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(54) **SCALE MODEL COURSE**

MASSSTABGETREUER MODELLVERLAUF

MODÈLE RÉDUIT DE PISTE DE COURSE

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Description

Field of the Invention

[0001] The present invention concerns a scale model course (track) which is intended to realistically simulate conditions present in, for example automobile racing in accordance with the claims.

Background of the Invention

[0002] A major interest for many people is to build models which seek to simulate reality as closely as possible. For example, building model railways and the like has long been known. Many of these model tracks are excellent as far as model tracks go and they may have a lifelike look and design, but most of them lack features and functions that reflect the reality of the scale they are built in. Model railroads, for example, have a high degree of real-world features but this has not been transferred to other types of model tracks (courses).

[0003] Building model courses which seek to mimic auto racing, traffic conditions and the like are also previously known. A very large number of designs seek to simulate the conditions found in auto racing. A major problem arises, however, especially in smaller scales such as 1:43 and 1:60, given how little space there is in the actual models for operating components. This problem is particularly evident for models meant to simulate F1 and Go-cart where space in the model vehicle itself, regardless of scale is very limited. To recreate lifelike features in the models is impossible; the technology (power supply, electronics, mechanical components, etc.) for this simply does not fit. A number of different types of model courses have been developed in the past, most of which are of the slot car type. All of these tracks lack a high degree of realism in the models' handling characteristics such as scale acceleration, skidding (tire traction), braking, inching, reversing and more. For example, many model tracks lack true scale realism during acceleration and braking of the model. The model course even lacks realistic features for the overall driving experience such as lane departure zones, depots, access roads and more.

[0004] One problem with realistically simulating a car's driving characteristics in small scales is also how to emulate the laws of mechanics (kinematics, kinetics, etc.) so that the models behave like cars in full scale. Particularly problematic is the precision of steering and model adherence in relation to the course. Jerkiness and bouncing in current models reduces the experience of realism, just as the lack of the ability to correctly reflect the scale's tire traction conditions does, for example the ability to provoke skids and also alleviate the same.

[0005] Radio-controlled vehicles have been produced in numerous variants and versions. One problem with radio-controlled vehicles is being able to emulate the driving characteristics of cars in full scale, especially in smaller scales. Acceleration, braking, adherence, suspension and tire traction (grip) are not adapted to the scales of model cars. This means that there is no realistic connection between full scale cars and model cars.

[0006] Similar problems exist with ship models in small scales. To simulate a ship's full scale performance in small scales is impossible because the technology does not fit, and also that inertia can not be replicated with existing technologies. This means that it is difficult to simulate scale conditions such as inertia during acceleration and braking.

[0007] A further problem with radio-controlled models is that they are governed by a transmitter that emits radio waves. Today, there are concerns that transmitted radio waves may have harmful effects, and this is why transmitting output should be kept as low as possible.

Prior Art

[0008] Slot car racing tracks (sets) have long been known in numerous variants and versions. For example, the company Scalextric released a variant of a slot car track in 1957. Scalextric has subsequently developed and marketed a large variety of car racing sets. Operating radio-controlled cars on different types of racetracks where some tracks simulate real-world tracks, is also well-known. Common radio-controlled cars, however, especially small scale models, do not have an equivalent degree of realism in the model's characteristics regarding speed, road handling and the like.

[0009] A number of model courses that include an upper plane on which a model is driven, and a lower plane on which a drive unit is operated is already known. DE3529097 describes a variant of a car track which includes a model which is driven on an upper plane and linked via a magnetic coupler to a drive unit which is operated on a lower plane. The design includes a magnetic trolley which runs on the underside of the upper plane. The magnetic trolley's arm is connected to a drive unit operated on a guide rail or the like. The magnetic trolley is directly influenced by a compression spring that is not gear changed resulting in a reduction of the magnetic trolley's motion in the vertical direction. The design differs gratly from the design according to the present invention. Furthermore, the design has a low degree of realism.

[0010] DE1703655 describes a variant of a model track which includes a model driven on an upper plane and linked via a magnetic coupler to a drive unit which is operated on a lower plane. The design includes an attached arrangement of magnets which slide on the upper plane. The components for the magnetic effect are radially arranged packets of magnetic bars with the same arrangement in the model and drive unit for turning of the model. The design differs greatly from the design according to the present invention. Furthermore, the design has a low degree of realism.

[0011] DE1603507 describes a variant of a model track which includes a model which is driven on an upper plane that is attracted via a magnetic coupler to a drive unit

which is operated on a lower plane. The model's magnets holds a constant distance to the surface of the upper plane. The design differs greatly from the design according to the present invention. Furthermore, the design has a low degree of realism.

[0012] DE2704673 describes a variant of a model track. The track includes a model which is driven on an upper plane that is linked via a magnetic coupler to a drive unit which is operated on a lower plane. The design includes a feature by which the front wheel angle relative to the model's direction of travel is affected by the underlying drive unit. The design differs substantially from the design according to the present invention. For example, the magnetic coupler of the model does not slide on the surface of the upper plane. This design holds the wheels under a constant cohesive force between the magnets resulting in so-called "stick - sleep" effect occurring. The design has a low degree of realism.

[0013] Even DE3147315 describes a variant of a model track. The design differs substantially from the design according to the present invention. For example, the magnetic coupler in the model does not slide on the surface of the upper plane, placing the wheels of the model under a constant load. The design achieves a low degree of realism.

[0014] US5601490, by the applicant company Konami, describes a variant of a model course which includes an upper first plane on which a model is driven, and a lower plane on which a drive unit is operated. The model and the drive unit are connected by magnets. The model's movement is controlled by the drive unit's movement. The design differs substantially from the design according to the present invention. For example, the design's drive unit is limited (confined) by the slot in the lower plane. The magnetic trolley is not rotatably arranged relative to a vertical axis, as with the present invention, resulting in that only a varying plane parallel distance between the upper and the lower plane can be compensated by the design. The design also has the disadvantage of the model's wheels being weighed down by the cohesive force between the magnets. The model lacks a control function. Furthermore, the driver's head does not lean in a natural way through the curves of the course. The model also has no scale related tire traction.

[0015] A variant of a model track which seeks to simulate streets and buildings in a realistic manner is described in US5865661 and US6102770. These patents describe a variant of a model course which aims to realistically simulate an urban environment. The model course includes an upper plane on which models are designed to travel. The design further includes a drive unit which is operated on a lower plane. The design requires that the distance between the upper plane and lower plane remains constant. The model and the drive unit are connected by magnets. The designs have the disadvantage that the models' wheels are weighed down by the cohesive force between the magnets. These designs differ to a great extent from the present model track. For example, the model lacks a function in which the models' guide wheel turns in the curves. Furthermore, the driver's head does not lean in a natural way when cornering. The model also lacks an adjustable tire traction according to scale with an associated indicator which can be restored in the depot by a hidden mechanism for a moveable model figure with tools.

Brief Description of the Invention Concept

[0016] The main purpose of the present invention is to significantly reduce the above mentioned disadvantages and create a scale model course (track) with a high degree of realism. This is achieved with the aid of a model course in accordance with the claims characterizing parts.

Detailed Description of the Invention

[0017] The invention will be described in greater detail below with reference to the accompanying drawings that in an exemplifying purpose show the current preferred embodiments of the invention.

Fig. 1A shows schematically an example of a model course in accordance with the present invention as seen from above.

Fig. 1B shows schematically two cross-sections of the model course according to Fig. 1A.

Fig. 2 shows parts of the cross-section of the course in Fig. 1A more in detail.

Fig. 3 shows an example of a model in the form of an F1-automobile.

Fig. 4A shows a model that is linked via a magnetic coupler to a drive unit.

Fig. 4B and 4C show examples of the drive unit's modules.

Fig. 5 shows schematically the principal behind a conceivable brake for the drive unit.

Fig. 6A - 6C show a first embodiment of the magnetic coupler.

Fig. 7A and 7B show an alternate embodiment of the model's coupling part.

Fig. 8 shows the model's steering device in more detail.

Fig. 9A - 9C show the function of the driver's head leaning in curves.

Fig. 10 shows the steering unit connected to the model course.

Fig. 11A and 11B show the device for adjustment of the model's tire traction.

Fig. 11C shows schematically the theory for tire traction according to scale.

Fig. 12 shows an example of a test jig for tire traction.

Fig. 13A and 13B show an example of a skid indicator.

Fig. 14 shows schematically depot figures that reset the skid indicator.

Fig. 15A and 15B show alternate embodiments of the model course.

Fig. 16 shows an alternative model in the form of a boat.

[0018] With reference to the figures, a scale model course **1** in accordance with the present invention is shown schematically. The model course 1 is preferably a car track. In alternative embodiments the model course 1 may consist of any other type of model track 1 such as a road racing track for motorcycles, a race track for horses, a go-cart track, a water course for boats and ships, or any other type of track (course) where a high degree of realism in the movement of models is sought after.

[0019] The model course 1 includes at least one course **2,** at least one model vehicle (model) **3,** at least one drive unit **4,** at least one magnetic coupler **5** that connects the model 3 with the drive unit 4, and at least one controller **6** that transmits steering information to the drive unit 4. The size and design of the course 2 can vary greatly within the scope of the present invention. Furthermore, the number of models 3, the number of drive units 4 and the number of controllers 6 may vary widely within the scope of the present invention. The model course can be placed on or include a supporting surface **7.** A supporting surface may for example consist of one or more tables, benches or the like or even directly on a floor surface or other type of surface that can support the model course.

[0020] In alternative embodiments of the model course 1, it is conceivable that the course 2, in order to take-up less space when not in use, is constructed to fold up against a wall or the like in accordance with Fig. 15B.

[0021] The course 2 includes at least one upper course section **8** including at least one upper plane **9** consisting of the topside **10** of the upper course section 8. The course 2 further includes at least one lower course section **11** which includes at least one lower plane **12** constituting of the topside **13** of the lower course section 11. The upper course section 8 is in the vertical direction positioned above the lower course section 11. Between the upper course section's 8 underside **14** and the lower course section's topside 13 is formed an intermediate space **15** in which one or more drive units 4 are intended to be operated. The intermediate space 15 is formed by the upper course section 8 and the lower course section 11 being positioned at a certain distance from each other with one or more spacing bodies **16** or the like. The vertical height (length) of the spacing bodies may be fixed. Preferably the vertical height of the spacing bodies is adjustably arranged. The adjustment of height may be accomplished in increments or steplessly. The distance and angle between the underside 14 of the upper course section 8 and the topside 13 of the lower course section 11 may be essentially constant or vary along the extension of the course.

[0022] The upper course section 8 and the lower course section 11 are preferably made of at least one layer (material layer) of a sheet-shaped material. Preferentially the upper course section 8 and the lower course section 11 include two or more material layers of a sheet-shaped material. The material of each respective layer of material may vary greatly within the scope of the present invention. For example, the material of each respective material layer may consist of a cellulose-based material, a polymeric material or other suitable material for the purpose. The material in each respective material layer may also consist of, or be a combination of, different types of materials. The material layer (material layers) in the upper plane can not however be made of a material that is attracted by a magnet. If the sheet-shaped material layers consist of spliced (joined) material layers, the seams are positioned in each respective material layer preferably in an overlapping manner (see Fig. 6C). Alternatively the upper course section 8 and the lower course section 11 may for example be constructed of separate modules that can be interconnected to form a whole course. This allows for great many variations in course design and is even practical for course storage and transport.

[0023] The upper course section's 8 topside 10 forms an upper plane 9 on which the model 3 is designed to travel. The upper plane 9 is in the exemplary embodiment of the present model course 1, is designed to resemble an automobile race track. For a realistic representation of a race track, the upper course section's surface, should preferably not cast glare or reflections. To prevent glare and reflections from occurring on the upper course section's surface, the upper course section's surface may for example be coated with matt hobby paint or the like. The model course is designed to simulate real conditions and genuinely found elements and objects. For example, the model course may include one or more lanes **17,** at least one depot **18** with staff, one or more lane departure zones **19,** one or more stands with spectators and several other types of race track elements that seek to mimic real-world objects or situations. The design of the course 2 may, in alternative embodiments, for example emulate

any of the major race tracks in Formula 1 (F1), NASCAR, Indy Car or other forms of competition and series. In alternative embodiments, the design of the race track need not be reality-based and can be designed to suit different preferences and adapted to the space available for the race track.

[0024] The model's 3 design may vary greatly within the scope of the present invention, therefore the model 3 shown in the figures does not limit the model's 3 possible designs in any way. The model's 3 movements are controlled by the drive units 4 movements through the magnetic connection via the coupler 5 to the drive unit 4. Preferably, the model 3 does not have its own engine (motor) for the propulsion of the model 3. Because the model 3 is preferably without its own engine and transmission, the possibility of making the model 3 more realistic even in smaller scales such as preferably a scale of 1:43 or another for the purpose suitable smaller scale is greatly enhanced. With reference to Fig. 3 is shown an example of a model 3 in the form of an automobile **20.** The car model 20 consists of a F1-auto in the exemplified embodiment. If the model 3 consists of a car model, the model can preferably include a body **21,** a first front wheel **22** and a second front wheel **23,** a first rear wheel **24** and a second rear wheel **25** and a driver **26.** (The model will be described in more detail below). Furthermore the car model may consist of a car with covered body.

[0025] With reference to Fig. 4A - 4C are shown an exemplifying embodiment of the drive unit 4. The drive unit's 4 design may vary greatly within the scope of the present invention. The drive unit 4 is intended to be placed and operated on the surface of the topside 13 of the lower course section 11. The drive unit 4 may be comprised of a single unit (module) or comprised of (consist of) two or more units, modules, sections or the like. The drive unit 4 shown in the figure does not limit the scope of protection for a drive unit in accordance with the present invention. The drive unit shown in the figures includes at least one rear module **27** and at least one front module **28.** In an alternative embodiment, it is conceivable that the drive unit has at least one lower module and at least one upper module. The drive unit 4 has a substantially larger mass than the model 3. The drive unit 4 shown in the figures has for example a mass that is approximately twenty times larger than the model's 3 mass.

[0026] The drive unit 4 includes at least one drive motor **29** which via at least one gear **30** drives at least one drive wheel **31.** If the drive unit 4 includes a drive wheel 31, it is preferably centrally located in the drive unit's 4 cross-sectional direction, whereby the driving force forward / backward for the drive unit originates only from one point. Because the drive wheel 31 is centrally located, the technical effect of no differential being needed is achieved. The drive unit is further comprised at least one first free-rolling wheel **32** and at least one second free-rolling wheel **33.** The drive unit is further comprised at least one guide wheel **34** that can rotate around an essentially vertical axis **35.** With the guide wheel 34, the drive unit's 4 direction can be changed (controlled). The guide wheel is preferably of a pivot wheel for models of F1-cars, Go-carts and similar models.

[0027] The drive unit 4 further includes at least one receiver **36** with which control information is received from the controller 6. The transfer of control information is preferably accomplished wirelessly from the controller 6 to the receiver 36. The received control information controls the drive unit's 4 speed and direction. The speed is controlled by the drive wheel's 31 rotational speed which in turn is dependent on the drive motor's 29 rotation speed and the gear's 30 gear ratio. The drive motor's 29 rotation speed is regulated by at least one electronic speed controller **120** or the like. The model's direction is controlled via the guide wheel's 34 angle (steering angle) V relative to the drive unit's 4 longitudinal direction (and transverse direction). A change in the guide wheel's 34 steering angle is accomplished with at least one servo or the like. Preferably, the guide wheel is directly connected to the servo's outward axle. Said servos may consist of any previously known type of servo which is suitable for the purpose. For example, the servo may consist of a servo which constitutes a servo with the designation Pico 5.4.

[0028] The drive motor 29 is preferably an electric motor which is powered by electrical energy stored in at least one accumulator. The drive unit's 4 relatively larger size than the model's size means that more space is available for rechargeable accumulators in drive unit 4 than would be available in the model 3. This results in a significantly longer run time than if the drive unit, transmission and accumulators were integrated into the model 3. The electric motor 29 is comprised of an appropriate, previously known design or hereafter developed design, of electric motor which is suitable for the purpose. For example, the electric motor, for models in the scale 1:43, may consist of an electric motor with a range of power from 0.3 to 2.5 W. The motor's power is tailored to the model's scale, to the type of model and to the size of the rotating mass. The electric motor 29 is preferably connected via a centrifugal clutch **37,** for example, the model 34-CK2, to the gear 30 with flywheel mass. The design further comprises also one or more flywheels (flywheel mass) with which the model receives an acceleration (start-up inertia) and a deceleration inertia. The motor can be made to be easily replaceable in the drive unit. The amount of flywheel mass (inertia) may be varied by one or more small flywheels being added, or removed, as needed. The design may even include a sound generator **124** or similar for producing essentially authentic sound or recreated engine sound.

[0029] The drive unit 4 further includes a brake function. Since the drive unit 4 and the model 3 are linked by the magnetic coupler 5, the model 3 is also slowed during braking of the drive unit 4. The brake function can be achieved in several different ways and with several dif-

ferent technical solutions. Fig. 5 shows an exemplifying embodiment of the brake unit **38** included in the drive unit 4. The brake unit 38 in the preferred embodiment is comprised of a variant of a disc brake **39.** The disc brake 39 includes at least one brake disc **40.** The brake disc 40 may be a separate brake disc or as shown in Fig. 5, alternatively the brake disc and the drive wheel may consist of an integrated unit. If the brake disc is integrated in the drive wheel, the drive wheel consists of a, for the purpose, suitable material such as brass. The brake function is achieved by using at least one brake pad (brake-shoe) **41** or the like which is operated against the brake disc 40, alternatively against the flywheel mass, with an adjustable force. The adjustable force allows the braking to be regulated. Preferably the brake pad 41 is connected to a maneuvering lever **42** which at its one end is bearingly and pivotly arranged around a center of rotation (rotation point) **43.** The lever 42 is in its other end connected to a servo **44** via a connecting part **45.** For example, the servo may consist of a servo sold under the name Dymon D-47, which can for example be radio-controlled by a separately connected potentiometer in for example a foot pedal or similar. Preferably, the connecting part 45 is comprised the of at least one tension spring **46** which is preferably arranged to be interchangeable. Since the tension spring 46 is arranged to be replaceable, the brake's function and characteristics may be adjusted by choosing a different tension spring 46. Note that Fig. 5 only shows the principle of the brake function. The brake pressure from the levered maneuvering lever will preferably operate on the appropriate part of the drive unit's inertia periphery radius at a relatively high gear (transmission) ratio between the motor and drive wheels.

[0030] Acceleration according to scale is achieved by the motor's and flywheel's mass being adjusted in conjunction with each respective model's acceleration and braking characteristics according to its scale.

[0031] With reference to Fig. 6A - 6C is shown the included magnetic coupler 5 in more detail. The magnetic coupler 5 is comprised of at least one first coupling body **47** and at least one second coupling body **48.** The first coupling body 47 and the second coupling body 48 are arranged to be temporarily linked by the magnetic attraction between at least one first magnet in the first coupling body 47 and at least one second magnet in the second coupling body 48. The first coupling body 47 is intended to be placed on the underside 14 of the upper course section 8 and the second coupling body 48 is intended to be placed on the topside 10 of the upper course section 8.

[0032] The first coupling body 48 in the exemplifying embodiment of the present invention consists of a trolley, cart, carriage or magnetic trolley **49** which includes at least one magnetic body **50.** The magnetic trolley 49 is articulately connected to one end of a spring-loaded arm **51.** The spring-loaded arm's 51 other end is pivotly (foldable, articulated) mounted in the drive unit 4. The spring-loaded arm 51 can move to a great extent in the vertical direction. If the model and the track is of the scale 1:43 the arm 51 may for example move up to 240 (50 - 120 mm, the drive unit 4 in this case is 50 mm high) percent of the drive unit's 4 height in the vertical direction with an essentially nearly constant lift.

[0033] The magnetic trolley 49 is, via at least one connection point **52,** articulately arranged in the x-, y- and z-planes relative to the spring-loaded arm 51. The magnetic trolley 49 includes at least one first pair of wheels **53** and one second pair of wheels **54.** The first pair of wheels 53 is pivotally (360 degrees) arranged around a common axis (the center of rotation is preferably the magnetic axis) **55** in the magnet trolley. Respective wheels **56** and **57** in the second pair of wheels 54 consist of pivot wheels, that is, are individually rotatable around a vertical axis, which requires a very small force for a change in direction. The connection point 52 may for example consist of a connecting pin (conductor pin) **111** which is articulately arranged in at least one hole **112.** The hole 112 is preferably of an oval shape which allows the connecting pin 111 to move in the oval hole 112 during angle changes of the arm 51 relative the magnet trolley 49. The connection point 52 is preferably located at a distance from the first wheel pair's common axis. Connection point 52 may also consist of another for the purpose suitable design.

[0034] (At the minimum distance between the lower and the upper plane, both wheels in the wheel pair can adjust their tilt within the range of 0-5 degrees in any direction relative to the lower plane. At the maximum distance between the upper and lower plane, said degrees may amount to 0-20 degrees in all directions, even here in relation to the lower plane.)

[0035] The second coupling body 48 is preferably some variant of a sliding clutch **58.** In the preferred embodiment the sliding clutch 58 includes at least one magnetic body **59** which slides on the surface of the topside 10 of the upper course section 8. The coupling body 48 even includes at least one connection part **60** with which the magnetic body 59 is connected to the model 3. The magnetic body 59 consists preferably of a neodymium magnet, alternatively other for the purpose appropriate type of magnets may be used. The moving magnetic body's 59 relatively smooth and hard surface slides over the contact points (bumps) in the surface of the topside 10. The magnetic body's 59 contact area, between the magnetic body 59 and the surface of the topside 10 of the upper course section 8 are of a size which means that any irregularities in the surface of the track's (course's) topside does not significantly affected the magnetic body.

[0036] (This relative constant real contact area provides a stable resistance without "stick - sleep" phenomenon at a reasonably right balance of power (attraction) between the magnetic bodies 50 and 59. When the magnet trolley starts, this stability is maintained even during the small offset between bodies 50 and 59 (lag). The connection part's surface is affected by the balance of

force that eliminates risk of the "stick-sleep" effect from the seams and the like in the course surface.)

[0037] The connection part 60 may consist of several different designs. In preferred embodiments, the connection part 60 will essentially not affect the model 3 with any downward force. In one preferred embodiment the model 3 is not affected by any downward force from connection part 60. In order to make this possible, connection part 60 consists of a flexible material such as a relatively thin elongated tongue **61** or the like. The tongue 61 may for example be made of a cellulose-containing material such as any type of paper or the like. The tongue 61 can also be made of another type of flexible material such as celluloid or other for the purpose suitable flexible material. The magnetic body 59 may be linked to the connection part 60 with at least one magnetic body **113.**

[0038] When the drive unit 4 moves on the lower plane the magnetic trolley 49 lies against the underside of the upper plane. The magnetic trolley 49 includes at least one first magnetic body which is moved by the magnetic trolley against the upper plane's underside. In alternative embodiments the magnetic trolley 49 may include at least one mounting for at least a second magnet. In other embodiments the magnetic trolley also has a third magnetic body and possibly additional magnetic bodies.

[0039] In alternative embodiments of the present invention in which existing commercially available ready-made model vehicles (modified) are used, the tongue 61 consist of, or incorporates, a material made of metal that connects to the vehicle. The tongue 61 is preferably of a prestressed type that is used for minimizing (lifting) the model's weight.

[0040] Referring to Fig. 7A and 7B is shown an example of an alternative embodiment of the second coupling body 48. In this embodiment, the magnetic body 59 is partially contained and movably arranged in a cavity **62** located in a control house **63** in the front part of the model's chassis. The coupling body 48 in accordance with this embodiment is preferably for use in cars models equipped with a reverse function. The cavity 62 may for example be round or oval or any other form suitable for this purpose. The cavity 62 is preferably formed as a groove and arranged to be rotatable relative the vehicle's chassis.

[0041] The model's 3 propulsion and steering is accomplished when the sliding clutch, with details **64-67,** through the magnetic attraction from the drive unit affects the in the middle articulated control house's 63 cavities and thus its angle insertion. The steering column **68** gives parallelism between the control house and tires. During forward travel of the vehicle, the magnetic body is located at the forward position (position) **69.** When reversing the vehicle, the magnetic body is located in the rear position (position) **70.** When changing direction between forward and backward, and vice versa, the magnetic trolley 49 is preferably turned about one half turn.

[0042] The model includes a steering function that causes the angle of the front wheels 22 and 23, in relation to the direction of travel, to change in a lifelike manner when the model 3, by the drive unit's influence via the coupling device 5, changes direction. This function may for example be achieved with a front chassis design in accordance with the design shown in Fig. 8. The upper figure shows a cross-section of the wheels center of the model's front chassis from above. In the lower figure the cross-sectional view is through the wheel center of the model's front chassis from the front. The steering function is achieved by a pivot function inside the front wheels 22 and 23. The pivot axle **114** is located forward of the wheel axle. This means that the wheels 22 and 23 of the model 3 turn when the drive unit turns. The faked brake caliper **71** is articulated vertically in the front suspension forks **72** and **73** with at least one axle **74.** This articulation has its fulcrum **75** located inside the tires' inside **76** (preferably at its center) and somewhat in front of the tires' center. The front tires 22 and 23 turn and adapt directly parallel with the sliding clutch's direction of movement through a pivot function. The details **77** and **78** form a steering column and a movable link arm in the shown embodiment in the figures and are fixated on their steel tips **79** between the magnetic bodies 80 and 121. The link arm's 78 movability (alternatively the steering column) aids in the concealment of the pivot function in the front wheels. Alternatively, the steel tips 79 and the magnetic bodies **80** and 121 may preferably be replaced with the steering column 77 and the link arm 78 being bent into position. The steering column and the movable link arm may in alternative embodiments be connected to each other with another for the purpose suitable design.

[0043] Referring to Fig. 9A and 9B is shown how the present invention includes a feature that allows the driver's 26 head **81,** or upper body, to tilt in connection with the steering angle of the model such as is experienced during traveling through curves or in turns. The tilt of the driver's 26 head 81 during cornering is achieved by the magnet trolley 49 including a second magnet **82** which in curves affects a magnetic body (such as a neodymium magnet) **83** under the driver's 26 head 81 to tilt sideways.

[0044] During cornering the guide wheel 34, in the form of a pivot wheel, is preferably affected proportionately in relation to the steering angle. The distance between the vertical fulcrum **84** of the pivot wheel as a whole (could consist of the servo's outward shaft) and the pivot wheel's center of rotation **85** results, during a rotation of the guide wheel's (pivot wheel's) fulcrum 84, in a shift of the drive unit's center and the balance arm's link pin 111 relative the magnetic trolley 49. A direction of change for the magnetic trolley occurs, as mentioned earlier, around the magnet bodies 50 and 59, which means that the magnetic body 82 on the bracket **86** swings out from the center of the drive unit. Fig. 9A and 9B show how the driver's 26 head 81 is balanced on an edge **87** in a groove **88** in the neck area. The head (or alternatively upper body) is provided with at least one balance weight which preferably includes at least one magnetic body 83. The magnetic body (balance weight) 83 is controlled by magnetic at-

traction to the swinging magnet 82 body of the magnetic trolley. When the control on the controller transmits data to the drive unit that the guide wheel is to turn to the right or to the left the driver's head leans (tilts) in proportion to the steering angle on the controller. The design also allows the driver's 26 head 81 to lean even if the model 3 is stationary. The function that allows the driver's head to tilt (lean) during cornering may in alternative embodiments be achieved in other for the purpose suitable ways.

[0045] With the present invention, the drive unit's 4 (indirectly the model's) inching speed and acceleration features are tailored to simulate the true scale conditions of the model used. The adaptation of the characteristics of inching and acceleration may be achieved by interaction of the centrifugal clutch with the transmission system's inertia and the model's (linear) mass in combination with light braking towards the rotating mass. An infinitely variable speed control and near true scale acceleration is obtained when a suitable electric motor is combined with at least one rotating mass and the linearly moving mass in the drive unit. The electric motor's and the transmission system's rotating mass (flywheel) consists preferably of interchangeable units. By way of this design, the drive unit 4 may even re-create an illusion of full-scale inertia for the model.

[0046] The control unit 6 may be of a previously known technology that is suitable for the purpose of a control unit 6. The control unit 6 includes at least one transmitter **89** that sends control information to at least one receiver 36 with a reliable power supply from an accumulator in order to keep radio interference from occurring (that for example may occur from a power supply via dangling cords). In an alternative embodiment as shown in Fig.10, the transmitter's antenna **91** may be connected with a conduit **92** to a layer of metal foil **93,** for example aluminum foil or similar, placed in the lower course section 11. In alternative embodiments it is conceivable that the metal foil 93 consists of net or similar. This design allows for keeping a constant distance between the transmitter and the receiver. The design also allows for transmitter signal output to be greatly minimized in comparison to known types of radio-controlled vehicles.

[0047] With reference once again to Fig. 2 is shown in a cross-section how characteristics on the surface of the topside 10 of the upper course section 8 may be simulated. The simulation of characteristics on the surface of the topside 10 may be achieved by different surfaces on the topside of the lower course section that are provided with different characteristics, structures and smoothness (profiles). Different characteristics, profiles and smoothness on the surface of the lower course section will directly affect the conditions for propelling the drive unit and the model because the guide wheel's 34 diameter is relatively small. This design allows for the different characteristics of the different course sections to be realistically imitated. If the upper course section's surface (to its appearance) consists of a driving lane 17, the surface of the topside of the lower course section, on which the drive unit is operated, consists of a smooth surface. If the upper course section's surface to its appearance consists of grass 19, the surface of the topside of the lower course section may consist of a roughened surface. If the upper course section's surface to its appearance consists of gravel, that is to say where the car is "out of race", the surface of the topside of the lower course section is then made of a profiled surface that makes it very difficult or even impossible for the further travel.

Embodiment Example that Includes a Device for Adjustment of the Rear Wheel's Road Grip and a Skid Indicator

[0048] For the embodiment simulating a race car track, the present invention seeks to mimic true to scale the traction that a racing car such as a F1-car has in reality. This means that the traction that exists during cornering for a full-scale F1-car needs to be adapted (adjusted) to the desired scale level.

[0049] Fig. 11A and 11B show an example of the device (design) with which tire traction according to scale for the model's rear tires 24 and 25 may be adjusted. An adjustment function for tire traction may for example be achieved by the model including at least one pivot wheel **94,** which essentially bears the weight of the model's rear chassis **95.** The pivot wheel 94 includes a bearing such as a miniature ball bearing. The bearing allows for the pivot wheel 94 to achieve a very low rolling friction.

[0050] The rear wheels 24 and 25 bear only a minor part of the weight from the model's rear chassis 95. Preferably, the rear wheels 24 and 25 bear only a miniscule fraction of the weight from the model's rear chassis 95. The relative distribution between the weight that the pivot wheel 94 bears and the rear wheels 24 and 25 bear may be adjusted via an adjustment device **96.** The adjustment device 96 in the exemplifying embodiment shown in Fig. 10A and 10B consists of at least one double-tongued plate spring **97,** alternatively at least one single-tongued plate spring, which in its one end **98** is attached to the vehicle's chassis and in its other end **99** is attached to, and holds up, the wheel axle **100** with the rear wheels 24 and 25. The wheel axle's 100 vertical position may be adjusted by the adjustment of the plate spring's 97 position in the vertical direction. The adjustment of the plate spring's 97 position may for example be achieved with the aid of an adjustment screw **101** or other for the purpose suitable adjustment device. By turning the adjustment screw 101 in the one direction, the position of the wheel axle 100 is raised relative the topside of the upper course section, and by turning the adjustment screw 101 in the other direction, the position of the wheel axle 100 is lowered relative the topside of the upper course section. Minimal tire traction consists of the guide wheel's (pivot wheel's) rolling friction, when the rear wheels do not come into contact with the underlying surface. By adjusting the wheel axle with the rear wheels 24 and 25 downward, the tire traction via the rear wheel's skid fric-

tion (sideways) is increased. Complete sideways tire traction in a vertical line for the model's rear axle consists of a combination of the mentioned rolling friction and the friction from model tires' pressure against the course surface 10.

[0051] In order for the value of tire traction for the rear wheels 24 and 25 to be the same for each respective model 3, each respective model's 3 value of tire traction may be calibrated in some form of test jig 102. One example of a conceivable test jig 102 is shown in Fig. 12. The degree of the slope's tangent value coincides with full-scale tire traction divided by the model's scale (for example 1:43).

[0052] In alternative embodiments of the present invention, the model 3 includes an indicator **104** which indicates (shows) if the model has been driven faster than the scale speed allows in a curve or another type of turn. Fig. 13 shows an exemplifying embodiment of the present indicator 104. In a first embodiment, the indicator consists of an indicator part **105** which is articulated and pivotally arranged around a fulcrum (axle) **106.** Turning of the indicator part 105 occurs around an essentially vertical fulcrum placed in the vehicle's axial center line. The indicator part 105 includes at least one first part **107** of a material that attracts a magnet. To the first part 107 is attached at least one material layer **108,** of a material that is preferably not attracted by a magnet. To the model's chassis on each side of the vehicle's center line is attached at least one magnetic body. The design further includes at least one first magnetic body **109** and at least one second magnetic body **110** which are attached to the model's chassis on each side of the vehicle's longitudinal center line.

[0053] The non-magnetic material 108 in part 107 trails along the course when the skid indicator 104 is used. If too high a speed is reached according to scale in a curve, the model's rear wheels will more easily release their grip against the surface of the course's topside than the trailing segment with accompanying angle displacement between the model 3 and the indicator part's material layer 108. When the change in angle is sufficient enough, the magnetic thinner section of part 107 locks against one of the magnetic bodies 109 and 110. The protruding section of indicator part 105 lies still in the indicated position until the time when a reset of the indicator 104 occurs. A reset of the indicator may for example occur when the model 3 is driven into a depot where the indicator is reset. Fig. 14 shows magnets **114** inside the depot figures **115** that are attracted and moved by a hidden control disc **116** with its magnets. The depot figures 115 lift/fixate the model's rear chassis by wedging. The control disc's powerful magnet **119** attracts the wider rear section of indicator part 107 to its neutral position and a reset of the indicator 104. The function and mechanics of the control disc 116 are made so that the magnet 119 has an increased distance to the underside 14 during the time of the lift of the model's rear chassis. The indicator's sensitivity may even be calibrated on a special disc with gradients and coupling points for the model.

[0054] The text below and Fig. 11A - 11C are intended to create an understanding of the presumptions that exist to create tire traction according to scale. To transfer the physical laws that exist for the rear tire traction during cornering in a non-sloped curve with a real F1-car to the corresponding equivalent for a model car's rear tire traction, the relationship 1 divided by the scale is used. If a scale of 1:43 is used, 1 is then divided by 43. The parameters used are tire traction (the friction coefficient between tires and asphalt) speed and curve radius. This relationship can be compared with the balance of torque in accordance with Fig. 11C. V1 = the model's total weight, V2 = weight of the model's rear tires, V3 = weight of the model's front tires, V4 = weight of the model's nose section, E2 = measurement to the model's center of gravity Tp without rear tires, P1 = pressure on the pivot wheel, v = speed in meters per second, R = curve radius, E1 = the model's Tp horizontally from the connection point, X = measurement from the connection point to the pivot wheel, Y = measurement from the connection point to the center point of rear tires, Qu = friction coefficient plastic tires/course surface, C = centrifugal force, P2 and P3 = pressure on the rear wheels, P4 and P5 = pressure on the front tires, Ru = roll resistance from the rear tires vertically, Md = torque resistance from the rear tires vertically and F1 = force on the plate spring. Mp = Ru x P1 x 9,81 x X, Md + Mp = C x E1. Note that guide groove 117 in Fig. 11A for the rear axle's pivot motion that balances on the plate spring.

[0055] Fig. 15A and 15B show alternative embodiments of the model course.

[0056] Fig.16 shows an alternative type of model course with boats, ships or the like. This design includes a second magnetic coupler.

Advantages of the Invention

[0057] The present invention achieves a number of advantages. First, a model is achieved that moves on a course (track) without using slots (grooves) which gives a much more realistic experience than designs with slots. Second, a design is achieved that transfers the mechanical laws properly to each scale model. Third, a design is achieved that allows a long running time for models on a small scale. Fourth, a system is achieved by which an infinite number of models included in the system can be operated by a single drive unit on the course. Fifth, a design is achieved with which small scale car models can inch and perform precise stops. Sixth, a design is achieved with scale features regarding acceleration, deceleration, inertia, tire grip, proportional steering, and more. Seventh, the present system has a single drive point, which replaces the differential technique. Eighth, authentic engine sounds may be added in both stationary and driving modes. Ninth, the present invention can indicate if the scale speed in curves has been exceeded. Tenth, this indication (fake accident) can be restored in

a depot of a movable figure by hidden controls, while other functions such as timing can also be accomplished in the unseen plane. Eleventh, the driver's head in the models can lean proportionately to the radius of curves and the driver's head movement can also be controlled remotely when the model is stationary. Twelfth, small changes, one to two degrees negative slope, in the course's curves can easily illustrate a course exposed to different weather types, such as rain. Thirteenth, illustrated lane departure zones may affect the movement of car models in a realistic way. Fourteenth, models with covered chassis can be equipped with remotely controlled functions such as headlights on/off, turn signals right/left and even built in video cameras for filming. Fifteenth, the upper plane may be formed into a landscape with slopes/hills and also include bridges and other structures. Sixteenth, the distance between the transmitter/receiver is essentially constant regardless of the drive unit's position on the course. Seventeenth, the model's own control system is hidden. Eighteenth, existing plastic building kits and other models of vehicles on the market and even floating models can after revision/supplements be made lifelike. Nineteenth, the present invention provides great freedom in designing models that can be included in the system.

[0058] In the detailed description of the present invention, design details may have been omitted which are apparent to persons skilled in the art. Such obvious design details are included to the extent necessary so that the proper and full performance of the present invention is achieved.

[0059] Even if certain preferred embodiments have been described in detail, variations and modifications within the scope of the invention can become apparent for specialists in the field and all such are regarded as falling within the scope of the following claims. For example, in alternative embodiments it is conceivable that the course 2 includes several layer-formed course sections. It is also conceivable that the model includes a receiver that controls different functions in the model. Further, the drive unit's motor may consist of another for the purpose suitable type of motor. The drive unit's gear wheel can in alternative embodiments be replaced by a worm gear or other for the purpose suitable gear. Further, the motor and gear may consist of an integrated unit. Furthermore, electronic components may be separately added to models with covered bodies. For example the headlight function may be turned on and off. The model may even include a turn signal function. The model consists preferably of a vehicle such as an automobile. The automobile can in alternative embodiments consist of a model that seeks to simulate some type of previously known vehicle. In alternative embodiments the vehicle may consist of a boat or other for the purpose suitable model.

Claims

1. Scale model course (1), intended to simulate real-world conditions with a high degree of realism, including a course (2), comprised of an upper course section (8) on which at least one model (3) is intended to be driven on the surface of its topside (10) and at least one lower course section (11) which together create an intermediate space (15) in which a radio-controlled drive unit (4) is intended to be operated, whose drive unit (4) via at least one magnetic coupler (5) is linked with the model (3) on the topside (10) of the upper course section (8), and that the model's (3) movement on the upper course section (8) is controlled by the drive unit's (4) movement on the lower course section (11) **characterized in that** the coupler (5) includes at least one first coupling body (47) and at least one second coupling body (48), whose second coupling body (48) includes at least one first magnetic body (59) which is connected to the model (3) via at least one flexible elongated connection part (60), whose first magnetic body (59) is intended to glide on the surface of the topside (10) of the upper course section (8) and be magnetically linked with at least one magnetic body (50) in the first coupling body (47) on the underside (14) of the upper course section (8), whose coupling body (47) is connected to the drive unit (4) via at least one arm (51).

2. Scale model course (1) in accordance with claim 1 **characterized in that** the first coupling body (47) consists of a trolley (49) comprised of at least one first pair of wheels (53) and one second pair of wheels (54) in which the first pair of wheels (53) is pivotally arranged to turn around a common axis (55) and that the second pair of wheels (54) consists of pivot wheels, that are individually rotatable around a vertical axis, and that the trolley (49) is, via at least one connection point (52), articulately arranged in the x-, y- and z-planes relative to the arm (51).

3. Scale model course (1) in accordance with one of claims 1 or 2 **characterized in that** the connection part (60) includes a flexible relatively thin elongated tongue (61) which consists of a flexible cellulose-containing material.

4. Scale model course (1) in accordance with one of claims 1 or 2 **characterized in that** the connection part (60) includes a flexible relatively thin elongated tongue (61) which consists of a flexible material of celluloid or like flexible material.

5. Scale model course (1) in accordance with one of claims 1 or 2 **characterized in that** the connection part (60) includes a flexible relatively thin elongated tongue (61) which consists of a flexible material of metal.

6. Scale model course (1) in accordance with one or more of the previous claims **characterized in that** the model (3) consists of a wheel equipped vehicle comprised of a body (21), a first front wheel (22) and a second front wheel (23), a first rear wheel (24) and a second rear wheel (25) and that said wheels (22, 23, 24, 25) have traction against the topside (10) of the upper course section (8).

7. Scale model course (1) in accordance with one or more of the previous claims 2 to 6 **characterized in that** the model (3) includes at least one driver figure (26) with a head (81) with a tilt function during steering angle changes achieved by the trolley (49) including a second magnet (82) which affects a magnetic body (83) under the driver's (26) head (81), which is balanced on an edge (87) in a groove (88) in the neck area of the driver's head (81) acting as a balance weight.

8. Scale model course (1) in accordance with claim 6 **characterized in that** the model (3) of the wheel equipped vehicle includes an indicator (104) that indicates when the model (3) has exceeded the highest scale speed allowed in a given curve, said indicator consisting of an indicator part (105) which is articulated and pivotally arranged around a pivot center axle (106) in which the indicator part (105) includes at least one first part (107) of a material that attracts a magnet and that to the first part (107) is attached at least one material layer (108), of a material that is not attracted by a magnet, and that the indicator (104) further includes at least one first magnetic body (109) and at least one second magnetic body (110) which are attached to the model (3) on each side of the model's (3) longitudinal center line.

9. Scale model course (1) in accordance with claim 8 **characterized in that** the scale model course (1) includes a device for resetting the indicator (104).

10. Scale model course (1) in accordance with claim 9 **characterized in that** the indicator (104) is reset when the model (3) is driven into the depot (18) and then affected by magnets (114) inside the depot figures (115) that are attracted and moved by a hidden control disc (116) with its magnet (119) attracting the wider rear section of indicator part (107) to its neutral position thereby resetting the indicator (104).

11. Scale model course (1) in accordance with claim 6 **characterized in that** the model (3) of the wheel equipped vehicle includes an adjustment device (96) for adjustment of the rear wheel's (24, 25) traction against the topside (10) of the upper course section (8), said device (96) comprised of an axle (100) with the rear wheels (24, 25) and at least one pivot wheel (94), which essentially bears the weight of the model's (3) rear chassis (95), said pivot wheel (94) including a bearing such as a miniature ball bearing which allows the pivot wheel (94) to achieve a very low rolling friction.

12. Scale model course (1) in accordance with claim 6 **characterized in that** the model's (3) front wheels (22,23) automatically turn during cornering which is achieved by the pivot axle (114) being located forward of the model's (3) front wheel's (22, 23) rotational axis.

13. Scale model course (1) in accordance with one or more of the previous claims **characterized in that** the model course (1) includes a sound generator (124) placed in the drive unit (4) for producing essentially authentic engine sound or recreated engine sound for the model (3).

14. Scale model course (1) in accordance with one or more of the previous claims **characterized in that** the lower course section (11) includes at least one layer of metal foil (93) which is intended to constitute an antenna (91) and is intended to he connected to at least one transmitter (89).

15. Scale model course (1) in accordance with one or more of the previous claims **characterized in that** the drive unit (4) includes a brake unit (38) and the brake unit (38) of the drive unit (4) brakes the model (3) by using at least one brake pad (brake-shoe) (41) which is operated against the drive unit's (4) flywheel mass, with an adjustable force made possible by at least one tension spring (46) with adjustable characteristics which allows the braking to be precisely regulated.

16. Scale model course (1) in accordance with one or more of the previous claims **characterized in that** model (3) of the wheel equipped vehicle has inching capability via the drive unit (4) achieved by interaction of the centrifugal clutch with the transmission system's inertia and the drive unit's (4) linear mass in combination with light braking towards the rotating flywheel mass, resulting in an infinitely variable speed control when at least one electric motor is combined with at least one rotating flywheel mass in the drive unit (4).

Patentansprüche

1. Maßstabgetreuer Modell-Parcours (1), vorgesehen, um reale Bedingungen mit einem hohen Grad an Realitätstreue zu simulieren, mit einem Parcours (2), bestehend aus einem oberen Abschnitt (8), auf dem mindestens ein Modell (3) auf der Oberfläche der Oberseite (10) fahren soll, und mindestens einem

unteren Abschnitt (11), die zusammen einen Zwischenraum (15) erzeugen, in dem eine ferngesteuerte Fahreinheit (4) betrieben werden soll, deren Antriebseinheit (4) über mindestens eine Magnetkupplung (5) mit dem Modell (3) auf der Oberseite (10) des oberen Abschnitts (8) verbunden ist, und wobei die Bewegung des Modells (3) auf dem oberen Abschnitt (8) durch die Bewegung der Antriebseinheit (4) auf dem unteren Abschnitt (11) gesteuert wird, **gekennzeichnet dadurch, dass** die Kupplung (5) mindestens ein erstes Kupplungsgehäuse (47) und mindestens ein zweites Kupplungsgehäuse (48) umfasst, wobei das zweite Kupplungsgehäuse (48) mindestens einen ersten Magnetkörper (59) umfasst, der an das Modell (3) über mindestens ein flexibles, verlängertes Anschlussstück (60) angeschlossen ist, dessen erster Magnetkörper (59) auf der Oberfläche der Oberseite (10) des oberen Abschnitts (8) gleiten soll und magnetisch mit mindestens einem Magnetkörper (50) im ersten Kupplungsgehäuse (47) an der Unterseite (14) des unteren Abschnitts (8) verbunden ist, dessen Kupplungsgehäuse (47) mit der Antriebseinheit (4) über mindestens einen Arm (51) verbunden ist.

2. Maßstabgetreuer Modell-Parcours (1) gemäß Forderung 1, **gekennzeichnet dadurch, dass** das erste Kupplungsgehäuse (47) aus einem Rollwagen (49) besteht, der mindestens ein Paar Räder (53) und ein zweites Paar Räder (54) hat, von denen das erste Paar Räder (53) schwenkbar angeordnet ist, um sich um eine gemeinsame Achse (55) zu drehen, und das zweite Paar Räder (54) aus Schwenkrädern besteht, die sich einzeln um eine vertikale Achse drehen können, und dass der Rollwagen (49) an mindestens einem Verbindungspunkt (52) gelenkig in der x-, y- und z-Ebene relativ zum Arm (51) angeordnet ist.

3. Maßstabgetreuer Modell-Parcours (1) gemäß Forderung 1 oder 2, **gekennzeichnet dadurch, dass** das Verbindungsstück (60) eine flexible, relativ dünne verlängerte Zunge (61) umfasst, die aus einem flexiblen, zellulosehaltigen Material besteht.

4. Maßstabgetreuer Modell-Parcours (1) gemäß Forderung 1 oder 2, **gekennzeichnet dadurch, dass** das Verbindungsstück (60) eine flexible, relativ dünne verlängerte Zunge (61) umfasst, die aus einem flexiblen zellulosehaltigen oder einem ähnlichen flexiblen Material besteht.

5. Maßstabgetreuer Modell-Parcours (1) gemäß Forderung 1 oder 2, **gekennzeichnet dadurch, dass** das Verbindungsstück (60) eine flexible, relativ dünne verlängerte Zunge (61) umfasst, die aus einem flexiblen Metallmaterial besteht.

6. Maßstabgetreuer Modell-Parcours (1) gemäß mindestens einer der vorhergehenden Forderungen, **gekennzeichnet dadurch, dass** das Modell (3) aus einem Fahrzeug mit Rädern besteht, das aus einem Gehäuse (21), einem ersten Vorderrad (22) und einem zweiten Vorderrad (23), einem ersten Hinterrad (24) und einem zweiten Hinterrad (25) besteht, und dass die besagten Räder (22, 23, 24, 25) über eine Traktion gegen die Oberseite des oberen Parcours-Abschnitts (8) verfügen.

7. Maßstabgetreuer Modell-Parcours (1) gemäß mindestens einer der vorhergehenden Forderungen 2 bis 6, **gekennzeichnet dadurch, dass** das Modell (3) über mindestens eine Fahrerfigur (26) mit einem Kopf (81) mit Neigefunktion verfügt, während die Lenkwinkel sich durch den Rollwagen (49) ändern lassen, der einen zweiten Magnet (82) beinhaltet, der einen Magnetkörper (83) unter des Fahrers (26) Kopf (81) beeinflusst, der auf einer Kante (87) in einer Nut (88) im Nackenbereich des Fahrerkopfes (81) (Oberkörper) ausbalanciert wird, der als Gegengewicht fungiert.

8. Maßstabgetreuer Modell-Parcours (1) gemäß Forderung 6, **gekennzeichnet dadurch, dass** das Modell (3) des Fahrzeuges mit Rädern über eine Anzeige (104) verfügt, die anzeigt, wenn das Modell (3) die höchste, in einer vorgegebenen Kurve zugelassene Tachogeschwindigkeit übersteigt, wobei die besagte Anzeige aus einem Anzeigeteil (105) besteht, das gelenkig und schwenkbar um eine Schwenkmittelachse (106) angeordnet ist, wobei das Anzeigeteil (105) aus mindestens einem ersten Teil (107) aus einem Material, das einen Magneten anzieht, besteht, und dass am ersten Teil (107) mindestens eine Materialschicht (108) angebracht ist, aus einem Material, das nicht von einem Magneten angezogen wird, und dass die Anzeige (104) weiter mindestens einen ersten Magnetkörper (109) und mindestens einen zweiten Magnetkörper (110) umfasst, die am Fahrgestell des Modells (3) befestigt sind, auf jeder Seite der Längsmittellinie des Modells (3).

9. Maßstabgetreuer Modell-Parcours (1) gemäß Forderung 8, **gekennzeichnet dadurch, dass** der maßstabgetreue Modell-Parcours (1) eine Vorrichtung zum Zurücksetzen der Anzeige (104) umfasst.

10. Maßstabgetreuer Modell-Parcours (1) gemäß Forderung 9, **gekennzeichnet dadurch, dass** die Anzeige (104) zurückgesetzt wird, wenn das Modell (3) in das Depot (18) gefahren wird, und dann die Magneten (114) in den Depot-Figuren (115) darauf einwirken, die von einer versteckten Steuerplatte (116) mit ihren Magneten (119) angezogen und gesteuert werden, die den breiteren hinteren Abschnitt des An-

zeigeteils (107) in seine neutrale Position bringen, indem Sie die Anzeige (104) zurücksetzen.

11. Maßstabgetreuer Modell-Parcours (1) gemäß Forderung 6, **gekennzeichnet dadurch, dass** das Modell (3) des Fahrzeuges mit Rädern eine Einstellvorrichtung (96) zur Einstellung der Traktion der Hinterräder (24, 25) gegen die Oberseite (10) des oberen Parcours-Abschnitts (8) umfasst, wobei das besagte Gerät eine Achse (100) mit den Hinterrädern (24, 25) und mindestens ein Schwenkrad (94) umfasst, das das Gewicht des hinteren Fahrgestells (95) des Modells (3) im Wesentlichen trägt, wobei das besagte Schwenkrad (94) ein Lager beinhaltet, wie beispielsweise ein Miniatur-Kugellager, das dem Schwenkrad (94) ermöglicht, einen sehr geringeren Rollwiderstand zu erreichen.

12. Maßstabgetreuer Modell-Parcours (1) gemäß Forderung 6, **gekennzeichnet dadurch, dass** die Vorderräder (22, 23) des Modells (3) sich in Kurven automatisch drehen, was dadurch erreicht wird, dass die Schwenkachse (114) sich vor der Drehachse der Vorderräder (22, 23) des Modells (3) befindet.

13. Maßstabgetreuer Modell-Parcours (1) gemäß mindestens einer der vorhergehenden Forderungen, **gekennzeichnet dadurch, dass** der Modell-Parcours (1) einen Tongenerator (124) in der Antriebseinheit (4) umfasst, der grundlegende authentische Motorengeräusche oder nachempfundene Motorengeräusche für das Modell (3) erzeugt.

14. Maßstabgetreuer Modell-Parcours (1) gemäß mindestens einer der vorhergehenden Forderungen, **gekennzeichnet dadurch, dass** am unteren Parcours-Abschnitt (11) mindestens eine Schicht Metallfolie (93) angebracht ist, die eine Antenne (91) darstellen soll, und an mindestens einen Transmitter (89) angeschlossen werden soll.

15. Maßstabgetreuer Modell-Parcours (1) gemäß mindestens einer der vorhergehenden Forderungen, **gekennzeichnet dadurch, dass** die Antriebseinheit (4) eine Bremseinheit (38) umfasst, und die Bremseinheit (38) der Antriebseinheit (4) das Modell (3) durch Verwendung von mindestens einem Bremsklotz (Bremsschuh) (41) bremst, der gegen die Schwungscheibenmasse der Antriebseinheit (4) gedrückt wird, mit einer einstellbaren Kraft, die durch mindestens eine Spannfeder (46) mit einstellbaren Eigenschaften ermöglicht wird, die die präzise Steuerung des Bremsvorgangs ermöglicht.

16. Maßstabgetreuer Modell-Parcours (1) gemäß mindestens einer der vorhergehenden Forderungen, **gekennzeichnet dadurch, dass** das Modell (3) des Fahrzeuges mit Rädern durch die Interaktion der Zentrifugalkupplung mit dem unbetätigten Übertragungssystem und der linearen Masse der Antriebseinheit (4) gegen die Antriebseinheit (4) gedrückt werden kann, in Kombination mit einem leichten Bremsen gegen die rotierende Schwungscheibenmasse, woraus eine unbegrenzt variable Geschwindigkeitssteuerung entsteht, wenn mindestens ein Elektromotor mit mindestens einer rotierenden Schwungscheibenmasse in der Antriebseinheit (4) kombiniert wird.

Revendications

1. Piste de modèle réduit (1), conçue pour simuler des conditions réelles avec un haut degré de réalisme, incluant une piste (2) composée d'une section de piste supérieure (8) sur laquelle au moins un modèle (3) est conçu pour être conduit à la surface de sa face supérieure (10) et d'au moins une section de piste inférieure (11) qui, ensemble, forment un espace intermédiaire (15) dans lequel une unité de conduite radiocommandée (4) est censée être utilisée, laquelle unité de conduite (4) est liée via au moins un coupleur magnétique (5) au modèle (3) de la face supérieure (10) de la section de piste supérieure (8), et que le mouvement du modèle (3) sur la section de piste supérieure (8) est commandé par le mouvement de l'unité de conduite (4) sur la section de piste inférieure (11), **caractérisée en ce que** le coupleur (5) inclut au moins un premier corps de couplage (47) et au moins un deuxième corps de couplage (48), lequel deuxième corps de couplage (48) inclut au moins un premier corps magnétique (59) connecté au modèle (3) par au moins une pièce de connexion prolongée souple (60), lequel premier corps magnétique (59) est conçu pour glisser à la surface de la face supérieure (10) de la section de piste supérieure (8) et être relié magnétiquement à au moins un corps magnétique (50) dans le premier corps de couplage (47) sur la face inférieure (14) de la section de piste supérieure (8), lequel corps de couplage (47) est connecté à l'unité de conduite (4) par au moins un bras (51).

2. Piste de modèle réduit (1) selon la revendication 1 **caractérisée en ce que** le premier corps de couplage (47) se compose d'un chariot (49) composé d'au moins une paire de roues (53) et d'une deuxième paire de roues (54), la première paire de roues (53) étant disposée en pivot pour tourner autour d'un axe commun (55) et la deuxième paire de roues (54) se composant de roues pivotantes capables de pivoter individuellement sur un axe vertical, et **en ce que** le chariot (49) est articulé par au moins un point de connexion (52) sur le plan des x, des y et des z par rapport au bras (51).

3. Piste de modèle réduit (1) selon l'une des revendications 1 ou 2 **caractérisée en ce que** la pièce de connexion (60) contient une langue prolongée souple relativement fine (61) en un matériau souple à base de cellulose.

4. Piste de modèle réduit (1) selon l'une des revendications 1 ou 2 **caractérisée en ce que** la pièce de connexion (60) contient une langue prolongée souple relativement fine (61) en un matériau souple de celluloïd ou un matériau souple similaire.

5. Piste de modèle réduit (1) selon l'une des revendications 1 ou 2 **caractérisée en ce que** la pièce de connexion (60) contient une langue prolongée souple relativement fine (61) en un matériau souple de métal.

6. Piste de modèle réduit (1) selon une ou plusieurs des revendications précédentes **caractérisée en ce que** le modèle (3) se compose d'un véhicule équipé de roues, composé d'un corps (21), d'une première roue avant (22) et d'une deuxième roue avant (23), d'une première roue arrière (24) et d'une deuxième roue arrière(25) et que lesdites roues (22, 23, 24, 25) ont une traction contre la face supérieure de la section de piste supérieure (8).

7. Piste de modèle réduit (1) selon une ou plusieurs des revendications précédentes 2 à 6 **caractérisée en ce que** le modèle (3) inclut au moins un conducteur (26) avec une tête (81) avec une fonction d'inclinaison pendant les changements d'angle de direction effectués par le chariot (49) incluant un deuxième aimant (82) qui affecte un corps magnétique (83) sous la tête (81) du conducteur (26), laquelle est équilibrée sur un rebord (87) dans un sillon (88) au niveau du cou de la tête du conducteur (81) (haut du corps) qui fait office de poids d'équilibrage.

8. Piste de modèle réduit (1) selon la revendication 6 **caractérisée en ce que** le modèle (3) du véhicule équipé de roues inclut un indicateur (104) indiquant quand le modèle (3) a dépassé la la vitesse maximale autorisée dans une bourbe donnée, ledit indicateur se composant d'une pièce d'indicateur (105) articulée et disposée en pivot autour d'un essieu central pivotant (106) dans lequel la pièce d'indicateur (105) inclut au moins une première pièce (107) en un matériau attiré par un aimant, **en ce qu'**à la première pièce (107) est fixée au moins une couche de matériau (108) d'un matériau non attiré par un aimant, et **en ce que** l'indicateur (104) inclut également au moins un premier corps magnétique (109) et au moins un deuxième corps magnétique (110) fixés au châssis du modèle (3) de chaque côté de la ligne centrale longitudinale du modèle (3).

9. Piste de modèle réduit (1) selon la revendication 8 **caractérisée en ce que** la piste de modèle réduit (1) inclut un dispositif de réinitialisation de l'indicateur (104).

10. Piste de modèle réduit (1) selon la revendication 9 **caractérisée en ce que** l'indicateur (104) est réinitialisé lorsque le modèle (3) est conduit au dépôt (18) puis affecté par des aimants (114) à l'intérieur des personnages du dépôt (115) qui sont attirés et déplacés par un disque de commande caché (116) dont l'aimant (119) attire la section arrière plus large de la pièce d'indicateur (107) vers sa position neutre, réinitialisant ainsi l'indicateur (104).

11. Piste de modèle réduit (1) selon la revendication 6 **caractérisée en ce que** le modèle (3) du véhicule équipé de roues inclut un dispositif de réglage (96) pour le réglage de la traction des roues arrière (24, 25) contre la face supérieure (10) de la section de piste supérieure (8), ledit dispositif (96) se composant d'un essieu (100) avec les roues arrière (24, 25) et d'au moins une roue pivotante (94) qui supporte l'essentiel du poids du châssis arrière (95) du modèle (3), ladite roue pivotante (94) incluant un roulement tel qu'un roulement à billes miniature permettant à la roue pivotante (94) d'exercer une très faible friction de roulement.

12. Piste de module réduit (1) selon la revendication 6 **caractérisée en ce que** les roues avant (22, 23) du modèle (3) tournent automatiquement dans les virages grâce à l'essieu pivotant (114) situé à l'avant de l'axe de rotation des roues avant (22, 23) du modèle (3).

13. Piste de modèle réduit (1) selon une ou plusieurs des revendications précédentes **caractérisée en ce que** la piste de modèle (1) inclut un générateur sonore (124) placé dans l'unité de conduite (4) pour produire un son de moteur authentique ou recréé pour le modèle (3).

14. Piste de modèle réduit (1) selon une ou plusieurs des revendications précédentes **caractérisée en ce que** la section de piste inférieure (11) inclut au moins une couche de film métallique (93) destiné à constituer une antenne (91) et à être connecté à au moins un émetteur (89).

15. Piste de modèle réduit (1) selon une ou plusieurs des revendications précédentes **caractérisée en ce que** l'unité de conduite (4) inclut une unité de freinage (38) et l'unité de freinage (38) de l'unité de conduite (4) freine le modèle (3) à l'aide d'au moins une plaquette de frein (segment de frein) (41) qui est actionné contre la masse d'inertie de l'unité de conduite (4), avec une force réglable rendue possible par au

moins un ressort de tension (46) aux caractéristiques réglables permettant de réguler précisément le freinage.

16. Piste de modèle réduit (1) selon une ou plusieurs des revendications précédentes **caractérisée en ce que** le modèle (3) du véhicule équipé de roues est capable d'avancer au ralenti à l'aide de l'unité de conduite (4) grâce à l'interaction de l'embrayage centrifuge avec l'inertie du système de transmission et la masse linéaire de l'unité de conduite (4) en combinaison avec un léger freinage vers la masse d'inertie en rotation, avec pour résultat un contrôle de la vitesse variable à l'infini lorsqu'au moins un moteur électrique est combiné à au moins une masse d'inertie en rotation dans l'unité de conduite (4).

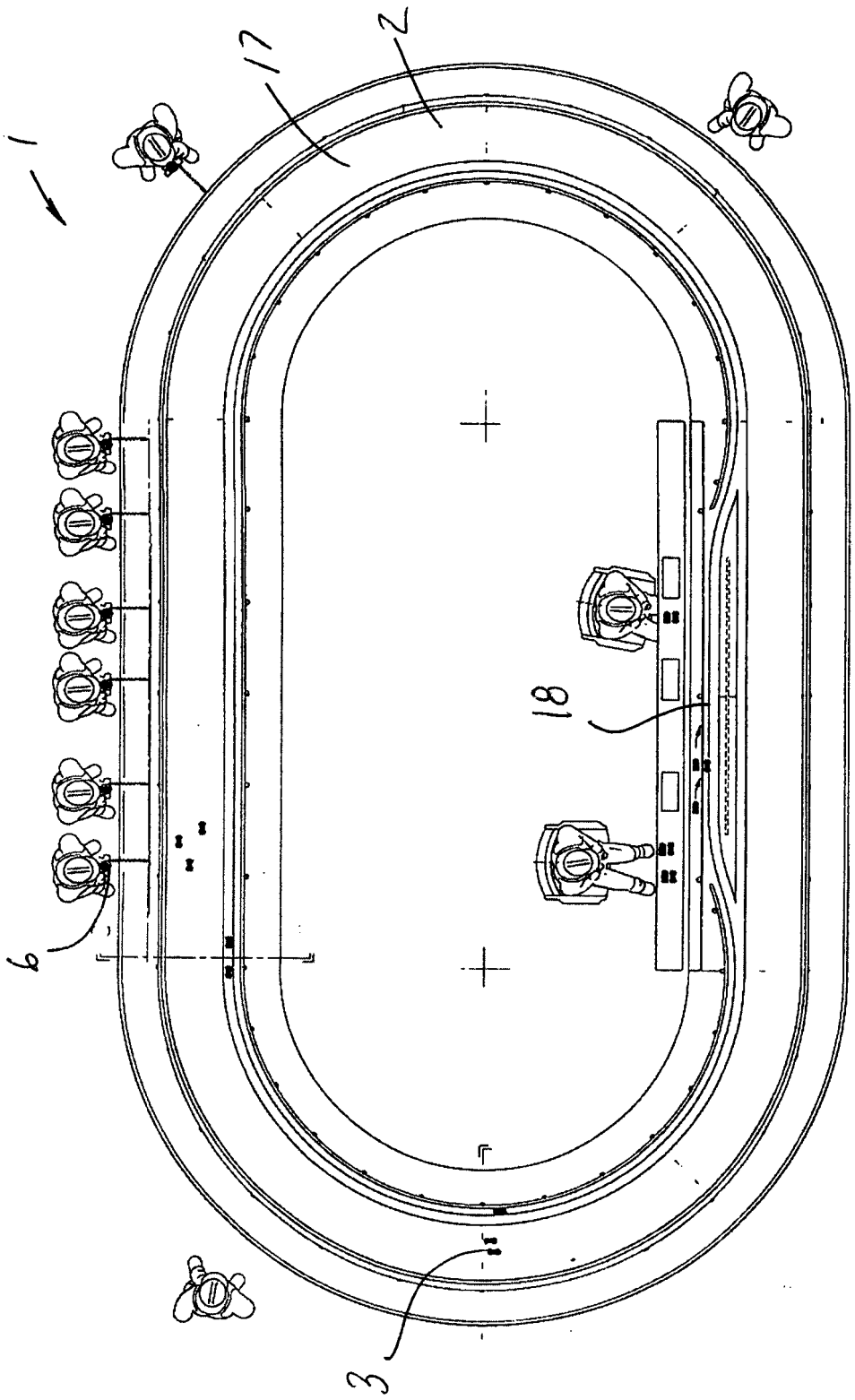


FIG 1A

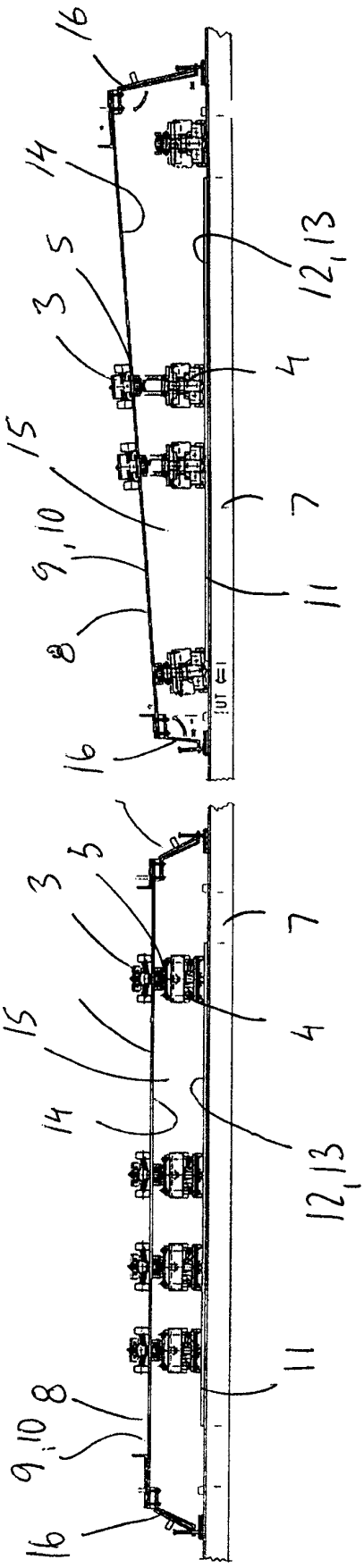


FIG 1B

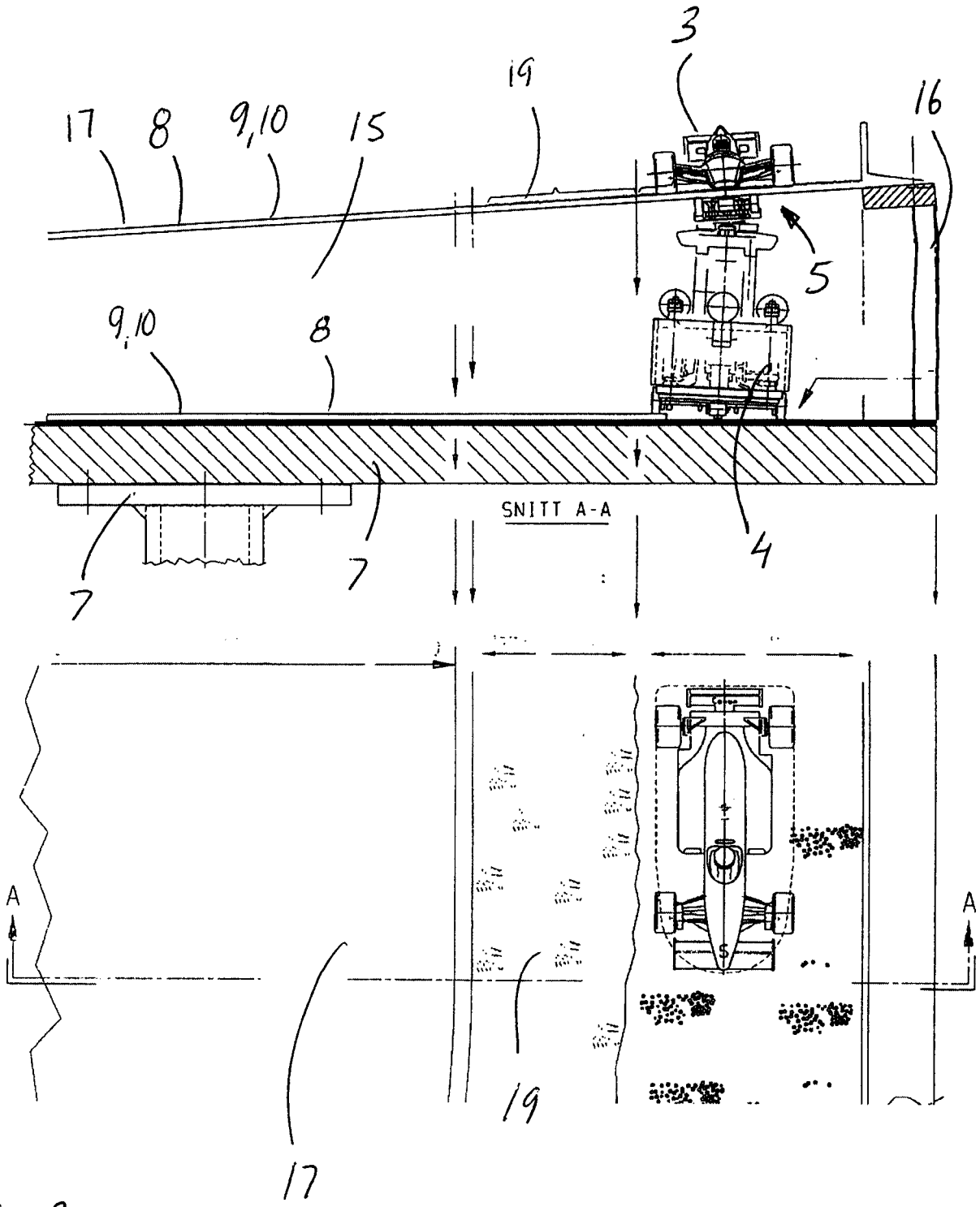


Fig 2

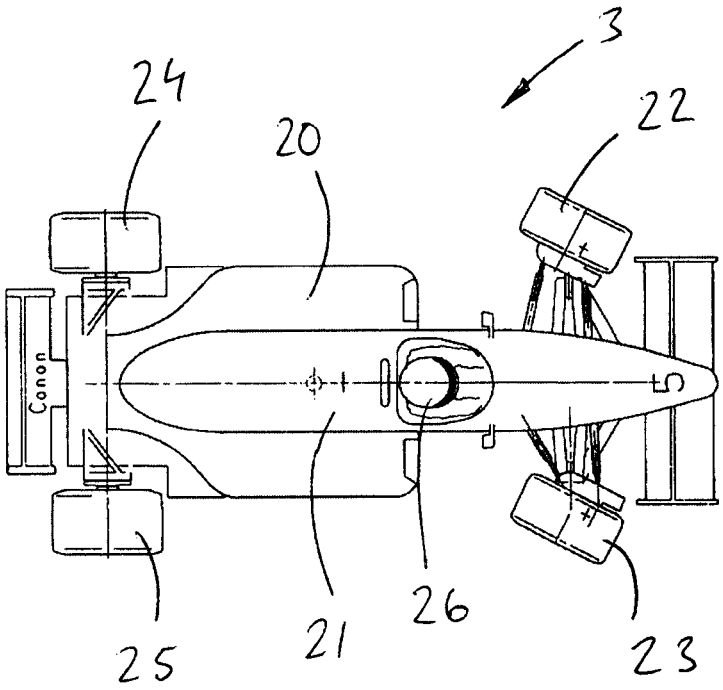


FIG 3

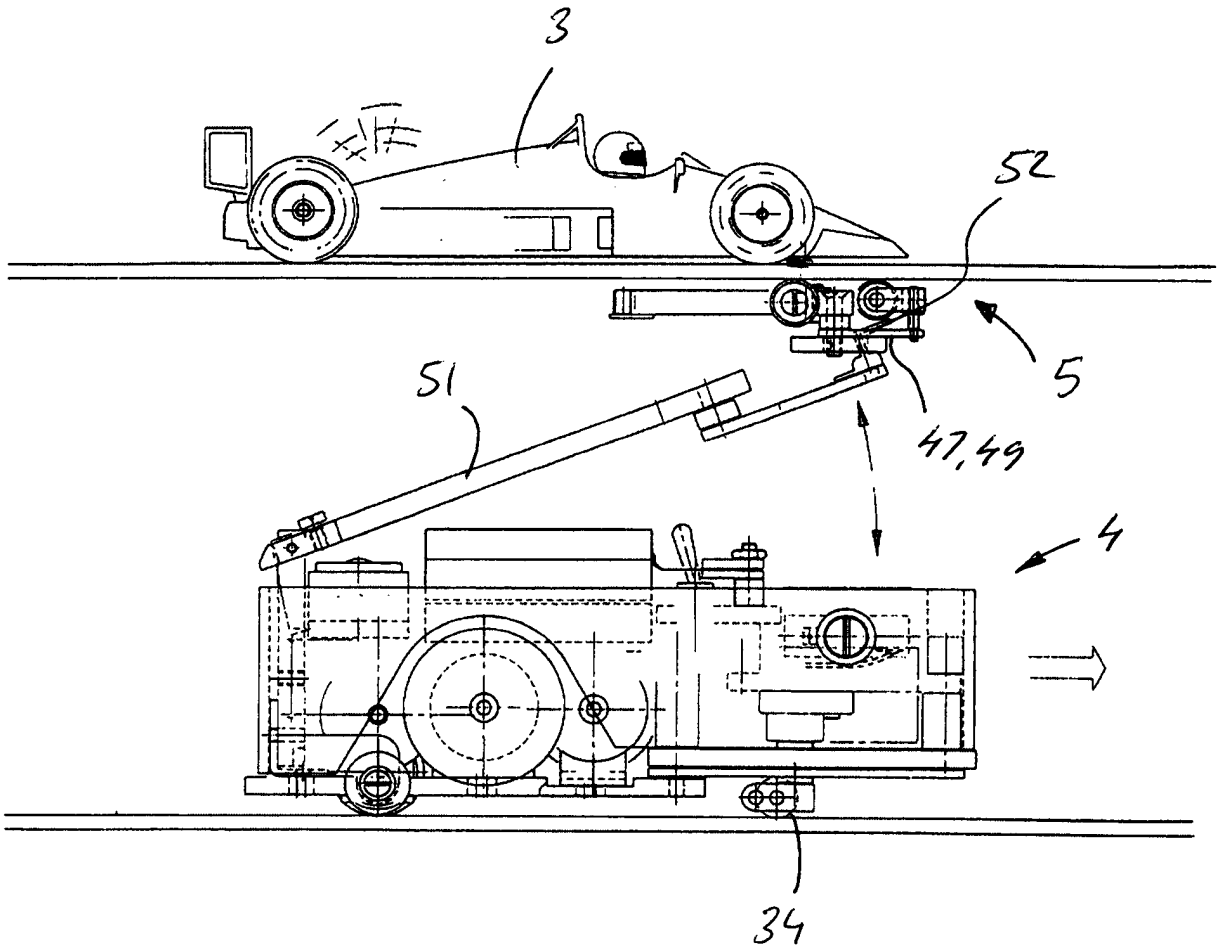


FIG 4A

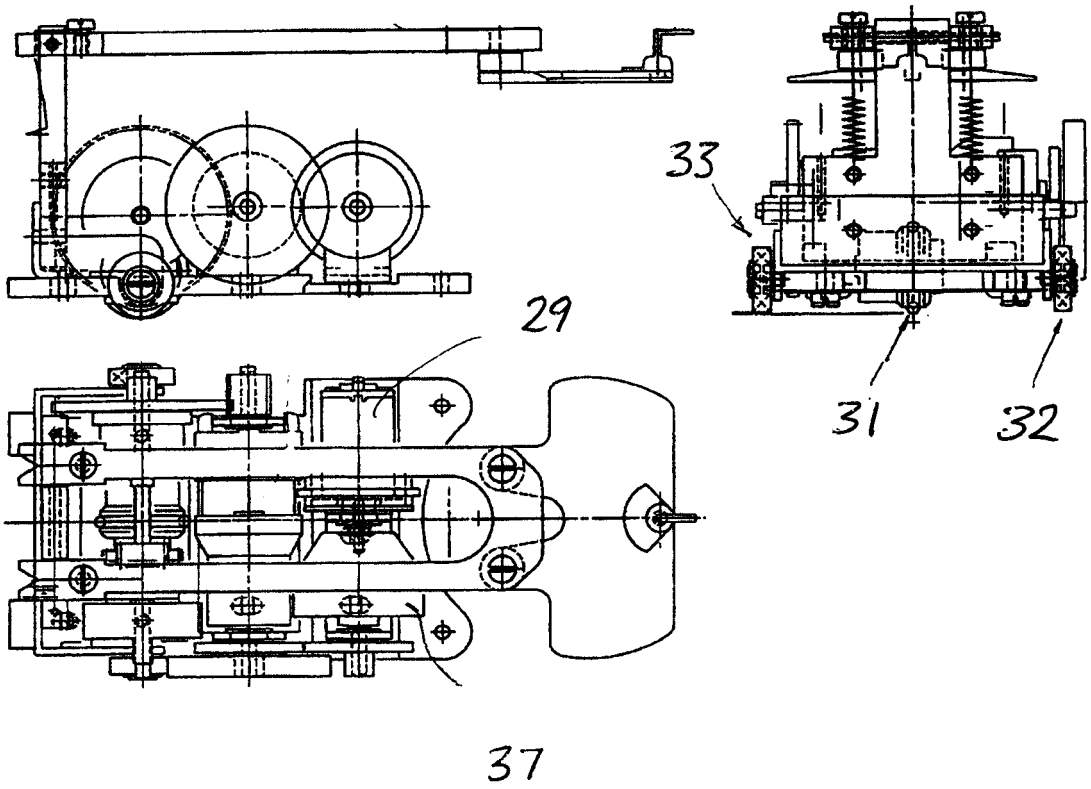


FIG 4B

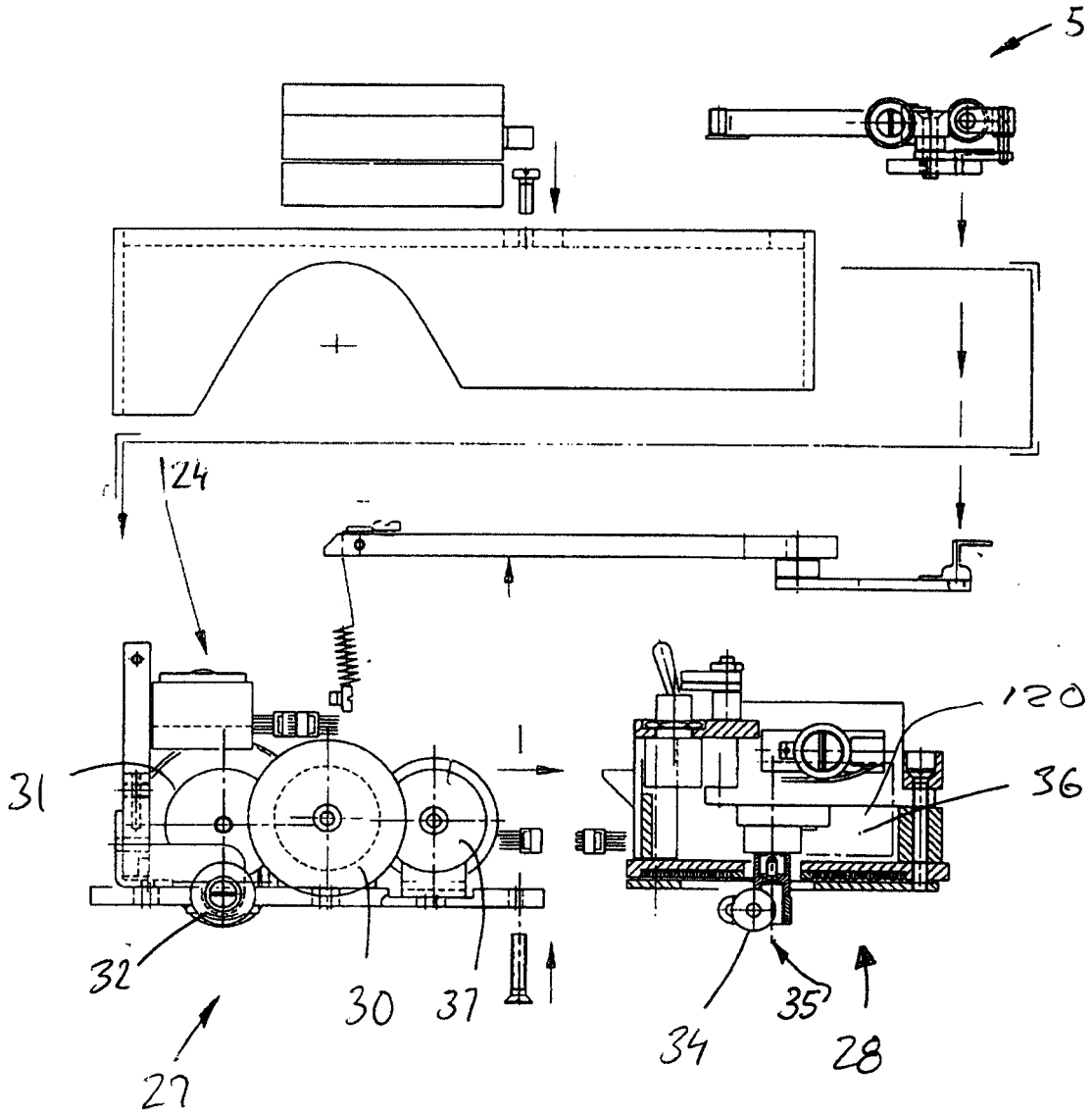


Fig 4C

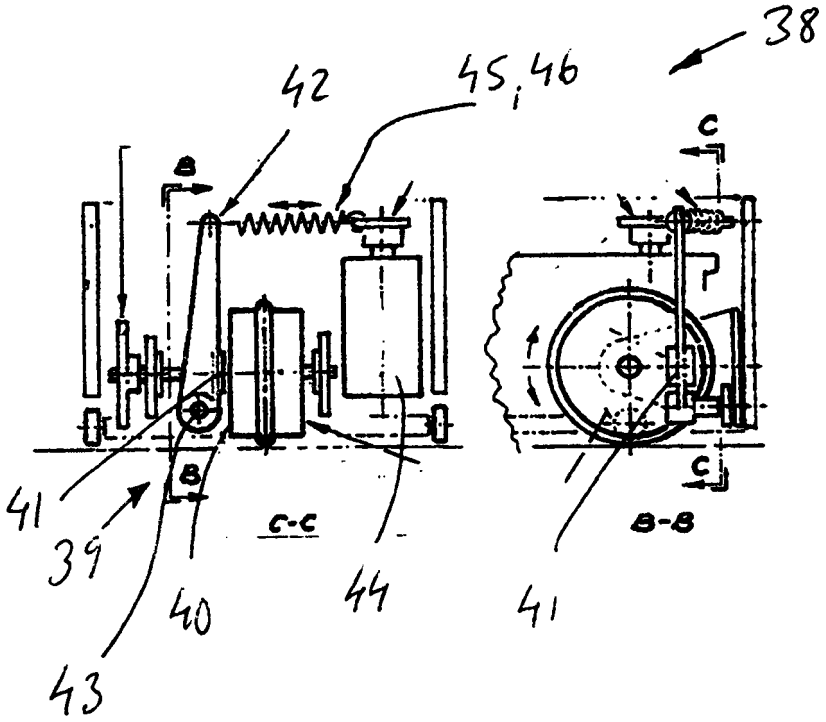


FIG 5

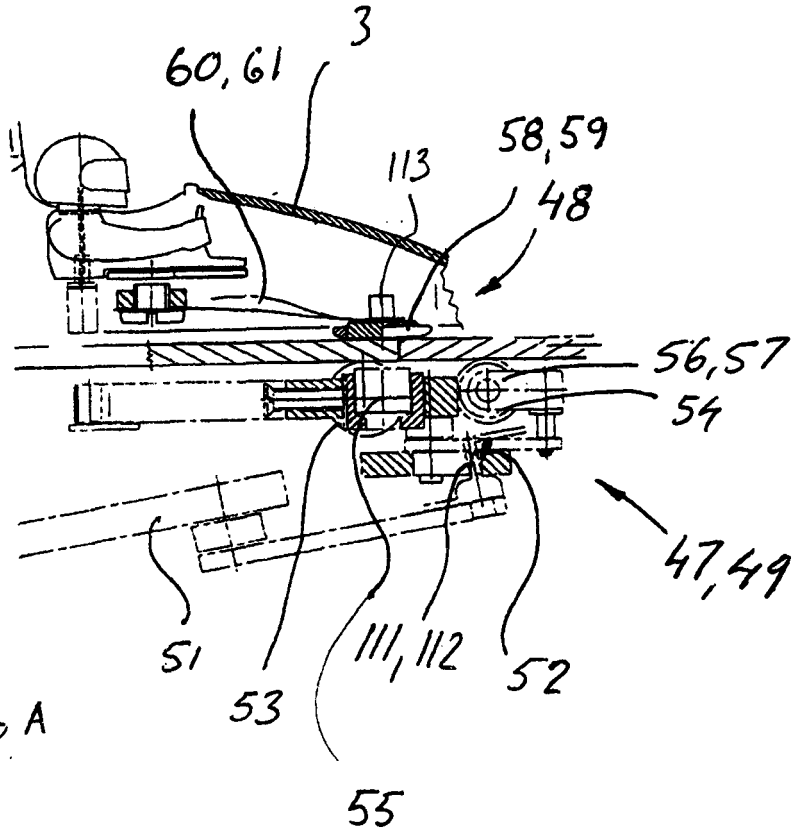


FIG 6 A

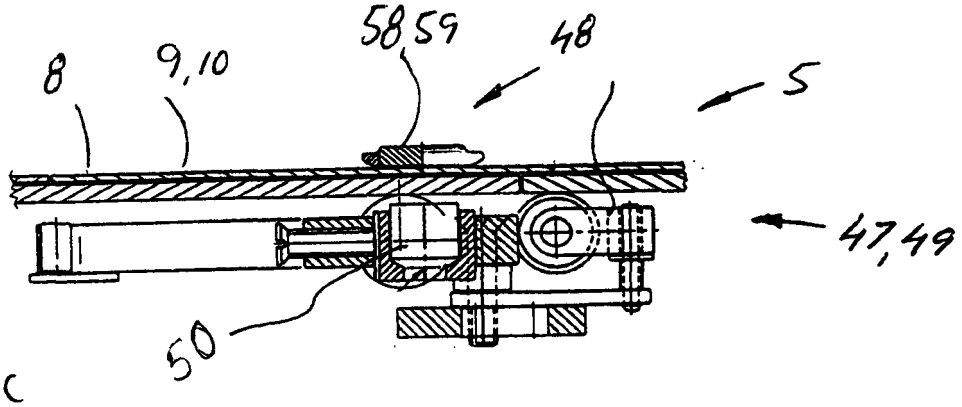


FIG 6C

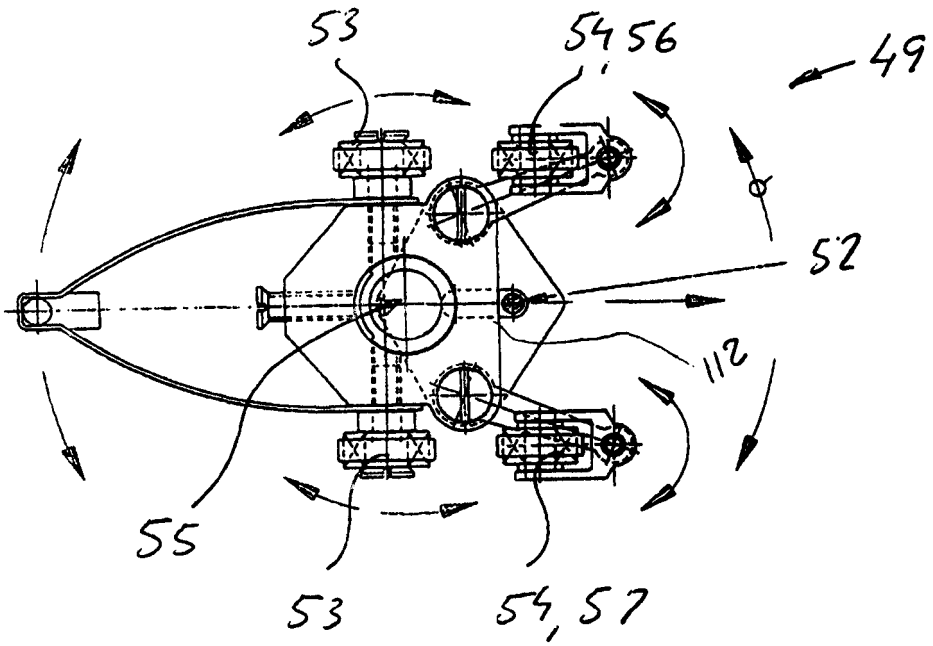


FIG 6B

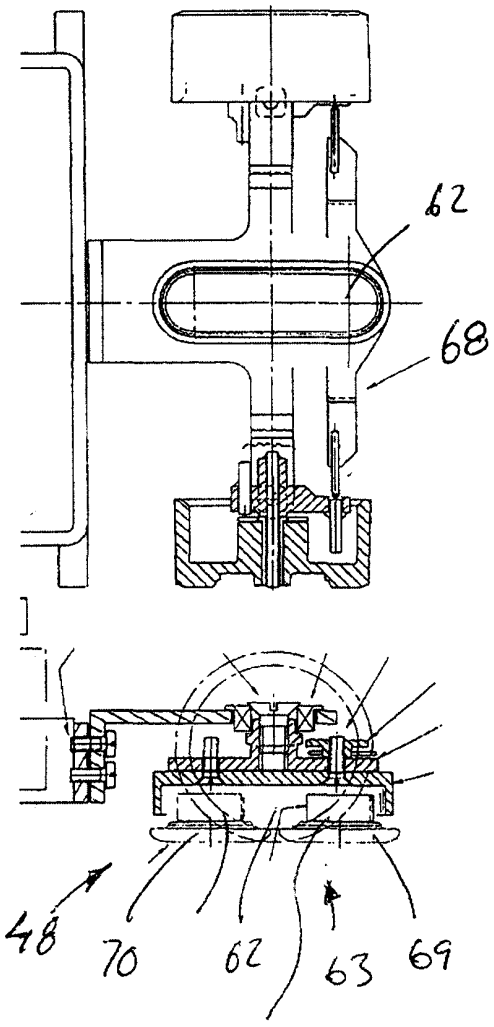


FIG 7A

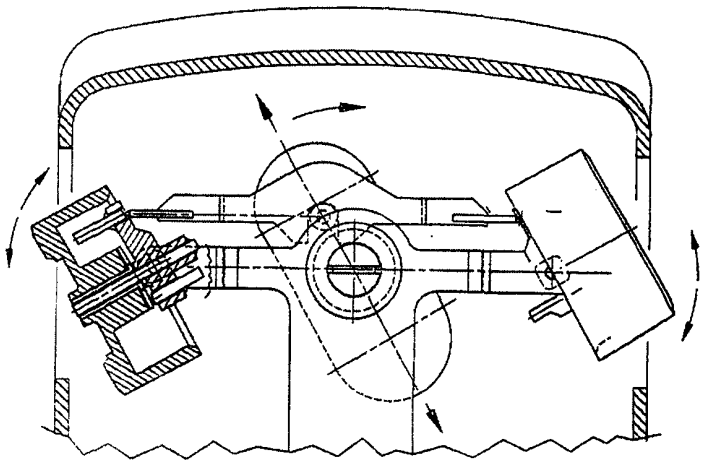
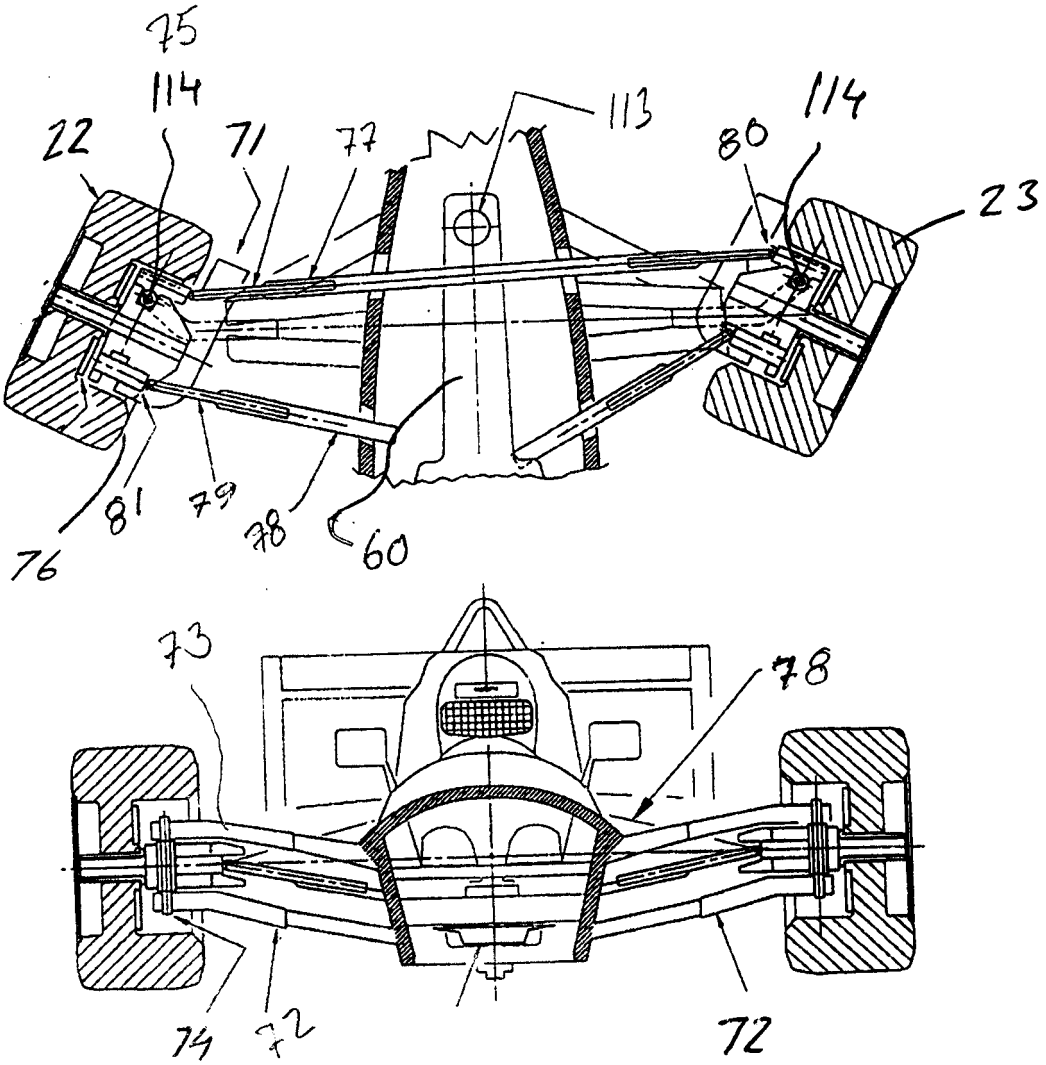


FIG 7B



Figur 8

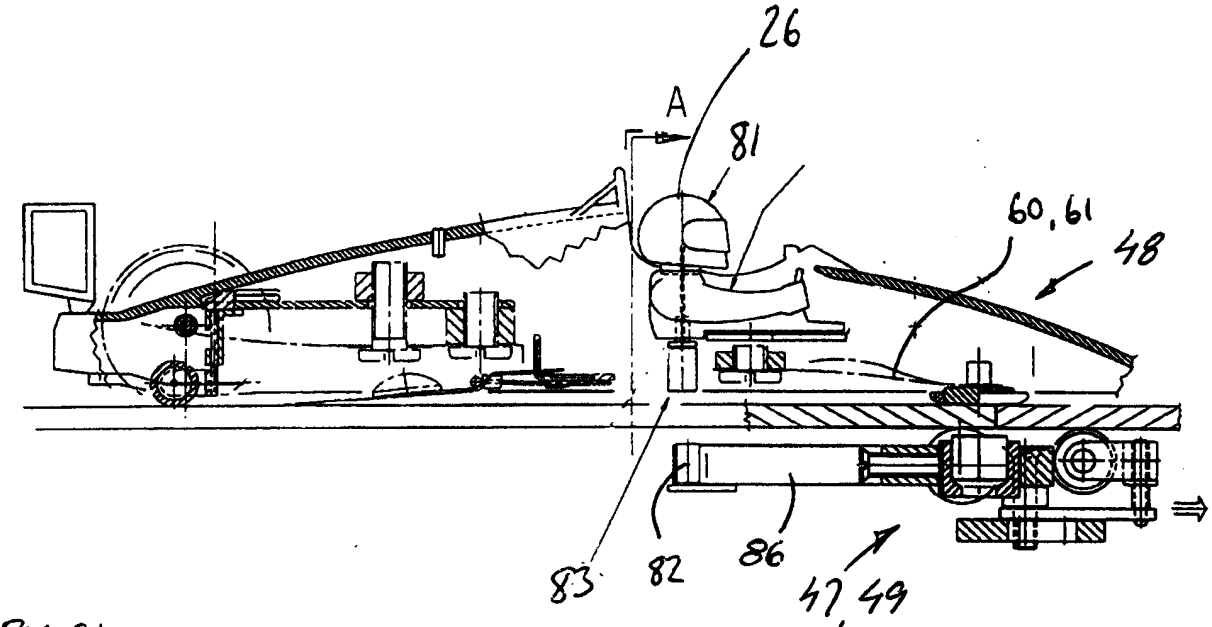


FIG 9A

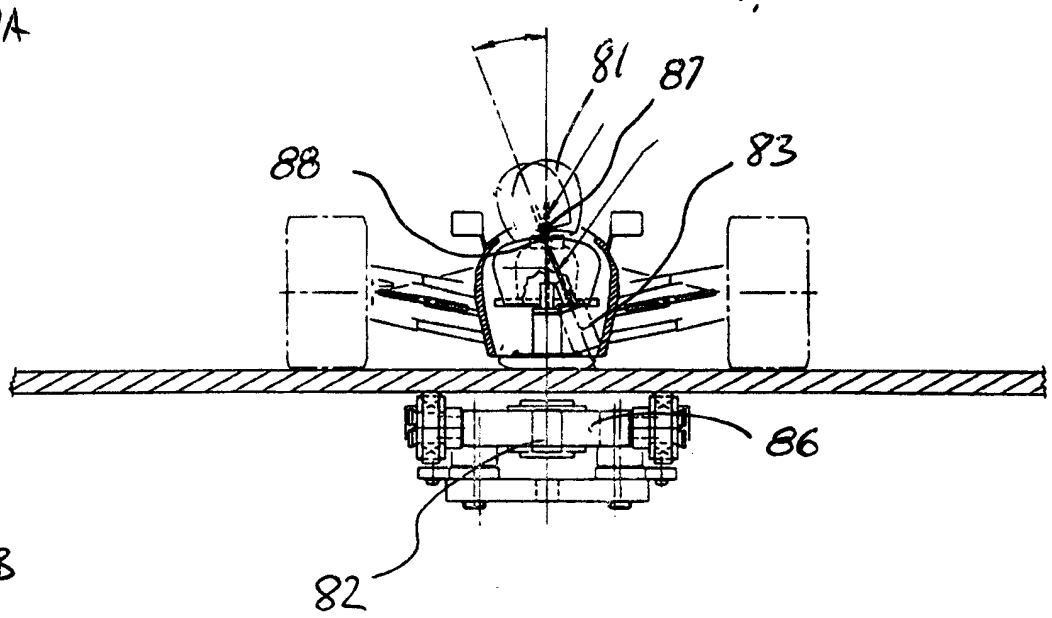


FIG 9B

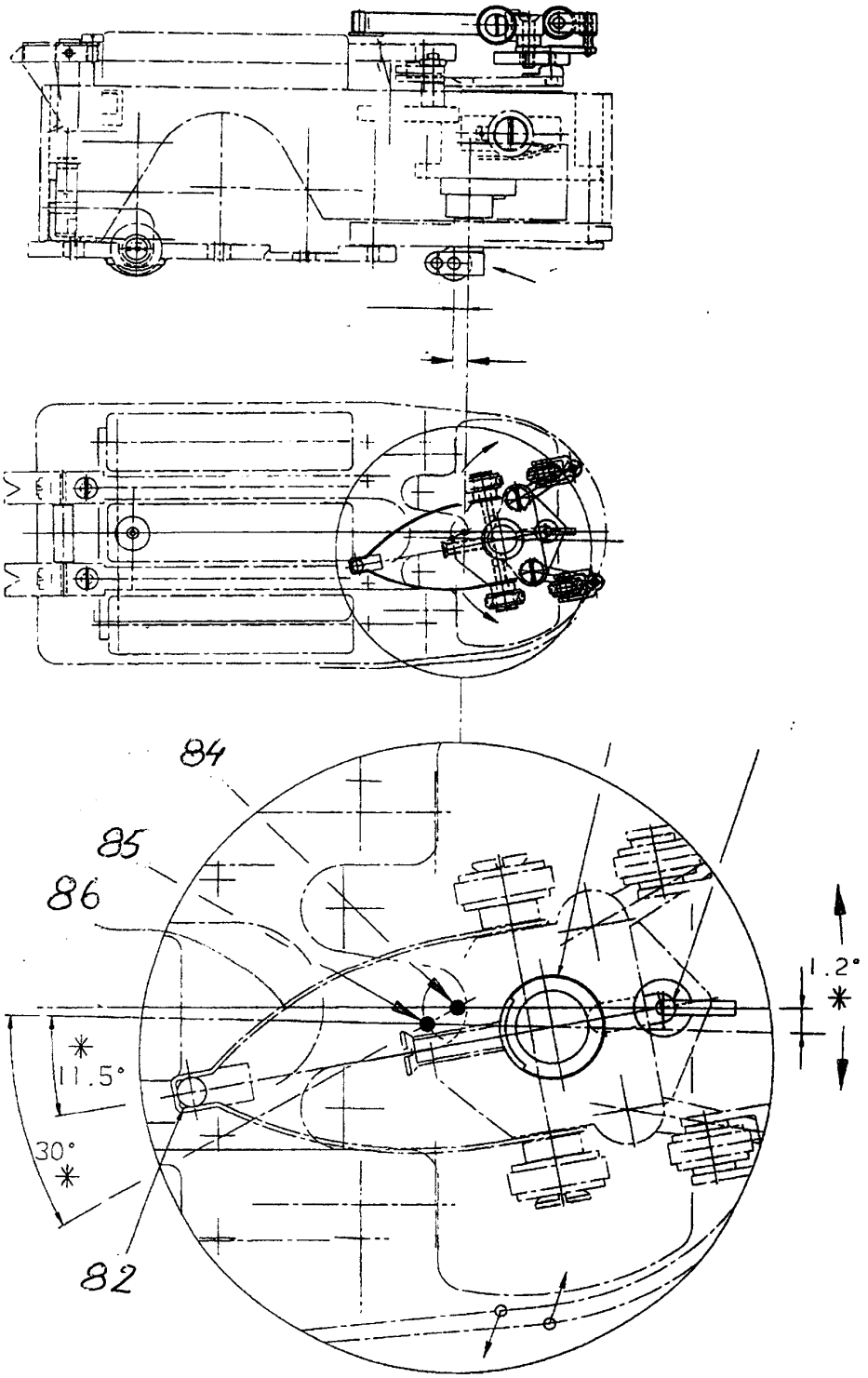


Fig 9C

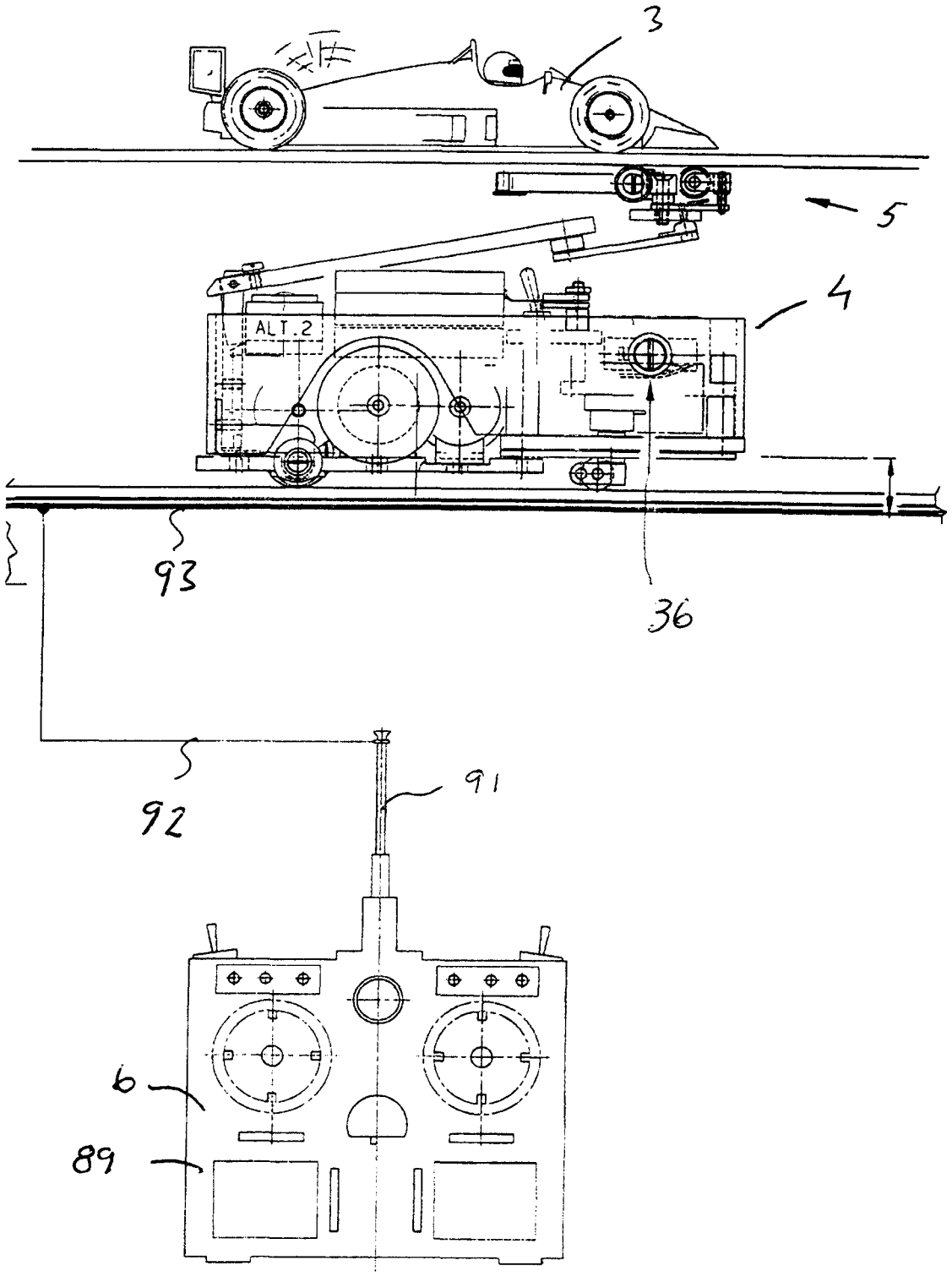


FIG 10

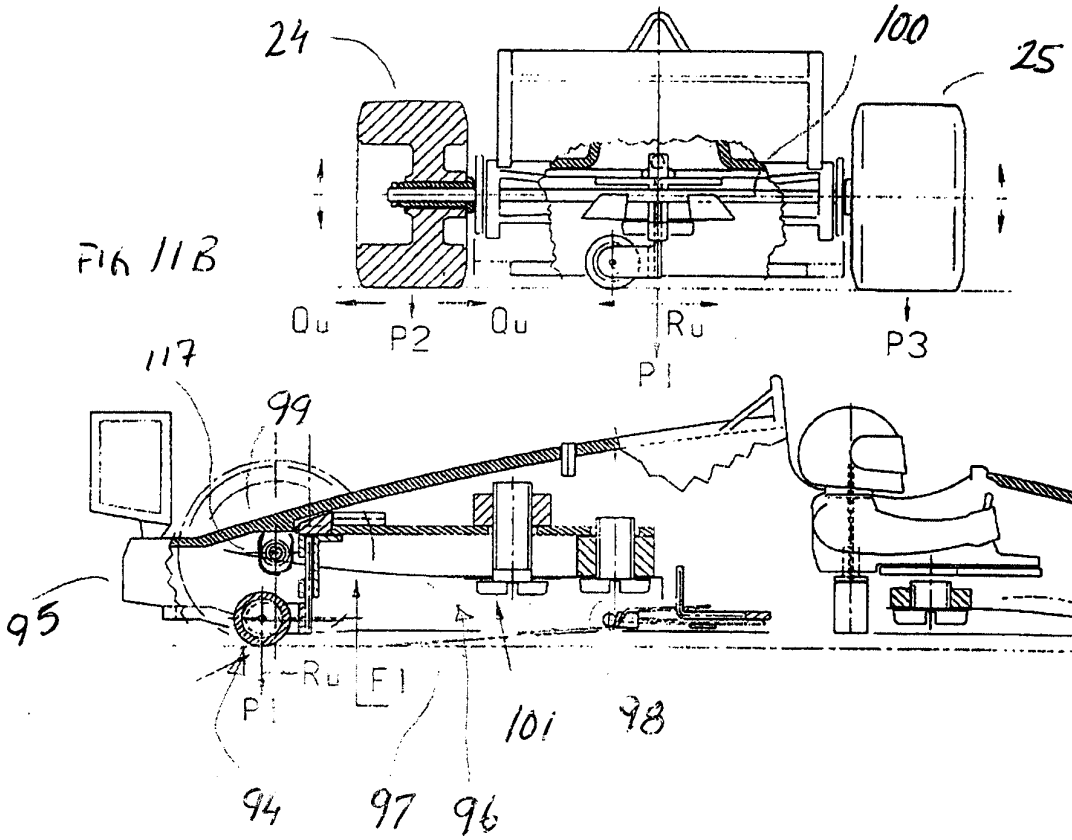


FIG 11B

FIG 11A

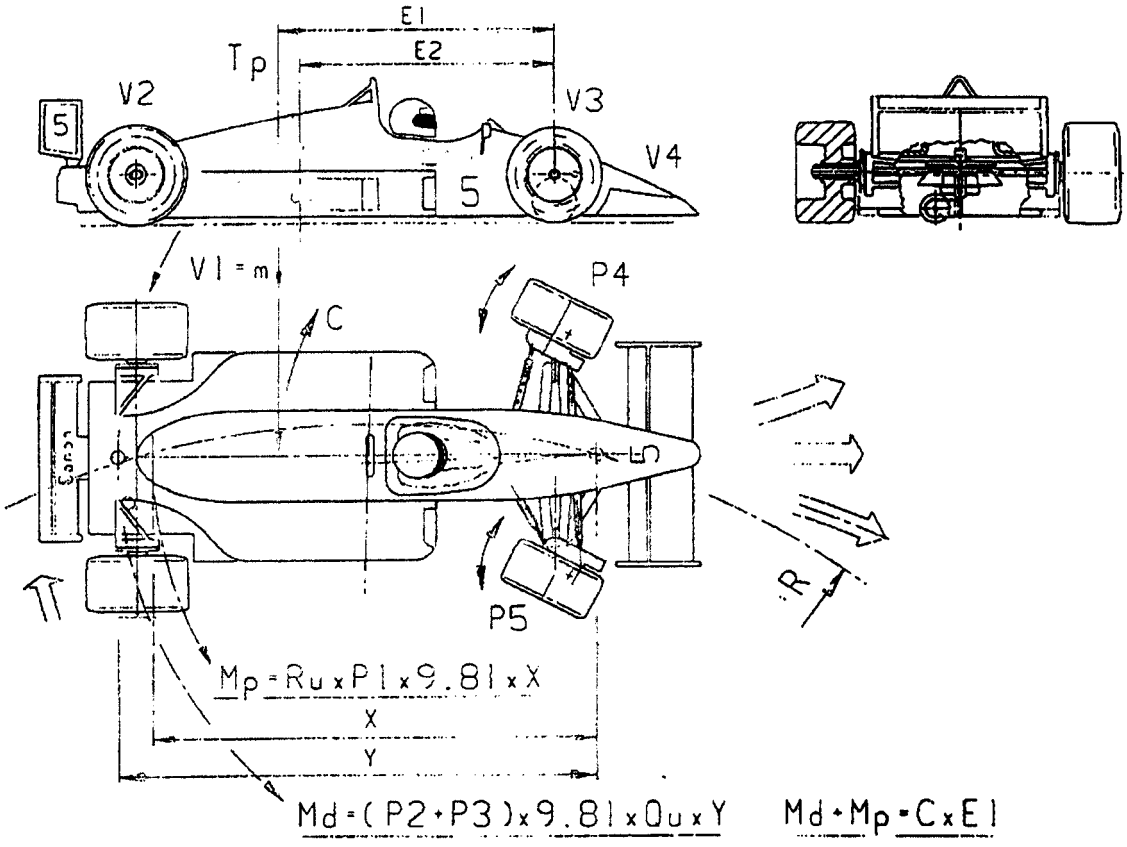

E1
E2
Tp
V2
V3
V4
5
V1 = m
C
P4
P5
R
Mp = Ru x P1 x 9.81 x X
X
Y
Md = (P2 + P3) x 9.81 x Qu x Y
Md + Mp = C x E1

FIG 11C

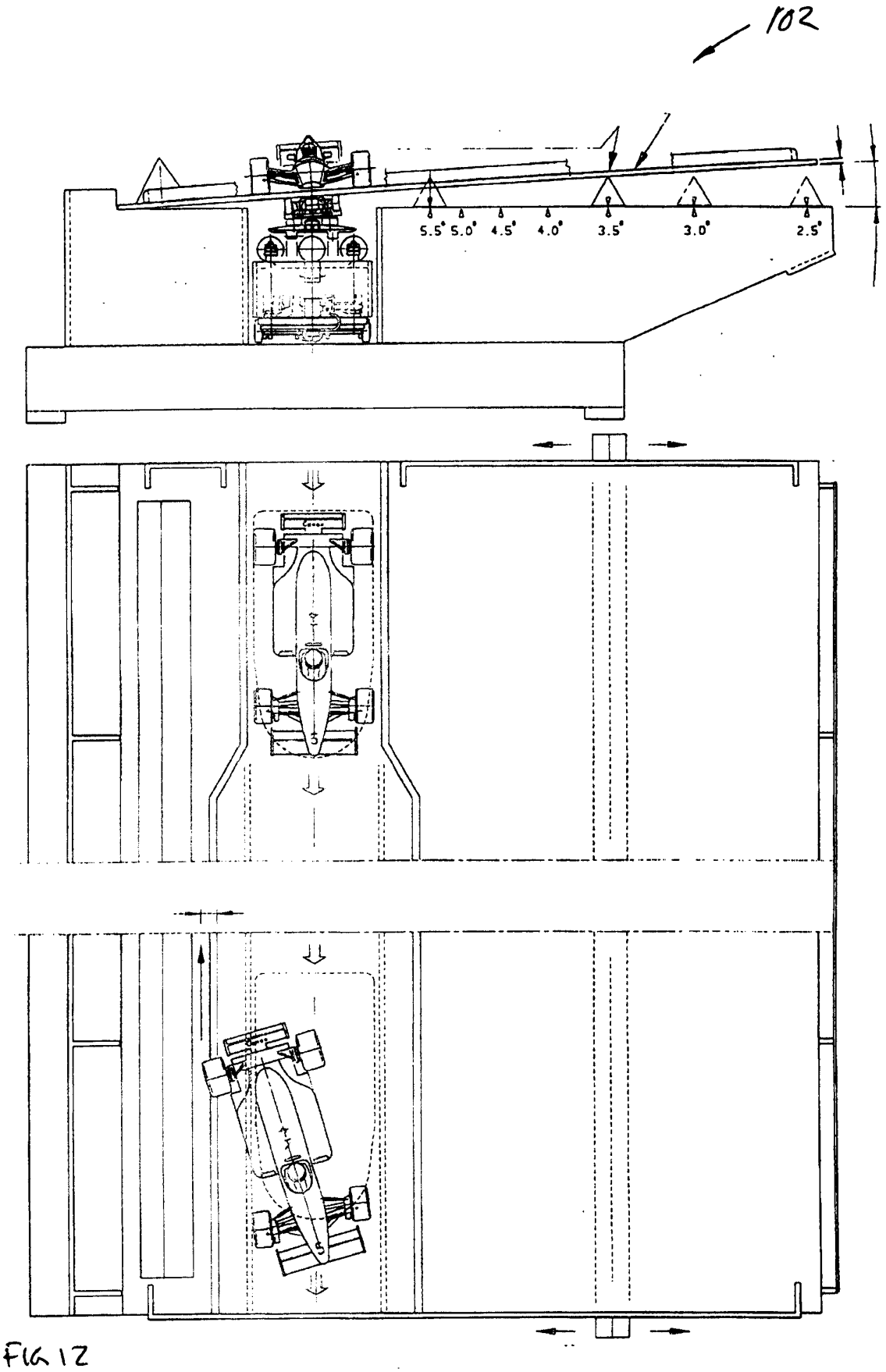


FIG 12

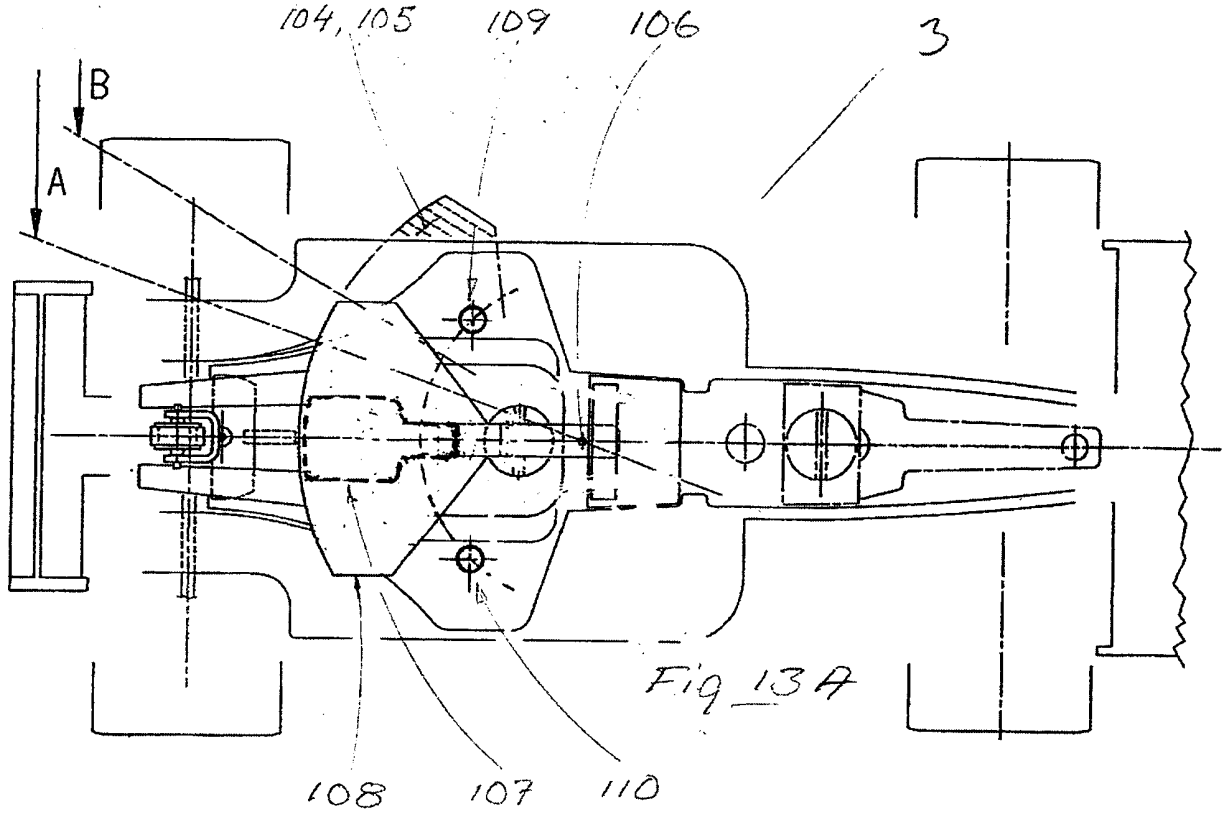


Fig 13A

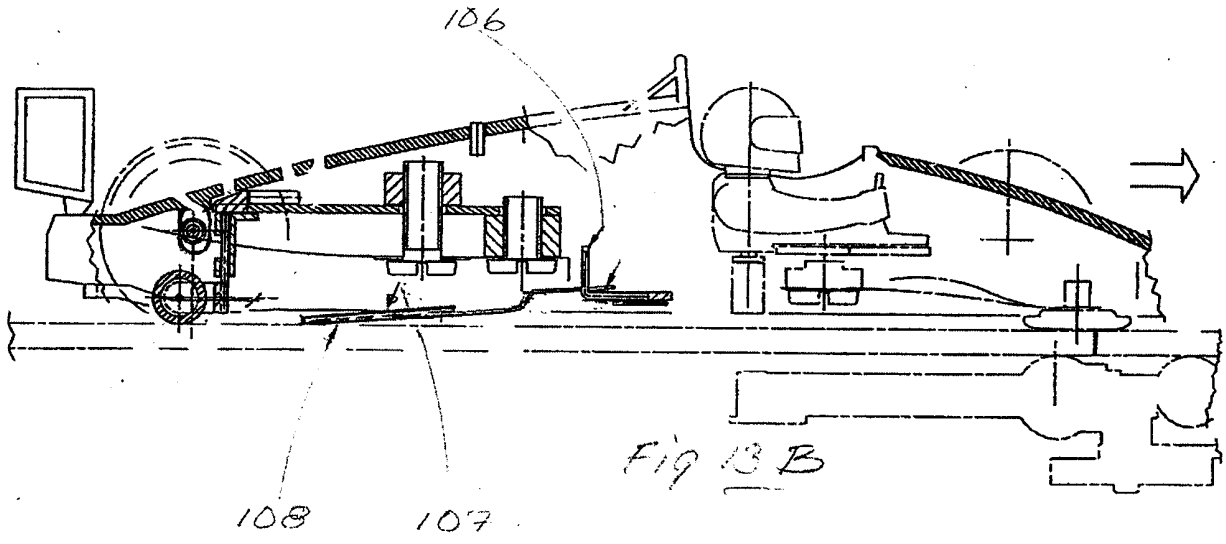


Fig 13B

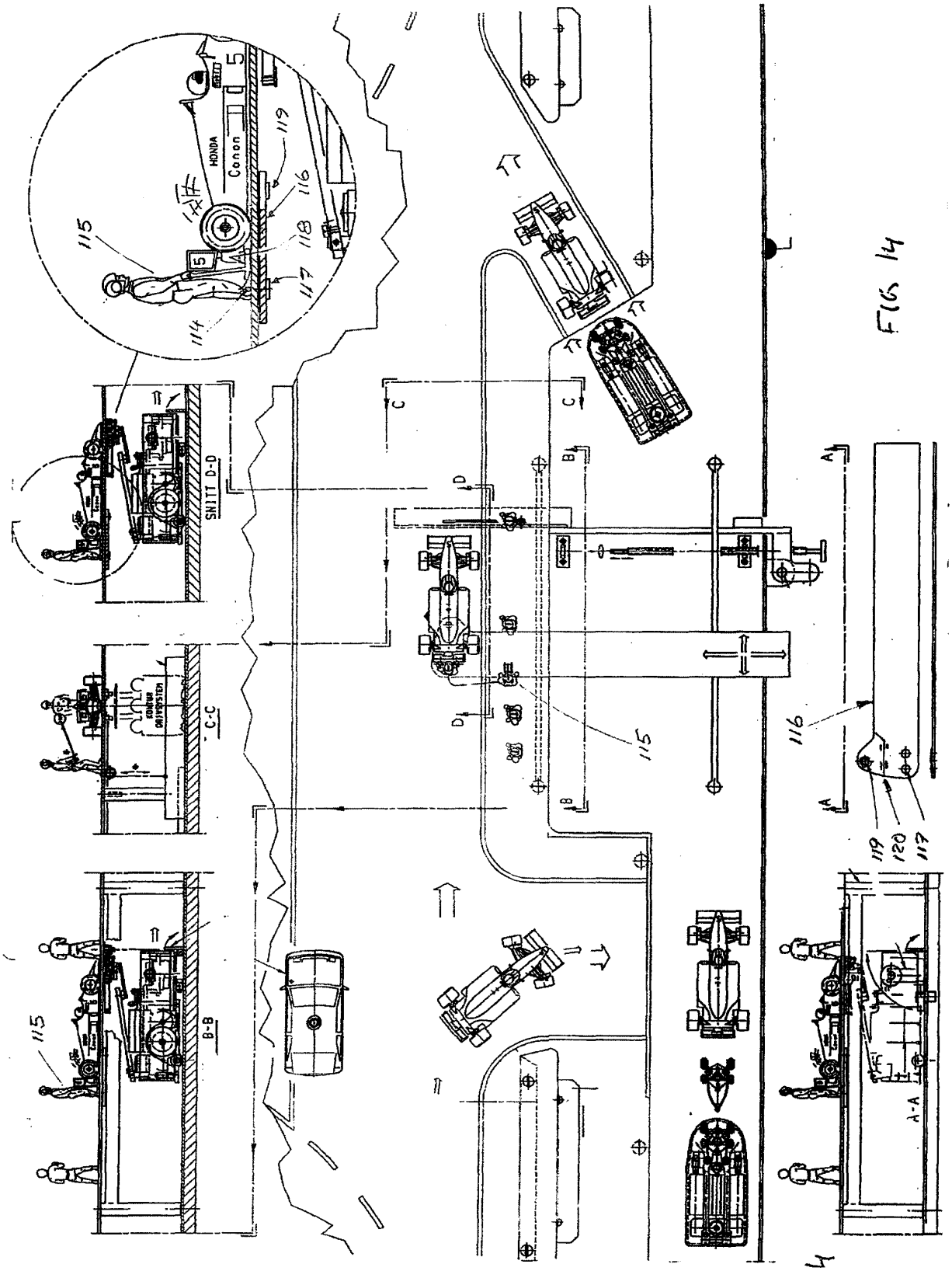


FIG 14

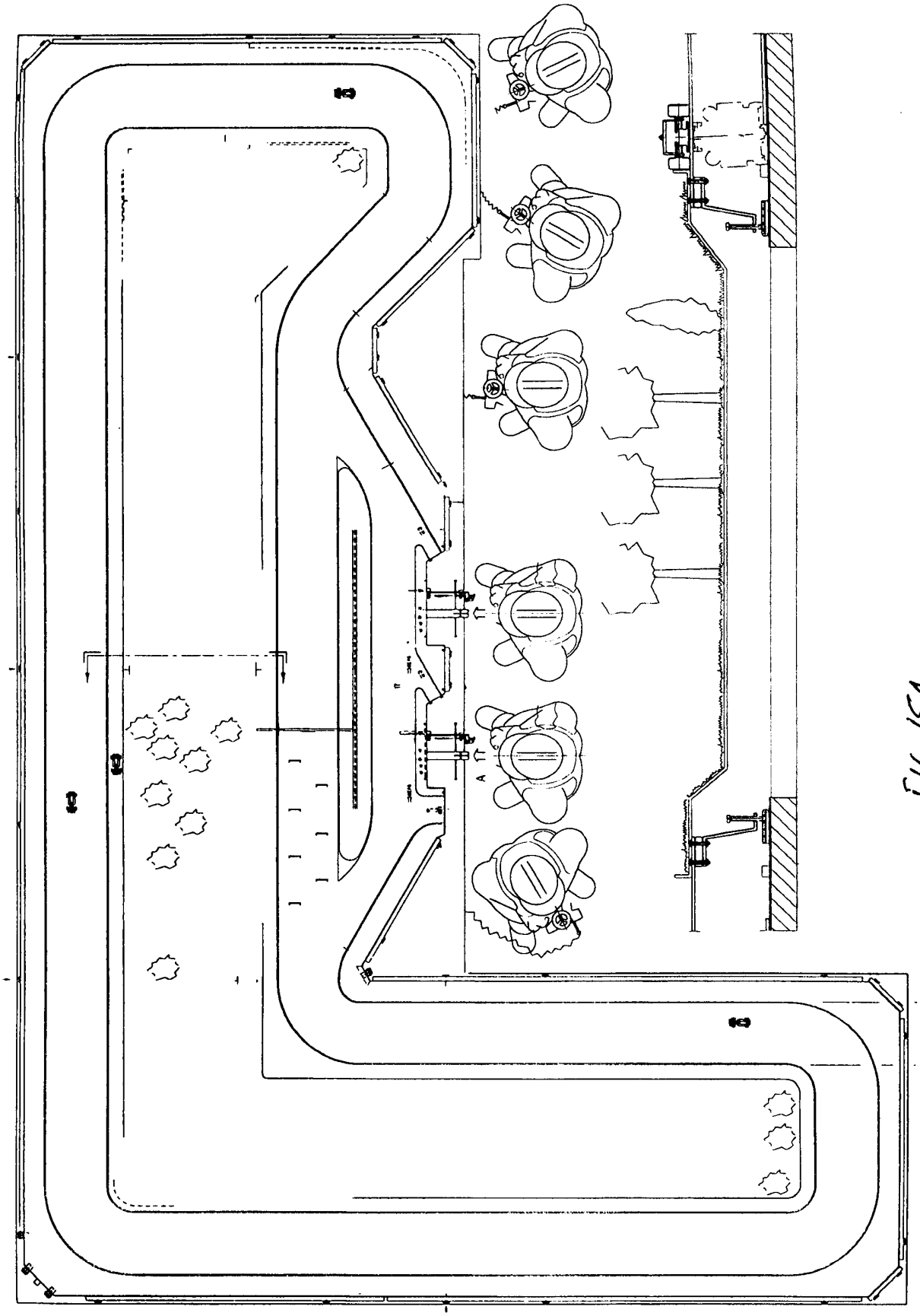


FIG 15A

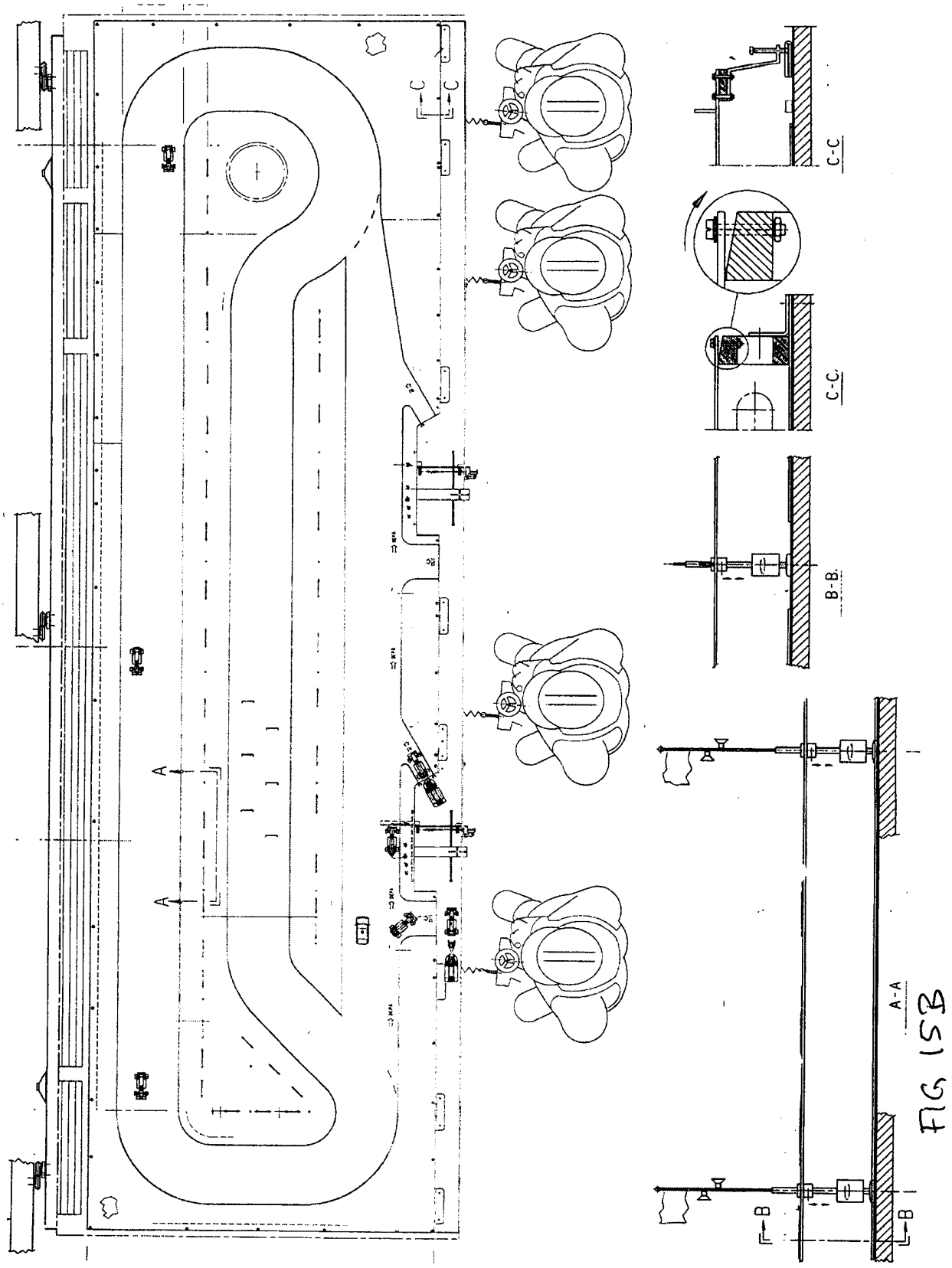


FIG 15B

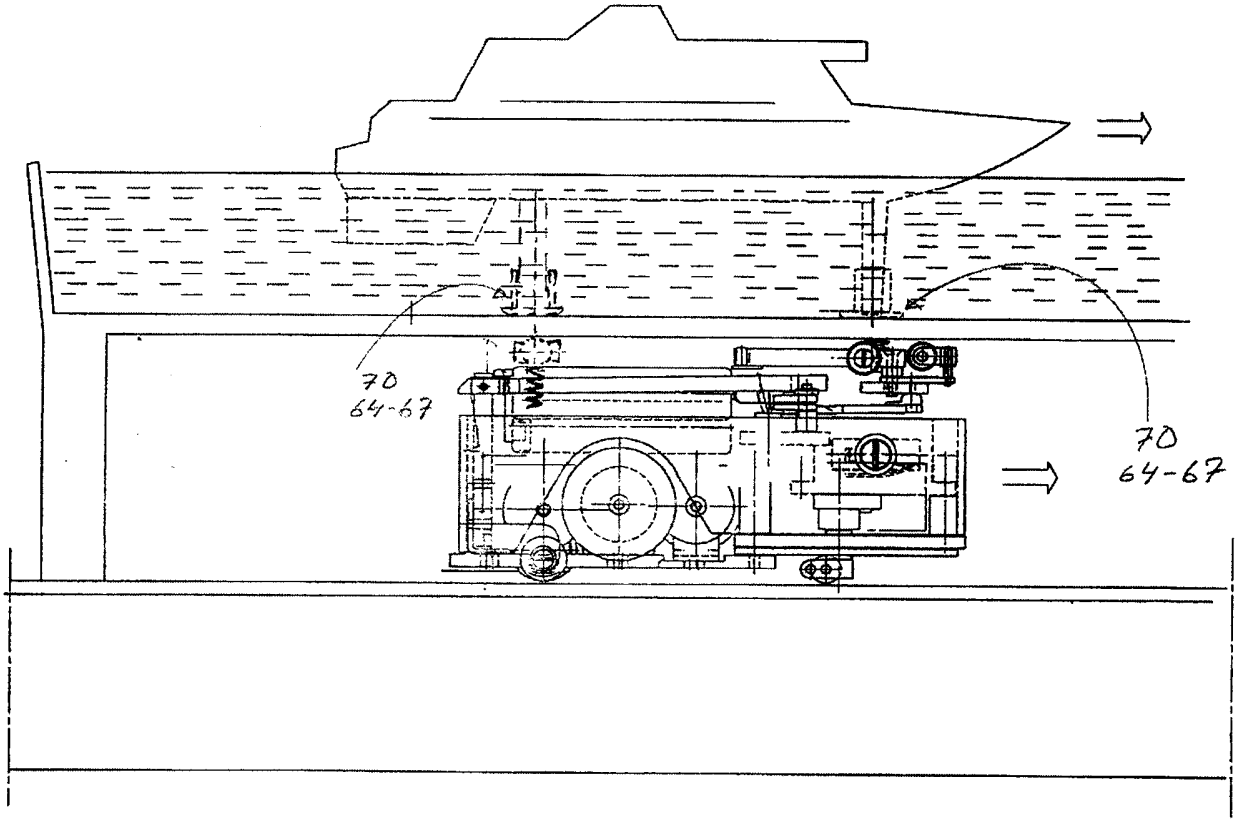


Fig 16

REFERENCES CITED IN THE DESCRIPTION

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