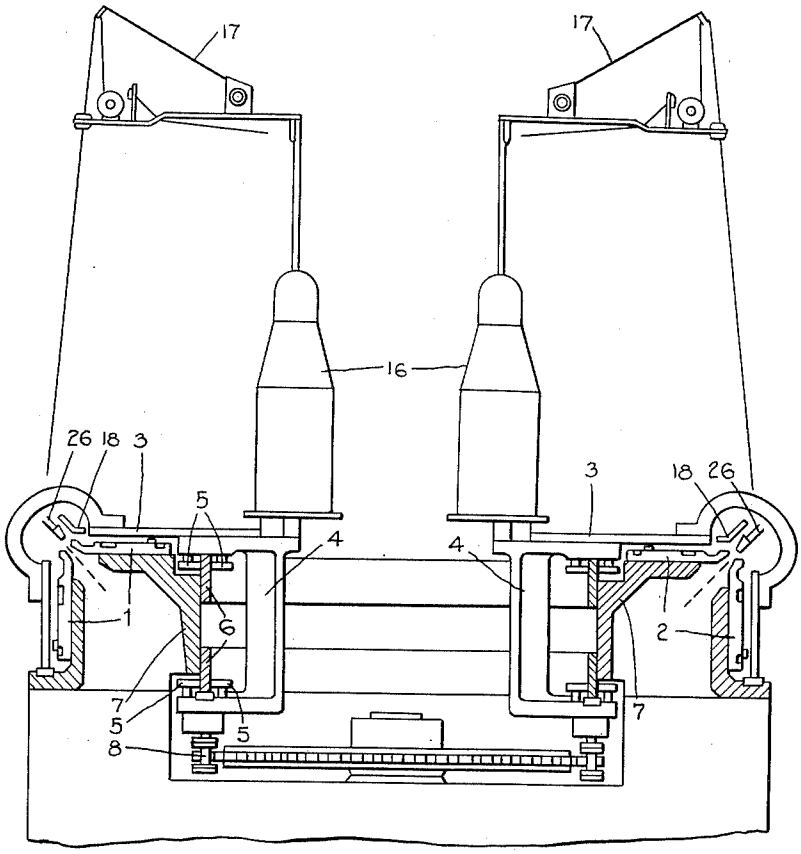
April 5, 1955 W. V. MEHNERT 2,705,408

FLAT KNITTING MACHINE WITH 2 PAIRS OF NEEDLE BEDS

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Fig. 1.



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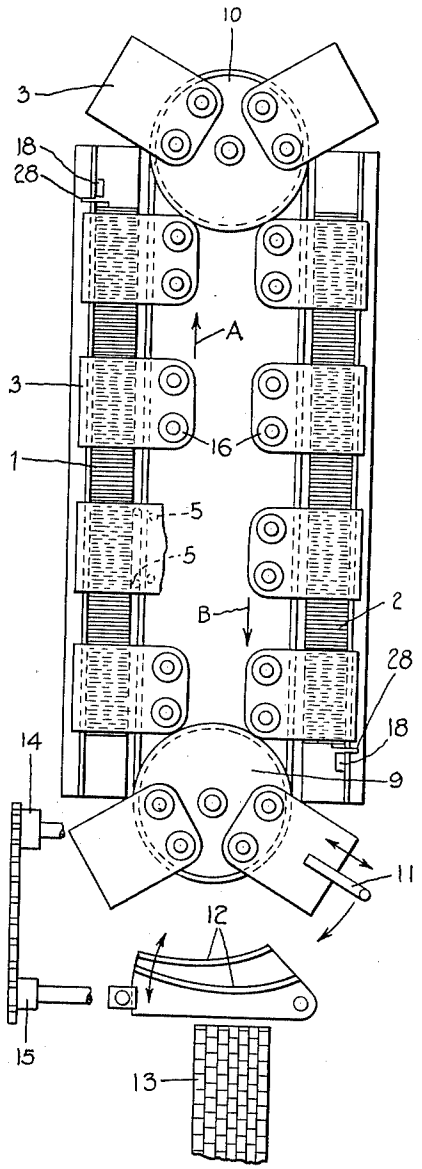
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Fig. 2.



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Fig. 4.

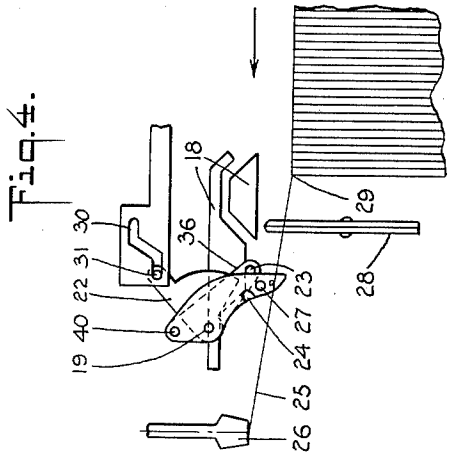


Fig. 5.

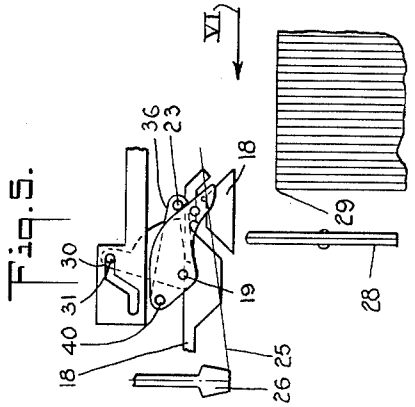
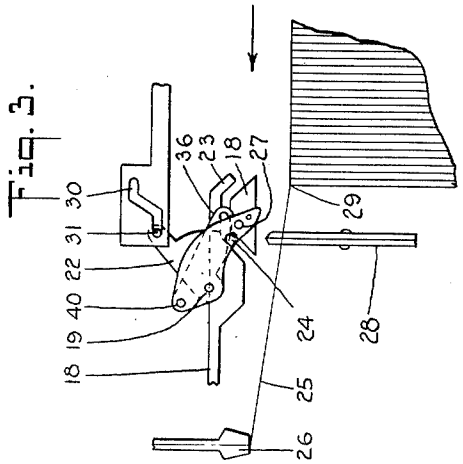


Fig. 3.



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Fig. 7.

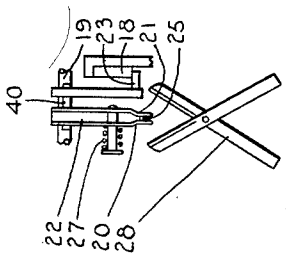


Fig. 5.

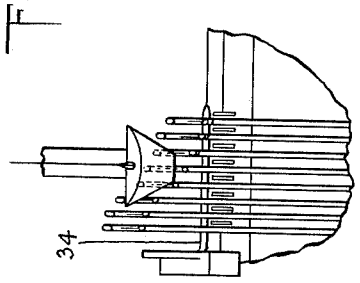


Fig. 6.

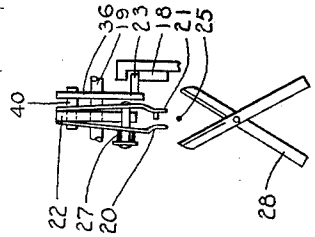
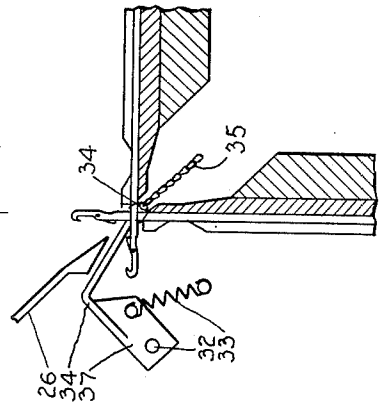


Fig. 8.



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United States Patent Office 2,705,408 Patented Apr. 5, 1955

2,705,408

FLAT KNITTING MACHINE WITH 2 PAIRS OF NEEDLE BEDS

Walter Volkhart Mehnert, Chemnitz, Germany, assignor to VEB Fahrradwerk Elite Diamant VVB IFA, Chemnitz, Deutsche Demokratische Republik

Application September 5, 1952, Serial No. 308,057

10 Claims. (Cl. 66—64)

The invention refers to knitting machines, and more particularly to a flat knitting machine with 2 pairs of needle beds.

The hitherto known flat knitting machines with one pair of needle beds produce a web of ribbed, tubular or fancy fabric. According to the width of the needle beds two or several pieces of fabric can be made, however only side by side. To make these pieces of fabric there is a slide with cams, which operates the needles in the needle beds and reciprocates from one side to the other. Formerly only one slide with one cam system was provided on these machines and the output was consequently only small. To increase the output, the slides were made with two or three cam systems side by side. The increased number of cam systems however did not increase the output, because the side by side arrangement of several cam systems necessitated a longer track for the slide and consequently wasted time. In spite of equal loop length the ribbing assumed a streaky appearance owing to several cam systems moving forward and backward and changing tension of thread.

Furthermore flat knitting machines with 2 pairs of needle beds are known but can be used only for making certain fancy goods and only in one piece of fabric so that there is no increase in output. There is also a flat knitting machine with one pair of needle beds in use with several slides with side by side cam systems and rotating carriers. On this machine only plain tubular fabric, but no double loop fabric like ribbing or the like can be made.

An object of the invention is to provide a flat knitting machine with two or several pairs of needle beds, by means of which two or more webs of fabric may be knitted simultaneously.

Another object of the invention is to provide a flat knitting machine, by means of which various types of fabric, such as ribbed fabric, cardigan or fancy fabric may be knitted with an output higher than that of hitherto customary flat knitting machines.

A further object of the invention is to provide a flat knitting machine by means of which uniform fabrics may be knitted.

Another object of the invention is to provide a flat knitting machine which may start the knitting of a fabric without the use of a so-called set-on-comb.

A further object of the invention is to provide a flat knitting machine by means of which holes may be readily closed if they should occur during a knitting operation.

Another object of the invention is to improve on the art of flat knitting machines as now customarily made.

Other objects and structural details of the invention will be apparent from the following description when read in conjunction with the accompanying drawings forming part of this specification, wherein:

Fig. 1 is a vertical sectional view of a knitting machine with two pairs of needle beds,

Fig. 2 is a top plan view of the knitting machine shown in Fig. 1,

Figs. 3–5 illustrate a thread clamping device in different operative positions,

Fig. 6 is an elevational view of the clamping device seen in the direction of the arrow VI shown in Fig. 5,

Fig. 7 is an elevational view of the clamping device similar to that shown in Fig. 6, wherein, however, the parts are in a different position,

Fig. 8 is a side elevational view of the fabric holding mechanism, and,

Fig. 9 is a front elevational view of the mechanism shown in Fig. 8.

The needle bed pairs **1** and **2** shown in Figures 1 and 2 are placed behind each other. The slides **3** are guided over carriers **4** by means of rollers **5** on guide bars **6**. The guide bars **6** fixed along the frame **7** of the machine are connected with each other at the ends by semi-circular guide bars, thus forming an endless slide bar. Parallel and beneath the guide bars is an endless chain **8** trained around a driving sprocket **9** and an idling sprocket **10** arranged at opposite ends of the machine. The carriers **4** are connected to and move with the chain **8**. Therefore, the slides **3** engaged by the carriers **4** are moved continuously over the pairs of needle beds **1**, **2** in the direction of the arrows A and B shown in Fig. 2, so that each needle bed pair **1** and **2** produces one piece of fabric.

Each slide **3** is provided with a controlling member or bar **11** (only one being shown in Fig. 2) which is influenced by controlling curves **12** connected to a controlling device **13**. The controlling curves **12** influence each slide **3** independently in dependence on the setting of the controlling device **13** so that each slide **3** can be differently adjusted according to the pattern to be made. The controlling device **13** is driven by the sprocket **9** through a mechanism including sprockets **14**, **15** and a chain trained around the latter. The sprocket **9** journalled in the frame of the machine is driven by the drive of the machine through the medium of a clutch and gears. Thread supplies **16** and thread tension devices **17** associated therewith are mounted on each slide **3**.

As best shown in Figs. 1–5, a controlling curve **18** and scissors **28** are provided, one each on the needle bed pair **1** and **2**. Each slide **3** carries a pin **19** serving as a pivot for a thread clamping device comprising two clamping legs **20** and **21** and a center piece **22** (see Figs. 3–7). The slides **3** move over the needle bed pairs **1** and **2** in the direction of the arrows A and B shown in Figure 2. When a slide **3** leaves the needles of a needle bed pair **1** or **2**, the clamping legs **20** and **21**, whose ends slip on the fabric, are rocked upwards about the pivot **19** by a pin **23** engaged with the controlling curve **18** and carried by a member **36** connected to said legs **20** and **21** by a pin **40**. This operation causes the legs **20** and **21**, which each have a nose **24**, to engage with their noses **24** the center piece **22** whereby they are spread apart from each other as shown in Fig. 6. Thus, the thread **25** issuing from the thread guide or thread feeder **26** fixed to the slide **3** will rest between and below both clamping legs **20** and **21**. When the slide **3** continues its movement, the pin **23** moves down the controlling curve **18**, whereby the clamping legs **20** and **21** by the pin **23** are brought together. The noses **24** move away from the middle piece **22** and the legs **20**, **21** clamp the thread **25** by the action of a compression spring **27** (Figure 7). At this moment scissors **28**—or other cutting instruments—cut the thread **25** behind the last working needle **29**.

A pin **31** secured to the middle piece **22** is engaged with a curve **30** slidably mounted on the slide **3**. Thus, said curve **30** may cause a rocking of the middle piece **22** about its pivot **19** into a down position (see Figures 3 and 4) or into a high position as shown in Figure 5. Therefore, as the clamping legs **20** and **21** are held in gripping engagement with the middle piece **22** by means of the spring **27**, the legs **20** and **21** may hold the clamped thread **25** in a high or low position in dependence on the position of the middle piece **22** controlled by the curve **30**, as desired. In the low position the thread will be caught by the needles and drawn from the clamping legs **20** and **21** and formed to loops when the slide moves onto one of the needle bed pairs. In the high position, however, the thread **25** cannot be caught by the needles and this position is utilized either to make a dead row or to knock-off loops from the needles, so that various patterns may be made or a fresh fabric having a tight beginning may be started.

Figures 8 and 9 illustrate a mechanism for holding down the fabric. Such a mechanism necessary for starting the fabric without using a so called set-on-comb or to knit up holes comprises a lever **37** turning about a pivot **32** secured to the slide **3** and a tension spring **33** urging

the lever against the fabric. A wire **34** secured to the lever **37** extends between the needle beds. Said wire sliding along the fabric **35** being knitted holds the latter down when the needles rise.

The operation of a flat knitting machine according to the invention is as follows:

The slides **3** with cams being adjusted for ribbing, cardigan or fancy fabric are constantly circulating in clockwise direction and simultaneously operate the needles of the front as well as back needle bed pair **1, 2.** It will thus be seen that, for instance, after having left the front needle bed pair, the slide **3** moves round to the back needle bed pair and passes over same and when it reaches the end it returns to the front needle bed pair. Thus, two pieces of fabric are produced. The cams are controlled outside the zone of the needles by the controlling device **13** without reduction of the speed of the slides. The width of fabric to be made may be pre-selected as desired according to the number of needles. By the continuous circulation of the slides and by making at least two webs of fabric at the same time, the output is very high. After each slide has passed the front or back needle bed pair, the thread is clamped by the clamping device **20, 21, 22** attached to the respective slide, and is then cut off between the clamping device and the last working needle by the scissors **28.**

The thread tensioning means arranged on the slides gives a uniform tension of the threads so that a uniform fabric is obtained.

I have described a preferred embodiment of my invention, but it is understood that this disclosure is for the purpose of illustration and that various omissions or changes in shape, proportion and arrangement of parts, as well as the substitution of equivalent elements for those, herein shown and described, may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

For example, several needle bed pairs may be arranged side by side, if several webs of fabric shall be knitted side by side.

I claim:

1. A flat knitting machine, comprising in combination: at least two pairs of needle beds, conveying means, actuating means associated with said conveying means for moving same, said conveying means extending along said pairs of needle beds, and a series of cam carrying slides, said slides being arranged side by side and each slide being in operative connection with said conveying means for movement over said pairs of needle beds.

2. A flat knitting machine, comprising in combination: at least two pairs of needle beds arranged one behind the other, a pair of wheels, endless flexible conveying means trained around said wheels, actuating means associated with at least one of said wheels for moving said conveying means, and a series of cam carrying slides, said slides being arranged side by side and each slide being in operative connection with said conveying means for movement over said pairs of needle beds.

3. In a flat knitting machine as claimed in claim 2, said endless flexible conveying means including a chain, a number of carriers equal to the number of slides, each carrier being connected with said chain, and each slide being connected with a carrier.

4. In a flat knitting machine as claimed in claim 1, a thread cutting device arranged near one of the ends of each pair of needle beds.

5. In a flat knitting machine as claimed in claim 1, at least one thread feeding device and at least one thread tensioning device arranged on each slide, and a thread clamping device carried by each slide.

6. A flat knitting machine, comprising in combination: at least two pairs of needle beds, conveying means, actuating means associated with said conveying means for moving same, said conveying means extending along said pairs of needle beds, a series of cam carrying slides, said slides being arranged side by side and being in operative connection with said conveying means for movement over said pairs of needle beds, thread clamping means carried by each slide, said thread clamping means being movable into a clamping position and into a releasing position, and controlling means arranged near one end of each pair of needle beds, for cooperation with said clamping so as to control the position thereof.

7. In a flat knitting machine as claimed in claim 6, said thread clamping means including a pair of clamping legs rockably mounted on the associated slide, a center element arranged between said clamping legs, resilient means associated with said clamping legs for urging same towards each other, said controlling means being associated with said clamping legs for rocking same, and protruding means arranged on at least one of said clamping legs, said protruding means being arranged for engagement with said center element so as to cause a spreading of the clamping legs upon a rocking of said clamping legs.

8. In a flat knitting machine as claimed in claim 6, said thread clamping means including a pair of clamping legs and a center element rockably mounted on the associated slide, said center element being arranged between said clamping legs, resilient means associated with said clamping legs for urging same towards each other, said controlling means being associated with said clamping legs for rocking same, protruding means arranged on at least one of said clamping legs, said protruding means being arranged for engagement with said center element so as to cause a spreading of the clamping legs upon a rocking of said clamping legs, and a movable controlling member on each slide operatively engaged with said center element for rocking same.

9. In a flat knitting machine as claimed in claim 1, a mechanism arranged on each slide for engagement with and holding down of the fabric knitted by the needles of the needle beds.

10. In a flat knitting machine as claimed in claim 1, a spring-loaded element swingably mounted on each slide, said element being arranged for engagement with and holding down of the fabric knitted by the needles of the needle beds.

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