

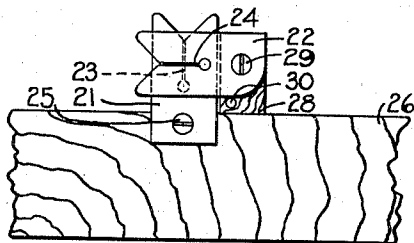
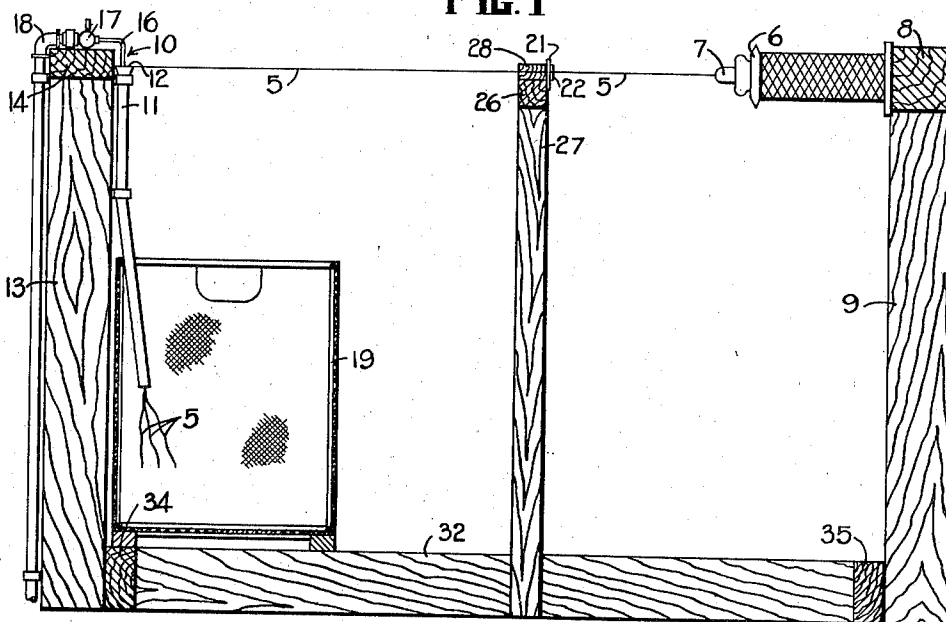
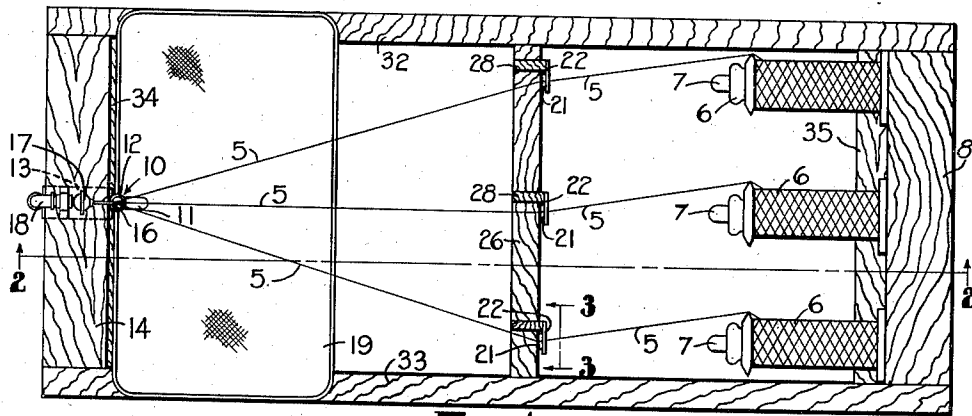
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THREAD INSPECTION APPARATUS

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THREAD INSPECTION APPARATUS

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This invention relates to a thread inspection apparatus and more particularly to apparatus for detecting irregularities in a continuously running thread.

5 While the apparatus may be utilized to inspect thread of either natural or synthetic origin, it is especially useful for inspecting synthetic threads, such as artificial silk thread. An inspection may be made of a synthetic thread not only to deter-
10 mine the quality of the particular thread but for the additional and sometimes more important purpose of determining whether or not the machine which produced that thread is operating satisfactorily. For example, if the openings of a
15 spinneret become clogged, the broken filaments which necessarily result will be instantly shown by a thread inspection apparatus such as that of the invention. Likewise, if the spool has been improperly wound due to some defect in the
20 thread traverse mechanism, the occurrence of such faults in the winding may be detected by the apparatus of the invention. By making frequent tests of the thread delivered from a thread-producing machine it is possible to determine
25 whether the machine is operating properly so that, if necessary, repairs may be made.

It has been found that for a thread inspection device to be satisfactory it must detect a thread irregularity without causing damage to the thread, as otherwise the nature of the irregularity cannot be determined. Thus, if a positive pull is exerted upon the thread and if an irregularity occurs such as to stop movement of the thread, the positive pull not only will break the thread
30 but will so mutilate the thread where the irregularity occurred that the character of the irregularity will not be ascertainable. For these reasons, it is desirable that movement of the thread be arrested, but the thread itself left unbroken.

40 A feature of the present invention is the provision of an apparatus which will exert an impositive drawing force upon the thread. Inasmuch as the force thus exerted upon the thread is of a yielding nature, the motion of the thread may be checked without causing thread breakage
45 and without destroying the identity of the thread irregularity. This makes it possible to examine the thread to determine the precise nature of the imperfection in the thread.

50 A preferred structural embodiment of the invention is illustrated in the accompanying drawing in which Figure 1 is a plan; Figure 2 is a section on line 2—2 of Figure 1; Figure 3 is a view on the line 3—3 of Figure 1 on an enlarged scale.

The thread 5 which is to be inspected ordinarily will be contained upon spools or bobbins, such as the bobbins 6 illustrated, from which the thread may be unwound by drawing it in an axial direction from the spool or bobbin. Such spools or
5 bobbins may be located removably upon pins 7 projecting from the same side of a horizontal beam 8 carried by uprights 9 of the apparatus framework. In the apparatus illustrated the pins
10 7 are parallel and lie in a horizontal plane although this is not essential. The thread-drawing device 10 which serves to pull the threads off the bobbins 6 preferably is located at the opposite end of the framework from the projecting
15 pins 7.

The illustrated thread-drawing device 10 comprises a tube 11 having its entrance end 12 preferably flared and located at about the same horizontal level as the axes of bobbins 6. Tube 11
20 is supported by being fixed to a centrally disposed upright support 13 of the apparatus framework and to a horizontal beam 14 upon the upper end of upright 13. Fluid, such as air, under pressure is directed into the upper flared end of tube 11 from a nozzle 16. Petcock 17 in the
25 supply pipe 18 controls the admission of fluid to nozzle 16. Supply pipe 18 is supported by attachment to upright 13 and beam 14. By locating nozzle 16 on the side of tube 11 which is away from the bobbins 6, the entrance of the
30 thread from the spools into the tube will not be obstructed.

Supply pipe 18 may be connected to any suitable source of fluid under pressure such as compressed air. It is only necessary that the fluid
35 be under sufficient pressure so that when petcock 17 is opened and fluid is forced to flow through tube 11, the current will be strong enough to exert a drawing action upon the thread. By controlling the admission of fluid
40 into nozzle 16, the thread may be drawn off bobbins 6 at as great a rate as is desired. It has been found that the drawing force exerted by the current of fluid flowing through tube 11 is dependent to some degree upon the length of the
45 tube, and for this reason it is desirable that the tube 11 be as long as is feasible.

At its lower end tube 11 extends into a collecting receptacle, such as basket 19. While this basket may be of any suitable size, it has been
50 found desirable that it be as large as is convenient, since greater assurance is thereby had that the thread delivered into the basket will be retained therein. If the collecting basket is of moderate size, it may be necessary to utilize as
55

side walls foraminous material such as a wire fabric, so that the air may freely escape. If the basket 19 is of sufficiently large size, so that the air upon issuing from the delivery end of tube 11 does not greatly disturb the mass of thread collected in the basket, it need not be provided with a cover and its side walls may be imperforate. Since the air, upon losing its velocity, likewise loses its carrying force, the thread will be deposited within the collecting basket 19.

In the illustrated embodiment each thread 5 traveling from a bobbin 6 to the thread-drawing means 10 passes through a pair of stripper elements 21 and 22, being in the illustrated embodiment means for detecting irregularities in the thread. These stripper elements are provided with slots 23 and 24, respectively, opening at one end of each element, the width of the slots being but slightly greater than the thickness of the thread. Stripper elements 21 are mounted so that their slots 23 are vertical while stripper elements 22 are mounted so that their slots 24 are horizontal and, as is shown in Figure 3, slots 23 and 24 of each associated pair of stripper elements 21 and 22 cross each other. By disposing the stripper elements 21 and 22 of each pair at right angles to each other in this manner, the slot of the one stripper element serves as a guide for the other stripper element. Furthermore, greater assurance is had that the slightest thread irregularity will be detected, since the crossing of the stripper elements results in all sides of the thread being acted upon.

The vertically disposed stripper elements 21 are secured by screws 25 along a horizontal beam 26 carried upon uprights 27 of the apparatus framework. It is preferable that each stripper element 21 be located directly in line with the corresponding pin 7. Stripper elements 22 are shown as carried by blocks 28 fastened upon the upper side of horizontal beam 26, and are preferably secured by screws 29 to the carrying blocks 28 in such manner that the stripper elements 22 are pivotally mounted. To retain the stripper elements 22 in a horizontal position about screws 29, stop pins 30 carried by the supporting blocks 28 preferably are provided.

The uprights 9 and 27 and the end uprights 13 are secured to longitudinally extending parallel side rails 32 and 33. These rails are retained in spaced-apart relation by the end rails 34 and 35. The centrally disposed vertical upright 13, to which tube 11 and supply pipe 18 are secured, is fastened both to end rail 34 and to the horizontal beam 14. Basket 19 may be positioned upon the side rails 32 and 33.

In putting the apparatus into use, the petcock 16 is first turned on. Thread from one of the bobbins 6 is then drawn from the bobbin and is delivered to the entrance end 12 of tube 11. The stripper element 22 through which the thread is to pass is next turned to an upright position about its pivot screw 29 and the thread is located in the slot 24. Stripper element 22 is then turned about its pivot screw 29 to a horizontal position, the thread being so guided in slot 24 that it enters slot 23 of stripper element 21. From this point onward the thread will continue to be drawn off bobbin 6 and through the slots 23 and 24 until some thread irregularity prevents passage of the thread through the stripper elements or until some defect in the winding upon bobbin 6 prevents the thread from unwinding.

Inasmuch as the thread-collecting device 10 functions to exert a yieldable drawing force upon the threads passing from bobbins 6, in the event that an irregularity in one of the threads causes movement of that thread to be checked by the stripper elements 21 and 22 the thread will not be broken. Moreover, due to the yieldable character of the force which the fluid passing into the tube 11 exerts upon the thread, the thread will be stopped so that the irregularity in the thread remains at its point of occurrence in the thread. In this manner it is possible for an attendant to examine the thread and determine the precise nature of the defect which caused the thread to stop.

For example, if stoppage of the thread was caused by a snarl in the thread, the snarl will remain in the thread and can be detected as such a defect, whereas if a positive drawing force had been exerted upon the thread and the thread had consequently been broken, it would be impossible to tell whether the defect had been caused by a broken filament, a loop or a snarl. In like manner, if the thread is stopped because of an underwind upon the bobbin, since the force exerted upon the thread to unwind it is of a yieldable nature, the character of the underwind will not be affected and it will be possible to determine the cause of the underwinding, as whether the underwind is caused by a defect in the manner of winding the thread upon the bobbin or is due to the washing over of the thread turns during subsequent processing of the bobbin.

Instead of the stripper elements 21 and 22 it is possible for an attendant to let the thread pass between his fingers on its way from the winding bobbin 6 to the thread-drawing device 10. Because of the yieldable nature of the drawing force upon the thread the operator may instantly check the motion of the thread for the purpose of determining its quality at a particular point. When he releases the thread it will rapidly pass through the fingers until some point further along the thread is reached for inspection. Since the thread-drawing means 10 is exerting a constant force upon the thread, the attendant may devote his entire attention to inspection of the thread before him and is not concerned with setting the thread in motion between points of inspection, or with possible breakage of the thread.

While the apparatus has been illustrated as a means for the inspection of thread which has been wound upon a conventional bobbin, it may be applied to an apparatus which is continuously producing thread. In such an application of the invention, the thread 5 may be one that is being continuously produced, as by a machine of the type disclosed in the application of Walter F. Knebusch and Alden H. Burkholder, Serial No. 7,114, filed on February 18, 1935. In such an arrangement, the apparatus may be utilized to determine whether the thread which is being produced is of high standard and may be collected as a high-grade product upon the regular collecting bobbin or whether the thread is of a faulty character and should be passed to waste. Other applications of the invention will be apparent.

Various modifications of the apparatus shown will occur to those skilled in the art. For example, instead of arranging the parts of the apparatus so that the thread travels in a generally horizontal path, they may be so arranged that

the bobbin axes are vertical and the thread passes vertically upwardly or downwardly. The supporting framework may be altered in this and other respects to suit different situations to best advantage.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty reside in the invention.

What is claimed is:

1. Thread inspection apparatus comprising a source of thread of substantially continuous length; means for detecting irregularities in the thread through which is passed thread from said source, said means arresting motion of the thread in the event an irregularity is encountered; and means for subjecting the thread to a fluid force which impositively draws the thread through said detecting means in such manner that the thread remains unbroken even though its motion is arrested.

2. Thread inspection apparatus comprising a source of thread of substantially continuous length, a thread-drawing device comprising a tubular passageway, means for inducing a current flow through said tubular passageway from one end thereof to the other whereby thread brought to the entrance end will be carried throughout the length of the passageway, and means between the source of thread and said thread-drawing device for detecting irregularities in the thread.

3. Thread inspection apparatus comprising a source of thread of substantially continuous length, a thread-drawing device comprising a tubular passageway, means for inducing a current flow through said tubular passageway from one end thereof to the other whereby thread brought to the entrance end will be carried throughout the length of the passageway, and means between the source of thread and said thread-drawing device for arresting movement of the thread upon the occurrence of an irregularity.

4. Thread inspection apparatus comprising a source of thread of substantially continuous length, means for drawing the thread from said source comprising a tubular passageway through which is induced a current of fluid tending to carry thread through said passageway, and, disposed between said source of thread and said drawing means, a member having an opening through which the thread is passed, said opening being substantially the size of the thread so that irregularities in the thread will be caught and motion of the thread arrested.

5. Thread inspection apparatus comprising a source of thread of substantially continuous length, means for drawing the thread from said source comprising an elongated tubular passageway through which is induced a current of fluid tending to carry thread through said passageway, and, disposed between said source of thread and said drawing means, a pair of slotted stripper elements through which the thread passes, said stripper elements being disposed with their slots crossing each other so that irregularities in the thread will be caught and motion of the thread arrested.

6. Apparatus comprising a plurality of sources of thread; a common tubular passageway so constructed as to permit thread from said sources to pass therethrough, said tubular passageway being of relatively small cross-section and of relatively great length as compared with said cross-section; means disposed at the entrance end of said tubular passageway for introducing thereinto a jet of fluid directed toward the discharge end of said tubular passageway; means disposed between said sources of thread and said tubular passageway for detecting irregularities in the thread; and, disposed at the discharge end of said tubular passageway, means for collecting the thread issuing from said tubular passageway.

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