# PATENT SPECIFICATION (11) 1 558 927

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(21) Application No. 34711/78 (22) Filed 9 Feb 1977

(62) Divided Out of No. 1558926

(31) Convention Application No. 705859 (32) Filed 16 Jul. 1976 in

(33) United States of America (US)

(44) Complete Specification Published 9 Jan. 1980

(51) INT. CL.[3] D05B 85/00
B21G 1/02

(52) Index at Acceptance
D1G 2F1



## (54) A SEWING MACHINE NEEDLE AND ITS MANUFACTURE


(71) We, THE SINGER COMPANY, a corporation organised and existing under the laws of the State of New Jersey, United States of America, of 30 Rockefeller Plaza, New York, New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-


This invention relates to sewing machine needles in which the butt is formed with a needle orienting flat, and to their manufacture.

It is known in the manufacture of such sewing machine needles that the blade, regardless of its size, must always be positioned a given distance from the plane defined by the flat. Only in this way can the sewing machine loop taker co-operate with all sizes of needles without the requirement for a relative adjustment of position of the parts of the sewing machine when each different needle size is used.

In the prior art this uniform distance has been obtained by cutting or forming the flat differently on different size needles; for smaller size needles more of the butt was cut away and the flat was wider, being located closer to the axis of the original cylindrical shape of the needle butt. This conventional way of forming needles resulted in certain disadvantages. For one thing, it made it difficult to design needle clamps because the needle butts accommodated therein varied in shape. It is desirable for needle clamps to include provision preventing insertion of needles therein in any but the one correct orientation, and such provisions are made more critical if varying needle butt shapes must be accommodated.

In accordance with the present invention there is provided a sewing machine needle having a cylindrical butt portion formed lengthwise with a needle orienting flat, and a blade portion extending integrally from said butt portion and formed with a transverse thread accommodating eye, the central axes of said blade and butt portions being offset to position said blade portion at a predetermined lateral spacing from the plane containing the needle orienting flat. The arrangement enables a uniform spacing to be obtained between the plane containing the flat and all needle blades regardless of size.

The sewing machine needle of the invention is preferably manufactured in accordance with the method described and claimed in our co-pending application No. 5349/77 (Serial No. 1558926) from which the present application has been divided out. In this co-pending application there is claimed a method of cold forming a finless sewing machine needle comprising a butt portion and a blade portion of reduced cross-sectional area extending from said butt portion to a free extremity, wherein said method comprises the steps of subjecting said entire blade portion to one finless flow pressing operation to form a continuous groove in said blade portion from the butt portion to closely adjacent said free extremity, and simultaneously, to form in said groove a portion of greater depth so as to provide a thin web in said blade portion, punching an eye hole through said thin web, and forming a point on the free extremity of said blade portion. In the manufacture of the needle of the invention the method includes the additional step of cold forming the needle orienting flat on the needle butt and simultaneously displacing the needle blade laterally of the butt by flow pressing operation to obtain the required uniform offset by the eye portion laterally of the plane containing the flat on the butt.

The invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is an elevational view of a blank of

cylindrical stock suitable for the formation of one needle in accordance with the invention;

Figure 2 is an elevational view of the blank of Figure 1 on which the needle blade portion has been swaged to a smaller diameter in readiness for subsequent cold forming operation;

Figure 3 is a cross-sectional view taken substantially along line 3-3 of Figure 2 and drawn at twice the scale of Figure 2;

Figure 4 is a lengthwise cross-sectional view of the needle blank after the blade portion has been subjected to the influence of one set of flow pressing dies to form both the shank and eye portions simultaneously, and in which a representation of the opposing flow pressing dies is included;

Figure 5 is a cross-sectional view of the blade portion of the needle blank taken substantially along line 5-5 of Figure 4, drawn at twice the scale of Figure 4, and including a representation of the opposing flow pressing dies;

Figure 6 is a cross-sectional view of the blade portion of the needle blank taken substantially along line 6-6 of Figure 4, drawn at twice the scale of Figure 4, and including a representation of the opposing flow pressing dies;

Figure 7 is a lengthwise cross-sectional view of the finished needle after the eye has been punched, the point has been formed, and a needle orienting flat has been formed on the needle butt in predetermined lateral offset relation to the needle eye;

Figure 8 is a cross-sectional view similar to Figure 4 but showing the arrangement in which the flat on the needle butt and the displacement of the needle blade with respect thereto is accomplished simultaneously by the same dies which shape the needle blade;

Figure 9 is an enlarged end elevational view taken from the butt end of the needle of Figure 8 showing three different size needle blades to illustrate the uniform spacing thereof with respect to the plane of the flat on the needle but, and

Figure 10 is an enlarged and elevational view of a typical prior art needle showing the manner in which uniform spacing of the needle blade with respect to the plane of the flat on the needle butt is obtained.

Referring to the accompanying drawings, Figure 1 illustrates a cylindrical metal blank 12 suitable for the ultimate fabrication of a sewing machine needle in accordance with this invention. Figure 2 illustrates the shape of the blank 12 after it has been subjected to a swaging operation in which the blank 12 has been divided into a cylindrical butt portion 13 and a coaxial blade portion 14 of smaller diameter than the butt portion. Figure 3 illustrates, at twice the scale, the cross-sectional shape of the swaged blade portion 14.

Figure 4 is a lengthwise cross-sectional view of the swaged needle blank 12 after the blade portion 14 has been subjected to one finless flow pressing operation. By this flow pressing operation, a continuous long groove 15 is formed lengthwise in the needle blade from the butt portion 13 to a point adjacent to the free extremity 16 of the needle blade. Figure 5 includes a representation of the cross-sectional shape of the flow pressing dies 17 and 18 along the blade portion 14 and it can be noted that the space between the needle blade accommodating cavity 19 in the bottom die 18 and the groove forming upper die 17 provides an excess of space of the cross-sectional area occupied by the needle blade so that room is provided for the needle blade to flow into the excess space between the dies 17 and 18.

It is to be noted that with this flow pressing operation, the formation of the groove 15 causes the metal of the blank to flow and causes flanges 20-20 to be raised one at each side of the groove 15. The depth D of the groove 15 can be made at least 40 per cent of the transverse height H of the needle blade as shown in Figure 5.

Referring again to Figure 4, the flow pressing dies 17 and 18 encompass and influence the shape of the entire needle blade 14 including an eye portion indicated at 25 which is shaped simultaneously with the formation of the long groove 15 by the dies 17 and 18. Figure 6 illustrates the cross-sectional shape of the needle blade at the eye and includes a representation of the dies 17 and 18 at this juncture. The bottom die 18 may be formed with a short groove forming projection 26 extending into the cavity 19 which serves to impress a short groove 27 into the needle blade at the opposite side from the long groove 15. The presence of the short groove 27 and the formation of an additional depression 28 in the long groove 15 by the top die 17, as shown in Figures 4 and 5, produces a thin eye-accommodating web 29.

Between the short groove 27 and the needle butt portion 13 a transverse scarf 30 can be pressed into the needle blade by inclusion of a suitable projection 31 in the bottom die 18 in order to provide clearance above the needle eye for passage of a sewing machine loop taker closer to the needle blade centerline better to seize a loop of thread from the needle.

The dies 17 and 18 may also be formed so as to influence a slight taper to the free extremity 16 of the needle blade to facilitate later pointing of the needle.

Insofar as concerns the shape of the needle blade, the operation of the single set of flow pressing dies 17 and 18 completely forms the blade into final shape except for two operations, namely; the punching of the eye 40

which may be accomplished by a conventional eye punch, and the formation of the point 50 which may be accomplished by a grinding operation.

The absence of a fin as a result of the flow pressing operation eliminates sharp edges, burrs and the like and greatly facilitates furnishing of the needle by eliminating polishing and surface treatment steps.

It is pointed out that in the formation of the long groove 15 and particularly within the eye portion as illustrated in Figure 6, the flanges 20-20 are preferably caused to diverge at an angle of at least 30 degrees on that side occupied by the long groove. Since the long groove side is the side from which thread must be passed through the needle eye 40, this flared arrangement of the flanges 20-20 greatly facilitates threading of the needle.

In certain types of sewing machine needles, notably those intended for use of household sewing machines, it is common practice to provide the butt portion 13 with a noncircular configuration to aid in properly orienting the needle in the needle receiving clamp on the sewing machine needle bar. Although a variety of different noncircular shapes might suffice, the most commonly used shape involves the formation of a flat 60 on the butt. Heretofore, such flats have been formed by a grinding operation. Moreover, a fixed lateral offset exists on each sewing machine between the plane locating the needle butt flat and the path of the loop taken which seizes a thread from the needle blade. The offset from the flat 60 to the needle eye on the needle blade therefore should preferably be a constant X. In the prior art as shown in Figure 10, this constant X is provided for in needles having varying diameter needle blades by grinding the flat deeper for needles with smaller diameter blades. In Figure 10, three different needle blade diameters $14_s$, $14_m$, and $14_l$ are shown together with correspondingly placed flats $60_s$, $60_m$, and $60_l$ so that the offsets $x_s$, $x_m$, and $x_l$ will all be substantially equal.

This prior art procedure is not followed in the present invention, but instead the flat 60 is formed on the cylindrical needle butt 13 by a die pressing operation simultaneously with which the entire needle blade 14 is displaced laterally relatively to the butt portion 13, i.e. the central axis of the butt and blade portions are displaced so that the constant offset X of the needle blade relatively to the flat 60 is maintained throughout the entire range of needle blade size.

In Figure 9 the arrangement of this invention is shown and the same three needle blade sizes $14_s$, $14_m$, $14_l$ are illustrated being offset by the die pressing operation in varying degrees so as to preserve the constant offset X. In Figure 9 the central axis of the needle butt is indicated at C butt and the central axis of the various size needle blades when properly displaced in accordance with this invention are marked $C_s$, $C_m$, and $C_l$ respectively.

The cold forming of the flat 60 on the needle butt and the displacement of the needle blade may be accomplished as a separate method step either before or after the flow pressing operation is performed on the needle blade. Figure 4 illustrates the flow pressing operation performed on the needle blade before the flat is formed on the butt so that a following pressing operation will be required to form the flat on the butt.

Figure 8 illustrates a set of dies arranged to influence the formation of the needle blade 14 simultaneously with that of the flat 60 on the needle butt and displacement of the blade 14.

WHAT WE CLAIM IS:

1. A sewing machine needle having a cylindrical butt portion formed lengthwise with a needle orienting flat, and a blade portion extending integrally from said butt portion and formed with a transverse thread accommodating eye, the central axes of said blade and butt portions being offset to position said blade portion at a predetermined lateral spacing from the plane containing the needle orienting flat.

2. A method of manufacturing a sewing machine needle as claimed in Claim 1, which comprises the step of subjecting the needle to cold pressing operations for forming a needle orienting, flat on the butt portion of the needle, and for simultaneously displacing the blade and the butt portions of the needle relatively to each other so as to space the needle blade at a predetermined distance laterally from a plane containing the flat on the butt portion.

3. A sewing machine needle substantially as described and as shown in the accompanying drawings.

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Printed for Her Majesty's Stationery Office,
by Croydon Printing Company Limited, Croydon, Surrey, 1980.
Published by The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.

1558927 COMPLETE SPECIFICATION
1 SHEET


*Fig.1*

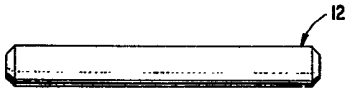



*Fig.3*


*Fig.2*

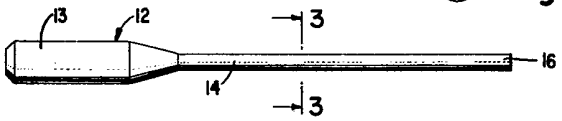



*Fig.4*

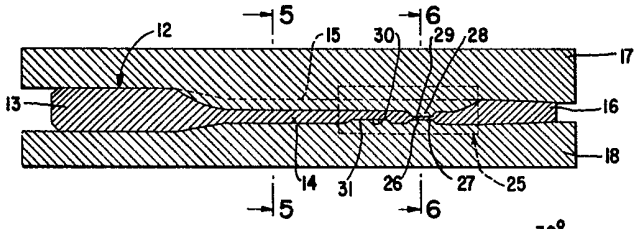
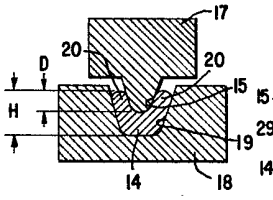



*Fig.5*



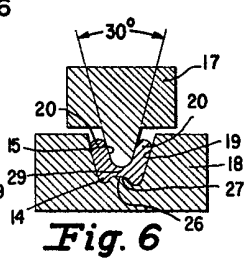




*Fig. 6*

*Fig. 7*

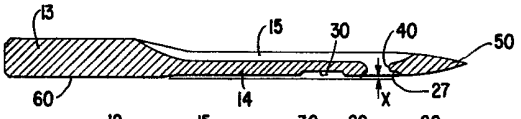



*Fig. 8*

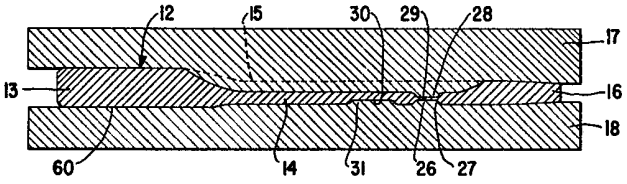



*Fig.10*
(PRIOR ART)

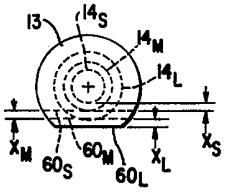



*Fig.9*