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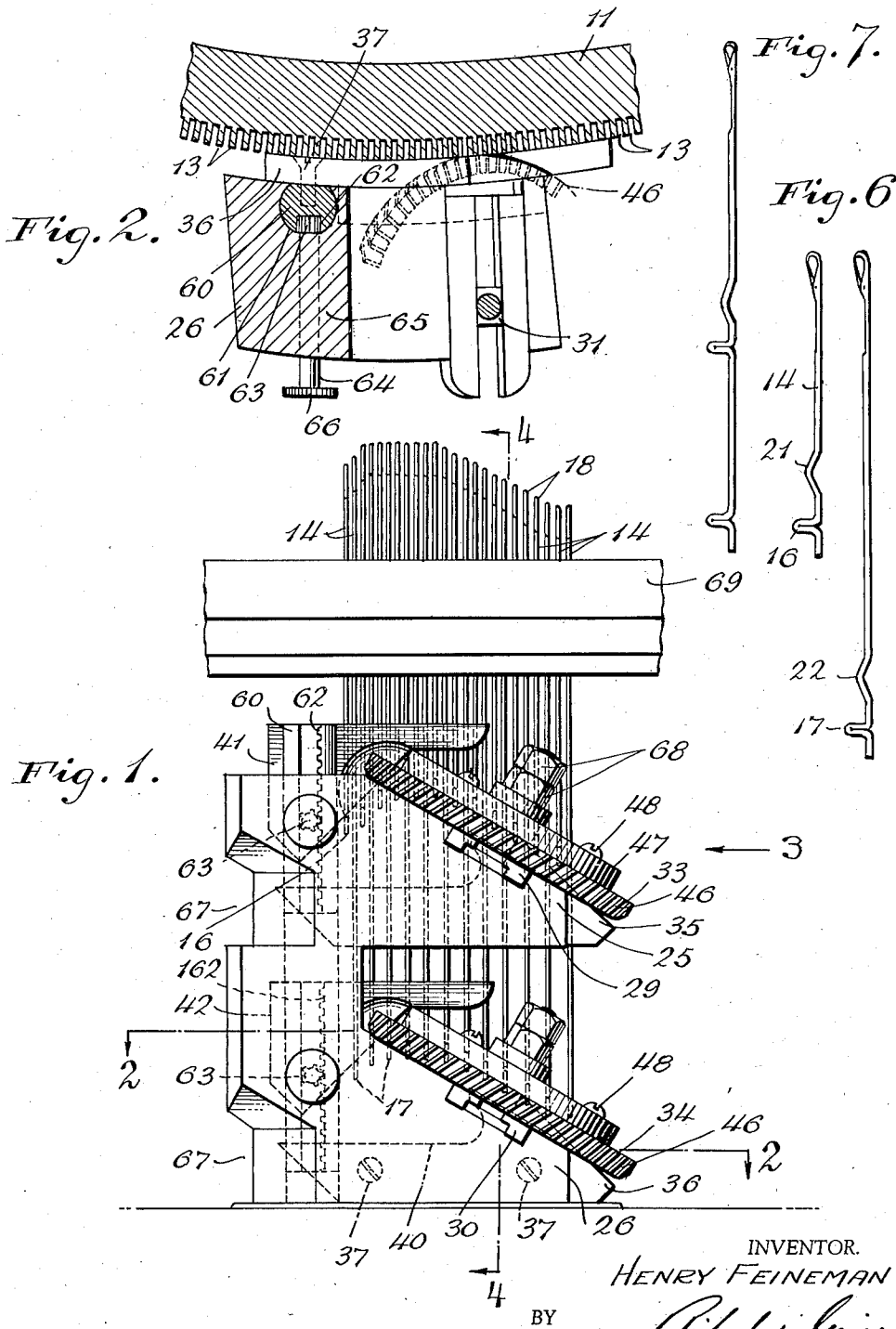
H. FEINEMAN

2,030,815

KNITTING MACHINE

Filed Dec. 12, 1934

2 Sheets-Sheet 1



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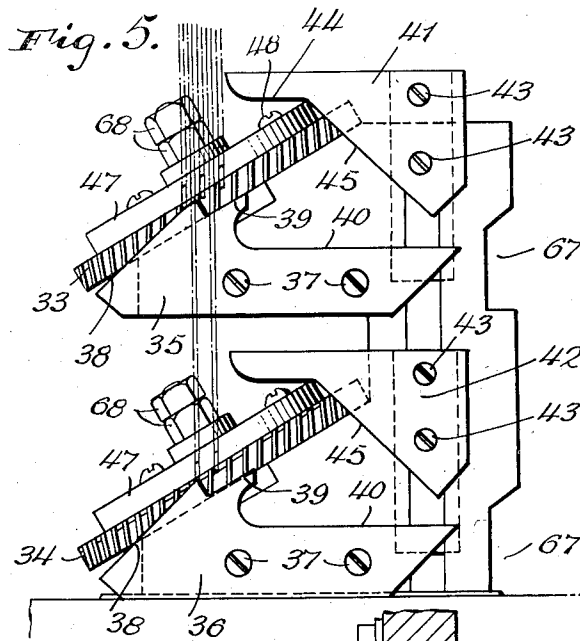
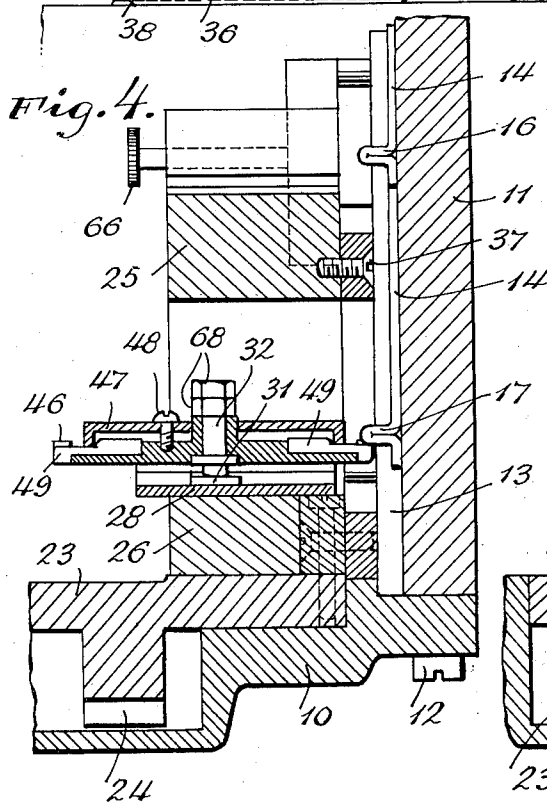
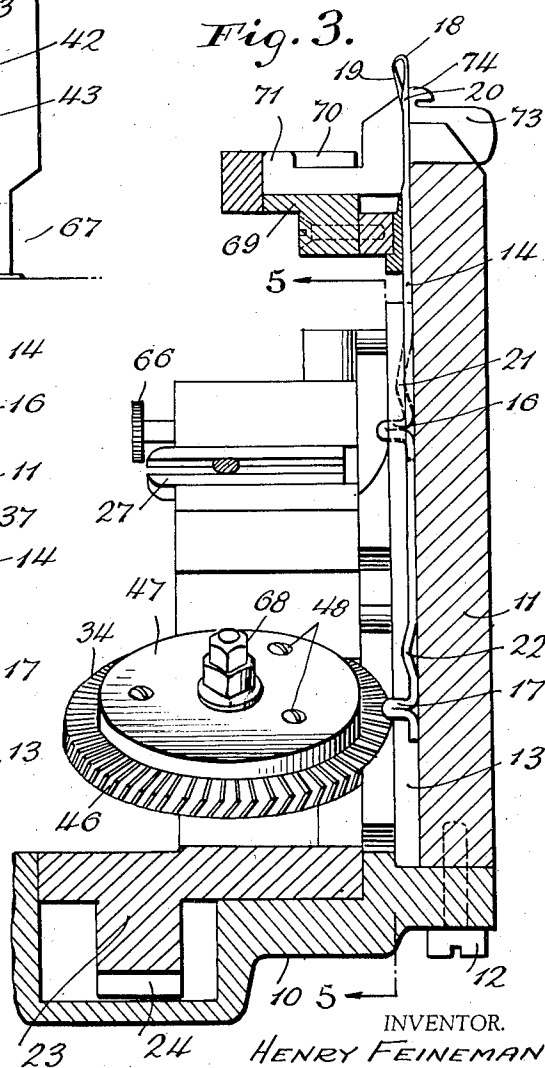
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,030,815

KNITTING MACHINE

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4 Claims. (Cl. 66—50)

The present invention relates to a knitting machine and it particularly relates to an improved construction of circular knitting machine of improved durability and with lessened maintenance cost.

The invention of the present application has a particular application to circular knitting machines having a circular bank of closely spaced knitting needles, and the invention will be particularly described in connection with a circular knitting machine of this character, although it is to be understood that it has other applications within the scope of the appended claims.

The quality of knitted fabrics and the desirability of the design and appearance thereof is controlled in many instances by the fineness of the loops or knitted threads, by the closeness by which they are spaced, and also by the size and appearance of the pattern which is applied thereto.

In the one type of knitting machine to which the present invention is applicable a plurality of rotating uplift and downstitch cams are utilized with intervening pattern wheels to cooperate with a plurality of cam follower portions, or butts of knitting needles, to alternately elevate and lower such knitting needles, said knitting needles when elevated and lowered being caused to form a succession of Jersey and/or tuck stitches which form the knitted fabric.

In forming patterns in the knitted fabric the cam follower or projection elements of said needles are caused to mesh with a pattern wheel and/or be elevated by said pattern wheel to cause a variation in the stitches, the variation of the positioning of the stitches causing the pattern to be formed.

These pattern wheels are at an inclination to the axis of the knitting machine, with a series of closely spaced vanes or teeth, the interstices between some of which are blocked. The blocked interstices contact with the butts or cam follower portion of the needles and elevate the needles to form a loop.

The vanes or teeth of these pattern wheels are relatively thin since the fineness of the pattern in the knitted material is more or less controlled by closeness of the knitting needles and the spacing of the vanes must be the same as the spacing of the needles.

It has been found that the vanes in these pattern wheels cannot be more closely spaced than to give a fineness of pattern of about 18 needles per inch. When the vanes of the pattern wheels are arranged so as to give a spacing of loops

closer than 18 to an inch, the vanes will be so thin that they are readily ruptured and bent during operation of the machine, and further closer spacing of the machine would result in a substantially decreased life period.

An object of the present invention is to provide a knitting machine construction in which with the utilization of ordinary needles and pattern wheels of standard mechanical construction, it is possible to achieve a greatly enhanced fineness of stitching and of pattern without unduly increasing the cost of construction, and without decreasing the life of the machine and durability thereof.

Another object is to provide an improved knitting machine in which by relatively simple manipulations within the skill of a knitting machine operator, it is possible to produce knitted fabrics of greatly enhanced fineness of pattern.

Other objects will appear during the course of the following specification.

In accomplishing the above objects it has been found most satisfactory to provide in a knitting machine of the circular knitting variety, a plurality of banks of needles with cams or butts at different levels, each of which bank of needles cooperate with a corresponding bank or series of pattern wheels.

It has also been found suitable in certain instances to improve the construction of the knitting machine by adjusting the stitch cam arrangements for lowering the needles by means of rack and pinion constructions.

The above and other objects will appear more clearly from the following detailed description, when taken in connection with the accompanying drawings, which illustrate a preferred embodiment of the inventive idea.

In the drawings;

Figure 1 is a fragmentary side sectional view of a knitting machine illustrating two of the pattern wheels in superimposed position.

Figure 2 is a top sectional view looking downwardly upon the line 2—2 of Fig. 1.

Figure 3 is a side view portion of the knitting machine shown in Figure 1 upon the line 3 indicated in Fig. 1.

Figure 4 is a side sectional view upon the line 4—4 of Fig. 1.

Figure 5 is a side sectional view upon the line 5—5 of Fig. 3.

Figure 6 is a view of the two knitting needles indicating the difference in position in the height of their butts or cam follower portions, and

Figure 7 is a side view of an alternative double butt needle construction.

Referring to the drawings, the knitting machine as shown is provided with a fixed base element 10, to which is bolted the cylindrical support element 11 by the bolts 12.

On the exterior cylindrical face of the member 11, is provided a series of recesses 13, see Fig. 2, which carry the knitting needles 14, which are arranged in two groups or series, one with elevated butts 16 and the other with depressed butts 17.

Each of these knitting needles is provided with the usual hook 18 and the latch 19 pivoted to the body of the needle at 20 as shown best in Fig. 3; and these needles are also provided with the projections 21 and 22 respectively. The table 23 is provided with a rack element 24 and it is conveniently rotated around the exterior of the cylinder 11 by a suitable pinion or other means engaging the teeth of the rack 24.

The carriage 23 carries the support elements 25 and 26 which are respectively provided with slots 27 and 28 receiving the upper and lower slot bars 29 and 30; in which slot bars may be inserted the lower squared ends 31 of the pivotal mounts 32 of the upper and lower pattern wheels 33 and 34 respectively.

The supporting elements 25 and 26 also carry the lifting cam elements 35 and 36 which are attached to the structure by means of screws 37 and which are provided with the uplift cam surface 38 for lifting the butts 16 and 17 to welt position, the pattern wheels serving to elevate a desired number and arrangement of these needles to the tuck stitch or Jersey stitch position.

These cams 35 and 36, as is best shown in Fig. 2, are curved to conform to the exterior face of the cylinder 11; and they are recessed as indicated at 39 to receive the edges of the pattern wheels 33 and 34.

The cams 35 and 36 are also provided with recesses 40 in which position may be placed additional cam elements to elevate all of the needles to Jersey or tuck stitch position if desired.

The stitch cams 41 and 42 respectively are also connected by the screws 43 to the sides of the support elements 25 and 26 adjacent the cylinder 11, and they are provided with the guiding or cam surfaces 44 and 45, the surface 45 being primarily effective for contacting with the butts 16 and 17 of the knitting needles and depressing them into proper position whereby a stitch will be formed.

The present invention is primarily directed to the construction and location of the pattern wheels 33 and 34. Each of the pattern wheels 33 and 34 is provided with a plurality of teeth 46 around the periphery thereof, which mesh with the butts 16 and 17 and which are filled by jack members 49 (see Fig. 4) causing elevation of the butts, as the carriage 23 and the pattern wheels 33 and 34 thereon rotate during the knitting operation. These jacks are usually held in position by the plate 47, and the screws 48, see particularly Figs. 1, 3 and 5.

Ordinarily where a single pattern wheel is utilized, it is necessary to provide a sufficient number of teeth 46 so closely spaced together that there will be recesses corresponding to each of the butts. As a result, the thickness of the teeth 46 and their strength will vary considerably with the closeness of spacing of the knitting needles 14, and when these knitting needles are more closely spaced back to back than 16 to an inch, the teeth are necessarily of such thinness and

of weak construction, that they readily become injured and damaged during operation.

The present invention primarily resides in the novel construction shown in Figs. 1 to 5 in which a plurality of pattern wheels are utilized to cooperate with a plurality of sets of knitting needles, the upper pattern wheel 33 operating on the upper butts 16, and the lower pattern wheel 34 operating on the lower butts 17. It is therefore, not necessary to make the teeth 46 of the pattern wheels excessively thin or too closely spaced together for practical purposes. By utilizing the plurality of pattern wheels 33 and 34 it is possible to make the teeth 46 of such pattern wheels 34 and the jacks 49 of such strength of construction that the pattern wheels will stand up under normal operating conditions without difficulty.

Although two superimposed pattern wheels 33 and 34 corresponding to two series of knitting needles with butts 16 and 17 are generally preferred, it is obvious that three or four superimposed rows of pattern wheels may also be employed.

It is also apparent that by the use of a plurality of pattern wheels, as shown at 33 and 34 meshing and/or cooperating to lift the butts 16 and 17, it is possible to get a much wider range in regulation of the tightness or looseness of the stitch, of the character of the pattern and/or of the characteristics of the final knitted fabric.

It is also apparent that by providing pattern wheels of this sort, it is possible to obtain a variation in the uplift cams 35 and 36 and down or stitch cams 41 and 42 which also permit of a greater adjustability in the knitting operation.

As shown the pattern wheels 33 and 34 are placed directly above each other but it is to be understood that they may be staggered or placed in various alternative relationship to give variation in characteristics of the knitted fabrics.

With the superimposed arrangement of the present invention it is desired to provide a means for readily adjusting the down stitch cams 41 and 42, which down stitch cams are preferably attached by the screws 43 to a rod or slider element 60 which fits in a recess 61 in the support elements 25 and 26.

Each of the slider elements 60 is provided with a rack 62 which engages with a pinion 63, controlled through the stud 64 bearing in the bore 65 in the blocks 25 and 26. The end of the stud carries the manual operating element 66 enabling convenient control from the exterior of the machine.

By varying the position of the down stitch cams 41 and 42 it is possible to vary the tightness and looseness of the knitting stitch and the two down stitch cams 41 and 42 may be adjusted, permitting a much greater variation.

The remainder of the knitting machine may be of the usual conventional construction.

The rear of the blocks 25 and 26 may be recessed at 67, see Fig. 1, to receive the lower ends of the next pair or series of pattern wheels 33 and 34. The pattern wheels 33 and 34 may also be held upon the pivot 33 by the nuts 68.

At the top of the knitting machine is preferably provided a carrier ring 69 provided with a series of slots 70, one for each needle which receive the sinker member 71 having projecting portions 73 together with the hooks 74 which serve to press the cloth after it has been knitted, away from the knitting needles 14.

The double butt cam of Fig. 7 may be actuated by the upper and lower bank of pattern wheels

to make tuck or Jersey stitches, with resultant variation and ability to control the design.

What is claimed is:

1. A circular knitting machine of the character
5 described having a circular bank of knitting needles, said knitting needles being arranged in groups or series alternately provided with butts at different elevations and a plurality of corresponding superimposed pattern wheels with
10 cams cooperating with said butts, said pattern wheels being arranged in corresponding series at different levels, the upper pattern wheels being arranged to act upon the higher butts of one group or series composed of alternate needles and
15 the lower pattern wheels being arranged to act upon lower butts of the other group or series composed of intermediate needles.

2. A circular knitting machine of the character described having a circular bank of knitting needles, said knitting needles being arranged in
20 groups or series alternately provided with butts at different elevations and a plurality of corresponding superimposed pattern wheels with cams cooperating with said butts, said pattern
25 wheels being arranged in corresponding series at different levels, the upper pattern wheels being arranged to act upon the higher butts of one group or series composed of alternate needles and the lower pattern wheels being arranged to
30 act upon the lower butts of the other group or series composed of the intermediate needles, said cams being provided with rack and pinion adjusting means.

3. A circular knitting machine of the character
35 described having a circular bank of knitting needles, said knitting needles being arranged in

groups or series alternately provided with butts at different elevations and a plurality of corresponding superimposed pattern wheels with
5 cams cooperating with said butts, said pattern wheels being arranged in corresponding series at different levels, the upper pattern wheels being arranged to act upon the higher butts of one group or series composed of alternate needles and the lower pattern wheels being arranged
10 to act upon the lower butts of the group or series composed of the intermediate needles, said butts and said cams being mounted sufficiently above one another as to assure that the lower wheel will not interfere with the upper butts and the
15 upper wheel will not interfere with the lower butts.

4. A circular knitting machine of the character described having a circular bank of knitting needles, said knitting needles being arranged in
20 groups or series alternately provided with butts at different elevations and a plurality of corresponding superimposed pattern wheels with cams cooperating with said butts, said pattern
25 wheels being arranged in corresponding series at different levels, the upper pattern wheels being arranged to act upon the higher butts of one group or series composed of alternate needles and the lower pattern wheels being arranged
30 to act upon the lower butts of the other group or series composed of the intermediate needles, the lower butts and wheels being sufficiently below the upper butts and wheels that the range of action of the wheels will be substantially removed from one another preventing any interference therebetween.
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