



(22) Date de dépôt/Filing Date: 2001/11/13

(41) Mise à la disp. pub./Open to Public Insp.: 2002/05/14

(30) Priorité/Priority: 2000/11/14 (200193346.5) DE

(51) Cl.Int.⁷/Int.Cl.⁷ B65G 15/58

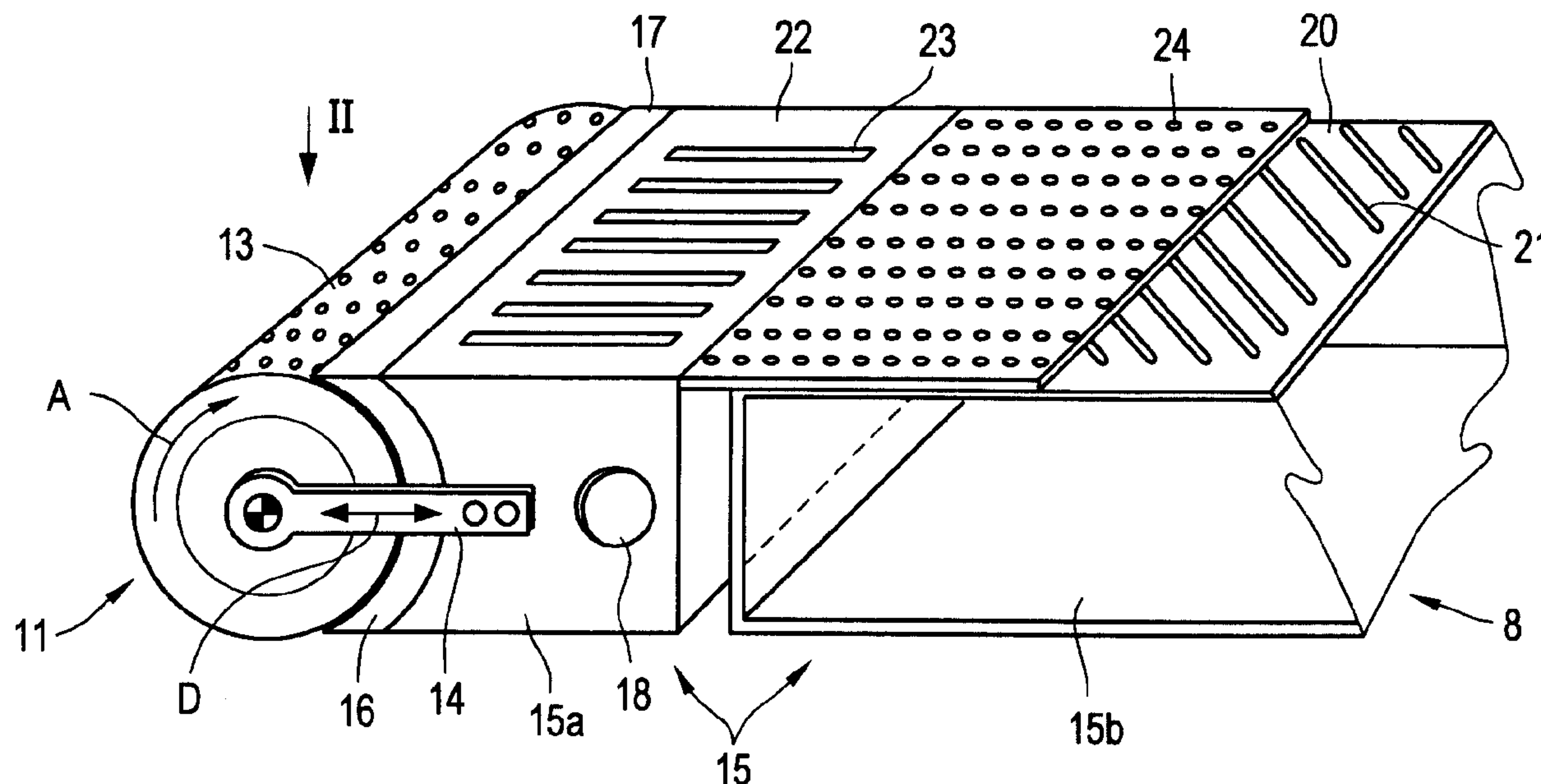
(71) Demandeur/Applicant:
VOITH PAPER PATENT GMBH, DE

(72) Inventeur/Inventor:
DEMERS, SYLVAIN, CA

(74) Agent: SIM & MCBURNEY

(54) Titre : TRANSPORTEUR A BANDE ASPIRANTE

(54) Title: VACUUM BELT CONVEYOR



(57) Abrégé/Abstract:

A vacuum belt conveyor comprises an air-pervious endless belt (10), a first pulley (11) positioned at the upstream end of the conveyor and a second pulley (12) positioned at the downstream end of the conveyor, the pulleys guiding the belt (10) when the belt is travelling. The endless belt (10) comes into contact with a plate (20) having openings (21) which are connectable to a source of negative pressure. According to the invention, the belt (10), in the area of the upstream end of the conveyor, is in contact with a curved and perforated guiding surface (13), with the perforations, too, being connectable to a source of negative pressure. Preferably, the curved and perforated guiding surface is formed as the rotary shell (13) of the first pulley (11), which is formed as a suction roll.

**Voith Paper Patent GmbH
Sankt Pöltener Strasse 43
D-89522 Heidenheim**

**File No.: PN11181 DE
"Suction Pickup Pulley"**

5 VACUUM BELT CONVEYOR

ABSTRACT

A vacuum belt conveyor comprises an air-pervious endless belt (10), a first pulley (11) positioned at the upstream end of the conveyor and a second pulley (12) positioned at the downstream end of the conveyor, the pulleys guiding the belt (10) when the belt is travelling. The endless belt (10) comes into contact with a plate (20) having openings (21) which are connectable to a source of negative pressure. According to the invention, the belt (10), in the area of the upstream end of the conveyor, is in contact with a curved and perforated guiding surface (13), with the perforations, too, being connectable to a source of negative pressure.

Preferably, the curved and perforated guiding surface is formed as the rotary shell (13) of the first pulley (11), which is formed as a suction roll.

20 (Fig. 3)

**Voith Paper Patent GmbH
Sankt Pöltener Strasse 43
D-89522 Heidenheim**

**File No.: PN11181 DE G
"Suction Pickup Pulley"**

5 VACUUM BELT CONVEYOR

FIELD OF INVENTION

The invention relates to a vacuum belt conveyor having the features stated in the preamble of claim 1. Vacuum belt conveyors are used to facilitate the threading of a paper web into a machine for the production or finishing or processing of such a web. When a papermaking machine is started (or restarted after a web break) a narrow "tail" or lead-in strip is separated from the running web. This tail is transferred by means of the vacuum belt conveyor, e.g. from the end of a machine section to the infeed area of a following machine section.

15

DESCRIPTION OF PRIOR ART

Reference is made to the following documents: DE 299 10 850; US 3,355,349; Brochure "Double-Tail-Elimination of the Fibron Machinery Corporation, New Westminster, BC, Canada; DE 199 62 731; DE 199 00 986; DE 100 09 188.

20 In the German Utility Model 299 10 850 a vacuum belt conveyor is disclosed which comprises an air pervious endless belt travelling across two pulleys and a vacuum box. The negative pressure of the vacuum box propagates through the conveying run of the belt in order to draw a web or "tail" to be guided by the conveyor belt by suction. One of the pulleys is displaceable in order to tension the belt.

25

According to US 3,355,349, at the infeed or upstream end of the conveyor, a severing means or tail cutter is arranged comprising a toothed knife which extends transversely, i.e. parallel to the pulley axis. Before the belt conveyor begins to convey the tail of a web, the complete web including the tail is running (e.g. from a last drying cylinder) downwardly, passing the infeed end of the belt conveyor and finally entering into a waste bin or waste pulper. A small "tail doctor" is provided at the last drying cylinder for peeling off the tail from the dryer shell and for transferring the tail onto the belt conveyor. When the latter is beginning to operate the tail cutter is severing the tail and thusly forming a new beginning of the tail which is now conveyed to the calender.

30

35 If no tail cutter would be present the belt conveyor would repull a "double tail"

- 2 -

upwardly from the waste bin causing problems during the threading operation. Reference is made to the above mentioned brochure "Double-Tail Elimination".

According to DE 199 62 731 (not yet published), an improvement has been proposed
5 comprising an infeed tray. This results in a more reliably operating of the belt conveyor, even with increased working speed. However, there is existing a need for further improvements in the way mentioned before.

SUMMARY OF THE INVENTION

10 It is an object of the present invention to provide an improved conveying apparatus which will operate reliably with various paper grades, even with paper grades of high strength and also in modern paper making or finishing machines operating at extremely high speed (e.g. more than 2000 meters per minute).

15 It is a further object of the present invention to eliminate a tail doctor at the web-delivering roll or cylinder. Also, the use of a tail cutter and of an infeed tray should be avoided.

Another object of the invention is an improved design which allows to arrange the
20 upstream end of the conveyor closer than hitherto to a web-delivering surface (e.g. surface of a roll or cylinder).

The aforementioned objects, as well as further objects that will come out later, are attained by the features defined in the appended claims.

25

According to the present invention, a belt conveyor (having the features mentioned in the preamble of claim 1) further comprises a curved and perforated guiding surface for the air-pervious endless belt; this guiding surface being arranged at the upstream end of the conveyor; the perforations of the guiding surface being outwardly open
30 toward the endless belt and inwardly open toward a source of negative pressure.

- 3 -

In operation, the curved and perforated guiding surface is acting as a suction pickup area which can be placed very close to the travelling path of the web, e.g. close to a web-delivering surface (fabric or felt or roll or cylinder). Thusly, the web or tail, in particular a new beginning of the tail, can be transferred onto the conveyor's belt in a much shorter time than hitherto.

In some cases, the suction pickup area of the vacuum belt conveyor can directly contact the web travelling path so that the tail, in particular a new beginning of the tail, can be transferred directly onto the conveyor's belt.

In other cases, when the web is travelling across a surface of a roll or cylinder the tail, preferably a new beginning of the tail, is peeled off from that surface by means of at least one marginal nozzle. Immediately thereafter, the tail is picked up by the conveyor's belt in the area of the curved and perforated guiding surface. Best results are to be expected, if the new beginning of the tail is being formed in a short distance upstream of the (preferably two) marginal nozzles, e.g. according to DE 199 00 986.

As a result, according to the invention, an improved threading process in paper machines will be obtained, without the need for a tail doctor at the web delivering roll or cylinder. Furthermore, the vacuum belt conveyor will not need an infeed tray. In many cases, a tail cutter will be avoided, too.

The attached drawings show the invention by way of examples.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows the upstream end of a vacuum belt conveyor according to the present invention (without the belt) in an oblique view;

Fig. 2 is a view along arrow II of Fig. 1;

Figs. 3 and 4 are side views of different alternative embodiments of the invention;

Figs. 5 and 6 show different situations in a paper making machine wherein vacuum belt conveyors are provided.

- 4 -

DESCRIPTION OF THE EMBODIMENTS SHOWN IN THE DRAWINGS

The vacuum belt conveyor 8 shown in Figs. 1 and 2 comprises a first pulley 11 positioned at the upstream end of the conveyor. An air-pervious endless belt and the downstream end of the conveyor (including a second pulley) are not shown.

The first pulley 11 has a perforated shell 13 and is rotatably supported by two bearing shields 14 which are rigidly connected to an upstream section 15a of a vacuum box 15. This vacuum box 15 is subdivided into said upstream section 15a and a downstream section 15b. In operation, pulley 11 will rotate e.g. clockwise as shown by arrow A; the endless belt will travel accordingly.

The upstream section 15a of vacuum box 15 is open toward the first pulley's perforated shell 13. Sealings 16 and 17 are provided between shell 13 and section 15a. In operation, a negative pressure is created within the upstream section 15a (e.g. by connecting it via vacuum inlet 18 to an external source of negative pressure, not shown). The negative pressure will then propagate through those perforations of shell 13, which are momentarily not covered by the belt, into the interior of pulley 11 and from there through the other perforations of shell 13 and through the air-pervious belt. Therefore, the belt will seize (by suction) a web or a tail 9 (to be transferred) earlier than with a conventional vacuum belt conveyor having only solid pulleys. This favorable result may be further improved by marginal air blast nozzles 46 (to be explained below, see Fig. 5). For tensioning the belt, pulley 11, upstream section 15a of box 15 and the sealings 16, 17 are commonly displaceable relative to the downstream section 15b of box 15, see double arrow D of Fig. 1. For guiding the elements 11, 15a, 16, 17 two bearing plates 19 (Fig. 2) are rigidly connected to the stationary downstream section 15b which comprises the customary cover plate having suction openings 21.

The upstream section 15a, too, comprises a cover plate 22 (made of ceramic or other low friction material) wherein suction slots 23 are provided which extend (preferably)

- 5 -

parallel to the belt's travelling direction. Connected to plate 22 is a thin perforated sheet (or "runner" 24) made of e.g. stainless steel; runner 24 will slide on cover plate 20 when the belt will be tensioned.

- 5 The negative pressure provided in the upstream section 15a should preferably be higher than the negative pressure provided in the downstream section 15b. Various external or internal vacuum sources may be utilized as disclosed in patent application DE 100 09 188, not yet published. As an alternative: The interior of suction pulley 11 may be connected to a vacuum source via a hollow journal of the pulley. In order to
10 drive the belt, one of the pulleys is connected to a motor. As an example, the second pulley (supported by the downstream section 15b) may be driven by an internal motor as disclosed in DE 299 10 850.

The vacuum belt conveyor shown in Fig. 3 comprises an air-pervious endless belt 10,
15 a first pulley 11, a second pulley 12 and a vacuum box 25. A web or tail to be conveyed is shown at 9. Again, the first pulley 11 is formed as a suction pulley comprising a perforated rotary shell 13. In contrast to Figs. 1 and 2, vacuum box 25 is formed as a single stationary piece which comprises a cover plate 20 with the customary suction openings 21. Vacuum box 25 supports both the first pulley 11 and
20 the second pulley 12; the latter being displaceable in order to tension the belt 10; the first pulley is not displaceable relative to vacuum box 25.

Vacuum box 25 is open toward the rotary shell 13. Again, sealings 16, 17 are provided. Vacuum created within box 25 propagates into first pulley 11 and through
25 belt 10 so that the tail 9 is forced by suction to cling to the belt 10 earlier than hitherto, i.e. already at the periphery of suction pulley 11. If needed, the interior of vacuum box 25 may be subdivided by a partition wall 26, so that next to suction pulley 11 a higher vacuum can be provided.

- 30 Fig. 4 is showing a further variation of the above described vacuum belt conveyors. Similar to conventional conveyors, the belt 10 is travelling across two normal solid

- 6 -

5 pulleys 11a and 12 which are supported by a one-piece vacuum box 35. In the area of the upstream end of the conveyor, there is a stationary, convexly curved and perforated guiding surface 32 for the belt 10. This curved guiding surface 32 is forming a curved suction area which is for the same purpose as the suction pulley 11 of Figs. 1-3.

10 The curved guiding surface 32 is formed e.g. by a perforated curved plate 33 which may be an integral part of the plane cover plate 20a of box 35 or may be separate from that cover plate 20a which, in any case, is positioned somewhat oblique relative to the return run of belt 10. Vacuum box 35 may include or may support a box section 34 which is wrapped around a part of first pulley 11a and which supports said curved perforated plate 33.

15 Fig. 5 shows some details of a paper making machine comprising a last drying cylinder 40, dryer felt 41, felt roll 42, paper roll 43 and doctor 44. The normal travel path of the paper web is shown at 9A. During the threading process, the web is running downwardly at 9B, a tail 9 is separated from web 9B (at arrow 45), peeled off from cylinder 40 by one or two marginal nozzles 46 (see Fig. 2) and immediately seized by a first vacuum belt conveyor 8. This conveyor transfers the tail 9 to a
20 second belt conveyor 8'; at least the first conveyor is designed according to the present invention.

Fig. 6 shows a vacuum belt conveyor 8A which again is designed according to the invention. Here, the upstream end of the conveyor contacts a felt or fabric 49 which
25 supports a travelling paper web 9D. This web is directly transferred by contact onto the belt of the conveyor 8A. Here, the bottom belt run is the conveying run.

**Voith Paper Patent GmbH
Sankt Pöltener Strasse 43
D-89522 Heidenheim**

**File No.: PN11181 DE G
"Suction Pickup Pulley"**

5 VACUUM BELT CONVEYOR

PATENT CLAIMS

1. Vacuum belt conveyor (8) comprising:
 - 10 a) an air-pervious endless belt (10);
 - b) a first pulley (11) positioned at the upstream end of the conveyor and a second pulley (12) positioned at the downstream end of the conveyor, the pulleys guiding the belt (10) when the belt is travelling;
 - 15 c) the endless belt (10) having a conveying run travelling from the first to the second pulley and having a return run travelling from the second to the first pulley;
 - d) the conveying run being in contact with a plate (20) having openings (21) which are connectable to a source of negative pressure;
 - 20 e) characterized in that the belt (10), in the area of the upstream end of the conveyor, is in contact with a curved and perforated guiding surface (13, 33), with the perforations, too, being connectable to a source of negative pressure.
2. Vacuum belt conveyor as claimed in claim 1, wherein the curved and perforated
25 guiding surface is formed as the rotary shell (13) of the first pulley (11).
3. Vacuum belt conveyor as claimed in claim 1, wherein the curved and perforated guiding surface is formed as a curved, stationary plate (33).
- 30 4. Vacuum belt conveyor as claimed in claim 2, further comprising:
 - a) a vacuum box (15; 25) positioned within the loop of the belt (10);
 - b) the vacuum box being open towards the perforated rotary shell (13) of the first pulley (11) and carrying sealing elements (16, 17) which may contact the outer surface of the rotary shell (13).

35

- 2 -

5. Vacuum belt conveyor as claimed in claim 4, wherein the vacuum box (15) is subdivided into at least two sections (15a, 15b) arranged one behind the other along the belt's travelling path.
- 5 6. Vacuum belt conveyor as claimed in claim 5, wherein the vacuum box's upstream section (15a) which is open towards the perforated shell of the first pulley (11) may be supplied with a higher negative pressure than the downstream section (15b).
- 10 7. Vacuum belt conveyor as claimed in claim 4, wherein one of the two pulleys (11,12) is displaceable for tensioning the belt (10).
8. Vacuum belt conveyor as claimed in claim 7, wherein the second pulley (12) is displaceable relative to said vacuum box.
- 15 9. Vacuum belt conveyor as claimed in claim 7, wherein the first pulley (11) is supported by the vacuum box (15a) and wherein both the first pulley and the vacuum box are displaceable relative to a stationary element (e.g. a frame).
- 20 10. Vacuum belt conveyor as claimed in claim 9, wherein said stationary element is formed as a second (downstream) section (15b) of the vacuum box (15).
11. Vacuum belt conveyor as claimed in claim 1, wherein at the upstream end of the conveyor (8) at least one marginal nozzle (46) is provided for emitting an air jet
25 between a web-delivering roll or cylinder (40) and the web or tail (9) and for urging the web or tail onto the upstream end of the conveyor (8).
12. An apparatus according to claim 11, wherein the at least one marginal nozzle (46) is adapted to urge the new beginning of the web or tail (9) onto the
30 upstream end of the conveyor.

Fig. 1

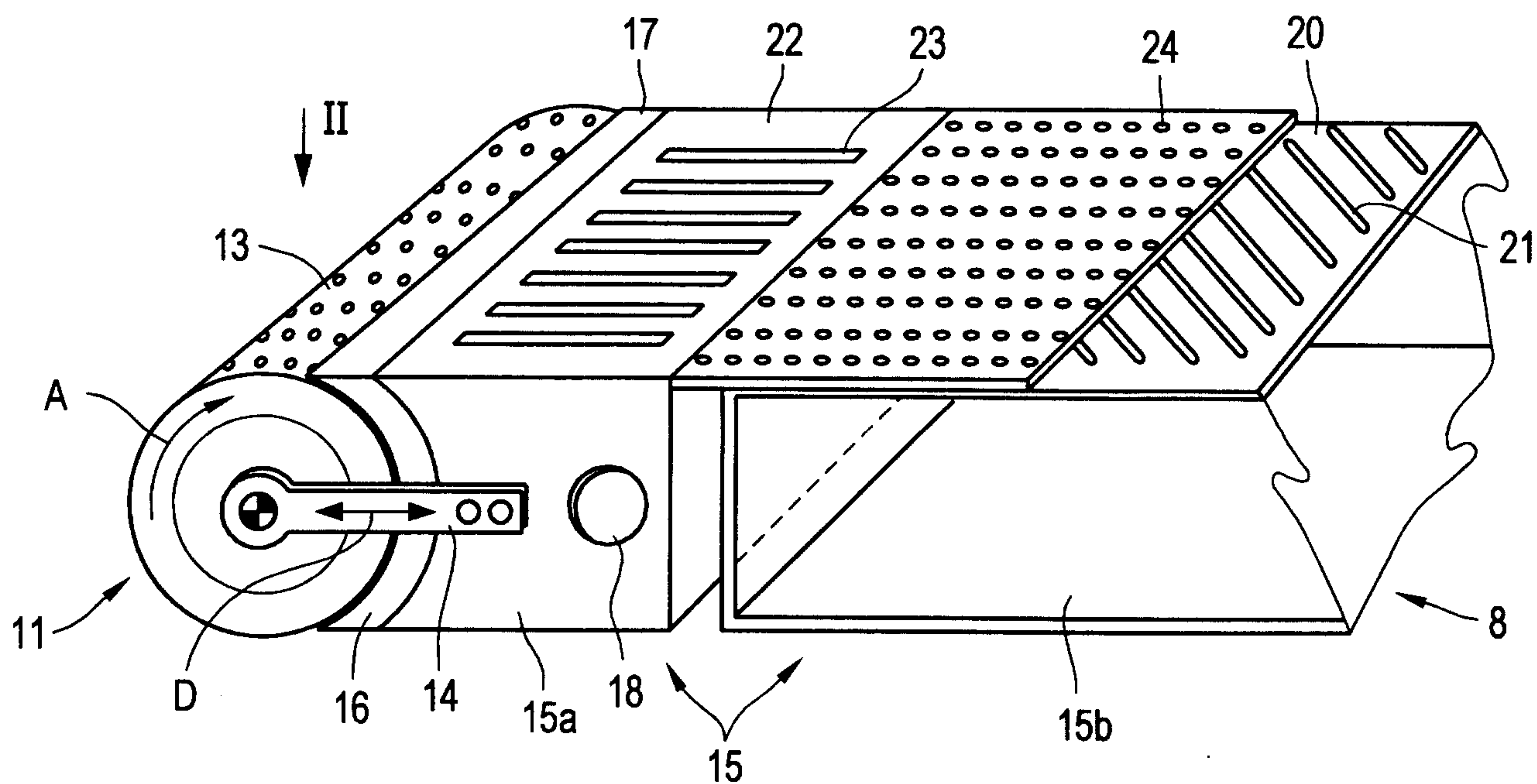
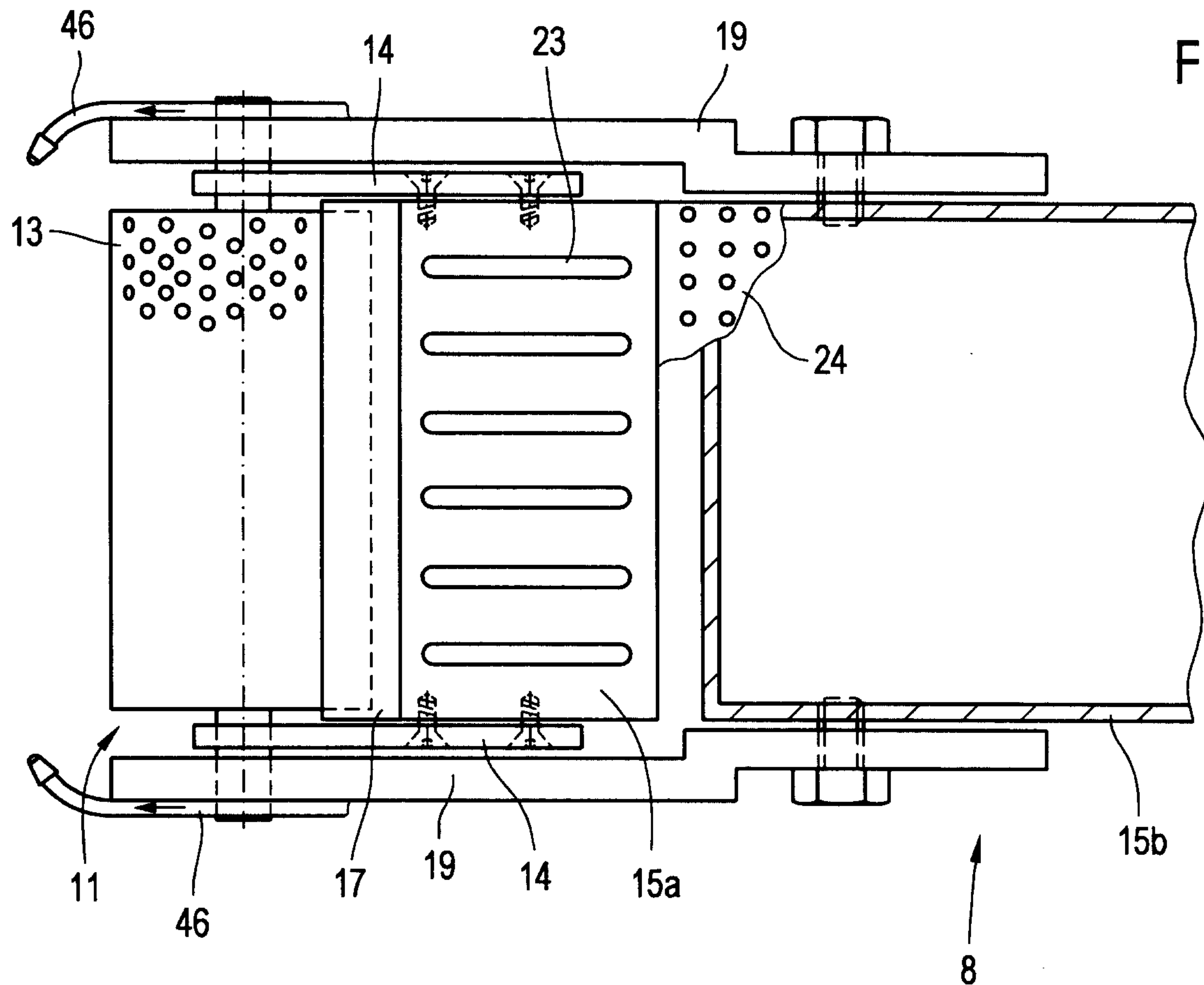


Fig. 2



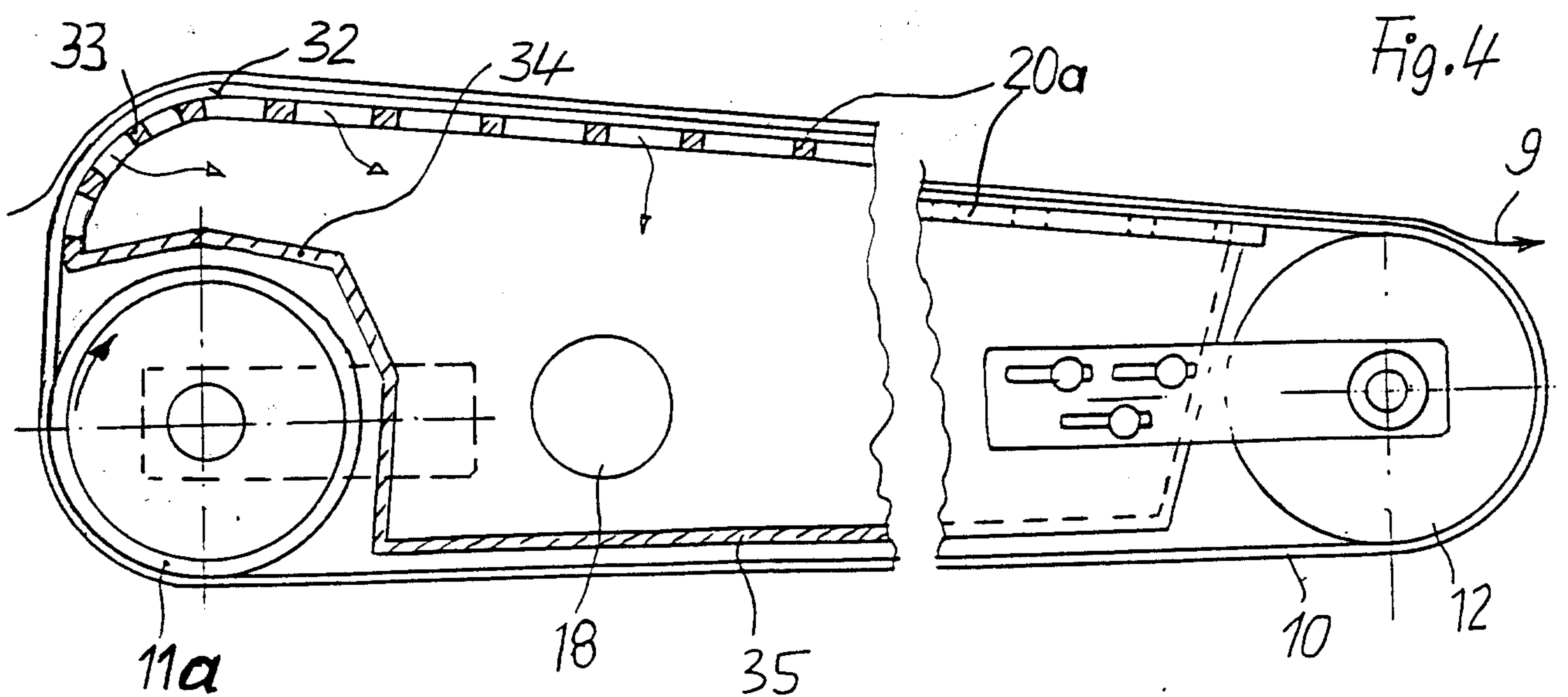
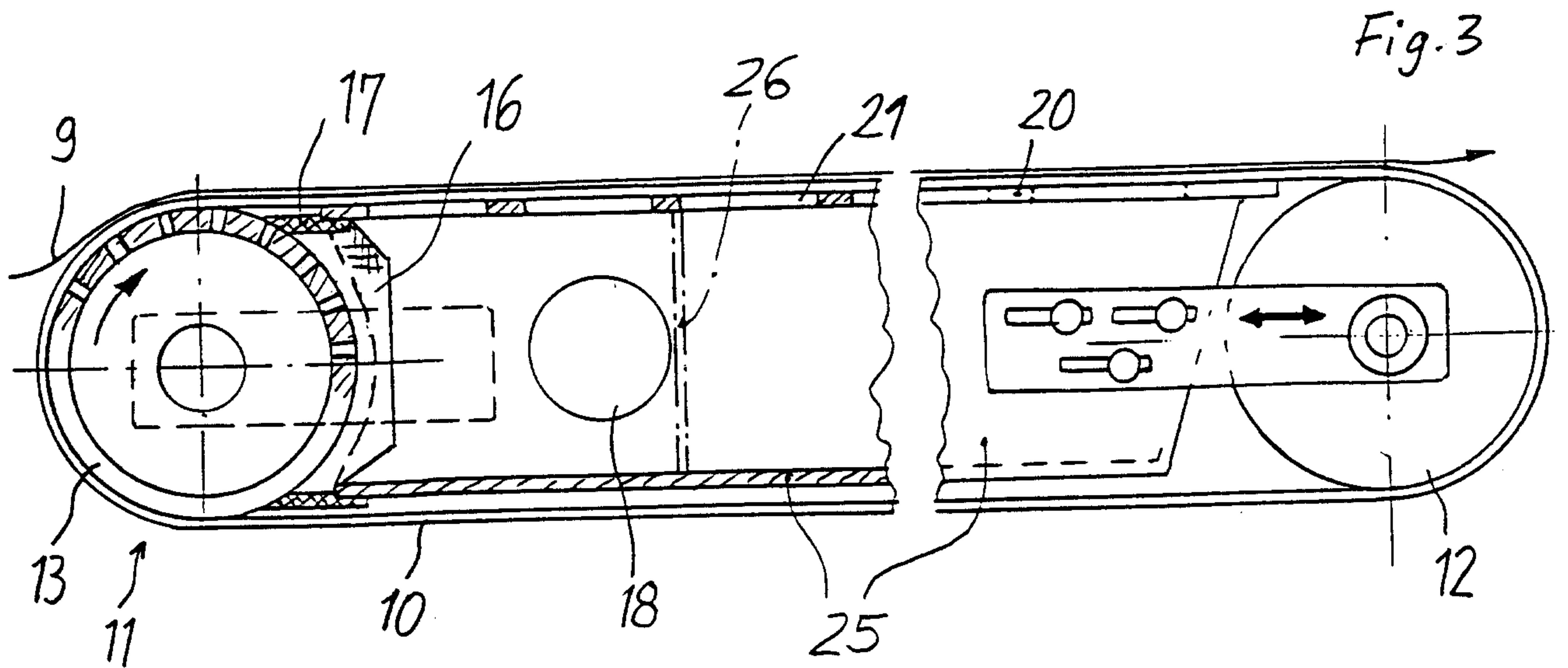


Fig. 5

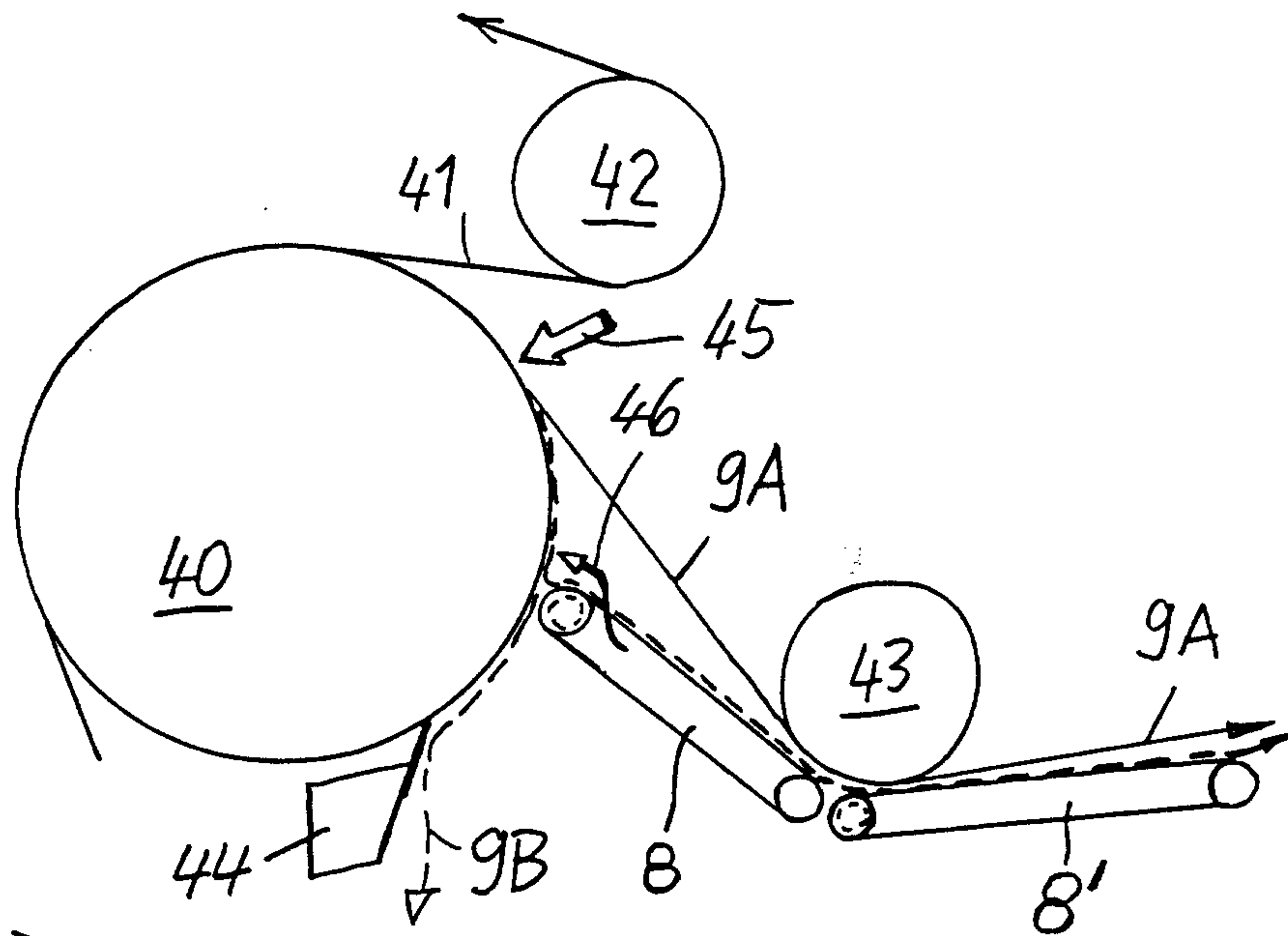


Fig. 6

