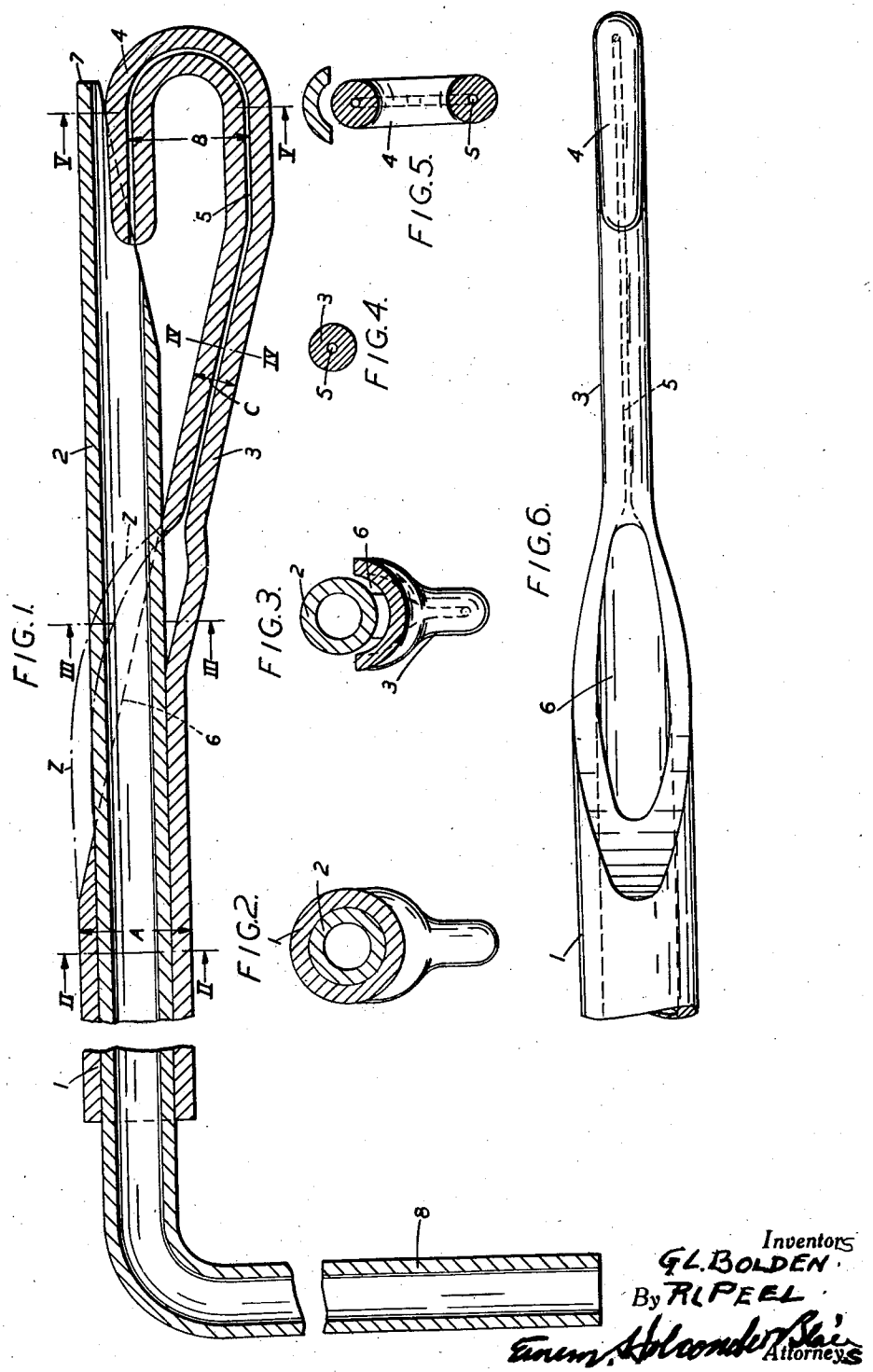
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KNITTING ELEMENTS OF KNITTING MACHINERY

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KNITTING ELEMENT OF KNITTING MACHINERY

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1 Claim. (Cl. 66—120)

In United States Patent No. 2,229,929 tubular machine knitting needles are described in which the needle hook is formed as an extension of a portion of the wall of the tubular shank. Thus, the material available for the hook is limited by the thickness of the wall and may be insufficient for the best results in the case of fine gauge needles. It has, therefore, been proposed to make the portion of the wall at which the hook emerges thicker than the other portions of the tube wall and one way in which this may be done, according to United States Patent No. 2,237,480, is to braze or solder a strip along one side of the tube, the hook being formed on the strip rather than on the tube itself. An aim of the present invention, however, is to provide a method of forming an adequate hook at the end of the tubular shank, even in the finest sizes, without the necessity for any special tubing or for any brazing or like process.

The aforesaid aim is achieved, according to the invention, by swaging the whole of one end of a tube to form the needle hook. Accordingly, the main body of the hook is of tubular rather than solid cross-section, although in the swaging operation the bore of the tube in relation to its wall thickness is very greatly reduced.

In order that the invention may be clearly understood and readily carried into effect, one construction in accordance therewith will now be described, by way of example, with reference to the accompanying drawing, in which:

Figure 1 is a sectional elevation of a machine knitting needle with an associated tongue,

Figures 2 to 5 are sections respectively on the lines II—II, III—III, IV—IV and V—V in Figure 1, and

Figure 6 is a plan of the forward part of the needle in Figure 1.

The needle is formed from a tube, the cross-section of which is such as to provide the needle shank 1 that serves as a guide for a tubular tongue 2. The whole of one end of the tube is swaged and bent to form the needle hook which comprises a straight portion 3 and the hook proper 4. Being formed from a tube, the hook has a narrow central passage 5. A lateral opening 6 is formed in the side of the tube to permit the tongue 2 to slide to-and-fro relatively to the needle between a position in which the tip 7 of the tongue is concealed within the needle shank and the position shown in Figure 1 where the tip 7 overlaps the needle hook.

In the manufacture of the needle, the swaged pin that is to constitute the hook 3, 4 first projects axially from the shank 1 and is then offset to the position required for the straight portion 3, the angle being determined by a suitable jig. Next the portion of the tube indicated by dotted lines Z in Figure 1 is eliminated by grinding or milling so as to provide the opening 6, and finally the hook proper 4 is formed at the end of the pin.

When the invention is applied to a warp knitting machine, such needles, arranged parallel to each other, are secured at their tail ends by moulding into a block of lead or synthetic resin, and a row of such blocks is secured in the well known fashion along a needle bar which is moved to-and-fro by the mechanism of the knitting machine. The backwardly projecting ends 8 on the tongues are similarly mounted in blocks secured along a tongue bar which is also moved to-and-fro in timed relationship with the needle bar. Accordingly, in the to-and-fro movements of the needles and tongues, each tongue slides in the tubular shank 1 of its respective needle, and the action is such that, after a loop of yarn has been drawn by the needle hook, the needle advances while the tongue 2 recedes to the position in which its tip 7 lies behind the opening 6. In this movement the needle passes through the loop of yarn which travels along the sloping edges of the opening 6 to a point such that the tongue can pass through the loop of yarn when the tongue again moves forward with respect to the needle. Then the loop of yarn can be cast off while the tip 7 of the tongue is covering the needle hook and the latter is drawing a new loop.

Although the invention is particularly suitable for warp knitting machines, it may also be applied to other forms of knitting machines. Thus, the needles may be separately mounted in tricks and formed with butts to be acted upon by cams. The associated tongues would also be furnished with butts to be acted upon by further cams.

The drawings are on a greatly enlarged scale and, by way of example, it may be mentioned that in a 28 gauge needle, designed in accordance with the invention for a warp knitting machine, (that is a needle for a row containing 28 needles to the inch) the dimension A (Figure 1) is 0.018 inch, the dimension B is 0.020 inch and the dimension C is 0.008 inch. The length of the needle is 1.844 inches. The needle may be made of carbon steel, in which case the usual heat treatment for such material is necessary. The associated tongue may be made of stainless steel or the metal known as K Monel or other suitable material such as phosphor bronze. Alternatively,

the needle may be made of stainless steel and furnished with a K Monel tongue.

The swaging operation on an initial length of tube, to provide the pin to be bent to the shape of the hook, is advantageously effected in a machine comprising a rotary member formed with a slot at right angles to and extending on each side of the axis of rotation. In this slot is a split die and the adjacent faces of the two halves of the die are formed to the shape of a cylinder of the cross-section of the required pin. The end of the tube is fed into a flared end of this cylinder and, as it approaches the other end of the cylinder, undergoes a rapid hammering action due to the dies which are acted on by hammer members having their outer ends projecting respectively from the ends of the slot so that they sweep past a series of pairs of diametrically opposed rollers in a stationary cage. The hammer members are simultaneously driven inwards (against the action of centrifugal force) sharply by each pair of rollers so that the tube is reduced in diameter, while its wall thickness is increased, by a series of blows at points distributed around its axis. The swaging may be effected in stages with intermediate annealing. After the hook has been bent to shape, the needle may be hardened, tempered, ground and polished by such processes as are well known in connection with the manufacture of machine knitting needles.

We claim:

A machine knitting needle comprising a tubular shank, the whole of one end of which is swaged to form a pin, the said pin being formed so that it is offset to one side of the shank and bent to the shape of a hook, and the said shank being further formed with an opening, on the side thereof remote from the aforesaid side, for the passage of a tongue which alternately overlaps the needle hook and is withdrawn into the shank.

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