Aug. 10, 1948. A. C. FRANKWICH 2,446,647

APPARATUS FOR DETECTING IMPERFECTIONS IN FILAMENTARY MATERIALS

Filed March 27, 1946 2 Sheets-Sheet 1

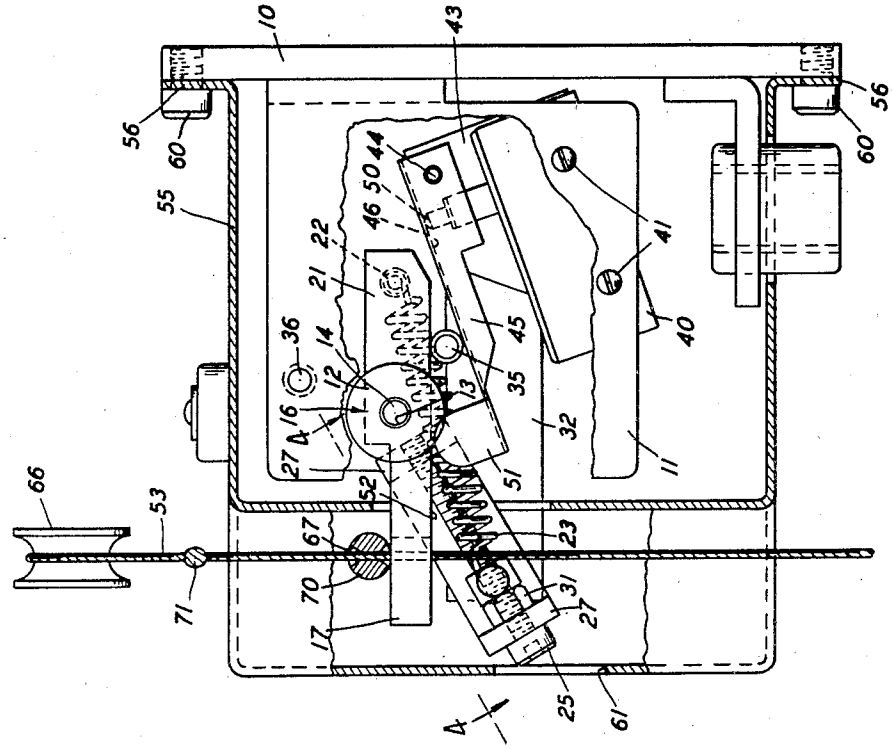


FIG.-2

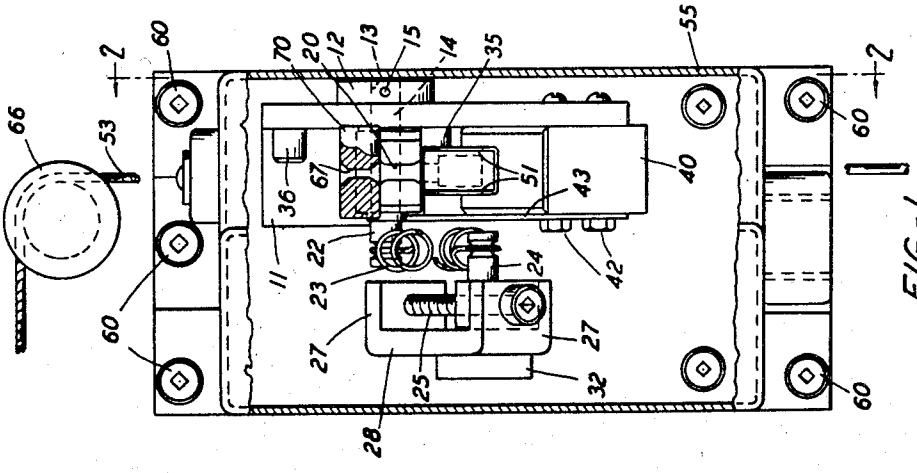


FIG.-1

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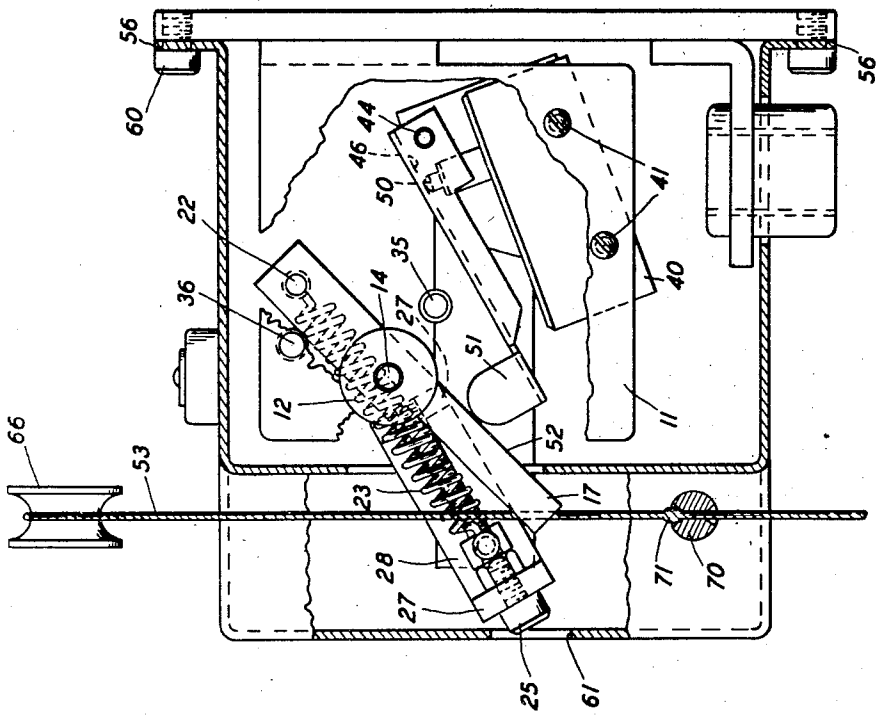


FIG. - 5

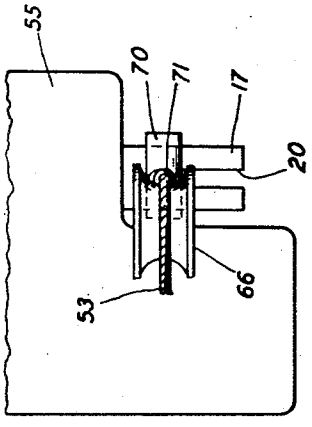


FIG. - 3

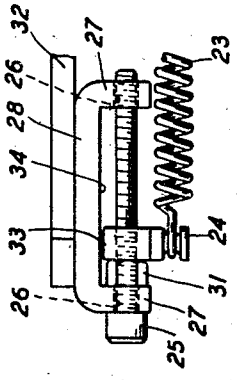


FIG. - 4

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APPARATUS FOR DETECTING IMPERFECTIONS IN FILAMENTARY MATERIALS

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8 Claims. (Cl. 28—64)

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This invention relates to apparatus for detecting imperfections in filamentary materials, and more particularly to apparatus for stopping the operation of knitting machines, braiding machines, or the like, when a knot or other enlargement occurs in a strand being operated upon thereby.

An object of the invention is to provide new and improved apparatus for detecting imperfections in filamentary materials.

Another object of the invention is to provide knot-detecting apparatus which may be adjusted to pass knots below a predetermined size and prohibit the passage of knots above a predetermined size.

In accordance with a specific embodiment of the invention, there is provided an imperfection-detecting apparatus comprising a pivotally mounted arm biased in its normal operating position in one direction by resilient means arranged in a toggle relationship therewith. A size-gauge is positioned on the end of said pivotally mounted arm and has provided therein a bore designed to permit a textile insulated conductor to be advanced therethrough and also to permit the passage therethrough of a conductor containing permissible manufacturing variations without actuating the toggle arrangement beyond its tripping point. When a conductor being advanced through the detector contains a knot of such size that it will not pass through the detector, it is engaged thereby and actuates the pivotally mounted arm in a direction opposed by the resilient biasing means. After the pivotally mounted arm has been actuated a predetermined distance thereby, the toggle action of the resilient bias serves to snap the arm around to its tripped position, whereupon it actuates a switch to cause the operation of the machines and the advancement of the conductor to be stopped.

A clear understanding of the invention may be had from the following detailed description, when read in conjunction with the appended drawings, in which like numerals designate like parts of the apparatus throughout the drawings, and in which:

Fig. 1 is a front elevation of an apparatus embodying the invention, with a portion of the cover broken away;

Fig. 2 is a vertical section of the apparatus taken along line 2—2 of Fig. 1;

Fig. 3 is a fragmentary, top plan view of the apparatus;

Fig. 4 is a fragmentary, sectional view of a

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portion of the apparatus taken along line 4—4 of Fig. 2, and

Fig. 5 is a view similar to Fig. 2 with some of the parts shown in their operated or tripped position.

Referring now to the drawings and more particularly to Fig. 2, there is shown an apparatus for inspecting a conductor as it advances from a knitting machine, or the like. This apparatus comprises a base plate 10 on which is mounted an L-shaped bracket 11. The bracket 11 is provided with a boss 12 having a bore 13 extending therethrough, in which a post 14 is rigidly secured by means of a pin 15. A tripping arm 16 is rotatably mounted on the post 14 and is provided with a forked end 17 formed thereon by means of a slot 20. An opposite end 21 of the tripping arm 16 has a post 22 secured thereto, which serves to engage the right hand end of a tension spring 23. The left hand end of the tension spring 23 is secured to a slide 24 (Fig. 4) threadedly mounted on an adjusting screw 25.

The adjusting screw 25 is rotatably mounted in a pair of bores 26—26 provided in legs 27—27 of a U-shaped support 28. A collar 31 is pinned on the adjusting screw 25 adjacent to the left hand leg 27 of the U-shaped support 28 and serves to maintain the adjusting screw 25 properly positioned in the U-shaped support. The U-shaped support 28 is angularly positioned on the end of a support 32, rigidly secured to the base plate 10, so that the adjusting screw 25 is centrally aligned with the post 14. Rotation of the adjusting screw 25 serves to cause the slide 24 to traverse back and forth between the legs 27—27 of the U-shaped support 28. The slide 24 is prevented from turning when the adjusting screw 25 is rotated by means of a flat end 33 which abuts the inside surface 34 of the U-shaped support 28. The tension spring 23 acting between the slide 24 and the post 22 secured on the end of the arm 16 creates a toggle relationship between the arm 16 and the spring 23. When the post 22 is positioned below the common center line of the slide 24 and the post 14, the arm 16 is normally maintained in a substantially horizontal position against a stop 35 (Fig. 2). When the arm 16 is rotated in a counter-clockwise direction about the post 14 so that the post 22 moves slightly above the common center line of the slide 24 and the post 14, the toggle action of the spring 23 snaps the arm 16 further around in a counter-clockwise direction to its tripped position against a stop 36 (Fig. 5). The position of the slide 24 on the adjusting screw 25 determines the amount of force

the tension spring 23 is exerting on the arm 16 to maintain it in its normal operating position. However, due to the fact that the adjusting screw 25 is angularly positioned with respect to the post 14, the various positions which the slide 24 may take thereon will not vary the amount of rotation required of the arm 16 before the toggle action of the spring 23 carries the arm to its full tripped position.

A switch 40 is angularly positioned on the bracket 11 by means of a pair of screws 41—41 and nuts 42—42 threadedly mounted on the ends thereof. The screws 41—41 also serve to clamp a bracket 43 (Fig. 1) to the left hand side of the switch 40 on which is secured a post 44. A channel-shaped arm 45 has one end thereof pivotally mounted on the post 44, so that its inside surface 46 engages a spring-pressed plunger 50 of the switch 40. The arm 45 is so constructed that its normal weight will not depress the plunger 50 and thereby actuate the switch. The other end of the arm 45 is provided with a pair of ears 51—51, which are positioned adjacent to the under side 52 of the tripping arm 16 (Fig. 2). The switch 40 may be electrically connected, in any conventional manner, to the means for driving the textile insulating machine (not shown) and advancing a conductor such as a conductor 53 through the machine and its respective imperfection-inspecting apparatus shown in Figs. 1 and 5.

The entire mechanism mounted on the bracket 11 and the support 32 is enclosed by a housing 55 provided with flanges 56—56. The housing 55 is secured to the base plate 10 by means of a plurality of bolts 60—60 threaded into the base plate 10. The front portion of the housing 55 adjacent to the adjusting screw 25 is provided with an opening 61 through which the adjusting screw 25 may be adjusted without removing the housing 55 from the apparatus.

The conductor 53, which is to be inspected, is fed over a suitable guide pulley 66 (Fig. 1) and through a bore 67 provided in a size-gauge 70 movably positioned on the forked end 17 of the arm 16 so that the bore 67 is aligned with the slot 20 provided therein. The bore 67 provided in the size-gauge 70 is of such diameter that it will permit the conductor 53 to be advanced therethrough without actuating the pivotally mounted arm 16. The bore 67 will also permit the conductor 53 to be advanced through the size-gauge 70 when it contains permissible manufacturing variations in its diameter. When the advancing conductor 53 contains an imperfection such as a lump 71, which is of such size that it will not pass through the bore 67 of the size-gauge 70, continued downward travel of the conductor rotates the arm 16 in a counter-clockwise direction against the toggle action of the spring 23 to a point where the toggle action of the spring 23 serves to further rotate the arm 16 to its full tripped position.

The above-described embodiment of the invention operates as follows:

The conductor 53, which is to be inspected as it emerges from a textile insulating machine, is drawn over the guide pulley 66 and passes downwardly therefrom through the bore 67 of the size-gauge 70. The tension of the spring 23 is adjusted so that the passing of a normal conductor 53 through the bore 67 of the size-gauge 70 will not actuate the arm 16. The initial impact of certain allowable manufacturing variations present in the conductor 53 will actuate the arm 16 to some extent, but the tension spring 23 may be adjusted to prevent such allowable variations from actuating the arm 16 beyond the tripping point of the toggle arrangement between said arm and said spring. However, when the conductor 53 contains an enlargement such as the lump 71, of such size that it exceeds allowable manufacturing limits, it is so tightly engaged by the bore 67 that its downward pull overcomes the toggle action of the spring 23 and rotates the arm 16 in a counter-clockwise direction. When this occurs the post 22 provided on the end 21 of the arm 16 moves in a counter-clockwise direction until it is aligned with the post 14 and the slide 24.

After the post 22 has reached this point, the toggle action of the tension spring 23 acting between the slide 24 and the post 22 serves to quickly rotate the arm 16 further around in a counter-clockwise direction, whereupon its under-surface 52 engages the ears 51—51 provided on the arm 45 (Fig. 5). As the arm 16 is carried by the toggle action of the spring 23 to its full tripped position against the stop 36, it actuates the arm 45 causing the surface 46 thereof to depress the spring-pressed plunger 50 of the switch 40. When the switch 40 is so operated, it serves to deenergize the associated driving means, whereupon the insulating machine driven thereby is stopped. Further downward travel of the conductor is not permitted, except for such travel as is caused by the normal coasting of such driving means and machines after the power has been disconnected. However, due to the fact that such machines normally coast to a full stop, the arm 16 is tripped to such a position, as shown in Fig. 5, that the size-gauge 70 engaged by the lump 71 slides off the forked end 17 of the arm 16, in which case undue tension on the conductor 53 is thereby averted and the danger of breaking the conductor or parts of the imperfection-detecting apparatus is eliminated.

The imperfection is usually severed from the conductor, whereupon the pivotally mounted arm 16 is manually reset so that the toggle action of the spring 23 again maintains it in its normal operating position, as shown in Fig. 1. The size-gauge 70 is then again positioned on the forked end 17 of the arm 16 and the conductor to be inspected is again threaded through the bore 67 of the size-gauge and through the slot 20 provided in the forked end 17 of the arm 16 to the advancing means (not shown). The driving means (not shown) are again energized, whereupon the conductor 53 is again advanced through the size-gauge as described above.

The arm 16 is provided with the adjustable toggle action so that it may be adjusted to allow a conductor having permissible manufacturing variations to be advanced through the size-gauge. However, the toggle action of the spring must be adjusted so that when the conductor contains knots or lumps which would prevent it from being further processed, such, for example, as by being passed through extruding dies of insulating machines, the arm will be actuated. The size of the tension spring used in the apparatus may be varied to suit the size of the particular conductor being inspected thereby, whereas the adjustment of the particular spring used is based on the tension required to catch non-permissible manufacturing variations such as knots, lumps, or the like in the conductor being inspected.

The above-described apparatus is particularly well adapted for use as a final inspection means,

whereby knots and other defects which render the conductor unsatisfactory may be detected before the inspected conductor is further processed, which process may be seriously hampered by the presence of such knots and defects on the conductor.

While the above-described apparatus is particularly well suited for the purpose mentioned above, it may readily be modified and adapted for use in detecting knots, lumps, slubs, and tangles which may occur in the various types of filaments used in knitting and braiding machines where it is necessary to prevent such defects from reaching the needles of the machine or for detecting the presence of lumps or other irregularities present on conductors emerging from various electroplating processes, and, therefore, the invention is to be limited only by the scope of the appended claims.

What is claimed is:

1. An apparatus for detecting imperfections in filamentary materials, comprising a size-gauge through which a filament may be advanced, pivotally mounted means for supporting the size-gauge while a filament is being advanced therethrough, means for stopping the advancement of the filament, means operable by movement of the supporting means for actuating said filament stopping means, a spring for biasing the supporting means against movement thereof in one direction and arranged to move the supporting means quickly after said supporting means has been moved a predetermined distance against the action of the spring, and means connected to one end of the spring for adjusting the bias applied by said spring against the supporting means so that the supporting means will not be moved by the passage through the size-gauge of a filament having allowable imperfections therein but will be moved to actuate the filament stopping means when a non-allowable imperfection in the filament engages the size-gauge.

2. An apparatus for detecting imperfections in filamentary materials, comprising a size-gauge through which a filament may be advanced, pivotally mounted means for supporting the size-gauge, a free end of said supporting means being slotted to receive the strand being advanced through the size-gauge supported thereby, resilient means having one end connected to opposite end of said supporting means for biasing the supporting means against movement in one direction, said resilient biasing means being arranged to move the supporting means quickly after said supporting means has been moved against the action of the biasing means through a predetermined distance, and means connected to the other end of the resilient means for adjusting the tension of the resilient biasing means so that the size-gauge supporting means will not be moved by the passage of a filament through the size-gauge having allowable imperfections therein but will be moved said predetermined distance by non-allowable imperfections in the filament so that said biasing means may further move the supporting means to permit the size-gauge to slide freely off the slotted end of said supporting means, whereby undue tension and breakage of the moving filament is averted.

3. An apparatus for detecting imperfections in filamentary materials, comprising a pivotally mounted arm having a forked end, a size-gauge movably positioned on the forked end of said arm and having a bore therein through which a filament to be inspected may be advanced, a spring

for resiliently biasing the arm in a transverse position with respect to the advancing filament, means for adjusting the tension of the spring, a switch electrically associated with the means for advancing the filament through said size-gauge, and means operable by said pivotally mounted arm for actuating the switch, whereby when the size-gauge positioned on the end of the pivotally mounted arm is engaged by an imperfection present on the advancing filament the pivotally mounted arm is actuated to a point where the spring thereafter quickly snaps the pivotally mounted arm in the same direction so as to actuate the switch actuating means and thereby stop the advancement of the filament.

4. An apparatus for inspecting a conductor as it emerges from a textile insulating machine, which comprises a size-gauge through which a conductor to be inspected may be advanced, pivotally mounted means for movably supporting the size-gauge, and means for resiliently biasing the supporting means in one direction so as to hold said size-gauge against movement by a normal conductor being advanced therethrough, said resilient biasing means being angularly positioned with respect to said pivotally mounted means so as to form a toggle relationship therewith, whereby when an imperfection on the advancing conductor engages the size-gauge and will not pass therethrough it rotates the pivotally mounted means to a point where the toggle action of the resilient biasing means operates to snap the pivotally mounted means around to its full tripped position.

5. An apparatus for inspecting a conductor being advanced from a textile insulating machine, which comprises a tripping arm, means for applying a predetermined resilient bias on said tripping arm to hold the tripping arm in a horizontal operating position, a size-gauge movably positioned on the extremity of said tripping arm and having a bore provided therein through which a conductor to be inspected may be advanced, a switch electrically associated with the means for advancing the conductor through the size-gauge, actuation of said switch serving to stop the advancing conductor, a switch actuating arm pivotally mounted over said switch and having one end thereof positioned to be engaged by the tripping arm, and means for stopping the rotation of the tripping arm after it reaches a predetermined tripped position, whereby when a lump is present on a conductor which will not pass through the size-gauge said lump will cause the pivotally mounted arm to be rotated to such an extent that it engages the switch actuating arm and thereby serves to stop the advancing conductor and allows the size-gauge to slide off the end of said arm before undue strain is applied to the conductor as it comes to a full stop.

6. An imperfection-detecting apparatus for inspecting conductors emerging from a textile insulating machine, which comprises a pivotally mounted tripping arm having a forked end positioned in the path of an advancing conductor, tensioning means secured to one end of the tripping arm for resiliently biasing the tripping arm in a horizontal position, means for adjusting the tension of the resilient biasing means, a size-gauge movably positioned on the forked end of a tripping arm and having a bore therein through which a conductor to be inspected may be advanced, switching means for stopping the advancing conductor, and means operable when the tripping arm is rotated for operating the switching

means, whereby when a lump is present on the advancing conductor which will not pass through the size-gauge positioned on the tripping arm it rotates the tripping arm to a point where the resilient biasing means thereafter rotates the arm further around its pivot point so that it engages the switch operating means which serves to stop the advancement of the conductor while the size-gauge is permitted to slide off the end of the tripping arm as the conductor comes to a full stop.

7. An apparatus for inspecting a conductor for imperfections as it emerges from a knitting machine, which comprises a size-gauge through which a conductor to be inspected may be advanced, means for supporting the size-gauge against movement with the conductor being advanced therethrough, means for resiliently biasing the size-gauge supporting means, said resilient biasing means serving to maintain the supporting means in a horizontal operating position and for tripping the supporting means after it has been partially actuated to its full tripped position, switching means for stopping the advancing conductor, switch actuating means operable by said size-gauge supporting means, and means for permitting the supporting means to be tripped to such a position, whereby when the advancing conductor contains a lump which will not pass through the size-gauge said lump and gauge engaged thereby will rotate the supporting means a given distance whereupon the resilient biasing means will rotate the supporting means to its full tripped position and thereafter slide freely off the supporting means so as to prevent undue tension on the advancing conductor before it comes to a full stop.

8. An imperfection-detecting apparatus for inspecting a conductor advancing from a textile insulating machine, which comprises a rotatable tripping arm, means for resiliently biasing the tripping arm so as to maintain it in a horizontal operating position, said tripping arm being provided with a forked end through which a conductor may be advanced, a size-gauge positioned on the forked end of said tripping arm and having a bore provided therein through which a conductor to be inspected may be advanced, means for adjusting said resilient biasing means to prevent said tripping arm from being tripped by allowable irregularities present in the conductor being advanced through said size-gauge positioned thereon, switching means for stopping the advancing conductor, means operable by said rotatable tripping arm for actuating the switching means, and means for stopping the rotation of the pivotally mounted arm after it reaches its full tripped position, whereby when the tripping arm is actuated by the presence of a lump in the advancing conductor, the resilient biasing means will cause the tripping arm to move its full tripped position whereupon the size-gauge will slide freely over the forked end of the tripping arm before undue strain is applied to the advancing conductor as it comes to a full stop.

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