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DRIVE FOR THE KNITTING TOOLS OF WARP KNITTING MACHINES

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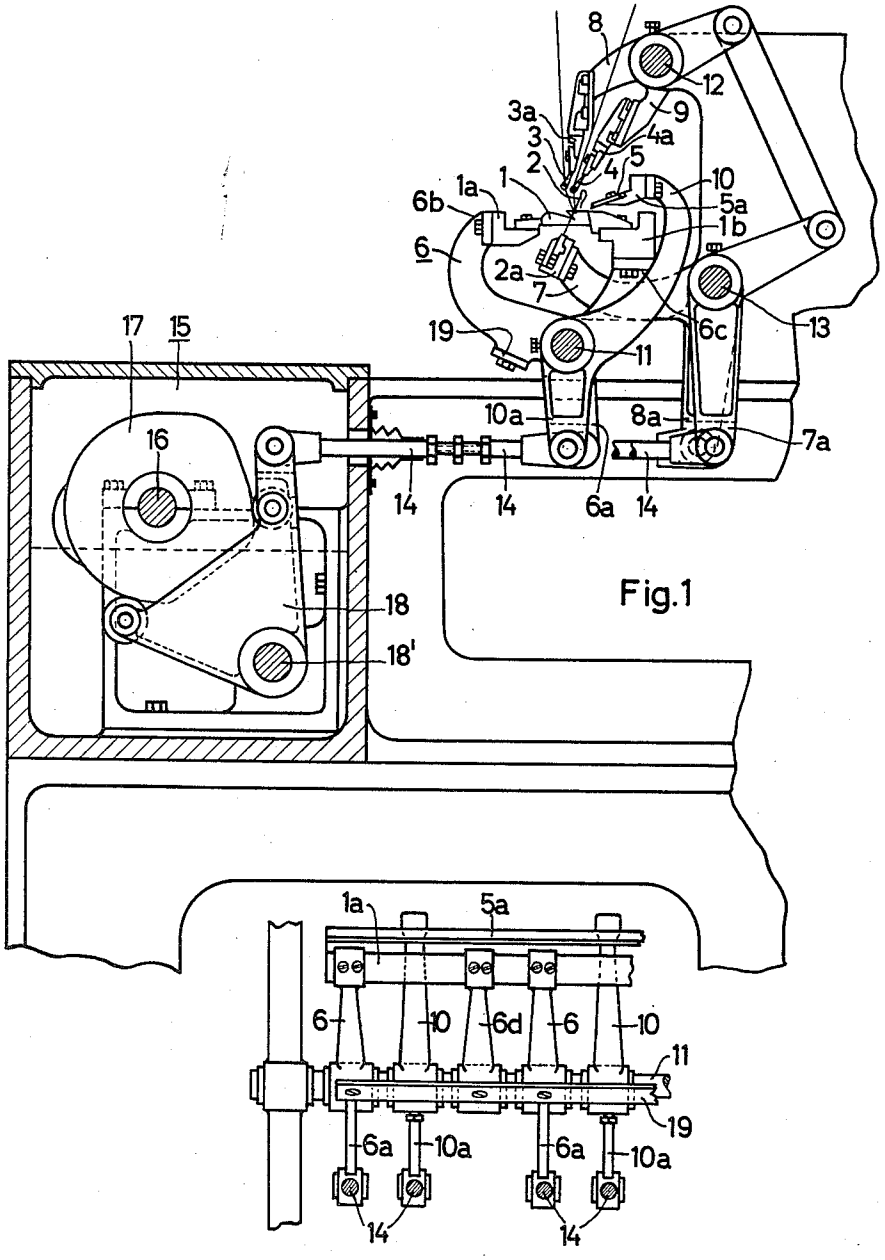


Fig.1

Fig.2

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DRIVE FOR THE KNITTING TOOLS OF WARP KNITTING MACHINES

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6 Claims. (Cl. 66—86)

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My invention relates to high-speed warp knitting machines of the flat-frame type, particularly to the drive and control means for the knitting tools of such machines, and is related to the invention of my copending application Serial No. 332,356, filed January 21, 1953.

In such warp knitting machines, the sinker plates (also known as knock-over bits) that form the knocking-over surface for the loops of yarn and also serve to cast the fabric off the hooks of the knitting needles, must be driven to reciprocate at an extremely high speed; and when the loops are being cast off, the needles are moved toward the sinker plates also at a great speed. To cope with the rapid oscillatory stresses thus imposed upon the sinker plate structures, it has been proposed to join the sinker plates at both ends with holders of a different material and to mount the holders on respective sinker bars. In a known machine of this kind, the sinker bars are formed as bridge pieces of a horizontally mounted frame which is placed in reciprocating motion not only in the horizontal but also in the vertical direction. The horizontal driving motion of the sinker plates is applied to only one side of the carrier frame, while the vertical motion is applied to the opposite frame side. This requires a very heavy frame structure if the sinker plates are to be uniformly driven at both ends without occurrence of vibration trouble. The heavy design involves correspondingly large space requirements and also requires coping with increased acceleration forces and a resulting increase in wear.

It is an object of my invention to minimize these deficiencies and to provide a drive for the sinker plates in flat warp knitting machines that satisfies all requirements with the aid of a machine structure of utmost simplicity.

Another object of my invention is to eliminate in the sinker plate mechanisms of such machine the occurrence of stresses and inaccuracies due to heat-responsive deformation of material that may be caused by differences in temperature.

According to one of the features of my invention, I mount the two ends of each sinker plate on two respective sinker bars common to all plates, and I firmly seat the two bars on a plurality of U-shaped carrier levers which are mounted on a common shaft in straddling relation to the needle bars of the machine. According to another feature of the invention, the carrier levers are loosely seated on the common shaft and have arms that extend downwardly from the common shaft and transmit the driving motion to the sinker bars. The carrier levers for the sinker plates are interconnected by a rigid rail, and this rail consists preferably of the same material as the sinker plates. The pressers for periodically closing the spring beards of the knitting needles are mounted on levers which, according to another feature of the invention, may also

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be mounted on the common shaft of the sinker-bar levers and may also be equipped with downwardly directed arms to be actuated through these arms.

The foregoing and more specific features of the invention will be apparent from the embodiments exemplified by the drawings, in which Fig. 1 shows a partial and part-sectional side view of a flat-frame warp knitting machine according to the invention; and Fig. 2 shows a sectional front view of part of the same machine showing especially the carrier levers for the sinker bars and needle bars.

The knitting tools of the illustrated machine consist essentially of knock-over bits or sinker plates such as the one shown at 1, a set of spring-beard needles of which one is shown at 2, a pair of eye needles 3 and 4 for each beard needle, and a presser 5 for periodically closing the spring beards during the loop-forming operation. It will be understood that, as conventional in such machines, a large number of spring-beard needles 2, sinker plates 1 and eye needles 3, 4 are arranged in respective rows that extend longitudinally of the machine, that is, perpendicularly to the plane of illustration in Fig. 1 and horizontally within the plane of illustration of Fig. 2. All sinker plates 1 of the row are mounted on two longitudinal bars 1*a* and 1*b*. The beard needles 2 are all mounted on a longitudinal needle bar 2*a*. The eye needles 3 and 4 are all mounted on respective longitudinal bars 3*a* and 4*a*. Similarly, the pressers are mounted on a common longitudinal bar 5*a*. These different bars are secured to respective carrier levers 6, 7, 8, 9 and 10. The carrier levers are rotatably disposed on shafts 11, 12, 13 and are equipped with extensions 6*a*, 7*a*, 8*a*, 10*a*. Linked to these extensions are connecting rods 14 that extend into a gear housing 15. A drive shaft 16 extending through the gear housing 15 carries a number of control cams 17 which cooperate with cam follower members 18 pivotally mounted on a shaft 18′ parallel and eccentric to the cam shaft 16. The cam follower members 18 are linked to the respective connecting rods 14 to impart reciprocating motion to the respective carrier levers and the knitting tools mounted thereon.

Each sinker plate 1 has its two ends firmly secured to the respective sinker bars 1*a* and 1*b*. The two sinker bars are mounted on a plurality of U-shaped carrier levers 6 and are secured to the respective legs 6*b* and 6*c* of the levers. A total of seven levers 6 may be provided, for instance. All U-shaped carrier levers 6 are pivotally seated on the shaft 11 and their respective extensions 6*a* point downwardly from the shaft. The connecting rods 14 actuated from the members 18 of the control gearing are linked to the ends of these extensions. The carrier levers 10 for the presser bar 5*a* are also pivoted on shaft 11. The extensions 10*a* of the carrier levers 10

are actuated by connecting rods from the follower members of a correspondng set of cams so that the pressers operate in the proper phase relation to the movements imparted to the sinker plates.

The two legs 6*b* and 6*c* of each U-shaped carrier lever 6 extend around the needle bar 2*a* mounted on the carrier lever 7. All U-shaped carrier levers 6 are firmly interconnected by a rail 19 that extends longitudinally of the machine. Rail 19 and carrier levers 6 consist preferably of the same material as the sinker bars 1*a* and 1*b*. This has the advantage of avoiding internal stresses within the sinker assembly that may otherwise be due to non-uniform thermal expansion. Since the carrier levers 6 are loosely rotatable on shaft 11, they can freely expand or contract relative to each other also without imposing stresses upon the structure. Besides, the connecting rail 19 provides for a completely uniform driving motion and mass compensation of the carrier levers 6 and hence of the sinker bars 1*a*, 1*b*.

As apparent from the front view shown in Fig. 2, the shaft 11 is mounted on the frame structure 20 of the machine. Aside from the loosely rotatable carrier levers 6 that are equipped with driving extensions 6*a*, there are other carrier levers 6*d* which, while otherwise identical with the levers 6, do not have an extension 6*a* and hence are not linked to a connecting rod 14. All carrier levers 6 and 6*a*, however, are interconnected by the rail 19. The machine may, for instance, be equipped with three levers 6 each having a driven extension 6*a* and four levers 6*d* without a driving extension. Due to the connection of all these levers by the rail 19, an always reliable and quiet actuation of the sinker bars is secured. The carrier levers 10 for the presser bar 8*a* may be rigidly joined with the shaft 11. These levers are driven by corresponding connecting rods 14 from a pertaining set of cams.

It will be understood that the carrier levers 7 for the beard needle 2 and the carrier levers 8, 9 for the eye needles are driven to reciprocate about the pertaining pivot shafts in the proper cyclical relation to the operation of the beard needles, sinker bars and pressers. The driving movement for the needle-carrying arms is also supplied from cams of the above-described control gear.

It will be apparent to those skilled in the art that my invention permits of various modifications in design and arrangement without departing from the essential features of the invention and within the scope of the claims annexed hereto.

I claim:

1. In a flat warp-knitting machine having knitting-needle bars and sinker plates, a driving device for the sinker plates comprising two parallel sinker bars extending transverse to the sinker plates, each sinker plate having its two ends mounted on said respective sinker bars, a plurality of substantially U-shaped carrier levers pivotally mounted on a common shaft in straddling relation to the needle bars, said sinker bars being mounted on the respective legs of said carrier levers, each of said U-shaped carrier levers having an extension directed downwardly from said shaft, and drive means linked to said extensions for imparting reciprocating motion to said sinker plates.

2. In a flat warp-wrapping machine having knitting- needle bars and sinker plates, a driving device for the sinker plates comprising two parallel sinker bars extending transverse to the sinker plates, each sinker plate having its two ends mounted on said respective sinker bars, a plurality of substantially U-shaped carrier levers pivotally mounted on a common shaft in straddling relation to the needle bars, said sinker bars being mounted on the respective legs of said carrier levers, each of said U-shaped carrier levers having an extension directed downwardly from said shaft, drive means linked to said extensions for imparting reciprocating motion to said sinker plates, said needle bars having respective carrier levers also pivoted on said shaft and equipped with downwardly directed extensions, and further drive means linked to said latter extensions for imparting reciprocating motion to said needle bars.

3. In a flat warp-knitting machine having knitting-needle bars and sinker plates, a driving device for the sinker plates comprising two parallel sinker bars extending transverse to the sinker plates, each sinker plate having its two ends mounted on said respective sinker bars, a plurality of substantially U-shaped carrier levers pivotally mounted on a common shaft in straddling relation to the needle bars, said sinker bars being mounted on the respective legs of said carrier levers, a rigid rail firmly joined with all of said carrier levers, at least one of said carrier levers having an extension directed downwardly from said shaft, and reciprocatory drive means linked to said extension for imparting motion to said sinker plates.

4. In a warp-knitting machine according to claim 2, a rigid rail firmly joined with all of said carrier levers of said sinker plates, and another rigid rail firmly connected with all of said carrier levers of said needle bars.

5. In a warp-knitting machine according to claim 2, a rigid rail consisting of the same material as said sinker plates and being firmly joined with all of said carrier levers of said sinker plates, and another rigid rail consisting of the same material as said needle bar and being firmly connected with all of said carrier levers of said needle bars.

6. In a flat warp-knitting machine having knitting-needle bars and sinker plates, a driving device for the sinker plates comprising two parallel sinker bars extending transverse to the sinker plates, each sinker plate having its two ends mounted on said respective sinker bars, a plurality of substantially U-shaped carrier levers pivotally mounted on a common shaft in straddling relation to the needle bars, said sinker bars being mounted on the respective legs of said carrier levers, said carrier levers having extensions directed downwardly from said shaft, said needle bars having respective carrier levers also pivoted on said shaft and equipped with downwardly directed extensions, a cam shaft with control cams and cam followers coacting with said cams, and respective connecting rods linking said cam followers with said extensions of said carrier levers of said sinker bars and of said carrier levers of said needle bars respectively.

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