(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 633 213 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **94110288.1**

(22) Date of filing: **01.07.94**

(51) Int. Cl.[6]: **B65H 51/20**, B65H 54/86, D01H 13/18, D02J 13/00

(30) Priority: **10.07.93 DE 4323059**
02.12.93 DE 4341048

(43) Date of publication of application:
11.01.95 Bulletin 95/02

(84) Designated Contracting States:
CH DE FR GB IT LI

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(54) Textile machine having yarn accumulator.

(57) A textile machine for processing a filament yarn (12) and comprising a feed system (18) for advancing a yarn along an operative path of travel and into a treatment zone. A yarn accumulator (1) in the form of a deflecting plate (3) is positioned downstream of the feed system for temporarily storing the yarn upon a yarn break or slackening of the yarn, with the plate being positioned generally transverse to the operative path of travel and with one of the side edges thereof being closely adjacent the path of travel. Also, a yarn guide is positioned on the side of the yarn path of travel opposite from the one side edge of the plate, such that in normal operation the operative yarn path of travel runs between the one side edge of the deflecting plate and the yarn guide. Upon a yarn break or the development of slack in the advancing yarn, the yarn impacts against the deflecting plate (3) and forms an accumulation of the yarn. The plate may be coated with an adhesive to adhere the accumulation thereto, or the accumulation may drop from the plate and fall into an underlying collection bin (26).

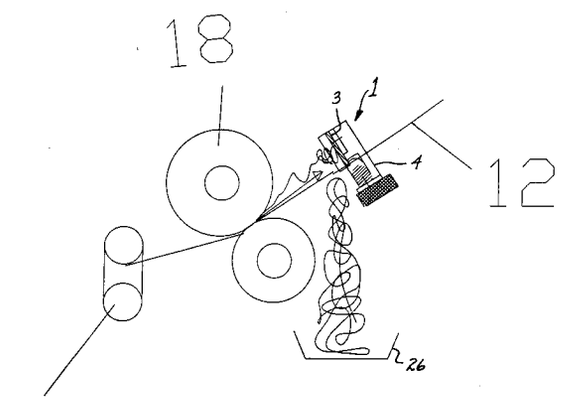


FIG.5

EP 0 633 213 A1

Background of the Invention

The present invention relates to a textile machine for processing a filament yarn, wherein the yarn is advanced by a feed system into a treatment zone and withdrawn from the treatment zone by means of an extraction system, and wherein a yarn accumulator is arranged downstream of the feed system for temporarily storing the yarn in the event of a yarn break or other irregularity in the advance of the yarn.

A machine of the described type is known, for example, from DE-OS 22 54 736. In a machine of this type, it is necessary to withdraw the yarn from its production or processing zone always at a higher speed than it is supplied thereto. With this type of yarn delivery, irregularities often occur in the yarn delivery. These irregularities may be caused by the yarn production method itself, or they may be caused by a disturbance in the subsequent steps of the process. Such irregularities in the yarn delivery can easily result in breakdowns of the process, such as by having the yarn become entangled, or by the yarn forming laps. The problem of lap formation is of very great importance in the operation of textile machinery, inasmuch as laps can damage a textile machine. Such a formation of laps may occur, even when there are only short-time irregularities in the yarn delivery, which can develop, for example, in the takeup zone of the textile machine, especially when it is necessary to transfer the continuously advancing yarn from a fully would package to an empty tube.

The known apparatus also has the disadvantage that it requires an adequately strong source of compressed air, and must either be in operation continuously, or be shut down, when breakdowns occur. By the time the apparatus becomes operative, it may however be already too late to avoid the above noted problems.

As a further disadvantage, it is recognized that upon yarn breaks occurring downstream of the feed system, the dropping yarn end may become entangled, or be wound in other feed systems, or it may wrap about other rotating elements of the processing station for that yarn or adjacent processing stations. Also, if worst comes to worst, the dropping yarn end may even damage the machine elements. Finally, it is very difficult to subsequently remove the yarn residues.

It is accordingly an object of the present invention to provide an apparatus for temporarily accumulating a quantity of yarn resulting from the slackening or breakage of the yarn downstream of a yarn feed system, and which is constantly ready of operation and does not require auxiliary equipment.

It is a further object of the present invention to provide a yarn accumulator of the described type which has provision for catching a dropping yarn end upon a yarn break, and rendering the end harmless.

Summary of the Invention

The above and other objects and advantages of the present invention are achieved in the embodiment illustrated herein by the provision of a filament yarn processing apparatus which comprises a yarn feed means for advancing the yarn along an operative path of travel and to a treatment zone, and a yarn accumulator positioned immediately downstream of a yarn feed means, and which comprises a deflecting plate having opposite side edges. The plate is positioned generally transverse to the operative yarn path of travel, with one of the side edges of the plate being adjacent the operative path of travel. Thus the advancing yarn is not significantly deflected by the plate when advancing along its operative path of travel. However, in the event of a yarn break or the like, the advancing yarn engages the plate.

The yarn feed means defines a natural yarn delivery path along which the yarn is advanced in the absence of guidance downstream of the feed means, and to insure that the advancing yarn engages the plate in the event of a yarn break or the like, the plate is preferably positioned so as to intersect the natural yarn delivery path.

The yarn accumulator preferably also comprises a yarn guide disposed on the side of the operative yarn path of travel opposite from the one side edge of the plate, and such that the operative yarn path of travel runs between the one side edge of the plate and the yarn guide.

In accordance with the present invention, the deflecting plate causes the quantities of yarn to accumulate at a harmless place and, as a result of this accumulation, to then appear no longer as an individual yarn. While an individual yarn is easily caught by other machine elements as a result of unavoidable air currents, the resulting accumulation retains the yarn and is not susceptible to the air currents because of its larger mass.

The use of the present invention does in general not require any modifications of the textile processing machine. However, it may be useful to offset the yarn withdrawal or extraction device relative to the feed system, so that the extraction device does not extend along the natural yarn delivery path of the yarn feed means. This natural yarn delivery path is in general the tangent to the feed system, or in a so-called pressure-roll type feed system, the common tangent to the driven feed roll and the pressure roll. However, even without such modification, the deflecting plate is effective, since it is arranged always in the direct vicinity

of the operative yarn path, or even in the operative yarn path, in the case of a regular advance, which is predetermined by the feed system and the extraction device.

Brief Description of the Drawings

Some of the objects and advantages of the present invention having been stated, others will appear as the description proceeds, when considered in conjunction with the accompanying drawings, in which

Figure 1 is a cross sectional view of a yarn false twist texturizing machine which embodies the present invention;

Figure 2A is an enlarged fragmentary view of the portion of Figure 1 illustrated within the area II;

Figures 2B and 2C are top plan and side elevation views respectively, of a slightly modified version of the accumulator shown in Figures 1 and 2A;

Figure 3 is a cross sectional view of a yarn false twist crimping machine showing another embodiment of the invention;

Figure 3A is a fragmentary cross sectional view of the deflecting plate of the present invention and illustrating one embodiment of an adhesive coating applied thereto;

Figure 4 is a fragmentary view of a portion of the false twist crimping machine shown in Figure 3; and

Figure 5 is a view similar to Figure 4 but further illustrating a container bin for collecting the waste yarn.

Detailed Description of the Preferred Embodiments

The embodiments as described below illustrate the invention used in association with a yarn false twist texturing machine for processing synthetic filament yarns. It will be understood however, that the invention is useable with other textile processing machines which include a yarn feed means for advancing a yarn along an operative path of travel.

As schematically illustrated in Figures 1 and 3, the texturing machine comprises a yarn supply package **10**, on which a thermoplastic filament yarn **12** is wound. The yarn **12** is withdrawn under a certain tension by a feed system **18** via a yarn guide **14**. In the direction of the advancing yarn, downstream of feed system **18**, a first, elongate heater **20** extends, over which the yarn advances and is heated to a predetermined temperature. Arranged at the outlet end of heater **20** is a further yarn guide **22**, which deflects the yarn so as to advance it to a cooling plate **24**. The heater **20** and cooling plate **24** may be arranged relative to one another approximately in a roof-like configuration, with the yarn guide roll **22** forming the apex of the roof-like structure. Below the cooling plate **24** is a conventional false twist unit schematically illustrated at **28**, which for example may be structured in accordance with German Patent 22 13 881 or U.S. Patent 4,339,915. Arranged downstream of the false twist unit **28** is a further feed system **30**, which serves to draw the yarn both over the heater **20** and the cooling plate **24**.

In the direction of the advancing yarn, and below the feed system **30** is a set heater, which is constructed as a curved heating tube **34** which is surrounded by a heating jacket **32**. The latter serves to heat the heating tube **34** externally with vapor to a predetermined temperature. Preferably, the heating tube **34** and its jacket are arranged upright.

Heating tube **34** is connected seamlessly, i.e., in an airtight manner, to an equalizing tube **42**. Also, a yarn guide **44** is positioned in the bent portion of a channel **38**, which joins the heating tube **34** to the equalizing tube **42**, and the yarn guide **44** is constructed as a pin or roll with a peripheral groove.

Arranged at the outlet end of tube **42** is a further feed system **46**. The latter is a pressure-roll type feed system, and comprises a driven feed roll **46.1** and a pressure roll **46.2**, which freely rotates and presses the yarn in a slip-free manner against the feed roll. Adjacent thereto is a yarn accumulator **1** which is described further below. The yarn is wound on a takeup package **50** which is driven on its circumference by a friction roll **52**. A traversing mechanism **54** is positioned upstream of the friction roll **52**, which reciprocates the yarn **12** along package **50**, and causes it to be wound in a cross wound package. A suction tube **62** (Figure 2A) with radial holes precedes the yarn traversing mechanism. The suction tube **62** allows the yarn to be removed by suction, when the package **50** is fully wound, and when for purposes of doffing the package the yarn needs to be cut between suction tube **62** and yarn traversing mechanism **54**.

Located above equalizing tube **42** is a platform **56**, which is supported by rails or posts **58** on the floor **60** and which serves as an operator's aisle.

Figure 2A is an enlarged detail view of the takeup zone within the area II of Figure **1**, and in particular Figure 2A illustrates in more detail the yarn accumulating device **1**, which becomes operative, when the yarn breaks or slackens.

As best seen in Figures 2A-2C, the yarn accumulator **1** comprises a yarn guide **2** and a deflecting plate **3**, which are mounted to a common support **4**. The deflecting plate **3** has opposite side edges 5, 6, and it is angled along an apex line 7 to define two plate segments 8, 9, which are inclined

with respect to each other in V-shape at an angle of about 90°. When viewed in the direction of the yarn advance as illustrated in Figure 2B, the apex line 7 extends toward the yarn guide **2**. Also, the yarn guide **2** lies at a short distance behind deflecting plate **3**.

The plate **3** may for example consist of two flat metal sheets, which are joined along the apex line **7**, or it may comprise a unitary flat metal sheet which is bent in V-shape along the apex line.

The deflecting plate **3** may alternatively be a flat surface, or it may have the shape of a funnel, the axis of which extends approximately in the natural direction of the operative yarn advance. Also, the deflecting plate **3** may be provided with an adhesive coating on the side thereof facing the yarn feed system, for the purpose of retaining a broken yarn end as further described below. This adhesive coating for example may comprise a film which is coated on both sides with an adhesive material, and which is applied to the plate so that one coated side is exposed. Alternatively, the deflecting plate may be covered with a cling tape which has a hook-like fibrous adhesive coating as schematically illustrated in Figure 3A.

The plate **3** is mounted so as to be generally transverse to the operative yarn path of travel, and with the side edge **5** being spaced from but closely adjacent the path of travel. Also, the yarn guide **2** is disposed on the side of the yarn path of travel opposite from the side edge **5** of the plate **3**, and such that the yarn path of travel runs between the side edge **5** and the yarn guide **2** in normal operation. Thus, the advancing yarn is not deflected by the plate **3** during normal operation.

The yarn guide **2** is provided, on the one hand, with a yarn guide element, which is arranged likewise closely adjacent the operative yarn path of travel. The guide surface of the yarn guide extends along an extension of the apex line **7**, which is formed by deflecting plate **3**, but is slightly spaced apart from its side edge **5**. Consequently, there exists a gap between the side edge **5** of deflecting plate **3** and the guide edge of yarn guide **2**, which permits the yarn advancing under tension to pass without contacting, as best seen in Figure 1. The guide element of yarn guide **2** is laterally bordered by guide plates, which cover the side edge **5** of the deflecting plate and form a lateral boundary of the yarn path. The arrangement of the deflecting plate **3** and the yarn guide **2** in the machine is such that the apex line **7** of the deflecting plate is aligned approximately perpendicularly with respect to the yarn path of travel.

In the machine illustrated in Figure 1, the yarn is wound free of trouble, and consequently the yarn advances along its operative path of travel and under an adequate tension between feed system **46** and the takeup. As a result, the yarn accumulator remains inoperative in this operating condition. Shown in Figure 2A, is the situation when the yarn is cut between suction tube **62** and yarn-traversing mechanism **54**, and subsequently pulled into the interior of suction tube **62**. At this moment, the speed at which the yarn is withdrawn from feed system **46** is considerably reduced for a short time. As a result, there may arise the risk that the excessive amount of yarn entangles, forms laps, or leads to other disturbances. This is prevented by the yarn accumulator **1** of the present invention, which is arranged at a short distance downstream of feed system **46**.

In the event the yarn is no longer advanced under an adequate tension, the yarn will impact against the deflecting plate at the apex line **7** between the two flat segments **8, 9** of deflecting plate **3**. To this end, the yarn accumulator is arranged such that the deflecting plate is positioned along the common tangent to the feed roll **46.1** and the pressure roll **46.2** of the feed system **46**. Upon impacting the deflecting plate, the yarn starts to pile up. Thereafter, the yarn is pulled out from this pile by the suction device **62**. The quantity of yarn which accumulates in this pile, is variable. The present invention thereby accommodates without harm a condition wherein the feed system **46** delivers a constant quantity of yarn but the quantity of yarn withdrawn is not constant as a result, for example, of the interrupted takeup or irregularities of the process.

In the false twist crimping machine illustrated in Figure 3, as well as Figures 4 and 5, a deflecting plate **3** mounted to a common support **4** is positioned downstream of the first feed system **18**, which advances the yarn in the direction of the heater **20**. The second feed system **30** which is adjacent the false twist unit **28** serves as a yarn withdrawal or extraction system.

Figure 3 illustrates the yarn in its normal or operative path of travel. Figures 4 and 5 illustrate the operating condition, in which a yarn end is down, and the broken yarn end is continuously supplied by the feed system **18**. In this operating condition, one may incur the risk that the broken yarn end enters into takeup package **50**, the drive elements of which, in particular friction roll **52** and yarn traversing mechanism **54** continue to be in operation. The broken yarn end also may be caught in an adjacent processing station. These potential problems are avoided with the yarn accumulator **1**, which is arranged at a short distance from the outlet end of the feed system **18**. The structure of the yarn accumulator corresponds to that of Figures 2A-2C, as described above.

In operation, the yarn advances under tension along its operative path of travel, so that it passes

between and does not contact either the side edge **5** of deflecting plate **3** and the guide edge of yarn guide **2**. It is however possible to also offset the yarn accumulator relative to the yarn path, so that the yarn is slightly deflected on the deflecting plate or the yarn guide. This would involve only a matter of yarn tension and wear. In the event the yarn breaks, it is no longer under tension and is ejected by feed system **18** against the deflecting plate, namely into the apex line **7** between the two flat surfaces of deflecting plate **3**. To this end, the yarn accumulator is arranged such that the deflecting plate extends along the common tangent to the feed roll and pressure roll of feed system **18**, or in a position which has previously been found by tests to intersect with the natural yarn delivery path along which the yarn is advanced in the absence of guidance downstream of the feed system **18**.

When impacting upon the deflecting plate, the yarn piles up. In the embodiment of Figure 4, it is assumed that the deflecting plate is provided with an adhesive coating as described above. As a result of the coating, the yarn will adhere to this adhesive coating, thus avoiding the risk that the yarn comes into contact with other rotating machine elements or drifts freely in the machine and is entrained by an air current. Thereafter, the film may be simply pulled off the deflector plate, thereby removing the yarn residue. Where a cling tape is employed as illustrated in Figure 3A, the tape can be simply torn away from the deflecting plate, after a yarn break has occurred and yarn material has piled up.

In the embodiment of Figure 5, the deflecting plate **3** is not covered with an adhesive coating. Therefore, the accumulated quantity of yarn drops from the deflecting plate in the form of a yarn tangle. However, a collecting bin **26** is provided below the deflecting plate, which is positioned so as to collect the accumulated tangle.

The natural yarn delivery path of the feed system in the meaning of this invention is theoretically the tangent to the point, at which the yarn leaves the feed system, or the common tangent, when the feed system is of the nip type or employs nip rolls. Practically, however, deviations may result, for example, when in a feed system employing nip rolls, the yarn adheres more to one of the rolls than to the other. Deviations may also result, when the yarn is "spat out" in a horizontal direction, provided it is under no tension. Therefore, in cases of doubt, it will be necessary to determine by test the natural yarn delivery path of the yarn when under no tension or low tension. Under some circumstances, it may also be necessary to consider the speed of the feed system.

In the drawings and specifications, there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation.

Claims

1. An apparatus for processing a filament yarn and comprising

yarn feed means for advancing the yarn along an operative path of travel and to a treatment zone, and

a yarn accumulator positioned immediately downstream of said yarn feed means for temporarily storing the yarn upon a yarn break or the like, said yarn accumulator comprising a deflecting plate having opposite side edges, with said plate being mounted generally transverse to the operative path of travel and with one of said side edges being adjacent the operative path of travel, and such that the advancing yarn is not significantly deflected by the plate when advancing along the operative path of travel but the advancing yarn does engage the plate upon a yarn break or the like.

2. The apparatus as defined in Claim 1 wherein said yarn accumulator further comprises a yarn guide disposed on the side of said operative yarn path of travel opposite from said one side edge of said plate, and such that the operative yarn path of travel runs between said one side edge of said plate and said yarn guide.

3. The apparatus as defined in Claim 2 wherein said plate is angled along an apex line to define two plate segments which are inclined with respect to each other, and with the apex line extending toward said yarn guide when viewed in the direction of the yarn advance.

4. The apparatus as defined in Claim 3 wherein the deflecting plate is coated with an adhesive material on the side thereof facing said yarn feed means.

5. The apparatus as defined in Claim 2 further comprising a yarn collection bin positioned below said deflecting plate so as to be adapted to receive the yarn after the yarn engages the deflecting plate.

6. The apparatus as defined in Claim 2 wherein said one side edge of said plate is spaced from the operative yarn path of travel and such that the advancing yarn is not deflected by the plate when advancing along the operative path of travel.

7. The apparatus as defined in Claim 1 wherein said yarn feed means defines a natural yarn delivery path along which the yarn is advanced in the absence of guidance downstream of the feed means, and wherein said deflecting plate is positioned so as to intersect the natural yarn delivery path.

8. The apparatus as defined in Claim 1 wherein said yarn feed means comprises a driven feed roll and a cooperating pressure roll which engages the feed roll so as to define a common tangent, and wherein said deflecting plate is positioned along the common tangent of said rolls.

9. The apparatus as defined in Claim 1 wherein said treatment zone comprises yarn false twisting means comprising, in serial arrangement, an elongate heater, an elongate cooling plate, a false twisting unit, and a second yarn feeding means.

10. The apparatus as defined in Claim 1 wherein said treatment zone comprises a yarn winding apparatus for winding the advancing yarn into a cross wound package.

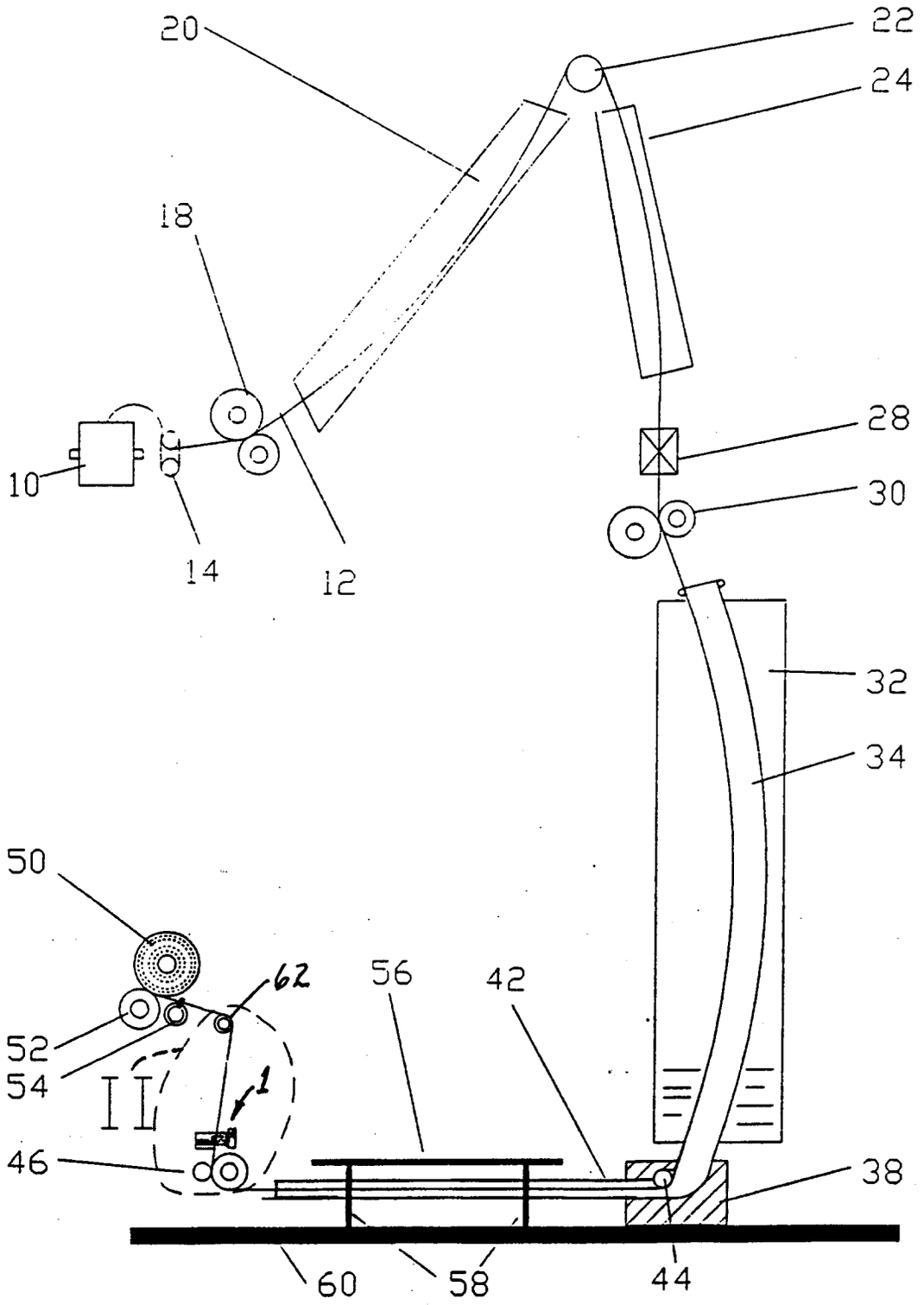


FIG. 1

FIG. 2 B

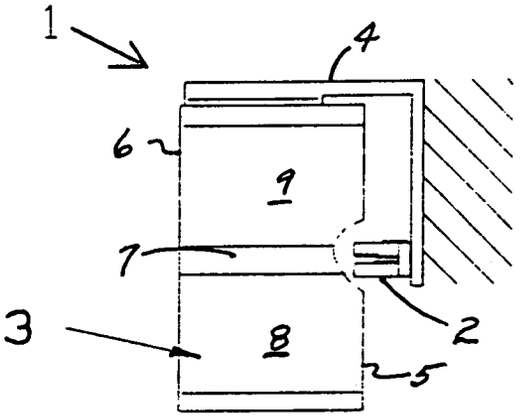
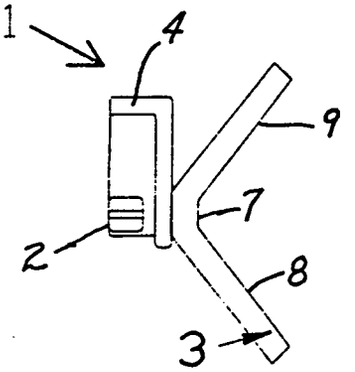


FIG. 2 C



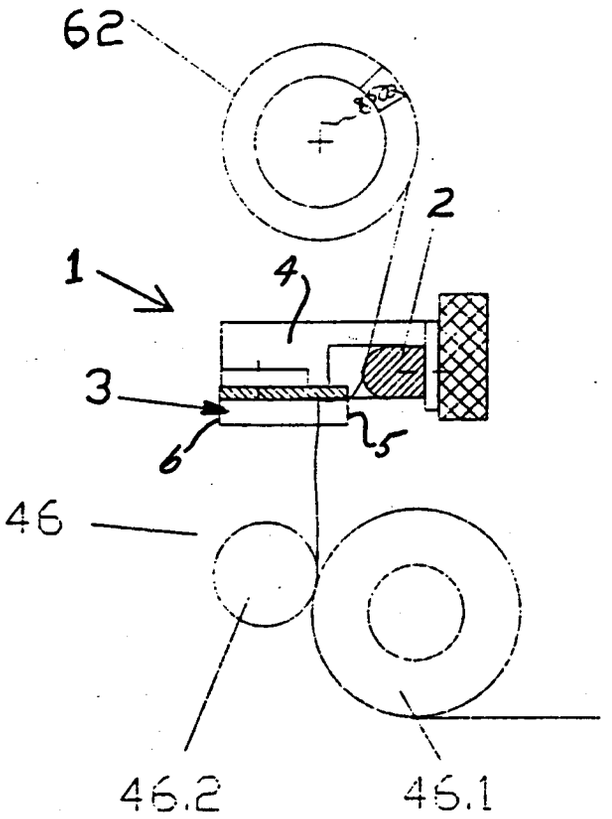


FIG. 2 A

FIG.3A

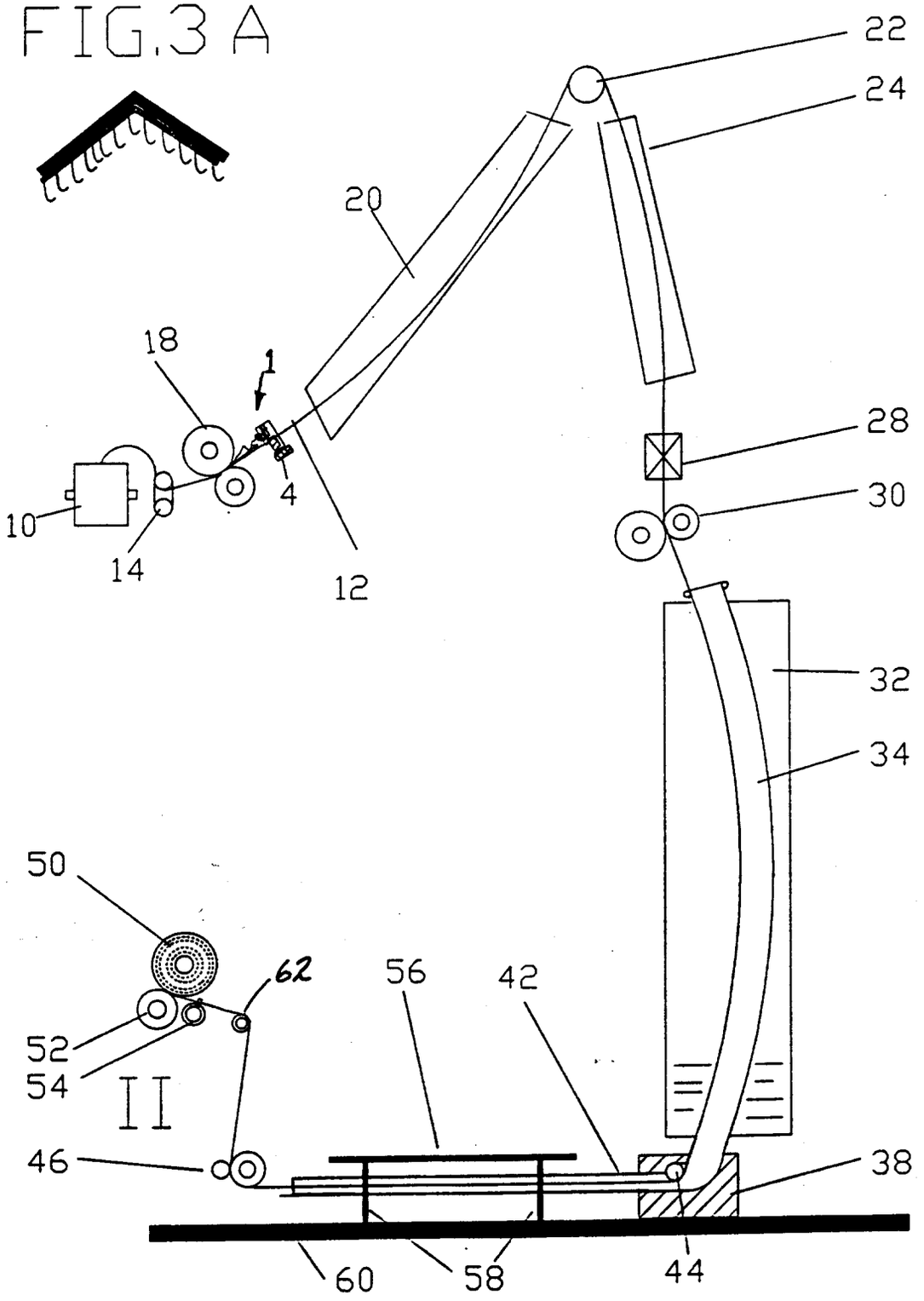


FIG.3

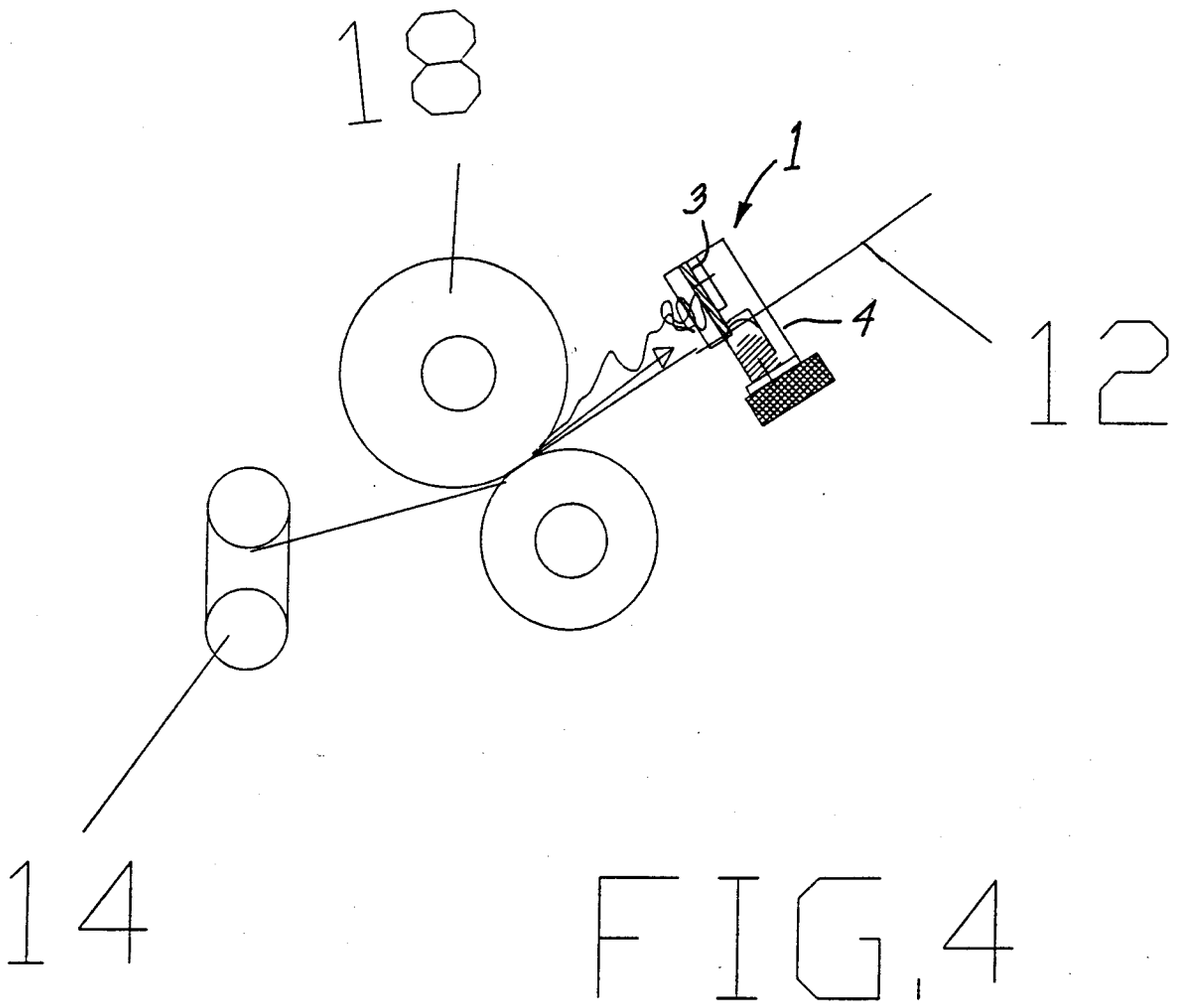


FIG.4

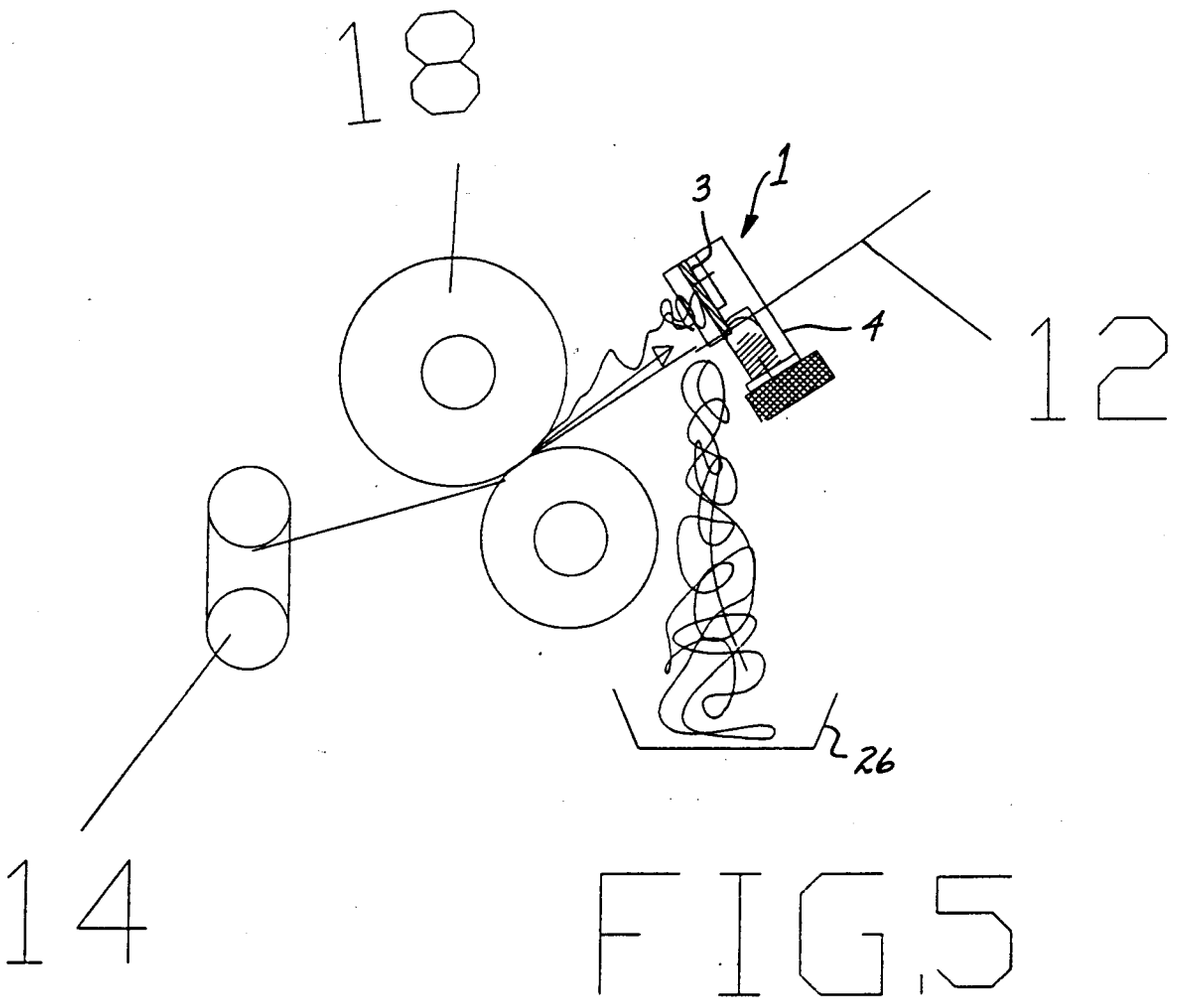


FIG.5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 11 0288

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.6)
A	GB-A-526 635 (ERNST GESSNER AG)		B65H51/20 B65H54/86 D01H13/18 D02J13/00
A	FR-A-342 236 (SOCIÉTÉ ALSACIENNE DE CONSTRUCTIONS MÉCANIQUES)		
A	FR-A-1 402 460 (WALTER REINERS)		
A	FR-A-735 104 (P. SWYNGEDAUW)		
A	FR-E-44 604 (P. SWYNGEDAUW)		
A	FR-A-367 701 (H.B. REYNOLDS)		
A	DE-C-123 449 (C. & J. SCHULER)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65H
D02J
D02G
D01H
D03D
D02H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 October 1994	D Hulster, E

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