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(56) Documents Cited:
GB 2200529 A
DE 102007016530 A1
US 4530483 A
US 20070065248 A1
EP 1342662 A1
US 5871318 A
US 4496271 A

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Other: **Online WPI and EPODOC**

(54) Title of the Invention: **Anchorage systems**
Abstract Title: **Anchorage system for fixing articles to vehicle floor rail**

(57) An anchorage device releasably fixable to a track (6, Figure 6), intended for anchoring restraining straps or an integral formation which forms part of a seat or bracket in a vehicle. The strap may be for securing a wheelchair. The system uses a track (6) having a channel with a lip (61, Figure 6) having periodic cut-outs (64, Figure 6). The anchorage device has laterally-projecting feet 13, spaced correspondingly to the cut-outs (64) so it can be placed in the track channel and then fixed in position by shifting along the track so feet 13 are out of alignment with the cut-outs (64). At an intermediate level above the tops of the feet 13 and below the bottom (111, Figure 3) of the anchorage device body 1 are has one or more fixed laterally-projecting abutments 15. The abutments 15 meet the shoulders of the track cutouts (64) after sliding half a step, to prevent further movement. Provision of the abutments 15 increases the longitudinal load-bearing capacity of the system in that direction. A locking plunger 2 can be provided to hold the device against return to the captive position.

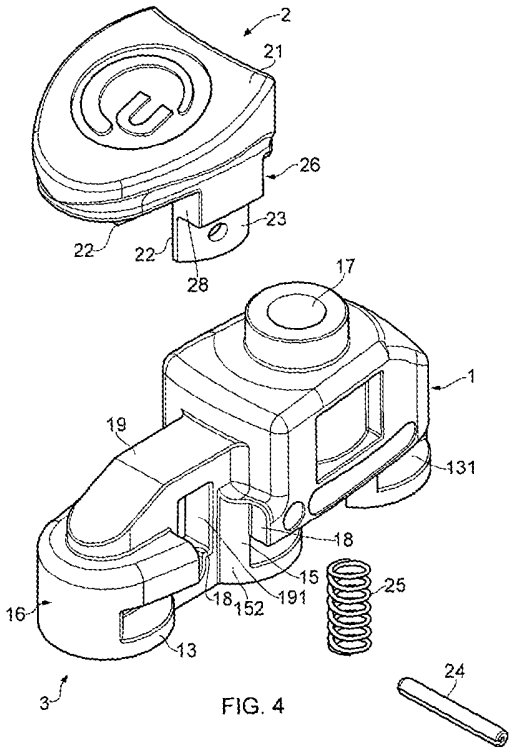

FIG. 4

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date but within the period prescribed by Rule 22(1) of the Patents Rules 2007.

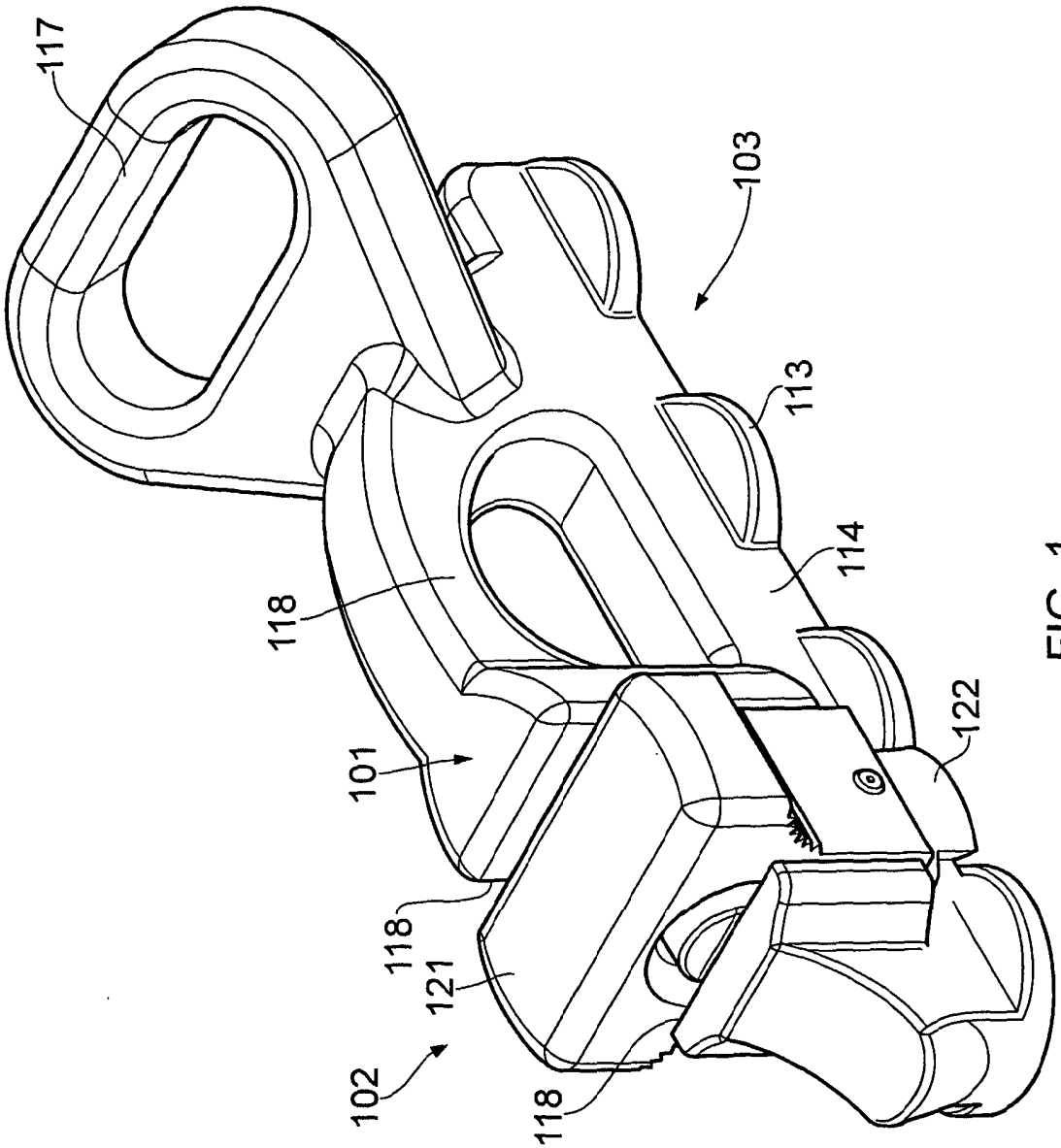

FIG. 1

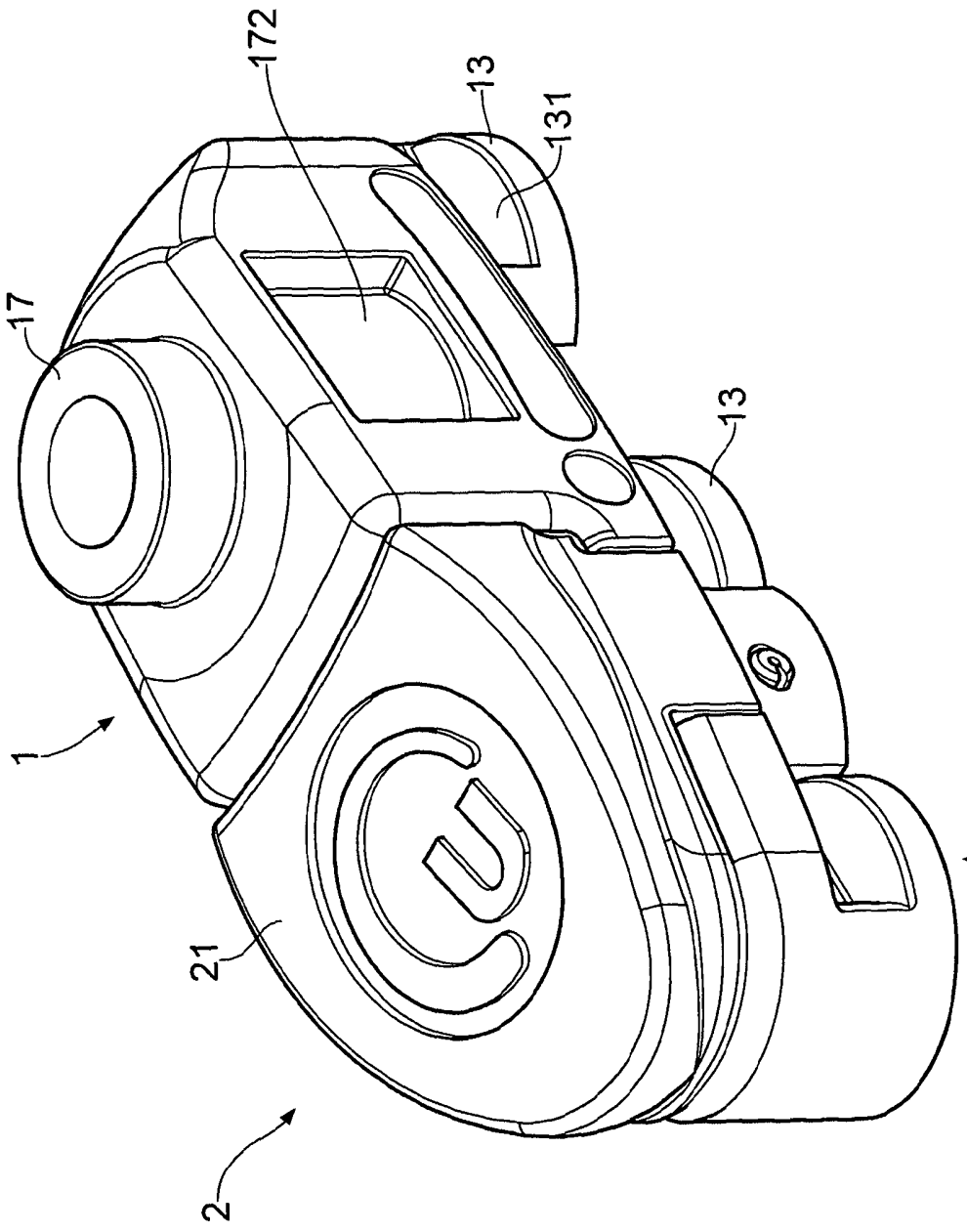

FIG. 2

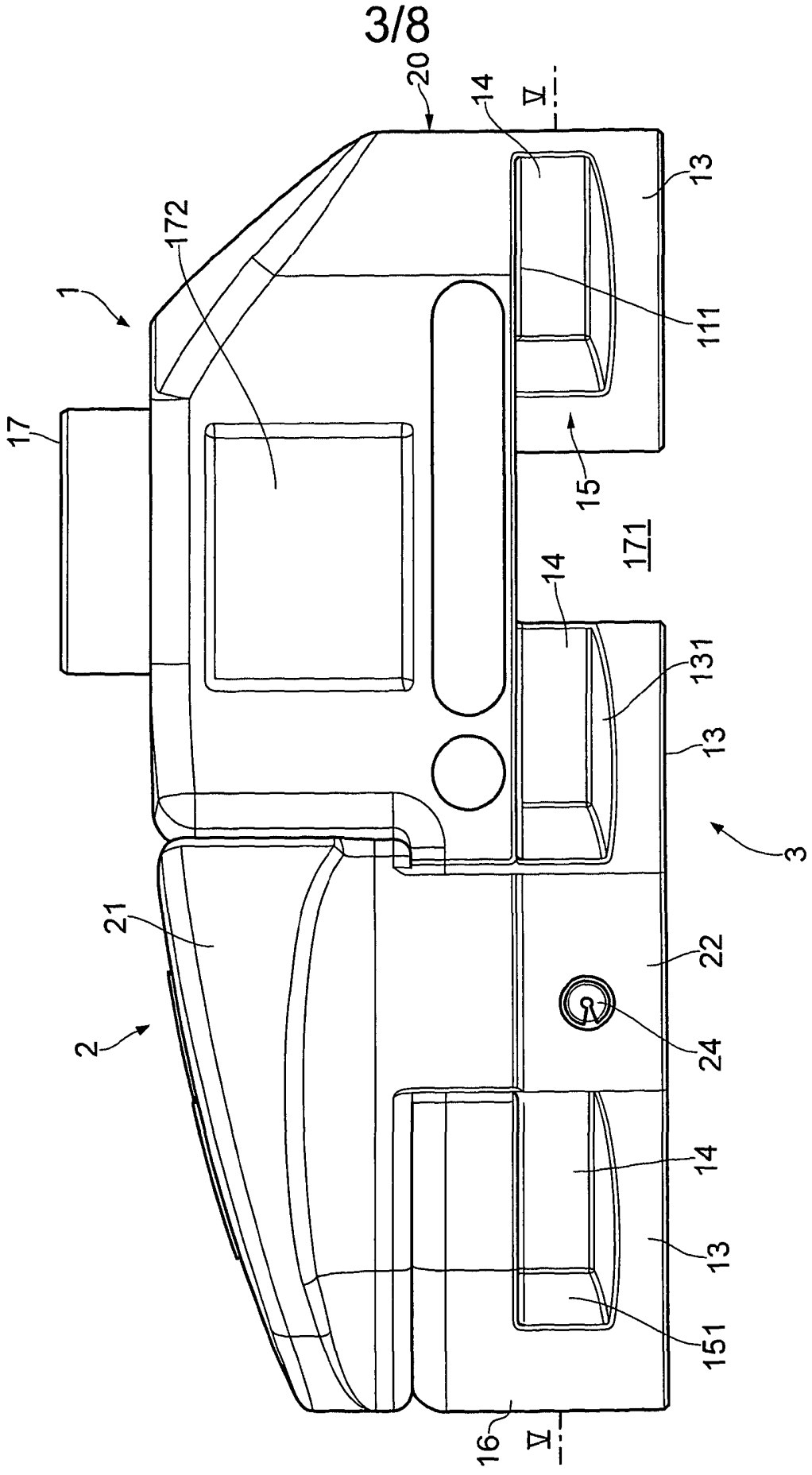

FIG. 3

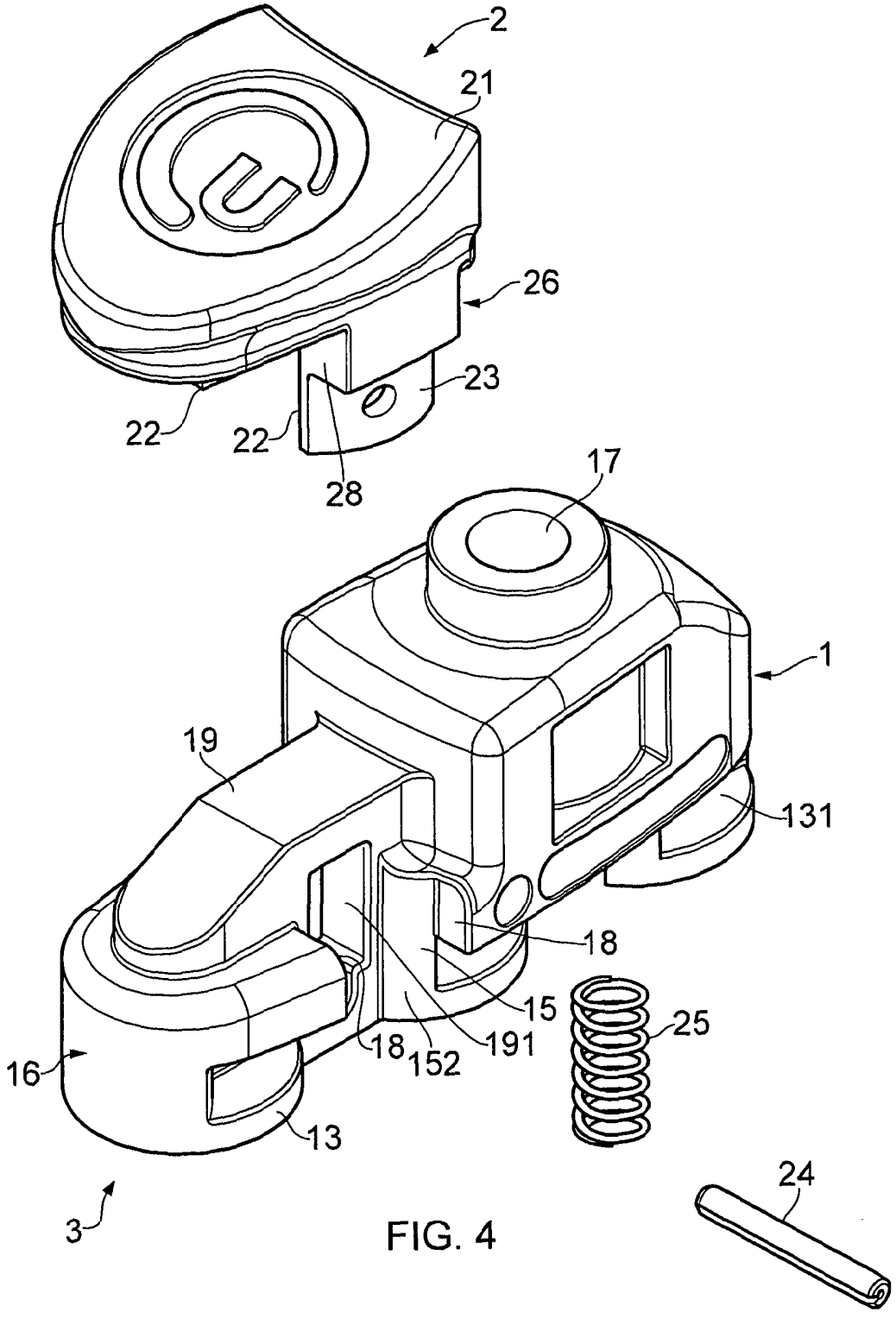

FIG. 4

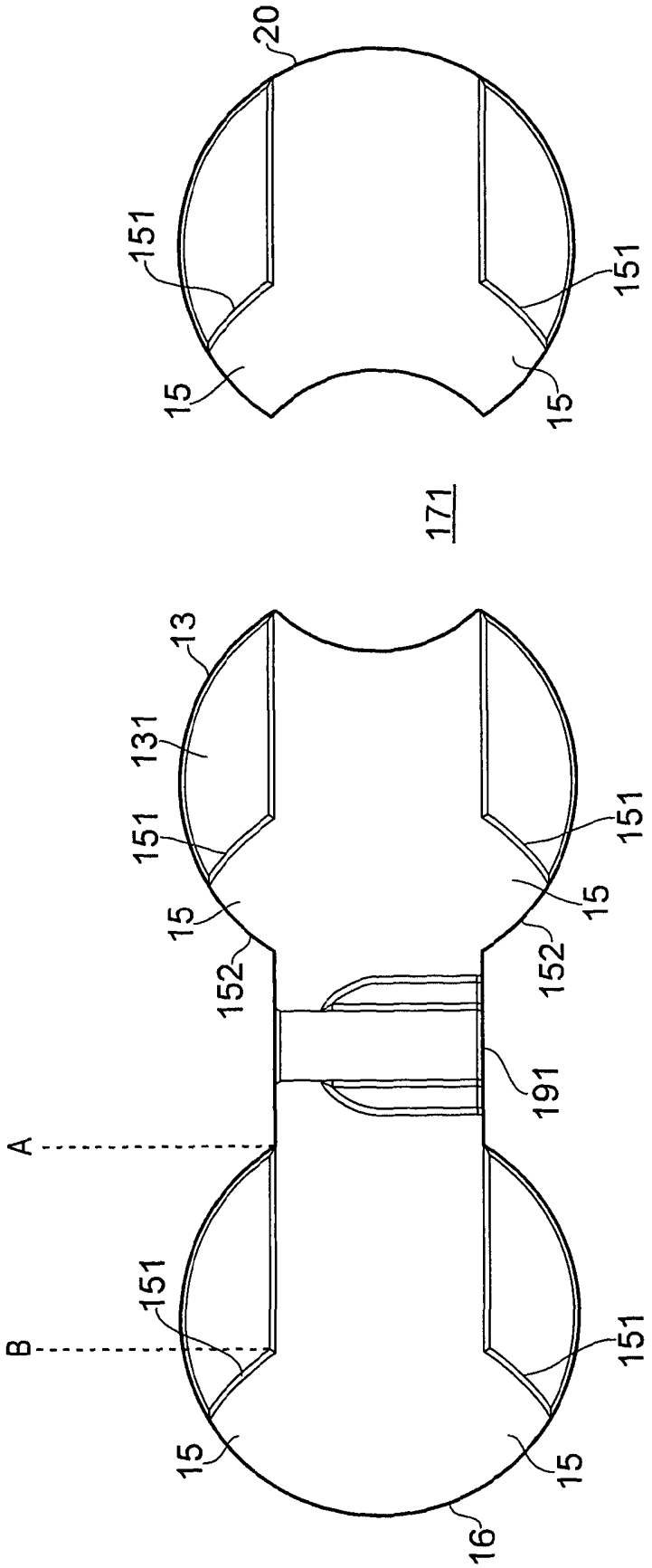
20
151
151
15
15
171
13
131
151
151
15
15
152
152
191
A
B
151
151
15
15
16
F
R

FIG. 5

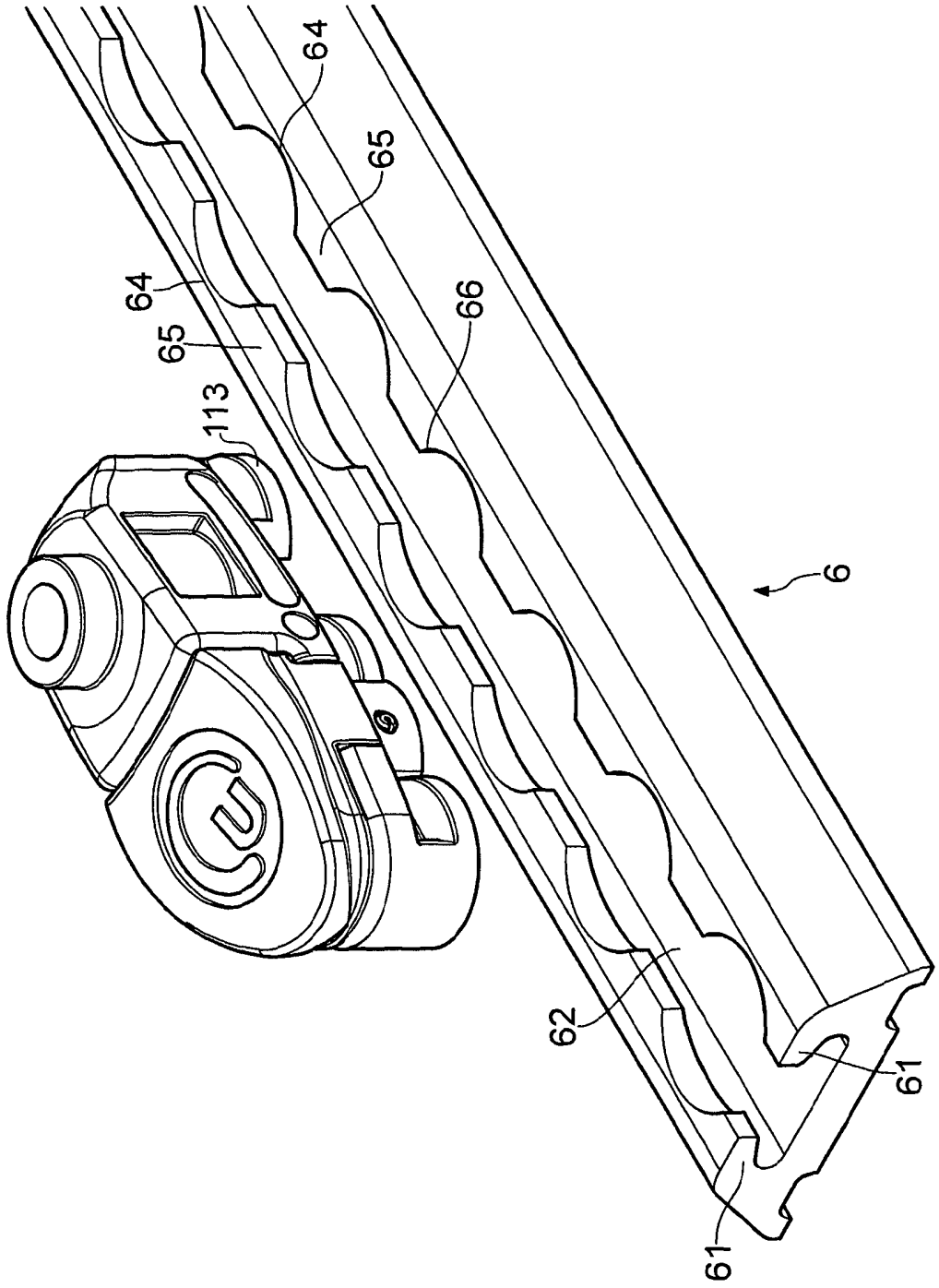

FIG. 6

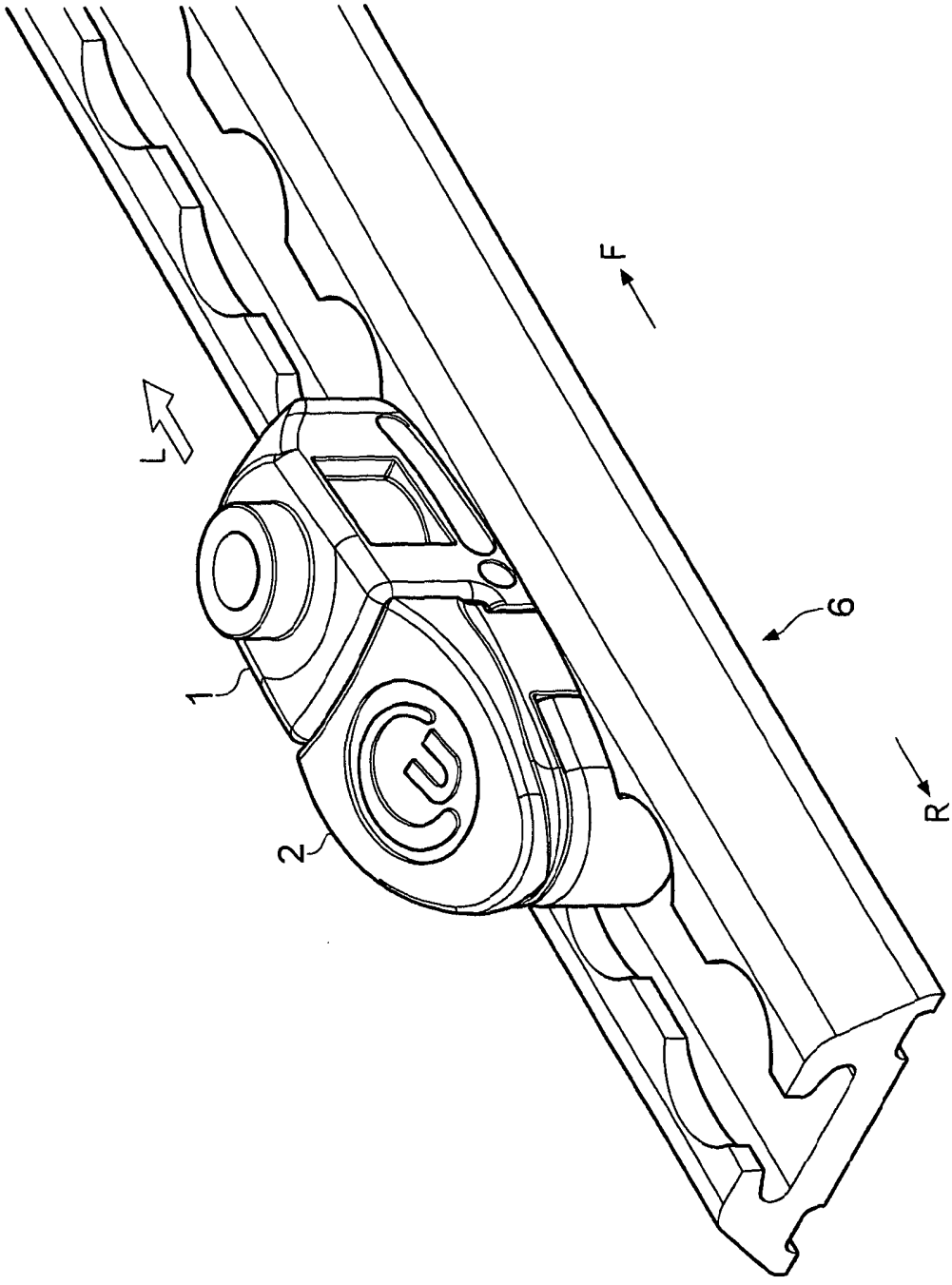

FIG. 7

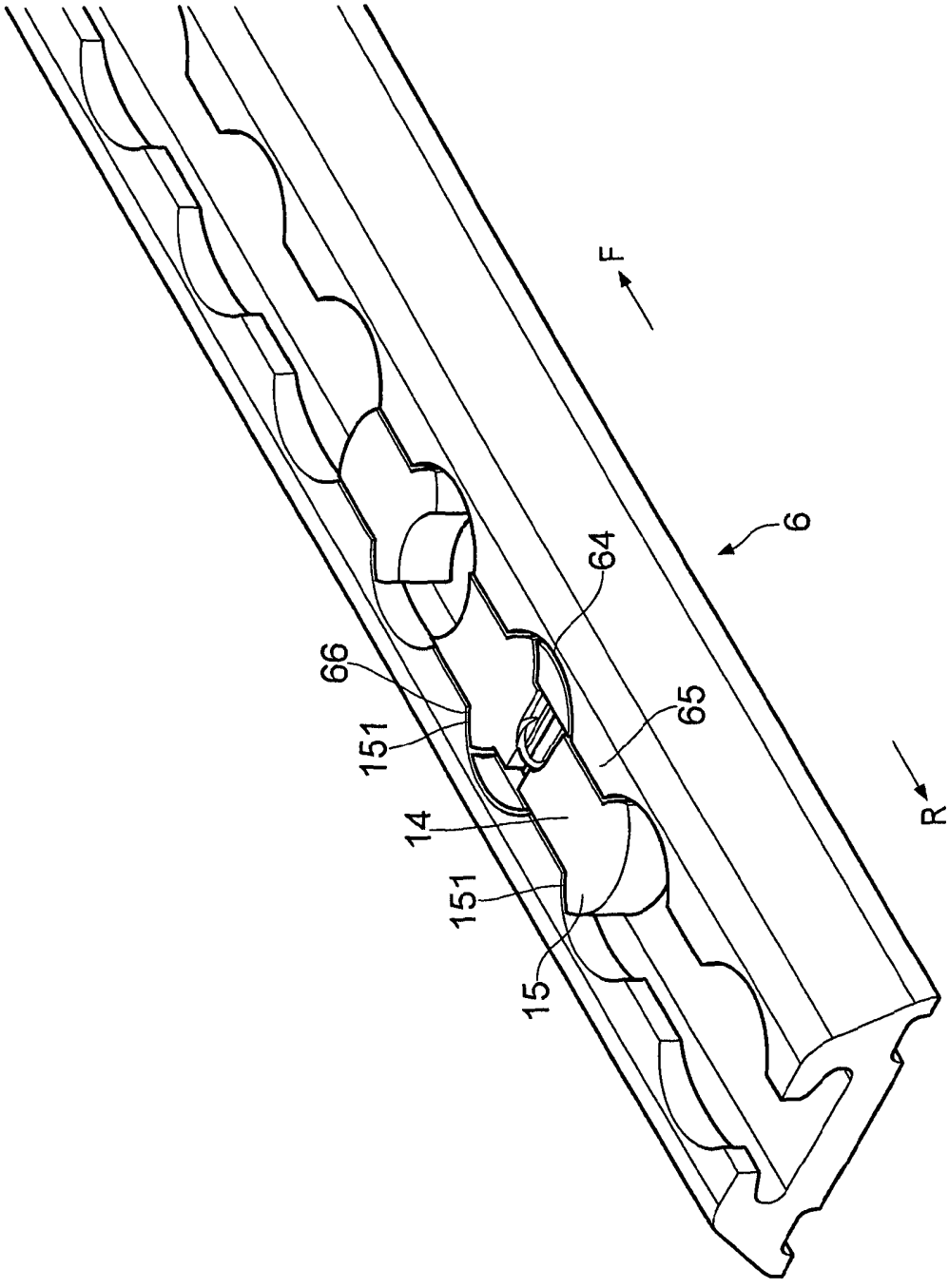

FIG. 8

ANCHORAGE SYSTEMS

This invention has to do with systems for anchoring articles by means of track or rail formations. It has particular application in anchoring objects in vehicles, such as vehicle furniture e.g. seats, and wheelchair restraints such as straps and the like.

It is well known to adapt the floors of vehicles (such as vans, minibuses and coaches) for the securing of furniture, seating, wheelchairs or other objects at any of a range of locations with variable position according to need. Typically this is by one or more tracks fixed onto or integrated into the vehicle floor. The tracks have an upwardly-open internal channel, usually formed using extruded aluminium, and the top opening of the channel - extending the length of the track - is defined between opposed overhanging lips.

Objects adapted to be retained on the track (anchorages) have enlarged feet or inverted T-portions which can be slid into the track and held captive beneath the opposed lips. The most popular track format (seen in Figure 6) is "scalloped" track 6 in which the channel opening 62 is interrupted by a series of periodic enlargements of a circular outline i.e. each lip 61 has a series of circular arc "cut-outs" 64 opposed to corresponding cut-outs 64 on the opposite lip 61. Anchorages have correspondingly-sized circular feet which can be offered up to the track with the feet aligned with

the cut-outs, lowered into the track and then moved along half a step so as to be held captive beneath the narrower parts 65 of the lips. Means are provided for holding the system at this intermediate position so that the attached device cannot escape. Usually this is by means of a sprung plunger of the device disposed half-way between the circular feet, which can be dropped down into one of the circular cut-outs 64 of the track.

Fig 1 exemplifies an anchorage device of this known type. It has a cast steel body 101 with retaining formations for straps - in this case rings 117, 118 - an anchoring formation 103 along its lower side and a locking plunger 102. The anchoring formation 103 consists of a straight longitudinal bar or keel 114 of uniform with, able to run in the top channel opening 62 of the track. Lateral projections 113 in the form of circular segments are provided at intervals corresponding to the periodicity of the track scallops 64, to either side along the bottom keel 114 and cast integrally with it for strength and simplicity. (There is a well-known alternative in which downward mushroom formations, each with a full circular head and a central stem, project down from a bottom surface of the anchorage body.) The locking plunger 102 has a top grip 121 to be grasped beneath its head by thumb and finger, an internal spring (not shown) urging it to its downward position, and sideways-convex locking portions 122, integral with the head 121, which extend down the sides of the body 101

between two of the feet 113. The device is anchored to track 6 of the Fig 6 type by aligning its feet 113 with the cut-outs 64 of the track, lowering it with the plunger 102 raised, shifting it to a desired position with the feet 113 underlying the lip portions 65 between the cut-outs 64. The plunger 102 is released so that its convex parts 122 engage in a track cut-out and hold the device longitudinally in position.

Thus anchored, the feet 113 resist lifting forces while the convex plunger portions 122 resist longitudinal forces. The body 101 has front and rear buttress surfaces 118 to keep the plunger 102 in alignment and transfer longitudinal forces.

These rail fixing systems are widely used because of their versatility and ease of use. Fixtures do not need to be slid into the track from the end, but can be offered up at any point along its length. One particular use of current importance is in the securing of seating or wheelchairs in vehicles designed for use by elderly and/or disabled people. For example, wheelchairs are conventionally secured by a set of four restraining straps, one at each corner secured by respective anchorages to a pair of parallel tracks at either side of the wheelchair. Each anchorage may be attached to a simple belt or strap with a clip, karabiner or buckle, an adjustable belt, a retractable and/or tensionable belt on a reel or any other suitable device or fitting.

The aim of the present proposals is to provide new and useful anchorage devices which, in a track or rail anchorage system using channels with periodic lateral enlargements ("cut-outs"), provide a new way of engaging with the track, and in particular enable increased strength and reliability in relation to longitudinal loads. In the existing systems, under extreme longitudinal load, concentration of stress at the track cut-out engaged by the plunger 102 may cause failure of the anchorage.

Thus, in a first aspect we propose an anchorage system in which an anchorage device can be releasably fixed to a track. The track has an elongated channel with an upward opening (we say "upward" for convenient description and because the conventional use is in floors, but this should not be taken as limiting the orientation) and has an overhanging retaining lip at one or both sides of the opening, with a series of periodic lateral enlargements (cut-outs). As before, the corresponding anchorage device has a downward anchoring formation with two or more (usually three or more) longitudinally-localised lateral enlargements (feet) at a longitudinal spacing corresponding to the periodicity of the cut-outs. Above each foot the anchorage device has an intermediate downward extension portion which is laterally narrower than the feet. As before, the anchorage device can be offered up to the track with its feet aligned with respective cut-outs ("insertion/removal

position") and then shifted along the track to a position ("captive position") in which the feet are out of alignment with the cut-outs and held beneath by the overhanging lip or lips while the intermediate extension portion extends up between the lips.

According to our new proposal, the anchorage device has at least one fixed abutment formation at the intermediate level (i.e. between the top surfaces of the feet and the body above) which extends or projects laterally, so that in the captive position it abuts longitudinally against a shoulder of a corresponding cut-out. These shoulders (exemplified at 66 in Fig. 6) are portions of the cut-outs extending between their laterally widest parts and the intervening narrow parts of the track. Their shape will depend on the shape of the cut-outs, but they will always have some longitudinally-directed component. With the conventional circular arc cut-outs, the cut-out at each lip will have an arc portion constituting the shoulder.

Because the intermediate level abutment extends laterally, is fixed and meets a cut-out shoulder, it prevents further movement of the anchorage device along the track in that direction. The fixed abutment offers a means of transferring longitudinal load between the device and the track without having to rely on a movably-mounted plunger lowered into a cut-out.

Preferably such fixed abutments are provided projecting laterally to both sides of the device at the

intermediate level. Preferably plural such fixed abutments are provided at locations spaced longitudinally along the anchorage device. It is preferred that the fixed abutments have faces shaped complementarily to the shoulders of the cut-outs. This complementarity provides for the distribution of load (avoidance of point loads), increasing the maximum load. Thus, with arc cut-outs, the fixed abutments desirably have faces which (in horizontal cross-section) are arcuately convex.

The novel fixed abutments need to be appropriately positioned in relation to the periodicity of the feet, so that they meet the corresponding track shoulders when the feet are effectively captive between the track cut-outs. Considering the insertion/retraction position, each foot can be regarded as having a leading portion which will pass first under the track lip as the device is shifted towards the captive position. Relative to the axial position of that leading portion, the fixed abutment (or leading portion thereof) is desirably offset more than half the length of a cut-out (considering this length as the longest distance between the opposed shoulders of a cut-out, at the lip edge). This helps to ensure that substantial foot area is captive beneath the track channel lip when the abutment is engaged.

It will be appreciated that these positions and spacings can be assessed relative to the periodic spacing for possible foot positions, and do not necessarily require both an actual foot and a lateral abutment to be

present at the same specific position. However for a compact construction combining strength in relation to both vertical and longitudinal loads, it is preferred that a fixed intermediate level abutment is provided in conjunction with, preferably integral with, a foot of the anchorage device and preferably in conjunction with plural feet, and most preferably in conjunction with each of the feet. This maximises the available abutment area available to take longitudinal loads.

Generally speaking, the feet are provided by lateral enlargements at the base of the above-mentioned intermediate downward extension; effectively the upright of an inverted tee in lateral section. This upright may be the individual central stem of a mushroom-type formation, or more preferably a longitudinally-elongate keel formation extending along one or more respective feet and preferably also between feet. This is known in itself, and is advantageous in enabling the anchoring formation to be formed integrally with the body of the anchorage device by casting. It also lends itself to the formation of integral lateral extensions providing the abutments or longitudinally-directed shoulders which are the special feature proposed here.

Above the intermediate level the form of the body is not critical and is determined largely by the kind of anchoring connection to be provided. This may be in accordance with conventional practice. In a preferred form the body presents a downwardly-directed lower

surface portion, e.g. horizontal, facing down onto the intermediate level. It may be present as plural lower surface segments all at one level. Such surface portion may be at a level to rest on top of the track channel lips in the captive position. It may extend out laterally at least as far as the mentioned lateral extension(s), and may meet and support the latter from above e.g. as an integral whole.

Drawing together the preferred features discussed above, a preferred embodiment of our proposals is an anchorage device having a body, three or more regularly longitudinally spaced circular- or arcuate-outline foot portions beneath the body, laterally narrower stem portions connecting vertically between the body and the foot portions and, above a rear extremity of more than one of (and preferably each of) the foot portions, a forwardly-directed arcuately convex lateral shoulder abutment extending laterally outwardly relative to the narrow stem portion, preferably occupying the full height between an upward surface of the foot portion and a bottom (downward-facing) surface of the body. A single metal body casting may provide all of these elements.

Additionally, the anchorage device comprises locking means which, after the device has been moved to the captive position, is operable to hold it against longitudinal displacement back towards the insertion/release position. Desirably, as in known anchorage devices, this comprises a plunger element

mounted on or in the body of the device and positioned so that it can be lowered into a cut-out of the track when the device is in the captive position. Desirably, as in previous devices, the plunger is manually operable, and has a spring to bias it to its downward (locking) condition. Unlike previous anchorage devices, the plunger need not be relied on for transferring longitudinal loads. Indeed for longitudinal compactness the plunger may be provided immediately adjacent behind one of the characteristic shoulder abutments of the present proposals, and be limited to engagement against the opposite side of the corresponding cut-out so as to prevent movement of the device back to the release position. The skilled reader will appreciate that anchorage devices of the present proposals have a forward and a reverse direction, and should be installed in the track with the characteristic abutment(s) facing in the direction of the anticipated pull.

An anchorage device of the type described may be used in many situations and with any type or articles are to be secured to tracks of the kind described. However we particularly envisage its use in restraints (e.g. straps, optionally including retractor reels) for use with wheelchairs, mobility scooters and the like. The presently-proposed devices have particular utility in dealing with the ever-higher load-bearing requirements imposed in this field.

Aspects of the invention include the anchorage system as a whole, a vehicle comprising it, anchorage devices of the kind described, and articles comprising such anchorage devices, whether integrally or as an attachment. Preferred embodiments include restraint straps. Further aspects include methods of securing or restraining objects in vehicles, especially to vehicle floors, using anchorage systems and anchorage devices as described.

Embodiments of the invention are now described by way of example, with reference to the accompanying drawings in which:

Fig 1 is a perspective view of a known kind of anchorage device (already described above);

Fig 2 is a corresponding perspective view of an anchorage device embodying our proposals;

Fig 3 is a side elevation of the Fig 2 device;

Fig 4 is an exploded perspective view to show the device components;

Fig 5 is a horizontal section at V-V of Fig 3;

Figs 6 and 7 are oblique views showing the anchorage device being used with scalloped track, and

Fig 8 shows the track with the captive anchorage device sectioned as in Fig 5.

Referring firstly to Figs 2 to 5, an anchorage device according to our present proposals has a cast steel body 1 formed integrally with a lower anchorage formation 3. It also has a locking plunger 2. The body

1 has a front end 20 and a rear end 16 which are functionally distinct, as explained below. Towards the front end 20 the body 1 has a vertical bolt hole 17 for securing a strap mounting or strap retractor reel. A cavity portion 172 beneath the bolt hole houses an internal cavity for a nut, and there is a clearance 171 in the anchorage formation beneath, for access. This is just one example of a kind of securing formation which might be provided on the anchorage device; it could equally be simple apertures such as shown in Fig 1 for the direct attachment of straps, or some other kind of securement, or the body could be formed integrally with some object such as a seat, bracket or frame which is to be secured to the track.

The anchoring formation 3 has a central bar or keel formation 14, as in the Fig 1 device. It will be understood that the precise form of this is not critical provided that it has adequate strength and fits in the narrow portions of the track opening. It is not critical that it is continuous between adjacent feet 13. The lateral foot projections 13 are as seen before, providing feet with an overall circular outline to fit with a practical degree of clearance into the track cut-outs. Again it will be understood that their precise shape is not critical, but that they should maximise the area trapped beneath the track lip in the captive condition. It is not functionally critical that their arcs are circular, but this is usually the appropriate shape

because the track cut-outs are conventionally formed by drilling.

The illustrated device has three foot formations 13 at single spacing i.e. no cut-out positions left unoccupied. For many purposes three is a minimum number, but more may be used, sometimes fewer in special cases. There is no strict need for a continuous series i.e. an alternative device might bridge one or more unoccupied cut-outs.

A characteristic feature is the presence of intermediate height lateral extensions 15, disposed symmetrically at either side, with forwardly-directed convex shoulders or abutment surfaces 151. See Fig 5, where the forward and rearward directions F, R are indicated with arrows. The abutment shoulders 151 are integrally cast with the rest of the anchorage formation 3 and extend up from the top surfaces 131 of the feet 13 to meet a flat, wider undersurface 111 of the main body 1.

The shoulder surfaces 151 to either side lie on a substantially circular arc. At the left-hand end of Fig 5, the leading portion A of a foot 13 and a leading portion B of an abutment shoulder 151 are indicated. With reference to Figs 6, 7 and 8 it can be seen that the feet 13 are offered up and into the track in the conventional way. The presence of the lateral extensions 15 then prevents free sliding along the track, irrespective of the position of the plunger 2. Rather,

the device must be slid forwards and only by a distance corresponding to the distance between A and B, bringing all of the forwardly-directed shoulders 151 into complementary engagement with the edges (shoulders 66) of the corresponding cut-outs 64 as shown in Figs 7 and 8. As a result all six shoulders 151 engage the track to transfer longitudinal load (indicated at arrow L in Fig 7), which is thereby spread over a much larger area than with a single plunger engagement. The plunger 2 is no longer required to withstand longitudinal operational loads, because these are now taken by the fixed shoulders 151, and with the advantage that these fixed formations unlike the plunger are not subject to the tolerances of a movable component.

The rear faces of the lateral extensions 15 are not functional for load bearing. The rearmost face 16 is rounded for convenience and appearance. The rear of the foremost extension 15 is concavely recessed as part of the access 171 to the bolt hole. The centre extension 15 has rearwardly-directed shoulder faces 152 which fit against and guide the plunger 2 as described below.

The only role of the plunger 2 is to prevent the device from shifting backwards to the release position, so it can be formed uni-directionally. As conventionally, it has a saddle form and sits vertically slidably on a recessed seat 19 of the body. At the intermediate and foot level, its side limbs 22 have outwardly-convex surfaces 23 directed rearwardly, and front concave inner

surfaces (not shown) shaped to fit closely onto the convex rear faces 152 of the central lateral extensions 15 (whose own abutment shoulders 151 are where the forwardly-directed faces of a conventional plunger would have been). Higher up, the plunger limbs have front and rear abutment surfaces 26 which engage corresponding guide buttress surfaces 18 of the body (Fig 4). A plunger retaining pin 24 and biasing spring 25 operate in a central opening 191 of the body in the known way.

CLAIMS:

1. An anchorage system comprising an anchorage device which is releaseably fixable to a track,

the track having an elongate channel with an upward opening having an overhanging retaining lip, at one or both sides, with a series of periodic cut-outs,

the anchorage device having a downward anchoring formation with two or more longitudinally-localised lateral enlargements (feet) at a longitudinal spacing corresponding to a periodicity of the cut-outs, the anchorage device having above each foot an intermediate downward extension portion laterally narrower than the foot whereby the anchorage device can be offered up to the track at an insertion/release position with its feet aligned with respective cut-outs, and shifted along the track to a captive position in which the feet, out of alignment with the cut-outs, are held beneath the overhanging lip(s), and wherein the anchorage device has at least one fixed abutment formation at the intermediate level which extends laterally so that in said captive position it abuts longitudinally against a shoulder of a corresponding cut-out and to prevent further movement of the anchorage device along the track in that direction.

2. Anchorage system according to claim 1 in which plural said fixed abutments are provided, projecting laterally to both sides of the device at the intermediate level.

3. Anchorage system according to claim 1 or claim 2 in which plural said fixed abutments are provided at plural locations spaced longitudinally along the anchorage device.

4. Anchorage system according to claim 1, 2 or 3 in which the or each fixed abutment has a face shaped complementarily to the shoulders of the cut-outs of the track, for example, an arcuately convex face of the fixed abutment to engage arcuate cut-out shoulders.

5. Anchorage system according to any one of the preceding claims in which,

where a foot of the anchorage device has a leading portion which passes first under a track lip as the device is shifted towards the captive position, a said fixed abutment corresponding to that foot is offset longitudinally by more than half the length of a cut-out.

6. Anchorage system according to any one of the preceding claims in which the intermediate downward extension is in the form of a longitudinally-elongate keel formation extending along between plural feet, said feet and said at least one fixed abutment being formed integrally with the keel formation.

7. Anchorage system according to claim 1 in which the anchorage device has a body, three or more regularly longitudinally spaced circular or arcuate-outline foot portions beneath the body, laterally narrower stem portions connecting vertically between the body and the foot portions and, above a rear extremity of more than one of the foot portions, a forwardly-directed arcuately convex fixed lateral shoulder abutment extending laterally outwardly relative to the narrow stem portion.

8. Anchorage system according to claim 7 in which a said shoulder abutment is provided for each of the foot portions.

9. Anchorage system according to claim 7 or 8 in which each said lateral shoulder abutment occupies the full height between an upward surface of the foot portion and a downward-facing bottom surface of the body.

10. Anchorage system according to any one of claims 7 to 9 in which the body of the anchorage device is or has a single metal casting comprising all of the foot portions, stem portions and shoulder abutments.

11. Anchorage system according to any one of the preceding claims in which a locking means of the anchorage device, operable to hold it against longitudinal space from the captive position back towards

an insertion/release position, comprises a plunger element mounted on the body of the device and positioned so that it can be lowered into a cut-out of the track in the captive position, and the plunger is provided adjacent behind a said fixed abutment of the device, so as to engage only rearwardly against a corresponding cut-out shoulder in use.

12. The anchorage device of an anchorage system as defined in any one of claims 1 to 11.

13. A restraint strap including an anchorage device according to claim 12.

14. A vehicle comprising an anchorage system as defined in any one of claims 1 to 11.

15. A method of securing or restraining objects in a vehicle, using an anchorage system according to any one of claims 1 to 11.

Application No: GB0900194.2 **Examiner:** Mr Patrick Phillips

Claims searched: 1 - 15 **Date of search:** 13 August 2009

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
Y	1 - 5, 12 - 15	US 2007/065248 A1 (LEGEAY) Figures 1 to 3b and Paragraphs 39, 50 and 53.
Y	1 - 5, 12 - 15	US 5871318 A (DIXON) Whole document.
A	-	US 4496271 A (SPINOSA)
A	-	US 4530483 A (NORDSTROM)
A	-	DE 102007016530 A1 (AIRBUS)
A	-	EP 1342662 A1 (DAOUK)
A	-	GB 2200529 A (UNWIN)

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A61G; B60N; B60P; B61D; B64C; B64D

The following online and other databases have been used in the preparation of this search report

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
B60P	0007/08	01/01/2006