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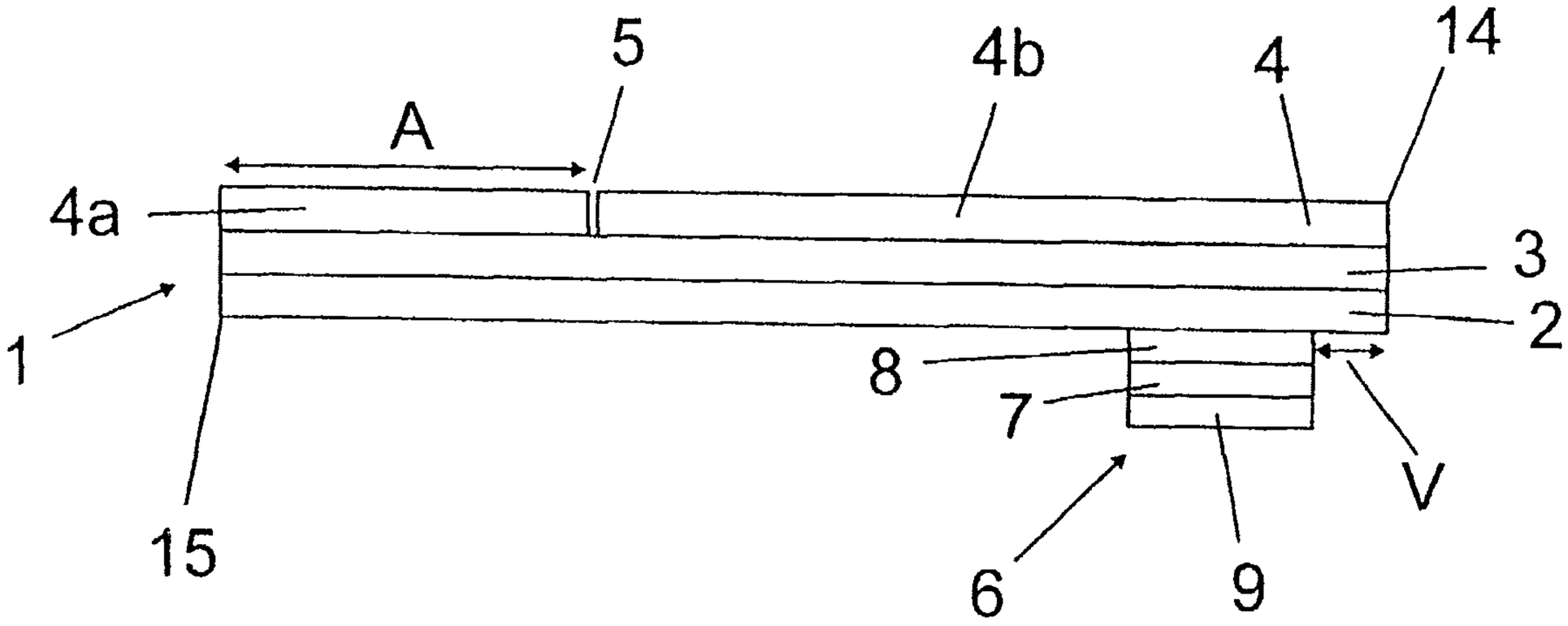
(54) Titre : BANDE ADHESIVE POUR ADHERENCE CONTINUE SUR UNE CALANDRE
(54) Title: ADHESIVE STRIP FOR CONTINUOUS ADHESION ON A CALENDER



(57) Abrégé/Abstract:
The invention relates to the use of a self-adhesive material having a shear resistance of at least 1000 minutes on coating base paper and at least 2000 minutes on gravure paper, respectively measured at 23 °C, at a relative atmospheric humidity of 55 %, and with a load of 1 kg, for an adhesive strip for the flying roll change of flat strip material wound on rolls.

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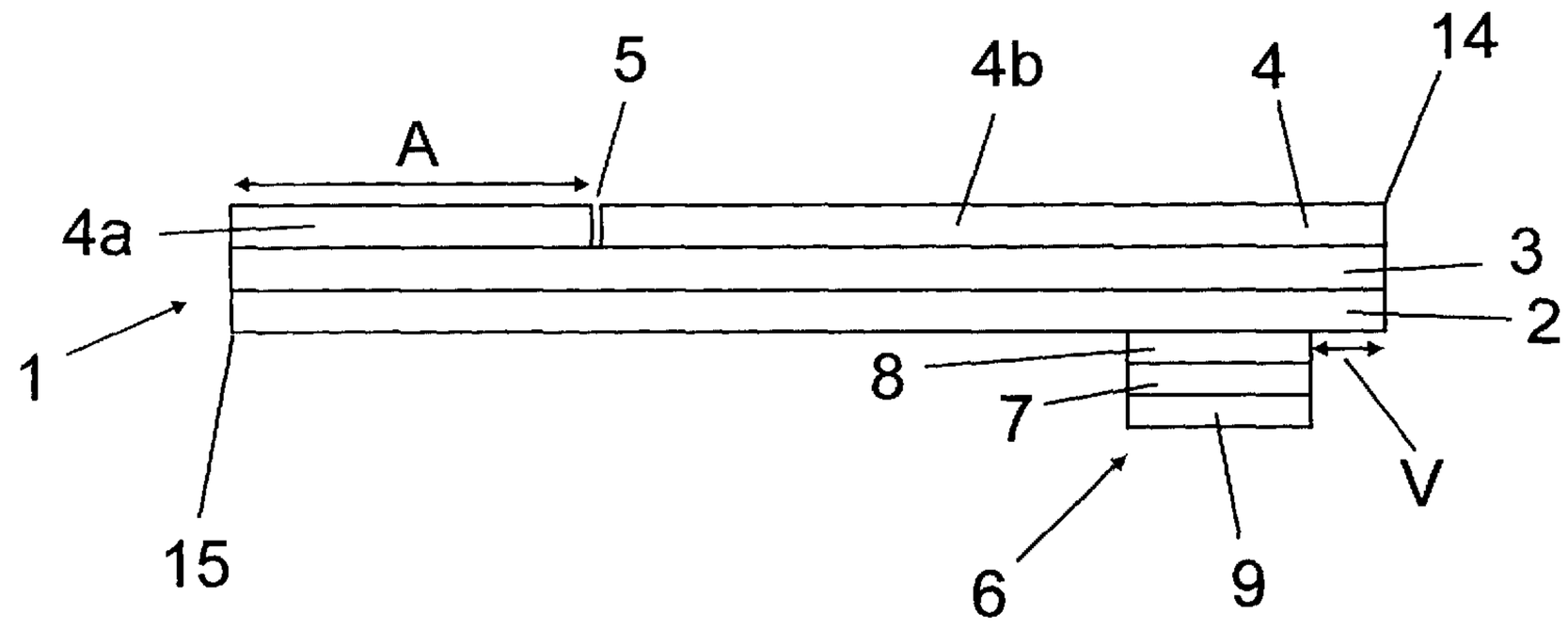
(54) **Title:** ADHESIVE STRIP FOR CONTINUOUS ADHESION ON A CALENDER

(54) **Bezeichnung:** KLEBEBAND FÜR DAS ENDLOSKLEBEN AM KALANDER



(57) **Abstract:** The invention relates to the use of a self-adhesive material having a shear resistance of at least 1000 minutes on coating base paper and at least 2000 minutes on gravure paper, respectively measured at 23 °C, at a relative atmospheric humidity of 55 %, and with a load of 1 kg, for an adhesive strip for the flying roll change of flat strip material wound on rolls.

(57) **Zusammenfassung:** Verwendung einer Selbstklebemasse mit einer Scherfestigkeit von mindestens 1000 Minuten auf Streichrohpapier und mindestens 2000 Minuten auf Tiefdruckpapier, gemessen jeweils bei 23 °C und 55 % rel. Luftfeuchte und bei 1 kg Belastung, für ein Klebeband für den fliegenden Rollenwechsel von auf Rollen aufgewickelten Flachbahnmaterial.

WO 03/020623 A1

Description

Adhesive strip for continuous adhesion on a calender

The invention relates to an adhesive tape which is intended for the flying splice of flat web material wound up into rolls and is equipped with a main backing, a self-adhesive composition on the front face, and at least one adhesive cleavable system on the reverse face, and to its use.

Flying splice in paper mills or the like is a common technique for replacing an old, almost fully unwound roll of paper by a new roll without having to stop the machines, which run at high speed. The end of the old paper web is adhered to the start of the new paper web in order to ensure maximum continuity of operation. This is accomplished using double-sided self-adhesive tapes, known as tabs, which on the one hand possess high adhesion and high tack but on the other hand, owing to their water-soluble self-adhesive compositions and paper backings, do not interfere with re-use of the paper wastes in the paper machine.

Conventionally the tabs are adhered manually to the start of the web; this operation requires the use of skilled personnel and leads to results which technically are not advantageous, since, as a result of the sequence of paper webs, fixing tabs, and adhesive strips, the bonds are relatively thick.

For adhesive bonding in flying splice a variety of products are available, including in particular products which in addition to a paper backing have a water-soluble self-adhesive composition coated on both sides.

Processes for preparing for and carrying out the splice and corresponding adhesive tapes are presented in, for example, publications EP 418 527 A2, DE 40 33 900 A1, DE 196 28 317 A1 and 198 30 673.

The nonadhesive covering of otherwise open adhesive areas is disclosed by DE 196 32 689 A2, an adhesive tape for dynamic loading during the splicing process, whose paper backing splits and, with its remains, covers the adhesives.

Also of this kind is an adhesive tape in accordance with DE 199 02 179 A1, likewise for a splicing process. This adhesive tape carries on its nonadhesive reverse face a double-sided adhesive tape which has a readily splicing paper backing which, during the splicing process, cleaves and covers the respective adhesives.

In order to avoid instances of tearing during flying splice the adhesive tape laminated on, with a paper backing made of splittable paper, is arranged in a recessed format, namely at a certain distance (V) from the long edge of the adhesive tape.

A further version is described in DE 198 30 674. There, an adhesive tape having two cleavable strips is described.

These adhesive tapes or splicing processes are unsuitable or poorly suited in practice to the operation of paper webs in calenders. Adhesive tapes for flying splice feature adhesives having high tack, including high initial tack. In the context of use in calenders, especially when the splice is run through the closed contact rolls, the effect of the temperature, the high web tension, and the pressure are detrimental to the splice or else to the calender.

As a result of the high temperatures there is a particular thermal load on the adhesive tape. On the one hand, the bond may come apart as a result of the prevailing web tension. On the other hand, the high temperatures and high pressures may result in the adhesive being squeezed out at the sides, or the adhesive composition is pressed by the bonded paper. These residues of adhesive can lead to the sticking of the paper webs to one another or to instances of sticking on the calender rolls. The result is web tearing or damage to the rolls; there are interruptions in the web processing operation. The rolls then have to be newly coated in a cumbersome and expensive process; furthermore, there is a risk of a high proportion of paper losses resulting from residues of adhesive or of adhesive tape on the rolls that are not immediately detected.

It was an object of the invention to provide an adhesive strip which can be used for flying splice in the case of calender processing without exhibiting the disadvantages of the prior art.

The object is achieved through the use of an adhesive as specified in claim 1. Further claims are to corresponding adhesive tapes and their advantageous embodiments and also to a splicing process in connection with flying splice.

Claim 1 relates accordingly to the use of a self-adhesive composition having a shear strength of at least 1000 minutes on coated base paper and at least 2000 minutes on gravure paper, measured in each case at 23°C and 55% relative humidity under a load of 1 kg, for an adhesive tape for flying splice.

Additionally claimed, accordingly, is an adhesive tape for flying splice, equipped with a main backing, a self-adhesive composition on the front face and at least one adhesive cleavable system on the reverse face, the self-adhesive composition having a shear strength of at least 1000 minutes on coated base paper and at least 2000 minutes on gravure paper, measured in each case at 23°C and 55% relative humidity under a load of 1 kg.

In one very preferred embodiment of the invention the self-adhesive composition used is a pressure-sensitive acrylate adhesive. It is possible with advantage to use both water-soluble and water-insoluble acrylates.
In addition it is also possible to use natural and synthetic rubber compositions and also dispersions of the compounds described above. It may be noted that in principle all basic types of pressure-sensitive adhesives which meet the inventive criteria can be used.

The shear strength is measured as follows:
To measure the shear strength of adhesives they are coated onto a standard backing (polyester film; thickness: 25 μm). Advantageously the same application rate of 25 g/m^2 is chosen in each case.
After drying and crosslinking, where appropriate, of the adhesive a strip 13 mm wide and at least 20 mm long is cut out and adhered to a paper of defined type (e.g., gravure paper, e.g., Neopress T 54, 54 g/m^2, or coating base paper, e.g., Mediaprint, 135 g/m^2). The bond area is 13 mm × 20 mm. In order to ensure a constant applied pressure during bonding the test specimen is overrolled twice slowly with a roller (weight: 2 kg). The test specimen produced in this way is loaded with a 1 kg weight parallel to the plane of the bond and a measurement is made of the time for which the adhesive strip remains on the paper.
In order to differentiate more effectively between the individual adhesives the test is conducted correspondingly at further temperatures (e.g., 40°C and 70°C).

In order to ensure flawless functioning the adhesive must hold a 1 kg weight for more than 1000 minutes on coating base paper and for more than 2000 minutes on gravure paper at 23°C and 55% relative humidity.

Self-adhesive compositions which can be used include, for example, self-adhesive acrylate compositions of the following constitution:

40 to 90% by weight acrylic acid, 60 to 10% butyl acrylate, or

40 to 90% by weight acrylic acid, 30 to 5% by weight butyl acrylate, 30 to 5% by weight ethylhexyl acrylate

added plasticizer: ethoxylated alkylamines, preferably C16 to C18, more preferably having 15 to 25 ethoxy units.

The blend of plasticizer with polymer amounts to between 55 to 75% by weight plasticizer and 25 to 45% by weight polymer.

Polymerization takes place free-radically in polar solvents using ethanol as regulator. Partial crosslinking is accomplished with aluminum chelate (0.3 to 1.2% by weight, based on the total amount).

The self-adhesive composition is preferably applied at a rate of from 30 to 60 g/m^2, particular preference being given to the choice of an application rate between 35 and 50 g/m^2.

The inventive adhesive tape is outstandingly suitable for use in operations wherein the flat strip material passes through one or more calenders.

The cleavable system advantageously has a much lower cleavage resistance than a paper backing, which is required to accommodate tensile forces. The cleavable system or systems is or are based preferably on sized, highly compacted paper, on a paper/film composite or on a two-film composite, said composite being composed of films and/or papers joined in linear and/or pointwise form in a defined manner. Examples of systems suitable for this purpose include in particular the following papers, paper composite systems or films:

- Readily cleavable paper systems.
- Duplex papers

  (Papers laminated together in a defined way, the process of cleavage proceeds extremely homogeneously; no stress peaks being produced as a result, for example, of inhomogeneous consolidation.

These papers are used for the production of wall coverings and filters.)

- Highly consolidated papers sized together in a defined way (papers having a high cleavage strength).

  Sizing may be carried out, for example, using starch, starch-containing derivatives, wallpaper pastes based on methylcellulose (tesa® paste, tesa AG, Hamburg; Methylan®, Henkel KGaA, Düsseldorf) or else based on polyvinyl alcohol derivatives. Such systems are described in, for example, EP 0 757 657 A1.
- Cleavable systems for which the cleavage forces are determined by the size of the adhesive bonding points; systems of this kind are described in, for example, DE 198 41 609 A1.
- Coextruded films.

The cleavable system or systems has or have advantageously the same width as the main backing. In a further advantageous embodiment, on the contrary, it is of advantage if the main backing is wider than the cleavable systems. Furthermore it is advantageous if the main backing overhangs the cleavable systems in the region of the front edge (long edge 14) by up to 15 mm, in particular from 0.5 to 15 mm, preferably from 1 to 7 mm, very preferably from 1.5 to 3.5 mm.

Where two or more cleavable systems are applied to the adhesive tape the distance between them is advantageously from 3 to 50 mm. Preferred distances chosen are from 25 to 45 mm, very preferably from 30 to 40 mm.

It is preferred to use a high-tensile-strength paper or film backing as the main backing. Backing materials that may be listed here include the following by way of example: papers with a low level of creping, machine-glazed base papers, smooth base papers coated on one side, printable decorative papers compacted and coated on both sides, wood-free, high-gloss kraft papers coated doubly on one side, without wishing to restrict the selection of the backing materials unnecessarily by dint of these examples.

Where there are two or more cleavable systems on the adhesive tape they may be composed of the same material and may hence have equal cleaving forces; alternatively it may be of advantage to provide for the cleavable systems to be composed of different material, so that they possess different cleaving forces.

In another preferred embodiment the self-adhesive composition is provided with a liner, which where appropriate is provided with a perforation or slit in the lengthwise direction.

It is particularly advantageous if the cleavage resistance of the cleavable system is from 5 to 70 cN/cm, in particular from 12 to 60 cN/cm. As regards measurement of the cleavage resistance, reference is made to DE 199 02 179 A1.

In the splicing process, an adhesive tape is adhered to a new roll of paper in a straight line below the topmost web in such a way that part of the adhesive tape remains free, while the underside of the adhesive tape is adhered to the underlying web and so secures the topmost web; where appropriate, initially only part of any liner that may be present on the self-adhesive composition has been removed, so that the part of the self-adhesive composition that is required for the splicing process is still lined with the liner and the roll in this state does not have a free adhesive surface. Thereafter, in final preparation for the splicing process, any remaining liner still present is removed, after which the new roll equipped in this way is placed alongside an old roll which is almost fully unwound and requires replacement, and is accelerated to the same rotational speed as the old roll, then pressed against the old web. The exposed self-adhesive composition of the adhesive tape adheres to the old web with the webs at substantially the same speed; at the same time, the cleavable backing made of cleavable material cleaves and with its residues nonadhesively covers the two self-adhesive compositions which were coated on it. In the course of the ongoing operation the bond site, together with the webs thus bonded, after splicing has taken place, passes through a calender.

Following the contact of the adhesive tape with the outgoing web, therefore, the cleavable system of the adhesive tape cleaves, so that the topmost paper ply of the new roll is released and there are no longer any open sticky residues.

In order to withstand the high temperatures and/or pressures it is preferred to use an inventive adhesive tape, i.e., a tape which possesses a particularly high-shear-strength adhesive, for joining the paper webs.

The splicing process can be carried out advantageously such that the adhesive tape is adhered in a straight line at right angles or with an acute angle of up to 15° transversely to the running web.

The purpose of the text below is to describe the invention in more detail, using an example, without wishing thereby to restrict it unnecessarily. In the drawings

Fig. 1 shows a diagrammatic side view of an adhesive tape of the invention

Fig. 2 shows a diagrammatic side view of an adhesive tape according to Fig. 1, adhered to a roll of paper and ready for flying splice

Fig. 3 shows a view in accordance with Fig. 2 but after flying splice has taken place

In detail Fig. 1 shows an adhesive tape 1 having a main backing 2 made of paper with a low level of creping, coated on one side with a water-soluble self-adhesive composition 3. The total thickness of the main backing 2 with self-adhesive composition 3 is 0.088 mm, the width 150 mm, on the market as tesakrepp 51447 from Beiersdorf AG, Germany.
The self-adhesive composition 3 is lined with a siliconized release paper 4, which at a distance of 30 mm from the left-hand margin is provided with a slit 5, allowing the left-hand portion 4a of the release paper 4 to be removed first of all, then the right-hand portion 4b.
Bonded below the adhesive tape 1 in the region of its right-hand end is a strip of a double-sided adhesive tape 6, composed of a cleavable paper backing 7, coated on both sides with water-soluble self-adhesive composition 8 and 9 respectively. The adhesive tape has a width of 9 mm.

Fig. 2 illustrates how such an adhesive tape 1 is stuck beneath a paper web 11 of a new roll of paper, specifically with the left-hand portion, after the portion 4a of the release paper 4 has been removed from the latter. Beforehand the adhesive tape has been adhered with the exposed self-adhesive composition 9 onto the paper web 12 of the roll of paper that is situated beneath the paper web 11. The right-hand portion 4b of the release paper 4 has also been removed, so that the roll of paper thus equipped is ready for a flying splice, with the bond of the adhesive tape 1 running at right angles over the roll.
The self-adhesive composition 3 is now exposed and, for the flying splice, constitutes the contact area with outgoing webs. The contact area has a width of 120 mm and extends over the entire width of the roll of paper.

The (new) roll of paper equipped in this way is brought alongside the unwound (old) roll of paper to which the new roll is to be attached. The new roll of paper is accelerated to a rotational speed which corresponds virtually to the speed of the outgoing web. Once both speeds have been adequately synchronized, the splice can be completed: the outgoing web 13 is brought into contact with the periphery of the new roll by means of a contact shaft (not shown) and the self-adhesive composition 3 adheres in accordance with Fig. 3 to the outgoing paper web 13. Instantaneously after adhesive contact, the cleavable paper backings 7 cleave in such a way that one part 7a remains on the adhesive tape 1 and covers the self-adhesive composition 8 there while the other part 7b remains on the self-adhesive composition 9 which bonds to the paper web 12. Consequently both self-adhesive compositions 8 and 9 are neutralized, so to speak, no longer bond, and therefore do not interfere in the further operation in the paper-processing machines.

The inventive adhesive tape is surprisingly suitable for flying splice in processing sequences in which the splice passes through a calender. The previous adhesive splicing tapes of the art are unsuitable for this purpose owing to the softness (low shear strength) of the pressure-sensitive adhesives used. Unexpectedly, the adhesives which it has been possible to use to date only for the manual, static splicing operation exhibit a sufficiently good tack in order to allow splicing for the inventive adhesive tape when used for the flying splice operation, despite their shear strength and the associated hardness, and even under high shear, pressure, and temperature stresses. Even at the high speeds occurring in the course of a flying splice, splice reliability is maintained: thus it has been possible to demonstrate by means of tests that the splicing operation proceeds successfully even at speeds of up to 1200 m/min.

This figure significantly exceeds the expectations which must nowadays be imposed on systems in which the flat web material, especially paper webs, pass through calenders. At the present state of the art, speeds of up to 300 m/min are realizable here.

The application rate of the self-adhesive composition can be kept very low; unexpectedly for the skilled worker, even at application rates, for example, in the range between 30 and 60 g/m^2, in particular at 40 g/m^2 (within the bounds of the customary error tolerances), the initial tack of the self-adhesive composition is good and the adhesive tape is suitable for use for flying splice. As a result of the low application rates the thickness of the adhesive tape as well is low, so that the adhesive tape outstandingly withstands the pressure stress on its passage through.

Claims

1. Use of a self-adhesive composition which consists of 25 to 45% by weight of a polymer of 40 to 90% by weight of acrylic acid and 60 to 10% by weight of butyl acrylate and of 55 to 75% by weight of ethoxylated alkyl amines and having a shear strength of at least 1000 minutes on coating base paper and at least 2000 minutes on gravure paper, measured in each case at 23°C and 55% relative humidity under a load of 1 kg, for an adhesive tape for the flying splice of flat web material wound into rolls in operations where the flat tape material passes through one or more calenders.

2. Adhesive tape for the flying splice of flat web material wound into rolls in operations where the flat tape material passes through one or more calenders, equipped with a main backing (2), a self-adhesive composition (3) on the front face, and at least one adhesive cleavable system (6) on the reverse face, characterized in that the self-adhesive composition consists of 25 to 45% by weight of a polymer of 40 to 90% by weight of acrylic acid and 60 to 10% by weight of butyl acrylate and of 55 to 75% by weight of ethoxylated alkyl amines and has a shear strength of at least 1000 minutes on coating base paper and at least 2000 minutes on gravure paper, measured in each case at 23°C and 55% relative humidity under a load of 1 kg.

3. Use of a self-adhesive composition which consists of 25 to 45% by weight of a polymer of 40 to 90% by weight of acrylic acid, 30 to 5% by weight of butyl acrylate and 30 to 5% by weight of

ethylhexyl acrylate and of 55 to 75% by weight of ethoxylated alkyl amines and having a shear strength of at least 1000 minutes on coating base paper and at least 2000 minutes on gravure paper, measured in each case at 23°C and 55% relative humidity under a load of 1 kg, for an adhesive tape for the flying splice of flat web material wound into rolls in operations where the flat tape material passes through one or more calenders.

4. Adhesive tape for the flying splice of flat web material wound into rolls in operations where the flat tape material passes through one or more calenders, equipped with a main backing (2), a self-adhesive composition (3) on the front face, and at least one adhesive cleavable system (6) on the reverse face, characterized in that the self-adhesive composition consists of 25 to 45% by weight of a polymer of 40 to 90% by weight of acrylic acid, 30 to 5% by weight of butyl acrylate and 30 to 5% by weight of ethylhexyl acrylate and of 55 to 75% by weight of ethoxylated alkyl amines and has a shear strength of at least 1000 minutes on coating base paper and at least 2000 minutes on gravure paper, measured in each case at 23°C and 55% relative humidity under a load of 1 kg.

5. Adhesive tape according to at least one of claims 2 or 4, characterized in that the application rate of the self-adhesive composition (3) is from 30 to 60 g/m^2, in particular 35-50 g/m^2.

6. Adhesive tape according to at least one of claims 2, 4 or 5, characterized in that the self-

adhesive composition (3) is an acrylate-based composition.

7. Adhesive tape according to at least one of claims 2 or 4 to 6, characterized in that the cleavable system or systems (6) is or are based on sized, highly compacted paper, on a paper/film composite or on a two-film composite.

8. Adhesive tape according to at least one of claims 2 or 4 to 7, characterized in that the cleavable system or systems (3) has or have the same width as the main backing (2).

9. Adhesive tape according to at least one of claims 2 or 4 to 8, characterized in that the main backing (2) is a high-tensile-strength paper or film backing.

10. Adhesive tape according to at least one of claims 2 or 4 to 9, characterized in that the self-adhesive composition (3) is provided with a liner (4) which where appropriate is provided with a perforation or a slit (5) in the lengthwise direction.

11. Adhesive tape according to at least one of claims 2 or 4 to 10,characterized in that the cleavage resistance of the cleavable system (6) is from 5 to 70 cN/cm, in particular from 12 to 60 cN/cm.

12. Splicing process wherein the topmost web (11) of a roll of a flat web material has an adhesive tape (1) according to any one of claims 2 or 4 to 11 adhered partly behind it, while the underside of the

adhesive tape adheres to the underlying web (12) and hence secures the topmost web; where appropriate, initially only part (4a) of any liner (4) that may be present on the self-adhesive composition (3) has been removed, so that the part of the self-adhesive composition (3) that is required for the splicing process is still lined with liner (4b) and the roll in this state does not have a free adhesive surface; thereafter, in final preparation for the splicing process, any remaining liner (4b) still present is removed, after which the new roll equipped in this way is placed alongside an old roll which is almost fully unwound and requires replacement, and is accelerated to the same rotational speed as the old roll, then pressed against the old web (13); the exposed self-adhesive composition (3) of the adhesive tape (1) adheres to the old web (13) with the webs at substantially the same speed, while at the same time the cleavable backing (7) made of cleavable material cleaves and with its residues (7a, 7b) non-adhesively covers the two self-adhesive compositions (8, 9) which were coated on it, and wherein the bond site, together with the webs thus bonded, after splicing has taken place, passes through at least one calendar.

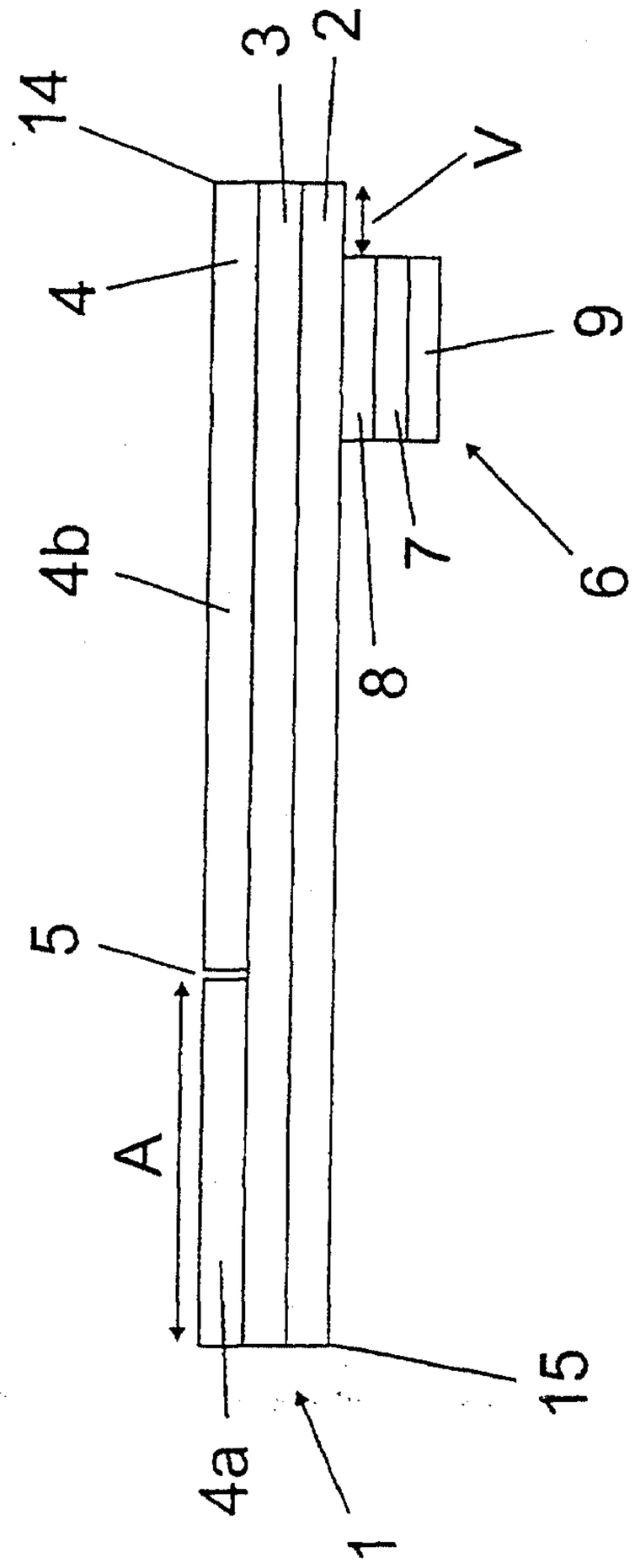


Fig. 1

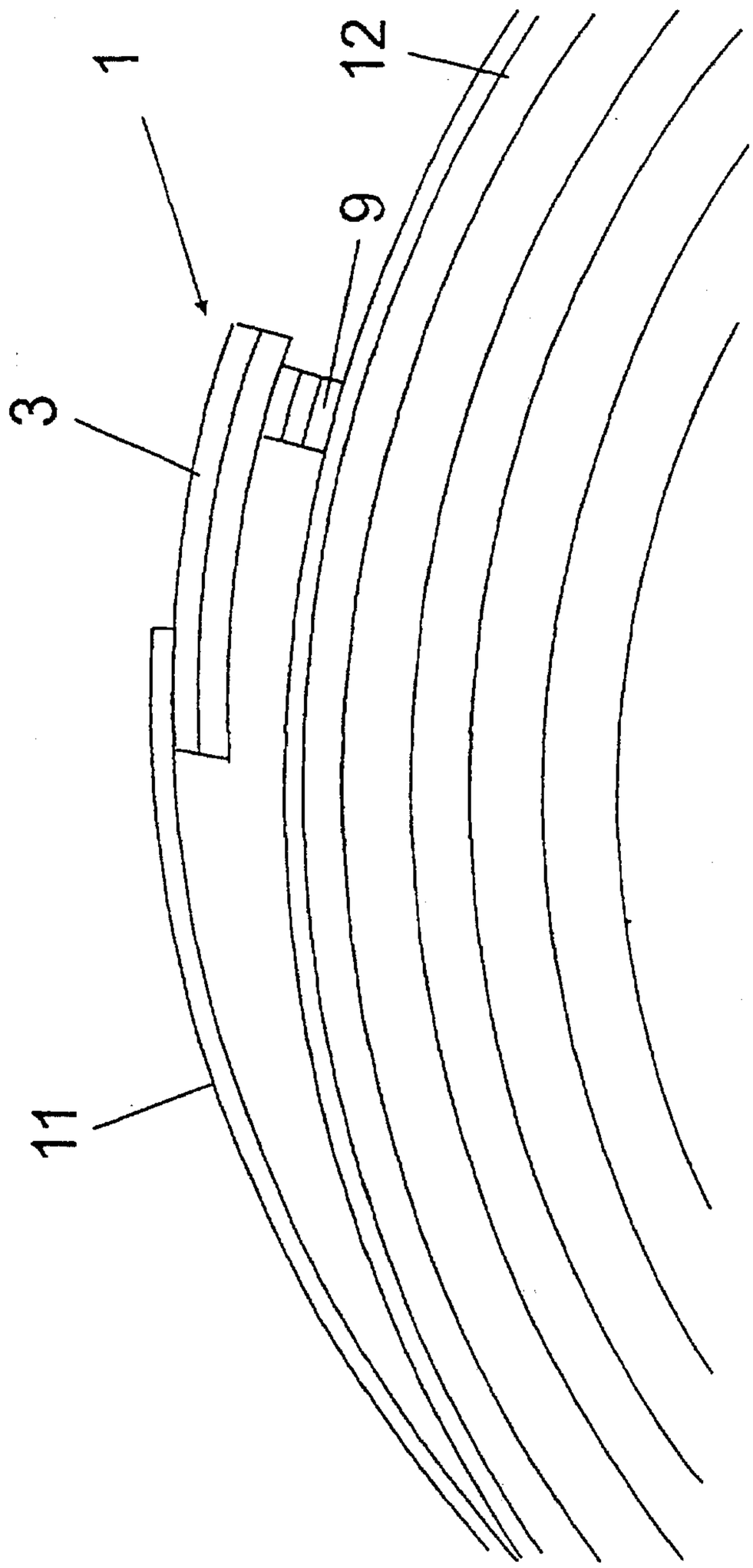


Fig. 2

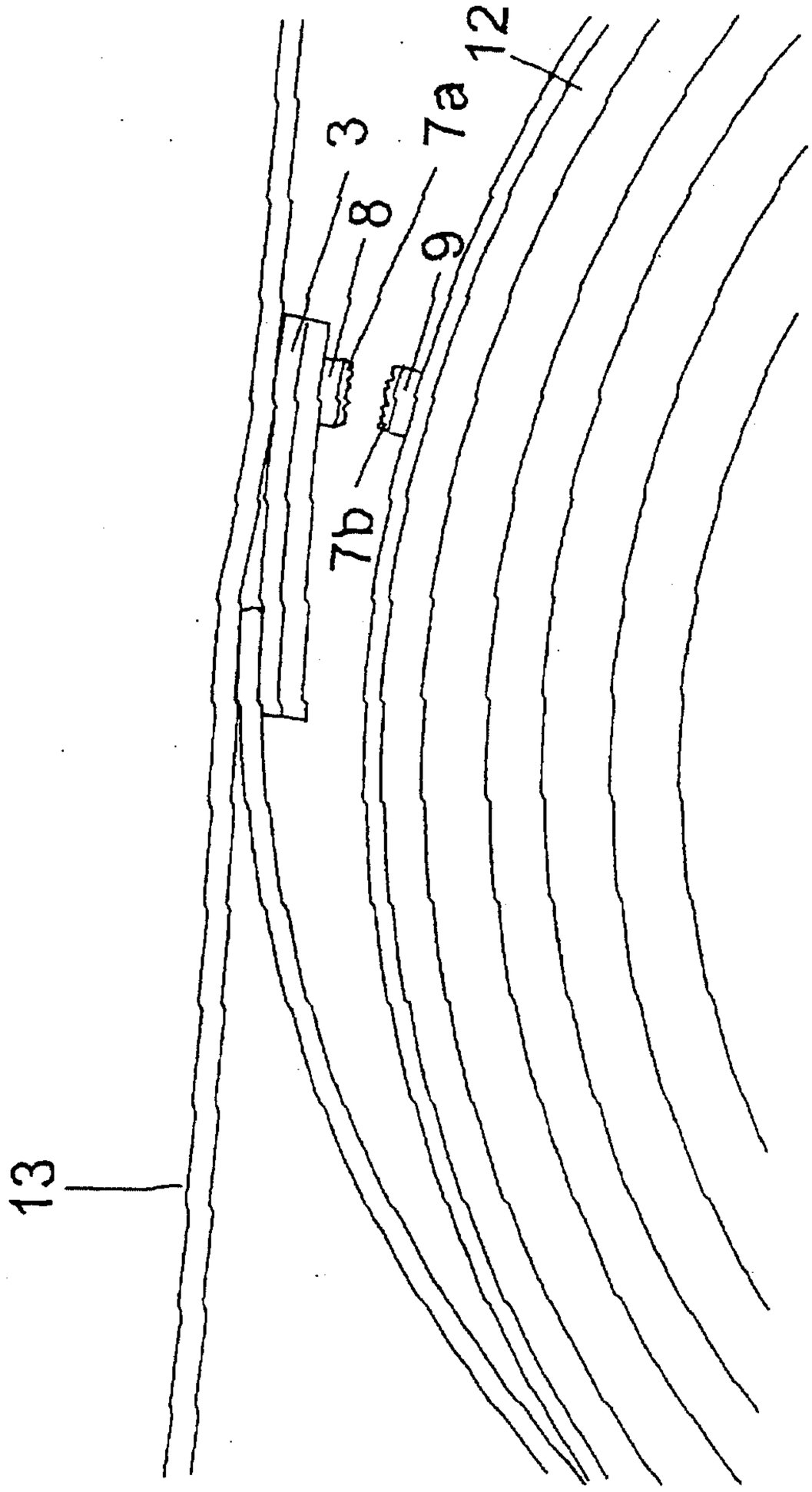
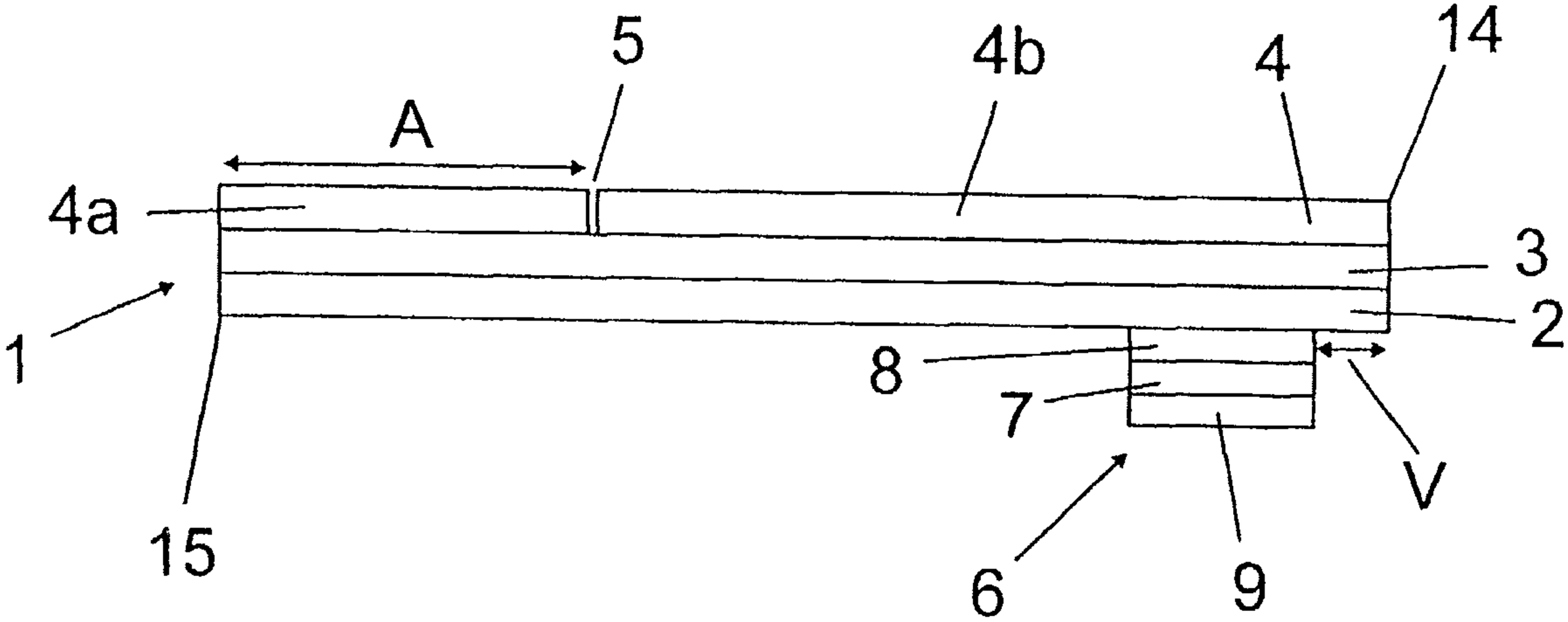


Fig. 3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