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PNEUMATIC SENSING SYSTEM

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FIG. 1

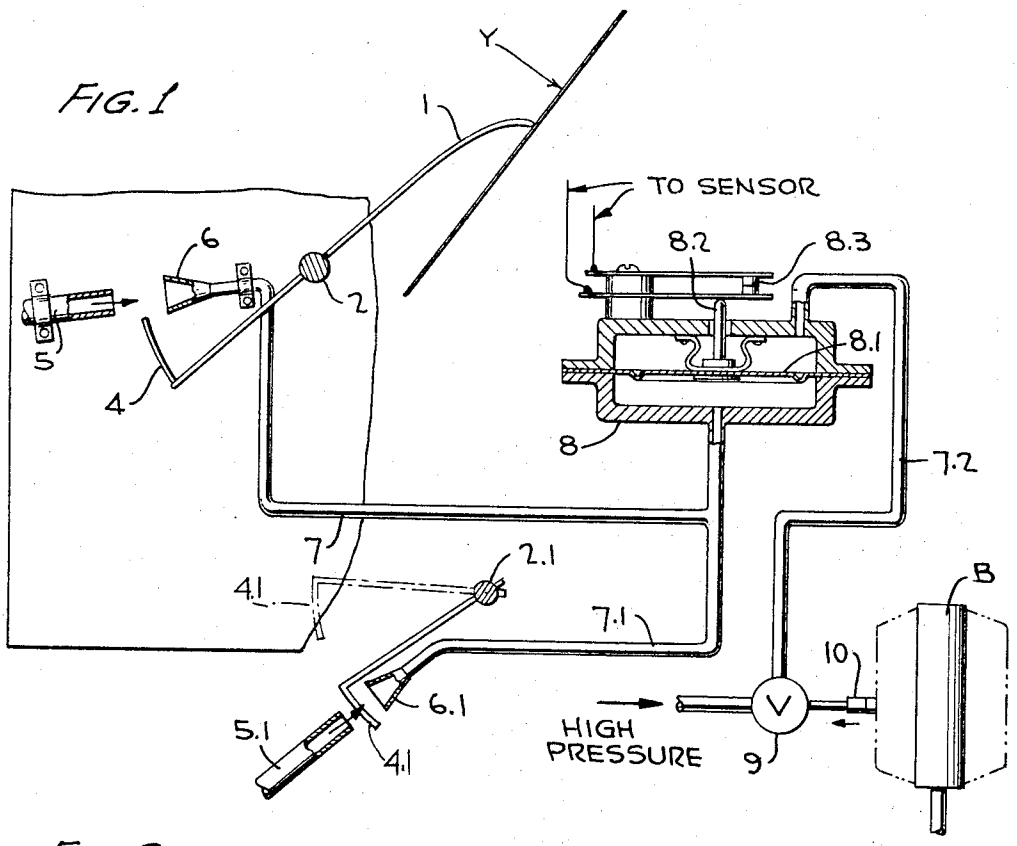
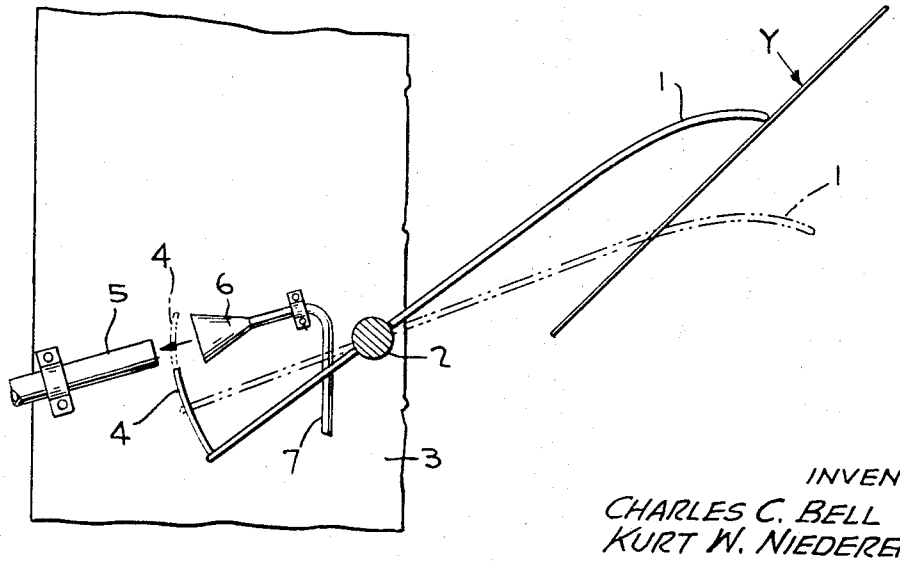


FIG. 2



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PNEUMATIC SENSING SYSTEM

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ABSTRACT OF THE DISCLOSURE

A pneumatic sensing system for sensing a yarn strand in a textile operation is described. The system comprises in combination a yarn feeler, a vane, an air jet and air receiver, and a fluid pressure transducer. The elements are constructed and arranged to continuously supply air to the transducer as long as a yarn strand is present. In the absence of a yarn strand, the vane, which is in operable association with the yarn feeler, will interrupt the air supply, exhausting the transducer, which will activate a signal to stop a work cycle, or initiate a rethreading procedure. A preferred embodiment utilizes the improved pneumatic sensing system in an automatic spinning unit having a patroling tender. This embodiment employs a registration vane in operable association with a second air jet and air receiver. The registration vane interrupts the second air supply at each spinning station, but the transducer is not exhausted unless both air jets are interrupted. When the pneumatic yarn sensing system is employed on a patrolling spinning tender, it can be coordinated with a full bobbin sensor.

Field of invention

This invention relates to textile equipment and machinery. More particularly, the invention is directed to an improved sensing system for the detection of a yarn strand in a textile operation which, in the absence of a yarn strand, will automatically stop a work cycle or initiate a rethreading operation.

Background and prior art

Various textile operations are encountered in which a yarn strand is running, or fed from one position to another. In automatic equipment of the aforesaid type, it is necessary to detect when the yarn strand is broken or when a yarn threading operation has not been properly effected. Yarn sensors or feelers are therefore employed in automatic textile machinery which will actuate a mechanical or electrical signal in the absence of a yarn strand. All of such yarn sensors, however, are limited in application. More specifically, most if not all textile operations are accompanied by an accumulation of lint, dust, oil, or the like. Accordingly, mechanical and electrical sensors can become fouled and as a result may fail to actuate the required signal. To offset the aforesaid, sensors have been developed which are extremely sensitive. The latter sensors are still not the complete answer since, because of their extreme sensitivity, they are often actauted accidentally, inadvertently interrupting the sequence of the textile operation.

Objects and brief description of invention

Accordingly, it is an object of the present invention to provide an improved yarn sensor for use with textile machinery which has extremely high amplification, but is not critically sensitive to malfunction variables.

It is another object of this invention to provide an improved yarn sensor for use with textile machinery which substantially precludes fouling.

It is another object of this invention to provide an improved pneumatic yarn sensor for use with textile machinery.

It is another object of this invention to provide a pneumatic yarn sensing device which can be employed on a patroling tender in a spinning operation which will detect the absence of a yarn strand at a spinning station, stop the tender and initiate a rethreading operation.

It is still another object of this invention to provide a pneumatic yarn sensing system which can be employed on a patroling tender in a spinning operation and comprises a yarn feeler and registration vane, whereby the yarn feeler will detect the absence of a yarn strand but will only stop the tender and initiate a rethreading operation when the yarn strand is absent at a spinning position.

It is still another object of this invention to provide an improved pneumatic yarn sensing device for use with an automatic spinning device having a patrolling tender which can be coordinated with a full bobbin sensor.

These and other objects of the invention will be more readily apparent from the following detailed description with reference to the drawing.

The aforesaid objects of the present invention are realized by constructing a sensor comprising a yarn feeler, a vane in operable association with said feeler, and an air jet and air receiver in communication with a fluid pressure transducer. The sensor is constructed and arranged to have the air jet supply air through the air receiver to the transducer, provided a yarn strand is present. In the event the yarn strand is absent, the vane in association with the feeler will interrupt the air supply to the transducer causing the transducer to be exhausted and actuate an electrical signal, sounding an alarm, stopping the textile operation and/or initiating a rethreading of the machinery.

As a preferred embodiment, the improved sensing system is employed on a patrolling tender controlling an automatic spinning unit. In this embodiment, a registration vane in association with a second air jet and receiver is utilized. The registration vane is constructed to interrupt the second air supply at each spinning station. However, the transducer is not exhausted unless both air jets are interrupted. In the preferred embodiment, it is possible to coordinate the transducer of the yarn sensing system with a second operation such as a full bobbin sensing device. If this expediency is employed, a relatively high air pressure is maintained on a valve means. A full bobbin sensing finger is constructed and arranged on the patrolling tender to actuate the valve, passing air to the side of the transducer opposite from that in contact with the air receivers in communication with the yarn sensor, which immediately actuates the stop circuit.

Although reference is made herein to an automated spinning operation, no attempt is being made to describe machinery of the aforesaid type in detail. Reference is made, however, to the commonly assigned Bell and Niederer co-pending application Ser. No. 534,081, filed

Mar. 14, 1966, for such apparatus. Additionally, as will be apparent, the present yarn sensing device can be employed in automatic winding machinery of the type described in Goodhue et al., U.S. Patent No. 2,764,362 issued Sept. 25, 1956. The invention is confined to the yarn sensing mechanism and the method and techniques of adapting the present system to such machinery is within the ability of one skilled in the art and does not require detailed discussion in the present disclosure.

Having described the improved fluid pressure sensing system in general terms, reference will be made to the drawing to define the preferred embodiment and to give a more complete explanation of its operation.

The drawing

In the drawing FIGURE 1 is a schematic arrangement of the pneumatic sensing system; and

FIGURE 2 is an enlarged detailed view of the yarn feeler, vane and air jet and receiver of the unit of FIGURE 1.

More specifically, a feeler wire **1** is pivotally mounted on a suitable frame, as for example, on a patrolling tender **3** (see FIG. 2) for a spinning machine of the type described in the aforesaid Bell and Niederer application. A vane **4** is associated with the portion of the feeler wire **1** which extends beyond the pivot point **2**. An air jet **5** blows air into receiver **6** which is delivered through conduit **7** to a fluid pressure transducer **8**. The transducer **8** can be of conventional design and comprises a diaphragm means **8.1** in operable association with a stem **8.2** which holds contacts **8.3** of a sensor relay together when the transducer **8** is receiving a supply of air. A second air jet **5.1** and air receiver **6.1** is in communication with the transducer **8** through conduit means **7.1**. A vane **4.1** pivotally mounted upon the patrolling tender **3** at **2.1** is constructed and arranged to automatically interrupt the second air jet **5.1** at each position of the spinning device. Additionally a source of high pressure is in contact with the second surface of diaphragm **8.1** of the transducer **8** through a conduit means **7.2**. The three way valve **9** is actuated by a sensor **10** on the patrolling tender **3** which senses when bobbin B is full.

In operation of the fluid pressure sensing system according to the preferred embodiment, the feeler wire **1**, the associated vane **4**, air jets **5** and **5.1**, transducer **8** and full bobbin sensor **10** are mounted on the carriage of the patrolling tender **3**. At each spinning position the registration vane **4.1** drops down and cuts off the air supply from jets **5.1** to receiver **6.1** as shown in FIG. 1. However, the contacts **8.3** of the sensor relay are not opened unless the air jet **5** to receiver **6** is also interrupted. This air supply is not interrupted unless the yarn strand Y in the spinning position is broken. If the yarn strand Y is broken the feeler wire **1** will drop as shown by the broken lines in FIGURE 2 causing vane **4** to interrupt the air supply. Since no air is flowing to transducer **8**, the transducer will be exhausted, causing diaphragm **8.1** to relax, opening contacts **8.3**. The sensor relay will signal the tender to stop and initiate a rethreading operation. In the event the bobbin B at the spinning position is full and requires doffing, full bobbin sensor **10** will actuate the three way valve **9** permitting high pressure to flow to transducer **8**. Regardless of whether the air flow from air jets **5** and **5.1** to the transducer **8** is interrupted, the transducer contacts **8.3** will open, signaling the patrolling tender **3** to stop and initiate the servicing operation.

Inasmuch as the actual spinning machine and patrolling tender referred to hereinbefore form no part of the present invention, a detailed description of the apparatus has not been set forth herein. Furthermore, since the adaptation of the presently described device to the spinning unit of Bell and Niederer can be readily accomplished by one skilled in the art having the present specification as well as the Bell and Niederer application as a guide, a detailed description of the adaptation is not being set forth herein.

The feeler wire **1** as employed in the present invention can be any material which is relatively light and possesses the necessary strength permitting it to be pivotally mounted. The feeler wire **1** is approximately 3½ inches long and 2½ inches wide at the point at which it contacts the yarn strand Y. The air for the air jets **5** and **5.1** can be supplied from any conventional pump. Since the patrolling tender **3** is preferably operated by an air motor, it may already be equipped with a supply of air. The fluid pressure transducer **8** employed, as indicated hereinbefore, can be of conventional design. However, because of its exceptional sensitivity, a transducer of the type disclosed in commonly assigned Kent co-pending application Ser. No. 579,664 filed Sept. 15, 1966, is preferred. The remaining elements of the construction are again conventional.

It should be appreciated that the instant invention is not to be construed as being limited by the illustrative embodiments. It is possible to produce still other embodiments without departing from the inventive concept herein disclosed. Such embodiments are within the ability of one skilled in the art.

We claim:

1. A pressure sensing system for providing a signal in response to the presence of a full bobbin comprising a pressure responsive transducer, means for introducing a first pressure to said transducer to urge said transducer to an inactive position, sensing means operable to detect a full bobbin, a second pressure, and means operable in response to detection of said full bobbin by said sensing means for presenting said second pressure to said transducer to thereby urge said transducer to an active position to provide said signal.

2. The combination as set forth in claim **1** wherein said transducer includes a movable diaphragm, said first pressure is a fluid directed against one side of said diaphragm, and the second pressure is a fluid directed against the opposite side of said diaphragm.

3. The combination as set forth in claim **2** wherein said second fluid pressure is under a relatively higher pressure than said first fluid pressure.

4. The combination as set forth in claim **1** wherein said system is mounted on a patrolling tender movable relative to at least one yarn processing station on an associated textile machine, said sensing means being operable as said tender moves proximate to said bobbin to contact said bobbin when full and thereby present said second fluid source to said transducer.

5. The combination as set forth in claim **1** wherein said means for introducing a first pressure to said transducer includes a fluid jet, and a fluid receiver for receiving the fluid from said jet for conductance to said transducer; and interrupting means responsive to the absence of yarn advancing from a supply source to said bobbin for stopping said first pressure to said transducer, said transducer in the absence of said first pressure being movable to said active position to provide said signal.

6. The combination as set forth in claim **5** wherein said system is mounted on a patrolling tender movable relative to at least one yarn processing station on an associated textile machine, and including means for presenting a third pressure to said transducer to urge said transducer to said inactive position, said third pressure to said transducer being stopped as said tender moves into a servicing position at said processing station, said signal being operative to commence a servicing cycle.

7. The combination as set forth in claim **6** wherein said transducer includes a movable diaphragm, said first and third pressures are fluid directed against one side of said diaphragm, and said second pressure is a fluid directed against the opposite side of said diaphragm.

8. The combination as set forth in claim **7** wherein said second fluid pressure is under a relatively high pressure than either one of said first or third pressures.

9. The combination as set forth in claim 8 wherein said first, second and third pressures are compressed air.

10. The combination as set forth in claim 8 including a pair of electrical contacts, and means controlled by movement of said diaphragm for effecting opening and closing of said contacts; said contacts when in one of said open and closed positions providing a signal, and when in the other of said open and closed position being inactive.

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