ABSTRACT

The present invention relates to a motor-vehicles storage device comprising a series of platforms each supporting a motor-vehicle, said platforms being mounted freely slideably and reciprocally in contact along two parallel horizontal superposed tracks, and transferring means at both ends of the tracks to transfer the platforms from one track to the other, said means comprising two rotating transferring arms in correspondence to first rails of the tracks and a single rotating transferring arm in correspondence to second rails of the tracks.

S Claims, 3 Drawing Figures
MOTOR VEHICLES STORAGE DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The object of the present invention is the provision of a device for the storage and/or the transport of articles of any kind and in particular of motor-vehicles, of the type known as a "rotating garage" and comprising a series of platforms movable along a closed circuit, each platform being adapted to support at least one motor-vehicle and to be stored in or removed from the garage in a given position along the circuit.

More particularly the device of the present application is of the type in which the platforms support the motor-vehicles are mounted freely slidably and reciprocally in contact along two parallel horizontal superposed tracks and in which there are provided transferring means, in the form of rotating arms, to transfer the platforms from one track to the other, at the ends of said tracks.

2. Description of the Prior Art

A structure of this type is described, for instance, in Italian Patent No. 532,983 or Canadian Pat. No. 612,968 and comprises platforms having four supporting points, two on each rail of the tracks, said supporting points being in the form of wheels mounted on pins projecting sidewise from the opposite sides of the platforms.

Said means for the transfer of the platforms, at the ends of the tracks, comprise at least two pairs of arms rotating in synchronism around two horizontal axes, the ends of said arms engaging, when the arms are in the vertical position, with a platform in order to support and thereafter guide it, along a semicircular transferring path, from the horizontal upper track to the lower one, or vice-versa.

According to a first embodiment of the device of the above mentioned Italian Patent No. 532,983, each transferring arm projects beyond its rotating axis into a second transferring arm, said arms then carrying out their function alternately with their diametrically opposite ends, and in such a way that at the moment when for example one of the arms ends receives a platform from a first horizontal track, the other end abandons a different platform on the second track.

According to the above embodiment the rotation axes of the arms must be mutually spaced in such a way as to permit the free rotation of the respective ends in the central crossing position; as the arms rotate in the same vertical plane, the said distance must therefore be greater than the distance between the diametrically opposite ends of each group of two combined arms.

On the other hand the size of the platform in the direction of the advancement axis, viz. in the sense of the "width" of the platform itself, must be at least slightly greater than the distance between the rotating axes of the two arms, so that the latter when assuming at the same time the vertical position may each find a corresponding supporting point of the platform. The said distance between the rotating axes imposes a great limitation as it requires, in practice, that the width of each platform must necessarily be greater than the distance between the diametrically opposite ends of one double arm, i.e., the vertical distance between the two sliding tracks.

As a consequence the platforms are much wider than is required by the size of the transported motor-vehicles, with an evident waste of space.

According to a different embodiment of the Italian Patent No. 532,983, the said limitation is overcome by the fact that the transfer arms are simple (viz. they do not project beyond their rotating axis into a second arm, as mentioned above) so that the distance between the two parallel rotating axes can be maintained just greater than the length of one of the arms.

As can easily be understood, since each of the arms has a length practically half the vertical distance between the two sliding tracks, the fact that the platform must have a width greater than said distance between the rotating axes, or than said reduced length of the arms, does not in practice constitute a notable limitation.

However, said structure — in respect to the first embodiment in which the transferring arms take up the platform every 180° of rotation — has the disadvantage that the arms take up the platform every 360° of rotation; therefore, the platform having the same rectilinear speed along the plane tracks, the transferring arms must cover a double run in the same time, hence they must have double speed.

This is not only a problem of dynamic stress during the transfer of the platforms on the circular path, but above all a problem of positive or negative acceleration of the platforms at the moment when they pass from the rectilinear paths to the curved paths or vice-versa.

SUMMARY OF THE INVENTION

All said drawbacks or limitations are overcome by the device of the present invention which further provides a simplified structure, less expensive both in construction and in maintenance.

In a storing and/or transporting device of the first general type described above, with double transferring arms adapted to take up the platform every 180° of rotation, this can be achieved thanks to the fact that each platform is provided with three supporting points, two of which are on a first rail and one on the second rail of the tracks, and that on the side of the first rail, two double transferring arms rotate in two spaced vertical planes and are pivoted on axes spaced apart by an amount just greater than the length of one simple arm, a first arm being provided in the position near the rotating axis, with arched slots forming a guide for the bearing point of the platform on the second arm in such a way as to ensure the free passage in the position where the arms are crossed, on the side of the second rail there being provided a third sole double transferring arm, the rotating axis of which is in an intermediate position between the axes of the first two arms.

BRIEF DESCRIPTION OF THE DRAWINGS

However the invention will be better described with reference to the annexed drawings, which represent a preferred embodiment, and in which:

FIG. 1 is a front view, of the device, seen from the side of the first rail, at the end of which are combined pairs of double transferring arms;

FIG. 2 is a view similar to FIG. 1 but seen from the side of the second rail, at the end of which there are combined single double transferring arms;
FIG. 3 is a partial diagrammatic view of the device, partially in section along lines III—III of FIGS. 1 and 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown, a series of platforms P, each adapted to support for instance a motor-vehicle, is set into motion along two horizontal parallel superposed tracks, an upper one formed by rails 1 and 2 and a lower one formed by rails 1' and 2'.

The platforms P bear on rail 1 by a pair of wheels 3 and 4 and on rail 2 by a further wheel 5; the axes of wheels 3, 4 and 5 are horizontal and parallel, and the axis of wheel 5 is located in an intermediate position between those of wheels 3 and 4.

The said wheels 3, 4 and 5 are the only three bearing points of the platform P; the effect of bearing on three points is to give great stability to the platform itself.

Each platform provides, in a known way, a series of pins 6 projecting from both sides, with which are engaged the toothed pinions 7 driving the advancement of the platforms along the rails, conventional intermeshing drive gearing 7' being provided for drivingly interconnecting the various rotating members in an entirely conventional manner, the drive gearing 7' in turn being driven by a conventional drive motor (not shown).

The said driving pinions 7 can be provided merely at the beginning and at the end of the tracks, the intermediate platforms being made to advance by pushing each other.

The said advancement system is disclosed in the above mentioned Patent No. 532,983, and that is why it is considered unnecessary to describe it further.

As shown in FIGS. 2 and 3 on the side of rails 2, 2' at each respective end there is provided only one double rotating arm 8, 8'; the horizontal rotating axis of arm 8, 8' is contained within the vertical transverse plane passing by the ends of the horizontal rails.

The rotation of the arm 8, 8' is synchronized in such a way, with the advancement movement imparted by the pinions 7 to the platforms, that when the arm 8, 8' is exactly vertical the axis of the wheel 5 of one platform is, in turn, on the same vertical.

In this position and immediately afterwards, the pin 5' of wheel 5 (see FIG. 3) passes — when the platform is being transferred from rail 2 to rail 2' — from the bearing point on rail 2 itself (which ends at this position), to the bearing point on the cradle-like end 8' of arm 8.

In the same position where rail 2 ends, begins a counter-tail 9 shaped as a semicircle, the centre of which coincides with the rotating axis of arm 8, 8'; the counter-tail 9 is connected directly, in its lower part, with rail 2'.

When the arm 8, 8' rotates — in clockwise direction with respect to FIG. 2 — it drags platform P along an arc, the safety of movement of the platform being ensured on the outer side by the bearing of wheel 5 against the counter-tail 9 and on the inner side by the bearing of pin 5' within the cradle 8'.

When the arm 8, 8' reaches the vertical again and immediately afterwards, the wheel 5 takes up again its bearing on the level, on rail 2', and starts its rolling along the same, while the arm 8, 8' continuing its rotation in clockwise direction frees the cradle-like end 8' from engagement with pin 5'.

The operation takes place in the opposite sense — with arm 8, 8' rotating in anticlockwise direction — when platforms must be transferred from the lower rail 2' to the upper rail 2.

Since generally the semicircular rail 9 implies a run of different length from and generally greater than the width of a platform, and since on the other hand it is necessary to ensure that said run is covered in a time equal to the time required by a platform to run on a track for a length equal to the width of the platform, (so that a second platform is ready to be taken up by arm 8, 8' from a first track when a first platform is abandoned by arm 8, 8' on a second track), it is obvious that the speed along rail 9 must be different from and generally higher than the speed along the tracks.

In order to avoid the higher peripheric speed of arm 8, 8' being attained instantaneously by platforms P at the moment when they are taken up from the rails 2, there are provided acceleration levers 10.

The said levers 10 are rotated around their respective pivots 10' by motor means, not shown, if desired by the same gearing 7' which was previously described; said levers can engage, by their fork ends, alternatively pins 3'-5' or 4'-5' of platforms P, in order to impart an acceleration movement to the platforms themselves, until their speed is equal to the speed along rail 9.

When on the contrary the platforms are abandoned by the arm 8, 8', the operation takes place in the opposite direction and the levers 10 perform the function of deceleration.

On the opposite side of the apparatus there are provided rails 1, 1' as shown in FIG. 1. At each end of said rails there are provided — instead of a single double arm 8, 8' — two separate double arms, respectively 12, 12' and 13, 13', which rotate in perfect synchronism with the arm 8, 8'. The parallel horizontal rotating axes of said arms are spaced by an amount just greater than the length of one single arm, viz., than the radius of the circumference covered by the platform bearing points during their transfer.

In correspondence with the outer arm 12, 12' there is provided, similarly to rail 9, a semicircular rail 14 starting at its upper end from the vertical plane X-X passing through the rotating axis of arm 12, and at a level just above rail 1, said rail 14 connecting at its lower end to the rail 1', again at the intersection with the said vertical plane X-X.

Against the said rail 14 bears the outer wheel 3 of platform P (see right-hand side of FIG. 1) at the moment of the transfer.

The rail 1, different from what happens for rail 2 on the other side of the apparatus, ends much before the starting position of rail 14, and precisely at the intersection with the vertical plane Y-Y passing through the rotating axis of the inner arm 13, 13'.

Between plane Y-Y and plane X-X — in order to support the wheel 3 which must be adapted to roll horizontally up to plane X-X, as described hereunder — there is provided an oscillating rail section or switch 15.

The said switch comprises a rail section 15' normally aligned with rail 1, and an oblique section 15'' integral with each other; said sections 15' - 15'' are moreover adapted to oscillate around a fixed pivot (not represented).
Thus, the wheel 3, which slides along rail 1 from left to right in FIG. 1 can proceed beyond plane Y-Y bearing against section 15"; continuing its movement, it reaches section 15'" and thanks to its weight makes the switch 15 oscillate in clockwise direction, then lifting the free end of section 15 well above the rail 1. (See the position shown on the left of FIG. 1).

The wheel 4 of the same platform arriving at that moment, ends its horizontal run on plane Y-Y. The position in which the axis of wheel 3 is on plane X-X and the axis of wheel 4 is on plane Y-Y, corresponds to the position in which the arms 12, 12' and 13, 13' are vertical, ready to support the wheels 3 and 4 respectively.

From this position, with a rotation in clockwise direction of the arms 12, 12' and 13, 13', there is effected the transfer of the platform from the upper rail 1 to the lower rail 1'.

During the first part of this rotation, along an arc less than 90°, the support of the platform P is ensured by the bearing of the pins 3, 4, 5 of the wheels 3, 4 and 5 on the cradle-like ends of the arms 12, 13 and 8, and by the contact of wheels 3 and 5 against the arched rails 14 and 9.

During the second part of the rotation, when the platform is at a level below the rotating axes of the arms 12 and 13, after a rotation over and beyond 90°, besides the bearing of the wheel 3 against the rail 14, there is also a bearing of the wheel 4 against the rail section 16.

Also this latter is arched and has its centre on the rotating axis of arm 13.

The rail 16 begins near the central zone of arm 12, 12', as it is better described hereunder, and ends as a mobile section 17 having a function of a switch, similar to switch 15. When the wheel 4 of the platform P during the descent comes into contact with and bears against the switch 17, it tends to make the switch 17 rotate in anticlockwise direction, until it is in the position shown on the left of FIG. 1, in which the switch forms the natural prolongation of the rail 16, up to joining with the lower rail 1'.

In this position the back part 17'" of the switch is lifted in such a way as to permit passing below the wheel 3 sliding down along rail 14.

When the movement takes place in the opposite direction — during transfer of the platform from the lower rail to the upper rail — the wheel 3 first of all bears against the said part 17" of the switch (see right-hand side of FIG. 1) moving from left to right in the drawing, and makes the switch itself rotate in anticlockwise direction in order to cause part 17' to form a prolongation of rail 16 and a lifting ramp for wheel 4.

In its thicker central part, in which there is also provided its rotation pivot, the arm 12, 12' is provided with two arched slots 18, 19 within which the wheel 4 is alternatively engaged.

The engagement takes place in the slot which is, in turn, located in the inner side with respect to the rotating axis, and fulfills two main functions: on one hand at the crossing of the two arms 12', 13 (or 12, 13'), which rotate on briefly spaced apart vertical planes, the slot 18 (or respectively 19) permits the passage of the wheel 4 (or respectively 3, at the other head of the plant) which run, as is necessary, in the same vertical plane as the wheel 3 (or respectively 4), and on the other hand it provides a transverse support for the wheel 4 (or respectively 3) just in the particularly critical zone close to a 90° angle of rotation.

Of course the curved shape of slots 18, 19 is designed to take into consideration not only the curved path covered by wheel 4 but also the fact that the slots themselves rotate, together with the arm 12, 12', in synchronism with wheel 4.

As a result, the slots 18, 19, in the position in which wheel 4 is engaged therewith, are arched in a direction opposite to the path of the wheel 4 itself, as shown for instance for slot 18 on the right-hand side of FIG. 1.

Thanks to the features of this apparatus, which permits the use of relatively narrow platforms, as said above, with respect to the vertical extent of the articles, viz. with respect to the vertical distance between upper and lower rails proportioned to the size of the articles themselves, it is possible to provide intermediate stopping positions also on the transfer arched runs; this can facilitate on the one hand the loading and unloading operations for the transported articles, and on the other it permits availing of a greater number of platforms (an extra one for each end of the apparatus) for a given length.

It is of course to be understood that the invention is not limited to the described embodiment but that other and various embodiments different from the above must be considered as coming within the scope of the present invention.

I claim:

1. In apparatus for the transport and/or storage of articles, comprising first and second superposed horizontal parallel tracks, each track comprising a pair of rails, a first plurality of platforms mounted for movement on said first track in contact with each other, a second plurality of platforms mounted for movement on said second track in contact with each other, means for moving said platforms along said first track in one direction and along said second track in the opposite direction, and transfer means at the ends of said tracks for transferring said platforms from one track to the other, said transfer means comprising, on each side of the track, at least a transferring double arm mounted for rotation about a horizontal axis between said first and second tracks, the ends of said double arms having means to engage and carry away from said tracks one platform for every 180° of rotation of said double arms; the improvement in which each platform comprises two support wheels on one side, said wheels being mounted on projecting pins fixed to said one side of the platform, said wheels rolling on one of the two rails of a said track, there being two said transferring double arms on said one side of the platform, means mounting said two transferring double arms for rotation about parallel horizontal axes spaced apart a distance substantially less than the total length of a said double arm, one of said two double arms having a passageway therein through which a wheel of a said platform passes during transfer of said platform by said two double arms thereby to avoid interference between said one double arm and the wheels of the platform.

2. Apparatus as claimed in claim 1, said axes being spaced from each other a distance just greater than the radius of a double said arm.

3. Apparatus as claimed in claim 1, there being two double arms adjacent one side of the platforms and only a single double arm adjacent the other side of the platforms, said single double arm rotating about a hori-
7. Zontal axis which is intermediate the axes of said two double arms, there being only three wheels on a said platform, two on said one side and one on the other side, said wheels having the same horizontal spacing as said axes.

4. Apparatus as claimed in claim 1, there being two said passageways in one of said two double arms, said passageways comprising arched slots.

5. Apparatus as claimed in claim 4, said arched slots being concave and opening toward each other on opposite sides of said axis of said one double arm.

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