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FR-A- 2 223 538
US-A- 2 791 338
US-A- 4 265 581

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Description

The invention regards an underground substantially circular parking installation.

Underground parking installations have become lately very popular in the most crowded cities. This is due to problems deriving from lack of space which impedes the realization of ground parking places and also to the fact that underground parking installations do not disturb the surroundings and enable an adequate layout of a remarkable number of motorcars.

Among these, a usually circular underground parking installation must be mentioned, consisting of a certain number of circular-shaped underground stories where motorcars are arranged radius-like on each story.

A vertically movable platform, stopping at each underground story and on the ground, provides the transfer of the motorcars in and out of the parking installation.

One of these known circular parking installations is disclosed in US-A-4 265 581. This document relates to an automated parking system including a multi-story tower having a plurality of parking areas radially disposed on several stories. A central lift truck moves vertically from ground story to the other stories and simultaneously rotates around a vertical axis to reach all parking areas; at the ground story the lift truck is continuous with an incoming and an outgoing area. The lift truck consists of a platform on which an upper plane element which is moveable in two opposite directions and has staves for supporting the vehicle and hooking lists to avoid sliding; the ends of the plane element are equipped with means engaging with corresponding means in ground story areas that are also equipped with staves for supporting the vehicle motor and means for moving the plane element in the two directions with respect to the platform.

However, this and other known systems suffer from several inconveniences. Some installations require ground structures which emphasize and even increase their overall dimensions not allowing a complete integration in the surroundings.

Some parking installations have complex systems for drawing and storing motorcars which make the installation very expensive and subject to frequent breakdowns. Furthermore, the complexity of the systems impedes the operation of the installation at sufficient speed in order to cope with the incoming and outgoing motorcar traffic. This latter feature is very important as there is one platform for the transfer of the motorcars in the parking installation and from this to the ground, so it must be able to operate rapidly to avoid queuing up outside the parking installation. It follows that

the drawing and transfer system of the motorcars is quite complex and complicated and this is detrimental to the rapidity of the operations.

One of the objects of the invention is to propose an underground substantially circular parking installation, able to integrate perfectly in the surroundings and having minimum dimensions on the ground.

It is also an object of the invention to propose an extremely simple and reliable motorcar drawing and transfer system enabling to obtain high transfer speed and thus quick operating cycles in the system.

For these and other purposes which will be better appreciated as the description follows, the invention proposes the realization of an underground substantially circular parking installation having vehicles parking areas disposed radially or partly radially on several underground stories; and a central lift truck which moves vertically from ground story to the lower stories and simultaneously rotates around a vertical axis together with the whole bearing column, to reach all parking areas; at the ground story, the lift truck being continuous with an incoming and an outgoing area, wherein the lift truck consists of a platform on which an upper plane element is movable in two opposite directions, said plane element having two pairs of chains on each side equipped with staves for supporting the vehicle and hooking lists to avoid sliding; the ends of said plane element being equipped with means engaging with corresponding means in ground story areas and underground parking areas; said areas being also equipped with pairs of chains on each side and staves for supporting the vehicle; first motor means for moving the plane element in the two directions with respect to the platform and second motor means for rotating the chains of the plane element and the chains of the ground area or underground parking areas space to which the plane element is temporarily connected by said engaging means.

The parking installation of the invention is now described and reference is made to the attached drawings, as follows:

Fig. 1

is the ground view of the parking installation;

Fig. 2

is the view of an underground story of the parking installation;

Figs. 3 and 4

are sections of the parking installations during two different operating stages of the lift truck and its bearing column while transferring motorcars;

Fig. 5

is the longitudinal section of the parking areas and of the parking lift truck on ground story;

Fig. 6

is the plan view of Fig. 7;

Figs. 7, 8 and 9

are section views of the parking installation during some operating conditions;

Fig. 10

is the schematic view of a variant of Fig. 1;

Figs. 11 and 12

are views of further variants of Fig. 2.

The underground substantially circular parking installation has an entry area 10 on the ground (Fig. 1), a lift truck 11 and an exit area 12 arranged in line or inclined.

In the underground (Fig. 2) the parking has a plurality of stories 14, substantially circular, disposed radially or partly radially, motorcar parking areas 15 (Fig. 11 and 12) are obtained; a free circular passage 9, which may be reached by stairs 18, is obtained in the inner part of the areas.

A circular column 16 rotating around its vertical axis (Fig. 3 and 4) is the center of the parking. The lift truck 11 which takes the motorcars to the selected stories 14 and to the respective parking areas 15 moves vertically in said column.

A stair 18 enables the persons in charge of the parking place to reach the various stories from the exterior by means of the passage 9 to the rotating column, obtained in each story.

The lift truck 11 consists of a platform 19 on which a plane element 20 is slidably assembled. Platform 19 carries a crosspiece 21 (Fig. 6) on which a drum 40 is assembled, on which cable 22 is wound; The ends of said cable are secured to two crosspieces 41 of plane element 20. A motor 23 gives rotation to drum 40 in the two directions causing the sliding of plane element 20 in the two opposite directions with respect to platform 19.

Two pairs of chains 24 are assembled on plane 20 and are operated by a motor 25; said chains carry two rows abreast of staves 26 and two pairs of lists 27. The staves form a support surface for the back wheels 28 of the motorcar (Fig. 7 and 8), whilst lists 27 realize support and constraint for the front wheels 29 of the motorcar against the sliding of the motorcar on plane 20.

On the ground the lift truck 11, as mentioned, is located between an entry area 10 and an exit area 12 (Figs. 1 and 5). Both of said areas, as well as underground radial parking areas (Fig. 2), have a frame structure equipped with two pairs of chains, such as chains 24 of plane 20, on which the staves 26 are constrained crosswise; said staves cover the whole extent of the entry areas 10 and exit areas 12 (fig. 5) and part of parking areas 15 (Figs. 6-9). Please note to this regard (Fig. 5) that, unlike parking areas 15, areas 10 and 12 have the double possibility of motorcar loading/unloading in the whole extent of the staves, that is after said

operations lower staves 25 and section 34 are located in an upper position able to receive the subsequent car immediately.

Areas 10 and 12 and parking areas 15 present chains 24 wound on a shaft 30 to which a drum 32 is connected by a reduction unit 33.

Operating in conjunction with said drum 32 the lift truck is equipped with an air friction clutch 31, the rotation of which is given by a motor 25; said clutch is engaged in the drum 32, which is connected to shaft 30 by reduction unit 33, when plane 20 is moved against a parking area 15 (figs. 8 and 9) or and entry or exit area.

The air friction clutch 31, Fig. 6 at right, is rigidly connected to an equal clutch 31 placed on the opposite side of the plane 20 so that plane 20 may engage any type of area from both sides.

As clutch 31 is rotated by motor 25 which operates chains 24 of plane 20, chains 24 of parking area 15 or of areas 10 or 12 are rotated in the same instant by said motor 25 as soon as clutch 31 and drum 32 are engaged to each other.

The following will be the operating sequence: when the motorcar is on the lift truck 11 (Fig. 7) and must be taken to one of the radial and underground areas 15, motor 23 is operated to take plane 20 in contact with opening 15. Motor 25 operates simultaneously, rotating shaft 30 of the lift truck 20 thus taking the staves in the contact area with opening 15.

Having reached that position, clutch 31 engages itself in the drum 32, motor 25 continues to rotate chains 24 of plane 20 in the direction of arrow A (Fig. 8) and then the motorcar moves in direction B; in the meantime, shaft 30 and chains 24 of space 15 with it will rotate in the direction of arrow C.

At the end of said operation the motorcar has been positioned as shown at Fig. 9, held by lists 27 on one of the parking areas 15 of the underground parking as illustrated in Fig. 2.

When plane 20 is back to platform 19 in right position, the lift truck may return to the ground where the entry and exit areas 10 and 12 are located (Fig. 5).

Areas 10 and 12, unlike underground areas 15, are equipped with staves 26 extending for the entire length or the respective pairs of chains with the exception of a small section 34 as housing of front wheel 29 of motorcars; said housing determines the exact position of the vehicle to avoid motorcar incoming and outgoing problems, the lift truck is present to draw and leave the car automatically.

Both areas 10 and 12 have drums 32 engaging in clutches 31 of the lift truck (Fig. 6) and so have the underground parking areas.

When motor 25 rotates chains 24 of the lift truck 11 and of areas 10 or 12 to which it is temporarily connected, the lists 27 will receive front wheel 29 from area 10 or will unload front wheel 20 on area 12 as their position on the lift truck 11 and on entry/exit/parking areas is adequately set and synchronized to carry out said operations automatically.

It will be easily appreciated that this invention is extremely simple and highly reliable from the construction point of view. Furthermore, structures on ground which normally disfigure the surroundings are not required.

In some cases it may be necessary or suitable to arrange entry and exit areas 10 and 12 as schematically illustrated in Fig. 10, that is radius-like with respect to central lift truck 11 and not in line as illustrated in Fig. 1.

The position of the areas 10 and 12 with respect to the lift truck is not relevant as the lift truck 11 is equipped with engaging means in said areas on both sides, therefore they may be arranged at any angle between each other without modifying the installation.

The same applies to the case where the stories 14 of the parking place have the column 16 eccentric with respect to the circular hole of the ground (Fig. 11) or when the hole is not circular but oval shaped (Fig. 12).

In both above cases it may be noted that the parking areas 15 will obviously be fewer than the ones of a circular parking installation (Fig. 12); column 16 and lift truck 11, nevertheless, will be the same as those illustrated in Figs. 1-9.

Claims

1. Underground substantially circular parking installation having vehicles parking areas disposed radially or partly radially on several underground stories (14); and a central lift truck (11) which moves vertically from ground story to the lower stories and simultaneously rotates around a vertical axis together with the whole bearing column, to reach all parking areas; at the ground story, the lift truck (11) being continuous with an incoming (10) and an outgoing area (12), wherein the lift truck (11) consists of a platform (19) on which an upper plane element (20) is moveable in two opposite directions, said plane element having two pairs of chains (24) on each side equipped with staves (26) for supporting the vehicle and hooking lists (27) to avoid sliding; the ends of said plane element (20) being equipped with means (31) engaging with corresponding means in ground story areas and underground parking areas; said areas being also equipped with

pairs of chains (24) on each side and staves (26) for supporting the vehicle; first motor means for moving the plane element (20) in the two directions with respect to the platform (19) and second motor means (25) for rotating the chains of the plane element (20) and the chains (24) of the ground story area of underground parking areas space to which the plane element (20) is temporarily connected by said engaging means (31).

2. Parking installation according to claim 1 wherein the engaging means consist of air friction clutches (31) engaging in suitable drums (32) of the areas to rotate simultaneously the respective chains (24) in the opposite directions of motorcar loading and unloading to and from the lift truck.
3. Parking installation according to claim 1 wherein entry and exit areas (10, 12) have crosswise staves (26) arranged on chains (24) for nearly the entire extent of said chains, whilst parking areas (15) and the lift truck (11) have staves (26) extending for a sufficient length to support back wheels of motorcars of various length and whilst front wheels are constrained by hooking lists (27).

Patentansprüche

1. Unterirdische, im wesentlichen kreisförmige Parkierungsanlage welche aufweist:
 - Fahrzeug-Parkierungszonen, welche radial oder teilweise radial in mehreren unterirdischen Geschossen (14) angeordnet sind;
 - einen zentralen Hubwagen (1), welcher sich vertikal vom Parterregeschoss zu unteren Geschossen bewegt und sich gleichzeitig zusammen mit der ganzen Lagersäule um eine vertikale Achse dreht, um alle Parkzonen zu erreichen, wobei im Parterregeschoss der Hubwagen (1) fortlaufend mit einer Einfahrtszone (10) und Ausfahrtszone (12) ist; wobei
 - der Hubwagen (1) aus einer Plattform (19) besteht, an welcher ein oberes ebenes Element (20) in zwei entgegengesetzten Richtung bewegbar ist;
 - das genannte ebene Element auf beiden Seiten zwei Paare von Ketten (24) aufweist, welche mit Stäben (26) zum Tragen des Fahrzeuges und mit Klammerbalken (27) zur Vermeidung des Rutschens versehen sind;
 - die Enden des genannten ebenen Elementes (20) mit Mitteln versehen sind,

welche mit entsprechenden Mitteln im Parterregeschoss und in den unterirdischen Parkzonen zusammenwirken;

- die genannten Zonen ebenfalls auf beiden Seiten mit Paaren von Ketten (24) und Stäben (26) zum Tragen des Fahrzeuges versehen sind; 5
 - erste motorische Mittel zum Bewegen des ebenen Elementes (20) in den zwei Richtungen bezüglich der Plattform; und 10
 - zweite motorische Mittel (25) zum Bewegen der Ketten des ebenen Elementes (20) und der Ketten (24) der Parterregeschoss-Zone des unterirdischen Parkzonenraumes, mit welchem das ebene Element (20) mittels der genannten Eingriffsmittel (31) zeitweilig verbunden ist. 15
2. Parkierungsanlage nach Anspruch 1, worin die Eingriffsmittel aus pneumatisch betätigten Reibkupplungen (31) bestehen, welche mit geeigneten Trommeln (32) der Zonen zusammenwirken, um die betreffenden Ketten (24) beim Laden und Entladen des Fahrzeuges auf den bzw. aus dem Hubwagen gleichzeitig in entgegengesetzte Richtungen zu bewegen. 20
3. Parkierungsanlage nach Anspruch 1, worin die Einfahrts- und Ausfahrtszonen (10, 12) querliegende Stäbe (26) aufweisen, welche auf Ketten (24) und annähernd über deren ganze Länge angeordnet sind, während die Parkzonen (15) und der Hubwagen (11) Stäbe (26) aufweisen, welche sich über eine genügende Länge erstrecken, um die Hinterräder von Motorfahrzeugen verschiedener Länge zu tragen, und die Vorderräder zwischen Klammerbalken (27) eingeklemmt sind. 30

Revendications

1. Installation de parc de stationnement souterrain substantiellement circulaire comportant des aires de stationnement de véhicules disposées en rayonnement ou partiellement en rayonnement sur plusieurs étages souterrains (14), et un chariot élévateur central (11) qui se déplace verticalement du niveau de rez-de-chaussée vers les niveaux inférieurs et qui peut tourner, simultanément, autour d'un axe vertical avec la totalité de la colonne de support pour pouvoir atteindre toutes les aires de stationnement, le chariot élévateur (11) se trouvant, au niveau de rez-de-chaussée, en continuité avec une aire d'entrée (10) et de sortie (12), installation dans laquelle le chariot élévateur (11) est constitué d'une plate-forme (19) sur laquelle un élément plan supérieur (20) est déplaçable dans deux 40

directions opposées, ledit élément plan comportant deux paires de chaînes (24) disposées sur chacun de ses côtés qui sont pourvues de cannelures (26) destinées à supporter le véhicule et de rampes de calage (27) servant à en éviter le glissement, les extrémités dudit élément plan (20) étant pourvues de moyens (31) s'engageant avec des moyens correspondants situés dans les aires de stationnement du niveau de rez-de-chaussée ainsi que dans les aires de stationnement souterrain, lesdites aires étant également pourvues de paires de chaînes (24) sur chacun de leurs côtés ainsi que de cannelures (26) destinées à supporter le véhicule, des premiers moyens motorisés servant à déplacer l'élément plan (20) dans les deux directions par rapport à la plate-forme (19), et des seconds moyens motorisés (25) servant à entraîner en rotation les chaînes de l'élément plan (20) de même que les chaînes (24) de l'aire de stationnement de rez-de-chaussée et des aires de parc de stationnement souterrain, espaces auxquels l'élément plan (20) est temporairement relié par lesdits moyens d'engagement (31). 15

2. Installation de parc de stationnement selon la revendication 1, dans laquelle les moyens d'engagement sont constitués d'embrayages pneumatiques à friction (31) coopérant avec des tambours (32) appropriés des aires pour entraîner simultanément en rotation les chaînes respectives (24) dans les directions opposées de chargement et de déchargement de véhicules sur le chariot élévateur (11) et à partir de celui-ci. 30

3. Installation de parc de stationnement selon la revendication 1, dans laquelle les aires d'entrée et de sortie (10, 12) comportent des cannelures croisées (26) disposées sur des chaînes (24) sur l'étendue quasi complète desdites chaînes, tandis que les aires de stationnement (15) et le chariot élévateur (11) comportent des cannelures (26) qui s'étendent sur une longueur suffisante pour supporter les roues arrière de véhicules de diverses longueurs tandis que les roues avant sont retenues par des rampes de calage (27). 35

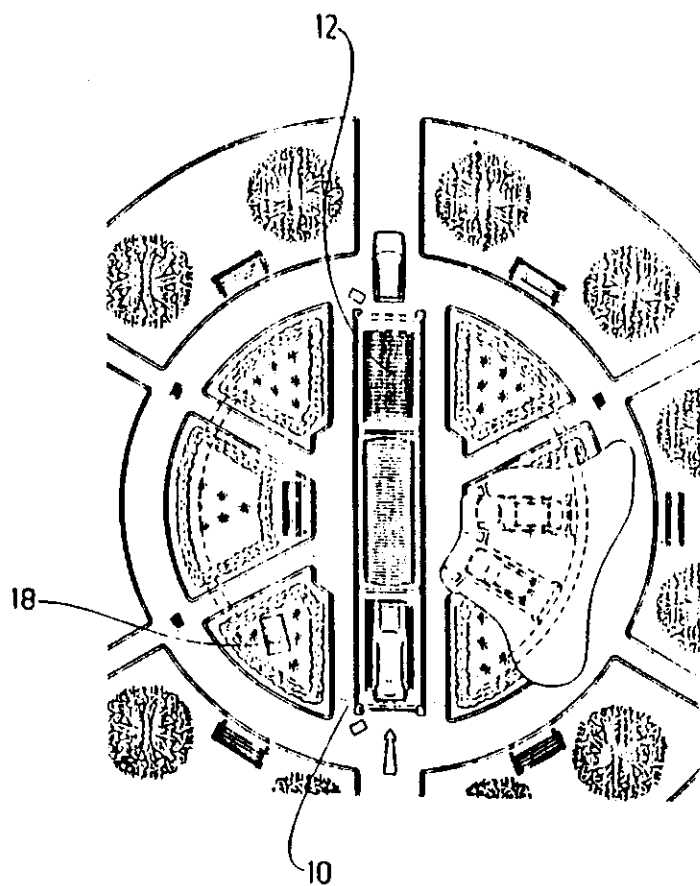


FIG. 1

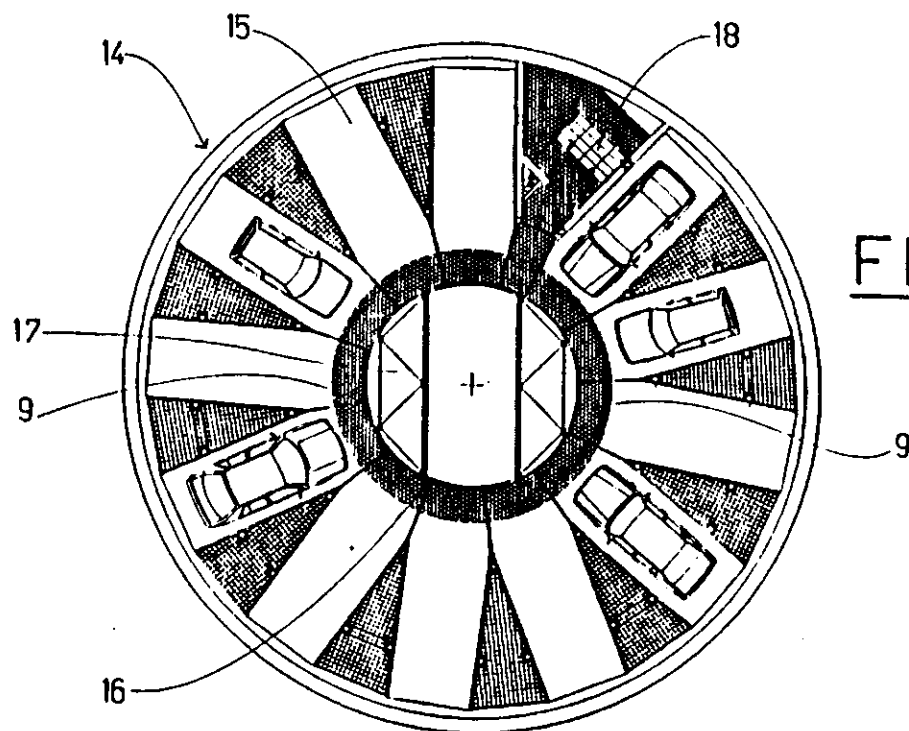


FIG. 2

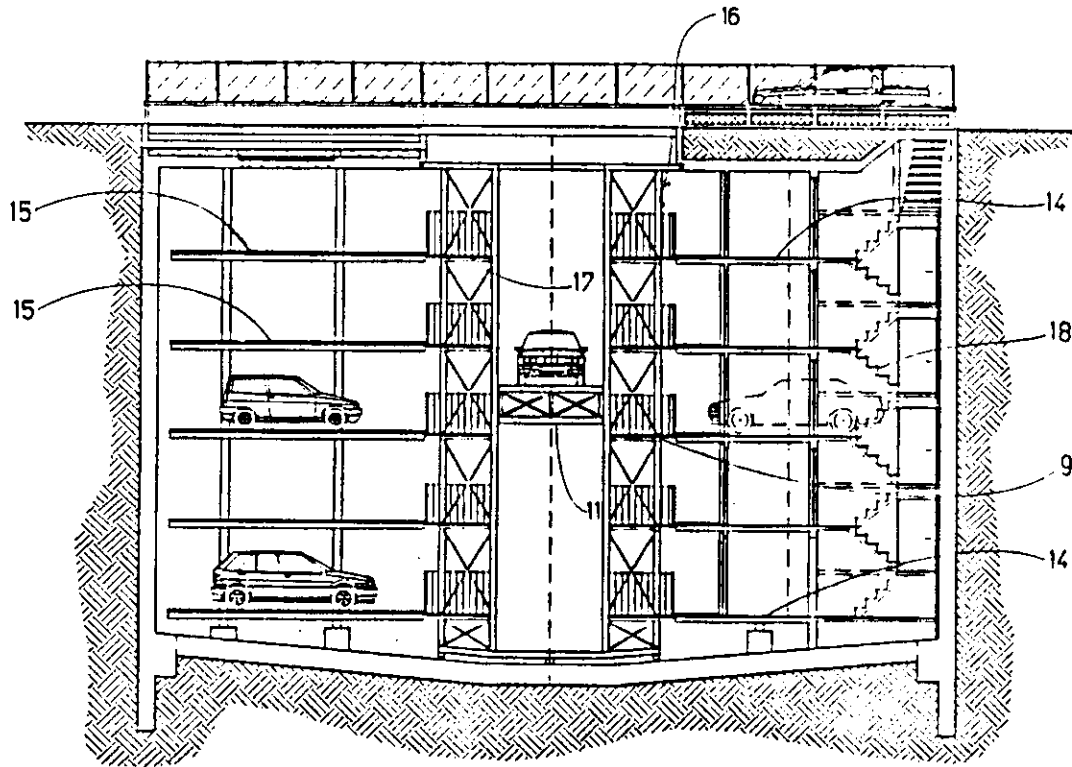
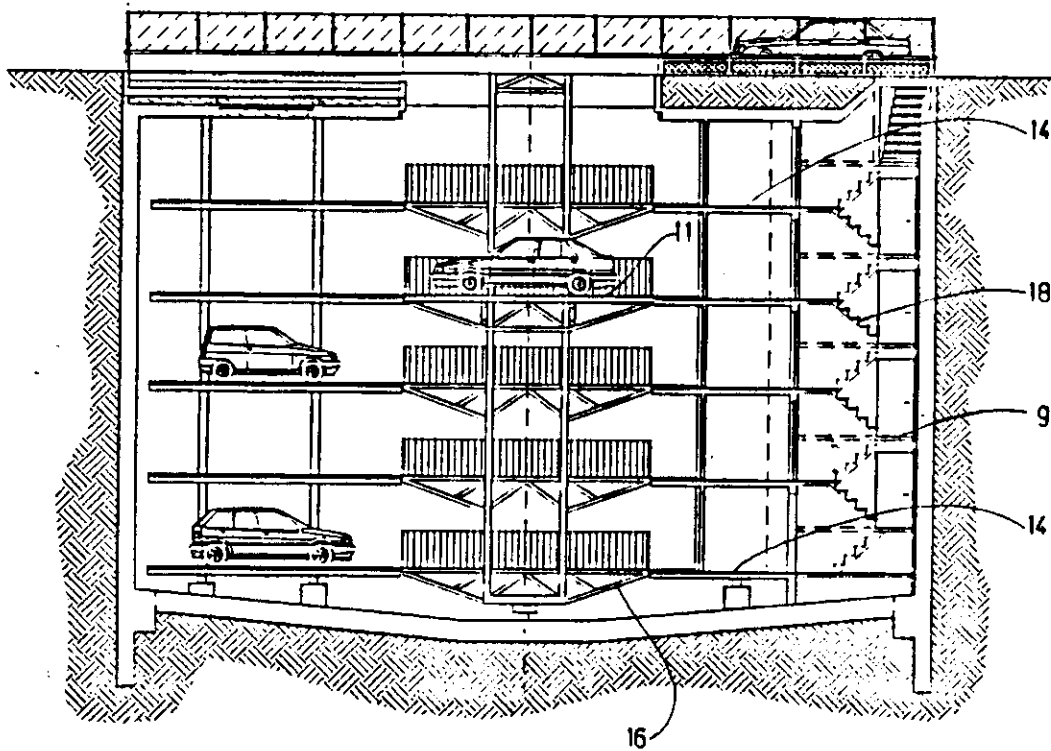


FIG. 3

FIG. 4



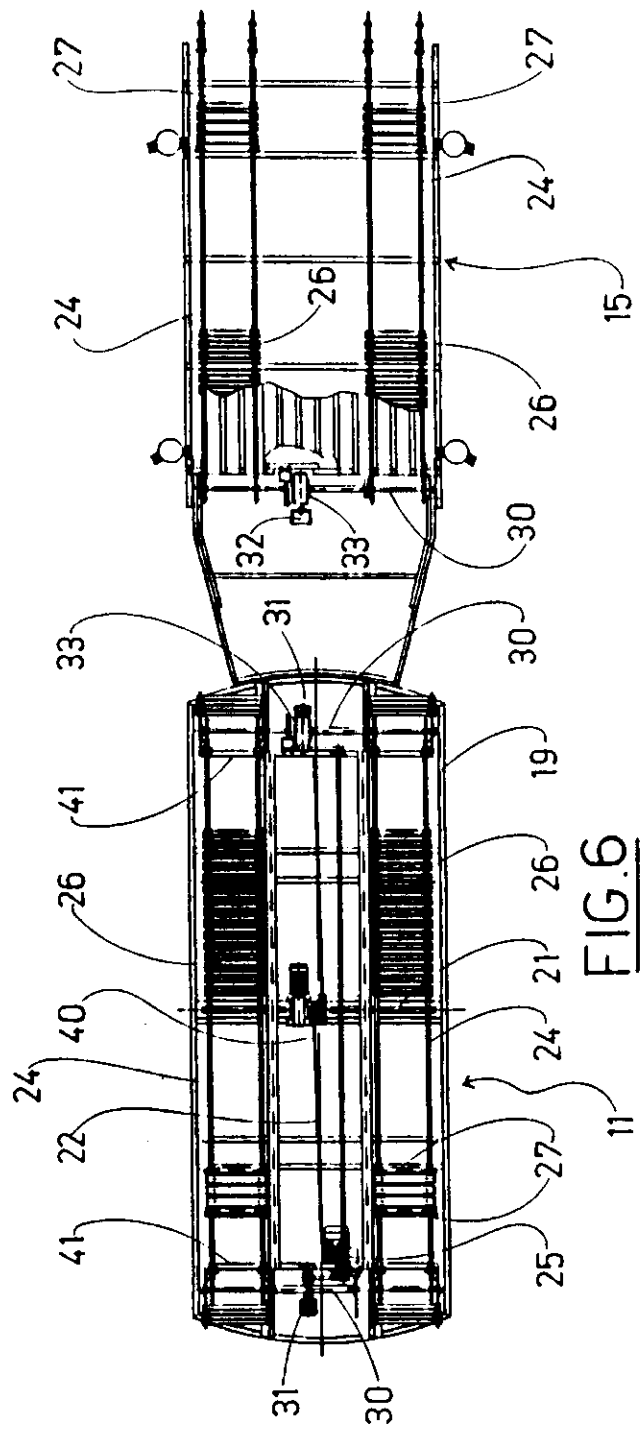
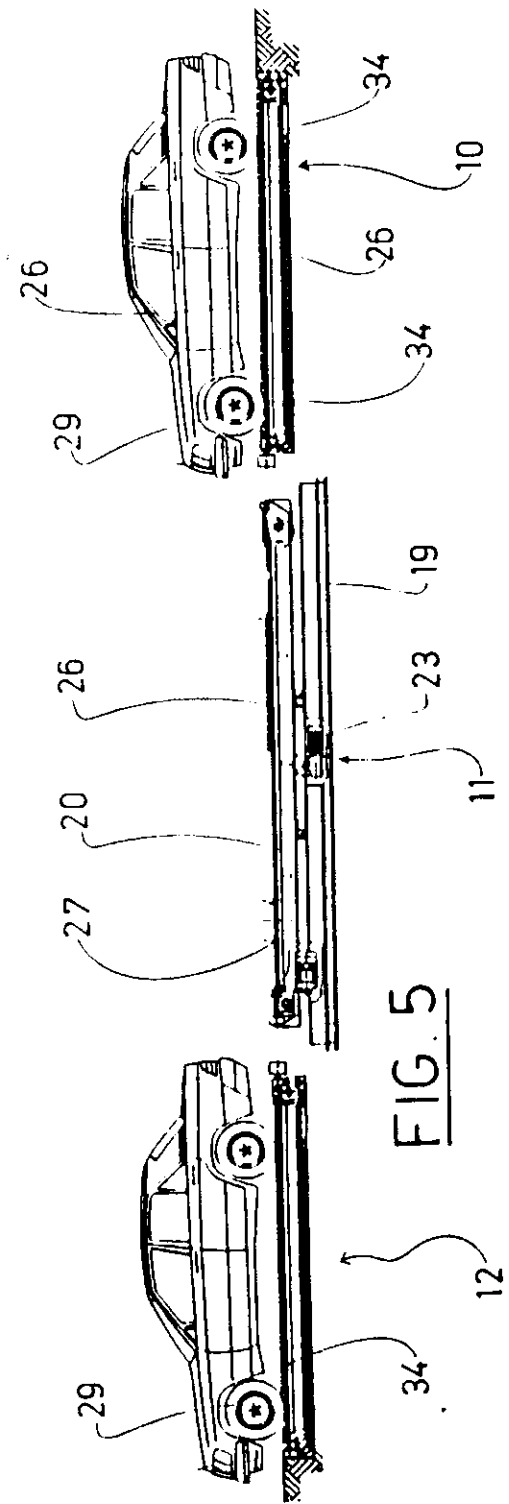


FIG. 7

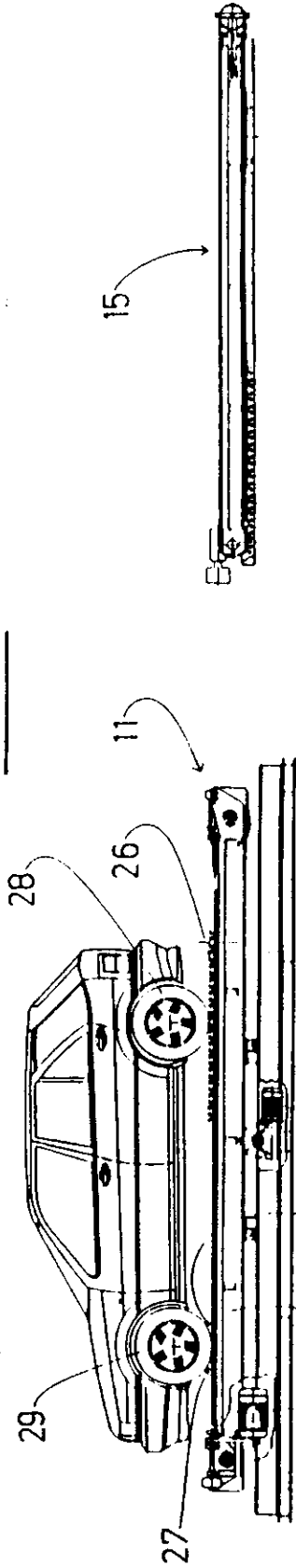


FIG. 8

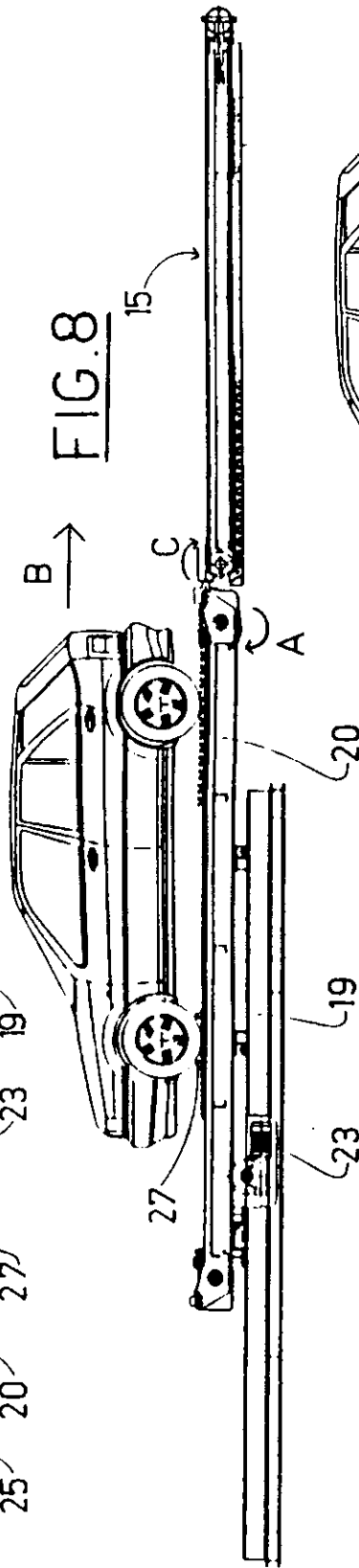


FIG. 9

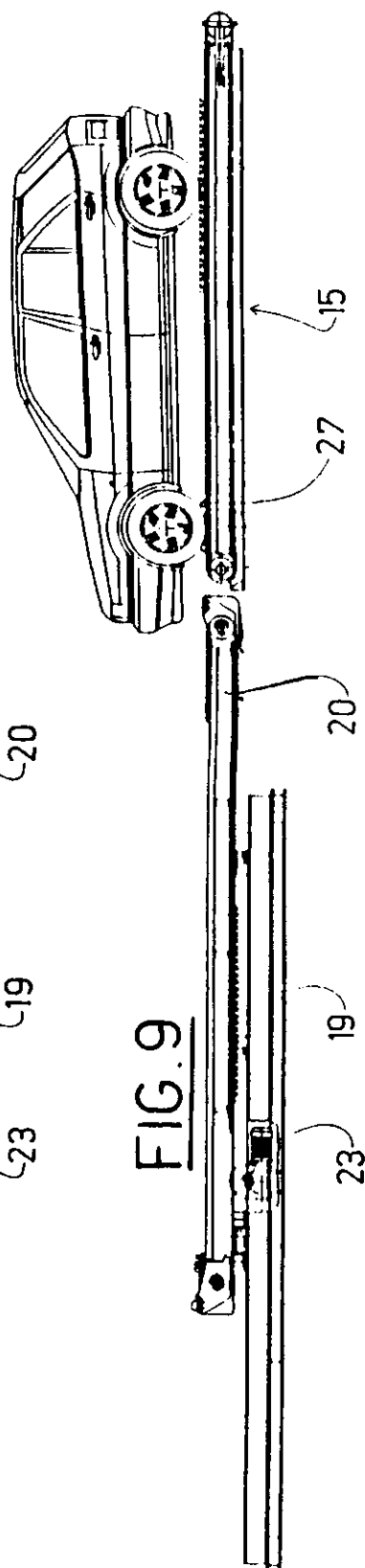


FIG.10

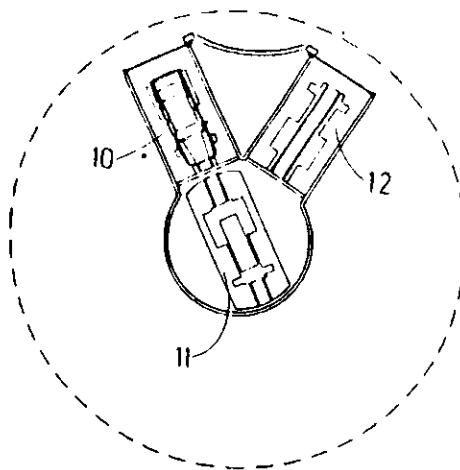


FIG.11

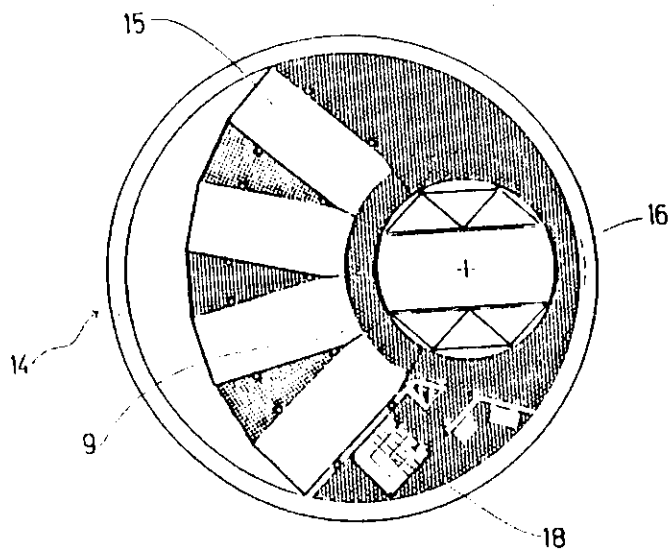
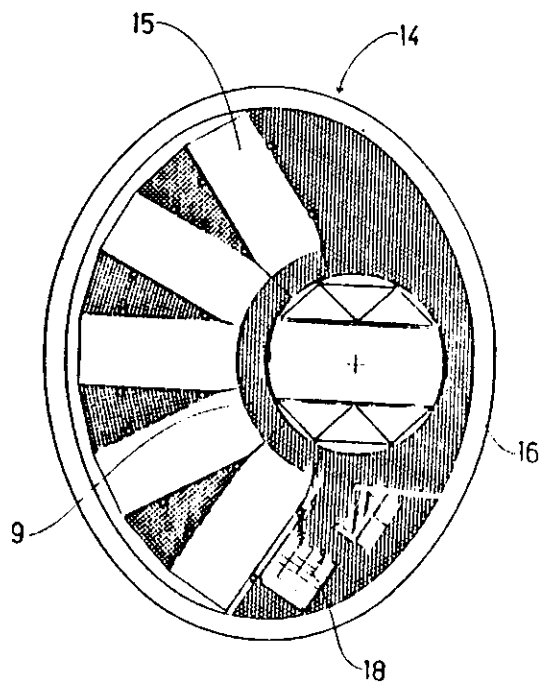


FIG.12



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