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LUBRICATING DEVICES FOR SEWING MACHINE LOOP TAKER

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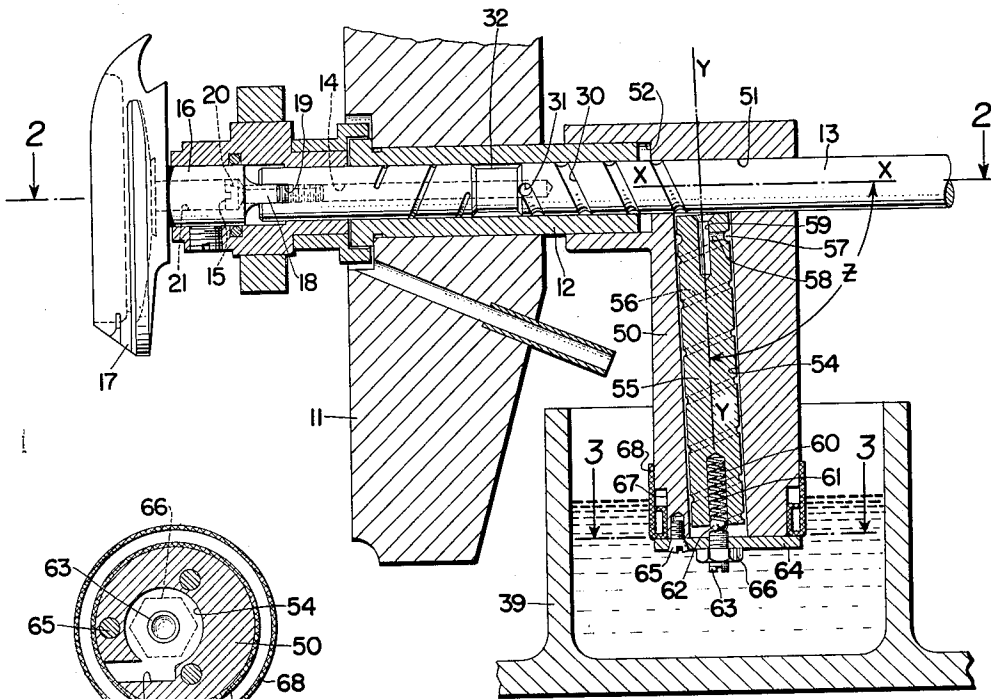


Fig. 1

Fig. 3

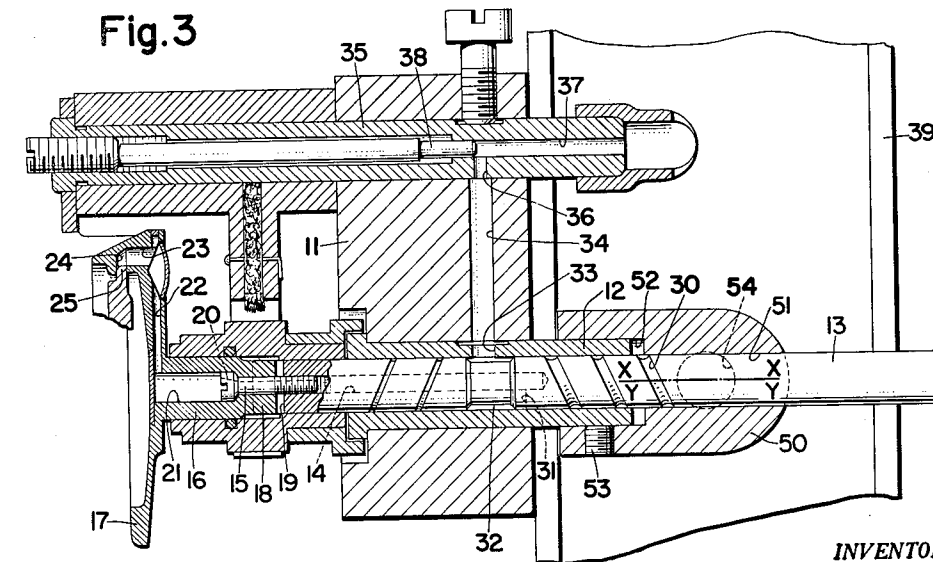


Fig. 2

WITNESS

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3,084,648 LUBRICATING DEVICES FOR SEWING MACHINE LOOP TAKER

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This invention relates to lock stitch sewing machines and more particularly to a novel and improved device for lubricating the raceway between a bobbin case and a circularly moving loop taker in a lock stitch sewing machine.

The requirements for the lubrication of a loop taker raceway are severely exacting. Too little lubricant delivered at any operating condition can cause the loop taker to overheat and seize, while even a slight excess delivered at any operating condition can cause work spoilage by oil staining.

It is known in the art to direct lubricant through an axial bore in a loop taker shaft and through radial bores therefrom to the loop taker raceway. It is also known to provide for a degree of regulation of pressure of lubricant in the loop taker shaft bore by a valved by-pass so as to influence the amount of lubricant which will be delivered to the loop taker.

The present invention is specifically concerned with the problem of delivering lubricant under pressure into the axial loop taker shaft bore for loop-taker raceway lubrication. Previously known devices of this category might be classified as being one of two types, i.e., those in which lubricant is delivered to the exterior of the loop taker shaft at atmospheric pressure as by gravity or by spray or mist as a result of agitation and thence into the shaft bore by means of a spiral groove on the shaft, and those in which the lubricant is delivered to the loop taker shaft at above atmospheric pressure usually by an auxiliary pump. Those delivering lubricant at atmospheric pressure encourage the introduction to the bearing surfaces of lint, dust and foreign material. Those involving an auxiliary pump means are generally complicated, involve plumbing, and require pump driving elements which make for a prohibitive cost insofar as concerns their practical use in sewing machines.

Moreover, either category of known devices for loop taker lubrication provides a greater variation in lubricant pressure in the axial loop taker shaft bore as the sewing speed varies than it is possible for the known valved by-pass to regulate satisfactorily.

It is an object of this invention to provide a simple and effective lubricant pump means for delivering lubricant at a substantially constant above atmospheric pressure to the exterior of the loop taker shaft and into the axial bore of a loop taker shaft for loop taker lubrication.

A further object of this invention is to provide a lubricant pump arrangement which may be disposed conveniently adjacent a sewing machine loop taker.

A still further object of this invention is to provide a lubricant pump means for sewing machine loop taker lubrication with a simple and effective means for selecting a substantially constant pressure at which the pump means will deliver lubricant.

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In the accompanying drawing of a preferred embodiment of this invention,

FIG. 1 represents a vertical cross sectional view of a loop taker drive shaft and associated supporting means having this invention applied thereto and including fragments of the sewing machine casing,

FIG. 2 represents a horizontal cross sectional view of the loop taker drive shaft and the means associated therewith taken substantially along line 2-2 of FIG. 1, and

FIG. 3 is a cross sectional view taken substantially along line 3-3 of FIG. 1.

In the drawing, 11 indicates a web in a sewing machine casing in which is affixed a bushing 12 having a loop taker shaft 13 journaled therein. The loop taker shaft is formed with an axial bore 14 tapped at the free extremity to accommodate a fastening screw 15 by which the shank 16 of a loop taker 17 is secured to the loop taker shaft with a tang 18 on the shank seated in a transverse slot 19 formed in the free extremity of the loop taker shaft.

A slot 20 lengthwise of the fastening screw 15 admits lubricant from the loop taker shaft bore to a bore 21 in the loop taker shank, which communicates by way of conduits 22 and 23 formed in the loop taker with a bearing raceway 24 in the loop taker in which a non-rotatable bobbin case bearing rib 25 is journaled.

The loop taker shaft 13 is formed externally with a spiral groove 30 terminating at a radial port 31 communicating with the axial bore 14, and lubricant delivered to the exterior of the loop taker shaft will upon rotation of the shaft be delivered into the axial bore. The spiral groove 30 also communicates with an annular shaft portion 32 of reduced diameter which opens onto a radial port 33 in the bushing communicating with a by-pass conduit 34 in the web 11. A valve body 35 secured in the web 11 is formed with a radial port 36, joining the conduit 34 with an axial bore 37 in the valve body. A needle valve stem 38 threadedly engaging the valve body is journaled in the axial bore 37 and may be adjusted to expose a selected portion of the radial port 36 to regulate the by-pass of lubricant from the loop taker shaft. The axial bore 37 opens at one extremity of the valve body vertically above a lubricant reservoir 39 formed in the sewing machine casing beneath the loop taker shaft.

The lubricant pump of this invention comprises a pump body member 50 formed with a transverse bore 51 snugly accommodating the loop taker shaft 13 and counterbored as at 52 slidably to embrace the loop taker shaft bushing 12. A set screw 53 serves to secure the pump body member in place on the loop taker shaft bushing with the pump body member 50 depending into lubricant in the reservoir 39.

The pump body member is formed lengthwise with a bore 54 having an axis Y-Y which preferably intersects the axis x-x of the loop taker shaft accommodating bore 51 at an angle slightly out of perpendicular relation thereto. As indicated in FIG. 1 the angular relation Z between the bores 51 and 54 is preferably on the order of 85° although a variation of several degrees is permissible.

Journalled in the bore 54 is a pump shaft 55 formed externally with a spiral groove 56 which is continuous to the lower extremity of the pump shaft 55 but which terminates at the upper extremity of the pump shaft in an

annular groove 57 spaced from the upper extremity of the pump shaft. A radial port 58 connects the annular groove 57 with a blind axial bore 59 formed in the upper extremity of the pump shaft 55. The spiral groove 56 might also be formed in the pump shaft accommodating bore 54.

At the lower extremity, the pump shaft 55 is formed with a blind axial bore 60 accommodating a coil spring 61 which biases an anti-friction ball bearing 62 into seated relation against a screw 63 threaded into a cap 64 secured beneath the pump body member as by screws 65. A lock nut 66 may be used to maintain selected adjustment of the screw 63 in the cap.

The pump body member at the lower extremity is formed with an annular external groove 67 accommodating an annular screen wire filter 68. The body member is also formed with a lubricant conduit groove 69 leading from the external groove 67 to the bore 54.

In operation, the top of the pump shaft being formed at right angles to the axis Y—Y of the pump shaft, and thus providing a right circular pump shaft extremity, is urged by the coil spring 61 into engagement at only one side with the loop taker shaft 13 so that upon rotation of the loop taker shaft, the pump shaft will be driven by the frictional engagement of only one side of the pump shaft therewith. Lubricant will be elevated by the spiral groove 56 to the annular groove 57 and through the port 58 and bore 59 to the space between the top of the pump shaft and the loop taker shaft bore. The spiral groove 30 in the loop taker shaft extends into the space between the loop taker and pump shafts so as by way of the port 31 to provide for admission of lubricant under the pressure developed by the pump shaft into the axial bore 14 of the loop taker shaft and thence to the loop taker raceway.

The pressure developed by the pump shaft 55 is self-regulating in that lubricant pressure in the space between the loop taker and pump shafts acts axially on the pump shaft in opposition to the coil spring 61 to lessen the normal forces upon which the frictional driving engagement between these shafts depends. An increase in pressure developed by the pump thus automatically results in a decrease in the frictional driving force imparted to the pump shaft decreasing the effectiveness of the pump and vice versa. The screw 63 may be adjusted to provide for a control of the lubricant pressure at which the pump will tend to maintain a constant value.

The importance of the pump of this invention toward the provision of ideal loop taker raceway lubrication is first in that it provides for a positive above atmospheric pressure on the loop taker shaft exterior thus preventing lint, dust, and foreign material from being drawn into the lubricant. Second, the provision of a substantially constant high lubricant pressure at the loop taker shaft exterior over the entire speed range of the machine results in a far more constant lubricant pressure within the axial loop taker shaft bore. The by-pass valve 38 thus will provide for a more even control over the lubricant pressure throughout the speed range of the machine. This substantially constant pressure within the lubricating system will not be affected appreciably by the spiral groove 30 in the loop taker shaft. Since the spiral groove 30 with this invention is supplied lubricant under pressure from the pump shaft 55, its influence will be minimized and, moreover, the effect of the spiral groove 30 in increasing the pressure as the sewing machine speed increases will be offset by the corresponding increase in the centrifugal force imparted by the radial port 31 in resisting passage of lubricant into the axial loop taker shaft bore.

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

1. A lubricating device for the loop taker raceway of a sewing machine having a casing, a lubricant reservoir in said casing, a loop taker drive shaft journaled in said

casing and communicating lubricant conduit means formed in said loop taker and in said loop taker drive shaft, said lubricating device comprising a pump housing formed with a transverse bore snugly embracing said loop taker drive shaft, means for fixedly securing said pump housing relatively to said sewing machine casing, a portion of said pump housing depending into said lubricant reservoir and formed with a longitudinal bore joining said transverse bore and opening onto said lubricant reservoir, said longitudinal bore having an axis intersecting the axis of said transverse bore in non-perpendicular relation, a pump shaft formed with an external spiral groove journaled in said longitudinal bore, said pump shaft being formed with a right circular extremity contiguous to said loop taker drive shaft, and spring means for urging said right circular extremity of said pump shaft into engagement with said loop taker drive shaft.

2. In a lock stitch sewing machine having a casing, a rotatable loop taker, a driven rotary loop taker shaft, journaled in said casing and operably connected to said loop taker, said loop taker shaft being formed with an axial bore, a raceway formed in said loop taker, a bobbin case journaled in said raceway, lubricant conducting conduits connecting said raceway with said loop taker shaft axial bore, a lubricant reservoir in said casing beneath said loop taker shaft, a bypass conduit communicating with said loop taker shaft axial bore and said lubricant reservoir for influencing lubricant pressure in said loop taker shaft axial bore, and means for elevating and delivering lubricant from said reservoir to said loop taker shaft bore at substantially constant pressure over a range of loop taker shaft rotation speeds comprising a pump housing formed with a transverse bore snugly embracing said loop taker shaft, means for fixedly securing said pump housing relatively to said sewing machine casing, a portion of said pump housing depending into said lubricant reservoir and formed with a substantially vertical pump shaft bore, joining said transverse bore and having an axis intersecting the axis of said transverse bore in non-perpendicular relation, a pump shaft journaled in said pump shaft bore, said pump shaft and said pump shaft bore being formed one with a smooth cylindrical surface and the other with a mating cylindrical surface formed with a spiral groove therein, said pump shaft being formed with a right circular extremity contiguous to said loop taker drive shaft, and spring means for urging said right circular extremity of said pump shaft into engagement with said loop taker drive shaft.

3. A device as set forth in claim 2 in which said spiral groove terminates in spaced relation from said transverse bore, said right circular extremity of said pump shaft being formed with a blind axial bore and conduit means formed in said pump shaft and extending from said blind axial bore radially into communication with said spiral groove.

4. A lubricating pump adapted for use on a driven rotary shaft of a sewing machine for delivering lubricant to said driven shaft at a substantially constant pressure over a range of driven shaft rotation speeds comprising, a pump housing formed with a driven shaft accommodating bore, a pump shaft bore formed in said pump housing intersecting said driven shaft accommodating bore and having an axis intersecting that of said driven shaft accommodating bore in non-perpendicular relation, a pump shaft journaled in said pump shaft bore and formed with a right circular extremity adjacent to said driven shaft accommodating bore, said pump shaft formed with a spiral lubricant elevating groove, spring means for urging said circular extremity of said pump shaft toward said driven shaft accommodating bore, and lubricant inlet means in said pump housing leading to a point on said pump shaft spaced from said right circular extremity.

5. A lubricating pump as set forth in claim 4 in which said spring means comprises a blind axial bore formed in

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the extremity of said pump shaft opposite said right circular extremity, a coil spring seated in said blind bore, a spherical anti-friction element engaging said spring and an abutment member carried by said pump housing and engaging said anti-friction element in opposition to said coil spring. 5

6. A lubricating pump as set forth in claim 5 in which said abutment member comprises a threaded screw formed with a seat for said spherical anti-friction member and a

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cap secured beneath said pump housing formed with a threaded opening adjustably accommodating said threaded screw.

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