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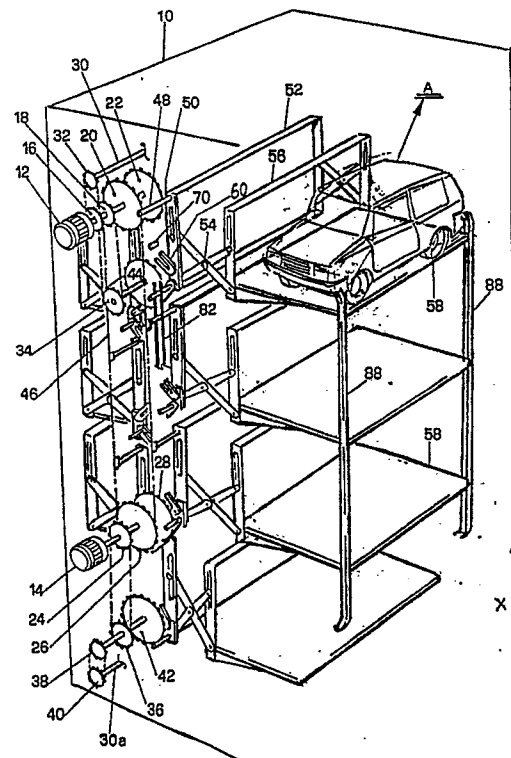
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54 **Automated plant for parking a large number of motor cars supported by single loading platforms.**

57 Automated plant for parking motor cars, singularly supported by corresponding loading platforms, comprising a load bearing structure associated to a kinematic complex capable of activating, along an annular track and in a closed cycle, various platforms which, at prefixed points of the track, are subjected to translation movement and stopping, if required, for the loading and/or unloading of single motor cars, in order to park in a limited space, a considerable number of motor cars, corresponding to the number of the platforms constituting the plant.

FIG.1



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AUTOMATED PLANT FOR PARKING A LARGE NUMBER OF MOTOR CARS SUPPORTED BY SINGLE LOADING PLATFORMS

The problem of parking privately owned motor cars which block the streets in urban centres, even invading the pavements, is becoming day by day increasingly serious. It is known that in order to resolve this problem and the difficulties encountered by public and private means, in some cases multistorey car parks have been built in which single spaces are provided for the temporary parking particularly of motor cars. This solution has not been widely enough used as said multistorey parks involve high building costs for the structures and because they take up too much space in proportion to the volume of cars parked.

The main purpose of the invention is to construct a mechanical and automatic plant for loading/unloading and the parking of a large number of motor cars, characterised by the fact that the ratio between the volume of space occupied by the plant and the total volume of motor cars parked is such that maximum utilisation of the space occupied is achieved.

A further characteristic of the plant is the fact that said plant can be used rapidly using, where possible, spaces corresponding to apartment block courtyards; empty spaces such as cellars and below cellar basements present in many buildings in old city centres.

The plant can be advantageously constructed on limited free areas in that its capacity is in proportion to its development in height.

The plant according to the invention can furthermore be set horizontally and develop, where possible, longitudinally thereby using up spaces that are relatively long and narrow.

In view of the above mentioned purposes and possibilities the plant according to the invention is characterised by the fact that it comprises a metal load bearing framework for the structure which is substantially parallelepiped on the sides opposite which the kinematic means for anular raising/lowering cycle are mounted; a plurality of platforms, each of which is able to carry one motor car or similar vehicle, or any other load. Each platform in upward movement with respect to a side of the bearing framework, when it reaches the top of same, is subjected to translation movement by means of which it is transferred to the downward branch of the plant; electromechanic and electronic means for the activation of the programming and control are foreseen so that each platform entering the plant, whether loaded or unloaded, can be recalled to the loading/unloading base at any moment.

Detailed characteristics of the plant are de-

scribed below with reference to the attached drawings, in which:

- Figure 1 is an axonometric view of the complete plant;
- 5 - Figure 2, on a different scale, illustrates some mechanical parts relating to a side of the plant in one of the movement phases; said particulars are symmetrically repeated on the parallel and opposite side of the plant;
- 10 - Figure 3 is a lateral view of some of the organs which support a platform during the translation phases;
- Figure 4 illustrates, in detail some kinematic organs which are part of Figure 2;
- 15 - Figure 5 is a front view of half of the plant, the other half of which, not illustrated, is symmetric and equal;
- Figure 6 is a side view, simplified and schematic, of some of the mechanical organs shows in Figures 4, 5 and 8;
- 20 - Figure 7, similar to Figure 1, shows a variant relating of the support points of the loading platforms;
- Figure 8, similar to Figure 3, refers to the variant in Figure 7;
- 25 - Figure 9 is a perspective view of a mechanism that integrates the variant of the plant illustrated in Figure 7 for the loading/unloading of the motor cars.
- 30 - Figure 10 is an axonometric and partial view of one variant of kinematic means of which to Figure 4.

With reference to Figure 1, the plant comprises a framework, preferably made of a suitable metal structure, substantially parallelepiped, schematically illustrated and indicated by 10, within and with respect to which motor organs 13, 14 are mounted, connected to corresponding shafts fixed to chain wheels 16, 18, 20, 22 and, respectively 24, 26, 28. A shaft 30, fixed to a chain wheel 32, runs transversely along the plant and, on the opposite side, not in view, is fixed to an identical wheel (32) which is part of a group of kinematic organs, identical to the wheel shown.

45 The wheel 20, by means of the chain 46, Figure 1, is coupled to the cogged wheel 26. In the interspaces between the cogs on the wheel 22, antifriction bearings are periodically engaged coaxial to the pins 48 formed by the extension of some of the pins of the links of the corresponding chain 46; said bearings are borne by arms 50 hinged on to the top of each side of each framework 52 of each platform 58, Figures 1, 2, 4, 5. The wheel 18, by means of another chain, is coupled to

the wheel 34. The wheel 16, by means of a corresponding chain, is coupled to the wheel 32 which transmits the angular movement to the shaft 30. The wheels 20, 26 connected by chain, are activated by motors 12, 14 coupled in electric shaft. The wheel 24 is coupled to the wheel 36 by means of a chain, said wheel, through the wheel 38, fixed to the same shaft, transmits motion to the wheel 40, Figure 1. The wheel 44 is fixed to the same shaft as the wheel 34. The wheels 32, 40, through the corresponding shafts 30, 30a, transmit motion to the group, not illustrated, which is identical and symmetric to that shown, mounted on the opposite side of the plant.

Some pins 48 of the links of the chain 46, Figure 4, as already mentioned, present extensions 50 fixed to the opposite sides 52a of each framework 52. Each framework 52, by means of levers 72, 74, articulated in 54, is connected to couples of upright columns 56 which support single platforms 58, Figures 3, 8. On the bottom, opposite sides of each framework 52, a mechanism is mounted, comprising a couple of forks 60, 62 fixed to pinions 64, 66, always attached. The two identical mechanisms, situated on the opposite sides of each platform, are fixed by means of the common shaft 68. Pins 70, 70a, Figures 2 and 5, are fixed to the main framework of the structure of the plant and interfere, respectively, the pin 70 with the fork 60 and the pin 70a with the fork 62, as described below. The arm 72, articulated in 54, is made up of two branches fixed to each other, lying on decks parallel to the lying position deck of the arm 74 to be found between the two branches of the arm 72. An antifriction bearing is mounted in correspondence with the articulation point 54. The upper extremities of the arms 72, 74 are engaged by linking up in corresponding holes 76, 78 made in the uprights of each framework 52 and in the uprights 56 fixed to each platform 58. The lower extremities of the couples of arms 72 are hinged rotating, by a connected shaft 80 and respect to the lower extremities of the opposite side uprights 56, and bear a platform 58, Figure 2.

Guides 82, Figures 4, 6, in a lengthened ring shape, are arranged on the opposite sides of the plant. Said guides, suitably grooved, engage rolling bearings 84, 86 borne by the shaft 50 and, respectively, by the shaft 68. In figure 1, for greater clarity, only one section of the guide 82 is illustrated, one of said guides being illustrated in a complete view in Figure 6

One or more of the front guides 88, Figures 1 and 7, engage corresponding sliding means which are to be found on the front edge of each platform 58.

Taking into account that each plant comprises a number of platforms in proportion to its height

and that between one platform and another, a distance sufficient to contain, with an adequate margin, the height of the highest possible vehicle that can be loaded is fixed, the plant functions as follows:

Each motor car to be parked will occupy one of the platforms 58. Two distinct possibilities are taken into consideration for loading and/or unloading each single motor car:

If, according to the laws in force, the driver is permitted to directly load his own vehicle, the moving car is placed directly on the lowest platform, situated at ground level of the plant which is in a non-working condition, while its wheels are blocked onto the deck of the platform by known means, not illustrated.

Should the laws in force not permit the driver to load his own car, the entrance of the plant is provided with premises containing loading equipment, as shown in Figure 9. Said equipment, situated at the front of the plant, comprises a mobile truck 92 on a track 94. Known means, not illustrated, are provided for activating the truck 92, in the two directions indicated by the arrows -Y-.

Said truck is provided with four forks indicated by 96, 98, 100, 102, the running being individually controlled in the two transverse directions with respect to the supporting beam 104, mobile on a vertical plane, this also in both directions, thanks for example, to the use of an electric motor and known transmission means.

The motor car to be parked, indicated by -A-, is brought to the front of the platform 58, transversely astride the forks on the equipment as per Figure 9, until the front or back tyres of the wheels, i.e. in forward gear or in reverse, meet the fork 102 against which it stops. The driver puts the hand brake on and leaves the car. The fork 100 is moved right up against the tyres, already stopped by the fork 102, in a moderately raised position with respect to the others. In sequence, the forks 96, 98 are moved up until they block the second couple of wheels, the front wheels in the case illustrated by Figure 9. The motor car blocked in this way by the four forks is slightly raised so as to allow its wheels to be deposited on the platform 58 which is in a waiting position. Subsequently, the truck 92 moves forward until the motor car -A- is positioned on the centre of the platform 58, where it is deposited, and by inverse movements, frees the wheels and withdraws. The loaded motor car is automatically blocked on the corresponding platform by known means, not illustrated. As other motor cars have to be parked, the plant is activated by means of the motors 12, 14. Supposing the upward movement of the plant is as indicated by the arrows -X- in Figures 1 to 7, the activation of the wheels 20, 26 - 34, 36, and the corresponding

chains, causes the loaded platform 58 to be raised until the following platform is brought into a position corresponding to the loading level.

The activation of the plant determines the upward and sequential movement of the various platforms 58 linked to the chain 46. The platform in the highest position with respect to the top of the plant, whether it is loaded or not, brings its fork from the position shown in Figure 2 to the position shown in Figure 3, i.e. to interfere with the fixed pin 70. The angular movement forced on said fork by said pin, illustrated in Figure 3, through the pinions 64, 66, Figure 2, is transmitted to the fork 62 and through this, to the fixed shaft 68 and to the arm 74 of the articulation 54. The angular movement of the shaft 68 causes the contraction of the pantographic articulation constituted by the arms 72, 74 and the translation movement of the framework 56 and the relative platform 58. The range of said movement is in proportion to the ratio established between the length of the lever constituted by the fork 60 and the length of the pantographic levers 72, 74. The framework 52 takes up the positions sequentially indicated by 52a, 52b in Figure 3, set by the movement of the chain 46, connected to the pin 48-50, which engages to the cogged wheel 22. At the same time, the opposite extremities of the shaft 68, provided with bearings 86, sliding in corresponding guides 82, engaging with the corresponding wheels 44, fit into the relative deviations 82a, referred to the opposite sides of the plant, passing from the position illustrated in Figure 4 to the position illustrated in Figure 6. Should the rollers 84 and 86 be drawn by the downward arc of the cogged wheels 22 and 44 from the radial zenithal position illustrated in Figure 6, the angular movement forced on the fork 60 by the fixed pin 70, as illustrated in Figure 3, forces the framework 56 to effect a translation movement which brings the platform 58, at the top of the plant and from the position indicated by -B-, to the position indicated by -C- in Figure 3. The bearing 84', drawn by the chain 46, descends along the guide 82, Figure 4, until it reaches the bottom of the plant and until the fork 62 engages with the lower fixed pin 70a, Figure 5, which forces the said fork and the pinions 64, 66 to effect an angular movement, together with the shaft 68, in the opposition direction to the movement effected when the corresponding platform had reached the top of the plant. Said movement takes the platform back from the position indicated by -C- to the position indicated by -B- in Figure 3, the loading/unloading position.

On request, both for loading and unloading, the equipment described and illustrated in Figure 9 can be used.

From the previous description, it is clear that for the loading and unloading operations, no preclu-

sions exist as long as said operations are carried out, indifferently, on the one or the other side of the plant.

According to the construction variant illustrated in Figure 8, with no alteration to the general characteristics and the functioning of the plant, each platform 58, instead of being entirely supported overhung by the couple of levers 56, is fixed in a balanced position with respect to same.

Obviously the plant according to the invention, as well as being orientated and developed vertically, can easily be adapted by modifications to the construction, to be used in suitable pits with longitudinal development, with loading and unloading means at ground level.

The use of the plant on a horizontal axis, as illustrated in Figures 5 and 6, as previously stated is advantageous in all cases where space in an upward direction is not available but where downward and sideways space is available. Such cases are frequently to be found in apartment block courtyards in buildings situated in old city centres.

According to a structural variant of the kinematic means relating to the particulars illustrated in Figure 4, it is advantageous to use the means described below and schematically illustrated in Figure 10.

According to said variant, in place of the anular guide 82, foreseen for both the sides of the framework, roller racks 110 are mounted, having a substantially anular shape which engage chain wheels 111 fixed to the shaft 112, provided with opposite extensions 113 which, with the end roller 114 in the positions of maximum ascent and maximum descent of each platform 58 are engaged by the cogged wheels 115, respectively 116, and are drawn into rotation. In place of the fork organs 60, 62, a hollow shaft 117 is mounted rotating on the shaft 112 to which the element 118 is fixed, said element being provided with three forked branches arranged at 120° each one with respect the other. The cogged wheel 66 is fixed to the hollow shaft 117 (Figure 2), always attached with a second cogged wheel 64 which transmits angular motion to the lever 74, Figure 3, articulated in 54 to the lever 72. Said couples of levers, mounted on the sides of each platform 58, are activated by the element 118 when said element, in the upward or downward run of each platform, reaches a position prefixed to interfere with one of the two forks in the upper pin 70 or the lower pin 70a, and forces translation movement on the corresponding platform on the horizontal plant which brings said platform to take up a position corresponding to the symmetrical and opposite angle depending on when the translation movement began, with respect to the vertical axis connecting the pins 70, 70a.

The side guides 88 (Figure 7), in the upper and

lower horizontal portions, involved in the translation movement of each platform, take on an elliptical configuration.

The fixed rack 110 is interrupted, at a prefixed point in 110a, Figure 10, in order to allow the shaft to cross its branches when the upward or downward movement of each platform is in reverse. The interruption 110a has an inferior width than the inside length of the cogs in the cogged wheels 111 so that these can overcome said interruption while maintaining attachment to the pins of the rack 110.

The advantages of the variant as per Figure 10 derive mainly from the fact that the support group for each platform is constantly engaged along the racks 110, on both sides of the plant, with synchronous movements and for the entire run.

The plant described above is completed by electric and electronic means which permit programming and completed automated functioning.

Claims

1. Automated plant for parking a large number of motor cars, supported by superimposed, single, mobile platforms (58), characterised by the fact that it comprises a load bearing framework (10), substantially tower shaped, on the two opposite sides of which kinematic organs are mounted comprising motors (12, 14) electrically coupled; chain wheels (16, 18, 20, 22) fixed to the common motor shaft (12); chain wheels (24, 26, 28) fixed to the common motor shaft (14); anular chains (46) connecting the wheels (20, 26); mobile frameworks (52), each one associated by means of pantographic articulations (72, 74), and frameworks (56) for single platforms (58), each one provided with end-of-run translators-inverters for the upward or downward movement, co-operating with fixed pins (70, 70a); furthermore characterised by the fact that each framework (52) is provided with symmetrical and protruding shafts (50) at the top of the opposite sides, engaged in anular guides (82), engaging with wheels (22), fixed to pins originating from the chain (46), of which said shafts (so) constitute the axial extension; furthermore characterised by the fact that the plant is integrated by loading/unloading equipment for the motor cars to be parked.

2. Plant according to Claim 1, according to a structural variant (Figure 10), characterised by the fact that each platform (58) is provided on its lower part with a shaft (112) having opposite extensions (113) terminally provided with rollers (114) drawn by cogged wheels (115, 116); said shaft being fixed to cogged wheels (111) constantly engaging a fixed pin rack (110) in order to conserve the constant position of each platform in movement during the horizontal translation of each one for which organs

(118) are provided made up of three forks at 1200 the one from the other fixed to a hollow shaft (118) and co-operating with the cogged wheels (66, 64).

3. Plant according to Claim 1, characterised by the fact that it comprises equipment for loading/unloading the motor cars (A), on any one of the platforms (58), comprising a truck (92) mounted on tracks (94), provided with four forks (96, 98, 100, 102) which can be controlled to move in both directions, on a horizontal plant; said forks supported by a beam (104) constituting part of the truck with respect to which said beam is mobile, on a vertical plant, in both directions; the truck (92) is provided with a motor (106) which is able to raise a motor car, suitably positioned with respect to said forks, and deposit it on one of the loading platforms (58) which constitute part of the plant.

4. Plant according to Claim 1, characterised by the fact that sliding means (84, 86) are also engaged in the anular guides (82), symmetric on the opposite sides of the structure, said sliding means being terminally borne by shafts (48, 50) of the framework (52) associated to each platform (58). A shaft (68), mounted in a longitudinal position opposite to the shaft (50), engages with cogged wheels (44), is mounted rotating with respect to the uprights (52a) of the framework (52) and is fixed to one fork (62) of a couple of forks (60, 62) which constitutes part of the translator-inverter mechanism mounted on the sides (52a) of each framework (52).

5. Plant according to Claim 1, characterised by the fact that each translator-inverter mechanism for the movement of each platform (58) comprises a couple of forks (60, 62) fixed to pinions (64, 66), always attached and cooperating, alternately, in the inversion phase of each platform (58), with respect to the load bearing structure, with fixed pins (70, 70a).

6. Plant according to Claims 1 and 3, characterised by the fact that the anular guides (82) are provided with connections (82a) which are engaged by terminal bearings (86) of the shaft (68), which is in turn fixed to opposite forks (62) and pinions (66) of the translator-inverter mechanism, while similar, lower connections (82b - Figure 6) are engaged by the terminal bearings of the shaft (48, so) protruding from the framework (52).

7. Plant according to Claims 1, 3 and 5, characterised by the fact that the shaft (68), guided until it engages with the wheel (44), concentric at the connection (82a), due to:- the action of the cogged wheel (22), engaging with the shaft (50); due to the movement of the shaft (so) engaged to the chain (46) and due to the action of the translator-inverter mechanism (60, 62, 68) and the relative movement forced on the pantographic articulation (52, 54, 56, 72, 74), determines the translation of each platform (58), from one side to the opposite side of the

plant, as long as each platform reaches the top of the said plant.

8. Plant according to Claim 1, characterised by the fact that each framework (52) associated to the movement of the chains (46) is connected to the framework (56) of the corresponding platform by means of a system of pantographic levers of which: levers (72, 74) mutually articulated (54) present one extremity hinged to the uprights (56) that support the corresponding platform (58) and, respectively, to the uprights (52) of the corresponding framework while the opposite extremities of said levers are mounted linked to holes (76, 78) in the uprights (52, 56).

9. Plant according to Claim 1, characterised by the fact that the plurality of platforms (58) is supported protrudingly by the corresponding uprights (52) of the respective frameworks (Figure 1).

10. Plant according to Claim 1, characterised by the fact that the platforms (58), according to a structural variant (Figures 7, 8) are fixed to the uprights (52) in correspondence with their transverse centre line.

11. Plant according to any one of the preceding Claims 1 to 10, characterised by the fact that the platforms (58) are provided with frontal sliding means engaging corresponding guides.

12. Plant for parking motor vehicles, in general, in particular motor cars, according to any of the Claims 1 to 11, according to a variant according to which the load bearing structure (10), instead of developing vertically is developed longitudinally, housed in suitable premises offered by free spaces.

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FIG.1

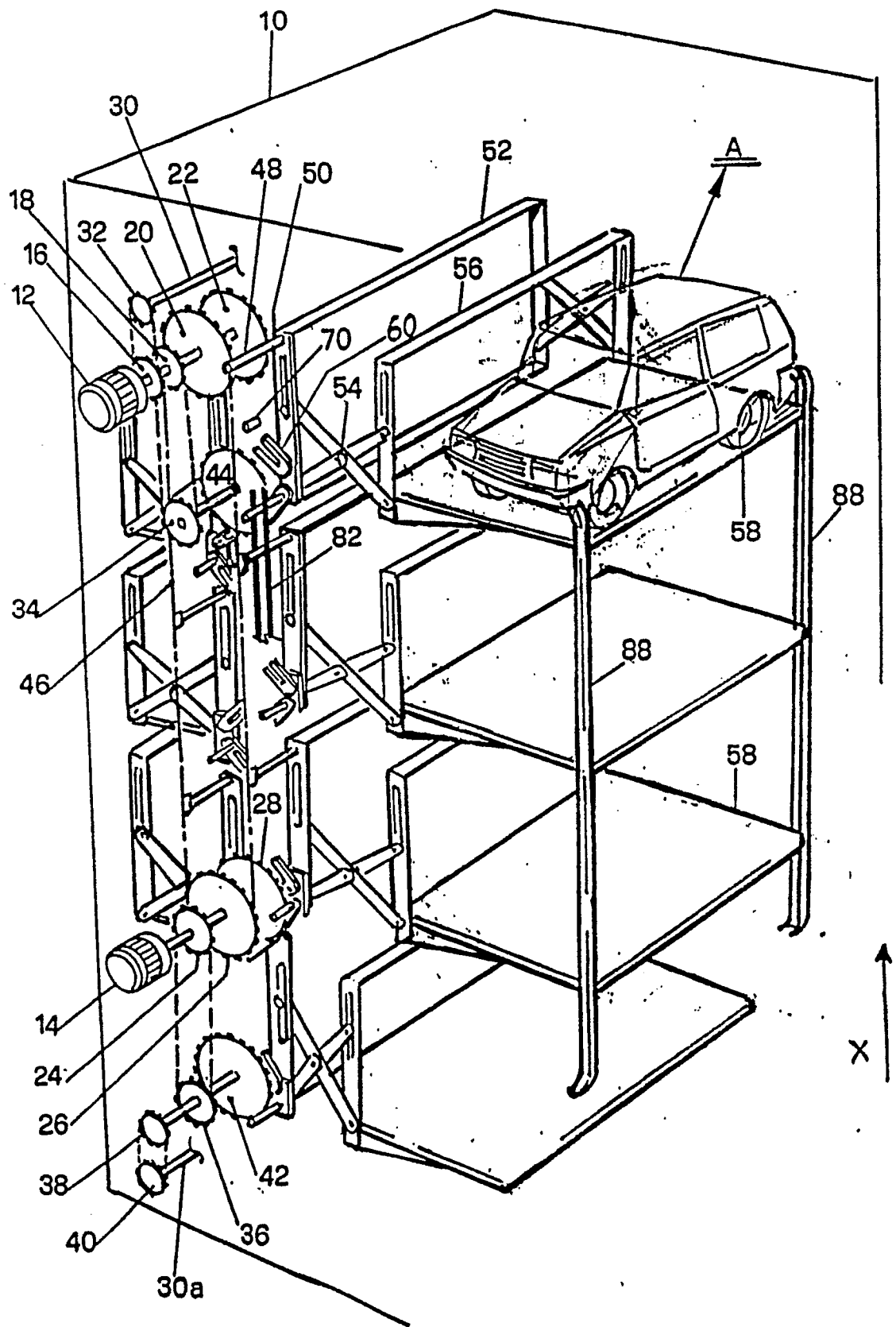


FIG.3

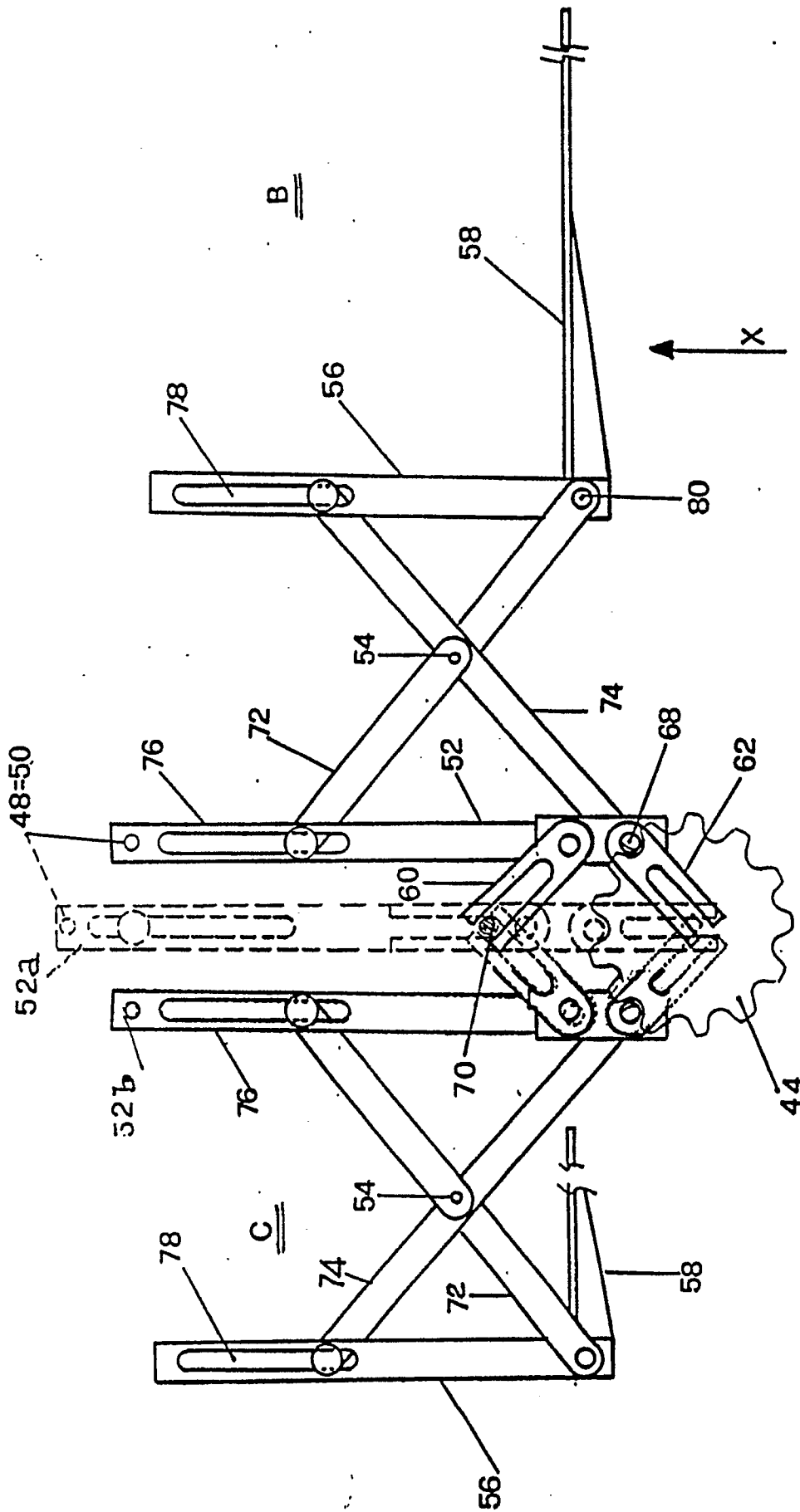
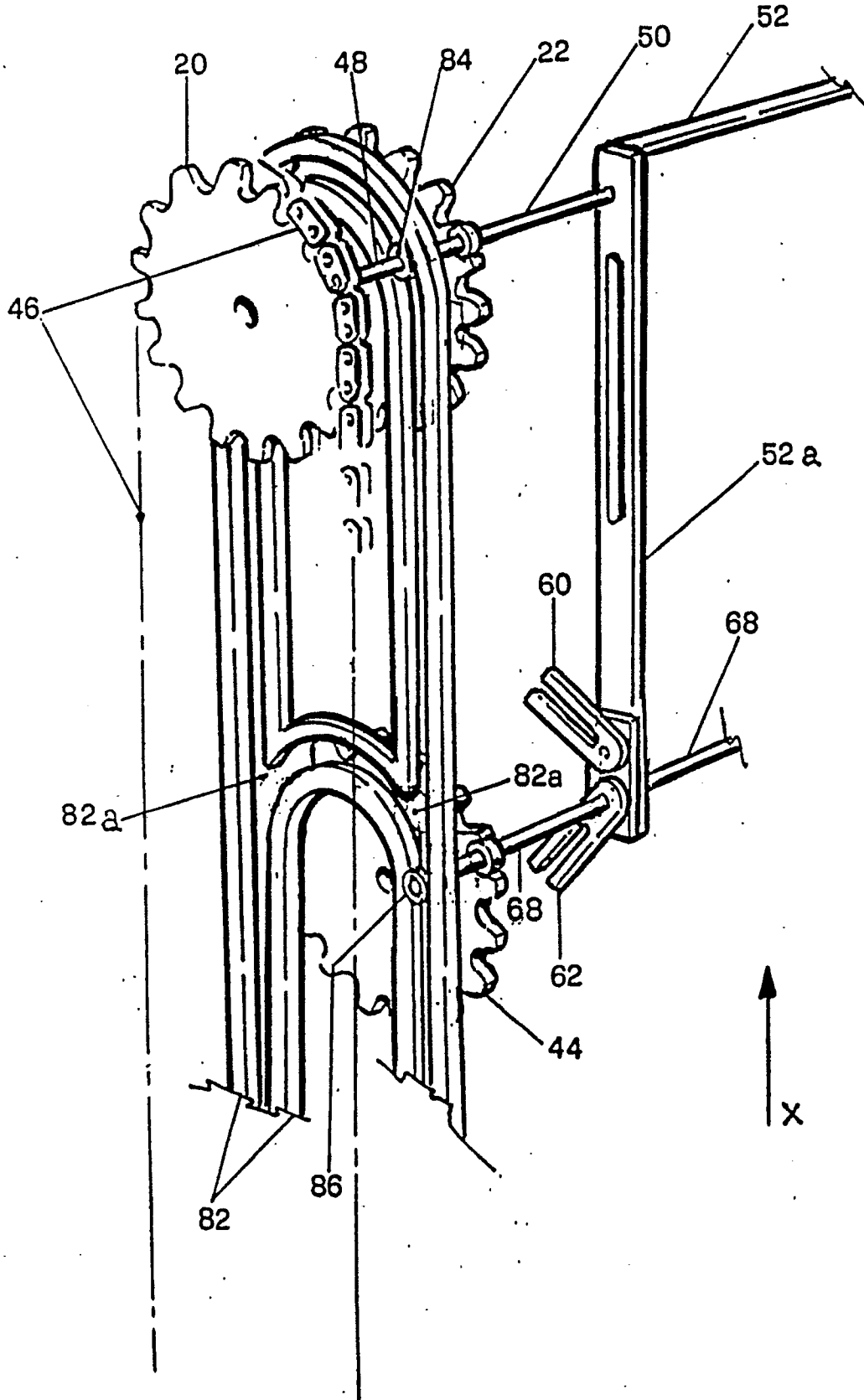


FIG. 4



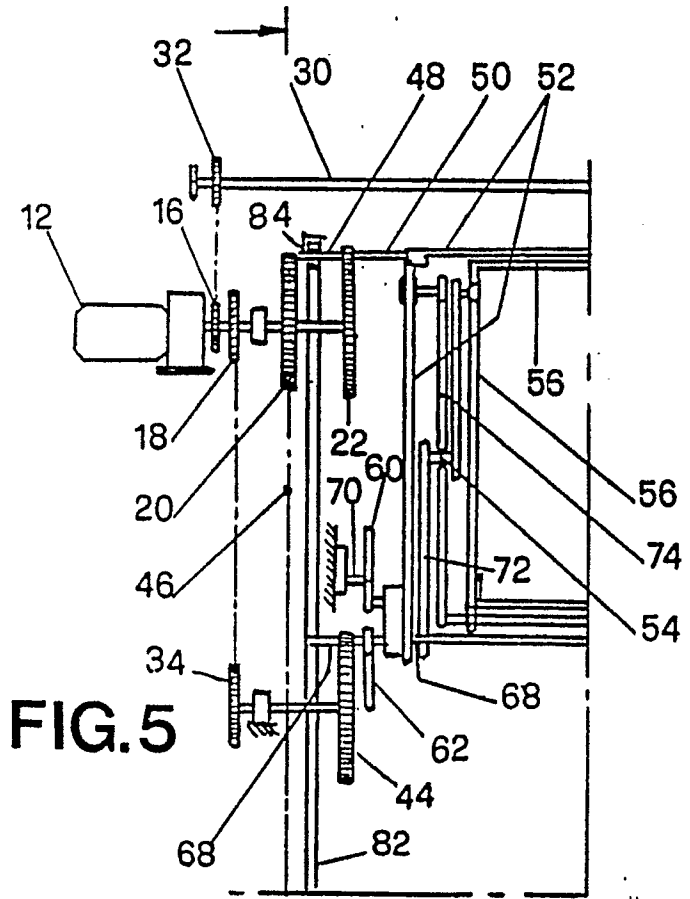


FIG. 5

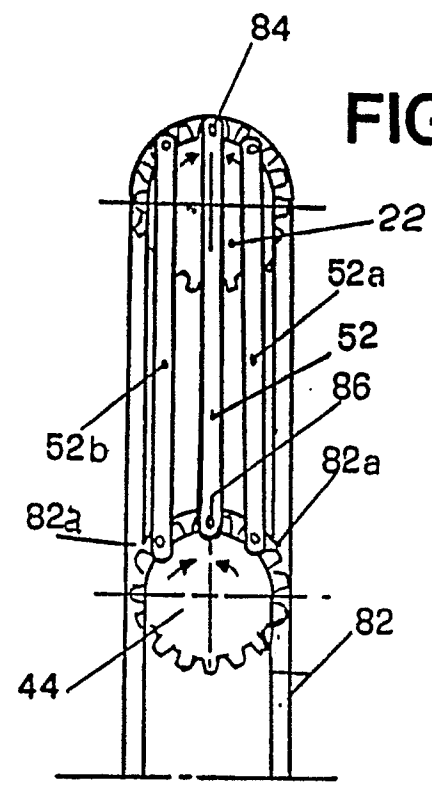


FIG. 6

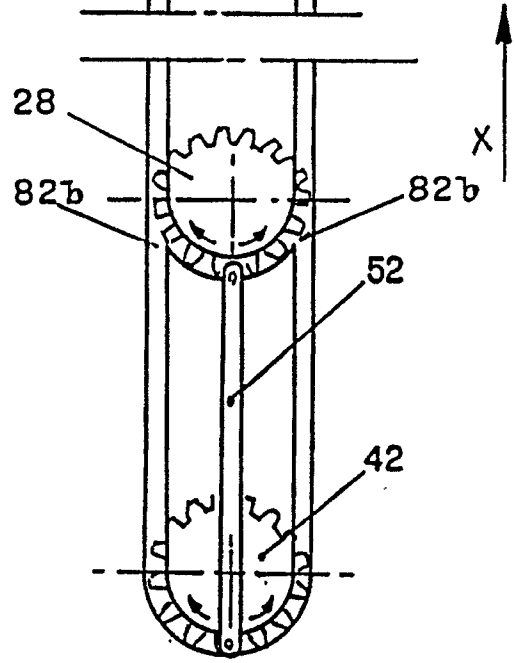
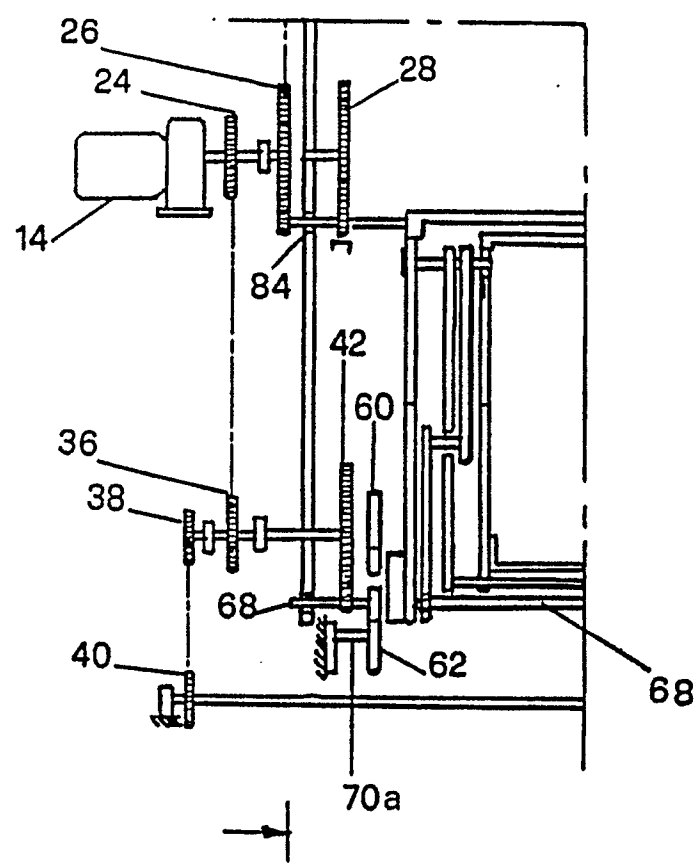


FIG. 7

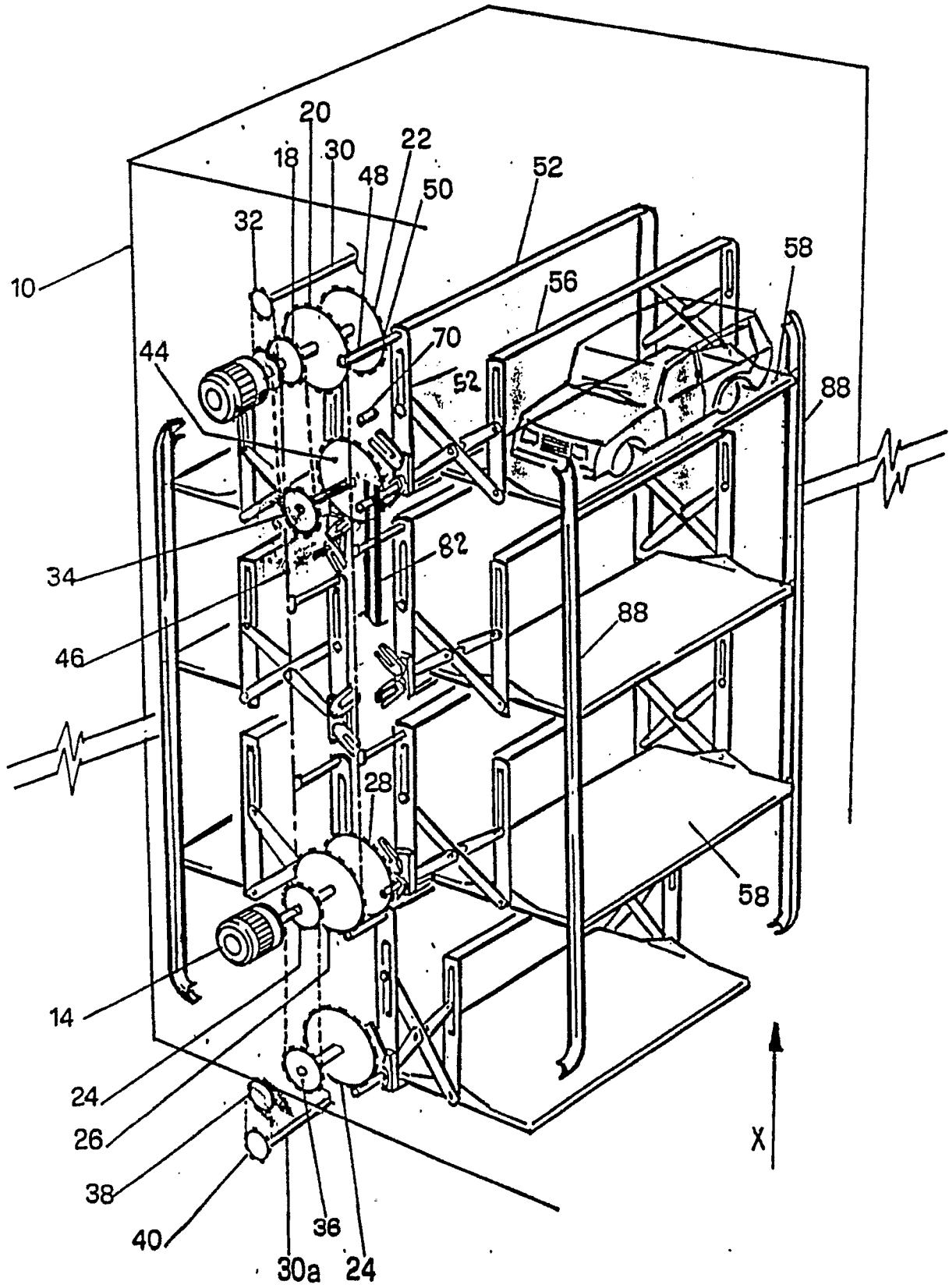


FIG.8

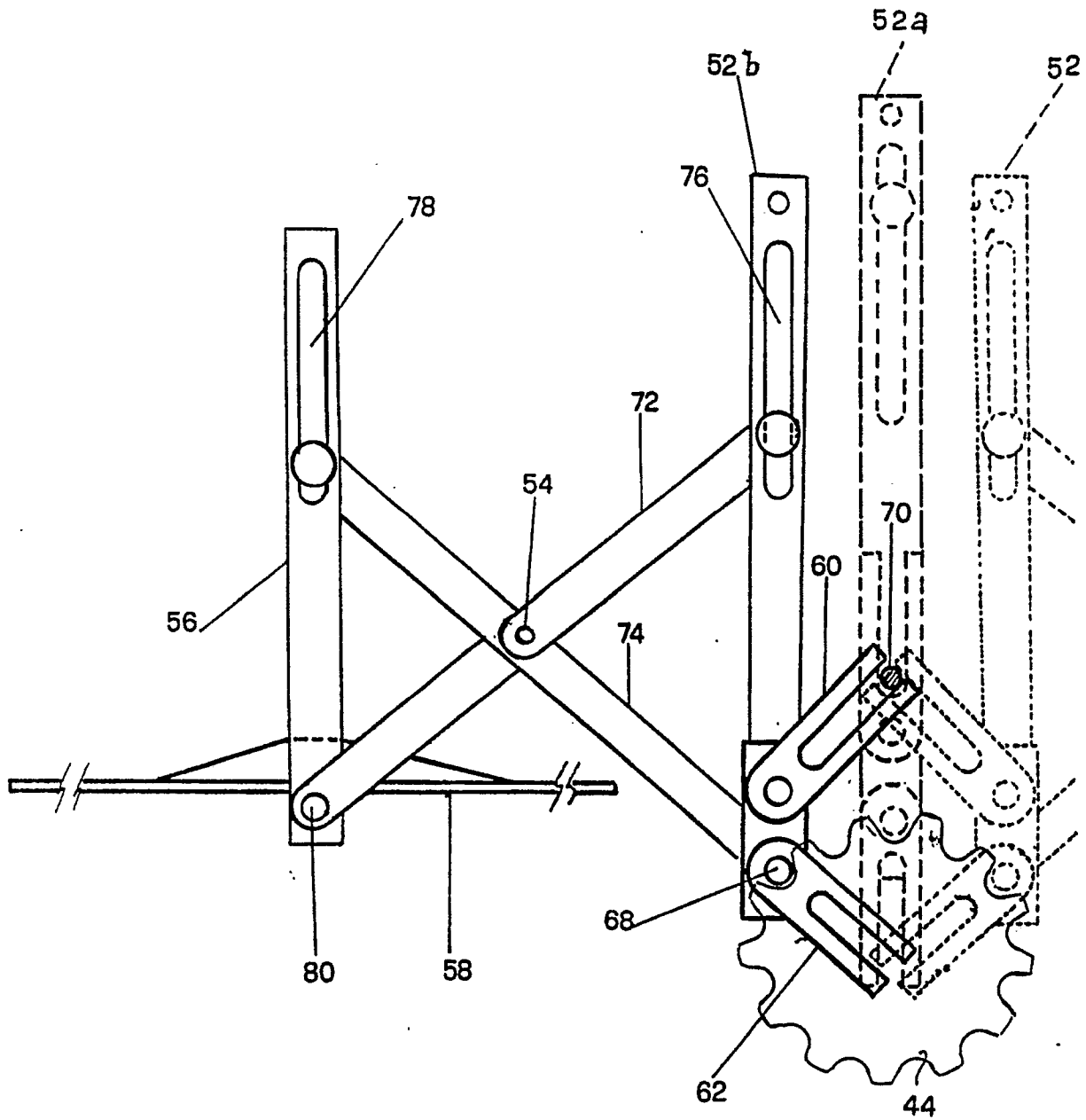


FIG. 9

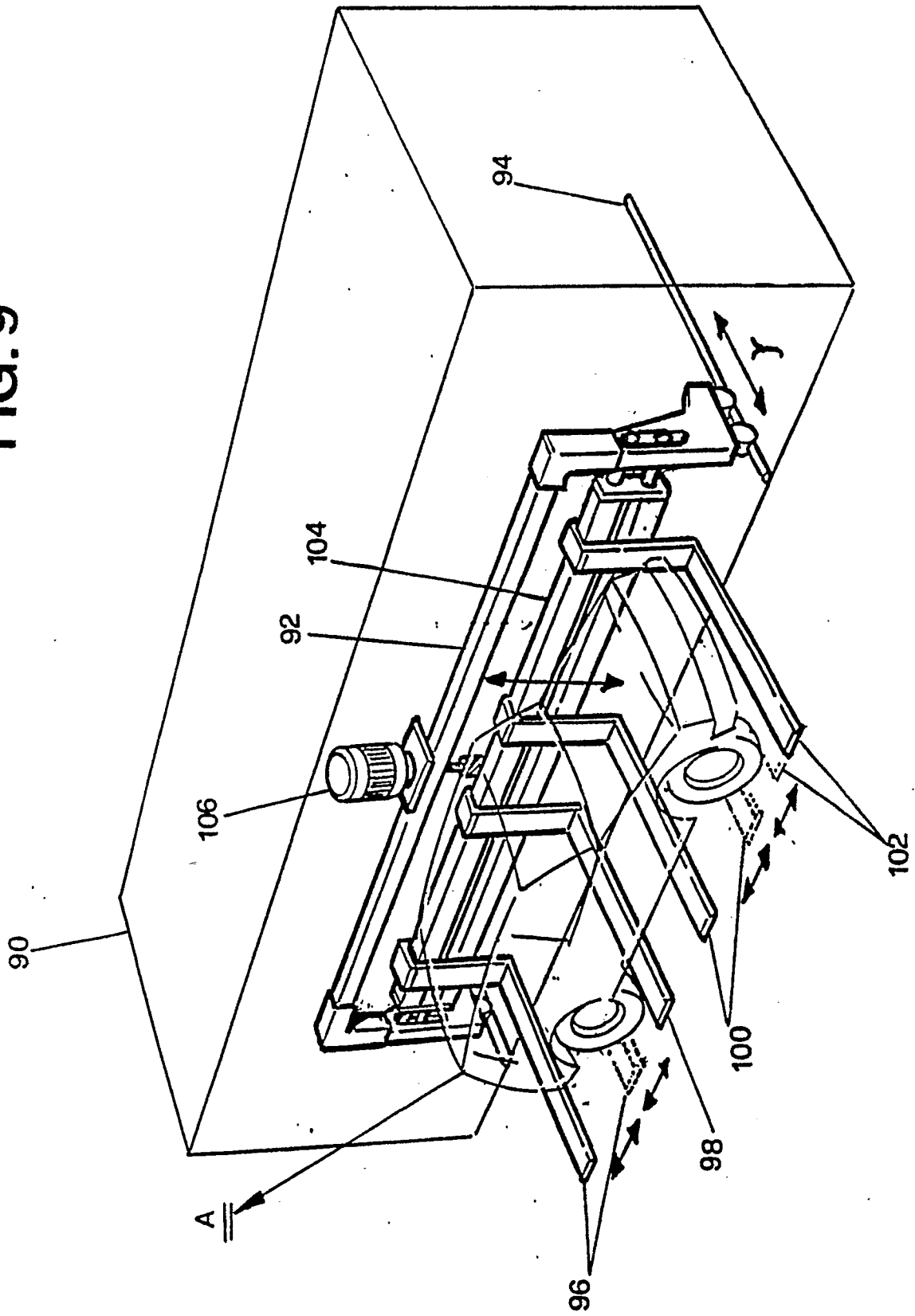


FIG.10

