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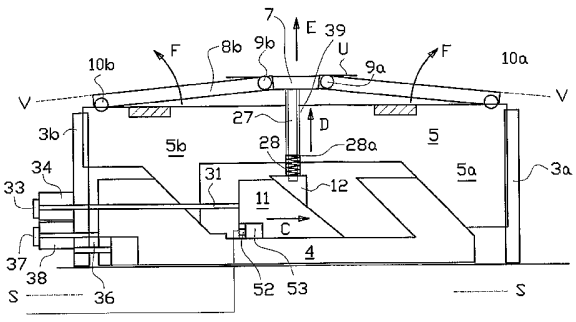
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(54) Title: TYRE BELT DRUM



(57) Abstract: Belt drum (1), particularly for shaping a belt layer and/or a tread layer or another tyre component provided with metal parts and the like into a circumferential whole, wherein the drum is rotatable about a centre line, comprising a number of support members (2) having a rigid support surface for the tyre component and situated at the circumference of the drum, wherein considered in a cross-sectional plane containing the centre line, the support members comprise middle support sections (7) and side support sections (8a, 8b) movably connected thereto, wherein the middle sections of the support members are moveable by first movement means (11, 12) between a first position, in which the respective support member forms a support surface that is parallel to the centre line, and at least one second position, in which a substantially convex support surface is formed by the respective support member, wherein the fBelt drum, particularly for shaping a belt layer and/or a tread layer or another tyre component provided with metal parts and the like into a circumferential whole, wherein the drum is rotatable about a centre line, comprising a number of support members having a rigid support surface for the tyre component and situated at the circumference of the drum, wherein considered in a cross-sectional plane containing the centre line, the support members comprise middle support sections and side support members are moveable by first movement means between a first position, in which the respective support member forms a support surface that is parallel to the centre line, and at least one second position, in which a substantially convex support surface is formed by the respective support member, wherein the first movement means are connected to the middle support sections in order to at least keep them parallel to the centre line in at least the one second position.

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TYRE BELT DRUM

The invention relates to a belt drum, particularly for shaping a belt layer and/or tread layer or another tyre component provided with reinforcement elements, such as of metal or aramide, and the like into a circumferential whole. The invention particularly relates to a drum on which a belt layer, a tread layer and an intermediately situated cap ply can be arranged.

In a process of manufacturing tyres it is known to make a package of several belt layers, optionally having opposite crossing steel wires, subsequently a so-called cap ply and finally one or more tread layers, on a drum, and then to supply the package to a carcass drum in order to be joined with the carcass parts for the tyre.

The cap ply can be arranged in the shape of a narrow, reinforced strip that is helically wound in one or several layers around the belt layers already arranged on the drum.

The more the shape of the cross-section of the tyre during the building process on the drum corresponds to the shape in the vulcanisation process, at the end of the manufacturing process of the tyre, the better a quality of tyre will be achieved.

It is desirable to arrange the strip on a diameter that corresponds with the final diameter dimension of the manufactured tyre as much as possible.

Furthermore in high performance tyres, in case of high speed, the tread of the tyre, which tread initially has a convex shape, will tend towards a flat condition. When the edge areas in the tread are only able to exert too low a resistance to the related diameter enlargement, undesired deformations may occur, which adversely affect the performance and driving comfort.

It is known to manufacture the tread on a drum having a membrane-like support surface on which the tread layers are arranged, after which by means of stamps positioned radially within the membrane and having a rigid pressure plane, the membrane is deformed to give the support surface, considered in longitudinal section of the drum, a convex shape, on which subsequently the strip of the cap ply is wound. As a result when arranging the cap ply strip, the tensions in said strip under conditions of use, for instance high speed, can be taken into account.

A drawback of this known approach is that applying the belt layers takes place on a membrane, which due to its nature cannot without additional measures offer a flat support surface to the belt layers. Furthermore when manufacturing tyres having treads of a deviating convexity, stamps adapted thereto will have to be arranged, which, if at all possible, is a laborious operation. Moreover several types of stamps will have to be kept ready.

There is a need for a belt drum with which in a simple and/or controllable way packages of at least belt layers and cap plies for tyres, such as for instance high performance tyres, can be made.

There is furthermore a need for a belt drum with which packages of at least belt layers and cap plies can be manufactured in optimal adjustment to extreme conditions of use of tyres, such as for instance high performance tyres.

There is furthermore a need for a belt drum with which packages of at least belt layers and cap plies can be manufactured in various diameters.

From one aspect the invention provides a belt drum, particularly for shaping a belt layer and/or a tread layer or another tyre component provided with metal parts and the like into a circumferential whole, wherein the drum is rotatable about a centre line, comprising a number of support members having a rigid support surface for the tyre component and situated at the circumference of the drum, wherein considered in a cross-sectional plane containing the centre line, the support members comprise middle support sections and side support sections movably connected thereto, wherein the middle sections of the support members are moveable by first movement means between a first position, in which the respective support member forms a support surface that is parallel to the centre line, and at least one second position, in which a substantially convex support surface is formed by the respective support member, wherein the first movement means are connected to the middle support sections in order to at least keep them parallel to the centre line in at least the one second position.

The belt drum may furthermore be provided with orienting means for keeping the middle support section parallel to the centre line at all times, in the one or several second positions and optionally in the first position as well.

From a further aspect the invention provides a belt drum, particularly for shaping a belt layer and/or a tread layer or another tyre component provided with metal parts and the like into a circumferential whole, wherein the drum is rotatable about a centre line, comprising a number of support members having a rigid support surface for the tyre component

and situated at the circumference of the drum, wherein considered in a cross-sectional plane containing the centre line, the support members comprise middle support sections and side support sections movably connected thereto, wherein the middle sections of the support members are moveable by first movement means between a first position, in which the respective support member forms a support surface that is parallel to the centre line, and at least one second position, in which a substantially convex support surface is formed by the respective support member, wherein the middle support sections are attached to the first movement means with a rigid angle.

In this way the belt layers are at all times reliably supported, when being arranged on the drum and when being made convex.

Considered in plane parallel to the centre line, the support members are divided, as a result of which in principle several convex shapes can be achievable. In one embodiment of the belt drum according to the invention, the support members are movable to, particularly are adjustable in, several, selected second positions having a different convexity, so that the shape of the tread of a type of tyre to be manufactured can be specifically adjusted to.

The middle support sections can be connected to the related side support sections for subjecting them to a rotational motion during movement between the first position and the at least one second position.

The middle and side support sections may be connected to each other so as to be rotatable about an axis tangential to the drum.

The side support sections can be movably and rotatably connected to the rest of the drum, again considered in a plane of longitudinal section of the drum.

In one embodiment the drum has a plane of symmetry that is perpendicular to the centre line and the support members in the second position form a support surface that is symmetrical with respect to the plane of symmetry and in the middle support section is situated further from the centre line than the adjacent side sections are.

The middle support section can form a substantially closed and/or straight support surface.

The side sections can form straight support surfaces and can be rotatably connected to the rest of the drum about points of rotation that in a direction parallel to the centre line are spaced apart from the plane of symmetry.

Preferably the points of rotation between the support sections one to the other and/or between the support sections and the rest of the drum – considered in a direction parallel to the centre line – are adjustable.

In one embodiment, in which the shortening of the length in a direction parallel to the centre line as a result of the radial expansion can be compensated, the support sections at the location of the mutual connection are movable with respect to each other in a direction parallel to the centre line. This can be done by means of a mortise and tenon joint, particularly by means of a slotted hole.

For maintaining a support surface in axial direction that continues as much as possible, the support sections can engage into each other considered in a direction parallel to the centre line.

In a further development the belt drum according to the invention is provided with first stop means for limiting the radial outward movement

of the support members to the second position, as well as with first adjustment means for adjusting the first stop means. In this way the second position and thus the convex shape can be adjusted adapted to the shape of the tread of the tyre to be manufactured.

The movement of the support members between the first and the second position can be easily and reliably achieved when the first movement means comprise first cone means and second cone means, wherein the first cone means are situated radially within the second cone means and are movable with a directional component in a direction parallel to the centre line in order to radially displace the second cone means, wherein the support members are connected to the second cone means for movement thereby. The first cone means are preferably movable according to a direction parallel to the centre line.

The said first stop means can be active in limiting the movement of the first cone means in a direction parallel to the centre line.

From a further aspect the invention provides a belt drum as described above, furthermore provided with second movement means for moving the support members from a position that is radially retracted with respect to the centre line to at least one position that is radially extended with respect to the centre line. Thus the diameter of the tyre to be manufactured can simply be adapted to using the same, shaping drum and the same support members.

The support members can be movable by means of the second movement means between both positions in a condition in which, considered in a cross-sectional plane containing the centre line, the support surfaces are situated parallel to the centre line.

The adjustment of the support members can be facilitated here by second stop means for limiting a joint radial outward movement of the support members, as well as by second adjustment means for adjusting the second stop means.

Just like the first movement means, the second movement means can comprise third cone means and fourth cone means, wherein the third cone means are situated radially within the fourth cone means and are movable with a directional component in a direction parallel to the centre line in order to radially displace the fourth cone means, wherein the support members are radially movable by the fourth cone means. The third cone means can be movable according to a direction parallel to the centre line. The second stop means can be active in limiting the movement of the second cone means in a direction parallel to the centre line.

In a combined embodiment of the belt drum according to the invention the third cone means are movable by the second cone means. The second adjustment means can be active in adjusting the distance between the second and the third cone means, considered in a direction parallel to the centre line.

From a further aspect the invention provides a belt drum, particularly for shaping a belt layer and/or a tread layer or another tyre component provided with metal parts and the like into a circumferential whole, wherein the drum is rotatable about a centre line, comprising a number of support members having a rigid, particularly substantially closed support surface for the tyre component, and situated at the circumference of the drum, wherein considered in a cross-sectional plane containing the centre line of the drum, the support members are moveable by first movement means between a first position, in which a support surface is formed that

is parallel to the centre line and at least one second position, in which a substantially convex support surface is formed.

From a further aspect the invention provides a belt drum, particularly for shaping a belt layer and/or a tread layer or another tyre component provided with metal parts and the like into a circumferential whole, wherein the drum is rotatable about a centre line, comprising a number of support members having a rigid support surface for the tyre component and situated at the circumference of the drum, wherein considered in a cross-sectional plane containing the centre line, the support members are moveable by movement means between a first position, in which a support surface is formed that is parallel to the centre line and is situated at a first radial distance from the centre line and at least one second position, in which a support surface is formed that is parallel to the centre line and is situated at a second radial distance that is larger than the first radial distance from the centre line, wherein the movement means comprise first cone means and second cone means, wherein the first cone means are situated radially within the second cone means and are movable with a directional component in a direction parallel to the centre line in order to radially displace the second cone means, wherein the support members are connected to the second cone means for movement thereby. In this way the belt drum can easily and reliably be adjusted as regards diameter.

The first cone means preferably are movable according to a direction parallel to the centre line.

Preferably the belt drum is provided with first stop means for limiting a radial outward movement of the support members, as well as with first adjustment means for adjusting the first stop means, wherein the first stop means are active in limiting the movement of the first cone means in a direction parallel to the centre line.

The aspects and measures described and/or shown in the application can where possible also be applied independent from each other. The individual aspects, such as support surface movement and support surface design and cone positioning, and other aspects may be the subject of divisional applications related thereto.

The invention will be elucidated on the basis of a number of exemplary embodiments shown in the attached drawings, in which:

Figure 1 shows a schematic cross-section, of one half of an exemplary embodiment of a drum according to the invention, in the initial position;

Figure 1A shows a cross-section according to arrow IA-IA of the drum of figure 1;

Figure 2 shows the drum of figure 1, in expanded position;

Figure 3 shows the drum of figure 2, in a convex shaping position;

Figure 4 shows an alternative exemplary embodiment of a drum according to the invention, in a cross-section comparable to the one of figure 1, however, without the possibility of shaping;

Figures 5A-C show a top view, end view and side view, respectively, of an exemplary embodiment of support members for a drum according to the invention;

Figures 6 and 7 show schematic views of two possible embodiments of support members in a drum according to the invention.

The drum 1, partially shown in figure 1, has a centre line S and has a circumferential series of support members 2 and end walls 3a, 3b. In the centre of the drum 1, coaxially about centre line S, a circumferential cone 4 formed as one body is accommodated so as to be slidable in a direction parallel to the centre line S, which cone 4 is provided with cone members 4a, 4b that are also circumferential. Cone members 4a and 4b have respective cone surfaces 20a, 20b that form circumferential cone surfaces. Said cone surfaces may form facets, that means that they are built up from a series of flat parts.

Radially outside the cones 4, pressure members 5 are arranged, for instance 24, provided with inwardly extending cone members 5a, 5b provided with cone surfaces 21a, 21b, that are oriented radially inclined to the inside, and which cooperate with cone surfaces 20a, 20b. At the radial outer surface of the pressure members 5 recesses 25a, 25b are arranged, in which circumferential contraction bands 26a, 26b have been accommodated.

At the axial ends the pressure members 5 are guided so as to be radially slidable in guides 24a, 24b in end walls 3a, 3b.

At the radial outside of the pressure members 5 support members 2 are supported, which define a surface, substantially closed support surface T. As can also be seen in figures 5A-C the support members 2 form plates, in this example 24, in a number equal to the pressure members 5. In this example the support members 2 have three parts, namely a (in both plane main directions) rigid middle section 7 and (in both plane main directions) rigid side sections 8a, 8b. At the location of the hinge pins 9a, 9b the middle section 7 is hinged to the side sections 8a, 8b. At the location of hinges 10a, 10b the side sections 8a, 8b are hinged to the pressure member 5, in this case near its axial ends, also see figure 5A-C.

It can furthermore be seen in figure 1 that a rod 35 projects in axial direction from the cone member 4b, which rod at one end is provided with a stop 37. Said stop may abut the permanent stop 38, that is attached to end wall 3a. The location of the stop 37 along rod 35 can be adjusted using means that are not further shown, in order to adjust the freedom of movement in the direction A of the cone member 4.

Figure 1 furthermore shows a pneumatic cylinder 51 which by means of line 50 is connected to a source of compressed air that is not further shown. They ensure the drive of the cone member 4 in the direction A, parallel to the centre line S.

A space 4c is left open between the cone members 4a, 4b, in which a circumferential cone ring 11, forming one unity, is arranged so as to be slidable in axial direction (S) over the radial outer surface 60 of cone 4. The cone ring 11 is provided with a cone surface 22, that may also be provided with facets, in this case also 24. A pressure piece 12 with a slanted surface 23 thereof supports on the cone surface 22. In the radial direction a pin 27 extends from the pressure piece 12, which pin at the location of 29 is attached in pressure piece 12 and at the location of 30, in two directions that are perpendicular to each other, is rotation-fixedly or rigidly (forming a rigid angle) attached to the middle section 7. The pin 27 extends through a radial passage 39 in pressure member 5. A compression spring 28 is placed around pin 27, and on the one hand rests against a radial inner surface on pressure member 5, for instance in the bottom of a recess 28a formed therein, and on the other hand against a radial outer surface of pressure piece 12.

In axial direction to the left a rod 31 extends from the cone ring 11, at the end of which rod a stop 33 is attached. For the stop 33 a permanent stop 34 is attached on the end wall 3a. The location of the stop 33 along the rod 31 can be adjusted using means that are not further shown, in

order to adjust the freedom of movement in the direction C (figure 3) of the cone member 4.

For movement in the direction C (figure 3) of the cone ring 11 use is made of a pneumatic cylinder 53, which by means of line 52 is connected to a source of compressed air.

It is noted that instead of said pneumatic cylinders use can be made of other movement means, such as hydraulic cylinders or spindle drives.

In the figures 5A-C an example of support members 2 is shown, wherein a middle section 7 is provided with an undulating edge, having projecting fingers 43a, b. The side sections 8a, b at the adjacent edges are provided with finger-shaped protrusions 42a, 42b, which interengage all-round with the fingers 43a, 43b, for forming a substantially closed support surface T, in the initial position.

At the other ends by means of pins 10a, 10b the side sections 8a, 8b are hingedly attached in holders 44a, 44b, that are fixed to pressure member 5.

As shown in figure 5C the hinge pins 9a, 9b with which the middle section 7 is hinged to the side sections 8a, 8b, are accommodated so as to be freely slidable (transverse to pin direction) in longitudinal holes 41a, 41b. As a result room is provided to an enlargement of the length defined by the sections 7, 8a, 8b when the support members 2 are in the position shown in figure 3. The finger interengagement 42a,b-43a,b prevents the creation of a transverse interruption in the support surface. It is noted that instead of hinge pins a rotatable connection with slide option can also be realised in other ways, for instance using a groove and tongue connection, wherein the tongue protrudes to such an extent into the

groove that also in the expanded position it remains extending into the groove.

In the initial position of the drum 1 shown in figure 1, the support members are placed with the support surface in the plane T. In said initial position belt layers are arranged, optionally with consecutive crosswise oriented reinforcement cords.

If a larger diameter of the support members is required, in connection with the diameter of the tyre to be manufactured, the air cylinder 51 is activated via the compressed air line 50, in order to move the cone 4 in the direction A. By cooperation of the surfaces 20a, b and 21a, b each pressure member 5 will be urged in the direction B radially to the outside. The pressure member 5 will then be guided in guides 24a, b. Said movement radially to the outside is counteracted by the contraction bands 26a, b. The radial distance between surface T and the centre line S is increased here, until finally the situation shown in figure 2 is achieved. The stop 32 has then abutted the stop 38. By adjustment thereof the desired distance S-T can be adjusted as desired.

During the movement of the cone 4 in the direction A, the cone ring 11, when considered axially, has been able to remain in its place. The support members 2 with their support surface are then still axially straight in the surface T.

Subsequently, in the position shown in figure 1, or shown in figure 2, a so-called cap ply is wound on the belt layers that have already been arranged, by means of a rubber strip provided with nylon reinforcement cords or reinforcement cables. Prior to commencing this, compressed air is put on line 52, for operating the pneumatic cylinder 53, in order to move the cone ring 11 in the direction C (figure 3). By cooperation of the surfaces 22 and 23 the pressure piece 12 will move radially to the

outside in the direction D and thus will the pin 27 and thus will the middle section 7, which due to the rigid connection 30 to the pin 27 will remain parallel to the centre line S with its support surface U. Because considered radially the pressure member 5 remains in its place, and as a result so will the hinges 10a, 10b, the side sections 8a, 8b will tilt in the direction F. The hinge pins 9a, 9b here move within the longitudinal holes 41a, b. The movement in the direction D stops when the stop 33 abuts the stop 34. By adjusting the stop 33 along the rod 31 the degree of expansion in the direction D can be adjusted, and thus the convex shape, in this case buckled convex shape, can be adjusted. In the case of figure 3 it then regards the angle between the slanted surfaces V and the surface U, the latter surface being parallel to the centre line S. The position of the middle section 7 can here remain positively controlled in the selected positions.

In figure 6 an alternative option is shown, wherein the hinge pins 10a, 10b are accommodated in longitudinal holes 56a, 56b in parts (that are not shown) 44a, 44b. The longitudinal holes 41a, b at the location of hinge pins 9a, 9b can then be dispensed with.

In figure 7 a further alternative is shown, wherein the hinge pins 10a, b have been replaced by hinge pins 10c, 10d that are situated further away from the axial ends of the side sections 8a, b. If so desired either the hinge pins 9a, 9b or the hinge pins 10c, 10d may be accommodated in longitudinal holes.

In the convex condition of the support members 2, as mentioned before, the strip for the cap ply is wound. After this has been done, the tread layers can be applied in order to complete the package, prior to this package being transferred to another drum, for instance a shaping/turn-up drum.

In figure 4 a drum according to the invention is shown, wherein only use is made of radial expansion in the direction B of pressure member 105, in order to bring the support members 102 with support surface T at a larger radial distance from centre line S. Comparable parts have comparable reference numbers, increased by 100.

When a package is ready the compressed air on the lines 50 or 52 can be released for facilitating taking the package from the drum 1, after which under the influence of the contraction bands 26a, b, 126a, b and the compression spring 28 a returning motion of the various parts takes place, until in the initial position of figure 1.

Claims

1. Belt drum, particularly for shaping a belt layer and/or a tread layer or another tyre component provided with metal parts and the like into a circumferential whole, wherein the drum is rotatable about a centre line, comprising a number of support members having a rigid support surface for the tyre component and situated at the circumference of the drum, wherein considered in a cross-sectional plane containing the centre line, the support members comprise middle support sections and side support sections movably connected thereto, wherein the middle sections of the support members are moveable by first movement means between a first position, in which the respective support member forms a support surface that is parallel to the centre line, and at least one second position, in which a substantially convex support surface is formed by the respective support member, wherein the first movement means are connected to the middle support sections in order to at least keep them parallel to the centre line in at least the one second position.

2. Belt drum according to claim 1, furthermore provided with orienting means for keeping the middle support section parallel to the centre line at all times.

3. Belt drum, particularly for shaping a belt layer and/or a tread layer or another tyre component provided with metal parts and the like into a

circumferential whole, wherein the drum is rotatable about a centre line, comprising a number of support members having a rigid support surface for the tyre component and situated at the circumference of the drum, wherein considered in a cross-sectional plane containing the centre line, the support members comprise middle support sections and side support sections movably connected thereto, wherein the middle sections of the support members are moveable by first movement means between a first position, in which the respective support member forms a support surface that is parallel to the centre line, and at least one second position, in which a substantially convex support surface is formed by the respective support member, wherein the middle support sections are fixedly attached to the first movement means.

4. Belt drum according to claim 1, 2 or 3, wherein the support members are movable to, particularly are adjustable in, several, selected second positions having a different convexity.

5. Belt drum according to any one of the claims 1-4, wherein the middle support sections are connected to the related side support sections for subjecting them to a rotational motion during movement between the first position and the at least one second position.

6. Belt drum according to any one of the claims 1-5, wherein the middle and side support sections are connected to each other so as to be rotatable about an axis tangential to the drum.

7. Belt drum according to any one of the preceding claims, wherein the side support sections are movably and rotatably connected to the rest of the drum, again considered in a plane of longitudinal section of the drum.

8. Belt drum according to any one of the preceding claims, wherein the drum has a plane of symmetry that is perpendicular to the centre line and

the support members in the second position form a support surface that is symmetrical with respect to the plane of symmetry and in the middle support section is situated further from the centre line than the adjacent side sections are.

9. Belt drum according to any one of the preceding claims, wherein the side sections form straight support surfaces and are rotatably connected to the rest of the drum about points of rotation that in a direction parallel to the centre line are spaced apart from the plane of symmetry.

10. Belt drum according to any one of the preceding claims, wherein the points of rotation between the support sections one to the other and/or between the support sections and the rest of the drum – considered in a direction parallel to the centre line – are adjustable.

11. Belt drum according to any one of the preceding claims, wherein the support sections at the location of the mutual connection are movable with respect to each other in a direction parallel to the centre line, such as by means of a mortise and tenon joint, particularly by means of a slotted hole.

12. Belt drum according to any one of the preceding claims, wherein the support sections engage into each other considered in a direction parallel to the centre line.

13. Belt drum according to any one of the preceding claims, provided with first stop means for limiting a radial outward movement of the support members to the second position, as well as with first adjustment means for adjusting the first stop means.

14. Belt drum according to any one of the preceding claims, wherein the first movement means comprise first cone means and second cone

means, wherein the first cone means are situated radially within the second cone means and are movable with a directional component in a direction parallel to the centre line in order to radially displace the second cone means, wherein the support members are connected to the second cone means for movement thereby.

15. Belt drum according to claim 14, wherein the first cone means are movable according to a direction parallel to the centre line.

16. Belt drum according to claim 13 and 14 or 15, wherein the first stop means are active in limiting the movement of the first cone means in a direction parallel to the centre line.

17. Belt drum according to any one of the preceding claims, furthermore provided with second movement means for moving the support members from a position that is radially retracted with respect to the centre line to at least a position that is radially extended with respect to the centre line.

18. Belt drum according to claim 17, wherein the support members are movable by means of the second movement means between both positions in a condition in which the support surfaces, considered in a cross-sectional plane containing the centre line, are situated parallel to the centre line.

19. Belt drum according to claim 17 or 18, provided with second stop means for limiting a joint radial outward movement of the support members, as well as with second adjustment means for adjusting the second stop means.

20. Belt drum according to any one of the preceding claims, wherein the second movement means comprise third cone means and fourth cone means, wherein the third cone means are situated radially within the

fourth cone means and are movable with a directional component in a direction parallel to the centre line in order to radially displace the fourth cone means, wherein the support members are radially movable by the fourth cone means.

21. Belt drum according to claim 20, wherein the third cone means are movable according to a direction parallel to the centre line.

22. Belt drum according to claim 19 and 20 or 21, wherein the second stop means are active in limiting the movement of the second cone means in a direction parallel to the centre line.

23. Belt drum according to any one of the claims 13-15 and any one of the claims 20-22, wherein the third cone means are movable by the second cone means.

24. Belt drum according to claims 19 and 23, wherein the second adjustment means are active in adjusting the distance between the second and the third cone means, considered in a direction parallel to the centre line.

25. Belt drum, particularly for shaping a belt layer and/or a tread layer or another tyre component provided with metal parts and the like into a circumferential whole, wherein the drum is rotatable about a centre line, comprising a number of support members having a rigid support surface for the tyre component and situated at the circumference of the drum, wherein considered in a cross-sectional plane containing the centre line, the support members are moveable by movement means between a first position, in which a support surface is formed that is parallel to the centre line and is situated at a first radial distance from the centre line and at least one second position, in which a support surface is formed that is parallel to the centre line and is situated at a second radial distance that is

larger than the first radial distance from the centre line, wherein the movement means comprise first cone means and second cone means, wherein the first cone means are situated radially within the second cone means and are movable with a directional component in a direction parallel to the centre line in order to radially displace the second cone means, wherein the support members are connected to the second cone means for movement thereby.

26. Belt drum according to claim 25, wherein the first cone means are movable according to a direction parallel to the centre line.

27. Belt drum according to claim 25 or 26, provided with stop means for limiting a radial outward movement of the support members, as well as with adjustment means for adjusting the stop means, wherein the stop means are active in limiting the movement of the first cone means in a direction parallel to the centre line.

28. Belt drum according to claim 25, 26 or 27, further provided with means for biasing the second cone means to the first position.

29. Belt drum according to any one of the preceding claims, furthermore provided with means for biasing the support members to the first position.

30. Belt drum provided with one or more of the characterising measures described in the attached description and/or shown in the attached drawings.

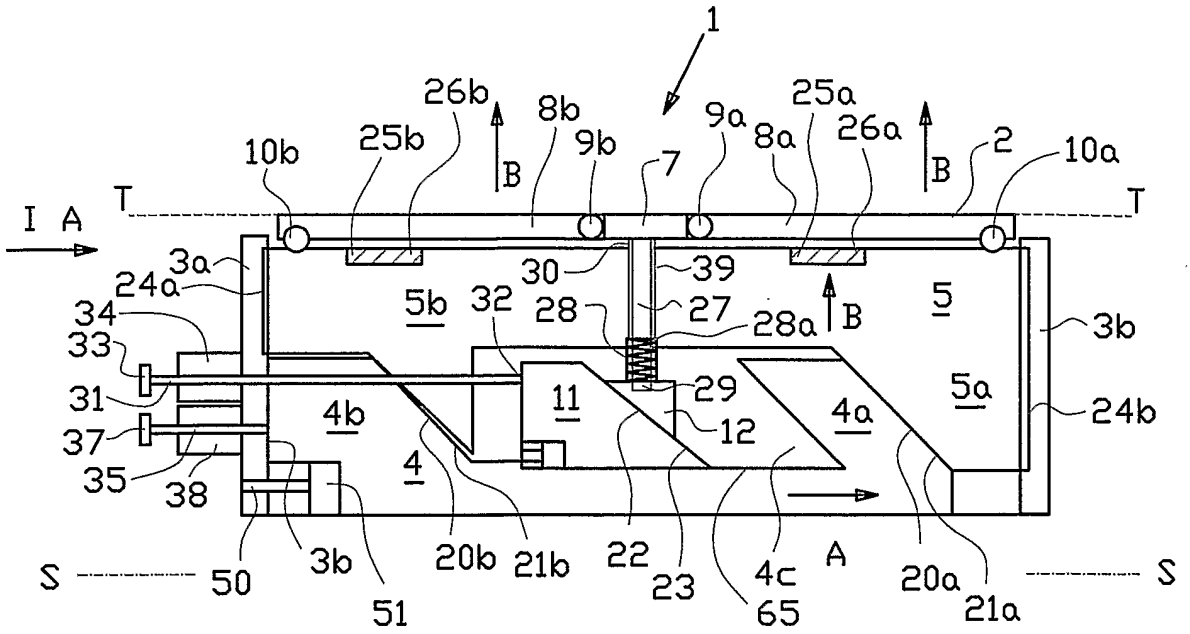

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26b
8b
9b
7
9a
25a
8a
26a
2
10a
10b
25b
B
T
T
I A
3a
24a
34
33
31
37
35
38
30
39
5b
32
28
27
28a
5
3b
29
11
4b
12
4a
5a
24b
4
50
3b
20b
21b
22
23
4c
65
A
20a
21a
S
S
51

FIG. 1

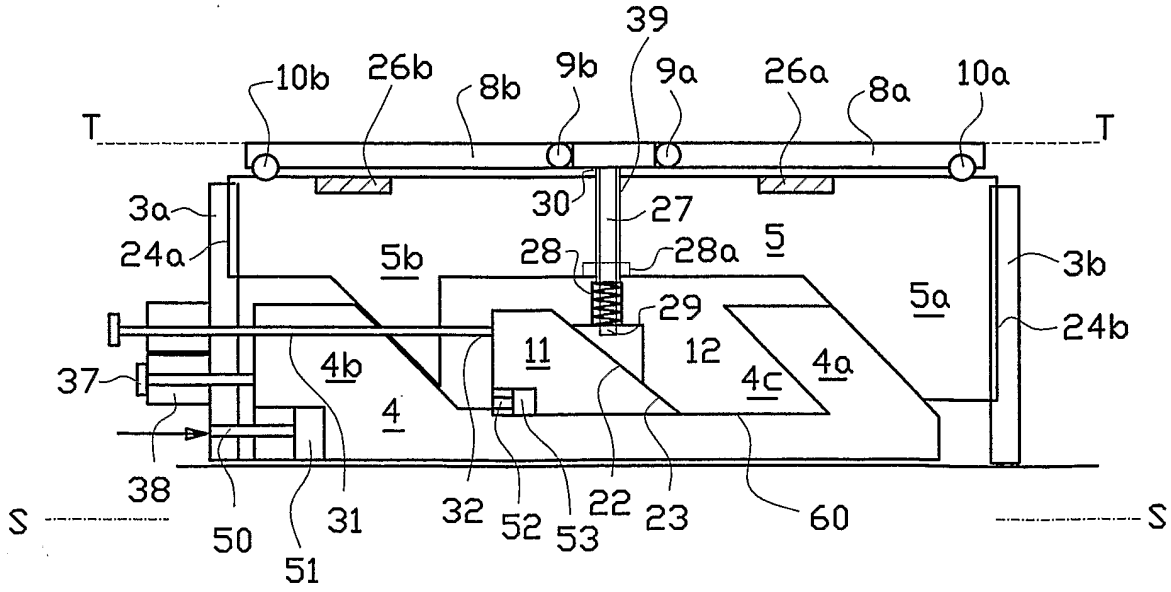

39
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26b
8b
9b
9a
26a
8a
10a
T
T
3a
30
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24a
5b
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5
3b
5a
29
24b
11
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23
60
S
51

FIG. 2

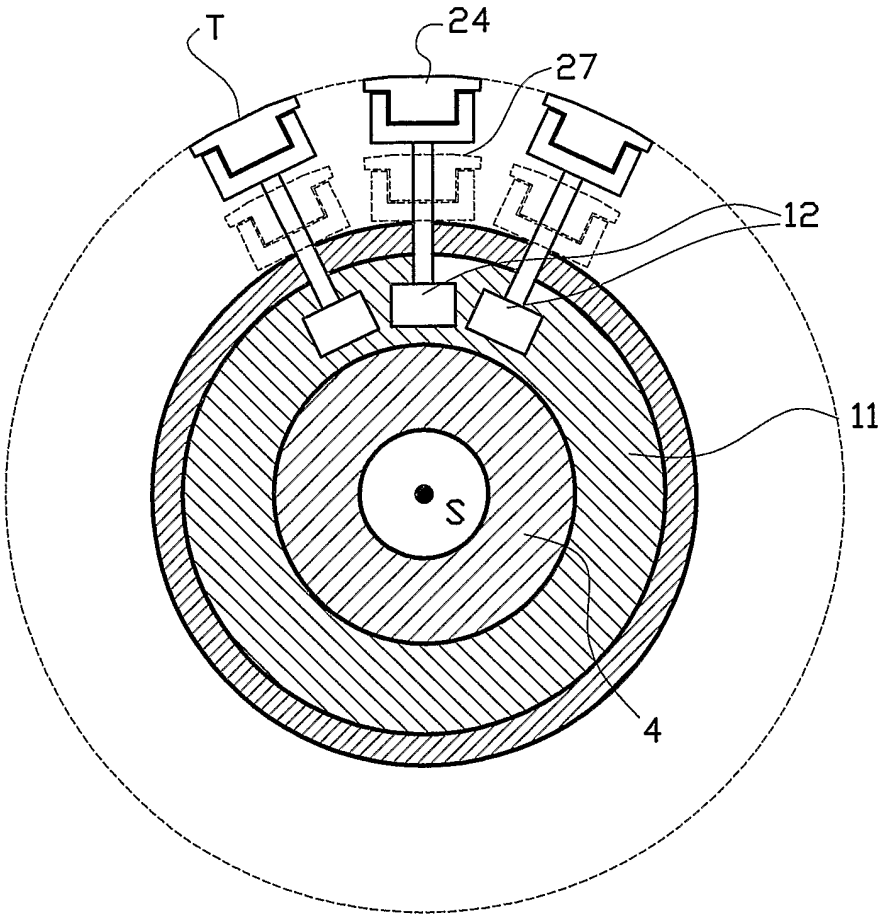


FIG. 1A

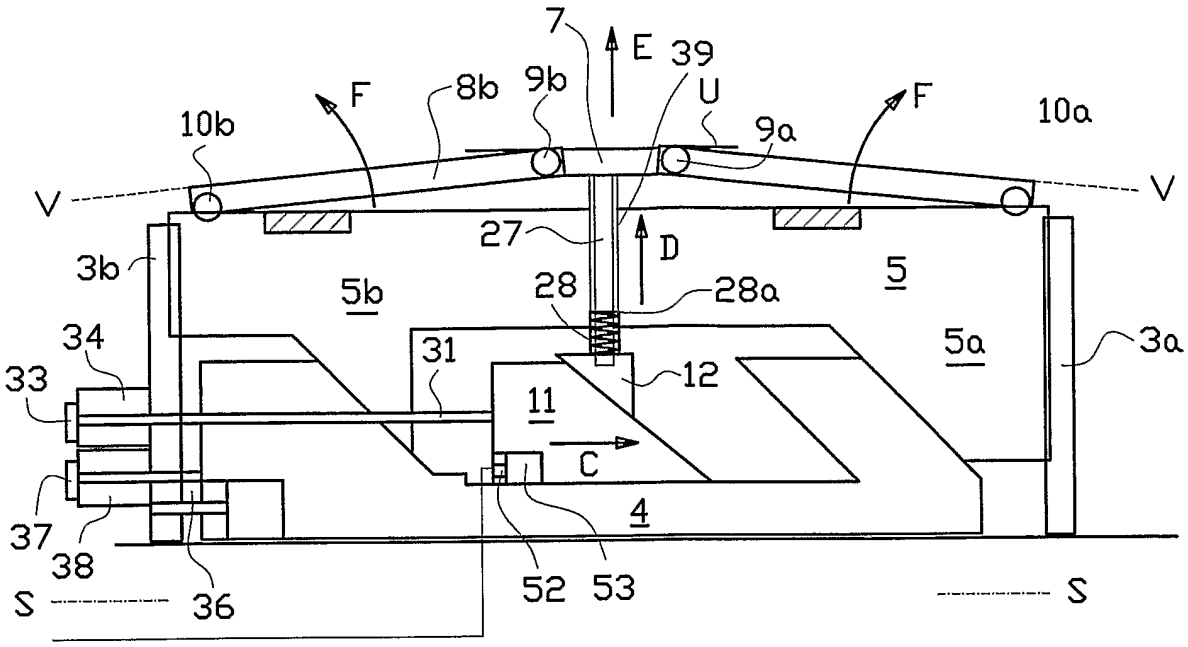

7
E
39
F
8b
9b
U
9a
F
10a
10b
V
V
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D
3b
5b
28
28a
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34
31
5a
3a
33
12
11
C
4
37
38
36
52
53
S
S

FIG. 3

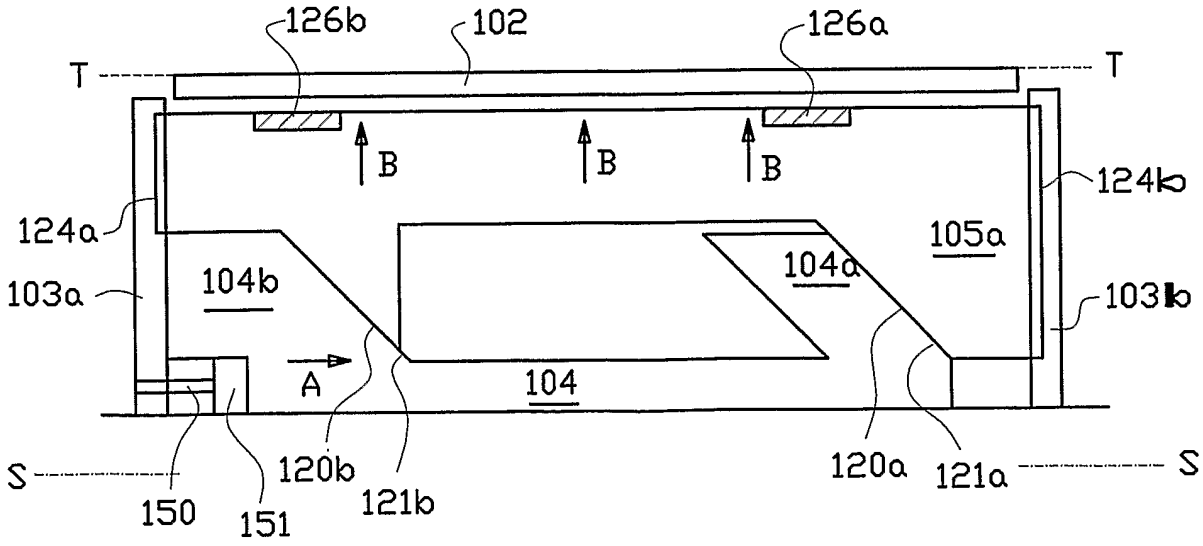

126b
102
126a
T
T
B
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124b
124a
105a
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103a
104b
103b
A
104
S
120b
121b
120a
121a
S
150
151

FIG. 4

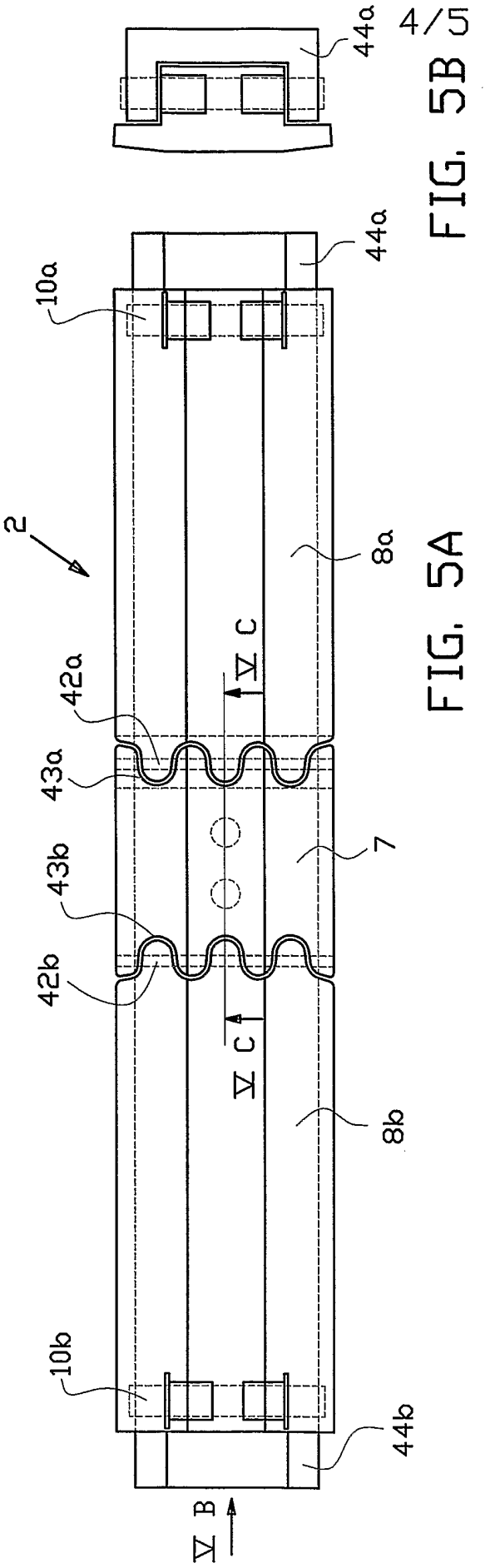


FIG. 5A

FIG. 5B

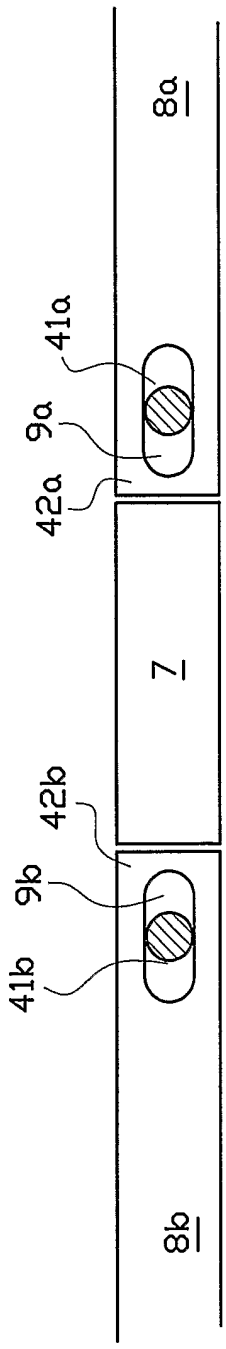


FIG. 5C

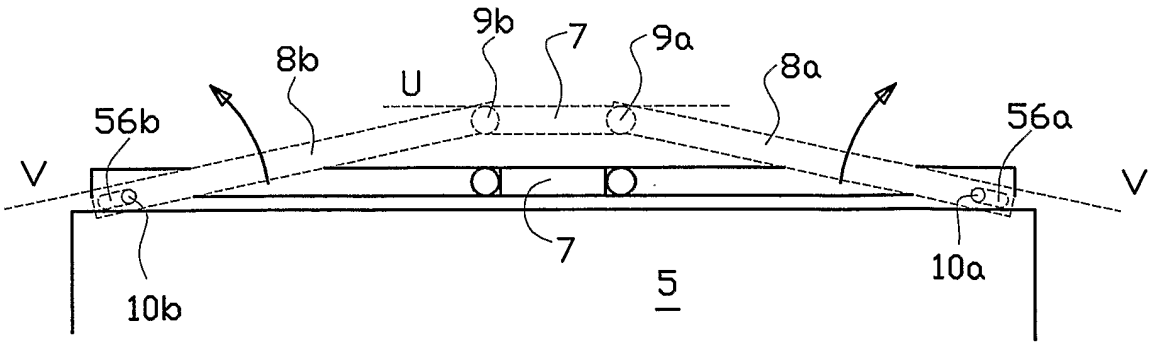


FIG. 6

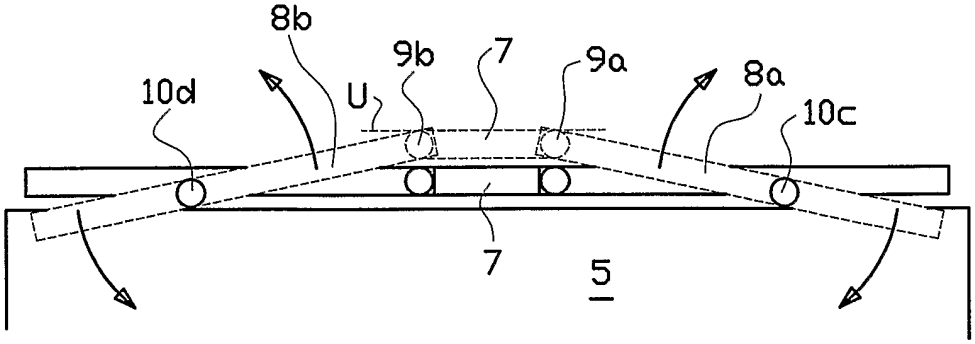


FIG. 7

INTERNATIONAL SEARCH REPORT

Inte al Application No
PCT/NL2005/000271

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B29D30/24

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)
IPC 7 B29D

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO 00/46018 A (FELTEN GILBERT ALPHONSE ; GOODYEAR TIRE & RUBBER (US)) 10 August 2000 (2000-08-10) page 6, line 7 - page 8, line 14; figures 1,2 page 9, line 9 - line 20; figures 4-6	1-3 14-24
X	FR 1 479 914 A (NAT STANDARD CO) 5 May 1967 (1967-05-05) figures 1,6	1-13
X	US 3 607 558 A (NEBOUT NOEL) 21 September 1971 (1971-09-21) figures 1,2,16,17	1-3

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 July 2005	26/07/2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Fregosi, A

INTERNATIONAL SEARCH REPORT

Int nal Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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X	EP 0 431 854 A (SUMITOMO RUBBER IND) 12 June 1991 (1991-06-12)	25-29
Y	column 3, line 12 - column 4, line 12; figure 1 column 5, line 49 - column 6, line 13; figures 1-5	14-24
X	US 3 207 648 A (SHILTS RICHARD L) 21 September 1965 (1965-09-21) figures 1-4	25-29
A	US 5 032 198 A (SAKUNO HIROAKI ET AL) 16 July 1991 (1991-07-16) column 15, line 9 - column 16, line 33; figures 23-25	1,3,25
A	US 4 846 907 A (YUZO KUMAGAI ET AL.) 11 July 1989 (1989-07-11) figures 3,7a-7d	1,3,25

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