



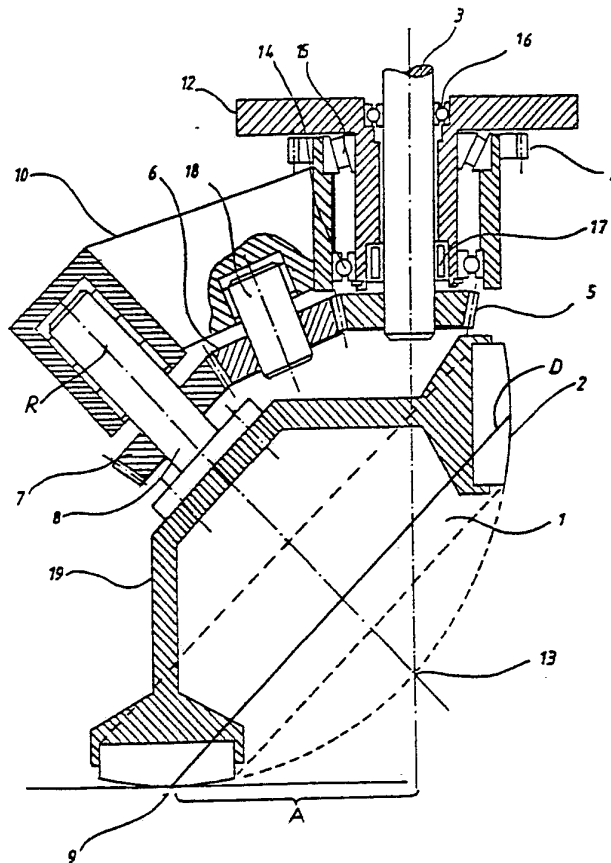
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification<sup>4</sup> : <b>B62D 61/00, B60B 19/00 B60K 17/30</b></p>	A1	<p>(11) International Publication Number: <b>WO 88/ 03492</b> (43) International Publication Date: 19 May 1988 (19.05.88)</p>
<p>(21) International Application Number: PCT/SE87/00520 (22) International Filing Date: 5 November 1987 (05.11.87) (31) Priority Application Number: 8604781-8 (32) Priority Date: 7 November 1986 (07.11.86) (33) Priority Country: SE (71)(72) Applicant and Inventor: SEGERLJUNG, Max [SE/SE]; PL 7180, S-911 00 Vännäs (SE). (74) Agents: ONN, Thorsten et al.; AB Stockholms Patentbyrå, Zacco &amp; Bruhn, Box 3129, S-103 62 Stockholm (SE). (81) Designated States: AT (European patent), AU, BE (European patent), BR, CH (European patent), DE (European patent), DK, FI, FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent),</p>		<p>NL (European patent), NO, SE (European patent), US.  <b>Published</b> <i>With international search report. In English translation (filed in Swedish).</i></p>

(54) Title: WHEEL MEANS FOR MOVING OBJECTS

## (57) Abstract

A means in an object movable on a ground, for instance vehicles, load carriers and corresponding things for removal of the object which means at least comprises a wheel arranged at the object. For achieving unique motion possibilities like for instance changing the motion direction of the vehicle 90° in relation to its previous direction the wheel (1) is driven and has its rolling point (9) resting against the ground positioned at a radial distance from a shaft (3) in relation to which the wheel with its rotation shaft (8) is turnably guided along a circle line having the mentioned radial distance as a radius round the mentioned shaft (3) for a change of the motion direction.



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Wheel Means for Moving Objects

This invention relates to a means in an object which is movable on a bed and which is for instance a vehicle, a load carrier and other types of machines and similar for moving the object, which means at least comprises a wheel arranged at the object.

The purpose of this invention is among other things to bring about a means for propulsion and control of for instance a vehicle, which means gives unique motion possibilities and is so constituted that it is possible by the aid of the means to change the motion direction of a vehicle to a direction perpendicular to the previous one.

That is achieved by the fact that the means according to the invention has the features mentioned in the claims.

Thus, equipped with the means according to the invention vehicles can be driven round sharp edges and in spaces requiring a little turning radius, and regarding vehicles like for instance load carriers for material transportation within the industry the essential advantage is achieved that transportation ways can be optimized and minimized and accordingly give an essentially better utilization of valuable areas. The means according to the invention is easy to control by means of simple mechanical facilities and under such circumstances also makes control and propulsion qualities possible which very well can be compared with those achieved by very advanced systems electronically controlled.

Besides the unlimited motion patterns being made possible by the present invention are achieved advantages like those that no increased wear arises neither on the wheel nor the ground during twisting or turning or on the wheel of a stationary vehicle. The wheel according to the invention does neither require a return to a neutral position for a continuous twisting and also in this regard the present means essentially differs from known technique, for instance hydraulic motor driven wheels for trucks being such an example where the wheels have to be twisted in return in order that tubes and similar things shall not be damaged. Another essential advant-

age achieved by the means according to this invention is that it is possible to put the means in right position irrespective of previous position and in quickest possible way.

In the following the invention is described more closely in the form of one single as an example illustrated embodiment with reference to the accompanying drawings, in which Fig. 1 shows a view of the means according to the invention and Fig. 2 shows a section through the same.

The means according to the invention comprises as a main element a wheel 1, which is preferably obliquely arranged as is shown in the figures and which at its periphery has a subspherical tread surface 2, this wheel being intended to be arranged in an object like for instance vehicles, load carriers, trucks and other types of machines and similar things. For the propulsion there is arranged a shaft 3 and for the control function itself a gear wheel, drive gear 4 or the similar intended to be connected to a shifting motor not shown in the drawing or another suitable driving means. Propulsion is made by bringing the shaft 3 to rotate by a motor not shown in the drawing, preferably via a driving gear.

The rotation of the driving shaft is in the example shown in the drawings transmitted via a transmission formed by a number of gear wheels 5, 6, 7 to the shaft 8 of the wheel which is obliquely arranged in relation to the shaft 3 in the shown example but which in other embodiments can be perpendicularly arranged in relation to the last mentioned shaft.

The shaft 3 is journalled in a plate 12 made together with a sleeve by means of bearings 16 and 17, which plate can be fastened at the object in question or comprise a part of this one, while the wheel shaft 8 is journalled in a base plate or a pivoting arm 10 in which also a shaft 18 for the intermediate drive gear 6 in the mentioned gear wheel transmission is journalled. The wheel shaft 8 is connected to the wheel 1 which besides the spherical part 2 comprises a rim 19 to which the shaft 8 can be fastened.

The rotation motion of the shaft 3 is accordingly transmitted to the wheel 1 which with its subspherical, peripheral

part 2 is in contact with the ground at the rolling point 9 and due to that fact drives the object in question in relation to the ground. As far as the shaft 8 is fixed against a pivoting motion in relation to the shaft 3 and is accordingly only permitted to rotate round its own rotational axis the propulsion is made in one and the same direction. In the example the mentioned fixation of the shaft 8 is achieved by the fact that the fundament 10 in which the wheel shaft 8 and the shaft 18 of the intermediate drive gear are journalled is in mechanical connection with the gear wheel or the drive gear 4 which is rigidly connected with a sleeve part of the fundament which can not rotate if the gear wheel or the drive gear 4 is not influenced by an outer driving means to rotate.

The fundament 10 with the shafts 8, 18 journalled therein is by means of bearings 14 and 15 pivotably journalled at the sleeve-formed part of the plate 12.

When influencing the gear wheel or the drive gear 8 so that this one is brought to rotate, the whole fundament 10 with the wheel shaft 8 will pivot round the shaft 3 and by so doing the wheel 1 with its rolling point 9 will describe a circular motion round the shaft 3. The rotation axis R of the wheel 1 intersects the prolonged center line of the driving shaft 3 in a point 13 on the imaginary sphere which is described during the rotation of one revolution by the subspherical periphery area of the wheel. Furthermore, the point of intersection between the rotation axis R of the wheel and a line D comprising the diameter of the wheel in the rolling plane is on a radial distance from the shaft 3.

In the embodiment shown in the drawings with a gear ratio of 1:1 between the shaft 3 and the wheel shaft 8 the wheel 1 in its rolling plane shall have the same circumference as the circle formed on the ground by the rolling point 9 when turning the fundament one revolution round the shaft 3. That means that the distance A shall be the same as the distance 0,5 D (see Fig. 2). Of course, this invention is not limited to such a gear ratio between the shafts 3 and 8 but every other gear ratio between them is possible within the scope of

the present invention. However, the circumferential velocity of the wheel shall be so adapted to the circumferential velocity in the rolling point 9 that the turning of the wheel round the shaft 3 gives rise to that these circumferential velocities correspond to each other in the rolling point when turning the wheel round the shaft 3. This gives no slide in relation to the ground but a soft motion free from losses is achieved in all directions along the plane on which the object provided with the means according to the present invention rests.

In order to minimize the uneven load is in the embodiment shown in the drawings the angle between the shaft 3 and the shaft 8 elected to  $45^{\circ}$  but as has been mentioned previously of course other angles can come into question within the scope of this invention.

A pivoting motion of the fundament round the shaft 3 immediately results in a change of the direction of the object under the presumption that propulsion is at the same time made via the shaft 3. In stationary objects, that is with a stationary shaft 3, the fundament 10 can be pivoted round the shaft 3 without influencing this one and without any removal of the object. Due to the fact that the gear wheel 6 is journalled in the fundament 10 between the gear wheels 5 and 8, a pivoting of the fundament 10 for guidance will not result in any contribution to the motion even if driving is made at the same time via the shaft 3.

The conical gear wheels 5, 6, 7 are designed with the same pitch.

The present invention is not limited to what has been described above and shown in the drawings but can be changed and modified in many different ways within the scope of the invention idea mentioned in the claims. Thus, it is possible to provide the wheel with a motor of its own for its propulsion and for its rotation round its rotation axis and in such a case there is no need of driving via the shaft 3.

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Claims

1. A means in an object movable on a ground, for instance vehicles, load carriers and corresponding things for removal of the object which means at least comprises a wheel arranged at the object, characterized in the combination of the following features:

5 - The wheel (1) is driven and has its rolling point (9) resting against the ground positioned at a radial distance from a shaft (3) in relation to which the wheel is turnably guided along a circle line having the mentioned radial distance as a radius round the mentioned shaft (3) for a change of the motion direction;

10 - The point of intersection between the rotation axis (R) of the wheel (1) and a line (D) comprising the diameter of the wheel in the rolling plane is at a radial distance from the shaft (3).

2. A means according to claim 1, characterized in that the circumferential velocity of the driven wheel is adapted to the circumferential velocity in the rolling point (9) that the turning of the wheel (1) round the mentioned shaft (3) gives rise to, and that these circumferential velocities correspond to each other in the rolling point (9) when turning the wheel round the mentioned shaft (3).

3. A means according to claim 1 or 2, characterized in that the circumferential area of the wheel containing the rolling point (9) has a subspherical form and that the rotation axis (R) of the wheel and the mentioned shaft (3) in relation to which the wheel is turnably guided are mutually arranged in that way that at least their imaginary prolongations in direction to the ground intersect each other in a point (13) on the spherical area described by the circumferential area of the rotating wheel.

4. A means according to any one of the preceding claims, characterized in that the shaft (3) is rotatably journalled by means of bearings (16, 17) in a plate (12) provided with an integrated sleeve intended to be fastened to the object.

5. A means according to claim 4, the shaft (3) being provided with a rigidly arranged gear wheel (5) and the wheel (1) having a shaft (8) rigidly mounted in the wheel, characterized in that the rotation of the shaft (3) is transmitted to the shaft (8) of the wheel (1) by means of an intermediate gear wheel (6) and another gear wheel (7) which is rigidly mounted on the shaft (8).

6. A means according to claim 5, characterized in that the intermediate gear wheel (6) is provided with a shaft pin (18) rigidly mounted on the gear wheel which pin is rotatably journalled in a fundament (10) and that the shaft (8) of the wheel (1) is rotatably journalled in the same fundament.

7. A means according to claim 6, characterized in that the fundament (10) is pivotably journalled on the sleeve of the plate (12) by means of bearings (14, 15).

8. A means according to claim 5, characterized in that when having a gear ratio of 1:1 between the wheel shaft (8) and the driving shaft (3), the diameter (D) of the wheel in the rolling plane is the same as the diameter of the circle that the wheel (1) with its rolling point (9) describes when turning the wheel (1) one revolution round the driving shaft (3).

9. A means according to any one of the preceding claims, characterized in that the rolling plane of the wheel is obliquely arranged in relation to the shaft (3).

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FIG.2

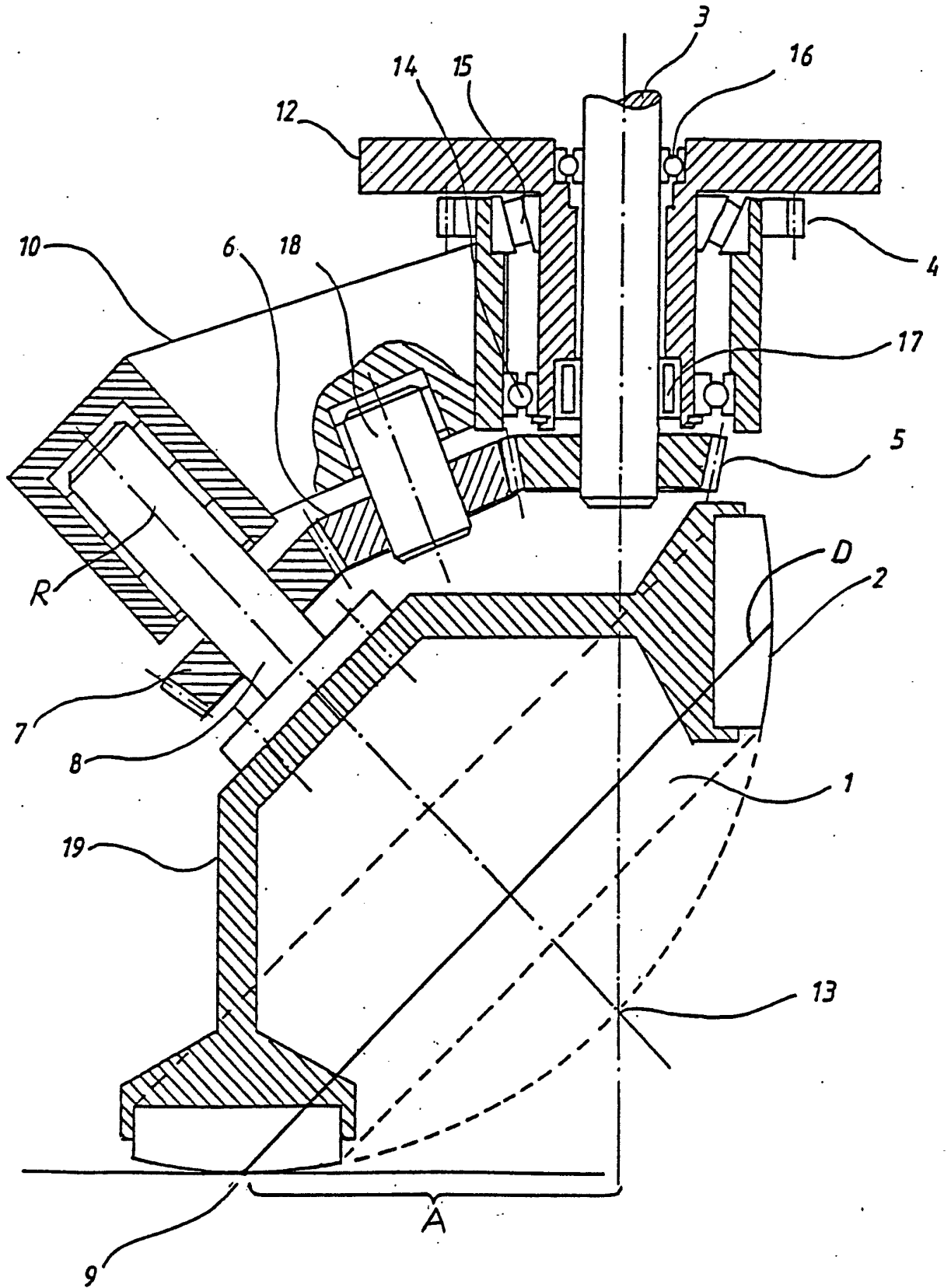
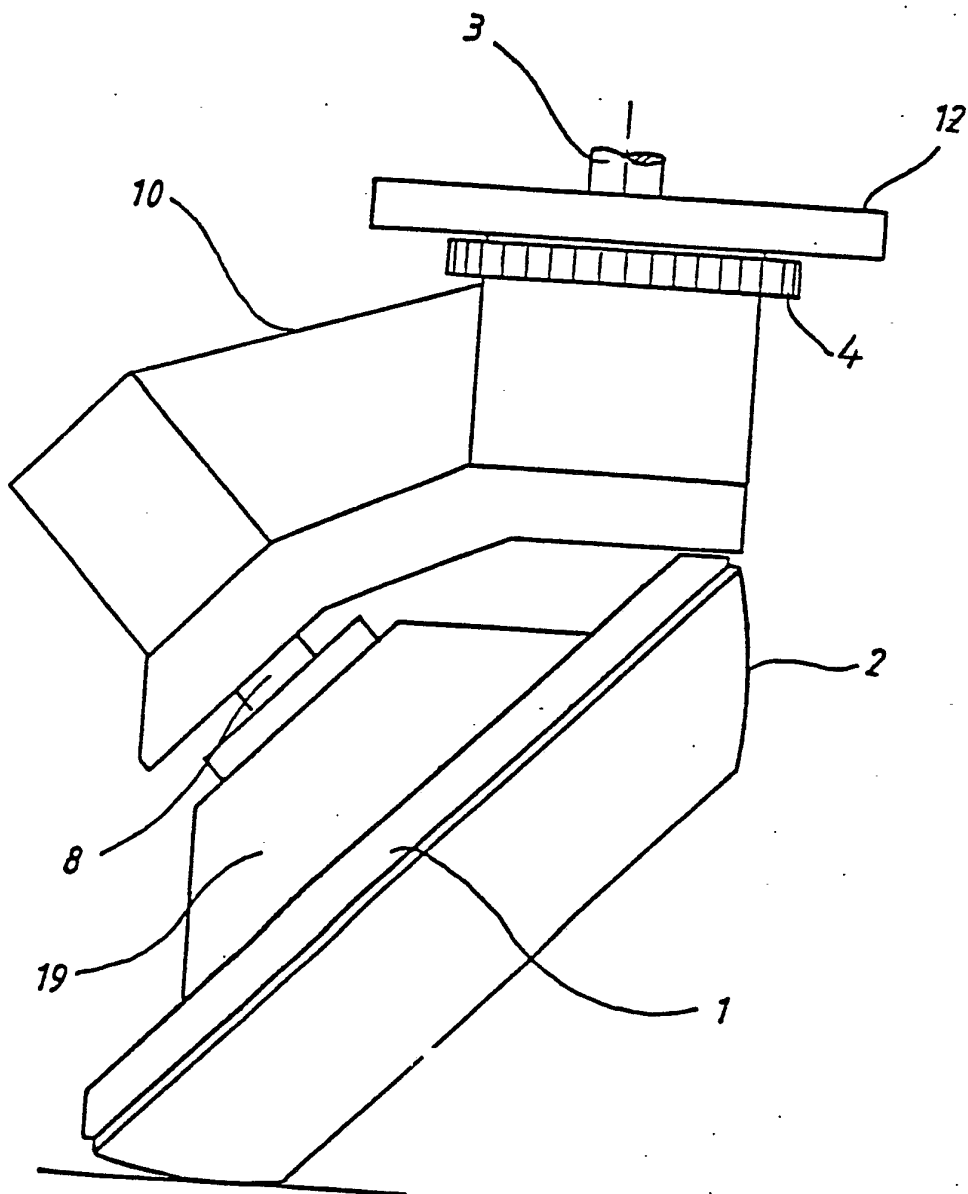


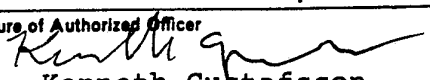
FIG.1



# INTERNATIONAL SEARCH REPORT

PCT/SE87/00520

International Application No

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to international Patent Classification (IPC) or to both National Classification and IPC		
B 62 D 61/00, B 60 B 19/00, B 60 K 17/30		4
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC 4	B 60 B 19/00,/14; B 60 K 17/30; B 62 D 57/00, 61/00-/10, 63/00,/02	
US C1	180:6.2, 6.24,7,7.1,21-24,45,46,252,253,257,.../...	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included In the Fields Searched <sup>8</sup>		
SE, NO, DK, FI classe as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b>		
Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	Patent Abstracts of Japan, Vol 9, No 219, M-410, abstract of JP 60-78831, publ. 1985-05-04 (See the whole document)	1,2,8
X	FR, A1, 2 541 960 (ARMINES) 7 September 1984 See figure 7	1
Y	US, A, 519 466 (EIKO SHIRAISHI) 28 May 1985 See figure 20	1,9
A	WO, A1, 83/02431 (CATERPILLAR TRACTOR CO.) 21 July 1983	
<p><sup>9</sup> Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
1988-01-20	1988 -02- 0 1	
International Searching Authority	Signature of Authorized Officer	
Swedish Patent Office	 Kenneth Gustafsson	

SP

## FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

II

Fields serched (cont)US CI 280:28.5V.  OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE <sup>1</sup>

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1.  Claim numbers ..... because they relate to subject matter not required to be searched by this Authority, namely:
2.  Claim numbers ..... because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3.  Claim numbers ..... because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI.  OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING <sup>2</sup>

This International Searching Authority found multiple inventions in this international application as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
4.  As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

## Remark on Protest

- The additional search fees were accompanied by applicant's protest.
- No protest accompanied the payment of additional search fees.