Sept. 8, 1936. H. DIEM 2,054,036

FLAT KNITTING MACHINE

Filed March 17, 1934 2 Sheets-Sheet 1

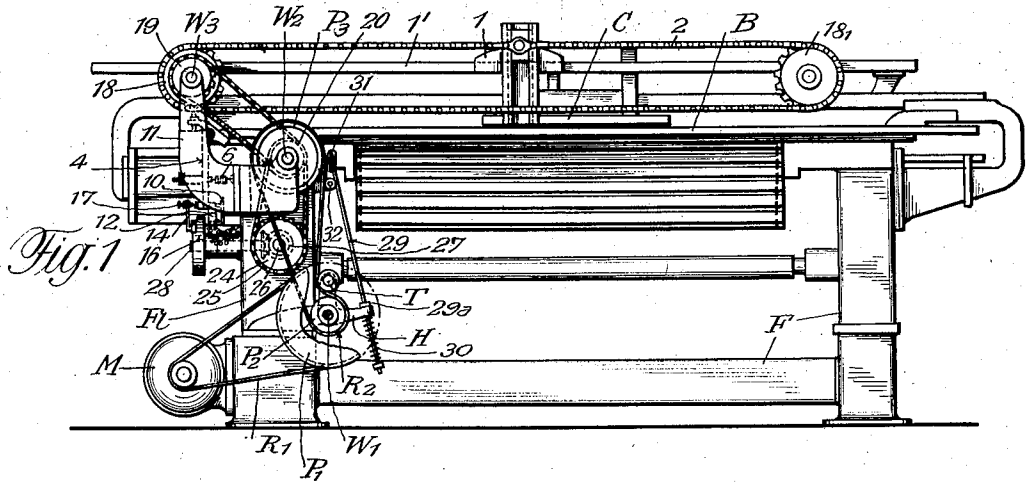


Fig. 1

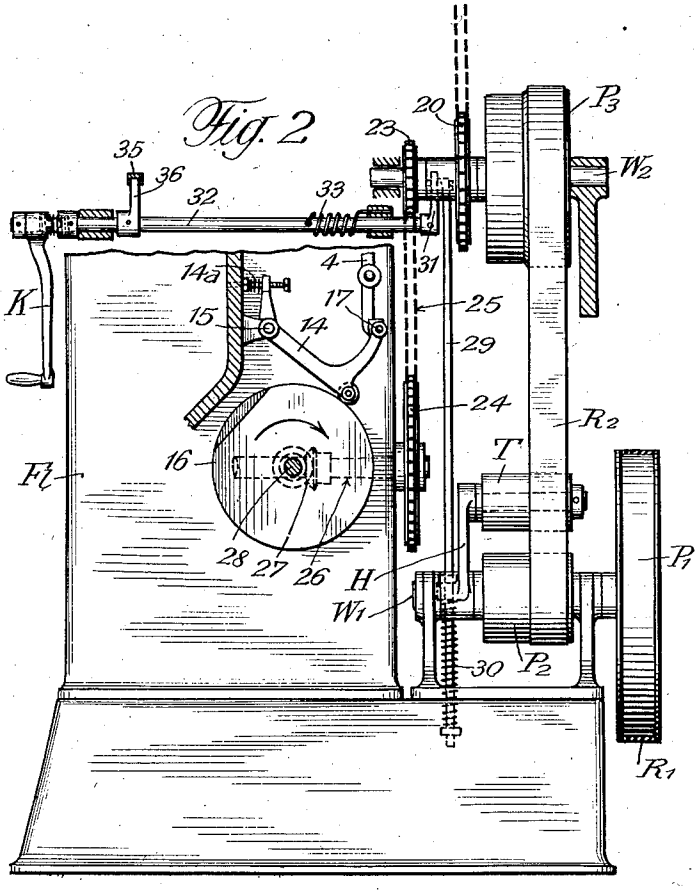


Fig. 2

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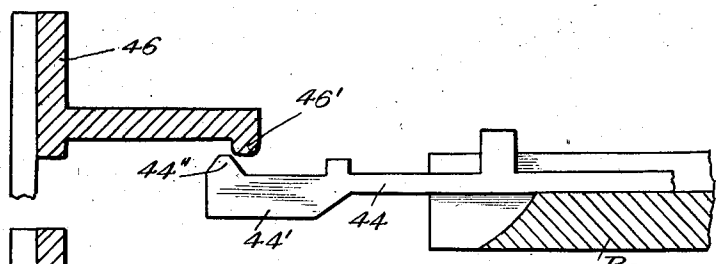


Fig. 3

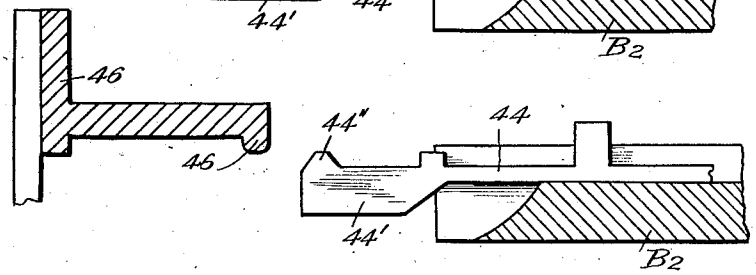


Fig. 4

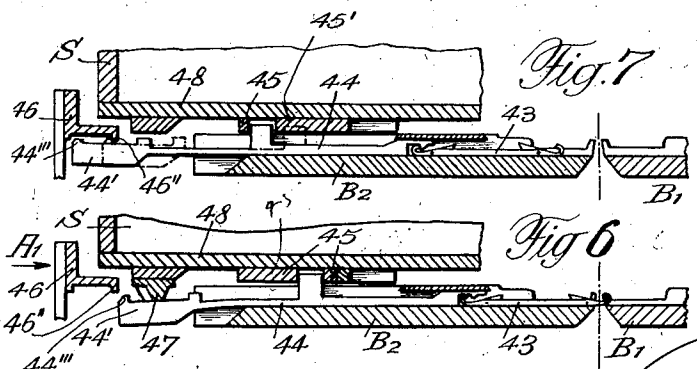


Fig. 7

Fig. 6

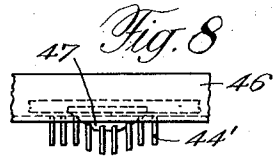


Fig. 8

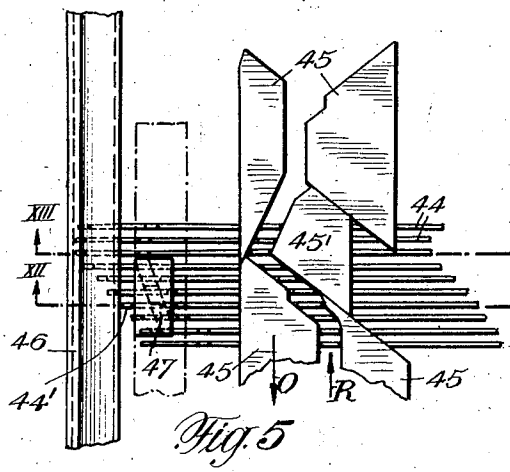


Fig. 5

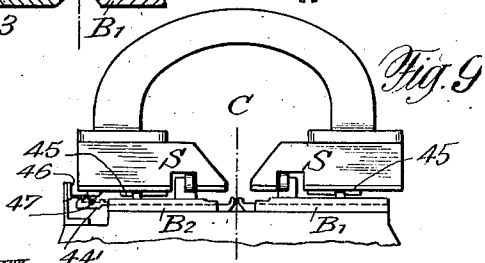


Fig. 9

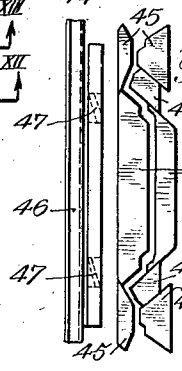


Fig. 10

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Patented Sept. 8, 1936

2,054,036

UNITED STATES PATENT OFFICE

2,054,036

FLAT KNITTING MACHINE

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Application March 17, 1934, Serial No. 716,021
In Germany March 25, 1933

9 Claims. (Cl. 66—63)

The present invention relates to flat knitting machines and has for its object to increase the safety of the movable parts of the machine against destructions that are apt to arise during the normal operation of the machine.

For machines of this kind and particularly flat pearl machines it is required that the knitting members such as the needles, the needle jacks and the like be locked in position against any unintentional displacements, in order to obviate destruction.

In the known devices used in flat pearl machines for locking the needles or needle jacks respectively in position with a view to avoiding any undesired advance movements of these knitting members, in general movable retaining means are applied which are either situated on the needle bed or spaced apart from the same by connecting means.

In order to lock in position the needle jacks in front and behind of the traversing needle lock, these retaining means are either actuated by separate rails, axles or the like or by control means provided in the cam slide. These arrangements are all complicated and either require special slide constructions or additional mechanisms which not only hamper the construction of the machine but also affect the efficiency of the latter.

According to the present invention these drawbacks are eliminated in the locking device for the knitting members by correlating to the springy needles or needle jacks respectively a stationary retailing rail to which the said knitting members are coupled in such manner during their return movements effected by the usual needle cam portions that disengagement and advancing of the needles or needle jacks respectively is possible only by influence of the needle cam portions cooperating with said knitting members in the working section of the effective needle bed area.

Advantageously, for this purpose suitable heels or snugs are provided on the shanks of the needle jacks which during the return movement of the jacks into inoperative position engage with mating heels or snugs on a ledge of the stationary retaining rail either by means of the shank of the jack being caused to resiliently slide across the stationary rail or being deviated in such manner that disengagement of the heels or snugs is only feasible by action of the needle lock.

In the accompanying drawings a constructional form of the invention is illustrated, in which

Fig. 1 shows a longitudinal elevation of the side of a flat knitting machine at which the drive is disposed,

Fig. 2 shows a sectional end view of the machine,

Figs. 3 and 4 each illustrate the arrangement of the needles and needle jacks in principle in two different positions of these knitting members respectively,

Fig. 5 shows a plan view of a modification of this arrangement on a smaller scale,

Fig. 6 shows a vertical section on the line XII—XII in Fig. 5,

Fig. 7 shows a similar section on the line XIII—XIII in Fig. 6,

Fig. 8 shows an elevation of Fig. 6 as seen in the direction of the arrow A',

Fig. 9 shows an end elevation of the needle cam slide,

Fig. 10 is a top plan view of the actuating cams of the needle lock.

The flat knitting machine as illustrated comprises a frame F on which the needle beds B_1 and B_2 are mounted. The needle cam slide C traverses these needle beds in the longitudinal direction of the machine and is operatively connected to a slide actuating member 1 which slides along a supporting rail 1' situated above the needle beds. At the left hand end of the machine frame the driving motor M is disposed which drives a pulley P_1 mounted on a shaft W_1 by means of a driving belt R_1. To the shaft W_1 a further pulley P_2 is fixed which transmits its movement to a pulley P_3 on a shaft W_2 by means of a driving belt R_2 influenced by a tensioning roller arrangement T.

On the shaft W_2 a chain wheel 20 is fixed which actuates a chain wheel 19 on a stub shaft W_3 through the intermediary of a link chain 3. The stub shaft W_3 is mounted in the upper end of a mounting arm 11 secured laterally of the machine frame and carries at the side of the chain wheel 19, a further chain wheel 18. A wheel 18' coordinated with the wheel 18 is mounted at the other end of the machine frame and a link chain 2 is passed about both these wheels, this chain being connected to the slide actuating member 1 and thus imparts its movement to the cam slide C.

From a chain wheel 23 carried by the shaft W_2 a corresponding chain wheel 24 positioned underneath the wheel 23 is actuated by means of a link chain 25, the wheel 24 being secured to a shaft 26 which is transversely mounted in the left hand standard F1 of the machine. The latter shaft drives by means of a pair of cooperating bevel gear wheels 27 a shaft 28 extending at right angles to the shaft 26 in the longitudinal direction of the machine and projecting beyond the front end

of the left hand standard Fl to carry thereat a cam disc 16. The tensioning roller T is disposed in usual manner on the free end of one of the arms of a swingable bell crank lever H the other arm of which is engaged by a rod 29 having a collar 29a which is urged on a bearing face by a compression spring 30 encompassing the adjacent end portion of this rod.

The upper end of the rod 29 is engaged by a crank arm 31 which is secured to the adjacent end of a tripping shaft 32 mounted in the standard Fl to extend in the transverse direction of the machine. A torsion spring 33 anchored to the standard Fl tends to turn the tripping shaft 32 in the clockwise direction (Fig. 2), the rod 29 thus being caused to rock the tensioning roller control lever H in the sense of retracting the tensioning roller T from the belt R_2 and consequently the machine is stopped.

In the Figs. 3 and 4 a portion of the rear needle bed B_2 of the flat knitting machine is shown inclusive of a needle jack 44 comprising a shank 44'. The two needle beds are traversed by the cam slide C which carries the two needle locks S (Figs. 9 and 10) including the cam portions 45 for actuating the needle jacks 44 which operate to shift the needles 43 in and out of operative position. Fig. 10 is a top plan view of a complete needle lock and the disposition of the same relatively to the retaining rail 46. To this rail the needle jack 44 is coupled on its resetting movement into inoperative position. The coupling engagement is effected in such manner that during the resetting movement of the jack by action of the cam portions of the needle lock the snug 44'' of the jack and the snugs 46' on the check rail interengage after resiliently slidingly passing by each other, whereby the thin shank of the jack deflects downwardly. In a similar manner the disengagement of the jack from the retaining rail is effected during the advance movement of the jacks by action of cam portions of the needle lock within the range of sinking the loops.

When it is required to improve the coupling engagement of the needles or needle jacks respectively that occupy their inoperative positions with a view to avoiding an undesired abrupt advance movement of these knitting members, the interlocking snugs on the shanks of the jacks and on the retaining rail 46 can be provided with straight engagement faces extending perpendicularly to the direction of movement, as shown in the Figs. 5 to 8. With this construction the mating snugs are prevented from merely slidingly disengaging by longitudinal tension action.

In order to render possible a relative longitudinal sliding movement in superposed position of the snugs 44''' and 46'', on the face plate 48 a guide member 47 is arranged which operates to deviate those needle jacks out of the plane of the needle bed which are required to be advanced by the cam portions of the needle lock within the operative range of the needle bed.

The operation of the locking device shown in the Figs. 5 to 8 is as follows:

Prior to the needle cam slide starting to traverse the needle bed B_2 either from right to left in the direction of the arrow O, Fig. 5, or from left to right in the direction of the arrow R, all the needle jacks 44 or needles 43 respectively are locked to the retaining rail 46 by means of the needle shanks 44' in such manner that the needle hooks the corresponding needles of which occupy the foremost position in the respective guideways of the needle bed are retained behind the contour of the knock over cam (Fig. 5). Thus, when the needle cam slide is moved across the needle bed, the thin extremely springy shanks of the needle jacks 44 or needles 43 respectively that occupy their working positions in the respective guideways of the needle bed are deflected downwardly by the guide member 47 (Fig. 6) during the advancing movement of these knitting members to such an extent that the snugs 44''' and 46'' are adapted to pass by one another in superposed position, whereby the knitting members are disengaged from the retaining bar 46. The disengaging operation endures, however, only for the time required for the knitting operation. During the return movement the snugs 44''' on the needle jacks 44 enter behind the snugs 46'' on the retaining rail 46 again by resiliently sliding past one another in superposed position or by being deflected by a separate guide member respectively whereafter the deflected shanks of the jacks reassume their normal shape, so that on the termination of the knitting operation the mating snugs or heels are coupled again.

I do not limit myself to the particular size, shape, number or arrangement of parts as shown and described, all of which may be varied without going beyond the scope of my invention as shown, described and claimed.

What I claim is:

1. In a flat knitting machine, knitting members having yielding shank portions, a stationary retaining member therefor, positive coupling means between said yielding shank portions and retaining means adapted to automatically lock said knitting members during their return movement into inoperative position, and means in the path of said yielding shanks to unlock said knitting members from said retaining means for movement into operative position.

2. In a flat knitting machine as per claim 1, in which the shanks of said knitting members are made extremely springy, so as to yield vertically under pressure.

3. In a flat knitting machine needle bed, knitting members slidably arranged thereon whose free ends are resilient, cam slides bearing the needle locks, a stationary retaining rail correlated to said knitting members collaterally of said needle bed for retaining said knitting members together with the knit, said resilient ends and said retaining rail having snugs so shaped that the snugs of said resilient ends will yieldingly slide over said snugs of the retaining rail to become interlocked with one another.

4. In a flat knitting machine as per claim 3 in which the engaging faces of said interlocking snugs are straight extending perpendicularly to the direction of movement, and that each cam slide is provided with a guide piece adapted to deflect said resilient ends in order to uncouple their snugs from those of said retaining rail.

5. In a flat knitting machine, a needle bed, springy knitting members slidably arranged in said needle bed, a needle lock slide traversing said needle bed, a stationary retaining rail correlated to said springy knitting members, and mating coupling means provided on said retaining rail and said knitting members respectively for positively locking said members to said rail in the inoperative positions of said members, and means in the path of said springy knitting members to unlock said mating coupling means by action of the respective advancing cams of said slide in temporary cooperation with said unlocking means within the knitting wave.

6. In a flat knitting machine, a needle bed, springy knitting members slidably arranged in said needle bed, a needle lock slide traversing said needle bed, a guide member provided in said slide to project into the path of said knitting members, a stationary retaining rail correlated to said springy knitting members, and interlocking cam faces provided on said retaining rail and said knitting members for positively locking said members to said rail in the inoperative positions of said members and adapted to engage with one another due to said springy knitting members deflecting by cooperation of said guide member and the respective retracting cams of said slide with said member within the knitting wave.

7. In a flat knitting machine, a needle bed, springy knitting members slidably arranged in said needle bed, a needle lock slide traversing said needle bed, a guide member provided in said slide to project into the path of said knitting members, a stationary retaining rail correlated to said springy knitting members, and interlocking engagement faces provided on said retaining rail and said knitting members to extend perpendicularly to the direction of movement of said members, for locking said members to said rail, in the inoperative positions of said members and adapted to engage with and disengage from one another respectively, due to said members deflecting perpendicularly, by passing, during the resetting and advance movement respectively, by said guide member by cooperation of the respective cams of said slide with said members within the knitting wave.

8. In a flat knitting machine, knitting members whose free ends are resilient, needle locks, means in the path of said resilient ends for deflecting the same away from said needle locks, a stationary retaining rail, positive coupling means between said resilient ends and retaining means adapted to automatically lock said knitting members during their return movement into inoperative position by cooperation of the respective retracting cams of said locks and to be uncoupled by action of the respective advancing cams of said lock in temporary cooperation with said deflecting means.

9. In a flat knitting machine, a needle bed, knitting members whose free ends are resilient and which are arranged in guideways of said needle bed, cam slides bearing the needle locks, a stationary retaining rail correlated to said knitting members collaterally of said needle bed above the bottoms of said guideways, said resilient ends and said retaining rail having snugs with correspondingly eased-off terminal ends adapting the snugs of said resilient ends to yieldingly slide over said snugs of said retaining rail by flexion of said resilient ends incidental to interlocking with one another.

HANS DIEM.