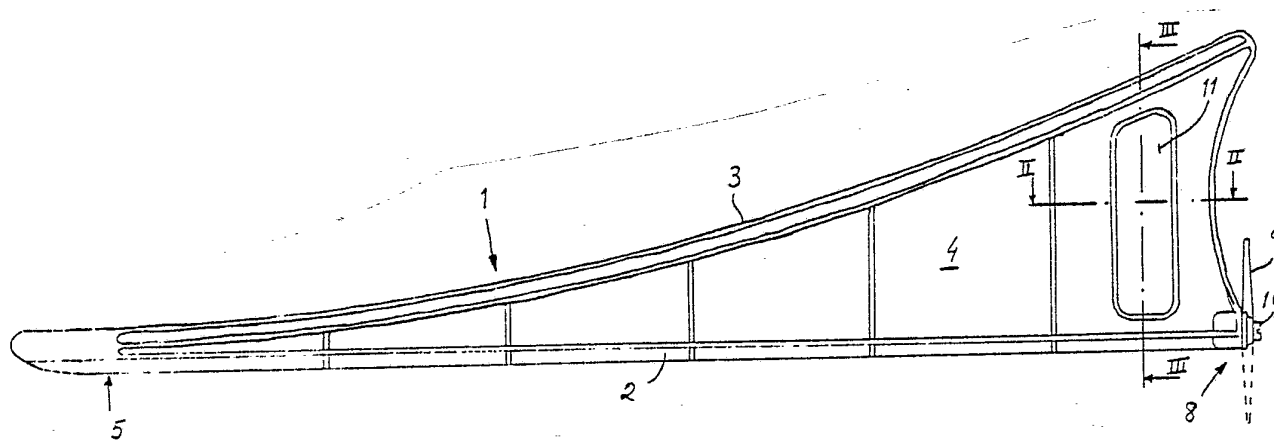




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |                                                                                                                                                                                                                                                                                                               |
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| (51) International Patent Classification <sup>3</sup> :<br><br>A63B 69/36                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | A1 | (11) International Publication Number: WO 85/ 00295<br>(43) International Publication Date: 31 January 1985 (31.01.85)                                                                                                                                                                                        |
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(54) Title: GOLF SWING TRAINING DEVICE



## (57) Abstract

Swing starter (1) comprising a straight target rod (2) and a curved rod (3) interconnected by a web (4). The curved rod has a radius of curvature of about 1,55 m and a length of about 0,6 m. The front portion (5) comprises a convex mirror (6) having an indicator line (7) parallel with the target line. The swing starter is placed on the ground having a pin (9) thereof extending down into the ground. The pin allows the swing starter to be pivoted under friction around an axis parallel to the target line. The golfer places himself beside the swing starter opposite the front end (5) thereof. The swing starter is pivoted until a convex mirror (6) positioned at the front end of the curved rod indicates that the correct swing plane has been achieved by viewing the shoulder portion of the golfer at a line (7) of the mirror.

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## 1

## Golf swing training device

The present invention relates to a device for training golf.

One of the most difficult moments in learning golf is how to move the club in order to achieve an efficient swing.

The ball trajectory is essentially controlled by five factors  
5 at the moment the club impacts the ball, viz. 1) the movement direction of the golf club head; 2) the speed of the club head; 3) the position of the club head; 4) the angle of the club head; 5) which point of the club head that impacts the ball.

In order that the golf club head should have the right properties at the moment of impact, it is important how the golf club  
10 is moved before the impact but also afterwards.

In the normal case it is assumed that the impact of the ball should be squarely from the side and at the centrum of the ball in order to obtain a straight trajectory for the ball. The club  
15 head should move parallel to the ground and tangentially to the target line at the moment of impact.

At such a normal swing the club head moves in a swing circle comprised in a swing plane, which essentially is defined by two points, viz. the golf ball and a rotational centrum close to the  
20 shoulder portion of the golfer, and the target line, i.e. the tangent of the swing circle at the bottom point should be aligned with the target line and the swing plane should be parallel with the target line.

At the start of a swing, the club head is placed behind the  
25 golf ball and the club head is moved backwards and upwards to the upper position and back in order to impact the ball. Such a move-



ment has often a tendency to be too upright or vertical which results in the club head passing along an outside-in path prior to impact with the ball, i.e. the tangent of the swing circle is not parallel with the target line. Such a movement usually imparts a spin to the ball causing a slice and an inefficient trajectory.

There are several devices for training the swing described in the literature. In the French patent specification FR-A-2201105 there is shown a device in the shape of a rod bent into a circle of a diameter of about 3 meters. The circle is placed around the golfer and is inclined a suitable angle. The circle is supported by a stand. At use the golfer places himself in the centrum of the circle which is inclined the desired angle. The golf head follows closely the circular rod and is not allowed to leave the swing plane. Such a device is certainly effective in forcing the golfer to move the club in one and the same plane. However, the device is very cumbersome and is only with great efforts movable. The device gives no indication of the target line. There is no possibility to decide which angle the swing plane should form with the ground for different types of clubs, in short it is rather inflexible.

In US patent specification US-A-3 942 802 there is shown a much smaller training device, which aims in correcting a defective outside-in swing. The device comprises a straight elongated rod extending roughly parallel to the target line but inclined upwards and to the right. The rod starts adjacent the ball and extends towards the target. The object is to give the golfer a vision of an inside-out swing at the moment of impact. If the swing is outside-in, the club head will hit the rod.

In US patent specification US-A-3 375 010 there is shown another swing training device comprising a rod, which is bent in a shallow vertical V-shape. The rod is supported above the ball and the rod forces the club head to move deeper both immediately before and after impacting the ball.

The two last-mentioned patent specifications focus the interest to the moment of impacting the ball. However, scientists claim that human muscle-to-brain-and-back-to-muscle reactions are too slow for the golfer to be able to consciously direct his entire



swing. Thus, most of the swing is controlled purely reflexively, and the above-mentioned two devices do only serve to show that a defective swing has been carried out, but is no positive help to obtain an efficient swing. The device according to the first-  
5 mentioned French patent specification may advantageously be used to train such reflexes.

The present invention starts from the standpoint that the last part of the swing is controlled by reflexes. Thus, a perfect swing can only be obtained if the start of the swing is perfect,  
10 while a defectively started swing must be corrected by reflexes, which do not give a repetitive result. However, the start of the swing may be controlled consciously by the golfer.

The object of the present invention is to provide a device which helps the golfer to obtain a carefully controlled swing  
15 start.

Another object of the invention is to provide a device, which indicates the correct swing plane to use, i.e. the angle between the swing plane and the ground.

These objects are obtained by a swing starter comprising a  
20 curved rod intended to indicate a desired swing plane for swinging a golf club. According to the invention, the curved rod extends from a golf ball position and backwards and upwards essentially along a portion of a circle corresponding to a desired swing circle. Moreover, the swing starter comprises an indicator means  
25 indicating when the rod has been inclined in relation to a target line for defining, together with the target line, a plane which corresponds to the desired swing plane. The curved rod indicates the bottom portion of the desired swing circle, i.e. the start of the swing, hence the name thereof.

30 Preferably, the swing starter comprises a straight target rod positioned close to the ground and having one pin adjacent one end thereof for engagement with the ground and connected to the target rod by a frictional connection, whereby the swing starter is pivotable under friction around an axis aligned with the target rod.  
35 The target rod is connected to the curved rod by a web and the curved rod has a width which hides the remaining portion of the swing starter.



The indicator means may be a convex mirror positioned in the front portion of the curved rod and having an indicator line parallel with the target line. Alternatively, the indicator means may be a portion of the swing starter below the curved rod which becomes visible beyond the curved rod when the desired swing plane has been obtained.

The invention also relates to a method of adjusting the swing starter, in that the golfer places himself opposite the front portion of the curved rod carefully along a line which is square to the target line and at a distance beside the swing starter which corresponds to the selected club length. Finally the inclination of the rod around an axis parallel to the target line is adjusted until the indicator means indicates that the desired inclination has been obtained.

Further objects and features of the invention will become apparent from the detailed description below of a preferred embodiment of the invention by reference to the appended drawings. Fig. 1 is a side view of a swing starter according to the invention. Fig. 2 is a plan view partially in section of the swing starter according to Fig. 1. Fig. 3 is a cross-sectional view according to line III-III of Fig. 1. Fig. 4 is a longitudinal sectional view according to line IV-IV of Fig. 2. Fig. 5 is a side view of an alternative embodiment of the invention.

In Fig. 1 there is shown the swing starter according to the present invention is a side view. The swing starter 1 according to Fig. 1 comprises a straight target rod 2 and a curved rod 3, which are joined by a web 4. The rods 2 and 3 converge in an apex portion 5. The curved rod 3 is partially circular in side view and has a radius of curvature of about 1,55 m and is about 0,6 meter long. The upper surface of the curved rod 3 is preferably plane as shown in Fig. 3 and is painted red.

The front portion or apex portion 5 is provided with a convex mirror 6 as shown in more details in Fig. 4. The mirror comprises a line 7 at its front surface, which is parallel to the target rod 2.

In the back portion 8 of the target rod, i.e. to the right in Fig. 1, a pin 9 is attached by means of a friction connection 10.



The pin 9 is pivotable as shown in Fig. 1.

The swing starter is used according to the following description. First of all, the pin 9 is pivoted downwards and pierced down in the ground. The apex portion 5 is placed in the desired direction, so that the target rod extends towards the target. The rod 2 may advantageously be used as a target line. Then, the golfer places himself beside the swing starter opposite the front portion 5 and at a line extending from the front portion 5 and square to the target line. The swing starter is inclined towards the golfer, so that he can only see the red upper surface of the curved rod 3, the remaining portions of the swing starter being hidden behind the curved rod 3. The golfer may control his (or her) position in the mirror 6 and the line 7 thereon should pass through the eyes of the golfer. The golfer may also control his position if he is square to the target line by controlling if his eyes are placed on the middle of the line 7. The swing starter is now placed in a position where the plane of the swing starter passes through the eyes of the golfer. However, such a plane is a little bit too vertical to be the proper swing plane which ordinary is considered being the plane passing through the shoulder portion of the golfer.

In order to indicate the right swing plane, the swing starter is further inclined about 5 to 8 degrees downwards. In this position the golfer views his shoulder portion in the mirror on the line 7 thereof and he may also see at the right end of the swing starter, a portion of the target rod 2 beyond the curved rod 3. Now the swing starter defines the correct swing plane.

Finally, the club head is placed above the mirror and is moved backwards, while the club head closely follows the circular path defined by the curved rod. In this way, the club, hands, arms and shoulder will be moved as a single unit around the fixed axis of the spine and a sense of "oneness" is obtained. At the upper end position of the club head, its position may be controlled in the mirror and should be visible on the line 7.

Finally the club is moved back and should follow the swing starter closely above the surface of the curved rod 3.

By training the swing start by this training device a clear



sense of the correct swing plane may be obtained and the importance of a correct swing start is emphasized.

When the correct feeling has been obtained, a golf ball is placed some centimetres before the mirror and the golfer moves himself the same distance backwards and performs a complete golf swing carefully following the swing starter beside it.

By the present training device it is possible to accurately determine the correct inclination angle of the swing plane. Moreover, it is possible to closely and carefully monitor the start of the swing.

The drawings show further constructional details. The web is provided with a through opening 11, which forms a hand grip for the swing starter. The target rod 2 and the curved rod 3 have the cross-sections shown in Fig. 3 in order to enhance the stability thereof. The web 4 and the target rod 2 are painted white, while the upper surface of the curved rod 3 is painted red in order to contrast to the green grass and so that a clear indication will be achieved of the position in which the curved rod 3 hides the remaining portion of the swing starter.

As shown in Fig. 4, the mirror 6 is positioned in a recess 12 in the front portion 5 and may have a radius of curvature of about 100 mm in the longitudinal section.

It may be observed that the radius of curvature of the curved rod 3 is about 1,55 m, which corresponds to the distance from the shoulder to the golf club head of an ordinary golfer. This distance may vary considerably from person to person and in dependence of which golf club length is used. However, the difference in the swing circle along the length of the swing starter for a swing circle of about 1,3 meter is only about 2 cm compared to a swing circle of about 1,55 meter, and this small difference may be neglected, especially since the difference is in the radial direction which is hardly visible to the golfer.

There are numerous amendments, which may be made to the swing starter which are within the scope of the present invention. A second embodiment of the swing starter is shown in side view in Fig. 5. The target rod is replaced by a golf club shaft 15, which is positioned in the grass and extends towards the target. The

swing starter 16 comprises a curved rod 17, which at the front portion is provided with snap fasteners 18 for connection to the club shaft, thus obtaining a frictional grip. The curved rod may be provided with a mirror at the front portion, or the alternative indicator means described above may be used. It is also possible to add a flange which becomes barely visible at the correct inclination angle.

There are further alternatives for the indicator means. It is of course not necessary first to adjust the swing starter to a plane passing through the golfer's eyes and then increase the angle (relative to the vertical) by 5 to 8 degrees, but the swing starter may be directly adjustable to the correct swing plane. This may be obtained by inclining the mirror 5 to 8 degrees in relation to the surface of the curved rod so that the correct swing plane is obtained when the line 7 of the mirror passes the eyes of the golfer. Furthermore, it is possible to use two offset lines, one for the eyeplane and one for the shoulder plane, in which case the mirror is convex also in the cross-sectional direction. There are other indicator means than the mirror, such as optical devices producing a moiré effect when the golfer views the device square to the surface thereof. Moreover, the target rod may be narrowing at the right end and at the side facing away from the golfer in order to allow the swing starter to be inclined 5 to 8 degrees until it becomes visible behind the curved rod. Alternatively the curved rod may be widening at the right end. The target rod may comprise a scale or indication lines showing the exact number of degrees of inclination relative to the eyeplane. Further modifications are feasible to a skilled person.

It is clear that the swing starter is intended to be used outdoors by piercing the pin 9 in the ground. However, the swing starter may also be used indoors by placing the pin 9 essentially horizontally pointing towards the golfer whereby the pin acts as a support for the swing starter.

The swing starter may be used as a putting trainer by placing the tip of the club head against the side of the curved rod and allowing the putter to follow the curved rod back and forwards. For this reason, the curved rod is provided with a recess at the



side as appear from Fig. 3.

It is possible to make the whole swing starter in a transparent material. In this case, the swing starter may be an integral piece of transparent plastic about 10 mm thick and having the roughly triangular shape shown. The upper edge may be painted red and the lower edge may be painted white to show the swing circle and target line, respectively.

In the embodiment shown in Figs. 1 to 4, the curved rod 3 and the target rod 2 may very well have a cross-section:

The indicator means may be a protrusion extending towards the golfer and two painted lines one at each side of the protrusion. When the same amount of lines are visible on each side of the protrusion, the eyeplane has been obtained. In order to adjust for 5 to 8 degrees further inclination, one of the painted lines may be narrower and the other thicker.

In the case of a mirror as indicator means, it is convenient to control the position of the shoulder portion by placing the club shaft from one shoulder to the other and checking that the club shaft is carefully parallel to the line 7 of the mirror. The line 7 is preferably provided with a small middle mark as shown in the drawings.

In a swing, the club will not always be square to the curved rod but will open a small amount. This opening of the club can be shown by cross lines on the curved rod as shown in phantom lines in Fig. 1. Alternatively, the right end of the curved rod may be somewhat chamfered.

The swing starter according to the present invention is an improvement of previously used club shafts laying on the ground and indicating the target line. Such a club shaft can only indicate the target line, while the swing starter according to the present invention gives the player the right arc within the right plane in relation to the target line.

While preferred embodiments of the invention has been described above, the intention is that the invention is not limited to these embodiments, but modifications obvious to a person skilled in the art are intended to be included within the scope of the invention as defined in the appended claims.



## C L A I M S

1. Swing starter comprising a curved rod (3) intended to indicate a desired swing plane for swinging a golf club, characterized in that the curved rod extends from a golf ball position and backwards and upwards essentially along a portion of a circle corresponding to a desired swing circle; and that the swing starter comprises an indicator means to indicate when the rod has been inclined in relation to a target line for defining together with the target line, a plane which corresponds to the desired swing plane and the curved rod indicating the bottom portion of the desired swing circle.

2. Swing starter as claimed in claim 1, characterized in that it comprises

a) a straight target rod (2) positioned close to the ground and having at least one pin (9) adjacent one end thereof for engagement with the ground, the pin being joined with the target rod (2) by a friction connection so that the swing starter is pivotable under friction around an axis aligned with the target rod,

b) a web (4) interconnecting the target rod (2) and the curved rod (3),

c) the curved rod having a width which hides to remaining portion of the swing starter when viewed from above.

3. Swing starter as claimed in claim 1 or 2, characterized in that the indicator means is a convex mirror (6) having an indicator line (7), the mirror being positioned at the front portion of the curved rod (3).

4. Swing starter as claimed in claim 3, characterized in that said indicator line (7) is parallel to the target line and positioned at the middle of the mirror.

5. Swing starter as claimed in claim 1 or 2, characterized in that the indicator means is a portion of the swing starter below the curved rod (3) which becomes barely visible when the desired swing plane has been obtained.

6. Swing starter as claimed in claim 1, characterized in that it comprises a connection means for connecting the curved rod to the shaft of a golf club, which is positioned



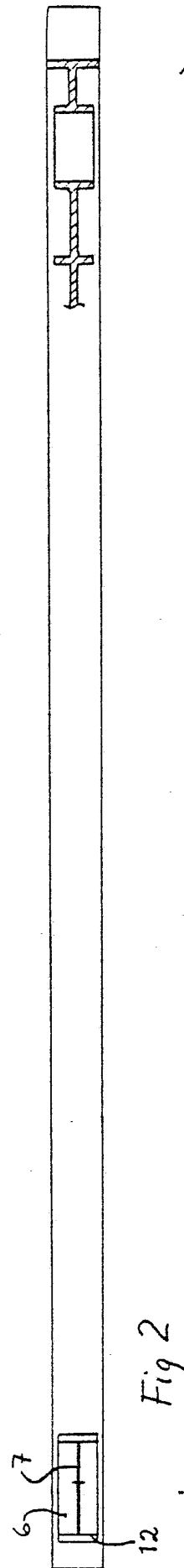
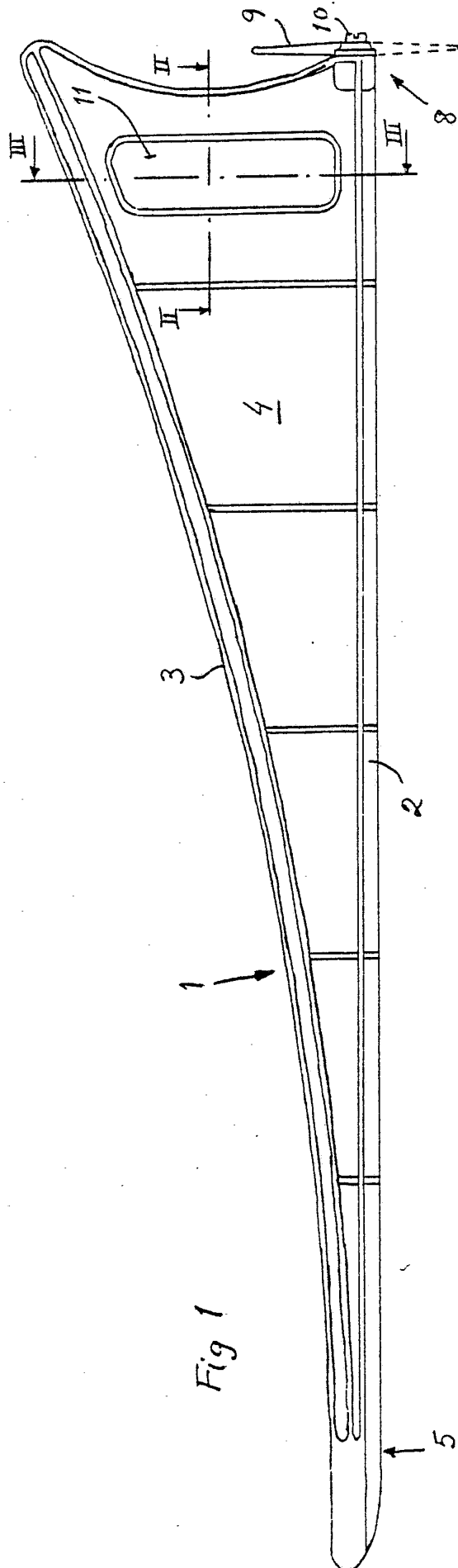
on the ground as a target line, the connecting means allowing the curved rod to be pivoted under friction around an axis along the target line.

5 7. Swing starter as claimed in anyone of the preceding claims, characterized in that the curved rod has an upper surface having a colour which differs from the colour of the remaining portion of the swing starter.

10 8. Swing starter as claimed in anyone of the preceding claims, characterized in that the curved rod has an upper surface which is essentially plane in cross-section.

9. Swing starter as claimed in any of the preceding claims, characterized in that the overall length of the swing starter is about 0,6 m and that the radius of curvature of the curved rod is about 1,55 m.

15 10. Method of adjusting the swing starter of claim 1, which comprises a rod (3) extending along a portion of a desired swing circle and an indicator means, characterized in that a golfer places himself opposite the front portion (5) of the swing starter carefully along a line which is square to a target  
20 line and at a distance from the front portion which corresponds to the club length used; and adjusting the inclination of the rod until the indicator means indicates that the desired inclination has been obtained.



1/2

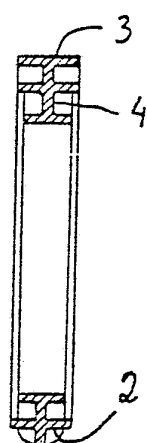


Fig 3

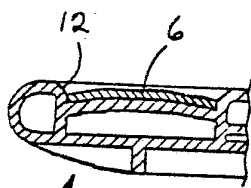


Fig 4

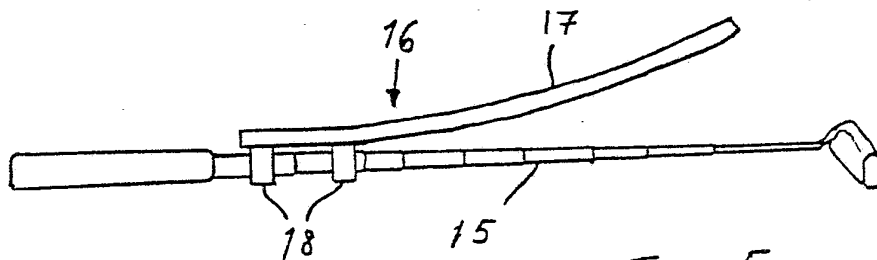


Fig 5

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/SE84/00260

| <b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>3</sup><br>According to International Patent Classification (IPC) or to both National Classification and IPC <span style="float: right;">3</span><br><div style="text-align: center; margin-top: 10px;">A 63 B 69/36</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                   |                                     |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
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| <b>II. FIELDS SEARCHED</b><br><div style="text-align: center; margin-top: 10px;">Minimum Documentation Searched <sup>4</sup></div> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <th style="width: 20%;">Classification System</th> <th style="width: 80%;">Classification Symbols</th> </tr> <tr> <td style="padding: 5px;">IPC 3</td> <td style="padding: 5px;">A 63 B 69/00, 36, 67/00, 57/00, 71/00</td> </tr> <tr> <td style="padding: 5px;">US C1</td> <td style="padding: 5px;">273: 26, 35, 181-192, 194</td> </tr> </table> <div style="text-align: center; margin-top: 10px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>5</sup></div> <div style="text-align: center; margin-top: 20px;">SE, DK, NO, FI classes as above</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                   |                                     | Classification System                                                                                                                         | Classification Symbols                                                                                                                  | IPC 3                                                                                                                            | A 63 B 69/00, 36, 67/00, 57/00, 71/00                                                                                                             | US C1                                           | 273: 26, 35, 181-192, 194 |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| Classification System                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Classification Symbols                                                                                                                            |                                     |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| IPC 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | A 63 B 69/00, 36, 67/00, 57/00, 71/00                                                                                                             |                                     |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| US C1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 273: 26, 35, 181-192, 194                                                                                                                         |                                     |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| <b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <th style="width: 10%;">Category <sup>6</sup></th> <th style="width: 60%;">Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup></th> <th style="width: 30%;">Relevant to Claim No. <sup>18</sup></th> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">US, A, 3 339 927 (R R NUNN)<br/>5 September 1967</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">X</td> <td style="padding: 5px;">FR, A1, 2 201 105 (DAISAN LEASE CO, LTD)<br/>26 April 1974<br/>&amp; JP 49073084</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">US, A, 3 580 584 (D P TROSKO)<br/>25 May 1971</td> <td style="text-align: center; vertical-align: top; padding: 5px;">2</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">US, A, 3 460 837 (N A CASSA)<br/>12 August 1969</td> <td></td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">US, A, 3 917 278 (D E STEINMAN, JR)<br/>4 November 1975</td> <td></td> </tr> </table> |                                                                                                                                                   |                                     | Category <sup>6</sup>                                                                                                                         | Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>                          | Relevant to Claim No. <sup>18</sup>                                                                                              | X                                                                                                                                                 | US, A, 3 339 927 (R R NUNN)<br>5 September 1967 | 1                         | X | FR, A1, 2 201 105 (DAISAN LEASE CO, LTD)<br>26 April 1974<br>& JP 49073084 | 1 | Y | US, A, 3 580 584 (D P TROSKO)<br>25 May 1971 | 2 | A | US, A, 3 460 837 (N A CASSA)<br>12 August 1969 |  | A | US, A, 3 917 278 (D E STEINMAN, JR)<br>4 November 1975 |  |
| Category <sup>6</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>                                    | Relevant to Claim No. <sup>18</sup> |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | US, A, 3 339 927 (R R NUNN)<br>5 September 1967                                                                                                   | 1                                   |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | FR, A1, 2 201 105 (DAISAN LEASE CO, LTD)<br>26 April 1974<br>& JP 49073084                                                                        | 1                                   |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | US, A, 3 580 584 (D P TROSKO)<br>25 May 1971                                                                                                      | 2                                   |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | US, A, 3 460 837 (N A CASSA)<br>12 August 1969                                                                                                    |                                     |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | US, A, 3 917 278 (D E STEINMAN, JR)<br>4 November 1975                                                                                            |                                     |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>*</sup> Special categories of cited documents: <sup>19</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> </div> <div style="width: 45%;"> <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>"G" document member of the same patent family</p> </div> </div>                                                                                                     |                                                                                                                                                   |                                     |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| <b>IV. CERTIFICATION</b> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 50%; padding: 5px;">           Date of the Actual Completion of the International Search <sup>1</sup><br/> <div style="text-align: center; margin-top: 10px;">1984-10-11</div> </td> <td style="width: 50%; padding: 5px;">           Date of Mailing of this International Search Report <sup>2</sup><br/> <div style="text-align: center; margin-top: 10px;">1984-10-15</div> </td> </tr> <tr> <td style="width: 50%; padding: 5px;">           International Searching Authority <sup>1</sup><br/> <div style="text-align: center; margin-top: 10px;">Swedish Patent Office</div> </td> <td style="width: 50%; padding: 5px;">           Signature of Authorized Officer <sup>10</sup><br/> <div style="text-align: center; margin-top: 10px;"> <br/>             Leif Törn           </div> </td> </tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                   |                                     | Date of the Actual Completion of the International Search <sup>1</sup><br><div style="text-align: center; margin-top: 10px;">1984-10-11</div> | Date of Mailing of this International Search Report <sup>2</sup><br><div style="text-align: center; margin-top: 10px;">1984-10-15</div> | International Searching Authority <sup>1</sup><br><div style="text-align: center; margin-top: 10px;">Swedish Patent Office</div> | Signature of Authorized Officer <sup>10</sup><br><div style="text-align: center; margin-top: 10px;"> <br/>             Leif Törn           </div> |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| Date of the Actual Completion of the International Search <sup>1</sup><br><div style="text-align: center; margin-top: 10px;">1984-10-11</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Date of Mailing of this International Search Report <sup>2</sup><br><div style="text-align: center; margin-top: 10px;">1984-10-15</div>           |                                     |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |
| International Searching Authority <sup>1</sup><br><div style="text-align: center; margin-top: 10px;">Swedish Patent Office</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Signature of Authorized Officer <sup>10</sup><br><div style="text-align: center; margin-top: 10px;"> <br/>             Leif Törn           </div> |                                     |                                                                                                                                               |                                                                                                                                         |                                                                                                                                  |                                                                                                                                                   |                                                 |                           |   |                                                                            |   |   |                                              |   |   |                                                |  |   |                                                        |  |