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July/August 2001 Vol. 17, No. 103

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NOTHING NEW UNDER THE SUN

A Look at the CSM Part IV

How latch needles form stitches and it's variations.

by Sharon Nani

The fourth article in the Circular Sock Machine Series contains information on the system that operates the latch needles; which in turn form the stitches for our knit projects. According to my Passap Knitting Machine Checklist from part Three in Issue 102 of MKS, this would be the third category of parts: **Cam Shells**, (locks) [carriages]. This comparison will follow the same format as the previous articles in this series: listing the CSM part first in bold lettering. The CSM term will follow with the flat bed terms: Passap in parenthesis and Holding Positions Machines in brackets.

For your convenience, I am going to include Part Three of my checklist and the Terminology Table first. This will give us a systematic way to approach the discussion of these very important parts of the knitting machines. The terms of the CSM main and ribber beds differ considerably. Therefore, they will have to be discussed as separate units.

Passap Knitting Machine Check List ***(note this format would be used for all knitting machines, just substitute the correct 'term' for your machine. Check the Terminology Comparison Table for your machine.)***

III. Set up the Locks (first the front, then the back)

What **Strippers** are used in this pattern? Stripper rules:

Use Orange Strippers when using needles on both beds (except - see black stripper)

Use Black Strippers when:

1. Using needles on only 1 bed.
2. Tubular or Half Tubular Knitting
3. When knitting a pattern using needles on both beds, but where there are 2 or more adjacent needles in the out of work position.

What is the **N/X Lever** and **Pattern Selector Dial** set to?

What is the **Stitch Size Regulator Dial** set to? (Single bed knitting must be stitch size 5 or larger; double bed knitting is usually between 3-6, depending on the size of the yarn).

Is an **Arrow Key** being used? If so depress it.

Table 1: Cam Shells, (locks) [carriages] Terminology for the main bed (taken from Instruction or Parts Manuals from my machines)

Circular Sock Machines: Auto Knitter (Ainslie) Legare 47 Gearhart	**Double Bed Machines Passap DM80 Passap E6000**	**Holding Position Machines Brother/Knit King Studio Artisan**
Cam Shell,	Front Lock	Main Bed Carriage
Up throw Cams,	Cams	Cams
Tension Cam,	Stitch Dial Cam	Tension Dial Cam
Tension Screw,	Stitch Dial	Tension Dial
Bed Plate,	Needle Bed	Needle Bed
Gear Ring and Crank Wheel,		
Yarn Carrier – Yarn Carrier – Carrier Bar	Black, Blue, and Orange Strippers	Sinker Plates

The **Cam Shell** (Front Lock) [Main Bed Carriage] consists of different cams, levers, buttons, and screws dependent upon the complexity of the types of stitches that particular knitting machine is suppose to form. To make a generalized statement: the cams are like "traffic directors" for the latch needles. The latch needles are directed into different positions and heights according to the cams that are operating at the time the 'row is knit'. Different cams have different functions, which can result in the formation of the stitch (whether it is a knit, tuck, or slip stitch) and/or the stitch size of that stitch. *(Refer to my series of articles on "Basic Stitch Construction in MKS issues 85 & 86 for details on how the needles form the types of stitches).* The levers, buttons, and screws operate the cams. Wow, now that is some simple statements. It just gets more complicated as the machines are more automated and therefore have more cams, buttons, and levers that must work in unison with each other.

Now, let me break the above paragraph down into some specifics to give you a better understanding of what is really happening. The CSM's and the basic manual flat bed machines are simple in structure in that they have fewer cams to deal with. The different stitch constructions form by placing the latch needles in a specific location in the cylinder (needle bed). The position of the latch needle allows it to be operated (or not operated) by a specific cam. *Note: I will discuss the possible fabrications that can be formed on the CSM's in the last article in this series.*

There must be at least two types of cams: one to form the stitch construction and one to form the stitch size. The cams that form the stitch construction are in a 'set of two' that work on opposite sides and in mirror image of each other. This is for knitting clockwise or counterclockwise on the CSM and for knitting right to left, and left to right on the flat beds.

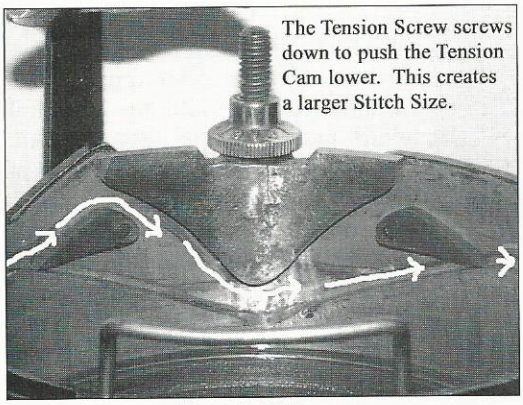

Figure 1: CSM cams.

Figure 1 shows the inside of my Auto Knitter cam shell with the cylinder removed for photography purposes. Notice, it only has these three cams: the **up throw cams** on the left and right and the **tension cam** in the middle. I drew in an arrow showing the path that the needle would take. As it hits the first up throw cam, which is the one in operation, the needle is forced 'upward'. This action allows the old stitch to go behind the hook of the needle. Then the needle is empty and at the same time when it is at the correct height, the yarn carrier places new yarn into the hook of the needle. By this time, the heel (bottom of needle) is now hitting the **'tension' cam**. The **tension screw** (stitch dial) regulates the position of the tension cam *(see Figure 1)*. The further down the screw is screwed, (the higher the number that the stitch dial is set to) the further down the cam is forced, the further down the needle is forced, and finally this results in a bigger knit stitch. Finally, since the 3rd cam (up throw cam on opposite side) is not in action and the needle is coming up to it from its backside, the needle is just allowed to go under the cam and out the other side. The three cams have done their complete job of forming the new stitch at the desired size. Now, wasn't that easy to follow when you are only looking at three cams? The only difference between the machines is the number of cams that direct the needle in a different direction to form different stitches.

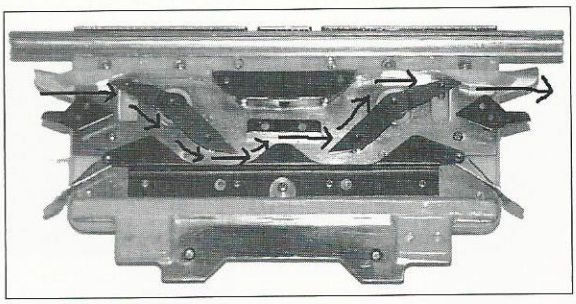

Figure 2: Cams of a Basic Flat Bed Carriage.

Figure 2 shows the underside of a carriage for a basic manual flat bed machine. It has more cams because there are separate buttons and levers that automatically put the latch needles in the correct positions to form the stitches. The simplicity of the mechanical functions remains the same. But now the needle can be forced into all three positions necessary to create the three basic stitch structures.

1. Knit Stitch: the cam forces the needle all the way forward, old stitch is behind hook, new yarn goes into hook, tension cam forces needle down to form desired stitch size.

2. Tuck Stitch: the cam forces the needle half way forward, old stitch remains in hook, new yarn forms a 'loop' of yarn also in hook, tension cam forces needle down to form desired stitch size.

3. Slip Stitch: the cam is not engaged; therefore it does not move the needle at all. This in turn does not allow the needle to catch the yarn, and the yarn slips behind the needle forming a straight line 'or float'. *See MKS Issue 85. Basic Stitch Construction.*

I highly recommend that you experiment and examine the lock [carriage] off your machine. Push the different buttons and move the levers. ***(Special Note: Since most CSM's that I looked at only have the three basic cams for the cam shell, there is no need for levers or buttons to operate these cams).*** At the same time, examine the underside of the lock and observe the cams that are moving. Turn your stitch dial and see how the cam moves up or down according to the setting. You can even take this a step further. Put the lock back on the needle bed. Bring about 20 needles to work position. Then observe what positions the needles go into as you engage different cams. (Follow the manual for your machine if you use pushers, punch cards, or electronics with the different buttons or levers). Can you relate to how the path for the needles is changed by the movement of each cam? It is not really important for you to understand the mechanics of these paths. But on the other hand, it is useful for you to understand the relationships that result into different stitch formations when you move the appropriate buttons or levers.

The next CSM terms in Table One are **Bed Plate, Gear Ring and Crank Wheel**. These are part of the 'needle bed', meaning they hold the cylinder, which in turn holds the latch needles. But they also serve another function in that they rotate the cam shell around the cylinder. It is the turning of the crank wheel that will rotate the cam shell around the cylinder with its needles, so that knitting may be accomplished. ***(Special note: I have read that not all CSM's operated in this fashion, there were some models where the cam shell was stationery, and the cylinder rotated. It is certainly fun and interesting to discover all the inventiveness and differences that have happened and are still happening in the knitting machine world!)***

See figure 3 for a picture of these three parts.

The needle beds of the flat bed knitting machines are stationary and the locks or carriages are moved back and forth across the needle bed, which holds the latch needles. We can physically move these locks with our hands or we can attach an accessory motor to accomplish this task

This finishes the terms in Table One and the space allotted for this article. I will continue with the Ribber Dial terms, some 'first aid guide' reminders, and more about fabrication in the next article. I hope you are having as much fun as I am in investigating how similar in function the machines of the past are with the machines of the present and hopefully we will look forward to seeing machines of the future!

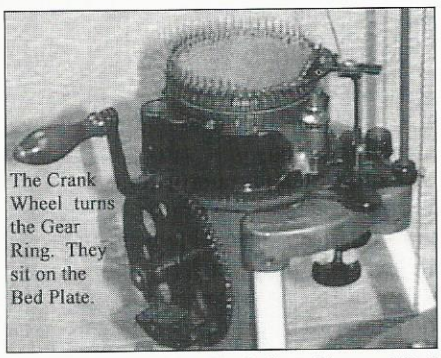

Figure 3: CSM Crank Wheel, Gear Ring, and Bed Plate.