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General view of the BUSCH double-bed hand knitting machine DM 420

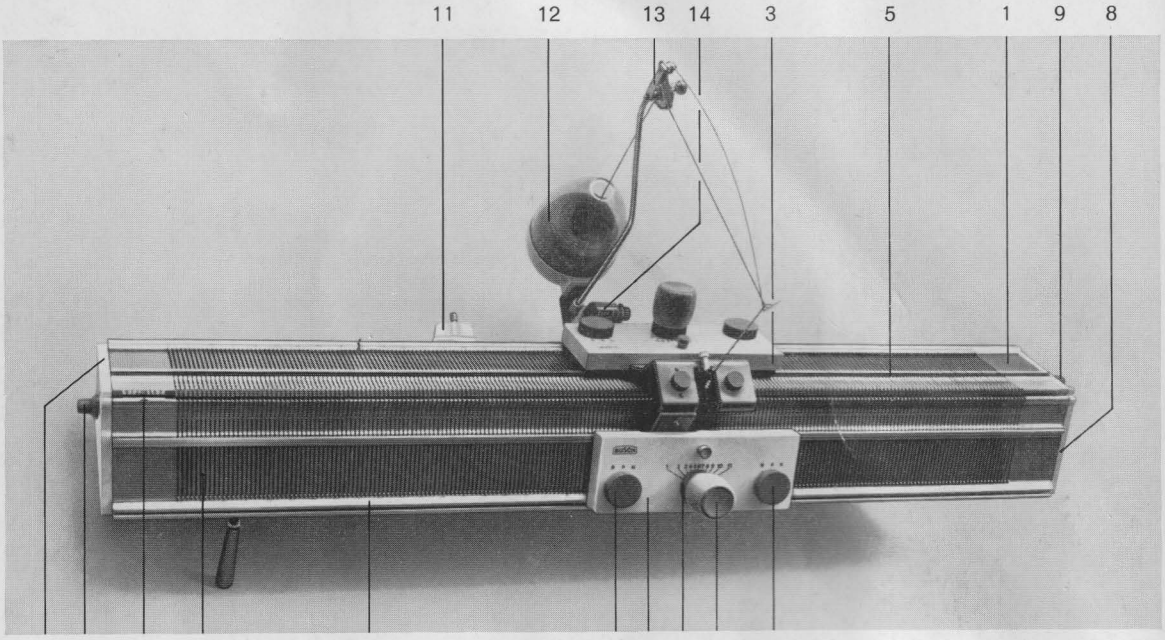
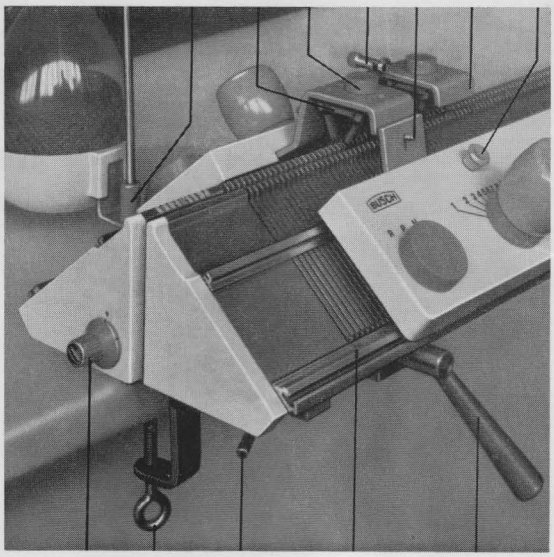


Fig. 1

1 Back needle bed
2 Front needle bed
3 Back cam box or carriage
4 Front cam box or carriage
5 Upper rail
6 Lower rail
7 Needle scale (gauge)
8 End protection caps
9 Knobs for altering distance between needle beds
10 Racking scale with indicator
11 Course counter lever
12 Wool holder
13 Thread tensioner
14 Course counter

Fig. 2



15 Screw clamps
16 Cranked lever for locking bed position
17 Racking handle
18 Pattern control (cam selector)
19 Stitch tension control
20 Knob for moving cam box
21 Needle return knob
22 Support bracket
23 Brushes
24 Detachable thread feeder guide
25 Knurled nut
26 Coupling pin between cam boxes
27 Thread tensioner bracket

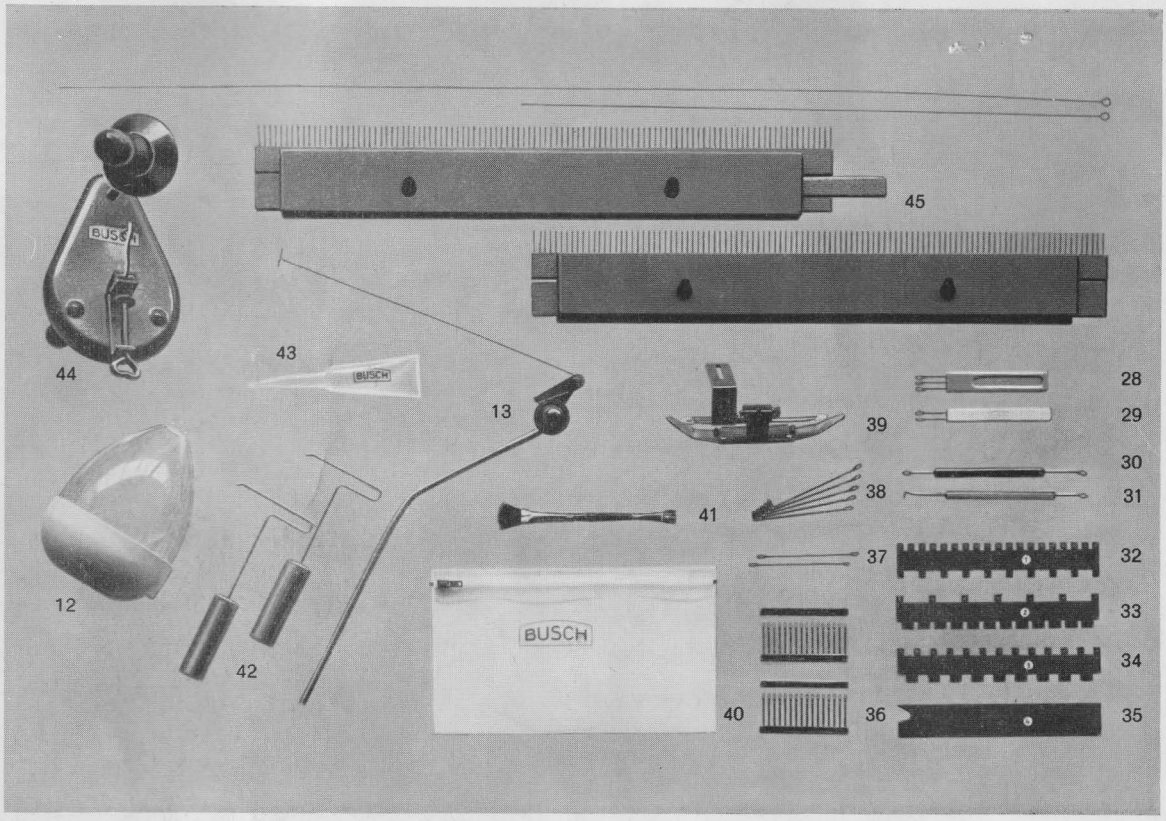


Fig. 3

Accessories

28 3-point transfer tool
29 2-point transfer tool
30 Threading-up tool with latch needle
31 Threading-up tool with point
32 Needle positioning card 1:1/1:3
33 Needle positioning card 1:5/2:1
34 Needle positioning card 1:2/2:2
35 Needle positioning card, all needles
36 Multi-(16)-transfer comb
37 Double-ended bodkin
38 Spare latch needles
39 Presser for weightless knitting on single bed
40 Accessories bag
41 Cleaning brush
42 Side weights
43 Oil can
44 Wool baller
45 Separable comb, two wires, 4 supplementary weights

Other accessories

Raglan transfer
Multi-(24)-transfer comb
Wool winder

Busch-Werke AG
reserve the right to modify the type, colour and number of accessories

Instruction manual for the

BUSCH

Double-bed Hand Knitting Machine DMS 420

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Instructions for unpacking and assembling the machine

Unpacking the machine

Remove the foam rubber packing from the sides. Lift out the machine, taking care that the cam box does not slide from the rails.

Assembling the machine

Mount the machine on a rigid table, at least 38 inches long. This is done by means of two screw clamps (15), located and adjustable beneath the machine. In the event of the screw clamps being hinged up, these should be lowered for securing. When securing the machine, make sure that the screw clamps are in a secure position on the table and screw up tightly (Fig. 2).

Description of machine (Fig. 1 and 2)

The following description is intended as a general introduction to your double-bed hand-knitting machine

I. Needle beds

Back needle bed = BNB (1)
Front needle bed = FNB (2)

a) The needle beds (NB)

serve to accommodate the latch needles. 210 Needle slots (tricks) are machined in each of the two bed surfaces, to guide the needles during the knitting movements. The needles are braked lightly by means of a brake spring, located beneath the upper guide rail, so as to prevent throwing of the needles during knitting.

b) Guide rails

There are two guide rails on each needle bed, one upper (5) and one lower (6) rail on which the cam boxes slide, i.e. are guided The lower guide rails are provided with a needle scale (7), which simplifies the counting of the necessary needles. The course-counter lever (11) is attached on the rear needle bed for the course counter, and can be pushed backwards and forwards in the guide rails, as required by slackening the screw. The counter lever must be always approximately in the middle of the knitting range. The upper guide rails can be withdrawn from either side, (e. g. for changing needles, etc.) Before withdrawal, the relevant end cap (8) must be removed.

c) Racking mechanism

A racking handle (17) is provided at the bottom left hand side of the front needle bed serving to rack the front needle bed. By operating the handle, the FNB can be displaced to the right or to the left, the movement being discernible to the touch and it is possible to rack over 7 needles.

Racking scale with racking indicator (10)

A racking scale is provided at the top left hand side of the BNB and the racking indicator on the FNB. The racking scale is calibrated from 0-7, with a mark between the numbers 3 and 4 (= 1/2 needle rack, or basic setting.)

d) Control knobs for setting the distance between needle beds (9)

These knobs are located at the ends of the BNB and serve to set the 6 different distances between the needle beds. This setting depends on the type of thread being knitted and on the pattern.

Setting the distance between needle beds

Release the cranked lever (16) at the bottom right and left hand side of the FNB; draw the FNB forward slightly, and set the two controls to the desired position. Position 1 represents the smallest spacing between the beds and position 6 the largest. Push the FNB back against the stop; tighten the cranked levers. The control knobs can be removed easily, once the slotted nut has been released with a screwdriver or coin.

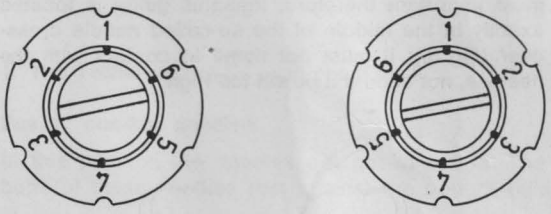


Fig. 4

Note: Care must be taken that the control knobs are not mixed up (Fig. 4).

The **right hand knob** has the numerals running clockwise.

The **left hand knob** has the numerals running anticlockwise.

e) Latch needles (Fig. 5)

Latch needles consist of a needle hook A, a latch B, the needle stem C and butt D.

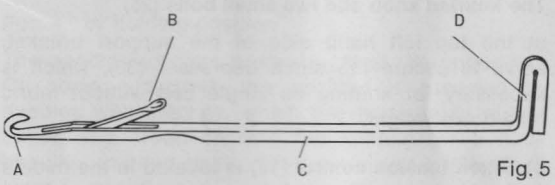


Fig. 5

The latch needles form an important and also very sensitive item of the knitting machine, and must be treated with particular care. Damaged latches lead to knitting faults; bent needles make knitting difficult.

2. Double bed cam boxes

Back cam box = BCB (3)

Front cam box = FCB (4)

The function of these is to impart the upward and downward movement to the latch needles during stitch formation. A bracket connects the FCB and BCB. The cam boxes can be disengaged by pressing down the coupling pin (26), enabling the cam boxes to slide separately over the needle beds. To couple the two cam boxes again, move them towards one another until they engage. The back cam box BCB also serves as a single bed cam box, with which all single-bed or jersey patterns can be knitted (stocking stitch patterns).

The most important parts of the cam box are:

a) Support bracket (22) **and brushes** (23)

as well as the detachable wool feed guide (24). The support bracket is located on the BCB. The brushes (23) screwed to it, serve to open the needle latches and at the same time prevent them from closing during stitch formation. The task of the yarn guide is to feed the wool into the open needle hooks. It is most important therefore, that this guide is located exactly in the middle of the so-called needle cross-over (Fig. 6); it must not come in contact with the needles, nor should it be set too high.

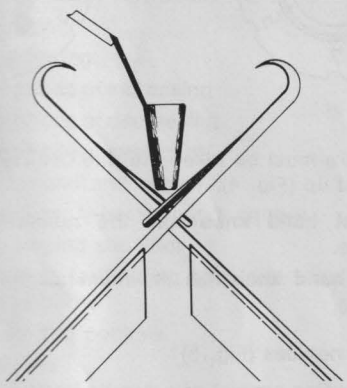


Fig. 6

The knurled knob and two small bolts (25)

at the top left hand side of the support bracket, serve to secure the stitch depresser (39), which is necessary for knitting on single bed without fabric take-down weight.

b) Stitch tension control (19) is located in the middle of the back and front cam boxes, and can be operated to set eleven different stitch tensions. The stitch tension (ST) is set by turning the knob so as to set the arrow to the desired value. The higher the number, the bigger the stitch. 1 = lowest stitch tension; 11 = highest stitch tension.

c) Hand grip (20)

is located on the stitch tension selector and serves to move the cam box to and fro.

d) Pattern controls (18)

There are 2 pattern control knobs on each side of both cam boxes, by means of which various patterns can be selected or alternatively, the cam box can be disengaged completely. Above the pattern control knobs are the letters N P R

Setting N = Normal knitting,
i.e. plain and purl stitches,
stocking stitch and rib.

Setting P = Cardigan and half-carigan
(Royal rib)

Setting R = a) Circular knitting (tubular)
b) rib
c) disengage cam box completely

The setting of the pattern controls will always depend on the pattern to be knitted and is indicated in a cam box setting according to the relevant pattern description.

e) Needle return knob (21)

is located above the hand grip. As the name "needle return knob" implies, the needles are returned automatically from the knitting position into the non-knitting position ready for the next row of knitting.

Needle returner engaged = Knob depressed

Needle returner disengaged = Knob pulled out

Unless otherwise indicated, the needle returner must always be disengaged (pulled out) during knitting.

f) Thread tensioner (13)

consists of a thread guide rod with thread tensioner and tension spring (Fig. 13). On the back cam box (BCB) there is a securing plate with socket (27) into which the thread tensioner bar is inserted, care being taken that the thread tensioner(Fig. 13) is towards the right. The wool or yarn holder is placed on the bracket.

g) The row counter (14)

is mounted on the same securing plate. Every time the row counter passes the row counter lever (11), it is tripped, thereby counting the rows. The row counter can be advanced or turned back by means of the small narrow wheel; it can be returned to zero by means of the wide wheel.

3. Accessories (Fig. 3)

The set-up comb (45)

is used for casting-on (= loose row) at the start of every knitted garment on the double bed machine. In addition, it withdraws the fabric from the working

needles, keeping it taut and uniform. Therefore the comb must always be suspended horizontally in the knitting. The comb is made up of two parts, (each with 105 eyes) which are placed together.
Depending on the knitting width, these can be used separately or as one. It is also provided with 2 rear weight bars with bolts, 2 front weight bars with a hole as well as 1 long and 1 short wire.

Stitch depresser (39)

With this, it is possible to knit single bed without comb and weigts. As mentioned previously, it is attached to the back cam box (Fig. 36) and prevents lifting of the stitches during knitting.

Needle selector combs

Nos 1-3 (32, 33, 34) serve to select certain needles, No. 4 (35) serves to raise every needle. Closed needle latches can be opened with the points of these selector combs.

Side weights (42)

are necessary, for example, when increasing several stitches on the double bed, knitting socks, etc.

Various transfer tools (28-31, 36,37)

serve to transfer certain stitches; crochet latch needle to pick up stitches.

A wool winder (44)

is used to prepare the material. All wools/yarns to be knitted on a hand machine have to be waxed and this is carried out during winding, in that the wool is run into the wool winder over a piece of paraffin wax or candle (Fig. 7).

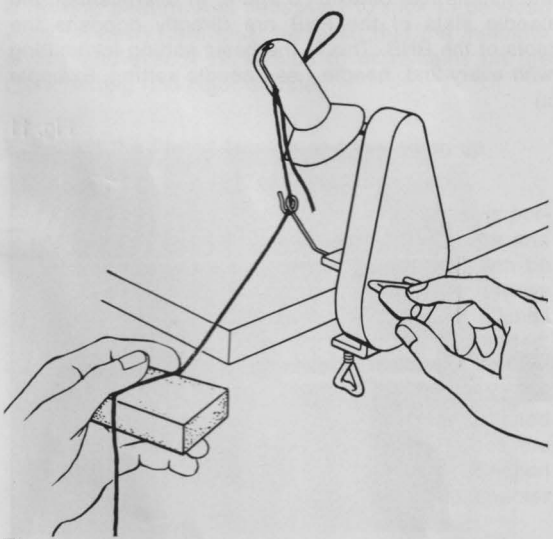


Fig. 7

The ball of wool should be as soft as possible and the **thread must always be drawn off from the inside.** Once the ball of wool is wound, grip the end in the slot and then lift off the ball.

Basic rules for knitting

It is of utmost importance that these basic rules are read thoroughly before starting to knit.

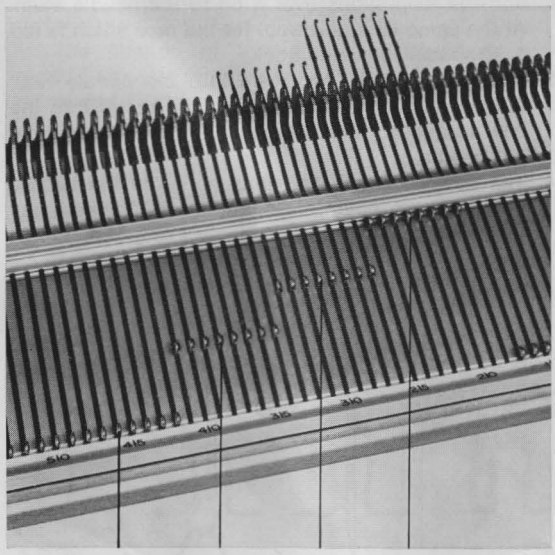


Fig. 8

1. The 4 different needle positions (Fig. 8)

Pos. 1 non-knit position

In this position the needles are not in action. The butts of these needles rest against the bottom rail.

Pos. 2 knitting position

The needle hooks are in contact with the upper edge of the needle bed. During knitting, the working needles are returned to position 2 after every traverse movement of the cam box.

Pos. 3 or upper working position

The open needle latches lie in front of the needle bed. The stitches (st) lie behind the latches on the needle stem.
Before pressing the stitches off, the needle latches have to be opened in this position.

Pos. 4 or holding position

The needle butts are pushed against the upper rail. On some occasions, this position is assumed by needles with stitches, which are temporarily out of action, e.g. when dividing the knitting for a neck opening, knitting heels, short rows and certain patterns.
Where the pattern permits, the needles in this holding position can be brought back to the knitting position automatically by means of the needle returner (21) or moved manually into pos. 3 (needle latches open).

2. The process of knitting (Fig. 9)

1. The loop hangs in the needle hook in pos. 2.
2. By operating the cam box, the needle is pushed from pos. 2 to pos. 3, with causes the latch to open and the loop slides over it on to the needle stem. At the same time, the wool for the next stitch is fed automatically into the hook.
3. The needle is drawn down into the needle bed, thereby closing the latch, with the result that the new thread is pulled through the loop already on the needle.
4. The newly formed loop thus hangs in the needle hook and the needle is again in pos. 2. The same process takes place when picking up single stitches, in which case the latches will have to be opened by hand, using the crochet hook.

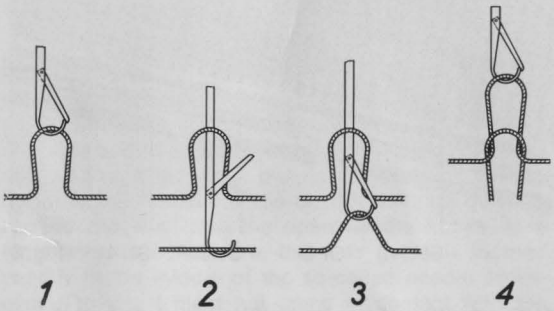


Fig. 9

3. Needle set-out = NS (needle layout)

The wide variety of patterns does not depend entirely on the setting of the pattern controls but also on the needle setout. Henceforward, the NS will be indicated in the form of line diagrams.

| | | | | | | | | | | | represents needles in action
. . . . . represents needles out of action (pos. 1)

Example a) When it states, cast on with every 2nd needle per needle bed, then the necessary needles must be pushed into the work-position (pos. 2) by means of needle selector comb No.1, starting from the middle, according to the following scheme (Fig. 10).

NS ⊥ . | . | . | . | . | back needle bed. BNB
| . | . | . | . | . ⊥ front needle bed. FNB

This means that the FNB and BNB are operating with only every 2nd. needle. This set-out is used for 1 plain/1 purl rib, half cardigan, cardigan, etc.

Example b) The instructions state that all needles of both beds are to knit

NS ⊥ | | | | | | | | | | | | | | | BNB
| | | | | | | | | | | | | | | ⊥ FNB

Generally speaking, in basic types of knitting the first needle on the left, on the BNB and the last needle on the right of the FNB are in working position (see examples a and b. Ns = edge stitches).
⊥



Fig. 10

Note

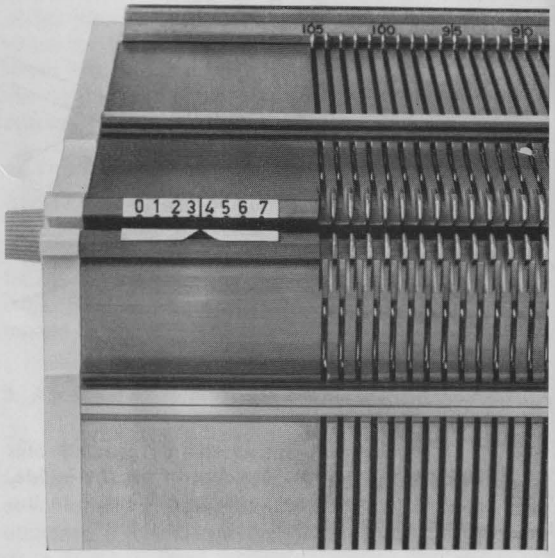
If the needles in both beds operate at the same time, then the needles must be able to cross-over in the middle. Collision of the needles would cause them to bend or break off or cause the cam boxes to jam. The following rules apply:

4. Position of the needle beds

a) Basic position (Fig. 11)

The indicator (I) of the racking scale (10) points to the middle line between 3 and 4. In this position, the needle slots of the FNB are directly opposite the slots of the BNB. This is the basic setting for knitting with every 2nd. needle - see needle setting, Example a)

Fig. 11



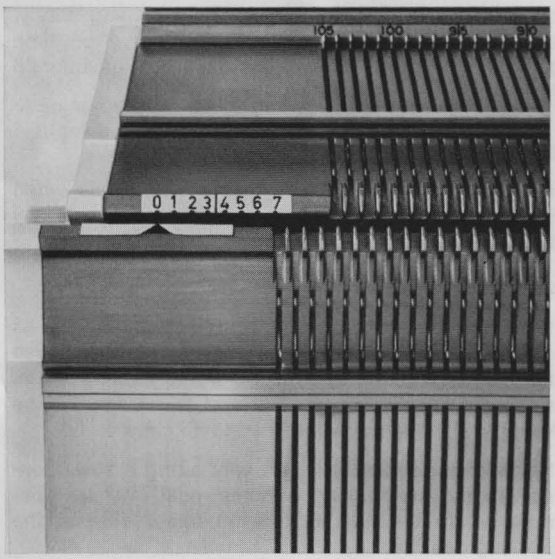


Fig. 12

b) Racking (Fig. 12)

The indicator on the racking scale points to a number. In this position, it is possible to knit with every needle, as indicated in the needle setting example b)

The needles will be staggered and can then cross each other in the middle.

If two or more adjacent needles in one needle bed are to knit, then the indicator must always point to a number. The same applies to all racking patterns, immaterial what the needle setting. If, when knitting a racking pattern, it is necessary to rack to between 3 and 4, every care must be taken that the indicator is not inadverantly racked on to or remains on the basic setting (indicator on line).

5. Setting the thread tension and threading up (Fig. 13)

The correct thread tension is also of greatest importance and will affect the whole knitting process and the knitted garment. The **tension spring** (46) can be set by means of the tensioner (47). It must always set in such a way that the tension spring stands approximately perpendicular when not threaded. (Fig. 14). The thread brake is adjusted by turning the knurled nut (48 in Fig. 15). Fine wools must be subjected to greater tension, and this is effected by tightening the knurled screw, which presses the helical spring tighter against the brake discs. Slacken the knurled screw slightly when knitting coarser wools.

Threading-up

Thread the end of the wool, from the inside of the ball, through the hole in the ball-holder cover. Place the thread between the brake discs (49), through the slot (50) into the hole in the horizontal pin (Fig. 13).

Thread the wool through the eyelet of the tension spring and into the eye of the double ended bodkin (37). Pull the bodkin with the wool down through the thread feeder guide between the two needle beds. Take the wool out of the bodkin. (Pull the wool well out).

Another method of threading-up, without double-ended bodkin is to move the cam box to one side until the thread feeder guide is beyond the needle beds.

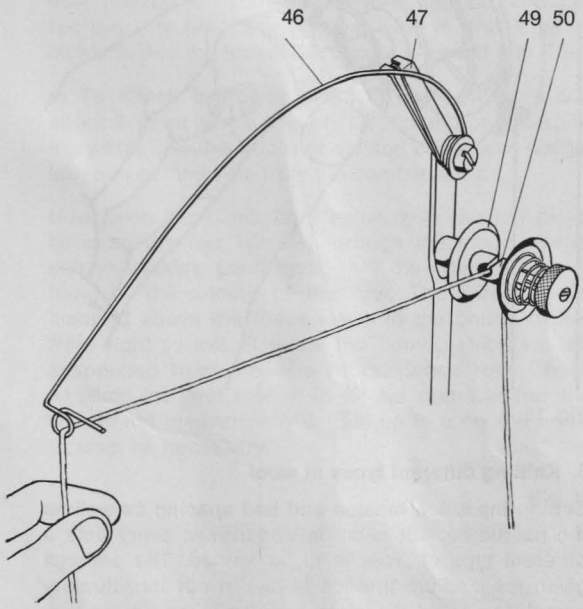
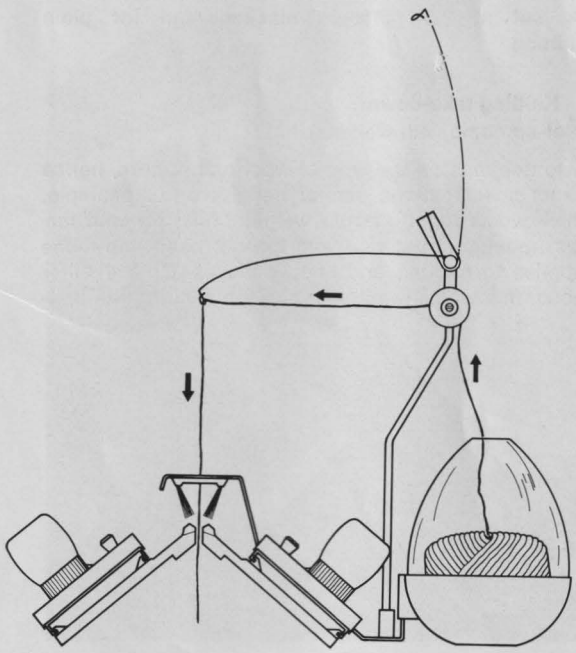


Fig. 13

Fig. 14



Hold the wool taut, vertically between the two hands and insert between the two superimposed flanges, so far until the thread is in the feed guide.

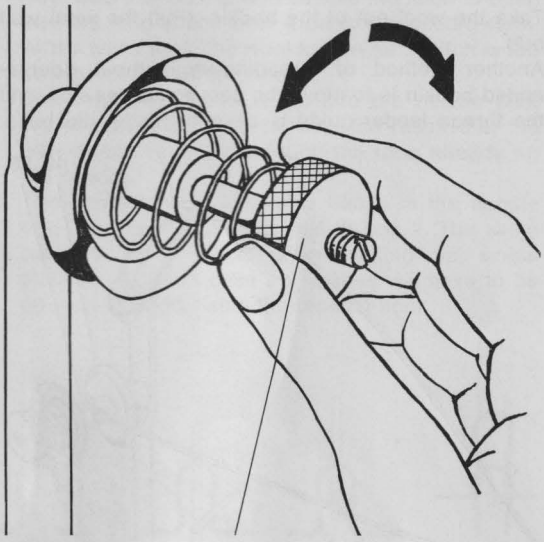


Fig. 15

6. Knitting different types of wool

Setting the stitch tension and bed spacing as well as the needle set-out must be undertaken every time a different type of wool is to be knitted. The settings given for medium threads (4-ply) in our introductory pamphlet should therefore only be taken as a general guide. As a rule, it can be said that for cardigan, half cardigan, racking patterns of all types, circular and stocking stitch, the stitch tension should always be set at 2-3 numbers slacker than for plain knitting.

7. Knitting take-down
(Set-up comb with weights)

also depends on the type of wool and pattern, hence exact specifications cannot be given. For example, thick wools require larger weights, possibly with further manual assistance with the left hand; the same applies to racking and knop patterns. On the other hand, fine wools require less weight. During the knitting process, the comb must always hang freely, should never lie on the knees or the floor. From time to time, the comb with weights must be repositioned (page 19).

8. Important points

It is advisable to use fine to medium wools when learning to knit. After a little experience, almost any type of wool can be knitted.

Knit slowly when learning

Move the cam box quickly over the knitting by all means, but not jerkily. Take care that you traverse the cam box uniformly over the whole knitting width, although moving too far beyond the edge of the knitting will lead to unsightly edge stitches.

Never change direction part way along a row. Control knobs and racking handles must only be operated when the cam box is on either side of the working needles.

Never move the engaged cam box over the knitting, without wool; the knitting will be dropped. Observe the ball of wool during knitting, especially when approaching the end of a ball.

Should the cam box motion suddenly become sluggish, first check whether the wool has become entangled, or whether a large knot has become entrapped.

The cam box must **never be traversed without wool** over the working needles when they are in **cardigan position,** since this would damage the needles. If the knitting is to be taken from the machine without casting off, set the pattern controls to N, break off the thread and traverse the cam box over the knitting, holding the comb down firmly.

The knitting machine should **not be used immediately** after transferring it from a cold to a warm room. (As applies also to sewing machines).

In order to knit with various needle set-outs, first ascertain the position of the needle beds for the desired pattern. This needle bed spacing is always indicated in the pattern description, and where necessary must be untertaken via the racking handle.

Introduction to knitting (double-bed)

1. As stated previously, from now on patterning, needle setouts, cam box settings, racking and bed spacings will be described schematically. The abbreviations and symbols used are explained below:

BNB	Back needle bed
FNB	Front needle bed
BCB	Back cam box
FCB	Front cam box
BS	Bed spacing
I	Indicator on racking scale
N	Arrow on pattern control pointing to N
P	Arrow on pattern control pointing to P
R	Arrow on pattern control pointing to R
St	Stitch
ST	Stitch tension
Ne	Needle
NS	Needle set-out (layout)
N/R	Needle returner
pl/pu	Plain and purl stitches

Example: I - 3, BS 4, $\frac{\text{N 6 R BCB}}{\text{R 6 N FCB}}$

This means that the indicator of the racking scale must point to 3, the bed spacing knobs on both sides to 4. The right hand pattern control on the BCB points to R and the left one to N. The reverse positions on the FCB. To be used for circular (tubular) knitting, as when starting to knit a rib.

2. Casting-on on double bed for ribs and hems

Every piece of knitting begins with casting-on, which can be carried out in various needle set-outs. The cast-on or the ribs must always be suited to the subsequent type of knitting.

1. 1 pl/1 pu on every 2nd. Ne
2. 1 pl/1 pu on every Ne (rib)
3. 2 pl/2 pu cast on (racked cast on)
4. Cast-on for round rib (double hem)
5. Cast-on with separating rows (for very sensitive wools)
6. Semi-loose circular cast-on

Each of these casting-on always begins with a so-called loose row and about 1-2 circular rows (= 2-4 rows on the row counter). Prior to starting the cast-on the cam box must always be located on the right hand side of the machine.

1. C 1 pl/1 pu every 2 nd. Ne.

a) I-centre line, BS 3, cam box on the right.

b) NS | . | . | . | . | . | . | BNB $\frac{\text{N 1 N}}{\text{N 1 N}}$ BCB
| . | . | . | . | . | . | FNB FCB

Move the appropriate needles to pos. 2 (Fig. 10).

Traverse the unthreaded cam box slowly back and fore over the positioned needles. This will open the latches. The cam box must be pushed across until all the working needles are clear of it.

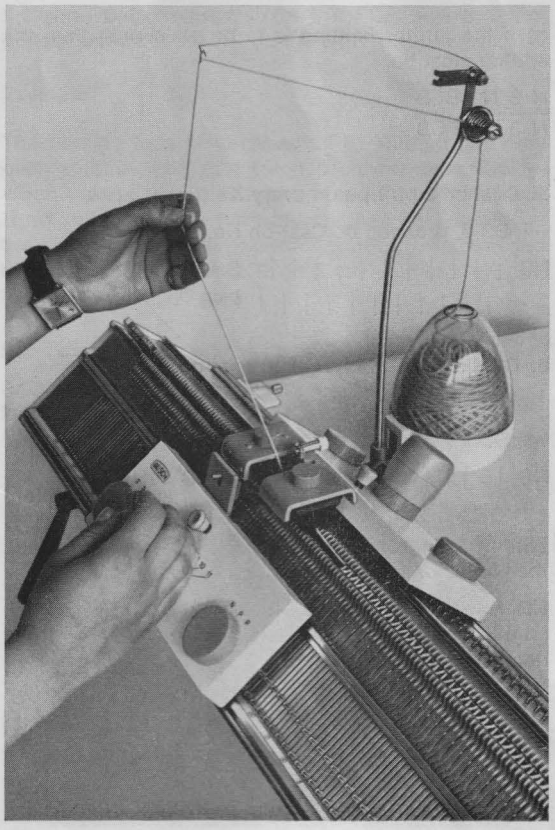
c) The cam box will again be on the right. Thread up with wool as described (page 9). Hold the end of the wool to form the loose row.

d) Casting on. Move the cam box from right to left over the raised needles. When the cam box is located over the last needle, some wool is drawn off by hand, so that the loose row cannot contract (Fig. 16).

e) To attach the comb (Fig. 17) Push the cam box about 8-12 inches to the left. Depending on the knitting width, use the whole or divided **comb with weight bar,** pull out the wire from the comb eyelets.

Now raise the comb from below with the left hand, between the two NB and through the loose row of stitches, **taking great care** that the comb comes to hang in the middle of the row. The wire is then inserted above the loose row into the comb eyelets from right to left. Release the comb, which will be suspended from the wire in the loose row. Check whether the first row is in all Ne and whether the wire is not inadvertently caught up in a needle hook. Correct as necessary.

Fig. 16



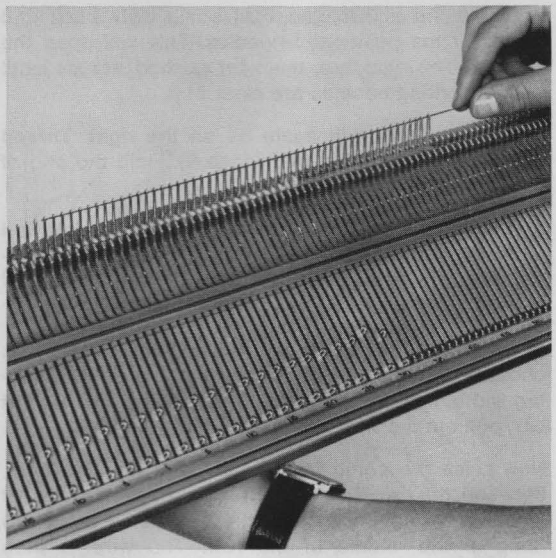


Fig. 17

f) Casting-on circular rows

After the loose row, knit 1-2 circular rows (= 4 rows on the row counter)

N 2 R BCB
R 2 N FCB

g) If the further knitting is to be **plain/purl,** then the setting must be

N 3 N BCB
N 3 N FCB

2. Cast on 1 pl/1 pu on every Ne (rib)

I-4, BS-3, proceed as Cast-on No. 1

NS | | | | | | | | | | BNB
| | | | | | | | | | FNB

3. Cast on 2 pl/2 pu, racked cast-on

1st variation (Fig. 18)

I-3, BS-3

NS | . | | . | | . | | . | | . | | BNB
| | . | | . | | . | | . | | . | FNB knitting position

When casting on the first row, it is essential to rack the FNB over 1 Ne to the right, i.e. I-4.

NB. After casting on the first row, rack the FNB back i.e I-3. Procedure as in casting-on No. 1. Carry on as desired.

To proceed with stocking stitch or to knit thick wool, the following applies:

2nd variation

Move I to centre line, BS-4

NS | | . . | | . . | | . . | | . . | |
| | . . | | . . | | . . | | . . | |

knitting position

To knit the first cast-on row, put I-2. Remaining operations as described. (Knit with I on centre line).

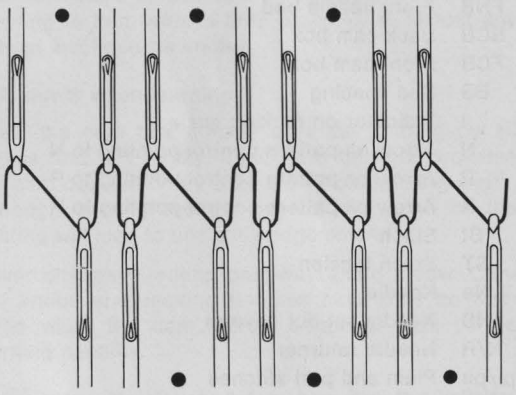


Fig. 18

4. Casting-on for circular welt (double welt)

is generally used for cardigans, tights, finishing borders, ect. NS and loose row as cast-on No. 2.
After the loose row, knit to the desired length (e.g. 10 circular rows or 20 rows) in circular. Change over to the desired pattern after the welt.

5. Cast-on with separator rows

is used wherever very fine and light wools are knitted. Thread in a spare length of light wool. First push the desired needles in the BNB to pos. 4. Engage the needle returner (21), latches open. Raise the comb with wire (Fig. 38) between the needle beds and hold it between the needles, tilting towards the back; move the cam box to the left and then release the comb. Knit some circular rows normally, break off the wool. Thread up the ground colour. Now push the necessary needles of the FNB into pos. 2. Knit the loose row with the following circular rows. Proceed knitting as desired. Disconnect the separating rows on completion of the piece.

6. Semi-loose circular casting on

with separator rows.

Move I-3, BS-3, NS and loose row as casting on No. 1. Use a spare length of wool for this purpose. After the 2 cast-on circular rows, thread in the ground colour. Knit another circular row. Now push up all the intermediate empty needles, then continue knitting circular or semi-circular as required. On completion, separate the separator row; cast-off the stitches; hem over or knit-on a border.

Basic types of knitting

This chapter includes those types of knitting which can be produced automatically by setting the pattern controls. These are:

1. Plain/purl (1 x 1 rib)
2. Royal rib or half cardigan
3. Cardigan
4. Stocking stitch on one needle bed or circular knitting on two beds (tubular)
5. Rib knitting (waves or Italian stitching).

1. 1 x 1 Rib knitting (plain)

displays plain stitches only on both sides, i.e. has the same appearance on both sides.

Setting $\frac{\text{N 3 N}}{\text{N 3 N}}$

The needles of both beds knit simultaneously
2 Plain/2 purl is also a rib pattern which is obtained by withdrawing some needles (Fig. 19).

2. Half cardigan (Royal rib) (Fig. 20)

To knit this pattern, one pattern control is set to P, while all the others are set to N. When knitting for example, with the following setting

$\frac{\text{N P}}{\text{N N}}$

then as the result of one movement of the cam box from left to right, tuck loops will be formed on the BNB, and stitches on the FNB. When moving the cam box from right to left, stitches will be knitted on both beds.

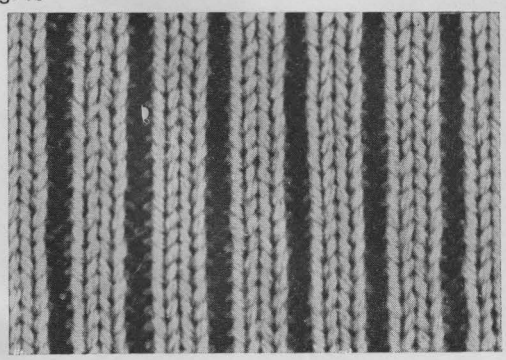
Half cardigan can be knitted with every needle (fine wool), every 2nd needle (medium weight pullover wool), every 3 rd needle (thick wool).

3. Cardigan (tuck or full cardigan) (Fig. 21)

To knit this pattern, two diagonally opposed controls must be set to P, e.g.

$\frac{\text{N P}}{\text{P N}}$

Fig. 19



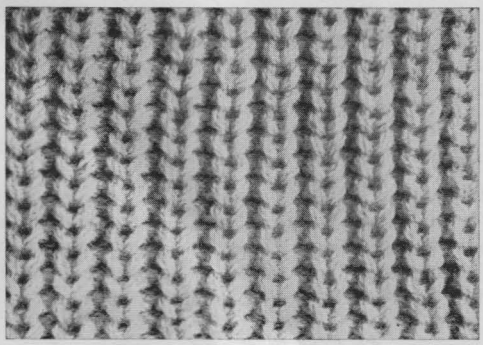


Fig. 20

Because of the diagonal cardigan setting, alternate stitches and tuck loops are formed on both NB. On moving the cam box from left to right, tuck loops are formed on the BNB an stitches on the FNB. When the cam box moves from right to left, stitches are formed on the BNB and tuck loops on the FNB. This pattern is knitted with every 2nd needle or with every needle (for fine wool). With every 3rd needle for thick wool.

4. Stocking stitch and circular knitting

Stocking stitch is only knitted on the BNB N N. Stitches are formed with every cam box traverse. Circular knitting is produced with both needle beds, in that one pattern control on the FCB and the diagonally opposite control on the BCB is set to R.

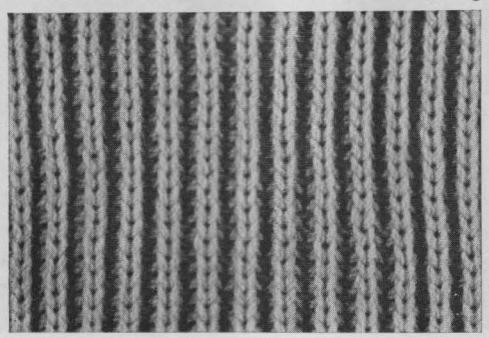
Example $\frac{\text{N R}}{\text{R N}}$

The outside face of this method of knitting has only plain stitches, and purl stitches on the reverse side. When traversing the cam box from left to right, there is no knitting on the BNB but stitches are formed on the FNB. When traversing from right to left, there will be stitches on the BNB and no knitting on the FNB.

Semi circular knitting (half open)

Knitwear remains open on one side. This method of knitting is mostly used when knitting thick wools on every 2nd needle and the number of needles of one

Fig. 21



NB is not sufficient when knitting stocking stitch. Adjoining the half-open circular casting on (page 12), the pattern controls are alternately set to non-knit after every 2nd row, as follows:

$$\frac{R\ R}{N\ N}$$ knit 2 rows $$\frac{N\ N}{R\ R}$$ knit 2 rows

If the control setting is altered in each case when the cam box is to the right, then the knitting will remain open on the left side. If the cam box is to the left, then the knitting will be open on the right. The welt or rib is knitted on subsequently.

5. Rib patterns (Fig. 22)

For this pattern, set 1 pattern control to R, and the remaining 3 to N, e. g.

$$\frac{N\ 5\ N}{N\ 6\ R}$$

The needles of the FNB will knit only every 2nd row. Cam box movement from right to left results in stitches on back and front NB; whilst movement from left to right knits stitches on BNB and does not knit on FNB. In this case, the FNB represents the face of the fabric.

4. Shaped knitting

Depending on the shape of the garment, it is necessary to alter the knitting width by increasing or decreasing.

a) Increasing

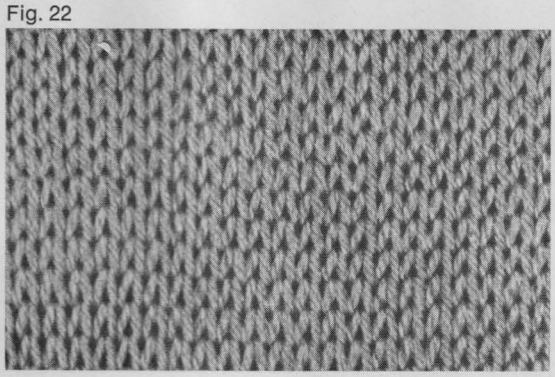
is achieved by putting previously resting needles (pos. 1) into the knitting position.

b) Decreasing

is achieved by transferring stitches, i.e. putting two or more stitches on to one needle.

The transfer of stitches is carried out with so-called transfer tools (see accessories); a 1-point, 2-point or 3-point tool, with which the end stitches are transferred. Make sure that the emptied needles are pushed down to pos. 1.

Fig. 22



Procedure: Engage the eye of the transfer tool in the needle hook of the stitch to be transferred, and pull the transfer tool along the extended line of the latch needle as far as possible, until the stitch comes to lie behind the latch. Now push the latch needle with the transfer needle back down until the stitch closes the latch and slides over the needle hook on to the transfer tool. Disengage the transfer tool from the needle hook and tilt it slightly towards the front so that the stitch does not slip off the tool.

When transferring stitches from the FNB to BNB (Fig. 23), e. g. when changing from double-bed to single-bed knitting, pattern dividing, etc., the transfer tool with the stitch being transferred, is tilted backwards slightly and the stitch held in front of the relevant needle of the BNB. This is then inserted in the stitch with the left hand and only withdraw the transfer tool when the stitch is held securely in the needle hook.

To transfer stitches **on the same NB** (Fig. 24), the eye of the transfer tool is engaged in the adjacent needle and the stitch slipped off.

Transfer of stitches with double-ended bodkin

e.g. from FNB to BNB

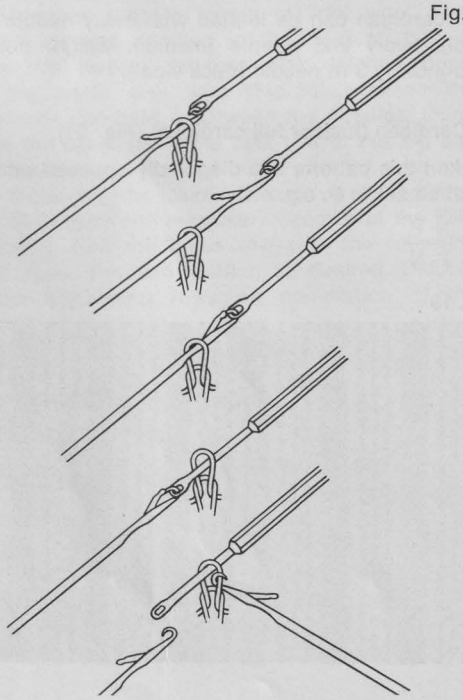
Use the double-ended bodkin instead of the transfer tool. First lift off the stitch as described. The relevant needle must be in the working position (pos. 2) with latch open. Tilt the bodkin backwards, engage the bodkin eyelet and slip the stitch off. (Fig. 25)

Increasing on the double bed

Single stitches at edge of knitting

Push the necessary needles into working position on the cam box side, then proceed knitting.

Fig. 23



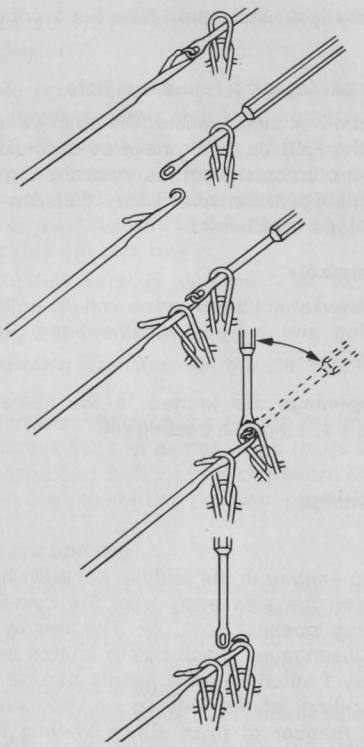


Fig. 24

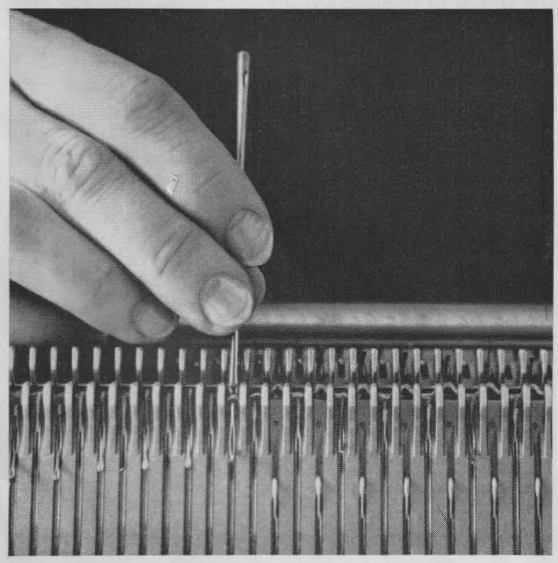
Increasing within the edge stitches (Fig. 26)

Transfer the desired number of needles outwards-over one needle, using the appropriate transfer tool. Transfer loops on to the emptied needles. Proceed knitting.

Several stitches

On the side away from the cam box, push the relevant needles into working position. Knit 1 row. Suspend the side weight (42). Raise the hook of the side weight between the needle beds, outside the knitting, and suspend it from the newly formed loose row (Fig. 27).

Fig. 25



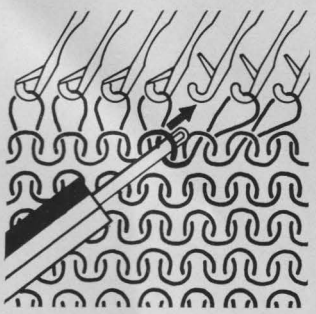
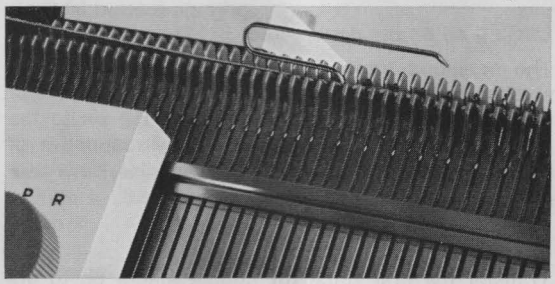


Fig. 26

Increasing a large number of stitches

Proceed as for several stitches, but also suspend the comb.

Fig. 27



Decreasing

can also be carried out at the edge of the knitting or within the edges. Single stitches can be decreased-on both sides and on both NB at the same time, irrespective of the cam box position.

1 Stitch at the edge of the knitting. Transfer the first stitch on to the adjacent needle. Push the emptied needle out of the working position.

Decreasing within the knitting: use the 2-point, 3-point or 16-point transfer tool to transfer the necessary stitches over one needle, towards the inside. This is mostly used with Raglan shaping, and it is necessary for this, always to transfer the stitches on both NB at the same time (Fig. 28).

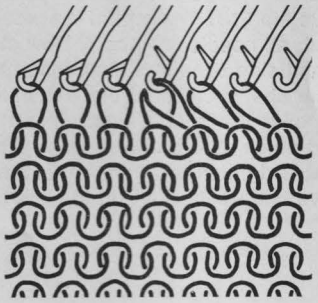


Fig. 28

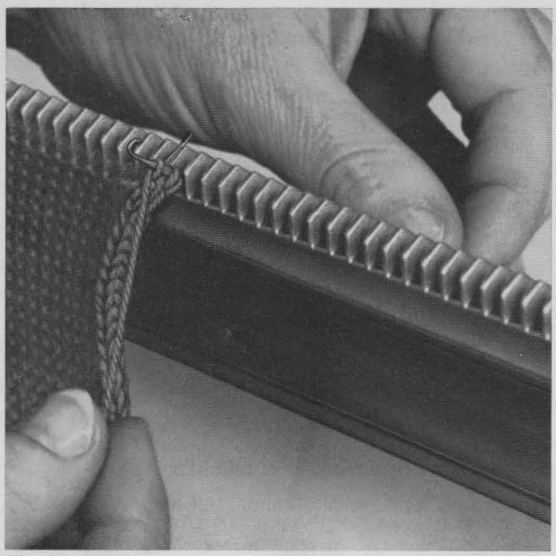


Fig. 29

Casting-off on the double-bed

The cam box must always be on the side of the stitches to be cast-off, and it is advisable to transfer the stitches to be cast off from the FNB on to the corresponding needles on the BNB, irrespective of whether these oppositely placed needles have stitches or not.

Casting-off with transfer tool

Transfer the first stitch (or double stitch) on to the adjacent needle. Push up the latch needle by hand until the stitches have slid over the needle latch. Lay the thread on to the opened latch and lower the needle with the left hand until a new stitch is formed. Transfer the new stitch on to the next needle and repeat the whole process as many times as necessary (Fig. 29).

Casting-off with latched crochet hook

at the end of a garment piece. The cam box must be to the right of the knitting. Transfer all stitches from FNB to corresponding needles on BNB. Push all needles of FNB into working position. Knit 1 row normally, then disengage the front cam box and move it to the right, over the knitting. This will 'press-off' all the newly formed loops, i.e. these loops will be dropped. Remove the FNB. The end of the wool will be on the left. Push all needles to pos. 4. Now starting from the right hand side of the knitting, insert the crochet needle, from the front, into the 1st stitch, let the stitch slide over the needle latch, insert the needle into the 2nd stitch, and pull it through the 1st stitch. Now pull the 3rd stitch through the 2nd, etc. until all stitches have been cast off. Pull the end of the wool through the last stitch, then take the knitting off the machine.

Stepwise casting-off a round arm hole

On the cam box side, transfer the stitches to be cast off from the FNB on to the needles of the BNB; cast off with the transfer tool as described previously. Repeat this operation after every 2nd row until the desired shape is obtained.

Sloping armhole

Transfer the 1st stitch on to the 2nd on both sides of the knitting and on both needle beds. Repeat as necessary.

Sleeve openings are knitted in the same way as armholes, i. e. stepwise casting-off.

Neck openings

V-Necks

Divide the knitting in the middle, i.e. push half of the needles (on the side away from the cam box) into the holding position (pos. 4). The needle returner must be disengaged. Each half is knitted separately. Reduce by 1 stitch on each needle bed, at the edge of the knitting, at the side to be reduced, for the specified number of rows. Since knitting is carried out on only half the piece, the take-up will not be over the full width. It is necessary therefore to suspend side weights on the edge of these needles which are working, and to pull the knitting down taut with the left hand. The second half of the divided work is knitted in corresponding manner.

Round neck

Cast off about one third of the number of stitches envisaged for the neck opening, from the middle of the knitting, with a thread of the same colour. Push the group of needles on the side away from the cam box, into the holding position. Proceed as in V-neck, but cast off stepwise as described for round armhole.

Square neck

Cast off the desired number of stitches in a straight line, then knit each side of the neck straight, but separately.

Straight opening (long slit)

Divide the knitting as for V-neck, but carry on knitting without decreasing.

Shoulder shaping

Transfer the specified stitches from the FNB to BNB at the cam box side, after every 2nd row; cast off as described or cast off by short rows (page 21).

Important points for knitting neck opening in various patterns

In order to proceed knitting the second half without fault, the following points should be noted:

a) If when dividing the knitting, the cam box is on the right, then it must again be on the right when starting the 2nd half. Except when knitting stocking stitch or plain pattern. In this case, it is immaterial which side the cam box is.

b) In all other knitting patterns, it is essential to insert the stitches in the needle hooks before proceeding with the 2nd half.

1st Variation Transfer with transfer tool, then proceed.

2nd Variation Engage the needle returner, knit 1 row, unpick this row as described (page 18). Disengage cam box, i. e. set all pattern controls to R, push back to starting position; proceed knitting.

Racked neck opening

Since the needle bed cannot be racked if needles in both beds are in holding position, the stitches on the needles of one bed to be pushed to holding position must be transferred to the opposite lying needles before dividing the knitting.
Only then push the needles to the holding position.
It is advisable to pencil mark on the needle bed, which needles have to have stitches, before proceeding with the 2nd half. Also note which side has to be racked.

Knitting buttonholes and pocket openings

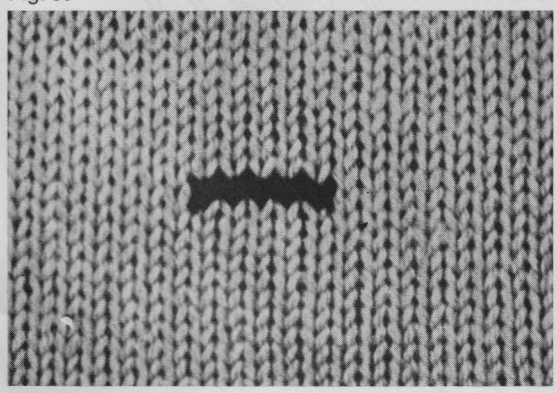
Small button holes

Transfer 1 stitch to the right and 1 stitch to the left on both needle beds at the required position. Leave the 4 empty needles in working position and proceed knitting.

Horizontal buttonhole (Fig. 30)

Knit on the necessary needles of the FNB and BNB with a different coloured auxiliary thread. Move the needles to pos. 3, lay the thread over them and knit

Fig. 30



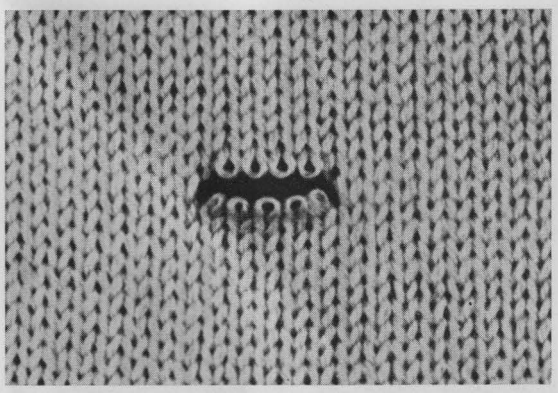


Fig. 31

individually by hand. Pull the two ends of the thread downwards between the needle beds with a latched crochet hook, and then knit on. On completion of the knitting, pull out the auxiliary thread and reinforce the edge by hand (Fig. 31).

Vertical buttonhole (Fig. 32)

First knit as for straight opening. Break off the wool once the required buttonhole length is achieved; put the previously working needles into holding position and push the other needles back to pos. 3, or, depending on the pattern, hang in the needle hooks. Knit the necessary rows; always select the odd row numbers, then proceed knitting over the whole width.

Horizontal pocket openings

Knit the necessary stitches with an auxiliary thread, as for horizontal buttonholes. Pull out the auxiliary thread after completion of the work and thread the open stitches on to auxiliary needle. Hang the open stitches back on the needle hooks; then knit the facing and pocket.

5. Broken wool, or joining on a new ball

If possible, knots in knitting should be avoided, since this would impair the appearance of the knitting. If it

Fig. 32

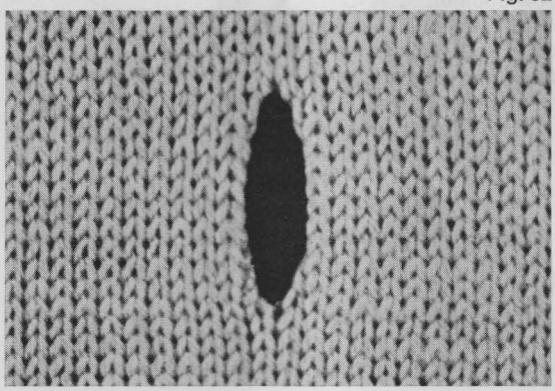




Fig. 33

can be seen that a ball of wool is about to end and the thread will not suffice for a whole row, join on a new ball by first knotting the two ends together. Using the latched crochet hook, pull the thread downwards-alongside the knitting until the knot or ends can be held. Carry on knitting and release the thread after 2-3 rows. The same procedure is to be carried out for a break in the wool in the knitting.

6. Correcting faults

Unrove individual rows

Should it happen that some kind of fault has been made, it is possible to unrove without taking the knitting from the machine. The wool between the knitting and the cam box is held taut by hand until the stitches are gathered (Fig. 33). Now move the wool backwards and forwards until it jumps out of the needle hooks. Move the disengaged cam box (i.e. all pattern controls to R) back to the end of the wool. Pull back the excess wool in the direction of the wool holder and proceed knitting. Turn back the row counter.

In the event of an incorrectly knitted stitch, penetrate into the stitch one row below (Fig. 34) and hang the stitch, together with the loop above it, in the needle hooks. Push the needles manually to pos. 3 until stitches slide behind the latches; lay the loop over the open latch and make new stitch.

Transferring a garment piece on to the double bed

Pick up all stitches on to a thin knitting needle. Remove FNB and transfer all the stitches, **including those destined for the FNB,** on to the BNB, in such a manner that the stitches of the FNB come to lie on the stitches of the BNB. Once all the stitches are transferred, the FNB is re-fitted and the appropriate stitches transferred to the FNB with the aid of transfer tools. Push all the empty needles not required to non-working position. Proceed knitting. In the case of knitting with every 2nd needle, e. g. 1 plain/1 purl, the stitches are then transferred as for stocking stitch, and transfer every 2nd stitch to the FNB, using the transfer tool.

A circularly knitted piece is held between the two needle beds and the rear stitches cast on to the BNB, while the front stitches are transferred to the FNB. Unpick 1-2 circular rows. Proceed with circular knitting.

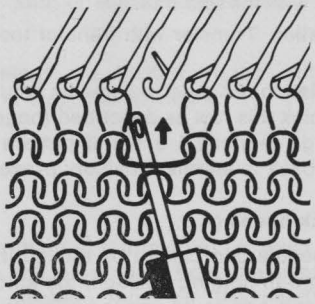


Fig. 34

Picking up stitches

Plain stitches (Fig. 35)

are picked up by inserting the latched crochet needle into the stitch from the front, allow the stitch to slip over the latch. Now pull the loop above it through the stitch. Once the last loop is knitted, the stitch is placed back on to the needle.

Purl stitches

The same process as for plain stitches, but in this case the latched crochet needle is inserted into the stiches from behind.

Cardigan stitches

Take up the stitch and the loop above it with the latched crochet needle and allow to slide over the latch. Pull the 2nd loop through the stitch and pull the 1st loop. Repeat. When picking up stitches on

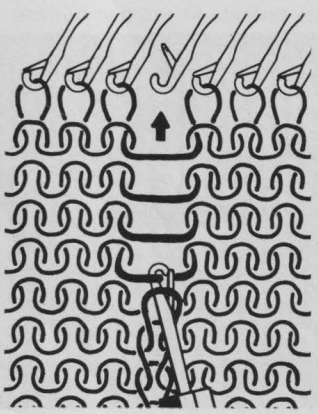


Fig. 3

the double bed machine it is advisable to slightly slacken the FNB and pull it forwards as far as possible, until there is sufficient space for picking up. Should the stitch have dropped too far, this can be picked up and sewn with loop stitch when the completed knitting is taken from the machine.

7. Attaching or removing the set-up comb

a) Pull out the wire from the comb. Hold the knitting down taut with the left hand to prevent stitches jumping out of needles. Take the comb in the right hand, and insert it in the knitting, from the back, below the needle bed. Thread the wire back into the comb and proceed knitting.
b) When the cam box is to the left of the knitting, remove the comb. Hold the knitting taut and insert the comb between the two NB, through the last row, (as for loose row). Thread the wire back into comb and proceed knitting.
c) Leave the comb in the knitting, and roll the knitting up from time to time, preventing its unrolling by inserting 2 or 3 normal handknitting needles into the knitting.

8. Knitting on one needle bed

(Jersey knitting)

If after a double bed border, it is desired to knit stocking stitch, then transfer all the stitches from the FNB to the opposite needles of the BNB (see page 14). Remove FNB by releasing the cranked levers (16) and pull the FNB forwards, taking care that the cam box does not slide off.
Setting N 7 N BCB.

Attaching and setting the presser

The presser can only be fitted after removal of the FNB. Unscrew the knurled knob on the support bracket (25) on the top left side of the back cam box. Fit the presser on to the 2 small bolts and screw the knurled knob tightly.

Setting

The presser should be set so that the nylon strip is located close to the stitches under the working needles but does not abraid the knitting excessively. Allow for wool thickness. **Note:** The nylon strip must never be set to rub against the needles or press them up, as this would lead to imperfect knitting. Once the presser is set correctly, tighten the knurled knob. The set-up comb can then be detached if required. Proceed knitting stocking stitch.

Different casting-on techniques on BNB

(single-bed casting-on)

1. Closed cast on
2 Loose cast on
3. Half open cast on

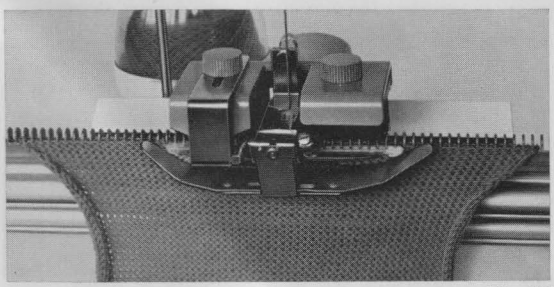


Fig. 36

1. Closed cast on (Fig. 37)

Push all the necessary needles to pos. 4; cam box on the right; thread up the wool. Make a slip knot at the end of the wool and place on to the first raised needle at extreme left. Using the right hand, wrap the wool anticlockwise around the needle. The small, fairly slack loops are pressed with the left thumb against the needle-bed. After completing the casting on, pull back the excess wool; open latches; engage needle returner; knit 1 row. It is advisable when knitting the first few rows, to push the needles back to holding position after each row.

2. Loose cast on (Fig. 38)

Start without presser. Push the required number of needles into pos. 4 and engage the needle returner. Insert the comb with wire with the left hand, between the needles at a slant towards the back and move the cam box slowly. Let the comb fall and proceed knitting. Secure the presser after a few rows.

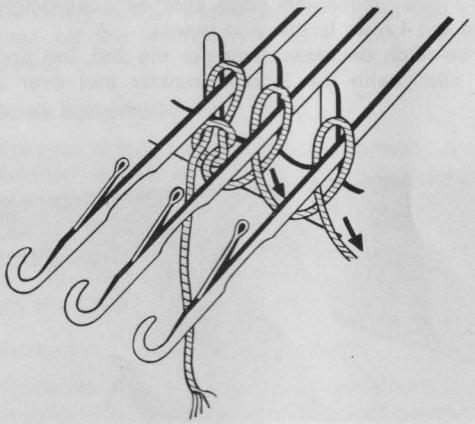
3 Semi-open cast on

Proceed as for open casting on, but start with only every 2nd needle. After the first row, push up all the intermediate empty needles and then proceed as above.

Double hem (Fig. 39)

This is normally produced on double bed in circular knitting but can also be produced on one bed. Closed

Fig. 37



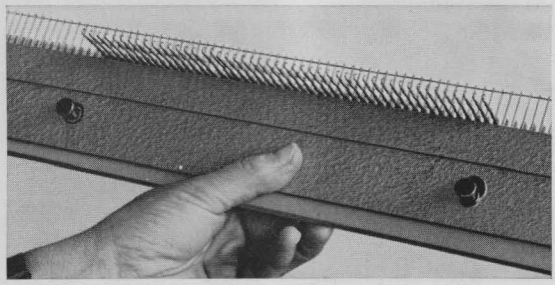


Fig. 38

cast on as described, knit twice the number of rows of the required hem width. Now hang all the casting-on loops on to the needle hooks and push the needles into pos. 4. Engage the needle returner and proceed. Depending on the type of pattern, it may be possible to transfer only every 2nd casting-on loop.

Double hem with zig-zag rib

Apart from a row of holes proceed as for double hem. After knitting half the hem height, transfer every 2nd stitch on to adjacent needle; leave the empty needles in pos. 2 and proceed.

Shaping on one bed

Generally the same rules apply as for shaping on double bed, the only difference being that knitting is on one bed only, and consequently only the stitches of one needle bed have to be considered. For this reason, this section will give only such instructions as are of special significance to single bed knitting.

Various Raglan decreasing methods, with fashioning marks.

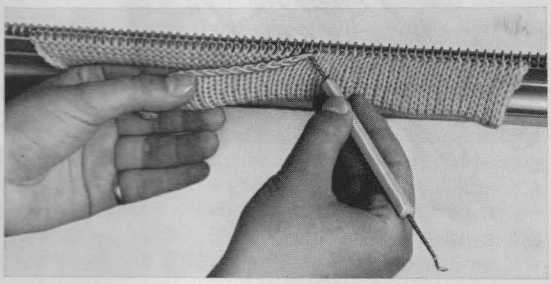
a) **Singie stitch decreasing.** Using the 2-, 3- or 16-point transfer tool transfer the required stitches over one needle towards the inside; knit 2 rows then repeat.

b) **Two-stitch decreasing.** e. g. 4th stitch to 6th, 3rd stitch to 5th. Use the 2-point transfer tool to transfer the 3rd and 4th stitches over 2 needles towards the inside; move the edge stitches accordingly then knit 4 rows further and repeat.

c) **Three-stitch decrease.** Transfer the 2nd, 3rd and 4th stitch with the 3-point transfer tool over 3 needles towards the inside. Move the edge stitches accordingly, but before pressing-off, push these needles to pos. 3, open latches and then knit 6 rows.

d) **Raglan sloping strip.** Transfer the desired group of stitches on the cam box side, (e. g. 6) over 2 needles towards the inside. Push 1 empty needle back to pos. 2 (this means that only 1 stitch is reduced), then knit 2 rows.

Fig. 39



Increasing several stitches at the edge of the knitting

Cast loops on to the desired number of needles on the carriage side, as for closed casting on. Before pressing off, push the needles into pos. 3 (Fig. 40.)

Divided increasing

e. g. after a border. Pick up all the stitches on a thin hand knitting needle in the following manner: Push needles to pos. 4, then working from right to left, insert the knitting needle from behind, through the stitches; push the latch needle back to pos. 2 with the thumb, and lift the stitch from the latch needle. Proceed in this manner until all the stitches are on the knitting needle (Fig. 41). Now push all the necessary needles to pos. 2, then using the transfer tool, replace the stitches on to the needle hooks, so that the next stitches will be formed from each of the loops. Before pressing off the first row, push all needles to pos. 3.

Divided decreasing

Start as for increasing, but when replacing the stitches, place 2 stitches on each needle.

Short rows (turning)

Certain knitted pieces require partly knitted rows, e g. pants, flared skirts, etc. i.e. in circumstances where decreasings, shapings, chest darts, etc., have to be worked in. For this purpose, a number of needles are temporarily put into the holding position.

Seat shaping single sided, following on a rib (Pants seam in the middle).

Example: Seat shaping is to be provided at the right hand side of the knitting. The cam box must be on the right. Knit 6 short rows of each 12 stitches. (i. e.

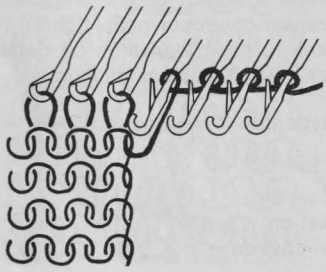


Fig. 40

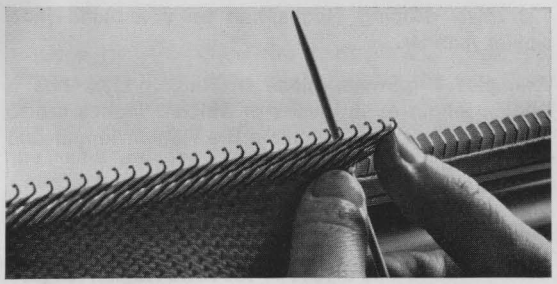


Fig. 41

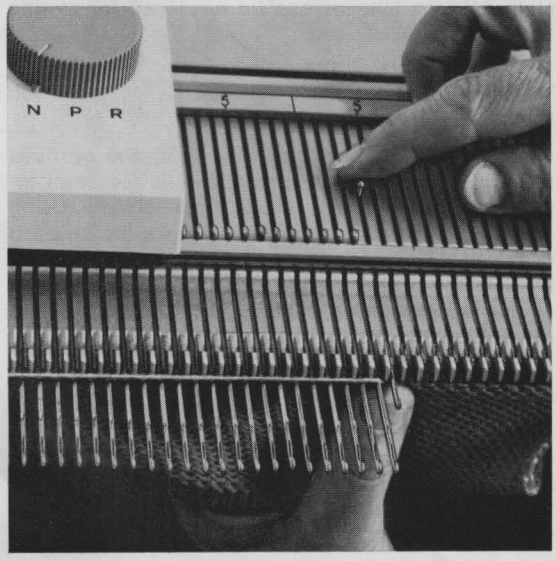
72 stitches). On the other side of the cam box, put 71 needles into holding position. Knit 1 row. Now the cam box is on the left; put the 72nd needle in to holding position = turning stitch (Fig. 42) Knit 1 row. Cam box now on the right. (Turning stitch replaces the looping of the needle). To the right of the holding group of needles, push the 12 needles + 1 turning stitch = 13 needles, to the upper working position (pos. 3). Open the latches and knit 1 row. On the cam box side, push the 13 needles (turning stitch) back to the holding position. Repeat this process until all the needles are knitting again.

Seat shaping in the middle of the knitting

(Pants seam at the side)

Example: Width of knitting = 84 stitches. 3 short rows of each 12 stitches = 36 stitches on each side are required. On completion of the border, the cam box is on the right hand side. On the left of the knitting, put 35 needles to holding position. Knit 1 row. Now put the 36th needle = turning stitch, into holding position. Push the 35 needles on the right hand side of the knitting to holding position and knit 1 row. This will bring the cam box back to the right. Push the 36th needle on the right of the knitting to holding position and push the 13 working needles on

Fig. 42



the left of the knitting to position 3. Knit 1 row, then push the 13th needle back to holding, etc. Repeat until all needles are knitting on both sides.

Chest darts

on one or both sides of the knitting. On the side away from the cam box, move about 6 needles to holding position and knit 1 row. Then on the cam box side, push another needle to holding position (turning stitch). Proceed in this manner until the desired width is reached, e. g. 5-6 short rows. In the case of chest darts on both sides, on completion of the short rows, move the holding needles on the side away from the cam box, to position 3. (in the case of cardigan, half-cardigan, etc., re-hang the stitches). Knit 1 row.

Sloping shoulders

instead of stepwise casting off, can be knitted as shortened rows. Procedure as for chest darts. In the case of double bed knitting, transfer the stitches from needles to be moved to holding position on the FNB on to the opposite needles of the BNB, and only then move the needles to holding position. After the final short row, move the needles, on the side away-from the cam box to pos. 3. Knit 1 row and then cast off all stitches together.

Round neck openings

can also be knitted as shortened rows. In this case, the stitches to be cast off stepwise are moved to holding, and on completion of the neck opening, the facing or collar can be knitted on directly.

Flares

are knitted single sided in the same way as darts. The knitting width is the same as the skirt length, hence knit sidewards.

Heels

are also knitted with shortened rows (see socks)

Buttonholes, Pocket openings, etc.

Generally knit as described for double bed knitting; cast off the necessary stitches with an auxiliary thread.

Small buttonholes

Transfer 1 stitch on to adjacent needle; leave the emptied needle in working position, and carry on knitting. Alternatively, transfer 1 stitch to the left and one to the right at the required position. Leave both emptied needles in working position and knit 2 rows on. Now take the thread loop from one of the 2 needles and transfer it, crossed with the lower loop.

Knitting thick wool in stocking stitch

There are a number of alternative methods available, according to the material and size of garment to be

knitted. If 105 needles are adequate for the width, then it is possible to knit with every 2nd needle on one NB. It is advisable to cast on with a loose row and namely with separating rows, i.e. knit the first 4-5 rows with an odd length of wool. These can be detached after steaming and the rib knitted on.

If the number of needles is not adequate, then knit semi-circular with every 2nd needle as described (page 14).

Another alternative with pressed-off rows on double bed

Start with a loose casting on row on the BNB as described, using every or every 2nd needle, depending on wool thickness. After casting on, replace the FNB and push the same number of needles on the FNB into working position and knit plain/purl. If knitting with every needle, or if working with a hard type of wool, it is advisable to allow the stitches of the FNB to drop after every 1 or 2 rows. To do this, disengage the front cam box, traverse the FNB to and fro, whilst pulling the comb gently downwards.

Note: In every case, the stitches have to be pressed-off before decreasing or casting off. Superfluous emptied needles must be moved to non-working position.

How to calculate the number of stitches and rows

Terms used in hand knitting, e.g. sample knitting, also apply to every handknitting machine. To obtain a correctly dimensioned garment, it is absolutely necessary to knit a specimen in the desired pattern. The manufacturers suggest knitting about 40 stitches per needle bed and about 80 rows in the desired pattern. Then take the knitting from the machine, let it relax for a few hours. Depending on the pattern, it may be advisable to steam lightly.

Note: The garment pieces to be knitted subsequently, must be knitted with the same wool tension, stitch tension and wool, as used for the trial piece.
Count the number of rows in a 6 inch length and the number of stitches to give 6 inches width.

Example:

4 inch width = 28 stitches
1 inch width = 7 stitches

4 inch length = 42 rows
1 inch length = $10^1/_2$ rows

Therefore, to knit a piece of fabric 19 inches wide, the result can be calculated from 7 x 19 = 133 stitches.

If the length from the rib to the armhole should be 12 inches, then the calculation would be $10^1/_2$ x 12 = 126 rows. Sloping pieces can be calculated in a similar manner.

Example: 1 garment piece in Raglan style has a Raglan length of 10 inches of which 7 inches are to be decreased. First calculate the Raglan length and Raglan width.

42 rows = 4 inches
$10^1/_2$ rows = 1 inch

10 x $10^1/_2$ = 105 rows Raglan length

28 stitches = 4 inches
7 stitches = 1 inch
7 inches x 7 = 49 inches wide

Since 49 x 1 stitches have to be decreased over 105 rows, divide the 105 rows by 49 = decreasing 1 stitch every 2 rows.

If 10 x 2 stitches (double decreasing) are to be decreased over 105 rows, the 105 rows are divided by 10, which gives 1 double stitch decrease every 5 rows.

Note: When counting the rows, always consider the pattern. In stocking stitch and plain patterns, all the actually knitted rows are visible. On the other hand, in cardigan, half-cardigan, rib and circular patterns, only every 2nd row is visible, i. e. if 42 rows are counted for 4 inches length, this will in fact mean 84 knitted rows.

Making-up a knitted garment

For a completed knitted article to provide pleasure, in addition to it being well knitted it must also be well made-up. Some hints for this are given below.
Pin the knitted pieces pattern-wise on to the ironing table; lightly steam smooth patterns, but leave relief patterns covered for a longer period with a damp cloth. Various stitches can be employed for sewing the pieces together, e. g.

Overstitching
(Fig. 43) (mattres stitch)

can be used with any form of knitting and provides an invisible seam. The garment pieces are sewn together on the right side, i.e. from the outside. Using a sewing wool, pick up stitches alternately on each of the two pieces, 1 or 2 loops (depending on garment) between the 1st and 2nd edge stitch. Pull the sewing wool until the stitches of both garment pieces are just contacting one another.

Flat seam stitch (Fig. 44)

for stocking stitch knitting. The two edges to be sewn are held together with the reverse side uppermost. Starting at the lower end, pick up the 2 illustrated loops with the sewing wool and attach them to the similar stitches on the opposite side.

Loop stitch (Fig. 45)

is used for joining up two parts having loose stitches. Using a woollen thread, pick up the first lower stitch on the right hand side of the knitting, pick up the 2nd stitch and pull the needle through. Then do the same with the first two upper stitches and proceed to the 2nd stitch of the lower piece and pull the needle through the 3rd stitch, etc.

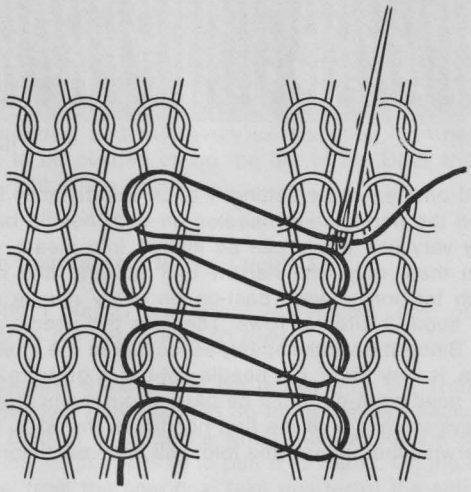
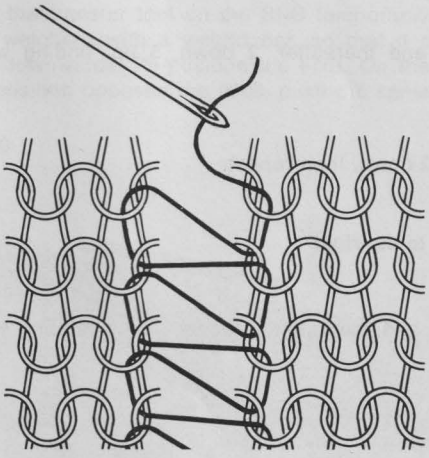


Fig. 43

Fig. 44



Linking stitch (Fig. 46)

This method of stitching is carried out manually, away from the machine. It can be used in all cases of double bed knitting, e. g. plain, rib, cardigan, etc. as well as circular, insofar as the tube has to be completed. In this case the wool is pulled through the stitches as shown in Fig. 46. This method of piecing up gives a pleasing, stretchable join.

Backstitch

is used when joining up seams on the cross, e. g. sleeves, armholes, etc. It is used mainly for joining up neck bands, closing borders, etc., which are taken out of the machine, without casting off stitches, merely knitted over with a few separating rows. The bands are steamed, the separating rows removed and the loose stitches on the face side of the knitting sewn together with lockstitch. To do this, pull the sewing thread from below, just at the edge of the knitting, through the 2nd stitch of the band to be attached. Then downwards through the 1st stitch and through the knitting, through the knitting and 3rd stitch and upwards again, etc.

In the case of a double welt (open circular hem), the opening edge of the knitting is inserted between the ciruclar hem, and sewn on with backstitch on the right face and with seam stitch on the reverse face.

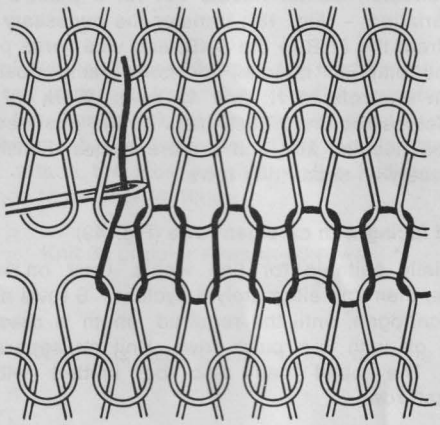
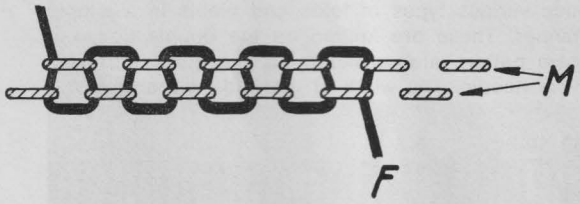


Fig. 45

Fig. 46



Various neck bands and closing strips and borders

1 plain/1purl band with circular hem (Fig. 47)

Cast on every 2nd needle on each needle bed, knit 12 rows plain/purl. Move all intermediate empty needles to working position and knit 6 cycles = 12 rows circular. Break off the wool and unthread. Now using an auxiliary, coloured thread, knit on 1-2 cycles. Set all pattern controls to N and knit 1-2 rows. Take the band out of the machine without casting off.

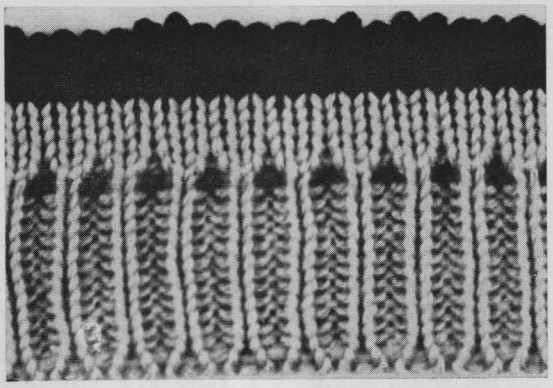


Fig. 47

2 plain/2 purl

with 2 x 2 rib on both sides (Fig. 48)

First cast on with every needle; knit 6 cycles = 12 rows circular. Select needle set-out 2 plain/2 purl (1st variation) - (Fig. 18); transfer the necessary stitches from the FNB to the BNB, and vice versa pushing the emptied needles to non-working position. Pattern controls to N; knit 12 rows. Work in buttonholes as required. Push back all the intermediary emptied needles and knit 6 more cycles. Finish off the piece with separating rows.

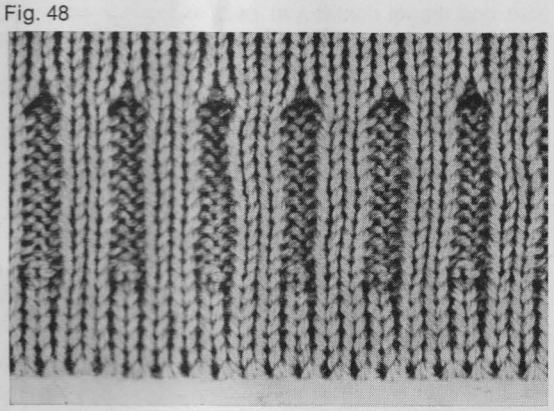
Round facing with cardigan rows (Fig. 49)

especially suitable for fine wools. Cast on every needle, then knit alternately 3 cycles = 6 rows and 2 rows caridgan, until the required length is reached. Finish off with 3 circular rows. Knit on separating rows. The band can also be knitted **without** cardigan rows

Folds and pleats

By appropriate needle setting, it is possible to produce various types of folds and pleats in a simple manner. These are knitted on the double bed, the basic pattern always being rib, i. e. plain/purl with every needle. The width of the folds will always depend on the needle setting, i. e. on the distance between the non-knitting needles on both needle beds. Only very fine wools can be knitted into pleats, and even then, only with narrow bed spacing and high stitch tension. Always cast-on on every needle and knit about 3 circular rows. Then set the needle set-out. Since the width-repeat, especially in the case of folds, is very large, the needle set-out is given in full. The needle set-out must be carried out methodically, always starting with the first needle on the BNB, left, otherwise the pattern (the fold) will become distorted.

Fig. 48



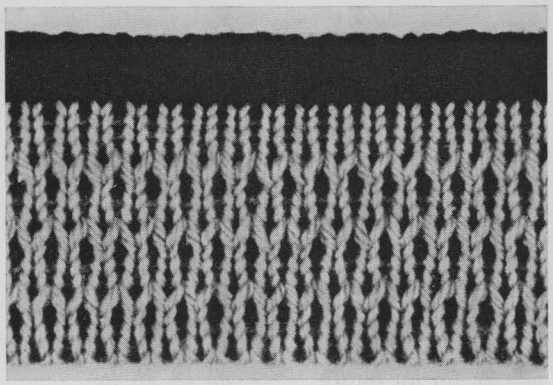


Fig. 49

Pleats

('up' means needles working; 'down' means needles not working)

BNB

2 up and thereafter, 2 down, 5 up, ending with 3 up.

FNB

5 up, 2 down, then repeat.

Folds to the right

BNB

12 up and thereafter, 2 down, 18 up, ending with 6 up.

FNB

18 up, 2 down, then repeat.

Folds to the left

BNB

18 up, 2 down, then repeat.

FNB

11 up and thereafter, 2 down, 18 up, ending with 7 up.

Flat pleats (hollow fold) always 2 down between 7 and 18

BNB

9 up, 2 down and thereafter 7 up, 2 down, 18 up, 2 down, 7 up, 2 down, 18 up etc., ending with 9 up.

FNB

3 up, 2 down and thereafter 18 up, 2 down, 7 up, 2 down, 18 up, 2 down, 7 up, 2 down etc. ending with 4 up.

It should also be mentioned that the edge stitches are not indicated in these specifications, so that on both sides, and with every skirt section, one needle has to be pushed in, on the left of the BNB and on the right of the FNB.

Men's socks, size 10-11 Example 1

1. Rib 1 plain/1 purl every 2nd needle; cast on 32 stitches per NB. knit 40-50 rows.

2. Circular transfer and leg length (Fig. 50) Transfer all stitches from the FNB on to the empty needles of the BNB. It is advisable when transferring the sock, to remove the FNB or to pull it forwards. On the side away from the cam box, take quarter of the stitches (16 stitches) on the 16-point transfer tool. Close the flap securely. Knit 1 row. Now on the side away from the cam box, pick up 16 stitches on the 16-point transfer tool. Turn these so that the edge stitches are in the middles (back seam of sock, Fig. 50). Hang the transfer tool on the BNB temporarily, possibly weighted with a weight bar, so that it cannot slide downwards. Re-position the FNB. On the FNB, at a position opposite the BNB, push the same number of needles to pos. 2; open the latches and transfer the stitches from the 16-point transfer tool (Fig. 51). Push back all the emptied needles to pos 1. The comb can be removed for circular transferring; attach the side weights to the knitting. Then change to circular knitting.

Fig. 50

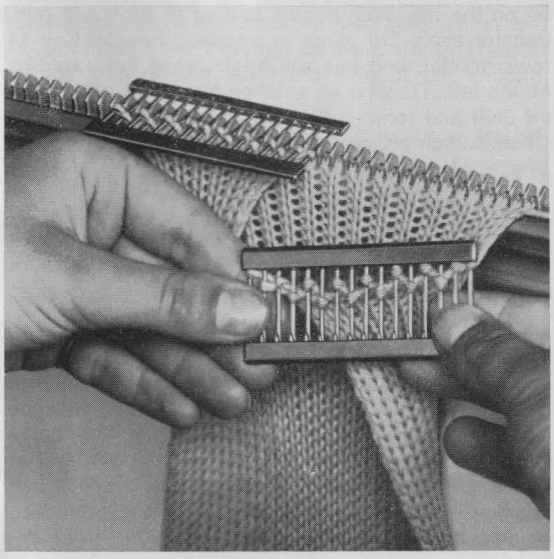




Fig. 51

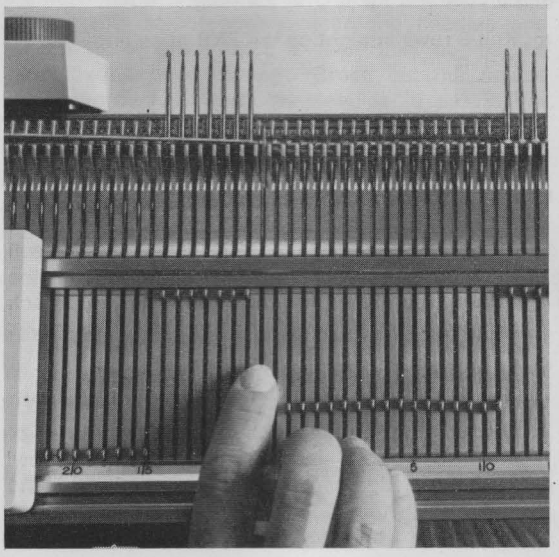
$\frac{\text{N 7 R}}{\text{R 7 N}}$ Knit 30 circular rows = 60 rows.

3. Heels

are knitted as shortened rows on the FNB

$\frac{\text{R 1 R}}{\text{N 7 N}}$

Fig. 52



a) On the cam box side, push the first working needle to pos. 4; knit 1 row.

b) Again push the first working needle to pos. 4; knit 1 row.
Continue in this way until about one third of the needles = 11 needles are in pos. 4, on both sides. To this end, attach side weights at the edge of the working needles of the FNB, and reposition from time to time, or pull down firmly with the left hand.

c) Together with the last raised needle push back the first needle on the side away from the cam box to pos. 3. (Nearest to the cam box.) Knit 1 row. Repeat this operation, until all needles are again in pos. 2 on both sides.

4. Foot

N 7 R
R 7 N

Transfer the lower of the edge stitches on to the opposite stitch on both sides of the knitting. (Work neatly). Knit 60 circular rows = 120 rows.

5. Toe

is finished off using the 2-point transfer tool, as for Raglan decreasing. Decrease 1 stitch on both NB on both sides of the knitting. (2nd stitch will be transferred to 3rd stitch). This decreasing is carried out 6 times after every 2nd circular row = 4 rows (to leave 20 stitches on each bed) and 8 times after every circular row = 2 rows. Knit 3 circular rows (separating rows) over the remaining 2 stitches and take the knitting off the machine.
Making up: sew on the rib by overstitching, and close the toe with grafting (linking).

Example 2: Heel with decreasing instep.

Knit as far as heel as described under section 1 and 2.

a) Knit 8 rows straight on the FNB at setting
R 1 R
N 7 N

before starting the heel, which is then knitted as discribed.

b) Pull the FNB forward a little; push 2 empty needles into pos. 2 on both needle beds on both sides of the knitting. Place an edge stitch from the 8 rows on to each of the empty needles. Knit the 2 edge stitches at the wool side, by hand. Attach side weights to the heel; replace the FNB.

c) R 7 N
N 7 R

Cam box on the left; push the 2 edge needles of the BNB on both sides to pos. 3, then knit 1 row. Push the 2 edge needles on the FNB to pos. 3 and knit 1 row. Knit 4 circular rows. (In the event of the cam box being on the right, reverse the above procedure, by first moving the needles to pos. 3 on the FNB and then on the BNB.)

d) **Instep decrease:** on both sides and on both needle beds, using the 2-point transfer tool, decrease one stitch twice after every 4 or 5 circular rows. Knit the foot as far as the toe as described previously.

Toe with double decrease

On both sides and on both needle beds, using the 2-point transfer tool, transfer the 3rd and 4th stitch inwards over 2 needles. (4th stitch to 6th needle, 3rd stitch to 5th needle). Move the edge stitches over 2 needles. Now knit 5 circular rows. Repeat this decrease with following 4 circular rows, then 3, 2 and 1 circular rows, until left with about 4 needles per needle bed.
Finish off as described above.

Tights for 2 year olds (4 and 6 years)
Method:

This garment is knitted in 2 parts. Seam up the middle; hem circular. Waistband 2 plain/2 purl; body length - stocking stitch; legs and feet - circular.

Setting

Circular - stitch tension 7.
Stocking stitch - stitch tension 7, 2 eplain/2 purl - stitch tension 4.

Right hand half of tights

1. Cast on 84 stitches (92 st, 100 st according to age) on each NB using every needle. For double hem, knit 16 rows, making provision in the 8th row for small holes on both NB, for threading elastic. Transfer 2nd st to 3rd. After the 16 rows, the cam box will be on the left. With needle setting to 2 plain/2 purl, transfer every 3rd stitch to adjacent needle. Knit 14 rows normal, and this will again leave the cam box on the left. Transfer all stitches from FNB to needles on BNB and remove FNB. Proceed knitting stocking stitch. Attach presser.

2 **Seat shaping** Knit 5 x 12 st = 60 sts (short rows) as described previously (page 21).
Move the 59 needles on the right hand side to pos. 4, etc.

3. **First straight panel** (body). Set row-counter to 0, then knit 86 rows (100, 120 rows).

4 **Circular transfer and thigh decrease.** On the cam box side (left in this case), unpick 1/4 of the stitches = 21 st (23 st, 25 st) to leave the wool supply on the left, after transferring the sts. on the BNB. Pick up 21 sts. (23, 25 st) on both sides on the 16-point tool or handknitting needle (as for sock). Move the FNB into position; transfer sts. on to needles of FNB. Proceed circular knitting. Knit 30 circular rows (60 rows), de-

creasing at the left of the knitting, on both BNB and FNB, 9 x 1 stitch after every 3rd circular row using 2-point transfer tool, beginning after the 6th circular row. This will leave 33 sts. per NB (37 st, 41 st).

5. **Second straight panel:** knit 30 circular rows (38, 46 circular rows).

6. **Leg decreasing:** Decrease 9 x 1 st every 3 rd circular row as for thigh decreasing. This will leave 24 sts per NB. (11 x 1 st leaves 26 sts; 11 x 1 st leaves 30 sts).

7. **Third straight panel;** knit 14 circular rows (20, 26 circular rows).

8. **Heel** is knitted on BNB. Cam box on the left; transfer sts as follows: On the right hand side of knitting, on both NB, pick up half the sts (12, 13, 15) on to 16-point tool. Secure the transfer tool well and push down between the two NB, to be clear of cam box. Move emptied needles to non-working position. Knit 1 row. The supply wool is now on the right on the FNB. Pick up the remaining sts of the FNB on the 16-point tool. Move the FNB slightly forwards or remove it completely. Push the necessary 12 needles on the BNB (13, 15 needles) to pos. 2 and transfer the last picked-up sts on to these needles. Supply wool will now be on the left of BNB. Leave the sts intended for the FNB on the 16-point tool for the time being. Knit the heel with 8 x 1 stitches (9 x 1 st, 10 x 1 st) (short rows) as for socks. Attach side weights. On completion of the heel, replace the FNB, transfer the sts to FNB and proceed with circular knitting.

9. **Foot:** knit 30 circular rows (38, 44 circular rows).

10. **Toe closing:** Proceed as for socks, but decrease 1 x 1 st after every 2nd circular row (2 x 1 st, 3 x 1 st) and 9 x 1 st (9 x 1, 10 x 1 st) after every circular row.

Left side of tights: Reciprocal to right hand side. For the seat shaping on the left of the knitting, move the needles to pos. 4 (cam box on the right). Thigh and leg decreasing on the right of the knitting. Transfer sts for heel on the left hand side of the knitting, etc.

Gusset: Cast on loosely on BNB. Cast on 31 sts (33, 35 sts): knit about 5 rows stocking stitch. Decrease on both sides with the 2-point transfer tool, 14 x 1 sts (15 x 1, 16 x 1 st) after every second row. Cast off the last 3 sts together. Place the loose sts back on to the needles; knit about 5 rows straight, then decrease as in first half.

Joining up: Steam the pieces lightly; insert the gusset; close the middle seam and thread in the elastic.

Care and maintenance

If the machine is not to be used for a prolonged time, protect it from dust by covering it with a dust-cover or the lid of the delivery carton. The machine

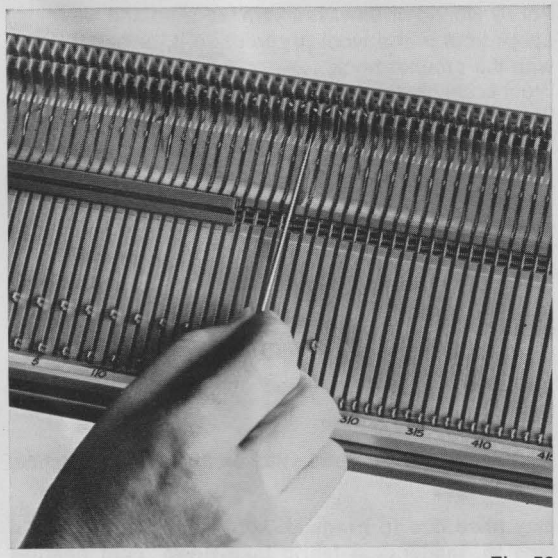


Fig. 53

should be cleaned periodically with brush (41), making sure to clean the guide tracks and needle tricks. Remove the cam box and brush the inside lightly. After everything has been dusted, apply a thin coating of oil to the needle butts, the tricks and to the inside of the cam box. Use only high grade machine oil (43), - do not use oils which will form deposits.

The correct oil should be used sparingly and frequently

Changing and cleaning of needles and needle guides (Fig. 53) It is very easy to change needles, by removing the relevant machine end cap and push the upper guide rail to one side until the damaged needle is accessible. Even when there is knitting in the machine, it is possible to change the needles. It is advisable to thoroughly clean the needles and needle tricks about once a year: take out all the needles and brake springs. Brush out the needle tricks thoroughly; wash the needles in paraffin or light petrol, dry well and oil lightly with a rag soaked in machine oil. Refit the brake springs into the two bolts and fit the needles in place. Take care when pressing down the needles, that the brake springs are not damaged. Return the guide rail to the machine.

Faults, sources of error and their remedy

Wrong setting of the needle beds (needles must cross over).

Needles may be bent (change needles)

Machine is too cold (see page 10)

Cam box and guide rails are soiled or dry (clean and oil)

Poorly wound or unwaxed yarn (re-wind and wax)
Large knot in the wool (try to undo it, or pull it down with the crochet hook.
Wool entangled at some point
Wrong stitch tension selected

Wrong setting of the stitch presser, in single-bed knitting (correct setting, see page 19).

In the event of the cam box jamming, move all pattern controls to R. Disengage cam boxes and try to push each one separately in the knitting direction. Push every needle downwards in turn, using a transfer tool, whilst moving the cam box carefully forwards. If the cam box cannot be released, withdraw the top guide rail until the cam box is free and lift it upwards. Any needles lifted out of their tricks must be replaced.

Faulty knitting, dropped stitches, poor edge stitches, wool breaks

may arise due to irregular wool supply, wrong stitch tension, inadequate fabric take down, bent needles or damaged needle latches.

Wool feed guide may be too high or not central to the needle cross over. Set-up comb may be hanging at a slant in the knitting or may be trapped; wrong edge-needle setting, wrong setting of tension spring in wool tensioner. Traversing the cam box too far or too haphazardly. Stitch presser badly positioned.

Description of patterns

General information on knitting patterns.

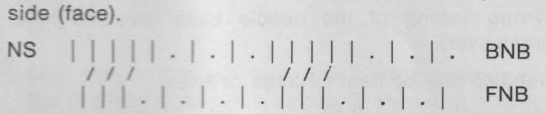
Great care must be taken that the needle set-outs specified for a particular pattern are properly effected. If a rib is to be followed by knitting according to a different needle set-out, then certain sts may have to be transferred or additional needles made to knit. These additional needles will have to be started off with a loop (cf. Fig. 26).

Formation of racked patterns

As the name implies, these patterns are knitted by racking the NB. By displacing the NB, the stitches are staggered to one side. Where sts of the FNB cross with sts of the BNB, these will appear as diagonal sts. All the sts of one face of the fabric can be made to lie at a slant, or some slanting and others straight.

This will depend on the needle set-out

Example: Indicator (I) - 4, FNB will be the pattern side (face).



If for example, knitting is carried out alternately with I-4 and 5, then the 3 adjacent needles of the FNB will cross with the corresponding needles of the BNB, and the resulting 3 sts will appear slanting. The individual 3 needles of the FNB only cross with the empty needle trick, i. e. with a non-working needle of the BNB, hence these will appear as straight wales.

Racking 4-5-4/every 4 rows, indicates that 4 rows are to be knitted with the I-4 and 4 rows with I-5. Racking being always over one needle. This procedure is repeated continuously.

Racking 2-4-6-4-2/every 2 rows, means knit 2 rows with indicator on 2, 2 rows with indicator on 4, 2 rows with I-6, 2 rows with I-4 = 8 row repeat. This is repeated continuously, thereby racking over 2 needles.

Slip-stitch (lacy) patterns

If a lacy pattern is to be knitted after a border, then before setting the needles, all sts of the FNB must be transferred to needles of BNB, then proceed with needle set-out on FNB.

Rib transfer patterns

can be knitted simply by transferring certain sts. Stitches may either be transferred over the whole knitting width or only at a particular position, in the form of a lengthwise rib, etc. Stitches are always transferred on that NB on which the cam box is set to rib.

Cable-stitch patterns

are knitted by crossing certain stitches, using the 1-, 2- or 3-point transfer tool, depending on the width of the cable. When crossing larger groups, e. g. 3 stitches, it is advisable to knit the cables by hand before crossing, using an auxiliary length of the same wool, making sure to pull long stitches. Pull the wool ends with a crochet hook down between the two NB. On completion of the knitting, hold the auxiliary wool at both ends and pull together until the stitches are nicely closed. Sew up or knot the auxiliary wool.

Rib patterns (Nos. 1-5) - plain knitting

1. Indicator (I) on centre line; Bed-spacing (B-S) 4,

N 6 N
N 6 N

NS every 2nd needle as for 1 plain/1 purl, or for fine wools, every needle (in this case, put I-4).

a) Disengage needle returner. On BNB, move every 2nd working needle (2nd, 4th needle etc.) to pos. 4; knit 3 rows; engage needle returner. Open latches; knit 1 row.

b) as under a), but with alternate needles, move to pos. 4 (1st, 3rd, 5th etc.)

c) Repeat a) and b) continuously.

2. Needle set-out and setting as in pattern 1. Needle returner remains disengaged.

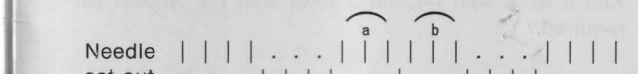
a) On BNB, move every 8th working needle to pos. 4; knit 2 rows.
b) Return needles to pos. 3; open latches. Move 1 needle on the right and left of the needle in pos. 3, to pos. 4; knit 2 rows.
c) Repeat operation b) until every 8th needle is again in pos. 4.
d) Repeat operations b) and c) continuously.

3. I-4, bed-spacing (B-S) 4, $\frac{\text{N 6 N}}{\text{N 6 N}}$

4-5-4/1 row racking



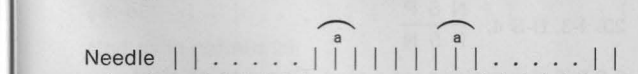
4. I-4, B-S 4, $\frac{\text{N 7 N}}{\text{N 7 N}}$



a) knit 12 rows
b) knit the 6 cable stitches on the BNB with an auxiliary thread (see page 28). Using the 3-point transfer tool, transfer the needle group temporarily on to the 3 empty needles on the left. Transfer the stitches of group **b** on to the needles of the group **a** and the stitches of group **a** on to needles **b.** Return the 3 empty needles back to pos 1.
c) repeat a) and b) continuously.

5. **Imitation plaiting**

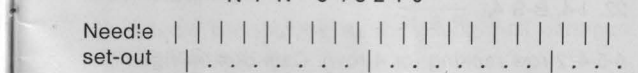
Setting as for triple cable (pattern 4) except that



a) knit 10 rows
b) knit the stitches **a** with a similarly coloured auxiliary thread. The stitches are not crossed. Pull the thread ends downwards between the NB.
c) repeat points a) and b) as necessary. On completion of the work, pull the stitches together as described.

Drop-stitch patterns (Nos. 6 and 7)

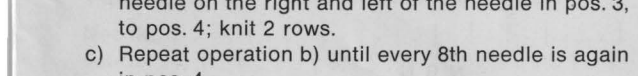
6. I-0, B-S 4 $\frac{\text{N 7 N}}{\text{N 7 N}}$ 0-1-2-3-4-5-6 -5-4-3-2-1-0 1 row racking



Press off the stitches of the FNB periodically (see page 28).

7. I-3, B-S 4, $\frac{\text{N 7 N}}{\text{N 7 N}}$

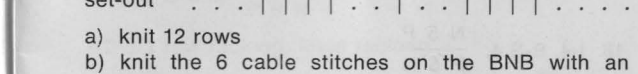
Transfer all stitches from FNB to BNB, only then



a) disengage needle returner; knit 1 row, detach front cam box and use it to press off the stitches, i. e. traverse cam box over the knitting. Let the front cam box stand outside the knitting range.
b) On the BNB, push every 4th needle (4th, 8th, 12th etc.) to pos. 4; knit 4 rows stocking stitch back cam box. Engage needle returner, knit 1 row.
c) Repeat point a)
d) Knit 5 rows stocking stitch. Repeat points a) to d) as required.

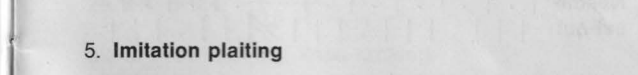
Fancy rib patterns (Nos. 8-12)

8. I-3, B-S 4, $\frac{\text{N 5 N}}{\text{N 6 R}}$



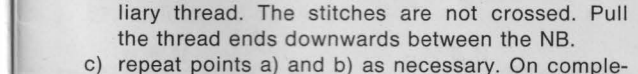
knit as required.

9. Settings as for pattern 8, cam box on the right, then



a) knit 8 rows
b) transfer the two outermost stitches of every 3rd group on to central needles; emptied needles remain in pos. 2. Repeat points a + b as required.

10. Settings as for pattern 8; carriage is on the right, then



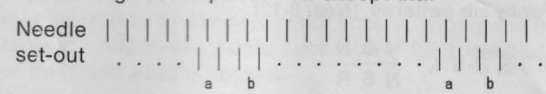
Basic pattern: FNB and BNB with every needle. On the FNB, transfer 20 sts at the position envisaged for the border, on to the BNB. Push back emptied needles to pos. 1.
a) move the middle 4 needles to pos. 2, see needle set-out, knit 8 rows.
b) using the 2-point tool, transfer the stitches **a** one needle to the left, transfer the stitches **b** one needle to the right; knit 2 rows; repeat a total of 4 times = 8 rows.
c) transfer stitches as under b) and immediately return the middle 4 empty needles to pos. 2. Knit 8 rows, then transfer the stitches of the 2nd group on to the BNB.
d) Repeat steps b) and c) as required.

11. Settings as for pattern 10



a) On the FNB, transfer every 8th st on to the next needle to the right (starting with the 5th st). Move emptied needles to pos. 1; knit 2 rows.
b) Transfer 1 st on to adjacent needles on both sides of empty needle (so that there are always 3 needles in pos. 1). Knit 2 rows.
c) Repeat point b) until 7 needles are in pos. 1. Every 8th needle will carry 3 st. Knit 2 rows.
d) Move 1 empty needle to pos. 2 on both sides of the needles in pos. 2. Knit 2 rows. Repeat this until all needles are working again.
e) Repeat a) to d) continuously.

12. Settings as for pattern 11. except that

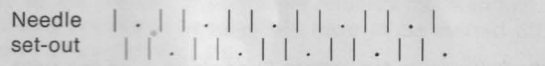


a) Knit 6 rows
b) On FNB, using 2-point tool, transfer the st **a** over 1 needle to the left; transfer the st **b** over 1 needle to the right. Knit 2 rows. Repeat a total of 3 times = 6 rows.
c) First transfer st as under a), which will thus form a group of 4; then knit 6 rows.
d) Repeat points b) and c) continuously.

2 Plain/2 purl in Half Cardigan/Royal Rib

(Casting on - see page 12)

13. I-3, B-S 4, $\frac{\text{N 5 P}}{\text{N 5 N}}$



Knit as required.

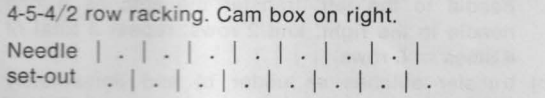
Half Cardigan and Cardigan racked patterns

(Nos. 14-26)

Unless otherwise stated, the cam box must always be on the right, before racking the needle bed (with the exception of knee racking 25-26).

14. I-4, B-S 4, $\frac{\text{N 5 P}}{\text{N 5 N}}$

4-5-4/2 row racking. Cam box on right.



15. I-4, B-S 4, $\frac{\text{N 6 N}}{\text{N 6 P}}$

4-5-4/2 row racking. Cam box on right.

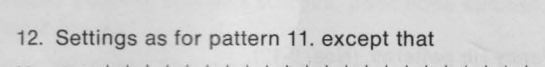
16. I-4, B-S 4, $\frac{\text{N 6 N}}{\text{P 6 N}}$

4-6-4/2 row racking. Cam box on right.

Needle set-out as for pattern 15.

17. I-4, B-S 4, $\frac{\text{N 5 P}}{\text{P 5 N}}$

4-5-4/racking. Cam box on right.



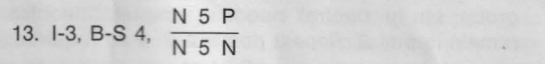
Knit 6 rows with I-4 and 2 rows with I-5. Repeat as required.

18. I-4, B-S 4, $\frac{\text{N 5 P}}{\text{P 5 N}}$

4-5-4/2 row racking (or 4 row). Cam box on right. Needle set-out as for pattern 17.

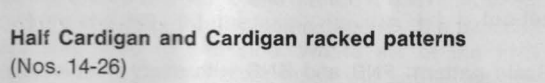
19 I-3, B-S 4, $\frac{\text{N 5 P}}{\text{P 5 N}}$

3-4-3/2 row racking. Cam box on right.



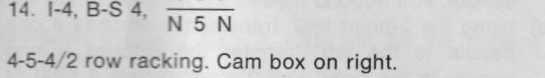
20. I-3, B-S 4, $\frac{\text{N 5 P}}{\text{P 5 N}}$

3-2-3/2 row racking (or 4 row). Cam box on right.



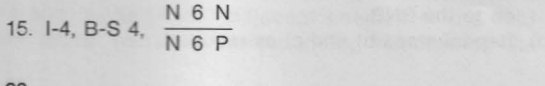
21. I-4, B-S 4, $\frac{\text{N 5 P}}{\text{P 5 N}}$

4-5-4/2 row racking (or 4 row). Cam box on right.



22. I-4, B-S 4, $\frac{\text{N 5 P}}{\text{P 5 N}}$

4-5-4/2 row racking (or 4 row). Cam box on right.



23. I-3, B-S 4, $\frac{N\ 5\ P}{P\ 5\ N}$

3-2 and 2-1/row row racking. Cam box on right.

Needle | . | . | . | . | . | . | . | . | . | . | . | . |
set-out . | . | . | . | . | . | . | . | . | . | . | . | . |

a) Knit 2 rows I-3 and 2 rows I-2; repeat 4 times = 16 rows
b) Knit 2 rows I-1 and 2 rows I-2; repeat 4 times = 16 rows
c) Repeat a) and b) (32 rows) as required.

24. I-4, B-S, $\frac{N\ 5\ P}{P\ 5\ N}$

4-5-2 rows racking (or 4 rows). Cam box on right.

Needle | | | | | . . | | | | | . . | | | | | .
set-out | | | . | | . | | | . | | . | | | . |

25. I-3, B-S 4, $\frac{N\ 5\ P}{P\ 5\ N}$

3-2-3/1 row racking; knee racking.

Needle | . | . | . | . | . | . | . | . | . | . | . | . |
set-out | . | . | . | . | . | . | . | . | . | . | . | . |

a) Knit 1 row I-3 and 2 rows I-2; repeat 6 times = 12 rows.
b) No racking on 13th; i. e. knit with I-2. Repeat a) and b) = 13 rows continuously.

26. I-3, B-S 4, $\frac{N\ 5\ P}{P\ 5\ N}$

3-2-3/1 row racking, knee racking.

Needle | | | . . . | | | . . . | | | . . . | | |
set-out | | | . . . | | | . . . | | | . . . | | |

Knit as in pattern 25.

Double half Cardigan (double Royal Rib)

27. Indicator to centre line, B-S 5

a) $\frac{N\ 6\ N}{N\ 6\ N}$ knit 2 rows b) $\frac{N\ 6\ N}{P\ 6\ P}$ knit 2 rows

Needle | . | . | . | . | . | . | . | . | . | . | . | . |
set-out | . | . | . | . | . | . | . | . | . | . | . | . |

Repeat a) and b) as required.

Double Cardigan

28. Needle set-out, etc. as for double half cardigan. Knit as follows:

a) $\frac{N\ 6\ N}{P\ 6\ P}$ knit 2 rows b) $\frac{P\ 6\ P}{N\ 6\ N}$ knit 2 rows

Knop patterns

29. I-4, B-S 5

a) $\frac{N\ 6\ N}{P\ 6\ P}$ knit 4 rows b) $\frac{N\ 6\ N}{N\ 6\ N}$ knit 2 rows, etc.

Needle | | | | | | | | | | | | | | | | | |
set-out | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |

30. I-4, B-S 5, 4-5-4/6 row racking.

Needle | . | . | . | . | . | . | . | . | . | . | . | . | . |
set-out . | . | . | . | . | . | . | . | . | . | . | . | . | . | .

1. a) $\frac{N\ 6\ N}{N\ 6\ N}$ I-4 knit 2 rows

b) $\frac{N\ 6\ N}{P\ 6\ P}$ I-4 knit 4 rows

2. knit as a) and b) but with I-5.

Repeat points 1 and 2 as required.

31. I-4, B-S 5, 4-5-4/6 row racking

Needle | | | | | | | | | | | | | | | | | |
set-out | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |

1. a) $\frac{N\ 6\ N}{P\ 6\ P}$ I-4 knit 4 rows

b) $\frac{N\ 6\ N}{N\ 6\ N}$ I-4 knit 2 rows

2 I-5 knit as for a) and b). Repeat points 1 and 2 as required.

32. I-3, B-S 5, 3-2-1-2-3 random racking.

| | . | | . | | | . | | | . | | | . | | | . | | |
. | . . | . . | . . | . . | . . | . .

1. a) $\frac{N\ 6\ N}{P\ 6\ P}$ I-3 knit 4 rows

b) $\frac{N\ 6\ N}{N\ 6\ N}$ I-2 knit 1 row c) $\frac{N\ 6\ N}{N\ 6\ N}$ I-1 knit 1 row

2 As for a), buth with I-1; as b) but with I-2; as c) but with I-3. Repeat points 1 and 2 as required.

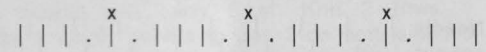
Various single-bed patterns (Nos. 33-48)

are knitted on the BNB with setting N 7 N. The needle returner is engaged only when all needles are working. Unless stated otherwise, needle set-out as for stocking stitch.
It is essential that the knitting be pulled downwards with the left hand when pushing the needles from pos. 2 to pos. 3 or 4 and when transferring stitches (lacy patterns, etc.).

Cardigan pattern

33. a) Disengage needle returner. Push every 4th needle (4th, 8th, 12th etc.) to pos. 4. Knit 3 rows. Engage needle returner. Knit 1 row.
b) Repeat stage a) but displaced midway, moving every 4th needle (2nd, 6th, 10th needle) to pos. 4. Repeat a) and b) as required.

34. Needle set-out



a) Disengage needle returner. Move needles marked x to pos. 4. Knit 2 rows.
b) Disengage needle returner; knit 1 row. Repeat a) and b) continuously.

35. a) Disengage needle returner. Move every 6th needle (starting with 2nd, 8th, 14th etc.) to pos. 4. Knit 2 rows.
b) Engage needle returner; knit 1 row. Repeat stages a) and b) as required, thereby moving the adjacent needles on the right (or on the left) to pos. 4.

36 a) Disengage needle returner. Move every 8th needle (8th, 16th, 24th) to pos. 4; knit 2 rows. Engage needle returner; knit 1 row.
b) Disengage needle returner. Move 1 needle on the right and left of the previously patterned needle, to pos. 4; knit 2 rows. Engage needle returner; knit 1 row.
c) Repeat stage b) until every 8th needle is again in pos. 4; knit 2 rows. Engage needle returner; knit 1 row.
d) Repeat stages b) and c) as required (or repeat stages a) to c) as required).

Lacy patterns

37. a) Transfer every 8th stitch on to the next needle to the right; leave emptied needle in pos. 2 (8th, 16th, 24th etc.); knit 2 rows.
b) Transfer the stitches on the left and right of the previously transferred stitches to the left and right (7th st to the left; 9th st to the right, etc.). Knit 2 rows.
c) Repeat step b) a total of 3 times, in each case transferring the stitches 1 needle to the right and left.
d) Repeat steps a) to c), beginning with the 4th, 12th, 20th stitches etc.
e) Repeat steps a) to d) as required.

38. a) Transfer every 2nd st (2nd, 4th, 6th, etc.) to the next needle on the right; leave emptied needles in pos. 2; knit 2 rows.
b) Repeat steps a), starting with 3rd, 5th, 7th stitch etc.
c) Repeat steps a) and b) as required.

Combined colour patterns

Basic colour remains threaded, unless otherwise stated, and is knitted with N N setting.
Pattern wool is fed by hand. Push the requisite needles to pos. 3. Open the latches and lay in the pattern wool. Close the needles, i. e. push the needles towards pos. 2 until all needles are closed. The pattern wool must always be fed in from the cam box side, i. e. the cam box must always be on the side where the wool is to be supplied. Setting R R, which means that the cam box is traversed empty over the knitting. Do not hold the running wool during knitting, otherwise it may break or lead to tight stitches. In order to carry on knitting with the basic colour, the cam box must be returned 'empty' to the supply wool.

2 Colour cardigan pattern

39. a) Knit 1 row in pattern colour as described.
b) Move every 4th needle to pos. 4 (4th, 8th, 12th etc.); knit 3 rows basic colour.
c) Repeat steps a) and b), but midway needles are moved to pos. 4 (2nd, 6th, 10th needles). Repeat the above as required.

40. a) Knit 1 row in pattern colour.
b) Move every 6th needle to pos. 4 (commencing with 2nd, 8th, 14th needles etc.). Knit 3 rows basic colour.
c) Repeat steps a) and b) continuously, but in each case, move the adjacent needle (on the right or left) to pos. 4.

41. a) Knit 1 row in pattern colours.
b) Move needles 4, 5, 6., 16, 17, 18., 28, 29, 30, etc., to pos. 4; knit 1 row basic colour.
c) Repeat steps a) and b) a total of 3 times.
d) Steps a) to c), but displaced midway, starting with needles 10, 11, 12, 22, 23, 24, 31, 32, 33, etc., moving needles to pos. 4.
e) Repeat steps a) to d) as required.

42. a) Knit 1 row in pattern colours.
b) Move needles 4, 5, 6., 16, 17, 18, etc., to pos. 4. Knit 1 row basic colour.
c) as a)
d) Move needles 3, 4 and 6, 7., 15, 16 and 18, 19 to pos. 4; knit 1 row basic colour.
e) as a) and b)
f) Repeat steps a) to e), but displaced midway (Beginning with needles 10, 11, 12, etc.).

Inlay patterns

In this method, only partial rows are knitted in the pattern colour.

43. a) Knit 1 row in basic colour.
b) Knit every 2nd needle (2nd, 4th, 6th, etc.) with pattern wool as described.
c) Repeat steps a) and b) but racked. Knit 1st, 3rd, 5th needles etc. with pattern wool; Repeat as desired.

Colour pattern with wool change

To knit this kind of pattern, the wool is re-threaded each time. For simplicity of operation, the wool is only threaded into the feed guide manually. The running threadline is held over the feed guide with the left hand. Care must be taken during knitting that the wool runs freely through the fingers. When starting each row, i. e. when the cam box is on the left or right hand side, the wool should be tensioned slightly. As soon as the first few stitches are knitted, let the wool run freely again.

44. a) Disengage needle returner; move every 4th needle (4th, 8th, etc.) to pos. 4; knit 3 rows with colour No. 1. Engage needle returner; knit 1 row with colour No. 1.
b) Re-thread wool. Repeat step a) but displaced midway. Move needles (2, 6, 10, etc.) to pos. 4; and knit with colour No. 2. Repeat all the above with 2 or more colours as desired.

45 a) Move every 4th needle to pos. 4; knit 3 rows with colour No. 1. Engage needle returner; knit 1 row.
b) Thread up colour No. 2; repeat step a), but with adjacent needles on the right moved to pos. 4.
c) Repeat continuously in 2 or more colours, in each case moving the adjacent needle on the right to pos. 4.

Fair Isle (Norwegian) patterning

A number of alternatives exist, the simplest and most positive is probably that involving the feeding of the basic colour and pattern colour by hand, i. e. without overfeed. As described, the wool must always be fed from the cam box side and laid into the needles in pos. 3. During the whole patterning operation, the cam box is disengaged.
R 7 R

Another method is to thread up the basic colour as usual and lay in the pattern colour by hand. Here too, the cam box stays at **R R.** Move all needles to pos. 4; moving the needles destined for the pattern colour to pos. 3. Lay in the pattern colour wool and close the latches. Move the cam box across the knitting and back as far as the ground colour. Engage the needle returner; open latches and knit the ground colour, etc.

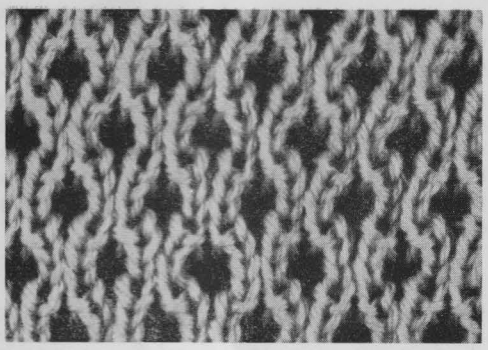
46. a) Move needles 3, 4., 7, 8., 11, 12, etc. to pos. 3; open latches and lay in the pattern colour over these, and move these towards pos. 2. Move the disengaged cam box over the knitting and back as far as the ground colour.
b) Move needles 1, 2., 5, 6., 9, 10, etc. to pos. 3; knit the ground colour as in step a).
c) Repeat steps a) and b).
d) Repeat steps a) to c) but knitting on alternate needles 1, 2., 5, 6., 9, 10, etc. with ground colour, and the remaining needles with pattern colour.

47. a) Knit every 6th needle with pattern colour (6th, 12th, 18th, etc.). Back to ground colour and knit all remaining needles with the basic colour.
b) Knit needles 5, 6, 7., 11, 12, 13., 17, 18, 19, etc. with pattern colour; back to ground colour and knit all remaining needles with basic colour.
c) as for step a).
d) Repeat steps a) to c), but staggered midway, beginning with needles 3, 9, 15, etc.

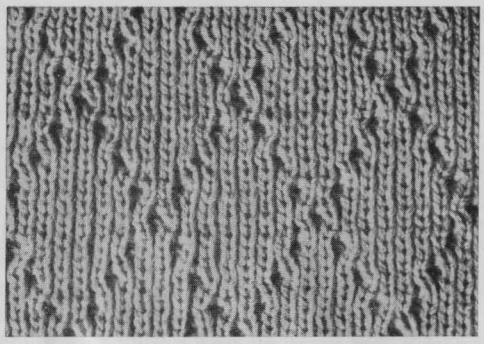
Fair Isle (Inca) patterning

In this case, the wool is re-threaded after every 2nd row. Certain needles are always in the holding position, and these are always exchanged for other needles at the same time as colour changing. Knit with N 7 N. A wide variety of patterns can be knitted by very simple means. The wool is merely threaded into the feeder guide and fed by hand.

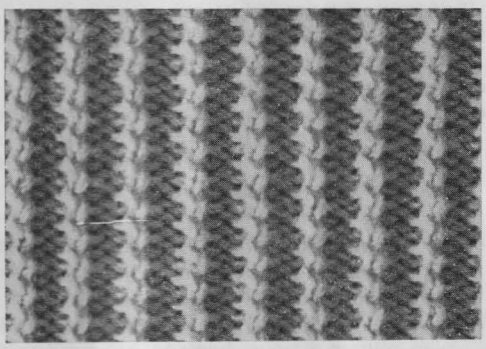
48. a) Move every 8th needle to pos. 4; knit 2 rows in colour No. 1.
b) Move needles back to pos. 3; move 1 needle on the left and right of the needle in pos. 3, to pos. 4; knit 2 rows with colour No. 2.
c) as for b), but knitting colour No. 1, etc. until every 8th needle is again in pos. 4 or pos. 3.
d) Repeat steps b) and c) as required, always taking into account the colour change.



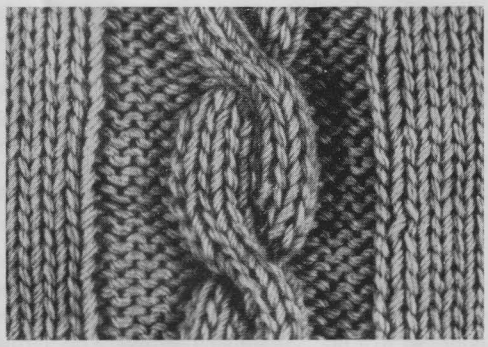
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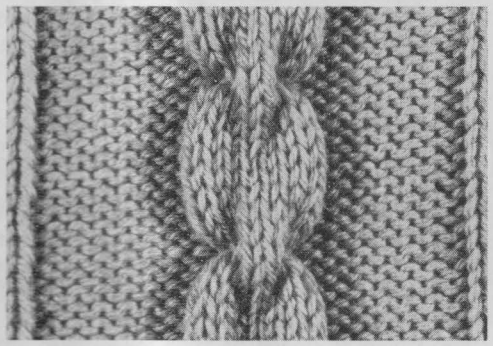
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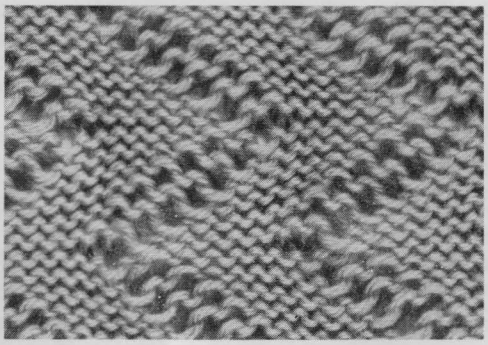
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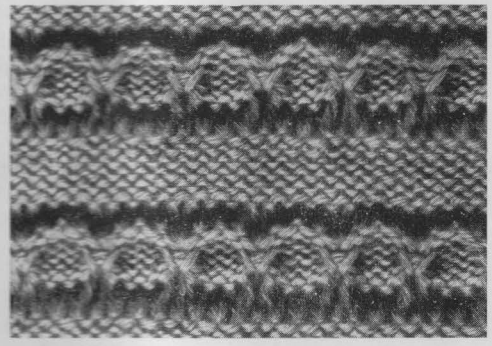
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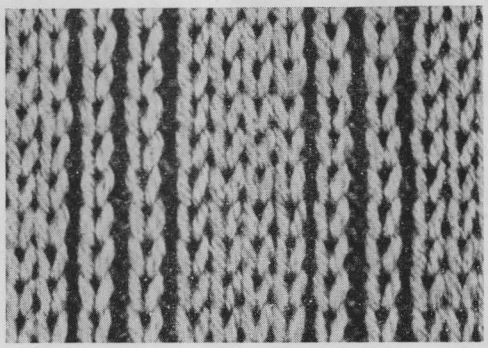
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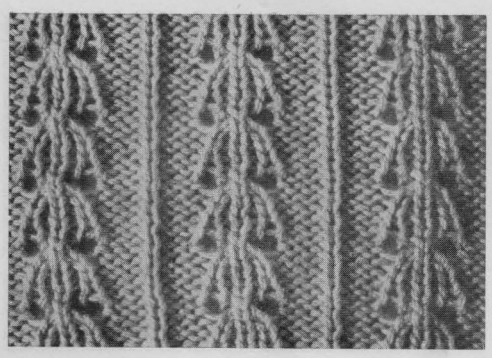
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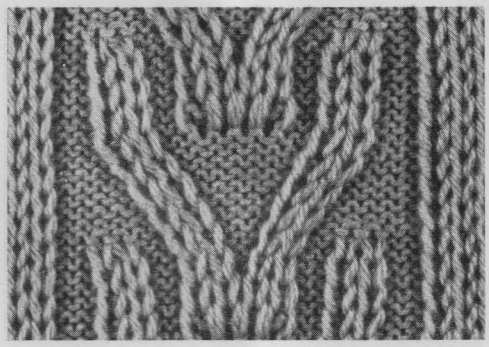
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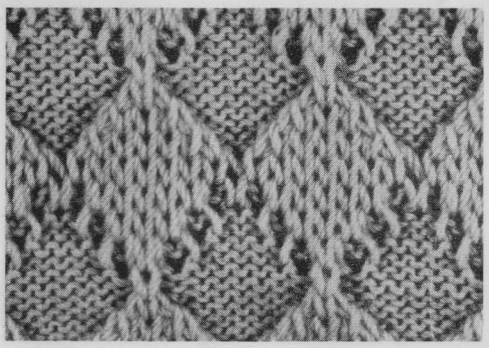
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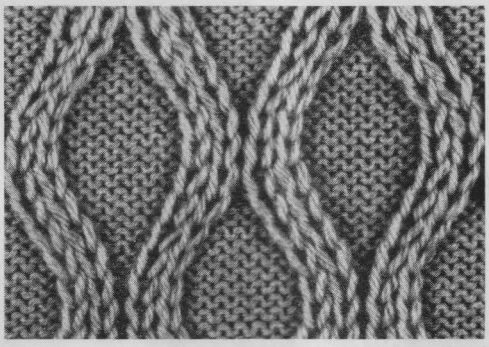
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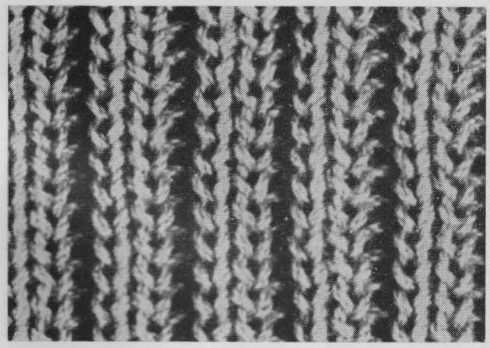
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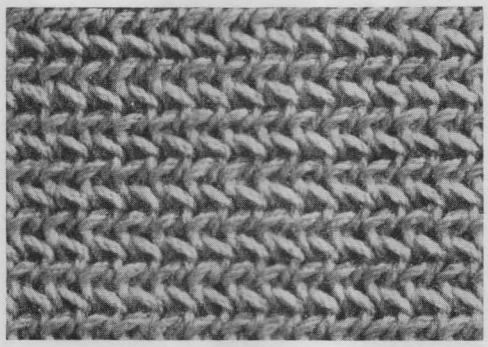
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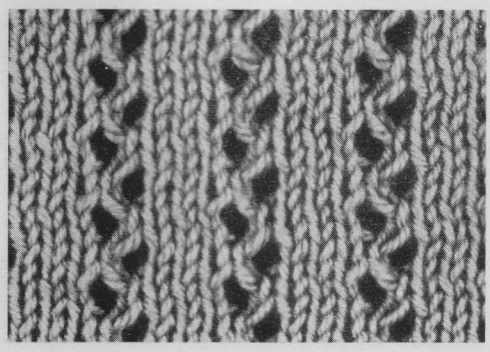
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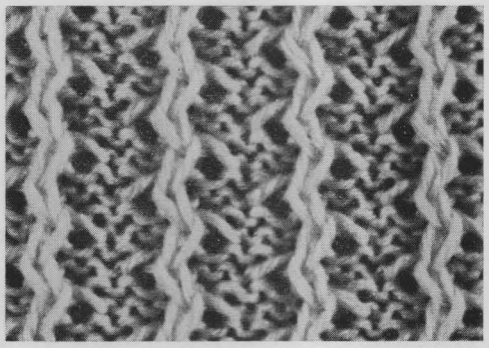
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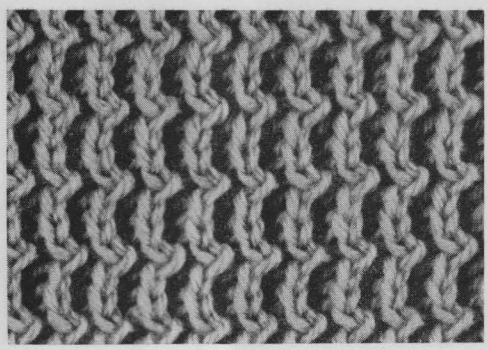
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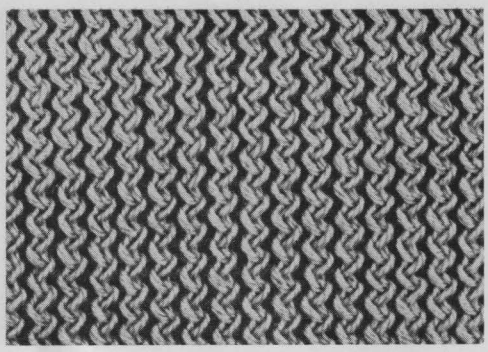
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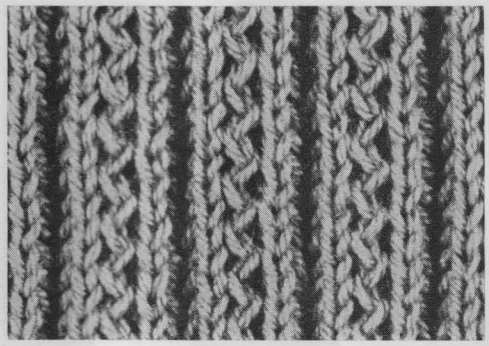
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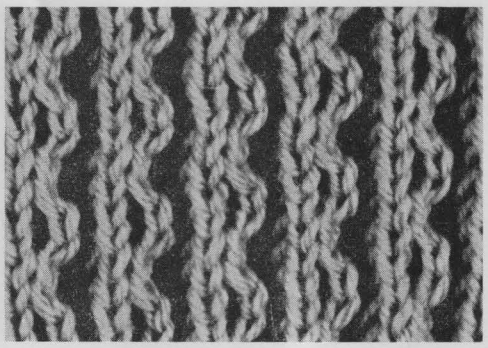
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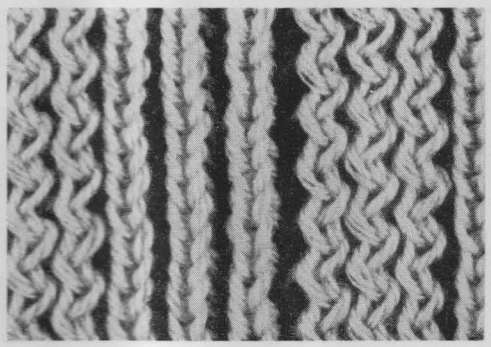
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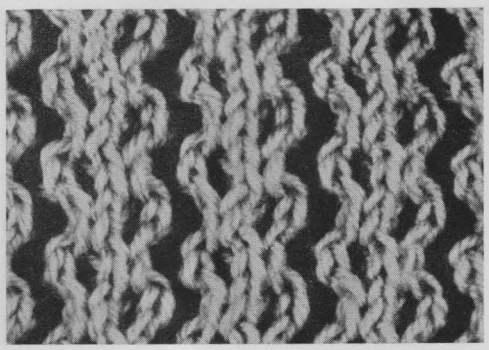
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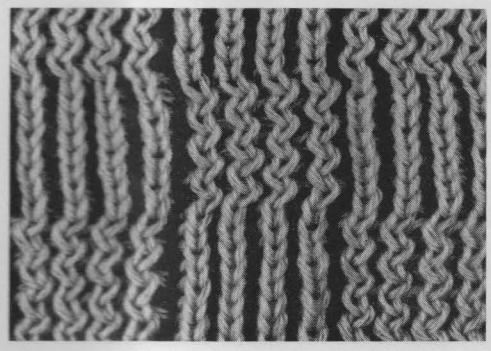
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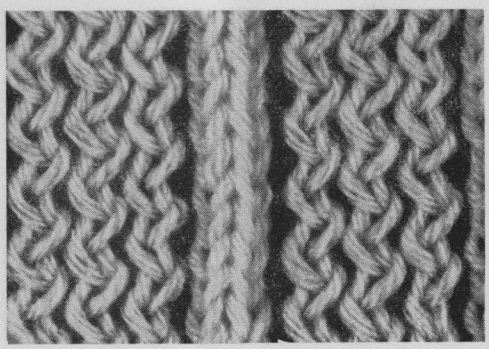
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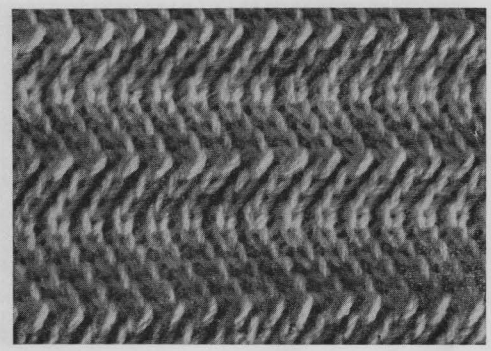
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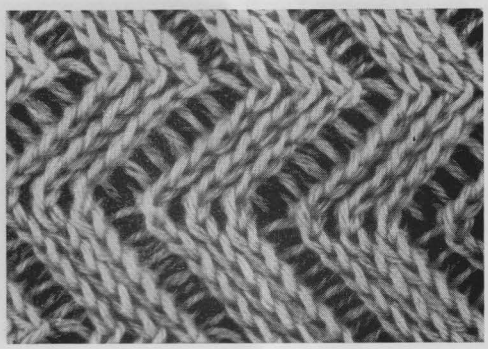
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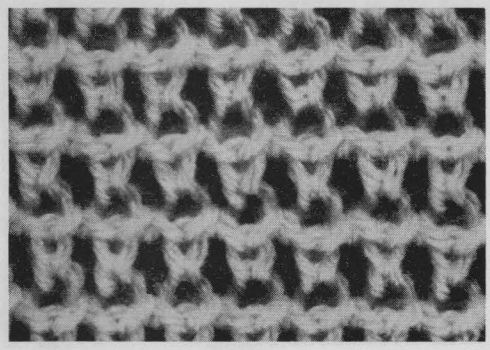
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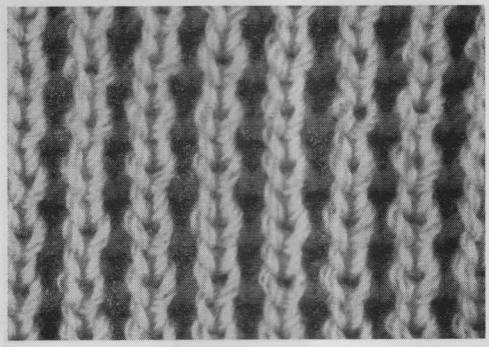
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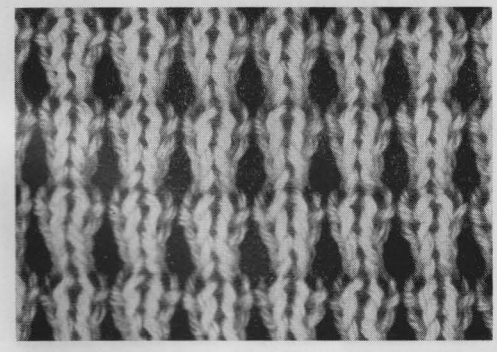
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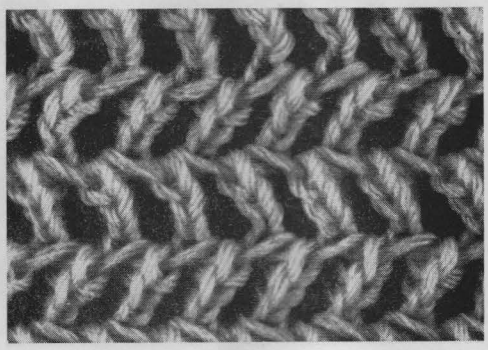
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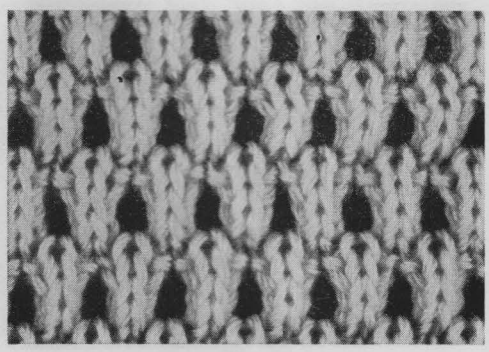
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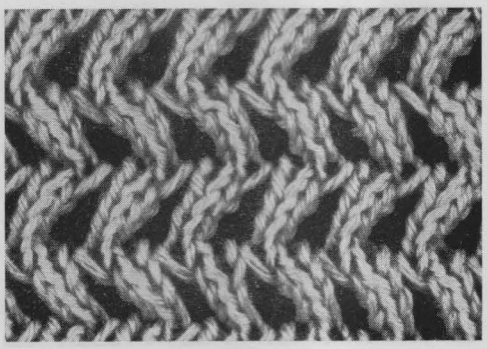
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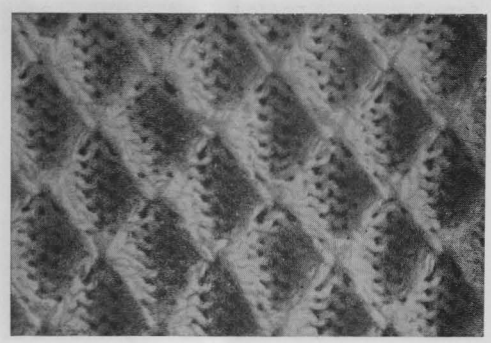
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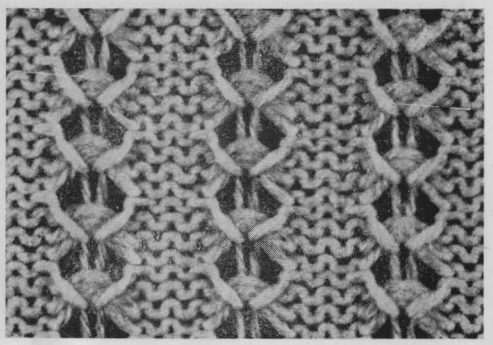
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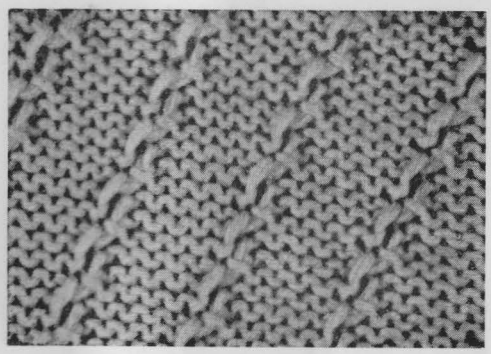
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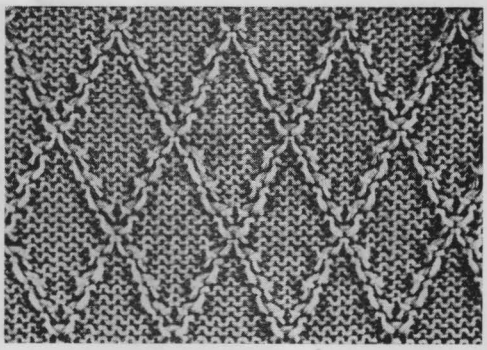
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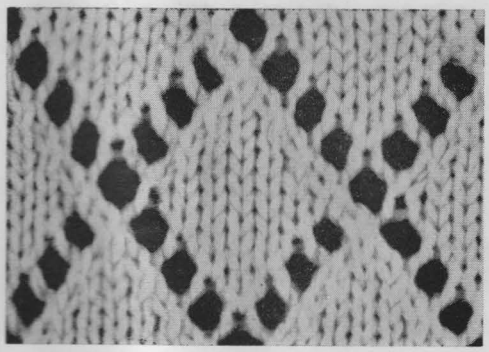
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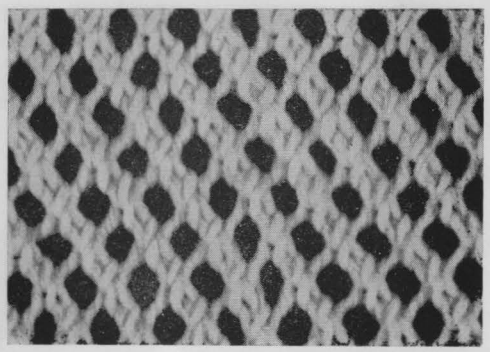
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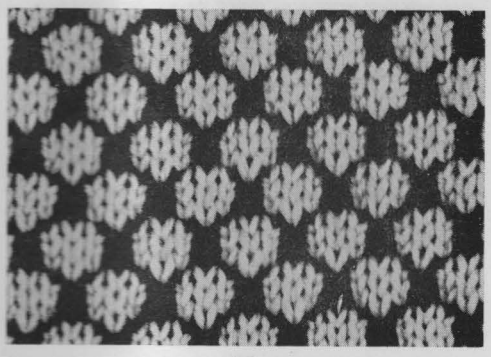
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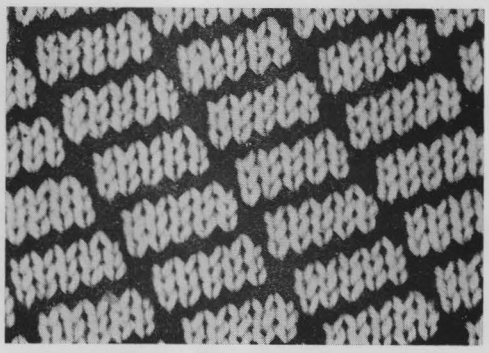
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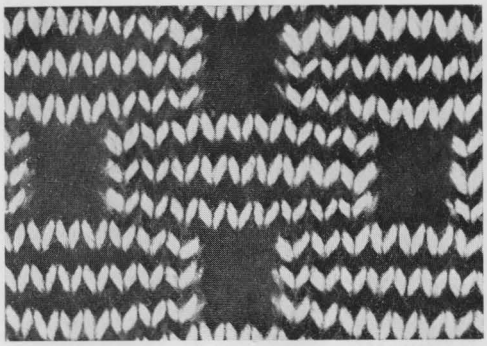
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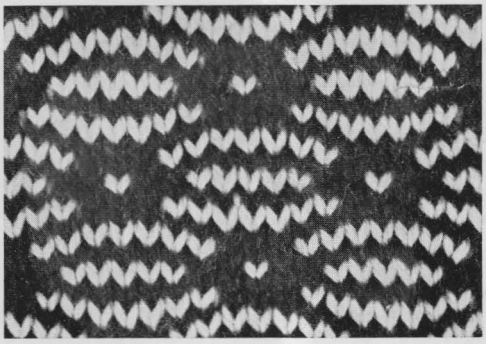
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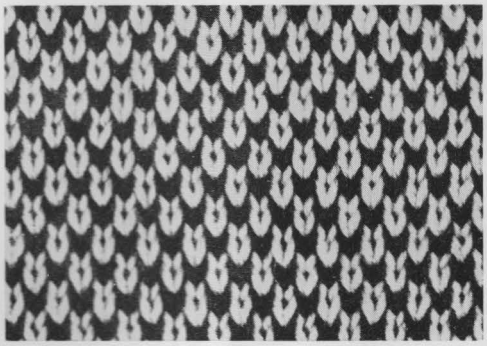
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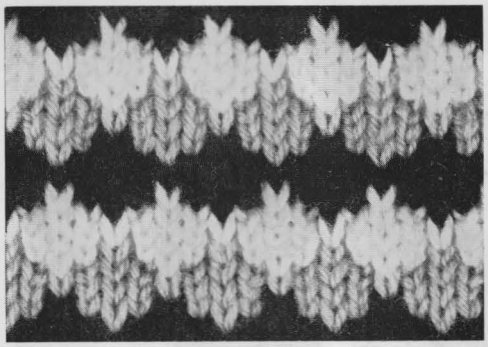
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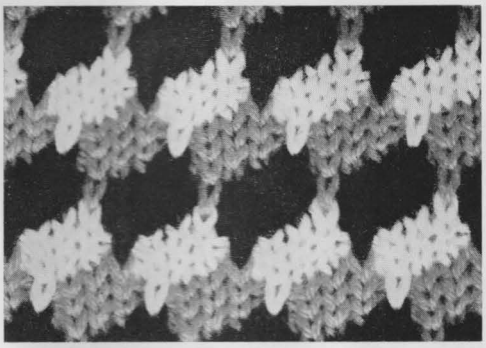
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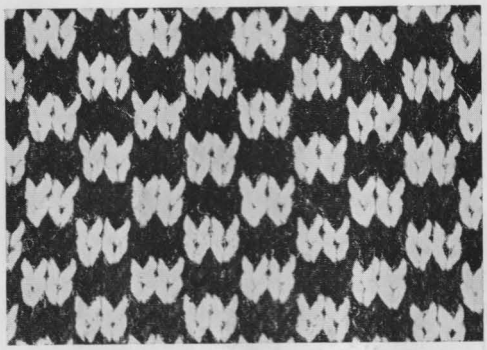
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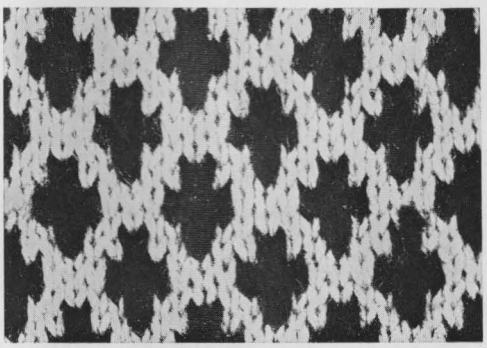
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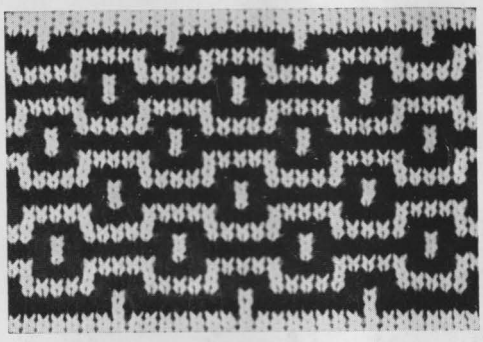
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