



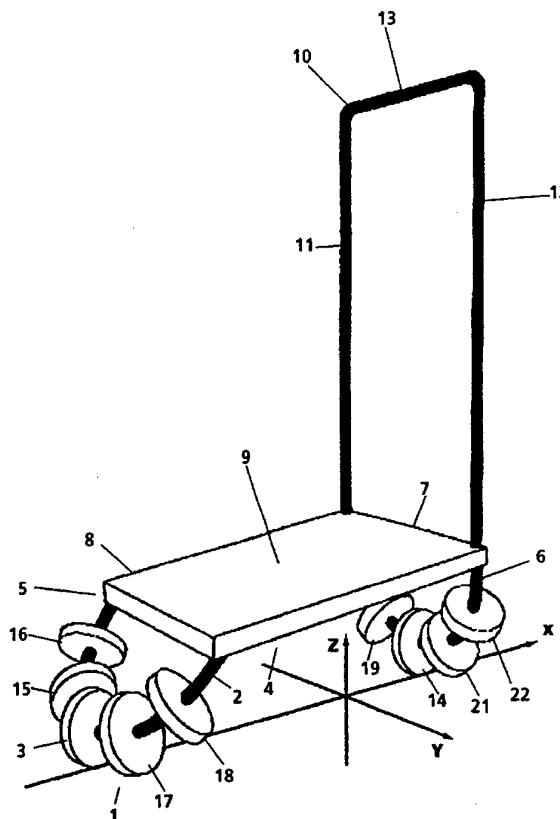
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(54) Title: DEVICE FOR CONTROLLING THE STEERING OF A MOBILE UNIT

(57) Abstract

A device for steering the direction of motion of a mobile unit and including one or several steering means (3, 14) arranged for roll/slide contact with a base (24) at a contact point common for said steering means and said base, the steering direction of the steering means determining the direction of motion of said mobile unit. Said steering means (3, 14) are arranged in a bracket (2, 6) which for the purpose of steering is pivoted between different pivoting positions around an axis extending substantially in the direction of motion of said mobile unit. The steering means are supported in said bracket in order to maintain different contact points along said bracket dependent on selected pivoting position and consequently a steering direction determined for each pivoting position.



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5 DEVICE FOR CONTROLLING THE STEERING OF A MOBILE UNIT

The present invention relates to a device for controlling the direction of travel of a mobile unit according to the preamble of the enclosed patent claim 1.

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One category of mobile units, to which the present invention relates, is sports appliances or playthings. One example of a sports appliance is the well-known skateboard, which demands very high handling skill. A contrast to this may be the classical scooter, showing an entirely conventional dirigible wheel, that is turned by the user in the wanted turning direction of the scooter. The turning takes place around an axis which is substantially transverse to the direction of travel and to the ground surface. A too simple control will remove the game component and has resulted in the scooter being used only by very young practicers and for useful purposes like indoor personnel transport at a place of work.

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One example of a form of scooter demanding a certain amount of skill for its handling is shown and described in US 4,093,252. This document discloses a two-wheel unit, both wheels of which are so called pivoting wheels, being self-aligning into the direction of travel. A control handle is connected to the board, by which the board may be turned basically along an axis extending in the direction of travel, whereby the equipment is brought to turn. Experience shows, however, that pivoting wheels are very difficult to control and will entail a big risk for

surprises regarding the direction of travel of the equipment.

5 Another category of application, to which the invention relates, consists of utility vehicles, especially of the kind arranged to follow accurately a predetermined route. Particularly vehicles having a considerable length demand dirigible wheels and a steering device both front and rear in order for the whole vehicle to follow a predetermined route and to be allowed a small turning radius. 10 This implies the use of a sophisticated servo equipment, which is usually costly.

The object of the present invention is to provide a device which by using simple means will fulfill exacting demands on steering properties. 15

Said object is achieved by the device according to the present invention, the characteristics of which will be described in the enclosed patent claim 1. 20

The invention will be further described below by way of an embodiment example and with reference to the enclosed drawings, in which:

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Fig. 1 depicts a perspective view of a mobile unit, in the category of sports appliances or playthings, according to the invention in a first embodiment;

Fig. 2, 3 and 4 show the appliance according to Fig. 1, viewed from the top, the side and the front respectively, in said first embodiment having steering devices in the shape of several wheels;

- Fig. 5, 6 and 7 show a schematic front view of the appliance according to the invention in various positions, depicting its steering function.
- Fig. 8 depicts, by a top view of the appliance according to the first embodiment, its steering function;
- Figs. 9 -14 schematically show the appliance in a second embodiment having one single steering device at each end of the equipment, depicting its steering function;
- Fig. 15 schematically shows one part of the appliance according to the invention in a third embodiment having two control devices contacting the ground surface in a neutral position;
- Fig. 16 shows one part of the appliance according to the invention in a fourth embodiment having one single elongated bow-shaped steering device.
- Fig. 17 shows the appliance according to the invention in a fifth embodiment having a multitude of spherical steering devices;
- Fig. 18 shows one part of the appliance according to the invention in a sixth embodiment, where one end of the appliance has one single spherical steering device.
- Fig. 19 and 20 show a schematic front and top view respectively of one part of the appliance in a seventh embodiment, where the steering devices are designed as sliding means in the shape of

skis;

Fig. 21 and 22 show, in corresponding views to Figs. 19 and 20, one part of the appliance where the steering devices are designed as runners; and

Fig. 23 shows an example of an application of the steering device according to the invention for the steering of a load-carrying vehicle.

The steering device 1 according to the invention comprises, as is best seen from Figs. 1-4, at least one holder hoop 2, carrying at least one steering device 3 for steering of a mobile unit on a ground surface, which is schematically depicted in Fig 1 as the x/y plane as seen in a three-dimensional coordinate system having x, y and z axes. In the shown first embodiment, the holder hoop 2 is fixedly attached at one end 5 of the mobile unit, whereas a corresponding holder hoop 6 is fixedly attached to the mobile unit at its other end 7. The mobile unit is preferably comprised by a frame 8, in the shown example forming a substantially rectangular unit, to which the holder hoops 2, 6 are attached, and which carries a platform 9. Said platform 9 may be totally integrated as part of the frame 8 or be a separate plate, e.g. screwed to the frame, conveniently in such a way that the platform has no upstanding edges on any sides. The platform may be equipped with some type of friction coating, ensuring that a user can stand with his feet in a stable way on the platform. A handle 10 extends upwards from one end 7 of the mobile unit, being substantially U-shaped and comprising two upright pipes 11, 12, attached to the frame 8 and carrying a handle part 13 at their upper end, conveniently being transverse to the direction of movement in the x direction of the mobile unit, i.e.

extending substantially in the z/y plane in the shown example. The upright pipes 11, 12 may however be angled reative to the rolling plane x/y and the handle part 13 may be U-shaped. The latter is conveniently equipped with a friction coating and located at such a level that a user may comfortably hold on to the handle part 13. The handle 10, apart from serving as a support for the user, also functions as a steering handle in a way to be further described below.

The steering device according to the invention of the first example depicted in Figs 1-4 thus comprises two holder hoops 2, 6 having adherent steering devices 3. In the shown example, each holder hoop 2, 6 has, apart from a first steering device 3, 14, a further number of steering devices 15, 16, 17, 18, 19, 20, 21, 22, in the shown example more exactly a total of five steering devices. In the shown first example, the steering devices furthermore consist of rolling means in the shape of wheels, rotatably mounted in bearings on the adherent holder hoop 2, 6, which is thus forming a rotatable shaft. In the depicted first example, the wheels have substantially fixed axial positions on the holder hoop, possibly having a small mobility within a limited segment. In this example, one of the wheels 3, 14 on each holder hoop 2, 6, has a symmetrical, central position relative to the respective holder hoop and the mobile unit 4 as a whole, and thus extends so that the wheels are symmetrically located relative to the longitudinal symmetry axis of the unit, which in this case may be considered as parallel to the x axis, which the wheels are thus contacting in the neutral position, as shown in Figs. 2, 3 and 4. The other wheels 15-18 and 19-22 are symmetrically located relative to the central wheels 3, 14 and consequently form a predetermined angle relative to the central wheels, viewed in the

x/y plane, see Fig. 2, as well as in the y/z plane, see Fig. 4.

5 As is best seen from Fig. 3, the holder hoops 2, 6 form an obtuse angle v, u relative to the x axis and are inclined outwards from the platform 9. In the shown example, the angles of the holder hoops 2, 6 are of different size, giving different steering properties through the wheels obtaining different angles at the
10 respective ends, as seen in the top view according to Fig. 2, i.e. viewed towards the rolling plane x/y. This entails different steering properties for the respective ends, which may be used to give the mobile unit as a whole suitable driving properties. In the shown first
15 example, the platform 9 is furthermore inclined relative to the plane of movement, which may also enhance the driving experience of the user. In a standard embodiment, the platform 9 may in this case be parallel to the transfer plane, i.e. normally horizontal independent of if the
20 holder hoops have different angles or not.

The consequence of the design of the steering means according to the invention is that in embodiments having several steering devices, as is the case of the first
25 example, all of said devices are not in contact with the plane of transfer x/y simultaneously, but are located at several different heights along the z axis when looking at the view according to Fig. 4, which shows a neutral position for the equipment. Furthermore, the steering
30 devices are positioned in several transversal positions, i.e. seen along the y axis. Through this design, the mobile unit as a whole is turnable or tiltable sideways substantially around the x axis and axes parallel thereto with the object of transferring the contact point 23 of
35 the rolling means to the ground surface along the holder

hoops 2, 6, and as the steering devices are arranged in the manner described above, every individual contact point will give a predetermined rolling direction of that specific rolling means and thereby a predetermined direction of movement of the mobile unit.

The principle of steering with the mobile unit according to the invention is best illustrated in Figs. 5-8, depicting the first embodiment example having five wheels on each holder hoop. When the mobile unit is held in a neutral position, as shown in Fig. 5, the mobile unit is resting completely on the central wheels 3, 14, see also Fig. 8. The mobile unit in the shown example is either propelled by the user standing with both feet on the platform 9 and the mobile unit is allowed to roll down a slope, i.e. the rolling plane x/y is inclined, or by the unit being used as a scooter, where one foot is standing on the platform 9 and the other foot is kicked against the ground surface 24. The balancing and control is facilitated by the user being able to hold on to the handle 10, but the handle is not a necessary prerequisite for the use of the unit, but may be eliminated in order to increase the degree of difficulty. In a universal embodiment, the handle may be demountably attached to the frame 8 or to one of the holder hoops 2, 6, e.g. by a quick-connect coupling at the lower ends of the upright pipes 11, 12. When you want to turn, the mobile unit is turned or tilted with the aid of the handle 10 (if fitted) and possibly also by inclination of the user's body, changing the location of the feet on the platform, changing the body load on the feet, etc. to a desirable extent, whereby after inclination to a certain angle, as illustrated in Fig. 6, the wheels 17, 21 come into contact with the ground surface 24 and a new point of contact 25 between the wheels and the ground surface is established. Because

at least one wheel, in the depicted example both wheels, which are now functioning as steering devices, are angled relative to the mobile unit longitudinal axis x , and because of said wheels not being mutually parallel, the mobile unit is steered to a turning motion along line 26. Note that through the angle of both wheels 17, 21 and differing steering directions, i.e. the steering direction of the first wheel towards the right and of the rear wheel towards the left, the unit will obtain an enhanced turning movement and improved pliability so that an exactly predetermined route can be followed by the unit. The degree of pliability is determined by the above shown angles v , u and by the shape of the holder hoops 2, 6. When the mobile unit is inclined further, as shown in Fig. 7, the outermost wheels 18, 22 will take over the contact with the ground surface 24 and thus form the steering and carrying devices. Through the larger inclination of these wheels relative to the x axis, see Fig. 8, a stronger turning movement of the mobile unit is obtained, thereby causing it to follow the route 28.

Turning to the left is accomplished in a way completely analogous to the above described turning movement to the right, but in the opposite direction by tilting or turning of the unit to the left about the longitudinal axis x , as indicated by a dotted line in Fig. 6. At an inclination to a first, smaller angle the wheels 15, 19 will each create a new contact point with the ground surface and determine by their rolling direction a turning movement along the dashed route 29 in Fig. 8. A further inclination of the mobile unit, as indicated by dashed lines in Fig. 7, will entail the wheels 16, 20 taking over the function of steering devices and creating one new contact point each with the ground surface, causing a sharp turn to the left along the route 30. It is evident

from the figures that for every new contact point a new turning axis is created, which is moved transversally along the plane of travel x/y and which more exactly forms the connection line between the momentary contact points or tangential points. This movement is however successive, as is also the change in turning radius, due to the fact that the wheels will assume the steering function successively and that in certain intermediate positions two engaged steering wheels will affect the steering simultaneously. This is enhanced by the steering wheels conveniently having an elastic friction surface made from e.g. rubber.

A second embodiment example of the present invention and the procedure for steering of said example is shown in Figs. 9-14. From this it will be evident that the same steering principle may be applied also in a case with only one steering device per holder hoop 2, 6. Hereby, the steering device 3 is mobile also in the axial direction along the holder hoop, which in the shown example must be designed so that the steering device 3 can slide easily along the holder hoop, which is created like an arc-shaped axle unit, with a circular cross section, common to all wheel positions. The steering device 3, which also in this example consists of a rolling means in the shape of a wheel or a roller, is conveniently rather wide and cylindrical or possibly slightly cambered, so as to give the bearing sufficient width to obtain stability. As can be seen from Fig. 9, showing the holder hoop 2 from above, said hoop is angled forward substantially in the same way as in the first embodiment example, whereby the steering device 3, when moving along the holder hoop, is given a varying angle relative to the longitudinal axis of the mobile unit. A neutral position is obtained also in this case, as shown in Figs. 9 and 10, with the mobile

unit 4 upright and the two steering devices, one for each holder hoop, located symmetrically relative to the extension of the holder hoop 2. As can be seen from Fig. 10, the steering device 3 obtains a rotational axis, which in the neutral position extends in the y direction, i.e. at right angles to the mobile unit longitudinal axis and direction of travel, i.e. the x direction. Consequently, the steering direction of the steering device 3 is the x direction, entailing that the mobile unit moves straightly forwards or backwards. When tilting or turning the mobile unit, as shown in Figs. 11 and 12, the steering device 3 will slide along its holder hoop 2 while still in contact with the ground surface, but will be successively turned regarding its rolling direction to an angle relative to the longitudinal axis x which will give the mobile unit a turning movement along a route 26 in analogy with what happens when a new steering device takes over the steering in the example according to Figs. 6 and 8. In a corresponding manner, an increasing turning movement with a smaller turning radius occurs by increased tilting of the mobile unit around a longitudinal axis, see Figs. 13 and 14, whereby the turning movement will follow e.g. the route 28. The moving steering device at the opposite end 5 of the unit will slide in a corresponding manner, but will obtain a steering direction to the left in analogy with the example depicted by Fig. 8, which will in a corresponding manner enforce the turning movement. Figs. 9-14 mainly show turning to the right, whereas Figs. 9, 11 and 13 only indicate, by a dashed line, inclination to the left which will cause a left hand turn completely in analogy with the previous example.

Figs. 15 to 22 depict various examples of the design of the steering device according to the invention while

using one and the same principle, whereby one holder hoop 2 is viewed schematically in frontal projections.

5 Fig. 15 represents a third embodiment example which differs from the first example by that instead of using one central wheel, it uses two wheels 31, 32, located relatively close to and symmetrically relative to the vertical center axis z so, that both wheels 31, 32 of the respective holder hoop 2 are in contact with the ground surface 10 24 in the neutral position shown in Fig. 15, with a steering direction of straight ahead. This design provides a relatively stable neutral position, demanding the overcoming of a certain tilting resistance, which in turn demands less balancing. The two wheels 31, 32 may of course be replaced by one single roller having the same 15 length as the two wheels including the intermediate distance. Otherwise, the steering device according to this embodiment functions in the same way as in the first example.

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Fig. 16 shows, by a fourth embodiment example, that the steering principle according to the invention can be achieved with one single, continuous steering device 33 for each holder hoop 2, without using any, or any significant, axial transfer along the holder hoop. In this 25 example, the steering device 33 is designed as one curved body with a circular cross section, where the body is either highly elastic with the least possible resistance to deformation, or divided into a number of individually rotating sections that each function like a separate 30 wheel. In this way a completely continuous turning movement is obtained when the mobile unit is tilted. The steering function is otherwise precisely the same as in the first embodiment example.

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In the fifth embodiment example according to Fig. 17, the steering devices are designed as a multitude of balls 34, rotatably mounted in bearings on the holder hoops 2, 6. With these, exactly the same steering function is obtained as by the first embodiment example.

Fig. 18 shows, by way of a sixth embodiment example, an alternate design of the arrangement at one of the holder hoops 2, that is, where the steering device is replaced by a pure rolling means, which is shown in this example as a ball 35, possibly having a fixed axis of rotation 36, extending in the y direction. In this case, no angular displacement of the rolling means is obtained, and no steering function, something which can in principle be deleted at one end 5, 7 of the mobile unit. It is actually possible to modify this embodiment in a simple manner to a steering function according to the invention by the holder hoop 2 allowing displacement of the rolling organ 35 along said hoop and by the hoop being angled forward like the above examples so, that said displacement entails a turning of the direction of the rolling axis according to the embodiment in Figs. 9-14. As an alternative, the steering may instead be made more complex by making one holder hoop rotational around an axis substantially in the z direction, by means of a conventional steering wheel or other steering device.

In the above examples, all steering devices have been in the shape of rolling means, but the principle of the invention is also applicable to other types of steering and carrying devices that provide movement of a mobile unit, like skis and runners for winter use, or in general, movement across media having low friction, like water.

Fig. 19 depicts, by way of a seventh embodiment example, a variation where the steering devices in principle are arranged in accordance with the first example, but where the rolling means are replaced by skis 37. The skis thus form sliding devices each having their own contact surface 38, arranged with a steering direction corresponding to the tangent of the contact point of each wheel according to the first example. The longitudinal direction of the skis thus forms the steering direction which is determined by that ski which at the moment has full contact with the ground surface 24.

Fig. 21 also shows an alternative where the rolling means are exchanged for sliding means, in this eighth example consisting of runners 39, intended to slide against ice or hard-packed snow. The runners are arranged in the same way as the skis in the previous embodiment example and the steering function is obtained in the same way as in the first embodiment example.

Fig. 23 depicts a special application of the steering device according to the invention for load-carrying applications, for example steering of a fork lift truck 40, e.g. a so called Automatically Guided Vehicle or AGV. In this example, however, a manual control has been selected for the sake of simplicity. The vehicle has in the conventional way a loading platform 41, which directly or via an undercarriage rests at one end on two pivoting wheels 42, that in a known way are pivoted around a vertical axis, the extension of which does not cross the horizontal rotational axis of the wheel, whereby the wheel will self-adjust according to the determined direction of travel. Conventional steering wheels at the other end of the truck have been replaced by the mobile unit according to the invention, whereby the platform of

the mobile unit can be replaced by a longitudinal tilting axle 43, to which the two holder hoops 2, 6 are fixedly attached, preferably by means of some form of crossbeams 44. The steering devices may for example correspond to the first embodiment example, but also the other embodiment examples may be used, e.g. the second embodiment example. The mobile unit is tiltably attached either directly to the load-carrying platform 41 or via the adherent undercarriage, by means of bearing sleeves 45, 46. The tilting axle 43 is further connected to a control means, depicted simply by a control lever 47, which is fixed to the tilting axle 43. The control lever 47 extends through an opening 48 in the platform. Sideways movement of the control lever 47 from a neutral position towards the right or the left entails, in the same way as in the above embodiment examples, a turning movement of the mobile unit, whereby a turning torque is applied on the load-carrying platform 41 around a point determined by the angles and locations of the holder hoops, entailing that steering is provided not only by a sideways movement of the front end of the truck but also of its rear end, as the pivoting wheels allow sideways movement. In this way the truck may be given a predetermined route which is of great importance in certain applications where the position of the truck, e.g. in certain loading or working stations must be exactly determined. For AGV applications the control lever 47 is replaced by a steering gear and a servo motor controlled by a regulating system for turning of the tilting axle 43 in dependence of an as such known control system.

The invention is not limited to the embodiment examples described above and depicted in the drawings, but may be varied within the frame of the enclosed patent claims. It is for example possible to adapt the mobile unit to move-

ment in water, where skis are utilized or replaced by
some form of floats or fins, which in principle may also
be used on snow. In an embodiment without a handle 10,
the turning of the mobile unit is performed completely
5 with the aid of the body of the user, either by the feet,
if standing up, or by transfer of the body load across
the platform. When using a handle, this may be shaped in
several ways, for example like a T. The platform may be
completed by some form of body or hull with protective
10 sides. Also in embodiments having only one steering
device, mobile along the holder hoop, sliding means are
conceivable. In this case the holder hoop forms a guide
for the mobile steering device. In all embodiments with
steering devices which move along the holder hoop, it may
15 be advantageous to have some means tending to hold the
steering device in its neutral position, e.g. two coil
springs, one on each side of the steering device,
arranged along the holder hoop. It is also conceivable to
adjust the steering properties by making the holder hoops
20 adjustable into different angles v , u , whereby the stee-
ring direction of the steering devices is influenced.

Claims

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1. Device for control of the direction of travel of a mobile unit, comprising one or more steering devices (3, 14-22/31-35/37, 39), arranged for rolling/sliding contact with a ground surface (24) at least at one point of contact (23, 25, 38) which is common to said steering device and the ground surface, at which contact point the direction of steering of the steering device determines the direction of travel of the mobile unit,
c h a r a c t e r i z e d i n that said steering devices (3, 14-22/31-35/37, 39) are arranged in at least one holder (2, 6), which for the accomplishment of said steering can be rotated between different turning positions around an axis extending substantially in the direction of movement of the mobile unit, and in that said steering devices are mounted in the holder so as to establish, in dependence of the selected turning position, different points of contact (23, 25, 38) along the holder and thereby a determined steering direction for each turning position.

25

2. Device according to claim 1,
c h a r a c t e r i z e d i n that the holder (2, 6) is shaped like a guide and exhibits one single steering device (3/35) which is arranged to move, as the holder is turned, along said holder whilst maintaining contact with the ground surface (24) and to obtain, through the running of the guide, different predetermined steering directions for each position on the holder.

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3. Device according to claim 2,
characterized in that said steering device
consists of a rolling means in the shape of a wheel (3)
or a ball (35) and in that the holder is designed like an
5 arc-shaped axle (36), extending transversely relative to
the direction of movement of the unit and being inclined
relative to the ground surface (24).

4. Device according to claim 1,
10 characterized in that said steering devices
(3, 14-22/31-35/37, 39) are more than one in number,
arranged at different height levels along the holder and
have a predetermined individual steering direction rela-
tive to the ground surface.

15 5. Device according to claim 4,
characterized in that said steering devices
(3, 14-22/31-35/37, 39) are arranged symmetrically
along the holder (2, 6).

20 6. Device according to claim 5,
characterized in that said steering devices
(3, 33, 34, 37/39) exhibit a central steering device
(3), which has a steering direction straight ahead when
25 the holder (2, 6) is in a neutral position.

7. Device according to claim 4,
characterized in that said steering devices
(3, 33, 34) consist of rolling means mounted in bea-
30 rings on the holder (2, 6).

8. Device according to claim 4,
characterized in that said steering devices
(37, 39) consist of sliding means in the form of e.g.
35 skis, runners or similar.

9. Device according to any of the preceding claims,
c h a r a c t e r i z e d i n t h a t s a i d h o l d e r s (2 , 6)
are two in number and arranged to be inclined outwards
5 relative to the ground surface (24) and to follow toget-
her the turning movements of the mobile unit.

10. Device according to claim 9,
c h a r a c t e r i z e d i n t h a t t h e t w o h o l d e r s (2 ,
10 6) are located at opposite ends of a sports appliance or
plaything, which exhibits a platform (9) or similar, by
the tilting of which said turning movements are obtained.

11. Device according to claim 10,
15 c h a r a c t e r i z e d i n t h a t a n u p s t a n d i n g h a n d l e
(10) is connected to said platform (9) or holders (2, 6)
for support and for tilting of the holders in order to
determine the steering direction of the mobile unit.

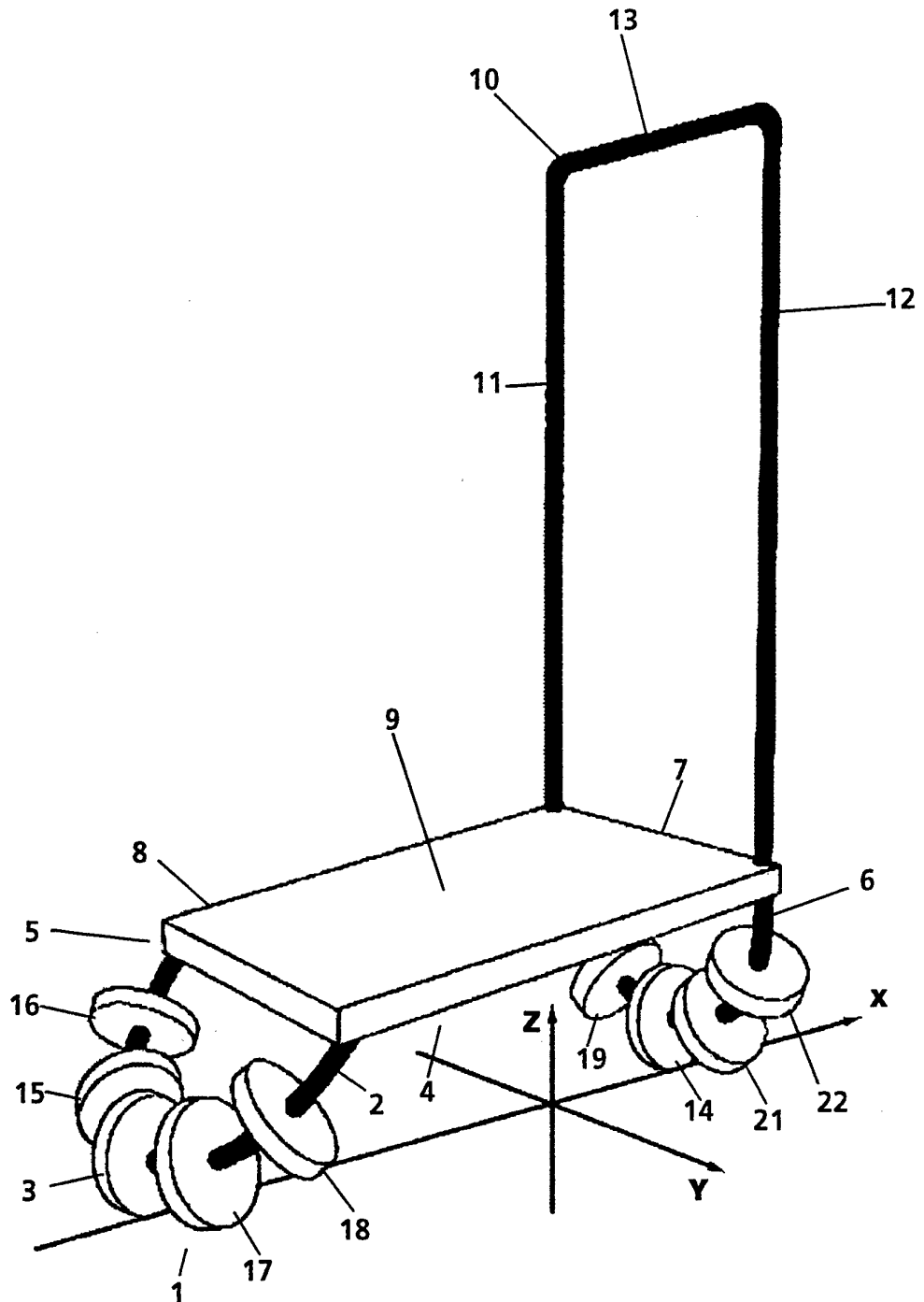


FIG. 1

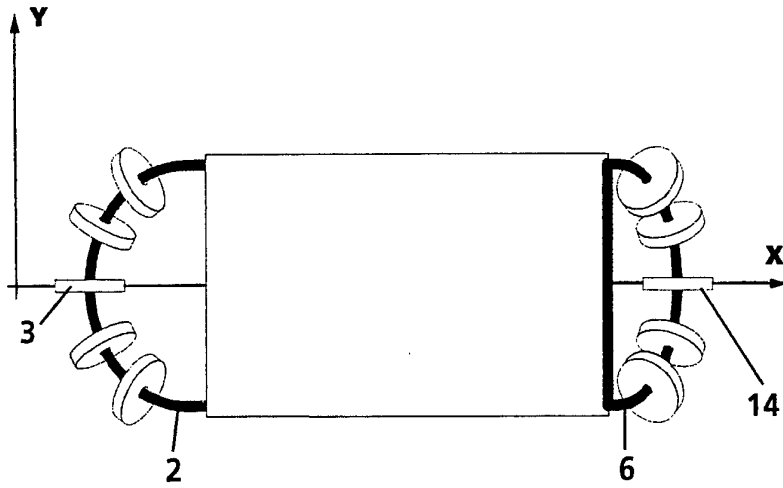


FIG. 2

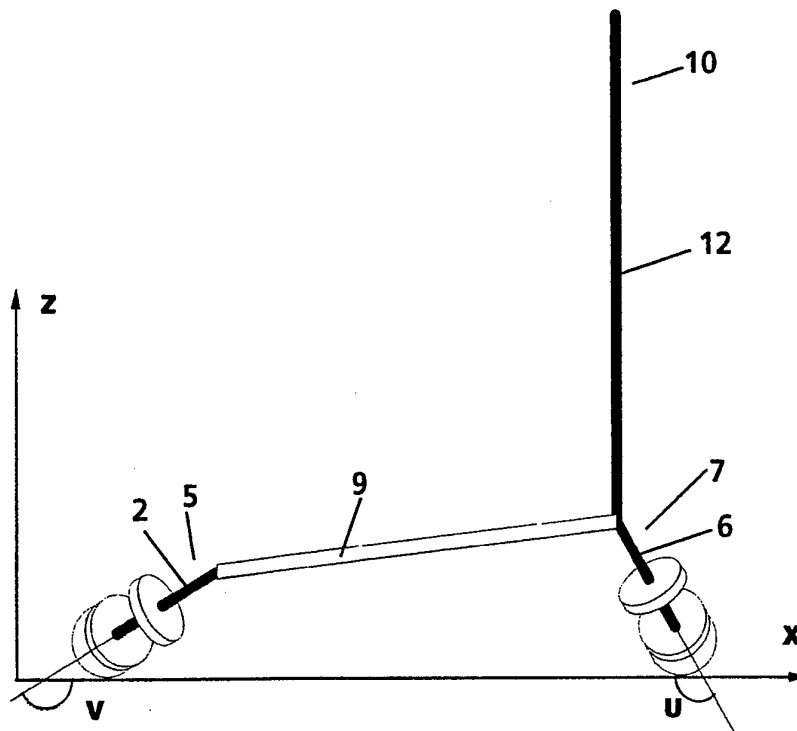


FIG. 3

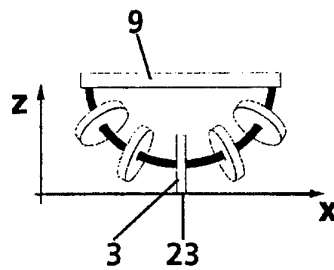


FIG. 4

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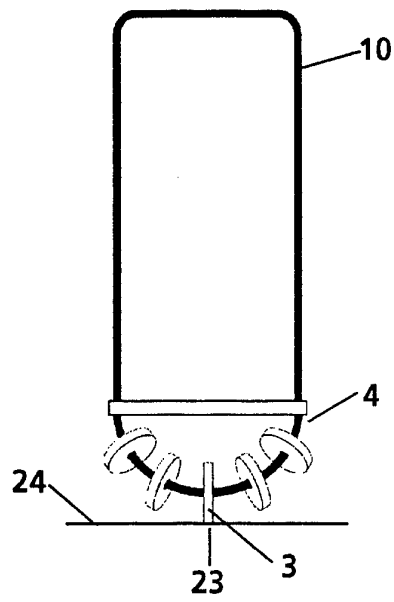


FIG. 5

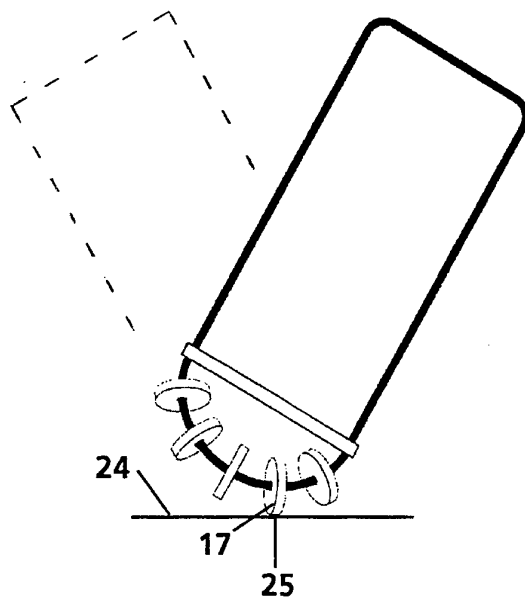


FIG. 6

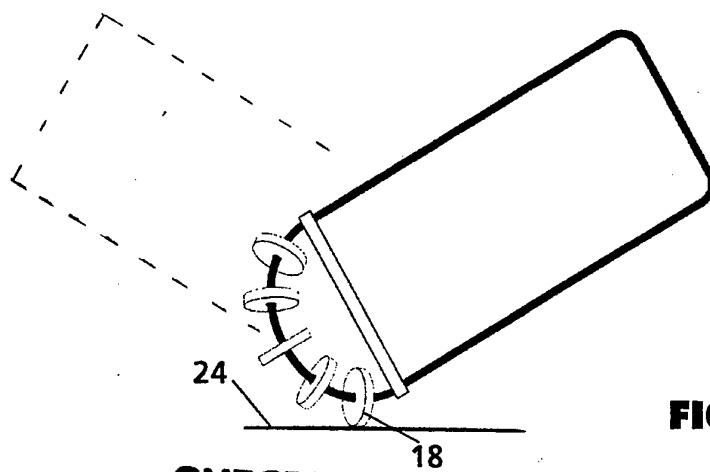


FIG. 7

SUBSTITUTE SHEET

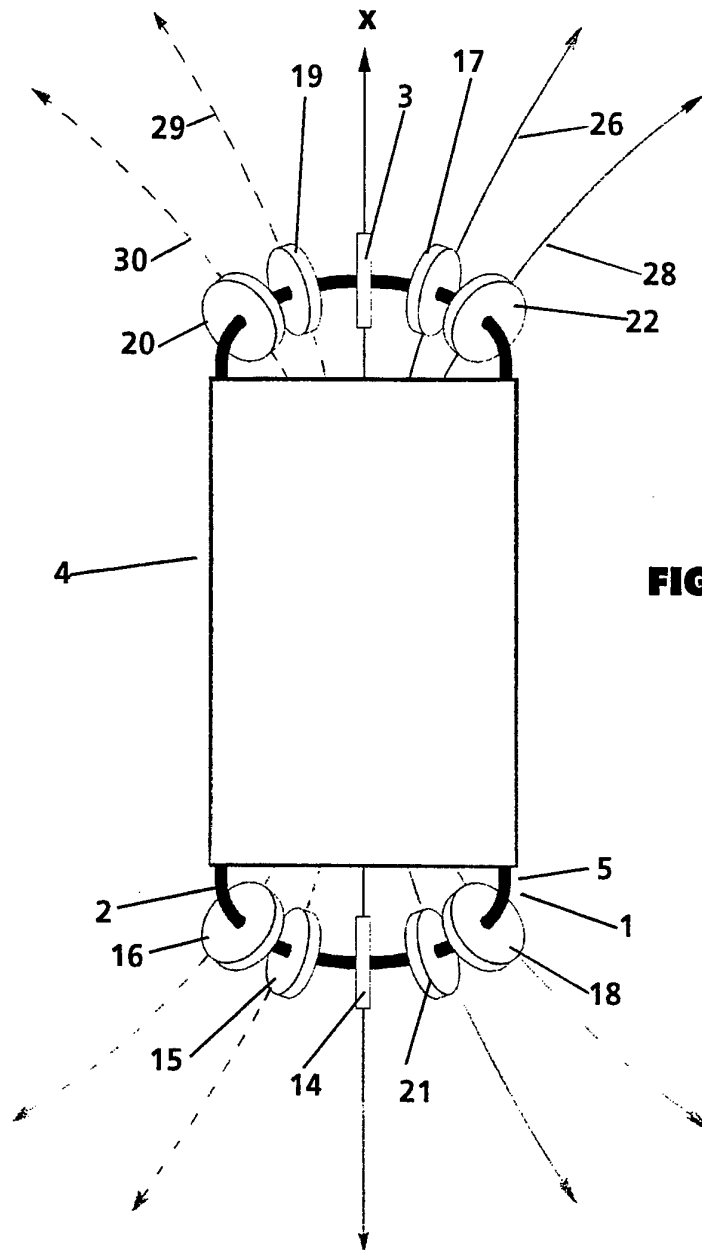


FIG. 8

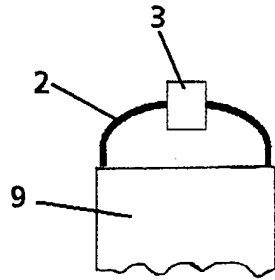


FIG. 9

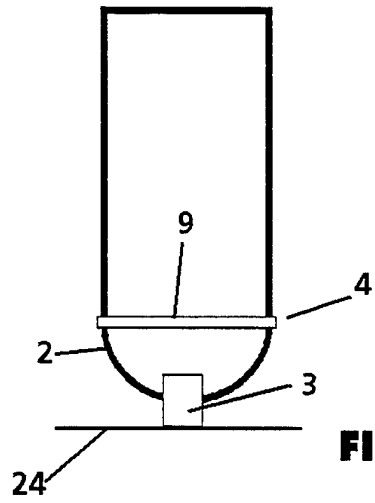


FIG. 10

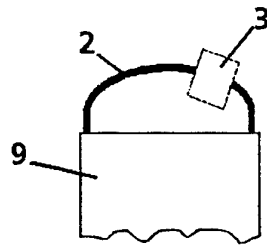


FIG. 11

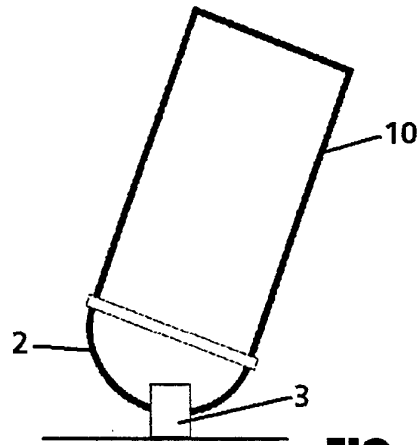


FIG. 12

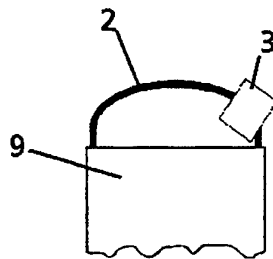


FIG. 13

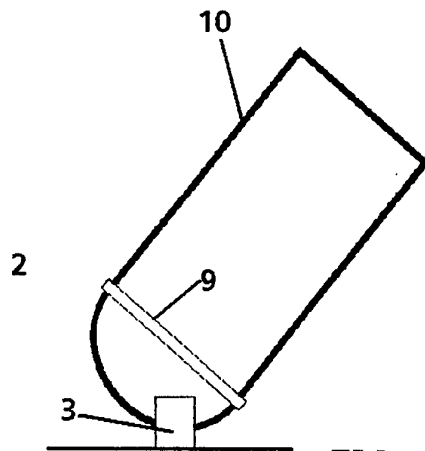


FIG. 14

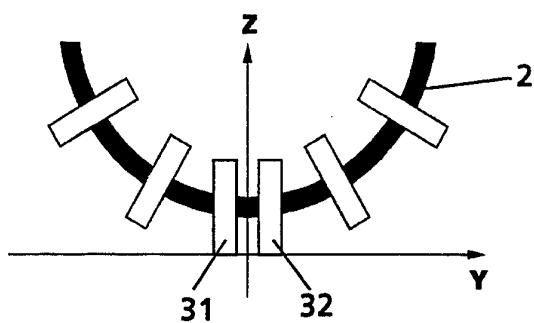


FIG. 15

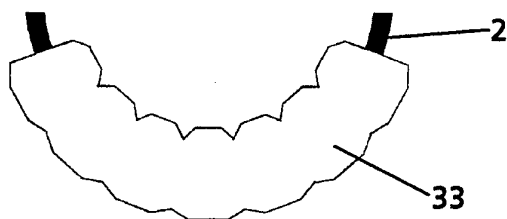


FIG. 16

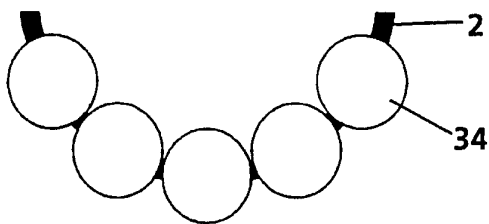


FIG. 17

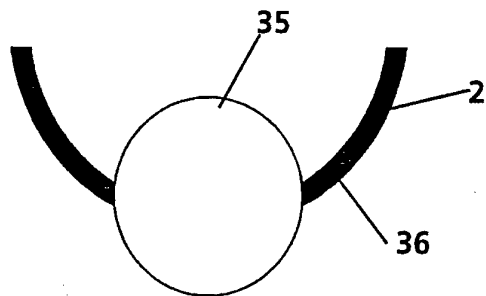


FIG. 18

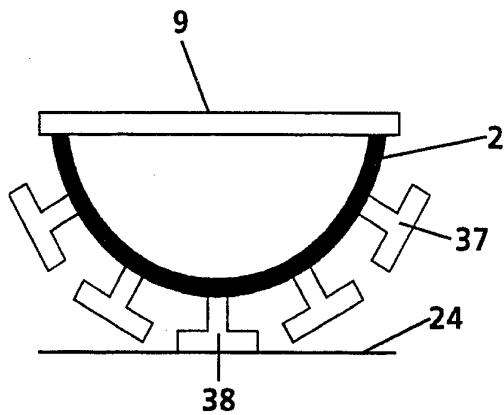


FIG. 19

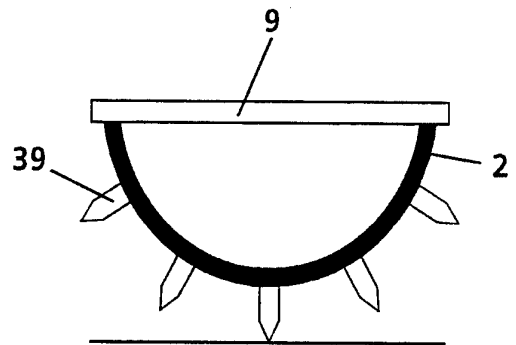


FIG. 21

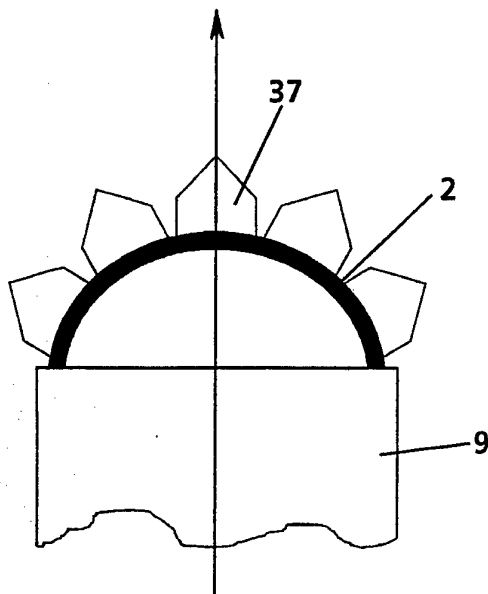


FIG. 20

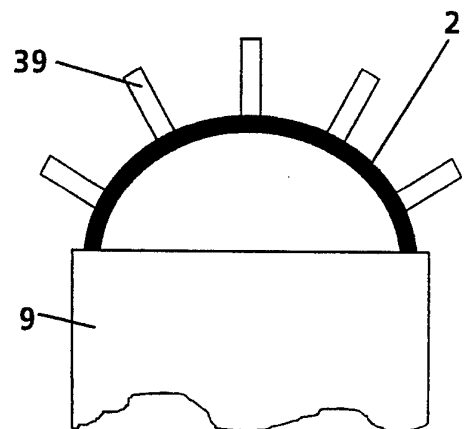


FIG. 22

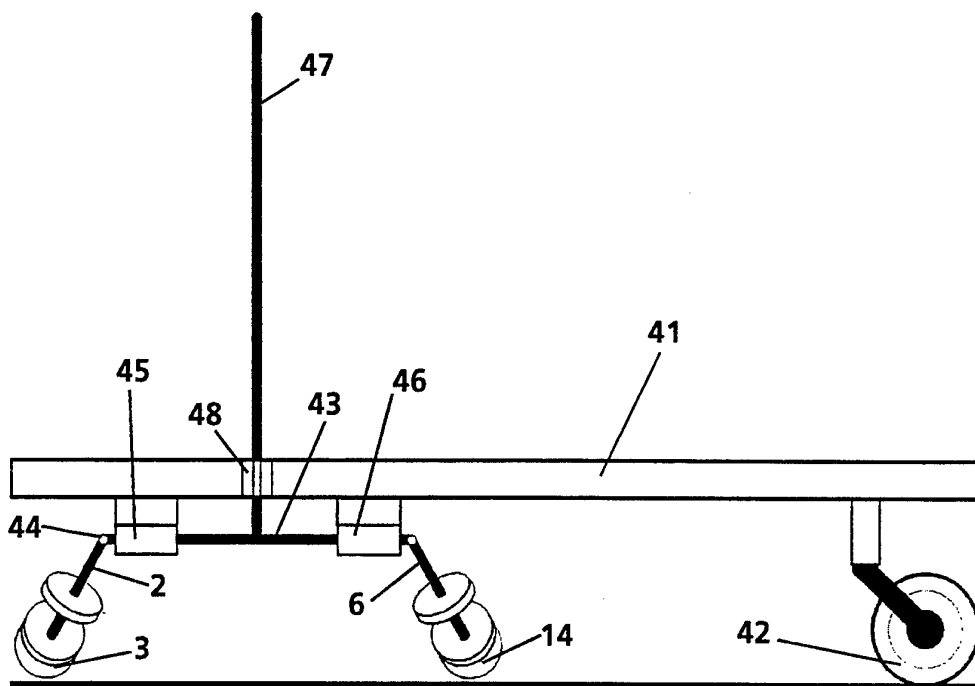


FIG. 23

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 94/00701

A. CLASSIFICATION OF SUBJECT MATTER		
IPC6: B62B 3/00 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC6: A63C, B60B, B62B, B62D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE,DK,FI,NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE, A1, 4140442 (PANNE, JOACHIM), 9 June 1993 (09.06.93) --	1,4,5,6,7
X	US, A, 3465843 (G.L. GUINOT), 9 Sept 1969 (09.09.69) --	1,4,5,6,7
X	US, A, 3856321 (SOLYMOSI), 24 December 1974 (24.12.74) -- -----	1,4,5,6,7
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed		"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
Date of the actual completion of the international search		Date of mailing of the international search report
13 October 1994		01 -11- 1994
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86		Authorized officer Göran Carlström Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT
 Information on patent family members

27/08/94

International application No.
 PCT/SE 94/00701

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A1- 4140442	09/06/93	NONE	
US-A- 3465843	09/09/69	BE-A- 769276 GB-A- 1152155	03/11/71 14/05/69
US-A- 3856321	24/12/74	AT-B- 332775 DE-A- 2351965 FR-A,B- 2203650 JP-A- 49073242	11/10/76 25/04/74 17/05/74 15/07/74