Dec. 7, 1954 E. P. FOSTER 2,696,035

FELTING NEEDLE

Filed Aug. 26, 1952

Fig. 1

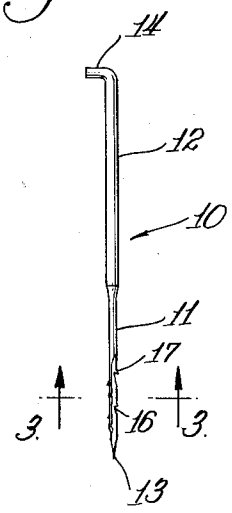
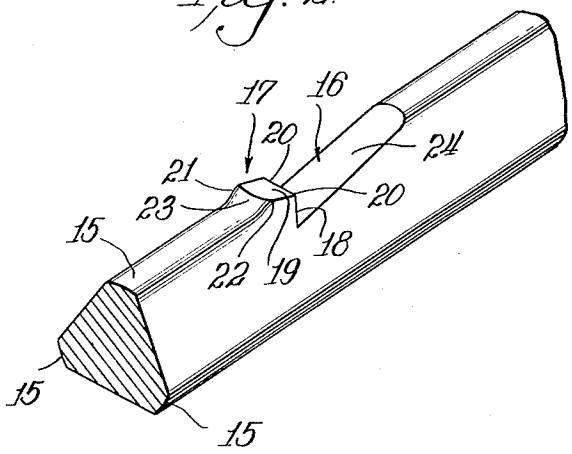


Fig. 2



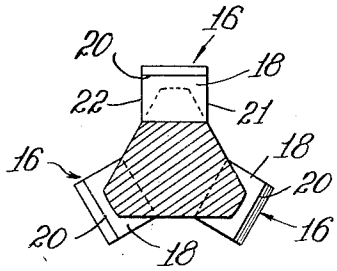
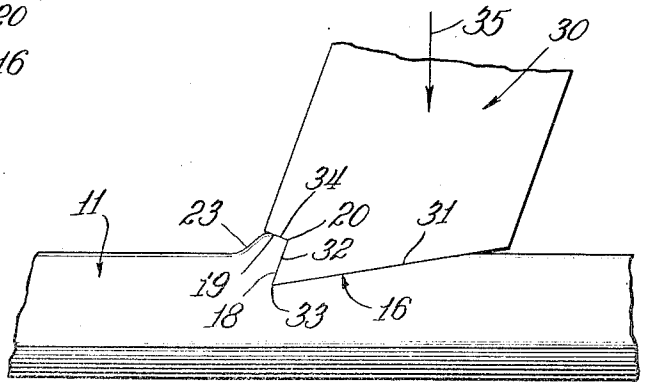


Fig. 3

Fig. 4



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FELTING NEEDLE

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3 Claims. (Cl. 28—4)

My present invention relates to improvements in felting needles.

In my prior Patent No. 2,349,086, dated May 16, 1944, I have disclosed a felting needle having a spur or barb in the body portion thereof which has a material engaging surface of considerable or appreciable width at its outer edge and of generally quadrangular outline. Such a working surface for the spur or barb of a needle provides for substantially increased efficiency of operation since the widened outer edge prevents considerable slippage of fibers being interlaid and provides a substantially large working surface to increase the capacity of the spur over prior known felting needle barbs or spurs.

Also, in my prior Patent No. 2,495,926, dated January 31, 1950, I have disclosed a further refinement of the needle of my first referred to patent in which the working surface of the barb has a generally quadrangular outline and in which the barb or spur is formed in the body portion of the needle from material displaced from the needle body in forming a notch or recess below the barb whereby I gain a larger barb comprising substantially all of the material displaced from the needle body so that a needle even more efficient in operation and having improved wearing qualities over the needle of my first referred to patent was gained.

As indicated in my two above referred to patents, felting needles are normally used in felting machines which, as is known, are employed for compacting loose felting materials such as wool, hair and fur or a combination of these and other like materials. One class of felting machines in use today comprises a needle mounting plate for supporting a plurality of downwardly extending felting needles with the plates being mounted for vertical reciprocatory motion above an endless horizontal conveyor upon which the material to be compacted or felted is carried. The needles carried by the plate are formed with pointed lower ends so that upon the downward movement of the plate the needles penetrate the fibrous uncompacted mass of felting materials on the conveyor with the barbs or spurs of the needles serving to engage and interlace such fibrous materials while such are controllably moved by the conveyor therebeneath. Further, the barbs of the needles are usually formed to free themselves of the material upon upward movement of the plate and the needles are secured in any suitable manner in the needle holding plate. The usual practice in this form of felting apparatus is to form the plate of two members with one member forming a base and having a plurality of openings through which the upper ends of the needles extend. The upper ends of the needles, opposite the pointed lower ends thereof, are suitably turned over so that such may rest upon the upper surface of the base member and these upper ends of the needles are then secured rigidly in place by clamping the upper plate member securely to the base plate member. By controlling the speed of the conveyor and reciprocating the plate at a desired rate, the degree of movement of the needles in and out of the loose fibrous material, as such is carried along by the conveyor, may be controlled to compact or felt the material, within limits, to the desired degree.

My present invention is directed primarily to the improvement of a spur having a working surface of the character of my second above mentioned patent, i. e., substantially quadrangular in shape and formed of material displaced from the needle body. In my first above referred to patent there is disclosed a spur for a felting needle formed in the body portion of the needle having generally downwardly directed parallel side walls and an end wall extending transversely of the body and intersecting the side walls, such end wall being of a substantially quadrangular area. As disclosed in that patent such a spur for a felting needle is preferably formed by removing certain material from the cylindrical stock of the needle to form a pair of lengthwise extending side walls to provide a rib extending lengthwise of the body portion of the needle. Thereafter the end wall of the spur is formed by removing material transversely of the rib and across or in between the side walls of such rib to form a recess for access of fibers to the working surface of the spur defined by the end wall. In my second above mentioned patent, however, the quadrangular working surface of the character herein of subject, was formulated by a spur die means inserted substantially transversely of the ribs formed longitudinally of the felting needle body and so configured as to capture the displaced material of the intersected rib and compress or form the same into a needle barb projecting outwardly of the rib and without any material loss or removal of the upset or displaced material from the needle body.

As noted in my second Patent No. 2,495,926 referred to above, it is preferable, in the method therein disclosed, to form a felting needle of the character of that patent by using substantially cylindrical metal stock from which certain areas are removed to form longitudinally reaching rib portions, with such rib portions being intersected by a suitable forming die to upset and displace certain material thereof to formulate a felting needle barb having a substantially quadrangular working surface area and in which such barb and working surface extend laterally or outwardly of the body portion of the needle.

My instant invention is particularly directed to the formation of a new and improved felting needle barb according to the practices as generally set forth in my second above referred to Patent No. 2,495,926, as will be recognized presently hereinafter. More particularly my instant invention contemplates the provision of an improved form of spur or barb for a felting needle in which the working surface of the barb is substantially quadrangular in area shape but which working surface extends laterally outward of the needle body.

Still further, and perhaps more importantly, my present invention contemplates the formation of felting needles in a manner whereby the projecting spur contains an outer wall portion disposed laterally beyond the working surface of the barb or spur and which wall is related substantially in right angular or normal relation to the face of the working surface whereby a new and improved efficiency of penetration for the barb is provided, which feature is especially important where backing fabric is employed in the formation of felt.

According to my present invention, I propose to form one or more spurs or barbs in the body portion of a felting needle by means of a suitably configured forming die adapted to upset certain material from the body of the needle with such upset material being reshaped to form the barb for the needle without any substantial loss or removal of the material so upset. Further, the body portion of my present needle, preferably is to be formed with a substantially polygonal cross sectional configuration to provide certain corner edges or lengthwise extending ribs in which the spurs or barbs of my present teachings are to be formed. As is known, it is conventional in the art today to make a felting needle from substantially cylindrical stock with that portion of the stock which is to form the body portion of the needle being swaged as, for example, to form it into substantially triangular cross section to provide corner edges in which the barbs or spurs may be formed.

It is further old in the art to form the felting needle barbs or spurs in the body portion thereof by striking the edges of the longitudinal ribs with a barbing knife formed similar in shape to a chisel. In using such a knife a substantially V-shaped recess is formed in the edge of the rib portion with material being displaced to form a projecting barb above the recess and transversely of the sides of the recess. However, it is to be noted that by using such a barbing knife no control of the displaced

material to predetermine the position of the outer edge of the barb with respect to the corner edge or lateral extension of the body is possible. It is further to be noted that the projecting barbs so formed with a barbing knife consist of only a relatively small portion of the displaced material of the needle body and therefore such are subject to rapid wear and are useful only over a short period of time. Many of the difficulties of this barbing knife process were successfully overcome by the teachings of my above referred to Patent No. 2,495,926 wherein I disclosed the utilization of a barbing die adapted to upset certain portions of the needle body material and preform such upset material into a desired configuration for the needle barb. However, in the utilization of a felting needle according to the teachings of that patent, it has been discovered that the sharp corner configuration of a barb therein, in some instances, was detrimental to a sound felting practice in that penetration of the needle through the felting materials during the compounding operation resulted in shearing of such felting fibers and more or less provided a barb having only normal efficiency as to penetration during the punching operation through the felting fibers.

It is the primary object of my present invention to disclose a new and improved formation of a felting needle barb made by a barb forming die process wherein certain material is upset from the body of the felting needle and reformed or reshaped into a desired barb having a substantially quadrangular shaped working surface and a laterally or outwardly projecting outer face disposed in substantially right angular relation to the working surface of the barb thereby to effect means for increasing the ability of the barb to penetrate into the felting fibers and lessening its tendency to shear such fibers during penetration when compounding the felting fabric.

Another object of my invention is to provide a felting needle spur or barb having a substantially quadrangular shaped working surface and in which a second outer face or surface is provided in right angular association with the working surface of the barb and extending laterally outward from the body of the felting needle and beyond the lateral limits of the barb's working surface thereby to effect a barb having improved penetration and compounding characteristics.

The above and further objects, features and advantages of my present invention will appear from the following detailed description of a preferred embodiment of my invention.

Now in order to acquaint those skilled in the art with the method of making and utilizing felting needles, in accordance with the principles of my present invention, I shall describe in connection with the appended drawings herein a preferred embodiment of my invention.

In the drawings:

Figure 1 is an elevational view of a felting needle made in accordance with the teachings of my present invention;

Figure 2 is a greatly enlarged perspective view of a portion of the body of the felting needle shown in Figure 1 and illustrating the formation of a barb or spur thereon made in accordance with the teachings of my invention;

Figure 3 is a detailed horizontal sectional view taken substantially along line 3—3 of Figure 1 and looking in the direction as indicated by the arrows of that figure; and

Figure 4 is a side elevational view illustrating the manner in which a barb, according to my present invention, is preferably formed in the body of a felting needle by means of a barbing die.

Referring now to the drawings, I have shown in Figure 1 a felting needle **10** constructed in accordance with my invention and which includes or comprises a body portion **11** and a shank portion **12**. The lower end of the body portion **11** is pointed as at **13** to facilitate penetration thereof through or into a bed of fibrous material to be compacted in the formation of felt fabrics in the manner as above related. The upper end of the needle, as illustrated, may be bent substantially at right angles to the shank portion **12** for providing a securing element or portional ear **14** to be clamped between a base member and a clamping member of a needle plate assembly as previously described. Also, as previously related such a needle plate is adapted to support a plurality of felting needles, such as that shown in Figure 1, which upon reciprocation of the plate assembly in the felting machine,

effect a suitable interlacing and compacting of loose fibrous felting materials.

Felting needles according to my instant invention may be made of any suitable stock having the necessary mechanical strength, as for example steel wire having preferably a circular cross section. In making up the needles of my present invention I prefer that the originally round or cylindrical steel wire stock be cut to a suitable length for a needle, with the portion thereof which is to become the body of the needle being appropriately swaged to form a triangular body cross section characterized by longitudinally extending ribs substantially as illustrated. The body portion may then be pointed at its lower end **13** and the upper or opposite end of the shank bent to form the securing element **14** as before noted. The shank portion **11**, is not disturbed and remains of circular or round cross section and coacts with the turned over upper ear **14** in providing a means for mounting the needle in a needle plate assembly, as previously related. Also I prefer to provide a felting needle having a body portion of polygonal cross section, such as that of a conventional triangle, to provide a plurality of corner edges **15** thereon, as illustrated in the partial, enlarged illustration of the body portion of my needle in Figure 2 of the drawings.

Referring now to Figure 2 of the drawings, it will be observed that a corner edge **15** of the body portion formed thereon is preferably slightly rounded as in the formation of the needle in my prior Patent 2,495,926 and that a portion of the material in such corner edge is displaced in the formation of a notch **16** in the shaping or formation of a spur or barb **17** projecting laterally of the body portion and outwardly of the notch **16**. Further, it will be regarded that the spur or barb, as shown in Figures 2 and 3 in particular, is formed with a substantially quadrangular end wall **18** defining its working surface. Up to this point the barb **17** is formed substantially in accordance with the general features and characteristics of the barb of my prior Patent 2,495,926, referred to above. However, it will be appreciated that a marked departure over the barb of that patent is made in my present needle barb by the formation of an angularly disposed quadrangular outer wall **19** which comprises an outer lengthwise extending wall defining the limit of the lateral projection of the barb and the leading edge **20** of the barb's working surface formed by its intersection with end wall **18**. It also will be recognized that the extension of the end wall **18** is substantially laterally beyond the corner edge **15** of the ribbed body portion in which the barb is formed and that the working surface of the barb and the outer wall **19** thereof extend laterally beyond the diametrical limits of the needle body whereby the leading edge **20** of the barb's working surface may readily engage and interlace loose fibrous felting material. Also the angular disposition of the outer wall **19**, in relation to the end wall **18** provides a substantially pointed or wedge-like character to the barb's leading edge whereby such may more readily penetrate and compact the loose fibrous felting materials into which such is thrust. In this regard the innovation of the angularly disposed outer wall serves as a means for alleviating or preventing undue shearing of the felting fibrous materials by the leading edge **20** of the barb's working surface as was present in the construction of the felting needle barb of my prior referred to Patent 2,495,926; such feature constituting the major improvement of my present invention over the prior art. The angular relation between the barb's working surface and the outer wall of the barb may more clearly be recognized upon examination of Figure 4 of the drawings wherein it will be seen that wall **19** lies in a plane disposed intersectingly or angularly as related to the longitudinal axis of the needle's body portion and that further such outer wall lies in substantially normal or right angular relation to the plane of the end wall **18** of the barb.

The barb **17** of my instant invention is further defined by side walls **21** and **22** which are substantially in parallel relation for a considerable distance upwardly or toward the shank end of the needle from the lateral termination of the barb and tapered to merge smoothly into the then merged or tapered inwardly adjacent their upper ends to meet the curvilinear extension or continuation **23** of the outer wall **19** formed at the extreme lateral limits of the barb and tapered to merge smoothly into the lateral edge **15** of the body portion in which the barb is formed.

The material displaced in forming the notch 16, as will be clear from a study of Figure 2, is caused to be displaced substantially upwardly and transversely in the needle body forming the barb 17 without lateral or sidewise spreading of the material outwardly of the lateral limits of a diagonally and inwardly directed surface or wall 24 which together with the end wall 13 of the barb define the notch 16. Also the wall 24, formulating one defining surface for notch 16, extends at a gradual slope toward the pointed end of the needle body and divergently away from the longitudinal axis of the needle at a general angle in the order of 9° as related to the longitudinal axis of the needle body. The elongated wedge shaped piece of material thus displaced from the corner edge 15 of the needle body in forming the V-shaped notch 16 is substantially all carried or caused to be moved generally away from the pointed end of the needle to form the barb having a substantially quadrangular shaped working end wall 18 which is of materially greater width than the rounded corner edge 15 of the needle body rib portion from which such is cut. Also the leading edge 20 of the barb's working surface projects, in the form shown in Figure 2 of the drawings, beyond the rounded corner or edge 15 a sufficient lateral distance whereby such may readily engage fibers to be interlaced. Further, substantially all the material displaced in forming notch 16 is utilized in the formation of the barb or spur which is of a substantial depth along the working face thereof to provide a long wearing as well as an efficient fiber engaging working surface for the barb.

It will also be understood that the several rounded corners 15 of the body portion of the needle each may be provided with one or more spaced barbs 17 and notches 16, of the construction above described, so that upon a single reciprocation of the felting needle a large number of fibers are caused to be engaged and interlaced thereby.

Referring now more particularly to Figure 4 of the drawings, I have shown a body portion 11 of the felting needle 10 of my present invention disposed horizontally for purposes of illustrating a barbing die 30 of a form adapted to formulate the notch 16 and barb 17 of my instant invention. It will be observed in particular that the barbing tool or die 30 is shown in the position it occupies normally upon completion of the forming of the spur 17. Such a barbing die may be mounted in any suitable clamp or holding device (not illustrated) adjacent its upper end for moving the die substantially vertically toward and away from the felting needle, as positioned in Figure 4 of the drawings. The mounting for the forming die is also preferably adaptable and of a character to provide for slight longitudinal translation of the die lengthwise of the needle body in a direction toward the spur or barb being formed, i. e., away from the point of the needle.

The die 30, as viewed in profile in Figure 4, comprises a first flat lower surface 31 disposed at an angle of approximately 9° to the horizontal for forming the notch wall 24. Wall 31 together with wall 32 forms a chisel-like intersection or cutting edge 33, with wall 32 being disposed at an angle in the order of 20° from the vertical or substantially 61° from the inclined lower wall 31 of the die. As will be recognized the lower wall 31 and wall 32 of the die form the substantially V-shaped notches 16 in the body of the felting needle. Also an angularly disposed upper wall 34 extends from the vertical limits of the forward wall 32 and at approximately right angles or 90° from the plane thereof to form the outer wall 19 of the needle barb. This arrangement of the die walls provides a notch or recess which serves to control the displaced metal in the forming of the needle spur or barb 17 and wall 18.

Although it will be understood that the above angular relation of the several walls of the die 30 may be varied as desired, it is preferable in the formation of a satisfactory spur, according to my present invention, that the die be formed as above specified. Also it will be appreciated, that the upper end of the forming die is carried by a satisfactory means having sufficient resiliency so that during a substantially vertical movement thereof, as indicated by arrow 35 in Figure 4, the cutting edge 33 cuts into the corner edge 15 of the felting needle body and effects the desired displacement of the metal from the notch lengthwise of the needle without

there being any substantial displacement of metal transversely of the wall 24 of the notch. The die also confines the flow of the displaced material by means of the intersecting walls 32 and 34 to define the working surface 18 and outer wall 19 for the barb.

Although the barbing die 30 may be made of any convenient material and of any size, it is preferably made of a width sufficient so that as the cutting edge 33 and corners of the several walls thereof become worn, the die or needle stock, or both, may be shifted with respect to each other to present new cutting and forming edges of the die to the needle body.

Further, I have discovered that by use of a barbing die such as I have described hereabove, the formation of barbs 17 therewith permit the inclusion of about two-thirds more material in the spurs than is gained in present day needles formed with a conventional form of barbing knives. This feature is particularly recognizable when it is appreciated that the conventional barbing knife of the prior art usually comprises a single chisel-like edge which is caused to be moved at right angles into the body of the needle for causing considerable of the material, displaced in forming the notch, to move transversely of the notch rather than into the spur or barb as I have specified hereabove. All in all, as stated in greater detail in my prior Patent 2,495,926, the formation of a barb with a die of the order described hereabove is to be much preferred over the use of a conventional barbing knife since the die permits the re-direction of the material removed in the formation of the notch and the needle barb. Further, it will be appreciated that by the special configuration of the die 30, the barb's angularly disposed outer wall 19 is integrally formed with, and at the same time as, the working surface or end wall 18 of the needle barb and may be, as related herein, conveniently disposed in right angular relation to the barb's working surface to effect the penetration principles, ascribed for my present invention. In this latter relation, it will be recognized that the positioning of wall 34 of the forming die determines the position of the barb's outer wall 19 and outer or leading edge 20 of the barb so as to gain the desired angular relation between the working surface and the outer wall of the barb as specified.

It will therefore be appreciated that while I have herein shown and described what I consider to be a preferred embodiment of my present invention, various changes, modifications and substitutions of equivalents or rearrangement of the elements of the barb and needle described may occur without departing from the spirit and scope of my invention. I, therefore, do not wish to be limited to the specific embodiment of my invention herein illustrated and described except as may appear in the following appended claims.

I claim:

1. As a new article of manufacture, a felting needle having a pointed lower end and a wedge-shaped recess formed in the body portion thereof, a spur overhanging and formed at the upper end of said recess such spur having a material engaging surface facing said recess, and an outer wall formed on said spur intersecting said material engaging surface at right angles.

2. As a new article of manufacture, a felting needle pointed at one end and having a polygonal shaped body portion, at least one wedge shaped recess formed in at least one of the corner edges of said body portion, a spur formed at the upper end of and overhanging said recess with a planar working surface thereon facing said recess, and an outer planar wall intersecting said working surface and lying within a plane disposed at 90° to said working surface.

3. A felting needle having a body portion of polygonal cross section, a wedge shaped recess formed in one apexual edge of said body portion, and a barb overhanging said recess and projecting laterally outward of said edge, said barb having an outer wall disposed at right angles to its working surface to define with said working surface a wedge shaped leading edge for said barb located outwardly of said body portion and adapted to penetrate loose felting fibers with a minimum shearing effect.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,349,086	Foster	May 16, 1944
2,495,926	Foster	Jan. 31, 1950