(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 043 735**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **81303117.6**

(51) Int. Cl.³: **A 63 C 17/02**

(22) Date of filing: **08.07.81**

(30) Priority: **09.07.80 GB 8022382**

(43) Date of publication of application: **13.01.82 Bulletin 82/2**

(84) Designated Contracting States: **CH DE FR GB IT LI NL SE**

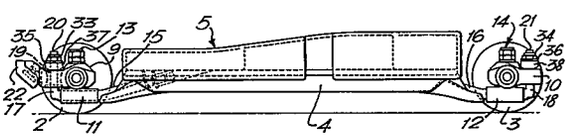
(71) Applicant: **JASONBURY LIMITED, Backwell Hill House, Backwell Bristol BS19 3DA (GB)**

(72) Inventor: **Bishop, Stephen, 24 Spanners Close, Chale Green Nr. Ventnor Isle of Wight (GB)**

(74) Representative: **Parker, Jeffrey et al, Frank B. Dehn & Co. Imperial House 15-19 Kingsway, London, WC2B 6UZ (GB)**

(54) Improvements in roller skates.

(57) A roller skate comprises a foot receiving chassis with a longitudinal strengthening rib (4) connected at each end to steering rods (15, 16) which terminate in upwardly projecting members (17, 18). The wheel pairs (2, 3) are mounted on saddle members (9, 10) which are connected to support members (11, 12) so as to be steeringly pivotable about vertical axes. The steering rods (15, 16) are rotatably received in support members (11, 12) and on such rotation caused by tilting of the chassis, the projecting members (17, 18) cause the saddle members (9, 10) to pivot to provide steering. Resilient bushes (37, 38) whose compression is adjustable provide a restoring force. In a further embodiment the steering assemblies may be pivoted from the outlying position shown to a position beneath the chassis to raise the roll centre.



EP 0 043 735 A1

"Improvements in roller skates"

Roller skating is a sport and pastime which has been enjoyed by countless people over the last hundred years or so. The conventional roller skate has a pair of front wheels and a pair of back wheels mounted on a base, which may be an integral part of a boot or alternatively a plate provided with fastening means for attachment to the shod foot of a wearer.

Roller skates have developed over the years from the fairly primitive forms used in Victorian times to the sophisticated arrangements of today. One major innovation in this development was the invention in the early 1930's of the so-called Chicago double action steering system, enabling roller skates to be steered under the control of the wearer. As an example of a double action steering system, reference may be made to British Patent Specification No. 666,587 which is one of many such systems patented between the 1930's and the 1950's.

Another early steering system is disclosed in British Patent Specification No. 426,457, although in this case the skate has only three wheels. The front pair of wheels are steerable by a link arrangement and the rear wheel although not steerable can be braked by rearward tilting pressure on the footplate.

A further major development in roller skates came with the introduction in theearly 1970's of the polyurethane wheel, initially conceived for skateboards. Wheels of polyurethane are hard wearing and inexpensive to manufacture, and their shock absorbing capability increases the comfort of the rider.

Despite over one hundred years of development, there is still room for radical improvement in the design of roller skates. This is particularly clear

when the shortcomings of presently available roller skates are considered from the viewpoint of their use out of doors, rather than on specially constructed skating rinks. Such rinks are provided with smooth, flat floors for the particular purpose of minimising vibration. However, the popularity of roller skating out of doors, on pavements or in roads for example, is now increasing, and existing roller skates are not totally suitable for this purpose as will hereinafter be explained.

The object of this invention is to provide an improved roller skate which is more precisely and effectively steerable than hitherto, and which is more stable and comfortable for the rider, particularly when traversing a sharply curved path at speed.

According to one aspect of the invention there is provided a roller skate comprising a foot-supporting chassis, a pair of front wheels and a pair of rear wheels, said pairs of wheels being disposed beyond the respective front and rear ends of the chassis and being supported in respective mountings so as to be steeringly pivotable about axes having at least a substantial vertical component in response to pivotal movement of the chassis about a longitudinal and substantially horizontal axis disposed between the ground and the tops of the wheels. Preferably the said horizontal axis is disposed below the axles of the wheels.

The arrangement according to this aspect of the invention presents a substantial improvement over known roller skates. The positioning of the front and rear pairs of wheels beyond the front and rear ends of the chassis provides a longer wheelbase which is inherently more stable in the direction of travel. The fact that both pairs of wheels are steerably pivotable preferably

about vertical axes, i.e. in opposite senses, makes for a positively responding steering action particularly taking into account the greater longitudinal separation of the wheels as compared with conventional skates. And the lowering of the longitudinal pivot axis and the chassis increases the degree of control available to the rider in maintaining balance from lateral forces. In conventional skates the chassis is usually at a level some 9 cm above the ground, whereas in accordance with the invention the chassis can be arranged as low as 4 cm from the ground and the longitudinal pivot axis be lower still. A substantial increase in lateral stability is obtained by this lowered configuration.

A further feature of the invention resides in the mounting assembly for the pairs of wheels. Conventional steering systems known as the "double action system" are exemplified in Specification No. 666,587. The chassis pivots to steer the wheels, but there is only one pivot line set at an angle diagonally between the horizontal and vertical lines of action. Thus one single pivot actuates both horizontal and vertical pivoting axes. The horizontal pivot line intersects the single diagonal pivot line at about 6 cm above the ground, this being the pivot axis line on which the rider's feet pivot. Becuase of this high roll centre of gravity and the high riding position of the rider the wheels must have a wider track (distance between wheel centres on the same axle) to counteract centrifugal forces to provide stability when cornering. This width of track, conventionally in the order of 5 cm between the insides of the wheels, means that the wheels have to travel a substantial pivotal distance when steering to reach a required angle of turn, which means that more force has to be applied by the feet, reducing the control available to the rider.

Because of this lack of control making sharp

cornering particularly unstable, such a skate is dangerous at speed unless the steering system is tightened up substantially, but this reduces the degree of steering available and is consequently counter-productive.

The object of the second aspect of this invention is to provide an improved steering system in which these drawbacks of conventional systems are eliminated or at least substantially reduced.

Thus viewed from this further aspect, the invention provides a steering assembly for roller skates and the like comprising a support member, a steering rod fixedly connected to the chassis of a skate or the like such rod being pivotably received in the support member for pivotal movement about a substantially horizontal axis, a wheel mounting saddle being pivotably mounted on said support member about a substantially vertical axis, said rod having an angularly projecting member engaged with the saddle at a distance from the vertical pivot axis the nature of the engagement being such that pivoting of the steering rod about its said horizontal axis causes the saddle to pivot about its said vertical axis whereby to provide steering.

Thus in contrast to conventional systems employing a single pivot axis, the steering assembly according to the invention articulates about two separate axes,one horizontal and one vertical. The advantages achieved by this arrangement are substantial. For example, the centre of roll, which is effectively the horizontal axis of said steering rod, can now be lowered to 2 cm or thereabouts above the ground, in fact well below the axles of the wheels. This lowering substantially improves the cornering stability of the skate. This means that the track axial distance from

the inside of one wheel to the other can be reduced to 3cm or even as little as 1.2 cm without significant loss of stability. As explained above, this reduces the distance travelled by the wheels for any given steering angle and reduces the steering force required. Thus a greater control over the steering is achieved, making for a substantially improved performance of the skate.

In a particularly preferred arrangement the angularly projecting member can comprise an integral portion of the steering rod, although a separate member rigidly secured to the rod may instead be used.

A particularly important subsidiary feature of the invention resides in the nature of the connection between the said projecting member and the saddle. To provide a rattle-free reception of the member in the saddle and accommodate the angular movement of the member, it may be closely received in a resilient bushing mounted in the saddle. Thus angular movement of the steering rod about the horizontal axis causes some deformation of the resilient bushing as the saddle pivots about the vertical axis. A block of polyurethane moulded into a suitable cavity formed in the saddle member is a preferred way of forming the bushing.

Another useful feature of the steering assembly is the possibility of obtaining a precisely controllable and adjustment of the stiffness of the sterring system, i.e. a restoring force generated by a given amount of pivoting of the steering rod. This can be achieved by disposing a resilient block between the member and the saddle such that the block deforms on pivotal movement of the steering rod to provide a restoring force. This block, which may be of relatively soft rubber, may take the form of a control bush mounted around the projecting member and urged into compressive engagement with the saddle. The projecting member may

be provided with a thread and a nut threadedly engaged thereon may serve to compress the control bush against the saddle. Thus the degree of compression of the control bush, and therefore the amount of restoring force for any given angular movement of the steering rod, may readily be adjusted.

Whilst the invention seen from its first aspect can incorporate steering systems of various types including for example a single pivot double acting assembly, the combination of the two inventive concepts described above i.e. a long wheelbase with a double pivot steering system having the features described, makes for a major and radical improvement in stability and control.

In order that the invention may be more readily understood, certain embodiments thereof will now be described by way of example with reference to the accompanying drawings, in which:-

Fig. 1 is a plan view of an improved roller skate constructed in accordance with the invention,

Fig. 2 is a side elevation of the skate,

Fig. 3 is a front elevation of the skate, and

Figs. 4 to 11 are perspective views of modified steering systems.

Referring firstly to Figs. 1,2 and 3 there is shown a roller skate having a foot plate or chassis 1, a pair of front wheels 2 and a pair of rear wheels 3. The chassis 1 is provided with a longitudinal strengthening spine 4 and with a peripherally extending rim 5 shaped to the contour of a boot or shoe and adapted by closing means 6 to grip a boot or shoe to fix the skate to the foot of a rider.

The wheels of the skate are the broad polyurethane wheels which were developed, particularly, for use on skateboards. The front and rear wheels, 2,3 respectively are rotatably mounted on respective axles 7,8

which axles are in turn supported on a saddle member 9,10.

The saddle members, 9,10 are mounted on support members, 11,12 by means of vertically extending pivot pins 13,14 about which the saddle members 9,10 are pivotable. Any wear in the pivotable mounting bush may be taken up by the two-nut locking assemblies threadedly engaged with the upper ends of the pins 13,14.

Now, the support members 11,12 are formed with a tubular sleeve in their lower parts through which pass respective steering rods 15,16, the opposite ends of which rods are secured to the strengthening spine 4 of the skate chassis 1. The steering rods 15,16 are rotatably received in the sleeves 11,12 so as to be pivotable about a substantially horizontal axis. Connected to each end of the steering rods is a respective upstanding portion 17,18 which passes upwardly through a bush 19 of resilient polyurethane material moulded in a cavity formed in a projection of the respective saddle member 9,10. The resilient bushes accommodate in a rattle free manner the angular movement in a vertical plane of the upstanding members 17,18.

The steering assemblies also include means for providing a restoring force to restore the skate to straight line travel. The respective upper ends 20,21 of the members 17,18 are threaded, and nuts 33,34 are engaged therewith. By means of washers 35,36 the nuts adjustably compress soft rubber control bushes 37,38 disposed around the projecting members. It will be seen that on pivotal movement of the skate chassis, the control bushes 37,38 are deformed, and thus provide a restoring force. The greater the degree of compression of the resilient bushes, the greater the restoring force of the skate when steering.

Mounted to the forward saddle member 9 is a composition block 22 which provides a brake as supplied on conventional skates.

The operation of the steering systems will now apparent. When the rider goes into a bend, he will naturally lean into it to counter-balance the centrifugal force. The chassis of the skate will therefore pivot, under the control of the rider, about a low horizontal axis determined by the tubular sleeves formed on the base of support members 11,12. This will cause the upstanding members 17,18 to pivot in a vertical plane, and their engagement with the saddle members 9,10 causes those members to pivot about a vertical axis which turns the wheels. It will be noted that this is a very precise steering action, all the more so because the low level of the horizontal pivot axis means that the individual wheels in the pairs 2,3 may be brought close together to reduce the friction force necessary to effect steering, and so give greater control.

A further point to note is that on steering the skate, the support members 11,12 by virtue of the interaction between pivoting members 17,18 and saddles 9,10 will travel along the steering rods 15,16 in a direction away from the main body of the skate. This by a small but appreciable amount will increase the wheelbase when cornering, increasing further the stability of the skate.

Figure. 4 shows a modified steering assembly which may be used with the skate of Fig.1. Here, the steering rod 15 is formed with an integral Rose bearing 24 which lies between the main body of the steering rod 15 and the integral upstanding portion 25 of it. The bearing is effectively a universal ball joint and the vertical axis of pivoting of the saddle will intersect the horizontal axis of the wheel axles at the centre

of the ball joint. The assembly otherwise operates in the same way as described previously in as much as pivotal rotation of the steering rod 15 about its substantially horizontal axis causes the upstanding member 25 to turn the wheels by its cooperation with the saddle 9 through resilient bushing 19.

A single pivot system modified to suit the skate of Fig. 1 is shown in Fig. 5. Here the steering rod 15 has an upwardly inclined portion 26 which is received in a bush formed in a support member 27 which carries the axle 28 of the wheels. The degree of tightness of the support member about the steering rod inclined portion is adjusted by the pair of nuts 29 in a known way. Again when the chassis of the skate is pivoted about a horizontal axis this causes the support member to pivot about the rod and effect a steering action. Although this system may be used with the skate of Fig.1 it may have a reduced control and sensitivity over the steering assembly shown in Figs 1, 2 and 3. Turning to Fig.6, the assembly there is substantially equivalent to that shown in Fig.1 except that it is reversed, i.e. for the front pair of wheels the upstanding member is located behind the wheel axle rather than in front. This means that the steering rod 15 now lies over the axles providing a higher roll centre. Despite the improved stability of the lower roll centre as described earlier, a higher roll centre may be a personal preferance of riders who are accustomed to a high centre, yet who require the improved stability achieved by the longer wheelbase which is a feature of the invention. Otherwise in Fig.6, parts corresponding to those in Figs. 1 to 3 have been numbered accordingly, so will not be described further here.

Fig. 7 shows a similar steering assembly where the steering rod 15 is arranged at the same level as the wheel axles 30. In this case the wheel axles are supported on a saddle member 9 which is pivotably mounted on support member 11 by means of a pivot pin 31. The forward end of the steering rod 15 is bent up to form a upstanding member 17 which passes upwardly through a forwardly extending portion 32 of the saddle 9 in the same way. Again a resilient bushing may be provided. Otherwise the operation of the assembly is the same as described with reference to Figs. 1 to 3.

In Fig. 8 there is shown a double-action steering assembly modified for use with a long wheelbase skate chassis as shown, for example, in Fig.1. An arm 39 is rigidly connected to the skate chassis, and this arm mounts the steering assembly in a forked portion 40 integral with the arm. The wheel carrying saddle 41 is mounted in the forked portion at two locations. The first location is a pivotal reception of a pin 42 mounted on saddle 41, this being received in a correspondingly shaped bore (not shown) formed in forked portion 40. The saddle includes a rearwardly extending tab 43 having an aperture through which loosely passes a bolt 44. The tab 43 is provided on its upper and lower faces with an engaging rubber washer 45 the compression of which is adjustable to tighten or loosen the steering action. In operation the steering assembly works in substantially the same way as a conventional double-action system.

Fig. 9 shows a double pivot steering assembly having many features in common with the embodiment described in Figs. 1 to 3. These parts are indicated with like reference numerals. However, in this embodiment the steering arm 17 is connected to the steering rod 15 by a spline and nut arrangement rather than by being welded, as shown for example in Fig.7. This embodiment also

includes a brake block 22.

Turning to Fig.10, there is shown a single axis double action steering assembly for use with a long wheelbase skate, which has certain features in common with the embodiment of Fig.5. These features bear the same reference numerals. In this case however the member 27 is formed with a flanged guideway 46 which receives in guiding engagement a rider 47. The rider may be moved along the guideway 46 and fixed in place as desired by a nut assembly 48. The rider 47 includes near its upper face a slot 49 which is engaged over a flexible tongue 50 integral with the main body of the skate. This flexible tongue 50 provides a restoring force when the skate is steered, the magnitude of this force being dependent on the position along its length where it engages the rider 47. The closer the rider is to the upper tip of the tongue, the less will be the restoring force for any particular angle of pivoting of the skate, and correspondingly the looser will be the steering felt by the user.

As seen in Fig.11 there is shown a modified double pivot steering assembly which is suitable for a short wheel base skate of otherwise conventional construction. It will be seen that the main chassis 51 of the skate is disposed over the wheels and the riding position is therefore correspondingly higher than in the other embodiments (see Fig.3 for example). Otherwise the construction of the steering assembly is not dissimilar to that shown in Fig. 9, except that in Fig.11 it is effectively upside down. As before, the wheels 2 are mounted on axles 7 which are secured to a pivoting saddle member 9, which is able to pivot about a vertical axis defined by a pin 52. Supported on the chassis of the skate is a steering rod 53 which has an angularly disposed steering portion 54 integral therewith. This portion 54 passes through a polyurethane bushing 19, and

is provided with a control bush 37, washer 35 and adjusting nut 33 in the same way as the embodiment of Figs. 1 to 3. Thus when the chassis of the skate is pivoted by a rider, the steering rod unit 53,54 causes the saddle member 9 to pivot about its vertical axis 52 and cause the skate to steer.

Turning finally to Fig. 12 there is shown a further embodiment of roller skate in accordance with the invention. This is a dual-purpose skate designed to achieve the benefit of the increased stability of the long wheel base skate, yet retain the manoevrability of the short wheel base skate which is required, for example, for roller skate dancing.

The wheels are mounted on steering assemblies similar to those of the embodiment of Fig.9. Specifically each has a support member 12 mounting a wheel carrying saddle member 9 which is pivotable about a vertical axis. The steering rod 15 has an angularly projecting member 17 passing through the saddle member and provided with stiffness control 33,35,37 as in the Fig.1 embodiment.

The difference in this embodiment however is that the steering rod 15 is not fixedly secured to the chassis 1, but is connected to the chassis by means of an articulated linkage 55. The figure shows both stable positions of the steering assemblies, the first being beyond the ends of the chassis,and the second being beneath and within the chassis, i.e. in the conventional position. A second part of the linkage 56 serves to support the inner side of the steering assembly, and it will be noted that in each position the orientation of the steering assembly is changed through 180^{o} so as to obtain the correct steering.

CLAIMS

1. A roller skate comprising a foot-supporting chassis (1), a pair of front wheels (2) and a pair of rear wheels (3) characterised in that said pair of wheels (2,3) are disposed beyond the respective front and rear mountings so as to be steeringly pivotable about axes having at least a substantial vertical component in response to pivotal movement of the chassis (1) about a longitudinal and substantially horizontal axis disposed between the ground and the tops of the wheels (2,3).

2. A roller skate according to claim 1 characterised in that said horizontal axis is disposed below the axles of the wheels.

3. A roller skate according to claim 1 or 2 wherein the front and rear wheels are mounted on respective steering assemblies characterised in that each said assembly comprises a support member (11,12), a steering rod (15,16) fixedly connected to the chassis (1) and pivotably received in the support member (15,16) for pivotal movement about a substantially horizontal axis, a wheel mounting saddle (9,10) being pivotably mounted on said support member (15,16) about a substantially vertical axis, said rod (15,16) having an angularly projecting member (17,18) engaged with the saddle (9,10) at a distance from the vertical pivot axis the nature of the engagement being such that pivoting of the steering rod (15,16) about its said horizontal axis causes the saddle (9,10) to pivot about its said vertical axis whereby to provide the steering.

4. A roller skate according to claim 3 characterised in that the projecting member (17,18) is closely

received in a resilient bushing (19) mounted in the saddle (9,10).

5. A steering assembly for a roller skate or the like comprising a mounting for the front or rear pair of wheels and adapted to steeringly pivot said pair of wheels in response to pivoting about a horizontal longitudinal axis of the chassis of the skate or the like, characterised in that said assembly comprises a support member (11,12), a steering rod (15,16) fixedly connected to the chassis (1) of the skate or the like such rod being pivotably received in the support member (15,16) for pivotal movement about a substantially horizontal axis, a wheel mounting saddle (9,10) being pivotably mounted on said support member (15,16) about a substantially vertical axis, said rod (15,16) having an angularly projecting member (17,18) engaged with the saddle (9,10) at a distance from the vertical pivot axis the nature of the engagement being such that pivoting of the steering rod (15,16) about its said horizontal axis causes the saddle (9,10) to pivot about its said vertical axis whereby to provide the steering.

6. A steering assembly according to claim 5 characterised in that the projecting member (17,18) is closely received in a resilient bushing (19) mounted in the saddle (9,10) to provide a rattle-free reception of the member (17,18) in the saddle (9,10) and accommodate the angular movement of the member.

7. A steering assembly according to claim 5 or 6 characterised in that a resilient block (37,38) is disposed between the projecting member (17,18) and the saddle (9,10) such that the block deforms on pivotal movement of the steering rod (15,16) to provide a restoring force to the steering system.

8. A steering assembly according to claim 7

characterised in that said resilient block (37,38) comprises a control bush mounted around the projecting member and urged into compressive engagement with the saddle.

9. A roller skate comprising a foot-supporting chassis (1), a pair of front wheels (2) and a pair of rear wheels (3), said wheels being mounted in respective steering assemblies, characterised in that a pivotal connection (55,56,57) is provided between the steering assemblies and the chassis whereby the wheels may be pivoted between a first position beyond the respective front and rear ends of the chassis the wheel axles being at substantially the same level as the chassis, and a second position in which the wheels are disposed beneath the chassis and within the respective ends thereof.

10. A roller skate according to claim 9 wherein each said steering assembly comprises a support member (11,12), a steering rod (15,16) fixedly connected to the chassis (1) and pivotably received in the support member (15,16) for pivotal movement about a substantially horizontal axis, a wheel mounting saddle (9,10) being pivotably mounted on said support member (15,16) about a substantially vertical axis, said rod (15,16) having an angularly projecting member (17,18) engaged with the saddle (9,10) at a distance from the vertical pivot axis the nature of the engagement being such that pivoting of the steering rod (15,16) about its said horizontal axis causes the saddle (9,10) to pivot about its said vertical axis whereby to provide the steering.

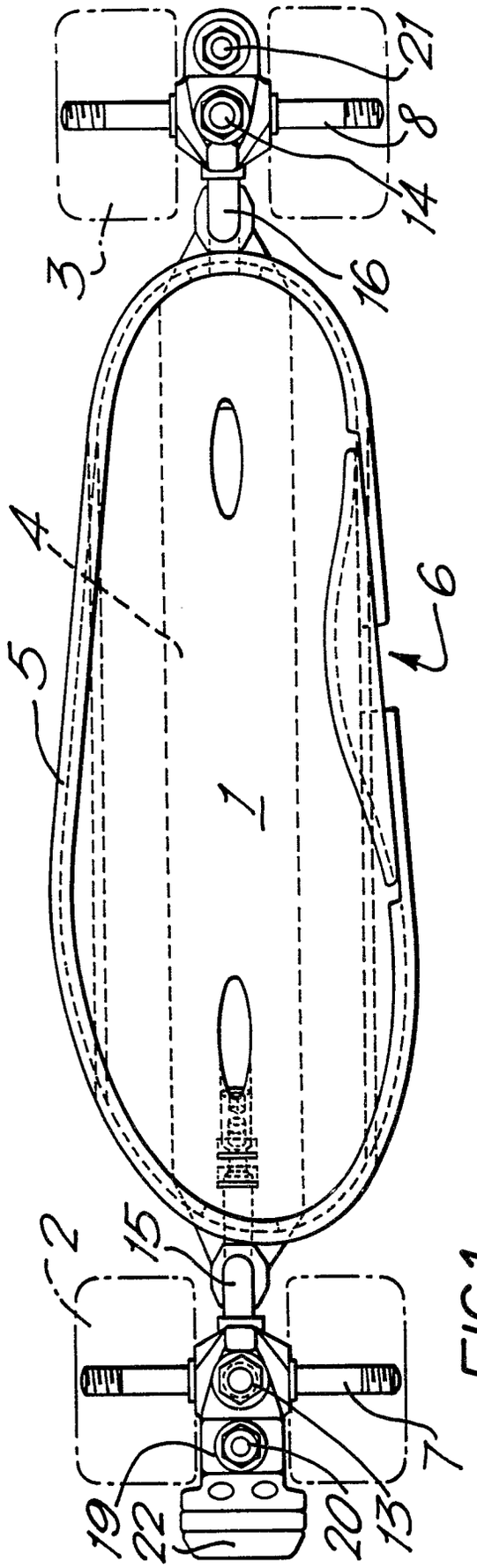

21
8
14
3
16
4
5
6
1
2
15
19
22
20
13
7

FIG.1.

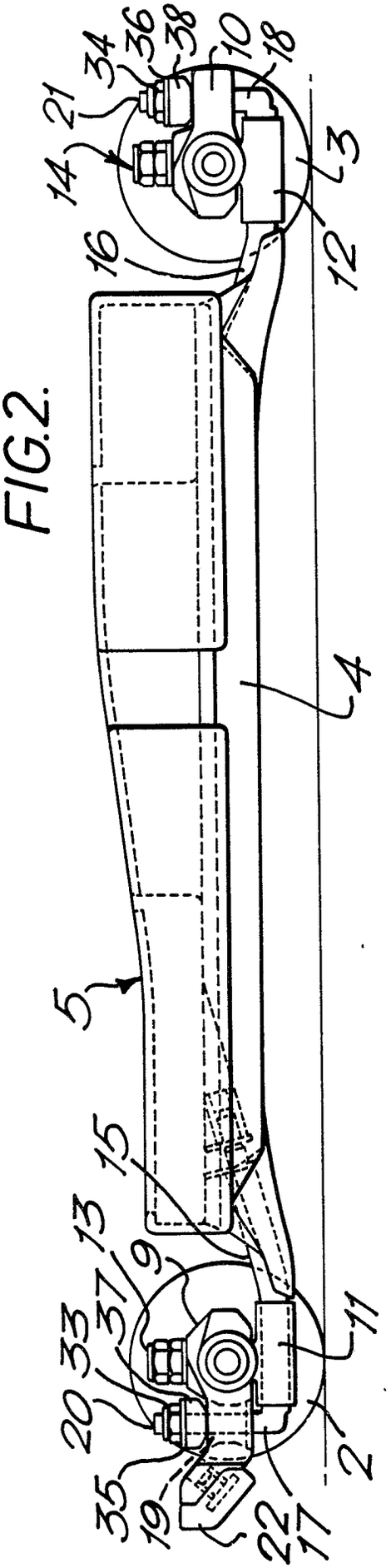

34
36
38
10
18
21
14
3
16
12
4
5
15
13
9
37
11
33
20
35
19
22
17
2

FIG.2.

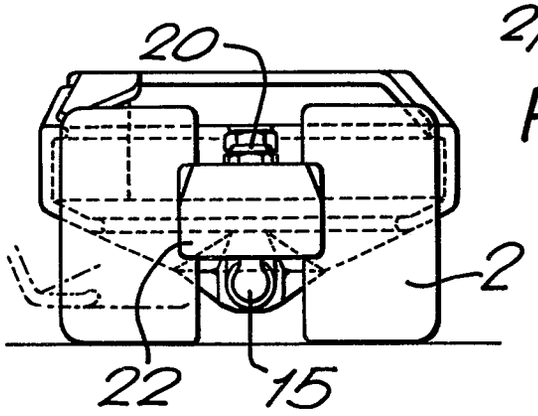


FIG.3.

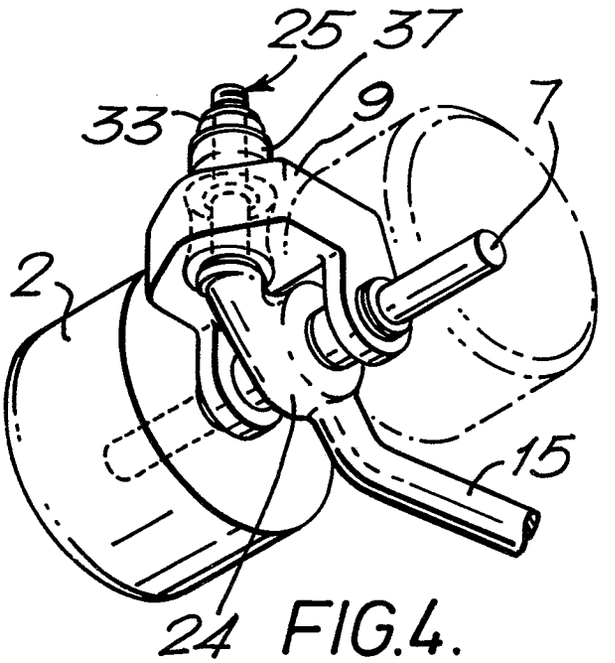


FIG.4.

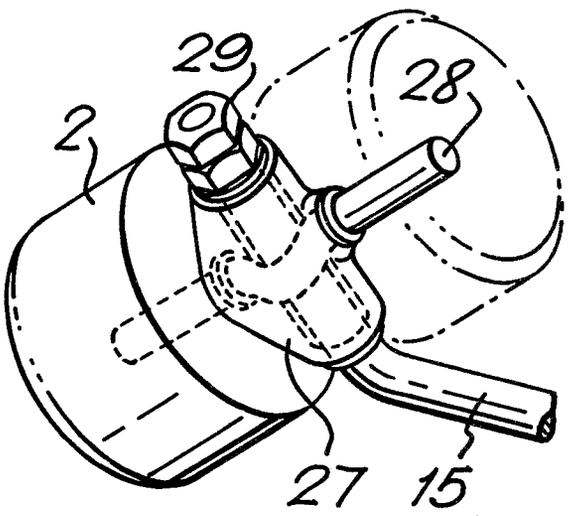


FIG.5.

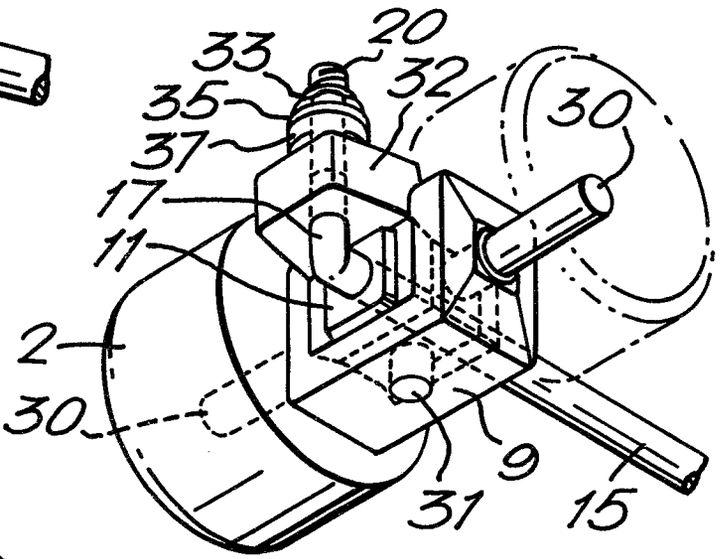


FIG.7.

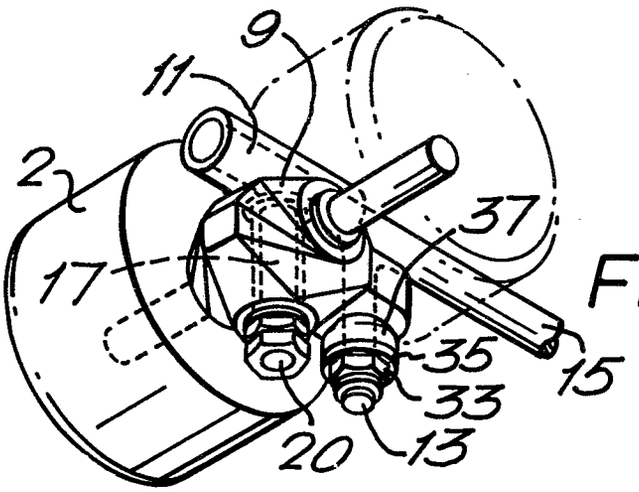


FIG.6.

FIG.8.

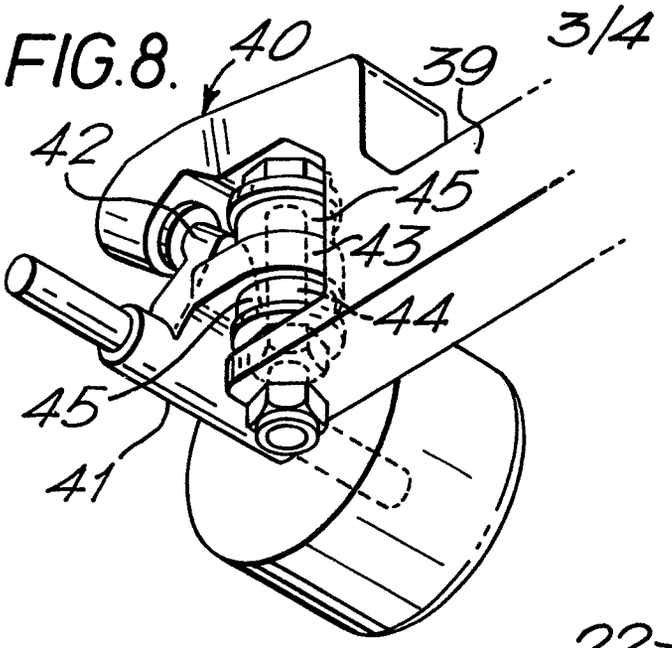


FIG.9.

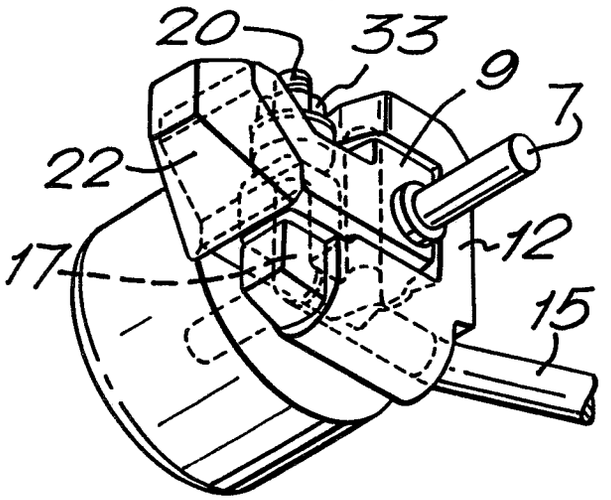


FIG.10.

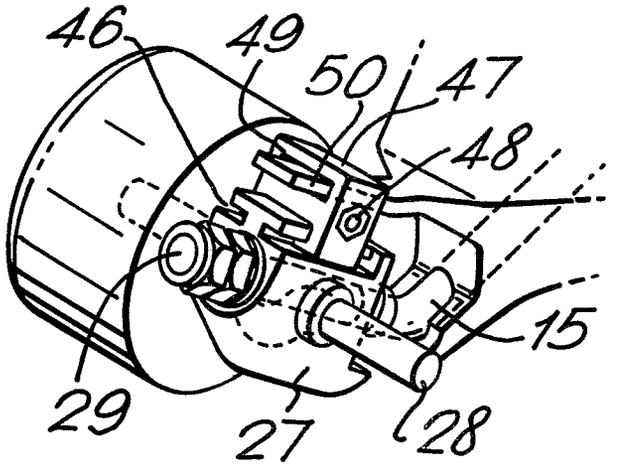
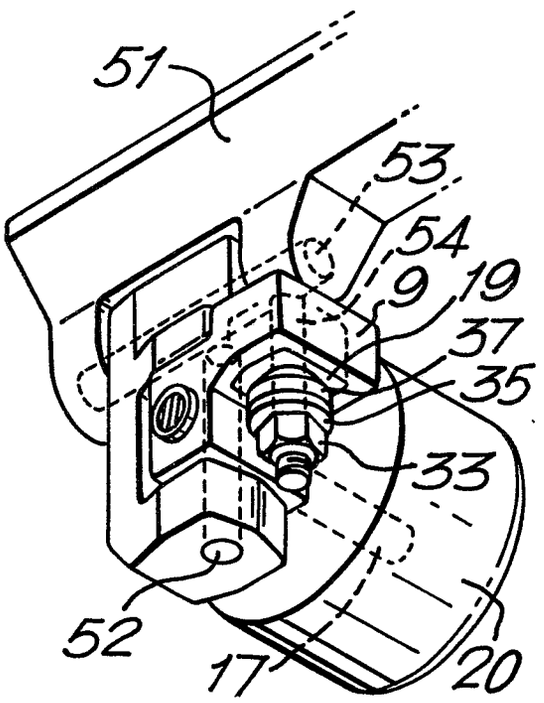


FIG.11.



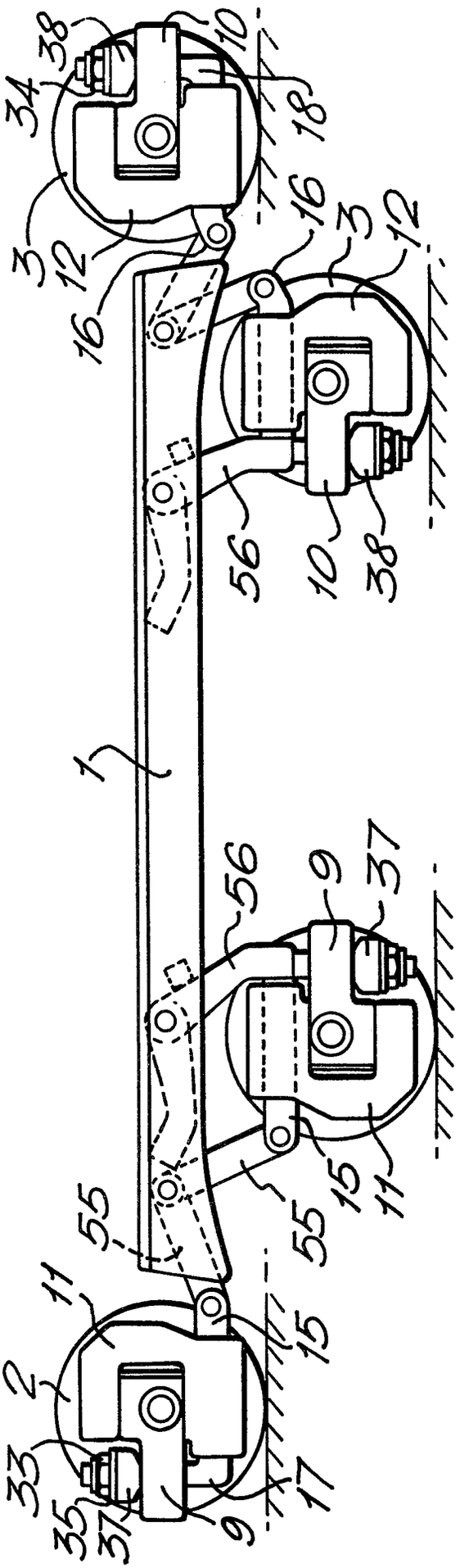

38
10
34
18
3
12
16
16
3
12
56
10
38
1
56
9
37
55
55
15
11
11
15
2
33
35
37
9
17

FIG.12.

European Patent Office

EUROPEAN SEARCH REPORT

Application number
0043735
EP 81 30 3117

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	US - A - 2 509 324 (HORN) * the whole document *	1,3-5
	DE - C - 167 622 (DANKOWSKA) * page 1, line 32 - page 2, line 3; figures 1,2 *	1,9
	DE - C - 439 934 (DRESING, KLEIN-MUNKTEN) * page 1, lines 40-66; figure 2 *	1
	US - A - 2 868 554 (RING) * figures 1,2 *	1
D	GB - A - 666 587 (HASELTINE, LAKE & CO.) * page 1, line 61 - page 3, line 27; figures *	3-5
A	US - A - 4 159 830 (SOLIMINE)	
A	DE - B - 1 019 942 (DORNSEIF)	
A	US - A - 3 046 032 (HUMPHRIES)	

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

A 63 C 17/02

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

A 63 C

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	6-10-1981	SCHLESIER

EPO Form 1503.1 06.78