May 2, 1950 T. J. PRICE 2,506,174

ELECTRONIC THREAD CLEARER

Filed May 10, 1946 2 Sheets-Sheet 1

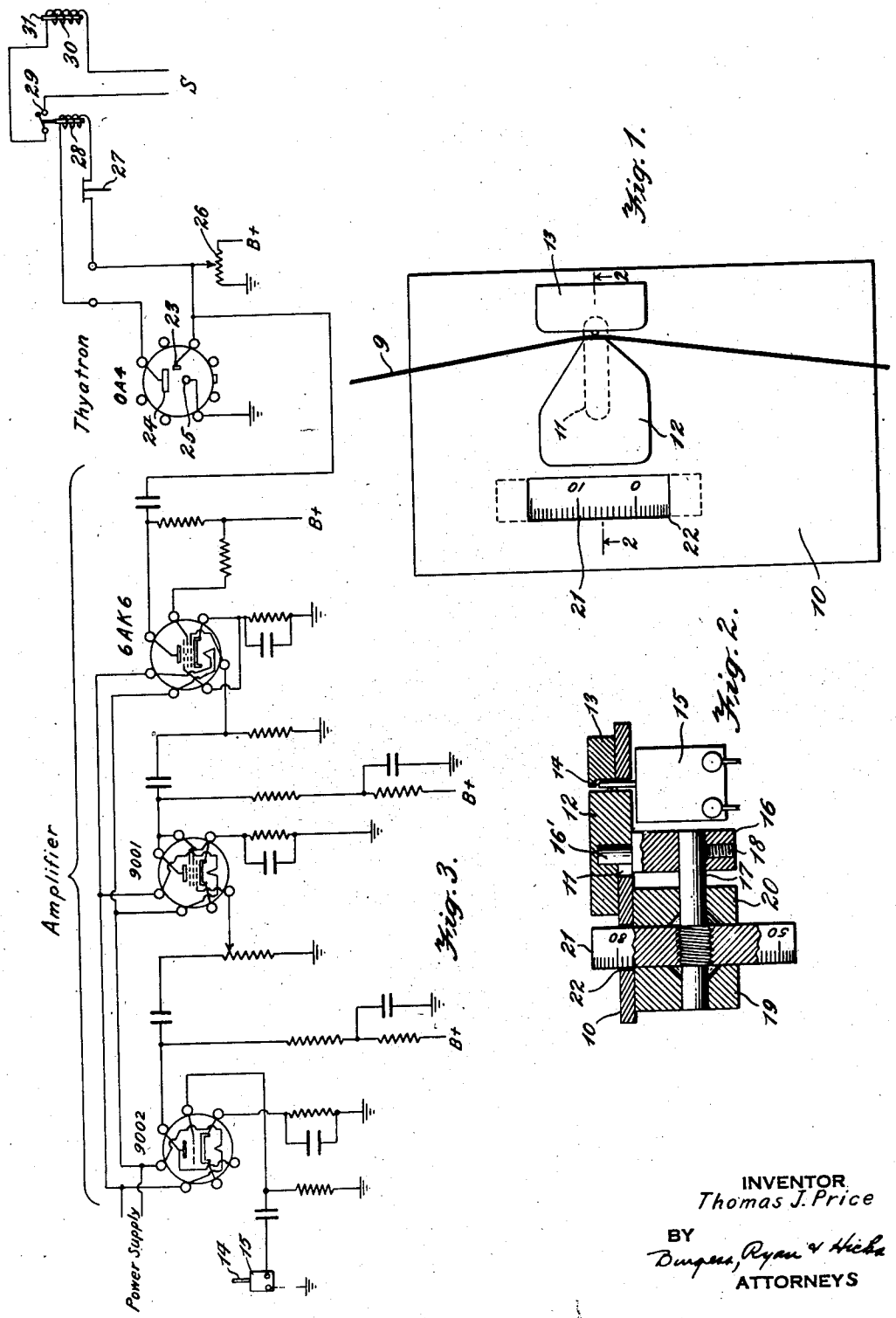


Fig. 3.

Fig. 1.

Fig. 2.

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Filed May 10, 1946 2 Sheets-Sheet 2

Fig. 4.

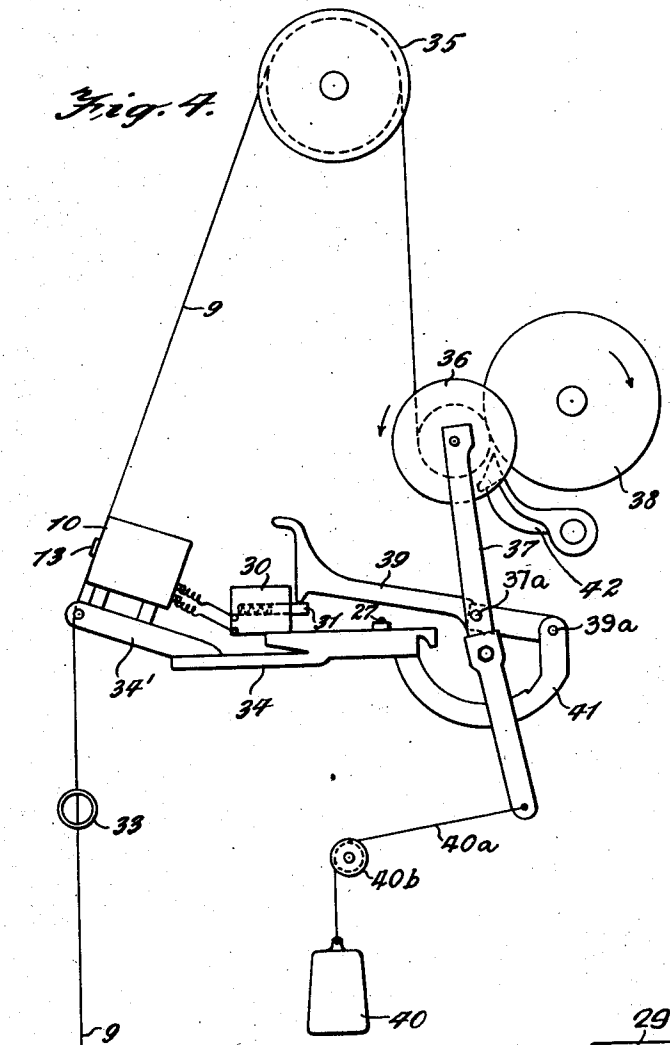
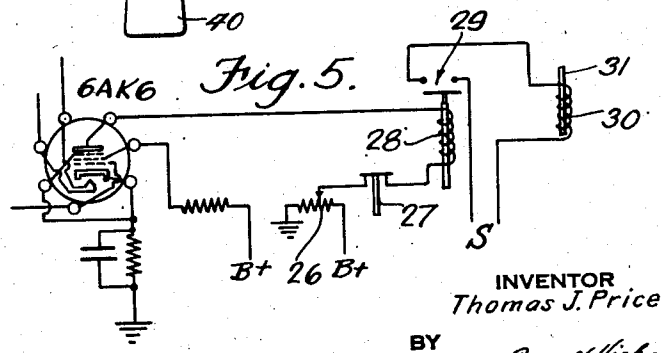


Fig. 5.



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ELECTRONIC THREAD CLEARER

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Application May 10, 1946, Serial No. 668,975

11 Claims. (Cl. 28—64)

1

This invention relates to improvements in thread testing devices and more particularly to an electronic device for detecting flaws or faults in thread.

The objects and advantages of the invention will be best understood from the following description and the accompanying drawings in which:

Fig. 1 is a front or plan view of a portion of an electronic testing device embodying the invention;

Fig. 2 is a section view taken along the lines 2—2 of Fig. 1;

Fig. 3 is a wiring diagram, illustrated schematically, for use in connection with an electronic testing device embodying the invention;

Fig. 4 illustrates diagrammatically a thread testing apparatus utilizing an electronic thread clearing device embodying the invention; and

Fig. 5 is a schematic wiring diagram illustrating a portion of a circuit for use in detecting thin spots in a thread;

Referring to the drawings in detail, there is a front panel 10 which has a slotted opening 11 into which a portion of a thread guide 12 is fitted. The thread guide 12 is movably mounted on the panel and is positioned opposite to a fixed member 13 that is mounted on the panel at one end of the opening 11. A pick-up needle 14 of a piezo-electric crystal pick-up unit 15 extends through the opening 11 at a point adjacent the fixed member 13 and between said member and the guide 12.

To move the thread guide 12 laterally on the panel relative to the fixed member and the pick-up needle, there is a pin 16' which extends through the opening 11 in the panel and into the body of the guide 12. The pin 16' is carried by a block 16 which has an opening into which one end of a shaft 17 is fitted. The pin-carrying block 16 is secured to the end of the shaft 17 by a set screw 18.

The shaft 17 is movable laterally of the panel 10 and may be supported therefrom in a suitable manner. In the illustrated embodiment, the shaft 17 is supported by a pair of spaced supports 19 and 20 extending from the rear of the panel. A portion of the shaft 17 between the supports 19 and 20 is threaded and engages with internal threads on a graduated drum 21. The supports 19 and 20 may be partially cut away adjacent their shaft receiving openings so there will be no interference with lateral movement of the shaft.

The drum 21 is held in a fixed position by the

2

supports 19 and 20 and the top of the drum projects through an opening 22 in the panel 10. Consequently, when the drum 21 is turned, the shaft 17 is moved laterally in the supports 19 and 20 and this movement is transmitted to the thread guide 12 which is connected to the shaft. The engaging threads on the shaft and the drum are preferably finely machined so that micro-adjustment of the thread guide relative to the pick-up needle 14 may be secured and the drum may be readily calibrated in terms of the distance between the guide and the pick-up needle.

When a thread 9 of a given size and diameter is to be tested for faults such as enlarged portions, the drum 21 is turned to position the thread guide 12 at a distance from the pick-up needle 14 corresponding to the diameter of the thread; i. e., so that the thread will normally just pass between them without touching the pick-up needle. The thread 9 may be inserted before or after this adjustment is made.

The output of the crystal pick-up 15 is connected to the input of an amplifier. The amplifier, illustrated in Fig. 3 is a three stage, resistance-coupled amplifier, utilizing vacuum tubes commercially identified as No. 9002, No. 9001 and No. 6AK6 in the successive stages of amplification. Inasmuch as this type of amplifier is well known to those skilled in the art, it is not necessary to describe it in detail. It will also be understood that any satisfactory amplifier may, if desired, be used in place of the specific amplifier illustrated.

The output of the amplifier is connected to the starter anode 23 of an 0A4 grid-controlled gaseous discharge tube. The main electrodes 24 and 25 of this tube are connected to a source of high voltage B+ through a circuit including an adjustable resistance 26, a switch 27 and a relay 28. The resistance 26 is adjusted so that the voltage normally applied across the grid-controlled tube approaches the breakdown or ionization voltage of the tube. Under these conditions if an additional voltage is applied to the grid-controlled tube, as for instance, from the starter anode, the path between the main electrodes will become ionized, thus completing the electrical path through the tube and permitting current to flow through it.

In other words, when a fault, such as an enlarged portion of thread 9, passes between the thread guide 12 and the pick-up needle 14, the mass of the fault striking the pick-up needle causes a voltage to be generated by the crystal pick-up device. This voltage is then amplified

and fed to the starter anode of the grid-controlled tube which already has a voltage approaching its ionization voltage impressed on it. This additional voltage causes ionization in the grid-controlled tube and permits current to flow through it. Since the operation of such a tube is instantaneous, this arrangement may be used effectively in a device of the character described here where the thread moves at high speeds.

When current flows through the grid-controlled tube, the relay 28 is energized and closes contacts 29. When the contacts 29 are closed, they connect a solenoid 30 to a source of electrical energy S thus energizing the solenoid 30 and causing it to retract a plunger 31.

As shown in Fig. 4, the thread 9 is fed from a spool 32 through a tensioning spring 33 from which it passes between the thread guide and pick-up needle of the testing device which is supported on an arm 34' extending from a table 34. After the thread 9 leaves the testing device, it passes over a pulley 35 and is wound onto a bobbin 36. The bobbin 36 is rotatably supported by an arm 37. The arm 37 is movable to carry the bobbin 36 into and out of frictional engagement with a driving drum 38.

The bobbin supporting arm 37 is pivotally carried at 37a by a lever 39. The end of the arm 37 is connected to a counterbalance 40 by a cable 40a that runs over an offset pulley 40b. One end of the lever 39 is pivoted at 39a on a bracket 41 that extends from the table 34 and the other end of the lever 39 is supported by the plunger 31 of the solenoid 30 in a position where the arm 37 holds the bobbin 36 in engagement with the driving drum 38. When the plunger 31 is retracted by operation of the solenoid 30 due to a fault in the thread striking the pick-up needle 14, the lever 39 drops down and carries the arm 37 with it. This moves the bobbin 36 downwardly out of engagement with the driving drum 38 and into engagement with a friction plate or braking shoe 42 that holds the bobbin against further rotation.

When the lever 39 drops down, it strikes the operating mechanism of the switch 27 which is in the circuit with the grid-controlled tube. This causes the switch 27 to open disconnecting the grid-controlled tube and causing it to deionize. After the fault in the thread has been examined or removed, the testing may be continued by lifting the lever 39 to engage the bobbin 36 with the driving drum 38 once more. When the lever 39 is lifted, the switch 27 is automatically closed and the plunger 31 moves outwardly under the end of the lever 39.

When it is desired to test for faults such as thin spots in the thread, the thread guide may be set so that there will normally be a constant friction between the thread and the pick-up needle as the thread passes between the guide and the needle. This produces a constant voltage in the pick-up that is transmitted to the amplifier. In this case, the output of the amplifier may be connected directly to a sensitive relay and the grid-controlled tube omitted.

The relay when energized by such a constant voltage supplied to it from the amplifier has its contacts open. However, if this normal voltage drops due to the passage of a thin section of thread between the guide and pick-up needle, the relay operates to close its contacts completing an electrical circuit similar to that created by ionization of the grid-controlled tube which energizes the solenoid 30 and retracts the plunger 31 to stop the thread winding device.

It will be appreciated that while thread has been referred to in the foregoing description as the material to be tested, the invention is equally applicable to the testing of filaments of material such as rayon, or the like, wire or other articles of a similar nature.

While a preferred embodiment of the invention has been shown and described, it will be obvious to those skilled in the art that various modifications and changes may be made without departing from the scope of the invention as defined by the appended claims.

I claim:

1. In a device of the character described, the combination of an electrically sensitive pick-up having a pick-up member associated therewith, a thread guide positioned relative to said pick-up member and means for positioning said thread guide accurately in relation to said pick-up member, said means comprising a shaft connected to said guide, the shaft being supported movably in a support and having a threaded portion, a graduated drum having an internal threaded portion engaging with the threaded portion of said shaft, said drum being held in a fixed position whereby said shaft will be moved upon turning of the drum.

2. In a device of the character described, the combination of an electrically sensitive pick-up having a pick-up member associated therewith, a thread guide positioned relative to said pick-up member, and means for positioning said guide accurately in relation to said pick-up member, said means comprising a shaft connected to said guide, the shaft being supported movably in a pair of supports and having a threaded portion located between said supports, a graduated drum having an internal threaded portion engaging with the threaded portion of said shaft, said drum being held in a fixed position by said shaft supports.

3. A thread testing device of the class described, characterized by an electrically sensitive pick-up of the piezo-electric type, means for guiding a thread in a predetermined relation to said pick-up and means connected to said pick-up for controlling the operation of a thread winding device, said means including an amplifier connected to the pick-up, and a switching device connected to said amplifier for controlling the operation of a thread winding device.

4. In an electronic thread testing device, the combination of an electrically sensitive pick-up, a thread guide positioned in spaced relation to said pick-up device, means for adjusting the distance between said guide and said pick-up device, means for amplifying the output of said pick-up device, and switching means connected to said amplifying means for controlling the operation of a thread winding device.

5. In a device of the character described, the combination of an electrical pick-up device, a thread guide positioned in spaced relation to said pick-up device, and means for adjusting the distance between said guide and said pick-up member, said means comprising a shaft connected to said guide, a support for said shaft and a graduated drum held in fixed position relative to said shaft and threadably engaging with said shaft whereby said shaft will move transversely in said support upon the turning of the drum.

6. An electronic thread testing device, comprising the combination of a pick-up having an electrically sensitive element associated therewith, a thread guide adjustably mounted in spaced rela-

tion to said electrically sensitive element whereby said thread guide may be accurately positioned relative to said element to permit the passage of a thread of predetermined size between the guide and the electrically sensitive element, an amplifier connected to said element and a switching device connected to the output of said amplifier, said switching device being connected in a circuit controlling the operation of a thread winding device for drawing the thread between the guide and the electrically sensitive element whereby variations in an electrical impulse induced in the electrically sensitive element due to variations in the size of the thread passing between the thread guide and said element will cause the thread winding device to be stopped.

7. An electronic thread testing device as defined in claim 6 for detecting thin sections in the thread, wherein the thread guide is positioned to maintain a constant frictional engagement between a predetermined size of thread and the electrically sensitive element whereby a constant electrical impulse will be induced in the pick-up and the switching device is energized by said electrical impulse when amplified to maintain the thread winding device in operation.

8. An electronic thread testing device as defined in claim 6 for detecting thick sections in the thread, wherein the thread guide is spaced from the electrically sensitive element a distance equal to the predetermined size of the thread whereby thick portions of the thread passing between said guide and said element will induce an electrical impulse in the pick-up and the switching device is connected to render the thread winding device inoperative when energized by said impulse when amplified.

9. An electronic thread testing device as defined in claim 6, including a solenoid connected to the switching device for controlling the operation of the thread winding mechanism.

10. An electronic thread testing device as defined in claim 6 wherein the switching device is a grid-controlled, gaseous discharge vacuum tube.

11. An electronic thread testing device as defined in claim 6 wherein the switching device is an electrical relay.

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