June 21, 1966 E. VOSSEN 3,257,518

YARN TENSION CONTROL DEVICE

Filed April 13, 1964 2 Sheets-Sheet 1

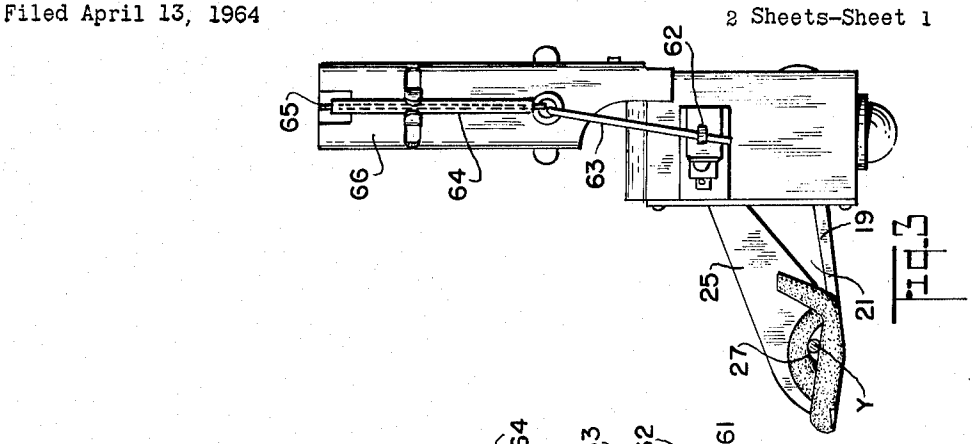


FIG. 3

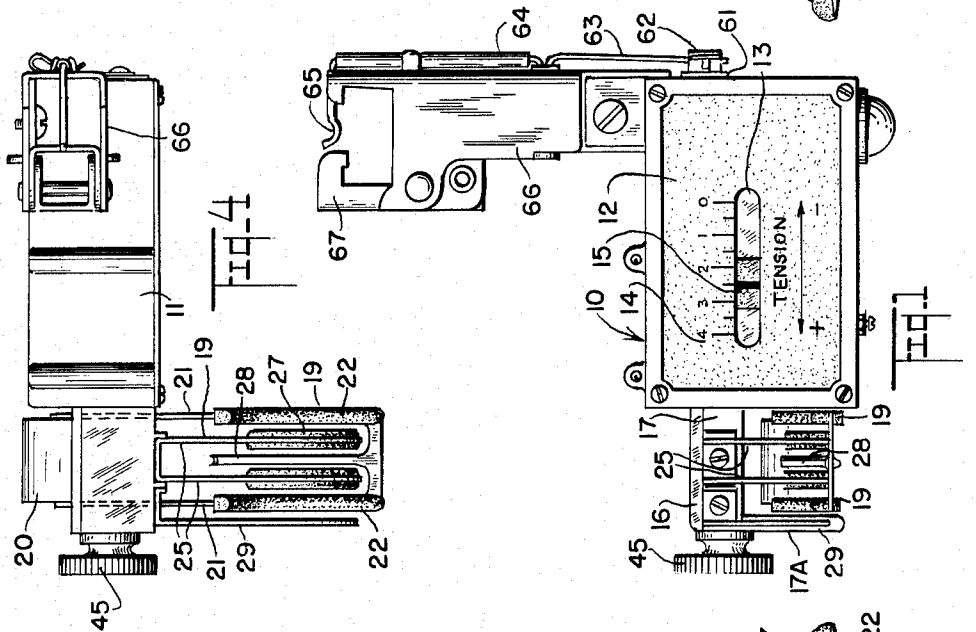


FIG. 4

FIG. 1

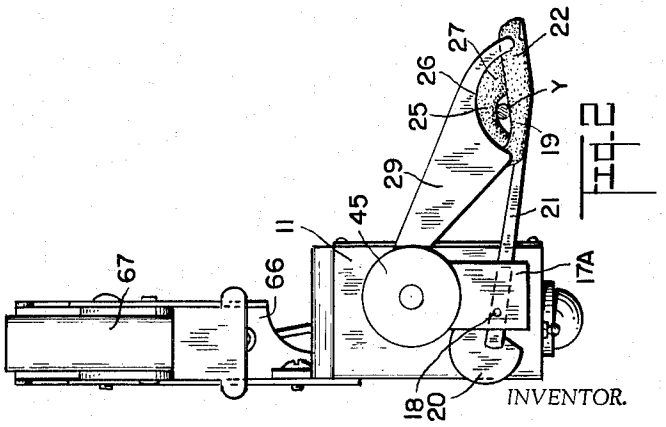


FIG. 2

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YARN TENSION CONTROL DEVICE

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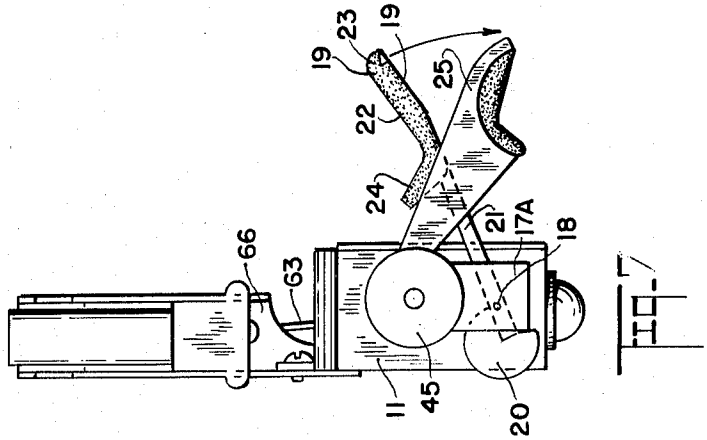


FIG. 7

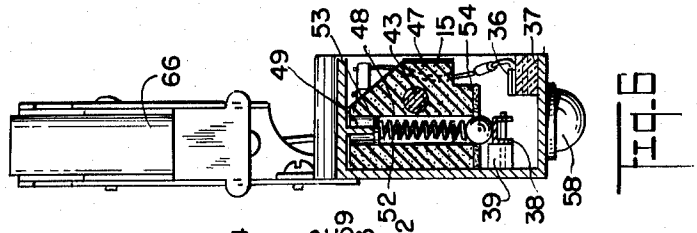


FIG. 6

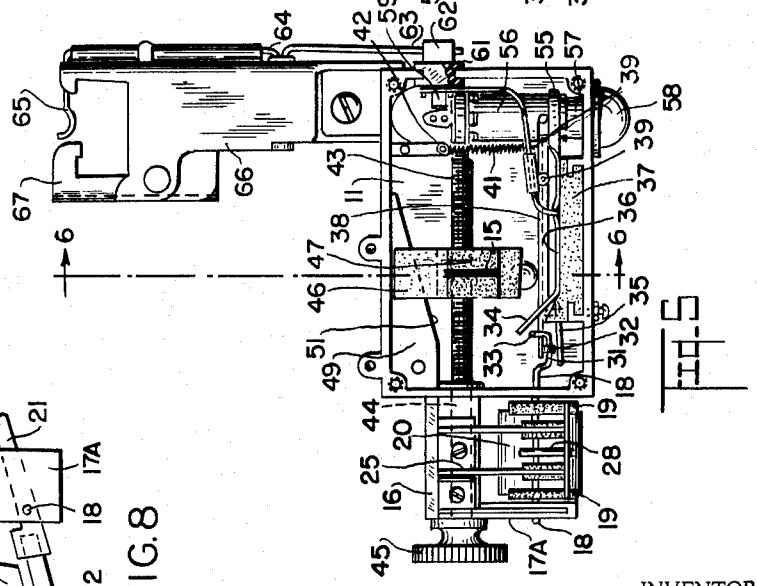


FIG. 5

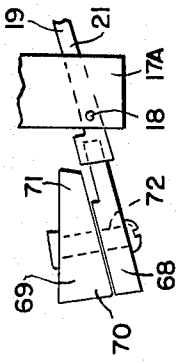


FIG. 8

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3,257,518

YARN TENSION CONTROL DEVICE

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Filed Apr. 13, 1964, Ser. No. 359,279
6 Claims. (Cl. 200—61.18)

This invention relates to a yarn tension control device and one in which the preferred degree of tension can be selected. It constitutes an improvement over Patent No. 2,515,479 issued to the present applicant on July 18, 1950.

The degree of tension that is preferred in different kinds of yarn and thread, depending upon the work being done, can be established by practice but in a large number of machines doing different work it is advantageous to provide a device through which the yarn is passed and in which the preferred degree of tension can be set in advance.

It is an important object of the invention to provide a tension control device in which the setting of dial means will automatically condition the device for action when the tension departs a predetermined degree from the selected setting so that an alarm can be given and the machine operation stopped.

Another object is to provide a settable device in which the ideal tension can be set and slight departures therefrom will be permitted before the warning signal is given or the machine stopped due to excessive tension or lack of tension in the yarn or thread, beyond the limits permitted by the device.

A further object of the invention is to provide a tension device which is operated by the yarn and will automatically adjust itself to the varying tensions of the yarn within allowable limits without giving any signal or stopping operation of the machine doing the knitting work.

Still further objects of the invention include the provision of means, in a compact organization, that lends itself to use in large numbers in a single machine so that each strand of yarn or thread passing from a supply spool to the needle is held separately and allowed to feed from supply source to work without danger of interference; to provide means for automatically controlling the operation of a machine when the tension of the yarn exceeds or is smaller than a predetermined amount, and to provide a device that is readily accessible to the operator, can be adjusted with a minimum of effort and time, and provides a signal so that the position of the detector that needs attention can be quickly located.

With these and other objects in view, the invention comprises certain constructions hereinafter described and then particularly pointed out in the claims and a preferred embodiment of the invention is illustrated in the accompanying drawings, in which:

FIGURE 1 is a face or front view of the tension control showing the visual setting and stop-motion warning means,

FIGURE 2 is a view in elevation taken at the left-hand end of the device illustrated in FIGURE 1, showing the yarn tension sensing arms,

FIGURE 3 is a view similar to FIGURE 2 taken at the opposite or righthand end of FIGURE 1 and showing the lead-in connection from the stop-motion head clamp means,

FIGURE 4 is a top plan view of the device shown in FIGURE 1, illustrating the relative position of the tension sensing arm means,

FIGURE 5 is a view similar to FIGURE 1, with the face plate removed to show the interior structure of the device,

FIGURE 6 is a view in sectional elevation taken on the line 6—6 of FIGURE 5 and illustrating the structure of the tension setting device,

FIGURE 7 is a view similar to FIGURE 2 showing an operating condition of the yarn tension sensing arms, and

FIGURE 8 is an enlarged view showing a modified form of adjustable counterweight used in conjunction with the tension sensing arms.

Referring to the drawings in detail, **10** indicates generally a yarn or thread tension control device including a rectangular metal housing **11** closed by a front plate **12** having a sight opening **13** which is calibrated along one edge as at **14** to indicate degrees of tension to which the device may be adjustably set. The face plate **12** may also indicate plus or minus degrees of tension to denote tensional stress or degree of slack in the yarn, passing through tension sensing arm means, visualized by an indicator marking **15** arranged to correspond with the calibrations **14** and settable as will be later described.

The housing (FIGURE 5) in its left wall, is shaped to provide a bracket **16** presenting a front face **17** and a depending end portion or strip **17A**. The lower portion of the strip **17A** and the end wall of the housing have journaled therein a shaft **18** to which is suitably secured laterally spaced tension sensing arms **19** whose rear ends are connected to a counterweight **20** to normally urge the arms **19** to a raised position as shown in FIGURE 7. Each arm, at its outer or free end has the extended arm portion **21** thereof partly encased in a porcelain sheath **22** which is shaped to provide a foot portion **23** and a heel portion **24** rounded at the junction to form a smooth seat for the free travel of yarn Y thereover and through a passage defined by laterally spaced arms **25** fixed to said front face **17** of bracket **16** and between which said arm portions **21** can swing upwardly as shown in FIGURE 7. The fixed arms **25** are arcuately shaped at their outer ends as at **26** and are covered on the inside of the curved terminal portions thereof by porcelain covers or sheaths **27** which co-act with the sheaths **22** to form the passage above referred to. The arms **19** are spaced apart and flank the inner fixed arms **25** and in addition carry a finger **28** disposed between the arms **19**, and movable between the arms **25**, for supporting the yarn, if it should sag, in the space between said arms **19**. The inner arms **25**, made in one piece, are mounted on the front face **17** of the bracket **16**, extend obliquely downward and are aligned laterally at their lower ends with a third single arm **29** of like shape.

The shaft **18** extends through the adjacent end wall of the housing **11** (FIGURE 5), is offset as at **31** to carry a bearing roller **32**, and provides a contact finger **33** whose free end is arranged to engage either the upper tongue **34** or the lower tongue **35** of a contact or conductor strip **36** mounted on an insulator block **37** secured on the bottom of the housing **11**. The roller **32** underlies the free end of a tension lever **38** pivoted at its opposite end in a bracket **39** secured to a wall of the housing and biased in one direction by a coil spring **41** depending from a stop pin **42** suspended in a suitable bracket from the top of the housing.

The degree of tension of the yarn or thread strand is regulated very closely through the medium of a fine screw shaft **43** extending into the housing **11** from the bracket **16**, the bracket and end wall of the housing providing bearings for an unthreaded portion **44** of the shaft, which carries a thumb-screw or adjusting means **45** at the end thereof projecting through the depending end **17A** of the bracket **16**. The shaft **43** carries an indicator block **46** of insulating material having a projecting front face portion **47** on which the indicator mark **15** is printed or

otherwise applied, the portion 47 being adjacent the sight-opening 13 in the face-plate through which the mark can be readily seen as it moves with respect to the calibrations 14. The indicator block 46 is slotted and bored as at 48 to straddle a guide plate 49 secured at the top of the housing 11 and presenting an inclined lower edge 51 which, at its lowest point, engages the bottom of the slot at the opposite sides of the block 46 to provide a stop for limiting the movement of the block in leftward direction. The bore portion of the opening houses a coil spring 52, a loose bearing disc 53 resting on top of the spring 52, and a ball 54 which protrudes from the bottom of the bore of the block 46 and presses on top of the tension lever 38. As the block 46 is adjusted to the left, the effort of the roller 32 necessary to raise the free end of the lever 38 increases to the maximum defined by the numeral "4" on the calibrated scale 14. This is the maximum force or tension that will have to be applied by the yarn Y on the arms 19 to swing the same down to a position where the yarn will lower the tension arms 19 and the yarn will slide off the sheath 22 of the arm extensions 21 to release the arms 19 so that they will snap to the high position shown in FIGURE 7. As the block 46 is adjusted to the right, the effort of the roller 32 necessary to raise the free end of the lever 38 decreases to the minimum defined by the cipher "0" on the calibrated scale 14. This is the minimum force or tension that may be applied by the yarn Y on the arms 19 to swing the same down to a position where the yarn can slip off the sheath 22 of the arm extensions 21 to release the arms 19 so that they will snap to the high position shown in FIGURE 7. The adjustment of the block 46 therefore to any position shown by the indicator permits the operator to preset the tension of the yarn desired in accordance with the working conditions of the machine.

The counterweight 20 and the tension lever 38 coact to set the desired tension as the resistance to the downward movement of the arms 19 is against the combined resistance of the counterweight and the tension lever. As increased tension of the yarn moves the arms 19 down to a predetermined degree, the contact finger 33 of shaft 18 engages the lower tongue 35 of the contact or conductor strip 36 to complete a circuit including the housing 11, a clip 55 on strip 36 engaging the metal casing 56 of an electrical socket 57 from which a light bulb 58 projects through a suitable opening in the bottom of the casing. As the arms 19 are released, when a broken end of yarn passes through, the counterweight and tension lever action moves said arms 19 upwardly so that the contact finger 33 of shaft 18 engages the upper tongue 34 of strip 36 to again complete the circuit as above described.

The circuit includes a lamp casing engaging spring contact clip 59 carried in an insulator 61 extending through the end wall of housing 11 and connected to another clip 62 outside the housing and to which latter is secured the end of a conductor wire 63 clamped to a current intake wire 64, terminating at its upper end in a contact arm 65. The contact arm 65 is mounted on a carrier 66 secured to the housing and which is adapted to be secured by a toggle clamp 67 to the channel member of a current supplying stop-motion head used for example in a knitting machine, as shown in FIGURE 6 of Patent No. 3,001,389 granted to applicant herein on September 26, 1961.

In addition to the control of the variation of yarn tension as accomplished by the action of the counterweight 20 and tension lever 38, an adjustable counterweight as shown in FIGURE 8 may be used which consists of a mounting disk 68 carried by the ends of the extended arm portions 21 of the arms 19 and beyond the shaft 18. The disk 68 has secured thereto a counterweight 69 which is diametrically tapered to provide relatively thick and thin arcuate portions 70 and 71 respectively, and is adjustably mounted for turning movement on the disk 68 by a pin 72 having a slotted head. A fine degree of

counterweight may be secured by rotating the weight 69 to bring the lighter or heavier portions thereof farther from the shaft 18 which constitutes the fulcrum of the arms 19.

When the tension of the yarn or thread, as it passes from the spools or spindles to the needles of the machine, through the settable yarn tension and stop-motion control device, exceeds the amount of tension shown by the "set" value, which is preferred for the type of work being done, the yarn starts to lower the arm 19 as the tension builds up, and when the finger 33 touches the flexible lower tongue 35, the circuit to a conventional stop-motion device or controller is closed and the knitting machine is stopped. The circuit to the lamp is also closed and the signal given by the lamp indicates to the operator which device needs attention. If the yarn should slide off the sheathed ends of arms 19 the action of the counterweight and the tension lever 38 will quickly snap the arms 19 up to cause the finger 33 to engage the upper tongue 34 of the contact strip 36 with the result that the lamp circuit will again be closed. It is immaterial that the circuit is momentarily broken when finger 33 disengages the lower contact strip in order to engage the upper contact strip. The machine will remain in stopped or inoperative condition.

When the tension of the yarn drops below the indicated preference on the dial, the arms 19 will begin to rise there being enough clearance between the arms 19 and 25 to permit the yarn to move in between the arms as the latter rise. When the resistance tension of the yarn has allowed the arms to rise to the extent of causing finger 33 to engage the tongue 34 of the strip 36, the circuit is closed, the lamp lights and the conventional stop-motion device or controller operates to stop the machine.

The invention is not to be restricted to the precise details of construction shown since various changes and modifications may be made therein without departing from the scope of the invention or sacrificing the advantages to be derived from its use.

What is claimed is:

1. A machine stopping and signalling device controlled by the tension in yarn or the like travelling from a source of supply to a work station, including interfitting movable and fixed arm means about which the yarn travels, a shaft connected to and operable by said movable arm means, having an offset roller portion and a contact finger, spaced contact means adapted to be connected into a machine controlling signal circuit and between which contact means said contact finger moves to engage either contact means to complete said circuit, spring urged lever means having a free end in yieldable engagement with said roller portion biasing the movable arm means upwardly against the resistance of said yarn tension, and indicator means adjustable lengthwise of said lever means applying pressure thereto to vary the resistance of said movable arm means to movement by the yarn, said movable and fixed arm means being laterally spaced and being shaped to provide a yarn passage, and said movable arm means presenting foot portions off which the yarn may slide when the tension thereof exceeds a desired limit, and counterweight means biasing the action of said movable arm means to raised position.

2. A machine stopping and signalling device according to claim 1 in which said indicator means includes adjustable threaded shaft means, an indicator block threaded to said shaft and movable therealong lengthwise of said lever means, a spring pressed ball means in the block engaging with the lever means to apply downward pressure to the free end thereof and stop guide means arresting the travel of said block in opposite directions and indicating the upper and lower limits of tension resisting force to be applied to the moving arm means by said lever.

3. A device controlled by the tension of yarn comprising a metallic housing, movable and fixed arm means mounted on said housing for engagement by said yarn, a shaft supporting the movable arm means extending into said housing and having offset roller carrying and finger portions, a tension lever spring biased at one end and overlying said offset roller carrying portion at its free end, spaced contact means between which said finger portion moves when the movable arm means moves up and down, said tension lever biasing the operation of the movable arm means upwardly to yieldably resist the tension of the yarn passing thereover, means varying the biasing force of said tension lever including indicator block means, a threaded shaft extending into said housing and along which said block means moves lengthwise of said tension lever, yieldable pressure means extending from said block engaging with said tension lever, a cover for said housing having a sight opening and a calibrated scale adjacent the sight opening, an indicator marking on said block visible through said sight opening and coacting with said scale to indicate the desired degree of tension in the yarn passing over said movable arm.

4. A device controlled by the tension of yarn as set forth in claim 3 including counterweight means on said movable arm means biasing the movable arm means for further upward movement in addition to and beyond the biasing action of said tension lever.

5. A device controlled by the tension of yarn as set forth in claim 3 including counterweight means on said movable arm means biasing the movable arm means for further upward movement in addition to and beyond the biasing action of said tension lever, and means for adjusting said counterweight to vary said biasing action thereof.

6. A machine stopping device according to claim 1 in which said counterweight means includes means for adjusting the counterweight means for varying the biasing action of said counterweight means.

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