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(54) **Device and method for supplying a strip for tire building**

(57) The invention relates to a device for supplying a strip, comprising a support surface for supporting the strip along a supply path, a first roller for guiding the strip along the support surface when the first roller is in an operative position with respect to the support surface and a first drive for driving the first roller in a first rotation direction about a first roller axis to advance the strip over the support surface in a conveyance direction along the supply path, wherein the first roller comprises brush members that are distributed around the first roller axis to form a circumferential brush surface for contacting the strip, wherein each brush member is resiliently flexible in a flexing direction about the first roller axis opposite to the first rotation direction. The invention further relates to a method for supplying a strip using the aforementioned device.

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Device and method for supplying a strip for tire building

BACKGROUND

The invention relates to a device and a method for supplying a strip for tire building.

WO 2014/057387 A2 discloses an apparatus for building tyres for vehicle wheels, with a forming support, an extruder for dispensing a continuous elongated element made of elastomeric material and two opposite conveyor belts arranged between the extruder and the forming support. The speed of the conveyor is controlled to vary the stretch coefficient. The head end of the continuous elongated element is not stretched because, once it has exited from the extruder, it is free until it reaches the conveyor. By subjecting the continuous elongated element - during the advancement - to a first stretching with a first stretch coefficient before applying on the support, it is possible to overcome the problems related to the head end.

The known apparatus has to be set up carefully to ensure that both conveyor belts are equally in contact with continuous elongated element during its advancement to ensure proper stretching. Improper setup or wear can cause tolerances between the opposite conveyors, resulting in less accurate stretching. Moreover, because of the large contact areas of both conveyors with the continuous elongated element, said element may not detach properly from said contact surfaces when the element leaves is discharged from the conveyor belts to the forming support.

It is an object of the present invention to

provide a device for supplying a strip for tire building, wherein the device and the method address at least one of the aforementioned drawbacks.

SUMMARY OF THE INVENTION

According to a first aspect, the invention provides a device for supplying a strip for tire building, comprising a support surface for supporting the strip along a supply path, a first roller for guiding the strip along the support surface when the first roller is in an operative position with respect to the support surface and a first drive for driving the first roller in a first rotation direction about a first roller axis to advance the strip over the support surface in a conveyance direction along the supply path, wherein the first roller comprises a plurality of brush members that are distributed around the first roller axis to form a circumferential brush surface for contacting the strip when the first roller is in the operative position, wherein each brush member is resiliently flexible in a flexing direction about the first roller axis opposite to the first rotation direction.

Because of their flexibility and their resilience, the brush members can automatically adapt to changes in thickness and/or shape of the strip, without requiring intermediate setup. The resilience can reliably bias the brush members against the strip, regardless of the thickness. Even when some of the brush members become shorter due to wear over time, the resilience still biases said worn brush members against the strip, thus ensuring a reliable contact between the first roller and the strip, regardless of tolerances or wear. The resistance between the brush members and the strips can advance the strip over the support surface in the conveyance direction.

In an embodiment each brush member is resiliently flexible in the flexing direction from an unflexed state

towards a flexed state, wherein the first roller axis in the operative position of the first roller is arranged at a first distance from the support surface at which the brush members are flexed from the unflexed state towards the flexed state upon contact with the strip. By choosing the first distance appropriately, it can be ensured that the brush members flex or bend upon contact with the strip.

In an embodiment thereof each brush member in the unflexed state defines a first radius of the brush surface, wherein the first distance is equal to or less than the first radius. Hence, the brush members can be arranged in contact with or in a flexed state at the support surface to ensure that the first roller reliably interacts with the strip supported on said support surface, regardless of its thickness and/or shape.

In a further embodiment thereof each brush member upon contact with the strip is arranged for flexing into the flexed state towards a second radius of the brush surface that is smaller than the first distance. Hence, the flexibility of the brush members can be chosen such that the thickness of the strip can pass between the brush surface of the first roller and the support surface.

In a preferred embodiment each brush member in its unflexed state has a brush member inclination opposite to the first rotation direction. Because of the brush member inclination, it can be prevented that the brush members bite into the strip. Instead, upon contact with the strip, the brush members can automatically flexed or bend from the unflexed state towards the flexed state, directing the ends of the brush members away from the strip instead of into the strip.

In a further embodiment each brush member is arcuate in its flexed state to form a convexly arcuate side, wherein the brush members are arranged to contact and slide over the strip with their convexly arcuate sides when the first roller is rotated in the first rotation direction. By allowing the brush members to slide over the

strip, any pressure forces exerted by the brush members onto the strip in a direction normal to the support surface can be prevented and/or minimalized. Preferably, any such pressure forces can be kept at a negligible level with respect to the friction generated between the brush members and the strip in the direction of conveyance during the sliding. Hence, the strip can be advanced in the direction of conveyance without exerting considerable pressure forces onto the strip in the normal direction.

Moreover, the leading end of the strip occasionally tends to stand up from the support surface. In the prior art conveyors, such a raised leading end may be caught and folded back onto the strip. The sliding action of the brush members prevents that the first roller catches the raised leading end and instead can deflect the raised leading end back towards the support surface.

In a further embodiment the device comprises a second drive for moving the first roller between the operative position at or near the support surface and an inoperative position spaced apart from the support surface. By spacing the first roller apart from the support surface, it interaction with the strip at said support surface can be reduced or terminated.

In an embodiment thereof the first roller axis in the inoperative position of the first roller is arranged at a second distance from the support surface at which all of the brush members are arranged to be spaced apart from the strip in their unflexed state. The first roller can thus be brought into and fully out of contact with respect to the strip.

In a further embodiment thereof the strip has a leading end, a main part and a trailing end in the conveyance direction, wherein the device further comprises a control unit that is electronically connected to the second drive for controlling the position of the first roller, wherein the control unit is arranged for moving the first roller into the operative position prior to or when

the leading end is supported on the support surface and for moving the first roller from the operative position into the inoperative position prior to when the trailing end is supported on the support surface. Hence, the interaction of the first roller with the strip can be limited to the leading end and/or the main part.

In an embodiment thereof the control unit is arranged for moving the first roller from the operative position into the inoperative position prior to when the main part is supported on the support surface. Hence, the interaction of the first roller with the strip can be limited to the leading end.

In a further embodiment thereof the first roller is arranged for advancing the strip over the support surface in the conveyance direction along the supply path onto a drum, wherein the control unit is arranged for moving the first roller from the operative position into the inoperative position when the leading end is advanced onto the drum. Once the strip is advanced onto and engaged by the drum, the strip can be pulled onto the drum by rotation of said drum. Hence, there is no need for advancing the strip with the first roller anymore.

In a preferred embodiment the device further comprises an extruder for supplying the strip to the support surface in the conveyance direction, wherein the extruder is arranged for supplying the strip to the support surface at an extrusion speed in the conveyance direction, wherein the first drive is arranged for rotating the first roller at a rotational velocity such that the tangential speed of the brush surface at contact with the strip is greater than the extrusion speed. By driving the first roller at a higher tangential speed than the extrusion speed, a stretching of the strip can be achieved. This is particularly useful for stretching the leading end, which is known to become bulky compared to the remaining part of the strip due to a disproportional die swell after leaving the extruder. Said die swell effects can at least partially

be compensated by stretching the leading end with the first roller.

In alternative embodiment the device further comprises an extruder that is arranged for initially flushing an amount extrusion material onto the support surface in the conveyance direction during a cleaning phase prior to the supply of the actual strip for tire building, wherein the first roller is movable into a cleaning position that is closer to the support surface than the operative position for strongly contacting the extrusion material during the cleaning phase. The flushing can be particularly useful during startup or after a period of inactivity of the extruder, to clean out extrusion material from a previous cycle of the extrusion process. In the cleaning position, the brush members of the first roller can more strongly contact the extrusion material on the support surface and thus make sure that most or all of the extrusion material is brushed away from said support surface prior to the actual supply of the strip for tire building.

Preferably, the extruder is arranged for stopping the flushing of extrusion material at the end of the cleaning phase, wherein the first drive is arranged for continuing the rotation of the first roller in the first rotation direction after the extruder has stopped flushing. Thus, with the flow of extrusion material stopped, the first roller can rip or break the extrusion material off from the extruder.

In an embodiment thereof the first roller and/or the support surface are arranged as close as possible to the extruder without contacting the extruder. In this manner, the effects of die swell can be reduced to a minimum. Moreover, slacking of the strip between the extruder and the first roller and/or the support surface can be prevented.

In one embodiment the support surface is formed by a conveyor belt that is arranged for running along with

the strip in a direction parallel to the conveyance direction. The conveyor belt can be used to support the strip along a considerable part of the supply path between the extruder and a drum downstream along the supply path.

In an alternative embodiment the device comprises a second roller with a circumferential application surface that forms the support surface, wherein the second roller is rotatable in a second rotation direction about a second roller axis that is parallel to first roller axis. The second roller can support and guide the strip around at least a part of its application surface towards a drum downstream along the supply path.

In an embodiment thereof the second roller is arranged to passively rotate in the second rotation direction along with the advancing strip. The second roller can thus merely function as a support surface for the strip.

In a further embodiment thereof the second roller is arranged for transferring and applying the strip to a drum at a transfer position downstream of the first roller along the supply path. The second roller can thus cooperate with both the first roller and the drum. At the first roller, the second roller can provide a support surface for the strip, while at the drum, the second roller can function as an application roller.

In an embodiment thereof the application surface of the second roller is formed by a solid layer of resiliently compressible material that is arranged for forcefully pressing the strip against the drum, wherein the layer of compressible material is arranged to be at least partially compressed at the transfer position as a result of the forceful pressing. The second roller can therefore reliably apply the strip to the drum, while the resilience ensures that the compressible material can return to its original form directly downstream of the transfer position. The deformation in the compressible material causes an abrupt transition between the deformed section and the

returned section of the layer, which transition can facilitate an easy release or detachment of the strip from the application surface of the second roller.

In another embodiment the device comprises a third roller with a circumferential stitching surface for stitching consecutive windings of the strip to each other on a drum at a stitching position downstream of the first roller along the supply path, wherein the stitching surface of the third roller is formed by a layer of resiliently compressible material that is arranged for forcefully pressing the consecutive windings of the strip against each other, wherein the layer of compressible material is arranged to be at least partially compressed at the stitching position as a result of the forceful pressing. The third roller can therefore reliably stitch consecutive windings of the strip to each other, while the resilience ensures that the compressible material can return to its original form directly downstream of the stitch position. The deformation in the compressible material causes an abrupt transition between the deformed section and the returned section of the layer, which transition can facilitate an easy release or detachment of the strip from the stitching surface of the third roller.

In an embodiment thereof the third roller is arranged to be in the stitching position at an oblique stitching angle to the drum, wherein the layer of compressible material is arranged for absorbing unevenness in the strip with respect to the layer of compressible material as a result of the oblique stitching angle. Consequently, the third roller can still reliably stitch the consecutive windings of the strip.

Preferably, the layer of compressible material is at least twenty millimeters thick, and preferably at least thirty millimeters thick. The thickness can increase the amount of compression that can be achieved in the radial direction of the roller.

More preferably, the compressible material in the

aforementioned embodiments has a Shore A hardness of thirty or less. Such hardness can provide the compression and resilience required for proper operation of the second and/or third roller. Preferably, the compressible material is a silicon rubber. The tacky material of the strip generally sticks less to silicone rubber and can therefore release easily from a layer of such silicone rubber.

In an embodiment, each brush member is formed as a bristle. Bristles can effectively brush and/or advance the strip and/or may possess the resilience that allows the bristles to flex or bend between the unflexed or unbend state and the flexed or bend state.

According to a second aspect, the invention provides a method for supplying a strip for tire building using the aforementioned device, wherein the method comprises the step of supplying the strip onto the support surface, providing the first roller in the operative position with respect to the support surface so that the brush surface contacts the strip, driving the first roller in the first rotation direction to advance the strip over the support surface in the conveyance direction, and allowing each brush member to resiliently flex in a flexing direction about the first roller axis opposite to the first rotation direction upon contact with the strip.

The method relates to the use of the device according to the first aspect of the present invention. Consequently, the method and its embodiments have same advantageous effects as the corresponding embodiments of the device.

In a preferred embodiment of the method, during the flexing, a convexly arcuate side is formed by each brush member, wherein the brush members contact and slide over the strip with their convexly arcuate sides when the first roller is rotated in the first rotation direction.

In another preferred embodiment of the method the method further comprises the step of moving the first roller from the operative position at or near the support

surface to an inoperative position spaced apart from the support surface.

In an embodiment thereof the strip has a leading end, a main part and a trailing end in the conveyance direction, wherein the first roller is moved from the operative position into the inoperative position prior to when the trailing end is supported on the support surface.

In an embodiment thereof the first roller is moved from the operative position into the inoperative position prior to when the main part is supported on the support surface. Hence, the interaction of the first roller with the strip can be limited to the leading end.

Preferably, the method comprises the step of advancing the strip over the support surface in the conveyance direction along the supply path onto a drum, wherein the first roller is moved from the operative position into the inoperative position when the leading end is advanced onto the drum.

In an embodiment of the method, the device further comprises an extruder, wherein the extruder supplies the strip to the support surface at an extrusion speed in the conveyance direction, wherein the first roller is rotated at a rotational velocity such that the tangential speed of the brush surface at contact with the strip is greater than the extrusion speed. This is particularly useful for stretching the leading end, which is known to become bulky compared to the remaining part of the strip due to a disproportional die swell after leaving the extruder. Said die swell effects can at least partially be compensated by stretching the leading end with the first roller.

In an alternative embodiment of the method, the device further comprises an extruder, wherein the extruder initially flushes an amount extrusion material onto the support surface in the conveyance direction during a cleaning phase prior to the supply of the actual strip for tire building, wherein the first roller is moved into a

cleaning position that is closer to the support surface than the operative position for strongly contacting the extrusion material during the cleaning phase. The flushing can be particularly useful during startup or after a period of inactivity of the extruder, to clean out extrusion material from a previous cycle of the extrusion process. In the cleaning position, the brush members of the first roller can more strongly contact the extrusion material on the support surface and thus make sure that most or all of the extrusion material is brushed away from said support surface prior to the actual supply of the strip for tire building.

Preferably, the flushing of extrusion material is stopped at the end of the cleaning phase, wherein the rotation of the first roller in the first rotation direction is continued after the extruder has stopped flushing. Thus, with the flow of extrusion material stopped, the first roller can rip or break the extrusion material off from the extruder.

The various aspects and features described and shown in the specification can be applied, individually, wherever possible. These individual aspects, in particular the aspects and features described in the attached dependent claims, can be made subject of divisional patent applications. It will for example be apparent to one skilled in the art that the second roller and the third roller can be used independently from the first roller for their respective purposes of application and stitching.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be elucidated on the basis of an exemplary embodiment shown in the attached schematic drawings, in which:

figure 1 shows a side view of a device for supplying a strip for tire building to a drum, comprising a

first roller, a second roller and a third roller according to a first embodiment of the invention;

figure 2 shows a side view of the device of figure 1 with the first roller in an operative position;

figure 3 shows a side view of the device of figure 1 with the first roller in an inoperative position and the second roller in a transfer position;

figure 4 shows a side view of the device according to figure 1 with the first roller in the operative position, the second roller in the transfer position and the third roller in a stitch position;

figure 5 shows a front view of the third roller in the stitch position;

figure 6 shows a side view of an alternative device for supplying a strip to a drum, according to a second embodiment of the invention; and

figure 7 shows the first roller in an optional cleaning position.

DETAILED DESCRIPTION OF THE INVENTION

Figures 1-4 show a device 1 according to a first exemplary embodiment of the invention for supplying an elongate, substantially continuous strip 8 for tire building to a drum 9. The strip 8 has a leading end 80, a trailing end that is ultimately created when the strip 8 is cut-off (not shown) and a main part 81 between the leading end 80 and the trailing end. The strip 8 comprises or consists of cordless or non-reinforced elastomeric material, e.g. rubber, for use in a green tire. Preferably, the drum 9 is a strip-winding drum with a circumferential surface 90 that is arranged for receiving consecutive helical windings W of the strip 8 in a manner known per se to build-up a cordless or non-reinforced tire component. The consecutive windings W may be arranged in an adjacent or overlapping configuration to build up tire components

with different cross sections. Examples of such tire components are inner liners, sidewalls and treads.

As shown in figures 1, 2 and 3, the device 1 comprises an extruder 2 for extruding extrusion material into the elongate, substantially continuous strip 8 in a conveyance direction C along a supply path P with a controlled extrusion speed V1. The device 1 is further provided with a first roller 3 and a second roller 4 downstream of the extruder 2 along the supply path P in the conveyance direction C for guiding the strip 8 towards the drum 9. The first roller 3 is rotatable in a first rotation direction M about a first roller axis S1, while the second roller 4 is rotatable in a second rotation direction N, opposite to the first rotation direction M, about a second roller axis S2 that is parallel or substantially parallel to the first roller axis S1. The first roller 3 and the second roller 4 are arranged on opposite sides of the supply path P, preferably with the first roller 3 above the supply path P and the second roller 4 below the supply path P, to form a roller set that is arranged for receiving and advancing the leading end 80 of the strip 8 along the supply path P.

As shown in more detail in figure 4, the first roller 3 comprises a cylindrical core 30 that extends coaxially and/or concentrically to the first roller axis S1 and a plurality of brush members, in this exemplary embodiment in the form of a bristles 31, originating from the core 30 and distributed circumferentially around and axially along said core 30. The plurality of bristles 31 extends spirally outwards from the core 30 under a bristle inclination A to form a circumferential brush surface 32 of the first roller 3. The bristle inclination A – measured as the angle of the base of the bristle 31 with respect to purely radial direction R at said base – is preferably in the range of three to forty-five degrees, and most preferably in the range of five to twenty degrees. The bristle inclination A puts the bristle 31 under an

inclination facing towards, against and/or opposite to the first rotation direction M.

Each bristle 31 is resiliently flexible between an unflexed or unbend state and a flexed or bend state. In the unflexed or unbend state, there are no significant external forces applied to the bristle 31. Hence, said bristle 31 can be considered to be unstressed and/or relaxed in the unflexed or unbend state. In figure 4, most bristles 31 are in an unflexed or unbend state. In said unflexed or unbend state, the bristles 31 extend up to and/or define a first radius R1 of the brush surface 32 with respect to the first roller axis S1. When the bristle 31, during rotation of the first roller 3 in the first rotation direction M, comes into contact with the strip 8, said bristle 31 is deflected, flexed or bend away from the strip 8 and the support surface 42 from the unflexed or unbend state into the flexed or bend state in a flexing direction F facing towards, against or oppositely into to the first rotation direction M. In said flexed or bend state, the bristle 31 is arcuate or substantially arcuate and forms a convexly arcuate side 33. Said convexly arcuate side 33 is arranged to contact and slide over the strip 8 during rotation of the first roller 3 in the first rotation direction M. In figure 4, a relatively small selection of the bristle 31, opposite to the second roller 4, is in contact with the strip 8 and flexed or bend towards and/or into the flexed or bend state. In said flexed or bend state, the bristles 31 extend up to and/or define a second radius R2 of the brush surface 32, smaller than the first radius R1, with respect to the first roller axis S1.

The bristles 31 are shaped as hair-like, thin elements, e.g. from a metal wire. Alternatively, the brush members can be shaped as flat and/or narrow band-like elements, e.g. from plastics, provided that they have the abovementioned characteristics.

As further shown in figure 4, the second roller 4 comprises a core 40 that extends coaxially and/or

concentrically to the second roller axis S2 and a solid layer 41 extending around said core 40 for forming a solid support surface 42 with respect to the first roller 3 along at least a part of the supply path P opposite to the first roller 3. Preferably, the solid layer 41 comprises a resiliently compressible material on the radial outside of the second roller 4 that forms a deformable and/or compressible circumferential application surface 43 for forcefully pressing the strip 8 against the drum 9 at a transfer position T. Said transfer position T is located downstream of the first roller 3 in the conveyance direction C along the supply path P. The layer 41 of compressible material is preferably at least twenty millimeters thick, and most preferably at least thirty millimeters thick, in the radial direction of the second roller 4. The compressible material has a Shore A hardness of thirty or less. The hardness is chosen such that application surface 43 can form a stable support surface 42 with respect to the first roller 3 while the same application surface 43 can be compressed under pressure with respect to the drum 9 to forcefully apply the strip 8 to said drum 9. Preferably, the compressible material is a silicon rubber. Silicon rubber easily detaches from the relatively sticky elastomeric material of the strip 8.

The second roller 4 is passively and/or freely rotatable in the second rotation direction N. In other words, the second roller 4 is not actively driven. Hence, the second roller 4 can passively follow and/or rotate along with the strip 8 as is it advanced in the conveyance direction C.

As shown in figures 1, 2 and 3, the device 1 comprises a first drive 51 for actively driving the first roller 3 in rotation in the first rotation direction M about the first roller axis S1. The device 1 further comprises a second drive 52 for supporting and moving the first roller 3 from an inoperative or inoperational position, as shown in figures 1 and 3, into and out of an

operative or operational position, as shown in figure 2.

In this exemplary embodiment, the second drive 52 is formed as an arm 53 that is rotatable about an arm axis K. Alternatively, the second drive 52 may be formed by any suitable displacement drive, e.g. a linear drive (not shown).

In the operative position the first roller 3 is arranged at or near the support surface 42 of the second roller 4. In particular, the first roller axis S1 is arranged at a first distance D1 from the support surface 42 of the second roller 4. Said first distance D1 is chosen such that the bristles 31 are flexed from the unflexed or unbend state towards the flexed or bend state upon contact with the strip 8. Preferably, the first distance D1 is equal to or less than the first radius R1 formed by the bristles 31 in the unflexed or unbend state. As a result, the bristles 31 are in contact with or bend with respect to the support surface 42 such that a strip 8 of any thickness can be caught by said bristles 31. The bristles 31 are arranged for flexing or bending into the flexed or bend state towards the second radius R2, which is equal to the first distance D1 minus the thickness of strip 8 at said bristle 31. In the inoperative position, the first roller 3 is spaced apart from the support surface 42 of the second roller 4. Preferably, the first roller axis S1 is arranged at a second distance D2 from the support surface 42 at which all of the bristles 31 are spaced apart from the strip 8 in their unflexed or unbend state.

As schematically shown in figures 1, 2 and 3, the device 1 further comprises a control unit 6 that is electronically connected to at least the second drive 52 for controlling the position of the first roller 3. Preferably, the control unit 6 is further electronically connected to the first drive 51 for controlling the rotational speed V2 of the first roller 3 and to the extruder 2 for controlling the extrusion speed V1.

As shown in figures 4 and 5, the device 1

optionally comprises a third roller 7 for stitching consecutive windings W of the strip 8 to each other on the drum 9 at a stitching position X. Said stitching position x is located downstream of the first roller 3 and preferably below the second roller 4 in the conveyance direction C. The third roller 7 is rotatable about a third roller axis S3 that is not necessarily parallel to the first roller axis S1 and/or the second roller axis S2. As shown in figure 5, the third roller 7 may be tiltable under an oblique stitching angle B with respect to the circumferential surface 90 of the drum 9 to more closely match the profile of the cross section formed by the consecutive windings W.

Like the second roller 4, the third roller 7 comprises a core 70 that extends coaxially and/or concentrically to the third roller axis S3 and a solid layer 71 extending around said core 70 for forming a solid circumferential stitching surface 72 with respect to the drum 9. Preferably, said solid layer 71 comprises the same resiliently compressible material as the solid layer 41 of the second roller 4. Hence, the compressible material in the solid layer 71 can be at least partially compressed as a result of the stitching pressure applied by the third roller 7 to the drum 9. In particular, the compressible material is arranged for absorbing unevenness between the consecutive windings W of the strip 8 and the stitching surface 72 of the third roller 3.

A method for supplying the strip 8 to the drum 9 using the previously discussed device 1 will be described hereafter in more detail with reference to figures 1-5.

Figure 1 shows the situation in which the extruder 2 is in the startup stage and starts to extrude the leading end 80 of a new strip 8 in the direction of conveyance C along the supply path P. Said leading end 80 tends to be relatively bulky as a result of disproportional die swell at the startup stage of the extruder 2. Shortly after leaving the extruder 2, the leading end 80 is

supported by the support surface 42 of the second roller 4. Prior to or as soon as the leading end 80 is supported on the support surface 42, the control unit 6 controls the second drive 52 to move the first roller 3 from the inoperative position into the operative position, as shown in figure 2.

In the operative position, as shown in figure 2, the first drive 51 is controlled to rotate the first roller 3 in the first rotation direction M about the first roller axis S1 at the rotation speed V2. During said rotation, the bristles 31 flex or bend upon contact with the strip 8 in the flexing direction F opposite to the first rotation direction M and slide with their respective convexly arcuate sides 32 over the strip 8. The sliding or brushing action of the bristles 31 ensures that the tips or free ends of the bristles 31 do not bite into the strip 8 but merely guide or gently urge the strip 8 towards and/or along the support surface 42. In particular, a slightly raised or upright leading end 80 may be deflected gently towards the support surface 42 by the brushing action of the bristles 31 to ensure proper application on the drum 9. The resistance between the brush surface 32 and the strip 8 drags said strip 8 in the conveyance direction C along the supply path P. The second roller 4 rotates passively along with the strip 8. Consequently, the strip 8 is advanced along the supply path P towards the drum 9.

Preferably, the rotational speed V2 of the first roller 3 is controlled by the control unit 6 based on the extrusion speed V1 of the extruder 2. As shown schematically in figure 4, it is advantageous to rotate the first roller 3 with a peripheral velocity or a tangential speed V3 at the second radius R2 that is greater than the extrusion speed V1, e.g. by a factor of at least one-and-a-half and preferably at least two. This causes the bristles 31 to slide over the strip 8 with a tangential speed V3 at the second radius R2 that exceeds the extrusion speed V1. Hence, the, leading end 80 tends to be stretched by the

first roller 3, which reduces the bulkiness of said leading end 80 as a result of the disproportional die swell at the startup stage of the extruder 2.

Figure 3 shows the situation after the control unit 6 has controlled the second drive 52 to move the first roller 3 back into the inoperative position. Preferably, the first roller 3 is returned to the inoperative position prior to the trailing end (not shown) reaching the first roller 3 and the support surface 42 at the second roller 4. Most preferably, the first roller 3 is returned to the inoperative position shortly after or when the leading end 80 has moved past the first roller 3 and the main part 81 is supported on the support surface 42. In particular, the first roller 3 is solely used to guide, advance and/or stretch the leading end 80 of the strip 8 in the startup stage of the extruder 2. In one embodiment of the invention, the first roller 3 is returned to the inoperative position when the leading end 80 is advanced onto the drum 9.

As shown in figure 3, the second roller 4 and the drum 9 are moved towards each other so that the leading end 80 of the strip 8 on the second roller 4 becomes situated between the application surface 43 of the second roller 4 and the circumferential surface 90 of the drum 9. Preferably, the first roller 3 is returned to the inoperative position when the leading end 80 is securely applied by the second roller 4 to the circumferential surface 90 of the drum 9. From that moment onwards, the stretching of the main part 81 of the strip 8 can be controlled between the drum 9 and the extruder 2. It is noted that in figure 3, the drum 9 is moved towards and into contact with the leading end 80 of the strip 8 at the second roller 4. Alternatively, the second roller 4 can be moved relative to the drum 9 to achieve the same effect.

In figure 3, the second roller 4 is forcefully pressed against the drum 9 to firmly apply the leading end 80 against the circumferential surface 90 of the drum 9. As

shown in figure 4, the compressible layer 41 deforms as a result of the application pressure. The deformation in the compressible material causes an abrupt transition L in the layer 41 between a deformed section G of the layer 41 that is still in firm contact with the drum 9 and a resiliently returned section H directly downstream of the deformed section G that is no longer in firm contact with the drum 9. This abrupt transition L facilitates an easy release or detachment of the strip 8 from the application surface 43 of the second roller 4.

As shown in figures 3, 4 and 5, the third roller 7 has moved into the stitching position X relative to the drum 9 to stitch the consecutive windings W of the strip 8. As best seen in figures 4 and 5, the third roller 7 is forcefully pressed against the drum 9 to firmly apply the consecutive windings W of the strip 8 against each other on the circumferential surface 90 of the drum 9. The compressible layer 71 deforms as a result of the stitching pressure to adapt to unevenness in the consecutive windings W relative to the stitching surface 72 of the third roller 3, regardless of the oblique stitching angle B.

Each roller 3, 4, 7 and its related features and effects are within the scope of the present invention both independently and in combination. For example, the second roller 4 can be used in a device without the first roller 3 and/or the third roller 7, e.g. solely for the purpose of application of the strip 8 to the drum 9. Similarly, the third roller 7 can be used in a device without the first roller 3 and/or the second roller 4, e.g. solely for the purpose of stitching consecutive windings of the strip 8 to each other on the drum 9.

Figure 6 shows an alternative device 101 according to a second embodiment of the invention. The alternative device 101 differs from the previously discussed device 1 only in that the second roller 4 is replaced by a conveyor belt 104. The conveyor belt 104 is provided with a support surface 142 (the upper run of the

conveyor belt 104) that is arranged for running along with the strip 8 in a direction parallel to the conveyance direction C at a section of the supply path P opposite to the first roller 3. This alternative embodiment may be supplemented with a further application roller (not shown) at or near the drum 9.

Figure 7 shows the first roller 3 in an optional cleaning position during a cleaning phase prior to the supply of the strip 8 for tire building. In the cleaning phase, the extruder 2 is arranged for flushing out extrusion material 82 that is left over from a previous extrusion cycle. Said extrusion material 82 may already be partially vulcanized and is unsuitable for use in a subsequent extrusion cycle. The first roller 3 is movable into the cleaning position from the operative and/or the inoperative position. In said cleaning position, the first roller axis S1 is at a third distance D3 from the support surface 42 that is smaller than the first distance D1 in the operative position. Hence, the bristles 31 are bend or flexed more than in the operative position and extend up to and/or define a third radius R3 of the brush surface 32 that is smaller than the second radius R2. Consequently, the bristles 31 contact the extrusion material 82 more strongly, thereby thoroughly brushing and/or cleaning the extrusion material 82 from the support surface 42. Preferably, the extruder 2 is stopped at the end of the cleaning phase while the first roller 3 continues to rotate, so that the extrusion material 82 can be ripped or broken off from the 'fresh' leading end 80 of the strip 8 of the next extrusion cycle. The extrusion material 82 can be dropped into a receptacle for waste (not shown) below the support surface 42.

It is to be understood that the above description is included to illustrate the operation of the preferred embodiments and is not meant to limit the scope of the invention. From the above discussion, many variations will be apparent to one skilled in the art that would yet be

encompassed by the scope of the present invention.

C O N C L U S I E S

1. Inrichting voor het aanleveren van een strip voor bandenbouw, omvattend een ondersteuningsoppervlak voor het ondersteunen van de strip langs een aanleverbaan, een eerste roller voor het geleiden van de strip langs het ondersteuningsoppervlak wanneer de eerste roller in een op operationele positie ten opzichte van het ondersteuningsoppervlak is en een eerste aandrijving voor het aandrijven van de eerste roller in een eerste rotatierichting rond een eerste rollerhartlijn teneinde de strip in een transportrichting over het ondersteuningsoppervlak langs de aanleverbaan voort te bewegen, waarbij de eerste roller een meervoud van borsteldelen omvat die zijn verdeeld rond de eerste rollerhartlijn teneinde een borsteloppervlak in de omtreksrichting te vormen voor contact maken met de strip wanneer de eerste roller in de operationele positie is, waarbij elk borsteldeel veerkrachtig flexibel is in een buigrichting rond de eerste rollerhartlijn tegengesteld aan de eerste rotatierichting.

2. Inrichting volgens conclusie 1, waarbij elk borsteldeel veerkrachtig flexibel is in de buigrichting van een ongebogen toestand naar een gebogen toestand, waarbij de eerste rollerhartlijn in de operationele positie van de eerste roller is aangebracht op een eerste afstand van het ondersteuningsoppervlak waarin de borsteldelen gebogen zijn van de ongebogen toestand naar de gebogen toestand bij contact met de strip.

3. Inrichting volgens conclusie 2, waarbij elk borsteldeel in de ongebogen toestand een eerste radius van het borsteloppervlak bepaalt, waarbij de eerste afstand gelijk is aan of kleiner is dan de eerste radius.

4. Inrichting volgens conclusie 3, waarbij elk borsteldeel bij contact met de strip is ingericht voor het verbuigen tot in de gebogen toestand naar een tweede radius

van het borsteloppervlak die kleiner is dan de eerste afstand.

5. Inrichting volgens een der voorgaande conclusies, waarbij elk borsteldeel in de ongebogen toestand een borsteldeelhoek heeft tegengesteld aan de eerste rotatierichting.

6. Inrichting volgens een der voorgaande conclusies, waarbij elk borsteldeel in de gebogen toestand gekromd is teneinde een convex gekromde zijde te vormen, waarbij de borsteldelen zijn ingericht in contact te zijn met en te glijden over de strip met hun convex gekromde zijden wanneer de eerste roller geroteerd wordt in de eerste rotatierichting.

7. Inrichting volgens een der voorgaande conclusies, waarbij de inrichting een tweede aandrijving omvat voor het bewegen van de eerste roller tussen de operationele positie bij of nabij het ondersteuningsoppervlak en een inoperationele positie op afstand van het ondersteuningsoppervlak.

8. Inrichting volgens conclusie 7, waarbij de eerste rollerhartlijn in de inoperationele positie van de eerste roller is aangebracht op een tweede afstand van het ondersteuningsoppervlak waarin alle van de borsteldelen in hun ongebogen toestand zijn ingericht op afstand gelegen te zijn van de strip.

9. Inrichting volgens conclusie 7 of 8, waarbij de strip in de transportrichting een voorlopend uiteinde, een hoofddeel en een achterlopend uiteinde heeft, waarbij de inrichting verder een regeleenheid omvat die elektronisch verbonden is met de tweede aandrijving voor het regelen van de positie van de eerste roller, waarbij de regeleenheid is ingericht voor het bewegen van de eerste roller tot in de operationele positie voorafgaand aan of wanneer het voorlopende uiteinde op het ondersteuningsoppervlak ondersteund is en voor het bewegen van de eerste roller tot in de inoperationele positie voorafgaand aan wanneer het achterlopende uiteinde op het

ondersteuningsoppervlak ondersteund is.

10. Inrichting volgens conclusie 9, waarbij de regeleenheid is ingericht voor het bewegen van de eerste roller van de operationele positie tot in de inoperationele positie voorafgaand aan wanneer het hoofddeel op het ondersteuningsoppervlak ondersteund is.

11. Inrichting volgens conclusie 9 of 10, waarbij de eerste roller is ingericht voor het in de transportrichting over het ondersteuningsoppervlak voortbewegen van de strip langs de aanleverbaan tot op een trommel, waarbij de regeleenheid is ingericht voor het bewegen van de eerste roller van de operationele positie naar de inoperationele positie wanneer het voorlopende uiteinde tot op de trommel is voortbewogen.

12. Inrichting volgens een der voorgaande conclusies, waarbij de inrichting verder een extruder omvat voor het in de transportrichting aanleveren van de strip aan het ondersteuningsoppervlak, waarbij de extruder is ingericht voor het aanleveren van de strip aan het ondersteuningsoppervlak met een extrusiesnelheid in de transportrichting, waarbij de eerste aandrijving is ingericht voor het roteren van de eerste roller met een rotatiesnelheid zodanig dat de tangentiele snelheid van het borsteloppervlak bij contact met de strip groter is dan de extrusiesnelheid.

13. Inrichting volgens een der conclusies 1-11, waarbij de inrichting verder een extruder omvat die is ingericht voor het in eerste instantie spoelen van een hoeveelheid extrusiemateriaal in de transportrichting tot op het ondersteuningsoppervlak gedurende een schoonmaakfase voorafgaand aan het aanleveren van de daadwerkelijke strip voor bandenbouw, waarbij de eerste roller beweegbaar is tot in een schoonmaakpositie die dichter bij het ondersteuningsoppervlak is dan de operationele positie voor het sterk in contact zijn met het extrusiemateriaal gedurende de schoonmaakfase.

14. Inrichting volgens conclusie 13, waarbij de

extruder is ingericht voor het stoppen van het spoelen van extrusiemateriaal aan het einde van de schoonmaakfase, waarbij de eerste roller is ingericht voor het voortzetten van de rotatie van de eerste roller in de eerste rotatierichting nadat de extruder is gestopt met spoelen.

15. Inrichting volgens een der conclusies 12-14, waarbij de eerste roller en/of het ondersteuningsoppervlak zo dicht mogelijk bij de extruder zijn aangebracht zonder de extruder te raken.

16. Inrichting volgens een der voorgaande conclusies, waarbij het ondersteuningsoppervlak gevormd is door een transportband die is ingericht voor het meelopen met de strip in een richting evenwijdig aan de transportrichting.

17. Inrichting volgens een der conclusies 1-15, waarbij de inrichting een tweede roller omvat met een aanbrengoppervlak in de omtreksrichting dat het ondersteuningsoppervlak vormt, waarbij de tweede roller roteerbaar is rond een tweede rollerhartlijn die evenwijdig is aan de eerste rollerhartlijn.

18. Inrichting volgens conclusie 17, waarbij de tweede roller is ingericht voor het passief met de voortbewegende strip mee roteren in een tweede rotatierichting.

19. Inrichting volgens conclusie 17 of 18, waarbij de tweede roller is ingericht voor het overbrengen en aanbrengen van de strip op de trommel bij een overbrengpositie stroomafwaarts van de eerste roller langs de afleverbaan.

20. Inrichting volgens conclusie 19, waarbij het aanbrengoppervlak van de tweede roller gevormd is door een vaste laag van veerkrachtig samendrukbaar materiaal dat is ingericht voor het krachtig drukken van de strip tegen de trommel, waarbij de laag van samendrukbaar materiaal is ingericht teneinde ten minste gedeeltelijk samengedrukt te worden bij de overbrengpositie als gevolg van het krachtig drukken.

21. Inrichting volgens een der voorgaande conclusies, waarbij de inrichting een derde roller omvat met een stitchoppervlak in de omtreksrichting voor het aan elkaar stitchen van opeenvolgende windingen van de strip op een trommel bij een stitch positie stroomafwaarts van de eerste roller langs de afleverbaan, waarbij het stitchoppervlak van de derde roller gevormd is door een laag van veerkrachtig samendrukbaar materiaal dat is ingericht voor het krachtig tegen elkaar drukken van de opeenvolgende windingen van de strip, waarbij de laag van samendrukbaar materiaal is ingericht teneinde ten minste gedeeltelijk samengedrukt te worden bij de stitchpositie als gevolg van het krachtig drukken.

22. Inrichting volgens conclusie 21, waarbij de derde roller is ingericht teneinde in de stitchpositie onder een schuine stitchhoek te staan ten opzichte van de trommel, waarbij de laag van samendrukbaar materiaal is ingericht voor het absorberen van oneffenheden in de strip ten opzichte van de laag van samendrukbaar materiaal als gevolg van de schuine stitchhoek.

23. Inrichting volgens een der conclusies 20-22, waarbij de laag van samendrukbaar materiaal ten minste twintig millimeter dik is, en bij voorkeur ten minste dertig millimeter dik.

24. Inrichting volgens een der conclusies 20-23, waarbij het samendrukbare materiaal een Shore A hardheid heeft van dertig of minder.

25. Inrichting volgens een der conclusies 20-24, waarbij het samendrukbare materiaal een siliconen rubber is.

26. Inrichting volgens een der voorgaande conclusies, waarbij elk borsteldeel als een borstelhaar gevormd is.

27. Werkwijze voor het aanleveren van een strip voor bandenbouw met gebruikmaking van de inrichting volgens een der voorgaande conclusies, waarbij de werkwijze de stap omvat van het aanleveren van de strip tot op het

ondersteuningsoppervlak, het verschaffen van de eerste roller in de operationele positie ten opzichte van het ondersteuningsoppervlak zodanig dat het borsteloppervlak de strip raakt, het aandrijven van de eerste roller in de eerste rotatierichting voor het voortbewegen van de strip over het ondersteuningsoppervlak in de transportrichting, en het toelaten dat elk borsteldeel veerkrachtig buigt in een buigrichting rond de eerste rollerhartlijn tegengesteld aan de eerste rotatierichting bij contact met de strip.

28. Werkwijze volgens conclusie 27, waarbij gedurende het buigen een convex gekromde zijde wordt gevormd door elk borsteldeel, waarbij de borsteldelen in contact zijn met en glijden over de strip met hun convex gekromde zijden wanneer de eerste roller geroteerd wordt in de eerste rotatierichting.

29. Werkwijze volgens conclusie 27 of 28, waarbij de werkwijze verder de stap omvat van het bewegen van de eerste roller van de operationele positie bij of nabij het ondersteuningsoppervlak tot in een inoperationele positie op afstand van het ondersteuningsoppervlak.

30. Werkwijze volgens conclusie 29, waarbij de strip in de transportrichting een voorlopend uiteinde, een hoofddeel en een achterlopend uiteinde heeft, waarbij de eerste roller bewogen wordt van de operationele positie tot in de inoperationele positie voorafgaand aan wanneer het achterlopende uiteinde op het ondersteuningsoppervlak ondersteund wordt.

31. Werkwijze volgens conclusie 30, waarbij de eerste roller bewogen wordt van de operationele positie tot in de inoperationele positie voorafgaande aan wanneer het hoofddeel op het ondersteuningsoppervlak ondersteund wordt.

32. Werkwijze volgens een der conclusies 29-31, waarbij de werkwijze de stap omvat van het over het ondersteuningsoppervlak in de transportrichting voortbewegen van de strip langs de aanleverbaan tot op de trommel, waarbij de eerste roller bewogen wordt vanuit de operationele positie tot in de inoperationele positie

wanneer het voorlopende uiteinde tot op de trommel wordt voortbewogen.

33. Werkwijze volgens een der conclusies 29-32, waarbij de inrichting verder een extruder omvat, waarbij de extruder de strip aanlevert aan het ondersteuningsoppervlak met een extrusiesnelheid in de transportrichting, waarbij de eerste roller geroteerd wordt op een rotatiesnelheid zodanig dat de tangentiele snelheid van het borsteloppervlak bij contact met de strip groter is dan de extrusiesnelheid.

34. Werkwijze volgens een der conclusies 29-32, waarbij de inrichting verder een extruder omvat, waarbij de extruder in eerste instantie een hoeveelheid extrusiemateriaal in de transportrichting tot op het ondersteuningsoppervlak spoelt gedurende een schoonmaakfase voorafgaande aan het aanleveren van de daadwerkelijke strip voor bandenbouw, waarbij de eerste roller bewogen wordt tot in een schoonmaakpositie die dichter bij het ondersteuningsoppervlak is dan de operationele positie voor het krachtig in contact zijn met het extrusiemateriaal gedurende de schoonmaakfase.

35. Werkwijze volgens conclusie 34, waarbij het spoelen van extrusiemateriaal wordt gestopt aan het einde van de schoonmaakfase, waarbij de rotatie van de eerste roller in de eerste rotatierichting wordt voortgezet nadat de extruder gestopt is met spoelen.

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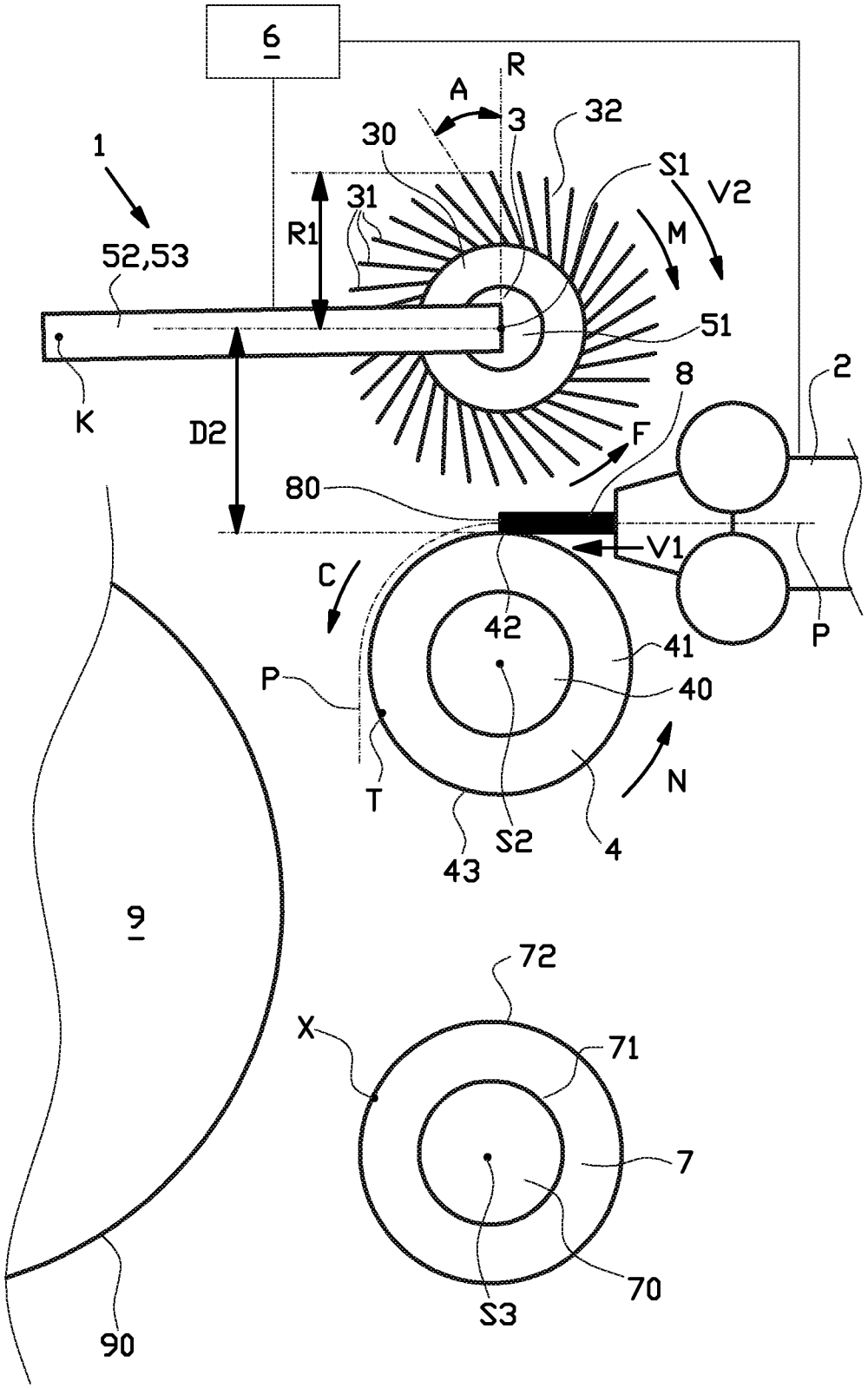
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FIG. 1

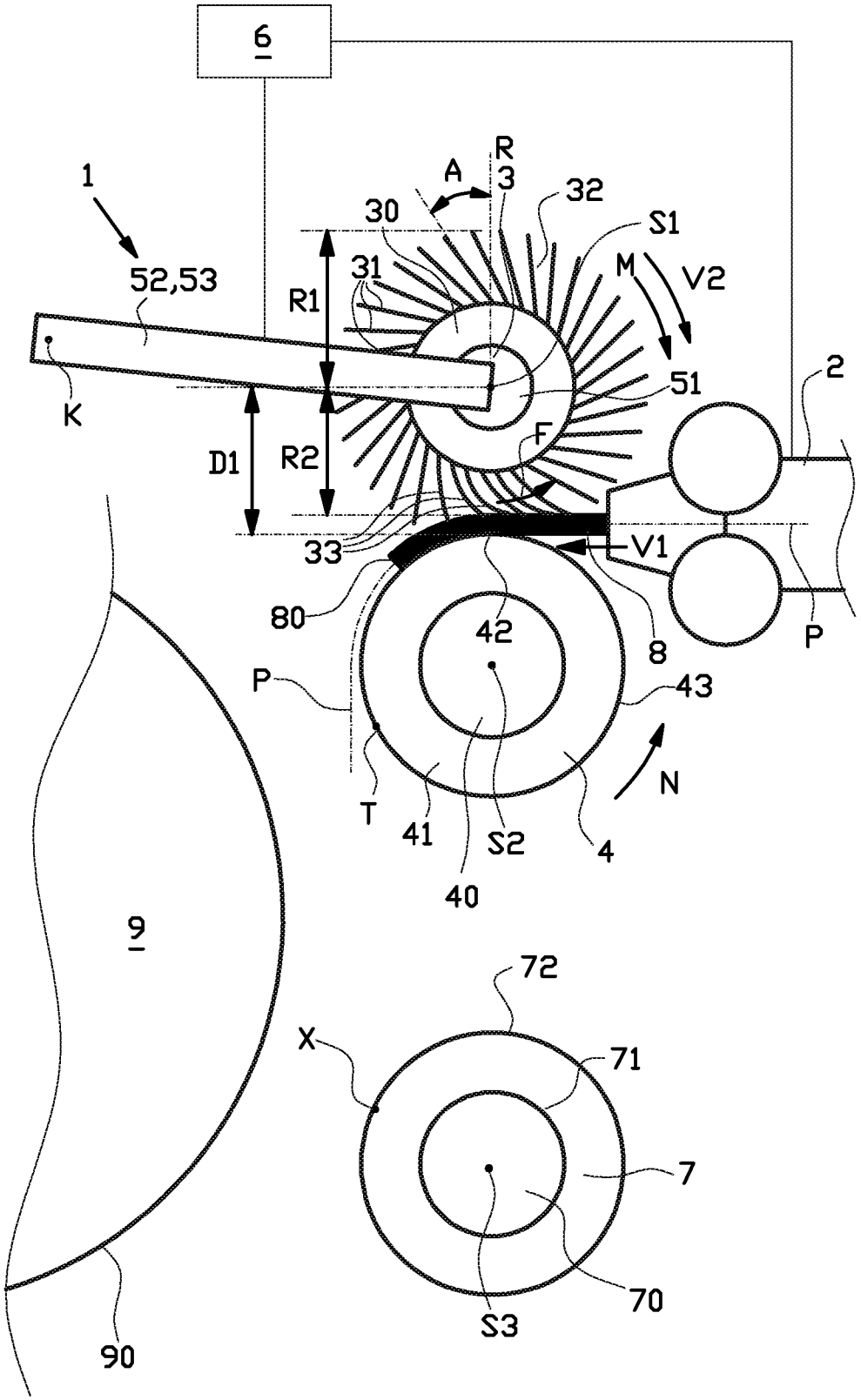
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FIG. 2

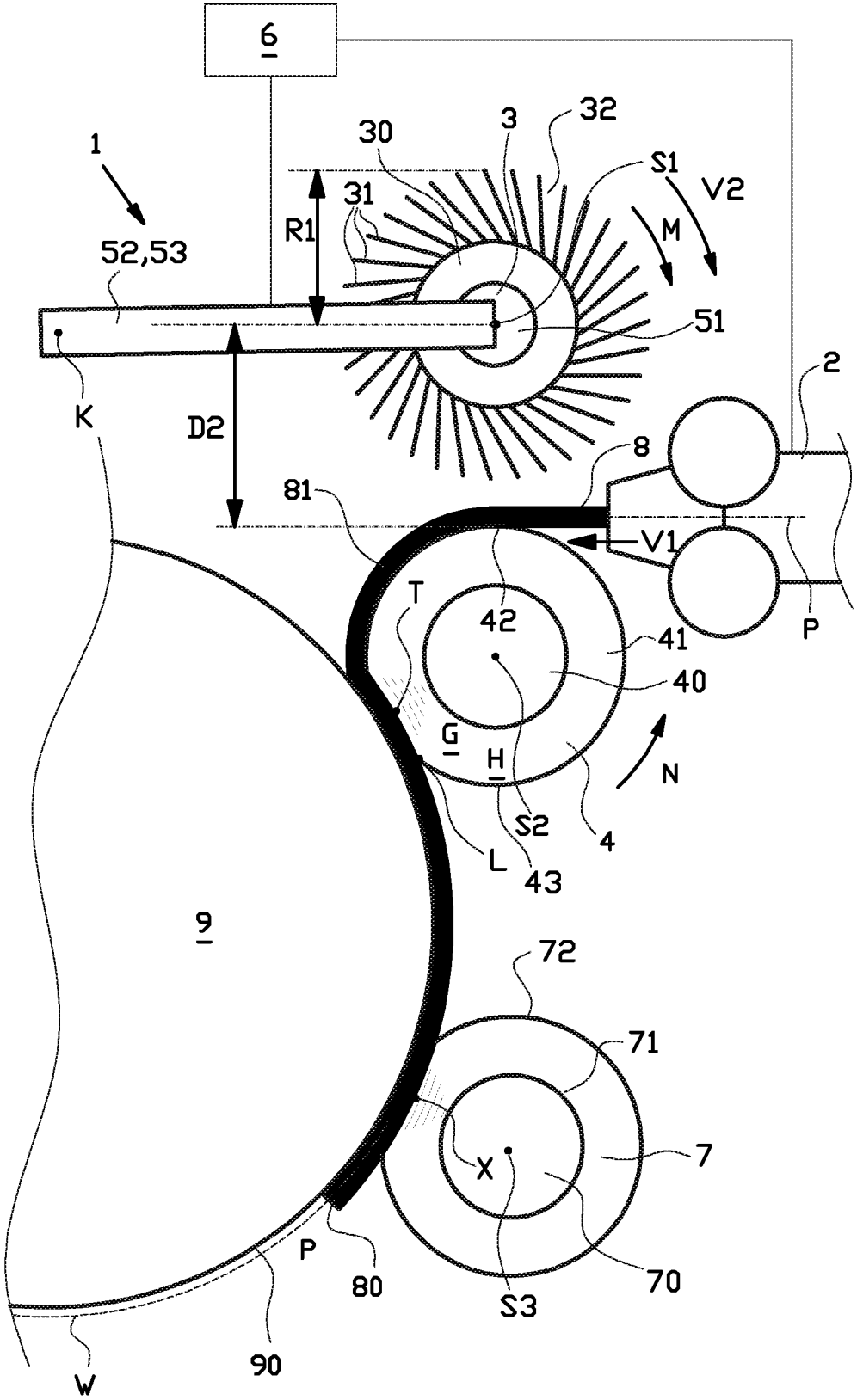
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FIG. 3

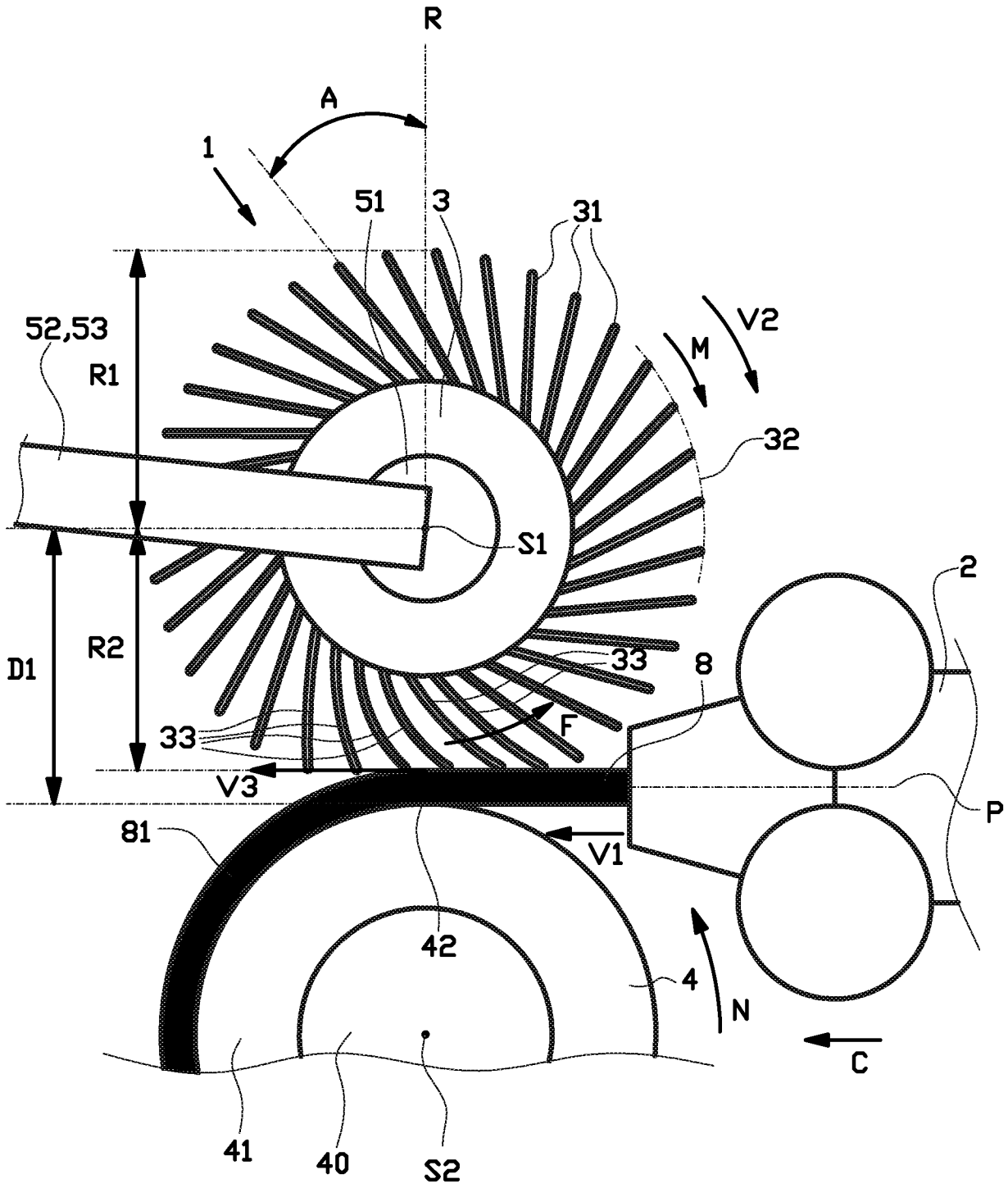
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FIG. 4

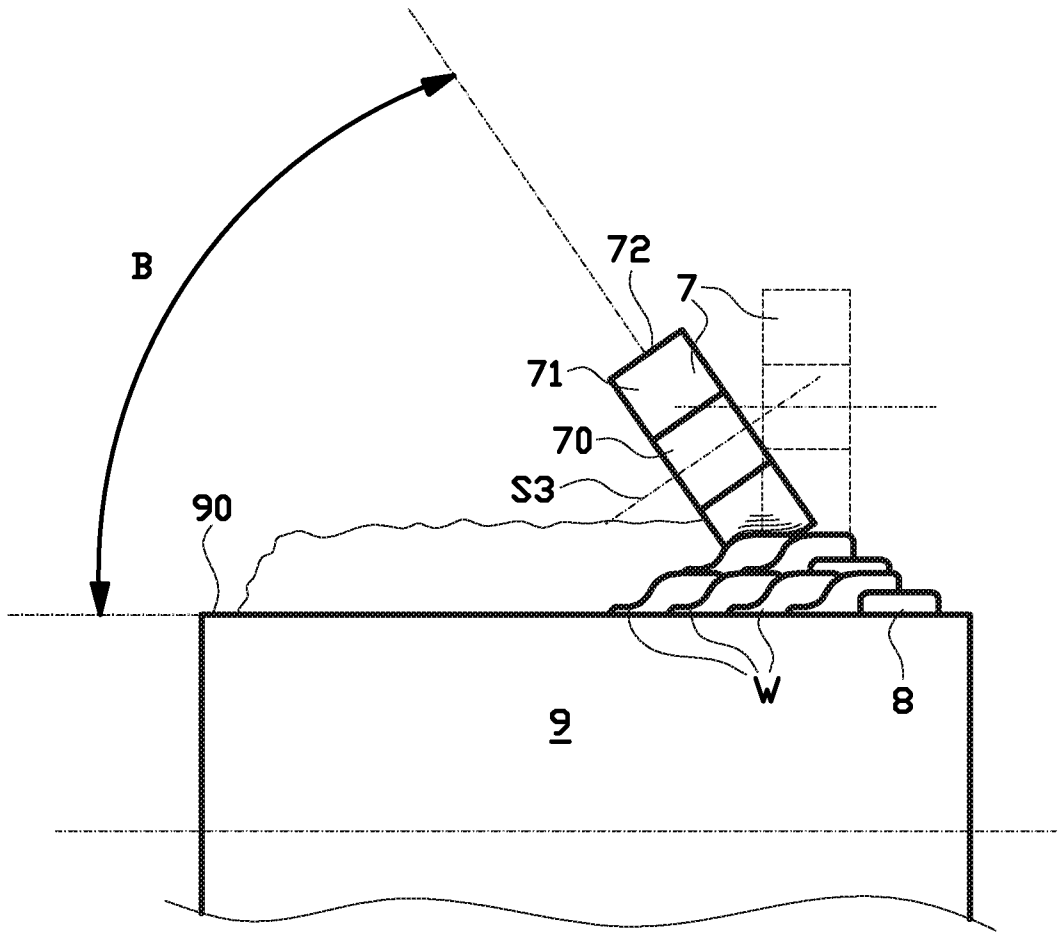

FIG. 5

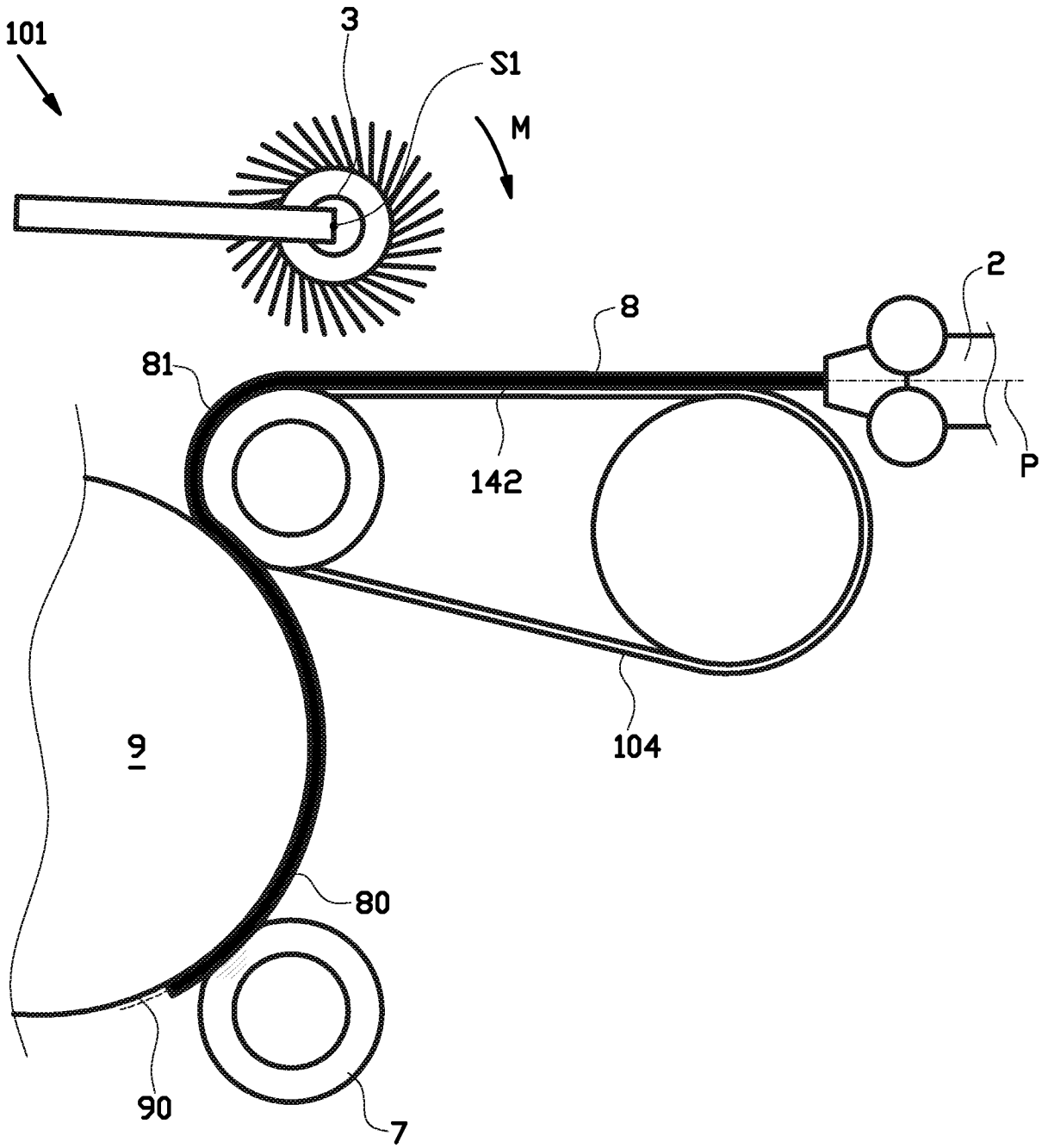

FIG. 6

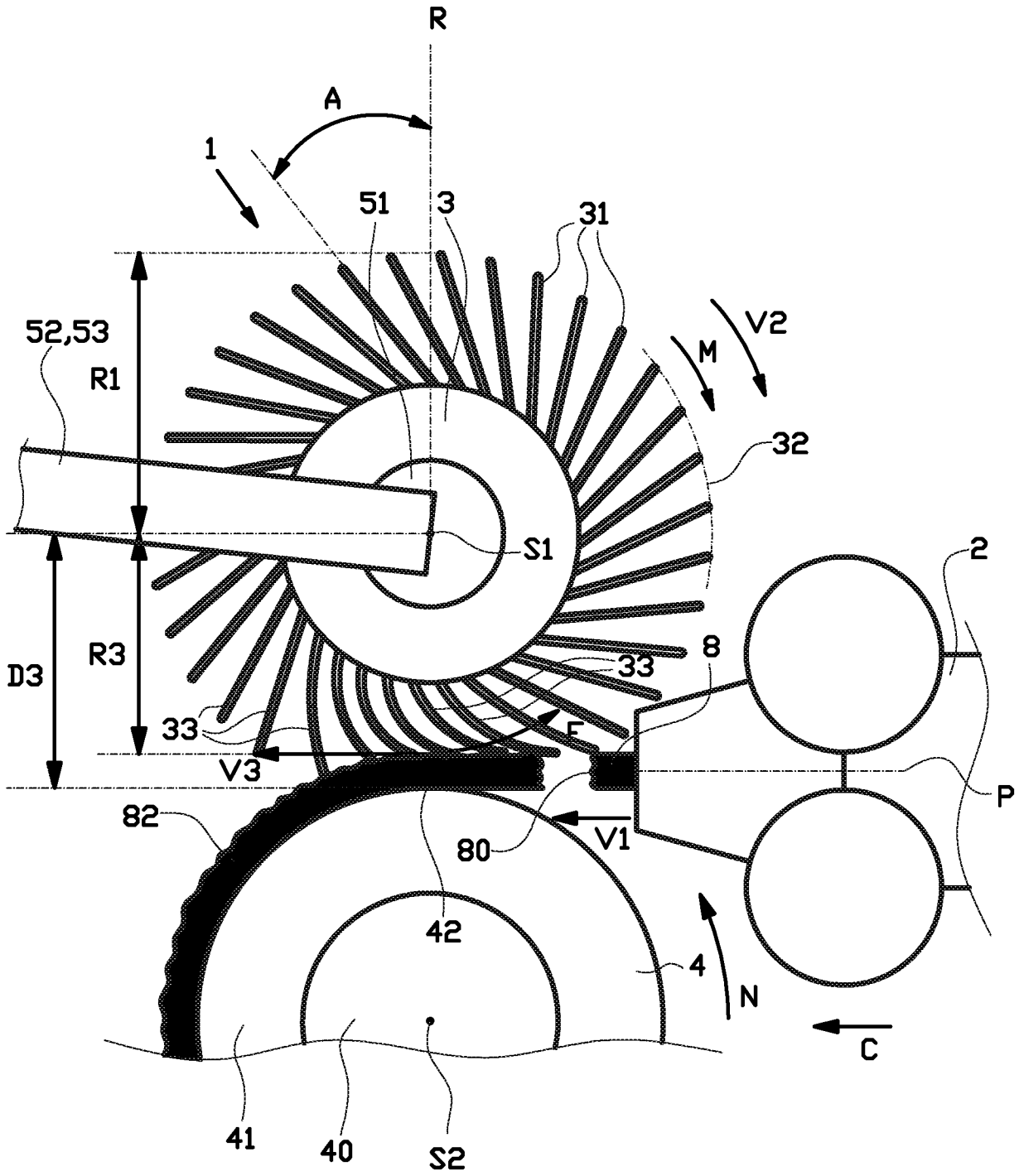
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FIG. 7

A B S T R A C T

The invention relates to a device for supplying a strip, comprising a support surface for supporting the strip along a supply path, a first roller for guiding the strip along the support surface when the first roller is in an operative position with respect to the support surface and a first drive for driving the first roller in a first rotation direction about a first roller axis to advance the strip over the support surface in a conveyance direction along the supply path, wherein the first roller comprises brush members that are distributed around the first roller axis to form a circumferential brush surface for contacting the strip, wherein each brush member is resiliently flexible in a flexing direction about the first roller axis opposite to the first rotation direction. The invention further relates to a method for supplying a strip using the aforementioned device.

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	NLP199444A
Nederlands aanvraag nr. **2017122**	Indieningsdatum **07-07-2016**
	Ingeroepen voorrangsdatum

Aanvrager (Naam)

VMI Holland B.V.

Datum van het verzoek voor een onderzoek van internationaal type	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.
27-08-2016	**SN67154**

I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

B29D30/16;B29D30/30

II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimumdocumentatie

Classificatiesysteem	Classificatiesymbolen
IPC	**B29D;B29C**

Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

III.	☐	GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES	(opmerkingen op aanvullingsblad)
IV.	☐	GEBREK AAN EENHEID VAN UITVINDING	(opmerkingen op aanvullingsblad)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2017122

A. CLASSIFICATIE VAN HET ONDERWERP
INV. B29D30/16 B29D30/30
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)
B29D B29C

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)
EPO-Internal

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie *	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	US 2 660 218 A (JOHNSON KERMIT F ET AL) 24 november 1953 (1953-11-24) * kolom 3, regel 21 - kolom 4, regel 30; figuren 1-4 *	1
X	US 4 276 105 A (GESSAGA RINALDO) 30 juni 1981 (1981-06-30) * kolom 5, regel 14 - regel 62; figuren 2-5C *	1-35
X	WO 2014/155240 A1 (PIRELLI [IT]) 2 oktober 2014 (2014-10-02) * bladzijde 17, regel 1 - bladzijde 19, regel 20; figuren 2-5 *	1-35

-/--

[X] Verdere documenten worden vermeld in het vervolg van vak C.

[X] Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

* Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvrage vermeld

"E" eerdere octrooi(aanvrage), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvrage, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid	Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type
6 maart 2017	

Naam en adres van de instantie	De bevoegde ambtenaar
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Fregosi, Alberto

1

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2017122

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN

Categorie *	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	US 2006/048884 A1 (KUDO SHIGEO [JP] ET AL) 9 maart 2006 (2006-03-09) * alinea [0037] - alinea [0053]; figuren 1-4 *	1-35
A	US 4 095 731 A (HARDING ANTONY ET AL) 20 juni 1978 (1978-06-20) * kolom 1, regel 38 - kolom 4, regel 16; figuur 1 *	1-35
A,D	US 2015/283771 A1 (FABBRETTI MARCO [IT] ET AL) 8 oktober 2015 (2015-10-08) in de aanvraag genoemd * alinea [0101] - alinea [0128]; figuur 2 *	1-35
A	US 2011/036484 A1 (SANGIOVANNI STEFANO [IT] ET AL) 17 februari 2011 (2011-02-17) * alinea [0121] - alinea [0129]; figuur 3 *	1-35

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar de stand van de techniek: NL 2017122

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
US 2660218 A	24-11-1953	GEEN	
US 4276105 A	30-06-1981	AR 220421 A1	31-10-1980
		AU 5233379 A	08-05-1980
		BE 879655 A1	15-02-1980
		BR 7907112 A	24-06-1980
		DE 2943829 A1	14-05-1980
		ES 485968 A1	01-09-1980
		FI 792774 A	01-05-1980
		FR 2440268 A1	30-05-1980
		GB 2033315 A	21-05-1980
		IT 1099875 B	28-09-1985
		JP S637938 B2	19-02-1988
		JP S5561446 A	09-05-1980
		LU 81840 A1	25-01-1980
		SE 7908928 A	01-05-1980
		US 4276105 A	30-06-1981
		ZA 7905670 B	31-12-1980
WO 2014155240 A1	02-10-2014	CN 105121144 A	02-12-2015
		EP 2978595 A1	03-02-2016
		WO 2014155240 A1	02-10-2014
US 2006048884 A1	09-03-2006	JP 2006076093 A	23-03-2006
		US 2006048884 A1	09-03-2006
US 4095731 A	20-06-1978	LU 78956 A1	21-06-1978
		US 4095731 A	20-06-1978
US 2015283771 A1	08-10-2015	EP 2906413 A2	19-08-2015
		RU 2015117649 A	10-12-2016
		US 2015283771 A1	08-10-2015
		WO 2014057387 A2	17-04-2014
US 2011036484 A1	17-02-2011	CN 102015269 A	13-04-2011
		EP 2271483 A1	12-01-2011
		JP 5542121 B2	09-07-2014
		JP 2011518689 A	30-06-2011
		KR 20110007131 A	21-01-2011
		US 2011036484 A1	17-02-2011
		WO 2009130727 A1	29-10-2009

WRITTEN OPINION

File No.	Filing date *(day/month/year)*	Priority date *(day/month/year)*	Application No.
SN67154	07.07.2016		NL2017122

International Patent Classification (IPC)
INV. B29D30/16 B29D30/30

Applicant
VMI Holland B.V.

This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the application
- ☐ Box No. VIII Certain observations on the application

	Examiner
	Fregosi, Alberto

Application number

WRITTEN OPINION

NL2017122

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ on paper

   ☐ in electronic form

   c. time of filing/furnishing:

   ☐ contained in the application as filed.

   ☐ filed together with the application in electronic form.

   ☐ furnished subsequently for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes:	Claims	2-35
	No:	Claims	1
Inventive step	Yes:	Claims	
	No:	Claims	1-35
Industrial applicability	Yes:	Claims	1-35
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. State of the Art

Reference is made to the following documents:

D1 : US 2660218 - A;

D2 : US 4276105 - A;

D3 : WO 2014/155240 - A;

D4 : US 2006/0048884 - A;

D5 : US 4095731 - A;

D6 : US 2015/0283771 - A (family member of WO 2014/057387);

D7 : US 2011/0036484 - A.

2. Claim **1** - Lack of novelty

2.1 Claim **1** relates to a device (1) for supplying a strip (8) for tire building, comprising :

(a) - a support surface (42) for supporting the strip along a supply path;

(b) - a first roller (3) for guiding the strip along the support surface when the first roller is in an operative position with respect to the support surface;

(c) - a first drive (51) for driving the first roller (3) in a first rotation direction about a first roller axis to advance the strip over the support surface in a conveyance direction along the supply path;

(b1) - wherein the first roller comprises a plurality of brush members (31) that are distributed around the first roller axis to form a circumferential brush surface for contacting the strip when the first roller is in the operative position,

(b1.1) - wherein each brush member (31) is resiliently flexible in a flexing direction about the first roller axis opposite to the first rotation direction.

2.2 Document **D1** (US 2660218 - A) discloses such a device, suitable for for supplying a strip for tire building, the device comprising the combination of features **(a)** to **(b1.1)**; namely :

- **(a)** is represented by separating plate 56;

- **(b)** is represented by rollers 57 or 58, features **(b1)** and **(b1.1)** being disclosed in the passages related to these elements, in combination with figures 1 - 4;

- **(c)** is represented by motor 83.

Claim **1** is therefore not novel.

3. Claims **1 - 35** - Lack of Inventive Step

3.1 In the tire building domain, devices and methods for supplying a strip (the devices comprising a support surface for supporting the strip along a supply path and a roller for guiding the strip along the support surface, the roller comprising a plurality of resiliently flexible brush members that are distributed around the roller axis to form a circumferential brush surface for contacting the strip) are well known: see for instance documents **D2** (US 4276105 - A) or **D3** (WO 2014/155240 - A).

3.2 The content of claim **1** of the present application differs from these disclosures in the additional feature **(c)**, since the brush rollers of **D2** and **D3** are not driven by any dedicated drive: in fact they are rotated by the advancing movement of the strip supported by the support surface.

Claim **1** is therefore novel vis-à-vis of **D2** and **D3**.

3.3 However, in the light of the introductory portion of the description of the present application (namely page 2, lines 24-35), no evident special technical contribution could be associated to said feature **(c)** of claim **1**.

This feature is thus regarded merely an alternative between two possibilities (a roller driven by a driving means or rotated by the advancing strip), which could simply be interchanged by the skilled person without any inventive activity.

3.4 In the light of the same arguments, also the subject -matter of independent claim **27** is regarded, "mutatis mutandis", as lacking inventive activity.

3.5 The dependent claims **2** to **26** and **28** to **35** do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of inventive step, since these features appear to be either disclosed or suggested in the available prior art or are simply considered as part of the common knowledge of the person skilled in the art of tire manufacture.

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