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Hogan

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[54] **YARN TENSION OR BREAK MONITORING APPARATUS**

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[52] **U.S. Cl.** **73/160;** 73/144

[51] **Int. Cl.** **G01l 5/04**

[58] **Field of Search** 73/144, 160; 242/45, 148; 200/61.13, 61.14, 61.18; 340/259

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Primary Examiner—Charles A. Ruehl

[57] **ABSTRACT**

A bifunctional stop motion device to detect either tension surges or broken yarn as the yarn is being forwarded in a path of travel from a source to a machine. The device includes a yarn guiding pulley on a counterbalanced arm arranged to pivot for high yarn tension so that it changes the yarn path to cause a conventional feeler riding on the yarn to rotate and actuate a stop motion device shutting down the machine.

5 Claims, 2 Drawing Figures

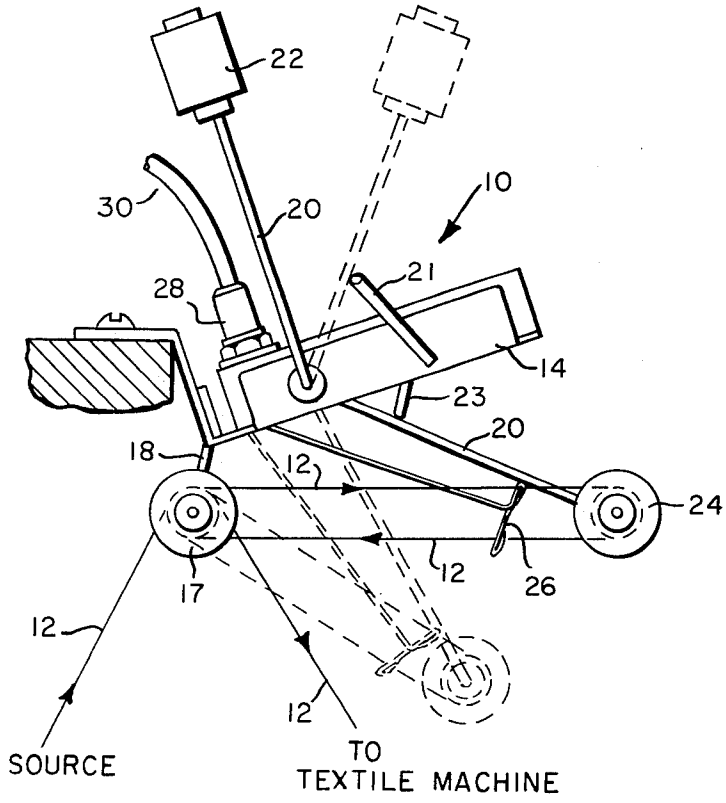


FIG. 1

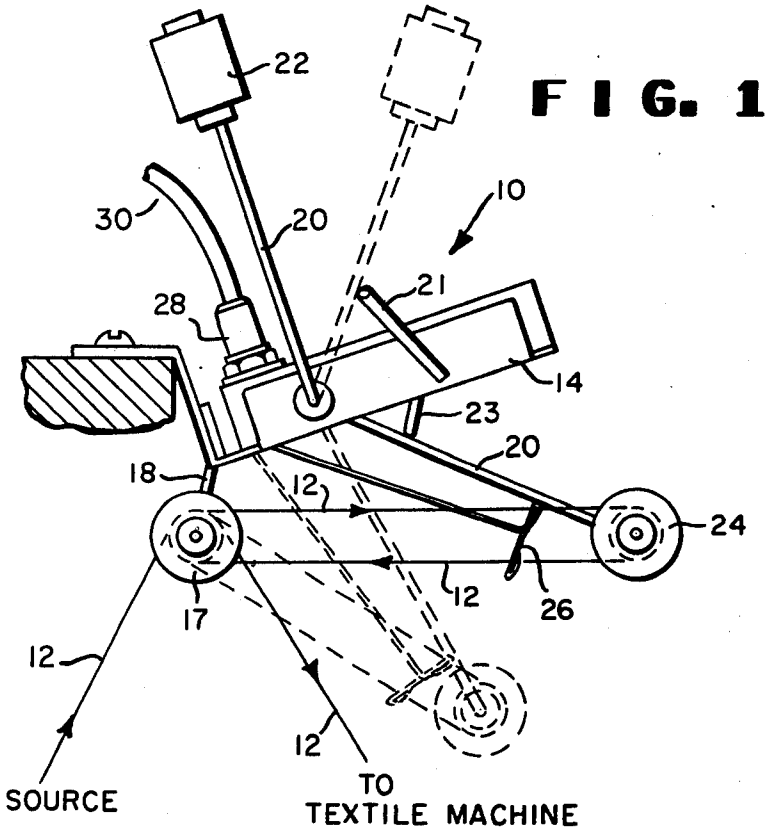
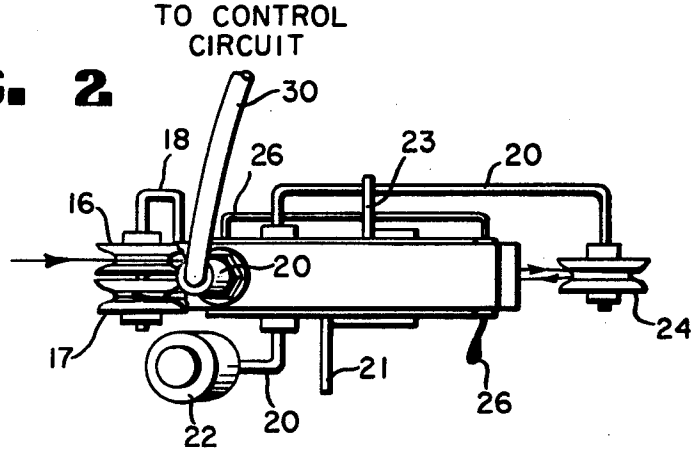

22
30
20
10
21
28
14
23
20
18
12
24
12
26
17
12
12
SOURCE
TO
TEXTILE MACHINE

FIG. 2


TO CONTROL
CIRCUIT
30
18
26
23
20
16
20
24
17
21
26
22
20

YARN TENSION OR BREAK MONITORING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to improved stop motion devices for textile machines and, more particularly, to an apparatus for detecting tension variations and breaks in yarn being forwarded under tension in a path of travel.

Typical commercially available stop motion devices rely on a signal or feeler arm supported by the yarn. When the yarn or thread breaks, the tension supporting the feeler arm goes to zero, allowing the arm to drop under gravity and actuate a switching arrangement to stop the yarn and the apparatus as it is being forwarded to what may typically be a knitting machine. There are other devices capable of detecting variations in tension in a thread being forwarded in a path, while still other devices combine the capability of detecting both variations in tension and breaks in a running threadline. These generally are complex and expensive.

It is the object of this invention to provide a simple efficient apparatus for detecting an increase in tension or a break in yarn being forwarded under tension in a path.

SUMMARY OF THE INVENTION

Accordingly, there has been provided an apparatus to detect a variation in tension or a break in yarn being forwarded under tension in a path, said apparatus comprising: a body member located adjacent said path; a first pulley around which said yarn passes rotatably mounted to said body member, an arm pivotally mounted intermediate its ends to said body member at a location spaced from said first pulley; means for biasing said arm against said tension; a second pulley around which said yarn passes rotatably mounted to said arm for swinging movement with said arm toward and away from said path; and means engaging said thread intermediate said first and second pulleys for detecting when the yarn moves more than a predetermined distance away from said path.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a side view of one form of apparatus of this invention.

FIG. **2** is a plan view of the apparatus of FIG. **1.**

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, an apparatus generally designated **10** is constructed according to the invention and engages a yarn **12** for determining increases in tension and/or breaks in the yarn which is being forwarded in a path from a source to a textile machine such as a knitting machine (not shown).

The apparatus **10** includes a body member **14** located in a fixed position adjacent the path of travel of yarn **12,** and a first pulley **16,** rotatably mounted to an extension **18** fastened to body **14.** An arm **20** extends through the body **14** and is pivotally mounted between its ends to the body. A counterweight **22** is attached to one end of the arm **20** and a second pulley **24** is rotatably mounted to the other end of the arm. A pair of stops **21, 23** is located on either side of body **14** to restrain extent of rotation of arm **20** in either direction. The counterweight serves as a means to bias the arm against stop **23** and against the tendency of the normal

running threadline tension or gravity to pull the pulley downward away from the stop **23** and the normal path of travel of yarn **12.** A feeler arm **26,** formed of wire with a loop at one end, is looped around and rides on yarn **12** supported by the tension in the yarn. The other end of feeler **26** is pivotally mounted to the body for free movement and enters the body **14** to engage switch **28** which in essence is a simple grounding device actuated by feeler **26** when it moves a predetermined distance from the normal path of travel of yarn **12** such as, for example, when a break occurs in the yarn. Lead **30** typically runs from switch **28** to the control circuit of a textile machine and when grounded by feeler **26** causes the machine to stop.

A pulley **17** mounted coaxially with pulley **16** on extension **18** is used to provide the particular thread path shown (around pulley **16** then pulley **24** and finally back to and around pulley **17**). This particular arrangement is preferred over one in which the threadline passes around only pulleys **16, 24** and then leaves from pulley **24.** The sensitivity of the preferred embodiment is independent of the mounting position relative to the fixed positions of the yarn on either side of the device. This occurs because the angle of wrap of yarn around pulley **24** does not change for the preferred embodiment and therefore the torque on arm **20** depends solely on yarn tension.

In operation, the apparatus **10** is located adjacent the path of travel of yarn **12** in such a manner that the yarn may be passed first partially around pulley **16** then around pulley **24** and back to and around pulley **17;** then it leaves pulley **17** toward a textile machine (not shown). When a preselected yarn tension is exceeded, as determined by the counterweight **22,** one of the yarn guide points, i.e., pulley **24** moves downward to the alternate position shown in FIG. **1** with arm **20** resting against stop **21.** The feeler arm **26** riding on yarn **12** moves downward with the yarn and in the alternate position shown grounds wire **30** by contacting an appendage of the wire **30,** i.e., switch **28** within body member **14,** thus, shutting down the textile machine involved. The above described motion changes the yarn path enough to activate the feeler **26** and stop the machine before the yarn breaks.

Various equivalent arrangements are possible within the scope of this invention. For example, the counterweight **22** and its function may be replaced by a spring between the arm **20** and body member **14** to give automatic reset when excess tension is released. A further alternate would employ a magnetic biasing means of suitable strength. This arrangement would also be independent of mounting orientation but only to the extent that will allow the feeler arm **26** to drop under the influence of gravity in case of complete break in the yarn. Alternatively, the arm **20** may be replaced by a flexible member and the motion of the member itself may act as a switch to shut off the machine rather than using a separate feeler arm **26.** In this manner, the geometric relation of the components may be rearranged to suit the needs of the machine without need for the influence of gravity in the operation if the yarn breaks.

What is claimed is:

1. An apparatus to detect a variation in tension or a break in yarn being forwarded under tension in a path, said apparatus comprising: a body member located adjacent said path; a first pulley around which said yarn passes rotatably mounted to said body member, an arm

mounted to said body member at a location spaced from said first pulley; means for biasing said arm against said tension; a second pulley around which said yarn passes rotatably mounted to said arm for swinging movement with said arm toward and away from said path; and means engaging said yarn intermediate said first and second pulleys for detecting when the yarn moves more than a predetermined distance away from said path.

2. An apparatus to detect a variation in tension or a break in yarn being forwarded under tension in a path, said apparatus comprising: a body member located adjacent said path; a first pulley around which said yarn passes rotatably mounted to said body member, an arm pivotally mounted intermediate its ends to said body member at a location spaced from said first pulley; means for biasing said arm against said tension; a second pulley around which said yarn passes rotatably mounted to said arm for swinging movement with said arm toward and away from said path; and means engaging said yarn intermediate said first and second pulleys for detecting when the yarn moves more than a predetermined distance away from said path.

3. The apparatus as defined in claim **2,** including a third pulley coaxially mounted with said first pulley around which said yarn passes after it leaves said second pulley.

4. The apparatus as defined in claim **2,** said means for biasing comprising a counterweight attached to one end of said arm.

5. The apparatus as defined in claim **2,** said variation in tension being an increase in tension.

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