(51) International Patent Classification 6:
E04B 1/343, E04C 3/38, E06C 1/10, 1/383 // E04H 15/48

(21) International Application Number: PCT/SE95/00073
(22) International Filing Date: 24 January 1995 (24.01.95)
(30) Priority Data:
9400207-8 24 January 1994 (24.01.94) SE

(71/72) Applicant and Inventor: NOBELIUS, Åke [SE/SE]; Dr. Salens Gata 1, S-413 22 Goteborg (SE).

(74) Agent: GOTEBOGRS PATENTBYRA AB; P.O. Box 5005, S-402 21 Goteborg (SE).

(11) International Publication Number: WO 95/20079
(43) International Publication Date: 27 July 1995 (27.07.95)


Published
With international search report.
With amended claims.
In English translation (filed in Swedish).

(54) Title: ROLLABLE OR FOLDABLE STRUCTURAL MEMBER

(57) Abstract
A rollable or foldable structural member (11), which in its rolled out or laid out condition can take up support or pressure forces, and which comprises a number of in series arranged support means (12) and at least two flexible pull means (14) which link said support means, and by means of which a pressure force can be applied to the support means for bringing them together and holding them together from a rolled up passive condition to an erect, active condition. A number of channels (15) corresponding to the number of pull means (14) are arranged in the support means (12) and, where applicable, in between these arranged intermediary parts (15), said channels running through said support means and intermediary parts, and being on one hand designed with a shape which is complementary to the cross section of the pull means along the entire length of the support means, on the other hand are arranged at the largest possible distance from and substantially right opposite each other as seen in the bending plane of the structural member. The channels (15) are so dimensioned, that the pull means (14) are freely movable in their longitudinal direction.
FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

<table>
<thead>
<tr>
<th>Code</th>
<th>Name</th>
<th>Code</th>
<th>Name</th>
<th>Code</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>Austria</td>
<td>GB</td>
<td>United Kingdom</td>
<td>MR</td>
<td>Mauritania</td>
</tr>
<tr>
<td>AU</td>
<td>Australia</td>
<td>GE</td>
<td>Georgia</td>
<td>MW</td>
<td>Malawi</td>
</tr>
<tr>
<td>BB</td>
<td>Barbados</td>
<td>GN</td>
<td>Guinea</td>
<td>NE</td>
<td>Niger</td>
</tr>
<tr>
<td>BE</td>
<td>Belgium</td>
<td>GR</td>
<td>Greece</td>
<td>NL</td>
<td>Netherlands</td>
</tr>
<tr>
<td>BF</td>
<td>Burkina Faso</td>
<td>HU</td>
<td>Hungary</td>
<td>NO</td>
<td>Norway</td>
</tr>
<tr>
<td>BG</td>
<td>Bulgaria</td>
<td>IE</td>
<td>Ireland</td>
<td>NZ</td>
<td>New Zealand</td>
</tr>
<tr>
<td>BJ</td>
<td>Benin</td>
<td>IT</td>
<td>Italy</td>
<td>PL</td>
<td>Poland</td>
</tr>
<tr>
<td>BR</td>
<td>Brazil</td>
<td>JP</td>
<td>Japan</td>
<td>PT</td>
<td>Portugal</td>
</tr>
<tr>
<td>BY</td>
<td>Belarus</td>
<td>KE</td>
<td>Kenya</td>
<td>RO</td>
<td>Romania</td>
</tr>
<tr>
<td>CA</td>
<td>Canada</td>
<td>KG</td>
<td>Kyrgyzstan</td>
<td>RU</td>
<td>Russian Federation</td>
</tr>
<tr>
<td>CF</td>
<td>Central African Republic</td>
<td></td>
<td></td>
<td>SD</td>
<td>Sudan</td>
</tr>
<tr>
<td>CG</td>
<td>Congo</td>
<td>KP</td>
<td>Democratic People’s Republic of Korea</td>
<td>SE</td>
<td>Sweden</td>
</tr>
<tr>
<td>CH</td>
<td>Switzerland</td>
<td>KR</td>
<td>Republic of Korea</td>
<td>SI</td>
<td>Slovenia</td>
</tr>
<tr>
<td>CI</td>
<td>Côte d’Ivoire</td>
<td>KZ</td>
<td>Kazakhstan</td>
<td>SK</td>
<td>Slovakia</td>
</tr>
<tr>
<td>CM</td>
<td>Cameroon</td>
<td>LJ</td>
<td>Liechtenstein</td>
<td>SN</td>
<td>Senegal</td>
</tr>
<tr>
<td>CN</td>
<td>China</td>
<td>LK</td>
<td>Sri Lanka</td>
<td>TD</td>
<td>Chad</td>
</tr>
<tr>
<td>CS</td>
<td>Czechoslovakia</td>
<td>LU</td>
<td>Luxembourg</td>
<td>TG</td>
<td>Togo</td>
</tr>
<tr>
<td>CZ</td>
<td>Czech Republic</td>
<td>LV</td>
<td>Latvia</td>
<td>TJ</td>
<td>Tajikistan</td>
</tr>
<tr>
<td>DE</td>
<td>Germany</td>
<td>MC</td>
<td>Monaco</td>
<td>TT</td>
<td>Trinidad and Tobago</td>
</tr>
<tr>
<td>DK</td>
<td>Denmark</td>
<td>MD</td>
<td>Republic of Moldova</td>
<td>UA</td>
<td>Ukraine</td>
</tr>
<tr>
<td>ES</td>
<td>Spain</td>
<td>MG</td>
<td>Madagascar</td>
<td>US</td>
<td>United States of America</td>
</tr>
<tr>
<td>FI</td>
<td>Finland</td>
<td>ML</td>
<td>Mali</td>
<td>UZ</td>
<td>Uzbekistan</td>
</tr>
<tr>
<td>FR</td>
<td>France</td>
<td>MN</td>
<td>Mongolia</td>
<td>VN</td>
<td>Viet Nam</td>
</tr>
</tbody>
</table>

- **Note:** The table lists countries and their corresponding codes as used in the Patent Cooperation Treaty (PCT).
Rollable or foldable structural member

FIELD OF THE INVENTION

The present invention relates to a rollable or foldable structural member, which in its rolled out or laid out condition can take up support or pressure forces, and which comprises a number of in series arranged support means and at least two flexible pull means which link said support means, and by means of which a pressure force can be applied to the support means for bringing them together and holding them together from a rolled up passive condition to an erect, active condition.

BACKGROUND OF THE INVENTION AND TECHNICAL PROBLEM

Rollable structural members according to the above are known, for example from SE 462 292 and US 3,070,188. A problem with the design shown in the first mentioned patent, is that the rolling from rolled up to rolled out condition is difficult, because each block must be individually guided into its correct position. The later patent shows a ladder where the arrangement of the distance means and the pull means is only intended to take up loads vertically. Both the designs also have practically no ability to take up torsion forces which means that these designs are very weak in laterally, which has resulted in that they never have come to practical use.

Previously known structural members have not met expectations with reference to the ability to withstand large horizontal loads in spite of low dead weight. Besides, they have not been possible to produce at a reasonable cost. They have also been difficult to handle.
OBJECT OF THE INVENTION

The object of the present invention is to provide a rollable or foldable structural member, which apart from that it can absorb considerable loads both horizontally and vertically, is stiff, has automatic guiding of the individual support means between themselves, so that it can be mounted without manual adjustment of the support means, has a low weight and price, and which has a very wide area of application.

THE SOLUTION

The invention solves the objects by providing a structural member wherein a number of channels corresponding to the number of pull means are arranged in the support means and, where applicable, in between these arranged intermediary parts, said channels running through said support means and intermediary parts, and being on one hand designed with a shape which is complementary to the cross section of the pull means along the entire length of the support means, on the other hand are arranged at the largest possible distance from and substantially right opposite each other as seen in the bending plane of the structural member, and wherein the channels are so dimensioned, that the pull means are freely movable in their longitudinal direction.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described with reference to the accompanying drawings.

Fig. 1 schematically shows a section through a support member according to the invention in a rolled up condition in a side view.

Fig. 2 shows a section through an end part of the structural member according to fig. 1 which is provided with an end part.
is a section along the line III-III in Fig. 2.

Fig. 4 shows schematically three interconnected structural members from the side during use as an arch.

Fig. 5 shows in a larger scale a section through the in fig. 4 circled connection element between two interconnected structural members.

Fig. 6 shows a longitudinal section through a part of a structural member according to a modified embodiment of the invention.

Fig. 7 is a section along the line VII-VII in Fig. 6.

Fig. 8 is a section along the line VIII-VIII in fig. 6.

Fig. 9 shows a section through an alternative embodiment of an intermediate part according to fig. 6.

Fig. 10 shows a section through a further embodiment of a structural member according to the invention, in the form of the longitudinal members of a ladder.

Fig. 11 is a section along the line XI-XI in fig. 10.

Fig. 12 shows a section through an intermediate part which is a part of the longitudinal member in fig. 10.

Fig. 13 shows a section through a supporting means which is a part of the longitudinal member according to fig. 10.

Fig. 14 schematically shows two on each other stacked supporting means in a rolled structural element.

Fig. 15 is a section through a combined sun blind arm and sun blind pillar designed structural member according to the invention.
DESCRIPTION OF A PREFERED EMBODIMENT

Fig. 1 shows a structural member 11 which is rolled onto a cylinder 10, which member comprises a number of serially arranged support means 12 and between these inserted intermediate parts 13. Two pull means 14 are running through a respective channel 15 in the support means 12 and the respective intermediate part 13. As fig. 2 shows, the pull means 14 are used for pulling the support means and the intermediate parts together, so that the structural member 11 is extended from its rolled up, unstable condition, to a stiff stable condition. The intermediate part 13 is provided with parts 13a, which are running for some distance in depressions 12a in the support means.

As Fig. 2 shows, the intermediate parts 13 can be provided with contact surfaces 17 towards the support means, which surfaces are not in parallel, but have an angle which renders the extended structural member 11 an arc shape. Fig. 2 shows the lower end of one such arc with an end piece 18, which can be attached to a surface by means of a plate 19 which is connected to the end piece via a hinge 20. By altering or varying the angle between the surfaces, arcs with different radius can be accomplished.

The pull means 14 are each wound on a respective axle 21, which by means of not shown catch means which enable tightening of the pull means and locking in the tightened condition. Preferably, the pull means 14 are comprise flexible bands, e.g. textile or steel bands depending upon for which object the structural members 11 shall be used.

Fig. 3 shows a support means 12 in section, which is made from an extrudable material, e.g. plastic or aluminum, while the intermediate part 13 is form pressed from the same material and has substantially the same section as the support means, but with the difference, that the support
means is a double sided female and the intermediate part a double sided male.

A number of longitudinal channels in the profile reduces the amount of material and the weight. The two oblong channels 15 for pull means 14, has a form which is complementary to the band 14, i.e. a rectangular section, which channels are located at the largest possible distance from each other, and substantially opposed to each other as seen in the bending plane of the structural member. The channels 15 are so dimensioned, that the band 14 is freely movable in its longitudinal direction, while the side edges of the channel almost abut the side edges of the band, and prevent the support means 12 from being angled or turned on the band.

Through holes 22 are arranged in the four corners of the profile, for steel rods 23 which are insertable by means of press fitting, which function to absorb and transmit occurring, axial pressure forces to a foundation, end section 18 coupling section 25 (fig. 4 and 5) or similar.

A hole 24 which is drilled right through the support means 12 can be used for assembling a number of structural members at a distance from each other, wherein tubes or rods are mounted in the holes 24 to connect two or more in parallel placed structural members, e.g. for forming a ladder with the rods constituting the steps.

Fig. 4 shows an arc which is assembled by means of three structural member sections 11, which sections 11 are interconnected by means of coupling elements 25a and 25b. Fig. 5 shows how the interconnection is made, by means of cooperating dovetail shaped slots 26 and bars 27 in the coupling elements, which slots enable transversal sliding together to a rigid interconnected joint. The pull means 14 are locked in one end in direction of pull, by means of a clamp joint 28.
Other pull means 14 than bands are possible, e.g. wires, but the band is advantageous by being low, by having a low height, a large tensile strength, by distributing the pressure over a large surface, by being torsionally stiff in the plane of the band, if the band has large stiffness, e.g. is a steel band and can be wound up without problem.

In the embodiment shown in fig. 6 - 9, are the protruding parts 13a and 13b of the intermediate part 13 inserted into the aperture 12a of the support means 12, so that when rolling up the structural element, i.e. a relative pivoting of the support means around an imaginary pivot point, e.g. the point 30, the parts 13a and 13b remain in engagement with the support means. This has a large significance when the structural member shall be activated by rolling out and all support means and intermediate parts shall fall into place automatically without manual aid. The parts 13a and 13b also been designed in such a way, that they with the support means interconnected come into abutment with each other with their contact surfaces 17, and thereby take part in transmitting the pressure forces acting upon the supporting member 11.

In fig. 6 the structural member 11 comprises, as seen from left in the drawing, of an end part 18 designed as an intermediate part with a simple male part 13b, a support means 12, which can have a larger or smaller length (the support means is cut in suitable lengths from an extruded profile tube), a straight intermediate part 13, a support means 12 and again a straight intermediate part 13. Where the structural member passes over into a curved shape, are sector shaped intermediate parts 13 according to fig. 9 used instead of straight intermediate parts 13 according to fig. 6. By choosing different angles α for the sector part 13c which is limited by the contact surfaces 31, the curvature of the structural member can be decided within wide limits.
Fig. 10-13 shows an alternative design of a structural member 11, e.g. the longitudinal member of a ladder, where the pull means 14, which in this example is constituted by a wire, is entirely placed inside the longitudinal member. For this object the wire is locked with one of its ends by means of a wire lock 28 in a bottom end part 32 and extends via a channel 15 up to a second upper end part 33, which is provided with two pulleys 34. The wire 14 runs via the pulleys down into another channel 15 and back to the first mentioned end part 32 and to a inside this arranged ratchet wheel 35. By turning the ratchet wheel clockwise in Fig. 10, the wire is stretched, which means that the ladder is erected from a rolled up to an extended condition.

Fig. 11 shows the design of the upper end part 33, while the design of the support means 12 and the intermediate part 13 is shown in fig. 13 and fig. 12 respectively.

Fig. 14 shows a section through two onto each other "stacked" profiles of a somewhat modified type, designed for band shaped pull means. The support means 12 been given such a profile, that they during rolling up of the structural member, with about half their height can engage and overlap each other. This renders the rolled up package lateral stability and reduces the space which the longitudinal member will require in its rolled up condition according to fig. 1.

For certain special functions, the support means 12 and intermediate part 13 of the structural member can be designed with special, outer attributes, in the form of longitudinal grooves, slots, rails etc. for attachment of supplementary details or for functional purposes. Thus, the upper edge of the support means can be designed as a rail 36 for a trolley 37, the wheels 38 of which are guided laterally by side supports 39 and upwards by top flanges 40, if the structural member for example composes a sun blind
arm according to fig. 15. Over the top flanges, the trolley is provided with a platform 41, which carries a front profile 42, to which on one hand is attached the sun blind fabric 43 and on the other hand an endless pull line 44, the front part 44a of which departs from a not shown wire drum to an in the front profile arranged not shown spring mechanism, which holds the pull line tight and further to a pulley which is arranged at the bottom end of the structural member. From there, the return part 44b of the pull line runs back to the wire drum.

When the not shown sun blind roll is rotated for feeding out sun blind fabric 43, the line 44 will pull the trolley 37 along the structural member, wherein the sun blind fabric is kept tight. The spring mechanism serves to compensate for those variations in length which will occur when the diameter of the fabric roll is reduced and the diameter of the wire drum increases, so that the fabric always is tight.

As is evident from the above described embodiments, the structural member can be designed in many different ways within the scope of the invention. The invention is however not limited to the above described embodiments, but several variations are conceivable. For example, the support means can be designed with male and female parts according to art engaging each other and making it possible to dispense with the intermediate parts. However, this implies that also the support means must be form pressed and provided with cooperating concave and convex surfaces, which by application of the pull means gives the structural member the desired strength against transversal forces.
CLAIMS

1. A rollable or foldable structural member (11), which in its rolled out or laid out condition can take up support or pressure forces, and which comprises a number of in series arranged support means (12) and at least two flexible pull means (14) which link said support means, and by means of which a pressure force can be applied to the support means for bringing them together and holding them together from a rolled up passive condition to an erect, active condition, characterized in that a number of channels (15) corresponding to the number of pull means (14) are arranged in the support means (12) and, where applicable, in between these arranged intermediary parts (13), said channels running through said support means and intermediary parts, and being on one hand designed with a shape which is complementary to the cross section of the pull means along the entire length of the support means, on the other hand are arranged at the largest possible distance from and substantially right opposite each other as seen in the bending plane of the structural member, and that the channels (15) are so dimensioned, that the pull means (14) are freely movable in their longitudinal direction.

2. Structural member according to claim 1, characterized in that the pull means (14) are composed by flexible bands, and that the longitudinal edges of the band are guided along the edges of the channel (15), so that the support means and possibly the intermediary parts are substantially immovable across the longitudinal direction of the band.

3. Structural member according to claim 1 or 2, characterized in that opposed end surfaces of the support means (12) and/or between these arranged
intermediary parts (13) are designed with torsion forces absorbing, protruding parts (13a; 70) and depressions (12a) corresponding to these, that the support means (12) are free relative to each other and relative to the intermediate parts (13) in the sense that they are not articulately connected to each other, and att the protruding parts (13a; 70) and the depressions (12a) are so designed, that for a relative mutual swinging of the support means or a swinging between the support means and the intermediate part, around an imaginary pivot axis at or adjacent the end surfaces of the support means, said parts (13a; 70) being only partially able to swing out of engagement with the depression (12a) and vice versa.

4. Structural member according to claim 1, characterized in that the support means (12) are made from a profile which has been produced by extrusion, which has been cut in suitable lengths across the longitudinal direction of the profile.

5. Structural member according to claim 1, characterized in that the intermediate parts (13) are produced by injection moulding or similar, with a central part (13c) and to this connecting side parts (13a, 13b) which are insertable into apertures (12a) in the support means (12), which central part (13c) is designed alternatively with straight sector shaped contact surfaces (31) towards the support means.

6. Structural member according to claim 5, characterized in that the side parts (13a, 13b) of the intermediate parts (13) are designed with such a length, that their end surfaces (17) are positioned in abutment against each other, when the side parts are inserted into the support means.
7. Structural member according to claim 1, characterized in that through holes (22) have been made in the support means (12) and where applicable in the intermediate parts (13), for receiving pressure rods (23), for transmission of axial pressure forces.

8. Structural member according to claim 1, characterized in that the support means and the intermediate parts are designed so that they can be stacked into each other, comprising relative to each other displaced parts, which are arranged to engage correspondingly displaced parts on the next following support means during rolling of the structural member.
AMENDED CLAIMS

[received by the International Bureau on 26 June 1995 (26.06.95);
original claims 1-4, 7 and 8 amended;
remaining claims unchanged (3 pages)]

1. A rollable or foldable structural member (11), which in its rolled out or laid out tight condition can take up support or pressure forces, and which comprises a number of in series arranged support means (12) and at least two flexible pull means (14) which link said support means, and by means of which a pressure force can be applied to the support means for bringing them together and holding them together from a rolled up passive condition to an erect, active condition, and which pull means (14) are arranged to running through channels (15) in said support means and being designed with a shape which is corresponding to the cross section of the pull means, characterized in that between the support means (12) are arranged intermediary parts (13) provided with contact surfaces (17) towards the support means, which surfaces, in the area where the structural member shall have arc shape, are designed sector shaped,
that the opposed end surfaces of the support means (12) and/or the intermediary parts (13) are designed with torsion forces absorbing, protruding parts (13a; 70) and depressions (12a) corresponding to these,
that the support means (12) and the intermediary parts (13) are axially movable in the direction of the slack pull (14) means,
that the pull means (14) are composed by flexible bands, freely movable in their longitudinal direction, and
that the channels (15) are located substantially opposed to and at the largest possible distance from each other.

2. Structural member according to claim 1, characterized in that the longitudinal edges of the band are guided along the edges of the channel (15).
3. Structural member according to claim 1 or 2, characterized in that the protruding parts (13a; 70) and the depressions (12a) are so designed, that for a relative mutual swinging of the support means and the intermediate part, around an imaginary pivot axis at or adjacent the end surfaces of the support means, said parts (13a; 70) being only partially able to swing out of engagement with the depression (12a).

4. Structural member according to claim 1, characterized in that the support means (12) are made from a profile which has been produced by extrusion, and cut in suitable lengths across the longitudinal direction of the profile.

5. Structural member according to claim 1, characterized in that the intermediate parts (13) are produced by injection moulding or similar, with a central part (13c) and to this connecting side parts (13a,13b), which are insertable into apertures (12a) in the support means (12), which central part (13c) is designed alternatively with straight sector shaped contact surfaces (31) towards the support means.

6. Structural member according to claim 5, characterized in that the side parts (13a,13b) of the intermediate parts (13) are designed with such a length, that their end surfaces (17) are positioned in abutment against each other, when the side parts are inserted into the support means.

7. Structural member according to claim 1, characterized in through holes (22) in the support means (12) and in the intermediate parts (13), for receiving pressure rods (23), for transmission of axial pressure forces.
8. Structural member according to claim 1, characterized in that the support means (12) and the intermediate parts (13) are designed so that they can be stacked upon each other, comprising relative to each other displaced parts, which are arranged to engage correspondingly displaced parts on the next following support means during rolling of the structural member.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**


According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC6: E04B, E04C, E04H, E06C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US, A, 3295269 (W. SCHUSTER), 3 January 1967 (03.01.67), column 2, line 53 - column 3, line 28, figures 1-4A</td>
<td>1, 2</td>
</tr>
<tr>
<td>X</td>
<td>US, A, 3349526 (W. SCHUSTER), 31 October 1967 (31.10.67), column 8, line 14 - line 25, figures 26-31</td>
<td>1, 2</td>
</tr>
<tr>
<td>X</td>
<td>US, A, 2822096 (W. SCHUSTER), 11 February 1958 (11.02.58), column 2, line 56 - column 3, line 12; column 4, line 37 - line 49, figures 4, 9, 10, 14</td>
<td>1, 2, 3</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C. See patent family annex.

**Date of the actual completion of the international search**

3 April 1995

**Date of mailing of the international search report**

17 May 1995

Name and mailing address of the ISA/Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. + 46 8 666 02 86

Authorized officer

Ingemar Hedlund

Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1992)
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US, A, 3851430 (W. SCHUSTER), 3 December 1974 (03.12.74), column 4, line 66 - column 5, line 32, figures 7-10</td>
<td>1,2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>EP, A1, 0468190 (SCHYDLO, M.T.), 29 January 1992 (29.01.92), column 6, line 1 - line 45, figures 2, 4</td>
<td>1-8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patent document cited in search report</td>
<td>Publication date</td>
<td>Patent family member(s)</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>US-A- 3295269</td>
<td>03/01/67</td>
<td>NONE</td>
</tr>
<tr>
<td>US-A- 3349526</td>
<td>31/10/67</td>
<td>NONE</td>
</tr>
<tr>
<td>US-A- 2822896</td>
<td>11/02/58</td>
<td>NONE</td>
</tr>
<tr>
<td>US-A- 3851430</td>
<td>03/12/74</td>
<td>NONE</td>
</tr>
</tbody>
</table>