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(54) **Cutting device and method for cutting-off a length of a continuous strip to form a tire component**

(57) The invention relates to a cutting device and a method for cutting-off a length of a continuous strip to form a tire component, wherein the cutting device comprises a cutting member for cutting the continuous strip at a cutting position and a feeding member that is movable in a feeding direction for feeding the length of the continuous strip in said feeding direction past said cutting position, wherein the feeding member is retractable in a retraction direction and wherein the cutting device further comprises a manipulator for retaining the length as the feeding member is retracted in the retraction direction, wherein the cutting position is located on the manipulator and wherein the cutting member and the manipulator are movable together in the feeding direction to cut-off of the length of the continuous strip at the cutting position on the manipulator while moving the length of the continuous strip in said feeding direction.

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Cutting device and method for cutting-off a length of a continuous strip to form a tire component

BACKGROUND

The invention relates to a cutting device and a method for cutting-off a length of a continuous strip to form a tire component.

WO 2006/068474 A1 discloses an assembly for producing a strip from a band of flexible material, having a device for picking up, displacing and placing said bands. The device is able to reach past the cutting line to pick up a cut-off strip and to pull it onto a discharge conveyor upstream of the cutting line. The band is obtained from an extruder. The extruder is arranged for extruding the band at a constant extrusion speed. However, the cutting and feeding at the known device is intermittent, resulting in jerks and jolts in the band upstream of the device. It is known to absorb these jerks and jolts with a suitable buffer, e.g. a festooner or a dancer roll.

It is an object of the present invention to a cutting device and a method for cutting-off a length of a continuous strip to form a tire component, wherein the effect of the cutting on the feeding of the continuous strip into the device can be reduced.

SUMMARY OF THE INVENTION

According to a first aspect, the invention provides a cutting device for cutting-off a length of a

continuous strip to form a tire component, wherein the cutting device comprises a cutting member for cutting the continuous strip at a cutting position and a feeding member that is movable in a feeding direction past the cutting position for feeding the length of the continuous strip in said feeding direction past said cutting position, wherein the feeding member is at least partially retractable in a retraction direction for exposing the length of the continuous strip to the cutting member at the cutting position and wherein the cutting device further comprises a manipulator for taking over and retaining the length of the continuous strip from the feeding member as the feeding member is retracted in the retraction direction, wherein the cutting position is located on the manipulator and wherein the cutting member and the manipulator are movable together in the feeding direction to cut-off of the length of the continuous strip at the cutting position on the manipulator while moving the length of the continuous strip in said feeding direction.

By moving the cutting member and the manipulator together in the feeding direction during the cutting, the continuous strip can continuously be fed into the cutting device in the feeding direction. Hence, an interruption in the feeding process as a result of the cutting can be prevented. Hence, jerks and bolts in the continuous strip upstream of the cutting device can be prevented. In contrast to the prior art device, the cutting device according to the present invention does not require a buffer such as a festooner or a dancer roll.

In an embodiment the cutting device comprises a first drive for driving the movement of the cutting member in the feeding direction and a second drive for driving the movement of the manipulator in the feeding direction, wherein the first drive and the second drive are synchronized to move the cutting member and the manipulator, respectively, at the same feeding speed in the feeding direction during the cutting-off of the length of

the continuous strip. Hence, the cutting member and the manipulator can be driven at the same feeding speed.

In an embodiment thereof the cutting device further comprises a control unit for controlling the first drive and the second drive to synchronously move the cutting member and the manipulator, respectively, at the same feeding speed in the feeding direction during the cutting-off of the length of the continuous strip. Hence, the operation of the cutting device can be automated to a large extent by controlling the drives with the use of the control unit.

In a further embodiment the cutting member is movable together with the feeding member in the feeding direction and the retraction direction. Hence, the movements of the cutting member and the feeding member can be related to each other, which can simplify the operation and/or control of the cutting device.

In an embodiment thereof the feeding member is a telescopic feeding conveyor that is extendable in the feeding direction past the cutting position and retractable in the retraction direction opposite to the feeding direction past the cutting position. Such a telescopic feeding conveyor is an effective means to advance the length of the continuous strip past the cutting position and to expose said advanced length to the cutting member at the cutting position by retracting said telescopic feeding conveyor.

In an embodiment thereof the telescopic feeding conveyor comprises a fixed portion that is fixed in the feeding direction and a telescopic portion that is movable with respect to the fixed portion in the feeding direction and the retraction direction, wherein the cutting member is fixed with respect to the telescopic portion in the feeding direction and the retraction direction. By fixing the cutting member with respect to the telescopic portion, the cutting member can be moved together with said telescopic portion, thereby simplifying the operation and/or control

of the cutting device.

In a combination of the aforementioned embodiment and the embodiment that introduced the first drive, the first drive is arranged for driving both the telescopic portion of the telescopic feeding conveyor and the movement of the cutting member. Hence, a single drive can be used to drive both the telescopic portion and the cutting member, thereby simplifying the operation and/or control of the cutting device.

In a further embodiment the manipulator is provided with an anvil member at the cutting position for cooperating with the cutting member to cut-off the length of the continuous strip. The anvil member can be made of a material that provides a stable cutting surface for cooperating with the cutting member and/or that is not easily damaged by the cutting.

In a further embodiment the cutting member comprises a first knife that is movable in a cutting direction towards the cutting position on the manipulator to cut-off the length of the continuous strip at the cutting position along a first cutting profile. Preferably, the first cutting profile is at least partially linear, non-linear, V-shaped, symmetric and/or asymmetric. Hence, a cut according to a predetermined cutting profile can be made.

In a further embodiment thereof the first cutting profile is a symmetric, non-linear cutting profile, wherein the feeding member is arranged for feeding the continuous strip past the cutting position along feeding path in the feeding direction, wherein the feeding path and the symmetry of the first cutting profile are offset with respect to each other. Hence, a symmetric cutting profile can be used to asymmetrically cut-off the length of the continuous strip.

In a further embodiment thereof the cutting member comprises a first retaining element for retaining the length of the continuous strip to the cutting member at

or near the first cutting profile. Said first retaining element can be used to retain the length of the continuous strip prior to the takeover by the manipulator. In addition, the first retaining element can be used to retain the length of the continuous strip during cutting.

In a further embodiment thereof the cutting member comprises a second knife that is movable in the cutting direction towards the cutting position on the manipulator to cut-off the length of the continuous strip at the cutting position along a second cutting profile that is different from the first cutting profile. Hence, the length of the continuous strip can be cut-off along different cutting profiles, depending on the cutting requirements.

In an embodiment thereof the cutting member comprises a knife actuator that is arranged for selectively moving one of the first knife and the second knife with respect to the other of the first knife and the second knife in the cutting direction towards the cutting position on the manipulator. Hence, only one of the knives can be made to contact and cut-off the length of the continuous strip.

In a further embodiment thereof, prior to the cutting, the cutting member is movable with respect to the manipulator to align one of the first knife and the second knife in the cutting direction with the cutting position on the manipulator. By correctly aligning either the first knife or the second knife with respect to the cutting position, the length of the continuous strip can be cut by the aligned knife at a single cutting position.

In a further embodiment thereof the first knife and the second knife are spaced apart in the feeding direction. Hence, the knives can be aligned with the cutting position by moving the cutting member in the feeding direction over the distance by which the knives are spaced apart.

In a further embodiment thereof the cutting

member comprises a second retaining element for retaining the length of the continuous strip between the first cutting profile and the second cutting profile. The second retaining element, alone or in combination with the first retaining element, can be used to retain the length of the continuous strip during cutting.

In a further embodiment the manipulator comprises a retaining element for retaining the length of the continuous strip to the manipulator. Hence, the manipulator can be used in any orientation, e.g. an up-side-down orientation.

In a further embodiment the retaining element is a vacuum retaining element or a magnetic retaining element. The vacuum retaining element can be used to retain a continuous strip of rubber or elastomeric material. The magnetic retaining element can be used to retain a continuous strip comprising ferromagnetic elements, e.g. steel reinforcement cords.

According to a second aspect, the invention provides a method for cutting-off a length of a continuous strip to form a tire component with the use of the aforementioned cutting device, wherein the method comprises the steps of:

- using the feeding member to feed the length of the continuous strip in the feeding direction past the cutting position;
- using the manipulator to take over and retain the length of the continuous strip from the feeding member;
- retracting at least a part of the feeding member in the retraction direction to expose the length of the continuous strip to the cutting member at the cutting position while retaining the length of the continuous strip as the feeding member is retracted in the retraction direction; and
- moving the cutting member and the manipulator together in the feeding direction to cut-off of the length of the continuous strip at the cutting position on the

manipulator while moving the length of the continuous strip in said feeding direction.

The method and its embodiments relate to the practical implementation of the cutting device and its respective embodiments. The advantages of the method are the same as the advantages previously discussed in relation to the cutting device, and will not be repeated hereafter.

In a preferred embodiment of the method the cutting device is arranged for continuously feeding the length of the continuous strip in the feeding direction during the feeding, retracting, take over and cutting-off. Hence, interruptions in the feeding of the continuous strip can be prevented throughout the steps of the method.

In an embodiment thereof a subsequent length of the continuous strip is already being fed in the feeding direction towards the cutting position as the previous length of the continuous strip is being cut-off. Therefore, a new or subsequent length of the continuous strip can already be prepared on the feeding member, which can significantly reduce the cycle time.

In another preferred embodiment of the method the cutting member and the manipulator are synchronously moved at the same feeding speed in the feeding direction during the cutting-off of the length of the continuous strip.

In a further embodiment of the method the cutting member is moved together with the feeding member in the feeding direction and the retraction direction.

In an embodiment thereof the feeding member is a telescopic feeding conveyor with a fixed portion that is fixed in the feeding direction and a telescopic portion that is movable with respect to the fixed portion in the feeding direction and the retraction direction, wherein the cutting member is fixed with respect to the telescopic portion in the feeding direction, wherein the telescopic portion of the telescopic feeding conveyor and the cutting member are moved together.

In a further embodiment of the method the cutting

member comprises a first knife that is arranged to cut-off the length of the continuous strip at the cutting position along a first cutting profile, wherein the cutting member comprises a second knife that is arranged to cut-off the length of the continuous strip at the cutting position along a second cutting profile that is different from the first cutting profile, wherein one of the first knife and the second knife is selectively moved with respect to the other of the first knife and the second knife in a cutting direction towards the cutting position on the manipulator.

In a preferred embodiment of the method, prior to the cutting, the cutting member is moved with respect to the manipulator to align one of the first knife and the second knife in the cutting direction with the cutting position on the manipulator.

In a further embodiment the method further comprises the step of aligning a different one of the first knife and the second knife prior to cutting a subsequent length of the continuous strip, wherein the method further comprises the step of cutting a waste length of the continuous strip to form a new leading end of the continuous strip that has been cut with the different knife. Cutting-off a relatively short waste length between changing over from one knife to another, allows for the leading end of the continuous strip, that was cut with the previously used knife, to be cut-off using the newly aligned knife.

In another further embodiment of the method the cutting member comprises a first knife that is arranged to cut-off the length of the continuous strip at the cutting position along a symmetric, non-linear first cutting profile, wherein the feeding member is arranged for feeding the continuous strip past the cutting position along feeding path in the feeding direction, wherein the feeding path and the symmetry of the first cutting profile are offset with respect to each other.

In a preferred embodiment of the method the

cutting device is used to cut-off the length of the continuous strip to form a gum strip. With the cutting device according to one or more of the aforementioned embodiments, gum strips can be produced quickly and reliably, without requiring a buffer between the supply device and the cutting device. Moreover, when asymmetrically cutting a gum strip, said gum strip can be wrapped around the edge of a breaker ply, where the part of the gum strip at one side of the breaker ply is supposed to be larger than the part of the gum strip at the other side of the breaker ply.

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.

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:

figures 1-8 show side views of a cutting device according to the invention during the steps of a method for cutting-off a length of a continuous strip to form a tire component;

figure 9 shows a top view of a cutting member of the cutting device according to figures 1-8; and

figure 10 shows a top view of an alternative alignment of the continuous strip with respect to the cutting member of figure 9.

DETAILED DESCRIPTION OF THE INVENTION

Figures 1-8 show a cutting device 1 according to an exemplary embodiment of the invention. Said cutting device 1 is arranged for cutting-off a length L of a continuous strip S to form a tire component, in this exemplary embodiment a gum strip 9. Gum strips 9 are used to cover sharp edges of tire layers, e.g. the sharp edges of a breaker ply.

The cutting device 1 is arranged for receiving the continuous strip S from a supply device, e.g. directly from an extruder (not shown). The extruder is arranged for extruding the continuous strip S at an extrusion speed. The cutting device 1 comprises a cutting member 2 for cutting the continuous strip S at a cutting position C and a feeding member 3 that is movable in a feeding direction F past the cutting position C for feeding the length L of the continuous strip S in said feeding direction F past said cutting position C. The feeding member 3 is at least partially retractable in a retraction direction R for exposing the length of the continuous strip to the cutting member 2 at the cutting position C. The cutting device 1 further comprises a manipulator 5 for taking over and retaining the length L of the continuous strip S from the feeding member 3 as the feeding member 3 is retracted in the retraction direction R, in a manner that will be described in more detail hereafter.

As best seen in figures 1 and 9, the cutting member 2 comprises a knife holder 20 with a first knife 21, a second knife 22 and a third knife 23. The skilled person will appreciate that more or fewer knives may be provided. As shown in figure 9, each knife 21-23 is provided with a different cutting profile P1, P2, P3 to cut-off the length L of the continuous strip S along said specific cutting profile P1, P2, P3. In particular, in this example, the first knife 21 is provided with a first cutting profile P1 that is V-shaped and symmetrical. The second knife 22 is provided with a second cutting profile P2 that is linear and extends at an oblique cutting angle A with respect to

the feeding direction F. The third knife 23 is provided with a third cutting profile P3 that, like the first cutting profile P1, is V-shaped, yet asymmetrical. Other cutting profiles, such as linear, non-linear, symmetric or asymmetric cutting profiles, can be provided depending on the cutting requirements. It is also envisioned that the knives are adjustable to change the cutting angle A or to change the angle between the legs of the V-shape.

Alternatively, the knives 21-23 may be provided with the same cutting profile, such that the cutting device 1 can be used for a longer time without interchanging the knives 21-23.

Said knives 21-23 are spaced apart in the feeding direction F. The cutting member 2 is provided with a knife actuator 24 that is arranged for selectively moving one of the knives 21-23 with respect to the other of the knives 21-23 in a cutting direction K towards the cutting position C, as shown in figure 7 for the first knife 21, for cutting-off the length L of the continuous strip S at the cutting position C. In this example, the cutting direction K is an upward cutting direction K, transverse or perpendicular to the feeding direction F. Prior to cutting, the cutting member 2 is movable in the feeding direction F to align one of the knives 21-23 in the cutting direction K with the cutting position C.

The cutting member 2 further comprises one or more retaining elements 25, 26, 27, 28 for retaining the length L of the continuous strip S to the cutting member 2 at or near the respective cutting profiles P1-P3. In particular, a first retaining element 25 is provided upstream of the first knife 21 in the feeding direction F, a second retaining element 26 is provided between the first knife 21 and the second knife 22, a third retaining element 27 is provided between the second knife 22 and the third knife 23 and a fourth retaining element 28 is provided downstream of the third knife 23 in the feeding direction F. The retaining elements 25-28 are preferably magnetic

retaining elements 25-28 or vacuum retaining elements 25-28.

As shown in figure 1, the feeding member 3 in this exemplary embodiment is a telescopic feeding conveyor 30 that is extendable in the feeding direction F past the cutting position C and retractable in the retraction direction R opposite to the feeding direction F past the cutting position C. The telescopic feeding conveyor 30 comprises a fixed portion 31 that is fixed in the feeding direction F and a telescopic portion 32 that is movable with respect to the fixed portion 31 in the feeding direction F and the retraction direction R. The fixed portion 31 and the telescopic portion 32 comprise a plurality of fixed pulleys 33 and a plurality of movable pulleys 34, respectively. The telescopic feeding conveyor 30 further comprises an endless belt 40 that is arranged in a loop around said plurality of pulleys 33 to form a transport run 41, in this example an upper run, and a return run 42, in this example a lower run, of the telescopic feeding conveyor 30. At least one of the pulleys 33, 34 is a driven pulley to move the endless belt 40 in a conveying direction D, so that the continuous strip S is continuously advanced at a feeding speed V in the feeding direction F on the transport run 41 of the telescopic feeding conveyor 30.

One of the movable pulleys 34 forms a first head pulley 35 at the leading end of the transport run 41 of the telescopic feeding conveyor 30 in the feeding direction F and one of the fixed pulleys 33 forms a second head pulley 36 at leading end of the return run 42 of the telescopic feeding conveyor 30 in the feeding direction F. The movable pulleys 34 of the telescopic portion 32 are mounted on a carriage 37 that is movable along a guide rail 38 in the feeding direction F and the retraction direction R. The cutting device 1 comprises a first drive 61 for driving the telescopic portion 32 in the feeding direction F and the retraction direction R. In particular, the first drive 61

is arranged for driving one of the movable pulleys 34 at a faster or slower speed than the speed than the fixed pulleys 33, so that the movable pulleys 34 of the telescopic portion 32 are moved along the guide rail 38. Hence, the location of the first head pulley 41 can be telescopically extended and retracted in the feeding direction F and the retraction direction R, respectively, with respect to the fixed portion 31 of the telescopic feeding conveyor 30 by moving the carriage 37 with the telescopic portion 32 of the telescopic feeding conveyor 30 mounted thereon along the guide rail 38 in said respective feeding direction F and retraction direction R with respect to the second head pulley 36. During said extension and retraction, the endless belt 40 may continuously be driven in the conveyance direction D to advance the continuous strip S supported on the transport run 41 without interruption in the feeding direction F.

In this example, the cutting member 2 is fixed with respect to or mounted onto the same carriage 37 that holds the telescopic portion 32. Hence, the movement of the cutting member 2 in the feeding direction F and the retraction direction R can be driven by the same first drive 61 that drives the movement of the telescopic portion 32 in said respective directions F, R. Alternatively, the cutting member 2 may be driven by a separate drive (not shown). Preferably, the cutting member 2 is movable in a recessing direction E opposite to the cutting direction K into a recessed position, as shown in figure 4, spaced apart from the manipulator 5.

As shown in figure 1, the manipulator 5 comprises a retaining body 50 and one or more retaining elements 51 for retaining the length L of the continuous strip S to the retaining body 50. The one or more retaining elements 51 are preferably magnetic retaining elements 51 or vacuum retaining elements 51. The cutting device 1 is provided with a second drive 62 for moving the manipulator 5 in the feeding direction F and the retraction direction R. In this

example, the second drive 62 is additionally arranged for moving the manipulator 5 towards the feeding member 3 in a pick-up direction B opposite to the cutting direction K. As seen in figures 1-8, the cutting position C is located on, fixed with respect to and/or moves together with the manipulator 5. In particular, the manipulator 5 comprises an anvil member 52 at the cutting position C for cooperating with the cutting member 2 to cut-off the length L of the continuous strip S. The anvil member 52 may be of a suitably hard material such that it provides a stable cutting surface for the knives 21-23 of the cutting member 2 and so that it is not easily damaged by the cutting action of the knives 21-23.

The first drive 61 and the second drive 62 are synchronized to move the cutting member 2, the feeding member 3 and the manipulator 5 at a feeding speed V in the feeding direction F during the cutting-off of the length L of the continuous strip 2. More in particular, the cutting device 1 further comprises a control unit 7 that is operationally and/or electronically connected to the first drive 61 and the second drive 62 to control said synchronized movements of the cutting member 2, the feeding member 3 and the manipulator 5.

A method for cutting-off a length L of the continuous strip S to form a tire component with the use of the aforementioned cutting device 1 will be described hereafter with reference to figures 1-9.

Figure 1 shows the situation in which the continuous strip S is fed from a supply device (not shown) in the feeding direction F onto the feeding member 3. In this example, the leading end of the continuous strip S is retained by the first retaining element 25 of the cutting member 2. The feeding member 3 is in a retracted position and is ready to feed the continuous strip S further in the feeding direction F. In the case of the telescopic feeding conveyor 30, the first head pulley 35 has been moved together with the telescopic portion 32 in the retraction

direction R with respect to the second head pulley 36. The transport run 41 is now relatively short and is ready to be extended in the feeding direction F by moving the telescopic portion 32 in the feeding direction F again. The situation as shown in figure 1 may be the last step of a previous cycle of the method, in which the manipulator 5 has just deposited a freshly cut-off length L of the continuous strip S onto a nearby discharge device (not shown). The manipulator 5 is in a standby position spaced apart from the continuous strip S. The manipulator 5 is empty and ready to retain a new length L of the continuous strip S.

Figure 2 shows the situation in which the feeding member 3 has been operated to feed the length L of the continuous strip S at the feeding speed V in the feeding direction F past the cutting position C. In particular, one or more of pulleys 33, 34 of the telescopic feeding conveyor 30 have been driven to move the endless belt 40 in the conveyance direction D at the feeding speed V to advance the continuous strip S, supported on the transport run 41 of the telescopic feeding conveyor 30, in the feeding direction F. Said feeding speed V may be equal to the supply speed of the supply device, e.g. the extrusion speed, or may be slightly different, e.g. to pull on the continuous strip S during the feeding. Meanwhile, the telescopic portion 32 of the telescopic feeding conveyor 30 has been moved by the first drive 61 in the feeding direction F at the same feeding speed V to increase the length of the transport run 41 in said feeding direction F. Hence, the feeding member 3 continuous to support the length L of the continuous strip S as said length L is advanced in the feeding direction F.

Figure 3 shows the situation in which the length L of the continuous strip S that has to be cut-off has been moved fully past the cutting position C on the manipulator 5. Now the manipulator 5 is moved in the pick-up direction B towards the continuous strip S at the feeding member 3 to

take over and retain the length L of the continuous strip S from the feeding member 3. Once the manipulator 5 is in contact with the length L of the continuous strip S, the one or more retaining elements 51 are activated to retain the length L of the continuous strip S to the retaining body 50. Meanwhile, the feeding member 3 is still advancing the continuous strip S at the feeding speed V in the feeding direction F. In the case of the telescopic feeding conveyor 30, the cutting member 2, the telescopic portion 32 and the manipulator 5 are still moved at the same feeding speed V in said feeding direction F.

Figure 4 shows the situation in which the cutting member 2 has been recessed in the recessing direction E opposite to the cutting direction K into the recessed position to release the continuous strip S, that is now instead retained by the manipulator 5, from the cutting member 2. Hence, the cutting member 2 can now be retracted in the retraction direction R towards the cutting position C independently of the continuous strip S.

Figure 5 shows the situation in which the feeding member 3 is retracted in the retraction direction R to expose the length L of the continuous strip S to the cutting member 2 at the cutting position C. As the feeding member 3 is retracted in the retraction direction R, the manipulator 5 retains and moves the length L of the continuous strip S further at the feeding speed V in the feeding direction F. In the case of the telescopic feeding conveyor 30, the telescopic portion 32 and the cutting member 2 mounted thereto are retracted together in the retraction direction R until one of the knives 21-23, in this example the first knife 21, is aligned with the cutting position C in the cutting direction K. The skilled person will appreciate that aligning a different knife 22, 23 with the cutting position C will simply involve retracting the telescopic portion 32 and the cutting member 2 mounted thereto further in the retraction direction R over the distance by which the knives 21-23 are spaced

apart. Meanwhile, the feeding member 3 has continued to advance the continuous strip S into the cutting device 1 at the feeding speed V and the manipulator 5 has continued to move the length L of the continuous strip S that is retained thereto in the feeding direction F at the same feeding speed V.

Figure 6 shows the situation in which the cutting member 2 has been moved back in the cutting direction K into contact with the continuous strip S at the cutting position C. The cutting member 2 is now ready for cutting-off the length L of the continuous strip S at the cutting position C. Meanwhile, the feeding member 3 has continued to advance the continuous strip S into the cutting device 1 at the feeding speed V and the manipulator 5 has continued to move the length L of the continuous strip S that is retained thereto in the feeding direction F at the same feeding speed V.

Figure 7 shows the actual cutting-off of the length L of the continuous strip S at the cutting position C. In this example, this is effectuated by moving the first knife 21 in the cutting direction K through the material of the continuous strip S at the cutting position S. In particular, the first knife 21 is moved in the cutting direction K onto the anvil 52 at the cutting position C on the manipulator 5. Meanwhile, the feeding member 3 has continued to feed the continuous strip S into the cutting device 1 at the feeding speed V and the manipulator 5 has continued to move the length L of the continuous strip S that is retained thereto in the feeding direction F at the same feeding speed V.

Figure 8 shows the situation in which the length L of the continuous strip S has been cut-off. Now that the length L has been cut-off, the manipulator 5 can be moved elsewhere independently from the continuous strip S to discharge the cut-off length L, e.g. to a discharge device (not shown). Meanwhile, the feeding member 3 is already feeding a new or subsequent length L of the continuous

strip S at the feeding speed V in the feeding direction F into the cutting device 1 for a subsequent cycle of the method.

Throughout the cutting steps as shown in figures 5, 6 and 7, the cutting member 2 and the manipulator 5 are moved together in the feeding direction F to cut-off of the length L of the continuous strip S with respect to the cutting position C on the manipulator 5 while moving the length L of the continuous strip S in said feeding direction F. As the manipulator 5 moves, the cutting position C is moved with the manipulator 5 in the feeding direction F. Preferably, the cutting steps of figures 5, 6 and 7 are performed while continuously moving the continuous strip S at a constant or substantially constant feeding speed V, e.g. by continuously driving the endless belt 40 of the telescopic feeding conveyor 30 in the conveyance direction D, by continuously moving the manipulator 5 at the same feeding speed V and by moving the cutting member 2 at the same feeding speed V to follow or keep up with the cutting position C on the manipulator 5. Hence, the cutting steps do not delay or interrupt the feeding of the continuous strip S in the feeding direction F. In fact, by continuously feeding the continuous strip S in the feeding direction F during the cutting steps, a new or subsequent length L of the continuous strip S is already being prepared on the feeding member 3, thereby significantly reducing the cycle time.

More in particular, the cutting device 1 according to the invention is arranged for continuously feeding the length L of the continuous strip S in the feeding direction F during the feeding, retracting, take over and cutting-off, as shown in figures 1-8.

Hence, in contrast to the prior art devices, the cutting device 1 according to the present invention does not require buffer members, e.g. in the form of a dancer roller or a festooner, upstream of the cutting device 1.

When aligning a different knife 21-23 with the

cutting position C on the manipulator 5, the leading end of the continuous strip S may still have a shape that corresponds to the cutting profile P1-P3 of the previously used knife 21-23. Hence, prior to starting a new cycle of the method, the steps of the method are performed for a relatively short length of the continuous strip S, e.g. a waste length, to cut-off the previously cut leading end of the continuous strip S to create a new leading end at the continuous strip S that corresponds to the cutting profile P1-P3 of the newly aligned knife 21-23. The waste length may be disposed manually or discharge to a waste bin by the manipulator 5.

Figure 10 shows a top view of the cutting member 2, similar to figure 9, during a step of an alternative method in which the feeding member 3 of figure 1 is arranged for feeding the continuous strip S past the cutting position C along feeding path in the feeding direction F, wherein the feeding path and the symmetry of the first cutting profile P1 are offset with respect to each other. Because of the offset, it is possible to cut-off the length L of the continuous strip S asymmetrically with the symmetrical first cutting profile P1. An asymmetric cut may be useful when wrapping a gum strip around the edge of a breaker ply, where the part of the gum strip at one side of the breaker ply is supposed to be larger than the part of the gum strip at the other side of the breaker ply.

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.

In summary, the invention relates to a cutting device 1 and a method for cutting-off a length L of a continuous strip S to form a tire component 9, wherein the cutting device 1 comprises a cutting member 2 for cutting

the continuous strip S at a cutting position C and a feeding member 3 that is movable in a feeding direction F for feeding the length L of the continuous strip S in said feeding direction F past said cutting position C, wherein the feeding member 3 is retractable in a retraction direction R and wherein the cutting device 1 further comprises a manipulator 5 for retaining the length L as the feeding member 3 is retracted in the retraction direction R, wherein the cutting position C is located on the manipulator 5 and wherein the cutting member 2 and the manipulator 5 are movable together in the feeding direction F to cut-off of the length L of the continuous strip S at the cutting position C on the manipulator 5 while moving the length L of the continuous strip S in said feeding direction F.

C O N C L U S I E S

1. Snij-inrichting (1) voor het afsnijden van een lengte (L) van een continue strip (S) teneinde een bandcomponent (9) te vormen, waarbij de snij-inrichting (1) een snijdeel (2) omvat voor het snijden van de continue strip (S) op een snijpositie (C) en een toevoerdeel (3) dat beweegbaar is in een toevoerrichting (F) voorbij de snijpositie (C) voor het toevoeren van de lengte (L) van de continue strip (S) in de toevoerrichting (F) voorbij de snijpositie (C), waarbij het toevoerdeel (3) ten minste gedeeltelijk terugtrekbaar is in een terugtrekrichting (R) voor het blootleggen van de lengte (L) van de continue strip (S) aan het snijdeel (2) bij de snijpositie (C) en waarbij de snij-inrichting (1) verder een manipulator (5) omvat voor het overnemen en vasthouden van de lengte (L) van de continue strip (S) van het toevoerdeel (3) wanneer het toevoerdeel (3) wordt teruggetrokken in de terugtrekrichting (R), waarbij de snijpositie (C) gelegen is op de manipulator (5) en waarbij het snijdeel (2) en de manipulator (5) samen beweegbaar zijn in de toevoerrichting (F) teneinde de lengte (L) van de continue strip (S) bij de snijpositie (C) op de manipulator (5) af te snijden terwijl de lengte (L) van de continue strip (S) in de toevoerrichting (F) bewogen wordt.

2. Snij-inrichting (1) volgens conclusie 1, waarbij de snij-inrichting (1) een eerste aandrijving (61) omvat voor het aandrijven van de beweging van het snijdeel (2) in de toevoerrichting (F) en een tweede aandrijving (62) voor het aandrijven van de beweging van de manipulator (5) in de toevoerrichting (F), waarbij de eerste aandrijving (61) en de tweede aandrijving (62) gesynchroniseerd zijn teneinde respectievelijk het snijdeel (2) en de manipulator (5) op dezelfde toevoersnelheid (V) in de toevoerrichting (F) te bewegen gedurende het

afsnijden van de lengte (L) van de continue strip (S).

3. Snij-inrichting (1) volgens conclusie 2, waarbij de snij-inrichting (1) verder een regeleenheid (7) omvat voor het regelen van de eerste aandrijving (61) en de tweede aandrijving (62) teneinde respectievelijk het snijdeel (2) en de manipulator (5) synchroon te bewegen op dezelfde toevoersnelheid (V) in de toevoerrichting (F) gedurende het afsnijden van een lengte (L) van de continue strip (S).

4. Snij-inrichting (1) volgens een der voorgaande conclusies, waarbij het snijdeel (2) samen met het toevoerdeel (3) beweegbaar is in de toevoerrichting (F) en de terugtrekrichting (R).

5. Snij-inrichting (1) volgens conclusie 4, waarbij het toevoerdeel (3) een telescopische toevoertransporteur (30) is die verlengbaar is in de toevoerrichting (F) voorbij de snijpositie (C) en terugtrekbaar in de terugtrekrichting (R) tegengesteld aan de toevoerrichting (F) voorbij de snijpositie (C).

6. Snij-inrichting (1) volgens conclusie 5, waarbij de telescopische toevoertransporteur (30) een gefixeerd gedeelte (31) omvat dat gefixeerd is in de toevoerrichting (F) en een telescopisch gedeelte (32) dat beweegbaar is ten opzichte van het gefixeerde gedeelte (31) in de toevoerrichting (F) en de terugtrekrichting (R), waarbij het snijdeel (2) gefixeerd is ten opzichte van het telescopische gedeelte (32) in de toevoerrichting (F) en de terugtrekrichting (R).

7. Snij-inrichting (1) volgens conclusies 2 en 6, waarbij de eerste aandrijving (61) is ingericht voor het aandrijven van zowel het telescopische gedeelte (32) van de telescopische toevoertransporteur (30) als de beweging van het snijdeel (2).

8. Snij-inrichting (1) volgens een der voorgaande conclusies, waarbij de manipulator (5) is voorzien van een aambeeld deel (52) bij de snijpositie (C) voor het samenwerken met het snijdeel (2) teneinde de

lengte (L) van de continue strip (S) af te snijden.

9. Snij-inrichting (1) volgens een der voorgaande conclusies, waarbij het snijdeel (2) een eerste mes (21) omvat dat beweegbaar is in een snijrichting (K) in de richting van de snijpositie (C) op de manipulator (5) teneinde de lengte (L) van de continue strip (S) bij de snijpositie (C) langs een eerste snijprofiel (P1) af te snijden.

10. Snij-inrichting (1) volgens conclusie 9, waarbij het eerste snijprofiel (P1) ten minste gedeeltelijk lineair, niet-lineair, V-vormig, symmetrisch en/of asymmetrisch is.

11. Snij-inrichting (1) volgens conclusie 9 of 10, waarbij het eerste snijprofiel (P1) een symmetrisch, niet-lineair snijprofiel is, waarbij het toevoerdeel (3) is ingericht voor het toevoeren van de continue strip (S) voorbij de snijpositie (C) langs toevoerbaan in de toevoerrichting (F), waarbij de toevoerbaan en de symmetrie van het eerste snijprofiel (P1) verschoven zijn ten opzichte van elkaar.

12. Snij-inrichting (1) volgens een der conclusies 9-11, waarbij het snijdeel (2) een eerste vasthoudelement (25) omvat voor het vasthouden van de lengte (L) van de continue strip (S) aan het snijdeel (2) bij of nabij het eerste snijprofiel (P1).

13. Snij-inrichting (1) volgens een der conclusies 9-12, waarbij het snijdeel (2) een tweede mes (22) omvat dat beweegbaar is in de snijrichting (K) in de richting van de snijpositie (C) op de manipulator (5) voor het afsnijden van de lengte (L) van de continue strip (S) bij de snijpositie (C) langs een tweede snijprofiel (P2) dat verschilt van het eerste snijprofiel (P1).

14. Snij-inrichting (1) volgens conclusie 13, waarbij het snijdeel (2) een mes actuator (24) omvat die is ingericht voor het selectief bewegen van één van het eerste mes (21) en het tweede mes (22) ten opzichte van het andere van het eerste mes (21) en het tweede mes (22) in de

snijrichting (K) in de richting van de snijpositie (C) op de manipulator (5).

15. Snij-inrichting (1) volgens conclusie 13 of 14, waarbij het snijdeel (2) voorafgaand aan het snijden beweegbaar is ten opzichte van de manipulator (5) teneinde één van het eerste mes (21) en het tweede mes (22) in de snijrichting (K) uit te lijnen met de snijpositie (C) op e manipulator (5).

16. Snij-inrichting (1) volgens een der conclusies 13-15, waarbij het eerste mes (21) en het tweede mes (22) op afstand van elkaar gelegen zijn in de toevoerrichting (F).

17. Snij-inrichting (1) volgens een der conclusies 13-16, waarbij het snijdeel (2) een tweede vasthoudelement (26) omvat voor het vasthouden van de lengte (L) van de continue strip (S) tussen het eerste snijprofiel (P1) en het tweede snijprofiel (P2).

18. Snij-inrichting (1) volgens een der voorgaande conclusies, waarbij de manipulator (5) een vasthoudelement (51) omvat voor het vasthouden van de lengte (L) van de continue strip (S) aan de manipulator (5).

19. Snij-inrichting (1) volgens een der conclusies 12, 17 en 18, waarbij het vasthoudelement (51) een vacuüm vasthoudelement of een magnetisch vasthoudelement is.

20. Werkwijze voor het afsnijden van een lengte (L) van een continue strip (S) teneinde een bandcomponent (9) te vormen met gebruikmaking van een snij-inrichting (1) volgens een der voorgaande conclusies, waarbij de werkwijze de stappen omvat van:

- het gebruiken van het toevoerdeel (3) teneinde de lengte (L) van de continue strip (S) in de toevoerrichting (F) voorbij de snijpositie (C) te voeren;
- het gebruiken van de manipulator (5) teneinde de lengte (L) van de continue strip (S) van het toevoerdeel (3) over te nemen en vast te houden;

- het terugtrekken van ten minste een deel van het toevoerdeel (3) in de terugtrekrichting (R) teneinde de lengte (L) van de continue strip (S) bloot te leggen aan het snijdeel (2) bij de snijpositie (C) terwijl de lengte (L) van de continue strip (S) wordt vastgehouden wanneer het toevoerdeel (3) wordt teruggetrokken in de terugtrekrichting (R); en

- het samen bewegen van het snijdeel (2) en de manipulator (5) in de toevoerrichting (F) teneinde de lengte (L) van de continue strip (S) bij de snijpositie (C) op de manipulator (5) af te snijden terwijl de lengte (L) van de continue strip (S) in de toevoerrichting (F) bewogen wordt.

21. Werkwijze volgens conclusie 20, waarbij de snij-inrichting (1) is ingericht voor het continue toevoeren van de lengte van de continue strip (S) in de toevoerrichting (F) gedurende het toevoeren, terugtrekken, overnemen en afsnijden.

22. Werkwijze volgens conclusie 21, waarbij een volgende lengte (L) van de continue strip (S) al toegevoerd wordt in de toevoerrichting in de richting van de snijpositie (C) wanneer de vorige lengte van de continue strip (S) wordt afgesneden.

23. Werkwijze volgens een der conclusies 20-22, waarbij het snijdeel (2) en de manipulator (5) synchroon bewogen worden op dezelfde toevoersnelheid (V) in de toevoerrichting (F) gedurende het afsnijden van de lengte (L) van de continue strip (S).

24. Werkwijze volgens een der conclusies 20-23, waarbij het snijdeel (2) samen met het toevoerdeel (3) bewogen wordt in de toevoerrichting (F) en de terugtrekrichting (R).

25. Werkwijze volgens conclusie 24, waarbij het toevoerdeel (3) een telescopische toevoertransporteur (30) is met een gefixeerd gedeelte (31) dat gefixeerd is in de toevoerrichting (F) en een telescopisch gedeelte (32) dat beweegbaar is ten opzichte van het gefixeerde gedeelte (31)

in de toevoerrichting (F) en de terugtrekrichting (R), waarbij het snijdeel (2) gefixeerd is ten opzichte van het telescopische gedeelte (32) in de toevoerrichting (F), waarbij het telescopische gedeelte (32) van de telescopische toevoertransporteur (30) samen met het snijdeel (2) beweegbaar is.

26. Werkwijze volgens een der conclusies 20-25, waarbij het snijdeel (2) een eerste mes (21) omvat dat is ingericht teneinde de lengte (L) van de continue strip (S) af te snijden bij de snijpositie (C) langs een eerste snijprofiel (P1), waarbij het snijdeel (2) een tweede mes (22) omvat dat is ingericht teneinde de lengte (L) van de continue strip (S) bij de snijpositie (C) langs een tweede snijprofiel (P2) af te snijden dat verschilt van het eerste snijprofiel (P1), waarbij één van het eerste mes (21) en het tweede mes (22) selectief bewogen wordt ten opzichte van de andere van het eerste mes (21) en het tweede mes (22) in een snijrichting (K) in de richting van de snijpositie (C) op de manipulator (5).

27. Werkwijze volgens conclusie 26, waarbij het snijdeel (2) voorafgaande aan het snijden bewogen wordt ten opzichte van de manipulator (5) teneinde één van het eerste mes (21) en het tweede mes (22) in de snijrichting (K) uit te lijnen met de snijpositie (C) op de manipulator (5).

28. Werkwijze volgens conclusie 26 of 27, waarbij de werkwijze verder de stap omvat van het uitlijnen van een andere van het eerste mes (21) en het tweede mes (22) voorafgaande aan het snijden van een volgende lengte (L) van de continue strip (S), waarbij de werkwijze verder de stap omvat van het snijden van een afvallengte van de continue strip (S) teneinde een nieuw voorlopend uiteinde van de continue strip (S) te vormen dat gesneden is met het andere mes (21, 22).

29. Werkwijze volgens een der conclusies 20-28, waarbij het snijdeel (2) een eerste mes (21) omvat dat is ingericht voor het afsnijden van de lengte (L) van de continue strip (S) bij de snijpositie (C) langs een

symmetrisch, niet-lineair eerste snijprofiel (P1), waarbij het toevoerdeel (3) is ingericht voor het toevoeren van de continue strip (S) voorbij de snijpositie (C) langs toevoerbaan in de toevoerrichting (F), waarbij de toevoerbaan en de symmetrie van het eerste snijprofiel (P1) verschoven zijn ten opzichte van elkaar.

30. Werkwijze volgens een der conclusies 20-29, waarbij de snij-inrichting (1) gebruikt wordt voor het afsnijden van de lengte (L) van de continue strip (S) teneinde een gumstrip (9) te vormen.

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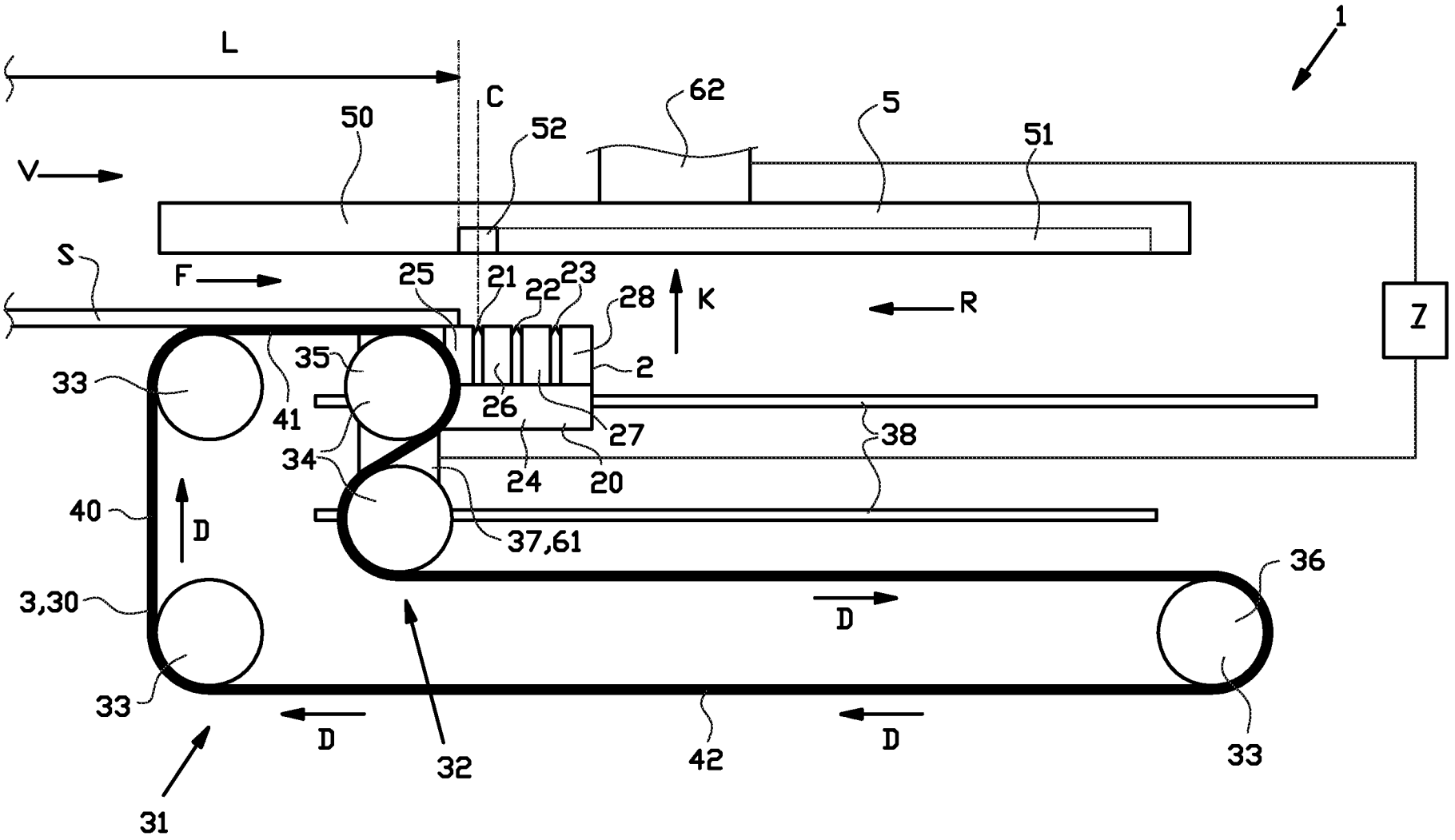
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FIG. 1

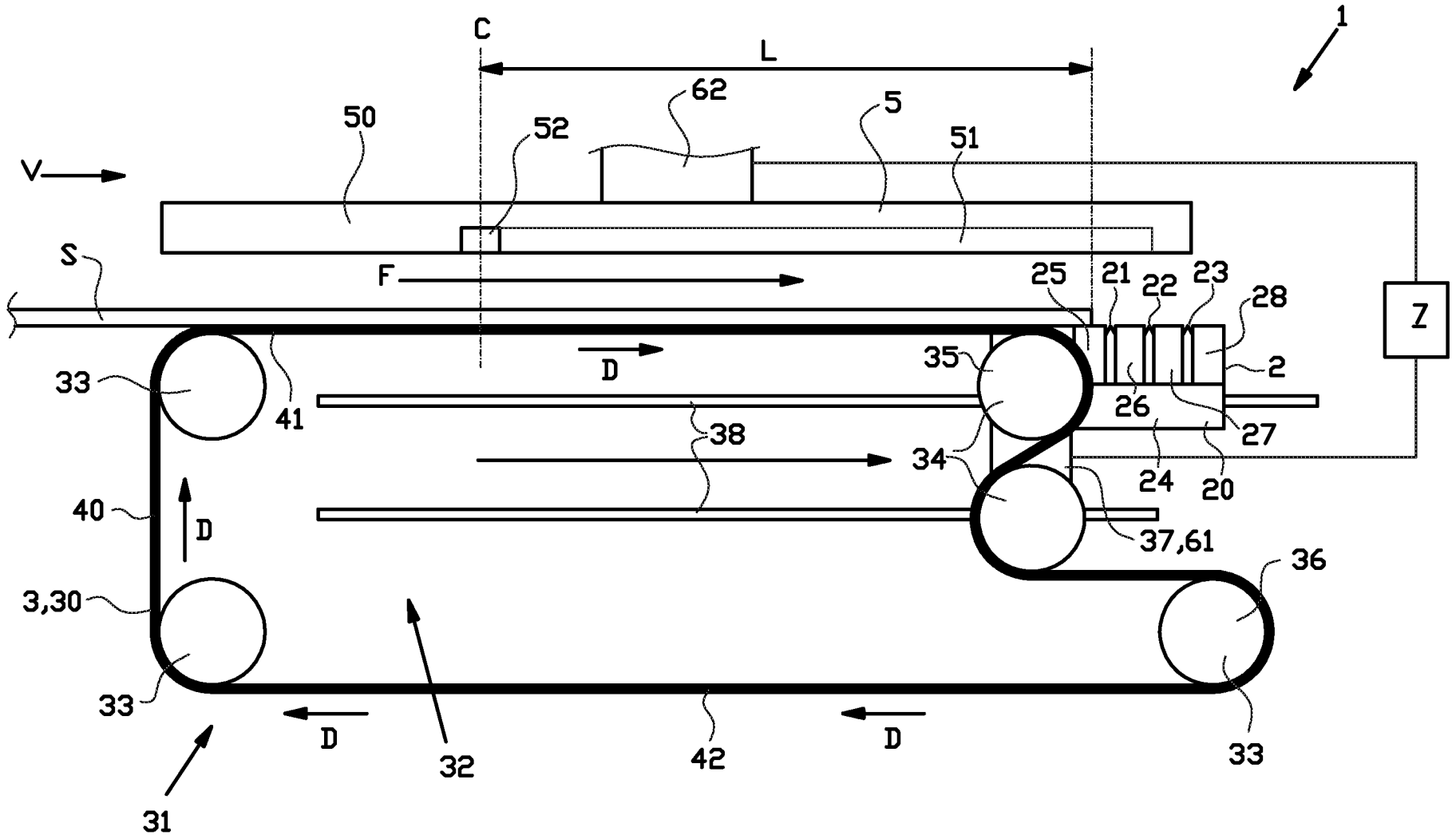
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FIG. 2

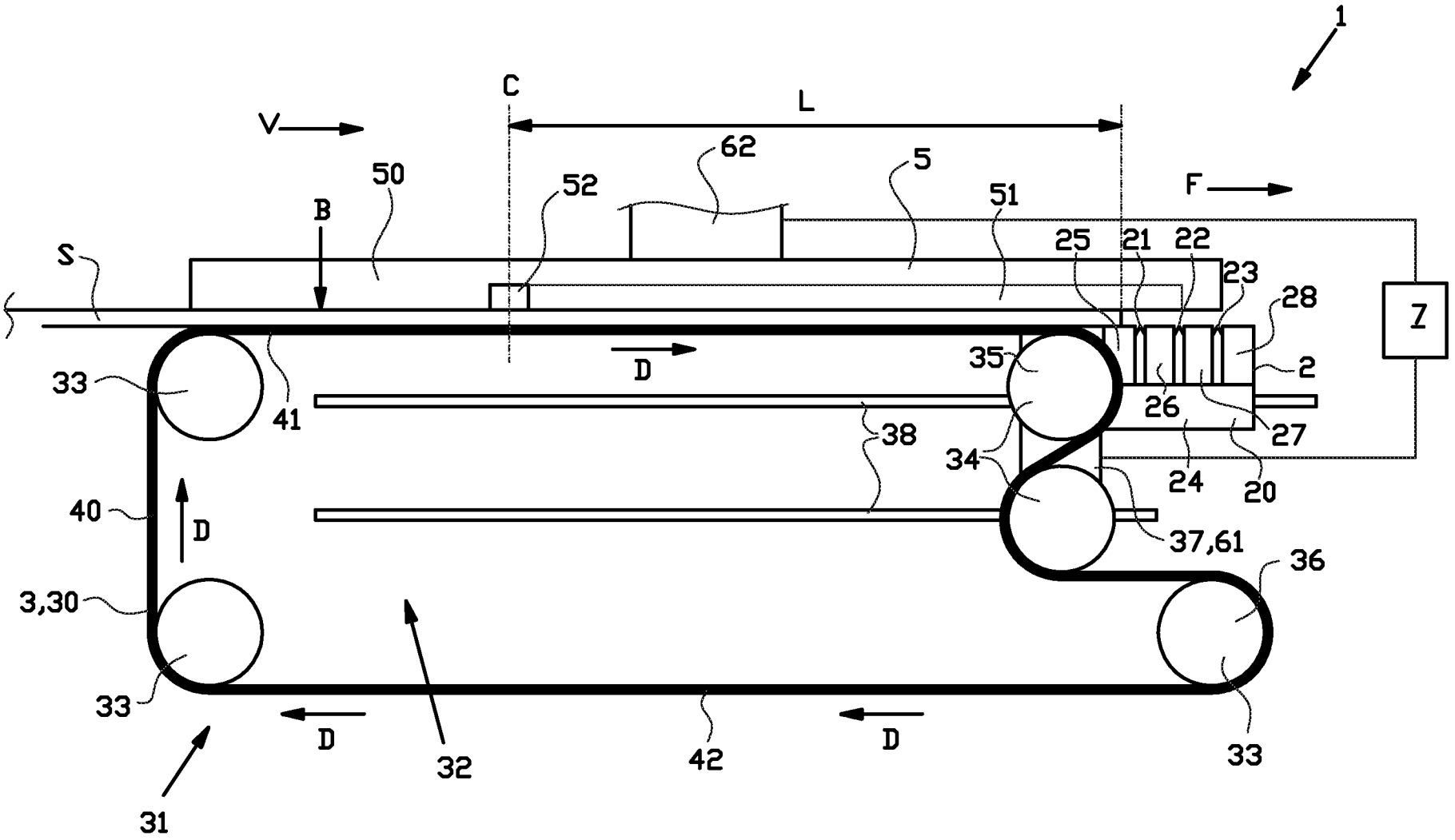
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FIG. 3

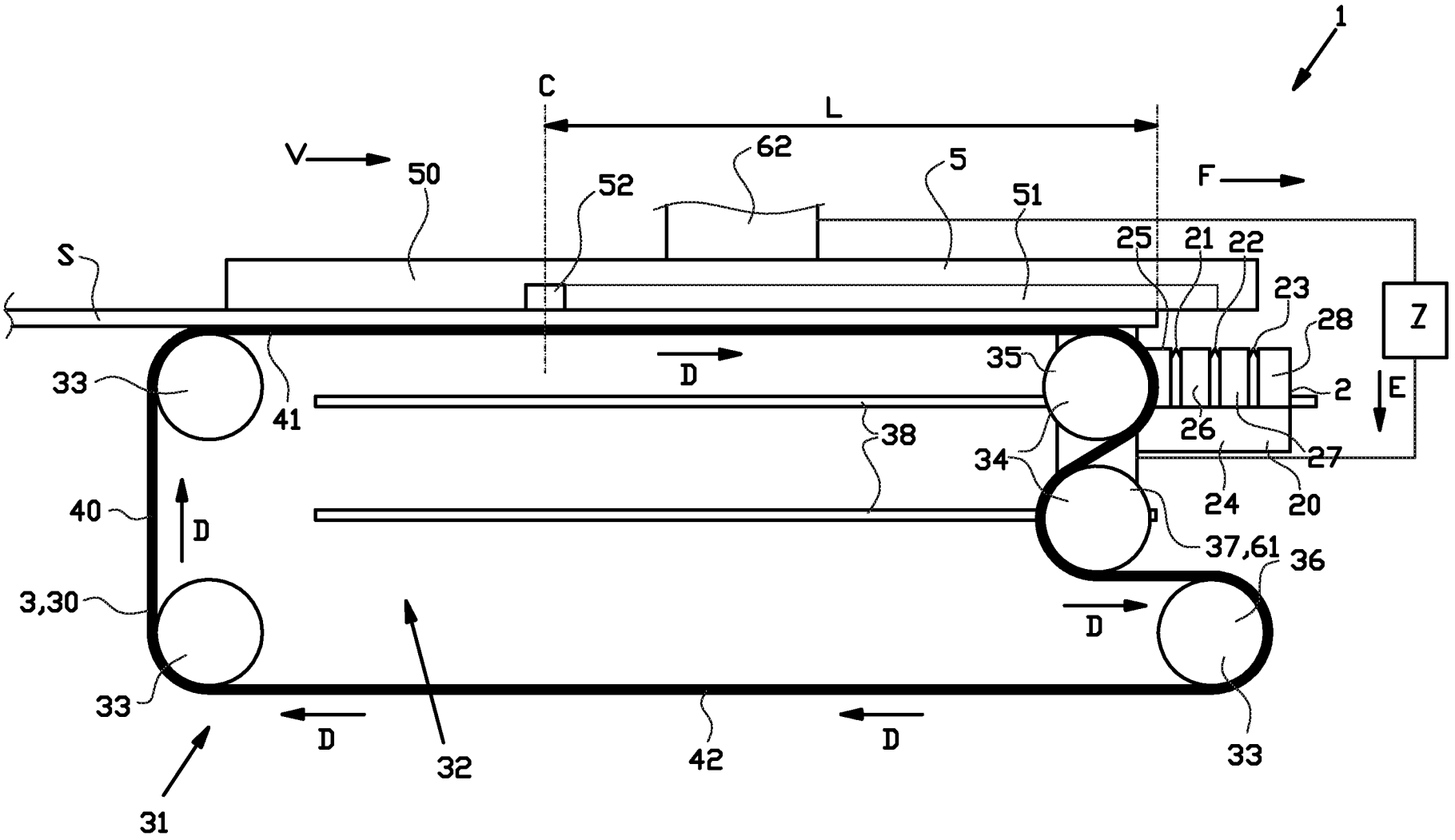
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FIG. 4

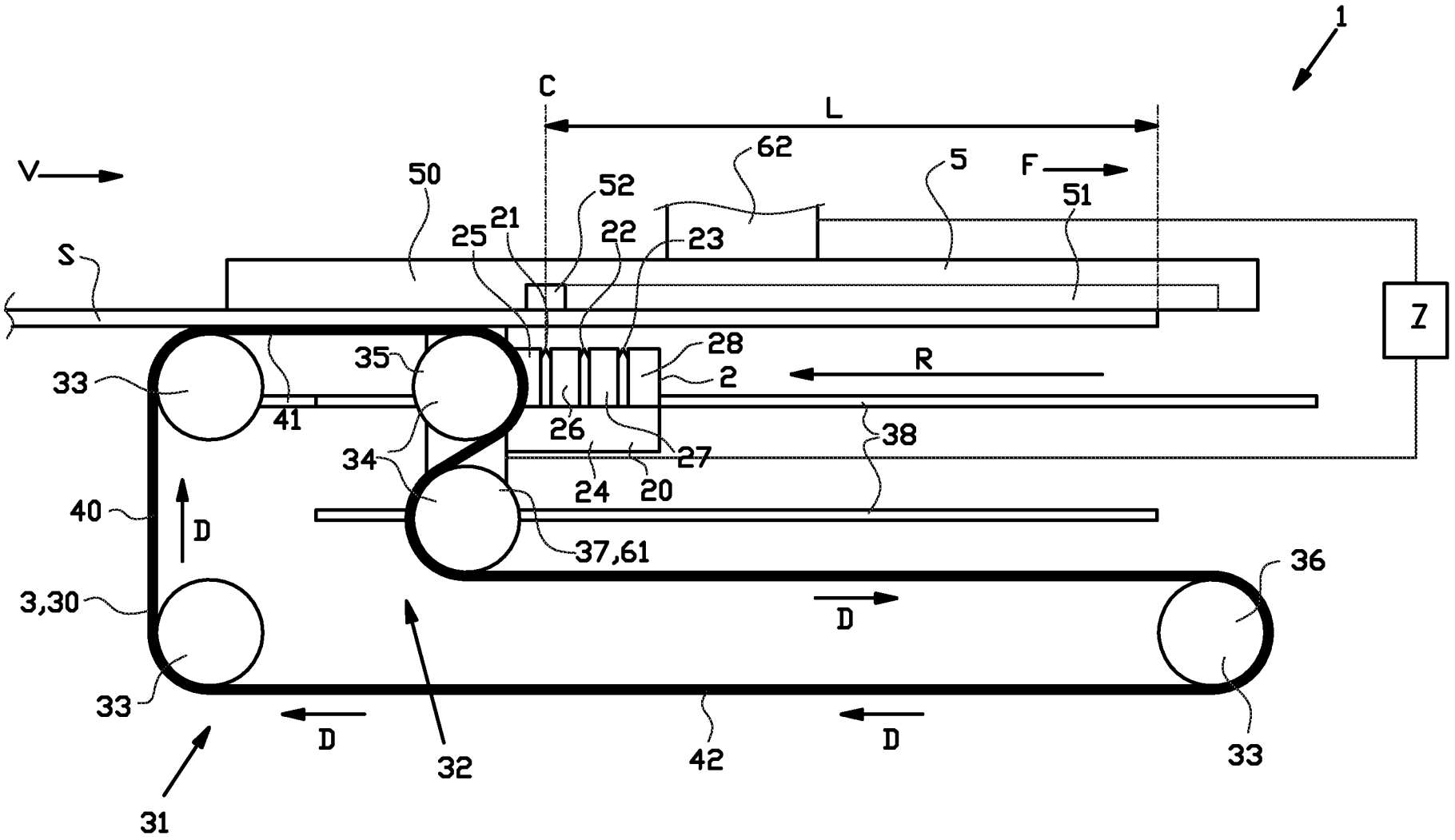
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FIG. 5

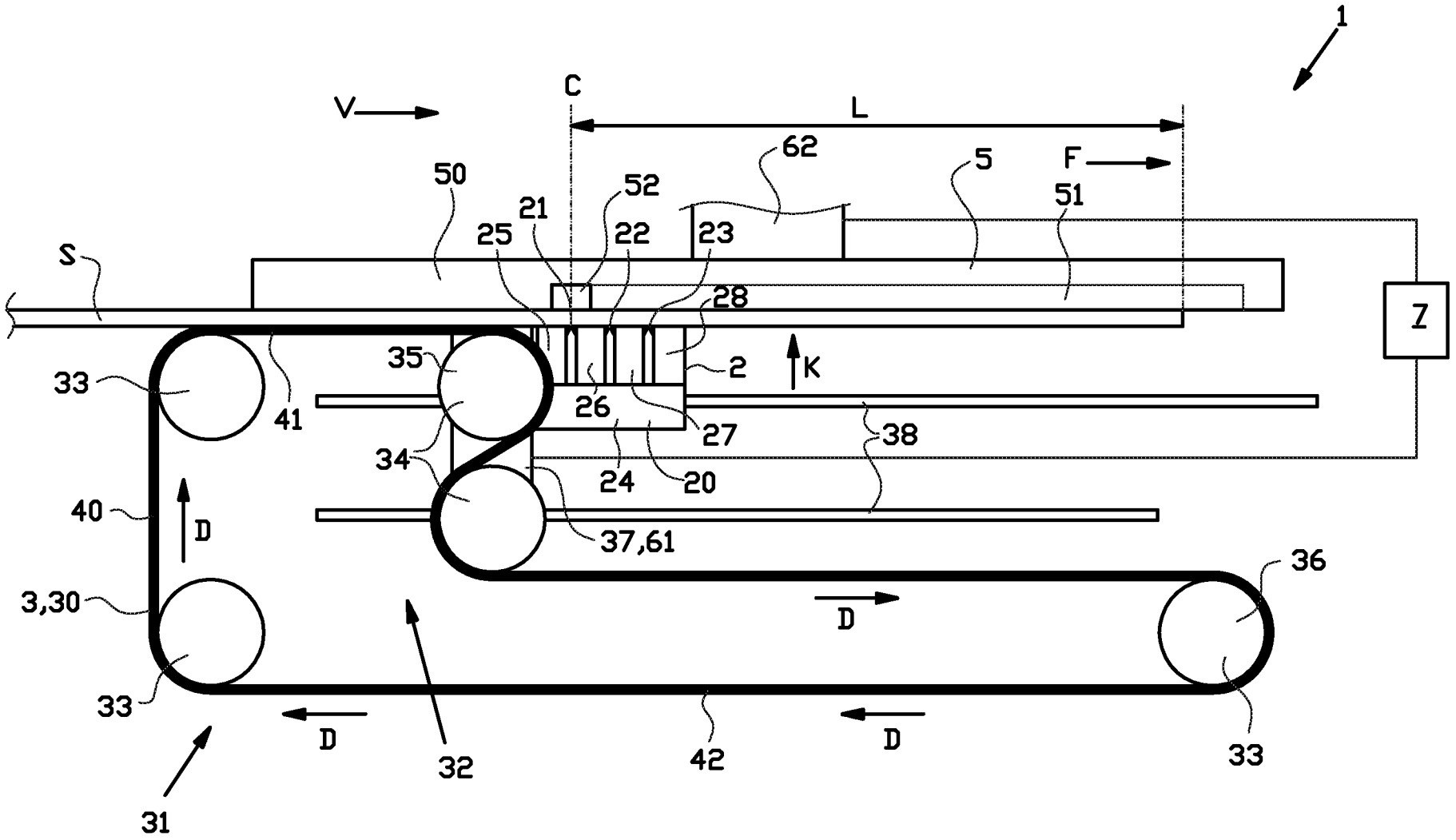
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FIG. 6

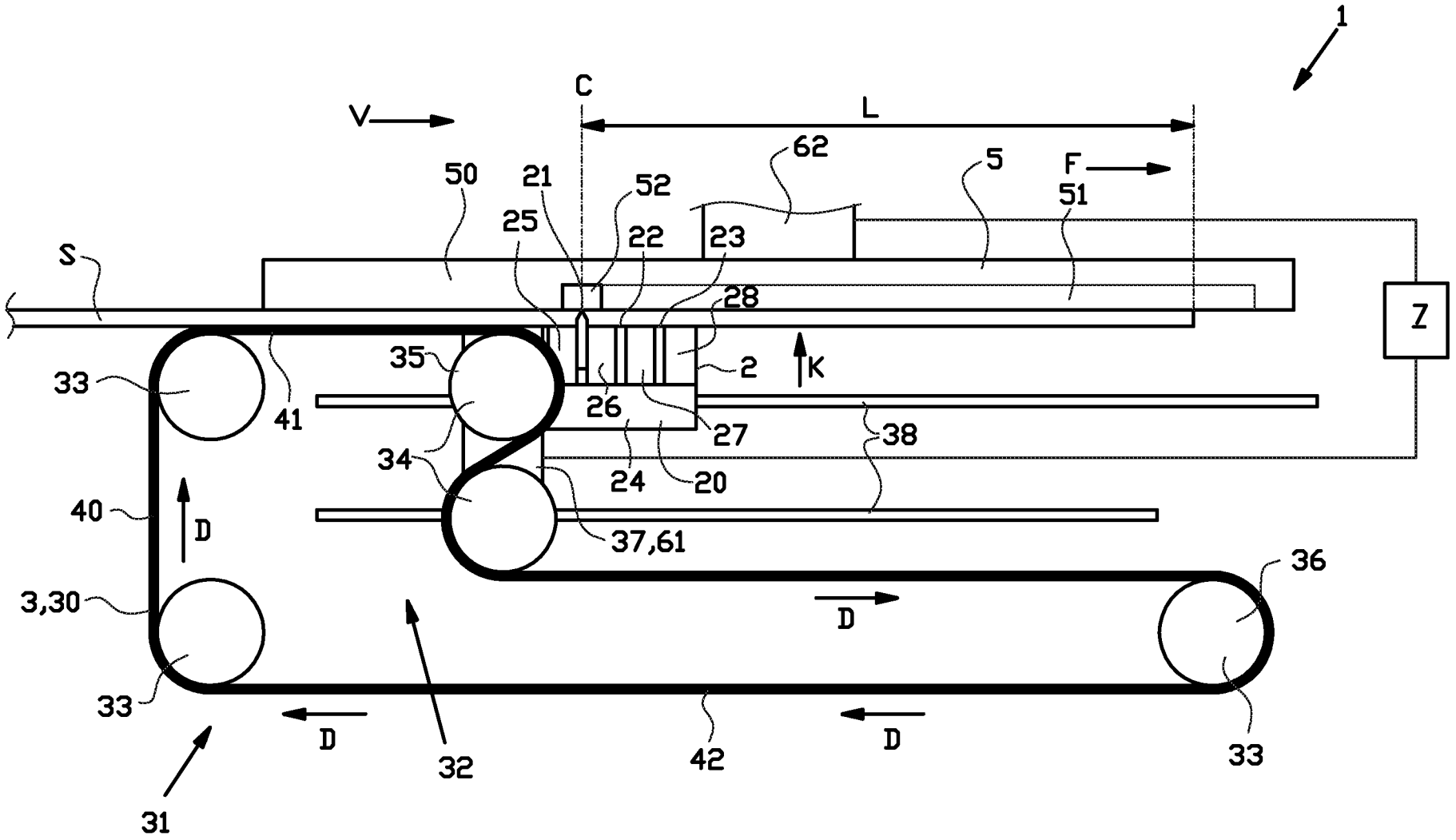
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FIG. 7

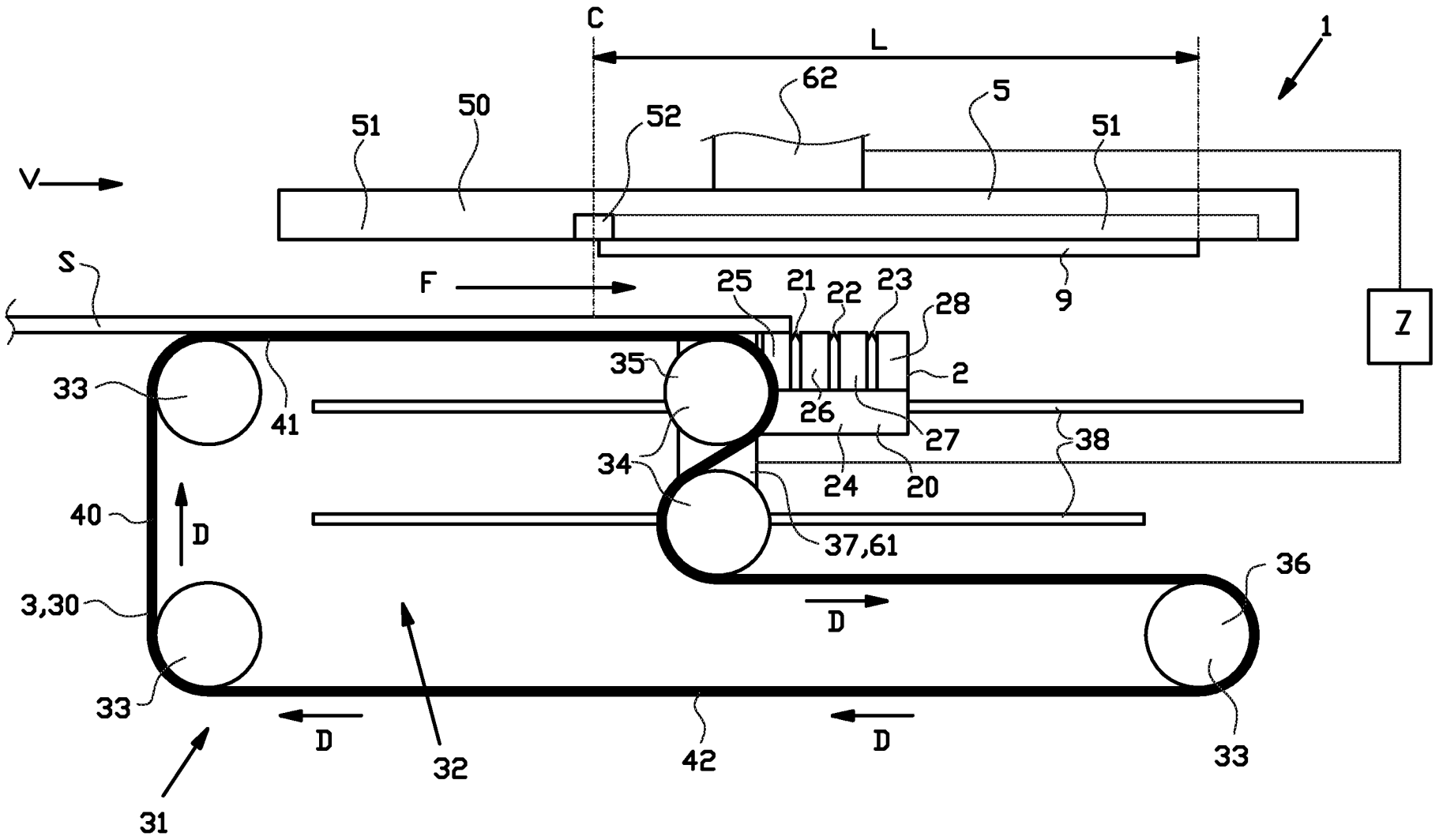
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FIG. 8

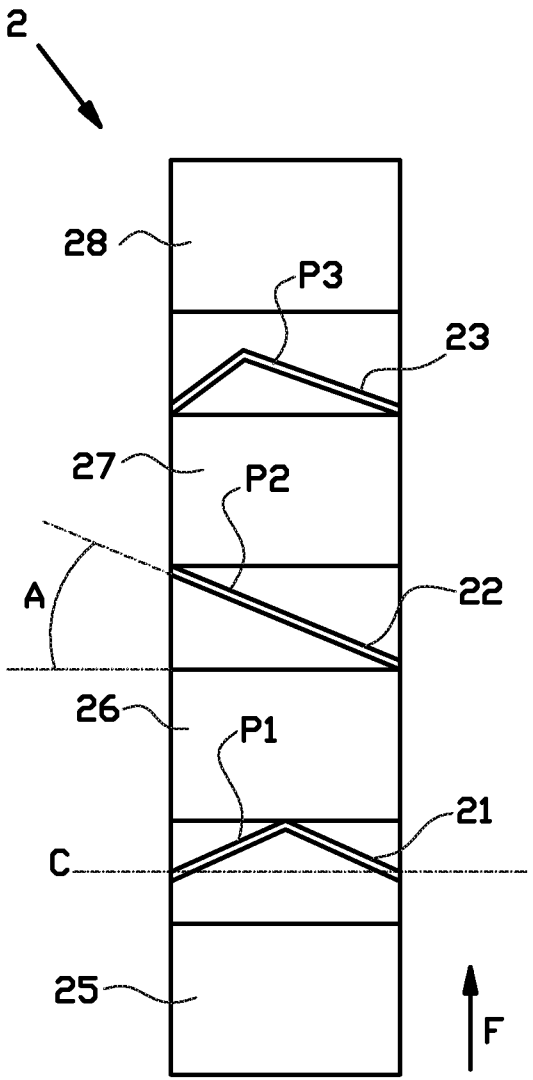

FIG. 9

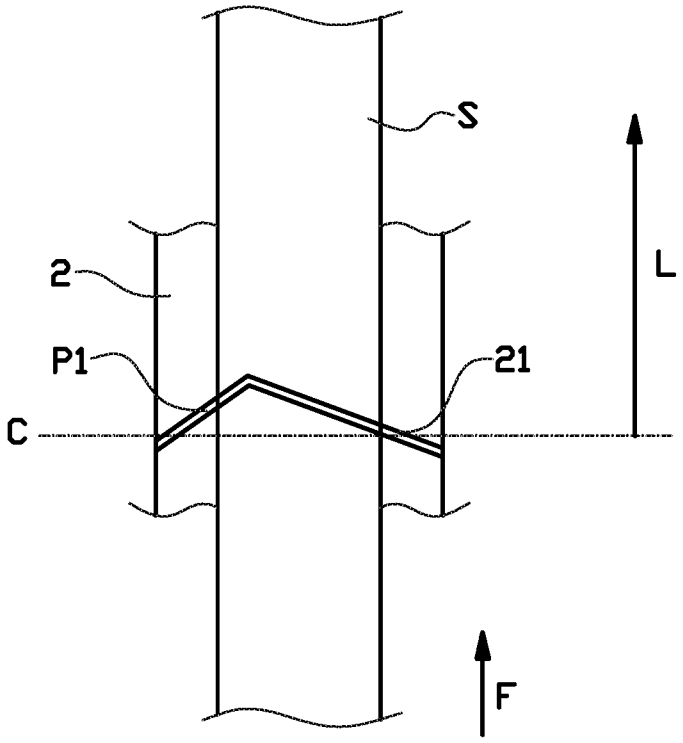

FIG. 10

A B S T R A C T

The invention relates to a cutting device and a method for cutting-off a length of a continuous strip to form a tire component, wherein the cutting device comprises a cutting member for cutting the continuous strip at a cutting position and a feeding member that is movable in a feeding direction for feeding the length of the continuous strip in said feeding direction past said cutting position, wherein the feeding member is retractable in a retraction direction and wherein the cutting device further comprises a manipulator for retaining the length as the feeding member is retracted in the retraction direction, wherein the cutting position is located on the manipulator and wherein the cutting member and the manipulator are movable together in the feeding direction to cut-off of the length of the continuous strip at the cutting position on the manipulator while moving the length of the continuous strip in said feeding direction.

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	NLP200653A
Nederlands aanvraag nr. **2018057**	Indieningsdatum **23-12-2016**
	Ingeroepen voorrangsdatum
Aanvrager (Naam) **VMI Holland B.V.**	
Datum van het verzoek voor een onderzoek van internationaal type **28-01-2017**	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. **SN68297**
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC) **B29D30/46;B26D1/56**	
II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
IPC	**B29D;B26D**
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 2018057

A. CLASSIFICATIE VAN HET ONDERWERP
INV. B29D30/46 B26D1/56
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 B26D

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.
A,D	WO 2006/068474 A1 (VMI EPE HOLLAND [NL]; GUTKNECHT HEINZ [NL]) 29 juni 2006 (2006-06-29) in de aanvraag genoemd * bladzijde 18, regel 1 - bladzijde 22, regel 9; figuren 1-8 *	1-30
A	US 2010/139467 A1 (GUTKNECHT HEINZ [NL] ET AL) 10 juni 2010 (2010-06-10) * alinea [0023] - alinea [0050]; figuren 1A-4I *	1-30
A	WO 2014/155258 A1 (PIRELLI [IT]) 2 oktober 2014 (2014-10-02) * bladzijde 14, regel 18 - bladzijde 27, regel 2; figuren 1-6I *	1-30

-/--

[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
28 juli 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

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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 2018057

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 2005/023717 A1 (WATANUKI YOSHIHIKO [JP]) 3 februari 2005 (2005-02-03) * alinea [0017] - alinea [0037]; figuren 1-4 *	1-30
A	US 2011/089228 A1 (GOTO SHUICHI [JP]) 21 april 2011 (2011-04-21) * alinea [0012] - alinea [0089]; figuren 1-7 *	1-30

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 2018057

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
WO 2006068474 A1	29-06-2006	BR PI0519191 A2	30-12-2008
		CN 101107119 A	16-01-2008
		EP 1831004 A1	12-09-2007
		JP 4744531 B2	10-08-2011
		JP 2008525223 A	17-07-2008
		KR 20070087199 A	27-08-2007
		NL 1027846 C2	23-06-2006
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		US 2010095820 A1	22-04-2010
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		CN 101646535 A	10-02-2010
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		JP 5189601 B2	24-04-2013
		JP 2010519060 A	03-06-2010
		KR 20090125792 A	07-12-2009
		NL 1033452 C2	27-08-2008
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		WO 2008123772 A1	16-10-2008
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		EP 2978596 A1	03-02-2016
		WO 2014155258 A1	02-10-2014
US 2005023717 A1	03-02-2005	AU 2004203290 A1	17-02-2005
		CN 1575959 A	09-02-2005
		DE 102004035058 A1	03-03-2005
		KR 20050013497 A	04-02-2005
		TW 200505659 A	16-02-2005
		US 2005023717 A1	03-02-2005
US 2011089228 A1	21-04-2011	CN 102056736 A	11-05-2011
		EP 2301745 A1	30-03-2011
		JP 5530926 B2	25-06-2014
		JP WO2009151022 A1	17-11-2011
		KR 20110022615 A	07-03-2011
		TW 201000366 A	01-01-2010
		US 2011089228 A1	21-04-2011
		WO 2009151022 A1	17-12-2009

WRITTEN OPINION

File No.	Filing date *(day/month/year)*	Priority date *(day/month/year)*	Application No.
SN68297	23.12.2016		NL2018057

International Patent Classification (IPC)
INV. B29D30/46 B26D1/56

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

NL2018057

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	1-30
	No:	Claims	
Inventive step	Yes:	Claims	1-30
	No:	Claims	
Industrial applicability	Yes:	Claims	1-30
	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 : WO 2006/068474 - A;

D2 : US 2010/0139467 - A;

D3 : WO 2014/155258 - A;

D4 : US 2011/0089228 - A;

D5 : US 2005/0023717 - A.

2. Claim **1 - 30** - Novelty and Inventive Step

2.1 Claim **1** relates to a cutting device (1) for cutting-off a length (L) of a continuous strip (S) to form a tire component, wherein the cutting device (1) comprises :

(a) - a cutting member (2) for cutting the continuous strip at a cutting position (C) ;

(b) - a feeding member (3) that is movable in a feeding direction (F) past the cutting position (C) for feeding the length of the continuous strip in said feeding direction past said cutting position ;

(b1) - the feeding member (3) being at least partially retractable in a retraction direction (R) for exposing the length of the continuous strip to the cutting member (2) at the cutting position ;

(c) - a manipulator (5) for taking over and retaining the length of the continuous strip from the feeding member (3) as the feeding member is retracted in the retraction direction;

(c1) - the cutting position (C) being located on the manipulator (5) ;

(d) - the cutting member (2) and the manipulator (5) being movable together in the feeding direction to cut-off of the length of the continuous strip at the cutting position (C) on the manipulator while moving the length of the continuous strip in said feeding direction.

2.2 Strip cutting devices wherein the feeding and the cutting of the strip are intermittent, are well known : see for example documents **D1** (WO 2006/068474 - A), **D2** (US 2010/0139467 - A), **D3** (WO 2014/155258 - A).

Strip cutting devices, wherein the cutting action is carried out by a cutting device moving in the same direction at the same speed of the continuously moving strip, are also well known (cutting "on the fly").

In particular, both documents **D4** (US 2011/0089228 - A) and **D5** (US 2005/0023717 - A) individually disclose: a cutting device for cutting-off a length of a continuous strip, the cutting device comprising a cutting member [feature **(a)**], a feeding member [feature **(b)**], a manipulator [feature **(c)**], wherein the cutting position is located on the manipulator [feature **(c1)**] and wherein the cutting member and the manipulator are movable together in the feeding direction to cut-off of the length of the continuous strip at the cutting position on the manipulator while moving the length of the continuous strip in said feeding direction [feature **(d)**] .

2.3 The subject-matter of claim **1** of the present application differs from this known prior ar disclosures at least in the feature **(b1)**, i. e. in that the strip feeding member is at least partially retractable in a retraction direction for exposing the length of the continuous strip to the cutting member (2) at the cutting position, whereas in **D4** and in **D5** the strip feeding members are not retractable; in fact in these disclosures the feeding members continuously feed the strip in the same direction even during the cutting phase.

Claim **1** is therefore novel.

2.4 The problem to be solved by the present application, as explained in page 1, lines 22-26, is regarded as to avoid the formation of jerks and jolts while dispensing with the use of strip buffer devices like festooners or dancer rollers.

2.5 This problem is solved by the cutting device comprising the combination of features **(a)**, **(b)**, **(b1)**, **(c)**, **(c1)**, **(d)** as recited in claim **1**.

In this manner, an interruption in the feeding process as a result of the cutting can be prevented, so that the formation of jerks and jolts is avoided and the cutting device can operate in a faster and more uniform manner.

2.6 It is evident that the problem to be solved underlying the present application has been recognized at least in documents **D4** and **D5** and solved therein. However, the combination of the constructional and functional features recited in claim **1** of the present application is neither known from, nor rendered obvious from the available prior art disclosures, taken alone or in combination.

It is therefore concluded that claim **1** implies an inventive activity, because it proposes a novel and non obvious alternative solution to a known problem.

2.7 Independent claim **20** relates to a method of cutting-off a length of a continuous strip to form a tire component, with the use of the cutting device defined in claim **1** and, as such, it is also regarded as novel and inventive.

2.8 Dependent claims **2** to **19** and **21** to **30**, as such, also meet the requirements of novelty and inventive step.

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