What makes the Knitting Needle Work?

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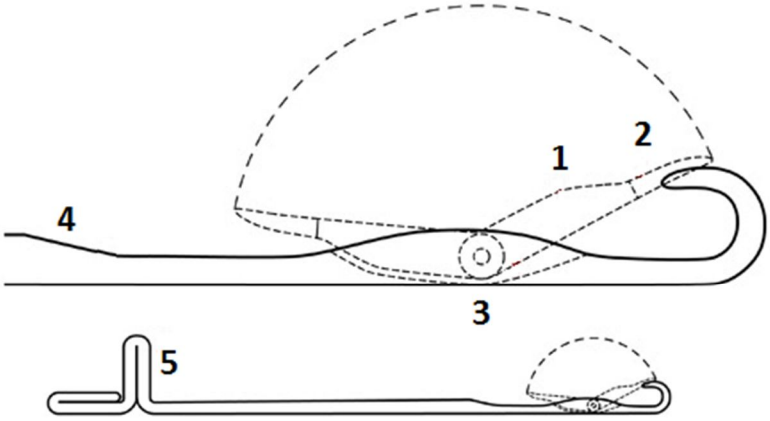
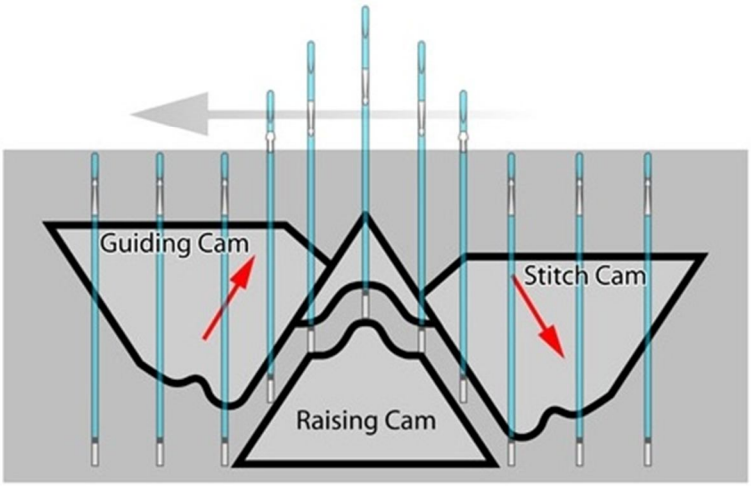
Knitters often wonder why needles break, whereas they should wonder that these tiny needles can take the tremendous amount of stress and yet knit. When the raising cam hits the needle even if it is moving at a slower speed of 3.5 Km/Hour the impact on the needle is too high due to the fact that it gets moving at its highest speed from a stand still position. When carriage is moving at the speed of one meter per second the needle completes its knitting action in less than 1/20 of a second. But the force of this impact can be understood by studying the mechanism of how the needle is set in motion at a speed presumably at the speed of the carriage if the angle of the raising cam is 45 degrees. The fact is that the needle attains this speed without losing any considerable time. Close investigation may show the initial movement as a jump from a still position at a speed which is little higher than that of the carriage. The moment it gets struck by the cam it has to attain the speed determined by the speed of the carriage and the angle of the raising cam and the time taken to do this is near zero seconds. The acceleration of the needle from zero to the velocity of the carriage will amount to a value close to infinity as the time taken to achieve this is close to zero. Therefore the impact (The G Effect) is of high nature. In layman's language it can only be compared with the action of a hammer hitting a nail. It is the elasticity of the needle butt that absorbs this impact and keeps the needle knitting new loops one after the other.



The parts of a needle:

1. Latch of the needle
2. Spoon of the latch
3. Axel of the latch
4. Shank of the needle
5. Butt of the needle.

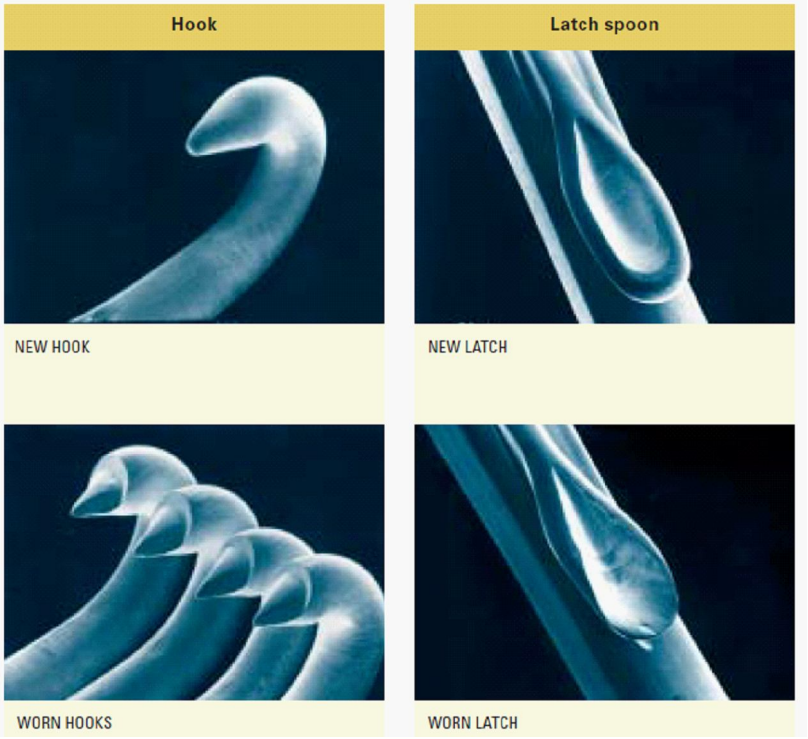


The Knitting Action

Image Courtesy Groz Beckert

The Needle hook takes this beating of the latch as well as the axle that holds the latch. When the needle is raised the stitch on the needle passes over the latch of the needle, the latch which is under pressure of the knitted loop held tightly by the take down force gets released it jumps and strikes the hook of the needle. The same happens in reverse when the needle is sliding back and new knitted loop passes through the old loop over the needle latch. The hook additionally has to work against the forces to pull the yarn to make a new knitted loop through the previous loop, counter the added forces right from the nose unwinding, the force of resistance on every turn of the yarn passing through its guides and finally the robbing action of the loop formed by the preceding needles. The Fabric take-down force also offers part of resistance in the formation of the new knitted loop as well and thus asserting a lot of stress on the needle hook. This stress can increase twenty fold when there is a slub, knot, multiple threads or any accumulated abraded fibre in the yarn.

The needle has only 1/20th of a second to bear this. On normal running on a machine with two systems a needle has to undergo this procedure four thousand to eight thousand times per hour or about one hundred thousand to one hundred eighty thousand times in a day. This kind of continuous hammering howsoever feeble it may be can make a dent on any kind of material. On seamless knitting machines the same frequency can be as high as seven million times per day. At this speed the movement of the latch will be three times faster than the flutter of an insect.



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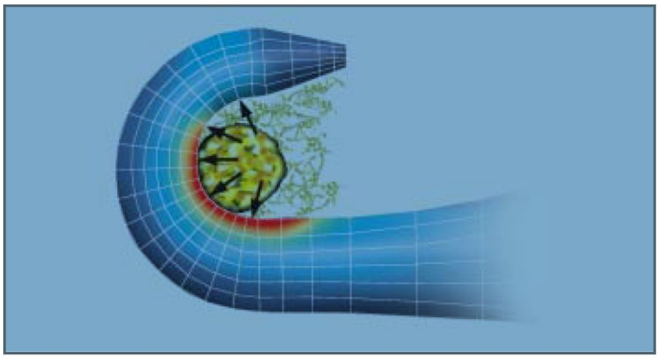

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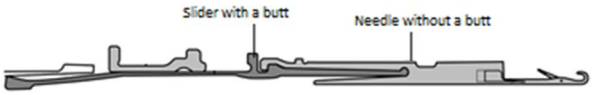
This is not all, the needle has to overcome the abrasion of yarn, the abrasion of impurities like dirt, vegetable matter, slubs etc. These impurities not only put stress on the needle hook but clog the groove of the needle latch as well which combined with the needle and latch action result in a wear and tear of the needle latch and its holding axle.

Research has shown that the abrasive matter can get accumulated in the spoon of the latch and with repeated knitting action can result is wear out of the head as well as the latch itself.

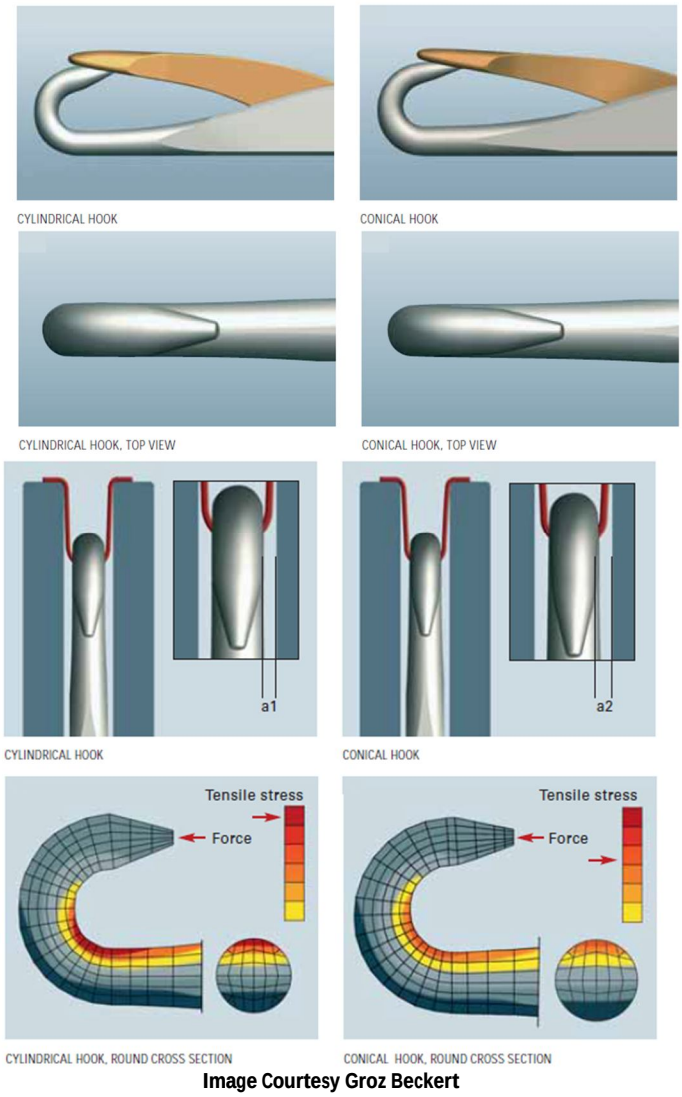
From above it is evident that a needle can break or get bent and hence become useless by forming defect in three parts, the butt, the hook and the latch. All three parts of a needle can get worn out, get bent and break. To enable a tiny needle to withstand this kind of beating day in and day out highly sophisticated engineering is required. Correct material and engineering process has to be designed to manufacture a needle that will stand these tough measures.



The recent developments in the needle engineering have addressed the tough demands of the needle, a knitter would like to use on his machine. The butt of the needle has been removed and a cheaper alternative like slider has been used. The cost of slider is almost one fifth of that of a needle. The striking force on the butt of the needle is the main cause of needle breakage. By introducing a slider that will move the needle vertically to form a new knitting loop, the needle is safe from breaking from the butt and become useless. Instead of the needle butt now the butt of the much cheaper slider will break keeping the needle intact.

There has been a lot of research done on the needle hook and the needle latch. The most effective development on the hook of the needle is to change its shape from cylindrical to conical. The conical hook offers same space to yarn between itself and the latch but at the same time takes lesser space to clear the previously knitted loop. Therefore a needle with conical head provides softer transition of the loop between the latch shank and head and thus substantially reduces friction forces in the new loop formation in comparison with the cylindrical hook.

The conical hook permits the needle for greater clearance between the needle head and sinker than is the case in conventional needles with cylindrical hooks. This allows yarns with poorer quality i.e., yarns with slubs and knots to be processed without problems to an optimum standard of quality of the knitted fabrics as well as decreasing substantially the resultant tensile stress effect on the needle hook because of these spinning faults.



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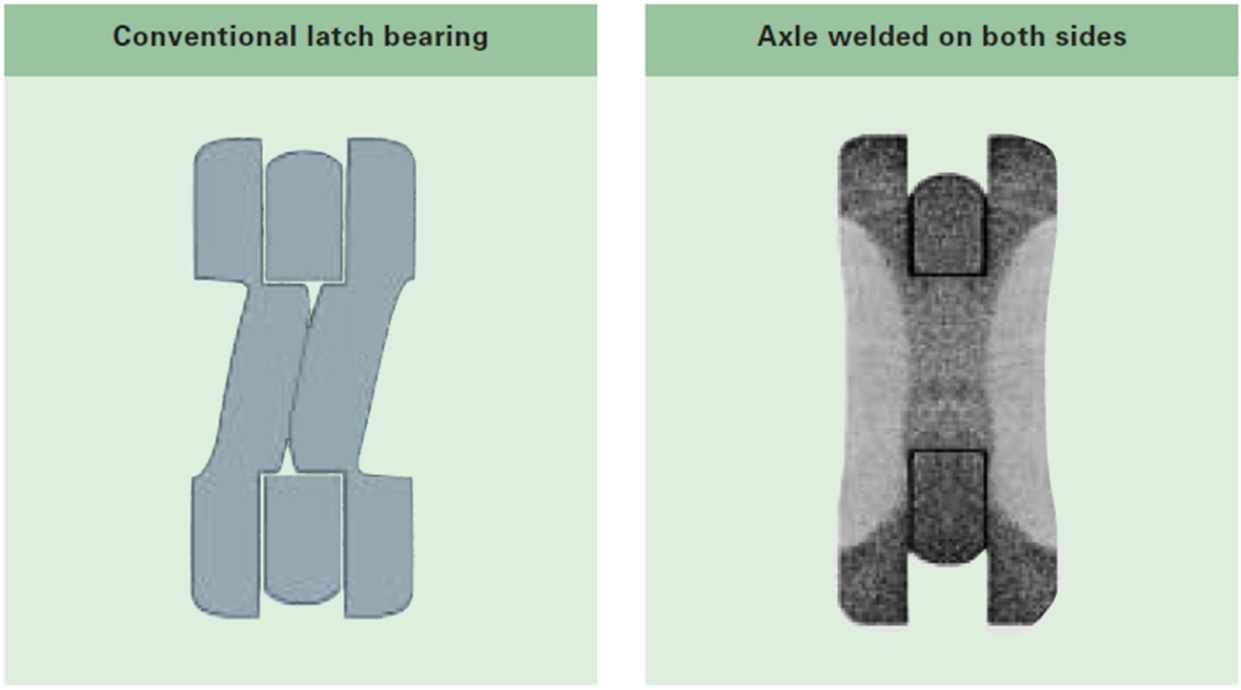
The knitting world has witnessed two major changes in the development of latch of the needle, namely the compound needle and the spring latch needle. Both types have distinct advantages of their own, not

getting into the comparison between the two the most important development has been the engineering of the axle of the latch. The new axle of the latch, with welding on both sides offers prolonged life with lesser effect of wear and tear on the latch and its axle.



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No amount of engineering can increase the life of a needle if the knitters don't learn the precautionary measures they have to take. The knitter shall use a yarn that is free from dust, vegetable and abrasive matter. Simple techniques such as rewinding of the yarn; rewinding will remove the dust contents and vegetable matter to some extent but will remove the slubs and big knots for sure and therefore decreasing the unreasonable stress on the needle hook considerably. The knitter shall keep the working area clean and thus can minimise the wear out of vital parts of the needles. Dust particles accumulated on needles can act as highly abrasive material considering the frequently on going movement of the needle. Timely cleaning using industrial vacuum cleaners and cleaning oils shall reduce the accumulation of dirt, foreign matter etc. in the needle latch grooves, tricks in the needle bed and other such parts that result in wear and tear of the needle and its parts. The Knitter can use correct knitting oil keeping in view the temperature of the work area as well as the gauge of the machine to decrease the resistance and abrasion between the tricks of the needle bed and needles. Lubricating oil with certain viscosity may not work adequately with change in gauge of the knitting machine and the temperature of the work area.

A humble suggestion to the knitting machinery manufacturers, they must redesign their carriages and bring out two major changes: one to make it more closed type and two by lowering the angle of the raising cam and increasing the angle of the lowering cam. This way not only the needle breakage will come down to minimum but it will also help in knitting with weaker yarns because of lesser robbing of the yarn by predecessor needles. A close cam system will also result in reduction of wear and tear of the knitting cams. The needle manufacturers have done enough and now it is the turn of the machinery manufacturers to come out with cam designs that will ensure lesser needle breakage.