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# (54) STEERABLE IN-LINE SKATE ROLLERS WITH BRAKES

(57) In-line roller skate for personal transport, sporting activity and entertainment, the rear wheel (2) of which can be steered by the movement of the skater's boot (5). The boot is attached to the frame (3) of the skate by two supports located within the confines of the frame which can move laterally on guides (9) allowing the movement of the boot. The movement of the boot is transmitted by means of mechanical elements to the axle (35) of the rear wheel (2), causing the wheel to rotate about its vertical axis. The skate has friction braking elements (15) which is composed of an elastic material, located in the frame, which acts progressively the more the rear wheel rotates.

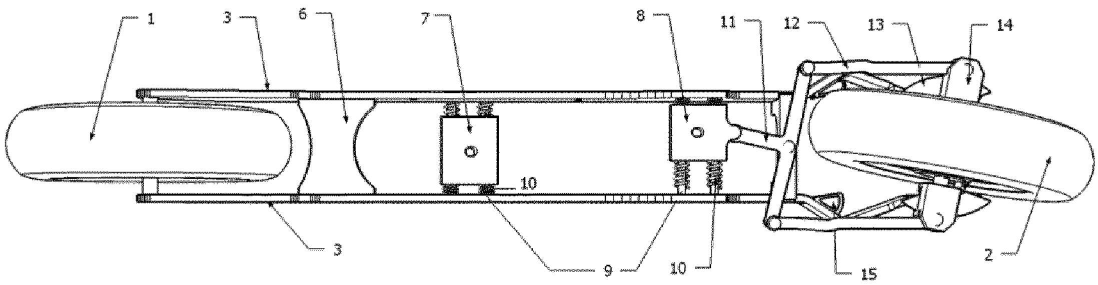


FIG. 2

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## Description

### Technical field

**[0001]** The invention is part of the sector of land transport for personal use, including its application in sports and entertainment activities, more specifically in those devices and systems that allow the user to move on elements equipped with wheels, such as skates and skateboards, driven by human power, with the help of small motors or with means of dragging, and in which the user stands on the device.

### Prior art

**[0002]** Roller skates and skateboards are devices which have the particularity of not incorporating handlebars, steering wheels or similar to be steered. They are controlled by the distribution of forces that the skateboarder exerts on their platforms with his feet, as well as their orientation and position. At present, we can classify these devices into four groups: skateboards, parallel roller skates, inline skates and Nordic skates.

**[0003]** Both parallel roller skates and skateboards have four wheels per skate, two at the front and two at the back, as if they were a conventional vehicle. They incorporate a similar mechanism in both cases to steer the wheels in the desired direction by shifting the skater's weight to one side or the other of the skate. For design reasons, the mechanism must be located below the platform that supports the user.

**[0004]** Inline skates, on the other hand, have the wheels, usually four, below the skate platform, aligned with the longitudinal axis of the skate and in the direction of travel, the wheels not being steerable. They are controlled by techniques similar to ice skating, which is why the base of the skate, which marks the limits of the projection of the center of gravity of the whole, does not usually exceed the length of the skater's foot.

**[0005]** Finally, the so-called Nordic skates have only two fixed wheels in line, arranged at the ends of the skate, in front of and behind the skater's boot. In this case, the platform that supports the user is placed between the wheels and not on top of them. This configuration makes it possible to design a wide range of skate models, as they can be fitted with practically any type of wheel in terms of diameter, width and materials, so that they are more versatile when it comes to adapting to the ground conditions and mode of use and are currently designed to be used on asphalt and smooth, regular surfaces as well as on dirt tracks and uneven surfaces in general. The latter are called all-terrain skates and are fitted with large pneumatic rubber tires, being the only types of skates that can do so with guarantees. Also, the structure of the skates can be designed in such a way that the user's support platform is at almost any height with respect to the ground, without the limitation of the previous models, and mount larger wheels without loss of stability due to the elevation of the center of gravity. Moreover, these skates have greater longitudinal stability due to the greater distance between the axles of the wheels, which is essential for uneven terrain and for travelling at higher speeds. On the other hand, these designs do not allow for continuous cornering, requiring them to be raised and reoriented alternately for changes in direction.

**[0006]** In all cases, the force required for movement is generally provided by the user himself, with his legs and sometimes also with the help of poles, although some devices may integrate small motors for this purpose.

**[0007]** The braking system on skates and skateboards is generally based on some element of friction applied to the ground or to a wheel, which usually forces the skater to adopt fewer stable positions. In some cases, the wheels themselves are used as a means of friction against the ground, which requires the use of advanced techniques on the part of the skater.

**[0008]** Although there are mechanisms designed to steer wheels individually with application in different fields, the methods known so far have not allowed their implementation in this type of skates, where the change of direction is intended to be due solely to actions that the skater performs with his or her feet on the skate platform.

**[0009]** Patent WO 200202043821A2 by James S. Page (2002) proposes field skates with a steerable front wheel and a drum brake on the rear wheel, attributing to this model the possibility of guiding the skates with techniques similar to skiing. However, it did not meet with the expected acceptance. The fact that the front wheel is steerable can cause irregularities in the ground to change its orientation unexpectedly, increasing the risk of loss of control.

**[0010]** Despite the many advantages of a two-wheeled skateboard with the platform between them, the fact that it is not possible to negotiate curves with them has relegated them to extremely specific and generally minority activities. On the other hand, if they were able to steer their wheels according to the skater's movements, the possibilities would be enormous, extending their use from the urban environment to roads, paths, and mountains.

**[0011]** Patent WO 0053276A1 by Rosso Michele (2000) also refers to roller skates with the ability to turn. In that patent, a fork is pivoted around a substantially vertical axis, and a front wheel is rotatably supported within fork. As is well known, a fork is an element that is integrated with the wheel and its axis of rotation to enable a pivot of the assembly, different from the rotation of the wheel, which connects with the rest of the structure of the device and provides the fork-axle-wheel assembly with steering capacity. In contrast to Rosso Michele patent, the pivoting system of this invention does not require a fork or physical pivot on which to orient the direction of the wheel, reducing the weight of the skates significantly. The ends of the axles rest and slide on rails that define a circular path on the imaginary vertical axis of the wheel and the entire rotating system is at or below the wheel axle height.

## Summary of the invention

**[0012]** The solution presented is based on the type of skate with two wheels, located at the ends, and the platform between them, where the rear wheel is adjustable and controlled by the skater's movements, thus incorporating the possibility of tracing curves with this type of skate. In addition, it incorporates friction brakes, whose braking force is proportional to the turning radius, which adds a more natural and stable way of controlling speed and braking, while increasing the user's safety.

**[0013]** The invention according to claim 1 proposes a skate with two wheels in line, located at the ends of the frame, with the skater's boot between the wheels, in which the axle of the rear wheel is free to rotate a certain number of degrees about its vertical axis, in either direction, giving this wheel the ability to modify the direction of movement of the skate. In order to allow the rear wheel to rotate, the rear of the frame is enlarged in such a way as to provide sufficient space for this rotation.

**[0014]** The invention aims to improve the performance of this type of skate, increasing versatility, control, and safety, enabling the use of techniques similar to those used in skiing to tackle descents in different situations and scenarios with guarantees. Likewise, it allows the design and configuration of its elements in multiple ways to better adapt to the environment and use foreseen for the final model. The arrangement of the wheels facilitates the incorporation of wheels of different characteristics in terms of diameter, width, rolling material, etc., enabling the skates to roll on different terrains, from asphalt and cement to dirt tracks, grass and others.

**[0015]** The arrangement of the wheels considerably improves longitudinal stability compared to traditional skates, resulting in better control at high speeds. The frame can be designed so that the platform is at a more appropriate height above the ground, either lower to increase stability, or higher to improve performance on uneven and bumpy terrain.

**[0016]** The rear wheel turning system is not affected by the dimensions and type of wheels, within the limits defined in the frame design, and its handling is similar to that of alpine skiing, allowing the user to chain curves as a technique for speed control on descents. Likewise, the progressive brake, with force proportional to the angle of rotation, allows its application without the need to adopt postures that compromise the skater's balance, considerably improving speed control on descents by linking curves, and even allows the brakes to be applied using the wedge technique, widely used in skiing, providing greater control and, therefore, greater confidence to the user.

**[0017]** The fact that the rear support of the skater's boot slides a few millimeters sideways to orientate the rear wheel for cornering does not affect the skater's stability, since the lateral movement of the boot is followed by an immediate change in the trajectory of the skate, so that the user perceives the movement of the boot as a small slide of the whole, not of the boot independently. The advantages of the invention are achieved with the steerable in-line skate rollers with brakes of claim 1. In the dependent claims are disclosed some examples and embodiments of the invention.

## Brief description of the drawings

**[0018]**

Figure 1 shows a perspective view of a skate, seen from the front, with the wheels aligned for a rectilinear movement and with an in-line skate type boot placed on the frame, representing a possible configuration of the present invention.

Figure 2 shows the plan view of a possible embodiment of the skate according to the invention, without boot or shoes on the frame, with the rear wheel rotated with respect to the platform for a curved movement.

Figure 3 is the profile view of figure 2.

Figure 4 represents the set of forces acting on the skate-skateboard system, moving on a horizontal plane during a change of direction.

Figure 5 shows the diagram of the parameters necessary to calculate the turning radius of the skate as a function of the angle of rotation of the rear wheel.

Figure 6 shows the detail of the most significant parts that make up the guidance system of a possible realization of the skate according to the invention, seen in plan and with the rear wheel aligned for a rectilinear trajectory.

Figure 7 is a modification of figure 6 showing the rear wheel with a given angle of rotation for the tracing of a curved trajectory.

Figure 8 shows a detail of a possible embodiment of the steering transmission system and the bearing and slide rail assembly, showing both the exploded view and the assembly with the rear wheel axle.

## Preferred embodiment of the invention

**[0019]** The present invention (Fig. 1) proposes a skate with two wheels (1 and 2) in line, located at the ends of the frame (3), with the skater's boot (5) between the wheels, in which the axle (4) of the rear wheel is free to rotate a certain number of degrees about its vertical axis, in either direction, giving this wheel the ability to modify the direction of movement of the skate. In order to allow the rear wheel to rotate, the rear of the frame is enlarged in such a way as to provide sufficient space for this rotation.

**[0020]** The skate (Fig. 2 and 3) has two supports for attaching the boot to the frame (3), a front support (7) and a rear support (8), located at heel height, which are aligned with the longitudinal axis of the skate. Both the front support (7) and the rear support (8) allow lateral movement, sliding on guides (9) on either side of the width of the frame (3).

**[0021]** The supports can adapt different geometries to be able to screw on inline skate boots (5) (Fig. 1), ski bindings (36) (Fig. 9) or roller ski bindings (37) (Fig. 10).

**[0022]** At equal lateral forces, the displacement of the rear support is greater than that of the front support, whose function is to facilitate the movement of the rear support. The lateral movement of the rear part of the boot is transmitted to the rear wheel (2) by means of a transmission system (11 and 12), which connects the rear support of the boot with the ends of the rear wheel axle. Springs (10) arranged in the path of the supports exert a force which opposes the change of position of the wheel axle, with force directly proportional to the angle of the axle, and which in the absence of other forces keep the rear wheel aligned with the frame, maintaining the straight movement of the skate.

**[0023]** Finally, the skid incorporates friction braking elements (15), arranged in such a way that they start to rub against the rear wheel from a certain angle of rotation of the latter and with a force proportional to the increase of this angle. By analogy, the braking force is also proportional to the lateral displacement of the rear support.

**[0024]** The invention aims to improve the performance of this type of skate, increasing versatility, control, and safety, enabling the use of techniques similar to those used in skiing to tackle descents in different situations and scenarios with guarantees. Likewise, it allows the design and configuration of its elements in multiple ways to better adapt to the environment and use foreseen for the final model. The arrangement of the wheels facilitates the incorporation of wheels of different characteristics in terms of diameter, width, rolling material, etc., enabling the skates to roll on different terrains, from asphalt and cement to dirt tracks, grass and others.

**[0025]** The arrangement of the wheels considerably improves longitudinal stability compared to traditional skates, resulting in better control at high speeds. The frame can be designed so that the platform is at a more appropriate height above the ground, either lower to increase stability, or higher to improve performance on uneven and bumpy terrain.

**[0026]** The rear wheel turning system is not affected by the dimensions and type of wheels, within the limits defined in the frame design, and its handling is similar to that of alpine skiing, allowing the user to chain curves as a technique for speed control on descents. Likewise, the progressive brake, with force proportional to the angle of rotation, allows its application without the need to adopt postures that compromise the skater's balance, considerably improving speed control on descents by linking curves, and even allows the brakes to be applied using the wedge technique, widely used in skiing, providing greater control and, therefore, greater confidence to the user.

**[0027]** The fact that the rear support of the skater's boot slides a few millimeters sideways to orientate the rear wheel for cornering does not affect the skater's stability, since the lateral movement of the boot is followed by an immediate change in the trajectory of the skate, so that the user perceives the movement of the boot as a small slide of the whole, not of the boot independently.

**[0028]** The set of forces acting on a skater when tracing a curve (Fig.4), is the same as in the case of a runner, a cyclist, etc. in the same situation. On the center of gravity of the system (16) acts the gravity force (17), $F_g = mg$, and the centrifugal force (18), $F_c = m\frac{v^2}{r}$, whose vector sum produces a resultant force (19) downwards and perpendicular to the skate platform. In conditions of dynamic equilibrium, the skate (20) is subject to forces that oppose the previous ones: the lateral friction force (22) of the wheels with the ground, opposite to the centrifugal force, and the normal force (21), opposite to that of gravity, whose vectorial sum (23) is of equal magnitude and opposite direction to the resultant of the forces applied at the center of gravity of the system (19), and also perpendicular to the upper plane of the frame.

**[0029]** It follows from the above that the steering system will only act if the skater intentionally exerts a lateral force with the boot, since in dynamic equilibrium the force that the skater exerts on the frame platform is perpendicular to it. Thus, these skates are equally suitable for use as commercial Nordic-type skates, both for impulsion and for rectilinear movement. Furthermore, whatever the speed or inclination of the skater in curves, the radius of the curve will only depend on the orientation of the skater's boot, with the user having control of the trajectory in his or her feet, without the need for additional elements.

**[0030]** As in Nordic-type skates, this invention (Fig. 1) comprises a frame (3) of resistant material, at the ends of which the wheels (1 and 2) are arranged, and on which the skater's boot (5) is placed, anchored, by means of screws, ties or other fastening elements, to some supports arranged on the frame, located one at the front and the other at the back. Unlike Nordic skates, the frame at the rear shall be of sufficient width or shape to allow the rear wheel to rotate about its vertical axis a specified number of degrees in either direction.

**[0031]** The space required, which the frame must allow for the rotational movement of the rear wheel, shall be calculated on the basis of two fundamental factors. On the one hand, the minimum necessary radius that the skid must reach and, on the other hand, the size of the wheel in terms of diameter and width. The turning radius in turn depends on the main use of the skate, since it is not the same to roll on asphalt roads at high speed, on dirt tracks or on roads. In the first case a radius of 3.5 meters is more than enough, for the second 2.5 meters is an adequate measure and in the case of roads a radius of 1.5 meters could be required. Once the minimum radius has been established, the angle that the wheel must adopt with respect to the frame for that radius is calculated. Figure 5 shows the scheme with the parameters involved in the calculation of the radius, where L (24) is the length between wheel axles, Rd (25) is the radius of the curve described by the front wheel, Rt (26) the radius of the curve followed by the rear wheel and $\alpha$ (27) the angle formed by the rear wheel with the frame and the front wheel, which in turn is the same as that formed by Rd - Rt, so that the calculation of the radius of the curve described by the front wheel is given by:

$$\propto = \arctan \frac{L}{R_d}$$

**[0032]** The size of the wheel to be mounted is chosen, width and diameter, which will define the minimum width of the frame and the extra space required at the rear, considering the angular sector described by the wheel profile in its rotation about the vertical axis.

**[0033]** The rotation system is considered as the set of elements involved in the transmission and transformation of the pivoting movement of the boot into a rotational movement of the rear wheel about its vertical axis.

**[0034]** Figure 6 shows, in plain view, all the elements involved in the rotation system, in a rectilinear trajectory position, while Figure 7 shows the same elements arranged in a curved trajectory of the skate. The system starts at the boot supports themselves, where the front support (7) has a hole (28) for the element that joins the boot to the support. The rear support (8) also has a hole (29) for the boot connecting element and, in addition, has a projection (30) to connect with the next element of the transmission. The supports slide sideways on guides (9) attached to the frame, which may incorporate springs (10) that tend to keep the supports in a centered position.

**[0035]** From the connector (30) of the rear bracket, elements are deployed to transmit the movement of the bracket and transform it into rotation. The crosshead (11) receives the movement of the rear support (8) and rotates on its axis (32), supported by the rotation support (31), which transmits the movement to the connecting rods (12) articulated at its ends (33 and 34). This push and pull the bearings (14), which are attached to the ends of the rear wheel (2) axle, and which slide on rails (13), causing the wheel to rotate. In this system, the rotational movement of the wheel axle reflects the movement made by the arms of the crosshead. This system of transmission of the linear movement of the rear bracket to the rotation of the axle can be replaced by a system of cables or by any other mechanical, pneumatic and/or hydraulic element that pulls and/or pushes the axle when moving the rear bracket laterally between the sides.

**[0036]** Although the figures referenced show only some springs (10) in the sliding guides (9) of the rear support, which can be metallic, elastomeric or of another type with a similar function, the springs can be arranged in different ways along the rest of the rotation system, as a unit or in combination.

**[0037]** The brakes (Fig. 7) are integrated into the frame by means of friction elements (15) which, at an angle of rotation of the rear wheel, rub against the rear wheel, reducing the angular velocity of the wheel, resulting in a braking force directly proportional to the angle of the wheel. Depending on the arrangement of these elements, they will contact the tread, the rim or an element provided for this purpose, the type of contact material being of a different nature depending on the desired braking intensity, friction zone and type of use of the skate. Thus, the friction material can be made of hard rubber, soft rubber or even metal, to name a few.

**[0038]** The braking element shall be provided with a certain flexibility to allow an increase of the wheel travel, from the moment it starts to friction until the applied force can lock it, thus, braking is more progressive and speed control is smoother. Finally, the brakes shall be anchored to the frame in such a way that they can be adjusted to initiate braking at a greater or lesser angle of rotation of the rear wheel, depending on the type of skater and use, by means of fasteners that allow the element to be moved closer to or further away from the wheel.

**[0039]** In order to give greater precision to the rotational movement of the rear wheel (Fig. 8), the sliding rails (13) of the bearings (14) are curved and form part of the same imaginary circumference, with a defined and constant radius, ensuring a uniform and symmetrical rotation of the wheel in both directions. The bearings could be replaced by a wheel rolling on the rail or even by a bevel gear running on toothed rails, achieving the same circumferential travel functionality of the rear axle ends.

**[0040]** The handling of these skates could be defined as a mixture of the techniques used in skiing with some used with inline skates. For forward movement, when the momentum lies exclusively with the skater, as is the case on flat terrain and uphill slopes, the techniques used are the same as in skating and Nordic skiing. For this, it is even advisable to use poles as in skiing. However, it is on the descents where the biggest difference and advantage over Nordic skates and others is observed, as the ability to guide together with progressive braking, combine a definite way to control speed by tracing esses, similar to what happens in skiing downhills.

**[0041]** As explained above, it is the movement of the rear part of the boot that serves to steer the rear wheel. To do this, the skater orients his body in the direction of the desired turn and transmits this rotation to the rear support. This movement is similar to downhill skiing and requires a skater's position similar to that of a skier. To control the speed of descent, the skater will chain turns that will make the brake act smoothly and make shorter radius turns when he/she wants to slow down sharply or stop altogether. These skates also allow the use of the wedge technique, which is widely used in skiing, so that the skater can brake without having to make turns, maintaining a straight trajectory.

The present invention is illustrated with the following example of preferred embodiments, which in no case are intended to be limiting in scope, and whose description is based on the figures described and in accordance with the numbering established therein.

**[0042]** The following example of realization (Fig. 1) considers the use of two skates, with the integration of a boot (5) in each skate, similar to those used in the so-called inline skates, which will be bolted to the frame (3) of the skate.

**[0043]** The skates are considered for multi-purpose use, both in terms of rolling surface and turning radius, so the wheels will be large and the turning radius moderately small.

**[0044]** The wheels (1 and 2) are 200mm in diameter and 50mm wide, both pneumatic, with rubber and aluminum rims, with their corresponding bearings.

**[0045]** The frame (3) (Fig. 2 and 3) is made up of two sides of high resistance aluminum 4mm thick, 30mm high and 620mm long, joined by the different elements integrated in the structure, the wheels being arranged at 580mm between their axles and providing a space between the inner faces of the sides of 70mm.

**[0046]** For a multi-purpose use of the skates, a minimum turning radius of 1800mm has been selected. With the dimensions established above, the angle of rotation of the wheel should be approximately 18°. Also, the extra space that the frame must have in the area where the wheel approaches the sides is about 12mm on each side.

**[0047]** To give greater rigidity to the structure, a side spacer (6) made of resistant plastic and crossed by screws that fix it to the structure is incorporated.

**[0048]** The boot supports (7 and 8), made of resistant plastic, are placed equidistant on either side of the average distance between wheel axles, 290mm, with a distance between the fixing screw holes of 165mm.

**[0049]** In figure 6, the front (7) and rear (8) boot support have widths of 50mm and 40mm and leave a free space of 10mm and 15mm on each side respectively, to house the springs (10), which are crossed by two screws threaded at their ends that act as sliding guides (9). The hole (29) for fixing the boot will allow the passage of a 6mm screw and will be cut 2mm to allow the arc traced when pivoting the boot sideways. Finally, the support has a protrusion (30) with a curved profile, which serves as a connection point with the crosshead (11).

**[0050]** The crosshead (11) receives the linear movement of the bracket, figure 7, which forces it to rotate on its axis (32), transmitting a pushing and pulling movement to the connecting rods (12), which in turn transmit the movement to the bearings (14), which finally causes a rotational movement in the rear wheel (2).

**[0051]** The friction braking system (15) consists of four rubber parts, two per pad, in the shape of a triangle with a hollow interior. The parts can be filled with an elastomer material so that the element can be compressed when pressed by the wheel to produce progressive braking depending on the angle of rotation of the rear wheel. These elements are bolted to the sides of the frame and their position can be adjusted so that the first contact is initiated at a greater or lesser angle of rotation.

**[0052]** The described braking system works by compression of the elastic material. However, it is also possible to implement rubber bands (38) fixed to the frame and spaced at a certain distance from the wheel (Figure 11). When the wheel touches the brake, the rubber band starts to tighten progressively, exerting more pressure on the wheel and increasing the braking effectiveness.

**[0053]** Figure 8 shows the shape of the crosshead (11) at the point of connection (30) with the rear support to receive the linear movement of the latter. This movement is transformed into rotational movement by pivoting the crosshead on its axis (32), which is supported by the rotation support (31), made of aluminum, and which, at the same time, serves as a separating element for the sides of the frame (3). The steering transmission elements, crosshead (11) and connecting rods (12), made of 3 mm thick steel, are joined by bolts (33) to provide the articulation of the assembly.

**[0054]** The connecting rods (12) connect with the bearings (14), located at the ends of the axle (35) of the rear wheel (2), by means of bolts (34) that allow their articulation. The bearings (14) have a T-shaped groove for sliding on guides, also T-shaped, and with a curved trajectory, the rails (13) being solidly attached to the sides of the frame (3). Both the bearing and the support are made of high-strength aluminum alloy and reduce friction by applying a solid lubricant.

## Claims

1. Steerable in-line skate rollers with brakes **characterized by** comprising one or more friction braking elements (15) on the wheels (1 and 2) or an element attached to them, which act from an angle of rotation of the rear wheel (2); and wherein the braking elements (15) exerts a force proportional to the rotation of the wheel as it is composed of an elastic material that can work in tension or compression, acting with a force proportional to the rotation of the rear wheel (2).

2. In-line roller skate rollers with brakes according to claim 1, having a forkless rotation system with all necessary elements at or below the wheel axle height; the skate incorporates a front support (7) and a rear support (8), located inside the frame (3), for screwing on in-line skating boots, ski bindings (36) or roller ski bindings (37).

**3.** In line-roller skate rollers with brakes according to claim 2 wherein the rear support (8) is connected to the ends of the axle (35) of the rear wheel (2) by means of a transmission system that allows the rear wheel (2) to rotate on its vertical axis without the need for a fork or physical rotation pivot, to provide the device with the ability to change direction and follow a curved path.

**4.** In line-roller skate rollers with brakes according to claim 2 or 3 wherein the rotation of the rear wheel (2) is achieved by lateral movement of the rear support, which slides on guides (9), transmitting the lateral movement of the boot into angular movement of the wheel axis in the horizontal plane.

**5.** In-line roller skate rollers with brakes according to any of the previous claims, with the skater's boot (5) between the wheels, in which the axle (4) of the rear wheel (2) is free to rotate a certain number of degrees about its vertical axis, in either direction.

**6.** In-line roller skate rollers with brakes according to any of the previous claims, wherein the supports slide sideways on guides (9) attached to the frame, which may incorporate springs (10) that tend to keep the supports in a centered position.

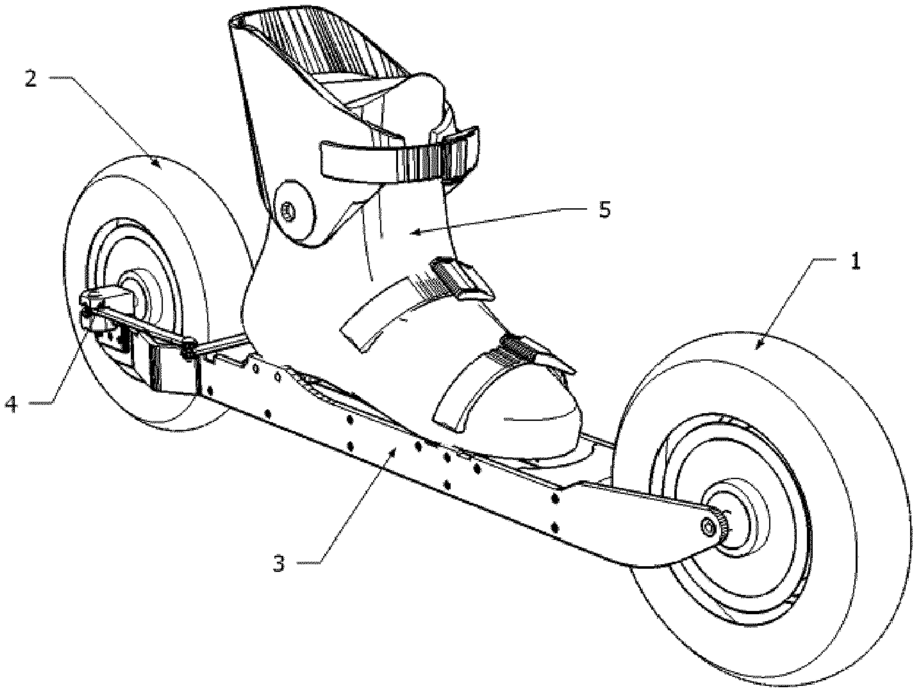


FIG. 1

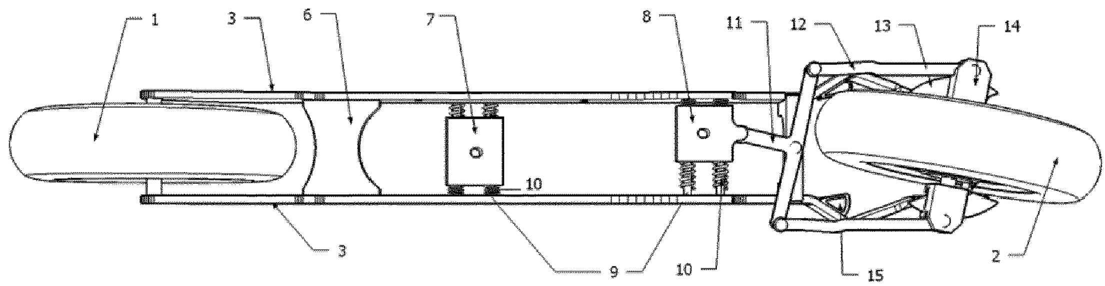


FIG. 2

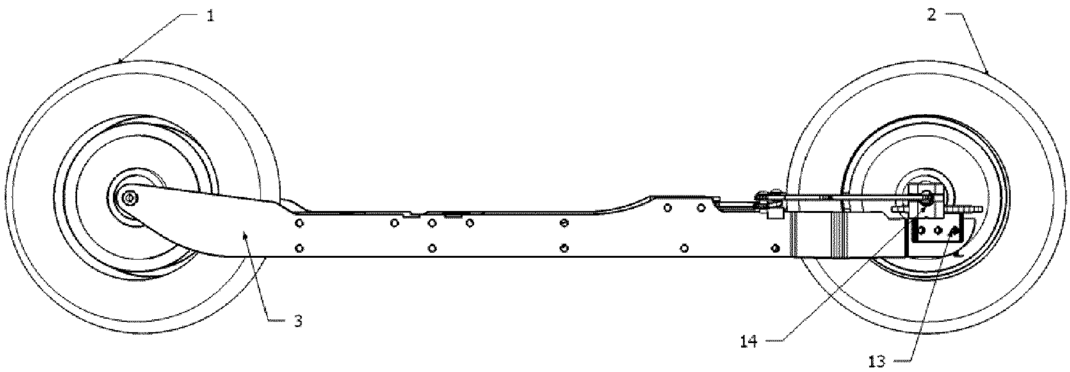


FIG. 3

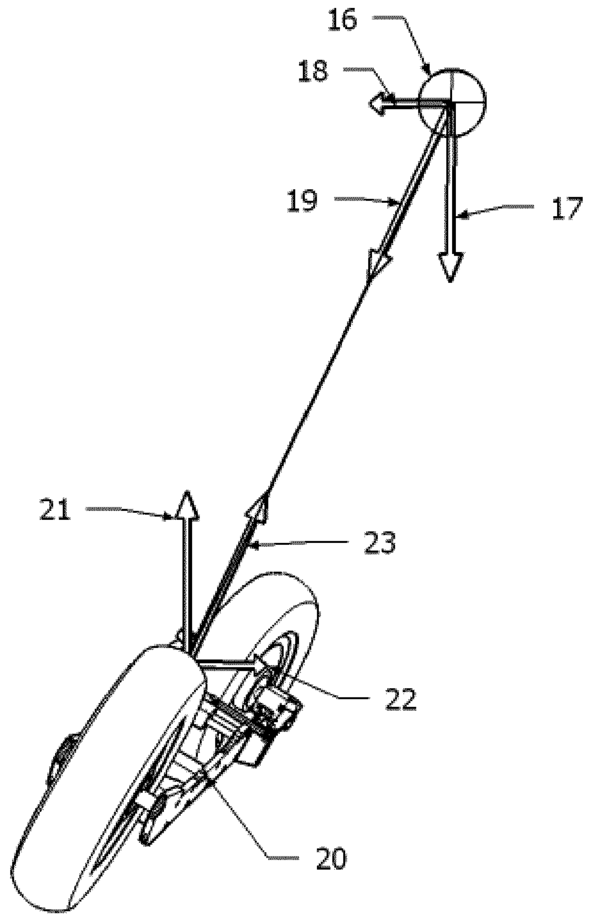


FIG. 4

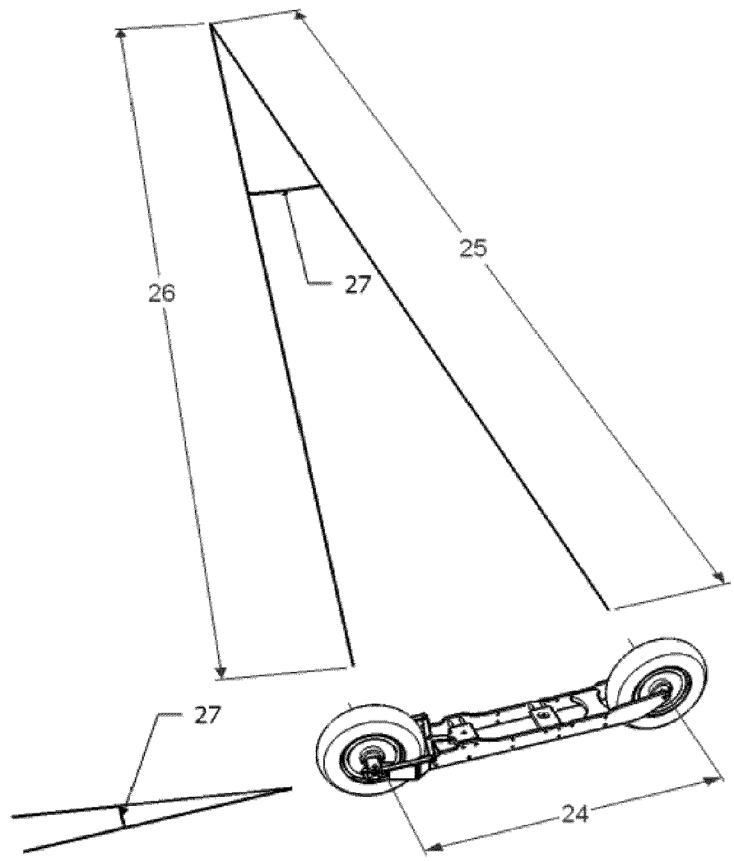


FIG. 5

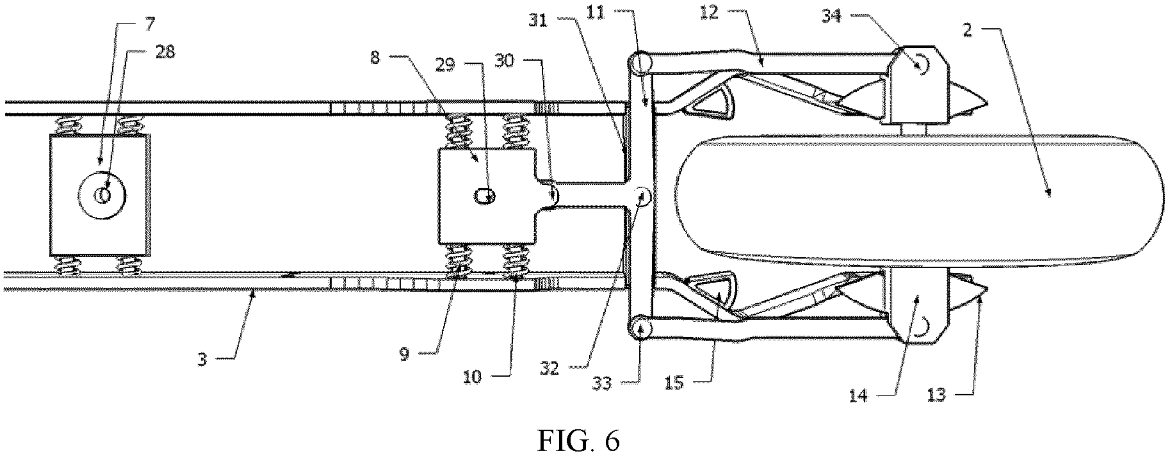


FIG. 6

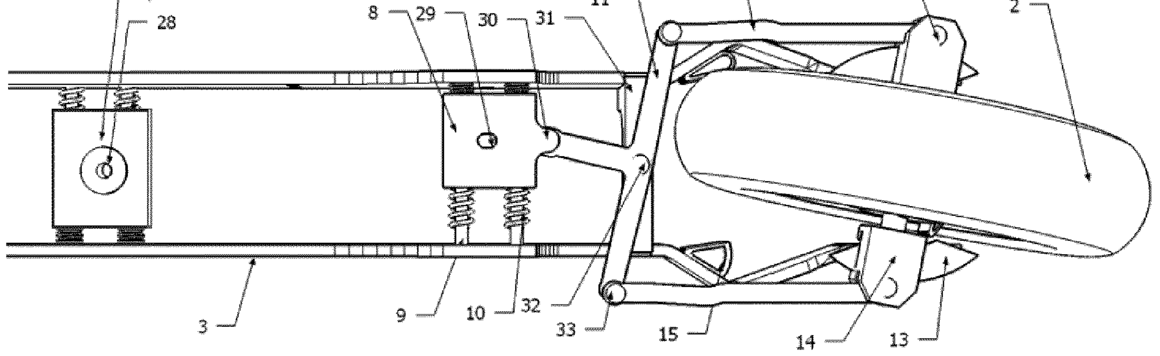
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FIG. 7

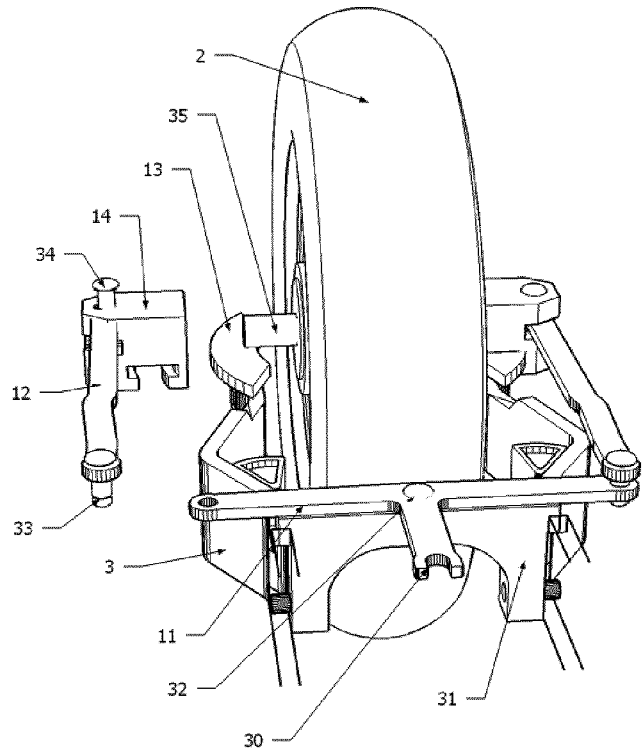
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FIG. 8

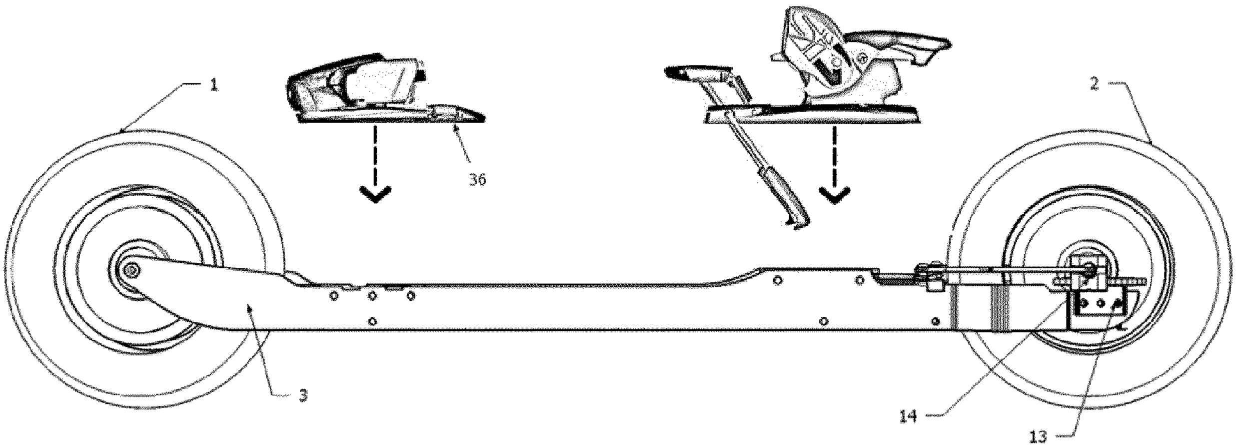


FIG. 9

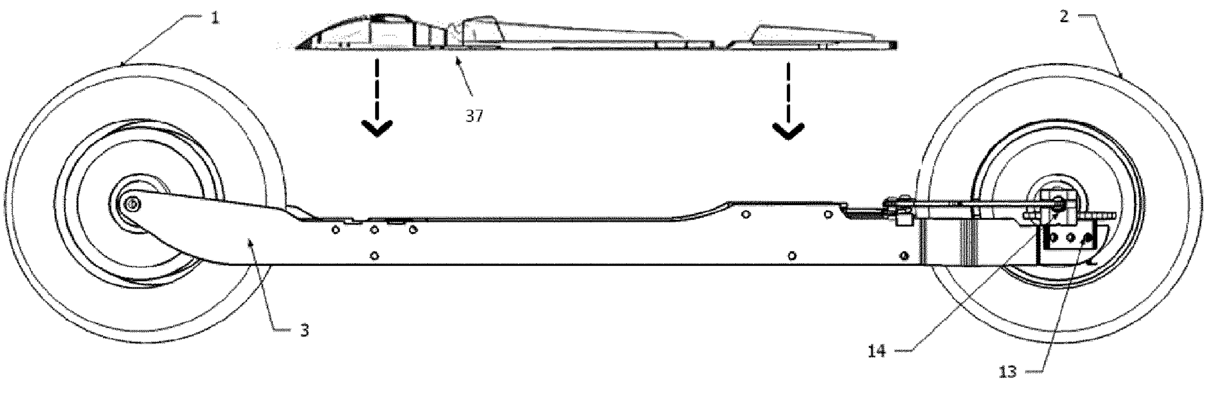


FIG. 10

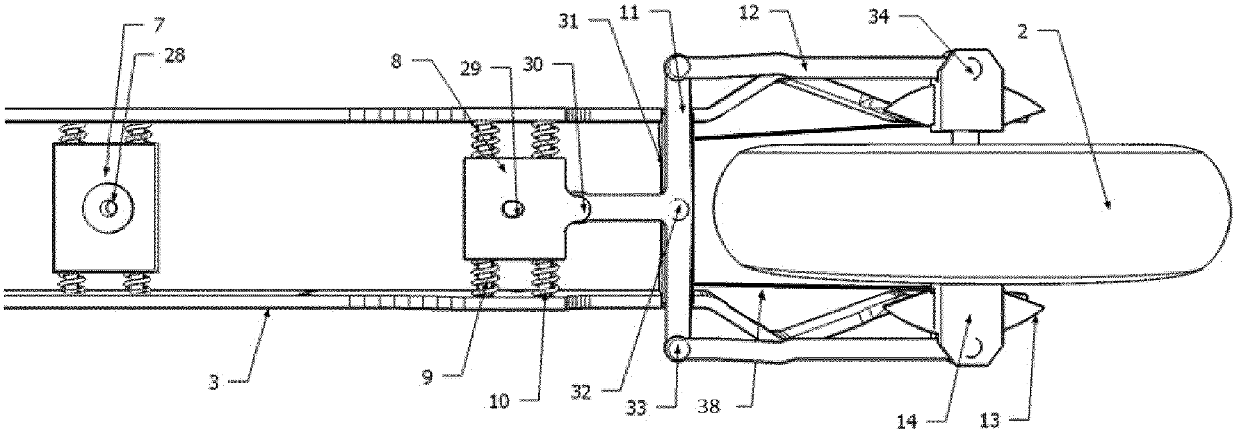


FIG. 11

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# EUROPEAN SEARCH REPORT

Application Number
EP 21 38 2312

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| X<br><br>Y<br>A | US 3 876 217 A (COPIER HENRI)<br>8 April 1975 (1975-04-08)<br>* column 2, line 28 - column 2, line 30; figures 1,5,6 * | 1,5<br><br>2,3<br>4,6 | INV.<br>A63C17/14<br>A63C17/04<br>A63C17/06 |
| Y | US 4 445 699 A (DARASKO EDWARD [US])<br>1 May 1984 (1984-05-01)<br>* column 3, line 31 - column 5, line 31; figures 1,2,3 * | 2,3 | |
| A | FR 2 862 232 A1 (REYNAUD PHILIPPE CLAUDE BAPTIS [FR]) 20 May 2005 (2005-05-20)<br>* page 3, line 6 - page 6, line 26; figure 1b * | 1-6 | |
| A | CH 185 999 A (KORGER HANS [CH])<br>31 August 1936 (1936-08-31)<br>* page 2, line 11; figure 1 * | 6 | |

TECHNICAL FIELDS SEARCHED (IPC)

A63C

The present search report has been drawn up for all claims

1

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 25 August 2021 | Murer, Michael |

CATEGORY OF CITED DOCUMENTS

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

25-08-2021

| Patent document cited in search report | | Publication date | Patent family member(s) | | Publication date |
|---|---|---|---|---|---|
| US 3876217 | A | 08-04-1975 | DE | 2413675 A1 | 02-10-1975 |
| | | | FR | 2201108 A1 | 26-04-1974 |
| | | | JP | S4970732 A | 09-07-1974 |
| | | | US | 3876217 A | 08-04-1975 |
| US 4445699 | A | 01-05-1984 | NONE | | |
| FR 2862232 | A1 | 20-05-2005 | NONE | | |
| CH 185999 | A | 31-08-1936 | NONE | | |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

## REFERENCES CITED IN THE DESCRIPTION



### Patent documents cited in the description


- WO 200202043821 A2, James S. **[0009]**
- WO 0053276 A1, Rosso Michele **[0011]**