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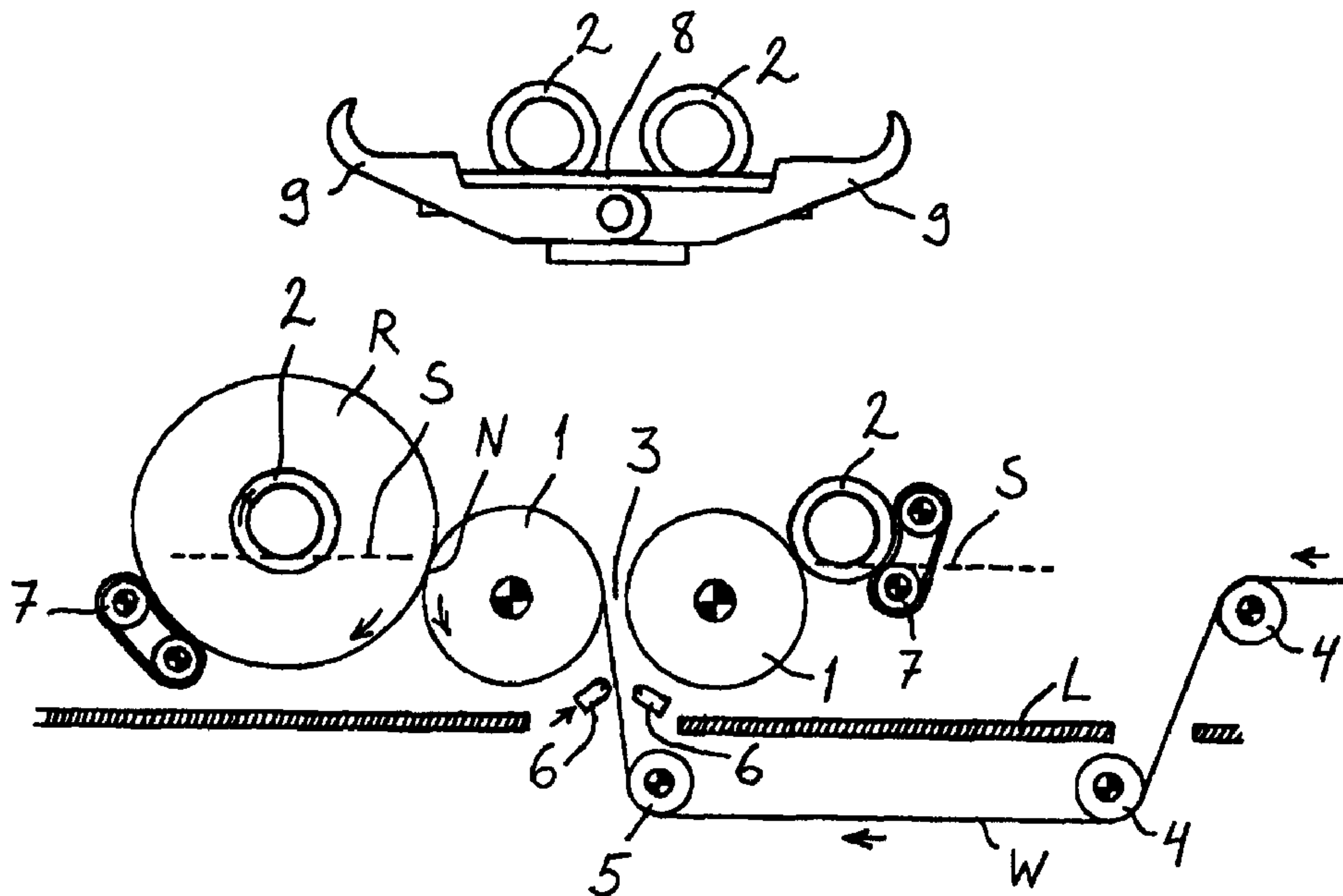
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(54) **PROCEDE DE BOBINAGE DE BANDE DE PAPIER OU DE  
CARTON ET BOBINEUSE DE BANDE DE PAPIER OU DE  
CARTON**

(54) **METHOD IN REELING OF A PAPER OR PAPERBOARD WEB  
AND REEL-UP FOR A PAPER OR PAPERBOARD WEB**



(57) Le procédé de bobinage d'une bande de papier ou de carton consiste à guider une bande (W) au moyen d'un cylindre de bobinage (1) sur une bobine (R) à former autour d'un arbre de bobinage (2). Les cylindres de bobinage (1) sont au moins au nombre de deux, les deux cylindres étant utilisés pour bobiner à tour de rôle la bande (W) sur la bobine correspondante. Les bobines (R) sont formées à tour de rôle dans des phases de bobinage situées des côtés opposés des deux cylindres de bobinage (1). La bande (W) se déplace entre les cylindres de bobinage (1) vers l'un ou l'autre des cylindres de bobinage (1) et la bobine (R) correspondante.

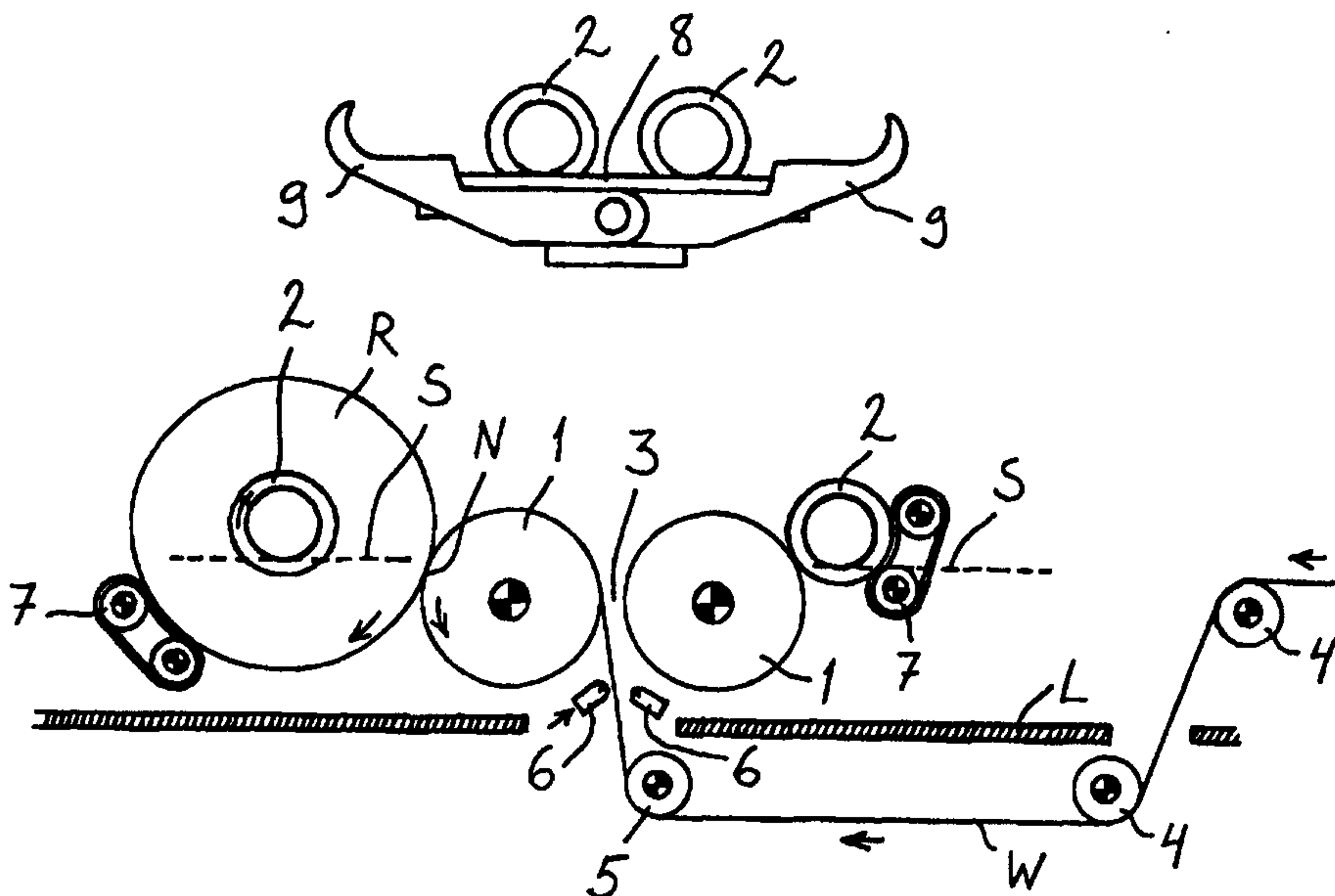
(57) In the method in reeling of a paper or paperboard web, a web (W) is guided by means of a reeling cylinder (1) onto a reel (R) to be formed around a reeling axle (2). There are at least two reeling cylinders (1), both of which are used to reel in turn the web (W) onto the corresponding reel. The reels (R) are formed in turn in reeling stations located on opposite sides of the pair of reeling cylinders (1). The web (W) travels between the reeling cylinders (1) to either reeling cylinder (1) and the corresponding reel (R).

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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/FI99/00453</p> <p>(22) International Filing Date: 27 May 1999 (27.05.99)</p> <p>(30) Priority Data: 981182 27 May 1998 (27.05.98) FI</p> <p>(71) Applicant (for all designated States except US): VALMET CORPORATION [FI/FI]; Panuntie 6, FIN-00620 Helsinki (FI).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): RÄTY, Jarkko [FI/FI]; Invantie 18 B 23, FIN-04400 Järvenpää (FI).</p> <p>(74) Agent: TAMPEREEN PATENTTITOIMISTO OY; Hermi-ankatu 6, FIN-33720 Tampere (FI).</p>	<p>(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments. In English translation (filed in Finnish).</p>	

(54) Title: METHOD IN REELING OF A PAPER OR PAPERBOARD WEB AND REEL-UP FOR A PAPER OR PAPERBOARD WEB



## (57) Abstract

In the method in reeling of a paper or paperboard web, a web (W) is guided by means of a reeling cylinder (1) onto a reel (R) to be formed around a reeling axle (2). There are at least two reeling cylinders (1), both of which are used to reel in turn the web (W) onto the corresponding reel. The reels (R) are formed in turn in reeling stations located on opposite sides of the pair of reeling cylinders (1). The web (W) travels between the reeling cylinders (1) to either reeling cylinder (1) and the corresponding reel (R).

Method in reeling of a paper or paperboard web and reel-up for a paper or paperboard web

5 The invention relates to a method in reeling of a paper or paperboard web, in which the web is guided by means of a reeling cylinder or a corresponding device guiding the web onto the reel to be formed around a reeling axle, wherein there are at least two reeling axles or the like, both of which are used in turn to reel the web onto the corresponding reel. The invention also relates to a reel-up for a paper  
10 or paperboard web.

In the final end of a paper or paperboard machine or in a finishing apparatus such as a coater for paper or paperboard, a continuous fibrous web coming from the preceding sections is reeled around a  
15 rotating reeling axle, i.e. a reel spool, to form a reel, i.e. a so-called machine reel. The reeling is conducted by means of a reeling cylinder rotating at the web speed, via which reeling cylinder the web enters the reel. Between the reeling cylinder and the reel, a loading is maintained, which causes a predetermined linear load in a reeling nip located in the  
20 contact point of the reel and the reeling cylinder approximately parallel to the reeling axle. Typically, the loading is effected by applying a load to the reel by means of a loading mechanism connected to the ends of the reeling axle towards the stationary reeling cylinder mounted in the frame of the reel-up at the same time when the reeling axle, supported  
25 by the ends, moves further apart from the reeling cylinder along with the growth of the reel. The above-described reel-up type is called a Pope-reel. In these reel-ups it is possible to implement the rotating of the reeling axle and the reel with a surface drive, wherein the reeling axle rotates freely in the support structures of the reel-up, and the force  
30 required for rotation is transmitted from the reeling cylinder via the reeling nip to the reel, or with a centre-drive, wherein not only the reeling cylinder but also the reeling axle is provided with a drive.

The reel-up type operating with the surface drive is presented e.g. in  
35 the Finnish patent 71107 and in the related US-patent 4634068. A centre-drive assisted reel-up is disclosed e.g. in the Finnish patent application 905284 by the applicant and in the related US-patent

5251835. A centre-drive assisted reel-up which is provided separately with a loading mechanism for the reel and a transfer mechanism for the reel, is disclosed in the European patent 604558 and in the related US-patent 5393008.

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Because a continuous web is passed from the preceding sections of the paper or paperboard machine or aftertreatment apparatus of the web at the running speed of the machine or apparatus, a reel change has to be conducted at intervals, i.e. when the reel to be reeled in the reeling station becomes full, the web is cut with a suitable method, which depends e.g. on the grammage of the web, and the new end of the web following the cutting point is guided around a new empty reeling axle, which is brought to the change station from a storage of reeling axles, i.e. from a so-called reel spool storage. The change sequence which is conducted at high web speeds is the most sensitive part of the reeling process, and it involves the transfer of the reeling axle from the reel spool storage to the change position into a change connection with the web travelling onto the reel being completed, the acceleration of the reeling axle to the web speed, cutting of the web in such a way that the web is cut at a desired moment and at a desired point of the reel-up geometry and its guidance immediately around the empty reeling axle, as well as the deceleration and stopping of the full reel of several tonnes in weight after the cutting of the web. There are numerous patents and patent applications related to this change sequence or a part thereof, and as examples reference can be made to the Finnish patent 95683 of the applicant and the related international publication WO 93/34495 (member pressing the web to prevent access of air to the web), to the Finnish application 915432 of the applicant and the related US patent 5360179 (cutting of the web by means of a water jet) and to the Finnish patent 97339 by the applicant and the related EP application publication 739695 (striking blade cutting device for cutting the web with a full-width cut).

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The reel spool storage from which the reeling axles are transferred to the change position before initiating the change, is typically located on horizontal rails. The rails are typically located in the travel direction of the web before the reel to be reeled and they end approximately above

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the reeling cylinder, from which point the first reeling axle is always lowered down to a device for initial reeling by means of lowering arms, as presented e.g. in the US-patent 4944467. The US-patent 4905925 discloses a reel spool storage in which the reeling axles are placed on rails above the reeling rails supporting the reel in the reeling station, from which position they are lowered downwards along inclined rails to the device for initial reeling in contact with the web travelling on the periphery of the reeling cylinder. The reel spool storage can also be integrated on the reeling rails.

Typically, the reeling cylinder has a stationary position in the frame of the reel-up. However, a solution for a reel-up is also known where the one in which the reeling cylinder is arranged in the frame to move in the vertical direction and to be loaded against the reel, whose position is arranged adjustable on the reeling rails. The solution, which is disclosed in the European patent 697006, enables moving the reeling axles along a straight path from the reel spool storage onto the reeling rails over the reeling cylinder, as well as the fixed position of the reeling axle during the reeling by compensating for the growth of the reel with the downward motion of the reeling cylinder. The European application publication 792829 discloses a reel in which the reeling cylinder to be loaded against the reel is capable of moving in the horizontal direction when the size of the reel grows and the reeling axle is rotating in stationary position.

Consequently, there are numerous known reel-up concepts. A common feature for all the above-mentioned reel-ups is either a stationary reeling cylinder or a moving reeling cylinder and a growing machine reel which is in nip contact therewith and on which reel the web running from the continuous production process or aftertreatment process of paper or paperboard is reeled. In particular, all reel-up concepts share the accurate and demanding change sequence to be effected by means of the reeling cylinder and the empty reeling axle brought in connection with the same. An undisturbed implementation of the change sequence to avoid broke sets high demands on the actuators and automatics, especially at current high web speeds which normally exceed 20 m/s, usually even 25 m/s.

In present centre-drive assisted reel-ups the change is typically implemented in such a way that during the initial reeling when the empty reeling axle has been accelerated to the web speed in the device for initial reeling, the empty reeling axle is in contact with the web travelling via the reeling cylinder, the web travelling via the reeling nip to the reel that is being completed. The reeling nip is opened by moving the reel being completed away from the reeling cylinder and the reeling axle is moved e.g. by means of the device for initial reeling into the change position between the reeling cylinder and the reel being completed, typically in such a way that after the nip between the reeling axle and the reeling cylinder the web travels a short distance on the periphery of the reeling axle and departs therefrom towards the reel. The web is cut after the exit point and guided immediately around the empty reeling axle, and thereafter it is possible to start to decelerate the full reel. The empty reeling axle, around which the web has started to accumulate, is changed when necessary from the device for initial reeling under the load of the loading devices in the reeling station, i.e. to a so-called secondary reeling, and at the same time the centre-drive of the reeling station is connected to the reeling axle. The discontinuity points in the aforementioned change sequence, involving e.g. the act of opening the reeling nip and the stopping of a complete reel at the full reel and the change from the initial reeling to the secondary reeling at the new reel, are, despite of all the technical improvements and precautions, difficult to control and may cause reeling flaws especially in the bottom and surface layers of the reel.

The European patent 483093 discloses, as one alternative, a reel-up in which two reeling cylinders and the corresponding reeling rails are placed on top of each other in such a way that the web can be guided via the upper reeling cylinder to the upper reeling station when the machine reel in the lower reeling station has become full. The path utilized in the change of the web to the upper reeling cylinder is long in the vertical direction, and the reeling cylinders and reeling rails superimposed at the same location in the longitudinal direction of the machine occupy space in the height direction.

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The purpose of the invention is to present an improvement for the prior art in continuous reeling-up, and to present a method and a reel-up in which the change sequence in particular can be implemented in a controlled manner, but which also introduces new possibilities for the implementation of the structure of the reel-up and for the production of the reels. To attain this purpose, the method according to the invention is primarily characterized in that the reels are formed in turn in reeling stations located on the opposite sides of a pair of web guiding devices, such as reeling cylinders. When the first reeling cylinder and the corresponding first reeling station are utilized to form a reel, the other one can be free, and if desired, the web can be changed to travel to the other reeling cylinder and onto the reel located in the corresponding second reeling station. A particular advantage of the invention is that the reel that has become full after the reel change as well as the reeling cylinder via which it has been reeled, can be treated in a desired manner without interfering with the new reeling process that has started after the change and is effected by means of the second reeling cylinder. The reels are formed in the machine direction on the opposite sides of the reeling cylinder pairs in their own reeling stations, wherein they can also be moved in different locations of the plane of the machine hall.

The purpose of the invention is also to present a reel-up which provides new possibilities for the implementation of the change sequence of the reel, and new possibilities for the placement of accessory devices. To attain this purpose, the reel-up is primarily characterized in that the reeling stations are placed on the opposite sides of the pair of web guiding devices, such as reeling cylinders. The reeling cylinders can be placed side by side so that their axes are substantially parallel to each other, wherein their centre axes are on the same height level or on different height levels, wherein their connecting plane can form an angle with the horizontal plane. The invention does not exclude the possibility that the reeling cylinders are placed on top of each other, wherein the aforementioned angle is 90°. In all cases, a passage is formed between the mantle surfaces of the reeling cylinders, via which the web is guided optionally onto either cylinder and the corresponding reel.

As for the other preferred embodiments of the invention, reference is made to the appended dependent claims and to the description hereinbelow.

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In the following, the invention will be described in more detail with reference to the appended drawings, in which

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Fig. 1 is a side-view of a reel-up,

Fig. 2 shows the reel-up of Fig. 1 in a change situation,

Fig. 3 shows a side-view of a second embodiment of the reel-up according to the invention,

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Figs 4—5 show a side-view of a third and a fourth embodiment,

Figs. 6—7 show embodiments by means of which the same side of the web is always facing outward in the reel,

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Figs. 8a—c show an embodiment equipped with moving reeling cylinders,

Figs. 9a—d and 10a—c show an embodiment equipped with reeling cylinders moving alternately, and

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Fig. 11 is a schematical top view of the reeling process and the act of transferring complete reels.

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Fig. 1 shows a reel-up which is arranged to reel a continuous web W passed at a fixed web speed in the terminal end of the paper or paperboard machine or finishing apparatus for paper or paperboard, such as a coater. The reel-up comprises a reeling cylinder 1 arranged rotatable by means of a drive, over which reeling cylinder 1 the web W travels to a reel R within a given sector and through a reeling nip N between the reeling cylinder 1 and the reel R, to end around a reeling axle i.e. a reel spool 2 rotating in a support structure. The reeling nip

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has a determined linear pressure as a result of the fact that the reeling cylinder 1 and the reel R are loaded against each other with a given force. This can be attained in a known manner by loading the reeling axle 2 towards the reeling cylinder 1 by means of a loading mechanism  
5 coupled to the ends of the reeling axle 2 or also by loading the reeling cylinder 1 against the reel R.

The paper or paperboard web W to be reeled is a full-width web which is typically several meters wide. This web is reeled around the same  
10 reeling axle to form a machine reel of several tonnes (e.g. over 5 tonnes) in weight, which reel can be rereeled later. Finally, the web is slitted into narrower part webs, which are wound to form customer rolls. The full-width web to be reeled has gone through a manufacturing or  
15 aftertreatment process in the sections preceding the reel-up, and the web is reeled substantially in the manufacturing or treatment width around the reeling axle, possibly in such a manner that trims have been cut off. Without restricting the concept of a full-width web to some fixed  
20 dimensions, it can be stated that the width of such a web to be reeled is typically over 3 m, and in wider machines it is in the order of about 8—10 m.

The support structures of the reeling axle 2 can be reeling rails along which the ends of the reeling axle move during the reeling, or a reeling carriage which receives the entire weight of the reel and is movable  
25 with suitable motion means in accordance with the growth of the reel R, e.g. along a path of motion in the direction of the horizontal plane. In Fig. 1, these structures are marked schematically with a broken line S. The support structures constitute a reeling station in which most of the reel is formed and in which it becomes full before the reel change.

30 The reel-up also comprises a second reeling cylinder 1, which is arranged in parallel with the first reeling cylinder so that their centre axes are approximately within a fixed distance from each other and aligned with respect to the cross machine direction. The cylinders rotate  
35 in opposite directions. The mantle surfaces of the reeling cylinders are located opposite to each other and in between them they form a narrowing and then again widening space 3, wherein the narrowest

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point is located in the area where the mantle surfaces are closest to each other.

5 The reeling cylinders 1 form a pair, on both sides of which there is a reeling station for producing the reel R by means of a corresponding reeling cylinder. The reels R are thus formed over the same area in the cross direction of the machine or apparatus. In Fig. 1, the reeling station of the first reeling cylinder 1 is located substantially after the reeling cylinder in the longitudinal direction of the machine, 10 approximately in accordance with the geometry used in known Pope reel-ups. The second reeling cylinder 1 is located before the first reeling cylinder 1 in the longitudinal direction of the machine, and its reeling station, in turn, is located before this second reeling cylinder 1. The web W is passed towards the reeling cylinders 1 underneath the second reeling station in the longitudinal direction of the machine, i.e. it has 15 such a travel path that it has sufficient space to travel beneath the full reel located in the second reeling station. The web W is guided to the reeling cylinders 1 via the space 3 between the reeling cylinders 1, in which it travels either to the first or to the second reeling cylinder 1.

20 In the situation shown in Fig. 1, the paper or paperboard web W is passed to the reel-up from underneath via a spreader roll 5. The web W is guided downwards by means of a first guide roll 4 located before the reel-up in the machine direction, over which guide roll 4 the web W 25 wraps and will be guided onto the lower level in which it is guided forward to the spreader roll 5 by means of a second guide roll 4. The lower level on which the second guide roll 4 is located can be situated below the floor level L of the machine hall to maintain the height of the reel-up on a normal level. The spreader roll 5 by means of which the 30 web W turns upwards, is located approximately by the space 3 between the reeling cylinders 1. The web W is passed from the spreader roll 5 obliquely upwards, via an opening located underneath the space 3, to the first reeling cylinder 1. On the first reeling cylinder 1 the web W wraps it over a certain sector running through the apex of the cylinder 35 and is guided onto the reel R via a reeling nip N located on the opposite side of the cylinder. In Fig. 1, the reeling nip N is located above the horizontal plane extending via the centre axis of the reeling cylinder 1 at

an angular distance of  $0^\circ$ — $90^\circ$  from the horizontal plane, but it can also be located underneath the horizontal level if the reeling cylinder 1 is in a sufficiently high position.

- 5 The free section of the web *W* between the spreader roll 5 and the reeling cylinders 1 is provided with change devices 6 on both sides of the web *W*. The change devices are placed before the narrowest point of the space 3 between the reeling cylinders 1 in the travel direction of the web. The purpose of the change devices is to change the run of the web from the first reeling cylinder to the second one and vice versa at a particular moment of time in the change sequence.

10 In the situation shown in Fig. 1, the reel *R* reeled via the first reeling cylinder 1 is becoming full. The second reeling cylinder 1 is in a standstill or it is rotating at a speed lower than the web speed, and the empty reeling axle 2 has been brought from the reel spool storage to the vicinity of the second reeling cylinder 1, whereafter it has been brought in contact with the cylinder by means of a device for initial reeling. The web *W* is cut by means of the change device 6 located on the same side of the web *W* with the first reeling cylinder 1, which change device can be a cutting device effecting a full-width cross cutting by means of a cutting stroke, or a cutting device moving across the web *W*. The cutting device can be brought in contact with the web before the cross cutting in the direction illustrated by the arrow. At the latest at the moment of cutting, the empty reeling axle 2 is in contact with the second reeling cylinder 1, and the reeling cylinder 1 and the reeling axle 2 therewith are accelerated to the web speed. The new end of the web *W* after the cutting point is guided to the second reeling cylinder 1 and over the same to the nip between the empty reeling axle 2 and the cylinder e.g. by utilizing air blast devices brought to the space 3. To guide the web *W* around the empty reeling axle 2 after the nip, it is also possible to use air blasts.

25 Fig. 2 illustrates the situation after the change. The web *W* travels onto the second reeling cylinder 1 via the space 3 between the cylinders, and turns against the original incoming direction of the web *W* guided by the reeling cylinder 1. The reeling nip *N* is located after the apex of

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the second reeling cylinder 1 in the direction of rotation of the cylinder, in the same area as on the first reeling cylinder 1. The full-sized reel R existing in the second reeling station at the final stage of the reeling is illustrated with a broken line.

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Since the change of the reel and the reeling process following thereafter takes place in its entirety by means of the second reeling cylinder 1, it is possible during the change and thereafter to handle the reel which is becoming full or is finished without having to pay attention to the ongoing change sequence or to the reeling process onto a new reel. Before the change at the final stage of the reeling process, the reel R is constantly in contact with the first reeling cylinder 1 through the nip N, and it is not necessary to move the reel R further apart, and correspondingly, separate press devices are not necessary to prevent the access of air to the reel. After the change the full reel R is advantageously stopped without opening the reeling nip N between the first reeling cylinder 1 and the reel R, i.e. the reel R is braked when the nip is closed. Because the first reeling cylinder is free from the web, its speed can be decelerated in a desired manner, and the reel is most advantageously stopped by braking the reeling cylinder 1, which transmits the braking force to the reel R by surface drive. When the reel is stopped or its speed has decreased under a suitable value, the reel R is detached from the contact with the reeling cylinder 1 and transferred away from the reel-up. When the reel has been detached from the reeling cylinder, a new empty reeling axle 2 can be brought immediately from the reel spool storage into connection with the reeling cylinder 1 to wait for a new change which now takes place from the second reeling cylinder 1 to the first analogously with the above-described change sequence. Thus, the change device 6 on the same side of the web W with the second reeling cylinder 1 conducts the cutting off and the web W is guided to the first reeling cylinder 1 again, on whose periphery it turns towards the empty reeling axle 2.

The reeling process can be implemented by means of a surface drive from the reeling cylinder 1, wherein a centre-drive is not necessary in either reeling station. The invention is not, however, restricted to reel-ups functioning on the surface drive principle, but it is possible and

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often advantageous to provide one or both reeling stations with a centre-drive of the reeling axle 2. Thus, when the web is cut off and changed, the reel can be stopped by braking by the centre-drive, and the nip between the reeling cylinder and the reel is still closed  
5 advantageously at least for the duration of the initial stage of the braking, e.g. most of the braking time, or until the reel has stopped rotating. The invention can also be used in such a way that after the change the nip is opened and the reel is stopped separately from the reeling cylinder 1 by braking by the centre-drive.

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Figs. 1 and 2 also show auxiliary reeling devices 7, which are arranged in corresponding reeling stations in contact with the reel R after the nip N in the direction of rotation of the reel R. The auxiliary reeling devices are driven, and their surface, which is in contact with the reel, travels at  
15 the peripheral speed of the reel. They can be composed of a rotating roll, or, as shown in Figs. 1 and 2, of a belt loop guided by several rolls, the belt of which belt loop is located against the surface of the reel within a particular section. The point in which the reel enters the contact with the corresponding auxiliary reeling device 7 is advantageously in  
20 the area of the lower half of the reel R.

Before the reel change, the auxiliary reeling device 7 can be set in contact already with the mantle of an empty reeling axle 2, wherein it simultaneously guides the web W around the reeling axle. When a belt  
25 device is used, the belt holds the web against the reeling axle 2 within a given section. The auxiliary reeling device 7 is arranged to move along with the growth of the reel, and this path of motion, which in Fig. 1 is marked with broken line arrows, can be implemented with a suitable mechanism. The auxiliary reeling device 7 does not have to cover the  
30 full width i.e. it does not have to correspond to the width of the reel, but it can be arranged in the central area of the reel in the transverse direction. Furthermore, it is possible to use numerous separate auxiliary reeling devices contemporaneously in the same reeling station.

35 When a full reel R is stopped with a surface drive by braking the reeling cylinder 1, the auxiliary reeling device 7 is detached, its speed can be reduced concurrently with the reeling cylinder, or it can rotate freely with

the reel. If the full reel is stopped by braking by the centre-drive so that the nip between the reeling cylinder and the reel is open, the auxiliary reeling device can still be maintained in contact with the reel, and it can be used to prevent the unrolling of surface sheets.

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Figs. 1 and 2 show a construction in which the reeling cylinders 1 are placed one after the other in such a way that the connecting plane of their centre axes is approximately horizontal. The structures of the reeling cylinders 1 and reeling stations in the reel up are advantageously identical in such a way that the entire structure is as mirror-symmetrical as possible when the space 3 between the reeling cylinders 1 constitutes the centre line. Fig. 3 shows another possibility to provide the reel-up with two reeling cylinders 1. Here, the reeling cylinders 1 are located on top of each other, i.e. the connecting plane of their centre axes is located in an angle of  $90^\circ$  with respect to the horizontal plane. The spreader roll 5 guides the web W into the space 3 between the reeling cylinders 1 approximately along the longitudinal direction of the machine. Between the spreader roll 5 and the mantles of the reeling cylinders 1 there are change devices 6 whose function is similar to that described hereinabove. The run of the web W changed from the first reeling cylinder 1 to the second one is illustrated with broken lines, and the full-sized reel R reeled in the reeling station of the second reeling cylinder 1 is also illustrated with broken lines. The geometry of Fig. 3 reduces the machine length but correspondingly increases the height, and as a result, in the reeling station located first in the longitudinal direction of the machine (in the primary travel direction of the web), the reel R to be reeled has to be handled in a significantly higher position than the second reel.

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The reeling cylinders 1 can be placed with respect to each other also in such a way that the position is an intermediate form of the geometries of Figs. 1 to 2 and, on the other hand, of the geometry of Fig. 3. The cylinders 1 can be located in an inclined relationship, i.e. the connecting plane of their centre axes can form an angle of  $0^\circ$ — $90^\circ$  with the horizontal plane on the entrance side of the web W, i.e. on the side from which the web is guided between the cylinders 1. To prevent the second reeling station from being raised too high with respect to the

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first one, the reeling cylinders 1 are positioned advantageously at an angle of max. 45°, more advantageously at an angle of max. 30°. Most advantageously the aforementioned angle is in the range of 0° to 15°

5 Fig. 4 shows an alternative in which the reeling cylinders 1 are located at a different height, and the angle  $\alpha$  is about 10°. The reeling cylinder 1 located first in the longitudinal direction of the machine is located in a higher position, and the web W can be brought to the pair of reeling cylinders 1 above the floor level L underneath the first located reeling cylinder 1 and the corresponding reeling station.

10 Fig. 5 shows a case in which the aforementioned angle is ca. 20° and the latter reeling cylinder 1 in the longitudinal direction of the machine is located at a higher position.

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The solutions of Figs 3 to 5 entail the same possibilities to use the auxiliary reeling devices 7 as in Figs. 1 to 2. The reeling axles 2 are provided with centre-drives, but it is possible to conduct the reeling process also with a surface drive only.

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The reeling cylinders 1 are placed so close to each other that the change of the web onto the opposite mantle surface can be easily performed. Thus, the narrowest point in the space 3 between the reeling cylinders is sufficiently narrow, so that it is necessary to deviate the new end of the web only as little as possible from its original direction in order to pass it onto the opposite reeling cylinder. The minimum distance between the mantles, i.e. the width of the narrowest point in the space 3, should be at least smaller than the diameter of the reeling cylinders, and if the reeling cylinders have different sizes, it should be smaller than the diameter of the reeling cylinder. The minimum distance in the space 3 is advantageously smaller than the radius of the reeling cylinders, or the radius of the smaller reeling cylinder. The reeling cylinders that are located close to each other are an advantageous solution also in view of the machine length or height.

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35 In the solutions of Figs. 1 to 5, the reeling cylinders 1 are rotating in opposite directions, wherein a space 3 is formed between their opposite

5 mantle surfaces, via which space 3 the alternative runs of the web W are passed. When the web is changed from one cylinder to another, the other surface of the web is simultaneously positioned against the reeling cylinder. As a result of this, that side of the web which on the preceding reel was facing outwards, will face inwards on this new reel. This does not usually cause any inconveniences, but e.g. in the case of coated paperboards or other grades, it might be desired that the web is always positioned the same side out in the reel. In Fig. 6 this has been solved in such a way that the reeling cylinders 1 are arranged to rotate 10 in the same direction, and there is a turning device, such as a reversing roll between them. Between the reversing roll 10 and one of the reeling cylinders 1 a space is formed, via which the alternative runs of the web travel, either to the reeling cylinder 1 and via its upper part to the reeling nip, or to the reversing roll 10 rotating in a direction opposite to 15 the reeling cylinder 1, the reversing roll 10 delivering the web to the reeling cylinder 1, over whose lower sector the web W wraps and travels to the reeling nip. By means of the turning device it is possible to set the same surface out on the reeling cylinder 1 located after the turning device as on the reeling cylinder 1 to which the web is passed 20 without the turning device.

Fig. 7 shows an arrangement that produces a corresponding result, in which arrangement the turning device, such as a reversing roll, effecting a corresponding turning, is not located in the narrowest point 25 between the reeling cylinders 1, but below the narrowest point between the reeling cylinders. In other respects the principle equals that of Fig. 6, i.e. the alternative runs of the web travel via the narrowest point between the reeling cylinder 1 and the reversing roll 10, either directly to the reeling cylinder or via the reversing roll 10 to the sector on the 30 mantle of the other reeling cylinder 1 which succeeds the narrowest point between the reeling cylinders 1 in the direction of rotation.

In the solutions of Figs. 6 and 7, it is possible to use change devices in the travel direction of the web before the second reeling cylinder 1 and 35 the reversing roll 10 in a similar way as in Figs. 1 to 2. Likewise, it is possible to use auxiliary reeling devices 7 according to the same

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principle as in Figs. 1 to 2. The reeling axles may be provided with a centre-drive or the reeling can be effected with a surface drive.

5 Figs. 8a to 8c present a solution which enables the loading between the reeling cylinder 1 and the reel R by means of a loading mechanism connected to the reeling cylinder 1. In Fig. 8a, the reeling cylinder 2 is stationary in the reeling station during the reeling process to collect the web W passed via the first reeling cylinder 1 onto the reel R. To compensate for the growth of the reel, the reeling cylinder 1 is provided  
10 with the possibility of moving away from the reeling axle 2 approximately in horizontal direction (Figs. 8a and b). When the reeling cylinder 1 is moving, it is simultaneously loaded against the reel R to produce a certain linear pressure in the reeling nip R. The arrangement is in other respects similar to that of Figs. 1 to 2, i.e. the web W is  
15 passed between the pair of reeling cylinders 1 onto the first reeling cylinder 1 and the alternative runs of the web travel via the narrowest point in the space 3 between the reeling cylinders. When the reel R has become full, the change sequence can be performed in the way described in connection with Figs. 1 to 2. The web W is transferred  
20 onto the opposite mantle of the second reeling cylinder 1 in the situation of Fig. 8c, in which the second reeling cylinder 1 and the empty reeling axle 2 are brought in contact with each other (illustrated with a broken line). This second reeling cylinder 1 can also move along with the growth of the reel R and it can be loaded against the reel when  
25 the reeling axle 2 in the corresponding reeling station remains stationary. This reeling cylinder 1 moves to the direction opposite to the direction of motion of the first reeling cylinder 1 during its reeling process (illustrated with a broken line arrow).

30 The cylinders 1 can be independently movable back and forth between the reeling stations, wherein the first reeling cylinder 1 moves towards the second one and vice versa. Figs. 8a to 8c, however, show a structure in which the pair of reeling cylinders 1 is arranged to move in the same support structure 11 back and forth in the direction of the reeling stations. The support structure 11 can be arranged movable  
35 e.g. on the support and under the guiding action of suitable guides. An advantage of the solution according to Figs. 8a to 8c is that both reeling

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cylinders 1 may share the same loading and transfer devices, i.e. they can be connected to a common loading and transfer mechanism. The distance between the reeling cylinders 1 remains constant during the transfer. The reel R can be grown in the first reeling station until the  
5 second, free reeling cylinder 1 enters the contact with the empty reeling axle 2, whereafter the change is conducted. The full reel has to be taken away so that the new reel can start to grow. The distance between the reeling stations and the size of the reels to be produced can be dimensioned with respect to each other so that in the situation  
10 of Fig. 8c, the nipping contact between the first reeling cylinder 1 and the reel R that is becoming full can be released, and the structure 11 can be transferred somewhat further towards the new, empty reeling axle 2 until the second reeling cylinder 1 enters in contact therewith, after which the change can be conducted. Thus, there is room for the  
15 reeling cylinder 1 to move back towards the full reel R.

Furthermore, the distance between the reeling cylinders 1 can be arranged adjustable in the support structure 11 (illustrated with a double-headed arrow in Fig. 8c), so that in the change situation in  
20 particular, it would be possible to move the reeling cylinders in suitable positions in the structure 11. For example in the situation of Fig. 8c, the distance between the reeling cylinders 1 can still be adjusted so that it is optimal before the change, for example it can be reduced. For example, when the reeling cylinder 1 is in contact with the empty reeling  
25 axle 2, the second reeling cylinder 1 can be moved apart from the full reel towards this reeling cylinder, or if it has initially been off the reel, it can be moved further away from the reel and closer to the reeling cylinder. The change devices can also be placed so that they move along with the common support structure 11.

30 The support structures S of the reeling axles 2 have a stationary position. Instead of stationary frame structures, it is also possible to use carriages held in place as support structures S, by means of which carriages the full reel can be moved away in the direction of the reeling  
35 axle 2.

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Figs. 9a—c illustrate schematically one way of changing the web W from one reeling cylinder to another. Here, the condition is that the reeling cylinders 1 are capable of moving with respect to each other between the reeling stations. The reeling can be effected on the principle shown in Figs. 1 to 2, i.e. the reeling cylinders 1 are stationary and the reeling axle 2 moves away from the reeling cylinder on the support of the support structure S. When the reel is becoming full, the second reeling cylinder 1 is brought from its fixed position closer to the first reeling cylinder 1 in order to conduct the change, i.e. the space 3 between the reeling cylinders is reduced. The reeling cylinder 1 can be brought very close to the web W travelling on the reeling cylinder 1, e.g. in contact with the same. Before the change, at the latest, the new reeling axle 2 is brought in contact with the second reeling cylinder 1 and the change is conducted (Fig. 9b), wherein the web wraps over the second reeling cylinder 1, and e.g. guided by suitable auxiliary devices it is wound around a new reeling axle 2. Thereafter the second reeling cylinder 1 together with the reeling axle 2 and the reel formed around the same can be moved further away from the first reeling cylinder 1, and stopped in the fixed position of its own (Fig. 9c). Thereafter the reeling process can be accomplished and when the reel R becomes full in this reeling station, the first reeling cylinder 1, in turn, moves from its fixed position closer to the second reeling cylinder 1, possibly in contact with the web passed via the second reeling cylinder 1 onto the reel R, and the change can be conducted analogously with the principle of Figs. 9a—b.

In Figs 9a—d the reeling is accomplished when the reeling cylinder 1 rotates in its fixed position and the reeling axle 2 moves further away from the reeling cylinder in the support structure. After the web W has been cut off, the reeling cylinder 1 can remain in nip contact with the full reel R for the duration of the braking of the reel R in a similar way as described above.

Figs. 10a—c show an embodiment in which the distance between the reeling cylinders 1 can also be reduced to conduct the change. The reeling process takes place along the same lines as in Figs. 9a—d, i.e. the reeling cylinder 1 rotates in its position during the reeling process

and the reeling axle 2 moves further away. When the reel R is becoming full, the nip is opened by moving the reeling cylinder 1 executing the reeling process closer to the second reeling cylinder 1 (Fig. 10a). Also in this case the reeling cylinders 1 can be brought in nip contact with each other. Since the nip N between the first reeling cylinder 1 and the reel R is open, it is possible to utilize the decreasing peripheral speed of the reel to produce a slackening web, which e.g. with a change similar to a bag change can be transferred to the second reeling cylinder 1. Thus, thanks to the possibility of motion of the reeling cylinder, it is not necessary to transfer the reel R to open the nip. After the web has been broken off the new web travels via the mantle of the second reeling cylinder 1 to the new reeling axle 2 brought into connection with the reeling cylinder, and the web begins to accumulate around it to form a reel. After the change the first reeling cylinder 1 can be moved back to its fixed position (Fig. 10b). Fig. 10c again shows the change from the second reeling cylinder to the first one, which takes place analogously with the process shown in Fig. 10a.

In the embodiments of Figs. 10a—c it is also advantageous to use a special press device, such as a brush device or a press roll, which is brought in contact with the reel R to prevent access of air under the topmost layers when the nip is open. In the drawings, this press device is described schematically with an arrow.

In the embodiments of Figs 8 to 10, the reeling axle 2 is equipped with a centre-drive, but the reeling process can also be effected only by means of surface drive with the reeling cylinder 1.

To secure the change, it is possible to utilize a suction in the reeling cylinders 1 which is directed through the mantle via openings and which suction can be restricted, if desired, e.g. to a given rotation sector, i.e. for example to the area between the entrance point of the web and the reeling axle 2. The suction arrangements can be e.g. similar to those known from the Finnish patents 74446 and 98506.

Fig.11 shows how reeling axles and the reels formed around them can be removed from reel-ups made according to the above-described

embodiments. Since the reel-up composed of two reeling cylinders and reeling stations increases the machine length, it is advantageous to remove the reels R from the reel-up in the direction of the reeling axles 2, i.e. in the cross direction of the machine, so that rolling rails or corresponding structures for removing the reels in the machine direction would not increase the length. After the reeling process the reel is transferred in the machine direction only a distance which is necessary for detaching it from the reeling cylinder, at the most to a distance from the reel equalling the radius of the complete reel and preferably at the most to a distance equalling half of the radius of the reel R. If the reeling cylinder 1 is movable, it is also sufficient that the reeling cylinder 1 is taken off the reel to the aforementioned distances and the reel R can remain stationary, and it can be taken directly from this position in the direction of the reeling axle. To perform the transfer, the reel R is supported during the reeling process in the reeling station by the reeling carriage, which after the reeling is transferred away from the reel-up in the transverse direction, or a reel reeled while having been supported by a fixed support structure, such as rails, is lifted up by means of a crane and moved away from the reel-up in the lateral direction. The aforementioned ways for removal can be carried out only in one of the reeling stations or advantageously in both of them, as shown in Fig. 11.

Figs 1 to 2 show a reel spool storage 8 shared by both reeling cylinders and reeling stations, from which storage empty reeling axles 2 can be lowered alternately into connection with the reeling cylinders 1. The reel spool storage is located above the pair of reeling cylinders and from the ends of its horizontal support structure supporting several reeling axles 2 in succession in the machine direction, it is possible to lower a new reeling axle 2 with transfer devices 9, such as lowering arms into connection with the corresponding reeling cylinder 1, to the devices for initial reeling of the reeling station, which can be known as such. In Fig. 2, this transfer stage is illustrated with arrows and broken lines. Similarly, it is possible to use known auxiliary devices and control devices in connection with the reeling stations without deviating from the inventive idea.

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Even though it was mentioned above that the reeling is effected alternately via the reeling axles, the change of the reel can be conducted via the same reeling axle with a normal change. Thus, it is possible to use the same reeling axle to reel several reels successively, and the other reeling axle and the corresponding reeling station are out of use for a longer period of time, wherein they can be serviced. It is possible to conduct short service for the free reeling cylinder and reeling station also when one reel is reeled with the other reeling cylinder and the web is changed thereafter to the free reeling cylinder.

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The reeling cylinder 1 journalled rotatable is described above as a device guiding the web W to the reel. It is, however, possible to use any surface moving in the travel direction of the web that receives the web entering the reel-up and guides the web onto the reel. According to the basic idea of the invention, there are two such devices guiding the web and comprising a corresponding moving surface, and they guide the web alternately to different reeling stations during continuously operating reeling-up.

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Claims:

1. Method in reeling of a paper or paperboard web, in which a web (W) is guided by means of a reeling cylinder (1) or a corresponding web guiding device onto a reel (R) to be formed around a reeling axle (2), wherein there are at least two reeling cylinders (1) or corresponding web guiding devices, both of which are used to reel in turn the web (W) onto the corresponding reel, **characterized** in that the reels (R) are formed in turn in reeling stations located on opposite sides of a pair of web guiding devices, such as reeling cylinders (1).
2. Method according to claim 1, **characterized** in that the web (W) travels between the web guiding devices, such as the reeling cylinders (1), to either device, such as the reeling cylinder (1), and to the corresponding reel (R).
3. Method according to claim 2, **characterized** in that the moving surfaces of the web guiding devices move in opposite directions, for example the reeling cylinders rotate in opposite directions, wherein between their opposite surfaces, such as the mantle surfaces of the reeling cylinders, there is a space (3) via which the web (W) travels in its turn onto the moving surface of the device, for example onto the mantle of the reeling cylinder (1), by means of which the web is passed to the corresponding reel.
4. Method according to claim 2, **characterized** in that the moving surfaces of the web guiding devices move in the same direction, for example the reeling cylinders (1) rotate in the same direction, and between the devices there is a turning device, such as a reversing roll (10), the web (W) being guided in its turn with a first surface positioned against the moving surface of a first device, such as against a first reeling cylinder (1) onto the corresponding reel, the first surface facing outward on the reel (R), or by means of the turning device such as the reversing roll (10) with the same surface positioned against the moving surface of a second device, such as against a second reeling cylinder (1) onto the corresponding reel, said same surface facing outward on the reel (R).

5. Method according to claim 1, **characterized** in that the moving surfaces of the web guiding devices move in the same direction, for example the reeling cylinders (1) rotate in the same direction, and the web (W) is passed in its turn between the devices, such as the reeling cylinders (1), via a first device such as a reeling cylinder (1) with a first surface positioned against the same, onto the corresponding reel, the first surface facing outward on the reel (R), or guided on that section on the moving surface of a second device, for example on that sector on the mantle of a second reeling cylinder (1) which follows after the space between the devices in the direction of surface motion/rotation, the same surface being positioned against the moving surface of the second device, such as against the second reeling cylinder (1), onto the corresponding reel, said same surface facing outward in the reel.
6. Method according to any of the foregoing claims, **characterized** in that the web (W) is passed in the longitudinal direction of the machine underneath the reeling station of one of the web guiding devices such as reeling cylinders, in between the web guiding devices such as the reeling cylinders (1).
7. Method according to claim 6, **characterized** in that the web guiding devices, such as the reeling cylinders (1), are placed one after the other in the machine direction and the web (W) is passed upwards from below vertically or obliquely and between the web guiding devices, such as the reeling cylinders (1).
8. Method according to any of the foregoing claims, **characterized** in that when the reel (R) to be reeled via a first web guiding device, such as a first reeling cylinder, has become full, the reel is changed by changing the run of the web (W) to a second web guiding device, such as a second reeling cylinder (1), via which the reeling of a new reel (R) is started.
9. Method according to claim 8, **characterized** in that in connection with the reel change the web (W) is cross cut before it enters the

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moving surface of the web guiding device, such as the surface of the reeling cylinder (1), and it is guided to the second reeling cylinder.

5 10. Method according to any of the foregoing claims, **characterized** in that the rotating speed of the reel (R) that has become full is reduced after the change with the nip (N) between the web guiding device, such as the reeling cylinder (1), and the reel (R) closed.

10 11. Method according to claim 10, **characterized** in that the rotation of the reel (R) that has become full is stopped after the change with the nip (N) between the web guiding device such as the reeling cylinder (1) and the reel (R) closed.

15 12. Method according to claim 10 or 11, **characterized** in that the entire reeling process of the same reel starting from the change of the web (W) to a new reel and ending in the act of slowing down or stopping the rotation of the full reel (R), is conducted with the reeling nip (N) between the web guiding device such as the reeling cylinder (1) and the reel (R) closed.

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25 13. Method according to any of the claims 8 to 12, **characterized** in that when the web (W) is reeled onto the reel via the first web guiding device, such as the first reeling cylinder (1), the speed of the moving surface of the second web guiding device, such as the peripheral speed of the second reeling cylinder (1), is smaller than the web speed, or it is stationary, and in connection with the reel change the moving surface of the second web guiding device, such as the second reeling cylinder (1), is accelerated to the web speed.

30 14. Method according to any of the claims 8 to 13, **characterized** in that before changing the web from the first web guiding device, such as the first reeling cylinder (1), to the second web guiding device, such as the second reeling cylinder, the distance between the devices such as the reeling cylinders (1) is reduced.

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15. Method according to claim 14, **characterized** in that the web guiding devices, such as the reeling cylinders (1), are brought into nip contact with each other.
- 5 16. Method according to claim 14 or 15, **characterized** in that before the change the second web guiding device, such as the second reeling cylinder (1), is moved closer to the first web guiding device, such as the first reeling cylinder (1), via which the web (W) travels onto the reel (R) that is becoming full (Fig. 9a).
- 10 17. Method according to claim 14 or 15, **characterized** in that before the change the first web guiding device, such as the first reeling cylinder (1), via which the web (W) travels to the reel (R) that is becoming full, is moved closer to the second web guiding device, such as the second reeling cylinder (1), to which the web is transferred (Fig. 10a).
- 15 18. Method according to any of the foregoing claims, **characterized** in that the reeling axles (2) are transferred to both web guiding devices such as the reeling cylinders (1) and to the corresponding reeling station from a common storage (8).
- 20 19. Method according to any of the foregoing claims, **characterized** in that the reeling is effected by means of at least one of the web guiding devices such as the reeling cylinders (1), preferably by means of both web guiding devices such as the reeling cylinders, by rotating the reeling axle (2) and the reel (R) located in the corresponding reeling station by means of surface drive.
- 25 20. Reel-up for a paper or paperboard web, the reel-up being provided with a reeling cylinder (1) or a corresponding web guiding device, which is arranged to guide the web (W) onto a reel (R) located in a reeling station, wherein there are at least two reeling cylinders (1) or the like, each being provided with a reeling station of its own to reel the web (W) alternatively by means of either reeling cylinder (1) or the like onto the reel (R), **characterized** in that the reeling stations are placed on
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opposite sides of the pair of reeling cylinders (1) or corresponding web guiding devices.

5 21. Reel-up according to claim 20, **characterized** in that the travel path of the web (W) to both web guiding devices such as the reeling cylinders (1) runs between the web guiding devices such as the reeling cylinders (1), and the reel-up is provided with means for guiding the web (W) alternatively on the moving surface of either device, such as on the mantle surface of either reeling cylinder (1).

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22. Reel-up according to claim 21, **characterized** in that the moving surfaces of the web guiding devices are arranged to move in opposite directions, for example the reeling cylinders (1) are arranged to rotate in opposite directions, wherein between their opposite surfaces such as the mantle surfaces of the reeling cylinders there is a space (3) through which the alternative runs of the web (W) are passed.

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23. Reel-up according to claim 21, **characterized** in that the moving surfaces of the web guiding devices move in the same direction, for example the reeling cylinders (1) are arranged to rotate in the same direction, and between the devices there is a turning device such as a reversing roll (10), wherein one of the alternative runs of the web is passed to a first device such as a first reeling cylinder (1) and the other one via the turning device to a second device such as a second reeling cylinder (1), the same surface being positioned against the reeling cylinder as on the first device.

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24. Reel-up according to claim 20, **characterized** in that the moving surfaces of the web guiding devices are arranged to move in the same direction, for example the reeling cylinders are arranged to rotate in the same direction, and one of the alternative runs of the web is passed between the reeling cylinders onto the moving surface of a first device, such as onto the mantle of a first reeling cylinder (1), and the other one to that section on the moving surface of a second device, for example on that sector on the mantle of a second reeling cylinder (1) which follows after the space between the devices in the direction of motion/rotation of the surface, the same surface being positioned

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against the moving surface of the second device, such as the second reeling cylinder, as on the first device (1).

- 5 25. Reel-up according to any of the claims 21 to 24, **characterized** in that in the travel path of the web (W) before the moving surfaces of the web guiding devices, such as the mantle surfaces of the reeling cylinders (1), there are change devices (6) for changing the web from the first device, such as the first reeling cylinder (1) to the second device, such as the second reeling cylinder (1).
- 10
- 15 26. Reel-up according to any of the foregoing claims 20 to 25, **characterized** in that the travel path of the web (W) in the longitudinal direction of the machine towards the web guiding devices, such as the reeling cylinders (1), runs underneath the reeling station of one of the devices such as reeling cylinders (1).
- 20 27. Reel-up according to claim 26, **characterized** in that the web guiding devices, such as the reeling cylinders (1), are placed one after the other in the longitudinal direction of the machine, and the travel path of the web (W) between the devices, such as reeling cylinders (1) is directed upwards from below in the vertical or oblique direction.
- 25 28. Reel-up according to claim 27, **characterized** in that the connecting plane of the centre axes of the reeling cylinders (1) forms an angle of 0 to 45 degrees, advantageously an angle of 0 to 30 degrees on the entrance side of the web.
- 30 29. Reel-up according to claim 28, **characterized** in that the connecting plane of the centre axes of the reeling cylinders (1) forms an angle of 0 to 15 degrees on the entrance side of the web.
- 35 30. Reel-up according to any of the foregoing claims 20 to 29, **characterized** in that the web guiding devices such as the reeling cylinders (1), and the corresponding reeling stations share a common storage (8) of reeling axles.

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- 5 31. Reel-up according to any of the foregoing claims 20 to 30, **characterized** in that at least one of the web guiding devices such as the reeling cylinders (1), preferably both devices such as the reeling cylinders, are arranged to rotate the reeling axle (2) and the reel (R) in the corresponding reeling station by means of surface drive.
- 10 32. Reel-up according to any of the foregoing claims 20 to 31, **characterized** in that at least one of the web guiding devices such as the reeling cylinders (1) is arranged movable.
- 15 33. Reel-up according to claim 32, **characterized** in that at least one of the web guiding devices such as the reeling cylinders (1) is arranged movable when in contact with the reeling axle (2) or reel (R) in the reeling station.
- 20 34. Reel-up according to claim 32 or 33, **characterized** in that the pair of web guiding devices such as reeling cylinders (1) is arranged in the same support structure (11) to move together, preferably back and forth in the direction of the reeling stations.
- 25 35. Reel-up according to claim 33 or 34, **characterized** in that at least one of the reeling stations is the reeling station for a stationary reeling axle (2).
- 30 36. Reel-up according to any of the foregoing claims 32 to 35, **characterized** in that the mutual position of the web guiding devices such as the reeling cylinders (1) is arranged variable.
- 35 37. Reel-up according to claim 36, **characterized** in that a second web guiding device, such as a second reeling cylinder (1) is arranged movable towards a first web guiding device such as a first reeling cylinder (1), via which the web (W) is passed onto the reel (Fig. 9a).
38. Reel-up according to claim 36, **characterized** in that a first web guiding device, such as a first reeling cylinder (1), via which the web (W) is passed onto the reel, is arranged movable towards a second web guiding device such as a second reeling cylinder (1) (Fig. 10a).

39. Reel-up according to any of the foregoing claims 36 to 38, **characterized** in that the web guiding devices such as the reeling cylinders (1) are arranged to be moved into nip contact with each other.

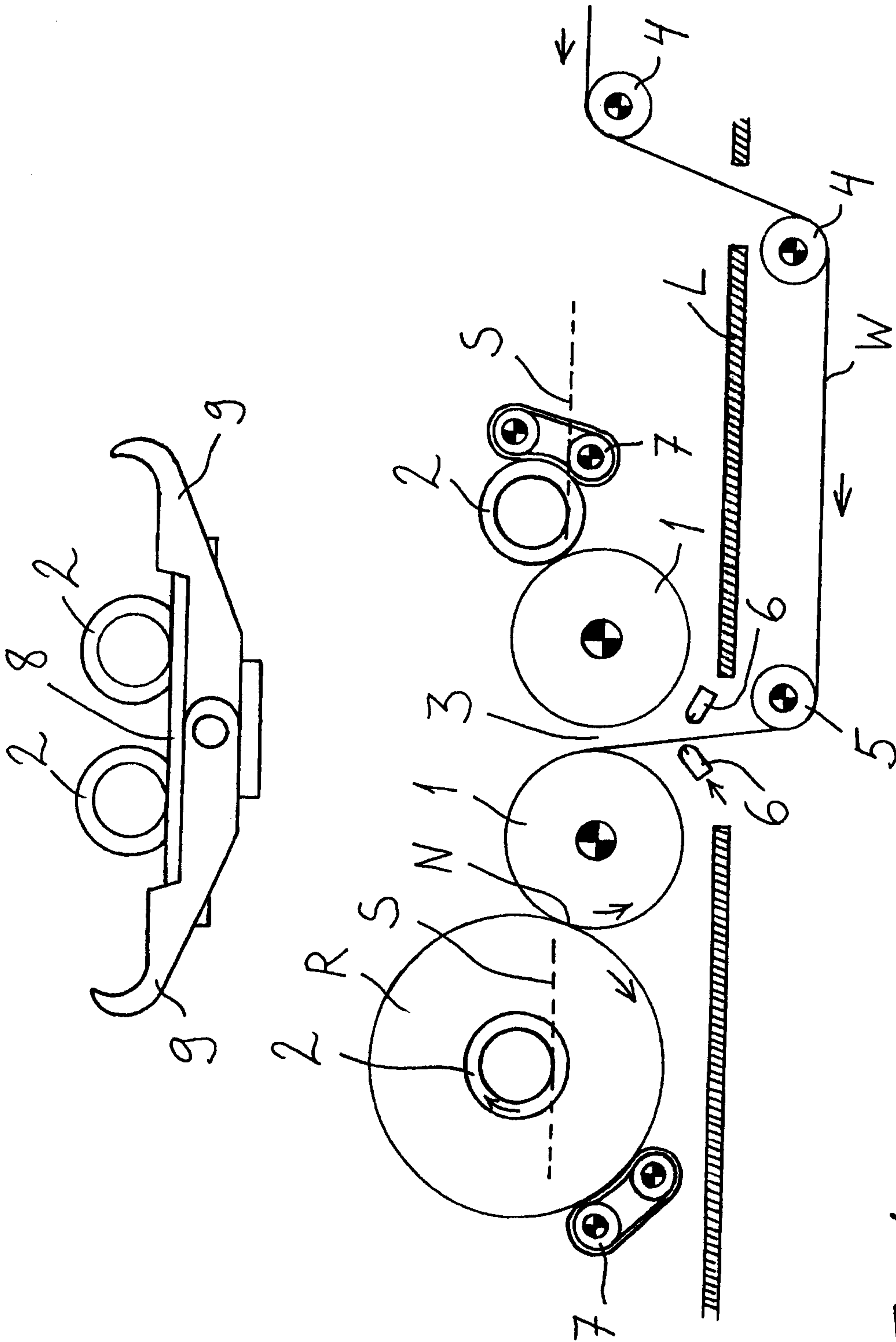


Fig. 1



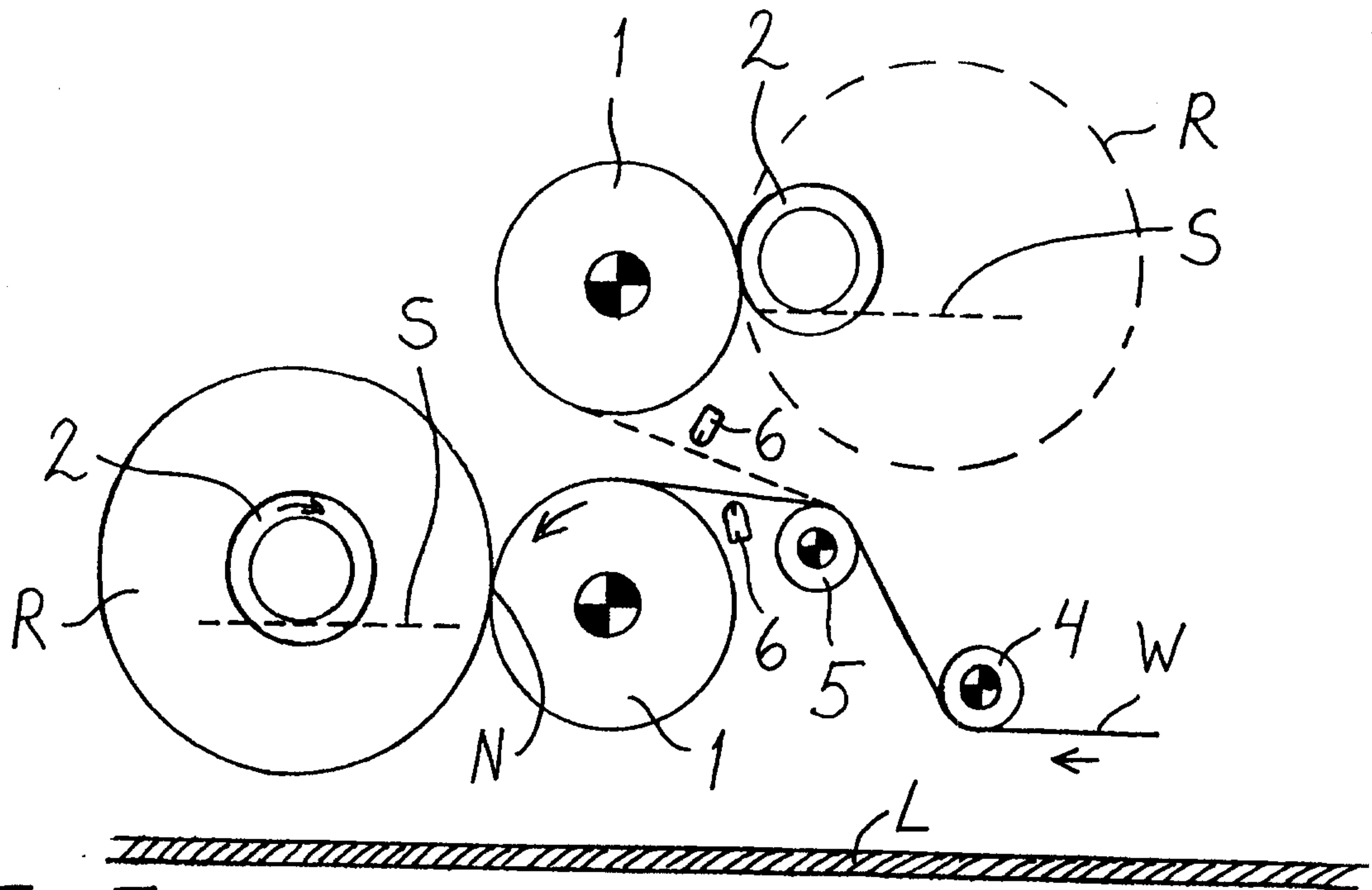


Fig. 3

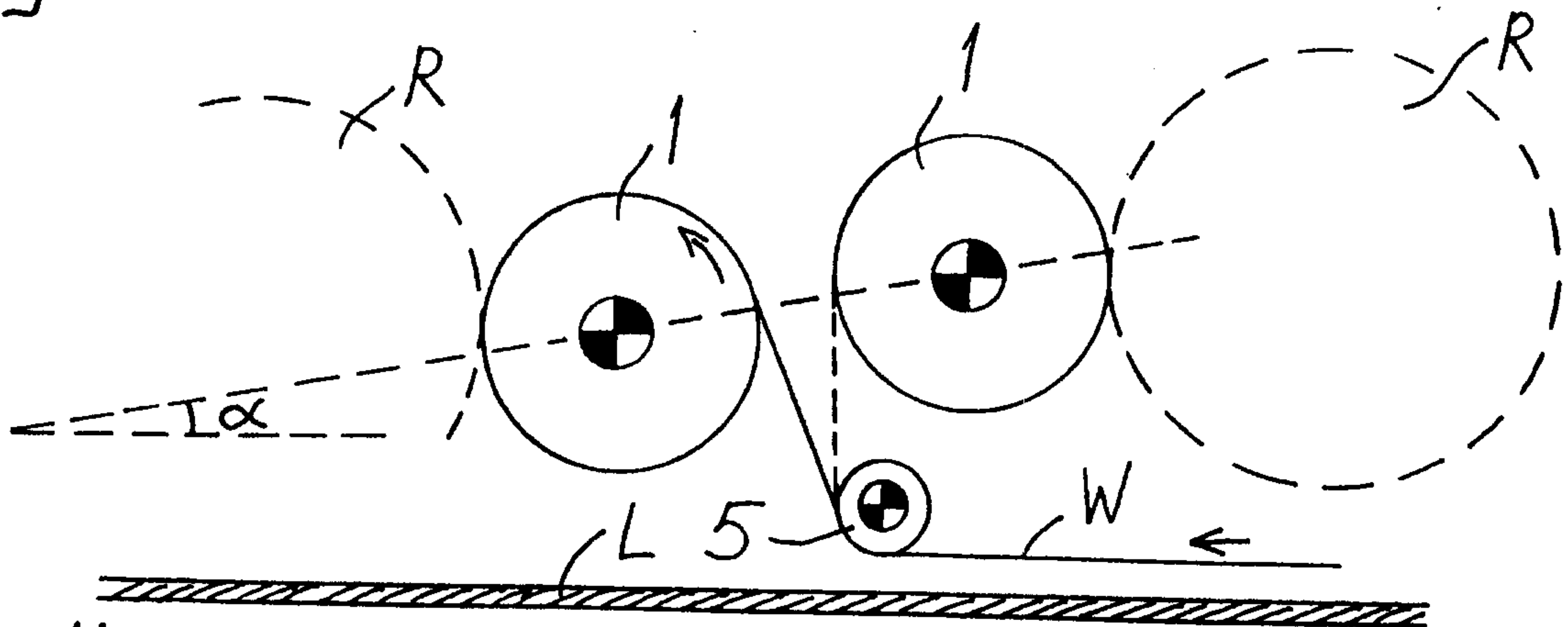


Fig. 4

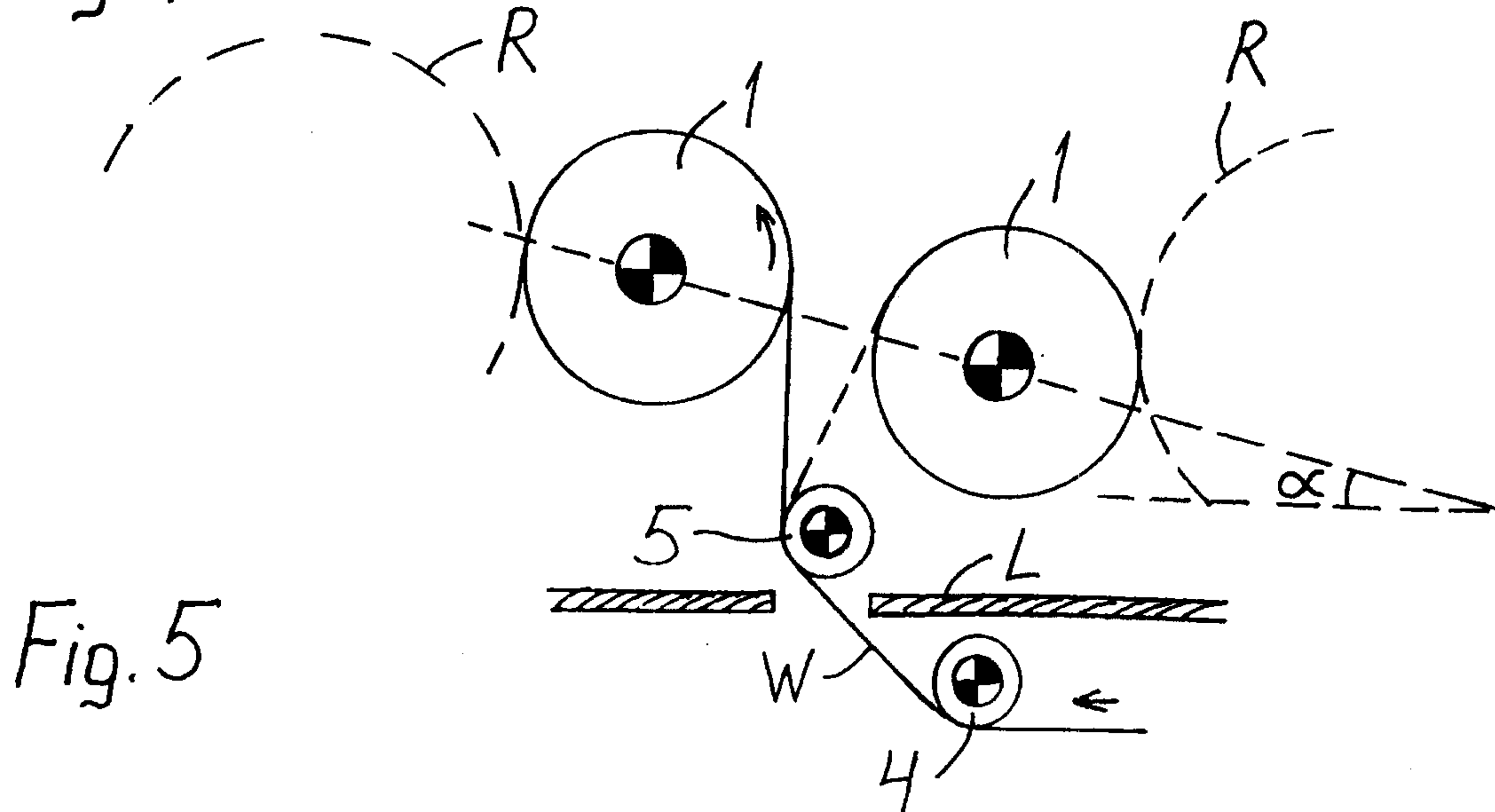


Fig. 5

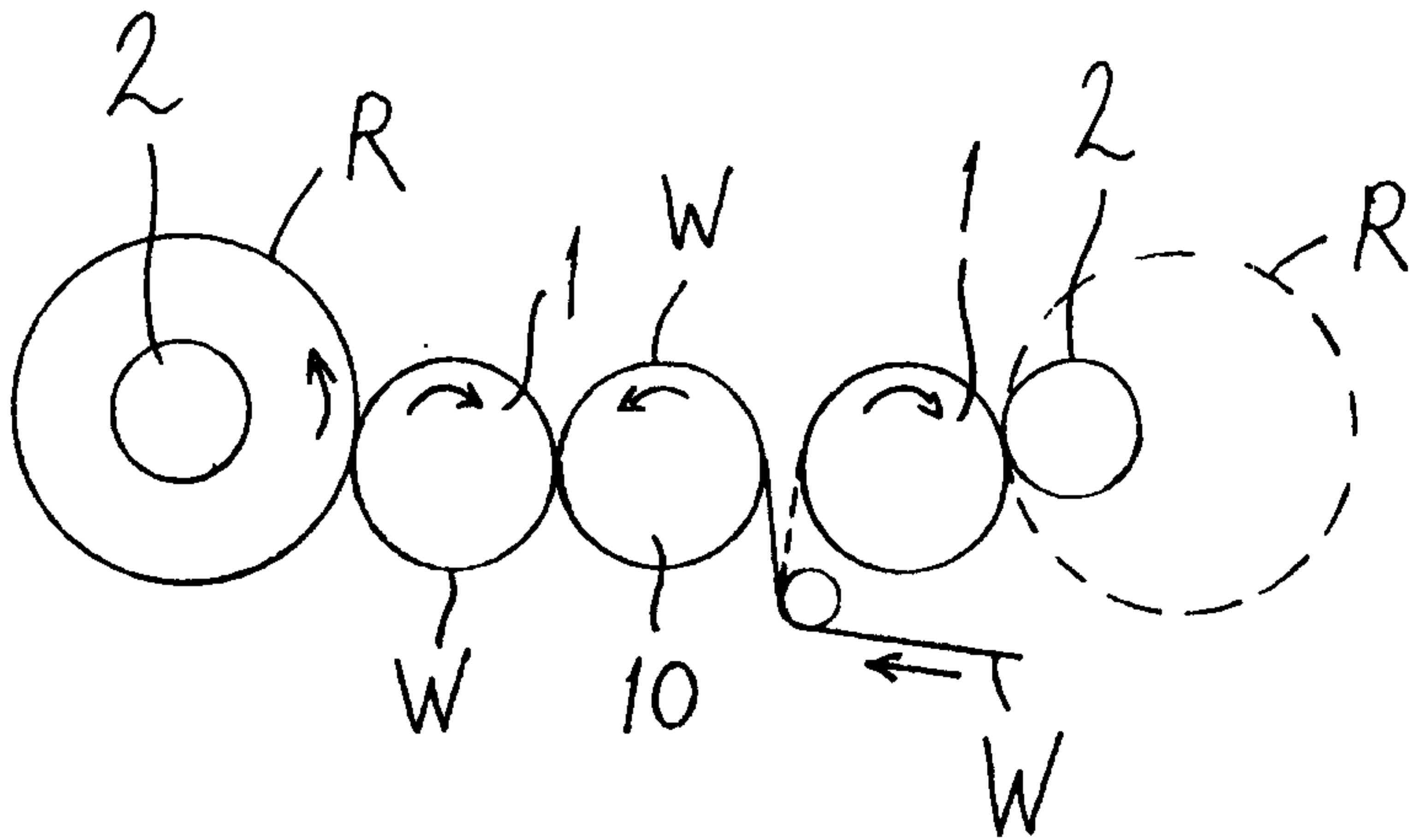


Fig. 6

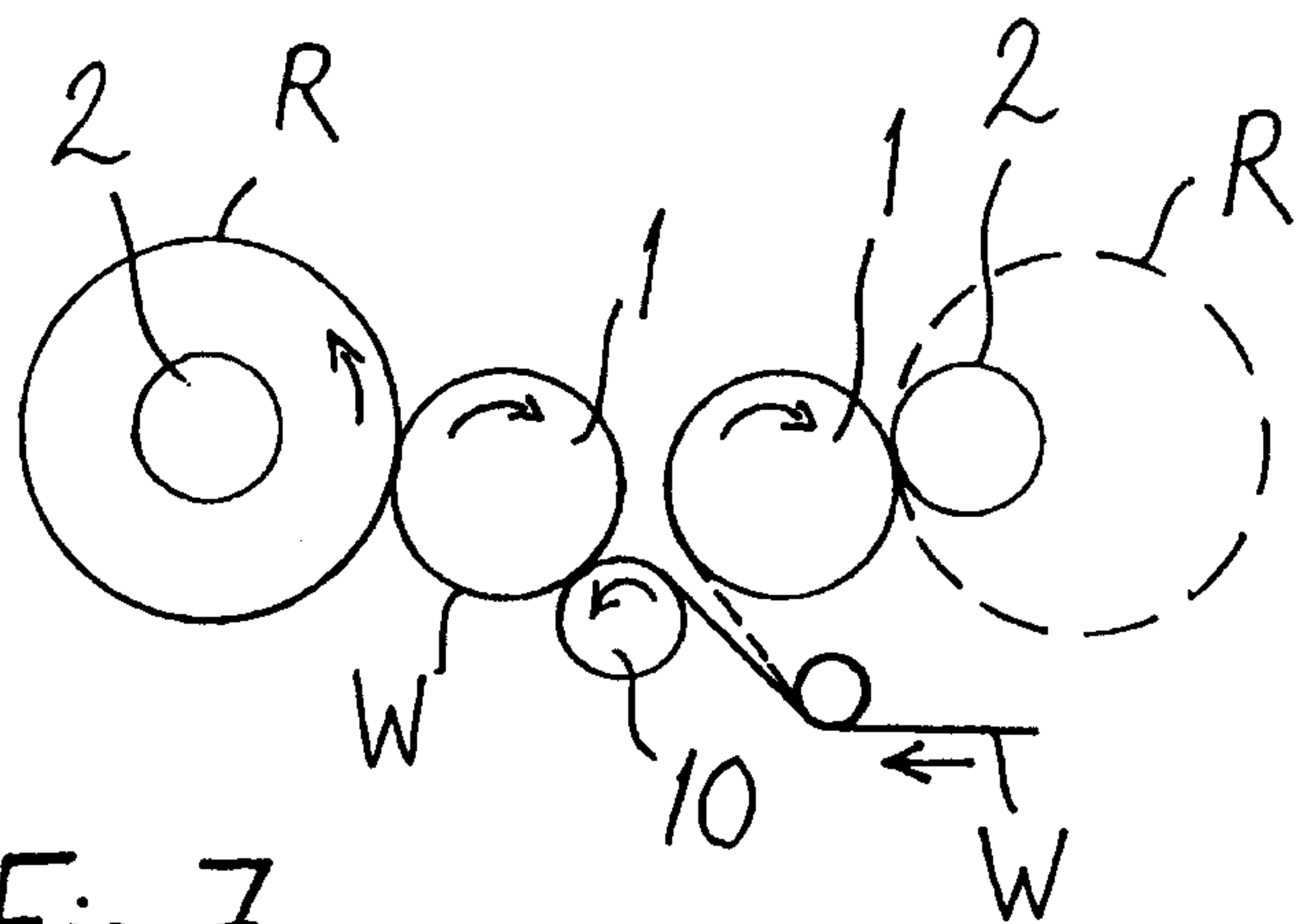


Fig. 7

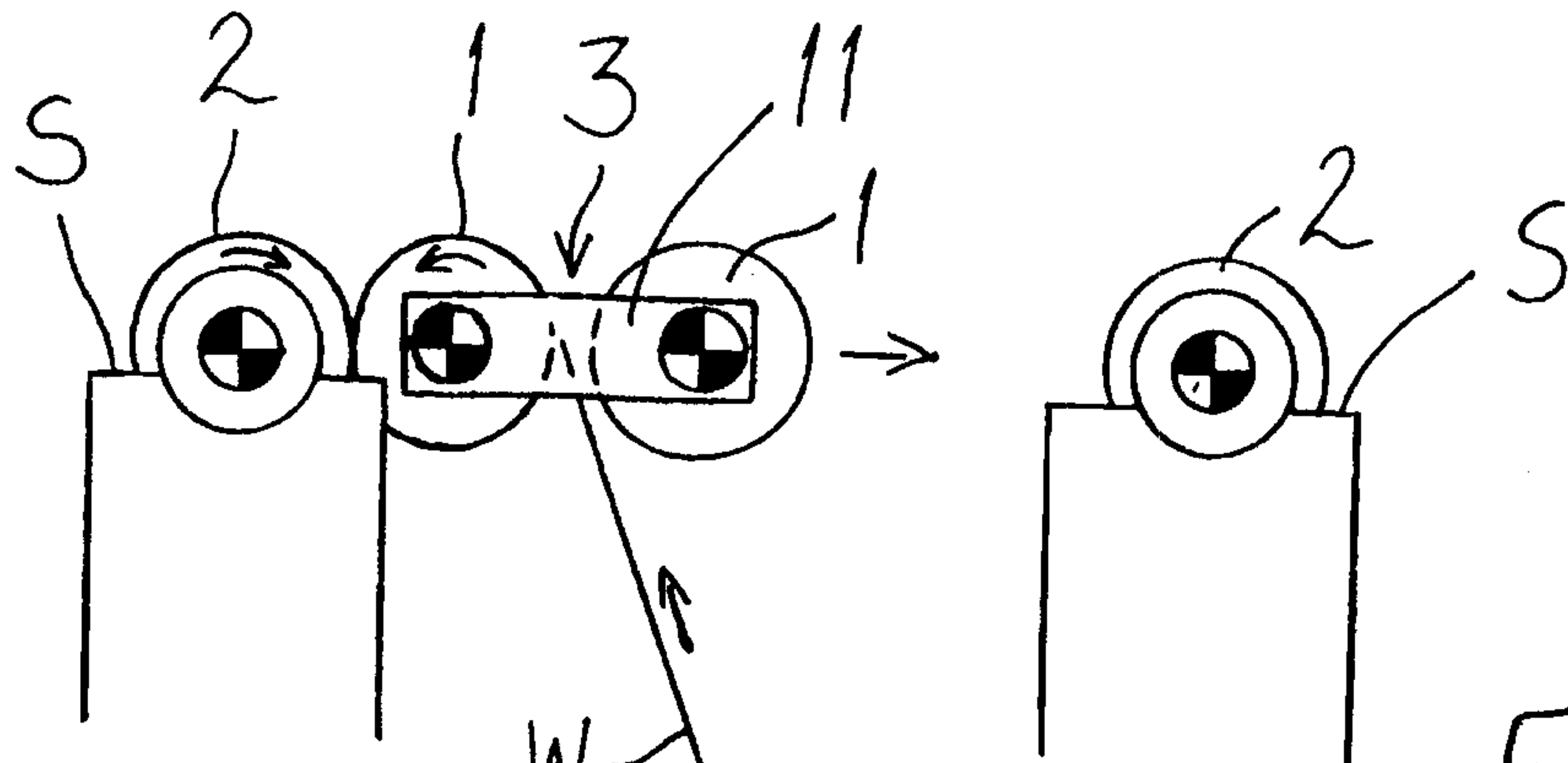


Fig. 8a

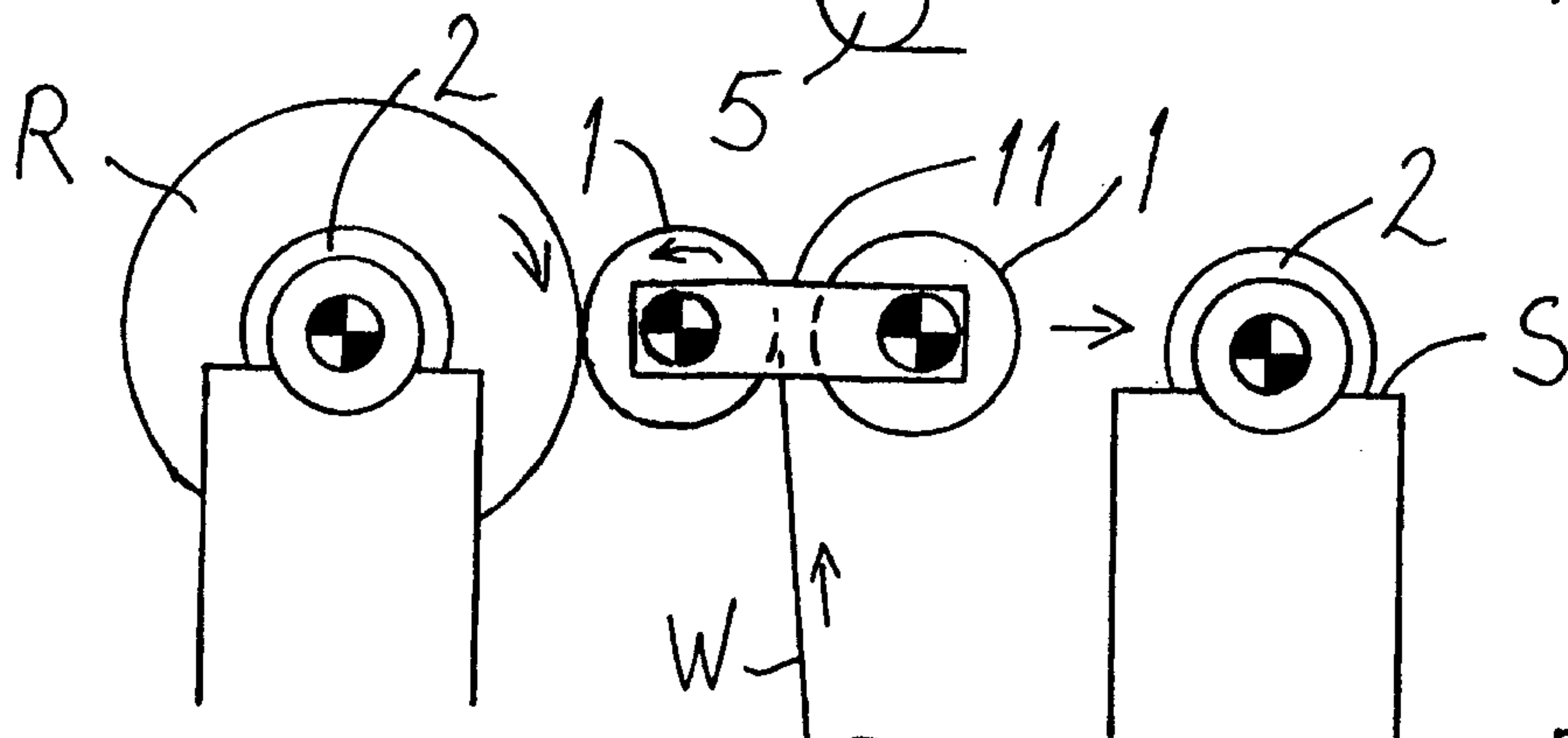


Fig. 8b

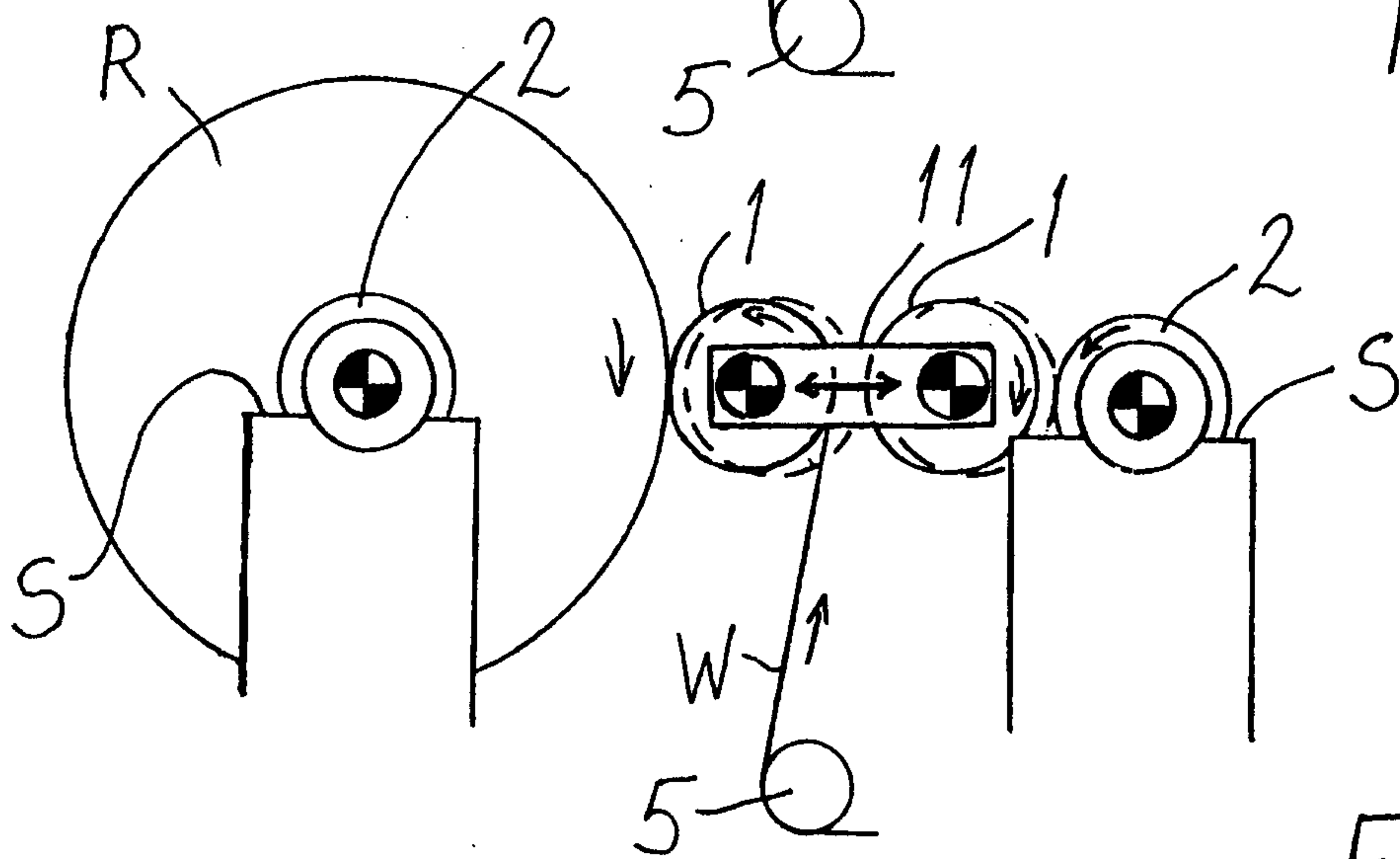


Fig. 8c

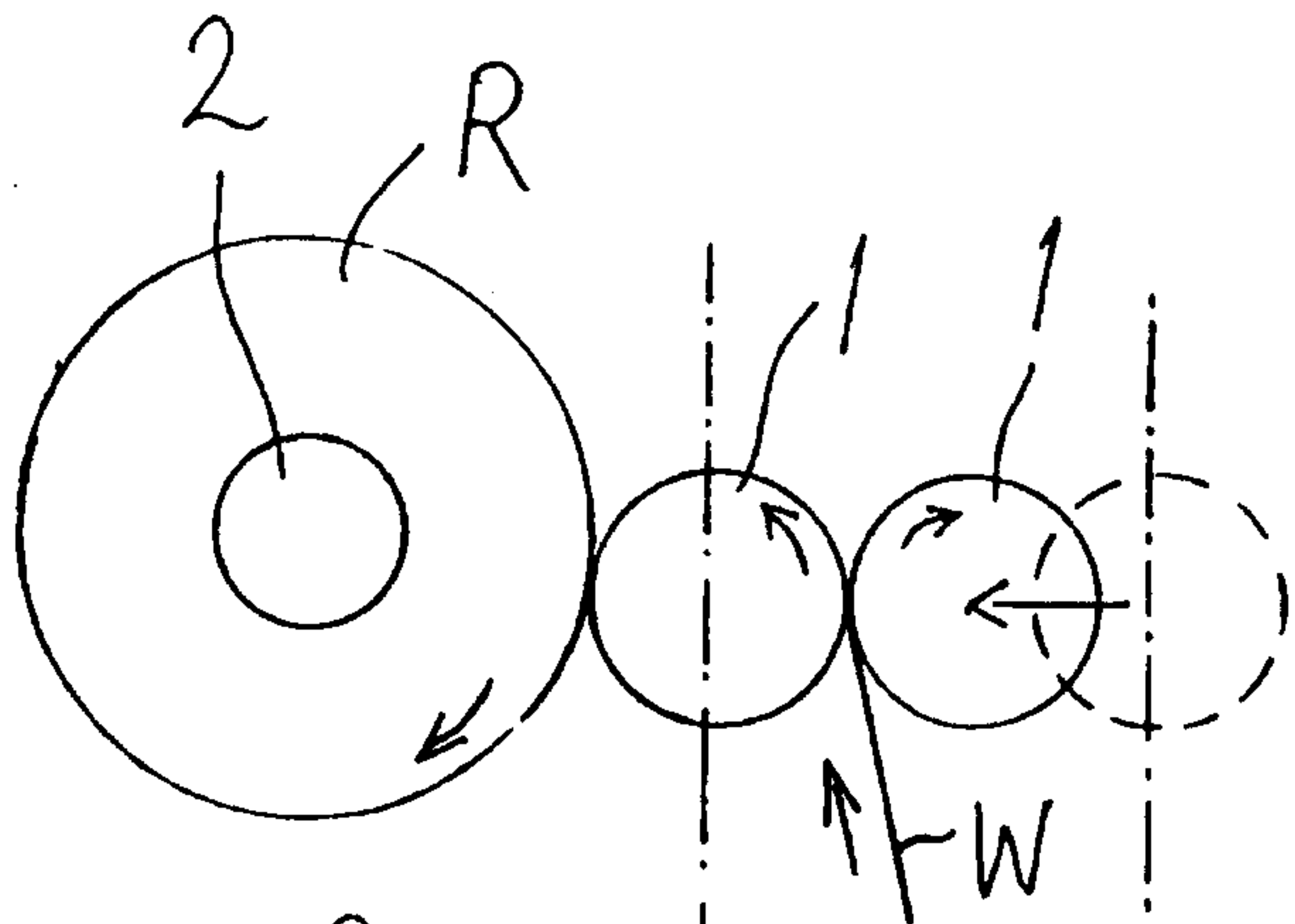


Fig. 9a

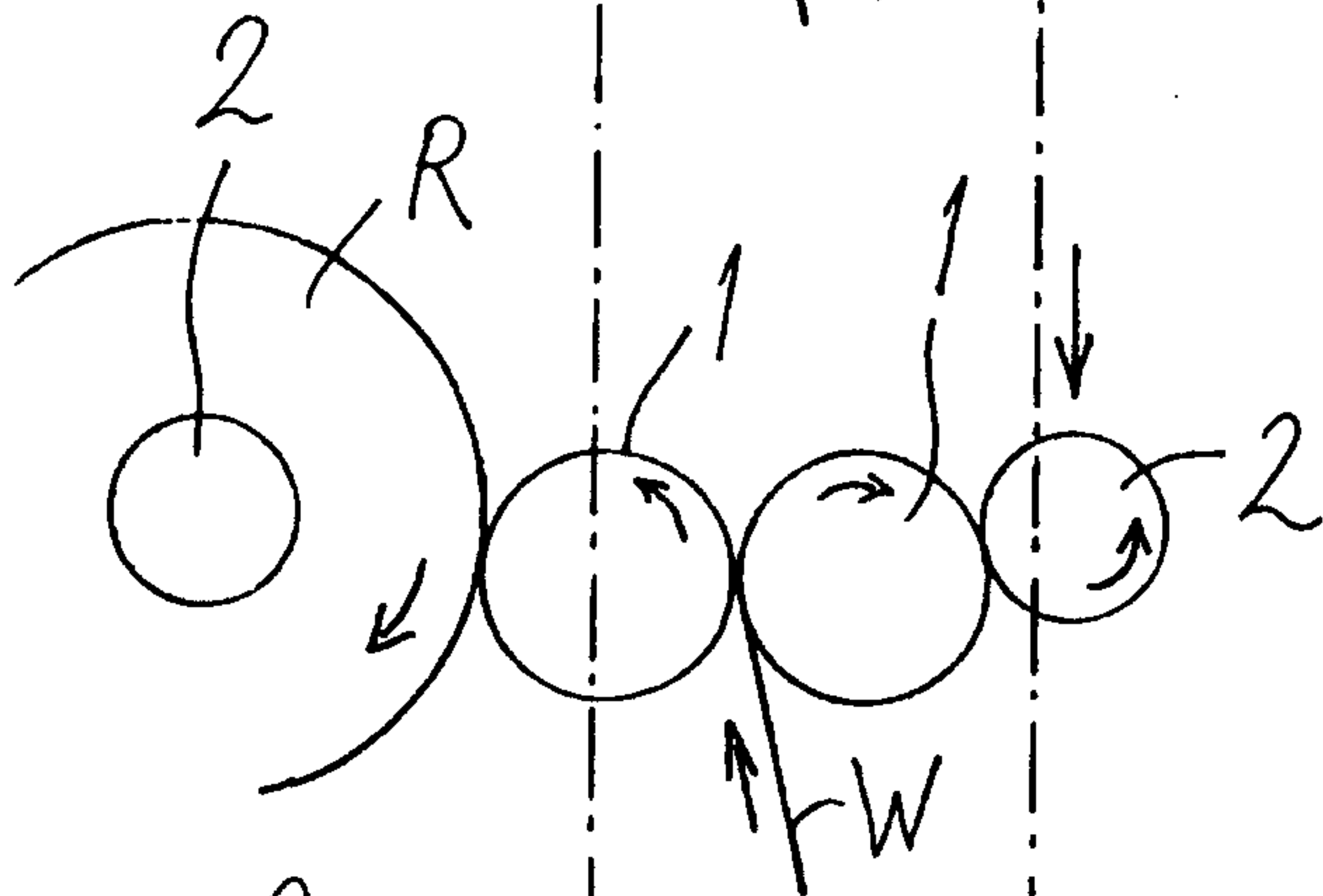


Fig. 9b

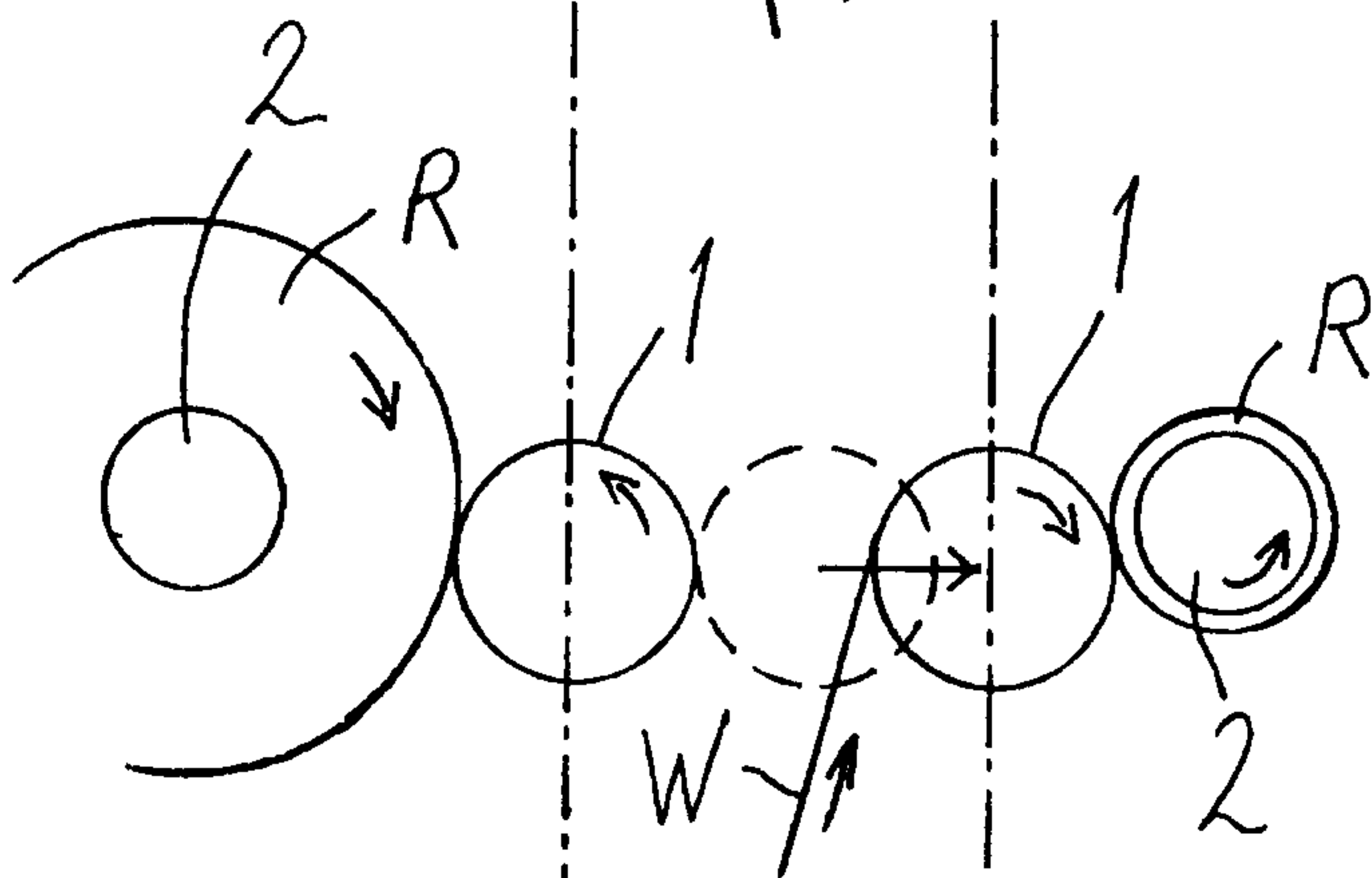


Fig. 9c

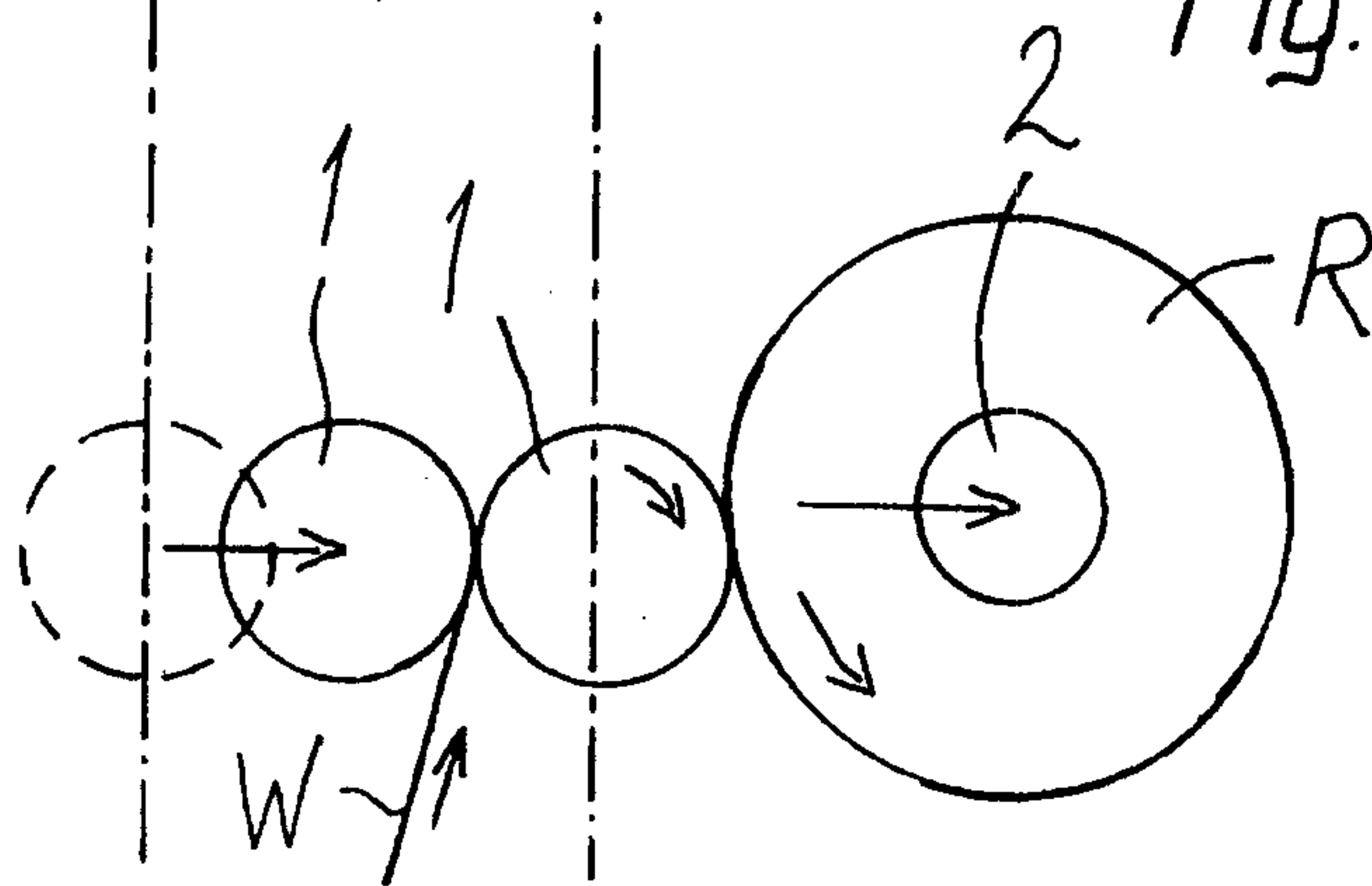
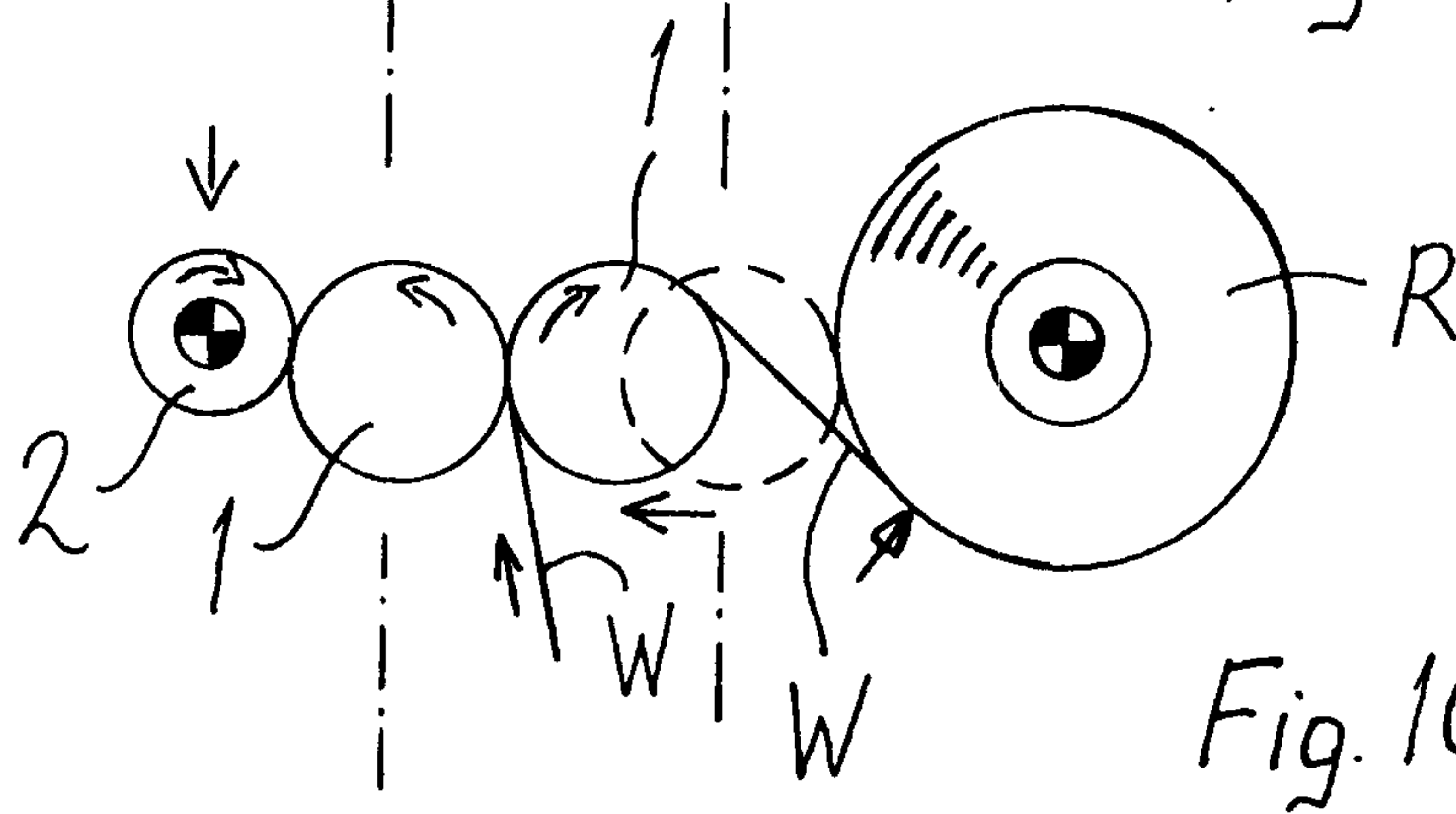
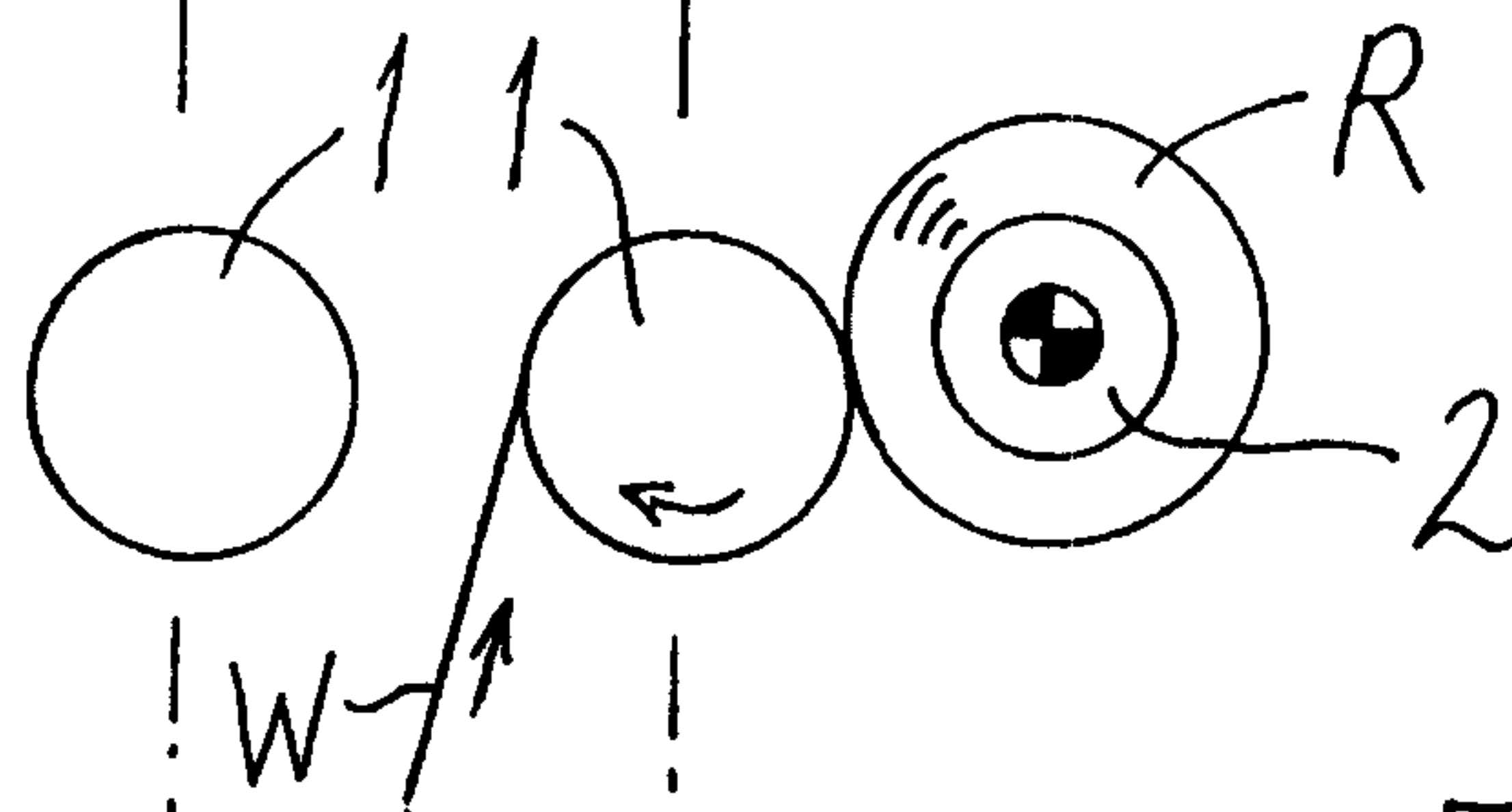
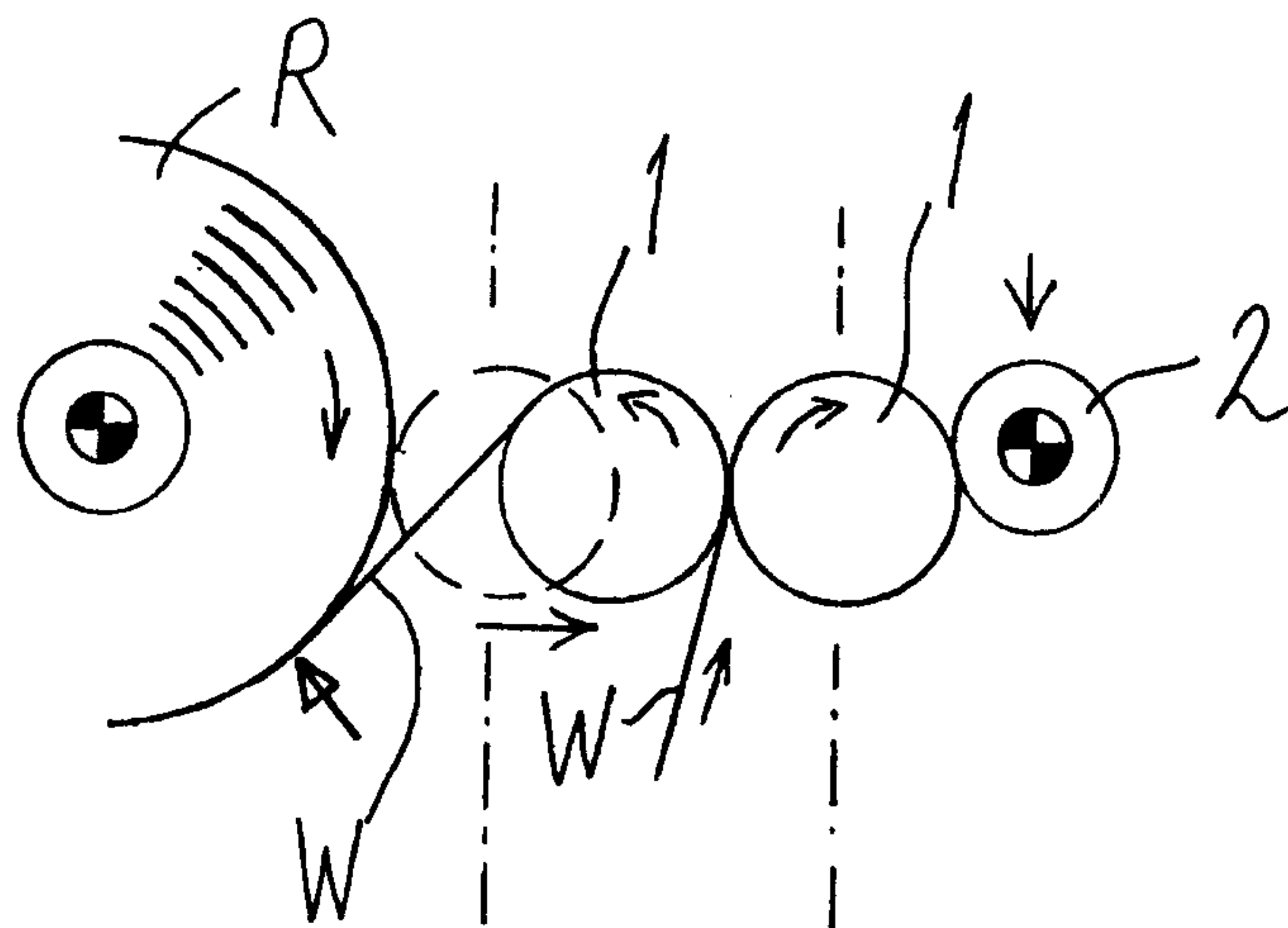


Fig. 9d



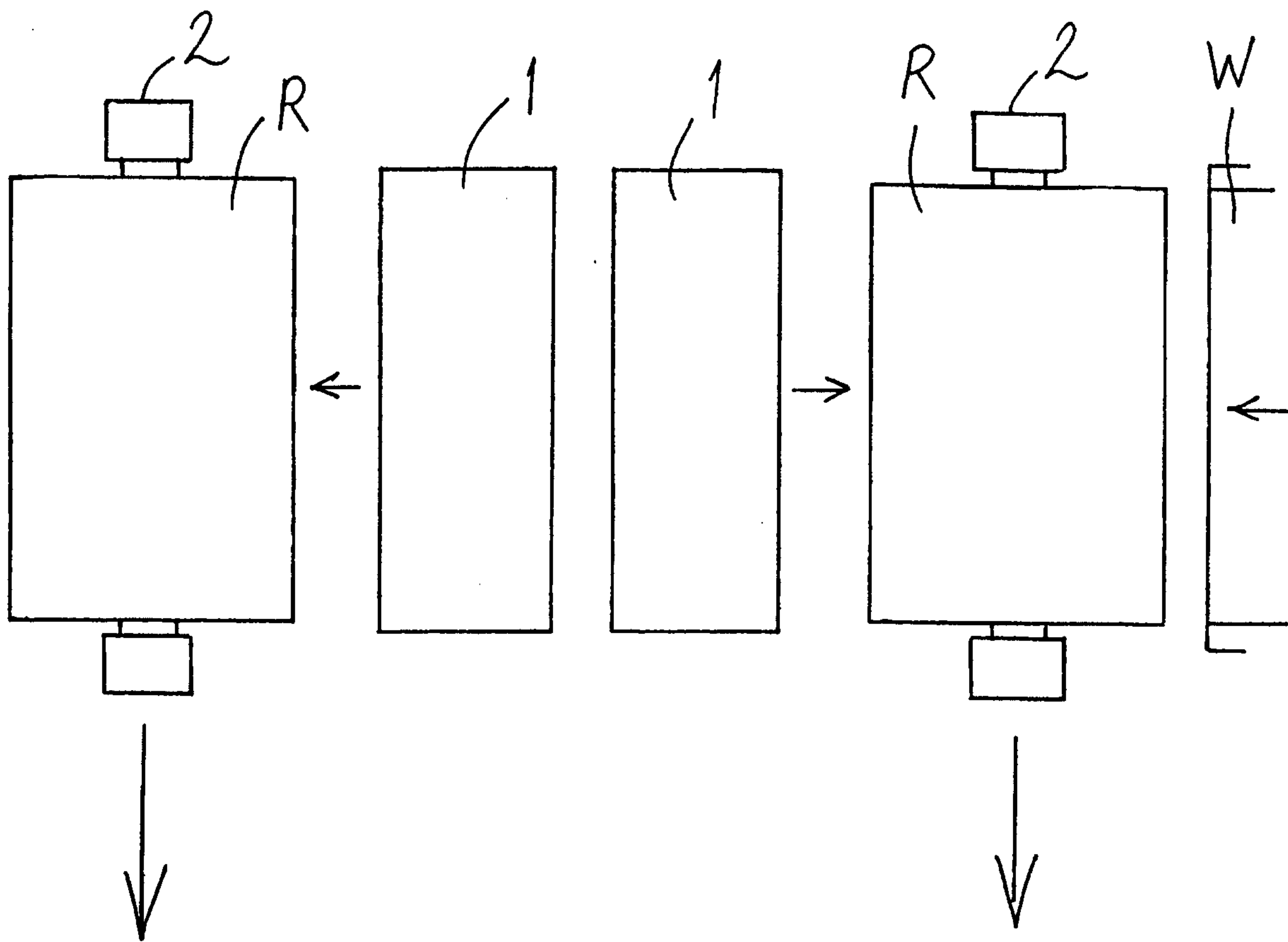


Fig. 11

