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TENSIONING DEVICE

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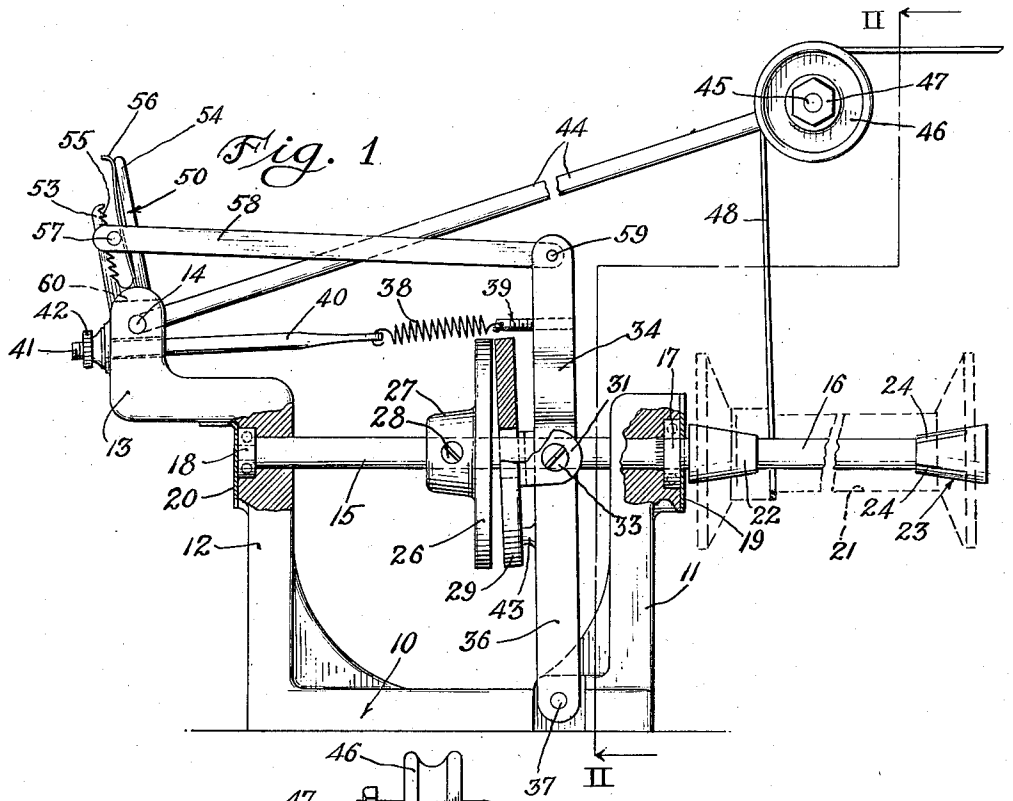


Fig. 1

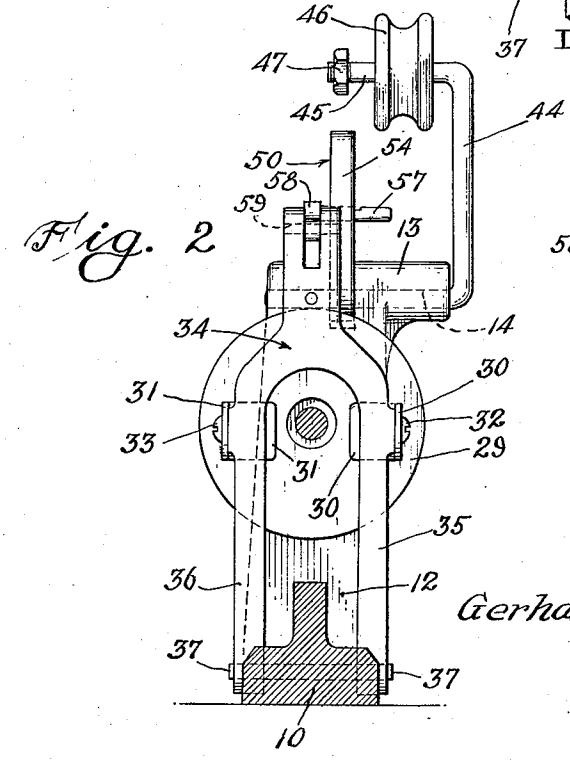


Fig. 2

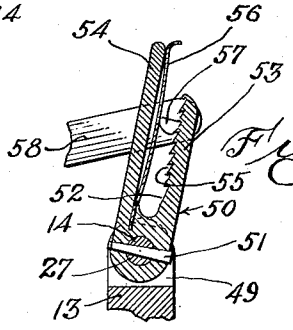


Fig. 3

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TENSIONING DEVICE

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This invention relates to tensioning devices and more particularly devices of the type adapted for use in tensioning wire while being wound into coils or the like for use in electrical apparatus.

It contemplates more especially the provision of a simple, dependable and accurate wire tensioning device that is sensitive, adjustable over a wide range, and will maintain a substantially uniform tension irrespective of irregularities that are usually encountered in supplying wire to a winding machine.

In producing coils for electrical devices it is important that coils for certain uses have an exact predetermined number of windings or convolutions. Other coils for different uses require a predetermined length of wire in the coil to procure the desired electrical characteristics. Owing to the fact that the wire as supplied by the manufacturer on the reels or spools may not always be uniformly wound, and because there frequently are variations in the degree of frictional association between adjacent convolutions of wire on the wire supply reels, it is important that a wire tensioning device afford sensitive, accurate and adjustable control on the wire as it is wound into coils.

In order to perform entirely satisfactorily the actual tension on the wire as it is wound into coils, must not vary within any appreciable degree in that the convolutions should be uniform in size and result in utilizing a uniform or predetermined quantity of wire corresponding to the predetermined or required computed length. Variations in tension will frequently cause the enameled coating of the wire to crack and peel. Consequently, when such defective wire is wound into a coil, there is apt to be a short-circuit across the coil and the resulting product is useless.

One object of the present invention is to provide novel means to control the tension of wire between the supply reel and the coil being wound therefrom.

Another object is to provide self adjusting tensioning means for imparting and maintaining a substantially uniform tension on wire as it is wound into coils.

Still another object is the provision of improved adjustable wire tensioning means for imparting and maintaining a substantially uniform and predetermined tension on wire as it is wound into coils.

A further object consists in the provision of novel friction braking means in wire tensioning devices for controlling and maintaining a substantially uniform tension on wire as it is withdrawn from a supply reel.

A still further object is to provide a friction control for a wire tensioning device that is adjustable to regulate and maintain a selected tension within a predetermined range.

Still a further object is to provide novel friction means in a wire tensioning device that is adjustable within a wide range for controlling the tension of wire operatively connected therewith.

Other objects and advantages will appear from the following description of an illustrated embodiment of the present invention.

Figure 1 is a view in side elevation of a device embodying features of the present invention.

Figure 2 is a transverse view partly in section and partly in elevation taken substantially as indicated along II—II in Figure 1.

Figure 3 is an enlarged fragmentary sectional view of an adjustable connection which permits adjusting the device for accommodating wires of different gauges.

The structure selected for illustration comprises a base member 10 cast or otherwise shaped to provide two upwardly extending arms 11 and 12, respectively, the arm 12 terminating in an offset bearing bracket 13 for accommodating and sustaining a rocker arm 14 to be hereinafter described. Journaled in said upright frame arms 11 and 12 is a horizontally disposed shaft 15 having an extension 16 projecting beyond the frame arm 11. Bearings 17 and 18 are provided in the frame arms 11 and 12 to rotatably support the shaft 15 with its wire supply reel supporting an extension 16, and axial displacement is precluded by bearing plates 19 and 20 fixed to the frame arms 11 and 12 to retain the bearings 17 and 18 in position.

A wire supply reel or spool 21 (shown in dotted outline—Figure 1) is mounted on the shaft extension 16 for engagement therewith by means of a pair of frusto-conical core gripping blocks 22 and 23. The core block 22 is, in this instance, rigidly secured to the shaft extension 16 while the core block 23 is axially movable thereon for frictional engagement therewith through the medium of longitudinal slots 24 that provides the necessary spreading resilience to normally engage the shaft extension 16 at any desired position therealong. The reels 21 having the wire supply wound thereon, are normally supplied with a central tubular core or axial bore into which the core gripping blocks 22 and 23 are frictionally engaged by displacing the displaceable core block

24 against the side of the reel 21 after it is placed in operative position against the block 22 on the shaft extension 16. In consequence thereof, it will be apparent that a wire supply reel 21 will rotate in unison with the shaft 15 by withdrawing wire under tension owing to the pull exerted by the coil winding feed mechanism or the like. The rotation of the shaft 15 is, in this instance, controlled by an adjustable tensioning device preferably comprising a disc 26 having a hub 27 enabling the rigid attachment thereof through the medium of a screw or other fastener 28 on the shaft 15 intermediate the frame arms 11 and 12.

A brake shoe or member 29 is adapted for cooperative engagement with the disc 26, the shoe 29 being composed of fiber or other material having a relatively high coefficient of friction. The shoe brake 29 is also disc shaped to confront the metallic disc 26, it being mounted by laterally extending angle brackets 30 and 31 attached thereto so as to provide a pivotal mounting as at 32 and 33 along a transverse horizontal line to a yoke 34. The yoke 34 has furcated lower members 35 and 36 which envelope or straddle the shaft 15 for pivotal connection to the sides of the base 10 by means of a pivot pin 37 that projects therethrough. As shown, the yoke 34 is adapted to be displaced so as to bring the pivotal non-rotating friction shoe 29 into and out of contact with the confronting rotating disc 26 and, because of the pivotal mounting of the shoe 29, the latter is normally disposed at an angle oblique to the cooperating face of the disc 26 when these confronting members are disengaged (Figure 1).

It will now be apparent that as the shoe 29 is moved into frictional engagement with the rotating disc 26, the upper portion of the shoe 29 is first brought into contact with a relatively small portion of the surface area of the disc member 26 and, as the shoe 29 is moved in further engagement or contact with the disc 26, the extent of frictional contact between the disc members 26 and 29 will gradually and progressively increase until the total operative areas of said members are in engagement. These friction elements 26 and 29 are normally urged into operative frictional relation to each other by a coil spring 38 anchored at one end to yoke 34 by a threaded member 39 with the other extremity connected to a rod 40 that projects through the offset bearing bracket 13 extending from the frame arm 12. The extremity 41 of the rod 40 is threaded to receive a thumb nut 42 which enables variations in the tension of the spring 38 to regulate or control the normal approaching urge between the confronting surfaces of the disc 26 and the shoe 29. When the disc members 26 and 29 are separated, the pivotal mounting of the latter is such to effect tilting in the direction of the disc 26; therefore, a projecting stud 43 is provided on the yoke 34 to limit the extent of tilting to a practical and advantageous degree.

Journaled in the offset bearing 13 of the frame arm 12 is the transversely extending rocker arm 14 which has an offset lever arm 44 in the form of a rod extending in the general direction of the primary shaft 15. The lever arm or rod 44 normally assumes an upwardly oblique position, and the upper end thereof terminates in a transverse extension 45 to carry a guide roller in the form of a flanged idler or sheave wheel 46. A nut or other fastener 47 threadedly engages the lever arm extension 45 to retain the rotatable sheave 46 thereon. A wire 48 extending from the supply reel 21, is trained thereover for supplying wire 48 to a coil winding or other machine requiring wire for conversion into preformed coils and the like. It is to be noted that the offset bearing bracket 13 is transversely slotted as at 49 in communication with the rock shaft 14 to accommodate an upwardly extending rocking lever 50 which is fixed to the rock shaft 14 by a pin 51 (Figure 3). The rocking lever 50 is formed with an upward extending lever slot 52 defined by confronting arms 53 and 54, the latter being longer than the former for reasons which will appear more fully hereinafter.

The shorter rock lever arm 53 is in the slot 52 to confront a flat spring member 56 to frictionally engage and maintain a laterally extending detent 57. The detent 57 is shaped to engage an individual tooth 55 and is connected to a lever 58. The opposite end of the connecting lever 58 is pivotally connected as at 59 to the upper end of the yoke 34 (Figure 1) and the pivotal position of the latter with its brake shoe 29 is thus determined by the position of engagement of the detent 57 along the ratchet teeth 55. The wire 48 from the supply reel 21 is trained around the idler wheel 46 and tensioned owing to the pull exerted by the winding machine (not shown). Consequently, the lever arm 44 is displaced downwardly and, the rock shaft 14 which is an integral part thereof, is displaced with the rocking lever 53 in clockwise direction (viewed from Figure 1) and through the connecting lever 58, imparts movement to the yoke 34 which in turn shifts the friction shoe 29 away from the confronting disc 26. This allows the shaft 15 with the supply reel 21 to rotate more readily and, therefore, diminish the pull on tension on the wire 48.

It will be manifest that when the wire as it is unwound from the storage reel 21 is relatively free, there is no appreciable amount of frictional resistance in the mechanism thus far described. Then the tension exerted upon the wire 48 through the idler wheel 46 on the arm 45, will be relatively small so that the tensioning spring 38 acting directly on the yoke 34 will tend to maintain the braking shoe 29 in complete frictional engagement with the cooperative disc member 25, for retarding the rotation of the shaft 15 and the reel 21 which is mounted thereon. However, when the friction unwinding from the supply reel 21 increases, the tension of the wire 48 acting through the idler 46 causes the lever arm 44 to move downwardly. This results in a corresponding degree of disengagement of the frictional shoe 29 with its cooperative disc 26, thereby reducing the friction load on the shaft 15, to permit it and the supply reel 21 to rotate somewhat more freely in paying out the wire 48.

In other words, the instrumentalities are self-compensating and is directly and automatically responsive to variation in the tension of the wire 48 as it is supplied from the reel 21 for maintaining substantially uniform tension in its travel to a winding machine or the like. The tilting shoe 29, it will be observed, progressively increases and decreases the surface reaction with the disc 26 so as to gradually create or relieve the friction to accomplish better and more uniform control.

When employing wires of different gauges, it is desirable to maintain such wires under different tensions. Therefore, there is an adjustment for

varying the tension or force necessary to effect engagement and disengagement of the cooperative members 26 and 29. Adjustment is afforded by the displacement of the detent 57 relative to its confronting ratchet teeth 55 on the rocking lever arm 53. When the detent 58 is disposed in a certain notch 55, such corresponds to an adjustment creating a predetermined tension for handling wire of a predetermined gauge and each of the notches 55 provide selected tensions to be maintained on wires of different gauges, and the surface of the rocking lever 50 adjacent the notches 55 may, if desired, be correspondingly calibrated. When the detent 57 is disposed in the uppermost notch 55, it corresponds to an adjustment for imparting the proper tension to wire of a maximum gauge for use in connection with a tensioning device within the range thereof.

Similarly, with the detent 57 disposed in the lowermost notch 55, this position corresponds to an adjustment for the smallest gauge of wire to be used with the device. It is to be noted that the upper extremity of the bearing bracket 13 is notched as 60 to accommodate the adjacent edge of the lever 58 when the detent 57 is in registry with the lowermost notch or ratchet tooth 55. Consequently, within these two extreme positions of adjustment a relatively wide range of different gauges of wire or tensions may be provided for in properly supplying such for different requirements. Should it be desired to provide or maintain a tension for a gauge of wire intermediate the size corresponding to two adjacent notch adjustments of the rocking lever 50 and the detent 57, such size wire is accommodated or tension accomplished by varying the tension in spring 38 through the manipulation of the nut 42, to obtain a sensitive control or fine tension adjustment acting upon the yoke 34 for urging the non-rotating friction shoe 29 toward its cooperating rotating disc 26.

It will be observed that the different positions of adjustment of the detent 50 along the notches 55 provide different effective lever arm lengths of the rocking lever 50. Thus when the detent 57 is positioned in the uppermost notch 55 corresponding to the position for using the heaviest gauge wire within the range of any particular device, the effective arm length of the rocking lever 55 is the greatest. Therefore, less movement of the upper end of rod 44 carrying idler 46 will be required to impart movement through lever 58 for displacing the friction shoe 29 toward or away from the disc 26 than when the detent 57 is disposed in the lower notches 55 to result in a shorter effective lever arm length for lever 55. This necessitates a greater range of movement of the outer end of lever arm 44 and idler 46 for moving the friction shoe 29 into and out of operative engagement with the disc 26. It must follow that it requires more force to cause such movement of friction shoe 29 when detent 57 is in the uppermost notch, than when the detent 57 is disposed in a lower notch 55. Such an arrangement is essential because the heavier the gauge of wire employed the more force is necessary to maintain the wire under desired tension or for that matter the gauge of wire may be ignored and only the effective tension may be the basis of calibrating the different positions on the rocking lever 50.

Various changes may be made in the embodiment of the invention herein specifically described without departing from or sacrificing any of the advantages of the invention or any features thereof, and nothing herein shall be construed as limitations upon the invention, its concept or structural embodiment as to the whole or any part thereof except as defined in the appended claims.

I claim:

1. A friction brake including a rotatable member, a cooperating non-rotatable member, and a yoke member for moving the latter into and out of operative engagement with the former, said non-rotatable member being pivotally mounted on and carried by said yoke member to normally assume an oblique angle to the cooperating surface of the rotatable member, whereby movement of said yoke member toward said rotatable member progressively effects cooperative contact between said rotatable and non-rotatable members so that said non-rotatable member swings about its pivot mounting to gradually increase the area of contact with said rotatable member.

2. In a device of the character described, the combination with a frame, of a wire supply reel supporting shaft journalled in said frame, a braking disc carried by said shaft for rotation therewith, a friction disc tiltably mounted on said frame to cooperate with said braking disc for retarding the rotation of said shaft, a wire guide supporting member operatively connected to said tiltably mounted disc for controlling the extent of frictional reaction between said discs, and spring means for imparting a predetermined urge on said wire guide supporting member for controlling contact between said discs.

3. In a device of the character described, the combination with a frame, of a wire supply reel supporting shaft journalled in said frame, a braking disc fixedly carried by said shaft for rotation therewith, another braking disc pivotally mounted on said frame to cooperate with said first named braking disc for retarding the rotation of said shaft to control the wire tension exerted in rotating said supply reel supporting shaft, adjustable means for controlling the relative initial positions of said braking discs, and means for varying said adjustable means for requiring a predetermined tension to bring said braking discs into initial contact.

4. A wire tensioning device comprising a frame, a shaft journalled in said frame to support a wire reel, a lever member pivotally mounted on said frame, a wire guide support rockably mounted on said frame, a flat friction surface element mounted on said shaft for rotation therewith, another flat frictional surface element carried by said lever arm in confronting relation with said first named friction element, a link adjustably interposed between said lever arm, and wire guide support to regulate the relative positions of said friction elements, and spring means for urging said lever arm in a predetermined direction opposing the tension exerted by a wire traversing over said guide and unwinding from the reel.

5. A wire tensioning device comprising a frame, a shaft journalled in said frame to support a wire reel, a lever member pivotally mounted on said frame, a wire guide support rockably mounted on said frame, a flat friction surface element mounted on said shaft for rotation therewith, another flat frictional surface element carried by said lever arm in confronting relation with said first named friction element, a link adjustably

interposed between said lever arm and wire guide support to regulate the relative positions of said friction elements responsive to the tension of the wire for controlling the speed of rotation of the shaft and automatically maintaining substantially uniform tension in the wire, spring means for urging said lever arm in a predetermined direction opposing the tension exerted by a wire traversing over said guide and unwinding from the reel, and means for varying the tension in said spring.

6. A wire tensioning device comprising a frame, a shaft journalled in said frame to support a wire reel, a lever member pivotally mounted on said frame, a wire guide support rockably mounted on said frame, a friction element mounted on said shaft for rotation therewith, another frictional element pivotally carried by said lever arm in confronting relation with said first named friction element, a link adjustably interposed between said lever arm and wire guide support to regulate the relative positions of said friction elements, spring means for urging said lever arm in a predetermined direction opposing the tension exerted by a wire traversing over said guide and unwinding from the reel, and means for varying the tension in said spring.

7. A wire tensioning device comprising a frame, a shaft journalled in said frame to support a wire reel, a movably mounted member on said frame, a friction element carried by said shaft for rotation therewith, another friction element mounted on said movable member to confront said first named friction element, a wire guide member rockably mounted on said frame, a serrated arm fixed to said wire guide member, a link operatively connected to said movably mounted member for adjustable association with said serrated wire guide arm to vary the confronting relation between said frictional elements responsive to the tension of the wire over said guide member, and spring means for urging said friction elements relative to each other.

8. A wire tensioning device comprising a frame, a shaft journalled in said frame to support a wire reel, a movably mounted member on said frame, a friction element carried by said shaft for rotation therewith, another friction element mounted on said movable frame member to confront said first named friction element, a wire guide member rockably mounted on said frame, a serrated arm fixed to said wire guide member, a link operatively connected to said movably mounted frame member for adjustable association with said serrated wire guide arm to vary the confronting relation between said frictional elements, spring means for urging said friction elements relative to each other, and means for adjusting said spring means.

9. A wire tensioning device comprising a frame, a shaft journalled in said frame to support a wire reel, a movably mounted member on said frame, a friction element carried by said shaft for rotation therewith, another friction element rockably mounted on said movable frame member to confront said first named friction element, a wire guide member rockably mounted on said frame, a serrated arm fixed to said wire guide member, a link operatively connected to said movably mounted frame member for adjustable association with said serrated wire guide arm to vary the confronting relation between said frictional elements, spring means for urging said friction elements relative to each other, and means for adjusting said spring means.

10. A wire tensioning device comprising a frame, a shaft journalled in said frame to support a wire reel, a movably mounted member on said frame, a friction element carried by said shaft for rotation therewith, another friction element rockably mounted on said movable frame member to angularly confront said first named friction element, a wire guide member rockably mounted on said frame, a serrated arm fixed to said wire guide member, a link operatively connected to said movably mounted frame member for adjustable association with said serrated wire guide arm to vary the confronting relation between said frictional elements, spring means for urging said friction elements relative to each other, and means for adjusting said spring means.

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