

June 25, 1963

E. VOSSEN

3,094,855

YARN FEEDING AND DEFECT DETECTING DEVICE

Filed Dec. 30, 1960

FIG. 1.

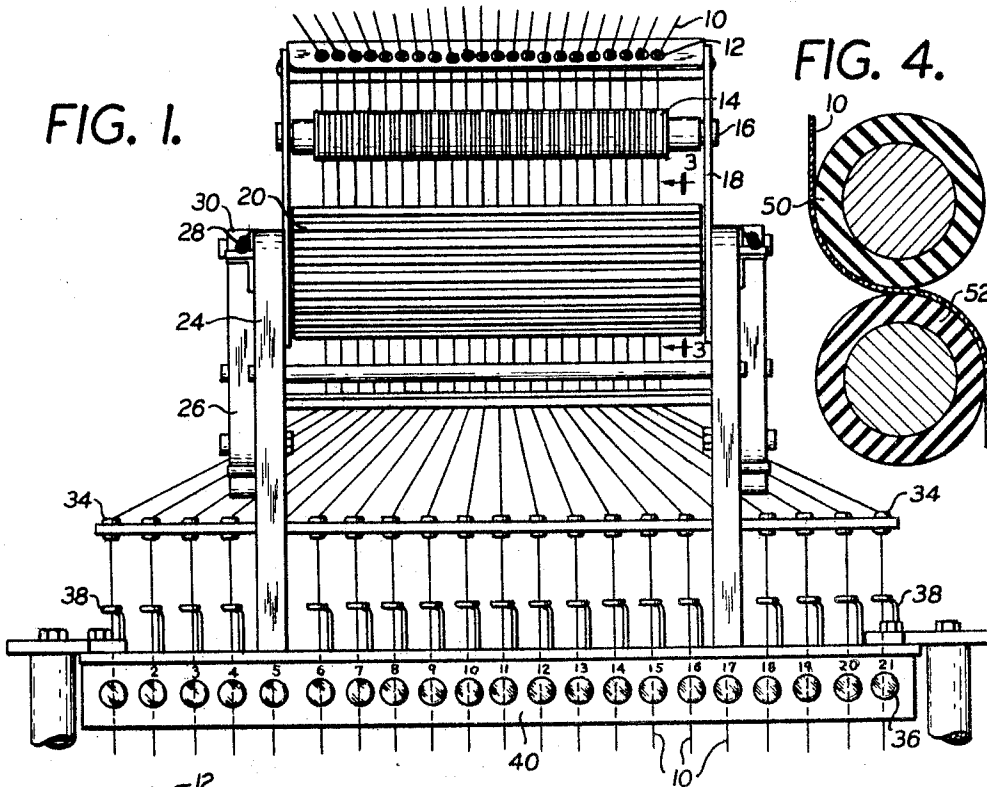


FIG. 4.

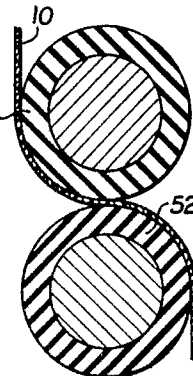


FIG. 2.

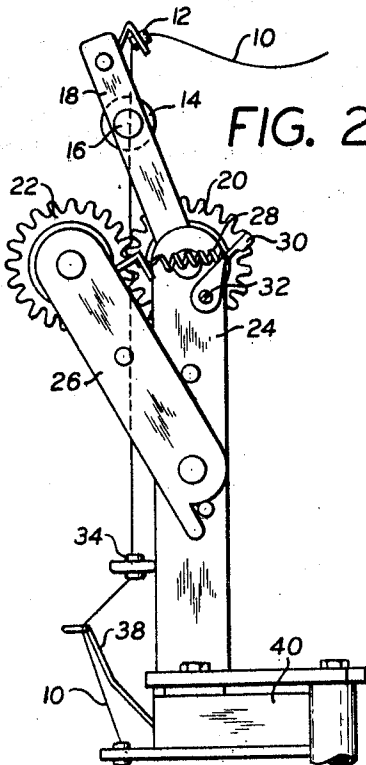
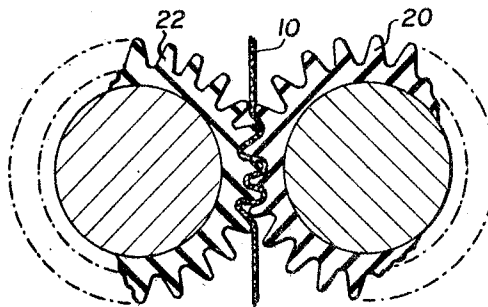


FIG. 3.



INVENTOR
EDWARD VOSSEN

BY *Samuel H. H. H.*

ATTORNEY.

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YARN FEEDING AND DEFECT DETECTING DEVICE

Edward Vossen, Malverne, N.Y., assignor to Stop-Motion
Devices Corp., Brooklyn, N.Y., a corporation of New
York

Filed Dec. 30, 1960, Ser. No. 79,708
3 Claims. (Cl. 66—163)

This invention relates to a device for facilitating the detection of defects in machines which utilize a plurality of threads or yarns, such as knitting, quilting and sewing machines, and for automatically stopping the machine.

It is of great importance in the manufacture of fabrics employing yarn or thread to detect conditions such as breaks and to maintain a smooth, uniform weave or stitching. The defects should be detected rapidly so that the machinery may be stopped and the condition rectified without excessive waste of material. Where a plurality of threads are utilized it is more difficult to detect a defect in a particular strand. It is desirable that the break or other defect be indicated by a predetermined slack in the line which permits a detector, such as a looped wire resting on the yarn, to fall and activate a switch, thereby turning off the feeding mechanism. Spring-loaded tensioning devices, however, which apply a desired tension to the yarn to promote uniform weaving or stitching, tend to counteract the effects of normal variations in slack and thus also mask the defect and prevent its detection.

In many machines of the character described, for example, quilting machines and sewing machines in general, there are bobbin threads which are normally concealed from view during operation of the machine and also spool threads which are normally visible during such operation. The two threads are brought together by means of the needle and they are interlooped or interlocked in order to form a stitch. It is difficult to detect a break in the concealed bobbin thread. This is especially true when a large number of such bobbin threads are used in a single machine. By the same token it is also difficult to detect a break in the spool thread when a large number of spools are utilized in a single machine.

It is the principal object of this invention to provide means for detecting a defect either in the bobbin thread or in the spool thread irrespective of where the defect occurs. The invention is predicated upon the principle that a defect in the bobbin thread will manifest itself in a diminution or cessation of feeding of the corresponding spool thread. Stated differently, when both threads are intact they will be interlooped or interlocked by the needle and as they are consumed in the stitching operation they are drawn from their respective sources. When a break occurs in the bobbin thread however, the spool thread is no longer engaged by said bobbin thread and it is no longer consumed in the stitching operation and is therefore no longer drawn from the spool. Conceivably, however, it may be carried along by the fabric but at a much slower rate than when it is normally engaged by the bobbin thread.

This condition in the spool thread when the bobbin thread is broken is not readily noticeable nor would it readily be detected by a defect detector. The invention is predicated upon the proposition that a broken bobbin thread could be detected if the corresponding spool thread developed an unusual slack condition. The invention pro-

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vides a pair of rollers which are tensionally held against each other. In the preferred form of this invention the two rollers are disposed in a substantially common horizontal plane and spring means is provided to urge them against each other. It is also equally feasible to dispose the two rollers in a common vertical plane, the upper roller resting by its weight against the lower roller and, if desired, additional weights may be provided in conventional manner to increase the pressure of the upper roller against the lower roller. These two rollers however held together are disposed across the feed paths of a plurality of spool threads at a convenient station between the spools and the needles. Yarn-tension devices are preferably placed between the spools and said rollers and additional yarn-tension devices are placed between the rollers and the needles. Yarn-defect detectors are placed between said last-mentioned yarn-tension devices and the rollers. In the use of this device the yarn is fed from the spools through the first-mentioned tension devices, then between the rollers, then in contact with the yarn defect-detectors, then through the second-mentioned yarn-tension devices, and finally to the needles. Normal feeding of the yarn will cause the rollers to rotate. Should any particular bobbin thread break, the corresponding spool thread or yarn will no longer be drawn under normal tension and at a normal rate. The remaining spool threads will however continue to feed normally and they will cause the rollers to rotate at their normal angular speed. This will result in feeding the thread which is no longer drawn under normal tension and a slack condition will accordingly develop in said thread. More precisely, since this particular thread continues to be fed although it is no longer being consumed at a normal rate, an abnormal slack condition will develop in it which the appropriate yarn-defect detector will be enabled to detect. Hence the present device achieves indirectly what it is unable to achieve directly, namely, to detect a broken bobbin thread. This it does by detecting an abnormal condition in the spool thread which relates to the broken bobbin thread.

As has above been stated, the present device is not limited to locating defects in the bobbin thread. Its yarn-defect detectors are equally adapted to detect defects in the spool thread.

It is therefore the principle of this invention to detect a defect which would normally not activate a stop-motion device. It then exaggerates said defect to the point of exciting and actuating the stop-motion means.

The detailed description and accompanying drawings which follow consider the device in one particular configuration. It is to be understood that this represents but one embodiment chosen for the purposes of explanation and illustration and is not to be construed as defining the limits of the invention.

FIGURE 1 is a front view of the instant device as mounted on a machine which utilizes a plurality of strands.

FIGURE 2 is a side view thereof.

FIGURE 3 is an enlarged, vertical section on the line 3—3 of FIGURE 1 showing the action of the rollers on the yarn.

FIGURE 4 is an enlarged vertical section similar to that of FIGURE 3 but showing a modified roller construction.

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As shown in FIGURE 1, a plurality of threads 10 are fed from separate spools (not shown) through eyelets 12 into individual sets of spring-loaded rotatable tensioning discs 14 arranged on a common axis 16. Each set includes a pair of discs with one disc being located on each side of a thread to apply friction and resulting tension to each strand. The eyelets and discs are mounted on a supporting bracket 18. The threads are then drawn through a pair of rollers 20 and 22, as shown in FIGURES 2 and 3. Each roller respectively is rotatably mounted on separate brackets 24 and 26 with bracket 26 being pivotally secured to stationary supporting bracket 24 so that roller 22 may be moved toward or away from roller 20. A spring 28 connects the two brackets to urge the rollers together and provide pressure on the threads therebetween. One end of the spring is connected to lever 30 which facilitates movement of one roller with respect to the other and is utilized to hold the rollers in an open position when necessary. The roller pressure may be made adjustable by means of screw 32 which secures the lever to bracket 24. The rollers may be made in cylindrical form and coated with resilient material to prevent slippage of the threads or, as shown in FIGURE 3, may be in the form of a toothed pinion gear made up of any suitable material, such as plastic. The meshed teeth provide a firm grip on each thread.

The threads are then guided through a second row of eyelets 34 and additional tensioning discs 36 toward a utilization device, such as a bank of needles (not shown). Resting on each thread between eyelets 34 and discs 36 is a wire loop defect detector 38 which is connected to an electric switch 40. Upon the occurrence of a break or defect in one line, a slack condition should be developed which permits the wire to fall and activate the switch to cause the remote yarn-feeding mechanism to halt.

Under normal operating conditions spring-loaded tensioning devices 14 and 36 absorb slack in the lines caused by motion of the needle or other minor variations to maintain a uniform tension on the yarn and provide separation of the threads and a smooth flow at the needles. However, if a break in the line should occur at a point between the tension device and needle, for example, the needle would no longer pull the yarn. The movement of the particular strand would then be stopped but no slack would occur at the detector adjacent the tensioning device to deactivate the machine.

As a result of the operation of the instant invention, however, the remaining unbroken threads continue to be drawn by the needles to maintain rotation of the rollers which, in turn, continue to pull the defective thread along. Thus, a large slack which is now sufficiently detectable will be developed between the roller and detector by the broken thread. The detector can then function to halt the entire feeding mechanism. A similar action would occur in a multiple-yarn sewing machine which utilizes interleaved upper and lower threads. A break in a lower thread would cause a decrease in tension in the corresponding upper thread, which effect would be minimized by the tensioning discs. However, the action of the rollers again creates an increased slack to permit stoppage of the machine. As an added feature, the detector and switch arrangement may be used to provide a warning light to indicate the location of a particular defective strand.

It can thus be seen that the instant invention provides improved control of a yarn-feeding mechanism and facilitates detection of defects in materials which utilize a plurality of threads or yarns. While only a single embodiment of the invention has been illustrated, it is apparent that the invention is not limited to the exact form or use indicated and that many variations may be made in the particular design and configuration without departing from the scope of the invention as set forth in the appended claims.

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Illustrative of the variations of which the present invention is susceptible is the showing of FIGURE 4. It will be noted in FIGURE 3 that the two toothed rollers therein shown are situated side by side on parallel axes in a substantially common horizontal plane. As shown in FIGURE 2, tension means are provided for urging these two rollers together. FIGURE 4 on the other hand discloses a pair of rollers 50 and 52 which are situated one above the other on parallel axes and in a substantially common vertical plane. The upper roller 50 rests upon the lower roller 52, the weight of the upper roller causing it to bear against the lower roller with a force corresponding substantially to the tensional force developed by the spring means shown in FIGURE 2. Rollers 50 and 52 are shown to be made of rubber-coated steel, that is, a steel core is covered by a rubber shell. This construction is purely illustrative and may be modified to fit the requirements of any given installation, for example, these rollers may be made of lighter materials such as aluminum for the core (which may, if desired, be hollow) and plastics for the covering. It should also be understood that the rollers shown in FIGURE 4 may also be utilized side by side in the manner shown in FIGURE 2. Similarly the rollers shown in FIGURES 2 and 3 may be situated one above the other as shown in FIGURE 4, in which case there would be no need for spring means to urge them together.

What is claimed is:

1. A yarn-feeding and defect detecting device adapted to be placed in a machine of the character described between a plurality of yarn-feeding spools and a plurality of yarn-drawing needles, comprising a support, a plurality of tensioning means mounted on said support for providing uniform tension to each separate strand of yarn at such yarn-drawing needles, means mounted on a support for guiding said plurality of strands toward said tensioning means, a plurality of defect-detecting means each mounted on said support in association with one separate strand and adapted to detect a predetermined slack in said strand upon the occurrence of a defect therein, means activated by said detecting means to automatically stop yarn feeding means upon said occurrence, a pair of engageable rollers rotatably mounted on said support and adapted to be driven by said plurality of said strands passing therebetween, means urging the engagement of said rollers whereby the remaining strands drive said rollers to overcome said tension and develop any slack in said defective strand which permits said detecting means to stop said feeding means, said rollers being in the form of toothed gears, one said gear being mounted on a movable bracket for engagement with the other, and said means urging said engagement including a spring connecting said bracket to said support, said guiding means including a first and second row of guides, said tensioning means including first and second rows of spring-urged tension discs, said rollers being positioned between said first row of tension discs and said second row of guides, and said detecting means including a row of wire loops resting on said strands and positioned between said second row of guides and said second row of tension discs, and said stop means comprising a row of electric switches adapted to be activated by said wire loops falling from said strands upon development of said slack and thereby causing said feeding means to stop.

2. A yarn-feeding and defect-detecting device adapted to be placed in a machine of the character described between a plurality of yarn-feeding spools and a plurality of yarn-drawing needles, comprising a pair of rollers which are held against each other in a common plane on parallel axes, yarn-tensioning means situated on one side of said rollers, additional yarn-tensioning means situated on the opposite side of said rollers and yarn-defect detecting means situated between said additional tensioning means and the rollers, whereby yarn may be fed from said spools

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through said first-mentioned yarn-tensioning means, then between the said two rollers, then in contact with said yarn defect-detecting means, then through said additional yarn-tensioning means, and finally to said needles, said rollers being provided with a plurality of longitudinally extending teeth, the teeth of each roller being in mesh with the teeth of the other roller and thereby firmly engaging and driven by the yarn between them.

3. A yarn-feeding and defect-detecting device in accordance with claim 2 wherein adjustable tension means

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are provided between the two rollers for urging and holding them together under desired tension.

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