United States Patent

[11] **3,576,560**

[72] Inventor Geert Jan Vermeulen
Deurne, Netherlands

[21] Appl. No. 755,346
[22] Filed Aug. 26, 1968
[45] Patented Apr. 27, 1971
[73] Assignee N. V. Machinefabriek L. te Strake
Deurne, Netherlands
[32] Priority Sept. 12, 1967
[33] Netherlands
[31] 6712480

[54] **ELECTRONIC THREAD GUARD**
6 Claims, 1 Drawing Fig.

[52] **U.S. Cl.** **340/259,** 57/81, 139/336, 250/206, 250/215, 315/134, 315/155, 340/419
[51] **Int. Cl.** **G08b 19/00**
[50] **Field of Search** 340/222, 220, 259, 419, 421, 146.1; 250/206, 215; 57/81, 109; 139/336; 200/61.13, 61.18; 315/149, 155, 134

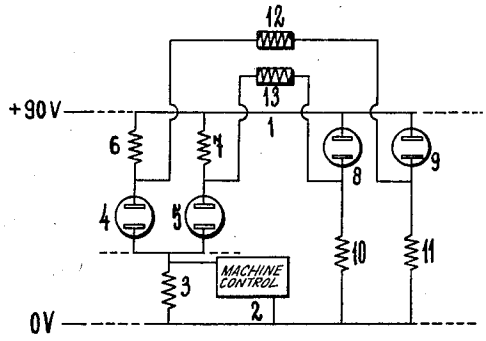
[56] **References Cited**

UNITED STATES PATENTS

2,651,031	9/1953	McConaghey	340/259
2,777,026	1/1957	Vossen	340/259X
3,158,852	11/1964	Schacher	340/259
3,268,732	8/1966	Grieder	250/206
3,298,401	1/1967	Stutz	139/371
3,345,812	10/1967	Pickering	340/259X
3,365,647	1/1968	Stone	250/206X
3,440,634	4/1969	Maurmann et al.	340/259

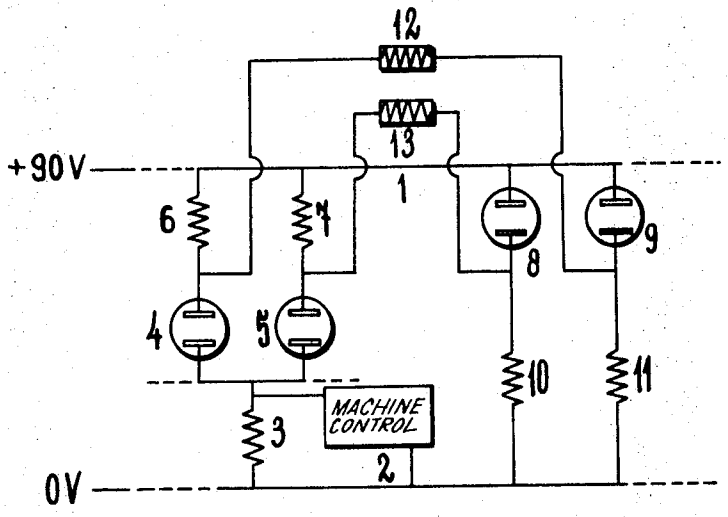
Primary Examiner—John W. Caldwell
Assistant Examiner—David L. Trafton
Attorney—Christel & Bean

ABSTRACT: An electronic thread guard for guarding a plurality of threads or groups of threads comprising a first set of glow discharge lamps, there being one lamp for each thread or thread group to be guarded, and a series resistor connected with the set between two supply voltage leads. A second set of lamps, there being one lamp with a voltage dropping resistor for each thread or thread group to be guarded, is connected between the two supply voltage leads. A light-dependent resistor included for each thread or thread group is illuminated or obscured in response to tensioning or slackening, respectively, of the corresponding thread or thread group and is connected to a corresponding one of the lamps in the first set and to a corresponding lamp in the second set. In response to the occurrence of a break in one of the threads or thread groups, the corresponding glow discharge lamp in the first set is ignited, and ignition of the other lamps in that set is prevented. The voltage across or current through the series resistor is utilized to stop the machine, and each lamp in the second set is ignited independently in response to slackening of the corresponding thread or thread group.



PATENTED APR 27 1971

3,576,560



INVENTOR.
GEERT JAN VERMEULEN
BY
Christel & Bean
ATTORNEYS

ELECTRONIC THREAD GUARD

In many textile machines, such as twining machines, creels and warping machines, thread guards are used for signaling the breakage of a thread or thread group and for stopping the machine. Upon the machine coming to a stop, usually many threads or thread groups which have not broken become slack, so that it is not simple to ascertain in which thread or thread group a break must be repaired before the machine can be restarted. Therefore, there is a need for a thread guard which indicates and continues to indicate, even after the machine has come to a stop, in which thread or thread group a break has occurred and which moreover possibly continues to indicate which thread or thread groups are slack, regardless of whether this has been caused by a thread breakage or not. The latter point is of importance for indicating to the operators after repairing the thread breakage, which threads or thread groups are still to be tensioned before the machine can be restarted.

The invention aims at providing an electronic thread guard which meets the above requirements.

For that purpose it is a feature of an electronic thread guard according to the invention that for each thread or thread group to be guarded, a glow discharge lamp and a series resistor in the order mentioned are connected in series between two supply leads which with respect to one another carry a stabilized voltage somewhat exceeding the ignition voltage of the glow discharge lamp, the series resistor being common to all resistors and glow discharge lamps and in which between the junction of each first resistor and first glow discharge lamp and a supply point with a lower voltage than that junction respectively, a light-dependent resistor is connected, which by intervention of a vane operated by the thread or thread group concerned, is illuminated as long as the thread or thread group concerned is tensioned and becomes obscured as soon as the thread or thread group concerned becomes slack.

As will be explained below, the glow discharge lamp concerned ignites as soon as a break occurs in a thread or thread group and the lamp remains ignited also after the machine has been stopped. In that case, no indication is obtained of the thread or thread groups which by stopping the machine have also become slackened. If that is required, it can be a further feature of the device according to the invention, that the supply point with a lower voltage than the junction, for each light-dependent resistor consists of a separate second glow discharge lamp which with one terminal is connected to the supply lead to which the resistors are connected and with the other terminal through a second resistor is connected to the other supply lead.

In that case, as soon as further threads or thread groups become slackened by the machine stopping, the corresponding second glow discharge lamps ignite also, but the corresponding first glow discharge lamps remain extinguished, so that eventually the ignited first glow discharge lamp indicates in which thread or thread group a break has occurred while the ignited second glow discharge lamps indicate which threads or thread groups have finally become slackened, regardless of whether this has been caused by a thread breakage or otherwise.

The invention is further elucidated below with reference to the DRAWING, which shows a circuit diagram of an embodiment of a thread guard according to the invention.

In the FIGURE, a stabilized voltage of e.g. 90 volts exists between the supply leads **1** and **2**. A series resistor **3** is connected to the supply lead **2** and between its free terminal and the supply lead **1**, glow discharge lamps **4**, **5** with each a resistor **6**, **7** in series are connected. For each thread or thread group to be guarded, a separate glow discharge lamp in series with a resistor is present. Further, glow discharge lamps **8**, **9**, each in series with a resistor **10**, **11** are connected between the supply leads **1** and **2** and of these glow discharge lamps also, a separate one is present for each thread or thread group to be guarded. The junction of each of the first glow discharge lamps and resistors is through a separate light-dependent resistor **12**, **13** connected to the junction of the corresponding second glow discharge lamp and resistor. All glow discharge lamps **4**, **5**, **8**, **9** have ignition voltages which are somewhat below the supply voltage, e.g. ignition voltages of 75 volts.

As long as all threads or thread groups to be guarded are tensioned, i.e. during normal operation of the machines, the respective vanes assume such positions that the light-dependent resistors **12**, **13** are illuminated by the ambient light or a lamp specially provided for that purpose. These resistors thereby have a low resistance, e.g. of the order of 10 kΩ. The resistors **6**, **7** and **10**, **11** have resistances of the same order of magnitude, e.g. also 10 kΩ. The voltage drop across each of the conventional resistors **6**, **7** and **10**, **11** thereby amounts to approximately 30 volts and the voltage drop across each of the light-dependent resistors **12**, **13** also amounts to approximately 30 volts. The voltage which is available for the glow discharge lamps **4**, **5**, **8**, **9** for that reason is not higher than approximately 60 volts, which is far below the ignition voltage, so that these lamps cannot ignite. As soon as one of the threads or thread groups to be guarded breaks, e.g. the thread or thread group which operates the vane which determines the illumination of the light-dependent resistor **12**, this light-dependent resistor becomes obscured, whereupon its resistance rises strongly and e.g. reaches a value of the order of magnitude of 1 MΩ. The voltage drop across the respective resistors **6** and **11** respectively in that case becomes very small, so that substantially the full supply voltage becomes available for the glow discharge lamp **4** and **9** respectively, which are ignited thereby. Ignition of the glow discharge lamp **4** indicates that the thread or thread group belonging to this lamp has broken. At the same time, the machine is automatically stopped by a device which responds to the voltage across or the current through the common series resistor **3**. This device can e.g. consist of a relay, the coil of which takes the place of the series resistor **3**, or of a relay, the coil of which is connected to the series resistor **3**, possibly through an amplifier. Upon the machine stopping, the nonbroken threads or thread groups **2** will generally become slackened, in this case e.g. the thread or thread group which cooperates with the vane of the light-dependent resistor **13**. Thereby, this light-dependent resistor too assumes a very high resistance, so that the voltage drop across the resistors **7** and **10** respectively becomes very small. Thereupon, substantially the full supply voltage is available for the glow discharge lamp **8**, so that this glow discharge lamp also ignites, indicating that the thread or thread group concerned has become slackened. The glow discharge lamp **5** on the other hand is not able to ignite, since the voltage drop across the series resistor **3**, caused by the current through the glow discharge lamp **4** which has already been ignited, is so large that the voltage available for the glow discharge lamp **5** is below the ignition voltage of that lamp. Therefore, among the first glow discharge lamps **4**, **5** only that lamp can ignite, which correspond to the thread or thread group in which a break has occurred.

Upon putting the machine back in operation, first of all the break is repaired in the thread or the thread group to which the glow discharge lamp **4** belongs. Subsequently, this thread or thread group is tensioned and thereupon, all other threads or thread groups, the glow discharge lamps **8** or **9** of which have been ignited, are tensioned too. By a short interruption of the supply voltage, all ignited glow discharge lamps are extinguished and upon switching the supply voltage on again, these do not ignite again, since all light-dependent resistors **12**, **13** are now illuminated. Thereupon, the machine can be restarted, during which all glow discharge lamps remain extinguished until another thread breakage occurs.

Although for simplicity the drawing shows a thread guard, which is suitable for guarding only two threads or thread groups, this number in practice usually is much larger. Therefore, in practice a correspondingly larger number of glow discharge lamps, resistors and light-dependent resistors is used. In certain cases, the light-dependent resistor can be replaced by microswitches, but these have the disadvantage of a much lower mechanical sensitivity than a vane.

If it is not necessary to indicate which thread or thread groups have become slackened upon the machine stopping, even if no break has occurred in these threads or thread groups, the right hand terminals of the light-dependent resistors 12 and 13 can be connected directly to the supply lead 2 or the tap of a voltage divider between the supply leads 1 and 2. The second glow discharge lamps 8 and 9 and the resistors 10 and 11 are then superfluous.

I claim:

1. An electronic thread guard comprising a plurality of resistors each connected to a first supply lead, a corresponding plurality of glow discharge lamps connected to corresponding ones of said resistors, there being one series combination of resistor and glow discharge lamp for each thread or thread group to be guarded, a series resistor connected to said glow discharge lamps and a second supply lead, whereby each resistor, each glow discharge lamp and said series resistor in the above order are connected in series between the two supply leads which with respect to one another carry a stabilized voltage which somewhat exceeds the ignition voltage of the glow discharge lamps, the series resistor being common to all resistors and glow discharge lamps, a light-dependent resistor connected between the junction of each resistor and glow discharge lamp and a supply point with a lower voltage than that junction respectively, said light-dependent resistor being illuminated as long as the thread or thread group concerned is tensioned and becoming obscured as soon as the thread or thread group concerned becomes slackened whereby in response to the occurrence of a break in one of the threads or thread groups the corresponding glow discharge lamp is ignited and ignition of the other lamps is prevented.

2. Electronic thread guard, according to claim 1, wherein the supply point with a lower voltage than the junction for each light-dependent resistor comprises a separate second glow discharge lamp of which one terminal is connected to said first supply lead to which the resistors are connected and the other terminal is connected through a second resistor to said second supply lead.

3. Electronic thread guard according to claim 1 wherein the circuit includes a device which stops the machine as soon as the voltage across or the current through the series resistor exceeds a predetermined value by the ignition of one of the first glow discharge lamps.

4. Electronic thread guard according to claim 2 wherein the circuit includes a device which stops the machine as soon as the voltage across or the current through the series resistor exceeds a predetermined value by the ignition of one of the first glow discharge lamps.

5. An electronic thread guard for guarding a plurality of threads or groups of threads comprising a first set of glow discharge lamps, there being one lamp having a voltage-dropping means connected thereto for each thread group to be guarded, a series resistor, said first set of lamps and said series resistor being connected in series between first and second voltage supply leads which carry therebetween a stabilized voltage somewhat greater than the ignition voltage of each of said glow discharge lamps, a second set of glow discharge lamps, there being one lamp having a voltage-dropping means connected thereto for each thread or thread group to be guarded, a plurality of light-dependent resistors, there being one resistor for each thread or thread group to be guarded, each light-dependent resistor being illuminated as long as the corresponding thread or thread group is tensioned and becoming obscured as soon as the thread or thread group becomes slackened, each of said light-dependent resistors being connected to a corresponding one of said lamps and voltage-dropping means in said first set and to one of said lamps and voltage-dropping means in said second set whereby in response to the occurrence of a break in one of the thread or thread groups, the corresponding glow discharge lamp in the first set is ignited and ignition of the other lamps in that set is prevented and each lamp in said second set is ignited independently in response to slackening of the corresponding thread or thread group.

6. An electronic thread guard according to claim 5 wherein the circuit includes a device which stops the machine as soon as the voltage across or the current through said series resistor exceeds a predetermined value by the ignition of one of said glow discharge lamps in said first set.