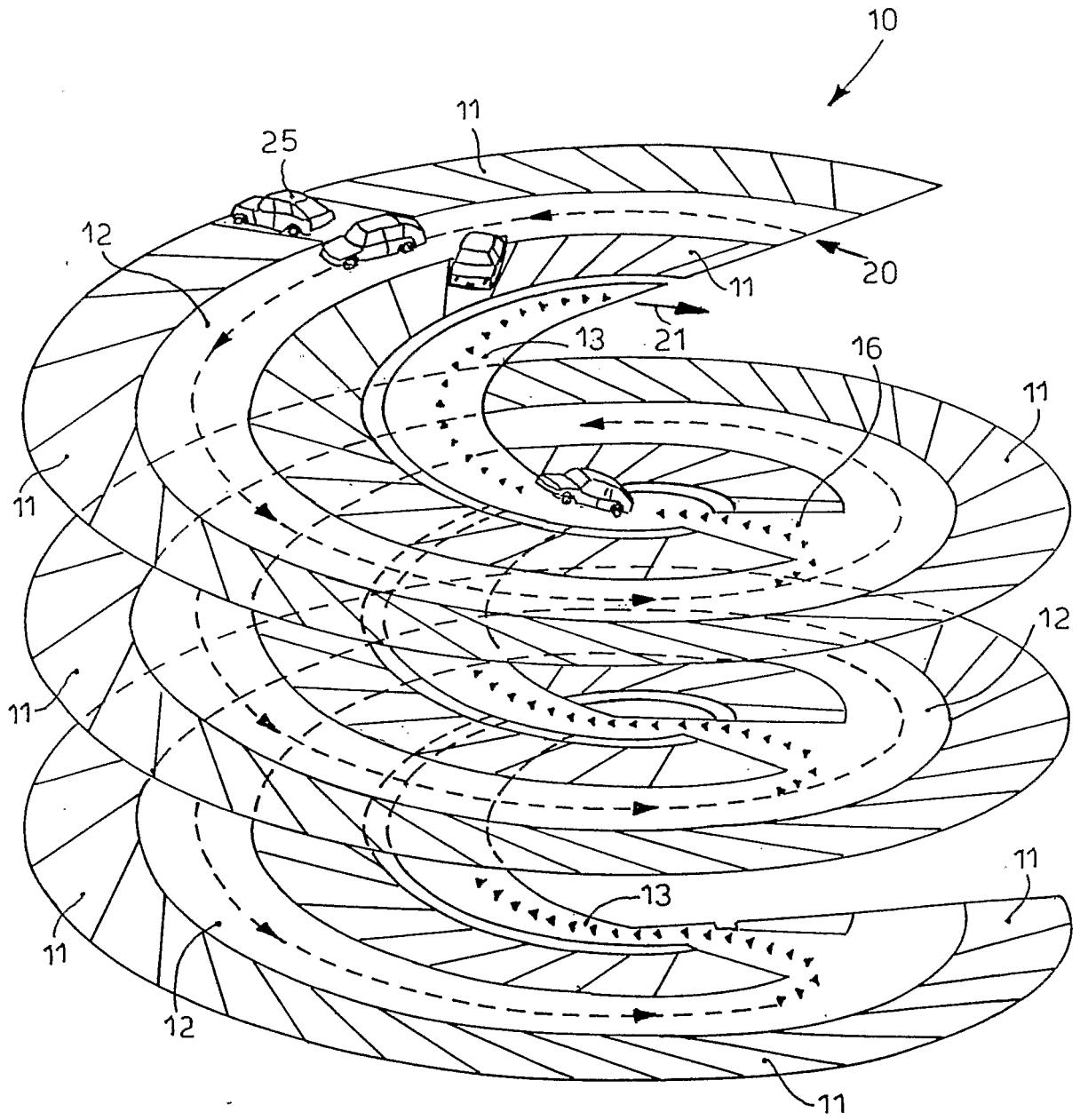


fig. 1

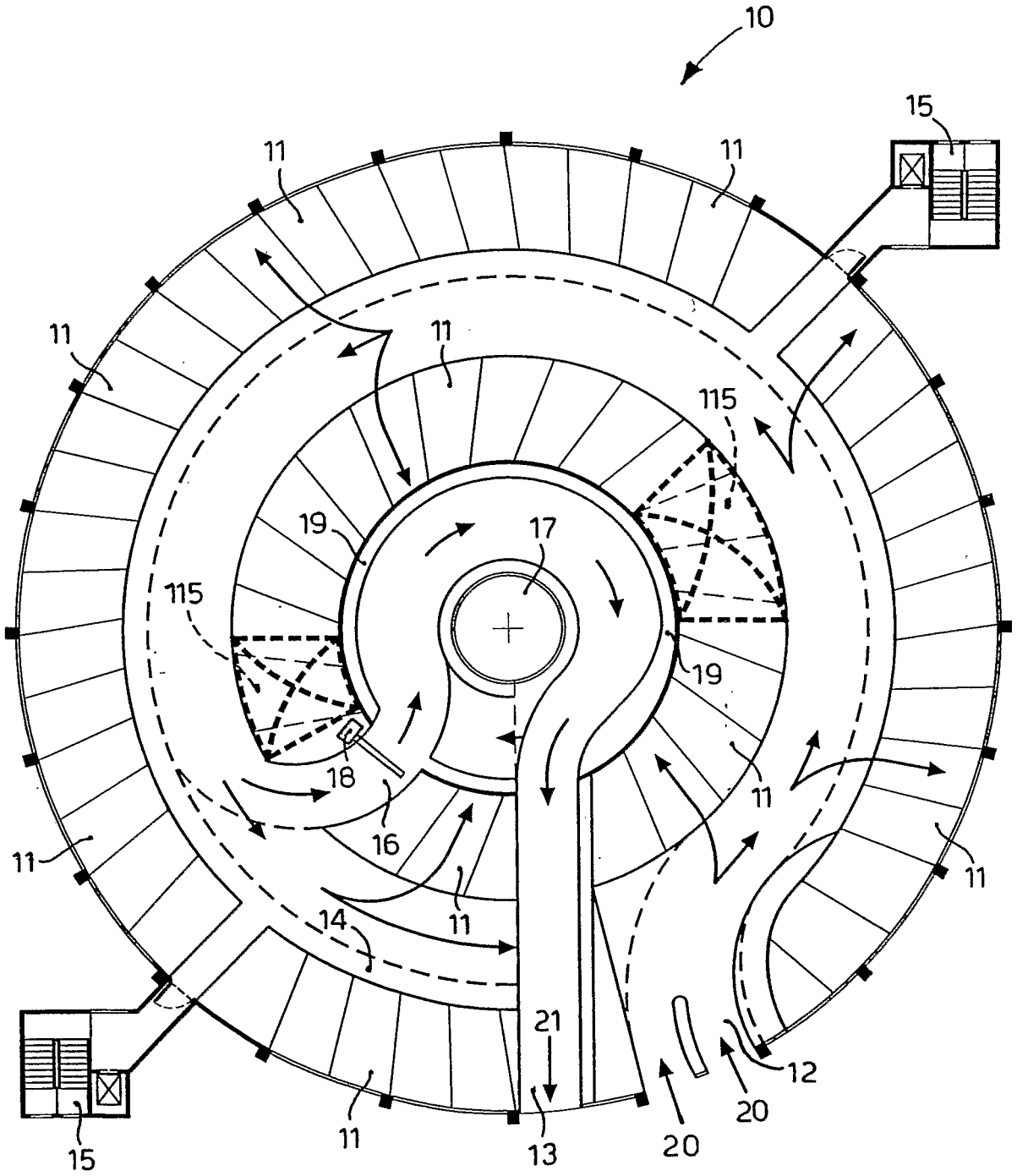


fig. 2

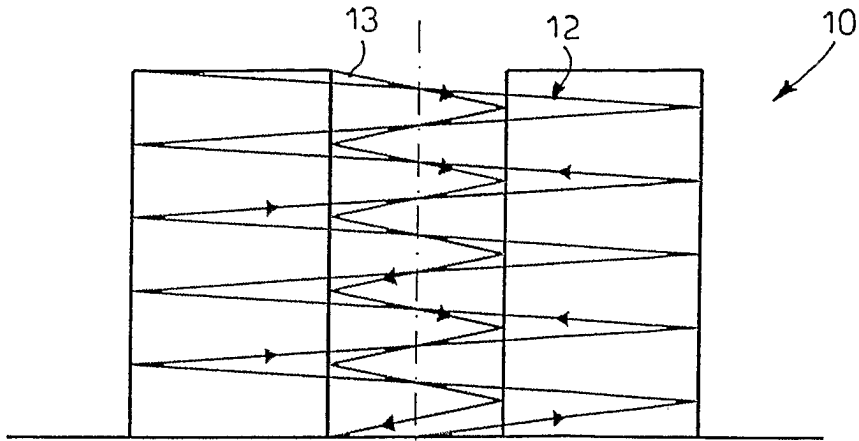


fig. 3

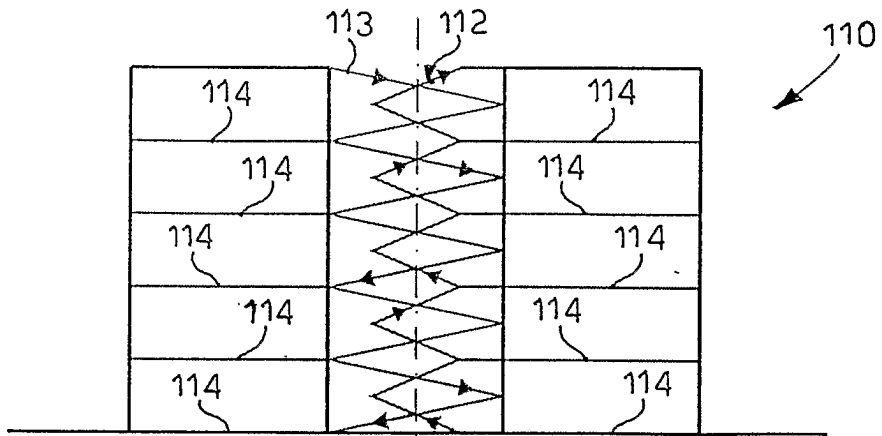


fig. 4

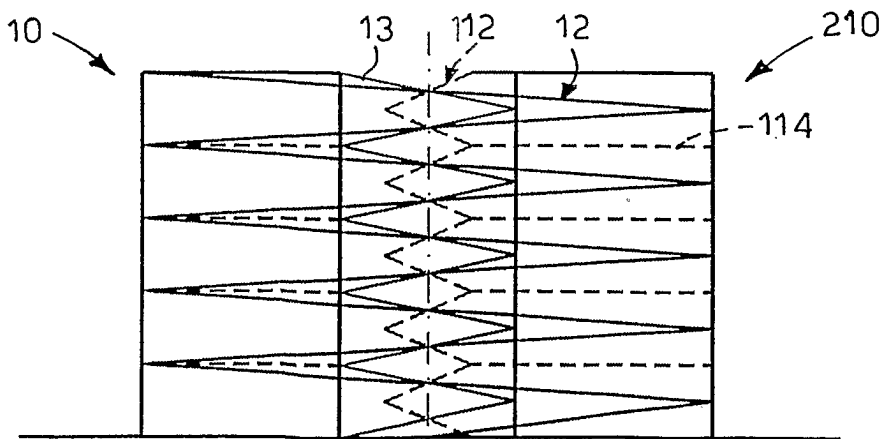


fig. 7

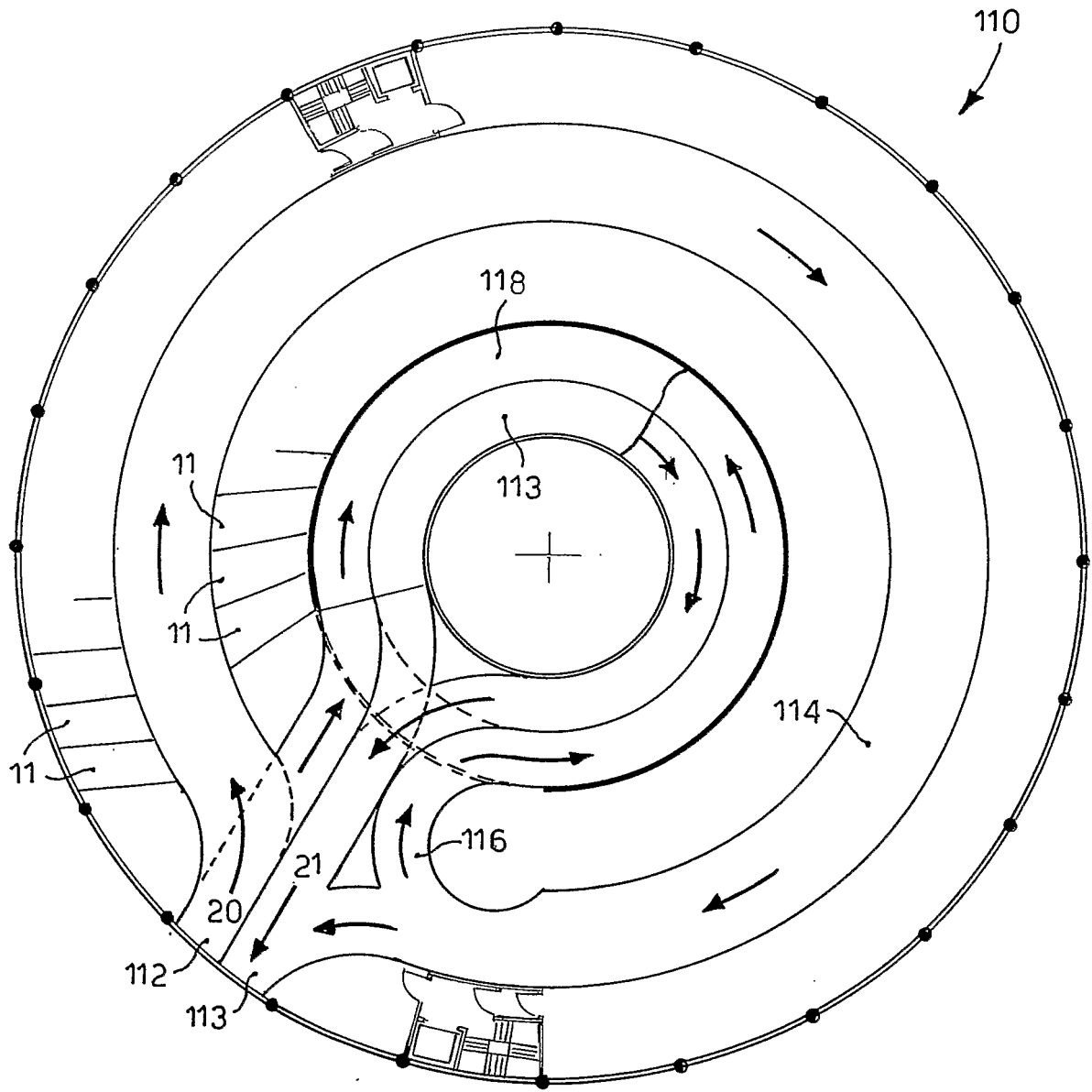


fig. 5

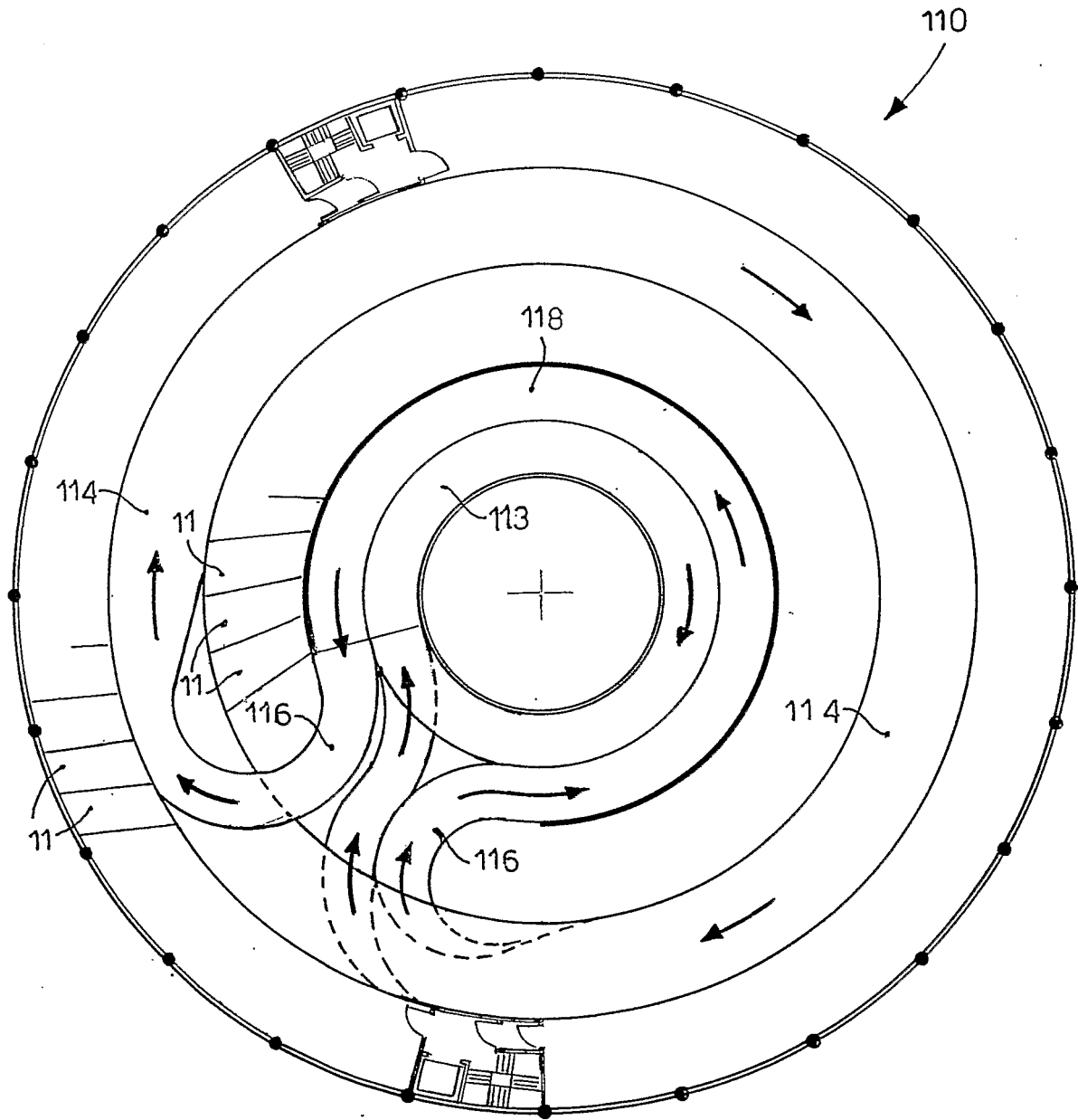


fig. 6

**REFERENCES CITED IN THE DESCRIPTION**

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