

PATENT SPECIFICATION

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(54) CAPACITIVE THREAD STOPPING MOTION

(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:

5 The invention relates to a capacitive thread stopping motion. 45

Thread stopping motions which clearly show the presence of a running thread at specified positions are required for monitoring production plants in the textile industry. Such thread stopping motions have already been in use for a long time. They may be in the form of mechanical thread detectors or they may be optical or thermoelectrical detectors. 10 Mechanical detectors have the disadvantage that they have to touch the thread continuously and may thus damage the thread structure and they display the location of a thread breakage after a delay owing to their mechanical inertia. In addition, they require the continuous presence of thread tension so as to hold a detecting lever in a suspended position. Optical thread stopping motions require a complicated arrangement of light 15 source and light receiver with a high consumption in energy when used comprehensively, and the reliability of the light source and light receiver is greatly impaired by unavoidable deposits of fibre dust. 55

Thermo-electrical thread stopping motions have also been suggested more recently, but these have the similar disadvantage of thermal inertia: the time interval from the moment of the thread breakage until a measurable change appears in the electrical operating value of the thread stopping motion may be kept small by relevant structural measures but cannot be excluded altogether. 60

According to the present invention, there is provided a capacitive thread stopping motion which is arranged definitely to display the presence of a running thread by emitting a relevant signal in such a way that the signal fails immediately a running thread is absent, the said motion comprising a precision capacitor through which a thread to be monitored can run to form a portion of the dielectric of the capacitor, the precision capacitor being directly connected to a direct voltage source for producing an electric field and directly connected to an amplifier with a high input resistance. 65

30 The irregularity in the cross-section of the thread is advantageous in that it only produces an alternating voltage in the precision capacitor when the thread runs and this is processed in the amplifier as an alternating current signal. When the thread is stationary or absent, there is no alternating voltage and this forms a clear criterion for the passage of a thread. 70

35 The single figure of the accompanying drawing illustrates a capacitive thread stopping motion according to the invention. In the illustrated arrangement, a precision capacitor 10 has one of its electrodes directly connected to a direct voltage source 11 and the other electrode is directly connected to the input of an amplifier 12. The electrical input behaviour of the amplifier 12 is characterised by an input capacitance 13 (C_e) and an input resistance 14 (R_e). A thread 15 travelling between the electrode of the capacitor 10 causes a change in capacitance ΔC in the capacitor 10. During the passage of a thread 15, it amounts 40 80

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to about 10^{-16} F. The time constant $(C_x + C_E).R_E = \tau$ must be large in relation to the period in which the changes of capacitance takes place.

An alternating voltage ΔU is then produced by the capacitive divider C_x and C_E :

$$\Delta U = \frac{U.C_E}{(C_x + C_E) 2} + C_E + C_x$$

After the period τ , the voltage ΔU has dropped to 37%. This means that it is not possible to measure the cross-section of the thread over a longer period with the capacitive thread stopping motion. On the other hand, momentary variations in the cross-section of the yarn (i.e. its irregularity) may be determined. They produce an alternating voltage signal when the thread is moved through the precision capacitor 10. In the case of a stand-still or thread breakage, the alternating voltage signal disappears immediately, representing the functioning as thread stopping motion.

The irregularity of endless yarns is generally very slight so that the formation signal may disappear in the background noise under certain circumstances. However, in these cases, the static charge occurring with good insulating materials and always distributed very irregularly on the thread nonetheless produces an alternating voltage signal by electro-static induction.

With poor insulating materials, say moist or anti-statically treated endless yarns, a varying resistance placed by the thread between the plates of the precision capacitor 10 may also lead to a useful alternating voltage signal in some cases.

WHAT WE CLAIM IS:

1. A capacitive thread stopping motion which is arranged definitely to display the presence of a running thread by emitting a relevant signal in such a way that the signal fails immediately a running thread is absent, the said motion comprising a precision capacitor through which a thread to be monitored can run to form a portion of the dielectric of the capacitor, the precision capacitor being directly connected to a direct voltage source for producing an electric field and directly connected to an amplifier with a high resistance.

2. A capacitive thread stopping motion substantially as described with reference to the accompanying drawings.

ELKINGTON AND FIFE,
Chartered Patent Agents,
High Holborn House,
52/54 High Holborn,
London WC1V 6SH.
Agents for the Applicants.

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