United States Patent

[111] 3,593,027

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[33] **Germany**
[31] **H 63 183/42K**

[54] **WEB FAULT-DETECTING APPARATUS USING ROLLER CONSTRUCTED TO PREVENT BOUNCING**
6 Claims, 5 Drawing Figs.

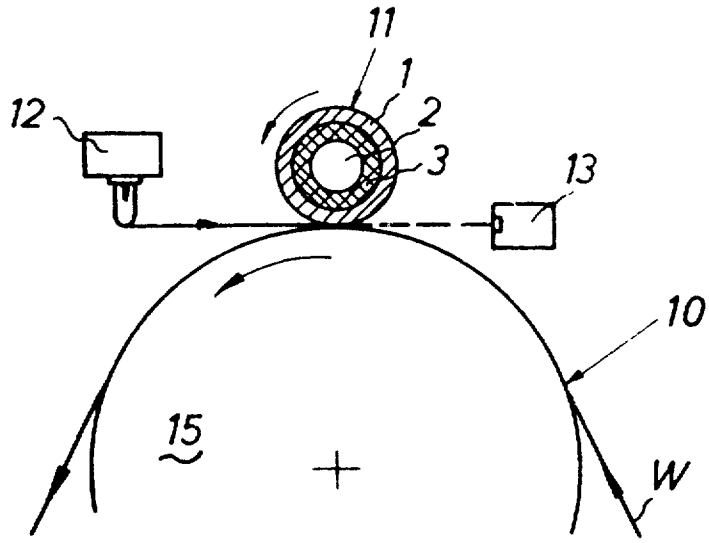
[52] **U.S. Cl.** **250/219,** 356/200, 29/130
[51] **Int. Cl.** **G01n 21/32**
[50] **Field of Search** ..... 250/219 D; 356/237, 238, 199, 200; 29/130; 74/57 Y

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Primary Examiner—Walter Stolwein
Attorney—Hill, Sherman, Meroni, Gross and Simpson

ABSTRACT: A fault sensing roller for use on a travelling web consisting of an outer shell and an inner core. The inner core is composed of a material having a greater mass than the outer shell and is spaced from the inner periphery of the outer shell by a yieldable elastomeric member thereby preventing "bouncing" of the roller after passage of a fault and maintaining true contact between the outer shell and the travelling web.



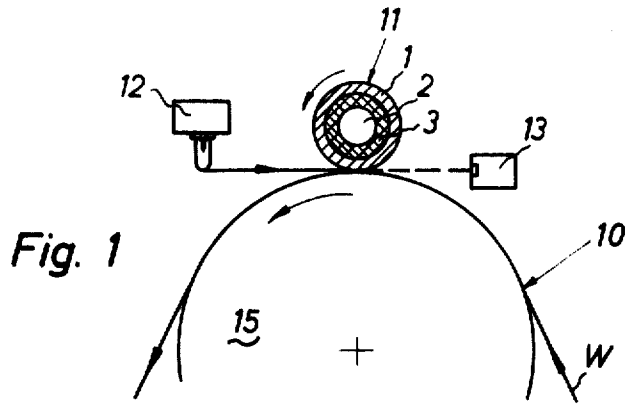


Fig. 1

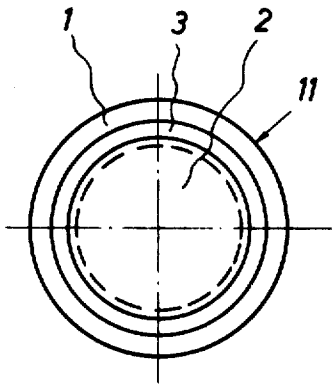


Fig. 2

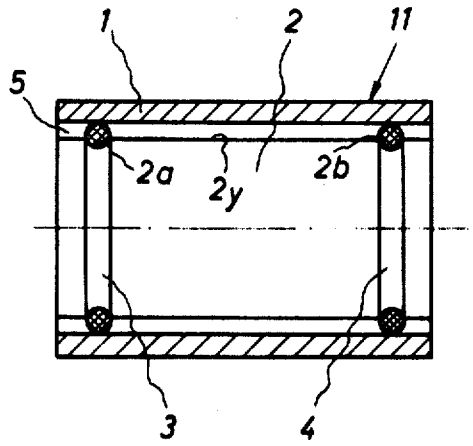


Fig. 3

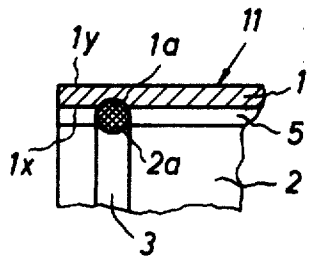


Fig. 4

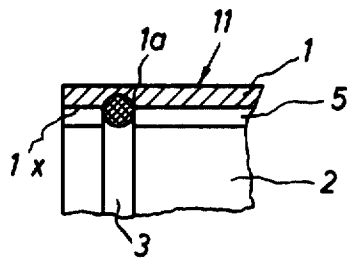


Fig. 5

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WEB FAULT-DETECTING APPARATUS USING ROLLER CONSTRUCTED TO PREVENT BOUNCING

The invention generally relates to web fault-detecting apparatuses and more particularly to fault-detecting rollers for use in apparatuses for detecting wrinkles, knots and other similar faults in continuously running webs, such as paper webs.

Conventional fault testing apparatuses for travelling paper webs comprise a backing roller supporting the paper web and a movably carried sensing roller in contact with the travelling web above the backing roller. A light source is arranged in front of the rollers and a photoelectric cell is arranged behind the rollers. In that manner, if a fault passes between the rollers the sensing roller is caused to rise and the light passes through the resulting gap striking the photoelectric cell and causing a current or current change to take place therein and thereby indicating the presence of a fault.

Conventional sensing rollers are generally composed of solid metal. However, this is highly unsatisfactory since such sensing rollers travel at high speeds in response to the travelling web and in such instances even a relatively small irregularity or fault causes the roller to bounce or to successively jump upon encountering a single fault. This type of successive jumping or bouncing of course is detected by the photoelectric cell as numerous faults so that in certain instances an entire portion of a travelling web is detected as being defective thereby producing great waste in the web material.

Accordingly, it is an important object of the instant invention to provide an improved sensing roller avoiding the aforesaid drawbacks.

It is yet another important object of the instant invention to provide a sensing roller that will maintain true contact with a travelling web at high speeds.

It is another object of the invention to provide a sensing roller having an outer shell and an inner core having a greater mass than the outer shell spaced within the outer shell by an elastically yieldable means whereby the outer shell moves in response to the actual faults and compresses the yieldable material without bouncing.

Other objects, features and advantages of the invention will be readily apparent from the following description of certain preferred embodiments thereof, taken in conjunction with the accompanying drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure, and in which:

FIG. 1 is an essentially diagrammatic side elevational partial view of a web fault-detecting apparatus employing the concepts of the instant invention;

FIG. 2 is a diagrammatic elevational end view of a sensing roller constructed in accordance with the principles of the invention;

FIG. 3 is a diagrammatic side elevational view of one embodiment of the sensing roller constructed in accordance with the principles of the invention;

FIG. 4 is a fragmentary diagrammatic side elevational view of another embodiment of the sensing roller constructed in accordance with the principles of the invention; and

FIG. 5 is a fragmentary side elevational view somewhat similar to FIG. 4 but illustrating another embodiment of the sensing roller of the instant invention.

In accordance with the principles of the invention, a fault sensing roller comprises a generally cylindrical hollow outer shell having an inner and outer peripheral surface, a generally cylindrical solid core having an outer peripheral surface loosely fitting within the hollow outer shell and out of contact with the inner peripheral surface of the outer shell. The solid core has a mass greater than the mass of the outer shell. An elastically yieldable spacing means is arranged in contact with the inner peripheral surface of the outer shell and with the outer peripheral surface of the core maintaining the relative position of the inner core in respect to the outer shell. Thus, the core has an outer diameter that is smaller than the inner diameter of the hollow shell and the space between the core and the shell is filled, at least in part, by an elastically yieldable spacing means which may be composed of, for example, rubber or similar elastomeric materials.

As shown in FIG. 1, a web fault-detecting apparatus 10 comprises a backing roller 15 mounted for rotation in the direction indicated by the curved arrow. The backing roll 15 supports a travelling web W and allows the travelling web W to pass over the backing roller 15. A fault sensing roller 11 is movably mounted for rotation above the backing roll 15 in the direction indicated by the curved arrow in contact with the travelling web W. A signal generating means 12 and a signal receiving means 13 (as for example, a light source and a photoelectric cell) is mounted in the vicinity of the fault sensing roller 11 detecting interruptions in contact between the sensing roller 11 and the travelling web W. Thus, when the sensing roller 11 is in true contact with the travelling web W, a first signal state exists between the signal generating means 12 and the signal receiving means 13 and when the sensing roller 11 is caused to move upwardly by the passage of a fault in the web then another signal state exists. This arrangement is conventional and may be arranged as desired.

The sensing roller 11 comprises an outer shell 1 and an inner core 2 loosely fitting within the shell 1. The outer hollow shell is composed of a smooth relatively lightweight material such as stainless steel, nylon, polyvinyl chloride resin, etc. The inner core 2 has a mass greater than the outer shell mass and may be composed of a relatively heavy material, as for example, lead, iron, etc. An elastically yieldable spacing means 3 is mounted between the outer shell 1 and the inner core 2 to maintain the relative position of the shell and the core in respect to each other. The spacing means 3 is composed of a yieldable elastic material such as rubber, elastomeric plastics, etc.

In one embodiment of the invention, the sensing roller 11 is constructed of a hollow outer shell 1 having a solid inner core 2 loosely fitting within the hollow core 1. The space 5 between the outer hollow shell 1 and the inner solid core 2 is at least partially filled with a yieldably elastic spacing means, such as a pair of toroidal rings 3 and 4 maintaining the relative position between the inner core and the outer shell. Of course, if desired, additional elastic rings can be utilized to space the core from the outer shell.

As illustrated in FIG. 3, one embodiment of the invention comprises providing a pair of spaced grooves 2*a* and 2*b* along the length of the inner core 2 for receiving the yieldable toroidal rings 3 and 4.

As illustrated in FIG. 4, another embodiment of the invention comprises providing sensing roller 11 having an outer shell 1 with an outer peripheral surface 1*y* and an inner peripheral surface 1*x*. The inner peripheral surface 1*x* has at least a pair of grooves 1*a* (the other of said pair not being illustrated) spaced along the length of the shell 1. The inner core 2 is provided with opposed grooves 2*a* along its outer peripheral surface 2*y* spaced along the length thereof and in substantial registry with grooves 1*a* on the outer shell for receiving the elastically yieldable toroidal rings 3. As will be appreciated, FIG. 4 illustrates only one end of the sensing roller and the other end is substantially similar.

FIG. 5 illustrates yet another embodiment of the invention wherein only the inner peripheral surface 1*x* of the outer shell 1 is provided with grooves 1*a* spaced along the length thereof receiving toroidal rings 3. The various grooves provide a means of retaining the yieldable spacing means in its relative position to allow the proper function of the sensing roller.

In operation, when the sensing roller of the instant invention travels rapidly over a fault or an unevenness, substantially only the outer shell 1 will move upwardly while the core 2, in consequence of its mass inertia, will very nearly retain its original position. The toroidal rings 3 and 4 are elastically deformed during this process and their elastic nature forces the outer

shell to pass over the fault in the web and maintain true contact with the web without bouncing or jumping, as in the case of a solid sensing roller.

In summation, it will be seen that the invention provides a fault sensing roller comprising a generally cylindrical hollow outer shell composed of a smooth relatively lightweight material, such as stainless steel or plastic, with an inner core loosely fitting within the outer shell. The inner core is composed of a material having a mass relatively greater than the mass of the outer shell, such as lead, and is spaced from the outer core by an elastically yieldable spacing means which allows the outer shell to move in response to faults on the web without causing undue movement of the inner core and thereby maintain true contact of the sensing roller with the travelling web.

I claim as my invention:

1. In a web fault-detecting apparatus, a fault sensing roller mounted for rotation in contact with a travelling web comprising, a generally cylindrical hollow outer shell having an inner and outer peripheral surface, a generally cylindrical solid core having an outer peripheral surface loosely fitting within said hollow outer shell and out of contact with said inner peripheral surface of said outer shell, said solid core having a mass greater than the mass of the outer shell and an elastically yieldable spacing means in contact with the inner peripheral surface of the outer shell and with the outer peripheral surface of the core maintaining the relative position of the inner core in respect to the outer shell.

2. In a web fault-detecting apparatus as defined in claim 1, wherein the elastically yieldable spacing means comprise at least a pair of toroidal rings composed of elastically yieldable material spaced from one another along the length of the sensing roller.

3. In a web fault-detecting apparatus as defined in claim 2, wherein the outer peripheral surface of the core is provided with at least a pair of grooves spaced from one another along the length thereof receiving the toroidal rings.

4. In a web fault-detecting apparatus as defined in claim 2, wherein the inner peripheral surface of the outer shell is provided with at least a pair of grooves spaced from one another along the length of said shell receiving the toroidal rings.

5. In a web fault-detecting apparatus as defined in claim 2, wherein the inner peripheral surface of the outer peripheral surface of the core are provided with at least a pair of opposed grooves spaced from one another along the length of said surfaces, said opposed grooves being in registry with each other receiving the toroidal rings therebetween.

6. In a web fault-detecting apparatus the combination comprising, a backing roller mounted for rotation, a travelling web supported by said backing roller and travelling thereover, a fault sensing roller mounted for rotation above said backing roller in contact with said travelling web and a signal generating and receiving means mounted in the vicinity of said fault sensing roller detecting interruptions in contact between said sensing roller and said travelling web, said fault sensing roller comprising an outer shell and an inner core loosely fitting within said shell, said inner core having a mass greater than the mass of the outer shell, with an elastically yieldable spacing means mounted between said shell and said core maintaining the relative position in respect to one another.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,593,027 Dated July 13, 1971

Inventor(s) Dieter Grieger

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

Column 4, line 12, after "outer" insert --shell and the outer--.

Signed and sealed this 13th day of June 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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