Oct. 4, 1966 D. ALTHAUS ET AL 3,276,227

FLAW TESTER FOR TEXTILE MACHINES

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Fig. 1.

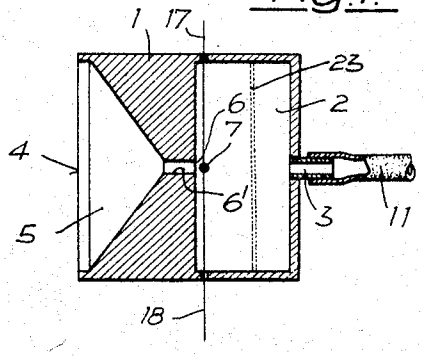


Fig. 2.

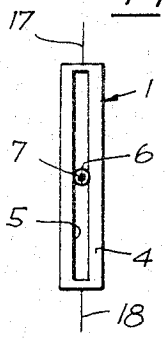


Fig. 3.

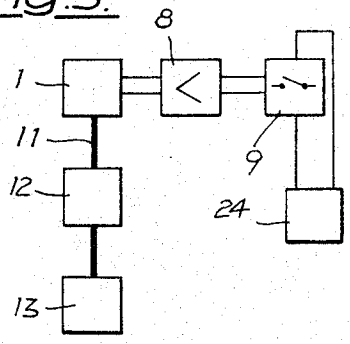


Fig. 4.

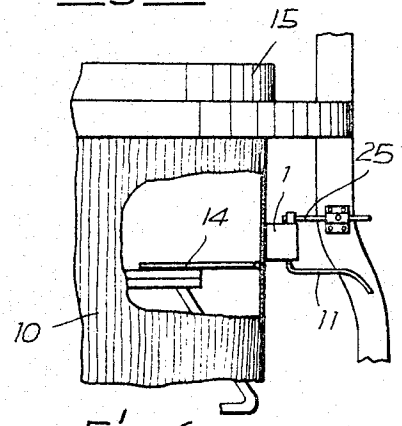


Fig. 5.

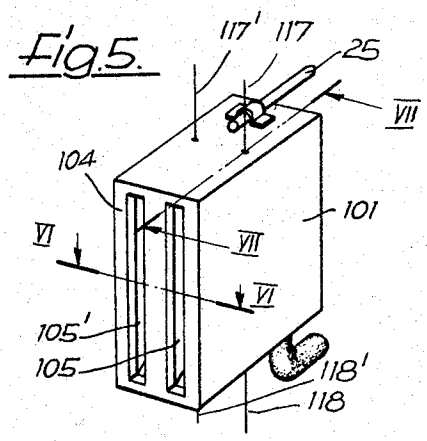
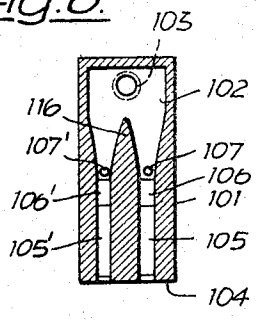


Fig. 6.



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Oct. 4, 1966 D. ALTHAUS ETAL 3,276,227

FLAW TESTER FOR TEXTILE MACHINES

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Fig. 7.

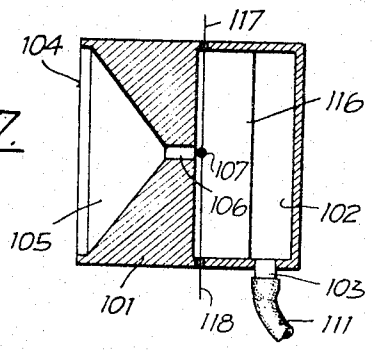


Fig. 10.

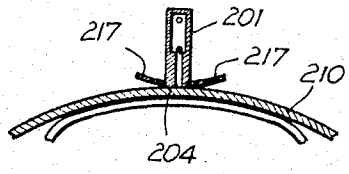


Fig. 11.

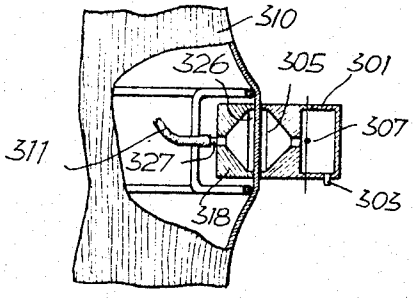


Fig. 12.

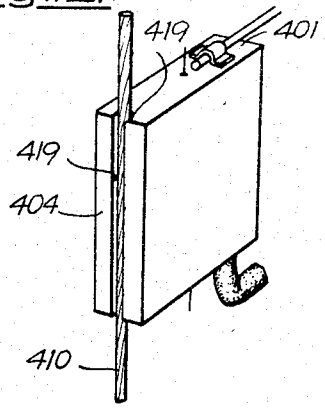
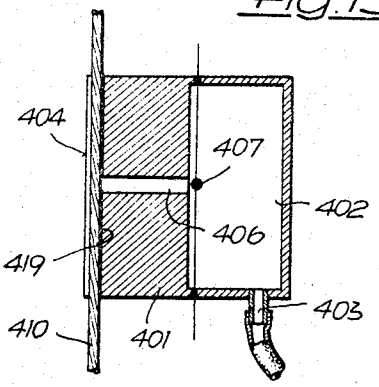


Fig. 13.



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Fig. 8.

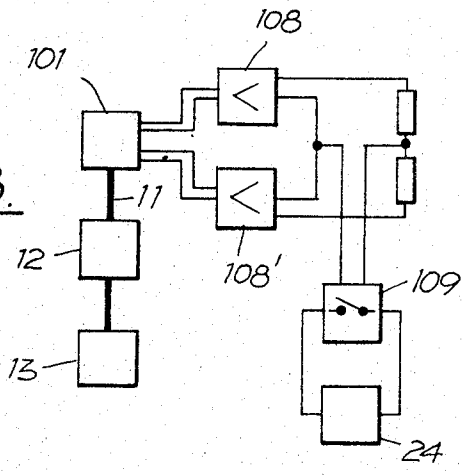
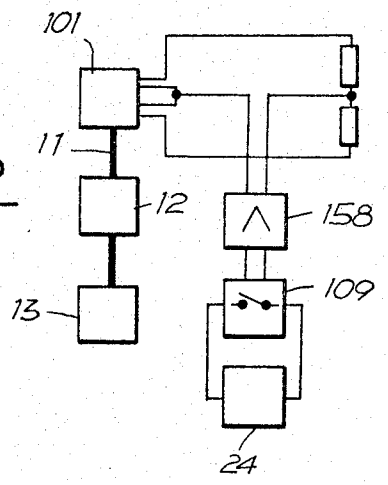


Fig. 9.



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FLAW TESTER FOR TEXTILE MACHINES

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Fig. 15.

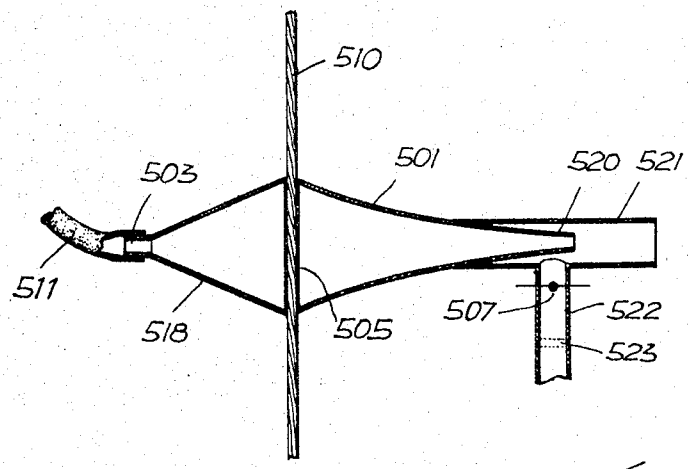
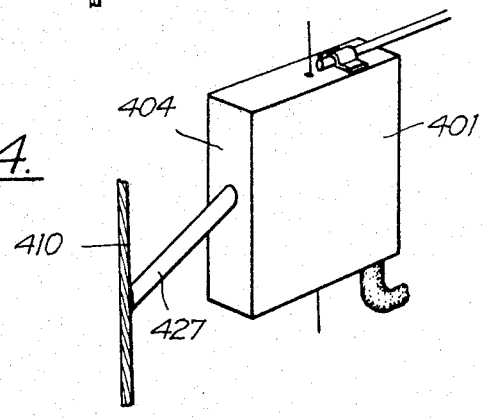


Fig. 14.



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Fig. 16.

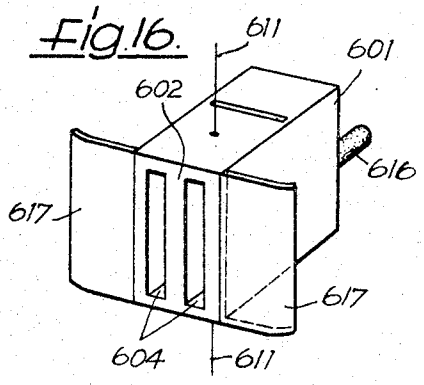


Fig. 17.

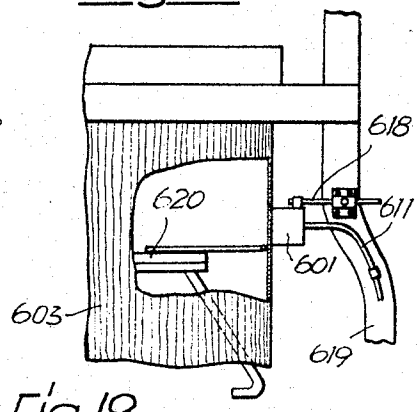


Fig. 18.

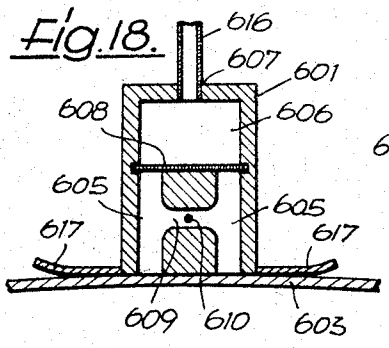


Fig. 19.

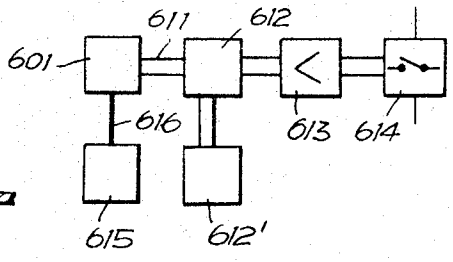


Fig. 20.

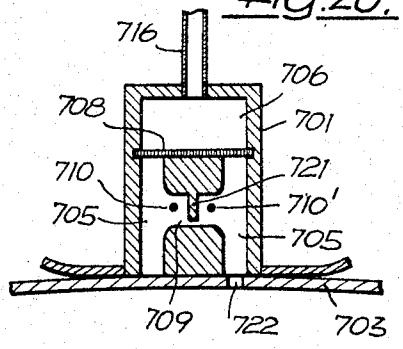
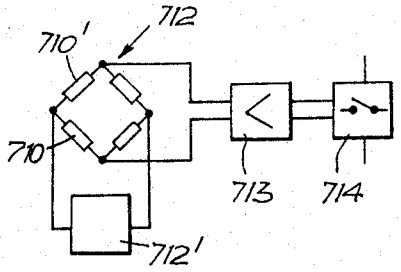


Fig. 21.



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FLAW TESTER FOR TEXTILE MACHINES

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Fig. 22.

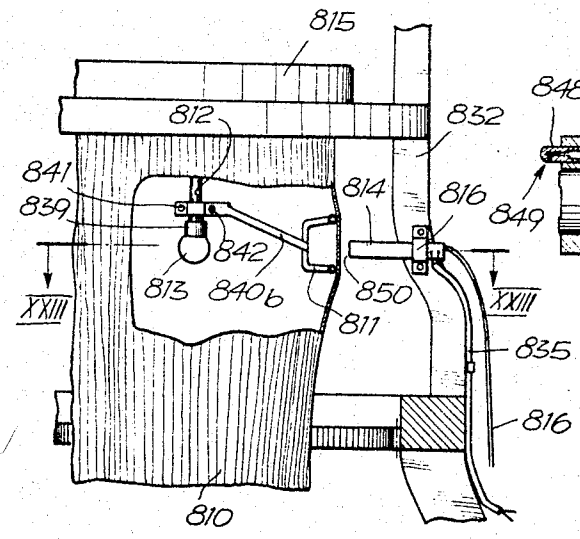


Fig. 24.

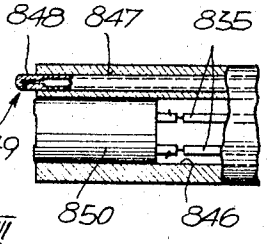


Fig. 25

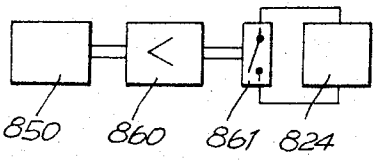
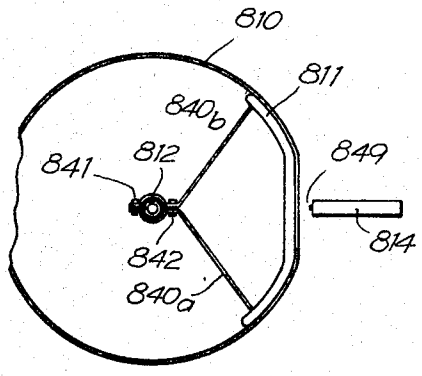


Fig. 23.



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United States Patent Office 3,276,227 Patented Oct. 4, 1966

3,276,227

FLAW TESTER FOR TEXTILE MACHINES

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Filed Aug. 24, 1964, Ser. No. 391,713
Claims priority, application Germany, Mar. 21, 1964, J 25,507; June 24, 1964, J 26,086
15 Claims. (Cl. 66—166)

The present invention relates to a flaw tester for textile machines, and more particularly for circular knitting machines, which is adapted to interrupt the operation of the machine when a flaw is detected in the fabric.

The flaw tests of the known types which test the fabric for flaws by mechanical means cannot be employed for testing at high speeds since the inertia of the testing arm is too great, nor can they be employed for machines which produce reversible fabrics since they only permit flaws to be ascertained in one face of such a fabric.

It is the principal object of the present invention to provide a flaw tester which operates very reliably even at very high testing speeds and regardless of the density of the fabric to be inspected and may also be employed for inspecting reversible fabrics, and which reliably detects any holes in a fabric even though they may have a size of only a few meshes.

Another object of the invention is to provide a flaw tester which detects all defective points of a fabric regardless of its design, color, or density and even at a high relative speed between the head of the flaw tester and the fabric.

A further object of the invention is to provide a flaw tester the flaw tracing means of which may either consist of an air or gas current or of a light beam, and which, although of a solid construction, is extremely sensitive in determining any flaws in a fabric and will not be damaged if for any reason the air or gas current is interrupted.

Another object of the invention is to design such a flaw tester in a manner so as to be capable of supervising the proper feeding of the thread or yarn toward the needles, especially in the vicinity of the latter.

These as well as numerous other objects, features, and advantages of the present invention will become more clearly apparent from the following detailed description thereof which is to be read with reference to the accompanying drawings, in which—

FIGURE 1 shows a longitudinal section of a scanning head according to a first embodiment of the invention;

FIGURE 2 shows a front view of the scanning head according to FIGURE 1;

FIGURE 3 shows a block diagram of the electric connections of the elements of a flaw tester with a scanning head according to FIGURES 1 and 2;

FIGURE 4 shows a partial view of a circular knitting machine which is equipped with a scanning head according to FIGURE 1;

FIGURE 5 shows a perspective view of a scanning head according to a modification of the invention;

FIGURE 6 shows a cross section which is taken along the line VI—VI of FIGURE 5;

FIGURE 7 shows a cross section which is taken along the line VII—VII of FIGURE 5;

FIGURE 8 shows a block diagram of the electric connections of the elements of a flaw tester with a scanning head according to FIGURE 5;

FIGURE 9 shows a block diagram of the electric connections of a modified circuit for a scanning head according to FIGURE 5;

FIGURE 10 shows a cross section of a scanning head for a circular knitting machine according to a further modification of the invention;

FIGURE 11 shows a cross section which is taken in a vertical direction through another modification of the scanning head according to the invention;

FIGURE 12 shows a perspective view of another modification of a scanning head according to the invention;

FIGURE 13 shows a longitudinal section of the scanning head according to FIGURE 12;

FIGURE 14 shows a perspective view of a modification of the scanning head according to FIGURES 10 and 11;

FIGURE 15 shows a cross section of a further modification of a scanning head according to the invention;

FIGURE 16 shows a perspective view of a further modification of a scanning head;

FIGURE 17 shows a partial view of a circular knitting machine with a scanning head according to FIGURE 16;

FIGURE 18 shows a cross section of a scanning head according to FIGURES 16 and 17 which is applied upon a fabric to be inspected;

FIGURE 19 shows a block diagram of the electric connections of the elements of a flaw tester according to a further modification of the invention;

FIGURE 20 shows a cross section of a scanning head according to still another modification of the invention in the position on a fabric to be inspected;

FIGURE 21 shows a block diagram of the electric connections of the elements of the flaw tester according to FIGURE 20;

FIGURE 22 shows a partial view of a circular knitting machine with a photoelectric flaw tester according to a further modification of the invention;

FIGURE 23 shows a cross section which is taken along the line XXIII—XXIII of FIGURE 22;

FIGURE 24 shows a cross section of the photoelectric scanning head according to FIGURE 22; while

FIGURE 25 shows a block diagram of the electric connections of the elements of the flaw tester according to FIGURE 22.

Referring to the drawings, and first particularly to FIGURES 1 to 4, the flaw tester according to the invention for detecting flaws in a piece of fabric which has been produced by a textile machine, such as a circular knitting machine **15**, comprises a scanning head **1**, as shown in FIGURE 1, which is provided with a pressure-equalizing chamber **2** which has a connection piece **3** at one side and a port **6** at the other side which leads to a slot-shaped nozzle **5** which increases in width like a funnel from the port **6** toward the outlet end, the front surface **4** of which is to be applied upon a piece of fabric **10** which is to be tested. Chamber **2** contains a screen **23** for the purpose of attaining a more uniform laminar flow of compressed air. Directly in front of the port **6** a heated wire **7** is mounted which is connected by conductors **17** and **18** to an adjustable amplifier **8**. The heated wire **7** may, however, also be mounted in the narrow part **6'** of the flow channel adjacent to the port **6**. A relay **9** which is connected to the output side of the amplifier **8** lies within the circuit of the drive mechanism **24** of the machine **15** which produces the piece of fabric **10**. The first pressure-equalizing chamber **2** is connected by a pressure line **11** on the connection piece **3** via an air-pressure tank **12** which serves as a second pressure-equalizing chamber to a pump **13** which pumps air under pressure into the flow channel of the scanning head. The pump could, however, also be provided in the form of a suction pump which draws the air from the outside through the flow channel of the scanning head.

As illustrated in FIGURE 4, the scanning head **1** is secured by an adjustable bracket **25** to a circular knitting machine **15** at the level of a spreader **14** which is mounted in a fixed position in the tubular piece of fabric **10** and spreads the latter within the area adjacent to the scanning head **1** to the form of a cylinder the outer surface of

which engages upon the scanning head. Slot 5 of the scanning head 1 should have a length at least equal to the increase in length of the tubular fabric 10 which is produced during one complete revolution thereof.

Before the operation of the knitting machine 15 is started, the pressure of the adjustable pump 13 and the degree of amplification of the adjustable amplifier 8 which also supplies the required voltage for heating the wire 7 are adjusted so that, if the tubular fabric is flawless, the energizing current for the relay 9 has a value slightly below that which is required for actuating the relay. In this condition, the air current flowing past the heated wire 7 and through the slot 5 and within the extent of the latter through the fabric 10 has such a high velocity that the temperature of the heated wire 7 is still higher than that which is required for actuating relay 9.

When the operation of the knitting machine is then started and a defect, for example, a dropped stitch or a ladder occurs in the fabric and passes within the area of the slot 5, the resistance caused by the fabric 10 to the flow of the air current decreases. As long as the ladder is located in front of the slot 5, the rate of flow of the air current flowing past the heated wire 7 is therefore increased and the wire is more strongly cooled. This temporary cooling of the wire 7 causes a momentary increase of the energizing current of the relay 9 so that the latter is actuated and the machine is stopped by its switch mechanisms.

Since during its production the tubular fabric 10 constantly turns and since the slot 5 has a length at least equal to the increase in length of the fabric during the one complete revolution thereof, the scanning head 1 traces along the entire piece of fabric, and covers all parts thereof. The sensitivity of the flaw tester is so high that even though a flaw occurs in only one face of a double-faced fabric, the rate of flow of the air current increases so strongly that the relay 9 will be actuated. Of course, since merely the uniform permeability of the fabric is thus tested, a colored design thereof will not affect the operation of the flaw tester.

The modification of the invention as illustrated in FIGURES 5 to 7 comprises a scanning head 101 which in principle forms a combination of two scanning heads 1 according to FIGURES 1 and 2 side-by-side of each other and contains two flow channels parallel to each other. This scanning head 101 the front surface 104 of which is to be applied upon the piece of fabric to be tested contains a pressure-equalizing chamber 102 which is provided with an inlet connection piece 103 and is connected by two ports 106 and 106' to two tapered outlet slots 105 and 105' which together with the ports 106 and 106' are separated by a partition 116 the rear end of which projects into the common pressure-equalizing chamber 102. Directly in front of the ports 106 and 106' and also separated by the partition 116 a pair of heated wires 107 and 107' are mounted which are connected by conductors 117, 118 and 117', 118' to two separate amplifiers 108 and 108', as shown in FIGURE 8, which lie in a bridge circuit the output side of which is connected to a relay 109. The heated wires 107 and 107' may however, also lie directly in a bridge circuit, the output side of which is connected to an adjustable amplifier 158, as shown in FIGURE 9, which controls the relay 109. This last-mentioned embodiment of the invention is otherwise of the same general construction as the embodiment according to FIGURES 1 to 4.

The scanning head 101 has the advantage over the scanning head 1 according to FIGURES 1 to 4 which has only a single flow channel that any undesired pressure fluctuations which are caused by the pump will not result in false indications of flaws in the fabric when actually none are present. Although such pressure fluctuations will lead to changes in the temperatures of the heated wires 107 and 107', these changes are equal in both wires so that the bridge will not thereby be unbalanced. The energizing current of relay 109 is therefore not changed when such pressure fluctuations occur.

If, however, a flaw in the fabric travels past the scanning head 101, it passes at first, for example, in front of the slot 105'. Since the flow resistance of this flow channel then decreases, the rate of flow of the air which flows past the heated wire 107' increases and the bridge is thereby unbalanced. The occurrence of a higher rate of flow of the air flowing past the heated wire 107 is prevented by the partition 116 until the flaw in the fabric has traveled from slot 105' to the slot 105. The heated wire 107 is then cooled more strongly than normally, while the wire 107' returns to its normal temperature. The bridge therefore does not regain its balanced condition unless and until the part of the fabric in front of both slots 105 and 105' is without flaw.

The movement of a flaw in the fabric past the scanning head 101 therefore results at the output side of the bridge into two signals which are employed for actuating the relay 109 and for thereby stopping the driving means 24 of the knitting machine 15.

The scanning head 105 may be connected in the same manner as the scanning head 1 according to FIGURES 1 to 4 either to a pressure pump or to a suction pump and it may also be secured to the machine in the same manner as shown in FIGURE 4.

In order to insure that the scanning head properly engages with and slides along the fabric to be tested, a further modification of the invention as illustrated in FIGURE 10 consists in providing the scanning head 201 with sliding skids 217 which are mounted on the opposite sides of the scanning head and form extensions of the end surface 204 thereof which engages with the material 210 to be tested. In every other respect this embodiment of the invention is designed in the same manner as the first embodiment according to FIGURES 1 to 4.

FIGURE 11 illustrates a scanning head 301 which is of the identical construction as the scanning head 1 according to FIGURE 1. However, the flow of air in the flow channel of this scanning head 301 is produced in a different manner. Directly opposite to the scanning head 301 which is applied upon the outer side of a tubular fabric 310 the corresponding mouth 326 of a nozzle 318 is applied upon the inner side of the fabric. This nozzle 318 is connected through a connection piece 327 and a pressure line 311 to a pump, not shown, so that the air current passes from the mouth 326 of nozzle 318 through the fabric 310 and then through the mouth 305 of the scanning head 301 in which it flows past and thereby cools the heated wire 307 and finally emerges through the connecting piece 303. All other parts and the mode of operation of this device are the same as those described with reference to FIGURES 1 to 4.

A further modification of the invention as illustrated in FIGURES 12 and 13 is designed especially for determining thread breakages. A scanning head 401 contains a pressure-equalizing chamber 402 which has a connection piece 403 and a port 406 with a heated wire 407 in chamber 402 directly in front of the port 406. This port forms the inner end of a flow channel which extends up to an end wall 404 in which a groove 419 is provided in which a thread 410 is guided is to be checked.

The other parts and the electric connections of the device according to FIGURES 12 and 13 are designed and arranged in the same manner as those of the device according to FIGURES 1 to 3 and its mode of operation is also the same. The pressure in the equalizing chamber 402 and the adjustable amplifier 8 which is connected in series with the heated wire 407 are adjusted so that the relay 9 which is connected in series to the amplifier 8 will not be actuated and the driving means 24 of the machine 15 will therefore also not be stopped unless the thread 410 is broken and has freed the mouth of the flow channel.

As illustrated in FIGURE 14, the flow channel may, however ,also be extended beyond the end wall **404** of the scanning head **401** by means of a tube **427** which has an open end in front of which the thread **410** may be passed. By such means it is possible to watch the thread in the immediate vicinity of the needles.

A further modification of the invention is illustrated in FIGURE 15 in which a scanning head **501** which may be applied upon one side of a piece of fabric **510** has a flow channel which gradually increases in width from a nozzle **520** toward an end opening **505**. Nozzle **520** extends into a tube **521** and forms an injector which has a suction duct **522** which is connected to the tube **521** adjacent to the nozzle **520** and contains a heated wire **507**. A screen **523** or the like which is provided in the suction duct **522** serves for steadying the air current which is produced by the injector in the suction duct.

The scanning head **601** according to a further modification of the invention as illustrated in FIGURES 16 to 19 has an end surface **602** which is to be applied upon a piece of fabric **603** to be tested and which is provided with two parallel slots **604** which form the end openings of two parallel flow channels **605** in the scanning head **601**. These channels **605** are connected to a chamber **606** which is provided in the scanning head **601** and has an inlet opening **607**. The open ends of channels **605** extending toward the chamber **606** are covered by a resistance element **608** consisting, for example, of a layer of dense felt which has a higher flow-resistance value than the fabric **603** to be tested.

The two channels **605** communicate with each other between the resistance element **608** and the slots **604** through a connecting channel **609** in which a conductor **610** is mounted which is heated by the flow of an electric current therethrough and the resistance of which varies with its change in temperature. This conductor **610** is connected by the lines **611** to one branch of a bridge circuit **612** the output side of which is connected to an adjustable amplifier **613** which, in turn, is connected at its output side to a relay **614** which is connected into the control circuit of the machine which produces the fabric **603**. The voltage for operating the bridge circuit **612** is supplied by an adjustable voltage source **612'**.

Chamber **606** is supplied with a current of compressed air by an adjustable blower **615** through a pressure line **616**. The air pressure in chamber **606** is adjusted so as to be slightly higher than atmospheric so as to insure that the air emerging from the slots **604** will pass at a low rate of flow through the fabric **603**. In order to improve the contact of the end surface **602** of the scanning head **601** with the fabric **603**, sliding skids **617** are provided on the opposite sides of the scanning head **601**.

A preferred arrangement and manner of securing the scanning head **601** when employed on a circular knitting machine is illustrated in FIGURE 17. The scanning head **601** is in this case secured to a frame member **619** of the knitting machine by means of an adjustable bracket **618** so that its end surface **602** rests flatly on the outer side of the piece of tubular fabric **603** which is spread by a spreader **620**. The scanning head **601** may, however, also be applied upon the inner side of the tubular fabric, if this should be more desirable in a particular case. The bracket **618** should then be secured to a support, not shown, which is provided at the inside of the tubular fabric.

The slots **604** should have a length at least equal to the increase in length of the tubular fabric **603** during one complete revolution of said fabric. If strips of material are to be tested, in which case the scanning head **601** is moved back and forth across the entire width of the strip, while the slots **604** extend in the longitudinal direction of the strip, these slots should have a length at least equal to the increase in length of the strip during each movement of the scanning head across the width of the strip.

The mode of operation of the device according to FIGURES 16 to 19 is as follows:

After the scanning head **601** has been applied upon the fabric to be tested, the bridge supply voltage is adjusted to the value which corresponds to the desired temperature of the conductor **610** and the desired velocity of flow in the channels **605** is produced by adjusting the overpressure in chamber **606** accordingly. The degree of amplification of the amplifier **613** is adjusted to such a value that the signal which is produced by a flaw in the fabric will just be strong enough to effect an actuation of the relay **614** reliably. In the event that immediately prior to the testing of one particular fabric another fabric of the same consistency has been tested, no new adjustment has to be made but the flaw tester only needs to be switched on.

If the piece of fabric **603** which is moving past the slots **604** is flawless the rate of flow in both channels **605** will be equal. Thus, there is no difference in pressure between the two end openings of the connecting channel **609** and the rate of flow in this channel is zero. If, however, a flaw in the fabric passes in front of one of the two slots **604**, the flow resistance in front of this slot decreases, whereas in front of the other slot no change occurs in the flow resistance of the fabric. Since the flow resistance of the resistance element **608** is relatively high as compared with the flow resistance of the fabric **603**, the amount of air flowing from the chamber **606** into the channels **605** remains the same practically at all times. This has the result that air flows from the channel **605** which is not located in front of a flaw through the connecting channel **609** into the other channel **605**. The heated conductor **610** is thereby cooled which causes a signal.

During the time when the flaw is located between the two slots **604**, the rate of flow in the connecting channel **609** is zero. If, however, the flaw then passes in front of the other slot **604**, the conditions are reversed and there will again be a flow in the channel **609**. The conductor **610** will thereby again be cooled which results in a second signal. The two signals are amplified in the amplifier **613** and one of said signals actuates the relay **614** which thereby stops the driving means of the machine which produces the fabric **603**.

FIGURES 20 and 21 illustrate a modification of the flaw tester as shown in FIGURES 16 to 19 which differs therefrom merely by the connecting channel being made of another shape and by the employment of two heated conductors. All those parts in FIGURES 20 and 21 which are similar to corresponding parts in FIGURES 16 to 19 are therefore indicated by reference numerals which are higher by **100** than those in FIGURES 16 to 19 and a detail description of these corresponding parts is omitted as being superfluous.

As shown in FIGURE 20, a partition **721** projects from one side in the connecting channel **709** so as to form a dead-fluid area in each of both directions. Each of these dead-fluid areas contains a heated electric conductor **710** and **710'** which from two branches of a bridge circuit.

Similarly as in the embodiment of the invention according to FIGURES 16 to 19, there can be a flow of air in the connecting channel **709** only if a flaw **722** in the material **703** is located in front of the end opening of one of the two flow channels **705**. As long as there is no flaw, the rate of flow of air in the connecting channel **709** is zero and the two conductors **710** and **710'** are not touched and cooled by the air. If, however, a flow **722** is located in front of the end opening of the channel **705** at the right side of FIGURE 20, a flow of air passes from the left channel **705** through the connecting channel **709** into the right channel **705**. A dead-fluid area then forms at the side of the partition **721** facing the right flow channel **705** with the result that only the

conductor 710 will be effectively cooled by the air flowing through the connecting channel 709. If the flaw 722 thereafter passes in front of the end opening of the left flow channel 705, the conditions are reversed and only the conductor 710' will be cooled. When the scanning head 701 slides over a flaw, the bridge circuit 712 will therefore be thrown out of tune twice for a short time and on its output side a positive and a negative signal will be produced. One of said signals, amplified by the amplifier 713, actuates the relay 714 which causes the driving means of the machine to be stopped.

If necessary it is also possible to apply two scanning heads upon the piece of fabric to be tested, for example, in the event that the increase in length of the tubular fabric during one complete revolution thereof, or the extent of a sliding movement of the scanning head relative to the fabric is greater than the maximum length of the slots 604 or 704 in a single scanning head of a size which may still operate economically. For some types of materials to be tested it may also be advisable to applying one scanning head upon the outer side and another scanning head upon the inner side of the material.

Another modification of the invention in which for carrying out the flaw inspection of a fabric a beam of light is employed instead of an air current as in the previous flaw testers is illustrated in FIGURES 22 to 25. As shown particularly in FIGURE 22, an electric lamp 813 which is screwed into a socket 839 is mounted at the inside of a tubular fabric 810 which is produced by a circular knitting machine 815. This socket 839 is secured to the free end of a pipe 812 the axis of which coincides with the central axis of the machine 815. The other end of pipe 812 is secured to the machine 815 in any suitable manner not shown in the drawing. Aside from supporting the lamp 813, pipe 812 also contains the necessary electric connecting lines for this lamp. Above the socket 839 a pair of skid holders 840*a* and 840*b* are clamped at one end upon the pipe 812 by means of screws 841 and 842, while the other end of each of these holders is secured to a sliding skid 811 which spreads the tubular fabric 810 at the level of the electric lamp 813 radially in the outward direction.

Approximately at the same level as the lamp 813, a tubular supporting member 814 is secured by a clamping strip 816 to a frame member 832 of the machine 815 in a manner so that its axis extends in the direction toward the center of the lamp 813. As may be seen in FIGURES 22 and 23, the skid holders 840*a* and 840*b* and the sliding skid 811 are shaped so as not to extend into the area of the fabric 810 adjacent to the connecting line between the lamp 813 and the tubular supporting member 814. This supporting member 814 has a cylindrical bore 846 in the open end of which a photoelectric element, for example, a photocell 850, is mounted which faces toward and cooperates with the lamp 813. This photocell is connected by an insulated cable 835 to the input side of a multistage amplifier 860. The anode circuit of the output stage of this amplifier is connected to a relay 861 the contacts of which, as indicated diagrammatically in FIGURE 25, switch off the electric driving means 824 of the machine 815 when the relay is actuated.

The wall of the tubular support 814 is provided with a thinner bore 847 which extends parallel to the main bore 846 and terminates into a nozzle 848 of a fluff blower 849 which is inserted into the end of the bore 847 facing the tubular fabric 810. The order end of bore 847 is connected to a hose 816 which leads to a supply of compressed air, not shown. The outlet opening of nozzle 848 is directed so that the jet of compressed air which is blown out of the nozzle will prevent any fluff or the like from settling on the light-sensitive end surface of the photocell 850.

The mode of operation of the photoelectric flaw tester according to FIGURES 22 to 25 is as follows:

When the knitting machine 815 is started or prior to this time, the lamp 813, the amplifier 860, and the fluff blower 849 are switched on. The sensitivity of the amplifier 860 is adjusted with regard to a flawless piece of fabric 810 so that the intensity of the light which is radiated from the lamp 813 and after penetrating through the fabric impinges upon the photocell 850 will be only slightly smaller than the intensity which would be required for the flow of a current of such a strength in the anode circuit of the output stage of the amplifier that the relay 861 which is connected into this circuit will be actuated. If a flaw, for example, a thread breakage, then occurs in the part of the fabric 810 which is being inspected, a greater amount of light will penetrate at this point through the fabric and the intensity of the light impinging upon the photocell 850 will be increased accordingly. The stronger illumination of the photocell 850 has the result that the current in the anode circuit of the output stage of the amplifier 860 will increase to the necessary strength to actuate the relay 861 which will then switch off the electric driving means 824 of the machine 815.

Since the tubular fabric 810 while being produced revolves continuously, every point of it will be inspected by the photoelectric scanning head and checked for possible flaws. The jet of compressed air which is blown out of the nozzle 848 then prevents any fluff or the like from settling on the surface of the photocell 850 facing the lamp 813.

The photoelectric flaw tester according to the invention may also be reversed in direction so that the photocell is mounted at the inside of the tubular fabric and the light source at the outside thereof. This permits the flaw tester to be moved still further toward the needles so that any flaws occurring during the knitting operation can be traced very soon after they have been made.

Although our invention has been illustrated and described with reference to the preferred embodiments thereof, we wish to have it understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

We claim:

1. A flaw tester for a textile machine for automatically stopping said machine as soon as a flaw has been detected in the material to be tested in said machine, comprising a scanning head adapted to be applied upon said material to be tested and movable relative thereto, said scanning head having at least one flow channel therein with an end opening at the side of said scanning head facing said material to be tested, means connected to said channel for producing a stream of gaseous medium adapted to flow through said channel and also through said material to be tested at least when a flaw in said material to be tested being located in front of said scanning head, at least one temperature-responsive element having a temperature differing from the temperature of said gaseous medium and being responsive to a change in the rate of flow of said medium in said flow channel, said element being disposed within said scanning head and adapted to produce signals in accordance with said change in the rate of flow of said medium in said flow channel, an amplifier having an input side connected to said element and adapted to amplify said signals, and switch means responsive to the output signals of said amplifier for switching off the driving means of said machine when a flaw has been detected in said material to be tested.

2. A flaw tester as defined in claim 1, wherein said flow-responsive element is disposed within the flow channel of said scanning head.

3. A flaw tester as defined in claim 1, wherein said temperature-responsive element is an electric conductor

having a resistance varying with its change in temperature.

4. A flaw tester as defined in claim 1, wherein said flow channel increases in width in the direction toward said end opening thereof.

5. A flaw tester as defined in claim 1, wherein said end opening of said flow channel is slot-shaped.

6. A flaw tester as defined in claim 1, wherein said end opening of said flow channel is disposed within a groove in said scannning head having its open side facing toward the outside and adapted to guide a thread to be tested.

7. A flaw tester as defined in claim 1, further comprising a pressure-equalizing chamber connected to said flow channel.

8. A flaw tester as defined in claim 1, wherein said pressure-equalizing chamber is contained within said scanning head.

9. A flaw tester as defined in claim 1, further comprising a flow-stabilizing element disposed within the stream of said medium through said scanning head.

10. A flaw tester as defined in claim 1, wherein said end opening at the side of said scanning head facing said material is slot-shaped and extends in the direction of the longitudinal axis of said material, said flow channel increases in width in the direction toward said end opening, means for securing said scanning head to said machine, said gaseous medium is air, said scanning head defines a pressure-equalizing chamber between said stream producing means and said flow channel, said temperature responsive element comprises a wire disposed within said flow channel, said amplifier is adjustable, said switch means includes a relay having a winding connected to said amplifier and having contacts for stopping the driving means of said machine when a flaw in said material has been detected, and stationary spreading means mounted within said material for spreading radially toward the outside of at least the area of said material penetrated by said air stream.

11. A flaw tester for a textile machine for automatically stopping the machine as soon as a flaw has been detected in a fabric in said machine, comprising a scanning head adapted to be applied upon said fabric and movable relative thereto, said scanning head having at least two parallel flow channels therein each having an end opening at the side of said scanning head facing said fabric, a connecting channel connecting said flow channels with each other, and a chamber connected to said flow channels, means connected to said chamber for producing streams of a gaseous medium adapted to flow through said flow channels and also through said connecting channel from one flow channel to the other if a flaw in said fabric is located in front of said end opening of one of said flow channels, an element responsive to the rate of flow of said medium disposed within said connecting channel and adapted to produce signals in accordance with the rate of flow of said medium through said connecting channel, an amplifier having an input side connected to said flow-responsive element, and switch means connected to the output side of said amplifier and responsive to the signals occurring at said output side of said amplifier for switching off the driving means of said machine when a flaw has been detected in said fabric.

12. A flaw tester as defined in claim 11, wherein said stream-producing means and said amplifier are adjustable for varying the rate of flow of said streams and the degree of amplification of said signals.

13. A flaw tester as defined in claim 11, further comprising a screenlike flow-resistance element within each flow channel for affecting the flow of said streams before reaching said connecting channel.

14. A flaw tester as defined in claim 13, wherein said flow-resistance element has a high resistance value in comparison to the flow-resistance of said fabric.

15. A flaw tester as defined in claim 11, further comprising sliding skids secured to said scanning head and projecting at opposite sides therefrom and extending the area of said scanning head adapted to be applied upon said fabric.

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