

March 17, 1964

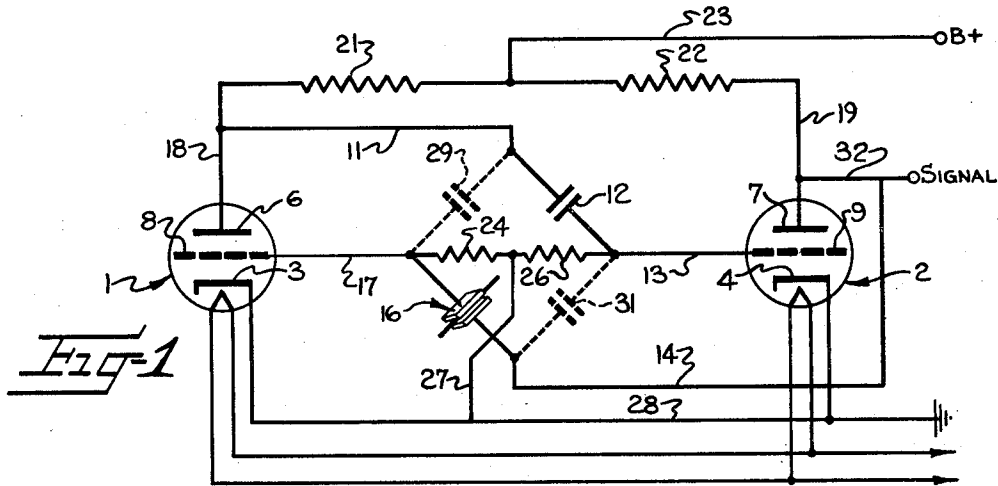
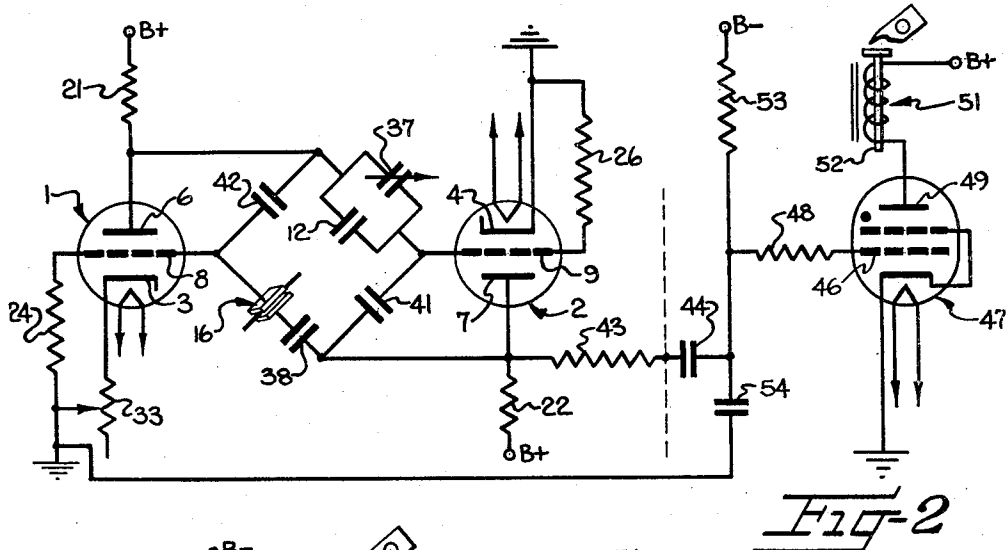
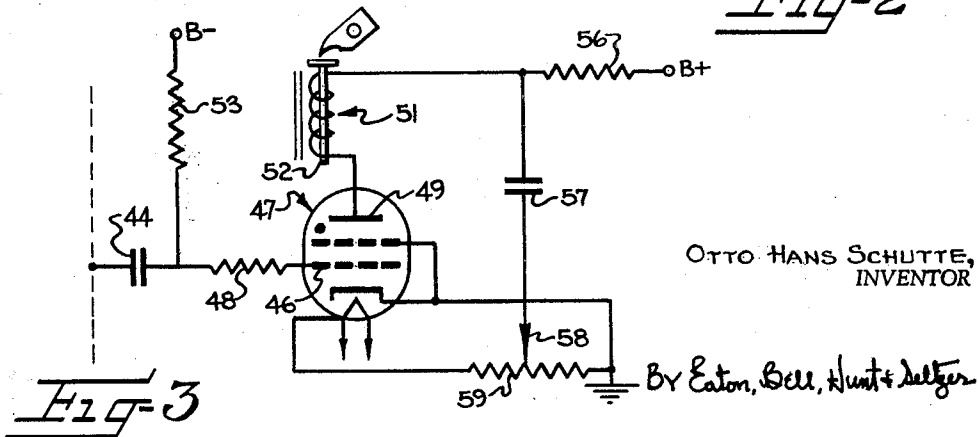
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3,125,708

OSCILLATOR CONTROLLED RELAY SYSTEM

Filed March 2, 1959

3 Sheets-Sheet 1



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O. H. SCHUTTE
OSCILLATOR CONTROLLED RELAY SYSTEM

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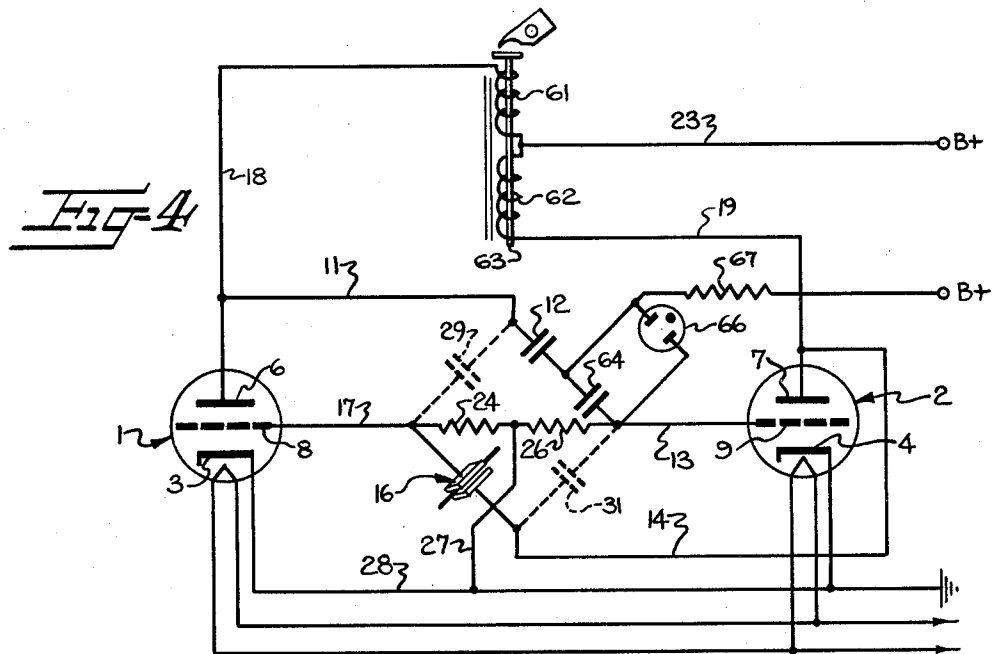
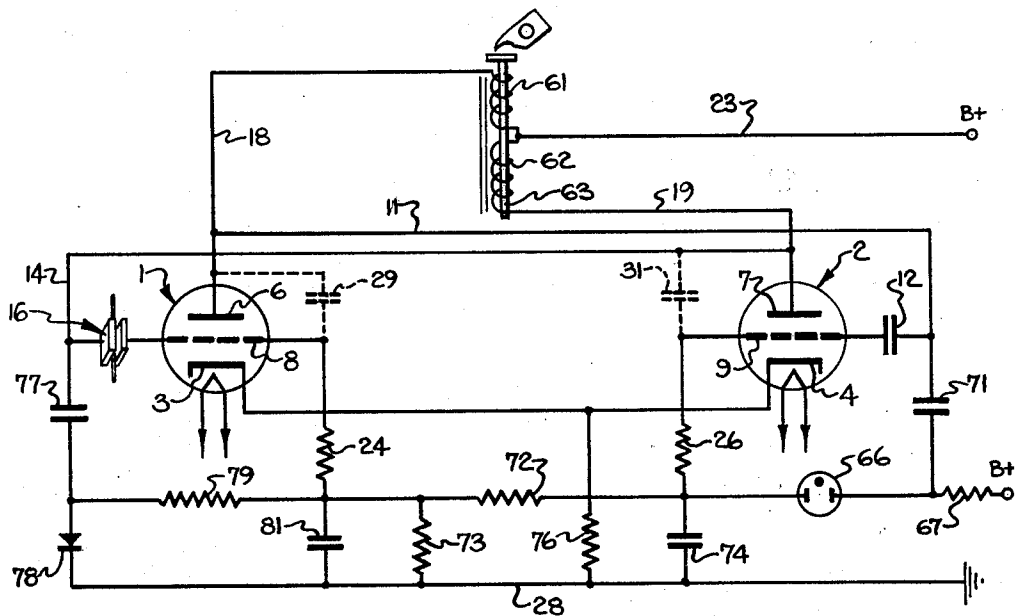


Fig-5

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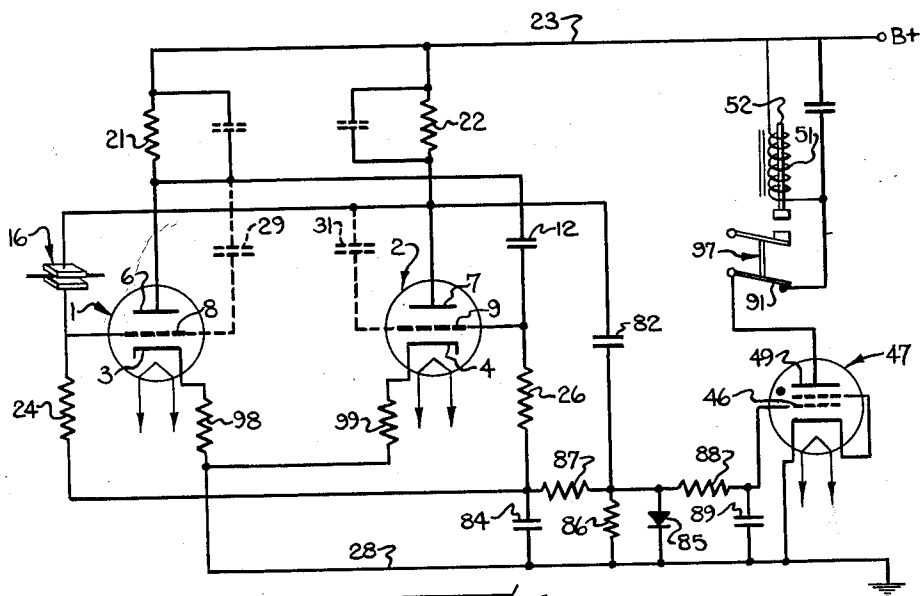


Fig-6

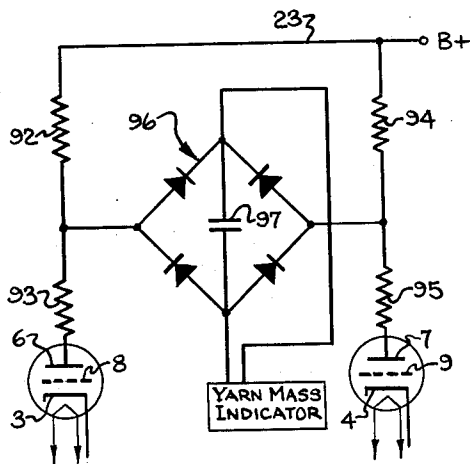


Fig-7

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3,125,708

OSCILLATOR CONTROLLED RELAY SYSTEM

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Filed Mar. 2, 1959, Ser. No. 796,481

Claims priority, application Netherlands Mar. 6, 1958

4 Claims. (Cl. 317-146)

The invention relates to an electrical circuit for measuring magnitudes, particularly magnitudes which are variable with time, which magnitudes are transmuted into variations in capacitance of a capacitor, which is incorporated in a chain of a generator circuit and which exerts a reaction on the action of the generator when the capacity is changed.

The magnitude measured may be some property of, for instance, an article produced in a manufacturing process, and the reaction of the generator circuit can be used for registering this magnitude, for signalling deviations and also, when the deviation from the desired value is too large, for interfering in all sorts of processes.

This invention particularly relates to an apparatus for the examination of textile material such as yarn and the like and more particularly to a control system for electrically operated yarn clearing apparatus referred to generally as a slub catcher which is employed to detect and provide for the elimination of non-uniform portions of yarn commonly referred to as slubs.

In the manufacture of textile material such as yarn the presence of short, thickened portions of yarn or portions substantially greater than the average mass of the yarn are highly undesirable. The yarn portions are generally referred to as slubs and as is well known, are caused by such factors as the incorporation of lint, fly, and similar unspinnable fibers in the yarn, broken filaments or improper drafting of the yarn as it is processed. If yarn of high quality is to be obtained these slubs must be removed as they weaken and materially reduce the quality of the yarn.

Many devices, both mechanical and electrical are presently available for removing or clearing yarn of such slubs and it is to the electrical type of slub catcher that this invention is particularly concerned with. Some presently available, electrically operated slub catchers utilizing electronic devices give outstanding results in the detecting of such slubs and provide for ready removal of virtually all of those undesirable slubs when the proper adjustments for sensitivity and the like have been made. One such slub catcher which utilizes such electronic devices or components is described and claimed in the copending patent application of Hendrik van Lingen and Henri Willem Schneider, Serial No. 770,482, entitled Apparatus for Examination of Textile Thread, filed October 29, 1958, and now abandoned. This slub catcher performs exceedingly well in commercial use and is characterized by an extreme sensitivity for precise and highly accurate slub detecting action.

However, such electronic slub catchers, of which the above is representative, contain a number of components, the adjustment of which is quite critical in order that the proper circuit operation be obtained. Furthermore, during use, these components, for instance electron tubes and the like, age in the well known manner so that periodic adjustment is often required in order to maintain the slub catchers in the proper operating condition. As each of the slub-catchers is arranged to monitor one end of yarn, the vast number of slub catchers that are generally required in a typical mill operation would demand the expenditure of considerable time and effort in order to keep these slub catchers in proper adjustment. This

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periodic need for adjustment results in considerable additional cost from the standpoint of time and labor expended, and from the loss of production during such periods of adjustment. Furthermore, the adjustment of such electronic slub catchers is a skilled operation requiring great care, and such skilled labor is often not readily available in the typical mill operation today.

Accordingly, a primary object of the invention is to provide a new and novel control system for electrically operated apparatus, measuring a physical property of said material.

Another object of this invention is to provide a new and novel control system for electrically operated apparatus, registering mass-deviations.

A further object of the invention is to provide a new and novel control system for electrically operated yarn clearing apparatus.

A still further object of this invention is to provide a new and novel control system for electrically operated catchers for thin places in textile material.

Another object of the invention is to provide a new and novel control circuit for an electrically operated slub catcher which may be readily adjusted for slub catching sensitivity and which when adjusted will remain in adjustment during prolonged use.

A further object of the invention is to provide a new and novel control circuit for an electrically operated slub catcher which is composed of a minimum number of parts so as to be extremely simple in construction and therefore utilizing a minimum of space, and which utilizes components which are readily available commercially and which do not require critical adjustment.

This invention further contemplates the provision of a new and novel control circuit for an electronic slub catcher which is rugged in construction, has a low initial cost, requires virtually no maintenance or periodic adjustment, and which may be assembled into a compact, relatively small structure.

A still further object of the invention is to provide a new and novel control circuit for an electrically operated slub catcher which may be arranged to either produce a slub indicating signal or which may include means within the circuit for performing a yarn control function when a slub is detected such as a clamping or cutting of the yarn.

Still another object of this invention is to provide a new and novel control circuit for an electrically operated slub catcher which is self stabilizing and which is capable of producing highly accurate, extremely sensitive slub detecting action.

Briefly, the objects of the invention and other related objects are accomplished by providing an oscillator circuit comprising a pair of electron tubes each of which has its output or anode connected to the input or grid of the other tube through feedback paths containing capacitances. A capacitance in one of these feedback paths is used as a yarn measuring capacitor through which the examined yarn is advanced. The two feedback paths are arranged to form a capacitive bridge with either the inter-electrode capacitances between the grid and anode of each tube or with additional capacitors so that the bridge oscillator circuit produces an output signal of a predetermined amplitude during oscillation. The presence of a slub within the yarn measuring capacitor increases the amplitude of the oscillator output signal so that in one form of the invention when the output signal has obtained a predetermined level a yarn control relay circuit is actuated to perform a control function. In another form of the invention, the presence of a thin place in the yarn measuring capacitor decreases the amplitude of the oscillator output signal, so that in one form of the invention, when after rectifying said output signal, said output signal

has obtained a predetermined level, a yarn control relay circuit is actuated to perform a control function. In still another form of the invention, an impedance or coil is connected to the anode of each of the tubes and associated with a common magnetic core, and an impedance such as a neon tube is connected in parallel with a capacitor in the other feedback path. The current flow during normal oscillation through the anode impedances is equal but the presence of a slub of predetermined mass within the yarn measuring capacitor increases the voltage across the neon tube causing its ignition so that the current flow in the two anode impedances is unequal inducing a magnetic field in their common core which can be used to perform a control function.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

FIGURE 1 is a schematic wiring diagram of a control circuit constructed in accordance with the invention to illustrate its basic principle of operation;

FIGURE 2 is a schematic wiring diagram of a control system suitable for commercial use which embodies the circuit of FIGURE 1 and which may be incorporated in a slub catcher for performing a yarn control function;

FIGURE 3 is a schematic wiring diagram showing a partial modification of the circuit of FIGURE 2;

FIGURE 4 is a schematic wiring diagram of a modification of the circuit of FIGURE 1;

FIGURE 5 is an improved form of the circuit of FIGURE 4 suitable for commercial use incorporating additional control features;

FIGURE 6 is a form of a circuit for catching thin places in the yarn, suitable for commercial use; and

FIGURE 7 is a wiring diagram showing a method for deriving a signal from the anode circuits of the generator tubes of the control system for registration purposes.

Referring now to the drawings and to FIGURE 1 in particular, there is shown a basic form of a circuit constructed in accordance with the invention which may be utilized in an electrically operated slub catcher for detecting and signaling the presence of a slub in yarn. As is well known, the electrically operated slub catcher to which this invention is directed may be of the type described and claimed in the above referred to copending patent application which utilizes a yarn examining capacitor between the plates of which the yarn is advanced.

The circuit of FIGURE 1 includes a pair of electron discharge devices or tubes 1, 2 containing cathodes 3, 4, anodes 6, 7 and grids 8, 9 respectively. The tubes or triodes 1, 2 are arranged to form an oscillator circuit of the bridge type and to this end the output or anode 6 of tube 1 is connected by means of conductor 11, capacitor 12 and conductor 13 to the grid 9 of tube 2. In turn, the anode 7 of tube 2 is connected by means of conductor 14, capacitor 16 and conductor 17 to the grid 8 of tube 1. The anodes 6, 7 of tubes 1, 2 are connected by means of conductors 18, 19 and resistors 21, 22 respectively to a common conductor 23 connected to a source of positive direct current voltage B+. The grids 8, 9 of the tubes 1, 2 are connected to grid resistors 24, 26 respectively which are connected in turn to a common conductor 27 which is connected at its other end to a ground conductor 28. The cathodes 3, 4 are also connected to the ground conductor 28 so that the grid resistors 24, 26 are connected between the grids 8, 9 and the cathodes 3, 4 of the tubes 1, 2 respectively.

The feedback paths interconnecting the two tubes 1, 2 are arranged as part of a conventional, four-sided capacitive bridge so that the other two legs of the bridge contain capacitances 29, 31. To this end, capacitor 29 is shown connected between conductors 11, 17 and capacitor 31 between conductors 13, 14.

In the circuit of FIGURE 1 the capacitances 29, 31 are shown in dotted lines as in one embodiment they repre-

sent the inter-electrode capacitances between the anode and grid of each tube and must be considered when the capacitors 12, 16 are very low in value. It should be understood, however, that the capacitances 29, 31 may be capacitors of a selected value to form the capacitance bridge of FIGURE 1 as will be described hereinafter.

One of the capacitors 12, 16 is selected as the yarn examining or measuring capacitor through which the yarn being examined is advanced and in the specific embodiment illustrated, capacitor 16 is employed for examining the yarn. The yarn is advanced by any suitable means (not shown) between the plates of capacitor 16. The values of the capacitances in the bridge of FIGURE 1 are selected so that the circuit will oscillate provided that the resistances 21, 22 are not too low. If the capacitance of the yarn measuring capacitor 16 is constant as in the case when no yarn is present between its plates or when yarn of uniform mass is passing within the plates, the circuit will oscillate to produce a signal having a predetermined amplitude in accordance with the selected values of the circuit components, and the output signal of tube 1 is fed to the input of tube 2 and the output of tube 2 is fed to the input of tube 1 in a continuous or closed path.

Therefore, an output signal is taken off the circuit by means of conductor 32 connected to the anode conductor 19 of tube 2 having an amplitude which varies in accordance with the variation in the mass of the yarn advancing through capacitor 16. A slub being of greater mass should therefore materially increase the amplitude of the output signal as the impedance of capacitor 16 varies inversely with the mass of the yarn therein.

Referring now to FIGURES 2, 3 there is shown a form of a control system for a slub catcher which incorporates the basic control circuit of FIGURE 1 and wherein like numerals have been used to identify like parts. In the circuit of FIGURE 2, the anodes 6, 7 of tubes 1, 2 are connected to a source of positive direct current voltage B+ by means of resistors 21, 22 respectively and their grids 8, 9 are connected by means of grid resistors 24, 26 to the cathodes 3, 4 respectively which in turn are grounded as shown. The cathode 3 of tube 1 is grounded through an adjustable resistor 33 for a purpose to be explained hereinafter.

The output or anode of tube 1 is connected to the grid of tube 2 in one feedback path through a pair of capacitors 12, 37 arranged in parallel, with capacitor 37 of the variable type so as to provide for trimming or adjustment of the sensitivity of the circuit. The output or anode 7 of tube 2 is connected to the grid 8 of tube 1 through capacitors 38, 16 to thereby constitute the other feedback path.

The other two oppositely disposed legs in the capacitive bridge included in the circuit of FIGURE 2 are formed by providing capacitors 41, 42 rather than using the interelectrode capacitances of the tubes so that these capacitors 41, 42 interconnect the anode and grid of each tube in the manner of the circuit of FIGURE 1.

The output signal of the oscillator circuit of FIGURE 2 taken off the anode 7 of tube 2 is conducted through a coupling resistor 43 and a coupling capacitor 44 to the control electrode or grid 46 of a thyatron 47 through a resistor 48. As has been explained in the above referred to copending patent application, the thyatron 47 has its anode 49 connected to a coil 51 to form a relay circuit for performing a control function. The coil 51 which is connected to a source of positive direct current voltage B+ is provided with a core 52 in which a magnetic field is induced when current flows in the coil so as to magnetically attract a yarn clearing device such as a knife or the like. The thyatron grid 46 is also connected to a negative source of direct current voltage B- through a grid-leak resistor 53 as shown.

Thus, if the slub appearing between the plates of the yarn measuring capacitor 16 is of a sufficient mass to

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generate or produce a signal having an amplitude sufficient to increase the voltage on the grid 46 of the thyatron 47 in opposition to the voltage source B—, the thyatron will conduct and produce a flow of current in the coil 51 to magnetize the core 52 and the control function is obtained.

The resistor 43 and the capacitor 54 which is connected to the common ground connector form a low-pass filter to eliminate the high-frequency ripple on the signal voltage.

The variable resistor 33 is inserted in the cathode lead of tube 1 to make a finer adjustment possible by changing the effective slope of tube 1.

FIGURE 3 shows a slightly modified relay circuit arrangement which may be employed with the circuit of FIGURE 2 in that the direct current positive voltage source B+ for the thyatron anode 49 is connected to the coil 51 through a resistor 56. The junction of coil 51 and resistor 56 is connected through a capacitor 57 and a variable tap 58 associated with a potentiometer 59. The potentiometer 59 is connected at one side to the thyatron filament and the other side to the grounded thyatron cathode. With the circuit arrangement of FIGURE 3 the filament alternating current voltage is imposed on the anode direct current voltage through the variable resistance 59 and the capacitor 57.

Referring now to FIGURE 4 there is shown another embodiment of the invention wherein like numerals are also employed to identify like parts. Means are provided within the circuit itself of FIGURE 4 for obtaining a control function. To this end, a pair of impedances or coils 61, 62 are connected in the anode conductors 18, 19 of the tubes 1, 2 respectively and the common side of these coils are connected by means of conductor 23 to the positive source of direct current voltage B+ as in the circuit of FIGURE 1. A common core 63 is associated with both of the coils 61, 62. As will be explained hereinafter, the core 63 is arranged to perform a control function and to this end is associated with the yarn clearing device or knife of the slub catcher in the manner discussed in the above referred to copending patent application.

In the capacitive bridge of the circuit of FIGURE 4, another capacitor 64 has been added in the feedback path connecting the anode 6 of tube 1 with the grid 9 of tube 2. The capacitor 64 is in series with capacitor 12 and is associated with an impedance such as a diode or neon tube 66 connected in parallel therewith. One side of the neon tube 66 is connected to a source of positive direct current voltage B+ through a resistor 67 as shown. The ignition voltage of the neon tube 66 is selected so that during normal operation of the slub catcher circuit of FIGURE 4 the neon tube is not energized.

During the operation of the circuit of FIGURE 4, when the yarn is advancing through the measuring capacitor 16, the circuit oscillates normally in the manner discussed above with reference to the circuit of FIGURE 1 and the current flowing through the two coils 61, 62 is equal. With nearly equal current flow through the coils 61, 62 the influence of each coil on the core 63 is practically neutralized by the other coil.

When a slub appears within the plates of the measuring capacitor 16, the amplitude of the output signal of tube 1 becomes substantially greater so that the voltage drop across capacitor 64 increases proportionally. If the slub mass in the capacitor 16 is sufficiently large to produce a voltage drop across capacitor 64 of a magnitude which will produce ignition of the neon tube 66, current will flow through the resistor 67, the neon tube 66, the grid leak resistor 26, and through conductors 27, 28 to ground. This current flow will increase the voltage on the grid 9 of tube 2 so that a heavy flow of current will result in coil 62, creating an imbalance in the coils 61, 62. This action might be generally referred to as a "flip-flop"

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type of action in which the oscillator circuit is no longer effective.

This imbalance is further magnified by a drop in the anode voltage of tube 2 which voltage is fed through the other feedback path through conductor 14, capacitor 16, and conductor 17 to the grid 8 of tube 1, reducing the current flowing through coil 61 from tube 1. Furthermore, the grid 8 of tube 1 is driven more negative in that the capacitor 16 discharges when the anode voltage of tube 2 decreases causing a current flow through grid resistor 24.

This increase in current through coil 62 and decrease in current through coil 61 produces a resultant current imbalance of considerable magnitude and consequently induces a strong magnetic field in the common core 63. The magnetic field therefore induced in the core 63 is utilized to magnetically attract the slub catcher knife in the manner described in the above referred to copending patent application or magnetically actuates some other control device.

After the slub passes through the yarn measuring capacitor 16, the system will eventually return to normal and resume oscillating as the current ceases to flow in the grid leak resistor 24 and the grid voltage of tube 1 rises again to produce a decrease in the output voltage of tube 1, and a corresponding decrease in the voltage at the junction of capacitors 12, 64. The decrease in the voltage drop across capacitor 64 therefore extinguishes the neon tube 66 and the circuit begins to generate or oscillate again.

Referring now to FIGURE 5, there is shown another embodiment of the circuit of FIGURE 1 which is suitable for commercial use and wherein like numerals have also been used to identify like parts. In the circuit of FIGURE 5, capacitor 16 again constitutes the yarn measuring capacitor and the interelectrode capacitance between the anode and grid of each of the tubes 1, 2 is utilized to form the capacitive bridge discussed above.

The neon tube 66 is arranged somewhat different from the circuit of FIGURE 4 in that one side of the neon tube 66 is connected through a capacitor 71 to one side of capacitor 12 and to the anode 6 of tube 1. This side of the neon tube 66 is also connected to the source of positive direct current voltage B+ through the resistor 67. The other side of the neon tube 66 is connected to one side of the grid leak resistor 26 and to the ground conductor 28 through resistances 72, 73. This other side of the neon tube 66 is also connected to the ground conductor 28 through a capacitor 74.

Each of the tube cathodes 3, 4 are connected to the grounded conductor 28 by means of a common resistance 76 so as to aid in maintaining the stability of the circuit.

In order to further aid in maintaining the stability of the circuit of FIGURE 5, a rectifier circuit or "automatic voltage control" circuit is provided which comprises a capacitor 77 connected by means of conductor 14 to the anode 7 of tube 2. The other side of capacitor 77 is connected to a rectifier or diode 78 and a resistance 79 connected to the junction of the grid leak resistor 24 and resistances 72, 73. The rectifier circuit also includes a capacitor 81 connected between the junction of resistors 24, 79 and the ground conductor 28. During the operation of the circuit of FIGURE 5, therefore, the output signal appearing on the anode 7 of tube 2 is rectified so that a negative direct current bias voltage is applied to both of the tube grids 8, 9 simultaneously through the grid leak resistors 24, 26. In this manner drift in the oscillator output signal may be compensated for and the stability of the circuit is materially increased. The time constant of the low pass filter consisting of resistor 79 and capacitor 81 is chosen so that rapid variations in the oscillator amplitude caused by slubs will remain uncompensated.

The circuit of FIGURE 5 operates substantially the same way as the circuit of FIGURE 4 wherein a pre-

determined amplitude of the oscillator output signal produced by a slub of undesirable size in the yarn measuring capacitor 16 will produce ignition of the neon lamp 66 to thereby increase the voltage on the grid of tube 2 so as to increase the flow of current in coil 62 creating imbalance between the coils 61, 62 and performing the control function.

After a short delay determined by the resistor 72 and the capacitor 81 the grid 8 of tube 1 will also become more positive through resistor 24. Hereby the anode current of tube 1 will rise too, thus equalizing the magnetic flux in the core 63.

In FIGURE 6 there is shown a form of a control system for a "thin place" catcher for textile yarn, which also incorporates the basic control circuit of FIGURE 1.

The output or anode 7 of tube 2 is connected to a rectifier circuit comprising the elements 84, 85, 86, 87 through a capacitor 82.

The capacitor 82 is connected to the ground conductor by the resistance/diode parallel connection 86/85. The resistance condenser series connections 87, 84 and 88, 89 are connected in parallel to the resistance 86.

The elements 82, 84, 85, 86, 87 form an automatic control of the alternating voltage produced.

When the circuit is generating, a voltage fall is caused on the resistance 86, which voltage fall is led as negative grid voltage through the filter 87, 84 to the grids of the tubes 1 and 2.

The condenser 89 is connected in parallel to the grid cathode space of the thyatron 47. In the anode chain of the thyatron 47 a relay with a relay coil 51 and with a core 52 is connected, the movable armature 97 of which, being coupled to the contact 91, can clamp the thread if the coil is excited.

The resistances 98 and 99 have been provided in order to increase the stability of the generator. The part of the circuit consisting of the elements 82, 85, 86, 87 and 84 also is an inverse feed back in so far as at an increase of the amplitude of the alternating voltage produced, the negative grid voltage is increased, whereby an automatic control of the alternating current amplitude is obtained. The filter 87, 84 has a large time constant, so that rapid variations of the alternating voltage amplitude are substantially without any influence on the grid voltage.

However, when the variations are slow the automatic negative grid voltage will follow said variations.

The filter 88, 89 has a considerably smaller time constant and that to such a degree that, at the speed at which the yarn is advanced through the measuring condenser 16, voltage impulses are caused by the uneven places in the yarn, which modify the grid voltage of the thyatron, and, if they are strong enough, increase it to a voltage which is sufficiently less negative to ignite the thyatron.

Hereby the relay coil 51 is excited, which starts the thread-end catcher 97.

The switch 91 is at the same time controlled by the coil 51, so that the thyatron is extinguished again.

Switch 91 is constructed in such a way, that it returns to its original position after some time, so that the anode lead of the thyatron is closed again.

In order to cause the thyatron to ignite the voltage impulse of the grid generally must be positive. And this is the case at the passing of a thin place in the thread, as the capacity of the measuring condenser then decreases in consequence of which the action of the generator becomes feebler. The chances are that, after the thread-end catcher has done its work, no mass of textile thread is present in the measuring condenser and when the anode lead of the thyatron closes itself again, this would have to be ignited anew if the amplitude of the alternating voltage had the same or a still smaller value than at the passing of the thin place. By a judicious choice of the time constant of the filter 87, 84, however, it can be so arranged that the automatic grid voltage control has in the meantime caused the amplitude of the alternating volt-

age to increase to a degree sufficient to prevent the thyatron from being ignited again.

By a judicious choosing of the values of the circuit elements belonging to the automatic control device, the alternating voltage amplitude caused by any given substantially constant mass of textile thread and, therefore, the voltage of the thyatron can be made substantially independent from this mass. This automatic control also renders the circuit insensitive to fluctuations in the supply voltage.

Although the values of the capacitances and other electrical magnitudes are of no essential significance for the invention, a set of values is given here, which have proved satisfactory in practice.

21/22	-----ohms---	30,000
16	-----micromicrofarads---	5
82	-----do-----	15
84	-----microfarads---	0.3
86	-----ohms---	180,000
89	-----micromicrofarads---	5,000
98/99	-----ohms---	1,000

If it is only desired to measure or registrate the mass of the thread, the oscillator alternating voltage can be derived between the two anodes and so this modulated alternating current voltage can be used in a known way for measuring and registering purposes.

A method for deriving the voltage is shown in FIGURE 7.

The anode resistances 21 and 22 have here been divided into two parts: 92, 93 and 94, 95, and between the points of junction of these resistances a double-phased rectifier combination formed of four diodes has been connected, with a capacitor 97 from which the output voltage is taken.

The resistances 93 and 95 prevent the rectifier from being directly connected to the capacitance bridge between the grids and the anodes forming the feedback circuit.

It can be seen that there has been provided with this invention an extremely simple and rugged circuit for use with electronic devices such as a slub catcher. The circuits of the invention, while characterized by extreme accuracy and reliable performance, may now be quickly adjusted in a simple and easy manner by a relatively inexperienced operator so that once an adjustment has been made for sensitivity, the slub catcher circuit will operate indefinitely at the prescribed sensitivity without any concern for drift or the like. The components employed in the circuit are inexpensive, readily available commercially, and those that require any adjustment at all are few in number. As a result of the simple electronic principles which have been employed, long sought compactness, ease of assembly, indefinite life and other such highly desirable factors may now be obtained. The circuit of the invention lends itself to many modifications among which the circuits described above are representative. The circuits of the invention lend themselves to two methods of operation in particular, namely, to produce a slub indicating signal which may be utilized in any way to perform a control function or to actually provide electromagnetic means within the circuit itself by which the control function may be obtained.

In the drawings and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. A control system for yarn clearing apparatus comprising, in combination, an oscillator circuit comprising a pair of electron tubes and a pair of feedback paths for interconnecting the input of each tube to the output of the other tube, a capacitor in each of said feedback paths

one of said capacitors forming a yarn measuring capacitor in one of said feedback paths between the plates of which said yarn is advanced, said yarn measuring capacitor having a value which varies proportionally with the mass of said yarn, an impedance associated with the other feedback path, imbalance responsive means connected to the output of both of said tubes for performing a control function, said feedback path impedance being arranged to change substantially in value when a slub of predetermined mass is present in said yarn measuring capacitor and to produce an imbalance in said imbalance responsive means for performing said control function, a second capacitor in said other feedback path, said impedance comprising a discharge tube connected in parallel relationship with said second capacitor, and said discharge tube being arranged to conduct and substantially change its impedance value when the value of said yarn measuring capacitor reaches said predetermined magnitude corresponding to a slub of predetermined mass in said yarn.

2. A control system for yarn clearing apparatus comprising, in combination, an oscillator circuit comprising a pair of electron tubes and a pair of feedback paths for interconnecting the input of each tube to the output of the other tube, a capacitor in each of said feedback paths, one of said capacitors forming a yarn measuring capacitor in one of said feedback paths between the plates of which said yarn is advanced, said yarn measuring capacitor having a value which varies proportionally with the mass of said yarn, an impedance associated with the other feedback path, imbalance responsive means connected to the output of both of said tubes for performing a control function, said feedback path impedance being arranged to change substantially in value when a slub of predetermined mass is present in said yarn measuring capacitor and to produce an imbalance in said imbalance responsive means for performing said control function, means for rectifying the output signal of said oscillator circuit to produce a steady state signal, and means for conducting said steady state signal to the input of both of said tubes and automatically compensating for undesirable variations in said output signal.

3. A control system for yarn clearing apparatus comprising a bridge of capacitances including at least one yarn measuring capacitor between the plates of which said yarn is advanced, a pair of electron generator tubes, each

of said tubes including an anode, a cathode and a grid between each anode and the corresponding cathode, means applying an impedance to each anode, a grid leak resistance connecting each grid to the corresponding cathode, means electrically connecting said anodes to one diagonal of said bridge, and means electrically connecting said grids to the other diagonal of said bridge such that said electron tubes with said bridge form a circuit oscillating generator.

4. A control system for yarn clearing apparatus comprising a bridge of capacitances including at least one yarn measuring capacitor between the plates of which said yarn is advanced, a pair of electron generator tubes, each of said tubes including an anode, a cathode and a grid between each anode and the corresponding cathode, means applying an impedance to each anode, a grid leak resistance connecting each grid to the corresponding cathode, means electrically connecting said anodes to one diagonal of said bridge, means electrically connecting said grids to the other diagonal of said bridge such that said electron tubes with said bridge form a circuit oscillating generator, a thyatron relay tube, means for automatically controlling the grid-bias for the generator tubes and the thyatron relay tube comprising means for rectifying the oscillation produced by said generator, a low-pass filter having a long time-constant interposed between said rectifying means and the grid-leak resistances of said generator tubes, and a low-pass filter having a short time-constant interposed between said rectifying means and a grid of said thyatron relay tube.

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