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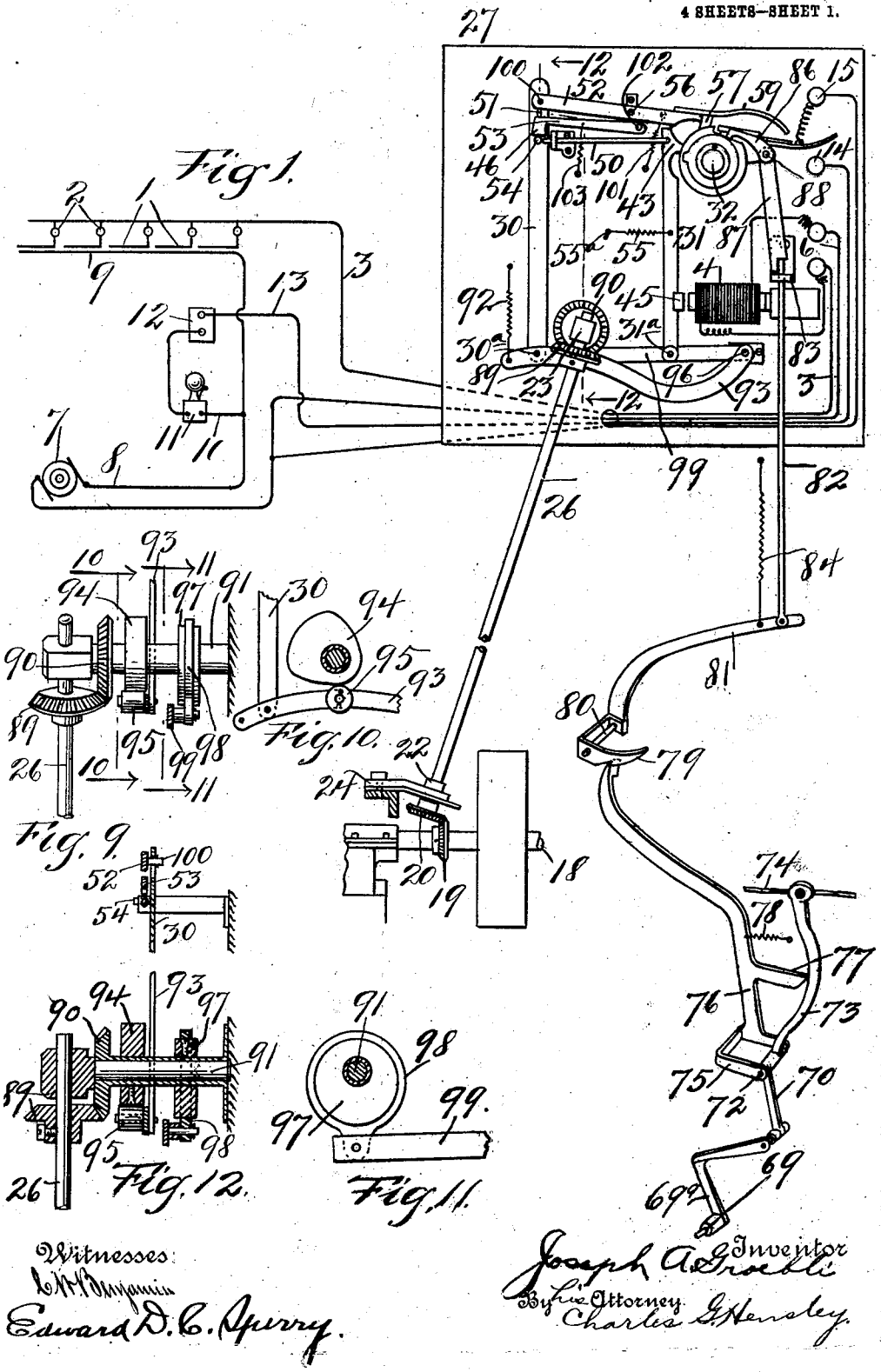
SAFETY MECHANISM FOR EMBROIDERING MACHINES.

APPLICATION FILED APR. 11, 1911.

1,037,471.

Patented Sept. 3, 1912.

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

Fig. 2.

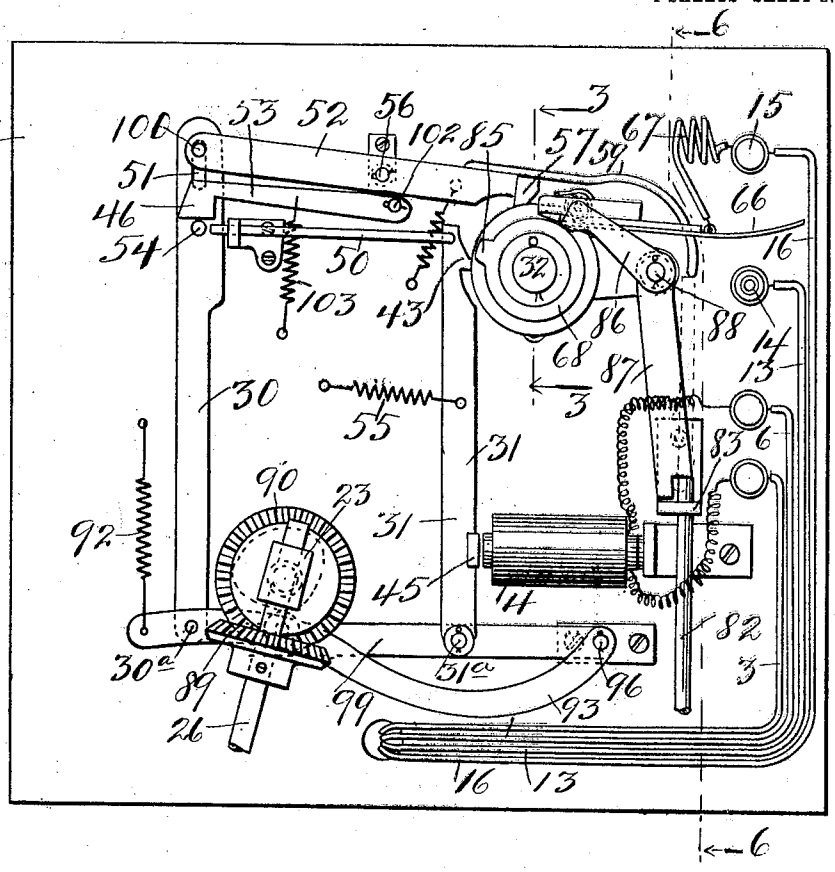


Fig. 3.

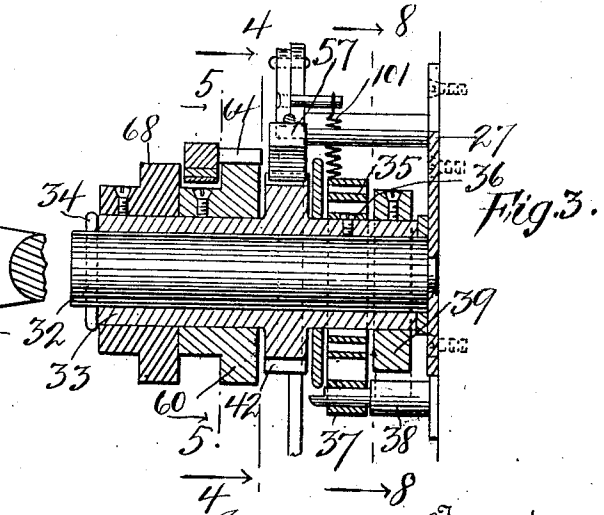
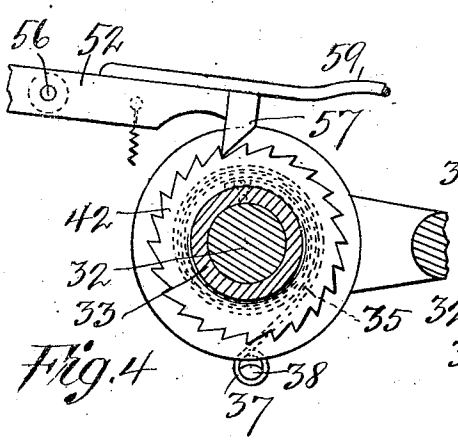


Fig. 4.



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4 SHEETS—SHEET 3.

Fig. 5

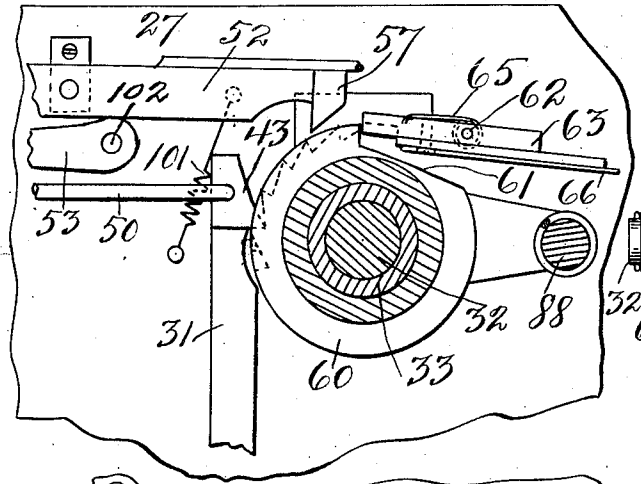
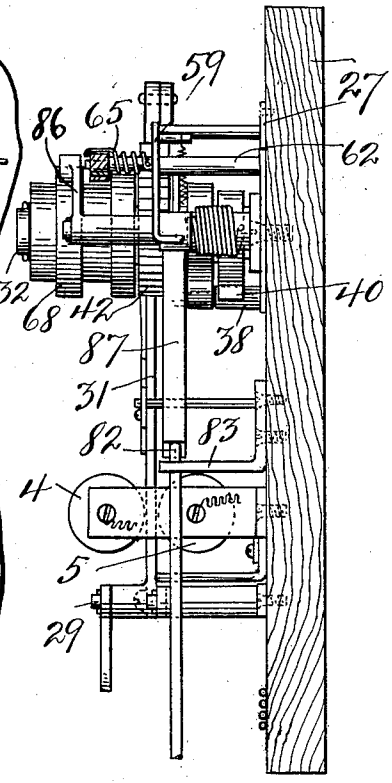


Fig. 6.



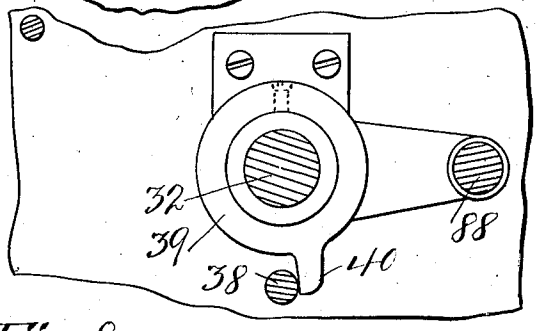


Fig. 8.

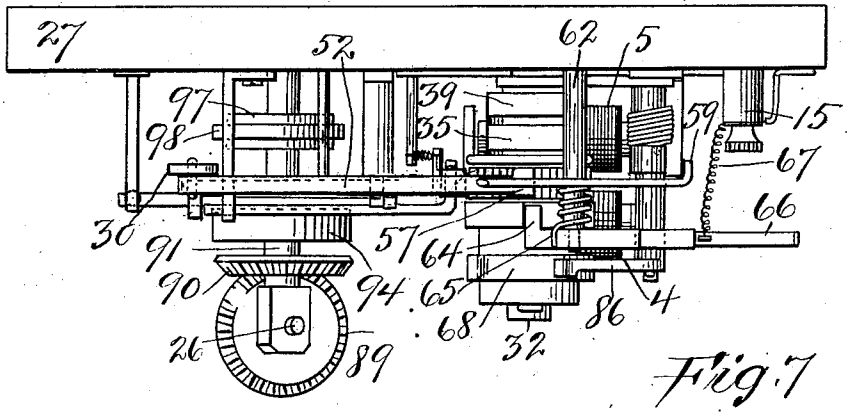


Fig. 7.

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APPLICATION FILED APR. 11, 1911.

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4 SHEETS—SHEET 4.

Fig. 13.

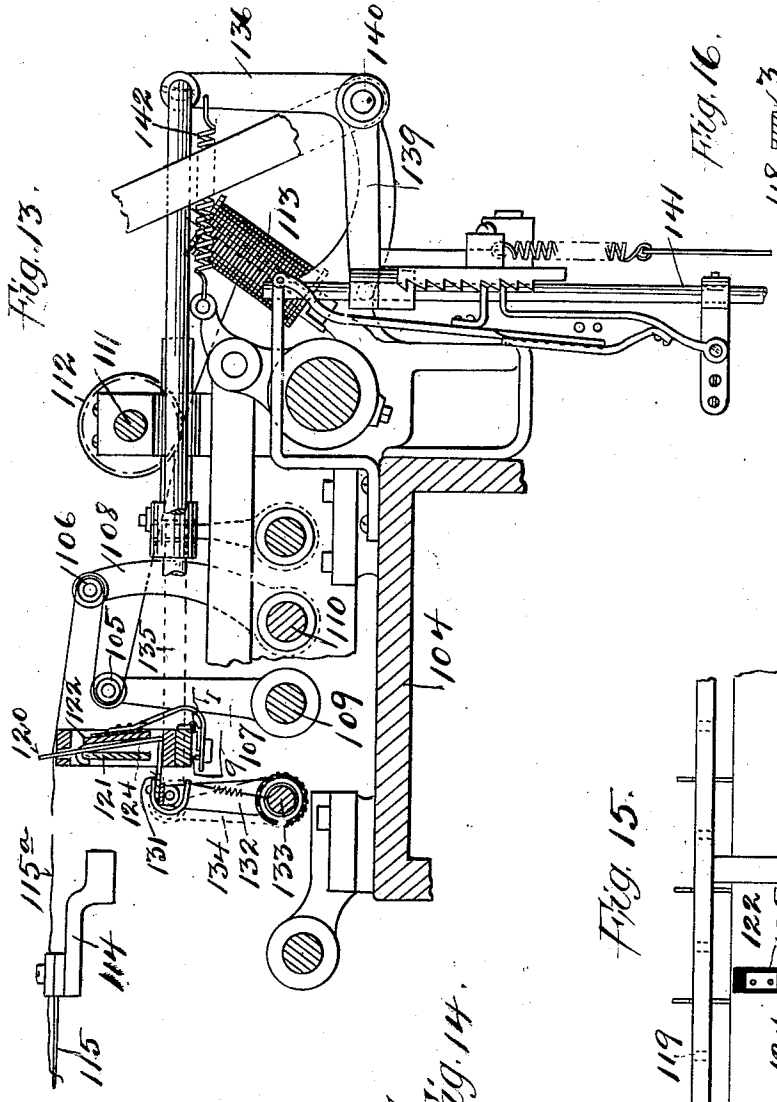


Fig. 16.

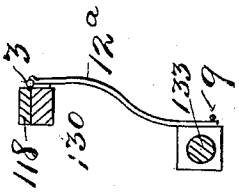


Fig. 15.

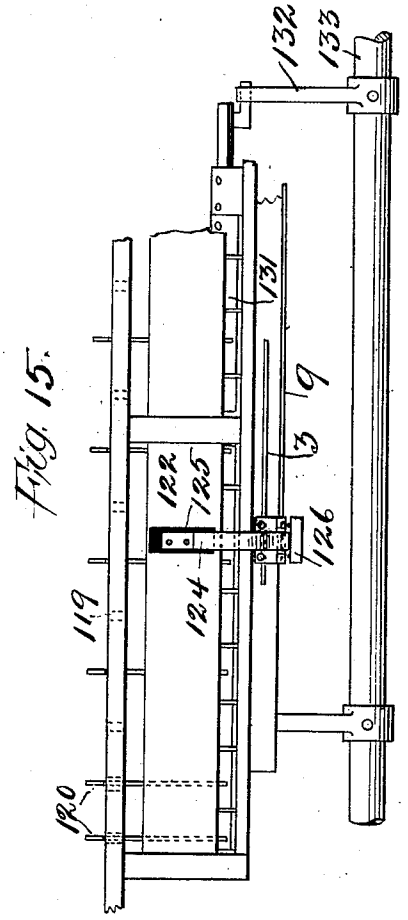
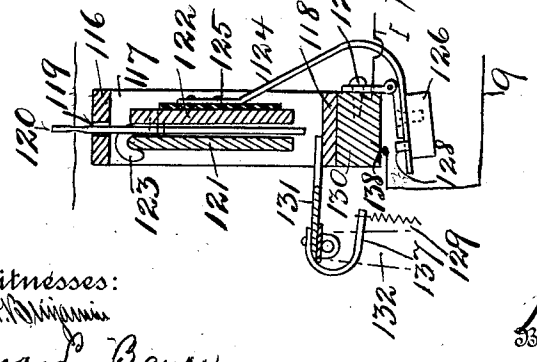


Fig. 14.



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UNITED STATES PATENT OFFICE.

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SAFETY MECHANISM FOR EMBROIDERING-MACHINES.

1,037,471. Specification of Letters Patent. Patented Sept. 3, 1912.

Application filed April 11, 1911. Serial No. 620,381.

To all whom it may concern:

Be it known that I, JOSEPH A. GROEBLI, a citizen of the United States, and a resident of the city, county, and State of New York, have invented a certain new and useful Safety Mechanism for Embroidering-Machines, of which the following is a specification.

My present invention relates to a stop mechanism for embroidering machines and the same is particularly advantageous in machines of the large type wherein several hundred needles simultaneously operate to produce an embroidered design, in multiple, on a fabric. In such machines much difficulty has been experienced in attending to the many threads which become broken or unduly slack and unless the broken or slack threads are detected and remedied the needle having the broken thread fails to perform its embroidering function properly, and the part of the embroidery being worked by such needle falls behind the other needles, and the defect in the design has to be remedied by hand work after the fabric has been removed from the machine, which entails considerable labor which cannot be previously estimated. This continual breaking of the threads is one of the greatest annoyances in the operation of the embroidering machine and aside from the fact that defects resulting therefrom increase the cost of the fabric, an uncertain element enters into the cost, because the number and extent of the defects cannot be accurately foretold. While the embroidering machine is in operation the attendant is engaged principally in keeping the needles properly threaded and though she may be diligent in doing so, there is always the possibility of one or more of the threads becoming broken or so slack as to produce defective work and it is the defects thus produced that my invention overcomes. It often happens that a defect in the thread will occur and but a few stitches will occur before the attendant observes the defect, and when she is apprised of it the defect may be often remedied while the machine is in operation and in such cases it may be advantageous not to stop the machine for obviating the defect where it can be done quickly and while the machine is in operation. In other cases however, the machine should be stopped. This is so, when a defect has existed in a thread or threads which escapes the attention of the attendant for a number of stitches or where a defect in one thread occurs while the attendant is attending to a previously discovered defect in another. In any case it is desirable to so control the machine that no matter what may cause the delay in attending to a defective thread, the machine will be automatically stopped when a defect exists during a given number of stitches. To reduce the attention necessarily required for all the threads on the machine is to reduce the cost of manufacture of the embroidery, and to reduce the defects in the same is to not only reduce the cost of the finished product, but also to eliminate one of the most objectionable items in the cost.

My present invention is devised to overcome the previous obstacles, and to control the machine, in its operation more or less automatically, so that the neglect or inability of the attendant to keep the threads in proper condition will not result in producing embroidery having more than trivial defects.

My invention in its fullest embodiment includes means for giving both visible and audible signals to warn the attendant that a defect exists, and also mechanism which will stop the machine if the attendant fails to obviate the defect during a reasonable time or if she fails to obviate all the defects. This mechanism for stopping the machine is so constructed that if a defect exists for a certain number of stitches the machine will be automatically stopped. I prefer to construct the same so that the machine will be stopped only when a predetermined number of consecutive stitches have been taken by the machine after the defect occurs, and which will be restored to starting or normal condition if after several stitches have been taken the defect disappears. The purpose of this restoring operation is to avoid useless stopping of the machine, for if the machine is stopped when not altogether necessary, the stop mechanism will be as objectionable as the difficulties which it is intended to overcome. Very often the defective thread will be corrected after the signal has been given, and before the machine is automatically stopped, in which event, my improved mechanism will be automatically restored so that the machine will not be stopped when

the defect has been obviated. This restoration is automatic and therefore is not dependent upon any attention by the operator. By this means it is possible to predetermine the number of stitches which the machine will be permitted to take after a defect arises, before the same will be automatically stopped, and the action will not be cumulative. That is, if the machine is set to be stopped when fifteen stitches have been taken after a defect arises, and a defect then arises and it is remedied after five stitches have been completed, and afterward another defect arises the mechanism will not operate after the tenth stitch following this second defect, but only after the fifteenth, owing to the restoration of the mechanism when the first defect was remedied. It may happen often that a defect, such as an undue slack in a thread, will show during one or several operations of the machine, and afterward disappear, without materially affecting the work and I desire to avoid stopping the machine for such unobjectionable details.

My present invention in no way interferes with the usual hand operated stopping device which is usually employed on the machine, though I prefer to combine parts of the latter with my improved device to save duplication of parts.

Reference will be made to an issued U. S. patent and also to a pending application as by such cross references the present case can be simplified.

In the drawings forming a part of this application, Figure 1, is an elevation of my invention, showing the electric circuits diagrammatically. Fig. 2, is an elevation, enlarged, of parts of the stop mechanism. Fig. 3, is a cross section taken on the line 3—3 of Fig. 2. Fig. 4, is a sectional view taken on the line 4—4 of Fig. 3. Fig. 5, is a sectional view taken on the line 5—5 of Fig. 3. Fig. 6, is a sectional view taken on the line 6—6 of Fig. 2. Fig. 7, is a plan view. Fig. 8, is a sectional view taken on the line 8—8 of Fig. 3. Fig. 9, is an elevation of certain cam movements. Fig. 10, is a section thereof, taken on the line 10—10, of Fig. 9. Fig. 11, is a similar view, taken on the line 11—11, of Fig. 9. Fig. 12, is a sectional view, taken on the line 12—12, of Fig. 1. Fig. 13, is a cross section, showing parts of the stitching mechanism of an embroidering machine and that part of my present invention whereby the thread defects are detected and the circuits operated. Fig. 14, is a section on an enlarged scale, of some parts shown in Fig. 13. Fig. 15, is an elevation of Fig. 14, and Fig. 16, is a sectional view showing a periodical circuit breaker.

For the purpose of detecting defects in the sewing threads of the embroidering machine I preferably employ a part of the mechanism shown and described in my pending application, Serial No. 513,246, and filed August 17th, 1909. Cross reference is made to that application to simplify the present case, since parts of that device are introduced into the present mechanism, without change.

In Figs. 13 to 16, I have shown a thread detecting device similar to that shown in my copending application above referred to. On the frame work 104, of the embroidering machine are shown the usual thread take up bars 105, 106 which are carried upon their respective supporting bars 107, 108, which swing with their shafts 109, 110, and any ordinary mechanism may be employed to rock these shafts. The shaft 111, supported on the frame work supports the usual tension roller or let off 112; and beyond this the thread spools 113 are mounted. To the left is shown the needle bar 114, which carries the sewing needles 115, in the usual manner. These elements are all commonly known in this art. Between the thread spool and the needle, and preferably between the thread take up and sewing needle I provide the device for testing the sewing thread to detect a defective condition therein. Plates 116, and 118, are arranged a short distance above one another and between the upright supports 117. The plate 116 has an aperture 119, for each detecting needle 120, while the plate 118, forms a support for the lower ends thereof under certain conditions. The detecting needle 120 is arranged in the line of the thread 115[a] and the latter passes through an eye in the needle, above the plate 116. The needle 120 lies between a stationary upright plate 121 and a movable upright plate 122, parallel therewith. The plate 121 is shown supported between the uprights 117, while the plate 122, is supported by hooks 123, thereon, which extend over the top of plate 121. The plate 122 is thus arranged to swing apart from the plate 121. Preferably on a wooden bar 130 secured against the member 118, I hinge a contact arm 124, which has a weight 126, on one end which tends to keep its upper end against the swinging plate 122. An insulating block 125 keeps the arm 124, electrically separated from the plate 122, to prevent short circuiting. The circuit wire 3, is connected with the contact arm 124, while a circuit wire 9, is arranged along the bar 130, in position where contact can be made by the point 128, of the contact arm. It is here where the circuits are closed when a defect exists in a sewing thread, for the purpose of operating the signals and stop mechanism. There are as many detecting needles 120, as there are sewing threads, each of which may operate independently. During the take up action on

the sewing threads they are supported above the bar 118, by the sewing thread with which they engage but move down when deprived of this supporting action or whenever the thread is unduly slack, or broken. There is a plate 131, one edge of which is reciprocated upon the top of bar 118, and across the plane of the detecting needles 120. The plate 131 is fulcrumed on the arms 132, which rock with the shaft 133. Arms 134, on the latter connects by a link 135, with an angle lever 136, 139, rocking on the stud 140. The angle lever 136, 139 is rocked by the reciprocations of a rod 141, and the action of a returning spring 142, connected to the angle lever. The device for operating the rod 141 is fully shown in my copending application herein recited. An arm 137, on the plate 131 extends below the fulcrum of the latter, and a spring 138, acting thereon keeps the forward edge of the plate in contact with the bar 118. The plate 131 supports the detecting needles at their lower ends during part of the stitching operation of the machine, is then moved from under the needles to the left, and is next moved across the path of the detecting needles. The plate 131 is moved from under the detecting needles just previous to the take up action on the sewing threads; and while the take up is drawing the thread taut the plate is moved over the bar 118, across the path of the detecting needles. All threads which are then in proper condition will be drawn taut, and will support their detecting needles above the edge of the plate 131. But if a thread is unduly slack or broken, its detecting needle will not be supported at this time, and as a result its lower end will be engaged by the plate 131. Such needle will be moved laterally by the plate 131, as shown in Fig. 13, and taking its fulcrum from the plate 116, it will rock the plate 122 outwardly upon its supporting hooks 123. The contact arm 124, will be swung by this action until contact element 128, makes contact with wire 9, when the circuit is closed between wires 3 and 9. This constitutes the detecting mechanism and for further details regarding the same reference may be had to my copending application Serial Number 513246, wherein the same is described in detail. The shaft 133, has an arm 12^a, connected at its lower end with wire 9. This arms swings periodically with the shaft 133, and periodically breaks the circuit by moving away from wire 3, the purpose of which will appear hereinafter.

In Fig. 1 I have shown diagrammatically, the electrical circuits and a reference will be here made to the same and the connection with the detecting parts of the mechanism referred to. The short legs 1, of the present electrical circuit correspond with, and are similarly operated to the legs of the said application, and they pass through the lights 2, by which visible signals are given at various locations throughout the length of the machine, and join a common connecting wire 3, of a circuit. The wire 3, passes to and connects with, one of the windings of a pair of electromagnets 4 and 5 and from the other end of the winding of the electromagnets a wire 6, passes the circuit to one of the brushes of a generator 7, or other source of electrical supply. From the other brush of the generator 7, a wire 8, carries the circuit to the wire 9, and the operation of the detecting mechanism causes one or the other legs 1, to be closed with this last wire, thereby closing the circuit which gives the visible signal through the lights. This action is for the same purpose as the lights in my said pending application, with the exception of the function performed by the electromagnets 4 and 5, as will appear hereinafter. From the wire 8, I have taken a branch 10, which passes the circuit through a bell 11, in series in this circuit, through the intermittent circuit breaker 12, which is the same as, and operates for the same purpose as the intermittent circuit breaker 82, in said application, thence through the wire 13, to a binding post 14. At this point the circuit is adapted to be opened or closed by means which will be described; and the circuit leaves the binding post 15, through the wire 16, from which it is taken back to one of the brushes of the generator 7, the wires 16 and 6, preferably uniting to eliminate as much wiring as practical. The circuits thus traced correspond with the cicuits of the said application, the means for operating them is pre preferably the same as in the said application and to a certain extent they perform the same functions. That is, the lights 2, give a visible signal when a defect arises in any of the sewing threads, which not only warns the operator of the existence of a defect, but also the approximate location thereof, while the signal bell 11, gives an audible signal when the defect continues for a given period of time. But in the present case the device for closing the circuit through the audible signaling device is different from that of my said application, as will be apparent. In the mechanism for operating the stop mechanism of the embroidering machine I have embodied the means for operating to close one of the signals, the one which gives the second or delayed signal, in the present showing this being the bell or audible signal.

The mechanism for operating to automatically stop the embroidering machine is preferably constructed and operated as follows:—I connect the stop operating mechanism up with some part of the machine which operates continuously, or which at

least operates during the stitching operations of the machine, and though this connection may be made with various parts of the embroidering machine mechanism I prefer, for the sake of avoiding complications in the embroidering machine mechanism, to connect the same with the main shaft 18, of the embroidering machine. On the main shaft 18, I have arranged a gear 19, which miters with a gear 20. The shaft 26 which carries the operating force to the safety mechanism is journaled in a journal 22, on a bracket 24, at one end, and in a journal 23, at its upper end; and the gear 20 is carried on the lower end o fthe shaft 26, whereby the latter is revolved in unison with the operation of the embroidering machine. The shaft 26, carries the operating force to the safety mechanism and for the purpose of distributing the operating force through different mechanism, I have arranged a gear 89, on the upper end of the shaft 26, which miters with the gear 90, mounted on a short shaft 91, from which the operating force is distributed to certain mechanisms. The shaft 91, therefore revolves synchronously with shaft 26, and therefore with the operation of the embroidering machine. There is a cam 94, on the shaft 91, which acts upon a roller 95, carried on a lever 93, which fulcrums from the point 96, whereby the lever is rocked at each revolution of the shaft. To this lever 93, at the point 30[a] I have fulcrumed an upwardly extending rod 30, which rises and falls with the lever 93, and which operates one of the pawls of the safety mechanism. There is an eccentric 97, on the shaft 91, about which engages a strap 98, and the latter is carried by another lever 99, which fulcrums from the point 96. At 31[a] of the lever 99, I have fulcrumed another upwardly extending rod 31, which carries a pawl 43 by which, and rod 30, the ratchet wheel of the mechanism is given a step by step movement. Through the connection just described it will be apparent that both rods 30 and 31 will rise and fall periodically, their time of movement being slightly different.

On the base plate 27 I have mounted an outwardly extending shaft, or rather stud 32, on which are provided certain revolving parts of the mechanism. On this stud I have provided a revoluble sleeve 33, which is held thereon by the pin 34. A mainspring 35, is coiled about one portion of the sleeve 33, having one end 36, connected fast to the sleeve and the other end 37, connected to an arbor 38, whereby the stress of the spring will cause a strain upon the sleeve to resist the revolution of the sleeve and return it to a given position, whenever the device for revolving the sleeve is released; and it is through this spring action that I restore the parts to a stated condition in the event that the detecting mechanism fails to show a defective condition in the threads for a predetermined number of consecutive operations of the embroidering machine; and also after the stop mechanism has been initiated, to bring the parts back to a starting position ready for the next operation. I have provided on the sleeve 33, a collar 39, which is fastened thereto and this collar carries a projection 40, which engages with a stop 38, and retains the sleeve and its associated parts in a given position. On the sleeve there is provided a toothed ratchet wheel 42, by which the sleeve may be given a step by step motion and I prefer to connect the device for giving the step by step motion, and the device for holding the sleeve against return, with this same ratchet wheel, to make the number of parts as small as possible. The upwardly extending arm 31, which is periodically rocked at each operation of the lever 99, and therefore at each stitching operation of the embroidering machine, has a pawl 43, on its upper end which is arranged to engage in the ratchet wheel 42. The arm 31, is provided with an armature 45, which comes in line with the cores of the electromagnets 4 and 5, and by the action of the electromagnets on this armature, when the magnets are energized by the closing of their circuit, the arm 31, is drawn toward the magnets, and thus the arm 31, is drawn into such a position as will cause its pawl 43, to engage the teeth of the ratchet wheel 42, to operate the latter. The arm 31, has a spring 55, connected therewith and with a stud 55[a] on the base which tends to draw the arm 31, to the left to retain the pawl 43, out of engagement with the ratchet except when the arm is drawn over by the magnets and this spring is of such a strength as can be overcome by the action of the magnets on the armature 45.

The upwardly extending arm 30 has a slot 51, in which engages a pin 100, on the lever 52, the arrangement being such that the lever 52, will be rocked at each downward movement of the arm 30 and will be returned by its spring, 101, on the return of the arm 30, but the slot 51, is such that, if the arm 30 is in its upper position the lever 52 may be rocked by other means as will be apparent in the subsequent description. It will be apparent that the action of the arm 30 is only to move the end of the lever 52 downwardly, leaving it to the action of its spring for the return movement. The lever 52, fulcrums at the point 56, and on one end it carries a pawl 57, which also engages the teeth of the ratchet wheel 42, and this pawl prevents the return movement of the sleeve at certain periods. Preferably secured to the lever 52 is a curved arm 59, which is acted upon by a rod at the same

time that the stop motion is operated, to cause the release of the pawl 57, as will appear.

On the sleeve 33, I have secured a cam 60, which is shown at the side of the ratchet wheel and this cam has shown thereon a recess 61. On a pin 62, is fulcrumed a make and break lever 63, which carries a laterally projecting pin 64, the purpose of which is to engage the cam 60, so that the lever 63, may be rocked. When the parts are in the position shown in Fig. 2, which is the starting or normal position, the pin 64, lies in the recess 61 of this cam and the lever 63, is held so by a spring 65, which surrounds the pin 62, and presses down on the end of lever 63. It will be apparent that when the sleeve and the cam begin to revolve to the left, the cam will act on the pin 64, to raise the end of lever 63, until the contact plate 66, carried thereby, and which is connected with the binding post 15, by a wire 67, finally contacts with the post 14, thereby closing the circuit which includes the bell. When the circuit is closed the second signal indicating that a defect has existed for a given number of stitches, will be given. On the sleeve I have also provided a cam which is adapted to initiate the operation of the stop mechanism. The cam 68, which is secured to the sleeve is adapted for this purpose as will now be shown.

By cross reference to U. S. Patents Nos. 607234 of July 12, 1898 and 911234 of February 2, 1909, it will be observed that I have there shown a mechanism which is adapted to bring the embroidering machine to a stop; and to avoid showing a complete stop mechanism herein, I prefer to make cross reference to said patents and to say that I prefer to employ that stop mechanism in conjunction with the present mechanism for initiating its operation. In these patents I have shown a shaft 17, and by rocking that shaft the stop mechanism is operated to bring the machine to a stop. I preferably connect my present mechanism to the shaft 17, of such structure, whereby the advantages of such stop mechanism will be utilized with my present mechanism for operating it. In the lower part of Fig. 1, I have shown a shaft 69, and this is preferably the shaft 17, of my said patents and by causing this shaft to rock the stop mechanism shown in said patents may be caused to operate. I have shown an arm 69ª, connected to this shaft, and this arm connects with a lever 70 which rocks on a shaft 72, which is suitably mounted on a stationary part of the machine. The arm 73, which is integral with the arm 70, has a hand rope 74, connected to the upper end and by pulling the rope one way or the other the stop mechanism is caused to operate either to stop the machine or start it. This is what may be called the hand control, and is the same as in my said patents. To the short shaft 72, is connected a straddling piece 75, which rocks freely on shaft 72. To this bracket I have connected an upwardly extending arm 76, which has an arm 77, to engage the arm 73, of the mechanism. A spring 78, is connected to the arm 76, to hold the parts in the position shown in Fig. 1, and to cause the rocking of arm 76 when the latter is released. The upper end of the arm 76, is engaged by a trigger 79, which rocks on a shaft 80, and when this trigger is released the spring 78, rocks the arm 76, and through the arm 77 operates the stop mechanism. To the trigger 79, I have connected a link 81, which is also fulcrumed to an upwardly extending rod, 82, which passes upwardly to a point where it will be operated on by the stop initiating mechanism. The rod 82, is guided by a bracket 83, so that it reciprocates vertically and a spring 84, tends to raise the rod for the purpose of releasing the trigger when the rod itself is released.

On the sleeve 33, I have provided a cam 68, which revolves therewith and the projection 85, of this cam is arranged to trip the lever consisting of the short arm 86, and a longer arm 87, which fulcrums at 88. The lower end of the arm 87, when the cam is in the position shown in Fig. 1, lies in the path of the end of the rod 82, thereby retaining the latter in its lower position. It is to be noted that the rod, 82, lies directly below the projecting plate 59 of the lever 52.

Upon a pin 102, just below the lever 52, I have fulcrumed an arm 53, the purpose of which is to engage the arm 50, projecting from the arm 31. On the arm 53, is provided a depending end 46, which is located where it can engage against the end of the arm 50, to hold the arm 31, over when it has been drawn by the magnets, to carry out the desired operations. On the rod 30 is a pin 54, which engages the arm 53, for the purpose of raising its engaging end at each upward movement of the arm 30, to disengage the projection 46, from the arm 50. The return movement of the arm 53, is caused by a spring 103, pulling down thereon.

The operation of my invention is as follows:—As the embroidering machine operates, the shaft 26, will be caused to revolve through the gears and this will cause the shaft 91, to revolve. The cam 94, acting on the lever 93, will rock the latter and this will cause a periodical reciprocation of the arm 30 and therefore lever 52. At each downward movement of arm 30, the lever 52, will be tripped to disengage its pawl 57 from the ratchet wheel 42, leaving the same subject to the action of the pawl 43, or the main spring. It will be apparent that since the arm 30, moves up and down almost simultaneously with arm 31, the downward movement of the arm 31, and its pawl 43,

will take place just as the lever 52, is tripped, and therefore when the pawl 57, is released from the ratchet. So long as there is no action in the circuits, the arms 30 and 31 will simply rise and fall without effecting any change in the mechanism, as the arm 31, is held away from the ratchet wheel by the spring 55. In this condition the main spring 35, holds the sleeve in what may be called a normal or starting position, with the stop 40, in contact with the arbor 38, and the cams in the position shown in Fig. 1. If now a defect occurs in a sewing thread of the embroidering machine, the detecting mechanism previously described will cause the circuit which includes the lights 2, to be closed by the contact arm 124, of said mechanism. Since the electromagnets 4 and 5, of my present structure are included in the circuit with the lights not only will the visible signals be given, but the magnets will be energized. The intermittent circuit breaker 12, so operates that the bell will not sound continuously, but the circuit will be intermittently broken at the breaker. Thus by closing the light circuit, the first signal is given. When the light circuit is thus energized, the magnetic action of the magnets acting on the armature 45, of the arm 31, will draw the latter to the right in Fig. 1, at a time when the arm is up. The arm 30, having been caused to rise by reason of its connection with the embroidering machine mechanism, and the armature 45, being on a line with the cores of the magnets, the magnets will draw the arm 31 toward them, sufficient to bring the pawl 43, into engagement with the teeth of the ratchet. When the arm 31 rose upwardly, the arm 53, was held high enough to prevent its depending end 46, from engaging the arm 50. The magnets having caused the pawl 43, to engage the ratchet, if the magnets should become deënergized the pawl will be temporarily held in the ratchet by the engagement of the end 46 of arm 53, against the end of the arm 50 and for this reason the downward movement of the arm 30, slightly precedes the downward movement of the arm 31. The arms 30 and 31 are now ready to descend and they will be caused to do so automatically. The action of the arm 30, on the lever 52, will cause the pawl 57, to disengage from the ratchet, leaving the latter subject to the action of the pawl 43. Upon the descent of the pawl 43, the ratchet wheel and likewise the sleeve with the cams which it carries, will be rotated, say one notch, by the pawl 43. As the arm 31, completes its downward movement, the arm 30, is returned to its upward position, so that the spring 101, can draw down the lever 52, and cause the pawl 57, to reengage the ratchet. By the time the pawl 57 is caused to reëngage the ratchet, the arm 53 is rocked by the pin 54 to carry the projection 46, away from the end of the arm 50 so that the arm 31, may be drawn by its spring 55, to disengage the pawl 43, from the ratchet. The movement of the sleeve just described placed a torsional stress upon the main spring, and the sleeve is now held in its advanced position by the engagement of the pawl 57, with the ratchet. This completes one stitching operation of the embroidering machine. If the defect in the sewing thread still exists upon the next stitching operation of the embroidering machine, the operation just described will be repeated and as a result the ratchet wheel, sleeve and cams, will be rotated one more notch, and the pawl 57, will again hold the ratchet in its advanced position. I preferably arrange the cam 60, and the arm 63, so that when the sleeve has been rotated three steps the arm 63 will rock sufficiently to cause its contact 66, to strike the post 14, when in consequence thereof, the bell circuit will be closed and the second or audible signal will be given, indicating to the attendant that a defect has existed for a predetermined number of operations of the machine. These signals may not be sufficient however, and the attendant may fail to attend to the trouble, in which event the stop mechanism will be operated preferably after several stitches have been taken, succeeding the last signaling. The step by step movement of the ratchet wheel and sleeve continues at each operation of the machine and if a defective condition of the threads continues after a predetermined number of stitching operations, preferably about 12, the projection 85, of the cam 68, will strike the lever arm 86, and as a result the lever 86, 87, will be rocked on its fulcrum, when the arm 87, will be moved away from the rod 82. The rod 82, being thus released, it is moved upwardly by its spring 84, likewise the link 81, and the trigger 79, will be rocked, to release the arm 76. This latter being released, will be drawn over by its spring 78, which will cause the shaft 72, to rock and through the lever 70, the shaft 69, will be rocked and thus the stop mechanism referred to in my said patents will be set into operation to stop the machine. When the rod 82, moved upwardly as just described, it struck the extended arm 59, of the lever 52 causing the latter to rock, the purpose of which is to release the pawl 57, when the stop mechanism has been initiated, so that the sleeve will be free to be returned by the main spring, so that the mechanism will be again in its starting position. When the defect in the sewing thread has been remedied the machine may be again started in the usual manner by pulling the hand rope. This will rock the arm 76, until it is again engaged by the trigger 79, when the

stop initiating mechanism will be in condition for the next operation. The whole mechanism is thus restored to an operative condition.

The above operation is what takes place when a defect exists for a number of consecutive stitches and is not properly attended to by the attendant. In some cases the attendant will rectify the condition of the defective thread either by rethreading the needle if the thread is broken or by taking up some of the slack if it is too slack, and before the machine has proceeded far enough to set the stop mechanism into operation. Again if the defect in the thread is merely caused by a slack in the thread, it may be taken up after several stitches later by the regular operation of the machine, in which event it would serve no beneficial purpose to let the stopping mechanism continue and stop the machine, but would in fact be a disadvantage. Therefore I have constructed the present mechanism so that it will be restored where the defect does not exist for the predetermined number of stitches in consecutive order so that if the defect disappears, the stop mechanism will begin all over again from its starting position. In either of the above events the action will be as follows:—The defect being detected as before, the arm will be drawn over by the magnets, and the pawl 43, will engage and rotate the ratchet wheel and sleeve, and the pawl, 57, will hold the ratchet in its advanced position. This will be caused by the closing of the light circuit and the same operation may be repeated for several stitches, and it may continue until the bell circuit is closed, provided the defect continues during consecutive stitches. If however, the defect disappears or is remedied before the stop mechanism is operated a different action will take place. The lever 52, it will be remembered is tripped automatically by reason of its operation by the arm, 30 with each operation of the embroidering machine. The ratchet is held from returning by the pawl 57, until the arm 31, moves to its elevated position. If, when the arm 31, is raised and the threads are being tested on a succeeding stitching operation, the defect which previously registered, fails to reappear, or continue to appear, the detecting needles 24, of my said pending application will all be held up and as a result the plate 19, of said construction will not be swung and the light circuit will not be closed as on the previous operations. The electromagnets therefore will not be energized during the operation of the arm 31, now under consideration, and the latter will not be drawn to the right against its spring so that when the arm 31, moves down there will be no engagement of its pawl 43, with the ratchet wheel. As the pawl 57, is automatically released, preferably just about the time the pawl 43, goes down, and as the latter is now not in engagement with the ratchet wheel, there will be nothing to hold the ratchet wheel at this moment as a result the main spring will revolve the sleeve, and its associated parts, until the stop 40 contacts with the arbor 38, when the sleeve and its parts will be restored to their first or starting position. The mechanism will now begin anew, and if a defect arises in any thread it will have to exist for the predetermined number of consecutive stitches before the stop mechanism will be operated. There will be performed by the present mechanism all the functions necessary to detect defects in the many threads of the machine to give proper signals warning of the existence of a defect, of its continuance for several stitches, and finally if the threads are not attended to the machine will be automatically stopped. By deferring the stopping of the machine a great deal of unnecessary stopping of the machine is avoided and the attendant is allowed proper time to remedy the defect to avoid stopping. By making the device self-restoring no attention need be given by the attendant to the stop mechanism to restore the same for its renewed operation.

It will be apparent that changes may be made in the structure without departing from the spirit and scope of my invention. It will also be apparent that the various branches of my invention may be segregated and used independently or separately to obtain the advantages thereof.

Having described my invention what I claim is:

1. An embroidering machine embodying means for stitching a fabric, means for testing the sewing thread, stop mechanism for stopping the embroidering machine adapted to be operated by said testing mechanism only when the latter is made operative by a defect or defects existing for a plurality of stitching operations of the embroidering machine.

2. An embroidering machine embodying means for stitching a fabric, means for periodically testing the sewing threads for the purpose of detecting the condition thereof, stop mechanism for stopping the embroidering machine, adapted to be operated by said detecting mechanism only when the latter is made operative by a defect or defects, existing in the sewing threads for a plurality of consecutive stitching operations of the embroidering machine.

3. An embroidering machine embodying means for stitching a fabric, means for testing the sewing threads to detect a defective condition thereof, a signaling device for indicating the existence of a defect

in the sewing thread and adapted to be operated by the said testing mechanism, a stop mechanism for the embroidering machine and means whereby said stop mechanism will be operated only when the signaling device is made operative for a plurality of operations of the embroidering machine.

4. An embroidering machine embodying means for stitching a fabric, means for testing the sewing threads to detect a defective condition thereof, a primary signaling device adapted to be operated by said thread testing device, a second signaling device adapted to be operated after a plurality of operations of said first signaling device, stop mechanism for the embroidering machine, and means whereby said stop mechanism will be made operative after said second signaling device has been made operative for a plurality of consecutive stitching operations of the embroidering machine.

5. An embroidering machine embodying means for stitching a fabric, means for testing the sewing threads to detect a defective condition thereof, a visible signaling device adapted to be operated by said thread testing device and adapted to indicate the approximate location of the defective thread, an audible signaling device adapted to be operated after a plurality of operations of said visible signaling device, stop mechanism for the embroidering machine, and means whereby said stop mechanism will be made operative after said second signaling device has been made operative for a plurality of stitching operations of the embroidering machine.

6. An embroidering machine embodying means for stitching a fabric, a testing device for periodically testing the sewing threads, stop mechanism for the embroidering machine, means whereby the stop mechanism will be made operative after a predetermined number of consecutive operations of the said testing device and means for restoring said stop mechanism to its initial position upon a discontinuance of the operations of said testing mechanism.

7. An embroidering machine embodying means for stitching a fabric, a testing device for periodically testing the sewing threads, a stop mechanism for the embroidering machine and means operated synchronously with the operation of the embroidering machine for setting the stop mechanism into operation, and means operated by said thread testing device and adapted to initiate the operation of said stop mechanism by its said operating mechanism only after the operation of said initiating device for a plurality of operations of the embroidering machine.

8. An embroidering machine embodying means for stitching a fabric, a testing device for periodically testing the sewing threads, stop mechanism for the embroidering machine and means operated synchronously with the operation of the embroidering machine adapted to set said stop motion into operation only after a plurality of operations of the testing device, and means operated by said thread testing mechanism, for initiating the operation of the stop mechanism by its operating mechanism.

9. An embroidering machine embodying means for stitching a fabric, a testing device for periodically testing the sewing threads, stop mechanism for the embroidering machine and means operated synchronously with the embroidering machine adapted to set said stop mechanism into operation upon a plurality of operations of the testing device, means operated by said thread testing device for effecting successive operations of said stop mechanism operating device, and means for restoring said latter device if the said means for causing its operation fails to operate consecutively for a predetermined number of operations.

10. An embroidering machine embodying means for stitching a fabric, a testing device for periodically testing the sewing threads, a stop mechanism for the embroidering machine, means for operating the stop mechanism, and adapted to be operated by a plurality of operations of said thread testing device, means for restoring said operating means, and means for automatically releasing said operating means when said stop mechanism has been operated whereby the operating mechanism will be restored by its restoring means.

11. An embroidering machine embodying means for stitching a fabric, means for periodically testing the sewing threads to detect a defect therein, stop mechanism for the embroidering machine, and means whereby said stop mechanism will be made operative only after a plurality of operations of said thread testing mechanism.

12. An embroidering machine embodying means for stitching a fabric, means for testing the sewing thread to detect a defective condition thereof, stop mechanism for the embroidering machine, means operated by the embroidering machine, and requiring a plurality of operations to set the stop mechanism into operation, and an electromagnet adapted to control the operation of said stop mechanism by its controlling mechanism, said electromagnet being controlled by said thread testing mechanism.

13. An embroidering machine embodying means for stitching a fabric, means for testing the sewing thread to detect a defective

condition thereof, stop mechanism for the embroidering machine, means operated by the embroidering machine and adapted by a plurality of operations to set the stop mechanism into operation, and an electromagnet adapted to control the operation of said stop mechanism, by its controlling mechanism, a signaling device in the circuit of said magnet, said signaling device and electromagnet being controlled by said thread testing mechanism.

14. An embroidering machine embodying means for stitching a fabric, means for testing the sewing thread to detect a defective condition thereof, stop mechanism for the embroidering machine and means for causing the operation thereof, comprising means adapted to be operated step by step, and arranged to cause the operation of the stop mechanism after a predetermined number of operations, means for operating said step by step means, and means operated by said thread testing device for effecting the operation of said step by step device.

15. An embroidering machine embodying means for stitching a fabric, means for testing the sewing thread to detect a defective condition thereof, stop mechanism for the embroidering machine, and means for causing the operation thereof, comprising means adapted to be operated step by step, and arranged to cause the operation of the stop mechanism after a predetermined number of operations, means for causing successive operations of said step by step device, means for holding the step by step device, means operated by said thread testing device for effecting the operation of said step by step device, and means for restoring said step by step device.

16. An embroidering machine embodying means for stitching a fabric, means for periodically testing the sewing thread to detect a defective condition thereof, stop mechanism for the embroidering machine, and means for causing the operation thereof, comprising means adapted to be operated step by step, and arranged to cause the operation of the stop mechanism after a predetermined number of operations, means for restoring the step by step device, and means for operating said step by step device, means for periodically holding said step by step device to prevent its restoration, and means operated by said thread testing device for causing the operation of said step by step device.

17. An embroidering machine embodying means for stitching a fabric, means for periodically testing the sewing thread, to detect a defective condition thereof, stop mechanism for the embroidering machine and means for causing the operation thereof, comprising means adapted to be operated step by step, and arranged to cause the operation of the stop mechanism after a predetermined number of operations, means for restoring the step by step device, means for operating said step by step device, means for periodically holding said step by step device to prevent its restoration, and adapted to hold said step by step device during the inactive period of said thread testing device, and to be released when the thread testing device, is active, and means operated by said thread testing device for causing, the operation of said step by step device.

18. An embroidering machine embodying means for stitching a fabric, means for periodically testing the sewing thread to detect a defective condition thereof, stop mechanism for the embroidering machine and means for causing the operation thereof, comprising means adapted to be operated step by step, and arranged to cause the operation of the stop mechanism after a predetermined number of operations, means for operating the step by step device comprising pawls, one of which is adapted to operate said step by step device, and the other to periodically hold the same, means operated synchronously with the embroidering machine for periodically operating said pawls, and means adapted to be operated by said thread testing device for causing said first pawl to become inoperative.

19. An embroidering machine embodying means for stitching a fabric, means for testing the sewing thread to detect a defective condition thereof, an electric signaling device operated by said testing device, stop mechanism for the embroidering machine, and means whereby the circuit of the signal device will be opened upon the operation of the stop mechanism.

20. An embroidering machine embodying means for stitching a fabric, means for testing the sewing thread to detect a defective condition thereof, an electric circuit controlled by said detecting device, and an electromagnet in said circuit, a second electric circuit including a signaling device, mechanical means for closing said second electric circuit, said mechanical closing means being controlled by said electromagnet.

21. An embroidering machine embodying means for stitching a fabric, means for testing the sewing thread to detect a defective condition thereof, stop mechanism for the embroidering machine, means operated by the embroidering machine for operating said stop mechanism, an electric circuit including an electromagnet, and controlled by said detecting device, said electromagnet being adapted to cause the operation of said stop mechanism by its operating mechanism, after a predetermined number of operations of said detecting device.

22. An embroidering machine embodying means for stitching a fabric, means for test-

ing the sewing thread to detect a defective condition thereof, an electric circuit controlled by said detecting device, and an electromagnet in said circuit, a second electric circuit including a signaling device, mechanical means for closing said second circuit, said mechanical closing means being adapted to close said second circuit, after a predetermined number of operations of the detecting device.

23. An embroidering machine embodying means for stitching a fabric, means for testing the sewing thread, to detect a defective condition thereof, stop mechanism for the embroidering machine and means for effecting the operation thereof, embodying a ratchet wheel, a feeding pawl for operating the same, means for operating the pawl, and means operated by said detecting device, adapted to cause the operative engagement of the feeding pawl with the ratchet wheel, whereby the latter will be operated step by step.

24. An embroidering machine embodying means for stitching a fabric, means for testing the sewing thread, to detect a defective condition thereof, stop mechanism for the embroidering machine and means for effecting the operation thereof, embodying a ratchet wheel, a feeding pawl for operating the same means for operating the pawl, and means operated by said detecting device, adapted to cause the operative engagement of the feeding pawl with the ratchet wheel, whereby the latter will be operated step by step, means for restoring the ratchet wheel, and a holding pawl engaging the ratchet wheel to hold the latter during the return movement of said first pawl, and means for releasing said holding pawl when said first pawl makes its active movement.

25. An embroidering machine embodying means for stitching a fabric, means for periodically testing the sewing thread, an electric circuit including a visible signal adapted to be closed by said testing device, an electromagnet in said circuit, a second circuit including an audible signal, a stop mechanism for the embroidering machine and means for causing the operation thereof, and the closing of said second circuit, embodying a shaft having cams and a ratchet wheel, a feed pawl for causing a step by step movement of the ratchet wheel, whereby the second circuit will be closed and the stop mechanism operated after predetermined numbers of operations of the ratchet wheel, means for periodically operating the feed pawl mechanically, said feed pawl being adapted to be moved into engagement with the ratchet wheel by said magnet, a spring for restoring the ratchet wheel when released, a holding pawl for the ratchet wheel, and means for operating the holding pawl whereby the same will be caused to hold the ratchet wheel during the inactive period of said thread testing device and released from the ratchet during the active period of the thread testing device, whereby upon the failure of the thread testing device to close first circuit consecutively, the ratchet wheel will be free to be restored by its said spring.

26. An embroidering machine embodying means for stitching a fabric, means for periodically testing the sewing thread, an electric circuit adapted to be closed by said testing device, and an electromagnet in said circuit, a stop mechanism for the embroidering machine, and means for causing the operation thereof, embodying a shaft having a cam and a ratchet wheel, a feed pawl for causing a step by step movement of the ratchet wheel, whereby the stop mechanism will be operated after a predetermined numebr of operations of the ratchet wheel, means for operating said feed pawl mechanically, said feed pawl being adapted to be moved into engagement with the ratchet wheel by said magnet, means for mechanically retaining said feed pawl in such engagement during the active movement of the pawl, a spring for restoring said ratchet wheel when released, a holding pawl for the ratchet wheel, said ratchet wheel being adapted to be restored by its spring upon the failure of the testing device to close said circuit for a predetermined number of consecutive operations of the machine.

Signed at the city, county and State of New York this 6th day of April 1911.

JOSEPH A. GROEBLI.

Witnesses:
EDWARD D. C. SPERRY,
A. A. DE CAET.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."