March 9, 1937. N. V. CHRISTENSEN 2,073,593

ROTARY HOOK SEWING MACHINE

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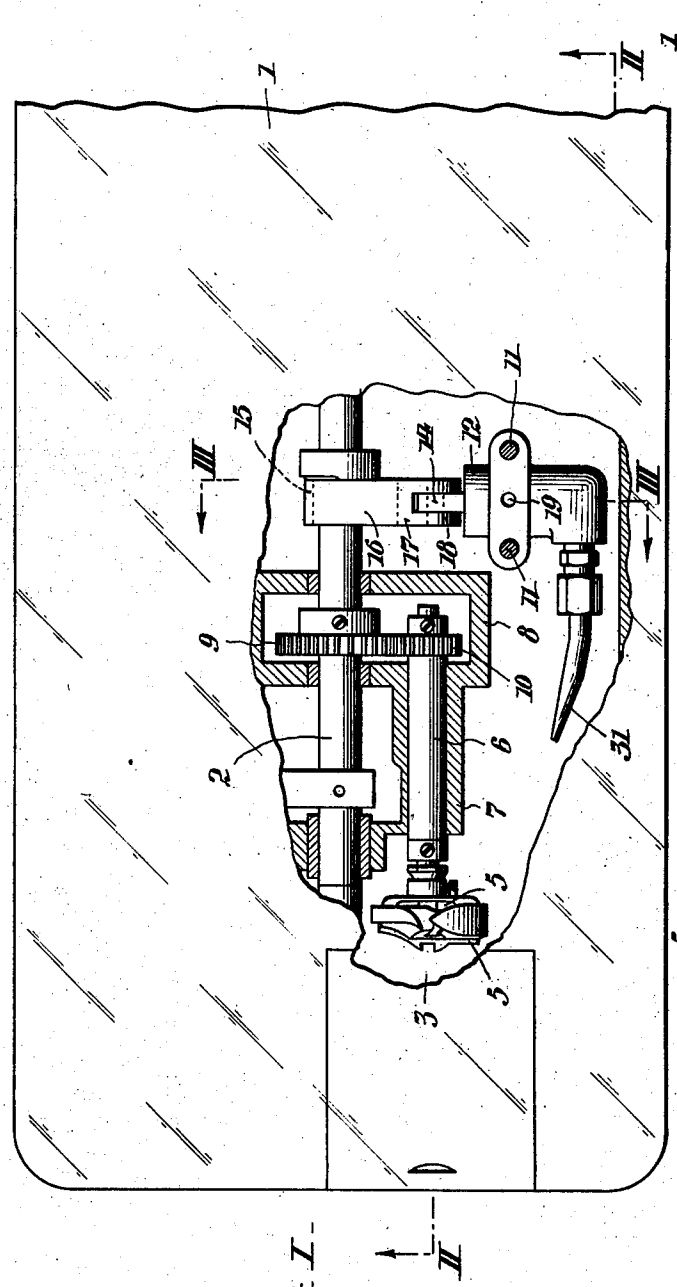


FIG. I.

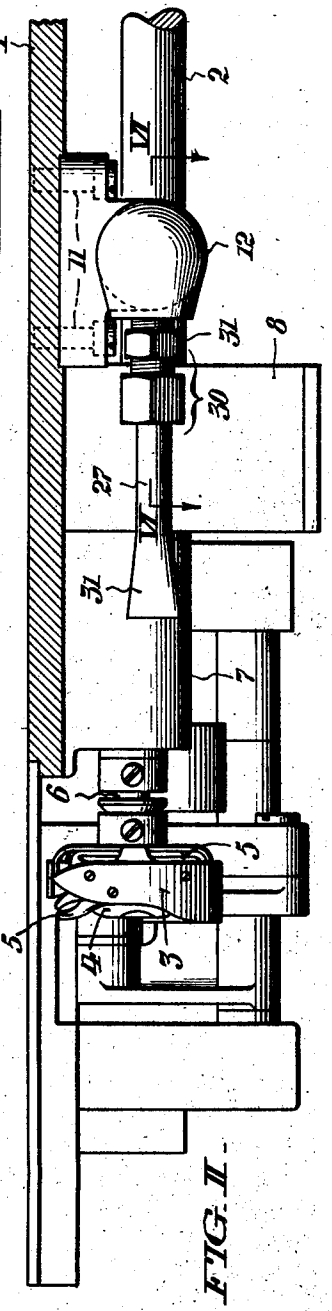


FIG. II.

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FIG. III.

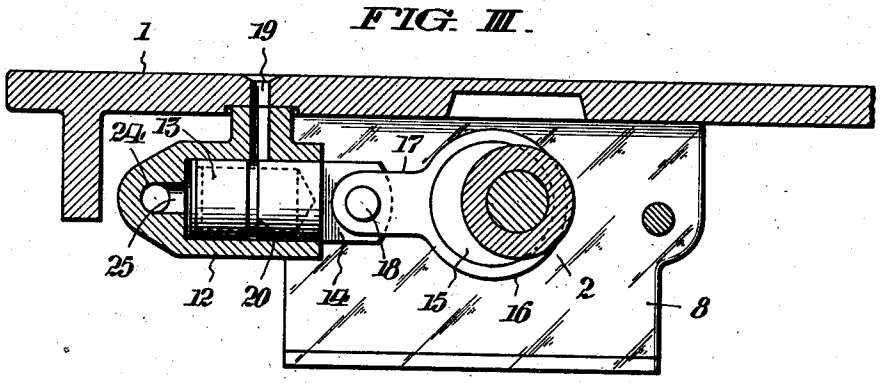


FIG. IV.

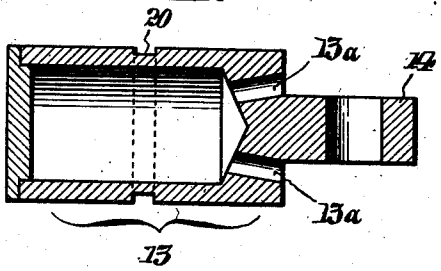


FIG. V.

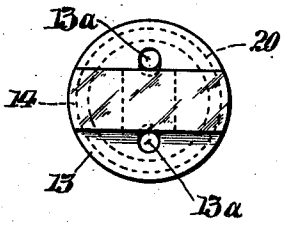
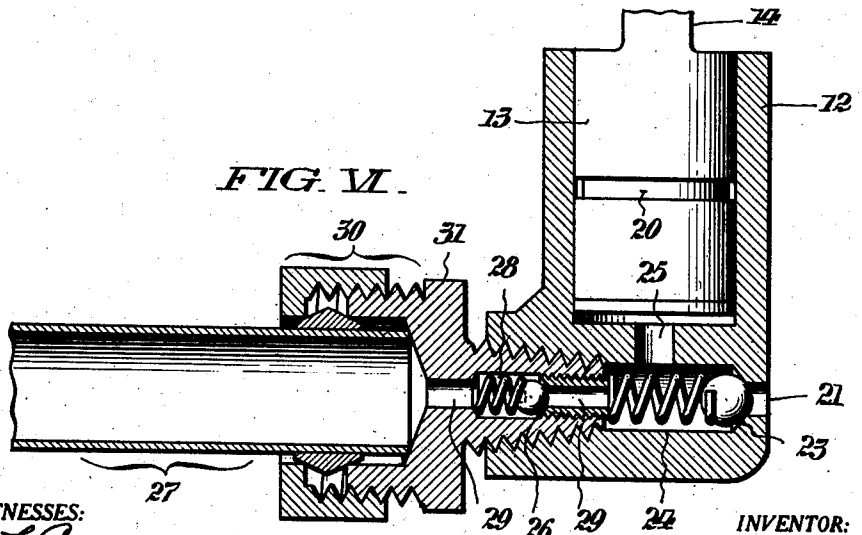


FIG. VI.



WITNESSES:
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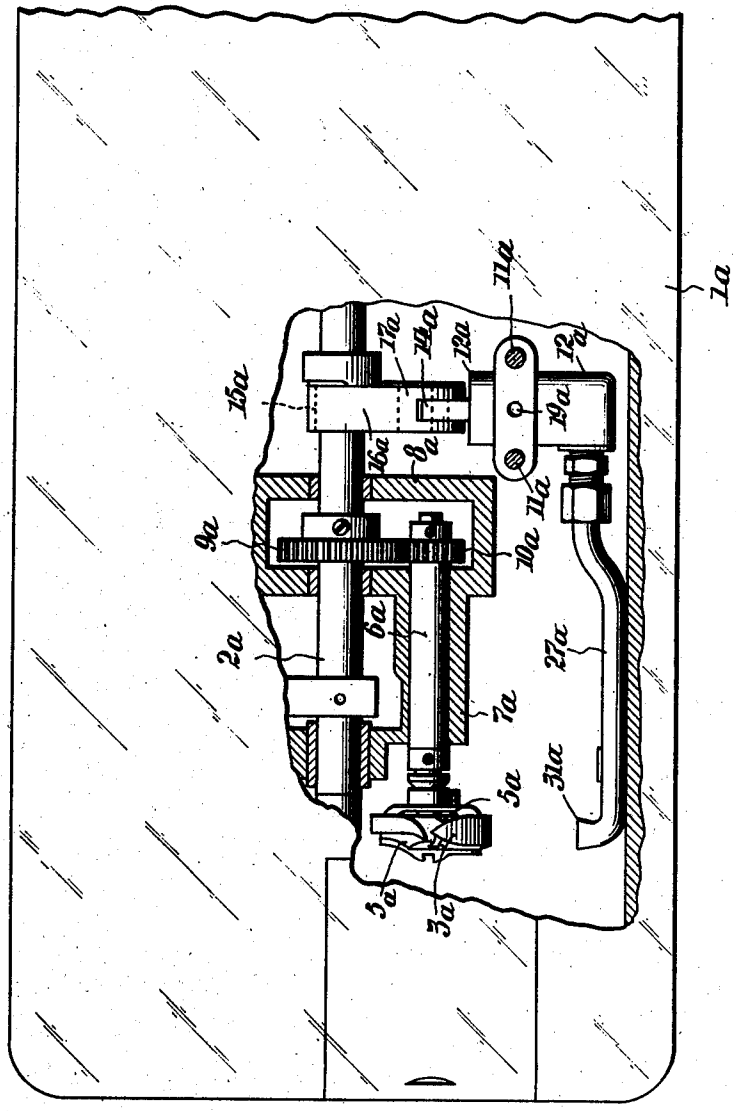
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ROTARY HOOK SEWING MACHINE

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FIG. VII.



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Patented Mar. 9, 1937 2,073,593

UNITED STATES PATENT OFFICE

2,073,593

ROTARY HOOK SEWING MACHINE

Norman V. Christensen, Chicago, Ill., assignor to Union Special Machine Company, Chicago, Ill., a corporation of Illinois

Application November 24, 1934, Serial No. 754,566

7 Claims. (Cl. 112—218)

This invention relates to rotary hook sewing machines, and it has reference more particularly to means for cooling the rotary hooks and keeping them free of lint and dirt.

Incident to high speed operation of machines of the kind referred to, considerable heat is generated by the rapid rotation of the rotary hook, as a consequence of which it must be discarded and replaced after a comparatively short period of service. This condition is aggravated by blanketing of the hook surfaces with lint which operates as insulation preventing ready dissipation from the hook of the heat generated by its rapid motion.

The purpose of my invention is to obviate this difficulty and lengthen the term of service of the rotary hook. This I accomplish by provision of reciprocating pump means capable of producing a substantially continuous blast of cooling air, and of means for discharging this air blast upon the rotary hook in such manner as to effectively cool the same and to prevent lint and dirt from collecting upon it, so that heat dissipation may take place freely by radiation and by convection.

In the drawings, Fig. I is a fragmentary view partly in plan and partly in section showing a rotary hook sewing machine embodying my invention.

Fig. II is a staggered longitudinal section taken as indicated by the arrows II—II in Fig. I.

Fig. III is a cross section taken as indicated by the arrows III—III in Fig. I.

Fig. IV is a longitudinal section through the piston of the pump means which produces the cooling air blast.

Fig. V is an end elevation of the piston as viewed from the right in Fig. IV.

Fig. VI is a sectional view of the pump taken as indicated by the arrows VI—VI in Fig. II and drawn to a larger scale; and

Fig. VII is a view similar to Fig. I showing an alternative embodiment of my invention.

With more detailed reference first to Figs. I–VI of these illustrations, 1 designates the work-supporting plate of the sewing machine. Beneath this are the bearings wherein the main shaft 2 of the machine is journaled. The stitch forming mechanism of the machine includes a rotary hook 3 surrounding a non-rotating bobbin holder 4, and a bobbin case 5 holding a bobbin. There is necessarily frictional engagement of the hook with the holder. The hook member 3 is secured to the protruding end of a countershaft 6 journaled in the boss 7 of the housing 8, through which the main shaft 2 extends. Mounted on the main shaft 2 within the housing 8 is a spur gear wheel 9 which drives an intermeshing gear 10 on the countershaft 6, the gear ratio being such that the countershaft is caused to rotate twice for each rotation of the main shaft 2, and therefore twice for each stitch.

Attached to the underside of the work-supporting plate 1, by means of screws 11, is a pump cylinder 12 within which reciprocates a hollow piston 13 (Figs. III, IV and VI) formed at one end with a flat-sided, integral, axial projection 14. The piston 13 is actuated by an eccentric 15 on the main shaft 2, whereof the strap 16 has a clevised extremity 17 (Fig. I) which engages over the axial projection 14 of said piston and whereto it is pivotally connected by a pin 18. The piston 13 is lubricated by oil or grease introduced through a hole 19 (Fig. III) in the work-plate 1 of the machine, and said piston is provided with a circumferential groove 20 to facilitate flow of the lubricant thereabout. At its outer end the piston is provided with openings 13a so that air may freely circulate through it to keep it cool.

During the suction strokes of the piston 13, air is drawn into the cylinder 12 through a lateral inlet port 21 in the closed or head end 12 of said cylinder under the control of a spring-influenced, suction-responsive, ball check valve 23. As shown in Fig. VI, this check valve 23 is disposed in a cylindric hollow 24 which is coaxial with the inlet port 21, and which communicates with the interior of the cylinder 12 by way of a connecting port 25. During the pressure strokes of the piston 13, air drawn in as above explained, is compressed and forced past a spring-influenced, pressure-responsive, ball check valve 26 into a tubular discharge nozzle 27, said valve 26 being disposed within the central enlargement 28 of an outlet port 29 which leads axially from the chamber 24 into the nozzle.

Referring still to Fig. VI, the discharge nozzle 27 is connected to the cylinder 12 by a screw and clamp nut coupling 30 whereof the component 31 has an axial bore which constitutes the air outlet 29 from said cylinder. Referring to Figs. I and II it will be observed that the end of the nozzle 27 is flattened and bent as at 31 so that the air is discharged upon the rotary hook 3 at a proper angle and from the rear, in the form of a definitely-directed, divergent stream or blast. In this way the air is caused to pass around the rotary hook 3 and also into the open back face of the same, thereby effectively cooling the parts, and, by virtue of impinging in part upon the external surfaces

and in part upon the internal surfaces, prevents lint from collecting with avoidance of such blanketing as would be likely to interfere with the ready dissipation of heat generated in the hook by the frictional contact of the rapidly rotating hook member **3** with the bobbin case **5**. The air stream delivered from the nozzle is substantially continuous in view of the rapidity of the pump reciprocations, and therefore effective under all conditions of operation.

In another form of my invention shown in Fig. VII, the flattened end **31***a* of the air discharge nozzle **27***a*, is bent at right angles so that the air is discharged directly toward the periphery of the rotary hook. By virtue of the divergency or spread of the air blast, parts of the stream will pass along the front and rear faces of the hook, so that the cooling and cleaning effect obtained is substantially the same as before. In all other respects, the modification of Fig. VII is like the first embodiment of my invention. Accordingly, to obviate the necessity for repetitive description, the corresponding parts have all been identified by the same reference numerals previously employed, with addition however, in each instance, of the letter "*a*" for the purposes of distinction.

The nozzle, it will be understood, may be placed in various different positions, the effort in all cases being to so place it as to enable it to best perform its required function of simultaneously cooling and cleaning the rotary hook and the adjacent parts.

Through my invention it is possible to operate sewing machines at very much higher speeds than heretofore without attendant injurious effects upon the rotary hooks through overheating, notwithstanding the added load of the pump which I purposely actuate from the low speed shaft **2** so as to have a minimum retarding effect upon the machine mechanism.

Having thus described my invention, I claim:

1. In a sewing machine, the combination of a work supporting bed, a rotary hook disposed beneath said bed, an air discharge pipe adjacent and spaced from said hook and dimensioned so as to direct a stream of air on to said hook to completely envelop said hook for preventing the accumulation of lint on the hook and for cooling said hook.

2. In a sewing machine, the combination of a work supporting bed, an open rotary hook disposed beneath said bed and rotating on a bobbin holder, an air discharge pipe adjacent and spaced from said hook and dimensioned so as to direct a stream of air onto and through said hook to completely envelop it, for preventing the accumulation of lint thereon, and for cooling the interengaging surfaces of said hook and the bobbin casing.

3. In a sewing machine, the combination of an actuating shaft, a rotating hook operated from said actuating shaft, an air discharge pipe associated with said rotating hook, said pipe being located at one side of the rotating hook and disposed so as to direct a stream of air onto and across said hook for preventing the accumulation of lint thereon and for cooling the same, means operated by said actuating shaft for supplying air to said pipe, said last named means including a cylinder having a ported connection to said pipe, a check valve in said ported connection for preventing air from being drawn from said pipe, a piston in said cylinder, and a check valve-controlled passage connecting said cylinder with the atmosphere.

4. In a sewing machine, the combination of an actuating shaft, a rotating hook operated from said actuating shaft and rotated twice for each rotation of the actuating shaft, an air discharge pipe associated with said rotating hook said pipe being located at one side of the rotating hook and disposed so as to direct a stream of air onto and across said hook for preventing the accumulation of lint thereon and for cooling the same, means for intermittently supplying said pipe with air, and a check valve located between said air supplying means and the pipe for preventing air from being drawn from the pipe by the supplying means.

5. In a sewing machine, the combination of an actuating shaft, a rotating hook operated from said actuating shaft and rotated twice for each rotation of the actuating shaft, an air discharge pipe associated with said rotating hook, said pipe being located at one side of the rotating hook and disposed so as to direct a stream of air onto and across said hook for preventing the accumulation of lint thereon and for cooling the same, a pump cylinder having a connection to said pipe, a check valve in said connection preventing air from being withdrawn from the pipe, and a piston operated by said main actuating shaft, said cylinder having a valve controlled port leading to the atmosphere whereby air is drawn from the atmosphere on the outward movement of the piston and delivered by the piston on the inward movement thereof to said pipe.

6. In a sewing machine, the combination of an actuating shaft, a rotating hook operated from said actuating shaft, an air discharge pipe located at one side of the actuating shaft and having the discharge end thereof spaced away from said rotating hook and disposed so as to direct a stream of air onto and across the peripheral portion of said rotating hook and at one side of the stitching point for preventing the accumulation of lint on said rotating hook and for cooling the same, and means for supplying air to said pipe.

7. In a sewing machine, the combination of an actuating shaft, a rotating hook operated from said actuating shaft, an air discharge pipe located at one side of said actuating shaft and disposed at one side of said rotating hook for directing a substantially constant stream of air onto and across said rotating hook for preventing the accumulation of lint thereon and for cooling the same, and means operated by said shaft for supplying air intermittently to said pipe for producing said air stream.

NORMAN V. CHRISTENSEN.