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CONSTRUCTION OF BOBBIN CASE ROTATION RESTRAINING MEANS

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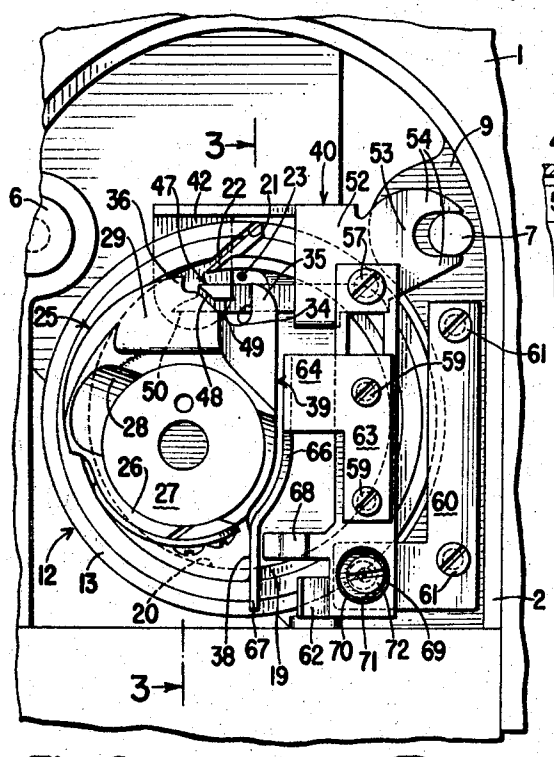


Fig. 2

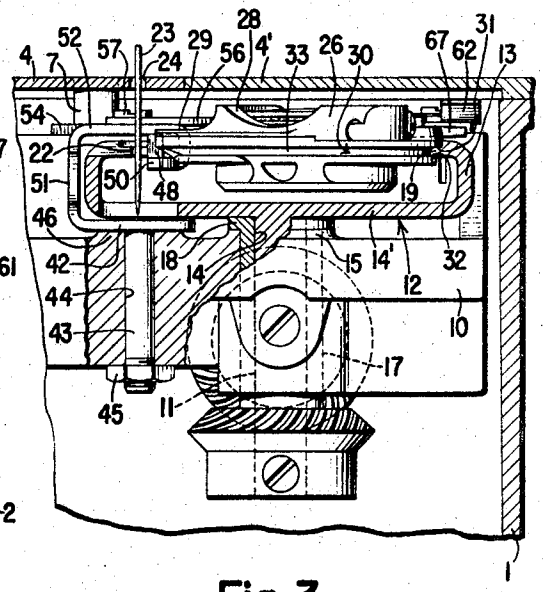


Fig. 3

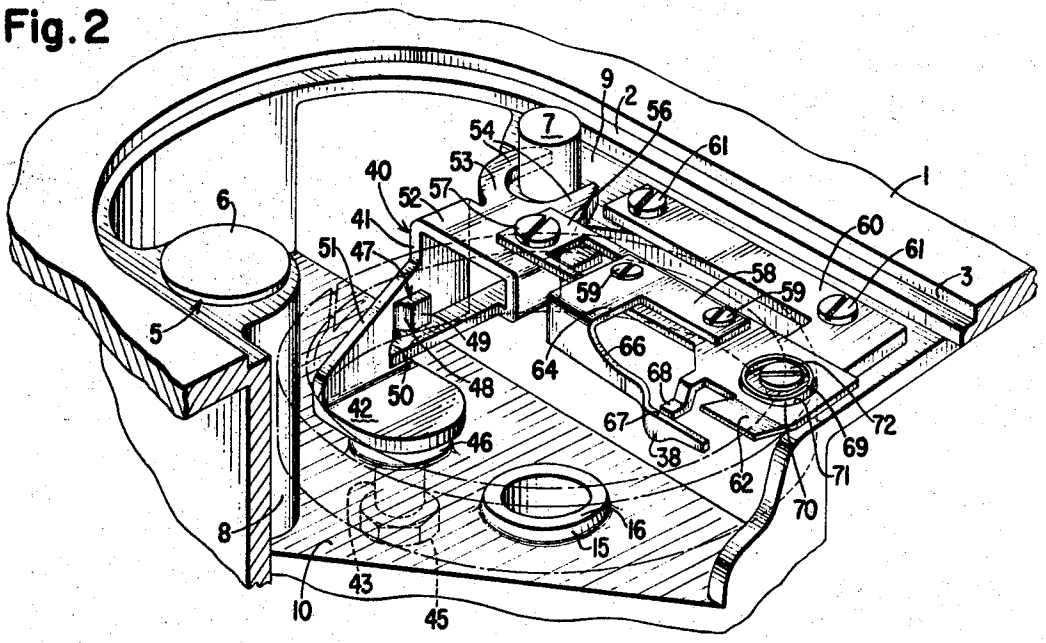


Fig. 1

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CONSTRUCTION OF BOBBIN CASE ROTATION RESTRAINING MEANS

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ABSTRACT OF THE DISCLOSURE

A sewing machine having means for holding the bobbin case stationary and preventing it from rotating with the loop taker or hook as the latter moves about its axis.

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to sewing machines and more particularly to a novel and improved rotation restraining means for the bobbin case of a vertical axis rotating loop taker, which restraining means also serves to releasably secure the bobbin case in proper operative position in the loop taker.

Description of the prior art

It is generally known in the art to provide a sewing machine with means for restraining the rotation of the bobbin case. However, the prior art structures used to accomplish this result have, for the most part, had to add parts to the basic sewing machine structure for mounting the restraining means. The use of these additional parts significantly increases the overall cost and complexity of the machine. This increased cost is partly due to the greater number of machining operations required, the increased number of strict tolerances that must be maintained for the added parts, and the added costs of assembling a relatively greater number of parts. It follows that, as a result of the increased number of parts, the means for restraining the thread carrier becomes a relatively more complex structure thereby presenting the increased probability of failure of the parts which go to make up the structure, thus making the mechanism less dependable. Also, as is well recognized in the sewing machine art, the possibility of thread entanglement increases with a corresponding increase in the number of parts required to carry out the sewing operation.

SUMMARY OF THE INVENTION

The present invention overcomes both these and other prior art deficiencies by providing a bobbin case restraining means located substantially entirely within the confines of the rotary hook and being secured in operative position by a pin used for mounting a throat plate which forms part of the basic structure of a sewing machine. The restraining means also includes a lug integrally formed with a nonrotatably mounted bracket and adapted to seat in a notch formed in the bobbin case. The elevation of the lug is determined by the same elevation which determines the elevation of the bobbin case, which latter elevation as is well recognized in the art, is of a particularly critical nature in order to insure proper coaction of the rotary loop taker and the reciprocating needle thereby necessitating relatively strict tolerances. Thus by relying upon structure already present in the sewing machine, it is seen that the present invention substantially decreases the number of machining operations required in the manufacture of the sewing machine and consequently the number of required strict tolerances.

Accordingly, it is a primary object of this invention to provide in a sewing machine a novel and improved restraining means that is of relatively simple design, highly economical, durable, dependable and efficient, and that will stationarily maintain the bobbin case during operation of the sewing machine.

Another object of this invention is to provide in a sewing machine having a vertical axis rotating hook, a novel and improved bobbin case restraining means which requires a minimum number of components for the mounting thereof on the sewing machine bed.

It is a further object of the present invention to provide a novel and improved bobbin case restraining means which is accurately mounted on an existing structure in the sewing machine, whereby no additional machining operations on the sewing machine bed are required.

It is also an object of the present invention to provide a properly orientated bobbin case retainer having substantially all of its associated structure outside of the confines of the rotary hook thereby reducing the possibility of interference with rotation of the hook as well as thread entanglement.

Having in mind the above and other objects that will be evident from an understanding of this disclosure, the invention comprises the devices, combinations and arrangements of parts as illustrated in the presently preferred embodiment of the invention which is hereinafter set forth in such detail as to enable those skilled in the art readily to understand the function, operation, construction and advantages of it when read in conjunction with the accompanying drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the bobbin case restraining means in accordance with the invention,

FIG. 2 is a top plan view of the bobbin case, the rotation restraining means and the loop taker of the sewing machine,

FIG. 3 is a vertical sectional view taken substantially on the line 3—3 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is illustrated as embodied in a sewing machine construction substantially in accordance with the sewing machine that forms the subject matter of the United States Patent of Johnson, No. 3,051,107, Aug. 28, 1962, wherein the machine is fully disclosed and to which reference may be had for a more complete understanding thereof.

With reference to the drawings, there is illustrated fragmentary portions of a bed **1** of a frame of a sewing machine having a laterally disposed U-shaped ledge **2** which is integrally formed with the inner surface **3** of a side wall of the bed **1**, and which is adapted to provide a seat for a throat plate **4** and a slide plate **4¹**, upon which throat plate the work is to be supported and held down by a presser foot (not shown). The throat plate **4** is adapted to be secured in its operative position by the combined coaction of a conventional spring loaded clamp generally indicated at **5**, having a head **6**, and a mounting stud or position pin **7** located transversely of the clamp **5** adjacent to the side wall of the bed **1**. The position pin **7** must be accurately located so that the throat plate can be properly held in place on the ledge **2**. The clamp **5** is disposed in a boss **8** integrally formed with both the inner surface **3** and the ledge **2**, while the position pin **7** is mounted in a recess formed in a bracket supporting shelf **9**, the latter of which is integrally formed with and transversely disposed from the surface **3**. The throat plate and slide plate provide a top cover for the sewing mechanism situated within the bed **1**, while a platform **10** of the bed **1** forms

a support upon which the said mechanism may be mounted.

As best illustrated in FIG. 3, an integrally formed depending hook shaft **11** of a vertical axis circularly moving loop taker of the rotating hook type, indicated generally at **12**, is journaled in the platform **10**. Rotation is imparted to the hook shaft **11** by an actuating mechanism similar to that described in the aforementioned Johnson patent. The rotary hook **12** is generally cup-shaped and comprises an outer ring **13** and the hook shaft **11** which is journaled in a bore **14** of a bushing **17** disposed in the platform **10** of the bed **1**. A boss **15** having an exposed peripheral surface **16** (see FIG. 1) is formed with a recess and is adapted to receve the hook shaft and bushing therein. The bushing **17** is concentrically located relative to the shaft **11** and comprises a concentric flange **18** seated on the milled surface **16** of the boss **15**. The vertical orientation of the hook is established with reference to the platform **10** and must be maintained within a relatively strict tolerance as is also true of the lateral orientation of the hook, for proper coaction with a reciprocating needle **23** shown in FIG. 3. The bore **14** is connected to the outer ring **13** of the rotary hook **12** by way of an arm **14¹** which effectively defines the bottom of the ring. The bottom of the ring is open except for the said arm. The ring **13** is also open at the top and has an inwardly directed flange **19** terminating in a free edge **20** which is circular and disposed concentrically of the axis of the hook shaft **11**. The continuity of the flange **19** is broken only by a slot **21** cut through the flange **19** from the free edge **20** and into the ring **13**. The slot **21** is orientated to define a loop seizing beak **22** situated internally of the hook **12**. It can be seen in FIG. 2, that except for a lug **47** and a portion of a spring-carrying member **58**, both of which are to be discussed hereafter, a bobbin case rotation restraining means **40** is disposed entirely outside the confines of the rotary hook **12** so that it will not interfere with rotation of the hook or cause any unnecessary thread entanglement.

The needle **23** passes through a needle hole **24** formed in the throat plate **4**. This hole must be accurately located for the needle to rise and dip without any sticking or rubbing which would interfere with good loop formation. This also requires that the opening in the bottom of the hook be located below the needle when it reaches its lowermost position (see FIG. 2) so that the needle can form the thread loop. Thus the importance of properly locating the throat plate and the hook is readily apparent, the former being accomplished by way of pin **7** and the latter by boss **15**. Included among the functions of the needle **23** is that it carries thread (not shown) through the needle hole **24** below the throat plate **4** where the stitch forming mechanism, to wit, the loop taker or hook **12**, can enter a thread loop formed by the needle at the proper time thereby forming the desired stitch. Thus, it is apparent that the loop seizing beak **22** must be at the proper elevation for the beak to seize the loop formed when the needle carries the thread down through the needle hole **24**. This is best illustrated by the relative location of the needle **23** and loop seizing beak **22** shown in FIG. 3. An inaccurate elevation of the hook can produce a faulty stitch because the beak of the hook will not properly enter the thread loop formed by the needle.

A thread carrier or more specifically a bobbin case, generally indicated at **25** (see FIG. 2), is eccentrically situated within the periphery of the rotary hook **12** relative to the axis of the hook shaft **11**. The bobbin case is mounted, as discussed below, so that the ring **13** can rotate relatively thereto. The bobbin case **25** includes a recess defined by an annular wall **26** (FIG. 3) for receiving a thread carrying bobbin **27**. The bobbin seats on a flange (not shown) extending inwardly from the lower portion of the wall **26** towards the center of the recess. The bobbin case is provided with a finger notch **28** which facilitates removal of the bobbin. Extending endwise from approximately the mid-point of the wall **20** is a transversely disposed flange **29**. In order to support the bobbin case in the ring **13** of the rotary hook **12** there are provided cooperating bearing surfaces between them. Towards this end, there is provided on the bobbin case **25**, as shown in FIG. 3, a peripheral groove **30** comprising a lower surface **32** and a peripheral bearing surface **33** which is adapted to receive the inner flange **19** of the ring **13**. As illustrated in FIG. 3, an upper surface **31** of the groove **30** bears against the top surface of the flange **19**, the lower surface **32** bears against the bottom surface of the flange **19** and the peripheral surface **33** is formed so as to be complemental to the free edge **20** of the flange **19**, which edge normally abuts against the surface **33**. As illustrated in FIG. 2, the flange **29** has a notch **34** formed therein adapted for receiving a lug and comprising a finger **35**, a shoulder **36** and an abutment face **37**. At its end opposite from the notch **34** the flange **29** has an abutment surface **38** which, during normal operation of the sewing machine, bears against a rotation restraining spring member. For a more specific description of the remaining structural parts of the bobbin case reference may be had to aforementioned Johnson patent.

The bobbin case **25** is generally semicircular in shape with a diametrical edge **39** defined by the abutment surface **38**, an adjacent edge of the wall **26**, and an edge of the finger **35**. Thus, as best illustrated in FIG. 2, when in operative position the bobbin case **25** is disposed eccentrically within the ring **13** with the peripheral bearing surface **33** against the free edge **20** and the diametrical edge **39** disposed substantially diametrically of the ring **13**. In order to maintain the above described operative position of the bobbin case **25** and to prevent it from rotating as the hook **12** turns, there is provided a bobbin case retainer generally indicated at **40**.

As shown in FIG. 1, the retainer **40** includes a positioning bracket **41** having a U-shaped flange **42** mounted on a threaded stud **43**. The stud **43** is in a hole **44** formed in the platform **10** provided for the mounting of the rotary hook **12** and is secured to the platform by a nut **45** on the threaded stud **43** at the underside of the said platform **10**. The hole in which the stud **43** is mounted is defined by a boss **46** on the upper surface of the platform **10**. The surface of the boss **46** provides a seating surface for the lower surface of the U-shaped flange **42**, as shown in FIG. 3, and is at substantially the same elevation relative to the upper surface of the platform **10** as is the surface **16** of the boss **15** which receives the hook shaft **11** and the hook shaft bushing **17**. Thus, by having the surfaces of the bosses **15** and **46** at identical elevations relative to a common reference surface, to wit, the upper surface of the platform **10**, only a single milling operation is required to establish them at the desired distance from the said reference surface. The flange **18** of the bushing **17** is of such depth as to properly elevate the rotary hook **12** when considered in conjunction with the height of the boss **15** relative to the upper platform surface for proper operative relationship with the reciprocating needle and the throat plate. The bobbin case retainer **40** includes a conventional lug **47** having a substantially chisel-shaped cross-section, a flat inclined abutment surface **48** and a transversely disposed substantially flat surface adjacent thereto. The lug **47** functions to secure the bobbin case against roation by seating in the restraining notch **34** thereof so that the inclined abutment surface **48** bears against the abutment face **37** of the notch **34** as the bobbin case **25** tends to rotate in a clockwise direction caused by the rotation of the ring **13** about its axis. The lug **47** is mounted on and adjacent the free end of a supporting finger **50** which is disposed inwardly of the periphery of the ring **13**. The lug **47** is arranged relative to the surface of the boss **46** so that it substantially corresponds to the elevation of the restraining notch **34** of the bobbin case **25** as determined by the height of the ring **13** with which the bobbin case **25** is operatively associated, where-

by the reference surface of the platform **10** is relied upon as the common base for all these elevations. Thus it is seen that the elevation of both the lug **47** and the bobbin case **25** is critical and must be maintained within strict tolerances during manufacture of the structural components which give the parts their overall height in order to produce a properly operative sewing machine. Failure to locate the lug and bobbin case at substantially the same elevation would result in the lug not properly seating within the notch **34** and thus, accordingly, there would not be any restraining force to preclude undesirable clockwise rotational tendency of the bobbin case. The lug **47** is laterally spaced at such a distance from a triangular-shaped vertical wall **51** integrally formed with the flange **42** to allow for the ring **13** of the rotary hook to freely pass therethrough. The supporting finger **50** upon which the lug **47** is mounted, is joined by a top wall **52** and a wall transversely depending therefrom. The radial location of the lug **47** is accomplished by means of properly locating the parts comprising a retainer **40** and particularly, by way of a fork-shaped finger **53** adjacent the top wall **52** of the positioning bracket **41** whose prongs or tines **54–55** are substantially circumferentially disposed relative to the position pin **7** used to position the throat plate of the sewing machine. The location of this pin is highly critical and requires strictly maintained tolerances in order to properly locate the throat plate. The pin **7**, as best illustrated in FIG. 1, is mounted on the shelf **9** integrally formed with and transversely extending from the lower part of the side wall of the ledge **2**. The bobbin case retainer **40** further includes a releasably mounted pivotal member **56** which pivots about the axis of a screw **57** fastening the member **56** to the top wall **52** of the positioning bracket **41**, a spring-carrying member **58** secured to the pivotal member **56** between the extremities thereof by means of screws **59**, and a substantially L-shaped supporting member **60** mounted on the shelf **9** with a pair of screws **61**. The pivotal member **56** is elongated and has an upwardly inclined lip portion **62** depending therefrom and is adapted to be manually lifted up and urged away from or towards the abutment surface **38** of the bobbin case **25**, as the case may be. The spring-carrying member **58** comprises a top surface **63** having a portion **64** extending beyond an edge of the pivotal member **56** wherefrom depends a bias portion **65** which is adapted to limit any counterclockwise rotational tendency of the bobbin case **25** by means of a downwardly bent arm **66** terminating in a spring section **67** constructed and arranged so that it will bear against the abutment surface **38** of the bobbin case. The bias portion **65** has a certain amount of resiliency inherently present therein and accordingly requires some restriction on its counterclockwise movement. This end is accomplished by means of a limiting flange **68** spaced from the lip **62** and having angularly orientated surfaces adjacent one another. The lowermost portion of the limiting flange **68** is spaced from and disposed rearwardly of the spring section **67** relative to the abutment surface **38** of the bobbin case **25**. This latter portion will bear against the rear surface of the spring section **67**, should the section be urged backwards, thereby limiting the section's lateral displacement.

The bobbin case retainer **40** is provided withan arrangement at the free end of the pivotal member **56** which positions the said member and thus the spring section **67** fastened thereto whereby there is provided a means for adjusting the restraining tension with which the bobbin case **25** is secured in operating position. The arrangement includes a cup-shaped washer **69** having a central aperture and a peripherally disposed rim **70**. The washer **69** is received within an elongated opening **71** in the pivotal member **56** and is secured to the supporting member **60** by a screw **72**. The central aperture of the washer **69** is substantially greater than the shank of the screw **72**, to provide for adjustment of the washer in a radial direction of the pivot screw **57** and hence, for adjustment of the alignment of the spring section **67** relative to the abutment surface **38** of the bobbin case **25**. The head of the screw **72** is disposed entirely within the periphery of the washer **69** and has a surface which is in substantially the same plane as the upper surface of the rim **70** thereby precluding the possibility of any thread becoming entangled with the screw head. The pivotal member **56** is adapted to be lifted from its normal operative position around the washer **69** and swung about the pivot screw **57** allowing for movement of the free end of the said pivotal member away from the bobbin case **25** thereby permitting ready removal of the bobbin case **25** from the ring **13**.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to a preferred embodiment of my invention which is for purpose of illustration only and not to be construed as a limitation of the invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.

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

1. In a sewing machine having a frame, a bed forming a lower portion of said frame, said frame having a head portion, said head portion having an endwise reciprocatory thread-carrying needle disposed therein, said bed having a positioning pin supported therein, said bed including a platform for supporting a lower stitch-forming mechanism, said platform being provided with a first raised portion and a second raised portion, a circularly movable loop taker journaled in said platform and including a ring, said loop taker being seated on said first raised portion of said platform and being elevated relative thereto whereby said loop taker operatively coacts with said thread-carrying needle, a bobbin case, said bobbin case and said ring having cooperating bearing surfaces arranged so that said bobbin case is also elevated relative to said platform, said ring supporting said bobbin case while allowing for circular movement of said ring relative to said bobbin case, constraining means for preventing said bobbin case from movement with said ring or relative thereto, said constraining means being constructed and arranged so that said bobbin case is releasably restrained from circular movement, said constraining means cooperating with said positioning pin to properly locate said bobbin case relative to said needle, said constraining means being seated on said second raised portion of said platform and being elevated relative to the same surface as the bobbin case and the rotary hook, said first and second raised portions of said platform having substantially the same elevation relative to said platform, whereby said platform provides a common reference surface.

2. In a sewing machine in accordance with claim **1** wherein said constraining means is constructed and arranged so that it is located substantially entirely outside the peripheral confines of said loop taker, said constraining means having only the circular restraining portion thereof being operatively associated with said bobbin case whereby said constraining means does not interfere with movement of said loop taker.

3. In a sewing machine in accordance with claim **1** wherein said bobbin case includes a restraining notch adapted for receiving a lug therein, said constraining means comprising a positioning bracket including a lug thereon, said lug being orientated so that it operatively engages said notch to preclude circular movement of said bobbin case.

4. In a sewing machine in accordance with claim **3** wherein said constraining means further includes a bias portion for operatively engaging a surface of said bobbin case whereby said lug prevents circular movement of said bobbin case in a first direction and said bias portion

limits circular movement of said bobbin case in a direction opposite said first direction.

5. In a sewing machine having a frame including a work supporting bed and an overhanging bracket-arm terminating in a head, an endwise reciprocatory needle bar journaled in said head, a thread carrying needle fixed in said needle bar, a circularly movable loop taker supported in said work supporting bed and disposed to cooperate with said thread carrying needle in the formation of lock stitches, a throat plate mounted on said work supporting bed and provided with a needle hole through which said needle reciprocates, a stud fixed in said work supporting bed and disposed to assist in holding said throat plate in correct register with said endwise reciprocating needle, a platform formed in said bed and providing a bearing supporting said loop taker for circular movement, a bobbin case journaled in said loop taker, and bobbin case rotation restraining means cooperating with said bobbin case to restrain said bobbin case from moving

with said circularly moving loop taker, said bobbin case rotation restraining means fastened to said platform and having a finger cooperating with said throat plate locating stud to lock said rotation restraining means on said platform accurately with respect to said circularly moving loop taker and said bobbin case.

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