No. 749,672. PATENTED JAN. 12, 1904.

E. A. HIRNER.

STITCH CAM FOR KNITTING MACHINES.

APPLICATION FILED JAN. 12, 1903.

NO MODEL.

FIG. 1.

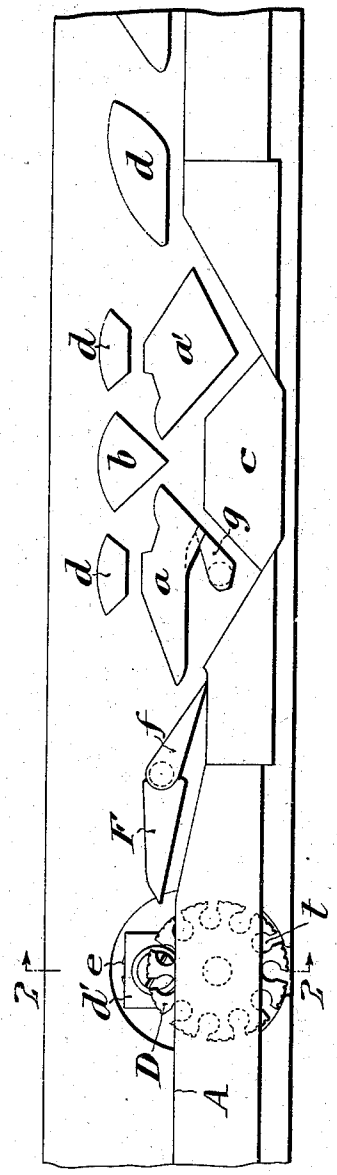


FIG. 4.

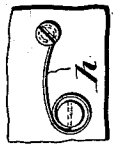
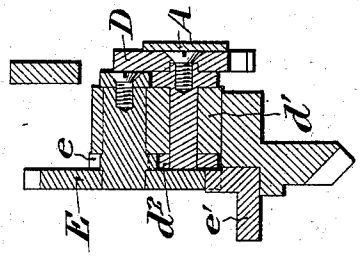


FIG. 3.



FIG. 2.



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UNITED STATES PATENT OFFICE.

EMIL A. HIRNER, OF ALLENTOWN, PENNSYLVANIA.

STITCH-CAM FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 749,672, dated January 12, 1904.

Application filed January 12, 1903. Serial No. 138,607. (No model.)

To all whom it may concern:

Be it known that I, EMIL A. HIRNER, a citizen of the United States, residing at Allentown, in the county of Lehigh and State of Pennsylvania, have invented certain new and useful Improvements in Stitch-Cams for Knitting-Machines, whereof the following is a specification, reference being had to the accompanying drawings.

In many varieties of knitting it is necessary to cause certain of the needles to operate differently from the others. For this purpose a temporary separation or sorting of the needles is effected, whereby they are caused to pursue different paths. This is particularly the case in the production of longitudinally-striped knitting, where certain of the needles situated at regular intervals from each other must perform, course after course, special functions in order to produce in the fabric at similar intervals tuck-stitches, draw-stitches, dropped stitches, or the like, dependent upon the variety of stripe to be produced. For this purpose switch-cams of various sorts have been devised by which the sorting of the needles is effected. In the case of the cam-cylinder of an ordinary stocking-knitter containing the usual set of reciprocatory knitting-cams the switch-cam may be located in proximity to the outer corner of that one of the stitch-cams which leads during continuous rotary knitting. In this way those needles which are to carry on the operation of plain knitting are deflected over the leading stitch-cam and pass beneath the following stitch-cam in the usual way, while the needles which are to perform special work—as, for example, tuck-stitches—are deflected into the groove which is beneath the leading stitch-cam. As a result these latter needles are not advanced sufficiently to throw the loops which they hold from the last course below the latch, so that they pass to the point where thread is again fed to them, still holding loops within their hooks. A difficulty, however, arises in the use of the groove below the leading stitch-cam as the path for these divergent needles by reason of the undue strain or tension which is put upon the thread when a needle is drawn down below the lower corner of the stitch-cam still carrying, as has been explained, a loop within its hook. This strain causes bad knitting and renders the fabric produced one which is easily ripped. To avoid passing the needles below the leading stitch-cam, as just described, I have invented a modified form for such stitch-cam, which I will now describe.

Figure 1 is an elevation of a portion of the interior of a cam-cylinder developed upon a plane. Fig. 2 is a vertical cross-section taken along the line 2 2 of Fig. 1, illustrating the switch mechanism in section. Fig. 3 is a detailed view of the latch-cam which in my improved construction forms a part of the stitch-cam. Fig. 4 is a detail view of the outside of the cam-cylinder at the point where this latch-cam is pivoted.

Referring to Fig. 1, it will be observed that the interior of the cam-cylinder contains the usual race or groove formed by the ledge A, upon which the hubs of the needles run. This needle-groove is interrupted by a set of reciprocatory knitting-cams, which, except for the change in the construction of the leading stitch-cam, embody the usual cams—that is to say, the paired stitch-cams *a a'*, the top center cam *b*, and the bottom center cam *c*. *d d d* are guard-cams, which need no further description.

I will first describe the switching device, which is illustratrated in the drawings, premising, however, that my invention is independent of the nature of the peculiar switching mechanism employed. The particular switching device which I have shown forms part of the subject-matter of an application heretofore filed by me, Serial No. 85,040, and consists of a rotating pattern-disk D, which is set in a plane tangential to the needle-groove in the relation thereto illustrated in the drawings, with its upper segment alone projecting above the groove. This disk D is fast to the end of a short shaft journaled in a block *d'*, which is set outside of the cam-cylinder in the region of which the wall of the cam-cylinder is cut away, so as to allow the projection through it of the disk D sufficiently to encounter the hubs of the needles as they pass along the needle-groove. On the other end of the shaft which carries the disk D is

a small pinion d^2, which meshes with a pinion e, which is journaled in the block d'. Alongside of pinion e is set a larger gear-wheel E. Outside of the base of the cam-cylinder is a toothed ring e', which is made fast to the bed-plate upon which the cam-cylinder rotates. By the train of gearing thus described the wheel D is caused to rotate as the cam-cylinder rotates and in the direction in which the hubs of the needles are traveling. A triangular cam F is set between the disk D and the stitch-cam a, with its apex toward the former. At one side of this cam F there is pivoted a one-way cam f, which allows needles traveling below it to pass freely out beneath it, while it prevents needles traveling in the opposite direction (during reciprocation of the machine) from coming into contact with the disk D. The periphery of the wheel D is furnished with transverse recesses t at intervals corresponding to the intervals between the needles which operate specially. As the cylinder revolves, these latter needles, running along the needle-groove, meet the recesses t and are consequently not lifted by the pattern-switch, but remain at the lower level and pass below the cam F, and therefore below the leading stitch-cam a. On the other hand, the other needles, which are not to operate specially, not meeting one of the recesses t, are raised by the periphery of the pattern-wheel D and in this way deflected above the cam F and passed into knitting operation above the leading stitch-cam in the usual way.

I will now describe the peculiar construction of the stitch-cam a, whereby I avoid employing the groove beneath this cam as the path for the specially-operating needles, and thus to avoid the difficulty in regard to the undue tension upon the loops held in the hooks of these needles, to which I have already referred.

The stitch-cam a has its lower half almost entirely cut away, leaving it of the outline shown in the drawings. Below it and about at the point where its lower point would normally be there is pivoted a latch-cam g, the cam-surface of which is opposite the adjacent edge of the bottom center cam c and the point of which reaches to beneath the lower edge of the cut-away stitch-cam a, normally resting in such position as to bring the cam edge of the latch-cam flush with the cam edge of the stitch-cam. The pivot of this latch-cam is encircled exterior to the cam-cylinder by a small spring h, under the torsional force of which the latch-cam g is maintained in the position of Fig. 1. By this construction it will be seen that the specially-operating needles, which, after passing the switch mechanism, remain at the lower level, pass across the field which is usually occupied by the stitch-cam without further depression, (except a very slight depression at the point where the stitch-cam is in contact with the latch-cam,) the latch-cam yielding to allow them to pass between it and the stitch-cam. The top of the bottom center cam being partially cut off, as shown in the drawings, these needles continue to pass along, carrying within their hooks the loops of the last course without any strain being put upon these loops. They therefore reach the point in the decline of the following stitch-cam a' where thread is fed to them without substantial change in vertical position. In this way they receive two successive threads within their hooks, producing what is usually known as a "tuck-stitch." When, however, in reciprocatory knitting the stitch-cam a, during the reverse motion, becomes the following stitch-cam, (in which case the switch mechanism is of course inoperative,) the cam a, supplemented by the latch-cam g, is able to perform its normal function of depressing the needles to the usual extent, for the latch-cam g is not capable of yielding to pressure coming from this direction.

In order that the joint between the stitch-cam a and the point of the latch-cam g may be as smooth as possible, I prefer to undercut that portion of the stitch-cam which is in contact with the point, giving to latter a corresponding bevel, as shown in Fig. 3. In this way the hubs of the needles as they pass down the cam-surface of the stitch-cam a do not meet a squarely transverse joint, in which case the wearing of the parts would gradually produce an objectionable roughness, but meet a diagonal joint, which by wear is made smoother, owing to the gradual transition of each needle-hub from the one part to the other.

Having thus described my invention, I claim—

1. In the cam-cylinder of a circular-knitting machine, a set of reciprocatory knitting-cams, one of the stitch-cams of which has its lower portion cut away, while its main cam edge is downwardly supplemented by a pivoted latch-cam, substantially as described.

2. In the cam-cylinder of a circular-knitting machine, the combination of a set of reciprocatory knitting-cams, one of the stitch-cams of which has its bottom portion removed, and a latch-cam pivoted below this stitch-cam with its point yieldingly pressed against its lower corner nearest the bottom center cam, substantially as described.

3. In the cam-cylinder of a circular-knitting machine, a set of reciprocatory knitting-cams, one of the stitch-cams of which has its lower portion cut away, while its main cam edge is downwardly supplemented by a pivoted latch-cam, the lower edge of the stitch-cam being undercut and the point of the latch-cam being correspondingly beveled where they are in contact, substantially as described.

4. In the cam-cylinder of a circular-knitting machine, a set of reciprocatory knitting-cams,

the lower edge of that cam which leads during full knitting being cut away; a switching mechanism whereby some of the needles may be deflected over this cam when it is the leading or idle stitch-cam; and a yielding latch-cam, occupying the cut-away portion of this stitch-cam, which yields to allow the balance of the needles to pass without material depression but which supplements the main cam edge of this stitch-cam during that portion of reciprocatory knitting when it is the following or active stitch-cam, to effect depression of the needles, substantially as described.

5. In the cam-cylinder of a knitting-machine a stitch-cam provided with an intermediate horizontal path for the needle-hubs; in combination with a pivoted cam guarding one end of this path as against needles approaching the stitch-cam at that end, but yieldingly movable, under the influence of the needle-hubs alone, to allow the passage of needles entering such intermediate path at the other end, substantially as described.

In witness whereof I have hereunto subscribed my name, in the presence of two witnesses, at Allentown, Pennsylvania, on this 8th day of January, 1903.

EMIL A. HIRNER.

Witnesses:
HARRY G. STILES,
O. R. B. LEIDY.