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(54) DETERMINATION OF YARN DEFECTS

(71) We, ZELLWEGER USTER LTD., a body corporate organised under the laws of Switzerland, of CH 8610 Uster, Switzerland, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the determination of yarn defects.

Simple mechanical devices are known which seek to determine and eliminate thick places in yarns by pulling the yarn through a slot adjusted according to the normal yarn diameter. Such a device, called a yarn clearer, assesses the yarn cross-section as the only criterion.

In addition, devices are also known and in many cases in use, in which the yarn cross-section is measured optically, capacitively or by means of another medium and transformed into an electrical signal which corresponds to the particular yarn cross-section. If the cross-section signal then exceeds predetermined value, the duration of the excess values goes into the measurement value. Such devices can therefore assess both cross-section and also lengths of any thick or thin places in the yarn and these yarn clearers generally guarantee a satisfactory yarn quality. However they fail in all cases in which a regular or substantially regular sequence of defects of small cross-section and small length is present. Individual examples of such defects are not in themselves disruptive; a corresponding yarn clearer of known type is therefore adjusted so that it does not respond to this type of thick places. Only after the multiple repetition of such defects at intervals of decimetres or metres does this lead to the corresponding yarn being unusable. Still more disruptive is the case of periodic repetition i.e. the occurrence of such thick places at strictly uniform intervals. A fabric produced from such yarn then has the so-called Moiré effect which

is also visible when the individual thick places disappear in the general unevenness characteristic of the yarn. These thick places cannot therefore be determined by measurement technology by shifting the response limit of the yarn clearer accordingly near to the average yarn cross-section. As the very disruptive Moiré effect is only formed when sufficiently large yarn lengths are processed, it is necessary for the determination of such regular or substantially regular sequences of thick places to extend over correspondingly long yarn sections.

The present invention provides a method for the detection of yarn defects which occur regularly or substantially regularly, comprising continuously scanning the cross-section of the yarn by a sensor to produce a corresponding electrical signal, producing an electrical pulse of constant height and width when the said electrical signal exceeds a predetermined value, continuously integrating (as herein defined) said pulses to produce a further electrical signal, comparing the said further electrical signal with a further predetermined value, and, when the said further electrical signal exceeds the said further predetermined value, initiating an output signal and/or activating a display means as an indication of a defective yarn having regular or substantially regular sequences of thick places.

"Continuously integrating" as that term is used herein, means that when a pulse arrives at the integrator it is received therein and its charge added to the charge already held in the integrator. This contrasts with the situation which exists in a known method of yarn fault detection described in U.K. Patent 1,341,135, where pulses are fed to an integrator over a predetermined time period and the capacitor then discharged before integration recommences for the next predetermined time period, which is equal to the first. In the present invention no such discharge occurs;

though of course a pulse fed into the integrator at a given time has progressively less and less effect as time proceeds on the total charge held by the integrator, because of leakage from the integrator.

The invention also provides an apparatus for carrying out the method of the invention, comprising a sensor for continuously scanning the cross-section of a yarn to be monitored and operable to produce an electrical signal corresponding to the yarn cross-section; a transmission channel arranged to receive the signal from the sensor, and including means for amplifying the signal, a frequency-dependent element which is adjustable to determine the defect length to be monitored, an adjustable first comparator for comparing the amplitude of the signals with an adjustable ideal value, a monostable multivibrator adapted to produce pulses of constant height and width, an integrator arranged to continuously integrate the said pulses, and a second comparator arranged to be controlled by a reference signal and to receive the signal from the integrator and a display or signal device arranged to receive the signal from the transmission channel.

The method and apparatus of the invention are advantageously used as an addition to known yarn clearers. Thus arranged, they form an additional evaluation facility for monitoring the yarn quality.

It would be unhelpful if in the event of the occurrence of yarn defects whose signals are able to pass the transmission channel of apparatus according to the invention, there took place only a yarn cut and a piece of the defective yarn were removed. This would be unusable yarn. The cause of this type of yarn defect should be sought in a fault in the spinning process which should be eliminated at source. For this purpose, an indication or signal display showing that such a fault has been detected is more suitable than merely cutting out a piece of yarn, which will shortly be followed by another such piece.

Some embodiments of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a schematic diagram of an apparatus for monitoring yarn defects with the necessary component groups, and

Figure 2 is a schematic diagram or a variant of the apparatus.

Referring to Figure 1, a yarn 1 to be monitored is taken off a bobbin 2 and wound in known manner on a parallel bobbin 3. In so doing, the yarn 1 runs through a sensor or measurement device 4, having a converter, which represents the cross-section of the yarn as an electrical signal U1. This signal is passed to the input of a transmission channel in which it is raised

to a suitable voltage level in an amplifier 5. The amplifier 5 is followed by a low pass filter 6 with an adjustable band pass. The adjustment of the band pass by means of a control value U_t determines the defective length so that in this low pass filter, short defects which should not pass the transmission channel are suppressed.

The signals U2 passing the low pass filter 6 reach a first comparator 7. The amplitude of the signals U2 is compared with an adjustable ideal value U_s in this comparator. If the amplitude exceeds the ideal value U_s , a signal U3 is transmitted to a monostable multivibrator 8. This monostable multivibrator generates a pulse U4 of constant amplitude and duration.

These pulses U4 are continuously integrated in an integrator 9, however, during the pulse gaps the pulse sum stored in the integrator is at least partially decomposed. The output voltage U5 of the integrator 9 acts on a second comparator 10 which is controlled by a reference signal U_b .

If only single pulses U4 occur at the monostable multivibrator 8, the integration of these pulses cannot achieve the value of the reference signal U_b . However, if the pulses U4 follow one another at relatively short intervals, which signifies an accumulation of yarn defects the integrator becomes increasingly charged until in the comparator 10 the reference signal U_b is reached or exceeded, as a result of which a defect signal U6 is initiated. This defect signal U6 can then be used to activate a suitable display or signal device, such as a meter 11, lamp 12, alarm 13 or relay 14 for initiating further switching functions or a combination thereof.

Figure 2 shows a second embodiment which is advantageously used when strictly periodic defects are to be determined. In this case the low pass filter 6 according to Figure 1 is replaced by a band pass filter 16, which is tuned to the corresponding repetition frequency. This repetition frequency is advantageously made adjustable by a control signal U_t supplied from outside, so as to be able to pick up periodicities over a certain frequency range. The remaining component groups and their functions are unchanged from those in Figure 1.

The method and apparatus of the invention can in themselves form a monitoring installation, with which the yarn 1 running through the measurement element 4 is examined merely for yarn defects consisting of a regular or substantially regular sequence of thick points. Such an arrangement is used when yarn production is already so perfect that other yarn defects, such as sporadic thick places, of all kinds, or double threads no longer occur.

The method and apparatus of the inven-

tion can however also form an addition to existing yarn clearers or yarn clearing installations which shows up a type of defect which could not be picked up with the conventional clearing equipment.

WHAT WE CLAIM IS:—

1. A method for the detection of yarn defects which occur regularly or substantially regularly, comprising continuously scanning the cross-section of the yarn by a sensor to produce a corresponding electrical signal, producing an electrical pulse of constant height and width when the said electrical signal exceeds a predetermined value, continuously integrating (as herein defined) said pulses to produce a further electrical signal, comparing the said further electrical signal with a further predetermined value, and, when the said further electrical signal exceeds the said further predetermined value, initiating an output signal and/or activating a display means as an indication of a defective yarn having regular or substantially regular sequences of thick places.

2. A method according to claim 1, wherein the monitoring of regular or substantially regular sequences of thick places is used as an additional defect monitoring system in a yarn clearer.

3. A method according to claim 2, wherein the determination of regular or substantially regular sequences of thick places is indicated on a display or signal device separate from an actual working circuit of the yarn clearer.

4. A method according to claim 1, wherein the first mentioned electrical signal is passed through a low pass filter.

5. A method according to claim 1, wherein the said first mentioned electrical signal is passed through a band pass filter.

6. A method of detecting yarn faults substantially as described with reference to Figure 1 or Figure 2 of the accompanying drawings.

7. An apparatus for carrying out the method claimed in claim 1, comprising a

sensor for continuously scanning the cross-section of a yarn to be monitored and operable to produce an electrical signal corresponding to the yarn cross-section; a transmission channel arranged to receive the signal from the sensor, and including means for amplifying the signal, a frequency-dependent element which is adjustable to determine the defect length to be monitored, an adjustable first comparator for comparing the amplitude of the signals with an adjustable ideal value, a monostable multivibrator adapted to produce pulses of constant height and width, an integrator arranged to continuously integrate the said pulses, and a second comparator arranged to be controlled by a reference signal and to receive the signal from the integrator and a display or signal device arranged to receive the signal from the transmission channel.

8. An apparatus according to claim 7, wherein the frequency-dependent element is a low pass filter.

9. An apparatus according to claim 7, wherein the frequency-dependent element is a band pass filter having an adjustable pass or repetition frequency.

10. An apparatus according to claim 7, capable of use as a defect detector for regularly or substantially regularly occurring sequences of thick places in a yarn.

11. An apparatus according to claim 7, combined with a yarn clearer.

12. An apparatus according to claim 11, wherein the display or signal devices can be activated independently of the working circuit of the yarn clearer.

13. An apparatus for the detection of yarn defects substantially as described with reference to Figure 1 or Figure 2 of the accompanying drawings.

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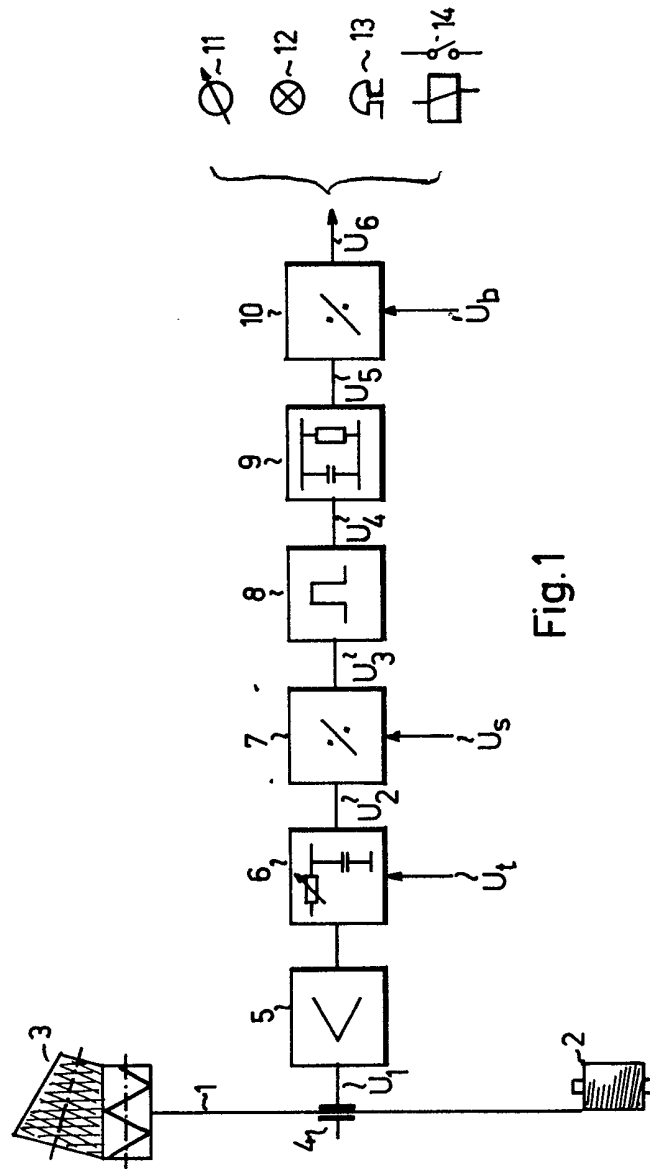


Fig. 1

