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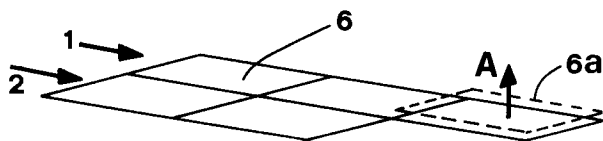
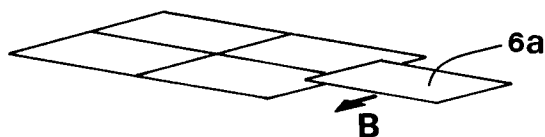
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(54) **Automated apparatus for parking cars.**

(57) The apparatus comprises longitudinal and transvers guides, defining an annular route for a plurality of platforms (6) disposed in two rows (1,2) side by side. One of the row is full, and the other one has a free space for a platform. The platforms are moved along the annular route in either direction, through a

series of lateral and longitudinal translations the platforms, so as to bring either an empty platform, in phase of parking a car, or a platform bearing the car desired, in phase of taking the car back, at a loading-unloading station.

FIG. 1a**FIG. 1b****EP 0 467 868 A2**

The present invention relates to an automated apparatus to park cars in side by side rows, which can be close to one another.

It is known that car parking in built-up areas is a serious problem nowadays.

As a matter of fact, the increasing traffic limitation in wide areas of town centres and the same limitation of parking along the streets involve the need to provide an adequate number of parking areas for cars, both outdoors and indoors.

Outdoor car parks are generally made by delimiting a sufficiently wide area and subdividing its surface into a certain number of single parking places, e.g. rectangular areas defined by lines drawn on the ground.

Such parking places are arranged in side by side rows while parking or taking the car back is allowed through driveways.

In the case of private parkings, parking-places may be provided with means suited to avoid parking for unauthorized vehicles, e.g. slewing pickets suited to be locked in raised position.

Public parkings, on the other hand, are usually provided with parking meters or other similar systems to measure the parking time, for the payment of a fee.

However, town centres have limited space for outdoor car parking, therefore also the number of vehicles which can be parked is limited.

Large outdoor car parks are rather located in suburban areas, e.g. near big business centres or airports. Such car parks bring several problems for the users, however, because of the time required to find a vacant place and to leave the car park after having deposited the car, and because of the time required for subsequently taking the car back.

Furthermore, outdoor car parks do not assure the protection of the vehicle against thefts, damages, and the like. Obviously it is possible to provide for guarded car parks, however with a remarkable increase of costs.

Similar problems arise also in the case of indoor garages, both for private and for public use.

In particular, the limited space available often makes parking operations very difficult.

In particular in public parkings, in order to use all the space available, vehicles are often arranged very close to each other.

Therefore taking a vehicle back involves a remarkable waste of time and requires the assistance of attendants to move other vehicles which obstruct the exit.

On the other hand, the parking of cars in narrow spaces and the need to move them makes it easier to damage them, e.g. because of little shocks.

In order to solve the above-mentioned problems, parking systems were recently concerned

with big research and development.

The aim of this research was to get a more rational use of available space and to make parking operations easier.

The European patent No. 0159297, in the name of the same Applicant, concerns a computerized apparatus which makes it possible to park vehicles on a series of platforms disposed in side by side rows and movable along an annular route.

Such apparatus includes an annular guide, fastened to a base, on which elements are disposed for supporting the platforms at equal distances from each other.

The elements are guided so as to provoke rotation of the platforms along the route.

The platforms are stopped at a station where the vehicles can be loaded on the platforms or unloaded from the platforms, while a bar normally obstruct the access to the loading station.

A programmed electronic unit, activated by the user through a special code, controls the operation of the bar, allowing the access to the park.

One of the objects of the present invention is to provide an automated apparatus which makes it possible to park vehicles quickly in side by side rows with the best use of the space available for parking, however assuring the protection of parked vehicles at the same time.

A further object of this invention is to provide an automated apparatus for car parking obtained through a technical solution which is simple, functional and reliable, as well as of versatile use, of course considering the conformation and dimension of the available space.

The objects mentioned hereinbefore are achieved in accordance with the claims.

The invention will be described further in detail, with reference to the accompanying drawings, wherein:

- Figs. 1a, 1b, 1c, 1d, 1e, and 1f show the various operating phases of the apparatus of the invention;
- Fig. 2 is a partial plan view of a first embodiment of this apparatus;
- Fig. 3 is a cross section according to line III-III of Fig. 2;
- Fig. 4 is a bottom view of the platform shown in Fig. 3;
- Fig. 5 shows detail A of Fig. 4;
- Figs. 6a and 6b are cross sections according to line VI-VI of Fig. 2, of transverse guide means in a lowered position and in a raised position respectively;
- Fig. 7 is a cross section according to line VII-VII of Fig. 2;
- Fig. 8 is a cross section according to line VIII-VIII of Fig. 2;
- Fig. 9 is a plan view of platform drive means;

- Fig. 10 is a partial side view of the drive means of Fig. 9;
- Fig. 11 shows a different embodiment of means for lifting the transverse guides;
- Fig. 12 is a schematic plan view of a portion of a second embodiment of the apparatus;
- Fig. 13 is a front view of a platform in the second embodiment and of relative vertical and transverse translation means;
- Fig. 14 shows a phase of the vertical translation of a platform inside the apparatus;
- Fig. 15 is a cross section according to line XV-XV of Fig. 13;
- Fig. 16 is a cross section according to line XVI-XVI of Fig. 13.
- Fig. 17 is a plan view of a terminal part of the apparatus of the invention.

Referring to Figs. 1 to 11, 1 and 2 designate two rows of platforms 6, disposed side by side, on which the vehicles are to be parked.

The platforms are located between lateral walls 3 which form an enclosure.

The enclosure has an opening 4 made in correspondence with an end of one of the rows of platforms, where there is a station 5 for loading vehicles on the platforms and for unloading vehicles therefrom.

Moreover one of the rows of platforms is shorter than the other, since one platform is missing, so as to leave a space free corresponding to one platform.

Platforms 6 of each row 1, 2 are linked with each other by coupling means 7, shown in detail in Fig. 5.

Such coupling means 7 do not block vertical movement for the platforms, and they are suited to automatically release a platforms 6 from the adjacent one, when this platform is moved vertically, for instance upwardly.

The platform 6 run over longitudinal guide means 8, or longitudinal guides 8, provided along the rows 1 and 2, while transverse guide means 9, or transverse guides 9, are provided at the ends of rows 1 and 2, so as to define an annular route.

The longitudinal guides 8 consist of track sections 10 bearing a plurality of revolving rollers 11 placed with their axes horizontal and transverse to the same track sections.

More precisely, each track section 10 include two channel sections 12, fastened onto a support 13 raised from the base 14 of the parking; the rollers 11 are mounted between the channel sections 12, as shown in Fig. 7.

Two longitudinal ribs 15, formed by sections fastened to the lower surface of each platform (as shown in Fig. 4) rest onto the rollers 11 of the longitudinal guides 8. This lower surface of the platforms is further stiffened by transverse ribs 16,

which are spaced so as they can rest on the transverse guides 9.

Each platform 6 is supported, in rest position, by two pairs of tracks 10.

5 The platforms 6 are also provided with side walls 17, turned downwards, which rest against a series of rollers 18, rotatably mounted, with vertical axes, on the side walls 3 of the parking (Fig. 8); the rollers 18 are preferably supported by shock-absorbing means.

10 A slight outward inclination of the guides 8, supporting the platforms, helps the platform to rest against the rollers 18.

15 The transverse guides 9 are made up of track sections 19, interposed among the tracks 10 of the longitudinal guides 8.

The transverse guide 9 include, like the longitudinal guide 8, pairs of sections 20 which bear a series of revolving rollers 21.

20 The track sections 19 are supported by a frame 22 which is vertically movable between a lowered position and a raised position with respect to the level of the platforms 6 defined by the longitudinal guides 8; this level is indicated by the dashed line 23 in Fig. 6a.

25 The frame 22 can be operated by a lifting device 24 consisting of a double leverage, comprising (see Figs. 6a and 6b) a pair of levers 25a, 25b, symmetrically hinged at one end to the bottom of frame 22 and at the other end to respective slides 26a, 26b.

30 These slides pass through relative sleeves 27a, 27b fastened to the base 14 and located one coaxial in respect of the other.

35 Two cranks 28a, 28b, are respectively linked to the sleeves and hinged to the centre of levers 25a, 25b. The slides 26a, 26b are provided with respective internal thread means 29a, 29b which are coupled with relative threaded sections 30a, 30b, of a shaft 30, which is made to rotate by a geared motor 31. The threaded section 30a, 30b have opposite handed thread.

40 As it is shown in Fig. 2, a geared motor 31 controls the lifting and the lowering of the pair of transverse guides 9 provided at each end of both rows of platform 1, 2.

45 According to a further embodiment, illustrated in Fig. 11, the frame 22 of transverse guides 9 can be lifted by hydraulic means, e.g. consisting of conventional jacks 32 mounted with vertical axis below the same frame.

50 Further track sections 33 are disposed in intermediate position between rows 1 and 2, and aligned with the transverse tracks 19.

55 The track sections 33 are supported by a support 35 in a fixed position corresponding to the raised position of the tracks 19, and rotatably bear series of rollers 34.

The platforms 6 are advanced step-by-step, along the annular route defined by the guides 8 and 9, by a driving device 36.

The driving device 36 comprises a plurality of lined up belts 37, disposed longitudinally in respect of rows 1 and 2, as well as a pair of transverse belts 38 respectively disposed at the ends of the same rows 1 and 2.

Each single belt 37, 38 is wound up on a pair of gear wheels 39 supported with vertical axes; the gear wheels of adjacent belts have a common axis.

The belts 37, 38 are provided with a roller 40, supported with vertical axis and protruding at the top, (Figs. 9 and 10).

The roller 40 engages either a transverse tongue 41 or a longitudinal tongue 42, fastened to the bottom of every platform 6. As it is visible in Fig. 4, the tongues 41 and 42 are disposed offset with respect to median axes of the platform 6.

In this way the roller 40 drives the platform when in the active run, i.e. while it moves along the branch of the belt located in correspondence with the tongue 41 or 42, and finds no interference in the return run, i.e. when it moves along the opposite branch of the belt.

The belts 37, 38 are moved by a geared motor 43 located at one end of each row 1, 2 and acting by interposition of an electromagnetic coupling 44, designed to control the switching between transverse translation or longitudinal advancement of the platforms 6.

The belts 37, 38 are also guided by fixed guides 45, in straight stretches.

The operation of the apparatus will be explained hereinafter, with particular reference to the sequence of operating phases schematically illustrated in Figs. 1a to 1f.

To park the vehicle, the user must drive the vehicle onto the platform 6 located in loading/unloading station 5, of course when the platform is vacant.

It may be useful to provide a movable barrier, which is lifted up to allow the passage of vehicles through the access/exit opening 4 of the parking.

After that the vehicle has been placed on the platform 6, the platform is moved to the raised position 6a, as indicated by arrow A in Fig. 1a. For this purpose, the transverse guides 9 of row 1 underlying the station 5, as well as those adjacent and aligned of the other row 2, are lifted up.

The lifting of transverse guides 9 of both rows is controlled by the relative geared motors 31 which, move the shafts 30 and cause the displacement of slides 26a, 26b of the devices 24.

Thus the levers 25a, 25b, linked to the frame 22 of the guides 9, are moved from a position in which they are lowered (Fig. 6a) to a position in which they are raised (Fig. 6b).

With the levers 25a and 25b in this position, the rollers 21 of the guides 9 protrude over the level 23 of the longitudinal guides 8, as indicated by dashed line 21a.

The lifting of platform 6 loaded at station 5 causes also the automatic release of means 7 which couple it, when it is lowered, to the adjacent platform along row 1.

The lifted platform 6a is then laterally transferred to row 2, as indicated by arrow B in Fig. 1b, sliding on the rollers 21 of the transverse guides 9 of the two rows, both lifted.

In this way the platform being transferred does not interfere with the underlying longitudinal guides 8.

During the transverse translation, the platform with the parked car slides also on rollers 34 of further tracks 33 fixed in a position so as to result raised and located between the two rows, as illustrated in Fig. 7 wherein, for the sake of clarity, the numeral 6a again indicates the position of the platform that is raised.

The displacement of the platform is actuated by the belt 38 of the driving device 36 which, in an active run M, with the roller 40 pushes against the longitudinal tongue 42 of the platform. In the return run M', however, the roller 40 does not interfere with the tongue 42.

The station where the loaded and lifted platform is transferred to, at the beginning of row 2, is empty initially, thus it can be occupied by the platform being moved.

The loaded platform is then brought back to the position 6b where it is lowered, as indicated by arrow C in Fig. 1c.

For this purpose, the lifting device 24 of the transverse guides 9 is reversely operated.

Subsequently, the platforms 6 left in the first row 1 are made to advance in step, as indicated by arrow D in Fig. 1d.

The longitudinal advancement of the platforms of the row 1 is actuated by the belts 37 of the driving device 36 which, similarly to what happens in the transverse translation, push with the roller 40 on the transverse tongue 41 of the platform in the active run M. The operation of a section of the driving device is best illustrated in Fig. 9.

Along the active run N, the roller pushes against the tongue 41 in position 40a, thus starting the drive.

When the roller has reached the deadlock 40b, rolling over the tongue 41, the tongue is left free and the roller goes back along the return run N'; during said return run, the roller does not interfere with the tongue, as indicated by 40c.

In phase of advancement, the platforms 6 slide on rollers 11 of the longitudinal guides 8 and are further guided by the lateral rollers 18, opportunely

dampened.

After the advancement of the platforms of the first row 1, the last platform of the second row 2 is transferred to the station left vacant at the end of the same row 1.

The transfer is carried out according to the phases explained hereinbefore, by lifting the platform to be transferred to the position 6c in which it is raised, then by transversely transferring the platform on the transverse guides 9, and lastly bringing it back to the position in which it is lowered, as indicated by the sequence of arrows E in Fig. 1e.

Finally, the platforms 6 left in the second row 2 are made to advance step-by-step, as indicated by arrow F in Fig. 1f.

The advancement is carried out by the corresponding belts 37 of the driving device 36, in the way illustrated hereinbefore.

At the end of the cycle just described, a vacant platform has been transferred to the loading/unloading station 5, while the station adjacent to the beginning of the row 2 is empty. Thus the apparatus is ready to receive a further vehicle to be parked.

Taking a vehicle back is carried out in a basically similar way. Obviously, in that case the platforms 6 are made to advance step-by-step along the annular route defined by the guides 8 and 9, so as to bring the desired vehicle at station 5.

With reference to the second embodiment (Figs. 12 to 17), the rows 1 and 2 are provided, lengthwise, with respective tracks 104 on which platforms 6 are slideably supported.

At the row ends there are second lateral-translation and guide means schematically designated by numerals 105 and 106 in Fig. 12, disposed transverse to the tracks 104. An annular route is thus defined.

A plurality of wheels 111, attached to the bottom of every platform 103 according to axes horizontally transverse to the same tracks, slidably rest on the tracks 104 (as shown in Fig. 13).

More precisely, each platform is provided with four wheels. As a whole, tracks 104 and wheels 111 make up first longitudinal-translation and guide means.

In an intermediate longitudinal position among the wheels 111, each platform has a plurality of stems 116 (Figs. 12 and 16), transversely assembled all equidistant and parallel to each other, held by an element 119 having the shape of a reversed "U".

Said stems 116 are suited to be engaged by at least a mesh means, e.g. a gear wheel 115 moved by a system of known type, comprising a shaft supported so as to result transverse in respect of the base of the apparatus.

This shaft is moved by a first motor means 145 and by a cardan joint 107 connecting motor and shaft. Two pinions 121 and the gear wheel 115 are keyed on the shaft.

The pinions 121 mesh with relative chains 120 to transmit motion to other pinion-gear wheel groups (Fig. 16), disposed aligned along the rows 1, 2.

Obviously, the number of such pinion-chain groups depends on the quantity of platforms to be moved, and they make up, as a whole, first motorising means of the apparatus.

The lateral-translation and guide means schematically designated by numerals 105 and 106 in Fig. 12, consist of a plurality of rollers 113 and 117 respectively disposed on two parallel rows F1 and F2 opportunely spaced out (Fig. 17).

More precisely, each roller 113 disposed along said row F1 circumferentially has a perimetral race 140 that engages with at least one element 141 (Fig. 15) of complementary shape fastened below each platform 6.

The element 141 is positioned corresponding to the race 140 of each roller 113 (Fig. 15) during the transverse translation of the relative platform. The function of the race 140 and element 141 is to correctly guide the platform during the transverse translation.

On the contrary, the rollers 117 disposed along the row F2 have no races.

The rollers 113 and 117 are motorized; a universal transmission system, schematically illustrated in Fig. 17, has the task of transmitting the motion to shafts 127, 128, 135, 136 which depart in pairs in orthogonal directions from a universal transmission device 132 associated with a second motor means 134.

More precisely, the shafts 135 and 136, by interposition of further universal transmission devices 131, 133, rotate relative pairs of shafts 125, 126 and 129, 130.

The rollers 113 and 117, disposed in correspondence with the rows 1 and 2, are keyed on these pairs of shafts.

On the other hand, the shafts 127, 128 are designed to move the rollers 113, 117 located in intermediate position between the two rows 1, 2 of platforms 6.

As best illustrated in Fig. 17, all the rollers 113 and all the rollers 117 of the same row are connected through a pinion and chain system. Furthermore, on the rows F1 and F2 there are idle rollers 112, 114 placed at the opposite ends of the same rows.

The platforms 6 which are located at the ends of each row 1, 2, and the various guide means 105, 106 connected with them, are subjected to the action of means 11 for vertical translation, lowering

and lifting, e.g. hydraulic jacks.

For vertical translation, a frame 114 for every group of jacks 110 has been provided.

The means 110 and the frame 114 which are located at one of the ends of the rows 1, 2 act independently from the means 110 and frame 114 which are located at the opposite end of the same rows 1,2.

Furthermore, each frame has at least one recess 170, or hollow, (Fig. 13 and 14), made in correspondence with the tracks 104.

The longitudinal dimension of each frame is equal to the length of a platform, while the transverse dimension of each frame is such to cover the the space of both the rows 1 and 2 of platforms.

The frame 114 bears also the rollers 112, 113, 117 and 124.

The operation of the second embodiment of the apparatus is similar to what has been described hereinbefore with regard to the first embodiment.

In fact, when the platform at the station 105 is vacant, and a car is loaded upon it, this platform is lifted up by jacks 110 located at the same station 105.

The lifting operation is well visible in Figs. 13 and 14, and schematically represented by A in fig. 1a.

More precisely, it can be observed that in Fig. 13 the jack 110 is lowered and the wheels 111 of the relative platform 6 rest on the relative tracks 104, with the gear wheel 115 meshing with the stems 116 associated with the same platform, as best illustrated in Fig. 16.

In Fig. 14 it can be seen how the jack 110 is raised, translating upwards the whole frame 114 placed in correspondence with the rows 1, 2 where the vacant space mentioned above is.

At this moment the second motor group 134 is actuated, which sets the rollers 113 and 117 in motion.

The rollers rotate according to X, Fig. 14, and carry out the transverse translation according to B (Figs. 12 and 1b) of the platform 6, guided by the rollers 113 provided with a race, engaged by the element 141.

A plate 180 is fixed to the bottom of the platform 103 so as to rest on the series of rollers 117 without races (Fig. 15).

Special first sensors, of known type and not illustrated, control the run of the platform both vertically and laterally, so as to stop the motor 134 once the platform 6 has reached a convenient position along the row 1, correspondingly above the vacant space mentioned hereinbefore.

Then the jack 110 is lowered again so that the platform just translated is accurately placed on the tracks 104 of the row 2, as indicated by C in Fig. 1C.

The vacant space close to the station 5 can be occupied by another platform now, i.e. by the platform which was adjacent to the platform just transferred.

For this purpose the first motor means 145 is actuated, in order to cause the rotation of the gear wheels 115 along the row 100, which are in mesh with stems 116 of the platforms aligned on this latter.

In this way the platforms are longitudinally transferred, according to D (Figs. 12 and 1d), until second sensors, of known type and not illustrated, detect the reaching of station 105 by the first platform of the row 1, after that the motor 145 is stopped.

Thus the platform 6 located in the row 2 and at the end opposite to that close to the station 5, can be lifted up from the frame 114, and then can be translated laterally according to E (Figs. 12 and 1e) in the row 1, in the same way already described hereinbefore.

A further longitudinal translation according to F (Figs. 12 and 1f) of the platforms along the row 2, brings the apparatus back to the initial condition, with a platform located at the loading-unloading station 5.

If this platform is vacant, another vehicle can be loaded onto it. Otherwise, if the platform located at the station 5 is not vacant, the car occupying said platform is ready to be taken back.

Opportunely the apparatus, in both embodiments, is provided with a series of switches (not illustrated) to allow the subsequent movements of platforms; the switches are disposed in correspondence with the stations located at the ends of the rows 1, 2.

In conclusion, the apparatus makes it possible to automate parking operations, while disposing vehicles in close rows.

Thus an optimal use of available space is achieved, since there are virtually no dead spaces, such as those required in conventional car parks for inner movements of vehicles.

Furthermore, the apparatus reduces the time required by parking operations, both in phase of deposit and of collection, and assures the safety of vehicles, since these are moved only via the respective platforms.

In a very simple and profitable way, it is possible to realize a further embodiment providing for more than one loading-unloading stations, e.g. on opposite sides of rows 1, 2, with a further speeding up of the operations for which the apparatus conforming to the invention has been designed.

Furthermore, the direction of movement of platforms can be either clockwise or counterclockwise, so as to minimize the time technically required to load and unload a vehicle.

The number and arrangement of rows may be different from the example illustrated. For instance the rows of platforms may be spaced out in order to describe a square ring; obviously the number of vehicles per each row may be any.

Claims

1. Automated apparatus for parking cars, **characterized in that** it comprises:

a plurality of platforms (6), disposed adjacent to each other according to a first row (1) and a second row (2), with said second row (2) shorter than said first row (1) so as to leave a space free corresponding to a platform (6), each of said platforms (6) being able to be loaded with a car to be parked;

at least one car loading-unloading station (5) disposed in at least one predetermined point of said first row (1) and second row (2);

first longitudinal-translation and guide means disposed longitudinally along at said first row (1) and second row (2);

second lateral-translation and guide means for said platforms (6), said second means being disposed transverse to said first guide means, at the ends of said first row (1) and second row (2), so as to define, with said first means, an annular route for said platforms (6);

two frames (22, 114), positioned at relative adjacent ends of said first row (1) and second row (2), for supporting said second means, each of said frames being independently moved vertically, when said free space is located in correspondence with said frame, from a position in which said frame is lowered, wherein said second means do not act on any overhead platform (6) resting upon the first guide means, to a position in which said frame is raised, wherein said second means act on one of said platforms (6) while said first means do not hold said platform (6);

first motorizing means for the longitudinal transfer of said platforms (6), along the row comprising said free space, according to a step equal to the length of said same space;

second motorizing means associated with each of said frames and actuated only when said frames have been moved to said position in which they are raised, said second means being provided for lateral translation of said platform (6), resting upon said second means, from one of said first and second rows to the other of said first and second rows;

first and second motor means suited to control said first and second motorizing means.

2. Apparatus according to Claim 1, **character-**

ized in that said first longitudinal-translation and guide means comprise tracks (104) and a plurality of wheels (11) correspondingly fastened to each platform (6) and slideably supported by said tracks (104).

3. Apparatus according to Claim 1, **characterized in that** said first motorizing means consist of at least one gear wheel (115) and one pinion (121) splined to a shaft supported so as to result transverse in respect of a base of said apparatus, said pinion being actuated by said first motor means (145) while said gear wheel (115) meshes with a plurality of transverse stems (116) fastened underneath each platform (103).

4. Apparatus according to Claim 1, **characterized in that** said second means consist of a plurality of first rollers (113, 117), made to rotate by said second motorized means, said rollers (113, 117) being disposed on at least two third rows (F1, F2) spaced from each other by a predetermined value, at least one of said third rows (F1, F2) bearing rollers (113) provided circumferentially with a perimetral race (140) within which are guided elements (141), having a shape complementary to said race (140), located underneath said platform (103) and engaging with said race when said lateral translation is carried out.

5. Apparatus according to Claim 4, **characterized in that** it includes second idle rollers (112, 114), disposed on said third rows (F1, F2) where said first rollers (113, 117) are supported, with each of said second roller having a race and being aligned to said first rollers provided with said race (140).

6. Apparatus according to Claim 1, **characterized in that** said second motorizing means consist of a plurality of shafts (125, 126, 127, 128, 129, 130, 135, 136) controlled by relative devices (131, 132, 133) for transmission of motion imparted by said second motor means (134).

7. Apparatus according to Claim 1, **characterized in that** each frame (114) has a recess (170) positioned correspondingly below said first guide means (104).

8. Apparatus according to Claim 1, **characterized in that** said second lateral-translation and guide means of each frame (22) include transverse guides (9) designed to allow the transverse translation of the platform resting upon

the same guides from one of said first and second rows to the other of said first and second rows when the relative frame (22) is in a position in which it is raised.

- 5
9. Apparatus according to Claim 1, **characterized in that** said first and second longitudinal and lateral translation means respectively consist of track sections (10, 19), which slideably bear, according to axes horizontally transverse to the same guides, a plurality of rollers (11, 21), upon which are suited to rest said platforms (6). 10
10. Apparatus according to Claim 1, **characterized in that** said first and second motorizing means comprise flexible means (37), longitudinally operated in respect of said rows (1, 2), and flexible means (38), operated transversely to the respective ends of the same rows (1, 2), said flexible means (37, 38) being provided with at least one respective roller (40) protruding at the top with vertical axis and engaging, during an active run of the said flexible means (37, 38), with tongues (41, 42), fastened underneath each platform (6). 15 20 25
11. Apparatus according to Claim 1, **characterized in that** said platforms (6) of said first row (1) and second row (2) are linked to each other by coupling means (7) which do not have any link to vertical movement, so as to be automatically released when said same platforms (6) are moved vertically with respect to one another. 30 35

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FIG. 1a

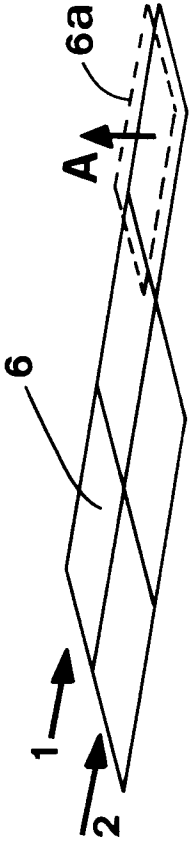


FIG. 1b

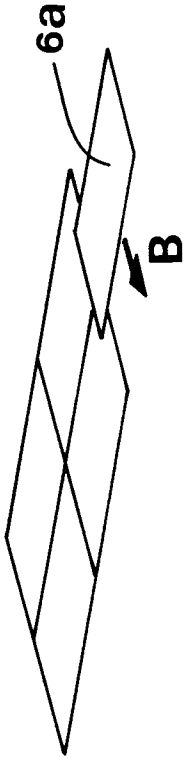


FIG. 1c

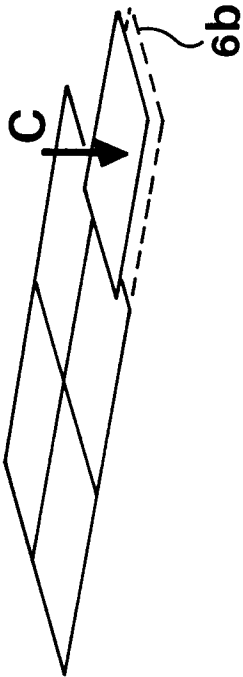


FIG. 1d

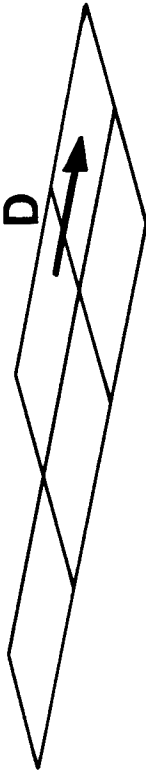


FIG. 1e

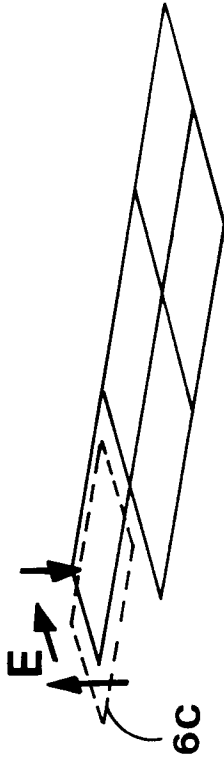


FIG. 1f



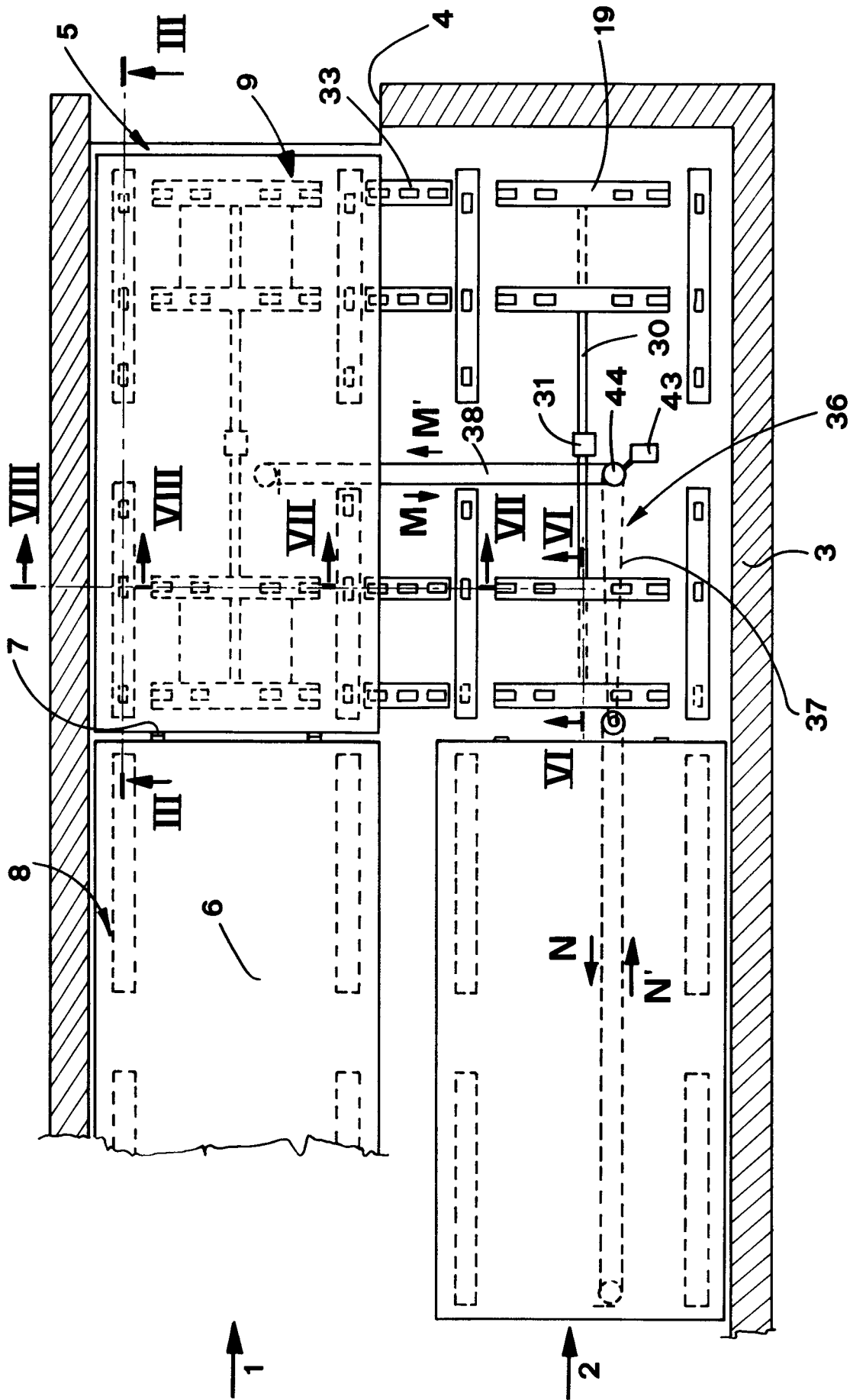


FIG. 2

FIG. 4

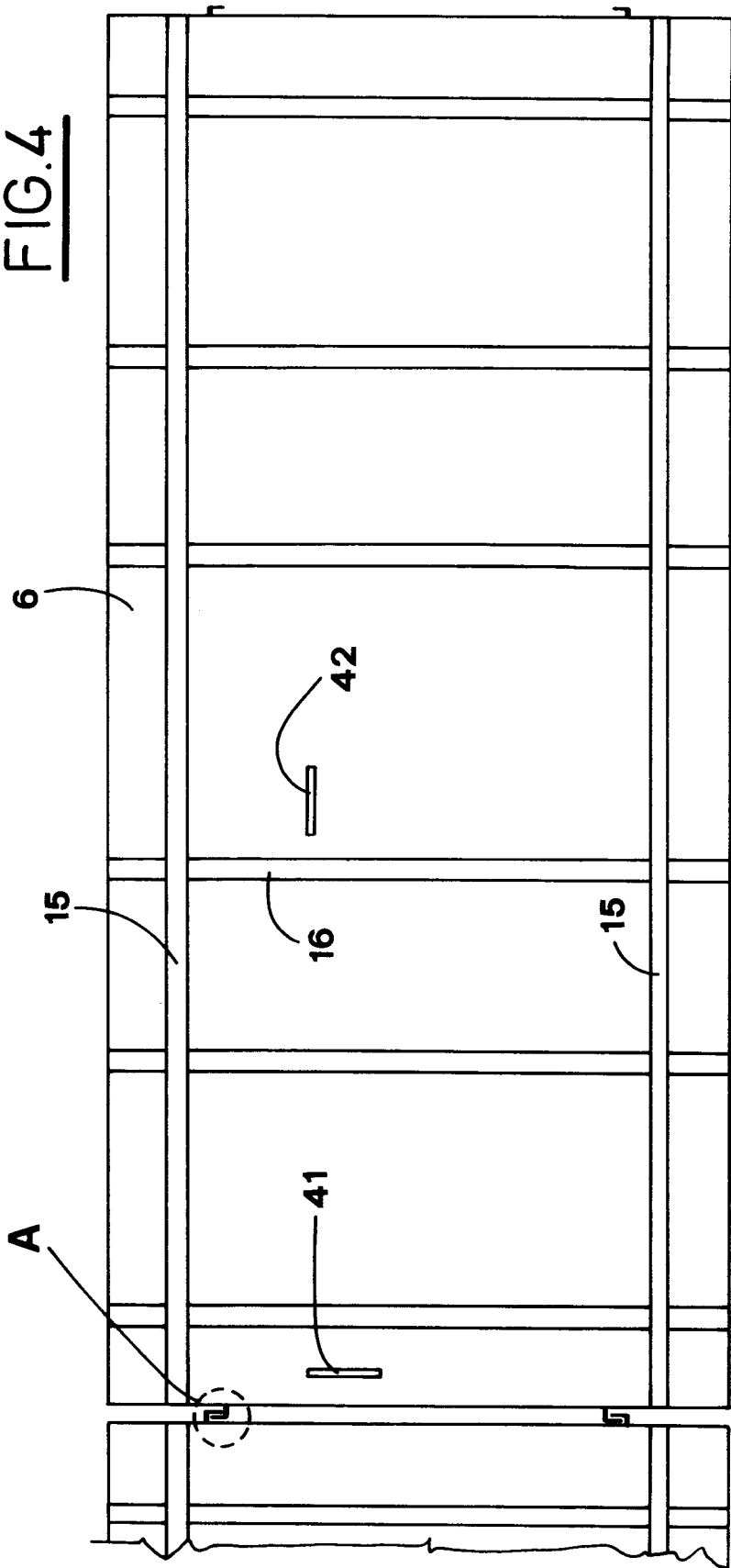
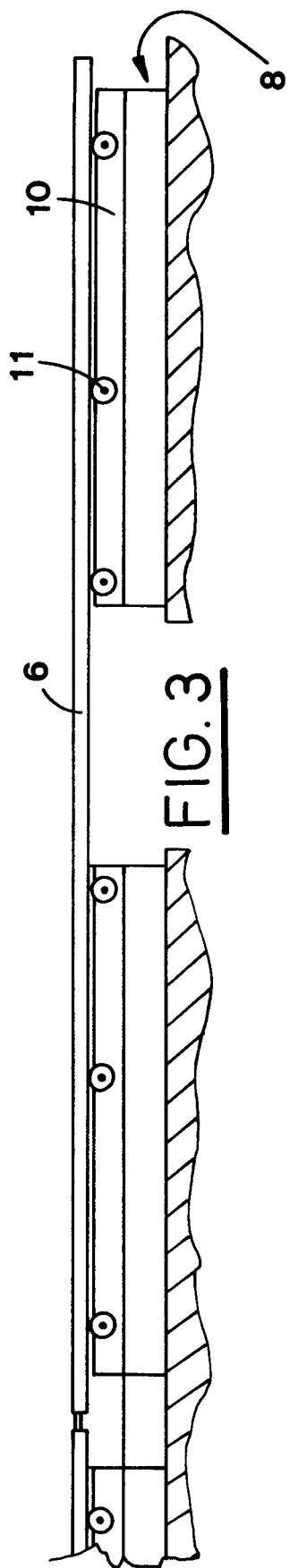
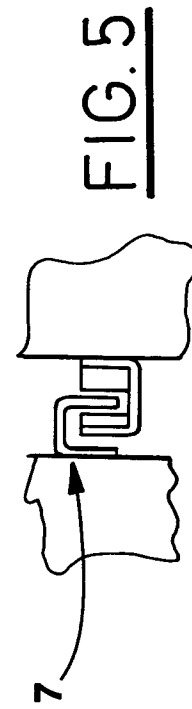
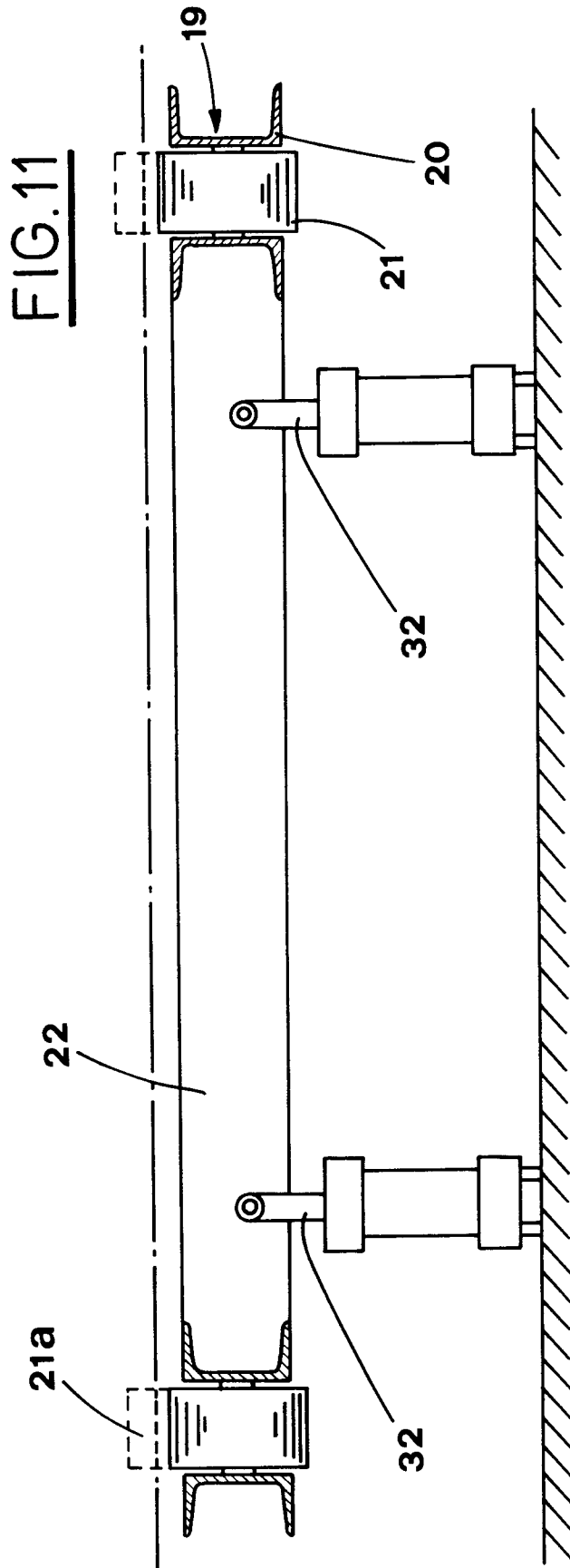
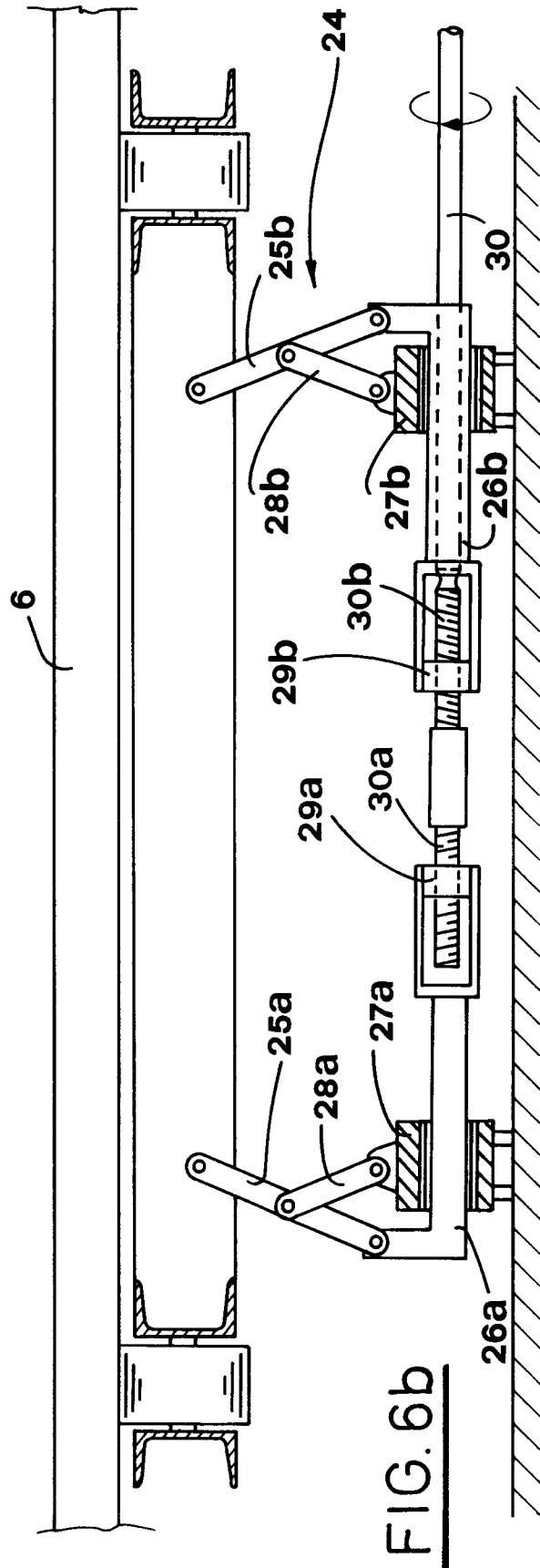
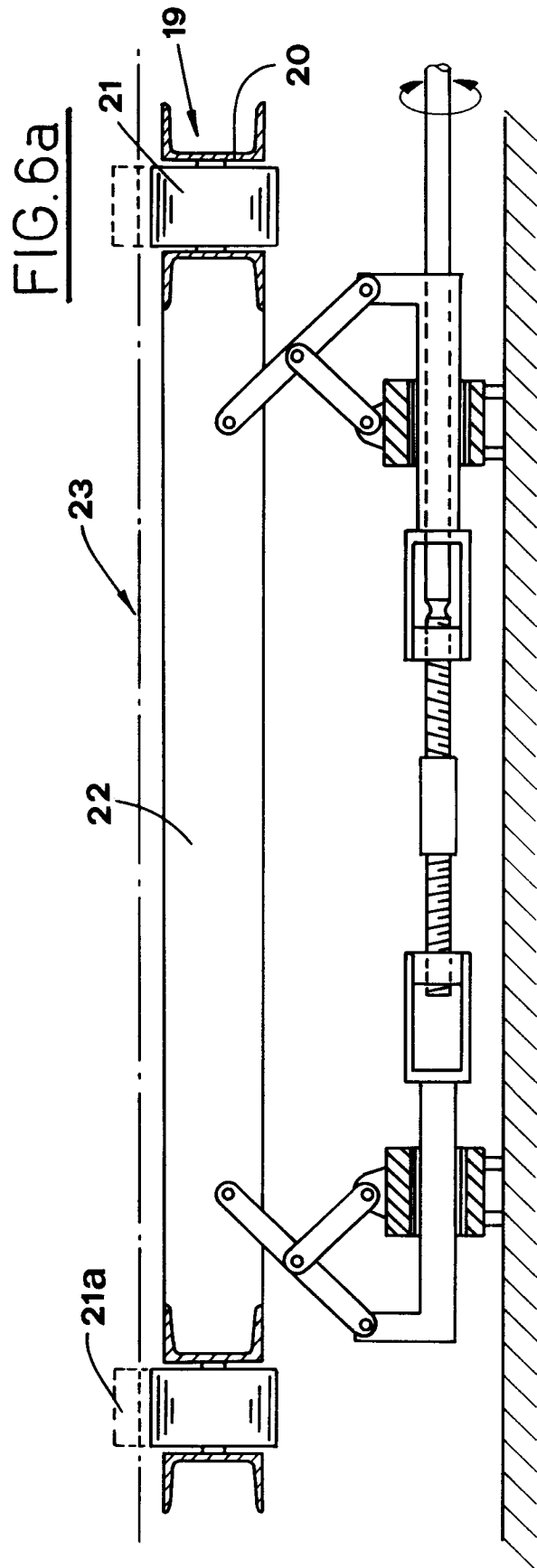


FIG. 3







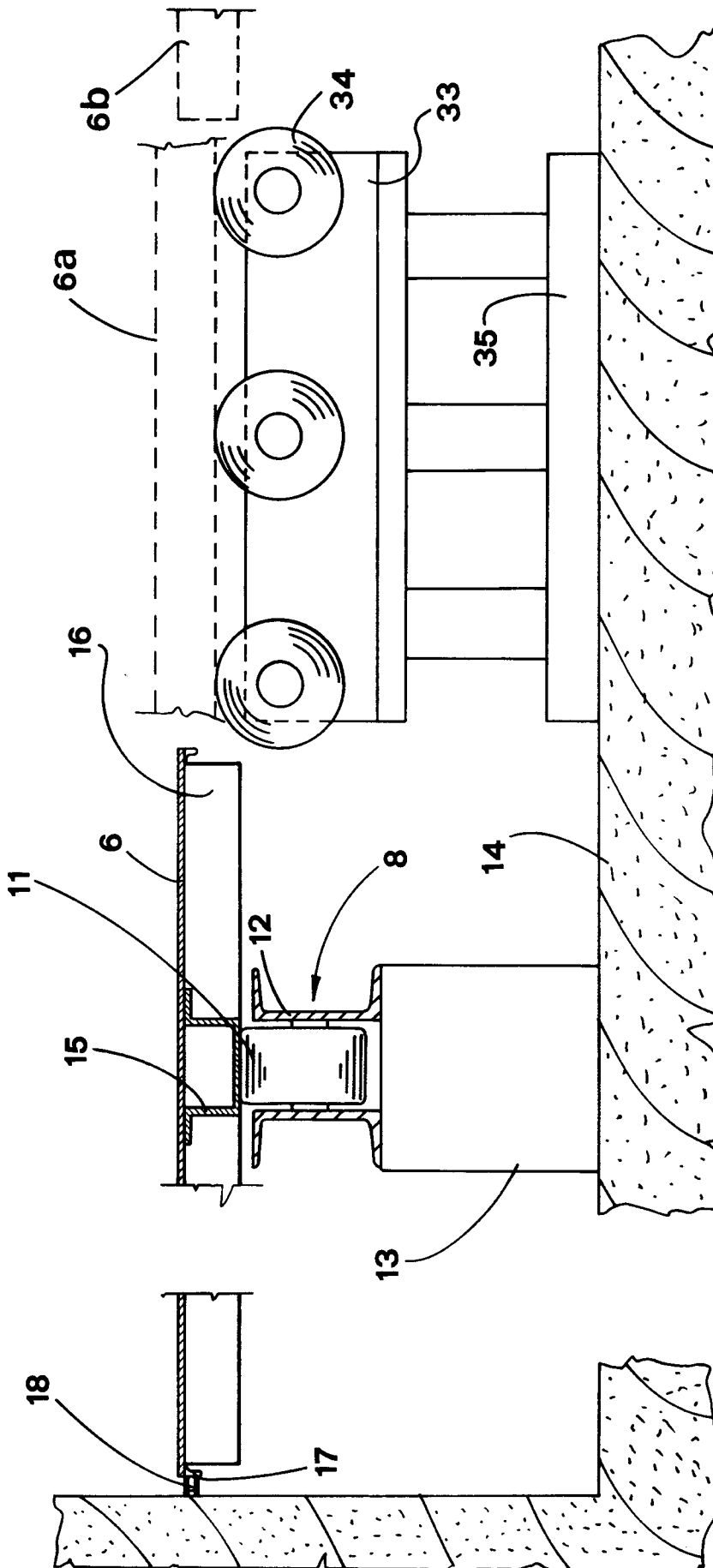
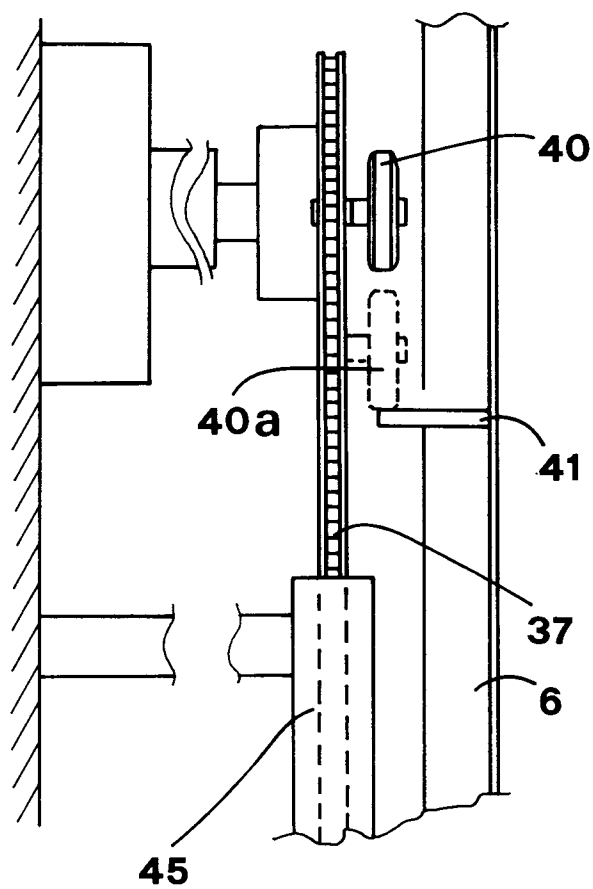
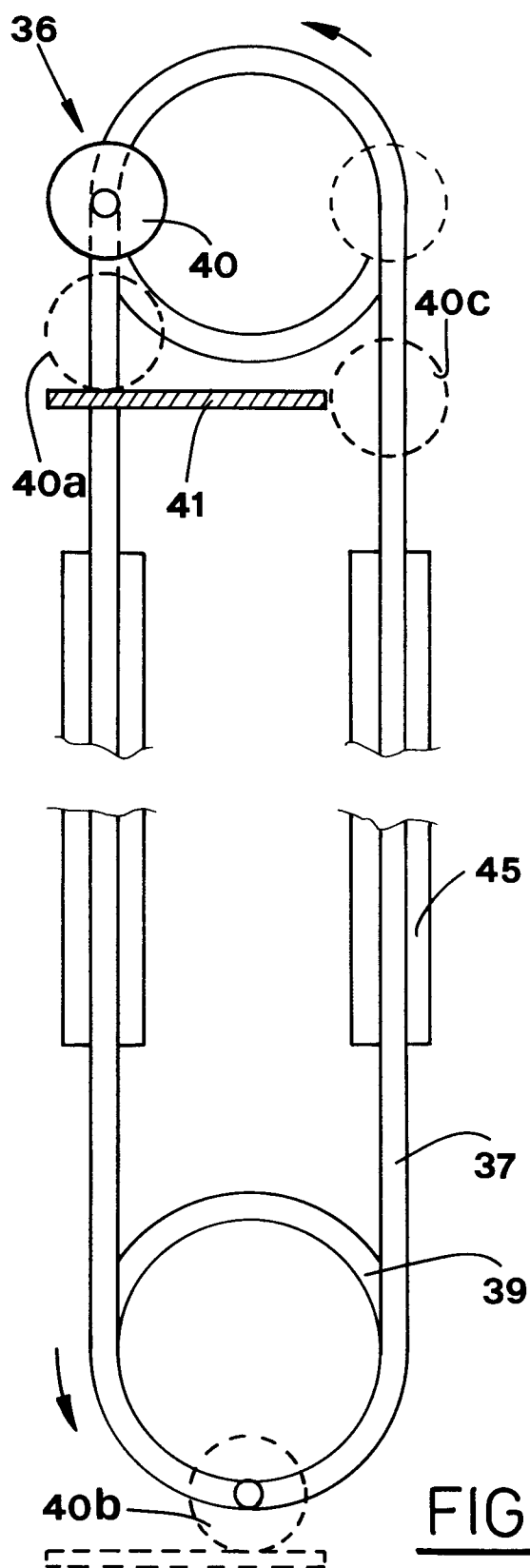
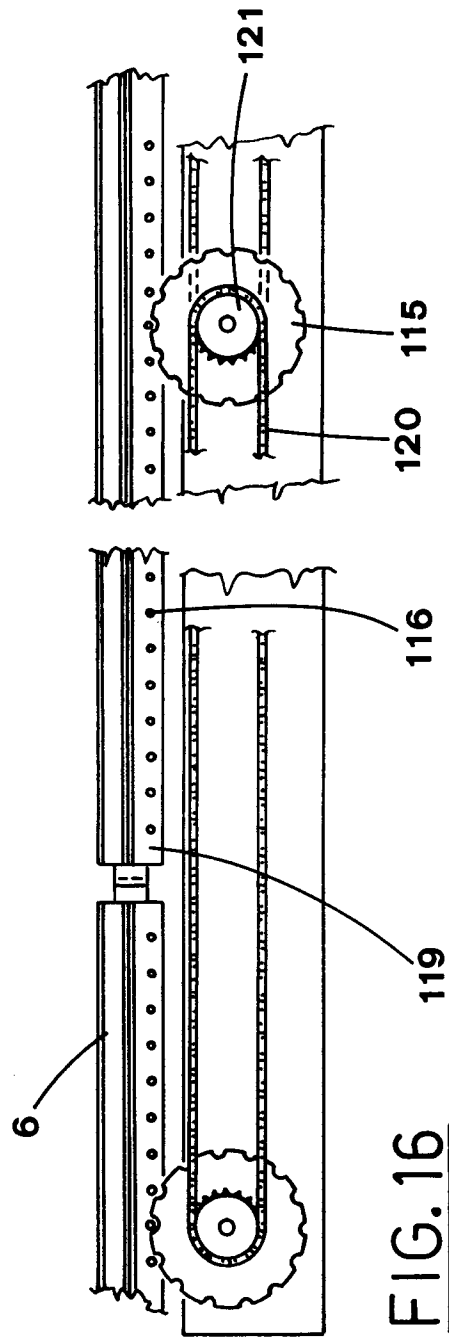
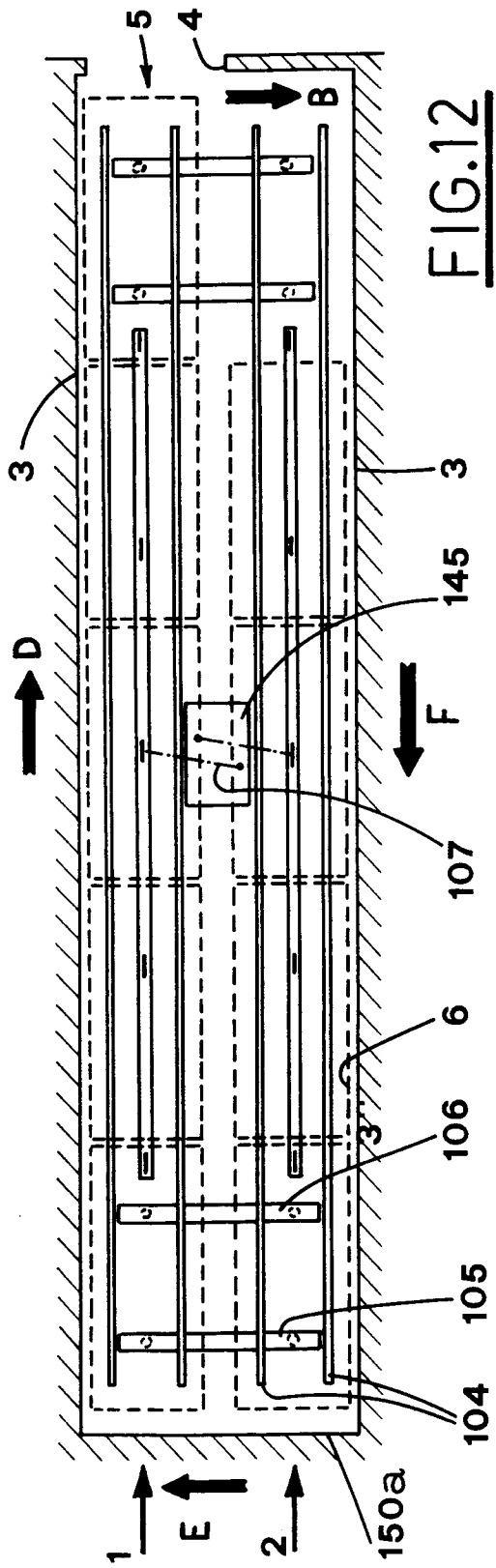
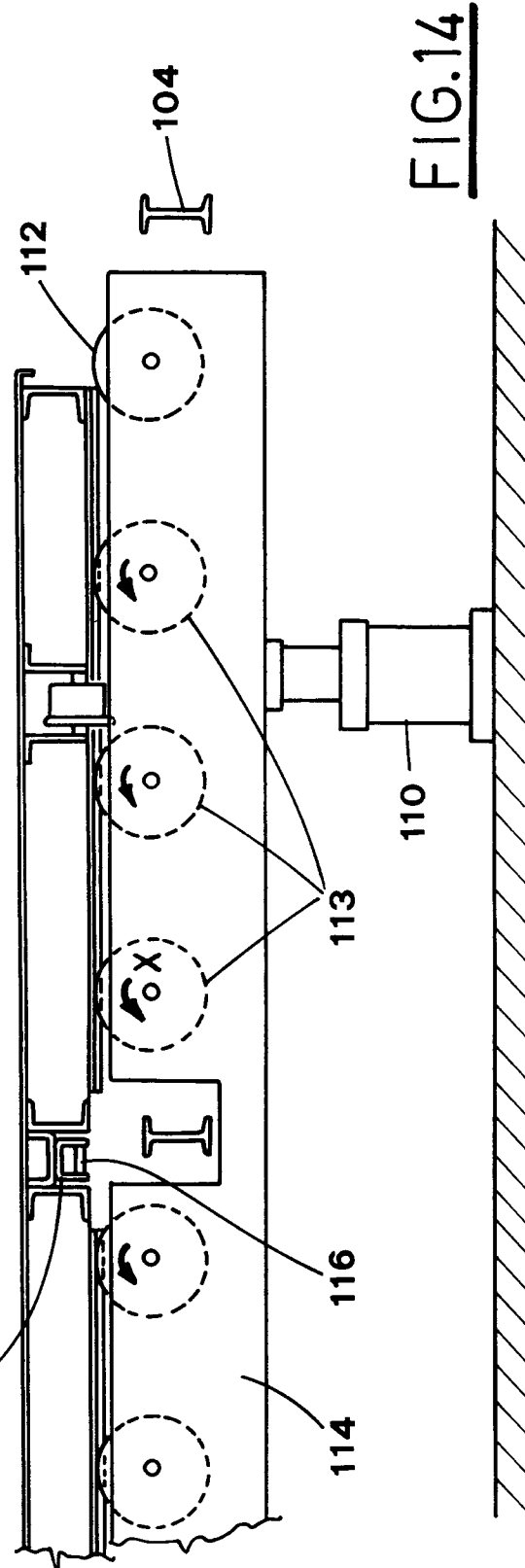
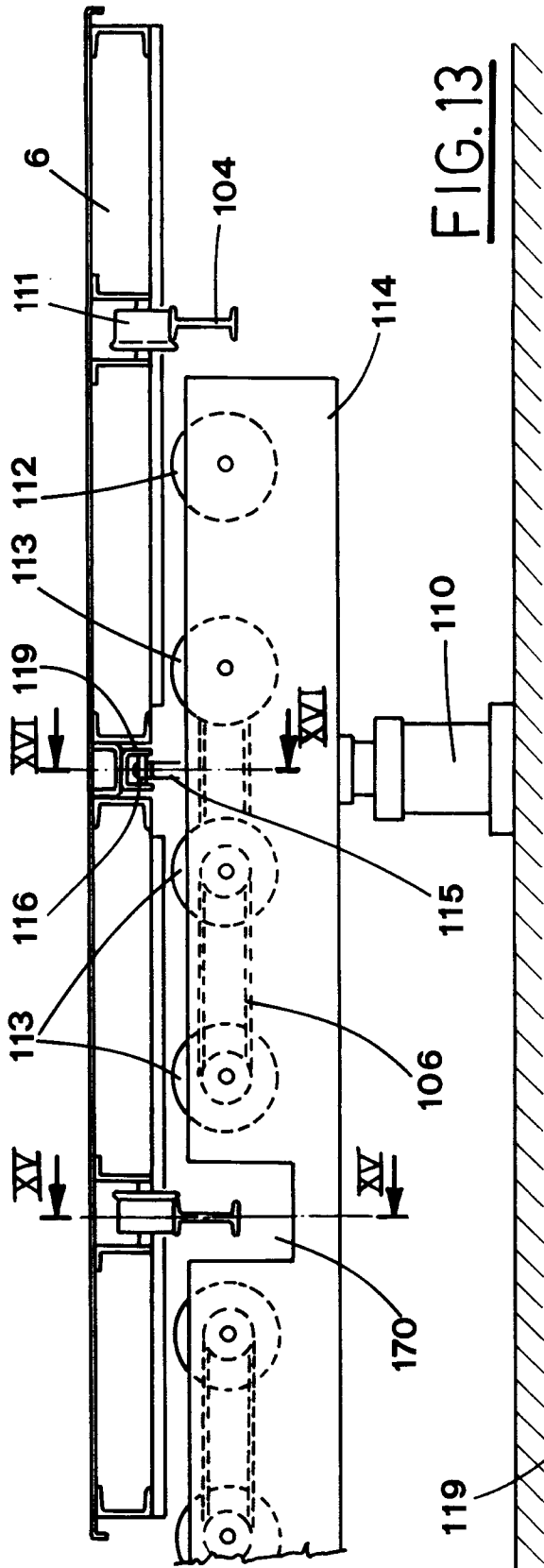


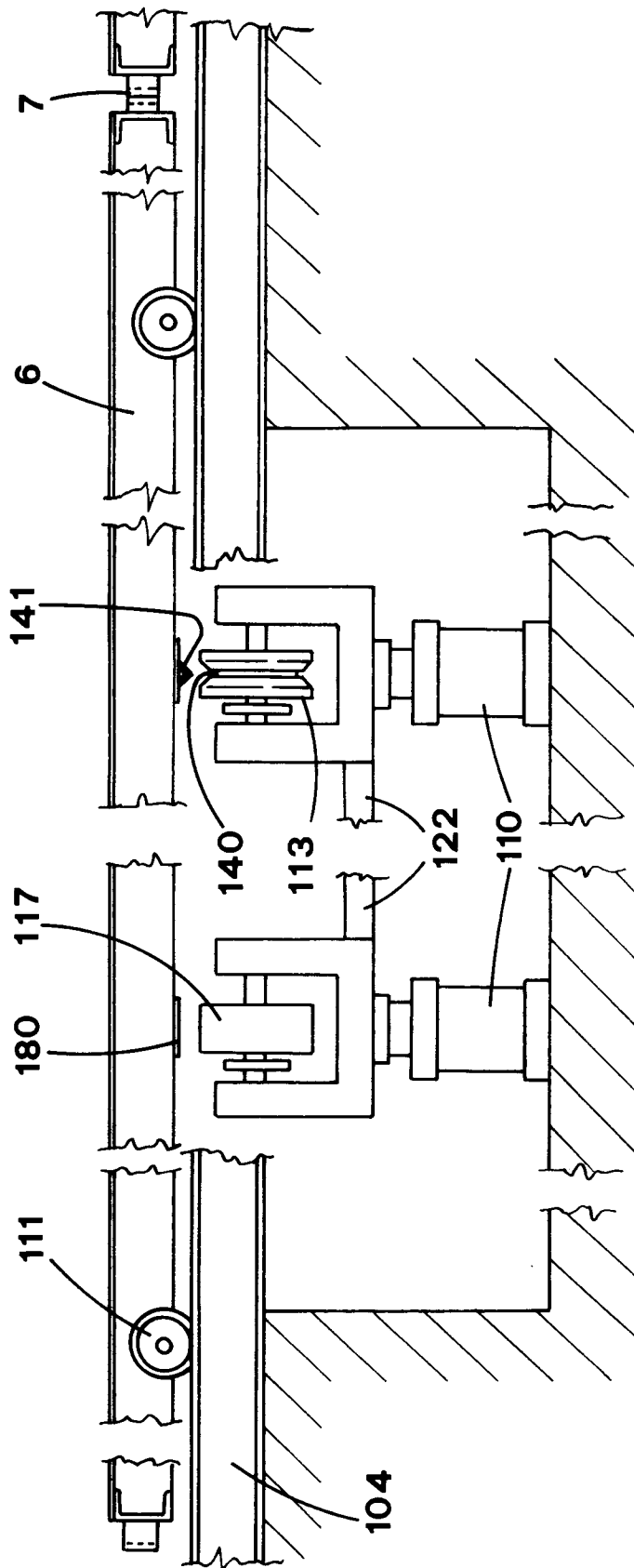
FIG. 7

FIG. 8









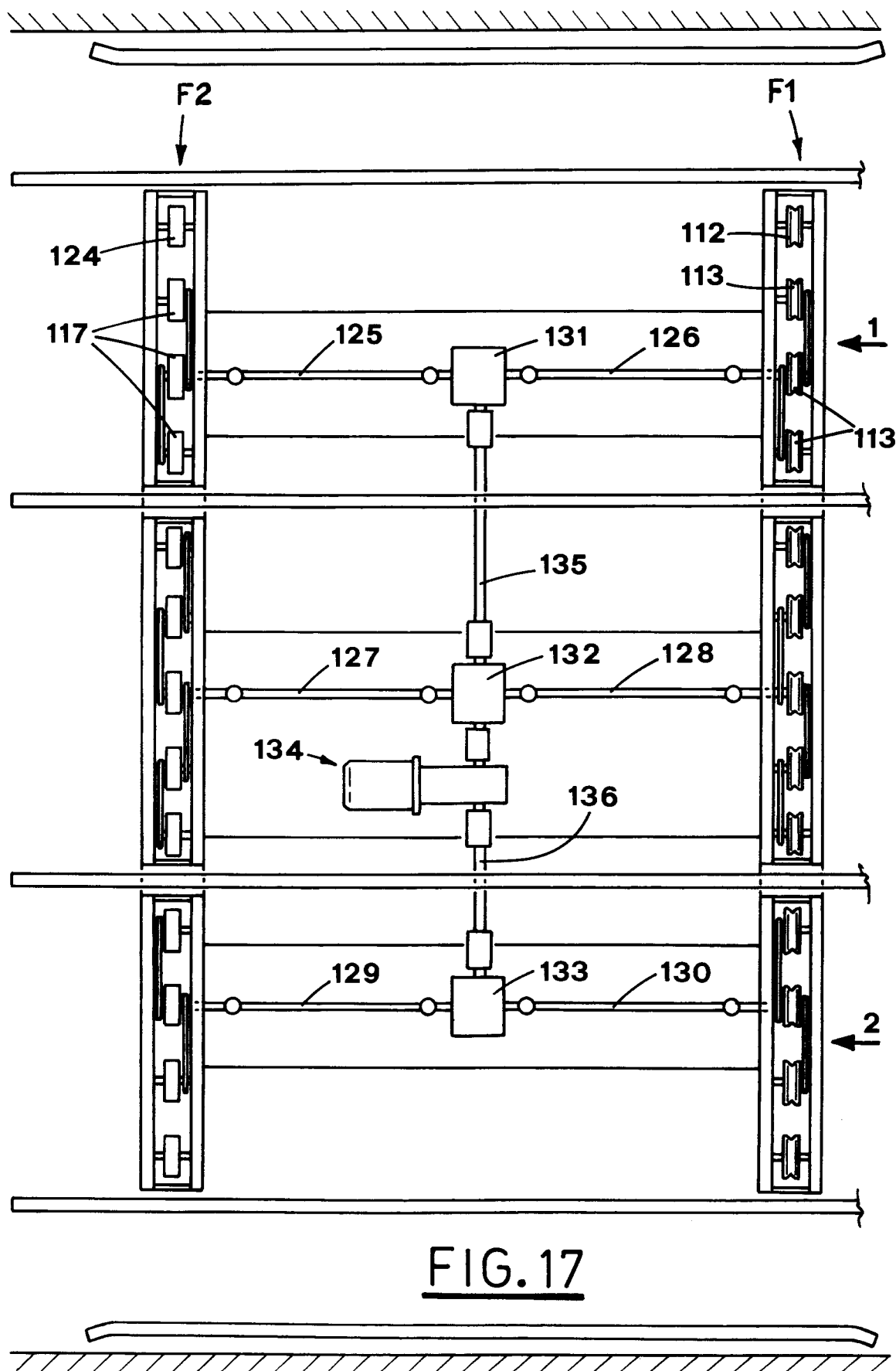


FIG. 17