

12

EUROPEAN PATENT APPLICATION

21 Application number: 88202070.4

51 Int. Cl.4: D03J 1/00

22 Date of filing: 23.09.88

30 Priority: 09.10.87 BE 8701155

43 Date of publication of application:
12.04.89 Bulletin 89/15

84 Designated Contracting States:
CH DE FR IT LI

71 Applicant: Picanol N.V.
Polenlaan 3-7
B-8900 Ieper(BE)

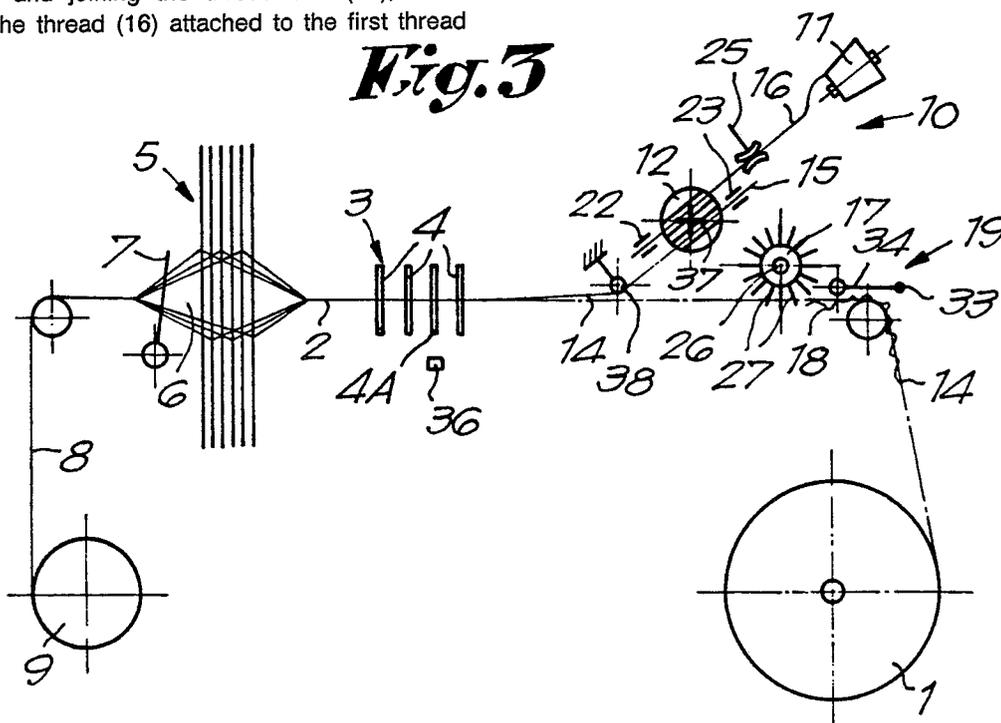
72 Inventor: Shaw, Henry
Zuiddreef 5
B-8982 Vleteren(BE)

74 Representative: Donné, Eddy
Bureau M.F.J. Bockstael nv Arenbergstraat
13
B-2000 Antwerpen(BE)

54 Method for repairing a broken warp thread on weaving machines, and device which uses this method.

57 The method consists in joining a thread end (15) attached to the cloth (8) to a separate thread (16); restarting the weaving machine; separating the second thread end (18), preferably by combing out the warp sheet using a rotating comb-shaped mechanism (17); and joining the thread end (18), when found, to the thread (16) attached to the first thread end.

Fig. 3



EP 0 311 168 A1

Method for repairing a broken warp thread on weaving machines, and device which uses this method

This invention concerns a method for repairing a broken warp thread on weaving machines, and devices which use this method, in particular for repairing warp threads in the case of breakages occurring between the warp beam and warp stop motion.

It is known that weaving machines are automatically stopped in the case of a break in a warp thread. The stop signal is generally supplied by a warp stop motion consisting of drop wires which are suspended from the taut warp threads, and which fall down in the case of a break in the warp thread, and make contact with an electrode, as known from Belgian patent no. 899.347, for example.

To carry out a repair, the weaver must then join a section of thread between the two thread ends of the broken thread, after which weaving can continue.

The object of the present invention is a method whereby the repair of a broken warp thread occurring between the warp beam and warp stop motion can be performed automatically and efficiently, in other words, with very brief weaving machine down time.

The method consists essentially in: joining the first thread end of the broken warp thread which is attached to the cloth to a thread from a separate thread supply; restarting the weaving machine; operating on the warp threads adjacent to the above-mentioned thread from the separate thread supply, by means of a device that can operate on the warp threads, by which a thread end can be separated from the warp sheet; and detecting whether the second thread end, attached to the warp beam, has been separated from the warp sheet; and, if said second thread end is detected on said device, joining the second thread end to said thread from the thread supply, after which weaving from the warp beam can continue. In the preferred embodiment, if the second thread end is not detected after a certain time, said device is automatically deactivated, and the required warp thread continues to be taken from the separate thread supply. Said device for operating on the warp threads preferably consists of a rotating comb-shaped mechanism which combs out the warp sheet.

Among the advantages offered by this method are the capability to continue weaving during combing-out of the warp sheet, and the fact that, because the combing-out of the warp sheet occurs at the point where the thread from the separate thread supply is supplied, the second thread end is presented by the comb-shaped mechanism in the

immediate vicinity of said thread from the separate thread supply, so that presenting and joining this second thread end and the above-mentioned thread takes very little time, and also, the repair device can be very compact.

The present invention also concerns a device which uses the above-mentioned method, which can be part of a single weaving machine, or can be so constructed that it serves several weaving machines.

In order to explain the characteristics of the invention, several preferred embodiments are described below, by way of example only and without being limitative in any way, with reference to the accompanying drawings, where:

- fig. 1 is a schematic diagram of a device according to the invention, showing the first step of the method;

- fig. 2 is a more detailed representation of the part labelled F2 in fig. 1;

- figs. 3, 4 and 5 represent the same device as in fig. 1, showing three other steps of the method;

- fig. 6 shows a variant of the device, and more specifically the part that positions the comb-shaped mechanism.

It should be noted that the figures are purely schematic, and that, for the sake of clarity, a number of components are shown in larger scale in the figures.

Fig. 1 is a schematic diagram of a weaving machine with the following components, which themselves are common technology: the warp beam 1, the warp sheet 2, the warp stop motion 3 with several rows of drop wires 4, the harnesses 5, the shed 6, the reed 7, the woven cloth 8, and the cloth beam 9.

According to the present invention, the weaving machine includes a device 10 for carrying out the above-mentioned method, consisting essentially of the combination of: a separate thread supply 11; a mechanism 12 for joining the first thread end 15 resulting from the break 13 in the broken warp thread 14, which is still attached to the cloth 8, to the thread 16 from said separate thread supply; a rotating comb-shaped mechanism 17 that can operate on the warp sheet 2 in order to separate the second thread end 18 from the warp sheet 2, where said second thread end 18 is still attached to the warp beam 1; a detector 19 for detecting whether or not the second thread end 18 has been separated from the warp sheet 2; a mechanism for joining the second thread end 18 to the thread 16 attached to the first thread end 15, for which the

above-mentioned mechanism 12 is preferably used in the embodiment shown; and a control unit 20, which controls all the above-mentioned components as well as the main drive 21 of the weaving machine, according to a cycle that corresponds to the method described above. A number of mobile thread clips 22, 23 and 24, are also shown in the figures. Their primary purpose is to keep during the joining of said thread 16 to the thread ends 15 and 18, these threads tensioned. A thread tensioner 25 can also be provided on the thread 16 from the separate thread supply 11.

It should be noted that the mechanism 12 for joining the above-mentioned threads together can be of any type. It can, for example, consist of a knotting device similar to that described in German patent No. 599.681. It can also consist of a device to form what is known as a welded splice. As the mechanism 12 in itself is common technology, it is only shown schematically in the figures.

The rotating comb-shaped mechanism 17 consists essentially of a shaft 26 provided with radial projections 27 or suchlike. The projections 27 can, for example, consist of spokes, blades or brush hairs. The mechanism 17 is mounted so that it can be presented to the warp sheet 2 in such a way that the projections 27 mesh with the warp sheet 2 and unravel from the warp sheet 2 any free thread ends, such as the thread end 18. The shaft 26 can be constructed such that it extends over the full width of the weaving machine.

As shown in fig. 2, the comb-shaped mechanism 17 can, for example, be mounted on a unit 28 which can travel along a rail 29 serving one or more weaving machines. The comb-shaped mechanism 17 can thus be presented to the warp sheet 2 by means of the outward movement of one or more pneumatic cylinders 30. The drive of the mechanism 17 consists of a motor 31 which provides the rotating movement of the mechanism 17 by means of a suitable transmission 32, for example a belt transmission.

The comb-shaped mechanism 17, which is equipped with the above-mentioned detector 19, can for example consist of a rotating arm 34 pivoting about a fixed point 33, which takes up another position if a thread is pressed against it, thereby opening and/or closing a contact 35.

Both the comb-shaped mechanism 17 and the detector 19 used with it are known in themselves, from Swiss patent No. 275.761, etc. A variant is described in U.S. patent No. 3.902.534.

The operation of the device according to the invention, which also corresponds to the method according to the invention, can be simply deduced from figs. 1 to 5.

Fig. 1 is a schematic diagram of a situation in which a thread break 13 has occurred between the

warp beam 1 and the warp stop motion 3 of a weaving machine. As a result, the drop wire 4A resting on the broken warp thread 14 falls down onto the corresponding electrode 36, so that an electric contact is made. This signal is used in the conventional manner to shut down the main drive 21 of the weaving machine, via the above-mentioned control unit 20. As a result of the warp stop motion signal, the control unit 20 will initiate the above-mentioned cycle.

As shown in figs. 1 and 3, the thread end 15 is first located and gripped, for example in clip 23. Methods for the location of the thread end 15 in the warp sheet 2 are also known; one such method, for instance, is described in Belgian patent application no. 8700254 made by the present applicant, and so will not be further explained here. As shown in fig. 1, the thread 16 from the separate thread supply 11 is kept in readiness by means of clip 22.

As shown in fig. 3, the mechanism 12 is presented in an appropriate manner respectively to the thread end 15 and the thread 16 from the separate thread supply 11, and a join, such as a knot 37, is made. It will be noted here that the thread end 15 and the thread 16 are tensioned so that they are aligned, before the join 30 is made; in other words, they are essentially parallel to the line connecting the thread guide 38 located adjacent to the warp sheet 2 and the thread tensioner 25.

In the meantime the rotating comb-shaped mechanism 17 is actuated by the above-mentioned pneumatic cylinder 30 and motor 31, so that it can operate on the warp sheet 2 in order to detect the thread end 18. As shown in fig. 3, this thread end is generally tangled among the warp threads 2.

According to the present method, once the knot 37 has been made, the weaving machine is restarted so that weaving can continue early. When making the knot 37, or afterwards, care should of course be taken to ensure that the newly-formed warp thread 14A is and remains tensioned, for example with the help of the above-mentioned thread tensioner 25. Automatic start-up of the weaving machine drive 21 can be initiated given two data items: firstly, that the mechanism 12 has made the knot 37, and secondly, that the fallen drop wire 4A has been disconnected from the corresponding electrode 36 by the tautening of the new warp thread 14A.

Clearly, after a certain lapse of time the second thread end 14 will be combed out of the warp sheet 2 by the comb-shaped mechanism 17, as shown in fig. 4, for example, and this will cause the contact 35 on the detector 19 to close.

As shown in fig. 5, the second thread end 18 is then preferably joined to the above-mentioned warp thread 14A, or in other words thread 16, using the same mechanism 12 to make the join 39, which

may for example be a knot, or using some other mechanism. For this purpose the second thread end 18 is withdrawn from the comb-shaped mechanism 17 by a hook-shaped clip 24 and presented to the knotting device or other mechanism.

Clearly, the weaving machine does not necessarily have to be stopped while the join 39 is being made. It should also be noted that the join 39 is made with the thread end 18 and the warp thread 14A taut and substantially in the same plane as the warp sheet 2, so that, after the join 31 has been made, the completely repaired warp thread 14A remains taut.

It is also clear that after the join 39 has been made, the various components, such as the above-mentioned mechanism 12, the mechanism 17 and the clip 22, are returned to their rest position, as shown in fig. 1.

In a particular embodiment, the rotating comb-shaped mechanism is deactivated if no further thread ends are observed after a given period of time. The new warp thread then continues to be fed from the separate thread supply.

Clearly, the above-mentioned special thread supply 11 does not have to consist of a reel or spool, but can also consist of a piece of thread of a particular length.

In a variant, shown in fig. 6, a rotating comb-shaped mechanism 17 that occupies only part of the width of the warp sheet can also be used. In this case the mechanism 17 is moved transversely across the warp sheet 2 by positioning devices 40 until it reaches the location of the fallen drop wire 4A, which corresponds to the location of the broken warp thread 14. A warp stop motion as described in Belgian patent No. 899.347 can be used for this purpose, with the electrode 36 consisting of various zones depending on the width of the cloth. In this case the mechanism 17 should preferably have an axial length equal to the length of one zone, and the mechanism 17 should be positioned above the zone in which the break occurred.

The above-mentioned positioning device 40 may consist, for example, of a slide 41 or similar, from which the mechanism 17 is suspended by means of the above-mentioned pneumatic cylinders 30, and a worm shaft 44 driven by a motor 42 via a gear transmission 43. The worm shaft 44 can mesh with a worm wheel 45 attached to the slide 41, so that the slide 41 can travel over the full width of the cloth.

The transmission 32 as shown in fig. 6, consists of a pinion coupling, but apart from that, it is identical to that shown in fig. 2.

It should also be noted that the above-mentioned automatic start can be performed because the following two conditions are met: firstly, the time lapse between the the weaving machine stop-

ping as a result of a warp break and then restarting is longer than the time required to make the join; and secondly, the above-mentioned drop wire 4A, which is suspended from the repaired warp thread 14A, is no longer in contact with the corresponding electrode 36. It is also self-evident that the automatic start is can be carried out either after making the join 37 or after making the join 39.

Clearly, the clips 22, 23 and 24 can also be controlled in an appropriate manner, and may or may not form part of the unit 28.

It is also clear that the mechanism 17 which operates on the warp sheet in order to separate the second thread end 18 need not necessarily consist of a rotating comb-shaped mechanism.

The present invention is not limited to the embodiments described by way of example and shown in the drawings; on the contrary, such a method for repairing broken warp threads, and the weaving machine which uses this method, can be made in different variants while still remaining within the scope of the invention.

Claims

1. Method for repairing a broken warp thread on weaving machines, in particular for repairing warp threads between the warp beam and warp stop motion, characterized in that it consists essentially in joining the first thread end (15) of the broken warp thread (14), which is attached to the cloth (8), to a thread (16) from a separate thread supply (11); restarting the weaving machine; operating on the warp threads (2) adjacent to the above-mentioned thread (16) from the separate thread supply, by means of a device (17) that can operate on the warp sheet in order to separate a thread end from the warp sheet (2), and detecting whether the second thread end (18), attached to the warp beam (1), has been separated from the warp sheet (2); and, if said second thread end (18) is detected on said device (17), joining the second thread end to said thread (16) from the thread supply (11), after which weaving from the warp beam (1) can continue.

2. Method as in claim 1, characterized in that, if the second thread end (18) is not detected on the above-mentioned device (17) within a given lapse of time, the required warp thread (14A) will continue to be taken from the separate thread supply (11), while the device (17) is deactivated.

3. Method as in claim 1, characterized in that the weaving machine can be automatically started after one of the thread ends (15, 18) has been joined to the thread (16) from the separate thread supply (11), if the following two conditions are met: firstly, the time lapse between the the weaving

machine stopping as a result of a warp break and then restarting is longer than the time required to make the corresponding join (37, 39); and secondly, the drop wire (4A), which is suspended from the repaired warp thread (14, 14A), is no longer in contact with its electrode (36).

4. Method as in claim 1, characterized in that the weaving machine will be automatically restarted after the join (37, 39) between one of the thread ends (15, 18) and the thread (16) from the separate thread supply (11) has been made, if the following two conditions are met: firstly, the mechanism (12) has made the join (37, 39) to between the corresponding thread end (15, 18) and the above-mentioned thread (16); and secondly, the drop wire (4A), which is suspended from the corresponding warp thread (14, 14A), is disconnected from its electrode (36)

5. Method as in claim 3 or 4, characterized in that the drop wire (4A) suspended from the corresponding warp thread (14, 14A) is kept away from its electrode (36) by keeping said warp thread (14, 14A) taut during and after the repair.

6. Method as in any of the above claims, characterized in that the first thread end (15) of the broken warp thread (14) attached to the cloth (8), and the thread (16) from the separate thread supply (11), are joined while being aligned and kept taut.

7. Method as in any of the above claims, characterized in that the second thread end (18) attached to the warp beam (1), and the thread (16) from the separate thread supply (11), which is already joined to the first thread end (15), are joined while being substantially in the same plane as the warp sheet (2) and kept taut.

8. Device as in any of the above claims, characterized in that it consists essentially of a separate thread supply (11); a mechanism (12) for joining the first thread end (15) resulting from a breakage (13) in the warp (2) of a weaving machine, which is still attached to the cloth (8), to the thread (16) from the separate thread supply (11); a device (17) which can separate a thread end from the warp sheet (2) of a weaving machine, and which operates on the warp sheet (2) of the weaving machine adjacent to the supply of the above-mentioned thread (16); a detector (19) that works with the device (17) and detects whether or not a thread end (18) attached to the warp beam (1) has been separated from the warp sheet (2); a mechanism (12) for joining a second thread end (18) separated from the warp sheet (2) to the thread (16) attached to the first thread end (15); and a control unit (20), which activates the above-mentioned device (10) in an appropriate manner after a warp thread breakage.

9. Device as in claim 8, characterized in that the device (17) consists of a rotating comb-shaped mechanism formed by a shaft (26) provided with radial projections (27), which can operate on the warp sheet (2) of a weaving machine.

10. Device as in claim 9, characterized in that the rotating comb-shaped mechanism (17) consists of a shaft (26) provided with brush hairs.

11. Device as in claim 8, 9 or 10, characterized in that the separate thread supply (11) consists of a spool.

12. Device as in claim 9 or 10, characterized in that the rotating comb-shaped mechanism (17) covers the full weaving width of a weaving machine.

13. Device as in claim 9 or 10, characterized in that the rotating comb-shaped mechanism (17) has a small axial length, while a positioning device (40) is provided to allow this mechanism (17) to travel transversely across the weaving width.

14. Device as in claim 12 or 13, characterized in that the rotating comb-shaped mechanism (17) is suspended from one or more pneumatic cylinders (30), and can be presented to the warp sheet (2) of a weaving machine through the movement of these cylinders.

15. Device as in claim 12 or 13, characterized in that it is equipped with a motor (31) coupled to the comb-shaped mechanism (17) by means of a transmission (32).

Fig. 2

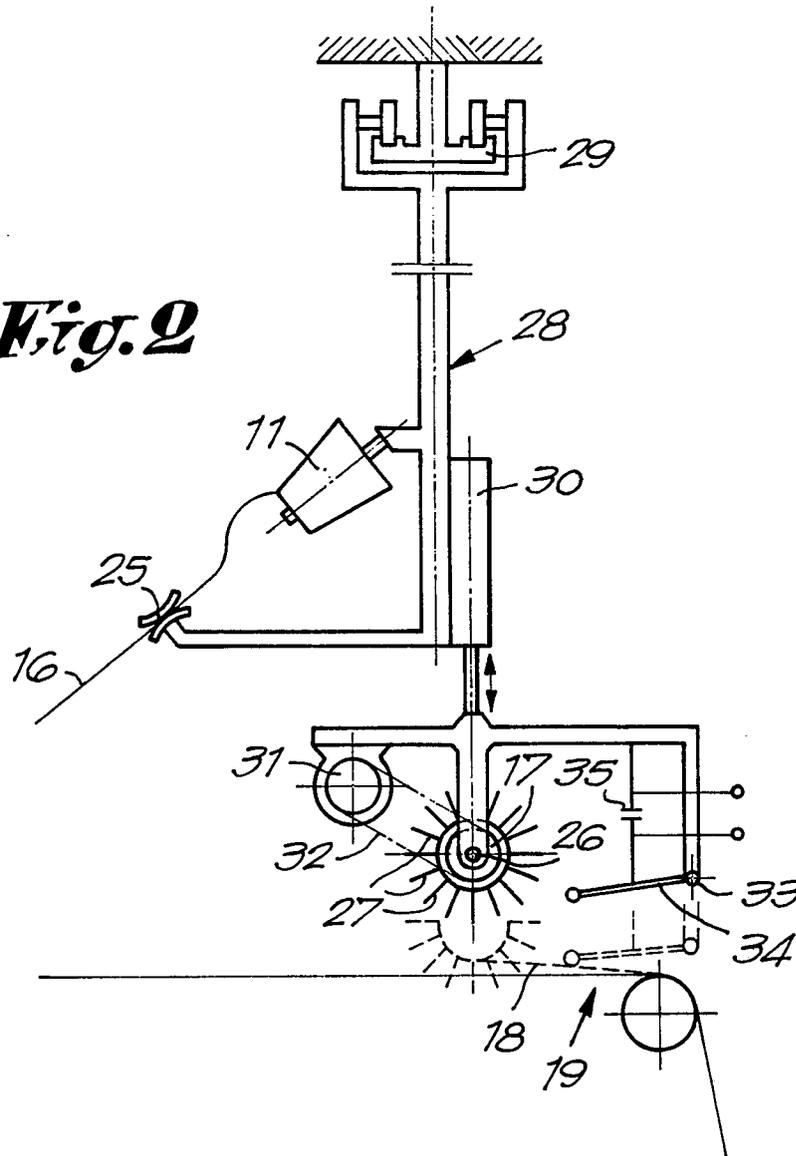


Fig. 6

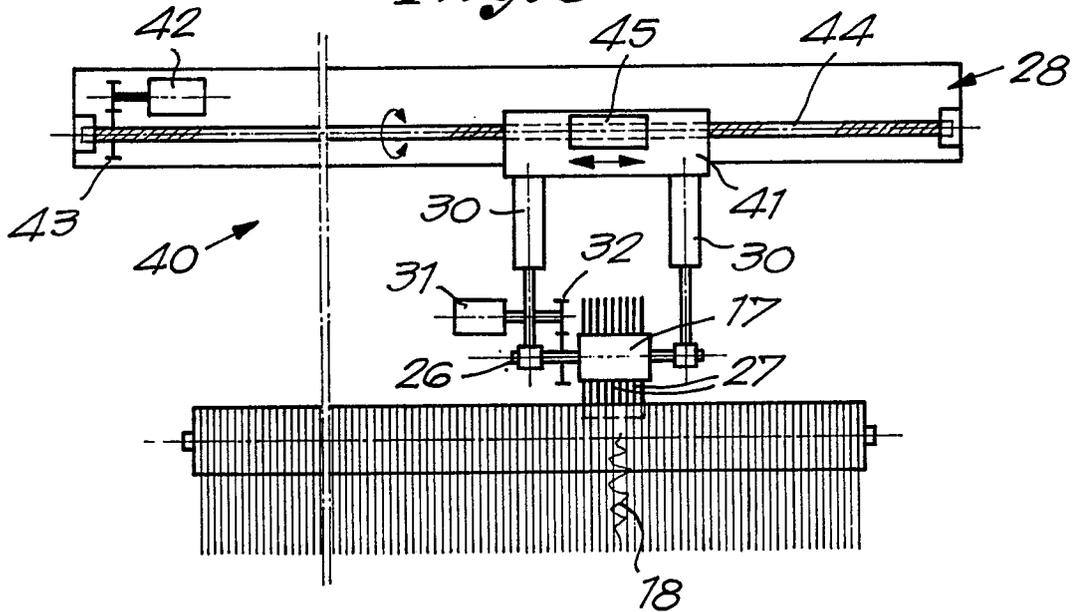


Fig. 4

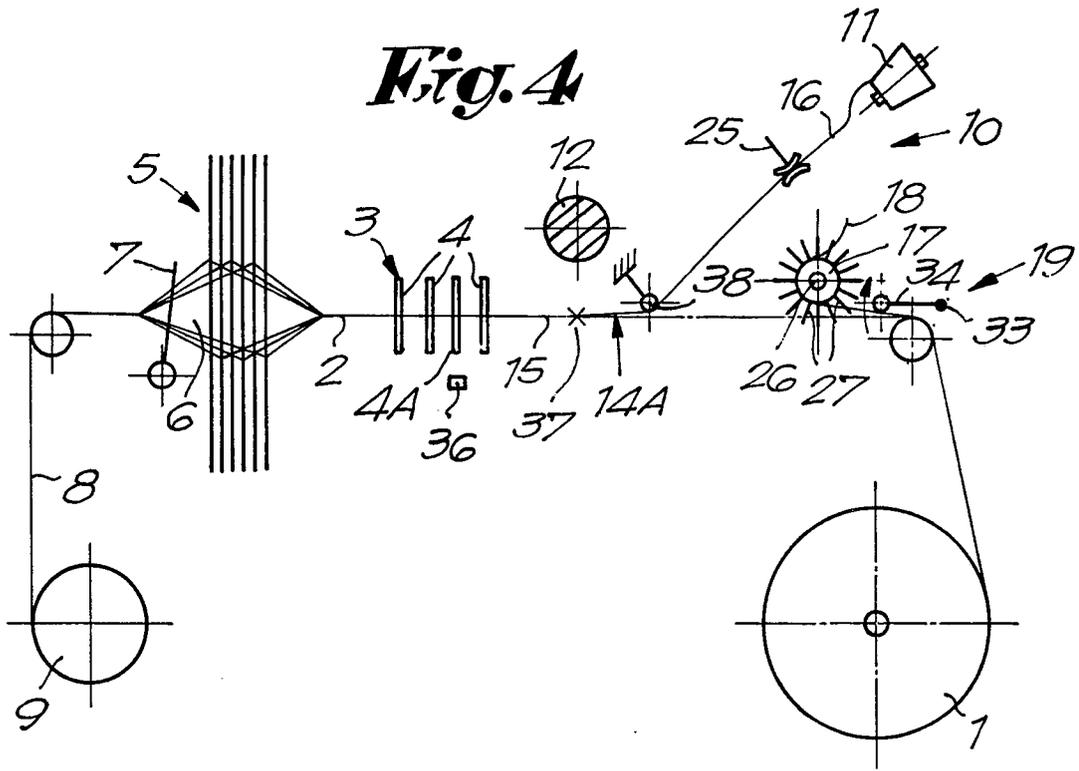
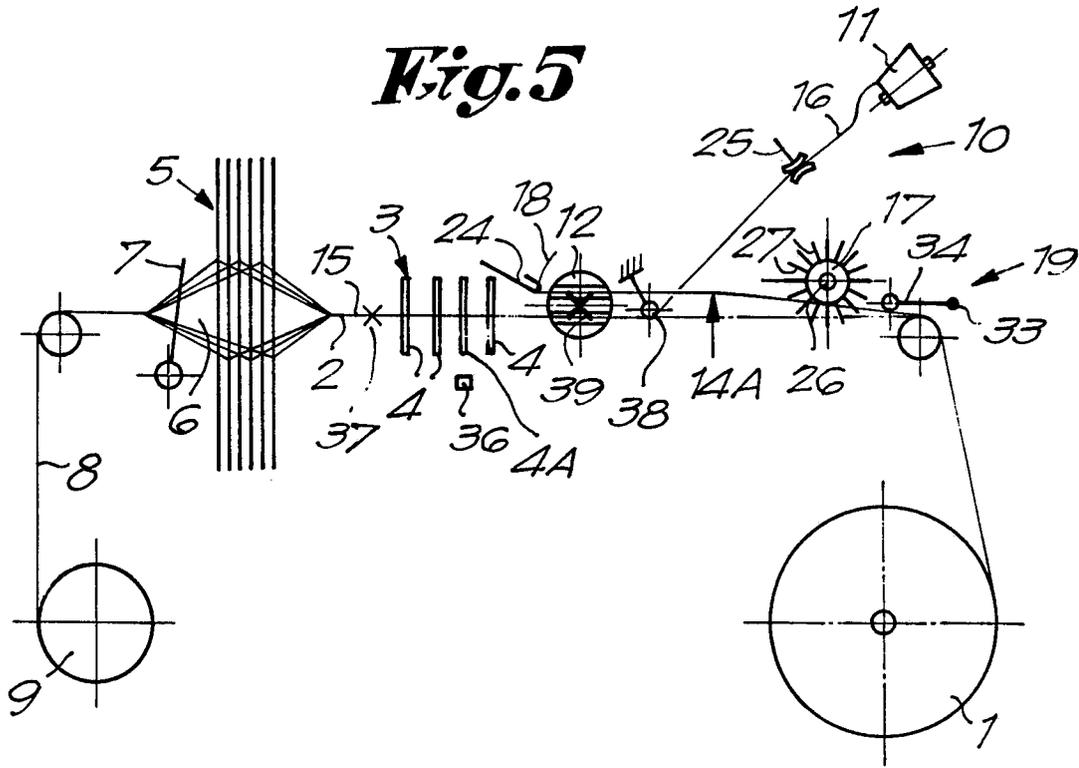


Fig. 5





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 20 2070

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	CH-A-276690 (KONINKLIJKE TRICOTFABRIEK G.J. WILLINK N.V.) ---		D03J1/00
A	GB-A-1148169 (REINERS) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			D03D D03J B65H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 25 JANUARY 1989	Examiner VAN GELDER P.A.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p>			

EPO FORM 1503 03.82 (P0401)