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Whittaker

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[54] **YARN WRAP DETECTOR ASSEMBLY WITH BUTTERFLY TYPE SENSOR AND SWITCH ACTUATOR**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **200/61.18,** 57/80, 200/61.13

[51] **Int. Cl.** **B65h 25/14**

[58] **Field of Search** 200/61.13–61.18; 57/55.5, 80, 81; 66/161, 162, 163; 28/50, 51, 53

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[57] **ABSTRACT**

A wrap detector for detecting a yarn wrap on a roller, comprising a pivotally mounted butterfly-type sensing member arranged adjacent to the surface of the roller and having a predetermined normal position relative to said roller, apparatus allowing a limited range of angular deflection of the sensing member from the normal position, apparatus operative, when the limited range is exceeded, to move the sensing member through a greater angle to a limit position lying well clear of the roller, and a switch mechanism actuated by the sensing member when in the limit position to control further yarn feed.

6 Claims, 3 Drawing Figures

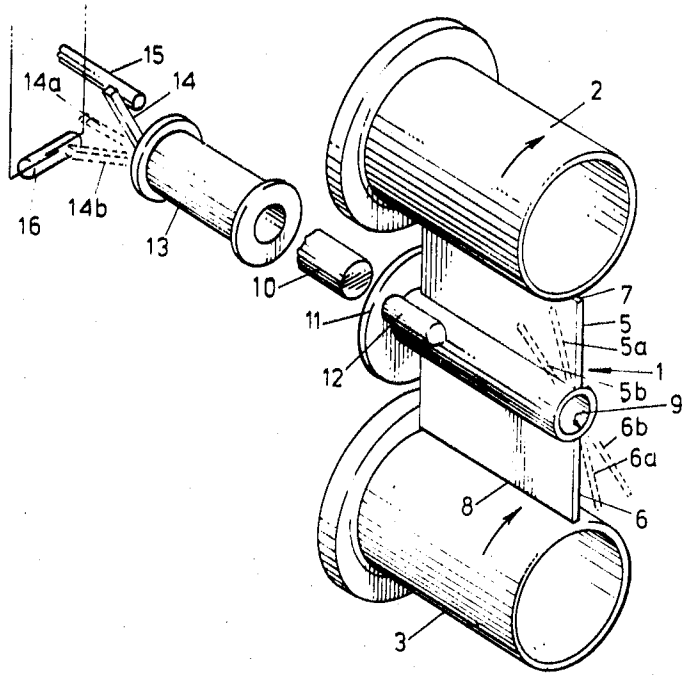


Fig. 1.

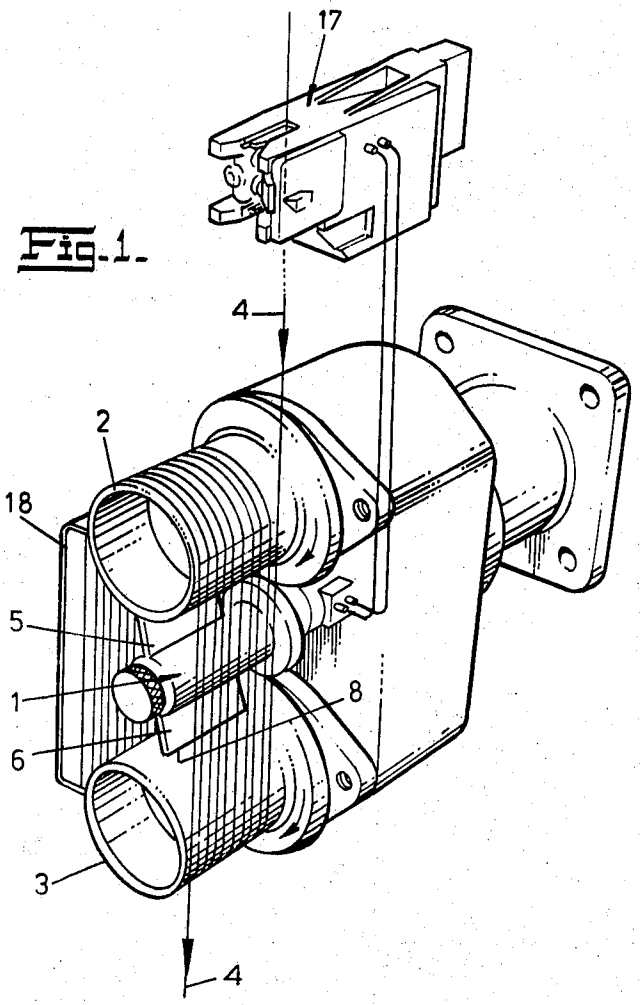
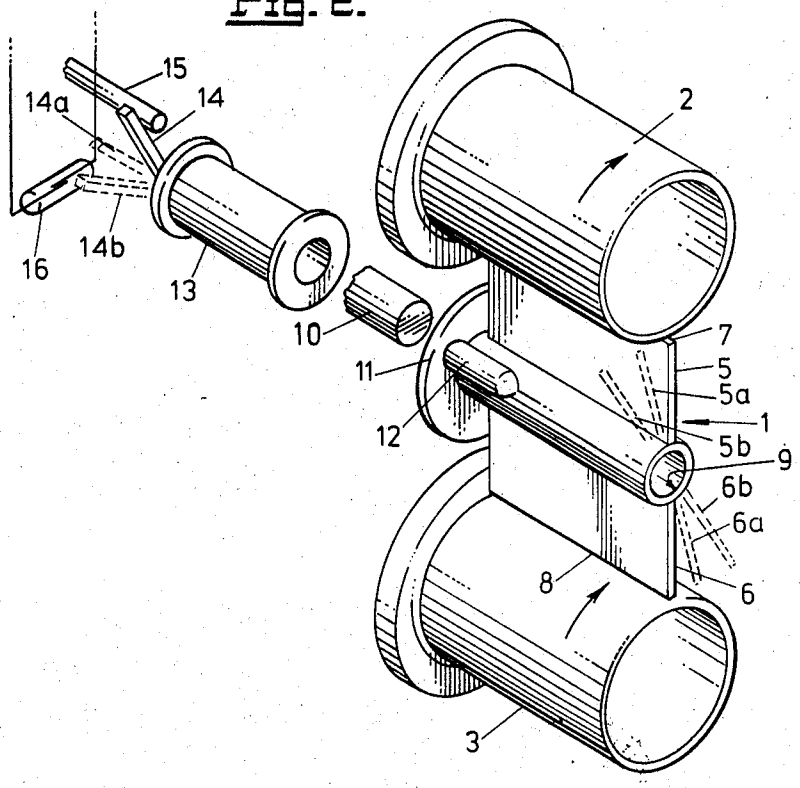


Fig. 2.



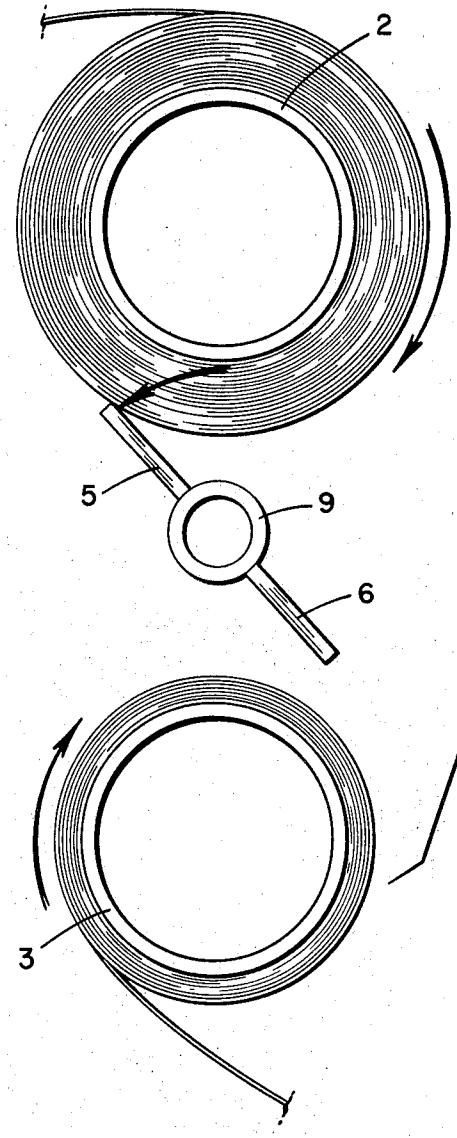


Fig. 3.

YARN WRAP DETECTOR ASSEMBLY WITH BUTTERFLY TYPE SENSOR AND SWITCH ACTUATOR

This invention relates to yarn wrap detectors.

In the processing of yarn, the yarn is usually required to travel over a number of driven rollers and if the yarn should break after passing over a roller it then proceeds to wrap itself round that roller. Various forms of wrap detectors have been proposed in the past, such detectors responding to the build up of a wrap and actuating means to stop the yarn processing equipment.

According to the present invention a wrap detector for detecting a yarn wrap on a roller comprises a pivotally mounted sensing member arranged adjacent to the surface of the roller and having a predetermined normal position relative to the roller, means allowing a limited range of angular deflection of the sensing member from its normal position, means operative, when the limited range is exceeded, to move the sensing member through a greater angle to a limit position lying well clear of the roller, and switch means actuated by the sensing member when in the limit position to control further yarn feed.

In a wrap detector as mentioned above, a wrap building up will cause the sensing member to undergo a deflection greater than its limited range and it will thus be moved to its limit position. This is well clear of the roller so that the roller may continue to rotate with the yarn wrapped on it without the sensing member rubbing on the wrapped yarn and distorting or tangling it to make it more difficult to remove from the roller. Desirably the switch means when operated by the sensing member operates a yarn cutter to cut the feed yarn, rather than stopping the whole of the yarn processing apparatus. With the yarn cut, and thus no feed to the roller, and with the sensing member positioned well clear of the roller surface, the roller may safely be left rotating indefinitely until the operator has time to clear the wrap.

Preferably the sensing member is held in its predetermined normal position and allowed a limited range of angular deflection by a magnet secured to move with the sensing member and normally lying against a ferromagnetic stop member. The magnetic force will normally hold the magnet against the stop member, and in this condition the sensing member is in its normal position. Small deflections of the sensing member away from this normal position will move the magnet away from the stop member, but the magnet will be attracted back to the stop member to return the sensing member to its normal position. A larger deflection, however, will move the magnet so that the stop member is no longer in the magnet field, or so that the attraction between the magnet and the stop member is overcome by other means. The magnet may be mounted directly on the sensing member or on a shaft or other element movable with the sensing member.

As an alternative to the magnet arrangement a mechanical latch may be used to retain the sensing member in its normal position and allow limited angular movement. For example, the sensing member in its normal position may engage behind a pawl at the end of a latch member spring biased into contact with the sensing member. Movement of the sensing member beyond the limited range of angular deflection will cause the sensing member to ride under and lift the pawl and latch member against the spring bias to free the sensing member for further movement. Alternative forms of mechanical or other latches giving the required control may readily be devised.

The means operative to move the sensing member to the limit position when the limited range is exceeded may be a weight mounted on the sensing member or a part connected thereto. This is a particularly suitable arrangement in combination with the magnetic latch, the value of the weight and the strength of the magnet being chosen so that over the desired limited range the couple due to the magnetic force is greater than that due to the gravitational force on the weight, but once that range is exceeded the couple due to the gravitational force is greater so that the sensing member swings to its limit position. Various forms of spring arrangements or other means may of course be used as alternatives to the weight.

Use of a magnetic latch has a further advantage in that the magnet may be used as the actuator for the switch means. Accordingly, the switch means is conveniently a reed switch operated by the magnet when the sensing member is in its limit position.

However, it is not necessary for the switch to be a magnetically operated reed switch and microswitches or photoelectric switches could equally well be used.

In order that the invention may be better understood, a specific embodiment of a wrap detector according to the invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:

FIG. **1** is a perspective view of a wrap detector and associated apparatus,

FIG. **2** is a perspective exploded view of the wrap detector of FIG. **1**; and

FIG. **3** is an end view of FIG. **2** and shows yarn wrap built up on rollers.

As shown in the drawings the wrap detector **1** is mounted between two rollers **2** and **3** around which a number of turns of yarn **4** may be passed. The two rollers are driven in the directions of the arrows. The wrap detector **1** comprises a sensing member in the form of two plates **5** and **6** having edges **7** and **8** lying adjacent to the surfaces of rollers **2** and **3** respectively. The two plates are joined by a hollow sleeve **9** which is pivotally mounted on a shaft **10.**

A disc **11** is secured to one end of the sleeve **9,** and a weight **12** is secured to the disc **11.** Also secured to the disc **11** is a bush **13** of non-magnetic material to which is secured a permanent magnet **14.** The assembly of the plates **5** and **6,** sleeve **9,** disc **11,** weight **12,** bush **13** and magnet **14** is such that it is all capable of pivotal movement as a unit about the shaft **10.**

The permanent magnet **14** normally lies against a stop pin **15** of ferromagnetic material. Positioned adjacent to the magnet **14** when in a deflected position **14***b* is a reed switch **16** electrically connected to a conventional yarn cutter and holder **17** in advance of roller **1.**

Operation of the wrap detector will readily be appreciated. In normal running of the yarn over the rollers the yarn will not run over the lower arc of the upper roller and upper arc of the lower roller so that there will be no yarn between the plates **5** and **6** and the rollers. The butterfly-type sensing member comprising the plates **5** and **6** is held in its normal position as shown in solid lines in FIG. **2** by the attraction of the magnet **14** to the stop pin **15.** If pivotal movement of the sensing

member should occur over a limited range of angular deflection, for example, due to vibration of the apparatus, then the magnet will return the sensing member to its normal position. The limit of such range is indicated by the broken line positions *5a*, *6a*, *14a* of the plates and the magnet.

If the yarn breaks, and commences to wrap itself round either roller then the thickness of yarn on the roller will deflect the sensing member anticlockwise as seen in FIG. 3. The deflection will increase as the thickness of the wrap increases, until the deflection reaches the end of the limited range of angular deflection, with the plates in positions *5a* and *6a*. When this occurs the moment due to the weight **12** will apply to the sensing member an anticlockwise couple greater than the clockwise couple applied by attraction of the magnet **14** to the stop pin **15**, and the sensing member will swing anticlockwise away from the rollers to a limit position indicated by broken lines *5b*, *6b* in the drawing. A stop (not shown) is provided to hold the sensing member in this limit position.

During such movement the magnet **14** moves to position *14b* and operates the reed switch **16** to affect the yarn feed. The reed switch controls the yarn cutter **17** ahead of the roller **1** so that when a wrap occurs the yarn is cut and held at the cutter **17** and no further yarn is fed to the roller. This, together with the fact that the sensing member lies some distance away from the roller surfaces means that the rollers can continue to rotate indefinitely without the wrap increasing or being rubbed by the sensing member. An operator can thus attend to clearing the wrap and rethreading the apparatus whenever he is available.

The yarn cutter may be of any desired type, and in particular may be a conventional knife arrangement or, particularly if handling thermoplastic yarn, may be an electrically heated wire movable into contact with the yarn. As an alternative to yarn cutting the switch **16** may act to stop the apparatus altogether. It will be seen that until the sensing member is positively reset by an operator to its normal position the reed switch **16** remains operated and normal operation of the apparatus can not be restarted, since the yarn cutter is held in its cutting position or the apparatus is stopped. On restarting, threading of yarn over the rollers is easy, since the wrap detector in its normal position does not lie adjacent to the yarn path.

It is to be understood that the foregoing description is merely of one embodiment of a yarn wrap detector according to the invention, and this can be varied in many ways. The detector can, of course be used to detect a wrap on a single roller, when one of the plates **5** or **6** may be omitted. The value of the weight and/or the strength of the magnet would then have to be changed to give the necessary operating limits. Latch and bias arrangements other than the magnet and weight shown can be used, and the reed switch may be replaced by a microswitch or photoelectric switch. However, the arrangement shown is of a particularly robust and simple nature and can therefore be manufactured cheaply to give long service.

The wrap detector as described is particularly suitable for use in a yarn heater wherein heater plates such as **18** lie one to each side of the space between two rollers.

What I claim is:

1. A wrap detector for detecting a yarn wrap on a roller, comprising a pivotally mounted sensing member arranged adjacent to the surface of said roller and having a predetermined normal position relative to said roller, means associated with said sensing member for allowing a limited range of angular deflection of said sensing member from said normal position, means, operative when said limited range is exceeded, for moving said sensing member through a greater angle to a limit position lying well clear of said roller and said yarn wrap, and switch means actuated by said allowing means when in said limit position for controlling further yarn feed.

2. A wrap detector according to claim **1** including a stop member of ferromagnetic material, and a magnet fixed to move with said sensing member, said sensing member being held in its normal position by engagement of said magnet with said top member.

3. A wrap detector according to claim **1** in which a weight is mounted to move with the sensing member, said weight being so positioned and of such value that immediately when said sensing member has moved to the end of said limited range said weight causes said sensing member to move on to said limit position.

4. A wrap detector according to claim **2** in which said switch means is a reed switch actuated by said magnet when said sensing member is in its limit position.

5. A wrap detector according to claim **1** in which said wrap detector is mounted between two rollers having two spaced parallel axes and said sensing element has a part lying adjacent to the surface of each said roller for deflection in the same sense by a yarn wrap occurring on either of said rollers.

6. A wrap detector according to claim **1** in which said switch means when actuated operates means for cutting the yarn and arresting feed of yarn to the roller.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,790,728 Dated February 5, 1974

Inventor(s) Harold Whittaker

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading of the Patent, identify the assignee:

-- Carding Specialists Co. Limited, Halifax, Yorkshire, England, a British Company --.

Signed and sealed this 17th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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