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(54) Titre : DISPOSITIF D'ENROULEMENT DE BANDES FIBREUSES, EN PARTICULIER DE BANDES DE PAPIER ET DE CARTON

(54) Title: DEVICE FOR WINDING OF FIBER WEBS, ESPECIALLY OF PAPER AND BOARD WEBS

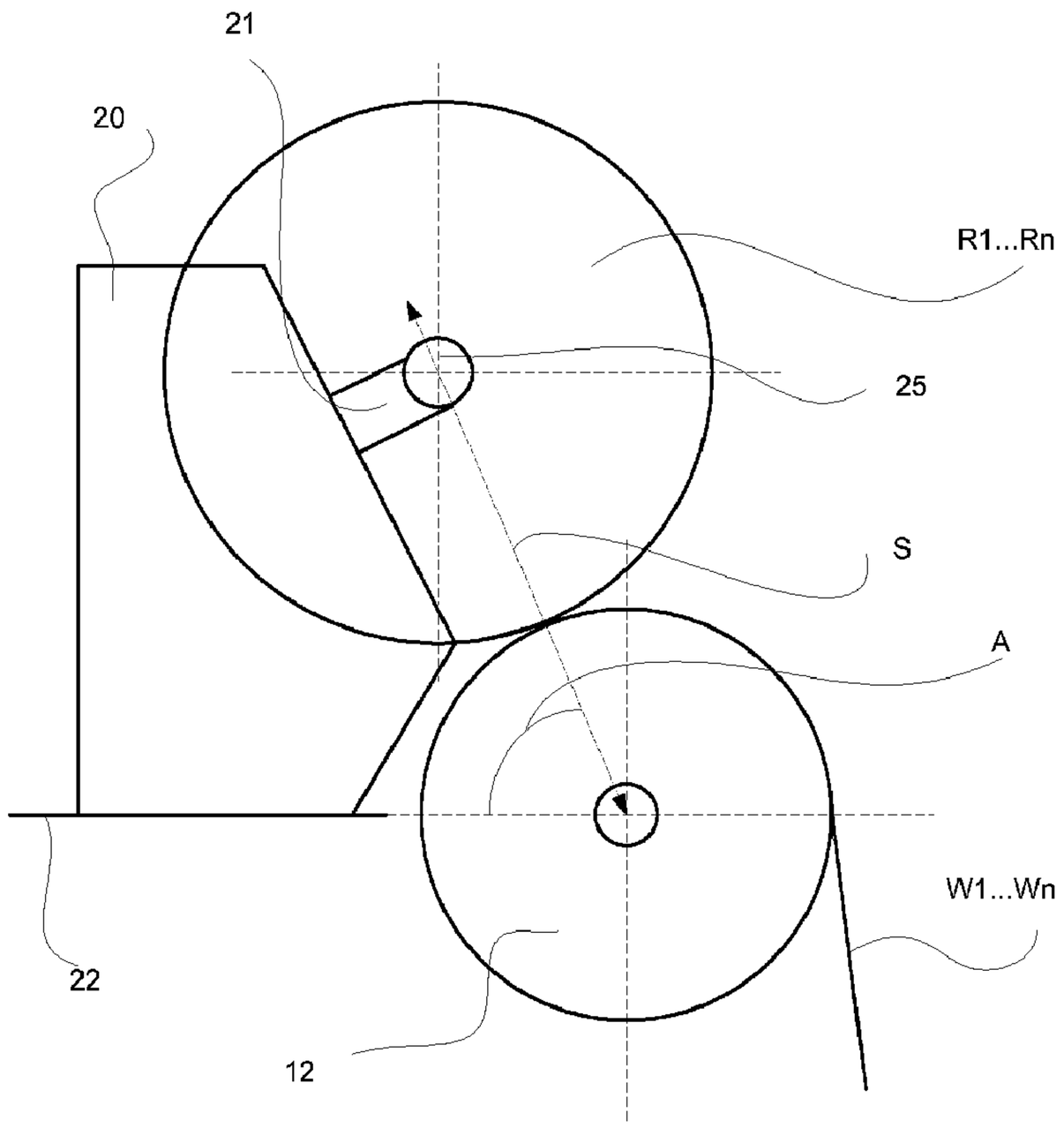

Fig. 1

(57) Abrégé/Abstract:
The invention relates to a device for winding fiber webs, particularly paper and board webs, into partial web rolls, which device includes winding stations (20) for winding partial web rolls (R1... Rn) via a nip between a winding roll (12; 13) and the roll being

CA 2807108 A1 2012/05/03

(21) 2 807 108

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(57) Abrégé(suite)/Abstract(continued):
formed (R1...Rn). The winding stations (20) are supported on a floor (25) or equivalent foundation and the mass of the roll being formed (R1... Rn) forms at least part of the nip load of the nip between the winding roll (12; 13) and the roll being formed (R1... Rn).

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[Continued on next page]

(54) Title: DEVICE FOR WINDING OF FIBER WEBS, ESPECIALLY OF PAPER AND BOARD WEBS

(57) Abstract: The invention relates to a device for winding fiber webs, particularly paper and board webs, into partial web rolls, which device includes winding stations (20) for winding partial web rolls (R1... Rn) via a nip between a winding roll (12; 13) and the roll being formed (R1...Rn). The winding stations (20) are supported on a floor (25) or equivalent foundation and the mass of the roll being formed (R1... Rn) forms at least part of the nip load of the nip between the winding roll (12; 13) and the roll being formed (R1... Rn).

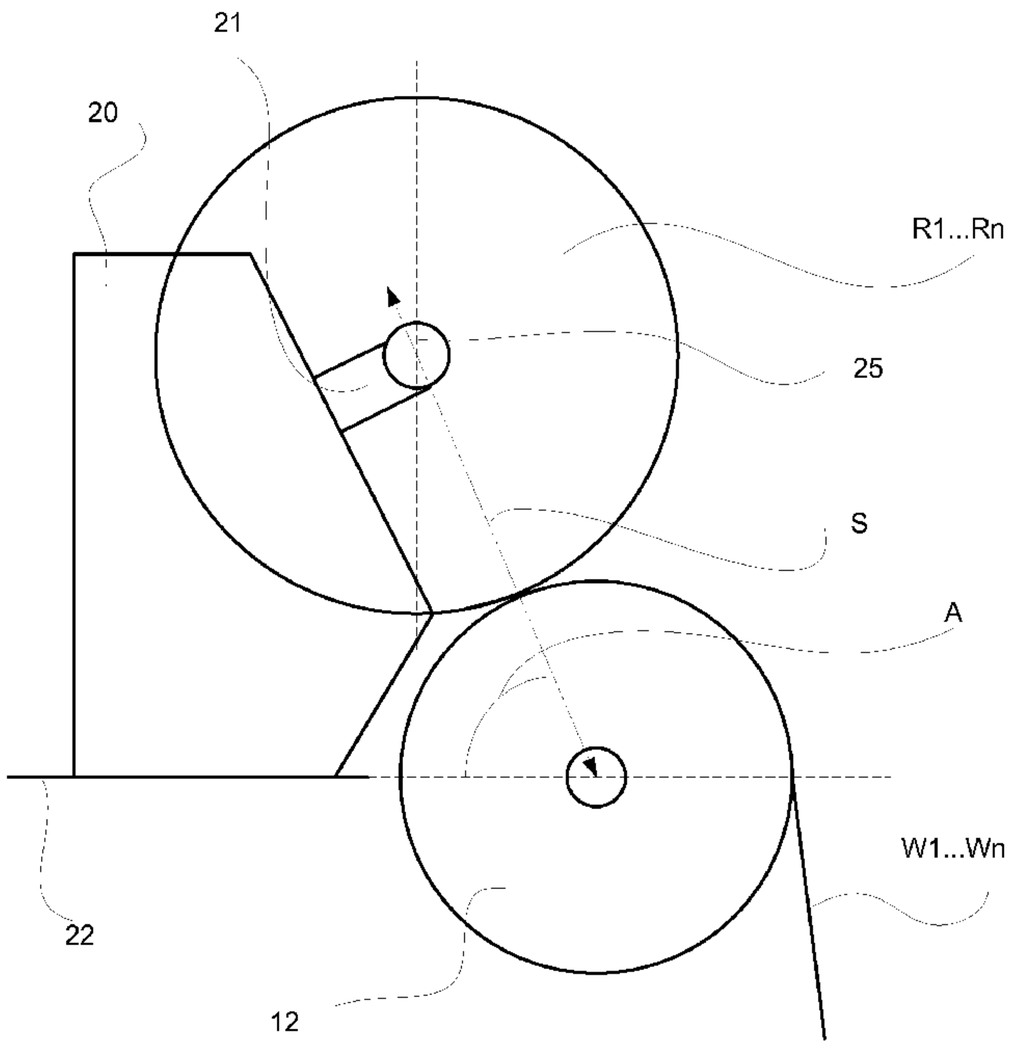

Fig. 1

WO 2012/056096 A1

WO 2012/056096 A1

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Device for winding of fiber webs, especially of paper and board webs

The invention relates to a device according to the preamble of claim 1 for winding fiber webs, particularly paper and board webs, into partial web rolls, which device includes winding stations for winding partial web rolls via a nip between a winding roll and the roll being formed.

The invention also relates to a method according to the preamble of claim 7 for winding fiber webs, particularly paper and board webs, into partial web rolls, in which method, partial web rolls are wound via a nip between a winding roll and the roll being formed on a winding station formed into connection with the winding roll.

It is known that a fiber web, e.g. paper, is manufactured in machines which together constitute a paper-manufacturing line which can be hundreds of metres long. Modern paper machines can produce over 450,000 tons of paper per year. The speed of the paper machine can exceed 2,000 m/min and the width of the paper web can be more than 11 metres.

In paper-manufacturing lines, the manufacture of paper takes place as a continuous process. A paper web completing in the paper machine is reeled by a reel-up around a reeling shaft i.e. a reel spool into a parent roll the diameter of which can be more than 5 metres and the weight more than 160 tons. The purpose of reeling is to modify the paper web manufactured as planar to a more easily processable form. On the reel-up located in the main machine line, the continuous process of the paper machine breaks for the first time and shifts into periodic operation.

The web of parent roll produced in paper manufacture is full-width and even more than 100 km long so it must be slit into partial webs with suitable width and length for the customers of the paper mill and wound around cores into so-called customer rolls before delivering them from the paper mill. This slitting and winding up of the web takes place as known in an appropriate separate machine i.e. a slitter-winder.

On the slitter-winder, the parent roll is unwound, the wide web is slit on the slitting section into several narrower partial webs which are wound up on the winding section around winding cores, such as spools, into customer rolls. When the customer rolls are completed, the slitter-winder is stopped and the rolls i.e. the so-

called set is removed from the machine. Then, the process is continued with the winding of a new set. These steps are repeated periodically until paper runs out of the parent roll, whereby a parent roll change is performed and the operation starts again as the unwinding of a new parent roll.

Slitter-winders employ winding devices of different types depending on, inter alia, on the type of the fiber web being wound. On slitter-winders of the multistation winder type, the web is guided from the unwinding via guide rolls to the slitting section where the web is slit into partial webs which are further guided to the winding roll/rolls on the winding stations into customer rolls to be wound up onto cores. Adjacent partial webs are wound up on different sides of the winding roll/rolls.

Of prior art, different types of multistation winders are known as the winders of slitter-winders. For instance, specification EP0478719 describes a known winder of a slitter-winder where the winding up of partial webs occurs on both sides of the winding roll such that, as the roll increases, its centre moves horizontally, at the so-called zero angle, in relation to the winding roll. In this known arrangement, a nip load is provided by winding chucks horizontally towards the winding drum by loading by an external force.

Specification FI71708 again describes a winder of a slitter-winder where winding arms are pivoted whereby, as the roll diameter increases, the winding nip transfers on the periphery of the winding roll, i.e. the wrap angle of the web on the winding roll changes.

Specifications EP0829438 and US4508283 describe winders of a slitter-winder where the winding stations are above the winding roll and suspended on a robust cross beam in the cross-machine direction and their support requires massive structures above the winding roll.

An object of the invention is to create a device and a method for winding fiber webs where the nip load is controlled throughout winding.

An object of the invention is to create a device and a method for winding fiber webs where the winding stations are sturdily supported.

An object of the invention is to provide a device and a method for winding fiber webs where the mass of the web roll being formed can be utilised in creating the nip load.

To achieve the above-mentioned objects and those which come out later, a device according to the invention is mainly characterised by what is presented in the characterising part of claim 1. A method according to the invention is mainly characterised by what is presented in the characterising part of claim 7.

According to the invention, winding up occurs utilising the mass of the roll and, as the roll increases, its centre moves linearly at a certain angle in relation to the winding roll, whereby the position of the nip remains stationary. The winding stations are sturdily supported on the machine level floor or equivalent foundation. To the floor or equivalent foundation are by foundation bolts and concrete pouring or equivalent fastening arrangement attached steel-structured or cast-iron foundation plates / foundation rails which comprise supportive guide rails. The winding stations are attached to the guide rails and the stations can be transferred in the machine width direction according to each web width. The sturdy support of the winding stations is provided by the above attachment and by the fact that the gravitations of the winding station and the web roll being formed principally apply perpendicularly towards the floor/foundation. The guide rail arrangement also controls sideward forces.

According to the invention in winding up, the mass of the roll is utilised for forming the nip load and, as the roll increases, its centre moves linearly, whereby the nip remains stationary and the wrap angle of the web does not change during winding.

According to an advantageous additional characteristic of the invention, the support angle of the roll is larger than 0 degrees and smaller than or equal to 90 degrees, most advantageously 45–80 degrees.

According to an advantageous additional characteristic of the invention, the winding stations are supported on the floor, thus providing them an extremely good and stable support without massive support structures above.

In the device according to the invention, the periphery of the completed web roll is advantageously close to the floor, whereby the delivery of the set is easy, because no separate roll lowering devices are required for transferring completed rolls out of the winding station. The distance of the periphery of the completed partial web roll to the floor is 5–50 mm, most suitably 5–25 mm.

The device according to the invention provides, when winding up webs on the winding stations, the control of the nip load required for winding between the roll and the winding roll throughout winding, because the mass of the roll being wound

can be utilised for providing the required nip load and the winding station, where the winding up occurs, is sturdily supported on the floor or equivalent foundation. According to an advantageous embodiment, the winding nip remains stationary throughout winding i.e. the wrap angle of the web entering the winding nip / its distance around the winding roll remains constant.

Next, the invention will be described in more detail with reference to the figures of the enclosed drawing, to the details of which the invention is intended by no means to be narrowly limited.

Fig. 1 schematically shows an implementation example of the invention.

Fig. 2 schematically shows an example of a slitting arrangement for applying the invention.

Fig. 1 schematically shows an exemplifying embodiment of the invention which is applicable e.g. for a slitting arrangement according to Fig. 2. The figure shows a winding roll 12, partial webs guidable to which are designated with reference W1...Wn. The partial webs W1...Wn are wound into partial web rolls R1...Rn via the winding roll 12 on a winding station 20. The winding station 20 is supported on a floor 22 or equivalent foundation, and the web roll R1...Rn is attached to the winding station linearly movably via a support arm 21 or equivalent. The web roll is created around a core 25 or equivalent winding spool which is connected from its centre to the support arm 21. As the web roll increases when the winding proceeds, the increasing web roll moves linearly at a certain angle A in relation to the winding roll 12, which is shown in Fig. 1 by an arrow S. The support angle A of the roll is larger than 0 degrees and smaller than or equal to 90 degrees, most advantageously 45–80 degrees.

When the web rolls R1...Rn are completed, it is easy to release them from the winding station 20 and to deliver the set i.e. to remove the completed partial web rolls R1...Rn from the winding roll 12, because the winding station 20 is supported on the floor 22 or equivalent foundation structure, whereby the periphery of the web roll is positioned close to the level of the floor 22.

The winding up of partial webs W1...Wn into partial web rolls R1...Rn occurs utilising the mass of the roll R1...Rn as the web roll supports itself advantageously at least of its partial mass on the winding roll 12 below. Hence, the mass of the web roll advantageously provides the nip load required for winding between the web roll and the roll. The other part of the mass of the web roll is supported by

winding chucks of the support arm 21 from the centre of the web roll from the core 25.

In the schematic example according to Fig. 2, a parent roll 10 is on the unwinding section from where a full-width web W unwinding from the parent roll 10 is guided to the slitting section guided by guide rolls 11. For clarity, slitting means, e.g. slitter blades, laser or water jet slitting means, have been omitted from the example of Fig. 2 but, in the slitting, the web W is slit in the longitudinal direction into partial webs W1... Wn, of which there are six (6) in the example of Fig. 2. Fig. 2 shows the change of the full-width web W into partial webs W1...Wn at the point of the slitting section. From the slitting, the partial webs W1...Wn are further guided via the guide rolls towards the winding rolls 12, 13 and to the first winding roll 12, on which a second partial web W2...W6 is guided for winding up into partial web rolls R2...R6 via the first winding roll 12 and every second partial web W1...W5 is guided for winding up into partial web rolls R1...R5 via the second winding roll.

In the example of Fig. 2, partial web rolls having an even reference number are wound on the first winding roll 12 and ones having an odd reference number are wound on the second winding roll 13 and equivalent partial web rolls are designated by an equivalent number index. There can naturally be less or more of the partial webs W1...Wn and naturally equivalently the number of partial web rolls being wound can be smaller or larger. Furthermore, the widths of the partial webs can be the same and/or different for providing partial web rolls of the same and/or of different width.

As evident from Fig. 2, substantially all partial webs W1...Wn pass via the first winding roll 12 and every second partial web W1, W3, W5 is guided to the second winding roll 13 and the winding up thus occurs via two winding rolls 12, 13. The slitted partial webs W1...Wn are brought together, most suitably parallelly by means of the guide roll/rolls 11 to the first/inner/rearmost winding roll 12, where every second partial web W2, W4, W6 is wound up on its winding station, and the rest of the partial webs W1, W3, W5 are guided to the second/outer/frontmost winding roll 13 to be wound up on their own winding stations.

The winding stations 20 according to Fig. 1 are advantageously positioned into connection with both winding rolls 12, 13. Naturally, the winding station 20 in connection with the second winding roll 13 is substantially a mirror image in relation to the winding station 20 being in connection with the first winding roll 12.

The invention was described above referring to only one of its advantageous exemplifying embodiments to the details of which the invention is not intended to be narrowly limited but many modifications and variations are possible.

Claims

1. A device for winding fiber webs, particularly paper and board webs, into partial web rolls, which device includes winding stations (20) for winding partial web rolls (R1...Rn) via a nip between a winding roll (12; 13) and the roll being formed (R1...Rn), which winding stations (20) are supported on a floor (22), and in which device the mass of the roll being formed (R1...Rn) forms at least part of the nip load of the nip between the winding roll (12; 13) and the roll being formed (R1...Rn), **characterised** in that the winding station (20) comprises means for transferring the roll centre linearly.

2. A device according to claim 1, **characterised** in that the winding station (20) comprises means (21) for supporting the web roll being formed from a winding spool/core (25).

3. A device according to claim 1 or 2, **characterised** in that a support angle (A) of the roll in relation to the winding roll (12; 13) is larger than 0 degrees and smaller than or equal to 90 degrees, most advantageously 45–80 degrees.

4. A device according to claim 1, **characterised** in that the periphery of the completed roll is close to the floor (22) at the distance of 5–50 mm, most suitably at the distance of 5–25 mm.

5. A device according to claim 1, **characterised** in that the device comprises two winding rolls (12; 13) and winding stations (20) formed into connection with both winding rolls.

6. A device according to claim 1, **characterised** in that the winding up of partial webs (W1...Wn) into partial web rolls (R1...Rn) is arranged utilising the mass of the web roll (R1...Rn) the web roll supporting itself at least of its partial mass to the winding roll 12 below, whereby the mass of the web roll can provide the nip load required for winding between the web roll and the winding roll and that the other part of the mass of the web roll is supported by winding chucks of a support arm (21) from the centre of the web roll from a core (25).

7. A method for winding fiber webs, particularly paper and board webs, into partial web rolls, where partial web rolls (R1...Rn) are wound via a nip between a winding roll (12; 13) and the roll being formed (R1...Rn) on a winding station (20) formed into connection with the winding roll (12; 13) which winding stations (20) are supported on a floor (22), and the mass of the roll being formed (R1...Rn)

forms at least part of the nip load of the nip between the winding roll (12; 13) and the roll being formed (R1...Rn), **characterised** by, in the method as the roll (R1...Rn) increases, its centre moving linearly at a certain angle (A) in relation to the winding roll.

8. A method according to claim 7, **characterised** by the support angle (A) of the roll in relation to the winding roll (12; 13) being larger than 0 degrees and smaller than or equal to 90 degrees, most advantageously 45–80 degrees.

9. A method according to claim 7, **characterised** by transferring the completed web roll (R1...Rn) from the winding station (20) directly onto the floor (22).

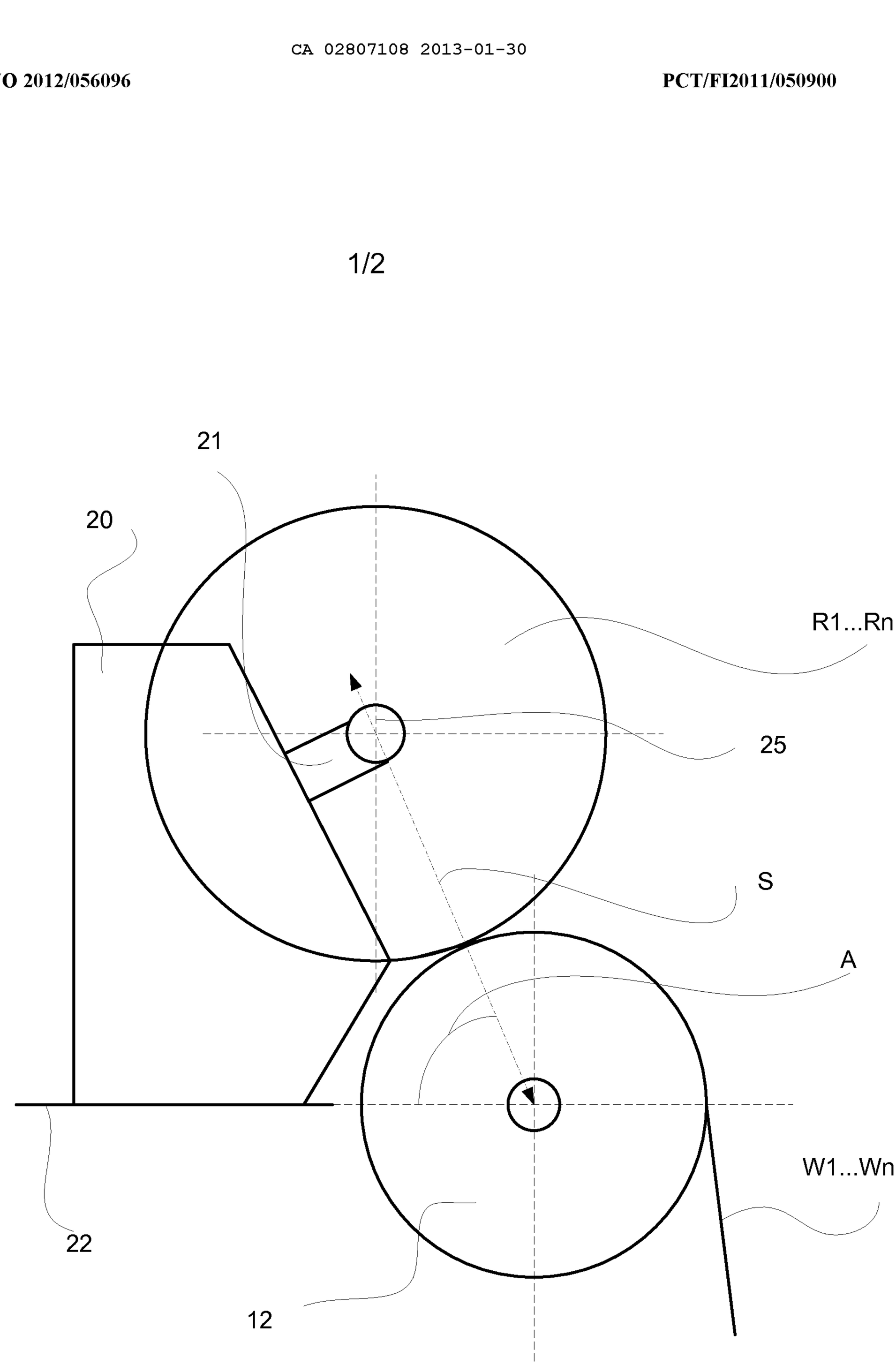

Fig. 1

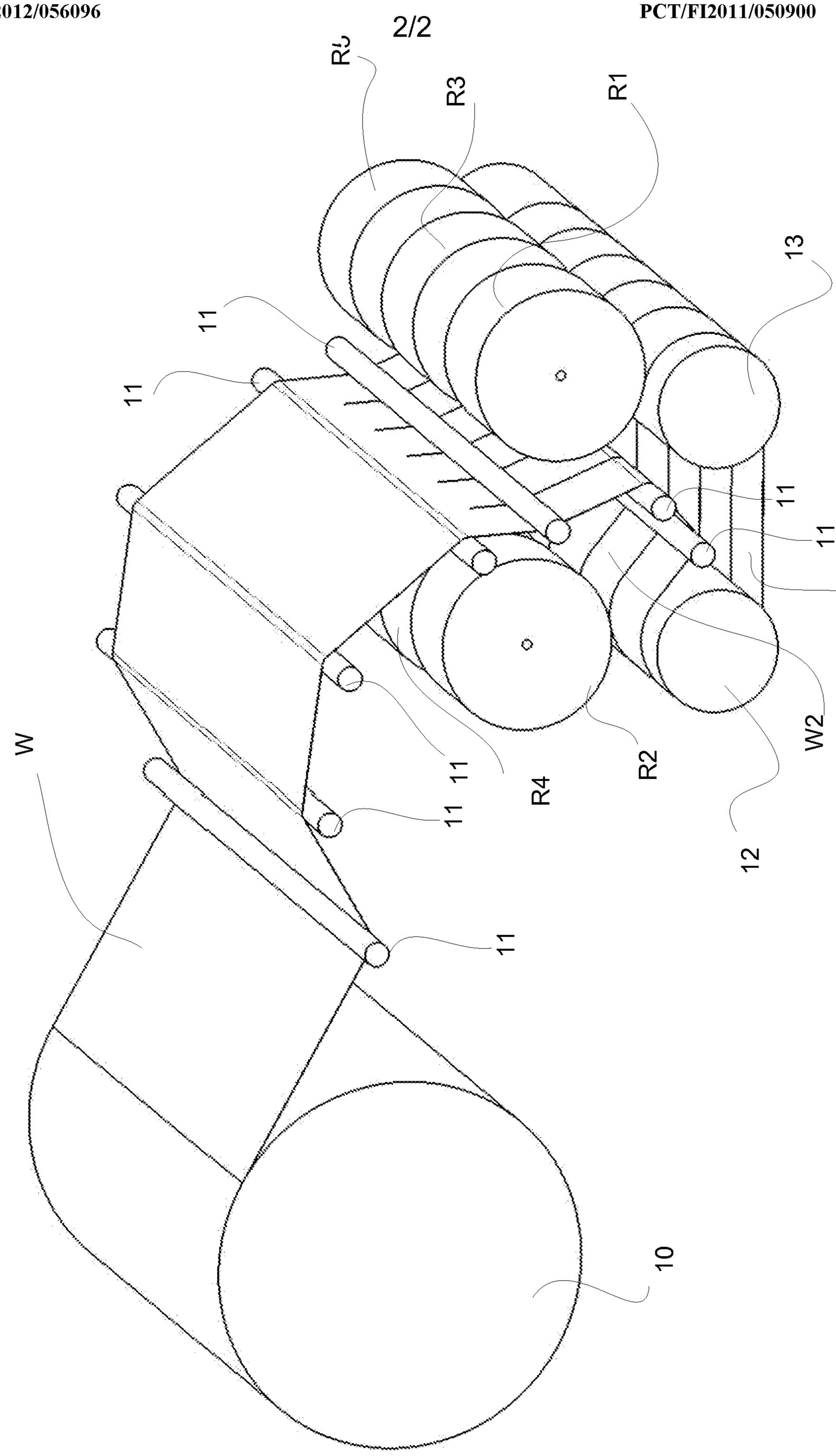

Fig. 2

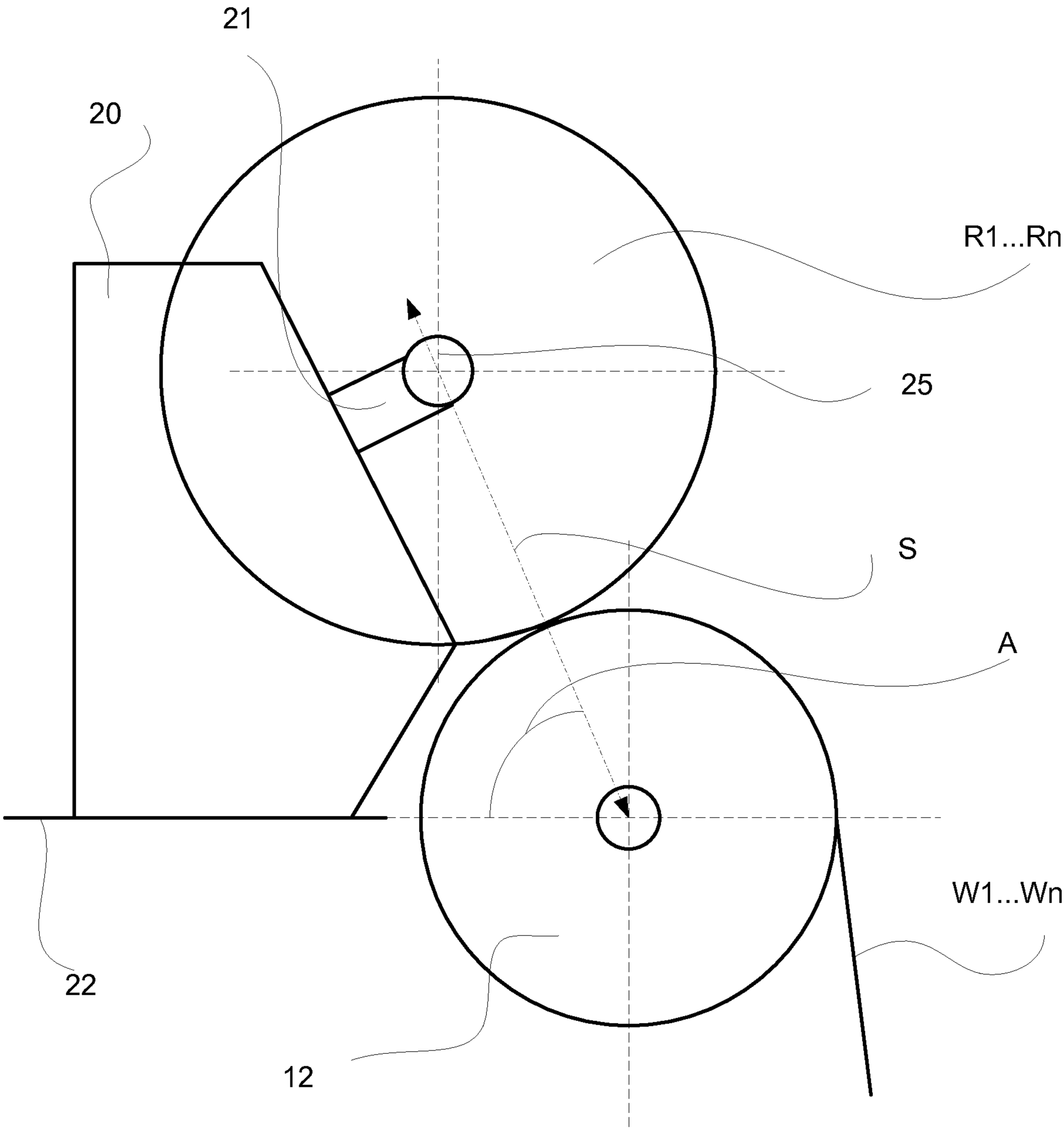

Fig. 1