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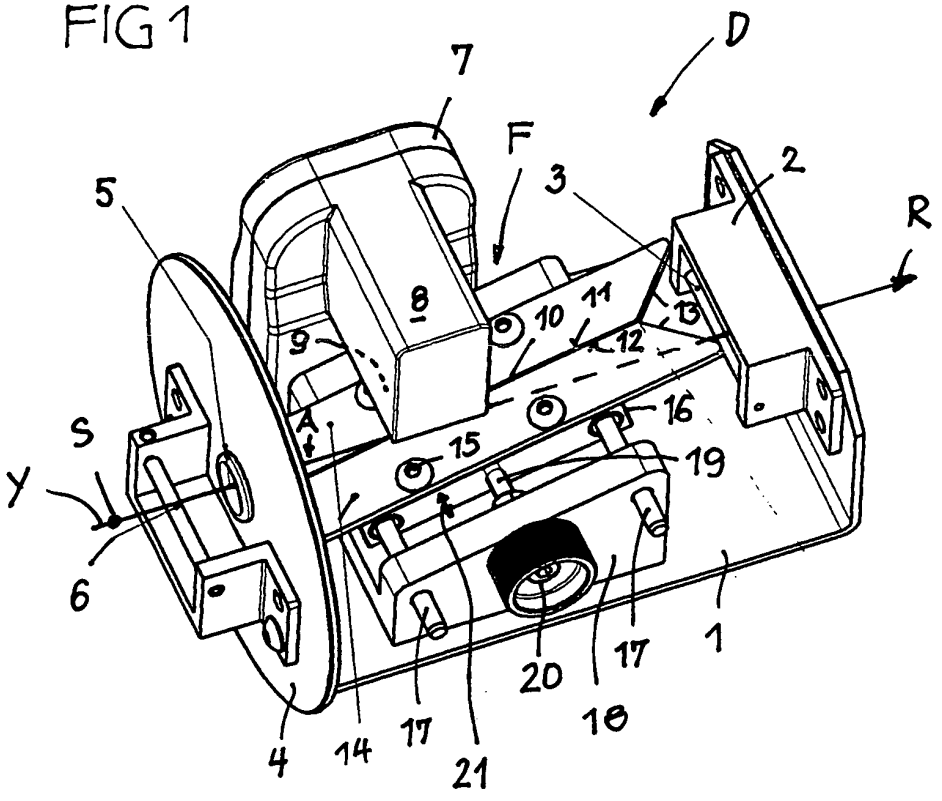
(54) **Yarn detector**

(57) A yarn detector D for detecting yarn defects S like knots or slubs in a running yarn Y by means of an electronic sensor 9 responding by a signal to an occurring yarn defect S comprises a mechanic and stationary catcher F through which the yarn Y may run along a predetermined first path A without a deflection until the occurrence of a yarn defect S, and which catcher displaces the yarn Y upon occurrence of a yarn defect S and by means of the yarn defect S into at least a second other predetermined path B at or in which the sensor 9 is positioned.

FIG 1



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Description

[0001] The invention relates to a yarn detector according to the preamble part of claim 1.

[0002] In yam processing systems e.g. comprising a weaving machine and weft yam feeders or a knitting machine and knitting yam feeders for producing high quality woven or knitted fabrics yarn defects like knots or slubs cannot be tolerated in the fabric. For this reason, e.g. upstream of each feeder, a yarn detector is positioned which detects the occurrence of such a yam defect and emits a signal which is used to turn off the feeder and the textile machine before the yarn defect is worked into the fabric. Then the yarn defect is either corrected or completely removed, before the yarn processing system is switched on again to continue the production of the fabric.

[0003] US-A-4,133,207 discloses a yarn detector of this kind. The lateral edge of a vibratably supported tongue forms a yarn passing gap together with a distant yarn guide. A piezo-element is secured on the vibratable tongue. The gap width is adjusted to the normal yarn thickness such that only knots or the like, or thick sections in the running yarn will contact the lateral edge of the tongue, causing the piezo-element to respond with signals. The yam permanently is deflected and mechanically loaded while being deflected around the yarn guide. This additional mechanical load is disadvantageous in the case of delicate yarn qualities, causes a yarn breakage and creates additional undesired yarn tension. Moreover, lint permanently is stripped off and is deposited around the tongue end until the vibrations of the tongue are suppressed finally.

[0004] The yarn detector according to DE-B-11 01 081 has a measuring head with a circumferential V-shaped groove having a circumferentially varying depth. A pick-up head abuts at the measuring head in the region of the groove. By rotating the measuring head the groove depth is adjusted to the normal thickness of the yarn. As soon as a knot or a similar thickened portion of the yarn is passing through the groove the pick-up head is dislocated and actuates a switch generating a signal. The yam permanently is deflected around the measuring head and is loaded with undesirable yarn tension, and tends to break early upon occurrence of a defect. Furthermore, lint permanently is stripped off from the yarn and tends to collect in the passing gap between the groove and the pick-up head. Collected lint is pulled through the gap from time to time and then might cause an error signal. Furthermore, the collected lint deteriorates the reading quality of the detector significantly.

[0005] It is an object of the invention to provide a yarn detector which is structurally simple and user-friendly, and which allows to detect a yam defect without breaking the yam and without hindering the yam run.

[0006] The object is achieved by the features of claim 1.

[0007] As long as the yarn does not contain a yam defect, the yarn is allowed to run through the yarn detector without any obstruction and without receiving any mechanical load. Upon occurrence of a yarn defect which exceeds the normal yarn thickness by at least a predetermined amount, the yarn defect itself is used as a auxiliary means to dislocate the running yarn, with the help of the catcher, into a second predetermined path which is offset from the first path and such that then the sensor is enabled to respond to the yam defect by a signal. This means that the sensor does not survey or contact the yarn as long as no yarn defect occurs. Thus, the sensor is less negatively affected by unavoidable lint and yarn material. The feeder arranged downstream of the yarn detector may already be switched off while the yarn defect is present in the yarn detector or somewhat later. The yarn detector is structurally simple and user-friendly, is a passive component in the yarn path but nonetheless permanently ready to detect any such yarn defects. The underlying idea is to provide the catcher such that it does not at all influence the yarn run as long as no yarn defect occurs, but to then use the yam defect itself to dislocate the yarn into the detection zone of the sensor in order to reliably detect the yam defect.

[0008] In a preferred embodiment the catcher is provided with a yarn passing gap extending substantially in yarn running direction, the width of which is larger than the normal yam thickness but is smaller than the thickness of the yarn defect. As long as no yarn defect occurs, the yarn passing gap does not mechanically act upon the yarn.

[0009] Expediently, the width of the yarn passing gap can be adjusted to be matched with the respective normal yarn thickness. This makes the yam detector user-friendly, because the user can use the yarn detector for all different yarn thicknesses by only adjusting the width of the yam passing gap according to the thickness of the processed yarn.

[0010] In a further expedient embodiment the yam passing gap is bounded at both sides by at least substantially parallel guiding edges which extend obliquely from one side of the first path to the other side of the first path. As soon as a yarn defect occurs, the yarn defect is caught by the catcher in the yam passing gap and rides upon the guiding edges such that the yarn is dislocated from the first path into the second path where the sensor is positioned. The sensor may respond to the presence of the yarn defect already while the yarn defect is riding along the guiding edges. However, it is also possible to position the sensor such that it responds to the jumping action of the yarn back from the second path into the first path when the yarn defect reaches along the inclined plane the downstream end of the yarn passing gap. The detection of this jumping action results in a very strong and clear signal, since the yarn jump causes a significant impact.

[0011] In an expedient embodiment the inclination of the guiding edges bounding the yarn passing gap may be adjusted arbitrarily in order to achieve a relatively ag-

gressive yam jump or a relatively mild yarn jump, respectively, e.g. depending on the yarn quality.

[0012] In a preferred embodiment the guiding edges of the yam passing gap are formed by two rods or two flat plates which are supported on a carrying structure such that the gap width can be adjusted by a relative movement at least of one of the guiding edges crosswise to the yarn running direction. The rods or plates do not influence the yarn as long as no yarn defect is present, but only catch the yarn defect in order to dislocate the yarn into the second path upon occurrence of the yam defect.

[0013] In an expedient embodiment both guiding edges bounding the yarn passing gap are adjustable in relation to one another in opposite directions. In this embodiment the centre of the yam passing gap will always remain in the first path irrespective of the adjusted width of the yarn passing gap.

[0014] The first path, as well as partly the second path, may be defined by yarn guides positioned upstream and downstream of the catcher. Preferably, at the upstream side at least one eyelet is provided, combined with a laterally extending rod placed upstream of the eyelet. The downstream yarn guide may be a lateral rod only which is placed adjacent to a larger outlet opening of the yarn detector.

[0015] In an expedient embodiment one rod or one plate is provided on a carrier which has guidances extending crosswise to the first path. The guidances engage slidably into a stationary base part. A threaded spindle extending from the base part into the carrier allows to adjust the gap width by displacing the carrier with the rod or the plate in the direction of the guidances. Instead the carrier could slide on the guidances which then are fixed in the base part. The threaded spindle may be coupled to the carrier and be threaded in a threaded bore of the base part, or may be supported in the base part and may be threaded in a threaded bore of the carrier.

[0016] In an expedient embodiment the yarn passing gap comprises a downstream end region which diverges in yarn running direction with a V-shape. This end region also may be used for threading the detector for the first time easily. As soon as the yarn defect riding along the guiding edges reaches this end section, the yarn defect will be released gradually by the V-shape such that the yam jumps back from the second path into the first path. This jumping action reliably may be used to produce a clear and strong signal representing the occurrence of the defect, if the sensor is adapted to respond to the impact.

[0017] In a preferred embodiment the sensor is a piezo-sensor which is contacted by the yarn either while the yarn defect is riding along the guiding edges or when the yarn defect is jumping back with the yarn from the second path into the first path, respectively.

[0018] In another expedient embodiment the sensor is an optical sensor responding to the presence of the yarn in the second path or the jumping action of the yarn back into the first path.

[0019] Expediently, the sensor is positioned in a housing part which extends laterally over the catcher. This position of the sensor assures that the sensor does not become contaminated by lint or other materials, because the sensor is positioned outside the first path along which the yarn is normally running.

[0020] An easy adjustment is allowed when the threaded spindle carries at least one knob which can be gripped from one or from both sides of the yarn detector.

[0021] An embodiment of the invention will be described with the help of the drawings. In the drawings is:

Fig. 1 a perspective view of a yam detector, and

Fig. 2 a side view of the yarn detector of Fig. 1.

[0022] A yarn detector D as shown in Figs 1 and 2 conventionally is applied in yarn processing systems containing e.g. a weaving machine and weft yarn feeders or a knitting machine and knitting yarn feeders, respectively, upstream of a feeder (not shown). The purpose of the yarn detector is to detect yarn defects like knots, slubs, loops or the like and generate a signal representing the occurrence of the yam defect. The processing system does not necessarily need to be switched off upon detection of a yarn defect but it could be one resulting action to switch off the yarn processing system and to remove the yarn defect. Other resulting actions could be to stop the feeder and/or to stop the textile machine, and/or to calculate the number of yarn defects and/or to activate a cutter or a removing device, etc.

[0023] The yarn detector D has an e.g. sheet metal body 1 with a bent-up end portion at which a boss 2 is mounted which contains a laterally extending rod 3 serving as a yarn guide. The rear side of the bent-up portion of the body 1 contains e.g. an opening 22 shown in Fig. 2, or even a yarn eyelet downstream of the laterally extending rod 3.

[0024] At the entrance side of the yarn detector D a round plate 4 is mounted which contains a central eyelet 5 upstream of which a second laterally extending rod 6 is placed. The eyelet 5 and the rod 6 serve as yarn guides. The upstream and downstream yarn guides define a first straight path A for the yarn Y running through the yarn detector D. In the embodiment shown, in particular in Fig. 2, the first path A extends slightly upwards from the entrance side to the exit side in relation to a horizontal orientation.

[0025] In-between the yarn guides 5 and 3 the yarn detector D contains a stationarily mounted mechanic catcher F. The catcher F defines an inclined plane which, in yarn running direction R, begins below the first path A and downstream of the eyelet 5 and terminates at the other side of the first yarn path A and above the laterally extending rod 3. The inclination angle is e.g. about 20° in relation to the first yarn path A.

[0026] In the shown embodiment, the catcher F is de-

fined by two flat plates 14 which define straight guiding edges 11, 12 bounding a yarn passing gap 10 extending essentially parallel to the yarn running direction R. The yarn passing gap 10 has a width which, preferably, is adjustable such that the width is a little bit larger than the normal thickness of the yarn Y but smaller than yarn defects S which ought to be detected. The yarn passing gap 10 has a downstream end region 13 which diverges with the shape of a V.

[0027] A generally U-shaped base part 18 is fixed on the body 1. One of the plates 14 can be fixed to the base part 18, while the other plate 14 is fixed to a carrier 16 (by means of fastening elements 15) which carrier 16 is equipped with guiding rods 17 (guidances) which slidably engage in guiding holes of the base part 18. The guiding rods 16 extend perpendicularly to the extension of the gap 10. A threaded spindle 19 is supported in the base part 18 and engages e.g. only into the carrier 16. The threaded spindle 19 has at least at one end a knob 20. By turning the knob 20 the carrier 16 and the plate 14 can be moved along the guidances 17 in order to adjust the width of the yarn passing gap 10 (in the direction of a double arrow 21).

[0028] While in the shown embodiment the other plate 14 is mounted stationarily, a not shown embodiment could have both plates mounted adjustably such that they can be moved in opposite directions by the threaded spindle 19 (not shown). Furthermore, instead the guiding edges 11, 12 could be defined by rods only, or by plates which are placed vertically.

[0029] A housing 7, e.g. containing electronic equipment like signal generating circuitry and/or signal evaluating circuitry, is fixed to the body 1. A housing portion 8 extends from the side over the catcher F and positions at least one electronic sensor 9 used for the detection of an occurring yarn defect S, while the yarn Y is running through the yam detector D in the direction R.

[0030] Fig. 2 illustrates that, as long as no yarn defect S occurs, the yarn Y is running along the first path A through the yarn detector without being obstructed or tensioned in the yam passing gap. As soon as a yarn defect S occurs, which has a thickness exceeding the normal yarn thickness of the yam Y by a sufficient amount and according to the adjustment of the width of the yarn passing gap 10, the yarn defect S will be caught by the guiding edges 11, 12 and will ride on the guiding edges upwardly until it reaches the end region 13. By this co-action between the catcher F and the yarn defect S the yarn Y will be dislocated out of the first path A into a second path B (indicated by dotted lines) which is offset relative to the first path A. When the yam defect S reaches the end region 13, the yarn Y will jump back from the second path B into the first path A.

[0031] The yam sensor 9, e.g. a piezo-sensor which may be contacted by the yarn in the second path B or an optoelectronic sensor, is positioned such that it detects either the presence of the yarn in the second path B and/or the passing of the yam defect S and/or the jumping action when the yarn jumps back from the second path B into the first path A.

[0032] As shown, the sensor 9 might be positioned at the lower side of the housing part 8. Instead the sensor 9 could be placed at another location, however, distant from the first path A. It is even possible to position the sensor 9 at the location of the laterally extending rod 3 or in the rod 3, because the yam Y will hit the rod 3 after jumping back into the first path A such that the hitting impact of the yarn can be used to detect the presence of the yam defect S which caused the jumping action with the help of the inclined catcher F.

[0033] As another alternative, the sensor could be actuated by a yam contacting member, like a lever, when the yarn has been dislocated into the second path B or when the yam is jumping back into the first path A.

Claims

1. Yarn detector (D) for detecting a yarn defect (S) which exceeds the normal yarn thickness by at least a predetermined amount like a knot or a slub, in a running yarn (Y), the yarn detector (D) comprising in a detection area at least one electronic sensor (9) responding by a signal to the yarn defect (S), **characterised in that** the yarn detector (D) includes a mechanic and stationary catcher (F) through which the yarn (Y) runs along a predetermined first path (A) without deflection until the occurrence of a yarn defect (S), and which catcher (F) upon occurrence of the yam defect (S) and by means of the yarn defect (S) displaces the yarn (Y) into at least one second predetermined path (B) which if offset relative to the first path (A) and at or in which the sensor (9) is positioned.

2. Yarn detector according to claim 1, **characterised in that** the catcher (F) has a yarn passing gap (10) extending essentially in yarn running direction (R), the width of which is larger than the normal yarn thickness but smaller than the thickness of the yarn defect (S) which is to be detected.

3. Yarn detector according to claim 2, **characterised in that** the width of the yam passing gap (10) is adjustable.

4. Yarn detector according to claim 2, **characterised in that** the yarn passing gap (10) in the catcher (F) is bounded at both sides by essentially parallel guiding edges (11, 12) which extend obliquely from one side of the first path (A) to the other side of the first path (A).

5. Yarn detector according to claim 4, **characterised in that** the oblique position of the guiding edges (11, 12) is adjustable in relation to the first path (A).

6. Yarn detector according to claim 4, **characterised in that** the guiding edges (11, 12) are formed by two rods or two plates (14) which are supported at a carrying structure such that the gap width is adjustable by a relative movement of at least one guiding edge (11, 12) essentially perpendicular to the yarn running direction (R).

7. Yarn detector according to claim 6, **characterised in that** both guiding edges (11, 12) are adjustable in opposite directions relative to one another.

8. Yarn detector according to claim 1, **characterised in that** at least the first path (A) is defined by yarn guides (5, 6, 3, 22) arranged upstream and downstream of the catcher (F), preferably by a respective eyelet and a respective rod or a combination of an eyelet and a rod.

9. Yam detector according to claim 6, **characterised in that** at least one rod or one plate (14) is supported on a carrier (16), that the carrier (16) comprises guidances (17) extending crosswise to the first path (A), that the guidances (17) are slidably contained in a stationary base part (18), and that a threaded spindle (19) is provided in the base part (18) such that it engages into the carrier (16).

10. Yarn detector according to claim 2, **characterised in that** the yam passing gap (10) in the catcher (F) and has a rear V-shaped end region (13) diverging in yarn running direction (R).

11. Yarn detector according to claim 1, **characterised in that** the sensor (9) is a piezo-sensor which is contacted by the yarn (Y) when the yarn is running along the second path (B).

12. Yarn detector according to claim 1, **characterised in that** the sensor (9) is an optical sensor.

13. Yam detector according to claim 1, **characterised in that** the sensor is positioned in a housing part (8) which extends laterally over the catcher (F).

14. Yarn detector according to claim 9, **characterised in that** the threaded spindle (19) carries a knob (20) which is accessible at least at one side of the base part (18).

FIG 1

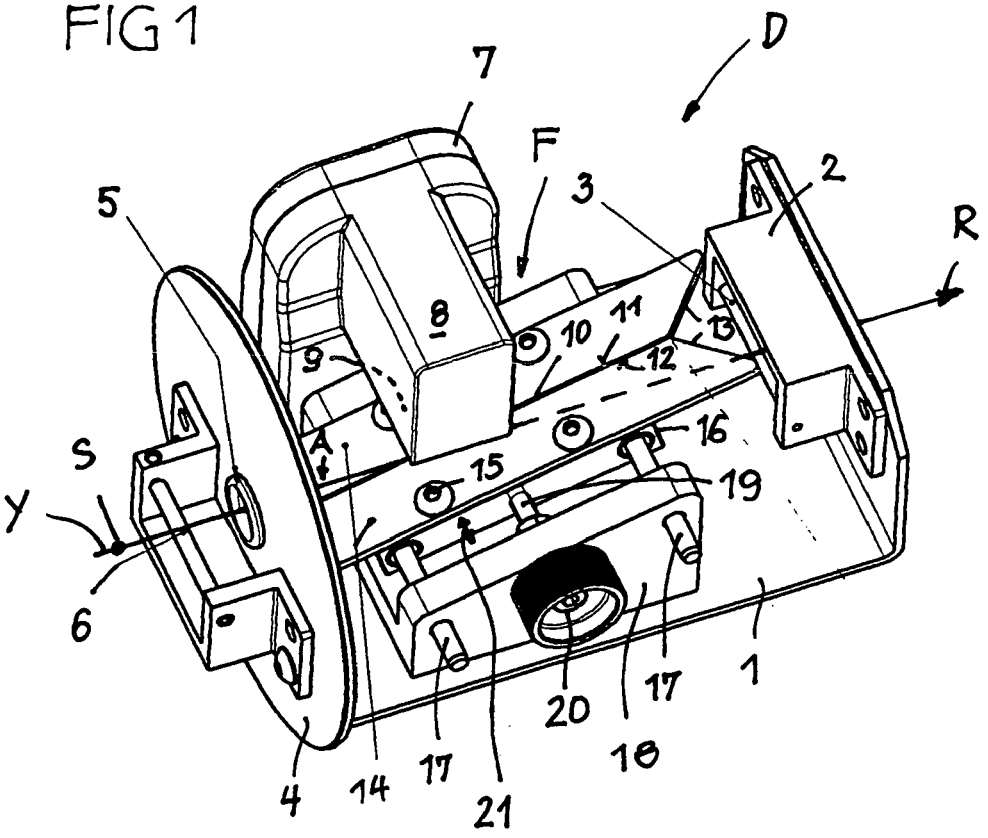
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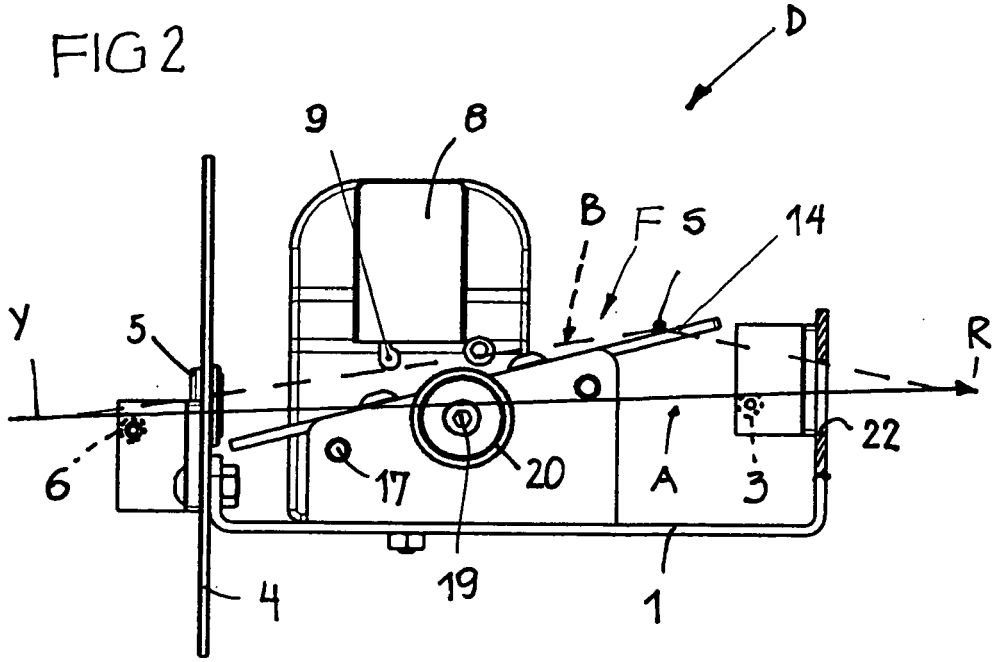
FIG 2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EUROPEAN SEARCH REPORT

Application Number
EP 07 02 4662

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 April 2008	Lemmen, René

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