



(51) International Patent Classification:
B60R 9/042 (2006.01)

(21) International Application Number:
PCT/IL2009/001129

(22) International Filing Date:
1 December 2009 (01.12.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/193,454 1 December 2008 (01.12.2008) US

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(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,

DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,
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SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT,
TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments (Rule 48.2(h))

(54) Title: CAR RACK

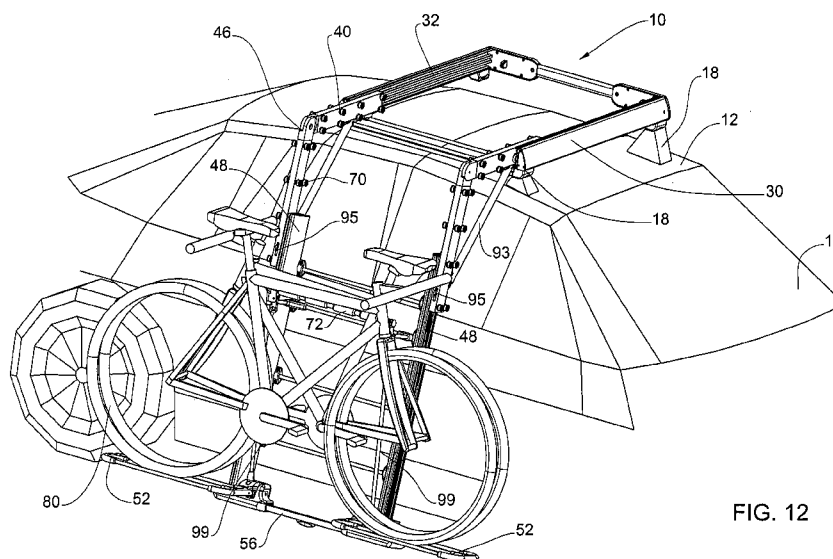


FIG. 12

(57) Abstract: A roof rack for mounting on a vehicle's roof top, comprising a frame fixed to the roof top, at least one rail assembly transversing the vehicle and comprising a first rail segment fixed with respect to the frame, a second rail segment slidable with respect to the first rail segment, a third rail segment pivotable with respect to the second rail segment about an axis perpendicular to a sliding axis of the rail, and a fourth rail segment slidable with respect to the third rail segment. At least the fourth rail segment comprising cargo supports. The rack being configurable between a stowed position wherein the segments are telescopically retracted and received within the frame, and a deployed position wherein said third and fourth rail segments extend downwards.

CAR RACK

FIELD OF THE INVENTION

This invention relates to car-racks. More particularly the invention is concerned with racks of the type mounted on rooftops of vehicles. A roof rack according to the present invention is multipurpose and is suited for carrying bicycles and other cargo, such as one or more wheelchairs, suitcases, ski gear and the like.

BACKGROUND OF THE INVENTION

The ever-growing popularity of cycling results in the search of bicycle racks for transporting bikes to riding locations etc. For that purpose, a large variety of devices have been proposed. Also, there is a need for such racks which are suited for carrying various types of cargo and where mounting of the cargo is not complicated or requires a considerable effort.

Several solutions are directed to carrying one or more bicycles on the rear bumper of the vehicles, on the rear sloping hatchback of some vehicles, or on the roof structure of the vehicles. Some of these structures allow positioning of the entire bicycle, while others require the bicycle to be partially disassembled, for example with one of the wheels removed.

Some of the rooftop bicycle carrier devices are compatible with conventional rooftop carrier racks that typically are provided as original equipment on some vehicles, such as sport utility vehicles (SUVs) and station wagons. Other carrier structures and systems are independent and attach separately to the vehicle or roof structure.

Lifting and securing of bicycles on rooftop devices can be a difficult and time-consuming task. The bicycles are often heavy and awkward to easily lift and position on rooftops, which in some vehicles are substantially high. Evenmoreso, with such bicycle rooftop racks which support the bicycle at an upright position there is always the risk of damage to the bicycle and/or vehicle upon colliding with a low structure, e.g. a garage

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roof, a tree, a bridge, etc. Still, the moments of inertia acting on a bicycle positioned at an upright position are substantially high and may tear the bike or rack from the vehicle rooftop, e.g. as a result of a speedy turn.

One example of a roof rack is disclosed in D 202005009558U disclosing a frame which can be used with any standard traverses attached to the roof of the vehicle. A second pair of transversal elements provided with projections to be inserted into longitudinal slots at the traverses is joined with fastening elements to the existing traverses. The rack assembled of a rectangular frame with a wind deflector at the front and two wheel holding units can be slid along the rails into a vertical position at the side of the vehicle, loaded with the bicycle or any other item slid back and fastened with straps.

EP 0921036A2 discloses a roof rack, for carrying bicycles on the roof of an automobile, having a frame of adjustable width. The support rollers, for the frame, are at the front side zone of the running rails. Part of the frame tubes form a bodywork support with a large and padded laying surface. Clamps secure the frame to the running rails while being carried on the roof.

US 5,421,495 is concerned with a roof rack for use with vehicles. The roof rack includes a frame attachable to the roof of a car and an arm movable relative to the frame between a first position wherein a portion of the arm is positioned below the roof along the side of the car and a second position wherein a portion of the arm is positioned above the roof of the car. The device also comprises a lock for locking the arm in its second position. The roof rack includes a stop mechanism for stopping the movement of the arm at its first position and selecting the first position such that the arm, or the object mounted thereto, does not touch the side of the car. The device is well suited to mounting bicycles onto the roofs of cars.

DE 4339947 discloses a roof rack for bicycle has two fixed cross-pieces and two adjustable longitudinal pieces, one of which has adjustable wheel grips while the other has frame grips to hold the bicycle flat on the roof. Two wheel grips are fitted for each wheel. The wheel grips are on a swivel mounting so the machine can be set into the grips vertically and swung down onto the roof. Another frame grip is fitted between the wheel grips to secure the bicycle in the vertical position and to swing down into the first position. The wheel grips are U-shaped and are adjustable to suit different wheel sizes.

DE 3513085 is directed to a manually operated bike lifter comprising a spring-supported mechanical device for the vertically guided lifting of a bicycle onto the roof-rack of a vehicle (especially a car) so that it can be transported. In the transport position, the bike lifter, which is itself mounted on the roof-rack, serves as a supporting frame for the bicycle, which is attached to the bike lifter by means of a universally usable holding clamp. It is formed by two metal frames (stand and extension arm) which are articulately connected to one another, the stand accommodating both bicycle wheels in a rail and the extension arm serving as a lifting crane. It is rotatably suspended in the roof-rack and can be fixed in three operating positions.

US 5,827,036 discloses a wheelchair lift which mounts to the roof of a vehicle such as an ordinary automobile using commonly available mounting hardware used for attaching a variety of rooftop storage containers to such vehicles. The wheelchair lift, powered by the vehicle's battery, is remotely operable from the driver's seat of the vehicle using a handheld or dash mounted controller. The preferred embodiment permits easy attachment of the wheelchair to a lifting assembly, which is then elevated with the assistance of an electric motor to a rooftop platform. Once securely positioned in a generally flat orientation, a hingedly attached cover member is lowered over the wheelchair and lifting assembly, and latched into position to the platform or support assembly.

US 4,236,860 discloses a device for selectably positioning an invalid's mobility aid appliance onto an automobile comprising support apparatus mountable onto the roof of the automobile; transfer apparatus, mounted onto the support apparatus for selectably transporting a mobility aid appliance between a storage position and a utilization position adjacent to the automobile; and a cover member articulately mounted onto the support apparatus so as to assume a raised orientation during the transport of the mobility aid appliance between storage and utilization positions and a lowered orientation when the mobility aid appliance is stored therebelow.

FR2626225 relates to a movable roof rack which is placed in an almost vertical position on the door side of the vehicle and thus allows loading, unloading and securing of heavy or bulky objects with ease. The roof rack consists of a movable part which slides parallel to the roof of the vehicle then pivots and comes into abutment against the lower rollers in an almost vertical position on the door side along the vehicle. The

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movable part of the roof rack includes, at its rear part, straps mounted on winders which, once the luggage has been loaded, make it possible to secure it easily without the addition of external straps.

In view of the difficulties associated with rooftop racks and the mounting of bicycle and other cargo on such racks, there is a need for an improved device and system which allows loading and carrying of bicycles and other cargo in an easier and efficient manner.

SUMMARY OF THE INVENTION

The present invention provides a roof-top rack for a vehicle which is easily manipulable between a stowed position and a deployed position, also at the presence of cargo on the rack.

According to the present invention there is provided a roof rack for mounting on a vehicle's roof top, said rack comprising a frame fixed to the roof top, at least one rail assembly transversing the vehicle, said rail assembly comprising a first rail segment fixed with respect to the frame, a second rail segment slidable with respect to said first rail segment, a third rail segment pivotable with respect- to said second rail segment about an axis perpendicular to a sliding axis of the rail, and a fourth rail segment slidable with respect to said third rail segment, at least said fourth rail segment comprising cargo supports; said rack being configurable between a stowed position wherein said segments are telescopically retracted and received within the frame, and a deployed position wherein said third and fourth rail segments extend downwards.

Any one or more of the following features and design embodiments may be applied in connection with the present invention:

- the roof rack comprises a pair of parallelly extending rail assemblies wherein the first rail segment of each rail assembly is associated with a front/rear bracket thereof, respectively.
- the first rail segment of each rail assembly constitutes a front/rear bracket thereof, respectively. Advantageously, the front/rear bracket have an aerodynamic shape.
- the fourth rail segments are each fitted with an extendible ground engaging support.

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- the ground engaging supports are axially extendible independent of each other. According to one embodiment, said ground engaging supports displace to their extended position under force of gravity. According to another embodiment said ground engaging supports are spring biased.
- the rack further comprises at least one axially extendible pivotable cargo support.
- the cargo support is modular or replaceable so as to comply with different types of cargo.
- the roof rack is a bicycle rack and wherein the cargo supports comprise at least a front wheel support and a rear wheel support.
- the at least front wheel support and rear wheel support are manipulable between a bicycle carrying position and other cargo carrying position.
- at the deployed position a pivot end of the second rail segment laterally projects from a side edge of the roof.
- the roof rack further comprises a limit mechanism to prevent the third rail segment from pivoting over 90° with respect to the second rail segment.
- at the deployed position a lowermost end of the fourth rail segment engages a ground surface.
- the third rail segment is pivotally attached to the second rail segment by a biased pivot mechanism thereby facilitating elevating the third rail segment into a position parallel to said second rail segment. Such a biased pivot mechanism is for example a torsion spring.
- a recoil force of the biased pivot mechanism is adjustable.
- the third rail segment is pivotally attached to the second rail segment by a pivot mechanism fitted with a radial arrest mechanism, thereby facilitating controlled displacement of the third rail segment through discrete positions. Such a mechanism may be a ratchet mechanism, a plunger mechanism and the like.
- a tension mechanism is provided to assist in retraction of said rail into the stowed position.
- the tension mechanism facilitates in retraction of at least one of the first rail segment and the frame, and the third rail segment and the fourth rail segment.

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- the frame is detachable attachable to the vehicle's roof top.
- a locking mechanism is provided for retaining the rack at its stowed position.
- there may be further provided a locking mechanism for retain the rack at its fully deployed position, however with the second rail segments being locked with respect to the first rail segments, to prevent their angular displacement. According to one embodiment, this mechanism is a piston assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the invention and to see how it may be carried out in practice, embodiments will now be described, by way of non-limiting examples only, with reference to the accompanying drawings, in which:

Fig. 1 is a front perspective view of a vehicle fitted with a roof top rack in accordance with the present invention, at its stowed position;

Fig. 2 is a rear perspective view of the roof rack of Fig. 1, enlarged;

Fig. 3 is a front view of the vehicle fitted with the roof rack;

Fig. 4 is a top view of the roof rack at its stowed position;

Fig. 5 is a right side view of the rack at its stowed position;

Fig. 6 is an enlargement of the portion marked VI in Fig. 1;

Fig. 7 illustrates a first step in deployment of the rack;

Fig. 8 illustrates the vehicle with the roof rack at its deployed position, however with cargo supports at their collapsed position;

Fig. 9 is an enlarged view of a portion of the roof rack at its deployed position;

Fig. 10 is an enlargement of the portion marked X in Fig. 9, with a visualized schematic illustration of the plunger mechanism;

Fig. 11A illustrates the roof rack at its fully deployed position;

Fig. 11B is an enlargement of a cargo support element;

Fig. 12 illustrates the vehicle fitted with the roof rack and a pair of bicycles mounted thereon at the deployed position;

Fig. 13 is a front view of Fig. 9;

Fig. 14 illustrates the roof rack mounted with a pair of bicycles; and

Fig. 15 illustrates the roof rack fitted on a pair of detachable roof rails.

DETAILED DESCRIPTION OF EMBODIMENTS

Attention is directed to the drawings illustrating a roof top rack generally designated **10** mounted on a roof **12** of a vehicle **14**. The rack **10** occupies a major portion of the roof illustrated in the drawings however does not depart from the width (Fig. 3) of the vehicle. A roof rack **10** is mounted on the vehicles' roof **12** by several mounting posts **18** (one at each corner) those being secured to the roof **12** either by appropriate balls or by suitable receiving grooves nowadays common in vehicles. Attachment may be permanent or detachable, at choice. In the particular example, the roof rack **10** is symmetrical and may be mounted as a right side mounting or a left side mounting, at owner's choice.

The roof rack **10** has a generally rectangular shape and it is displaceable between a completely stowed position (Figs. 1 to 5) and a deployed position (Figs. 11A, 12, 13).

The roof rack **10** illustrated in the drawings comprises two rail assemblies **22** parallelly extending to one another and transversing the vehicle **14**. It is apparent that in accordance with different embodiments (not illustrated) the roof rack may comprise one such rail assemblies or, where it is intended to bear substantially heavy loads, more than two rail assemblies may be provided.

The roof rack **10** comprises a rectangular frame **28** composed of a front rail **30**, a rear rail **32**, a right rail **34**, said frame **28** being open at the vehicle's left side. As can best be seen in the figures referring to the roof rack at its deployed position, the rail assemblies **22** each comprise a first rail segment which in the present example are the front rail **30** and the rear rail **32** which are integrated components of the frame **28**. However, in accordance with other embodiments (not illustrated) the respective front and rear rails **30** and **32** may be fixedly articulated to the frame members, optionally in a detachable manner. Rail assemblies **22** further comprise a second rail segment **40** slideably engaged with the first rail segments **30** and **32** respectively, and a third rail segment **42** is pivotally articulated to the second rail segment **40** by means of pivot **46** facilitating pivotal displacement upon an access substantially parallel to the vehicle's longitudinal axis and perpendicular to the sliding axis of the second rail segments. The rail assemblies **22** further comprise a fourth rail segment **48** slideably engaged with respect to the third rail segment **42**.

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The two parallel rail segments **48** constitute a support frame for carrying cargo and for that purpose several cargo support means are provided. In the particular example, the cargo supports (seen in Fig. 7 at their folded position and in Figs. 11A, 12, 13 at their deployed position) generally referred to at **52** are in particular suited for carrying various types of cargo e.g. a suitcase, crates/boxes, or one or more pairs of bicycle, as will be illustrated hereinafter in further detail. However, it is apparent, in particular from Fig. 1 that at the collapsed position of the cargo supports **52** they form a substantially flat platform for large items such as suitcases, boxes and the like and furthermore do not minimally interfere with the aerodynamic performances of the rack **10**.

The two force rail segments **48** are interconnected by a transversing bar **56** for rigidly defining structure and at the end of each of the force rails segment **48** there is provided a ground engaging support in the form of an independently extendable support foot **60** adapted for engaging the ground surface upon deploying the roof rack **10** into its fully deployed position (Figs. 8, 11A, 12 and 13), said support feet **60** being extendable so as to engage the ground surface also at the even of uneven surface or when the vehicle is unlevelled or parked by the curb. According to a particular design, the ground engaging support feet **60** are spring biased into their extended position, however, are provided with a locking member to retain same at their retracted position at the stowed position of the roof rack **10**.

The arrangement is such that the second rail segments **40** are telescopically slideable with respect to the first rail segments (front and rear rails **30** and **32**, respectively) and as appreciated in particular from Fig. 13, the second rail segments **40** are retractable to an extent that the pivot mechanism **46** extends substantially vertically above or beyond the width of the vehicle so as to prevent damage to the vehicle. It is thus apparent that the third rail segments **42** are pivotable about the second rail segments **40** only upon retraction of the second rail segments **40** with respect to the first segments **30** and **32**, as in the position of Fig. 7, illustrating the rack upon retraction of all segments, however before pivoting the third and fourth segments into the position of Fig. 8. However, upon retraction of the second rail segments **40** and the third rail segments **42**, the third rail segments **42** may be pivoted downward in direction of arrow **62** (Fig. 8) allowing the force rail segments **48** to telescopically extend until

engagement with the ground surface or until the ground engaging supports **60** engage the ground (Figs. 8 and 13).

The rail assemblies **22** may be full telescopic assemblies (namely wherein first, second, third and fourth rail segments are coaxially received within one another) or may be partially telescopic and partially non-telescopic sliding rails. However, in order to facilitate smooth deploying of the roof rack and retraction into the stowed position with or without cargo, a plurality of low friction rollers **70** are provided for smooth running over respective rails despite of a load mounted over the rack. Fig. 6 illustrates a particular design of roof rack wherein the profiles forming the rail assembly have a substantially aerodynamic provide, said profiles being made for example of extruded aluminum material rendering the rack simplicity and simple and cheap for manufacture. As can be seen in Fig. 6, the first rail segment **32** and the fourth rail segment **48** are identical profiles, though inverted and integrally formed with roller supports **74** to facilitate smooth rolling of rollers **70** supported over center axis **76**. Longitudinal opening designated at **61** serves for sliding receiving of the ground engaging foot **60** (not shown in Fig. 6).

The pivot mechanism generally designated as **46** is designed to facilitate pivotal displacement of the third rail segment **42** (with the force rail segment **48** associated therewith) with respect to the second rail segment **40**. According to one particular design, the pivot mechanism **46** is a torsion spring designed so as to prevent dropping of the rack upon deployment on the one hand and, on the other hand, to assist upon elevating the third and fourth rail segments into the elevated position of Fig. 7 towards a stowing position.

A different embodiment of a pivot mechanism is disclosed in Fig. 10 illustrating a ratchet-type mechanism wherein the second rail segment **40** is formed with a cylindrical housing **80** fitted with a plurality of notches **82** whilst the third rail segment **42** comprises two spring-biased plunger mechanisms **86**, each comprising a housing **88** radially extending from the pivot axis **89** and accommodating a spring-biased plunger **92** adapted for engagement within a corresponding notch **82** of the second rail **40**. The arrangement is such that pivotal displacement of the third rail segment **42** with respect to the second rail segment **40** is facilitated through a plurality of discrete angular positions wherein the event that the third rail segment is unintentionally released whilst

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the cantilever position of Fig. 7, it will not drop down freely, owing to the biasing effect.

It is appreciated that the biasing force of plungers 92 as well as the recoil force of a torsion spring mechanism (not shown) may be adjusted to preset levels corresponding with intended bearing weight of the rack.

When it is now desired to load a cargo on the rooftop rack, e.g. a pair of bicycles or the like, the following steps are taken: first, the rail assemblies are fully withdrawn, substantially horizontally into the position illustrated in Fig. 7. Then, the assembly is allowed to pivot downwards in direction of arrow 62 (Fig. 8) with the support seat 60 engaging the ground. Further, the cargo supports 52 are deployed into their operative position (Fig. 11a and 11b) and the cargo racks 72 and 74 are pivoted so as to project laterally and space the cargo (bicycles 80) from the rack as can best be seen in Fig. 13. The cargo is then secured to the rack e.g. by elastic bands or other fastening means and then the rack is collapsed by lifting the support seat 60 and pivoting of the frame about axis 46 into the substantially horizontal position (Fig. 7) whereupon the frame is retracted into the position of Fig. 14. It is noted that the rail segments 42 and 48 will not spontaneously displace into their retracted position owing to a stopper latch resting the rack at the closed, collapsed position.

It is noted that there is further provided a locking mechanism in the form of a retractable piston assembly 93 for retaining the rack at its fully deployed position (Fig. 13), said locking mechanism extending between the first rail segment 40 and the second rail segment 42, such that the second rail segment is pivotally locked with respect to the first rail segments, to prevent angular displacement. For releasing the locking mechanism a latch 95 is depressed, to facilitate the collapsing of the locking mechanism 93. According to one particular embodiment, the locking mechanism is a piston assembly which assists in dampening displacement of the second rail segment (and associated third rail segment) into the deployed position.

Further noted, the rack may be fitted with various arrangements designated for mounting different types of cargo and their support. As seen (for example in Fig. 9), a support rack 99 is provided (illustrated at an erect position), useful, for example, for supporting two pairs of bicycles. The support rack self-collapses once the rack is displaced into its collapsed configuration, or manual collapsing thereof may be required.

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Those skilled in the art to which this invention pertains will readily appreciate that numerous changes, variations, and modifications can be made without department from the scope of the invention, *mutatis mutandis*.

CLAIMS:

1. A roof rack for mounting on a vehicle's roof top, said rack comprising a frame fixed to the roof top, at least one rail assembly transversing the vehicle, said rail assembly comprising a first rail segment fixed with respect to the frame, a second rail segment slidable with respect to said first rail segment, a third rail segment pivotable with respect to said second rail segment about an axis perpendicular to a sliding axis of the rail, and a fourth rail segment slidable with respect to said third rail segment, at least said fourth rail segment comprising cargo supports; said rack being configurable between a stowed position wherein said segments are telescopically retracted and received within the frame, and a deployed position wherein said third and fourth rail segments extend downwards.
2. A roof rack according to claim 1, comprising a pair of parallelly extending rail assemblies wherein the first rail segment of each rail assembly is associated with a front/rear bracket thereof, respectively.
3. A roof rack according to claim 2, wherein the first rail segment of each rail assembly constitutes a front/rear bracket thereof, respectively.
4. A roof rack according to claim 3, wherein the front/rear bracket have an aerodynamic shape.
5. A roof rack according to claim 2, wherein the fourth rail segments are each fitted with a ground engaging support.
6. A roof rack according to claim 5, wherein the ground engaging supports are axially extendible independent of each other.
7. A roof rack according to claim 1, further comprising at least one axially extendible pivotable cargo support.
8. A roof rack according to claim 7, wherein the cargo support is modular or replaceable so as to comply with different types of cargo.
9. A roof rack according to claim 7, wherein the roof rack is a bicycle rack and wherein the cargo supports comprise at least a front wheel support and a rear wheel support.

10. A roof rack according to claim 9, wherein the at least front wheel support and rear wheel support are manipulable between a bicycle carrying position and other cargo carrying position.
11. A roof rack according to claim 1, wherein at the deployed position a pivot end of the second rail segment laterally projects from a side edge of the roof.
12. A roof rack according to claim 1, further comprising a limit mechanism to prevent the third rail segment from pivoting over 90° with respect to the second rail segment.
13. A roof rack according to claim 1, wherein at the deployed position a lowermost end of the fourth rail segment engages a ground surface.
14. A roof rack according to claim 1, wherein the third rail segment is pivotally attached to the second rail segment by a biased pivot mechanism thereby facilitating elevating the third rail segment into a position parallel to said second rail segment.
15. A roof rack according to claim 14, wherein a recoil force of the biased pivot mechanism is adjustable.
16. A roof rack according to claim 1, wherein the third rail segment is pivotally attached to the second rail segment by a pivot mechanism fitted with a radial arrest mechanism, thereby facilitating controlled displacement of the third rail segment through discreet positions.
17. A roof rack according to claim 1, wherein a tension mechanism is provided to assist in retraction of said rail into the stowed position.
18. A roof rack according to claim 17, wherein the tension mechanism facilitates in retraction of at least one of the first rail segment and the frame, and the third rail segment and the fourth rail segment.
19. A roof rack according to claim 1, wherein the frame is detachable attachable to the vehicle's roof top.
20. A roof rack according to claim 1, further comprising a locking mechanism for retaining the rack at its stowed position.

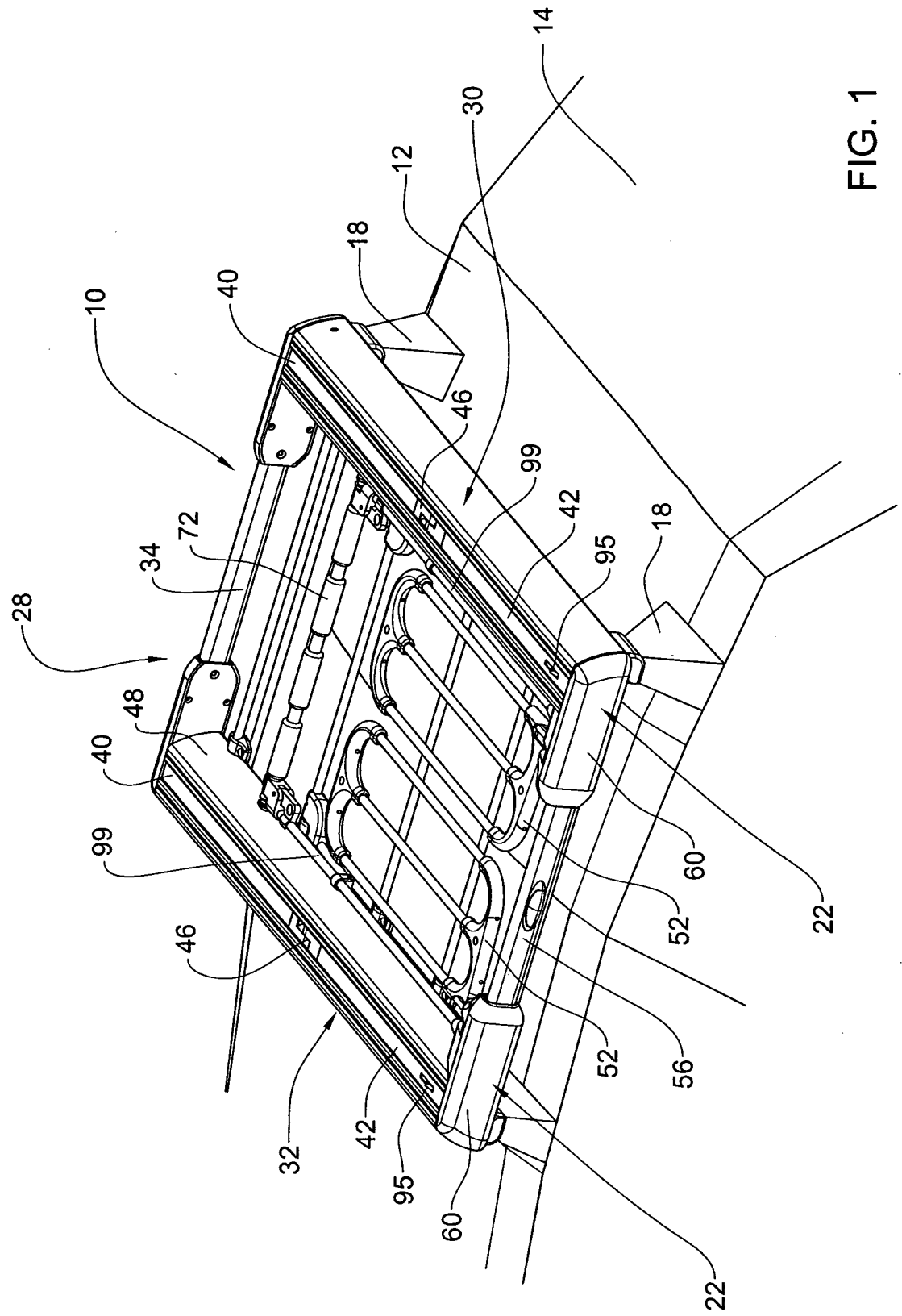


FIG. 1

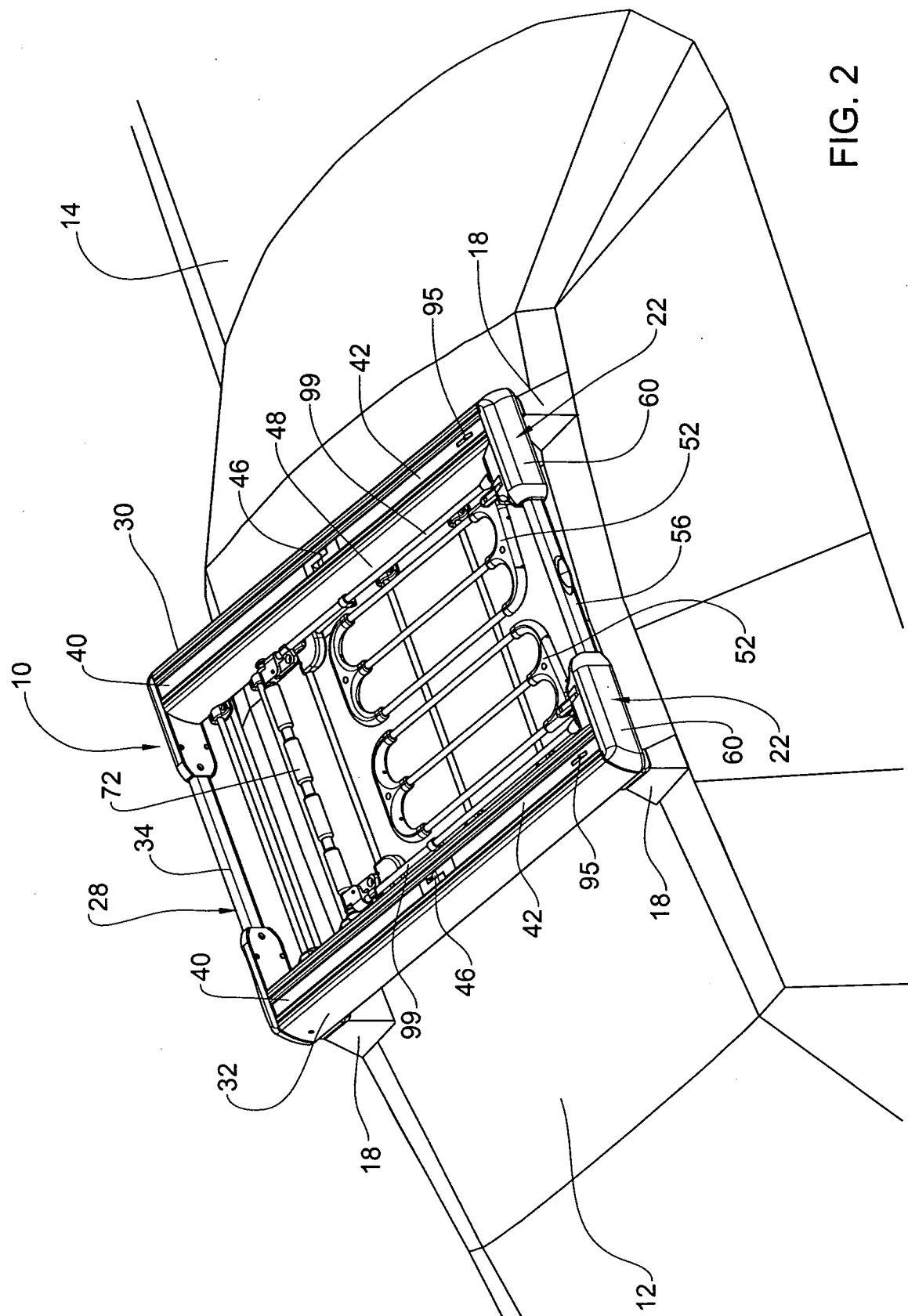


FIG. 2

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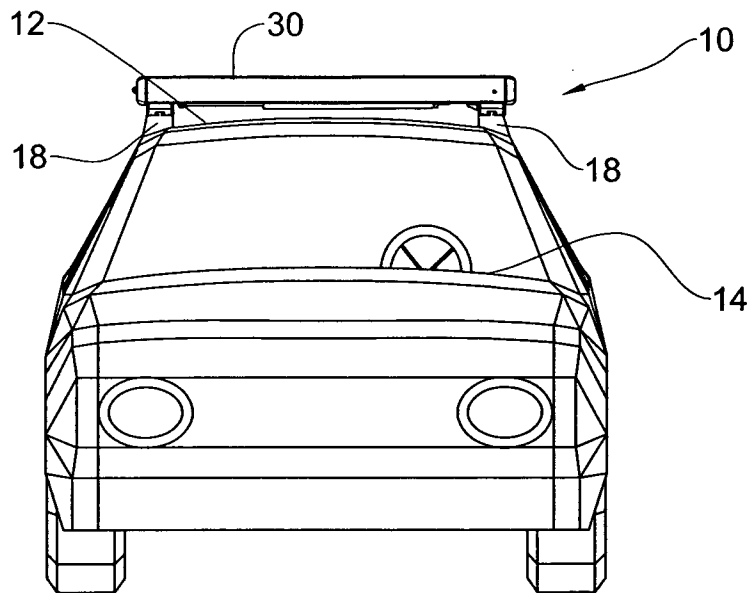


FIG. 3

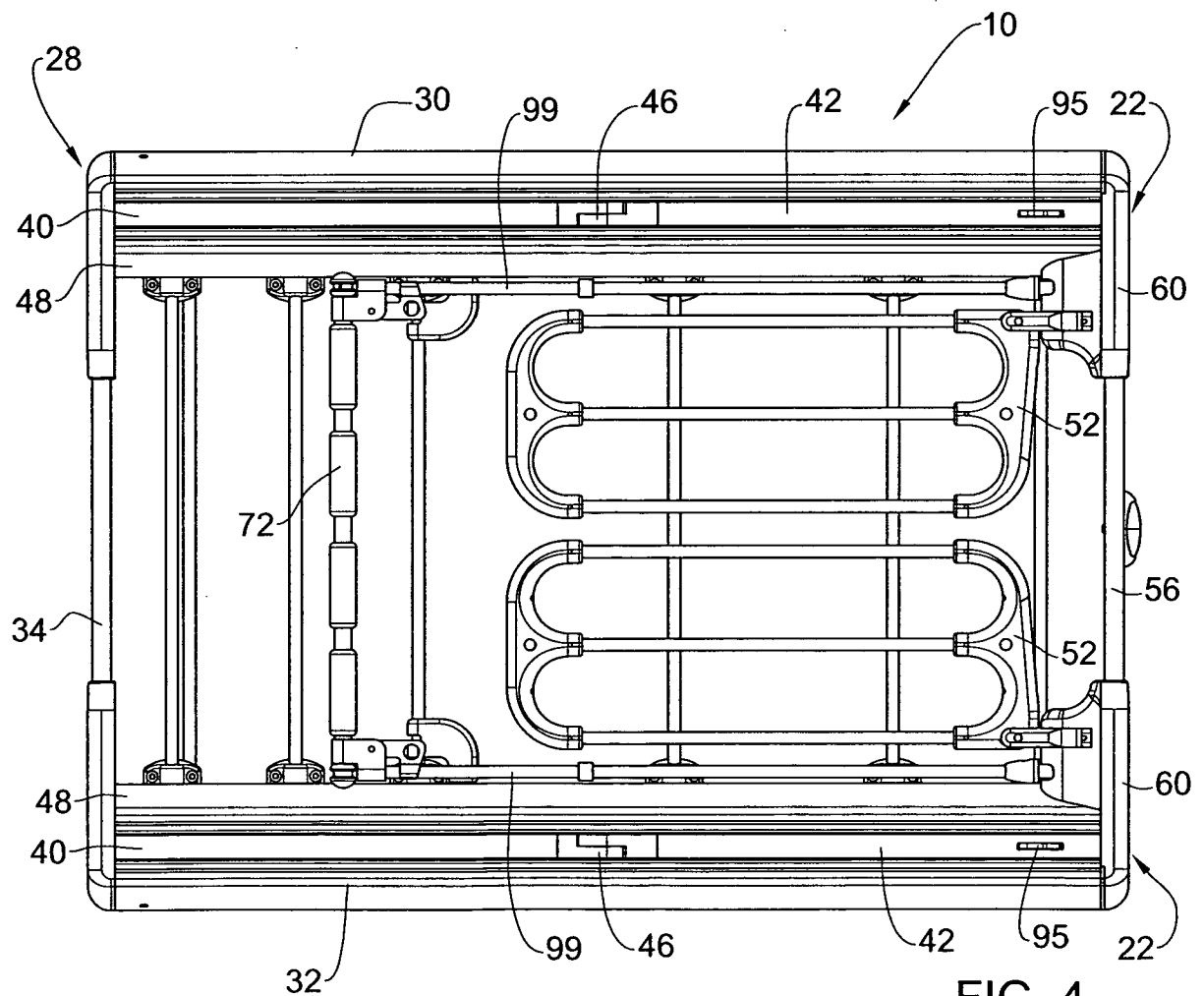


FIG. 4

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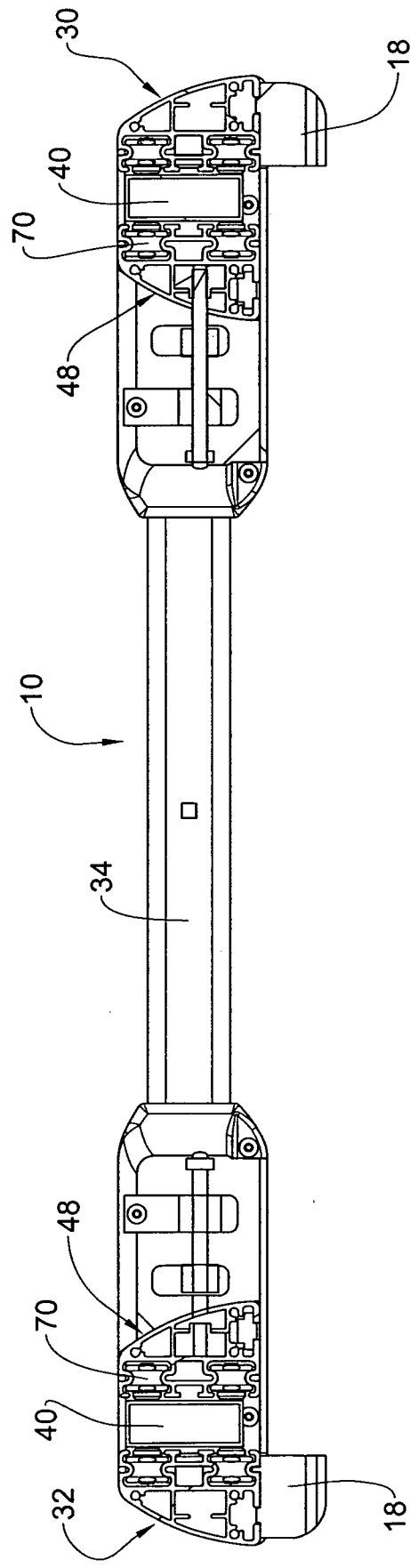


FIG. 5

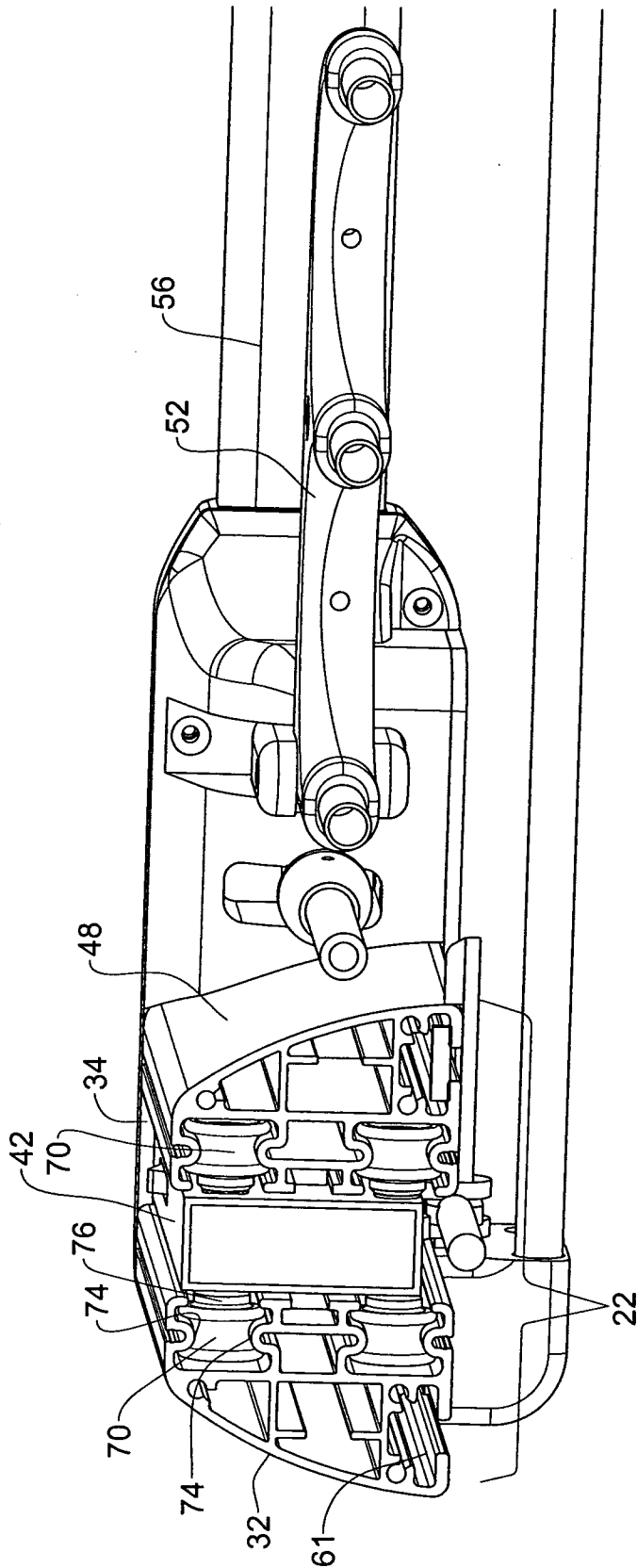


FIG. 6

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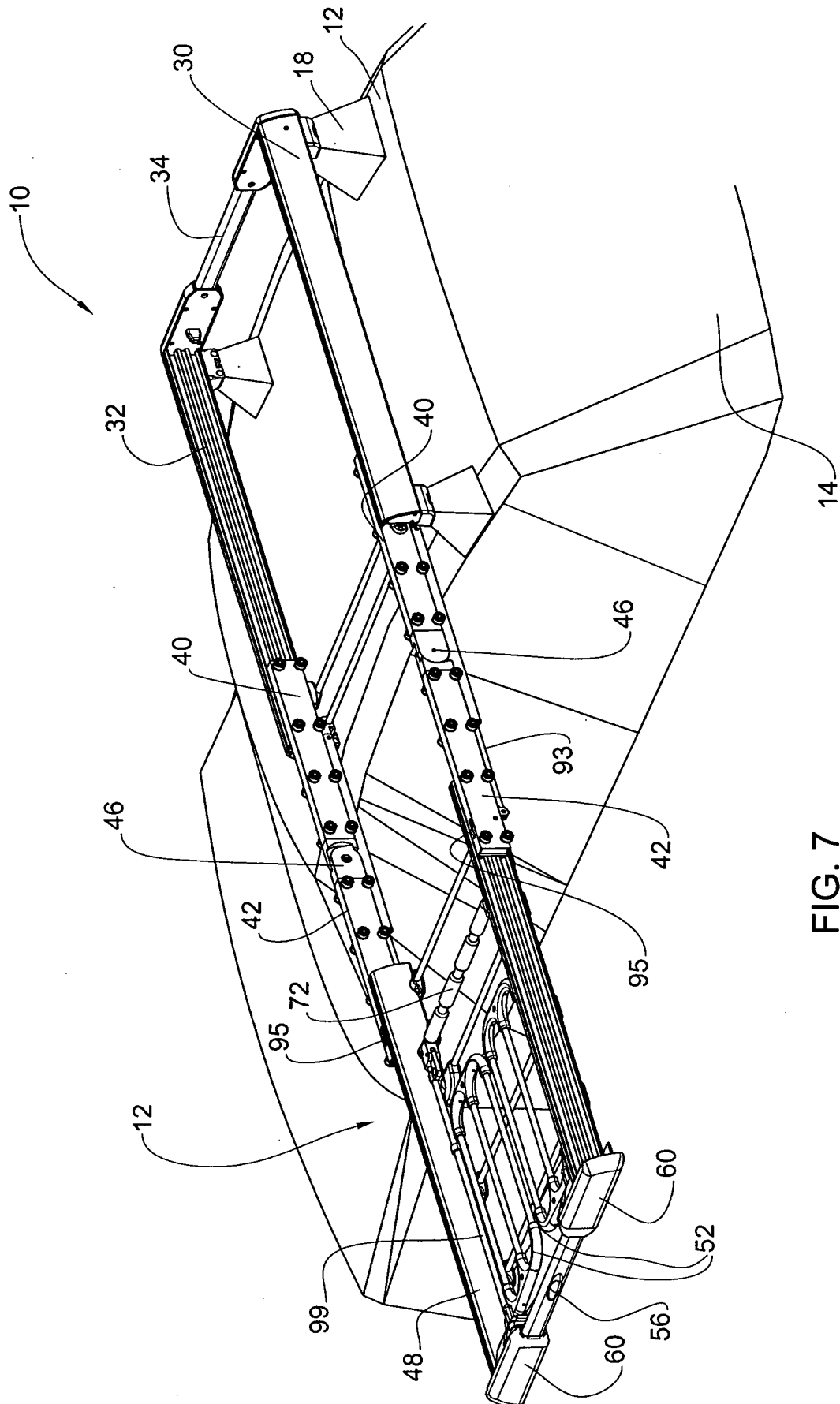


FIG. 7

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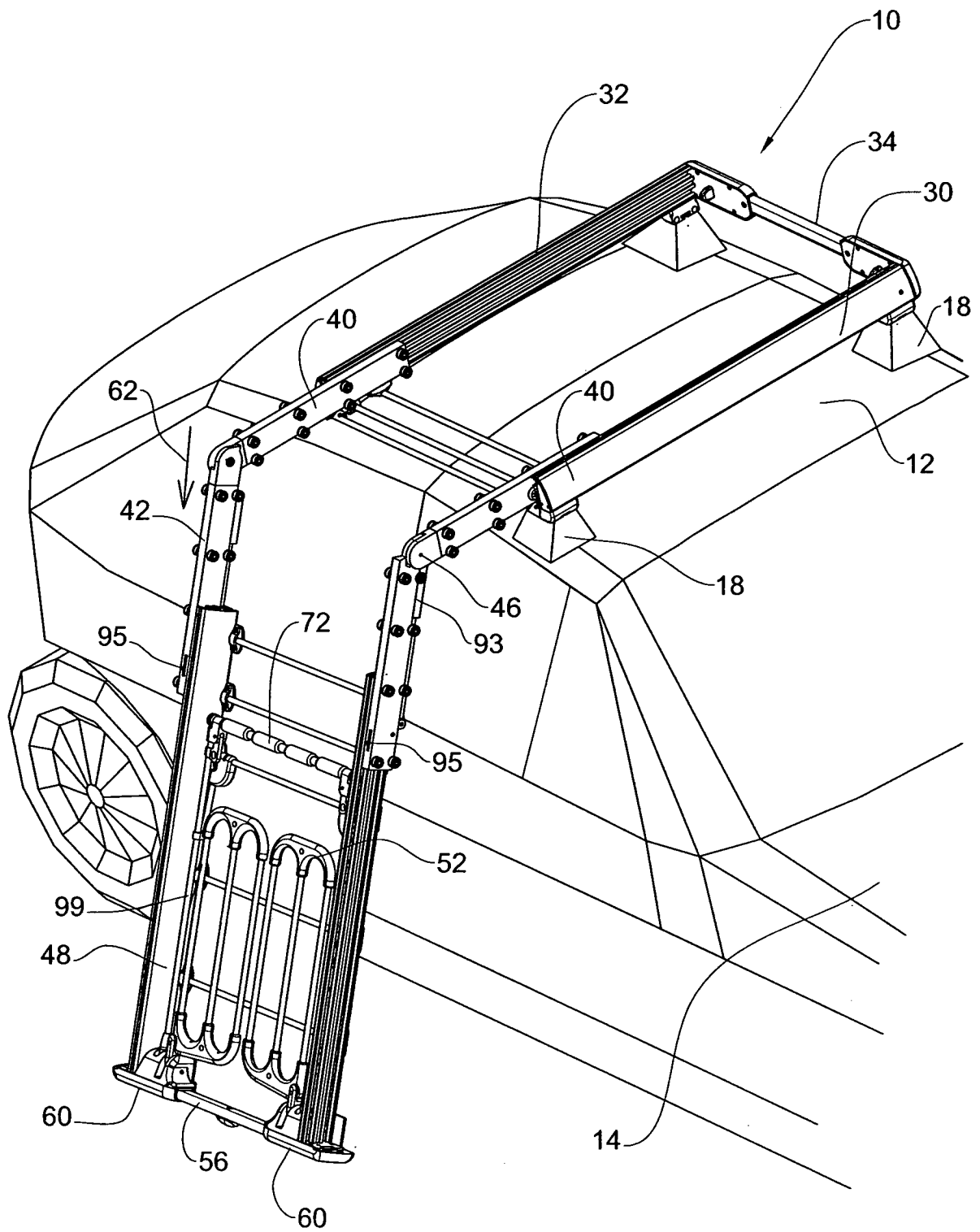


FIG. 8

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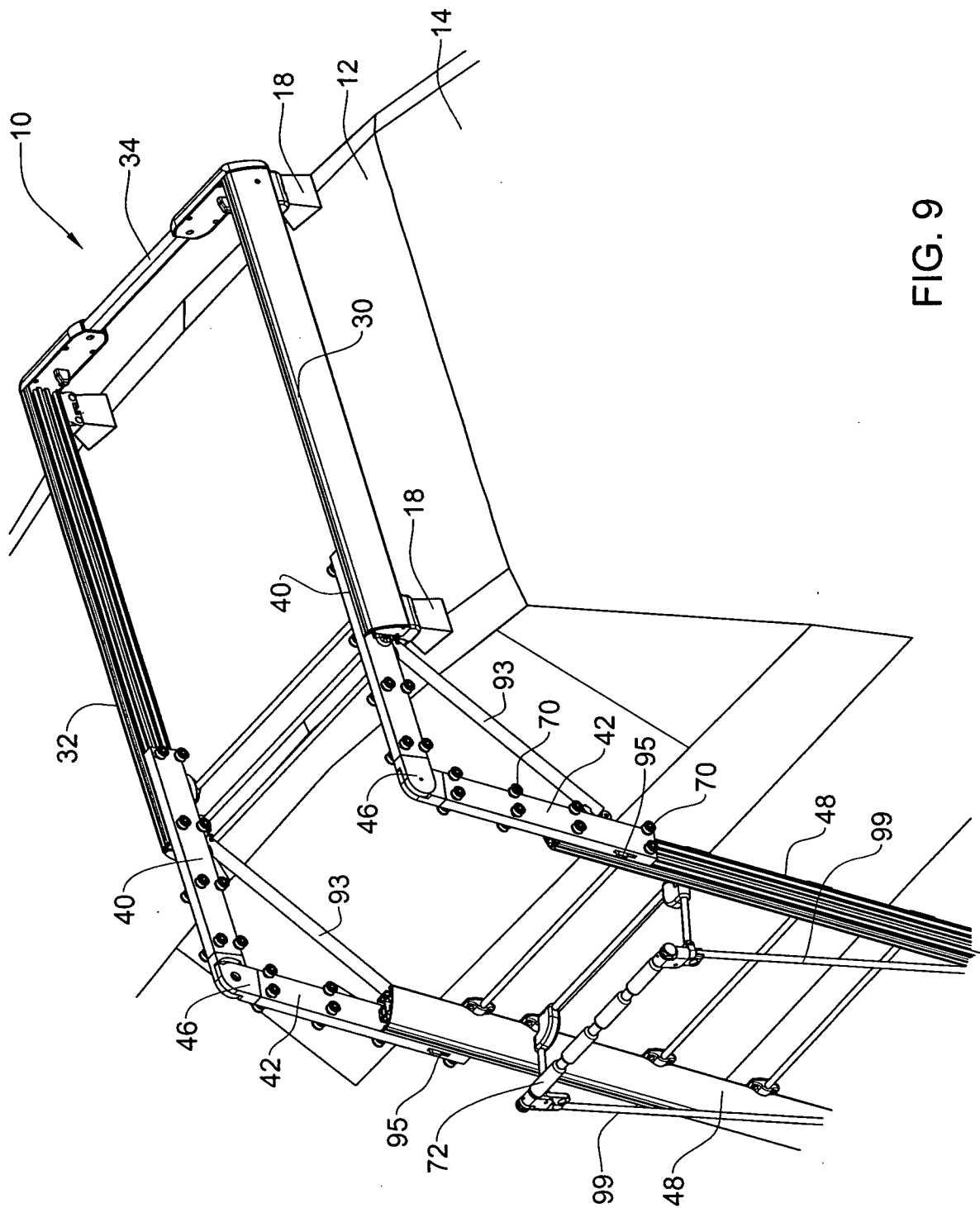


FIG. 9

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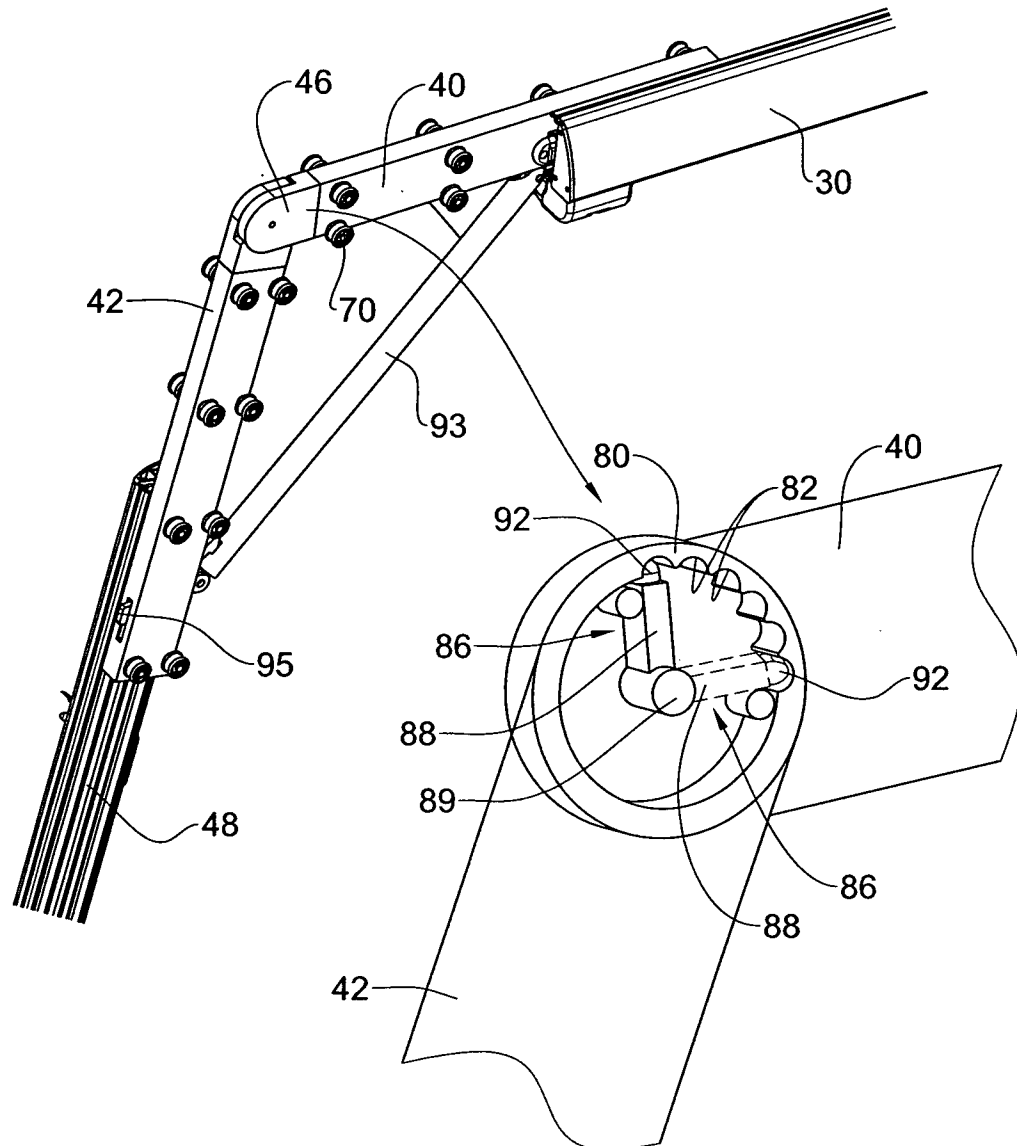


FIG. 10

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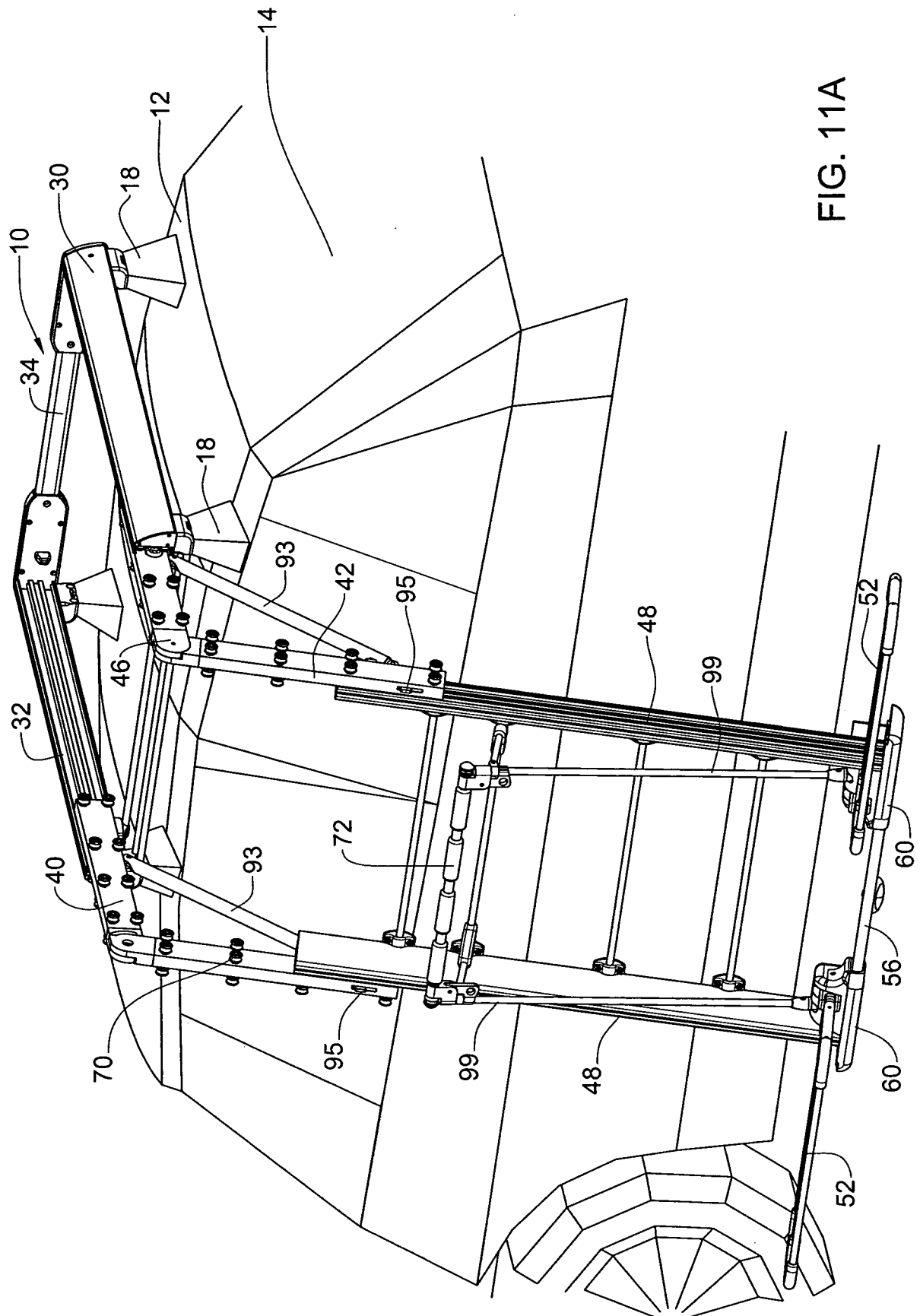


FIG. 11A

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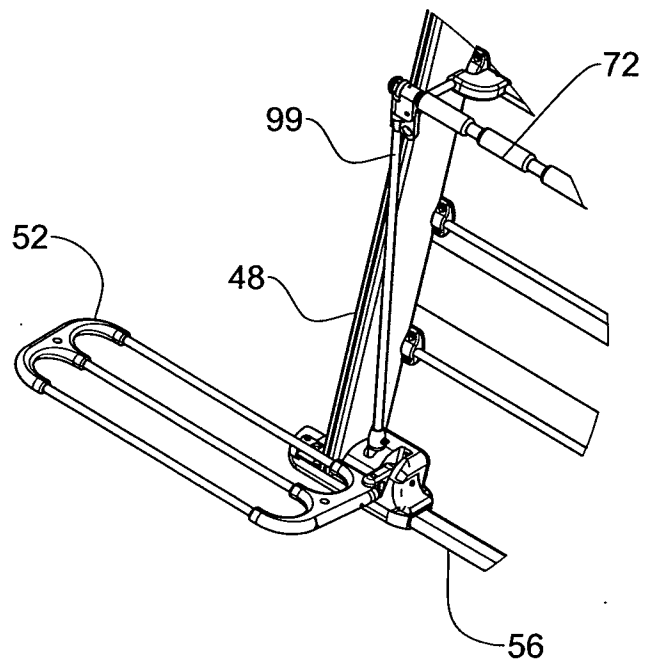


FIG. 11B

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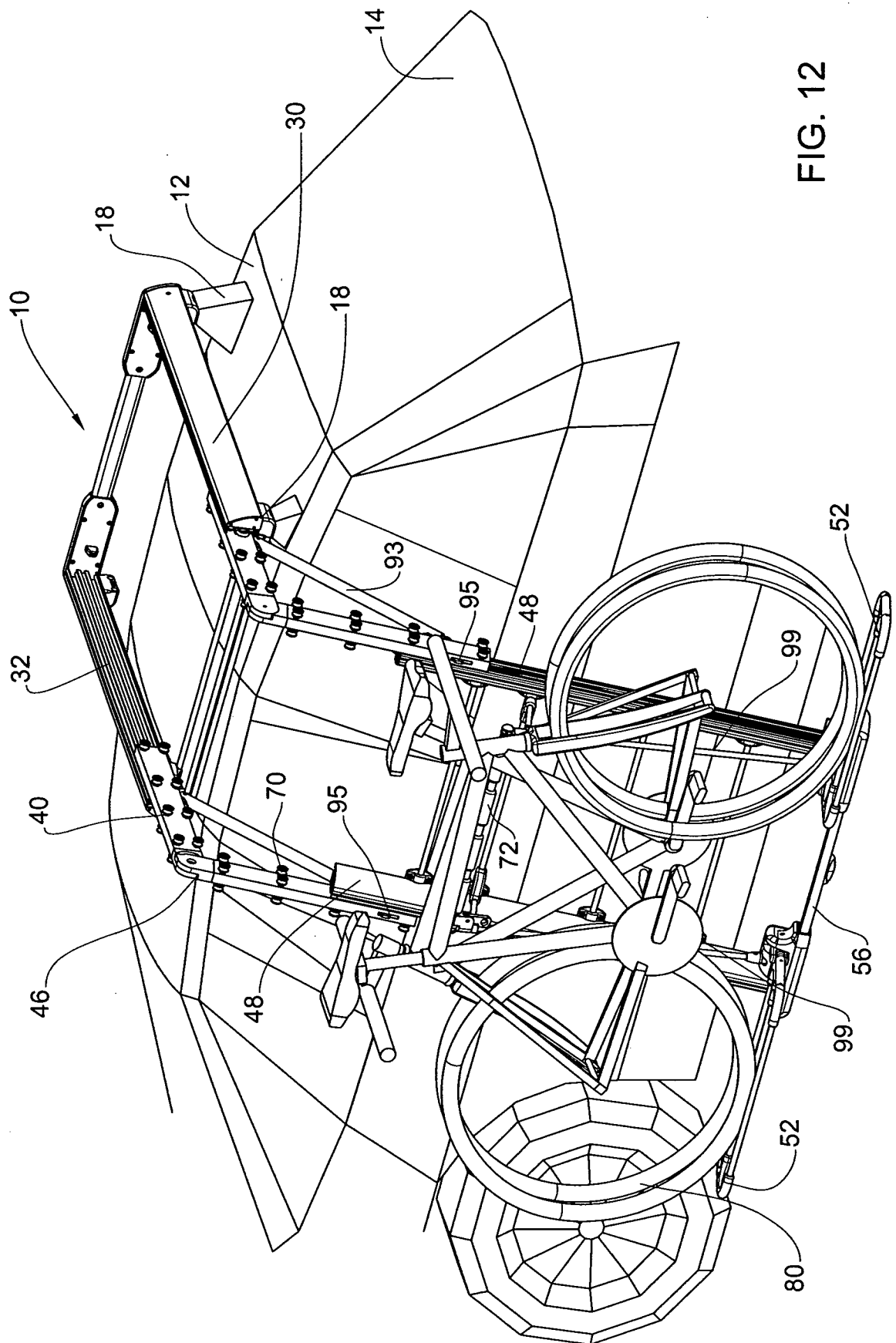


FIG. 12

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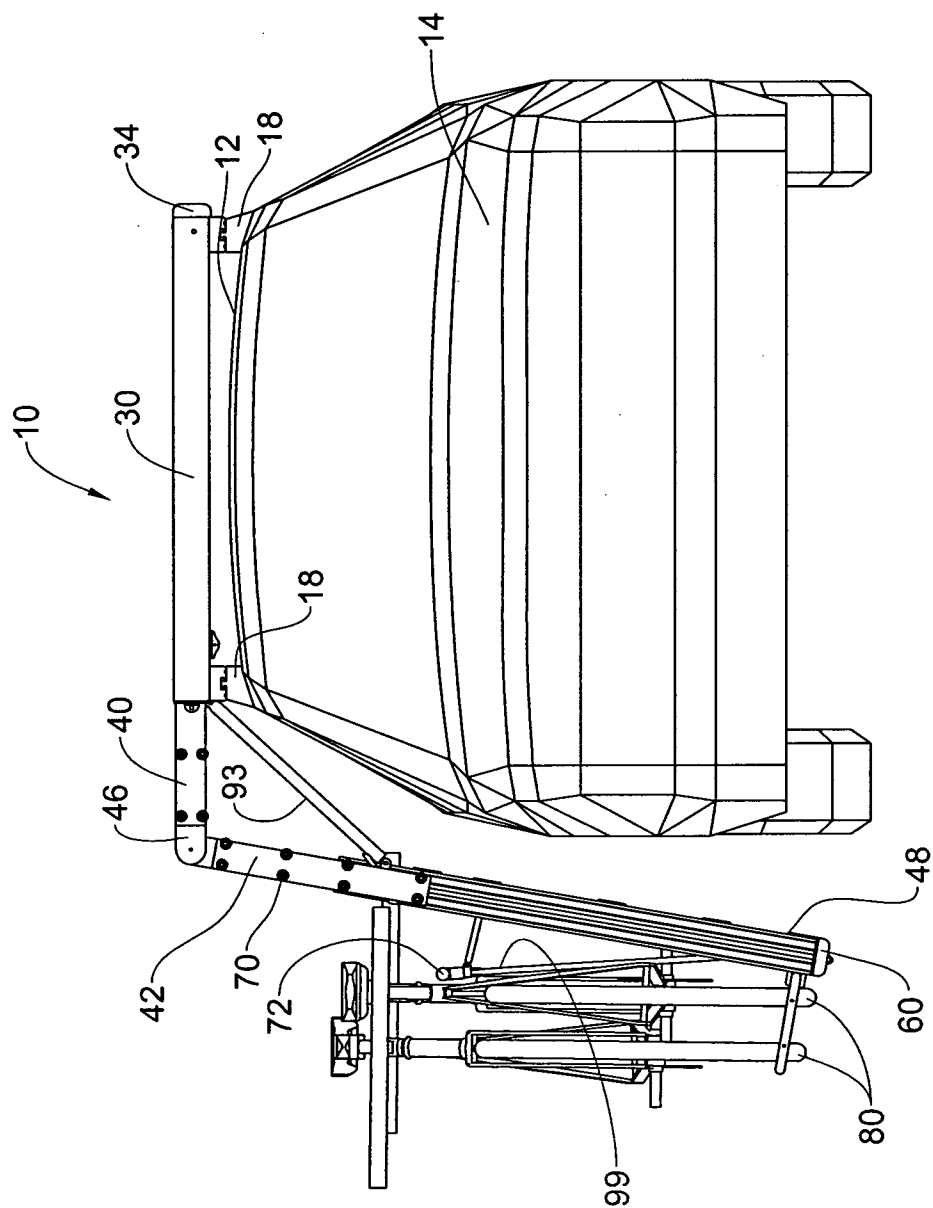
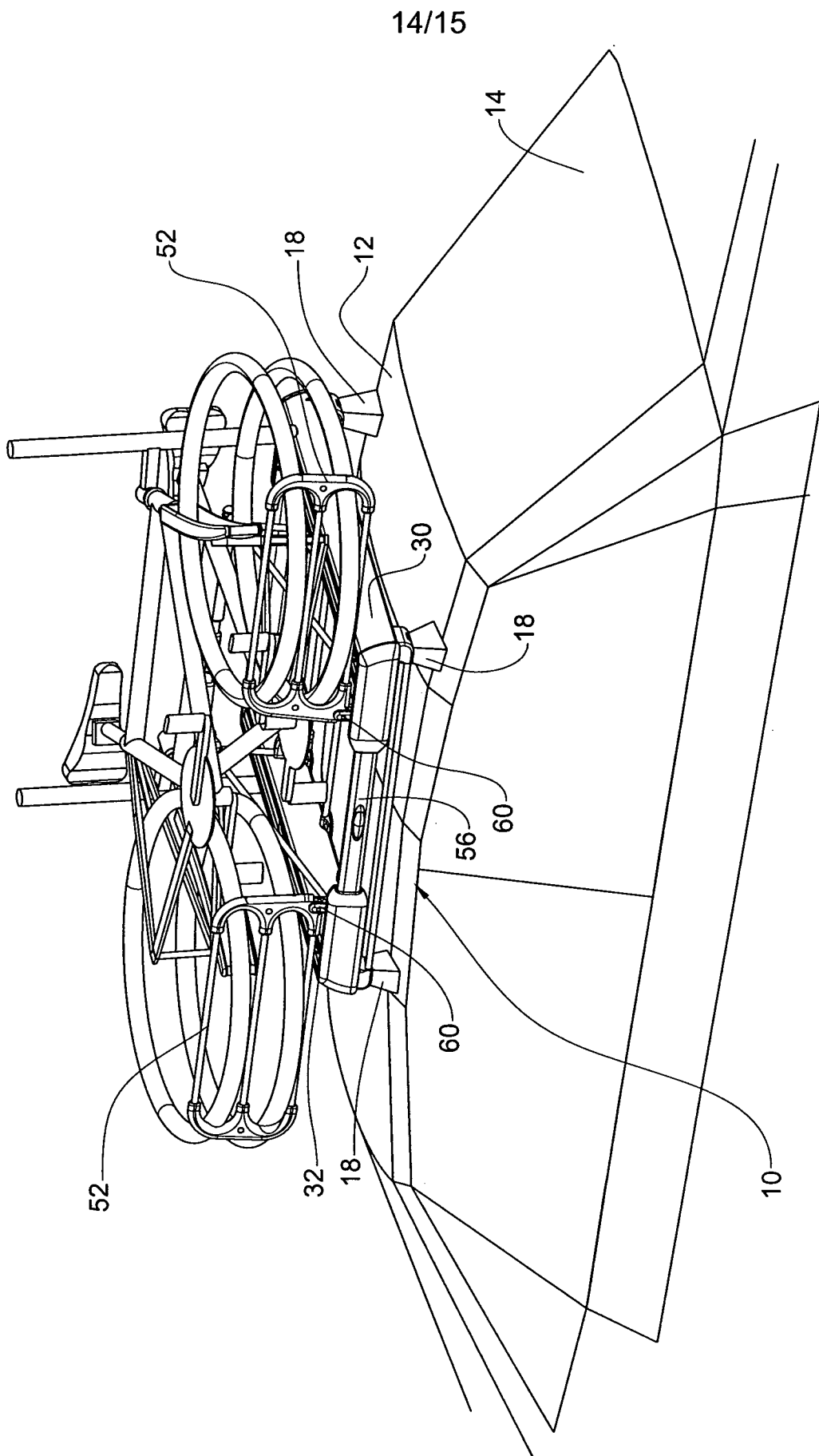


FIG. 13



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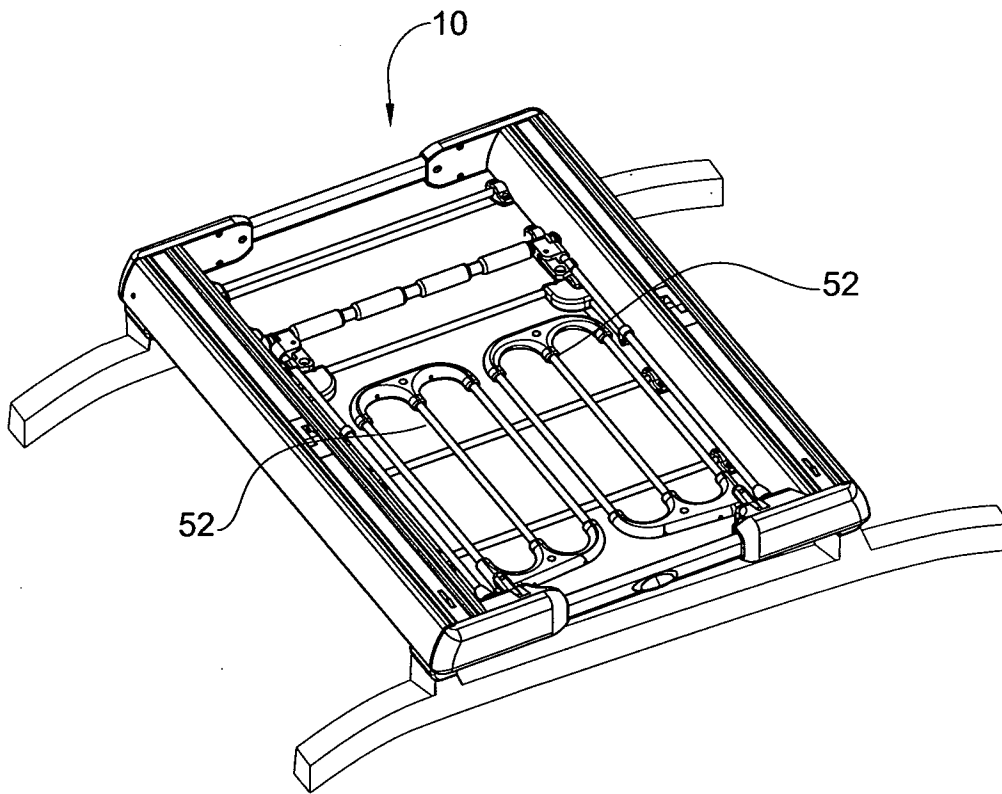


FIG. 15

INTERNATIONAL SEARCH REPORT

International application No
PCT/IL2009/001129

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60R9/042
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 067 723 A (WILLIAMS JOHN FREDERICK) 22 December 1982 (1982-12-22)	1-3, 5, 11, 13, 19, 20
Y	figures 1, 3-5 page 1, line 3 - page 4, line 21 page 4, line 2 - line 11	4, 6-10, 12, 14-18
Y	DE 20 2005 009558 U1 (HEUEL REINHARD [DE]) 25 August 2005 (2005-08-25) cited in the application abstract; figures paragraph [0017]	4
Y	FR 2 636 897 A (DEJOUX ANDRE [FR]; MARITEAU GILLES [FR]) 30 March 1990 (1990-03-30) abstract; figures page 4, line 3 - page 5, line 1	6
	-/--	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

31 March 2010

Date of mailing of the international search report

09/04/2010

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INTERNATIONAL SEARCH REPORT

International application No

PCT/IL2009/001129

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	WO 87/07568 A (PELTOLAN METALLI OY [FI]) 17 December 1987 (1987-12-17) page 5, lines 18-24 abstract; figures -----	12
Y	DE 35 13 085 A1 (ABEL RAINER) 30 October 1986 (1986-10-30) cited in the application claims 1,15,16; figures -----	14,15
Y	JP 07 047886 A (ABA DESIGN KK) 21 February 1995 (1995-02-21) abstract; figures -----	16
Y	DE 43 38 759 A1 (MALSCH GERHARD [DE]) 18 May 1995 (1995-05-18) abstract; figures column 6, line 29 - line 33 -----	17,18

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IL2009/001129

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DE 4338759	A1	18-05-1995	NONE