

March 17, 1931.

R. RUPF

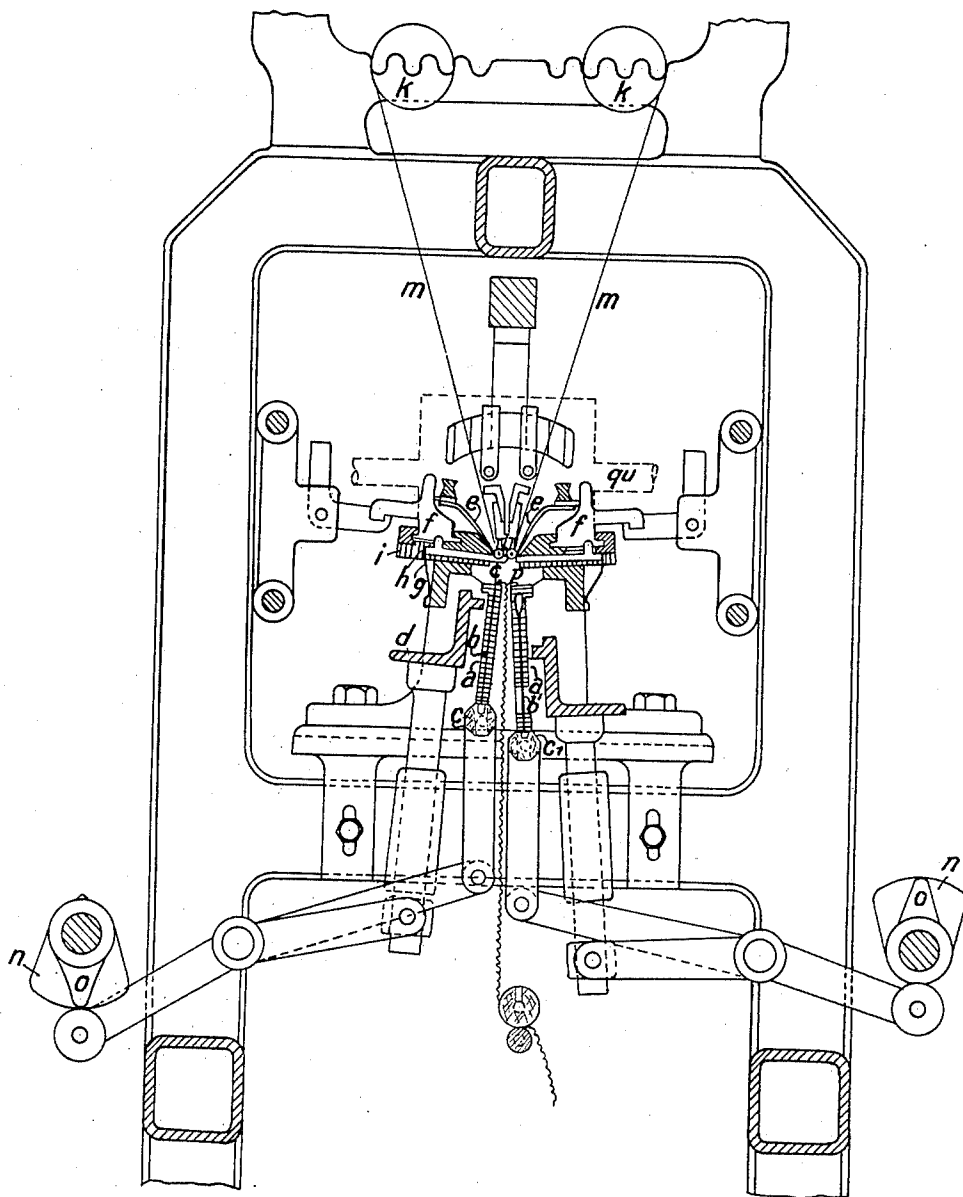
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WARP KNITTING FRAME

Filed Aug. 18, 1927

2 Sheets-Sheet 1

Fig. 1.



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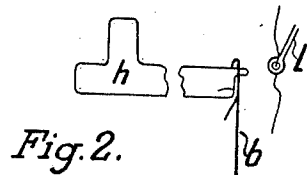
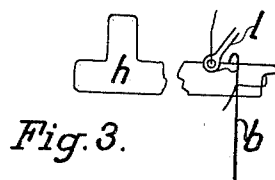
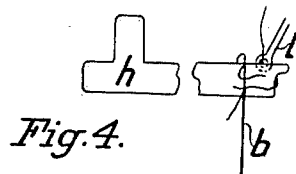
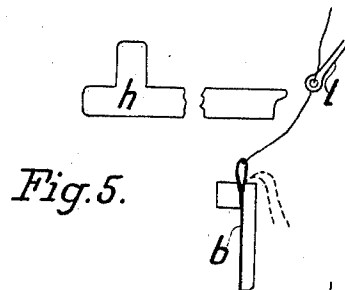
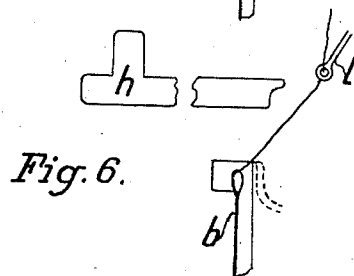
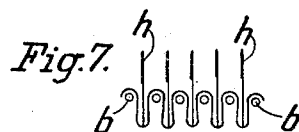
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UNITED STATES PATENT OFFICE

RUDOLF RUPF, OF APOLDA, GERMANY

WARP-KNITTING FRAME

Application filed August 18, 1927, Serial No. 213,891, and in Germany June 5, 1926.

The present invention relates to a warp knitting frame with weft knitting facilities, that is to say, a machine by which a new textile and knitted fabric comprising warp thread and weft thread meshes can be manufactured.

The endeavor to produce an elastic textile or knitted fabric comprising vertically running warp threads and a horizontally running weft thread has led to the construction of a machine which solves this problem by combining a flat knitting machine with individually movable needles and a warp knitting machine controlling the warp threads. It should however be taken into consideration that the needles forming the meshes successively also successively exert a tension on the warp threads beamed on a warp beam. As the warp beam must be braked in order to keep the warp threads stretched, it will not be able to give the individual threads the length necessary for the formation of the meshes but this requisite length can only be attained by a further stretching of the individual, already tensioned threads. In this manner, however, the warp loops will be tightened to such an extent that it cannot be drawn or only with difficulty over the head of the needle and that the knitted fabric receives an undesired firmness. If the tension of a thread were sufficient to overcome the braking power of the warp beam brake and to turn the warp beam, the warp threads which are not yet worked into meshes would hang loose and be without the necessary thread tension. In contradistinction thereto, the meshes, according to the present invention, are not formed singly and successively but all at the same time and in full working width of the machine. All warp threads also exert at the same time the tension (arising from the formation of the meshes) on the braked warp beam and the sum of tension forces exerted on each thread is greater than the braking power of the warp beam brake. The warp beam turns to the extent of the requisite thread length. In order, however, to enable all the needles which are provided with a latch to be drawn down simultaneously and thereby to form the double meshes, each

individual needle must receive a weft loop thread. This is effected by the individually movable sinkers guided in the sinker bed, which sinkers press the thread between the needles and keep it in this position until all needles are retracted, whereupon the depth of the loop in combination with a braking power acting on the warp-beam influences the firmness of the knitted fabric.

The operating stages of the present invention are as follows:

1. All needles are raised (Fig. 2).
2. The warp threads guided through the warp thread guides are pressed around the needles (Fig. 3).
3. The sinker bed is advanced and receded at will by a connection with the sinker board.
4. The sinkers loop the horizontal or weft thread between the needles (Fig. 4) actuated by the sinker cam traversing the needle-bed behind the weft yarn around the needles.
5. The needles are retracted together (Fig. 5).
6. The sinker bed recedes.

The warp thread guides lap the warp threads around the latch-needles in the same manner as in the case of the Raschel machine.

The sinkers being operated by a slide f press the weft thread, that has been brought into its correct position by the thread guides, between the vertically movable latch-needles. The needle bar draws the warp and weft threads now located together under the hook of the latch-needle, downwards in unison, and accordingly forms a double mesh. The needles have now reached a position where the tension wire p does not keep the latches open any longer and the latter close. The meshes formed in the preceding cycle are cast off over the head of the latch-needles by the stripping member. The needle again moves upwards and during this ascent the finished fabric pulls down the meshes which are then under the hook of the needles, whereby the latches are opened. When the needles have reached their highest position wherein the next operation begins the meshes are under the latch while the latches which have the tendency to close are held open by the tension wire p .

The patterning of the fabric is effected by means of a jacquard cylinder with pattern plates put on, by the latter being fitted on directly underneath the latch needle bed, and owing to recessed apertures, not raising individual needles or groups of needles into working position, while at the same time, by means of chain links running over a chain drum, the placing of the warp threads guided through warp thread guides is effected. Said chain links act on a lever which rocks the jacquard cylinder.

Figure 1 shows the warp knitting frame in cross section.

Figures 2 to 6 illustrate the successive positions of the threaded guide, sinkers and needles.

Figure 7 is a diagrammatic plan of the manner in which the sinkers act on the threads.

The needle-beds *a* moved up and down by the needle-bars *d* guide the latch needles *b* which are raised by the jacquard rollers *c* actuated by eccentrics or cams *o*. When the latch-needles *b* are in the highest position, the warp threads *m* delivered from the warp beam *k* by the warp thread guides *l* are lapped around the latch needles *b* by the lapping device in the same way as in the case of the Raschel machine. Whenever the needles are not raised into the operating position by the jacquard rollers no meshes are formed. Reference *qu*, shown in dotted lines in Fig. 1 is the pattern chain drum of the known kind. The sinker bed *i*, which is guided on guide rods and is actuated by suitable means, now moves forward and passes the sinkers *h* between the needles *b*, whereupon the thread-guide *e* is guided past the row of needles *b* by a slide *f* and places the weft thread on the needles *b*; the slide *f* also actuates the sinkers *h* which are subject to the pressure of the spring *g* in such a way that the sinkers are pushed back by means of wedge-shaped segments, similar to those employed on the knitting machine, immediately after the thread-guide *e* passes them, so as to allow free passage for the thread-guide. Immediately after the passage of the thread-guide *e* the sinkers are pressed back into their initial positions by means of the springs *g* and thus loop the weft thread that just has been passed along the row of needles between the latter and form open loops.

After the weft thread has been laid in over the whole working width of the machine and consequently a warp-thread loop and a weft-thread loop lie together under the hook of each needle, which is raised into working position by the jacquard cylinder, the needles *b* are drawn down by the needle bar *d* which is operated by eccentrics or cams *n*. The needles *b* have now reached the position *b'* in which the tension wire does not close the latches any more and the latter, consequently, close the meshes of the pre-

ceding cycle are stripped off over the head of the needles by the stripping comb. The jacquard roller *c* the path of which is governed by eccentrics or cams *o* reaches the position *c'*, see Fig. 1.

Figure 2 shows the sinkers *h* which are returned after the yarn guide has brought the weft thread in front of the sinkers, the sinkers are pressed forward by the spring *g* so that the sinkers press the weft thread between the latch needles where it remains in this position until all needles are simultaneously drawn back by the needle bar and consequently the weft threads pressed between the needles are brought from the sinkers under the hook.

Figure 3 illustrates the instant at which the spring *g* has moved the sinker *h* between the latch-needles *b* and placed the weft thread to the loop.

The warp thread guide has lapped the warp thread around the latch needle *b* according to Figure 4.

Figure 5 shows the meshes being cast off and the latch closed by the tension wire *p*.

Figure 6 shows the latch needles *b* in their lowest working position in their guiding bed *a*, which is provided at the upper end with a stripping comb.

The patterning of the fabric is effected by the jacquard cylinders *c*, provided with pattern plates, for the weft threads, in connection with the transposition of the warp thread guides *l* occasioned by the chain links running upon the drum *qu* positively connected with the main shaft by toothed-wheel and bevel-wheel transmission gearing.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A warp knitting machine comprising a plurality of latch needles, a guide frame for said needles, means for laying a weft thread on said needles, a sinker bar, a plurality of individually movable weft sinkers mounted on said bar, spring means for normally holding said sinkers in cooperative relation with said needles to hold the weft thread therebetween, a reciprocating cam member for successively withdrawing said sinkers, means for guiding warp threads around said needles, and means for simultaneously lowering all of said needles to form double loops.

2. A warp knitting frame having weft knitting facilities, comprising warp thread guides adapted to place warp threads around simultaneously raised latch needles, weft sinkers adapted to loop weft threads between said needles, a sinker bed, springs actuating the weft sinkers and guiding the same in the sinker bed, a wedge shaped member adapted to withdraw the weft-sinkers singly in advance of the passage of the weft thread guide and subsequently returning said sinkers after

the passage of the weft thread guide by the
spring into the position in which they loop
the thread between the needles, while hav-
ing two loops under the respective latch-
needles and means adapted to draw the loops
through a stripping comb to form double
meshes.

In testimony whereof I have signed my
name to this specification.

RUDOLF RUPF.