

(19)



(11)

EP 4 477 591 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.12.2024 Bulletin 2024/51

(51) International Patent Classification (IPC):
B65H 19/18 (2006.01)

(21) Application number: **24174265.9**

(52) Cooperative Patent Classification (CPC):
B65H 19/1852; B65H 2301/41414

(22) Date of filing: **06.05.2024**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(72) Inventors:
• **HAAPANEN, Jaakko**
04400 Järvenpää (FI)
• **RÄMÄ, Mikko**
04400 Järvenpää (FI)

(74) Representative: **Berggren Oy**
P.O. Box 16
Eteläinen Rautatiekatu 10A
00101 Helsinki (FI)

(30) Priority: **30.05.2023 FI 20235600**

(71) Applicant: **Valmet Technologies Oy**
02150 Espoo (FI)

(54) **UNWINDING SECTION AND A METHOD OF JOINING ENDS OF FIBER WEBS IN AN UNWINDING SECTION**

(57) The invention relates to an unwinding section for unwinding a fiber web (W) from a parent roll, which unwinding section (10) comprises at least one unwinder (11, 12) for unwinding a fiber web (W1; W2) from a parent roll and a joining device (20, 30) configured to join a trailing end of a running-out parent roll to a beginning end of a next, new parent roll to be unwound in a parent roll change, and which unwinding section (10) comprises or is located in vicinity of a broke handling device (42) configured to handle broke. The unwinding section (10) comprises a tensioning device (45) located between the joining and the broke handling and the tensioning device (45) is configured to tension and straighten the fiber web

(W2) to be joined between the tensioning device (45) and the joining device (20, 30) before joining of the end of the fiber web from the running-out parent roll and the end of the fiber web from the next parent roll to be unwound. The invention also relates to a method for joining ends of fiber webs in a parent roll change of an unwinding section (10), in which method the ends of the fiber webs (W1, W2) are configured to be joined by a joining device (20, 30). In the method the fiber web (W2) running from a next parent roll to be unwound is tensioned and straightened by a tensioning device (45) before joining of the end of the fiber web from the running-out parent roll and the end of the fiber web from the next parent roll to be unwound.

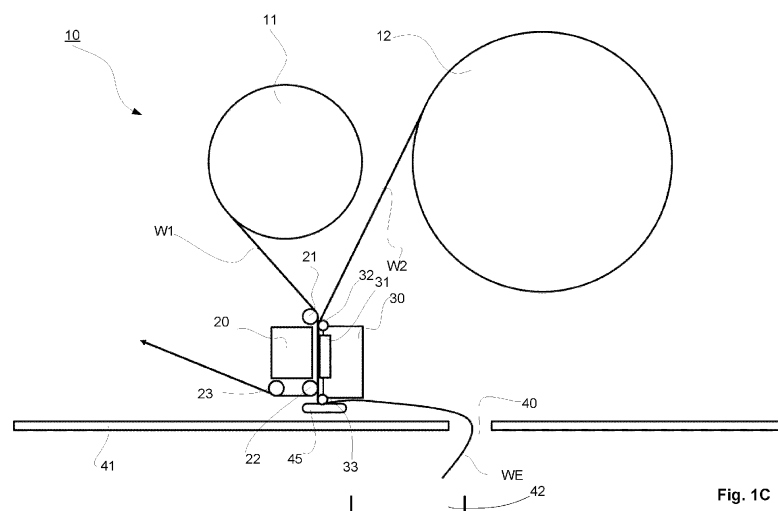


Fig. 1C

EP 4 477 591 A1

Description

Technical field

[0001] The invention relates generally to unwinding of fiber webs and to unwinding sections for unwinding fiber webs from parent rolls. Especially the invention relates to an unwinding section according to the preamble part of the independent claim 1 and of joining ends of fiber webs in an unwinding section according to the preamble part of the independent method claim.

Background

[0002] It is known that fiber webs, e.g. paper and board webs, are manufactured in machines which together constitute a fiber web production line which can be hundreds of meters long. As known from the prior art in fiber web producing lines typically comprise an assembly formed by a number of apparatuses arranged consecutively in the process line. A typical production and treatment line for fiber web comprises a head box, a wire section and a press section as well as a subsequent drying section and a reel-up. The production and treatment line can further comprise other sections and devices for treatment and/or finishing the fiber web, for example a sizer, a coating device, a calender. The production and treatment line also typically comprises at least one slitter-winder for forming customer rolls as well as a roll packaging apparatus.

[0003] In fiber web production lines, the manufacture of the fiber web takes place as a continuous process. A fiber web completing in the fiber web machine is reeled by a reel-up around a reeling shaft i.e. a reel spool into a parent roll the diameter of which can be more than 5 meters and the weight more than 160 tons. The purpose of reeling is to modify the fiber web manufactured as planar to a more easily processable form. On the reel-up located in the main machine line, the continuous process of the fiber web machine breaks for the first time and shifts into periodic operation. Reel-ups are used in fiber web production for reeling the fiber web coming from the fiber web production line, and also from a coating machine, a calender or a corresponding finishing device.

[0004] The fiber web wound onto the parent roll is full-width so it must be slit in longitudinal direction into partial fiber webs with suitable width and the partial fiber webs are wound to partial fiber web rolls (customer rolls) of suitable length or of suitable diameter for the customers. The slitting and winding take place as known from prior art in an appropriate separate machine i.e. in a slitter-winder. Slitter-winders employ winding devices of different types, for example multistation winders and two-drum winders. In the two-drum winders the partial webs are wound around winding cores supported by two winding drums to partial web rolls via a nip between the winding drums and the partial pulp web rolls being formed. In the two-drum winders also a belt arrangement i.e. a so-called

set of belt rolls with belt loop or belt loops located around two guide rolls can be used as the winding drum. As known in the prior art, also winding with a shaft without cores or together with cores can be employed in the winding of a pulp web into customer rolls on a slitter-winder.

[0005] As known from the prior art, in the slitter-winder the parent roll is unwound in an unwinding section, the full-width fiber web is slit on the slitting section into several narrower partial fiber webs which are wound up on the winding section around winding cores or around winding shafts or around winding cores located on the shafts, such as spools, into customer rolls. When the customer rolls are completed, the slitter-winder is stopped and the rolls i.e. the so-called set is removed from the machine after which the process is continued with the winding of a next set. These stages are repeated periodically until paper runs out of the parent roll in the unwinding section, whereby a parent roll change is performed and the operation starts again as the unwinding of a next parent roll. In cases the unwinding section comprises only one unwinder the stages are repeated until the fiber web on the parent roll runs out from the reeling shaft, at which point the parent roll is replaced, the end of the fiber web from the running-out parent roll is joined to the beginning end of the fiber web from a next, new parent roll and the operation restarts with the unwinding of a next parent roll from the reeling shaft. The unwinding section may also comprise two unwinders. For example in patent publication FI 121007 B is disclosed an unwinding section comprising two unwinding positions, in which the unwinding of a full parent roll is first begun in a first unwinding position of the unwinding section and then transferring the partially unwound parent roll to a second unwinding position during unwinding in the unwinding section and the unwinding is finished in the second unwinding position. In the slitter winders comprising two unwinders the slitting and winding stages are repeated until the fiber web on the parent roll runs out from the reeling shaft in the first unwinder, at which point the run of the fiber web is changed to be from the parent roll in the second unwinder by joining the end of the fiber web from the running-out parent roll in the first unwinder to the beginning end of the fiber web from a next parent roll in the second unwinder and the operation restarts with the unwinding of the next parent roll from the reeling shaft in the second unwinder. When the parent roll in the second unwinder is running out the unwinding is again changed to be from the first unwinder and the end of the fiber web from the running-out parent roll in the second unwinder to the beginning end of the fiber web from a next parent roll in the first unwinder and the operation restarts with the unwinding of the next parent roll from the reeling shaft in the first unwinder.

[0006] In the joining of the end of the parent roll to the beginning end of the next parent roll it has been difficult to find a functional joining method. For example using of adhesive tapes has proven disadvantageous, as the

tapes may peel of fibers from the surface of the fiber webs. At the present most promising joining method has turned out to be a form fitting joint, in which the ends of the fiber webs are joined to providing to the overlapping ends of the fiber webs form fitting attachment by a joining device, typically comprising a tool element and its counter element, between of which the overlapping ends are located for creating the joint. In connection with joining devices for joining the ends of the fiber webs for the parent roll change in the unwinder for a slitter-winder the preparation of the end of the new fiber web and removal of the broke fiber web is performed before joining the ends of the fiber webs. Typically, this has been done manually by the operators, which increases the work safety risks. It is also known to use a separate suction roll for collecting the broke fiber web for removal as a separate operation after the joining of the fiber webs.

[0007] In FI patent publication 129673 is disclosed a method and a device for joining ends of fiber webs in a parent roll change of an unwinder. The method is configured to be performed by a device comprising a tool element, a gripping device and a traversing punching device, whereby at a stage, in which a parent roll in the unwinder is almost empty, the run of the fiber web from the running-out parent roll is moved to a joining position at the tool element and the trailing end of the fiber web from the running-out parent roll is cut upstream from the joining position and the fiber web is attached to the tool element by means of gripping effect created by the gripping device, at a next stage a beginning end of a new fiber web from a new parent roll is guided to contact with and to an overlapping position with the trailing end of the fiber web from the running-out parent roll and the rotating movement of the new parent roll in the unwinder is stopped, at a next stage the traversing punching device is moved across the width direction of the fiber webs and is configured to make at least one joint cut to the overlapping ends of the fiber webs and to join the ends of the fiber webs to each other, the beginning end of the new fiber web from the new parent roll in the unwinder is cut downstream from the joint for removing the beginning end simultaneously or after making the at least one joint cut, and at a next control of tension of the joined fiber webs is turned on and the joint joining the ends of the fiber webs is ready. In this patent publication 129673 disclosed method at the stage in which the new parent roll has been transferred to the unwinder, the new parent roll in the unwinder is rotated and the end of the new fiber web is guided to a pulper, in which the end of the fiber web is tensioned and straightened by an element of the pulper for the joining of the ends of the fiber webs and the rotating movement of the new parent roll in the unwinder is stopped. These elements arranged in the pulper for tensioning and straightening the end of the fiber web are typically water showers and like and in some cases these types of elements of the pulper have proven not effective enough for secure operation, especially in cases where the pulper opening is remotely located in respect of the

joining location.

[0008] In known systems it has been difficult to find a well functional way to handle broke fiber web generated in connection of joining the ends of the running-out parent roll and the new parent roll. In particular relating to handling of the end of the fiber web from the running-out parent roll and the end of the fiber web from the next parent roll to be unwound after joining of the fiber webs such, that the broke guided to desired broke handling and the new fiber web is tight and straight enough for the joining.

[0009] Another object of the invention is to create an unwinding section for fiber webs and a method of joining ends of fiber webs in an unwinding section, in which the problems of from prior art known arrangements and methods are eliminated or at least minimized.

[0010] Another object of the invention is to create an unwinding section for fiber webs and a method of joining ends of fiber webs in an unwinding section, in which the problems relating to removal of the beginning end of the fiber web joined are eliminated or at least minimized.

[0011] A further object of the invention is to create an unwinding section for fiber webs and a method of joining ends of fiber webs in an unwinding section, in which savings are achieved in operator work.

[0012] An object of the invention is to create an unwinding section for fiber webs and a method of joining ends of fiber webs in an unwinding section, in which the disadvantages of known systems and methods relating to safety risks relating to manual operations are eliminated or at least minimized.

Summary

[0013] To achieve the above-mentioned objects and those which come out later, the unwinding section according to the invention is mainly characterized by what is presented in the characterizing part of claim 1. The method of joining ends of fiber webs in an unwinding section according to the invention, in turn, is mainly characterized by what is presented in the characterizing part of the independent method claims. Advantageous features and embodiments of the invention are defined in depending claims.

[0014] According to the invention the unwinding section for unwinding a fiber web from a parent roll comprises at least one unwinder for unwinding a fiber web from a parent roll and a joining device configured to join a trailing end of a running-out parent roll to a beginning end of a next, new parent roll to be unwound in a parent roll change, and which unwinding section comprises or is located in vicinity of a broke handling device configured to handle broke, wherein the unwinding section comprises a tensioning device located between the joining and the broke handling and the tensioning device is configured to tension and straighten the fiber web to be joined between the tensioning device and the joining device before joining of the end of the fiber web from the running-out parent

roll and the end of the fiber web from the next parent roll to be unwound. Advantageously the tensioning device is located between the joining device and the broke handling device.

[0015] According to an advantageous feature of the invention the unwinding section is located on a maintenance level comprising an opening for removal of broke fiber web to the broke handling device and the tensioning device is located above the opening and downstream in running direction of the fiber web running from the next parent roll to be unwound from the joining device.

[0016] According to the invention the tensioning device is configured to guide the cut beginning end of the fiber web from the next parent roll to be unwound after the joining of the ends of the fiber webs in the parent roll change to the broke handling device.

[0017] According to an advantageous feature of the invention the tensioning device is configured to guide the beginning end of the fiber web from the next parent roll to be unwound towards the opening and the broke handling device.

[0018] According to an advantageous feature of the invention the unwinding section comprises a counter roll for the tensioning device, and the counter roll is configured to provide a tensioning effect with the tensioning device and the fiber web from the next parent roll to be unwound is configured to be guided between the counter roll and the tensioning device.

[0019] According to an advantageous feature of the invention the tensioning device is movable between a resting position and a tensioning position.

[0020] According to an advantageous feature of the invention the tensioning device comprises a continuous belt loop running and supported by two or more rolls located inside the belt loop.

[0021] According to an advantageous feature of the invention the unwinding section comprises two unwinders and that the joining device comprises a movable tool element and a stationary counter element. Alternatively, according to an advantageous feature of the invention the unwinding section comprises only one unwinder and the joining device comprises a stationary tool element and a movable counter element.

[0022] According to an advantageous feature of the invention the unwinding section is an unwinding section of a slitter-winder.

[0023] According to the invention in the method for joining ends of fiber webs in a parent roll change of an unwinding section located in vicinity of or comprising a broke handling device configured to handle broke, the ends of the fiber webs are configured to be joined by a joining device, wherein the fiber web running from a next parent roll to be unwound is tensioned and straightened by a tensioning device before joining of the end of the fiber web from the running-out parent roll and the end of the fiber web from the next parent roll to be unwound, by the tensioning device located between the joining and the

broke handling the cut beginning end of the fiber web from the next parent roll to be unwound after the joining of the ends of the fiber webs in the parent roll change is guided to the broke handling device.

[0024] According to an advantageous feature of the invention in the method the fiber web running from the next parent roll to be unwound is tensioned and straightened by the tensioning device above a maintenance level.

[0025] According to an advantageous feature of the invention in the method the fiber web running from a next parent roll to be unwound is further tensioned and straightened by a tensioning device simultaneously and after joining of the end of the fiber web from the running-out parent roll and the end of the fiber web from the next parent roll to be unwound.

[0026] According to an advantageous feature of the invention in method the ends of the fiber webs are configured to be joined by a joining device comprising a tool element and a counter element and the trailing end of the fiber web from the running-out parent roll and the beginning end of a new fiber web from the next parent roll are guided to an overlapping position between the tool element and the counter element for joining and the beginning end of the fiber web running from the next parent roll to be unwound is tensioned between the joining device and the tensioning device.

[0027] According to an advantageous feature of the invention in the method the unwinding section is run at a crawling speed during the joining of the ends of the fiber webs.

[0028] According to an advantageous aspect of the invention the unwinding section comprises the tensioning device and the end of the fiber web from the next, new parent roll is guided to the broke handling device, for example to the pulper, such, that the fiber web to be joined coming from the new parent roll is located between the tensioning device and the joining device. The fiber web to be joined is tensioned and straightened between the tensioning device and the joining device before joining of the end of the fiber web from the running-out parent roll and the end from the next parent roll to be unwound. After the joining and the cutting of the fiber web, the cut end of the fiber web, i.e. the broke end of the fiber web continues its travel to the broke handling device assisted by the tensioning device.

[0029] The invention is utilizable in unwinding sections comprising one or two unwinders, in particular in unwinding sections of slitter-winders, in which the ends of the fiber webs in the parent roll change are joined by a joining device advantageously comprising a tool element and a counter element for creating a form fitting joint.

[0030] By the invention and its advantageous features several advantages are achieved: The end of the fiber web to be joined is securely tensioned and straightened before the joining and the broke fiber web is handled in connection with the joining operation. Thus, no broke fiber web remains to be handled after the joining. Also,

the end cutting does not need special accuracy as the cut end is guided to the broke handling and the finalizing end cutting is performed in connection with the joining. One of the main advantages is also, that no manual removal of the broke end is needed. Additionally, savings are achieved in operator work. The safety and ergonomics of the operator are also provided due to decreased need of manual work operations. The invention provides an improved and well-functioning way of handling broke fiber web generated in connection of joining the fiber web ends. Also, effectivity is increased as the fiber web is tightened and straightened before the joining in the location before broke handling. Further, manual operations are improved, as the tensioning device is located in a well reachable location.

Brief description of the drawings

[0031] Aspects of the invention, however, together with additional objects and advantages thereof, will be best understood from the following description of some example embodiments when read in connection with the accompanying drawings and in the following the invention is described in more detail referring to the accompanying drawing, in which

[0032] In figures 1A-1D is schematically shown an advantageous example of an unwinding section, which comprises two unwinders, according to the invention as a side view in different steps of an advantageous example of the method of joining ends of fiber webs in an unwinding section.

[0033] In figures 2A-2D is schematically shown another advantageous example of an unwinding section, which comprises one unwinder, according to the invention as a side view in different steps of an advantageous example of the method of joining ends of fiber webs in an unwinding section.

Detailed description

[0034] During the course of the description of the figures like numbers and signs will be used to identify like elements according to the different views which illustrate the invention. Repetition of some reference signs may have been omitted in the figures for clarity reasons.

[0035] In figures 1A-1D is schematically shown an example of an unwinding section 10, which comprises two unwinders: a first unwinder 11 and a second unwinder 12, at a time of a parent roll change. In the example the parent roll change is performed from the first unwinder 11 with the running-out parent roll to the second unwinder 12 with the new parent roll to be unwound next in the unwinding section. When the fiber web W runs out of the parent roll in the first unwinder 11, the parent roll change to a new parent roll in the second unwinder 12 is performed in the unwinding section 10. In the parent roll change a trailing end of the fiber web W1 from the running-out parent roll in the first unwinder 11 is attached to

the beginning end of the fiber web W2 from the new parent roll in the second unwinder 12 and there after the operation continues again as the unwinding of the new parent roll in the second unwinder 10. The joining device for attaching the ends of the fiber webs W1, W2 comprises a tool element 30 with a gripping device, which can be for example an underpressure device providing underpressure as gripping effect, and a joint forming element 31, for example a traversing punching device, advantageously a joining wheel, as well as a counter element 20 for the tool element 30. The gripping device may also be constructed of a fork plate and a gripping plate. In this example the counter element 20 has a fixed position and the tool element 30 is movable between a resting position and a joining position and the tool element 30 also has a tensioning position in between the joining position and the resting position. The tool element 30 comprises a support roll 32 for guiding the fiber web in connection with the tool element 30 during joining of the fiber webs W1, W2 and a counter roll 33 for guiding the fiber web in connection with the tool element 30 during joining of the fiber webs W1, W2 functioning with a tensioning device 45 for tensioning and straightening the fiber web W2. In connection with the counter element 20 guide rolls 21, 22, 23, are located for guiding the fiber web W1; W2 to next processing step in the next section, for example to slitting in a slitting section. Advantageously, the tool element 30 comprises as the joint forming element 31 a traversing punching device, advantageously a joining wheel with at least one punching element, advantageously at least one punching blade, advantageously several punching elements, advantageously several punching blades, and is configured to punch the overlapping ends of the fiber webs W1, W2 and simultaneously to join the ends of the fiber webs W2, W2. The joining wheel with punching elements is configured to move across the fiber webs in cross-direction in a traversing way. The joining wheel is advantageously an idle wheel and its rotating movement is provided by the fiber webs. The counter element 20 for the tool element 30 is advantageously planar in its main outer form and may be provided with grooves for the punching elements of the joining wheel 31. The beginning end of the fiber web running from the new parent roll from the second unwinder is moved to the joining position by the tool element 30. In the method and by the joining device the trailing end of the fiber web W1 from the running-out parent roll in the first unwinder 11 and the beginning end of the fiber web W2 from the new parent roll in the second unwinder 12 are guided to an overlapping position and pressed together by the tool element 30 and the counter element 20 simultaneously punching joining cuts by the punching elements of the traversing punching device 31 to both ends of the fiber webs W1, W2 such that a joint in tension direction of the fiber webs W1, W2 is achieved. The overlapping trailing end and beginning end of the fiber webs W1, W2 are punched by the at least one punching element of the traversing punching device 31 and pro-

vided with a joint cut form and tension of the fiber webs W1, W2 finalizes the locking between the ends of the fiber webs W1, W2 together such that the joint is formed. The form of the joint cut can vary and is selected depending on grade of the fiber web and on thickness of the fiber web. The unwinding section 10 comprises the tensioning device 45 and the end of the fiber web W2 from the new parent roll in the second unwinder 12 is guided through an opening 40 or like in a maintenance level 41, for example in a floor, to a broke handling device 42, for example to the pulper, such, that the fiber web W2 to be joined is located between the tensioning device 45 and the joining device 30, 20. The fiber web W2 to be joined is tensioned and straightened before joining of the end of the fiber web W1 from the running-out parent roll and the end of the fiber web W2 from the next parent roll to be unwound by the tensioning device 45. After the joining and the cutting of the fiber webs W1, W2, the cut end WE of the fiber web W2, i.e. the broke, beginning end WE of the fiber web continues its travel to the broke handling device 42 via the opening 40 in the maintenance level 41. Advantageously, as a counter device for the tensioning device 45 the counter roll 43 is arranged and the fiber web W2 is gripped between the tensioning device 45 and the counter roll 43. The tensioning device 45 is movable between a resting position and a tensioning position and it may also have a web guiding position, as the tensioning device 45 may also function as a transfer device for the cut beginning end WE of the fiber web, to be used for example, in cases where the opening 40 is remotely located in respect of the joining device 30, 20. Advantageously, the tensioning device 45 comprises a continuous belt loop running and supported by two or more rolls located inside the belt loop and thus, belt nip is formed between the tensioning device 45 and its counter roll 43, when they are in operation i.e. providing the tensioning and straightening of the fiber web W2 with the joining device 30, 20.

[0036] In the stage shown in figure 1A the fiber web W1 is running out from the first unwinder 11 with the running-out parent roll and the next, new parent roll to be unwound is in the second unwinder 12. The beginning end of the fiber web W2 running from the parent roll in the second unwinder 12 is guided freely via the opening 40 in the maintenance level 41 towards the broke handling device 42. The tool element 30 of the joining device 30, 20 is in its resting position. Also, the tensioning device 45 is in its resting position.

[0037] In the stage shown in figure 1B the tool element 30 of the joining device 30, 20 has been moved towards the counter element 20 and the fiber web W1 from the first unwinder 11 and the fiber web W2 from the second unwinder 12 are running between the tool element 30 and the counter element 20. The tensioning device 45 has been moved to be in contact with the counter roll 43 and the beginning end of the fiber web W2 coming from the next parent roll to be unwound is tensioned and straightened between the joining device 30, 20 and the

tensioning device 45 and its counter roll 43. The beginning end of the fiber web W2 running from the parent roll in the second unwinder 12 is guided via the opening 40 in the maintenance level 41 towards the broke handling device 42. As the joining device also a joining device configured to create an abutment joint can be used.

[0038] In the stage shown in figure 1C the tool element 30 is in the joining position and the ends of the fiber webs W1, W2 are joined by the joining device and cut. The beginning end of the fiber web W2 running from the parent roll in the second unwinder 12 is guided via the opening 40 in the maintenance level 41 towards the broke handling device 42.

[0039] In the stage shown in figure 1D the tool element 30 has been moved from the joining position towards the resting position to the tensioning position. The fiber web W2 is running to the next process section, for example to a slitting section. The cut, beginning end WE is gripped between the tensioning device 45 and its counter roll 33 at the cut end and the free end of the cut, beginning end WE is guided towards the broke handling device 42. At next, the grip between the tensioning device 45 and its counter roll 33 is released, the tool element 30 is returned to the resting position and the beginning end WE i.e. the broke end WE of the fiber web W2 has been guided via the opening 40 in the maintenance level 41 to the broke handling device 42.

[0040] In the method the unwinding section 10 is run at a crawling speed during the joining of the ends of the fiber webs W1, W2 i.e. during the stages described above in connection with figures 1A-1D.

[0041] In figures 2A-2D is schematically shown an example of an unwinding section 10, which comprises one unwinder 12, at a time of a parent roll change to a new parent roll is performed in the unwinding section 10, in which a trailing end of the fiber web W1 from the running-out parent roll is attached to the beginning end of the fiber web W2 from the new parent roll in the unwinder 12 of the unwinding section 10 and there after the operation continues again as the unwinding of the new parent roll in the unwinder 12. The joining device for attaching the ends of the fiber webs W1, W2 comprises a tool element 30 with a gripping device, which can be for example an under-pressure device providing underpressure as gripping effect, and a joint forming element 31, for example a traversing punching device, advantageously a joining wheel, as well as a counter element 20 for the tool element 30. The gripping device may also be constructed of a fork plate and a gripping plate. In this example the tool element 30 has a fixed position and the counter element 20 is movable between a resting position and a joining position and the counter element 20 also has a tensioning position in between the joining position and the resting position. The tool element 30 is followed in the running direction of the fiber web W1; W2 guide rolls 21, 22, 23 for guiding the fiber web W1; W2 to next processing step in the next section, for example to slitting in a slitting section. Advantageously, the tool element 30 comprises as the

joint forming element 31 a traversing punching device, advantageously a joining wheel with at least one punching element, advantageously at least one punching blade, advantageously several punching elements, advantageously several punching blades, and is configured to punch the overlapping ends of the fiber webs W1, W2 and simultaneously to join the ends of the fiber webs W2, W2. The joining wheel with punching elements is configured to move across the fiber webs in cross-direction in a traversing way. The joining wheel 31 is advantageously an idle wheel and its rotating movement is provided by the fiber webs. The counter element 20 for the tool element 30 is advantageously planar in its main outer form and may be provided with grooves for the punching elements of the joining wheel 31. The beginning end of the fiber web running from the new parent roll is moved to the joining position by the counter element 20. In the method and by the joining device the trailing end of the fiber web W1 from the running-out parent roll and the beginning end of the fiber web W2 from the new parent roll are guided to an overlapping position and pressed together by the tool element 30 and the counter element 20 simultaneously punching joining cuts by the punching elements of the traversing punching device 31 to both ends of the fiber webs W1, W2 such that a joint in tension direction of the fiber webs W1, W2 is achieved. The overlapping trailing end and beginning end of the fiber webs W1, W2 are punched by the at least one punching element of the traversing punching device 31 and provided with a joint cut form and tension of the fiber webs W1, W2 finalizes the locking between the ends of the fiber webs W1, W2 together such that the joint is formed. The form of the joint cut can vary and is selected depending on grade of the fiber web and on thickness of the fiber web. The unwinding section 10 also comprises a tensioning device 45 and a counter roll 43 functioning with the tensioning device 45 for tensioning and straightening the fiber web W2. The end of the fiber web W2 from the new parent roll is guided through an opening 40 or like in a maintenance level 41, for example in a floor, to a broke handling device 42, for example to the pulper, such, that the fiber web W2 to be joined is located between the tensioning device 45 and the joining device 30, 20. The fiber web W2 to be joined is tensioned and straightened before joining of the end of the fiber web W1 from the running-out parent roll and the end of the fiber web W2 from the next parent roll to be unwound by the tensioning device 45. After the joining and the cutting of the fiber webs W1, W2, the cut end WE of the fiber web W2, i.e. the broke, beginning end WE of the fiber web continues its travel to the broke handling device 42 via the opening 40 in the maintenance level 41. Advantageously, as a counter device for the tensioning device 45 the counter roll 43 is arranged and the fiber web W2 is gripped between the tensioning device 45 and the counter roll 43. The tensioning device 45 is movable between a resting position and a tensioning position and it may also have a web guiding position, as tensioning device 45 may also function as a transfer device for

the cut beginning end of the fiber web WE, to be used for example, in cases where the opening 40 is remotely located in respect of the joining device 30, 20. Advantageously, the tensioning device 45 comprises a continuous belt loop running and supported by two or more rolls located inside the belt loop and thus, belt nip is formed between the tensioning device 45 and its counter roll 43, when they are in operation i.e. providing the tensioning and straightening of the fiber web W2 with the joining device 30, 20. As the joining device also a joining device configured to create an abutment joint can be used.

[0042] In the stage shown in figure 2A the fiber web W1 is running out from the running-out parent roll and its trailing end is held by the tool element 30 of the joining device 30, 20. The next, new parent roll to be unwound is ready for unwinding and the trailing end of the fiber web W2 running from the new parent roll is guided via the counter element 20 of the joining device 30, 20 and between the tensioning device 45 and its counter roll 43 through the opening 40 in the maintenance level 41 towards the broke handling device 42. The counter element 20 of the joining device 30, 20 is in its resting position.

[0043] In the stage shown in figure 2B the counter element 20 of the joining device 30, 20 has been moved towards the tool element 30 to its tensioning position and the fiber web W2 is tensioned and straightened between the counter element 20 of the joining device 30, 20 and the tensioning device 45 and its counter roll 43. The beginning end WE of the fiber web W2 running from the parent roll is guided via the opening 40 in the maintenance level 41 towards the broke handling device 42.

[0044] In the stage shown in figure 2C the counter element 20 is in the joining position and the ends of the fiber webs W1, W2 are joined by the joining device 30, 20 and the beginning end WE of the fiber web from the new parent roll is cut off. The beginning end WE of the fiber web W2 is running between the tensioning device 45 and its counter roll 43 and guided via the opening 40 in the maintenance level 41 towards the broke handling device 42.

[0045] In the stage shown in figure 2D the fiber web W2 from the new parent roll in the unwinder 12 is running to the next process section, for example to a slitting section. The cut, beginning end WE is gripped between the tensioning device 45 and its counter roll 43 and the cut, beginning end WE is guided towards the broke handling device 42. At next, the grip between the tensioning device 45 and its counter roll 43 is released, the counter element 20 is returned to the resting position and the beginning end WE, i.e. the broke end WE has been guided via the opening 40 in the maintenance level 41 to the broke handling device 42.

[0046] In the description in the foregoing, although some functions have been described with reference to certain features, those functions may be performable by other features whether described or not. Although features have been described with reference to certain

embodiments or examples, those features may also be present in other embodiments or examples whether described or not. Above the invention has been described by referring to some advantageous examples only to which the invention is not to be narrowly limited. Many modifications and alterations are possible within the invention as defined in the following claims.

Reference signs used in the drawing

[0047]

10 unwinding section
11, 12 unwinder
20 counter element
21, 22, 23, 24 guide roll
30 tool element
31 joint forming element
32 support roll
40 opening
41 maintenance level
42 broke handling device
33, 43 counter roll for the tensioning device
45 tensioning device
W1 fiber web from running-out parent roll
W2 fiber web from next, new parent roll
WE end of the fiber web

Claims

1. Unwinding section for unwinding a fiber web (W1; W2) from a parent roll, which unwinding section (10) comprises at least one unwinder (11, 12) for unwinding a fiber web (W1; W2) from a parent roll and a joining device (20, 30) configured to join a trailing end of a running-out parent roll to a beginning end of a next, new parent roll to be unwound in a parent roll change, and which unwinding section (10) comprises or is located in vicinity of a broke handling device (42) configured to handle broke, which unwinding section further comprises a tensioning device (45) configured to tension and straighten the fiber web (W2) to be joined between the tensioning device (45) and the joining device (20, 30) before joining of the end of the fiber web from the running-out parent roll and the end of the fiber web from the next parent roll to be unwound, **characterized in, that** the tensioning device (45) is located between the joining and the broke handling and that the tensioning device (45) is configured to guide the cut beginning end (WE) of the fiber web (W2) from the next parent roll to be unwound after the joining of the ends of the fiber webs in the parent roll change to the broke handling device (42).
2. Unwinding section according to claim 1, **characterized in, that** the unwinding section (10) is located on

a maintenance level (41) comprising an opening (40) for removal of broke fiber web to the broke handling device and that the tensioning device (45) is located above the opening (40) and downstream in running direction of the fiber web (W2) running from the next parent roll to be unwound from the joining device (20, 30).

3. Unwinding section according to claim 1 or 2, **characterized in, that** the tensioning device (45) is configured to guide the beginning end of the fiber web (W2) from the next parent roll to be unwound towards the opening (40) and the broke handling device (42).
4. Unwinding section according to any of claims 1 - 3, **characterized in, that** the unwinding section (10) comprises a counter roll (43) for the tensioning device (45), that the counter roll (43) is configured to provide a tensioning effect with the tensioning device (45) and that the fiber web (W2) from the next parent roll to be unwound is configured to be guided between the counter roll (43) and the tensioning device (45).
5. Unwinding section according to any of claims 1 - 4, **characterized in, that** the tensioning device (45) is movable between a resting position and a tensioning position.
6. Unwinding section according to any of claims 1 - 5, **characterized in, that** the tensioning device (45) comprises a continuous belt loop running and supported by two or more rolls located inside the belt loop.
7. Unwinding section according to any of claims 1 - 6, **characterized in, that** the unwinding section (10) comprises two unwinders (11, 12) and that the joining device (20, 30) comprises a movable tool element (30) and a stationary counter element (20).
8. Unwinding section according to any of claims 1 - 7, **characterized in, that** the unwinding section (10) comprises only one unwinder (12) and that the joining device (20, 30) comprises a stationary tool element (30) and a movable counter element (20).
9. Unwinding section according to any of the previous claims, **characterized in, that** the unwinding section (10) is an unwinding section of a slitter-winder.
10. Method for joining ends of fiber webs in a parent roll change of an unwinding section (10) located in vicinity of or comprising a broke handling device (42) configured to handle broke, in which method the ends of the fiber webs (W1, W2) are configured to be joined by a joining device (20, 30), in which method the fiber web (W2) running from a next

parent roll to be unwound is tensioned and straightened by a tensioning device (45) before joining of the end of the fiber web from the running-out parent roll and the end of the fiber web from the next parent roll to be unwound, **characterized in, that** by the tensioning device located between the joining and the broke handling the cut beginning end (WE) of the fiber web (W2) from the next parent roll to be unwound after the joining of the ends of the fiber webs in the parent roll change is guided to the broke handling device (42). 5 10

11. Method according to claim 10, **characterized in that** in the method the fiber web (W2) running from the next parent roll to be unwound is tensioned and straightened by the tensioning device (45) above a maintenance level (41). 15

12. Method according to claim 10 or 11, **characterized in that** in the method the fiber web (W2) running from a next parent roll to be unwound is further tensioned and straightened by a tensioning device (45) simultaneously and after joining of the end of the fiber web from the running-out parent roll and the end of the fiber web from the next parent roll to be unwound. 20 25

13. Method according to any of claims 10 - 12, **characterized in that** in method the ends of the fiber webs (W1, W2) are configured to be joined by a joining device (20, 30) comprising a tool element (30) and a counter element (20) and the trailing end of the fiber web (W1) from the running-out parent roll and the beginning end of a new fiber web (W2) from the next parent roll are guided to an overlapping position between the tool element (30) and the counter element (20) for joining and that the beginning end of the fiber web (W2) running from the next parent roll to be unwound is tensioned between the joining device (30, 20) and the tensioning device (45). 30 35 40

14. Method according to any of claims 10 -13, **characterized in that** in the method the unwinding section (10) is run at a crawling speed during the joining of the ends of the fiber webs (W1, W2). 45

50

55

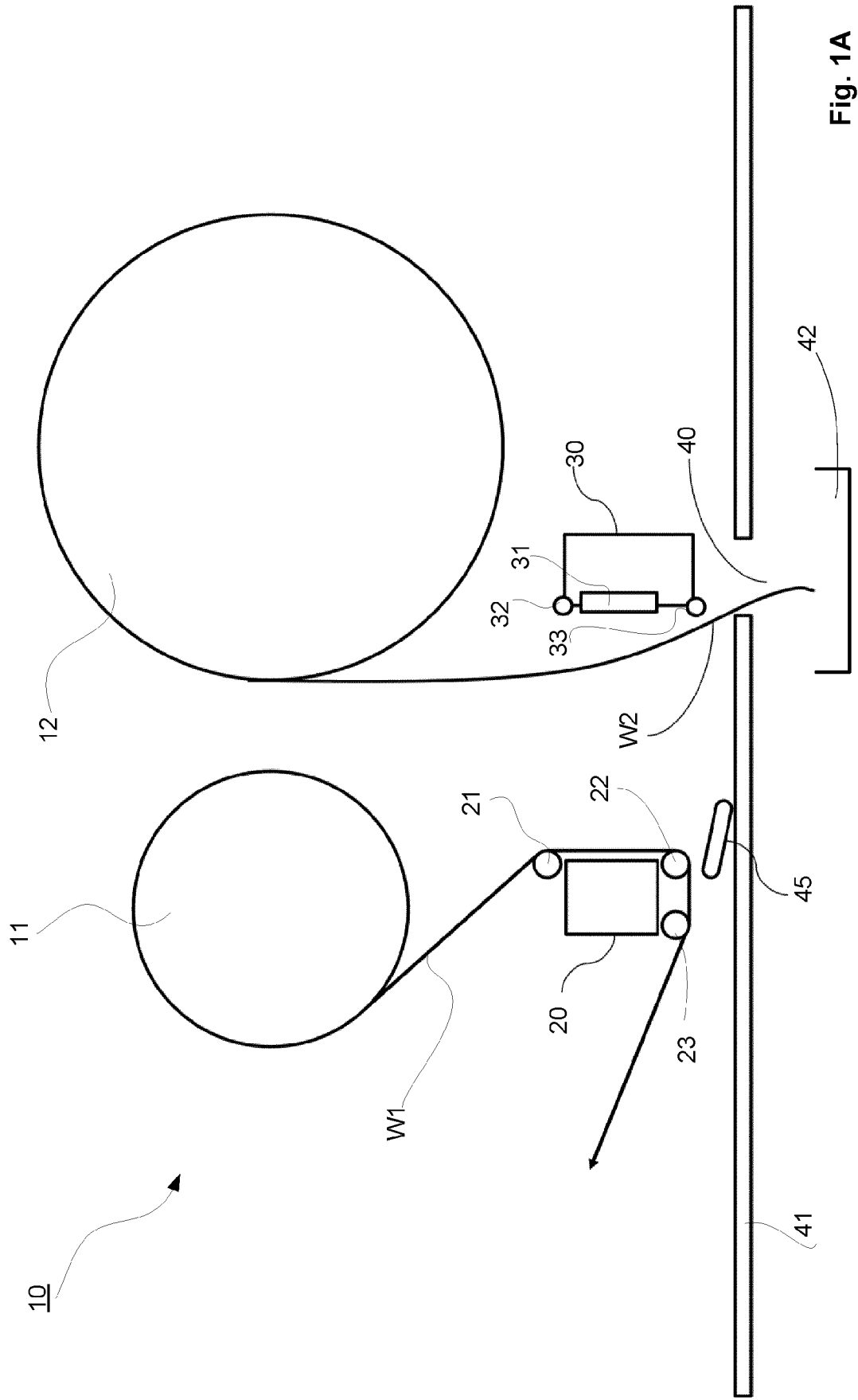
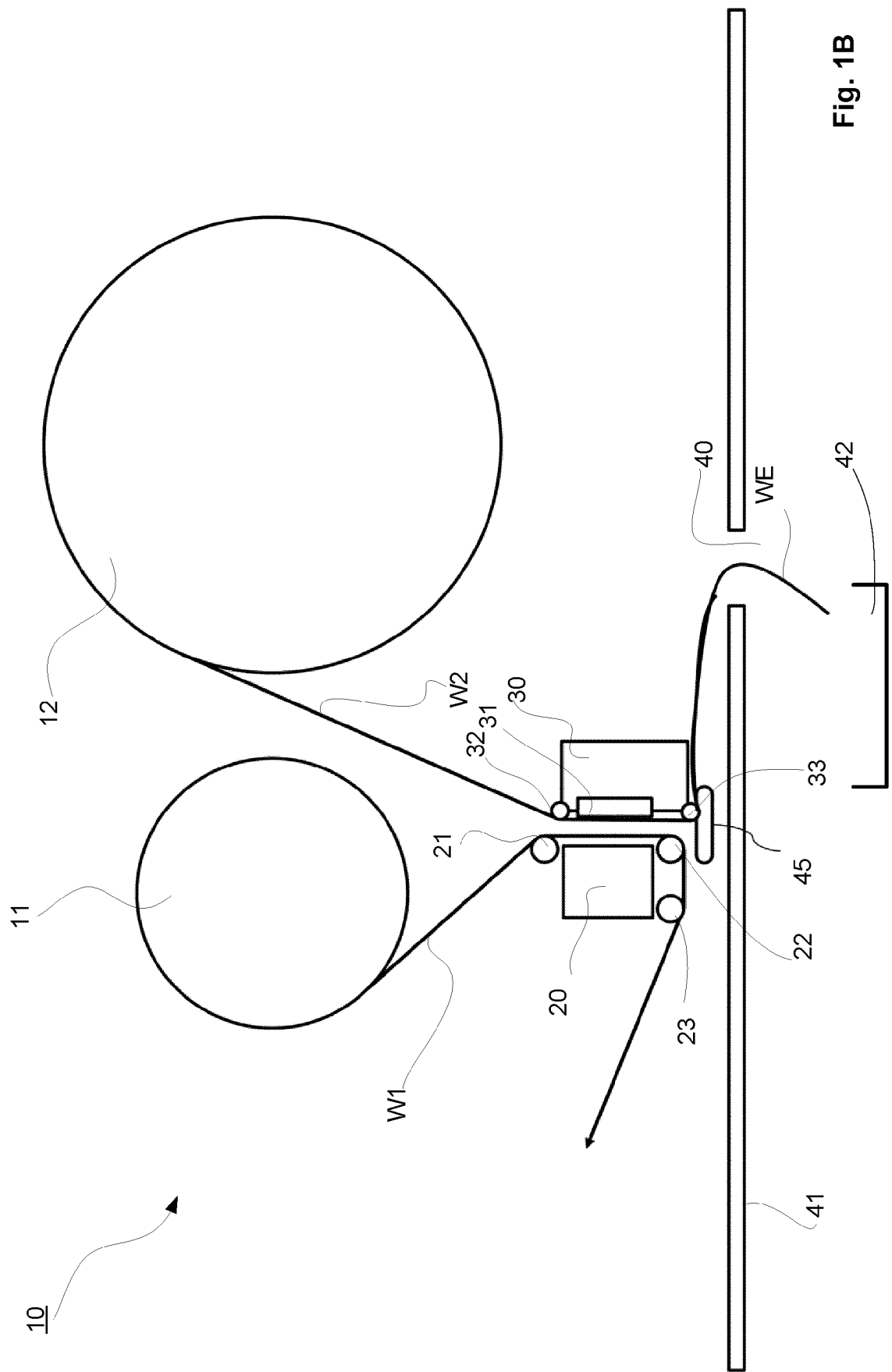


Fig. 1A



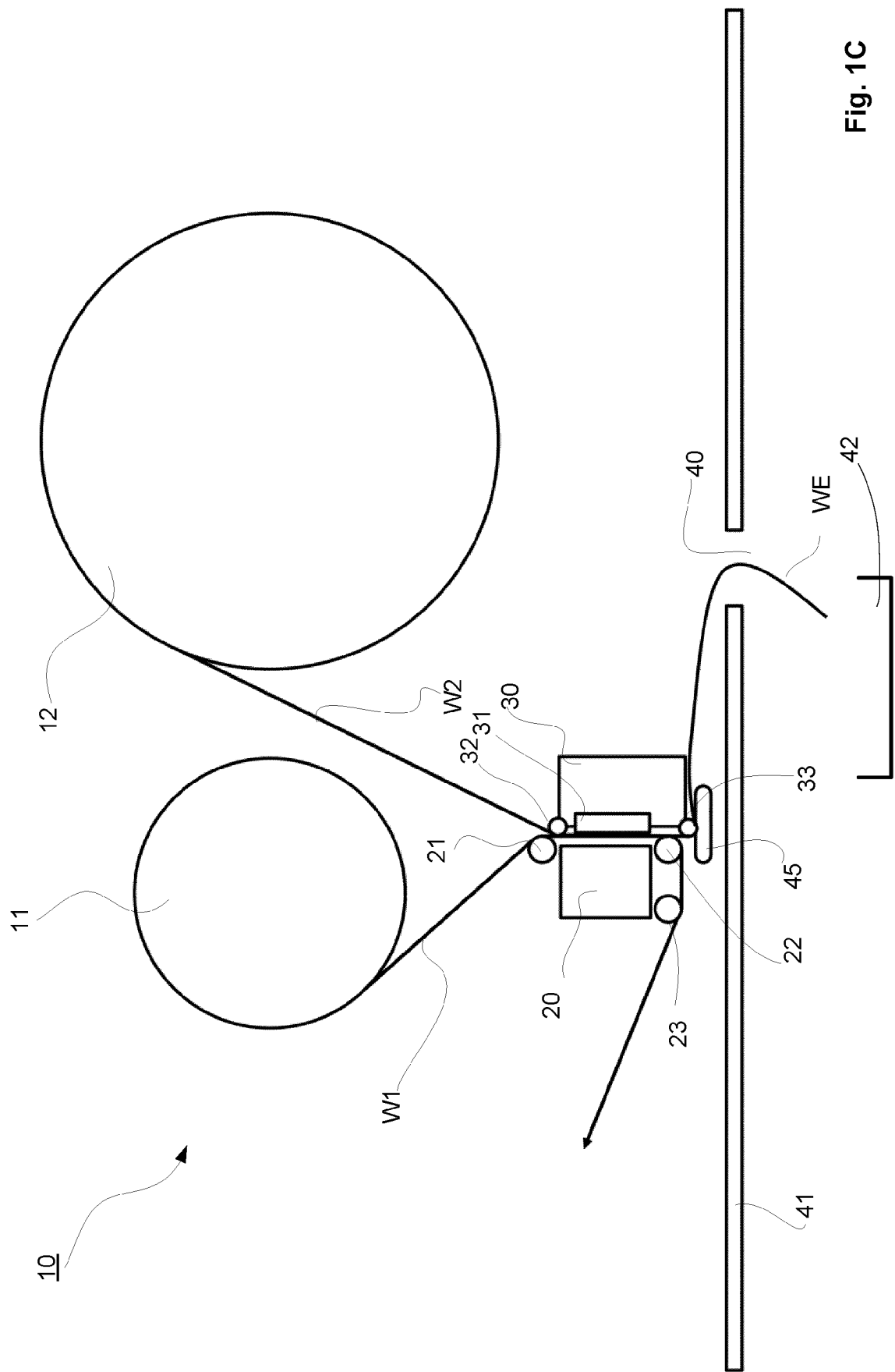


Fig. 1C

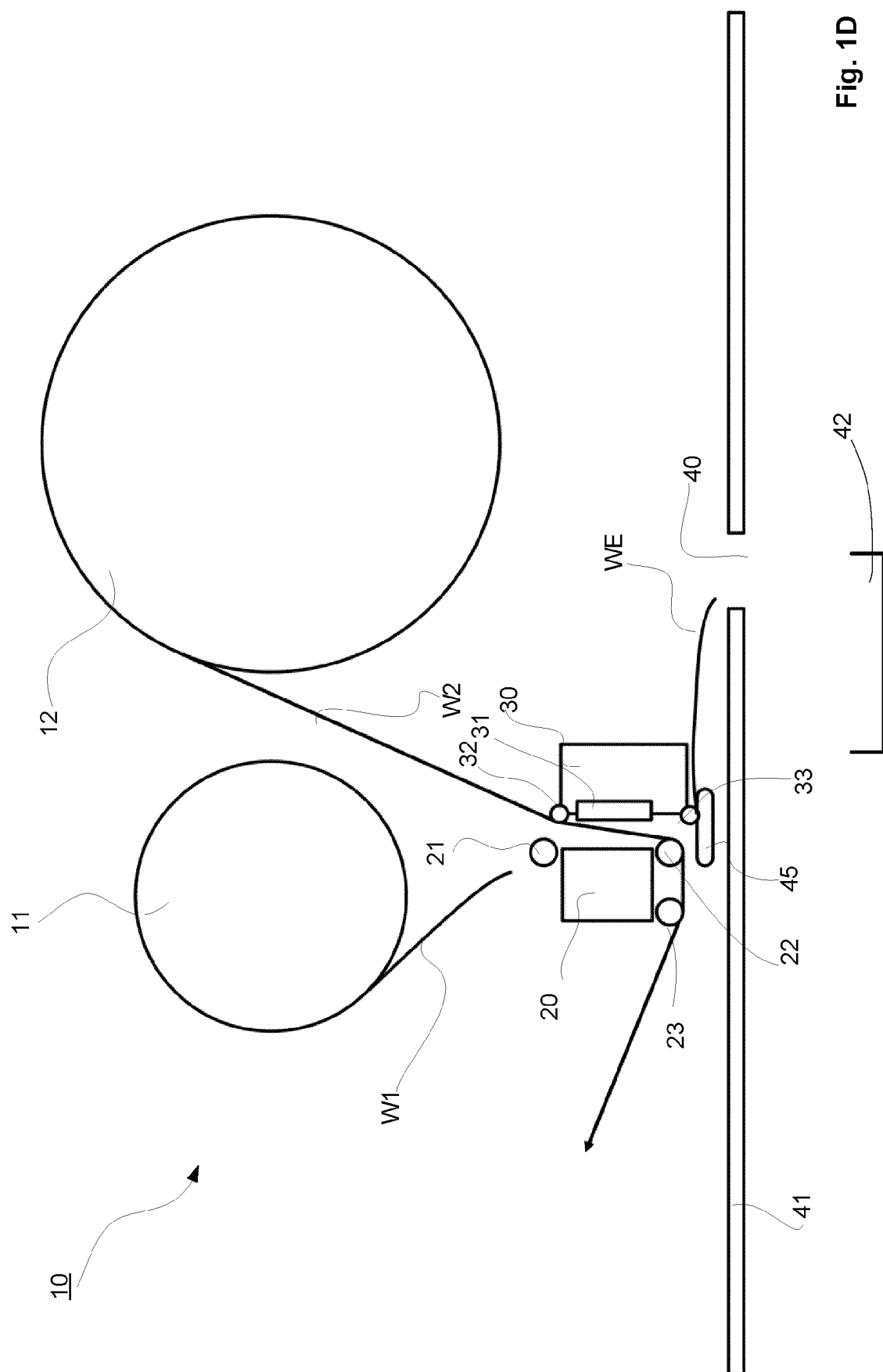


Fig. 1D

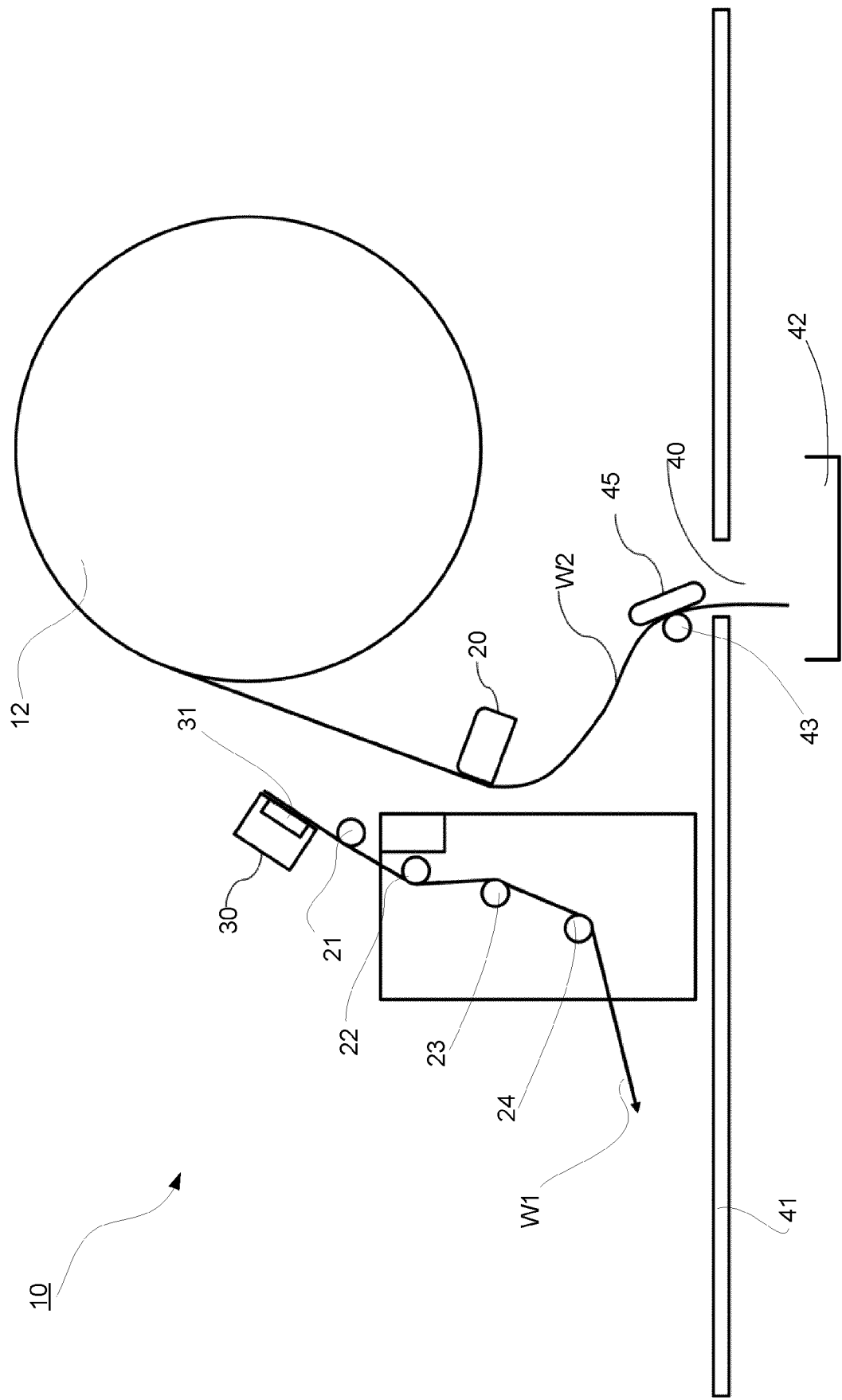


Fig. 2A

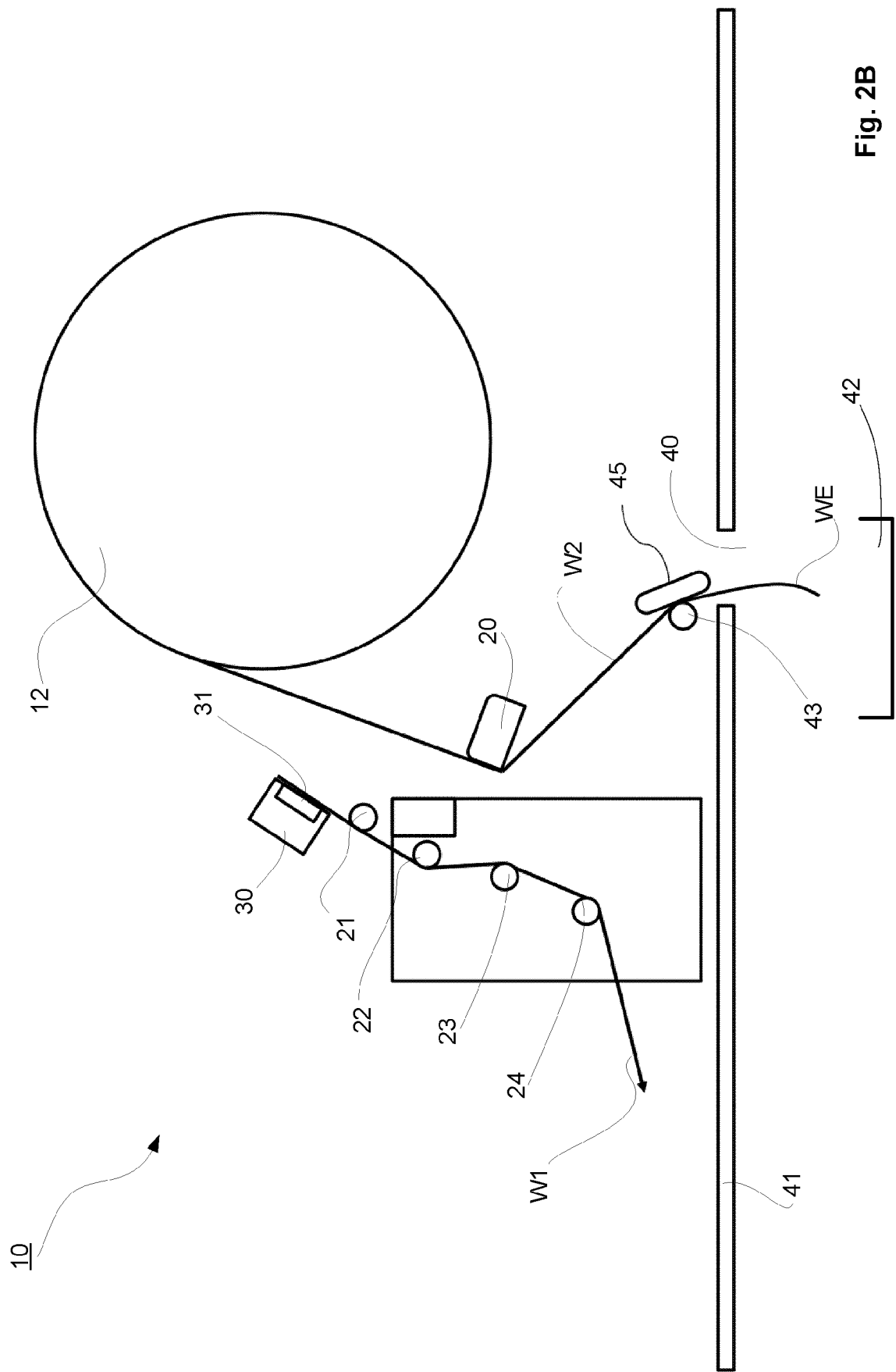
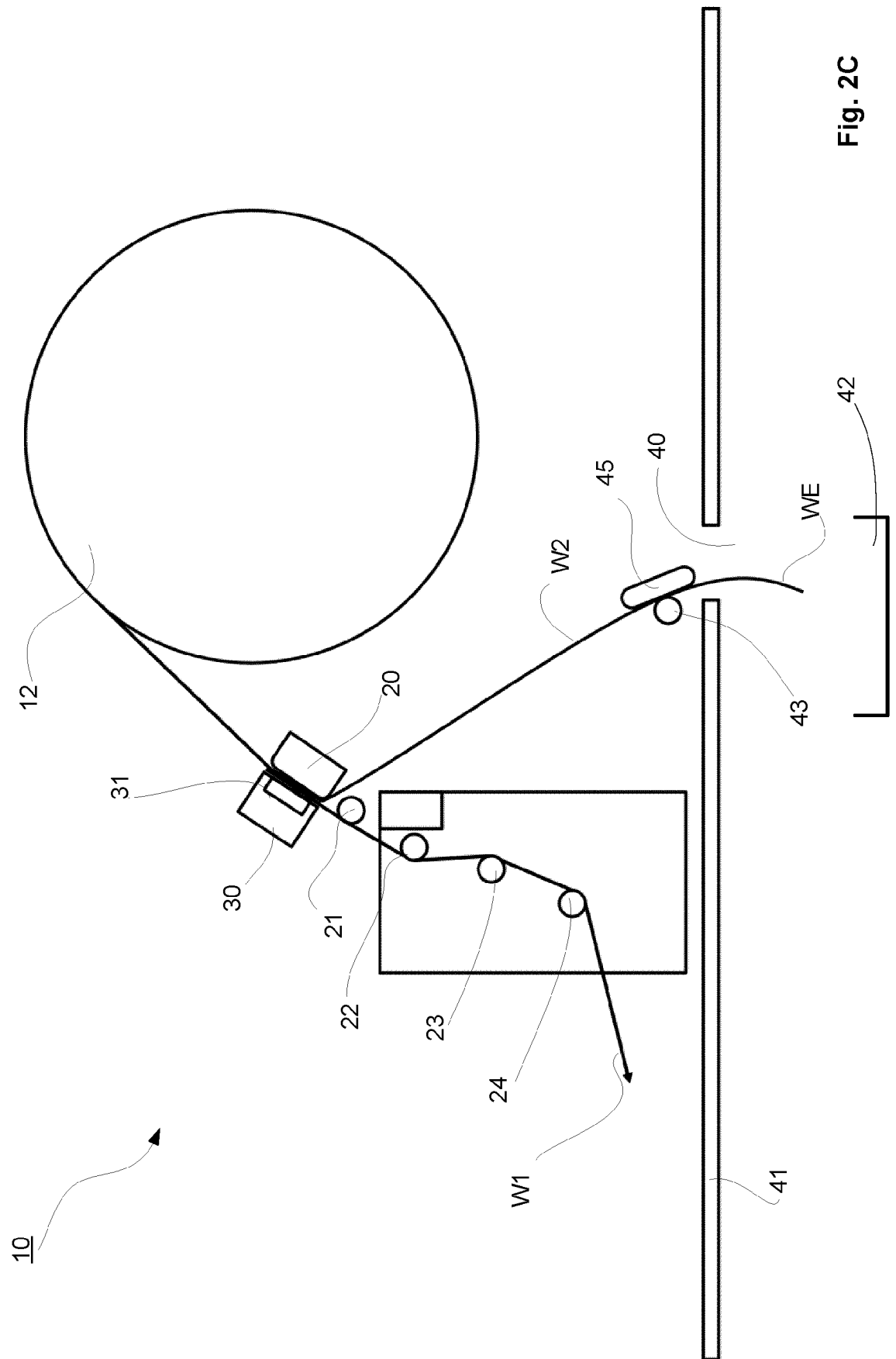


Fig. 2B



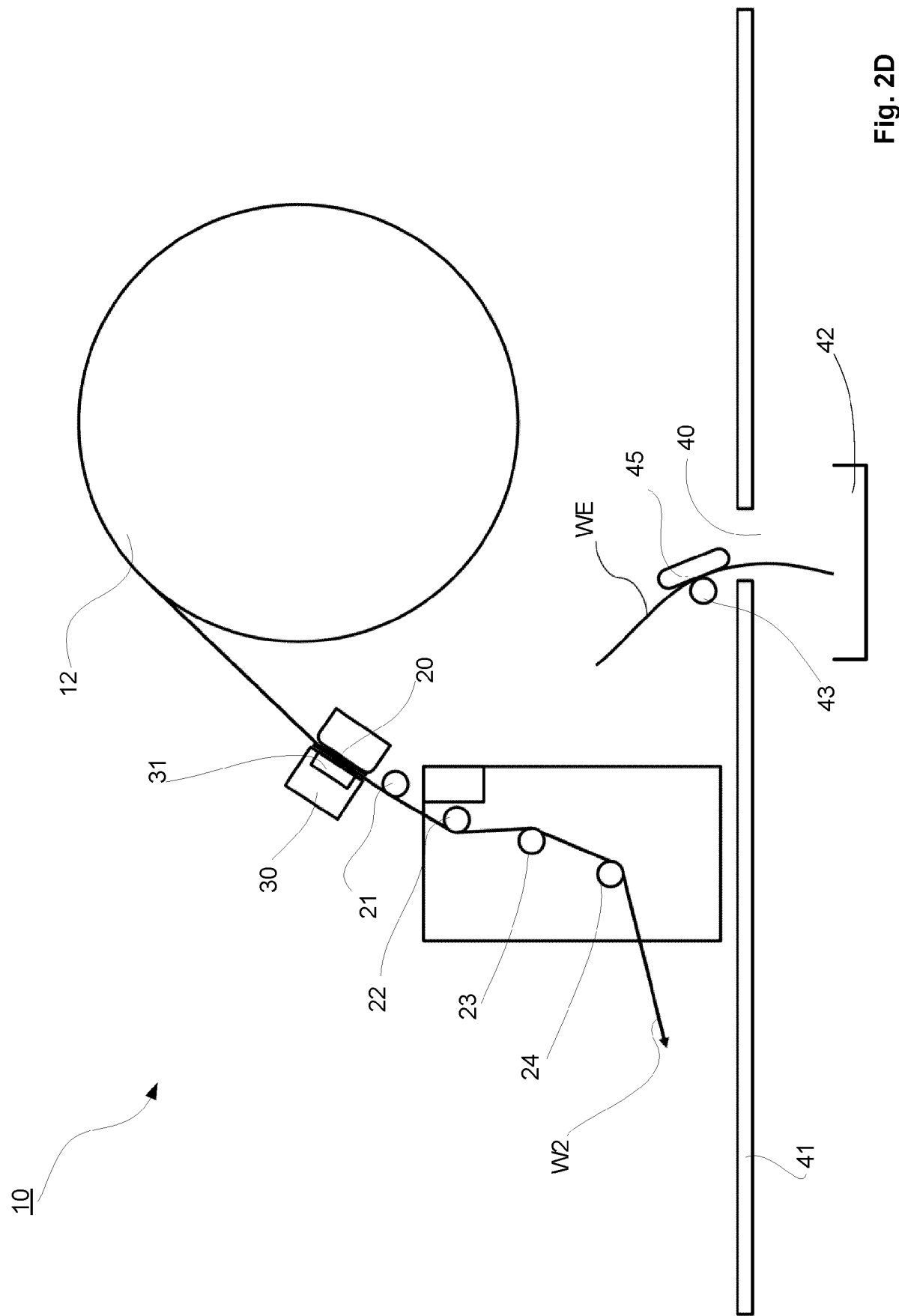


Fig. 2D



EUROPEAN SEARCH REPORT

Application Number

EP 24 17 4265

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 4 105 155 A1 (VALMET TECHNOLOGIES OY [FI]) 21 December 2022 (2022-12-21) -----	1,10	INV. B65H19/18
A	WO 2010/052374 A1 (METSO PAPER INC [FI]; ENWALD PETRI [FI] ET AL.) 14 May 2010 (2010-05-14) * the whole document *	1,10	
A	US 2004/129374 A1 (HEBELS ALBERT-BEREND [DE] ET AL) 8 July 2004 (2004-07-08) * paragraph [0044] - paragraph [0051]; figures *	1,10	
A	FR 2 272 933 A1 (BODENAN ROBERT [FR]) 26 December 1975 (1975-12-26) * claims; figures *	1,10	
A	FR 2 540 846 A1 (GD SPA [IT]) 17 August 1984 (1984-08-17) * the whole document *	1,10	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65H
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		29 October 2024	Haaken, Willy
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 24 17 4265

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29 - 10 - 2024

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
EP 4105155	A1	21-12-2022	CN	115477185 A		16-12-2022
			EP	4105155 A1		21-12-2022
			FI	129673 B		30-06-2022
			US	2022396444 A1		15-12-2022

WO 2010052374	A1	14-05-2010	AT	511278 A1		15-10-2012
			DE	112009002639 T5		16-05-2012
			FI	20086060 A		11-05-2010
			WO	2010052374 A1		14-05-2010

US 2004129374	A1	08-07-2004	CN	1488299 A		14-04-2004
			EP	1389603 A1		18-02-2004
			ES	2277976 T3		01-08-2007
			JP	4426230 B2		03-03-2010
			JP	2004073201 A		11-03-2004
			PL	361640 A1		23-02-2004
			US	2004129374 A1		08-07-2004

FR 2272933	A1	26-12-1975	NONE			

FR 2540846	A1	17-08-1984	BR	8307263 A		13-11-1984
			DE	3346592 A1		16-08-1984
			FR	2540846 A1		17-08-1984
			GB	2135283 A		30-08-1984
			IT	1169165 B		27-05-1987
			JP	S59149258 A		27-08-1984

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- FI 121007 B [0005]
- FI 129673 [0007]
- WO 129673 A [0007]