May 30, 1950 R. E. JOHNSON 2,509,600

ROTARY TAKE-UP FOR SEWING MACHINES

Filed July 27, 1948 3 Sheets-Sheet 1

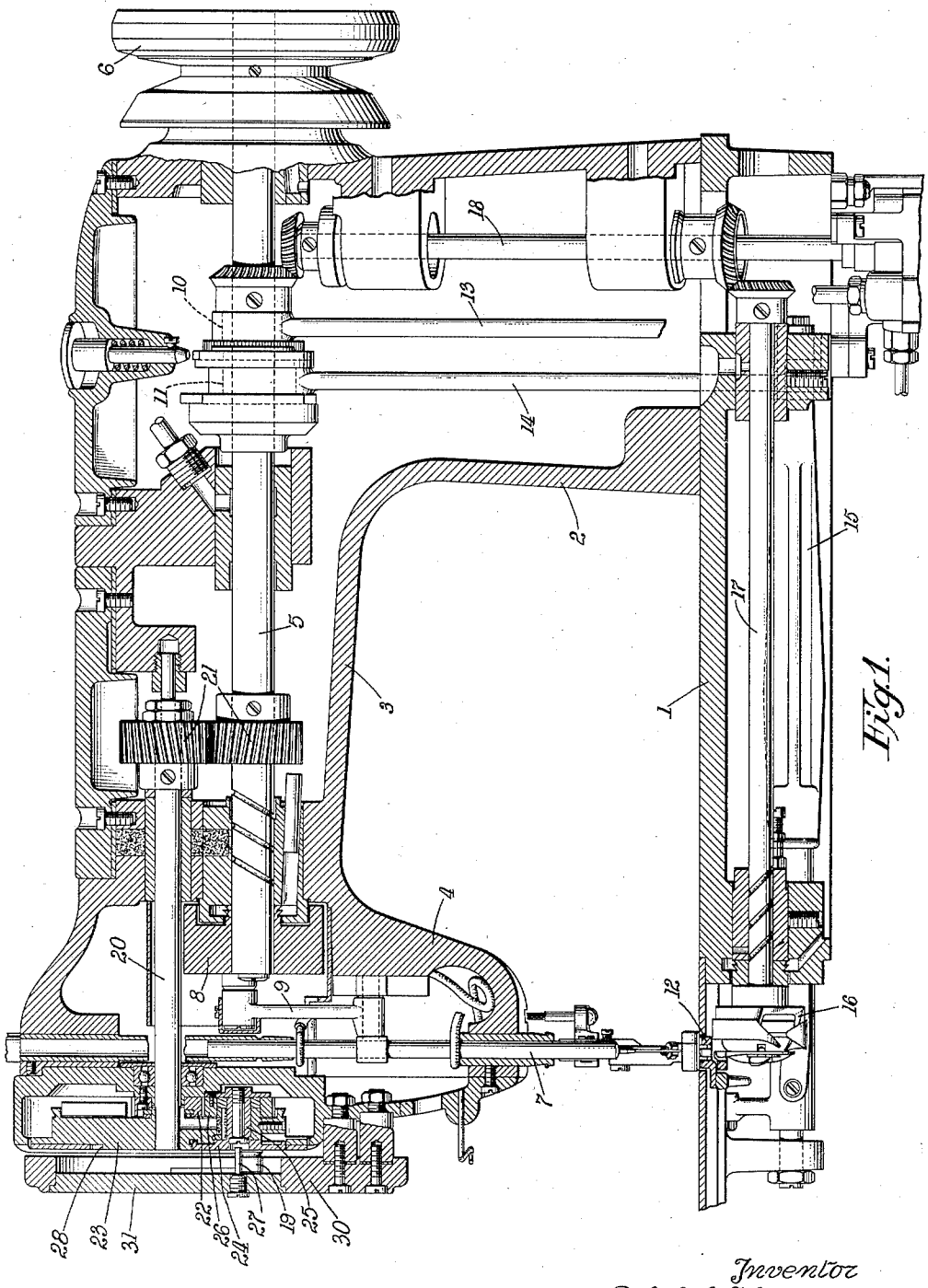

Fig. 1.

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Filed July 27, 1948 3 Sheets-Sheet 2

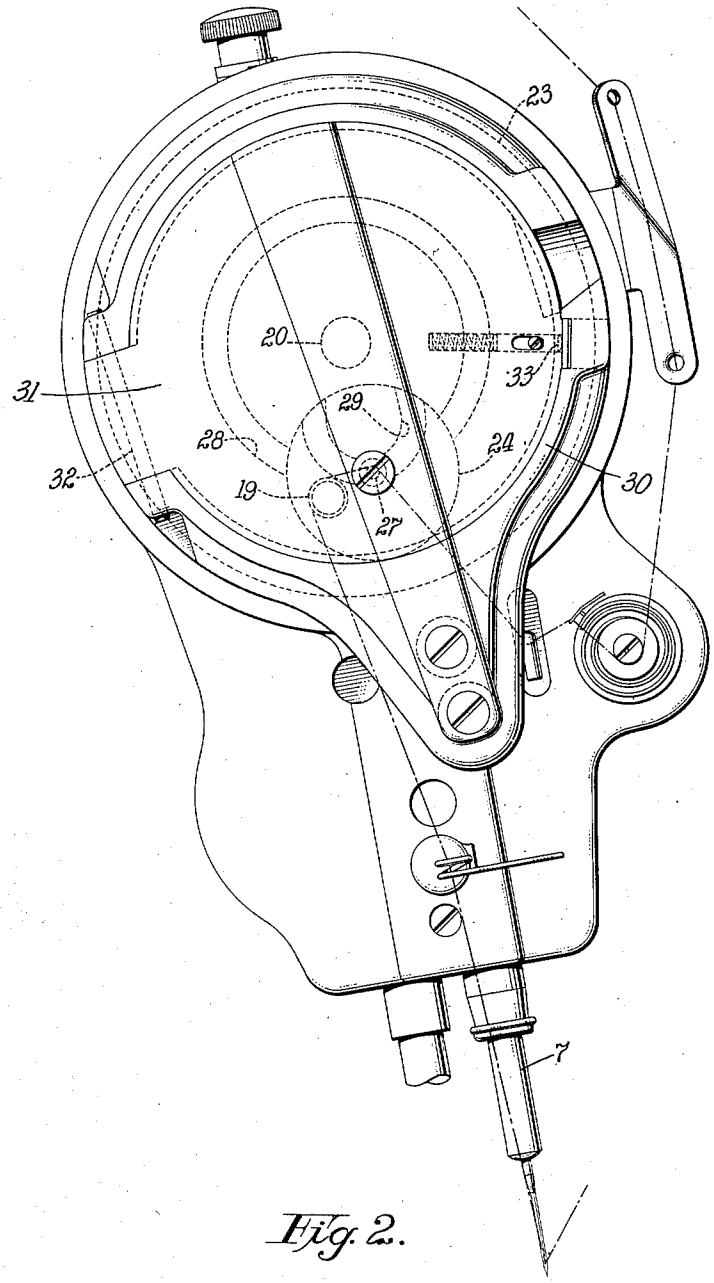

Fig. 2.

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ROTARY TAKE-UP FOR SEWING MACHINES

Filed July 27, 1948 3 Sheets-Sheet 3

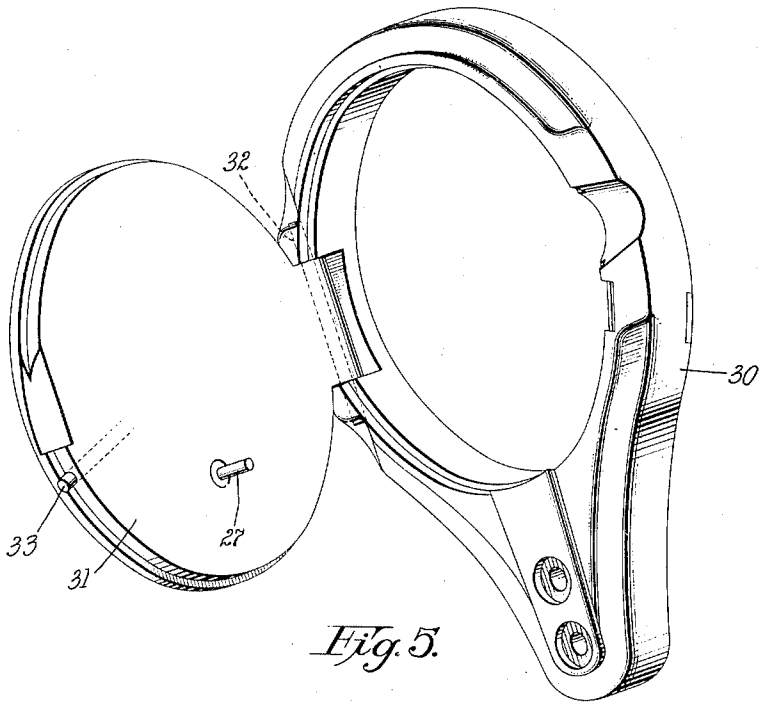

Fig. 5.

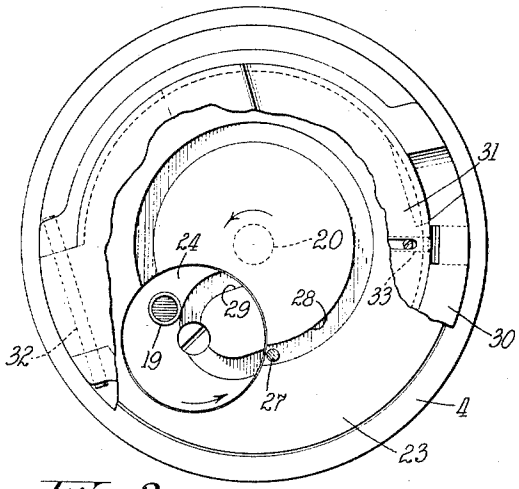

Fig. 3.

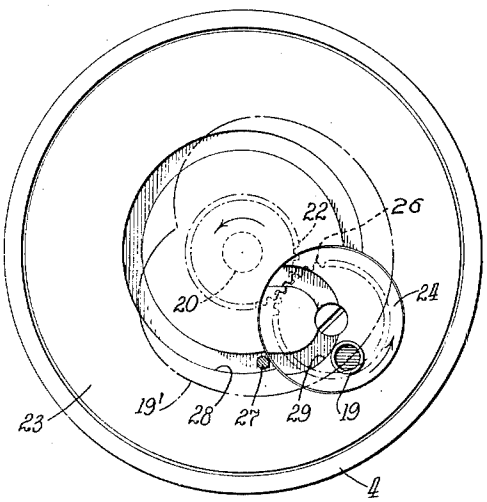

Fig. 4.

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UNITED STATES PATENT OFFICE

2,509,600

ROTARY TAKE-UP FOR SEWING MACHINES

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Application July 27, 1948, Serial No. 40,865

6 Claims. (Cl. 112—248)

1

This invention relates to a needle-thread take-up device for sewing machines, and more particularly to a rotary take-up for lock-stitch sewing machines.

A consequence of the use of rotary motion in the take-up or thread-controlling mechanism of a sewing machine is the probable occurrence of thread-winding in instances such as when the thread breaks and the end portion leading from the supply becomes snubbed or bound upon a rapidly revolving, thread-engaging element of the take-up.

A feature of this invention, therefore, is the development of a means for preventing thread-winding in rotary take-ups which is both effective in its operation and economical to produce. A further advantage of the new device is its adaptability to a single-rotary take-up, particularly one in which the thread-engaging element is cycled in a non-circular orbit.

The accompanying drawings show a preferred embodiment of the invention, in which,

Fig. 1 is a longitudinal vertical sectional view of a single needle, lock-stitch sewing machine containing the new take-up mechanism.

Fig. 2 is a head-end elevation of the sewing machine head and includes a full face view of the take-up.

Fig. 3 is a full face view of the take-up with a portion of the cover-plate broken away to reveal the movable, thread-engaging pin and the stationary thread-breaking pin.

Fig. 4 is a full face view of the take-up with the cover-plate completely removed and showing the rotatable, thread-engaging pin in a position subsequent to that shown in Fig. 2.

Fig. 5 is a perspective view of the cover-plate of the take-up showing the hinged element upon which the stationary thread-breaking pin is mounted.

The sewing machine in which the new take-up has been shown is of the conventional, single-needle, lock-stitch type, having a bed portion 1 supporting an upright standard 2 which carries an overhanging bracket-arm 3. The bracket-arm, which is provided at its free end with an enlarged hollow-head portion 4, houses a rotary arm-shaft 5 externally actuated through a belt-driven balance wheel 6. A needle bar 7, slidably mounted in the head portion is reciprocated by the arm-shaft 5 through a crank 8 and connecting link 9.

The arm-shaft also carries a feed-lift eccentric 10 and an adjustable, feed-advance eccentric 11 which convey the usual four-motor,

2

work-feeding movements to a feed-dog 12 through a pair of pitman links 13 and 14 and through a feed-advance rock-shaft 15 and a feed-lift rock-shaft (not shown). A rotary hook 16 is secured to the end of a rotary hook-shaft 17 journaled in the bed portion 1 and is driven from the arm-shaft 5 through a vertically disposed connecting shaft 18.

The take-up device comprises a single, movable, thread-engaging element 19 which is cycled in a mono-cusped, epitrochoidal orbit about the center of rotation of a rotary take-up shaft 20 which actuates the take-up. The take-up shaft 20 is driven from the arm-shaft 5 by means of a pair of gears 21 having a 1:1 speed ratio.

The epitrochoidal motion of the thread-engaging pin 19 is achieved by means of sun and planet motion in which a sun gear 22 is rigidly mounted to the frame of the sewing machine concentrically with respect to the take-up shaft 20 which extends therethrough. A large disk 23 is centrally mounted on the free end of the take-up shaft 20 and a small disk 24 having a hub-portion 25 is rotatably journaled in the large disk 23 eccentrically thereof. A planet gear 26 is secured to the hub 25 adjacent the inside face of the disk 23. The planet gear 26 meshes with the sun gear 22 and is caused to roll about the periphery thereof as the disk 23 is rotated by the take-up shaft 20. The small disk 24 is thus caused to revolve about the center of rotation of the take-up shaft 20, as well as to rotate about its own center. The thread-engaging pin 19 is mounted on the small disk 24 eccentrically thereof and hence partakes simultaneously of two revolutionary movements about spaced centers, resulting in its passing through a mono-cusped, epitrochoidal orbit 19' (Fig. 4) once for each stitch-forming cycle. For a detailed description of such a take-up motion, reference may be had to the U. S. patent application of D. A. Graesser, Serial No. 26,525, filed May 12, 1948.

This invention is primarily concerned with a means for preventing winding of the needle-thread upon the revolving, thread-engaging element. Without an anti-winding device it is possible, if the needle-thread should break, for a rotary take-up to wind upon its thread-engaging pin an extraordinarily large mass of thread in the brief interval it takes an operator to perceive the mal-function and stop the machine.

This anti-winding device comprises a stationary thread-breaking pin 27 the free end of which is received in a concentrically disposed

channel 28 in the large disk 23 during a portion of the take-up cycle, and in an interconnecting horseshoe channel 29 in the small disk 24 for the remainder of the cycle. The stationary thread-breaking pin 27 is supported by a take-up guard-plate 30 which is provided with a door 31 hinged thereto on an inclined axis 32. A latching detent 33 holds the door closed and maintains the stationary thread-breaking pin in its proper position relatively to the moving channels 28 and 29.

The annular, concentric channel 28 in the large disk 23 accommodates the stationary thread-breaking pin 27 for that portion of the cycle in which the large disk 23 is rotating past the stationary pin. The horseshoe channel 29 in the small disk 24 receives the pin for that portion of the cycle in which the small disk is being carried past the pin. In Fig. 4 the stationary pin is shown as it is passing from the channel 28 into the channel 29. In Fig. 2 the pin 27 is disposed in the center of the horseshoe channel 29, and in Fig. 3 it is passing from the channel 29 and reentering channel 28. The revolving thread-engaging pin at this point passes closer to the thread-breaking pin than at any other time in the take-up cycle, and in fact, momentarily yields control of the thread to the stationary thread-breaking pin over which the thread then lies (Fig. 2.) This represents the point at which the take-up gives up the maximum amount of thread to the needle and hook. In this interval the moving thread-engaging pin 19 has circumscribed the stationary pin 27. If, during the operation of the machine, the thread leading from the supply has at a previous point in the cycle become snubbed on the revolving thread-engaging pin 19, which condition precedes winding, it will be looped under the stationary pin 27 as the moving pin 19 describes its orbit thereabout. As the moving pin then moves upwardly away from the stationary pin the looped thread will be stressed, and the stress will increase with each cycle of the take-up until thread-breakage occurs, terminating the winding action.

It should be noted that because the free end of the thread-breaking pin projects into the channels 28 and 29, thereby extending inwardly beyond the root of the thread-engaging member, the possibility of the thread escaping off the end of the thread-breaking pin is practically precluded and its effective operation insured.

The broken piece of thread, if fouled on the pin 27, may then be removed by swinging open the hinged door 31, thereby carrying the breaking pin from its operative position to an exposed position facilitating the removal of the broken piece of thread. Because the door 31 is hinged on an inclined axis 32 it will, when released, tend to "fall" open, and will, furthermore, remain open until closed by the operator.

Having thus set forth the nature of the invention, what I claim herein is:

1. In a sewing machine, a rotary needle-thread take-up device including a thread-engaging member, driving mechanism for revolving said thread-engaging member in a mono-cusped epitrochoidal orbit at non-uniform angular velocities about a fixed center, a stationary thread-breaking element operative to prevent abnormal winding of the needle-thread on the thread-engaging member, and a carrier for positioning said thread-breaking element at a radial distance from the fixed center of revolution of the thread-engaging member greater than the minimum radius of revolution attained by said thread-engaging member and less than the maximum radius of revolution attained thereby.

2. In a sewing machine, a rotary needle-thread take-up device including a thread-engaging member, driving mechanism for revolving said thread-engaging member in a mono-cusped epitrochoidal orbit at non-uniform angular velocities about a fixed center, a stationary thread-breaking element operative to prevent abnormal winding of the needle-thread on the thread-engaging member, and a carrier for positioning said thread-breaking element within the orbital path traced by said revolving thread-engaging member at a radial distance from the fixed center of revolution thereof which is substantially equal to the minimum radius of revolution of the thread-engaging member plus one half of the distance between the minimum and maximum radii of revolution of the thread-engaging member.

3. In a lock-stitch sewing machine having a reciprocatory needle and a rotary hook, a rotary take-up device including a thread-engaging member, driving mechanism for revolving said thread-engaging member in a mono-cusped epitrochoidal orbit, a stationary thread-breaking element operative to prevent abnormal winding of the needle-thread on the thread-engaging member, and a carrier for positioning said thread-breaking element within the orbit of travel of said thread-engaging member, said thread-breaking element being disposed closest to the revolving thread-engaging member substantially at the point in the take-up cycle at which the take-up gives up the maximum amount of thread to the said needle and hook.

4. In a lock-stitch sewing machine having a reciprocatory thread-carrying needle and a rotary hook, in combination, a rotary needle-thread take-up including a thread-engaging member, driving mechanism for revolving said thread-engaging member in a mono-cusped epitrochoidal orbit, a stationary thread-breaking pin for preventing abnormal winding of the needle-thread about the thread-engaging member, and a carrier for positioning said thread-breaking member substantially along a straight line joining the thread-engaging member and the needle at that point in the take-up cycle at which the take-up gives up the maximum amount of thread to the said needle and hook.

5. In a sewing machine, a rotary needle-thread take-up device including a primary rotary element having a flat face and adapted to rotate about an axis substantially perpendicular to said face, a secondary rotary element mounted in said primary element eccentrically thereof and having a flat face substantially coplanar with respect to that of the primary element, means for rotating said primary element, means for concurrently rotating said secondary element about an axis parallel to that of the primary element, said secondary element thereby partaking of combination revolutionary and rotary movement, a thread-engaging element carried by said secondary rotary element eccentrically of the center of rotation thereof, a stationary thread-breaking pin for preventing abnormal winding of the thread on the thread-engaging element, said thread-breaking pin being disposed to project into the orbit of travel of the thread-engaging element, said primary rotary element being provided with a curvilinear channel to accommodate

the free end of said thread-breaking pin as the primary element rotates relative thereto, and said secondary rotary element being provided with a curvilinear channel interconnecting with that in the primary element and adapted to accommodate the thread-breaking pin as the secondary element rotates and revolves relative to the thread-breaking pin.

6. In a sewing machine, a rotary needle-thread take-up including a primary disk adapted to rotate about a fixed axis normal thereto, a substantially coplanar secondary disk rotatably mounted in the face of the primary disk eccentrically thereof and adapted to rotate about its own axis concurrently with the rotation of said primary disk, said secondary disk thereby partaking of combination rotary and revolutionary movement, a thread-engaging pin carried by said secondary disk eccentrically thereof, a stationary thread-breaking pin disposed substantially normal to the plane containing said disks and within the orbit of travel of said thread-engaging pin,

said primary disk being provided with an arcuate concentric channel for accommodating said thread-breaking pin as the primary disk is rotated relative thereto, and said secondary disk being provided with a curvilinear channel for accommodating said thread-breaking pin as the secondary disk is revolved and rotated relative thereto.

RALPH E. JOHNSON.

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The following references are of record in the file of this patent:

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