

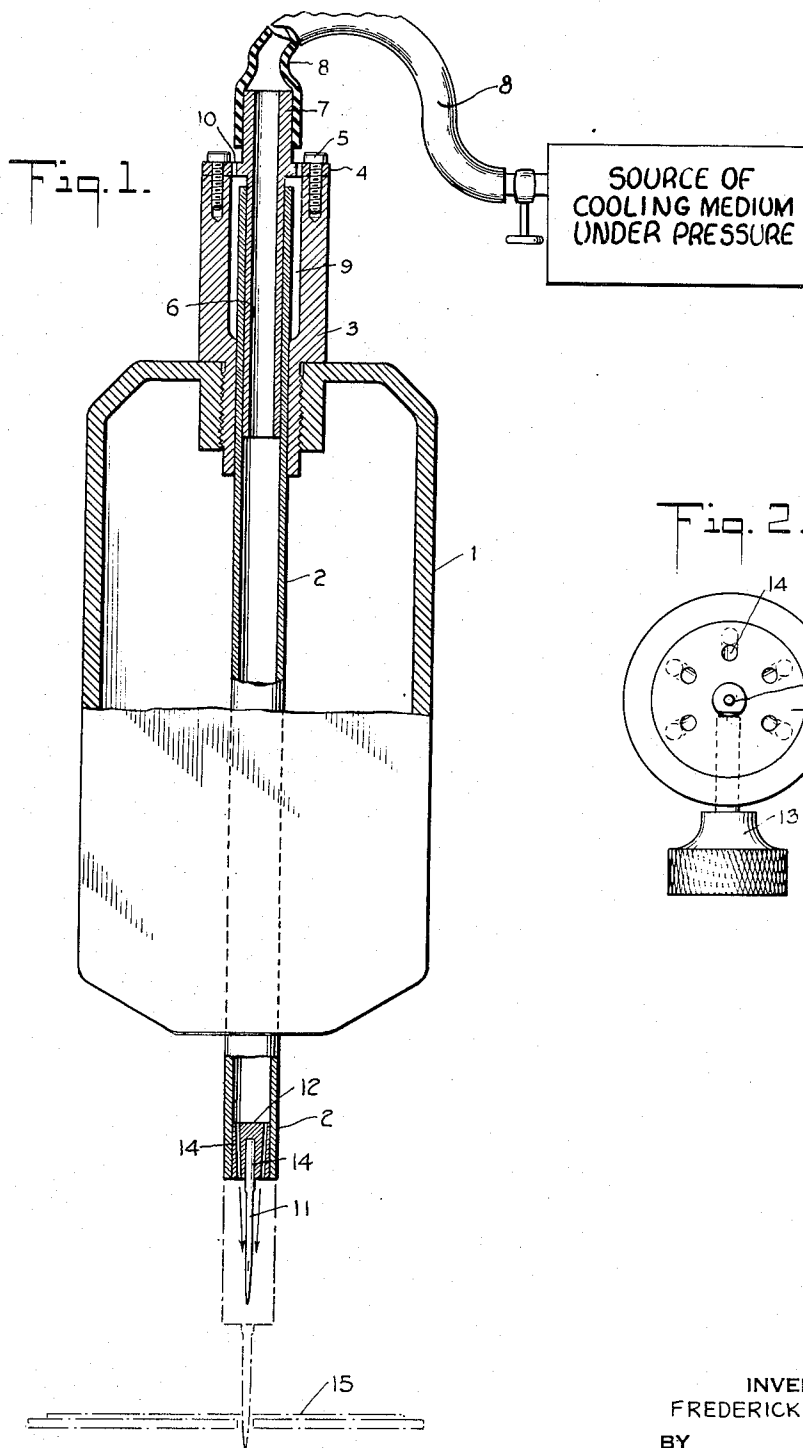
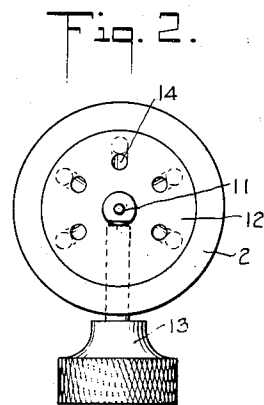
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NEEDLE COOLING DEVICE FOR SEWING MACHINES

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NEEDLE COOLING DEVICE FOR
SEWING MACHINESFrederick W. Adams, New York, N. Y., assignor
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2 Claims. (Cl. 112-218)

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The present invention relates to improvements in needle cooling devices and relates more particularly to a device for continuously cooling the needle in a sewing machine.

The present invention provides for the application of a plurality of jets of a cooling medium at high velocity directly to the eye of a needle during the sewing operation. By applying high velocity jets of the cooling medium continuously to the eye of the needle, an effective transfer of heat is obtained between the needle and the cooling medium not only during the sewing, but also during the time when the needle is at a standstill. The various objects and advantages of the present invention will be apparent and best understood from the following description and the accompanying drawings, in which:

Fig. 1 is an end view in partial section of a needle cooling device embodying the invention; and

Fig. 2 is a bottom view of the needle cooling device illustrated in Fig. 1.

Referring now to the drawings, Fig. 1 illustrates the end of a sewing machine head 1 in which a hollow needle bar 2 is mounted. The needle bar 2 is in the form of a tube and is slidably supported in the head 1 in spaced bearings. The needle bar 2 is reciprocated vertically in the sewing machine head 1 during the sewing operation in the usual manner by suitable mechanism (not shown).

In the illustrated embodiment, the upper bearing for the needle bar 2 consists of a fitting or sleeve 3 that is threaded to the head 1 and into which the upper end of needle bar 2 is slidably fitted. A coupling 4 is supported on the fitting 3 by studs 5 with the lower end 6 of the coupling extending into the upper end of the needle bar 2. The lower end 6 of the coupling 4 makes a sliding fit inside of the needle bar 2 and extends into the end of the needle bar a suitable distance to form a seal during reciprocation of the needle bar 2. The upper end 7 of the coupling 4 receives the end of a tube 8 of suitable material. The tube 8 may be made of rubber and it connects the hollow needle bar to a source of a cooling medium under pressure such as air which may be supplied from an air compressor.

For the purposes of the following description air will be referred to as the cooling medium, but it will be understood that a coolant such as water in atomized form may be injected into the cooling air, or other suitable coolants may be employed if desired. A lubricant may also be added to the cooling air so as to lubricate the

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thread in order to facilitate the sewing operation. It has been found that in sewing certain goods such as plastics and/or when sewing with synthetic thread such as nylon, the addition of such lubrication materially assists the sewability and reduces heat from the friction of the thread passing through the eye of the needle.

As shown in Fig. 1, the fitting 3 may be recessed to provide a passageway as indicated at 9 surrounding the connection of the needle bar 2 with the coupling 4. The passageway 9 communicates with vents 10 in the coupling support that permit any of the cooling air that escapes between the coupling and the needle bar to pass from the head. However, the cooling air may be supplied under pressure to the needle bar 2 by attaching the flexible, rubber tube 8 directly to the upper end of the hollow needle bar. Also, in types of sewing machines where the needle bar does not protrude above the top of the sewing machine head, the cooling air may be admitted under pressure to the needle bar through a suitable port or slide valve located within the head.

The hollow needle bar 2 permits the cooling air to pass through it without a substantial drop in pressure to the lower end of the needle bar 2 where a needle 11 is supported in a chuck 12. The chuck 12 is fitted within the opening at the lower end of the hollow needle bar 2 and is provided with a receptacle to receive the needle 11. The needle 11 may be held in place by a set screw 13 that extends through the needle bar and the chuck with its end bearing against the shank of the needle 11 when tightened, as shown in Fig. 2.

The chuck 12 is provided with a plurality of inclined passageways 14 that are spaced about the needle 11 supported therein. The passageways 14 are each inclined at an angle which directs a high velocity jet of the cooling air that is contained under pressure in the needle bar downwardly so that the jets impinge directly upon the eye of the needle 11 as indicated by the arrows in Fig. 1. By the term high velocity, a velocity is meant where a turbulent movement of the cooling air in the jet is obtained. When such a high velocity jet strikes the needle at the eye thereof, the turbulent movement of the cooling air in the jet results in a highly effective and rapid heat transfer between the needle and the cooling air. A turbulent movement of the cooling air in the jets may be obtained at velocities having the equivalent of a Reynold number of approximately 2300 or above (when measured in consistent units).

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To obtain the desired velocity of the jets using air under 10 pounds pressure per square inch, the passageways 14 are made relatively small in diameter with their length being sufficient to project the cooling air in a stream of uniform cross-section to the point where it impinges on the eye of the needle. The diameter of the passageways 14 may be as small as can be drilled conveniently and their length should be approximately five times their diameter. Although these values are not critical, the pressure drop produced will be too great if the passageways are made too long, but on the other hand they will not serve properly to direct the jets to the eye of the needle if they are made too short.

In the illustrated embodiment of the invention the hollow needle bar 2 and the chuck 12 form a chambered member which is connected to and reciprocates with the needle 11. Thus, the converging jets of cooling medium emerging from the inclined outlet passageways 14 are at all times directed at the eye of the needle and this critical point where the needle contacts with the thread is continuously cooled thereby.

In accordance with the present invention the high velocity jets of the cooling air impinge directly upon the eye of the needle which is the point where frictional energy due to penetration of the fabric being sewn is developed and where the maximum temperature of the needle occurs. Therefore, the desired cooling is obtained at the source of the heat and the needle temperature is substantially reduced during the sewing operation.

When the needle penetrates the fabric the jets discharge the air along the needle shaft against the fabric at a point where the stitch will be drawn up. In heavy sewing operations at high speed, needle temperatures may run between 350-600° F., if no cooler is employed. Use of the present cooler using air at 10 pounds per square inch pressure has been found to reduce the temperature at the needle eye by about 250° F. In normal sewing operations through heavy goods, when the needle is withdrawn from the goods at a machine stoppage the high temperature of the needle may readily cause fusing or weakening of synthetic threads, because the rate of cooling of the needle in still air is slow and the thread lays against the hot needle for a considerable period of time. It is impossible to touch a needle stopped under these conditions without burning one's fingers. When however the present needle cooler is used and the sewing machine stops with the needle above the fabric, the rate of cooling is extremely rapid so that the needle may be immediately grasped between the thumb and forefinger without any sensation of warmth from the needle. Attempts to measure this rate of cooling indicate that the needle reaches a temperature below 150° F. in less than two seconds and probably within a fraction of a second. This is very important when sewing with thread made of synthetics such as nylon because most breaks

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due to fusing or weakening of the thread occur when the machine is stopped and the needle is retracted from the goods.

The needle cooler of the present invention not only assists in the sewing of synthetic threads, but it also prevents the fusing or weakening of synthetic fabrics which are being sewn and which are readily damaged by a hot needle.

It will be understood that various modifications and changes may be made in the illustrated embodiment of the invention without departing from the scope of the invention as defined by the following claims.

I claim:

1. In a device for continuously cooling a needle of a sewing machine, the combination which includes a hollow needle bar mounted for vertical reciprocation in a head of a sewing machine, said needle bar having an upper end and a lower end and being open at its upper end, a coupling for connecting the upper end of the needle bar to a source of a cooling medium under pressure and including a sleeve mounted in a fixed position on the head of the sewing machine, said sleeve being open at its ends and having one end slidably fitted within the open end of the needle bar, and a tubular member connecting the other end of the sleeve to the source of the cooling medium.

2. A device for continuously cooling a needle of a sewing machine which comprises a hollow needle bar mounted for vertical reciprocation in the head of a sewing machine, said needle bar having an upper end and a lower end with a chamber connecting the upper and lower ends thereof, coupling means for connecting the hollow needle bar to a source of a cooling medium under pressure, said coupling means comprising a fixed member mounted on the head of the sewing machine, said fixed member including a sleeve, said sleeve being open at its ends and having one end slidably fitted within the upper end of the needle bar and its other end connected to the source of the cooling medium, a needle holding chuck located at the lower end of the needle bar, said chuck having a plurality of inclined passageways therein, said passageways being spaced relative to each other and being inclined at an angle with respect to the axis of the needle bar to direct converging jets of the cooling medium toward a point located beyond the lower end of the needle bar and the needle holding chuck.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,097,403	Eichhorn	May 19, 1914
1,686,439	Cooke	Oct. 2, 1929
2,418,429	Sauer	Apr. 1, 1947
2,418,483	Runcie	Apr. 8, 1947
2,442,033	Brantley et al.	May 25, 1948
2,593,203	Schwartz	Apr. 15, 1952