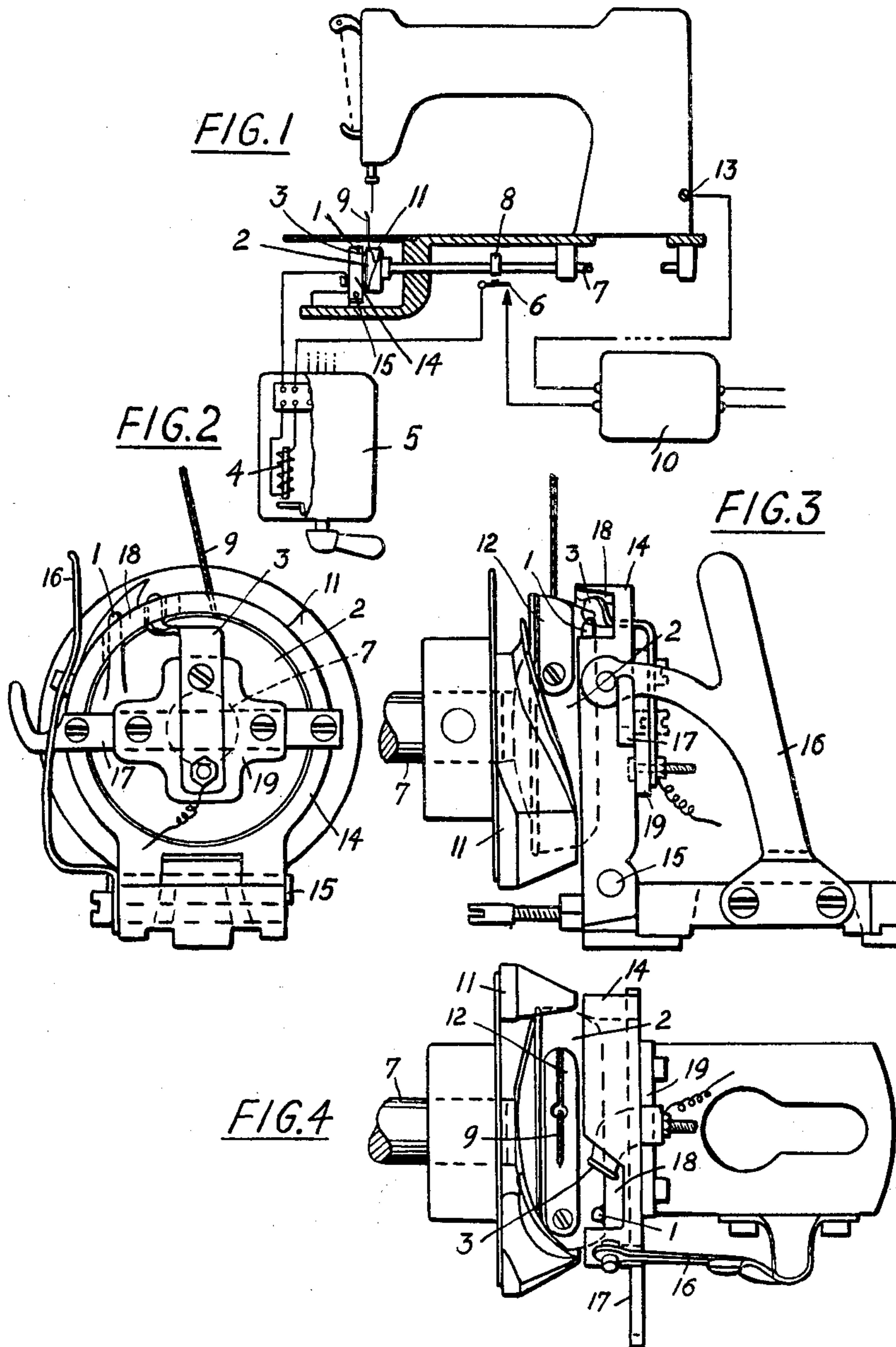


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AN AUTOMATIC EMBROIDERY MACHINE UPON  
BREAKAGE OF THE UNDERTHREAD  
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## MECHANISM OPERABLE TO DEENERGIZE THE MOTOR OF AN AUTOMATIC EMBROIDERY MACHINE UPON BREAKAGE OF THE UNDER-THREAD

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An underthread stop motion for sewing and embroidering machines is already known which comprises a feeler for contacting the underthread between the stitch plate and the hook, said feeler operating a contact for stopping the machine when the underthread is absent or the tension of the underthread slackens. The feeler is maintained in a to-and-fro pendulum motion by a cam disc mounted on the hook driving shaft for deflecting the feeler against the action of a spring.

In another known stop motion arrangement for sewing and embroidering machines a switch operable by a revolving cam is included in an electric circuit having stop motion contacts, said cam being connected with the stitch-forming elements of the machine to cause the switch to close the circuit only for the duration of the stitch. This circuit incorporates the winding of a relay which controls the stopping of the machine.

Another known device uses the bobbin case as such for monitoring the underthread and the retaining finger of the bobbin case as a means for generating a stop signal.

However, all these known underthread stop motions have the drawback that considerable difficulties arise when it is desired to fit them subsequently to an existing sewing or embroidering machine. Furthermore, they are in the way when threading the underthread and inserting the underthread bobbin. They also fail to provide the functional reliability which is essential to automatic embroidering machines, because the fluff which always collects in such a machine under the stitch plate impairs a rapid and reliable closing of the contacts even when the underthread is totally absent.

It is the object of the present invention to provide a means for breaking the circuit to the motor of a sewing or like machine when the underthread breaks, which avoids the aforesaid drawbacks and can be subsequently readily fitted to an existing machine.

The invention provides a means for stopping the motor when the underthread of a sewing machine or the like breaks, particularly automatic embroidering machines which comprises a rotatable hook having a shaft, a bobbin case adjacent said hook and entrainable thereby, a retaining finger mounted on said bobbin case and deflectable together with said bobbin case, an opening provided in said bobbin case for the withdrawal therethrough of the underthread, said opening being located with respect to the axis of the shaft of said hook so as to cause the underthread during withdrawal when the stitch is tightened to apply a torque to the bobbin case contrary to the direction of rotation of said hook, a pair of contacts provided for breaking the circuit to the motor when cooperating with each other, one of said contacts being formed by said retaining finger of said bobbin case and the other being formed by a stationary contact insulatedly located in the path of deflection of said retaining finger and extending toward said retaining finger in the direction of rotation of said hook, an electric circuit including said pair of contacts, a make-and-break switch also included in said circuit, and a cam arranged to operate said switch and connected with the stitch-forming elements of the machine

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to cause said switch to close said circuit during a portion of the stitching cycle.

The retaining finger of the bobbin case is electrically connected to the metal body of the machine through the hook and the hook driving shaft or through a stationary bobbin case cover.

Conveniently, the stationary contact for cooperation with the retaining finger of the bobbin case may be elastically mounted with respect to the bobbin case and may have a working face which is set at an angle to the direction of motion of the finger of the bobbin case. This permits the necessary pressure for establishing a reliable contact between the finger of the bobbin case electrically connected to the metal body of the machine and the cooperating stationary contact, which is connected with the winding of the relay, to be small.

A preferred embodiment of the invention will now be described by way of example and with reference to the accompanying drawing, in which:

FIG. 1 is a schematic view of a sewing machine, showing an underthread stop motion according to the invention;

FIG. 2 is a front elevational view of the bobbin case held in a ring-shaped holder which carries the stop motion and of the associated elements of the stop motion;

FIG. 3 is a side elevational view of the arrangement shown in FIG. 2, and

FIG. 4 is a top plan view thereof.

Referring now to the drawing, the underthread stop motion according to the invention comprises a stationary contact 3 which is insulatedly located in the path of deflection of a retaining finger 1 of a bobbin case 2. As shown in FIG. 1, a relay 5 with a winding 4 is electrically connected with the contact 3 and the circuit further includes a make-and-break switch 6 which is operable by a cam 8 mounted on the shaft 7 of a hook 11, voltage being supplied by a transformer 10.

The range of deflection of the finger 1 of the bobbin case 2 is determined by a widened recess 18 which is provided in a stationary part of the machine surrounding the bobbin case. According to the particular form of construction of the sewing, embroidering or like machine this part may be a bobbin case carrier, cover or ring-shaped holder.

As can be seen from FIG. 2, an underthread 9 when being withdrawn from the bobbin case 2 through an opening therein will urge the bobbin case 2 to rotate contrary to the direction of rotation of the hook 11. The underthread thus keeps the finger 1 of the bobbin case, which functions as a movable contact, in the open position. If no underthread is present or if the tension of the underthread slackens, then the friction occurring between the bobbin case 2 and the hook 11 would cause the bobbin case 2 to be entrained by the hook 11 until the finger 1 of the bobbin case 2 strikes against the contact 3 and thus closes the electric circuit through the relay winding 4, the switch 6, the transformer 10 and a return wire connected with the metal body of the machine at 13. An electrical circuit of generally conventional type suitable for this operation is disclosed in United States Patent 3,009,433 to Kuhn dated November 21, 1961. The relay 5 will thus stop the machine.

In normal operation the underthread 9 is kept under tension by a tensioning means in the form of a leaf spring 12 (FIGS. 3 and 4) which is mounted on the bobbin case 2.

The bobbin case 2 in the illustrated example is held in a ring-shaped holder 14 which is tiltable on a hinge 15. During operation the holder 14 is kept in position by a spring bracket 16 which clips into engagement with it. Secured to the holder 14 is a cross member 17 with a leaf spring which bears against the bobbin case 2.



The edge of the holder 14 facing the bobbin case 2 is formed with the recess 13 defining the range of deflection of the finger 1 of the case 2.

The contact 3 is located in the recess 13 in the direction of rotation of the hook 11, the working face of the contact being set at an angle to the direction of motion of the finger 1. The contact 3 is formed of a sheet metal strip which is attached to the cross member 17 of the holder 14 with the interposition of an insulating member 19 and which is appropriately bent to pass under the rim of the holder 14 and to project into the recess 13.

The aforescribed underthread stop motion functions as follows:

During each stitch the switch 6 which cooperates with the cam 8 is briefly closed, potential being thus applied from the transformer 10 to the contact 3. Due to the resistance offered by the leaf spring 12 mounted on the bobbin case 2 to the withdrawal of the underthread 9 from the bobbin, the bobbin case is urged in a direction contrary to the direction of rotation of the hook 11, thus preventing the finger 1 of the bobbin case 2 from touching the contact 3. However, when the bobbin is empty, or when the underthread breaks or becomes too slack, for instance by having run out of the leaf spring 12, then the bobbin case 2, which is electrically connected with the metal body of the machine, will be entrained by the hook 11 in the direction of rotation of same until the finger 1 strikes against the contact 3, closing the electric circuit as has been described and causing the relay 5 to stop the motor which drives the machine.

Since the bobbin case 2 must be removed from the machine for replacing the bobbin, and since the needle thread passes between the finger 1 and the contact 3 for forming each stitch, the finger 1 which functions as the movable contact is automatically swept clean of ends of thread, fluff and dust, thus ensuring that the stop motion will reliably operate.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

I claim:

1. Circuit closing mechanism for use with an automatic embroidery machine having stitch forming elements, said mechanism being adapted to de-energize the motor of the machine upon breakage of the underthread, including a rotatable shaft extending horizontally beneath the ma-

chine frame, an electrical circuit, a make-and-break switch in said circuit, a cam on said shaft arranged to operate said switch and synchronized with the stitch forming elements of the machine to cause said switch to close said circuit for a brief period during each stitching operation, a rotary hook mounted on said shaft, a pivotally mounted ring adjacent said hook, a bobbin carrier supported for rotative movement in said ring, a bobbin adapted to carry an underthread in said bobbin carrier, said ring having an elongated opening therein adjacent said hook, the underthread being adapted to extend through said opening, said opening being so located with respect to the axis of said shaft as to be adapted to cause the underthread during withdrawal when the stitch is tightened to apply a torque to the bobbin case contrary to the direction of rotation of said hook, a retaining finger comprising a first contact member fixed to said bobbin carrier extending through said opening, an insulated stationary contact carried by said ring extending through said opening at one end thereof, said underthread being adapted normally to bias said first contact member away from said fixed contact in a direction opposite the direction of rotation of said hook, said bobbin carrier frictionally engaging said hook whereby upon breakage of the thread the frictional engagement of said rotary hook with said bobbin carrier moves said bobbin carrier and hence moves said first contact into engagement with said stationary contact to close a circuit adapted to de-energize the motor of the machine.

2. Mechanism as claimed in claim 1, wherein the stationary contact for engagement with the retaining finger of the bobbin case is resiliently mounted with respect to the bobbin case and has a working face which is set at an angle to the direction of motion of the retaining finger of the bobbin case.

3. Mechanism as claimed in claim 2, wherein the ring is stationary during the operation of the machine but hingeably lowerable for replacement of the underthread bobbin, the ring being formed with a widened recess which determines the range of deflection of the retaining finger of the bobbin case, a cross member with a leaf spring is secured to the ring, and the stationary contact is formed of a sheet metal piece which is insulatedly attached to the cross member of the ring and is bent to pass under the rim of the ring and to project into the recess.

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