Oct. 19, 1971 MILAN HAVRANEK ET AL 3,613,400

KNITTING MACHINES

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Fig. 1

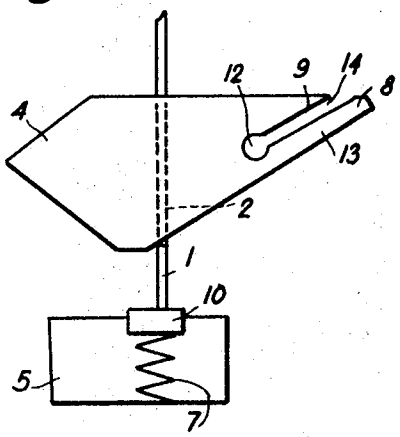


Fig. 2

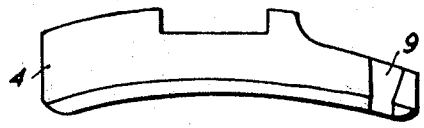


Fig. 3

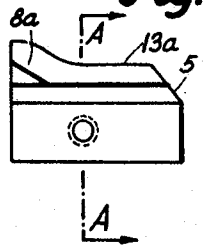


Fig. 4

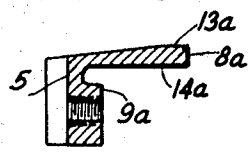


Fig. 5

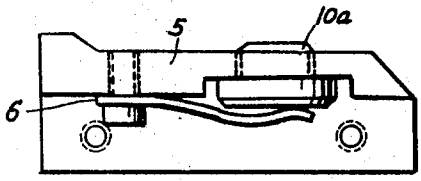


Fig. 6

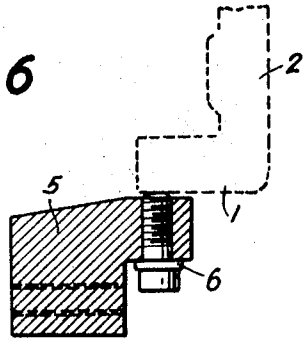


Fig. 7

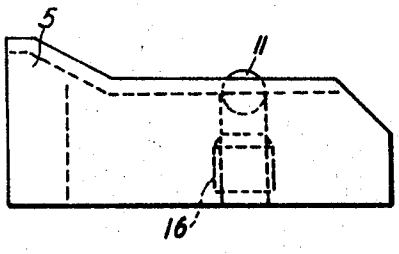
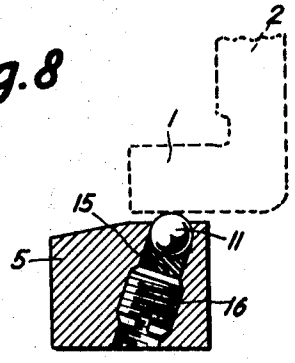


Fig. 8



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KNITTING MACHINES

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Fig. 9

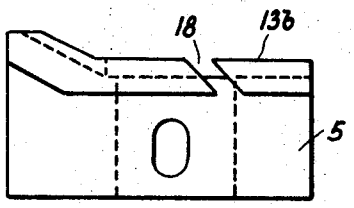


Fig. 10

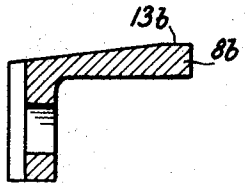


Fig. 11

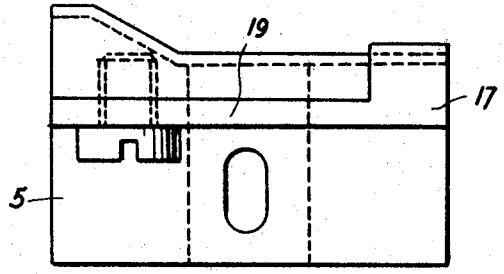
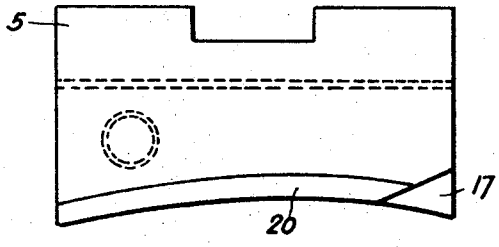


Fig. 12



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KNITTING MACHINES

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Int. Cl. D04b 15/32
U.S. Cl. 66—57 7 Claims

ABSTRACT OF THE DISCLOSURE

Knitting machine cams provided with operatively resilient members to absorb the impact between it and the associated needle/sinker butt.

The present invention relates to knitting machines and in particular to a novel cam therefore by which the force of impact of the needle or sinker butts is reduced.

In conventional knitting machines the cam as well as the needle or sinker butt are generally stressed at the point of impact against the cam. The impact creates a sudden acceleration of the needle or sinker, and unnecessarily vibrates the latches or hooks, causing more frequent failure, reduced reliability and shorter lifetime of the knitting machines in general. Products of lower quality are also obtained.

An attempt has been made to overcome this problem by reducing the angle of the cam at the point of impact. While the impact Pof the butt against the cam is thus reduced, it is necessary to increase the length of said cam in the horizontal direction, or the direction of movement of the needles or sinkers. This fact is particularly disadvantageous in multi system circular knitting machines, where the circumference is initially rather short. It is also disadvantageous in that increased yarn tension results.

It is an object of the present invention to provide means for ridding knitting machines with the aforementioned disadvantages.

It is another object of this invention to provide an improved and novel cam for knitting machines in which the force of impact of the butts, of needles, sinkers, etc. is significantly reduced.

According to the present invention knitting machine cams are constructed so that at their point of contact with the butt of the needles or sinkers etc., they are provided with an operatively resilient member which, may if desired be provided with a fixed buffer whereby the force of the resultant impact is completely absorbed.

By providing the resilient operative member the present invention results in the virtual elimination of unwanted impact, vibration and reverse acceleration of the needles etc.

The aforementioned advantages and objects as well as other will be seen from the foregoing description wherein reference is made to the appended drawings in which:

FIG. 1 is a diagrammatic view of a needle sinker and countercam in front elevation;

FIG. 2 is a plan view of the needle sinker of FIG. 1;

FIG. 3 is a front elevation of a modified form of countercam;

FIG. 4 is a section of the countercam taken along line A—A of FIG. 3;

FIG. 5 is a view of a modified cam with a resilient mounting of the buffer element in front elevation;

FIG. 6 is a side elevation section of the cam of FIG. 5;

FIG. 7 is another modification of the cam;

FIG. 8 is a side elevation section of the cam of FIG. 7;

FIG. 9 is a front elevation of still another modification in the countercam;

FIG. 10 is a side elevation of the countercam of FIG. 9;

FIG. 11 is a front elevation of yet another countercam; and

FIG. 12 is a plan view of the countercam of FIG. 11.

Turning to FIG. 1 there will be seen a needle/sinker cam arrangement comprising a butt **1** or needle **2** which is both operated by and impacts against a cam system comprising a stitch cam **4** and countercam **5** which are adapted to oscillate in a known manner. Mounted within the countercam **5** is a coil spring **7**, which abuts against a fixed buffer member **10** of lightweight material, formed at the end of the butt **1**. The stitch cam **4** is provided with a resilient finger **8** formed by cutting the body of the stich cam **4** with an angularly directed slot **9** which has a circularly cut bottom **12**. The outer surface of the finger **8** comprises the operative cam surface of the stitch cam **4** and rides upon the shoulder of the butt **1** to move the needle/sinker. The inner surface **14** of the slot **9** forms the inner surface thereof.

It will thus be seen that the cam arrangement shown in FIGS. 1 and 2 provide two resilient points at each of the two points of contact between needle/sinker and cam. The first resilient member comprises finger **8** formed on the stitch cam **4** and overcomes any impact force or concussion between the cam **4** and the butt **1** as the two move relative to each other. The second resilient point is at the countercam **5** itself and comprises the combination of coil spring **7** and the fixed buffer member **10**. Thus the concussive force exerted at the end of the butt **1**, transmitted through the member **10**, is reduced or completely overcome as the needle sinker moves downwardly.

In FIGS. 3 and 4 there is shown a countercam **5** one portion of which forms, by means of a recess **9***a*, a finger **8***a* which extends substantially perpendicularly to the direction of movement of needles **2** or jacks **3**. The recess **9***a* is shallow and is provided with only one wall **14***a* of any length, its opposite well being of minor extent relative thereto. The exterior wall **13***a* of the finger **8***a*, of course, provides the operative cam surface of the arrangement. The type of countercam structure shown in FIGS. 3 and 4 may be preferably used with a stitch cam **4** which does not have the resilient finger **8** since the finger **8***a* serves the purpose of resiliently absorbing energy as the finger **8**.

In FIGS. 5 and 6 still another modification is shown in which the countercam **5**, which is otherwise similar to that shown in FIGS. 1 and 2, is provided with a flat spring member **6** fixed at one end to the under surface of countercam **5** by a suitable rivet or other fastener. The spring **6** extends crosswise of the cam **5** to a point wherein its free end is located below a vertical bore in which a buffer member **10***a* is secured. The buffer member **10***a* preferably is in the form of a headed pin and is located in the bore with its head in contact with the spring member **6** whereby it may be forced downward against the spring by the needle **2** while maintaining contact with the butt **1**. During such movement the buffer member **10***a* is prevented from falling by its contact with the spring. The buffer member **10***a* may on the other hand comprise a ball member or any other suitable form desired. The embodiment shown in FIGS. 5 and 6 is of course similar in operation to that shown in FIGS. 1 and 2 and preferably is used together with the stripper **4** shown therein.

Still another embodiment is shown in FIGS. 7 and 8 wherein the countercam **5** is provided with a bore having a narrow circular opening situated beneath the butt **1**. Within the bore there is located a special shaped metallic buffer member **11** such as a ball bearing beneath which is

provided a resilient plug **15** made of solid rubber or other plastic resilient material. The plug **15** is held within the bore against the spherical buffer **11** by an adjustable screw **16** threaded into the bore. By adjusting the screw **16** the spring characteristic of the plug **15** may be changed as desired, forcing the ball **11** against the narrow bore opening.

In FIGS. 9 and 10 there is shown a modified countercam **5** similar to that shown in FIGS. 3 and 4 except that there is provided a pair of parallel extending fingers **8***b* separated in fork-like fashion by an angular slot **18**. The exterior surfaces **13***b* of course are again the operative cam surfaces.

Finally in FIGS. 11 and 12 there is shown another embodiment in which a buffer **17** forms an integral part of the resilient spring like member **19** similarly secured to the under surface of the countercam **5** by suitable rivets in the manner shown, for example in FIGS. 5 and 6. As seen in FIG. 12 it is preferred that the buffer **17** angularly overlap the fixed cam surface portion **20** of the countercam (or of the stitch cam **4** if used in connection therewith) so that the stroke of the buffer **17** and spring **19** is limited, thus preventing these elements from overriding the operative surfaces.

It will of course be obvious that the spring ratio or rate of the various resilient elements must be chosen to overcome the force of the impact of needle/sinker against the cam but not to interfere with the operation of the knitting machine as a whole. It is however, preferable and it has been found highly advantageous in eliminating the maximum impact and resultant vibration that the various spring elements and fixed buffers be formed and calibrated to obtain a frequency between 1 and 5 times greater than the frequency of the first harmonic which would occur on the impact of the butt against the cam arrangement.

In operation the present cam device may be employed on either flat or circular knitting machines in place of the present cam arrangements. No special tools or installation is required and its installation will be obvious to those skilled in the art. Operatively upon impact of the butt **1** of the needle **2** against any one of the buffers **10** or **11**, the spring **6** or **7**, or the rubber plug **15** is pressed downwardly, whereby kinetic energy is accumulated in the resilient elements **6**, **7** or **15** resulting in substantially dampening the impact of the knitting element **2**. This damping takes place along a path substantially longer then in the cams known hitherto since such cams were not resilient and did not act in a substantial linear direction to the impact force. The energy is again released after the butt **1** has been advanced to a further part of the cam **4** or **5** by normal operation of knitting machine thus having no kickback effect. In the embodiment with the recess **9** or **9***a* in the cam **4** or **5** as well as in the embodiment as shown in FIGS. 9 and 10, the energy is accumulated by the resilient bending of finger **8** or **8***a*. In the cam as shown in FIGS. 11 and 12 the energy is accumulated in the resilient spring **19**.

It will thus be seen that a novel cam arrangement is provided which successfully eliminates the disadvantages and hazards of impacting needles or sinkers on knitting machine cams. Since numerous modifications have been shown and various others will be obvious it is intended that this disclosure is for illustrative purposes only.

What we claim is:

1. A knitting machine cam arrangement for operating slidable knitting elements comprising a countercam body, having a surface adapted to engage with a butt of each knitting element to provide movement thereto, said surface being provided with a resilient element at the point of contact with each said butt and movable axially with respect to said countercam for a fixed distance to absorb the impact of said knitting element and define the extent of its movement, a stitch cam body adapted to move relative to the butt in a substantially transversely directed movement, said stitch cam body having an integrally extending resilient finger, said finger being integral at one end with said stitch cam body and adapted to provide a second impact absorbing cam surface for said butt.

2. A knitting machine cam arrangement for operating slidable knitting elements, comprising, in combination a stitch cam and a counter cam, each having a surface adapted to engage a butt of each said knitting element, said cams being respectively provided with first resilient means and second resilient means acting on each said butt whereby the impact of the movement of each said knitting element during operation is successively absorbed by said resilient means.

3. The arrangement according to claim **2** wherein said first resilient means comprises a finger integrally extending from said stitch cam and having a cam surface engaging with each said butt, and said second resilient means comprises a resilient element mounted on said counter cam at the point of contact with each said butt.

4. The arrangement according to claim **3** wherein said second resilient means comprises a buffer and a spring element mounted on said counter cam in axial alignment with said butt.

5. The arrangement according to claim **4** including means for adjusting the spring rate of said spring element.

6. The arrangement according to claim **4** wherein said buffer is a ball bearing and said spring is a rubber pad and screw means are provided to locate said ball and pad in adjustable axial alignment with said butt.

7. A knitting machine cam arrangement for operating slidable knitting elements, comprising, in combination a stitch cam and a counter cam, each having a surface adapted to engage a butt of each said knitting element, said cams being provided with first resilient means and second resilient means acting on each said butt whereby the impact of the movement of each said knitting element during operation is successively absorbed by said resilient means, wherein said first resilient means comprises a finger integrally extending from said counter cam and cantilevered below said knitting elements, and said second resilient means comprises a resilient element mounted on said counter cam at the point of contact with each said butt.

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WILLIAM C. REYNOLDS, Primary Examiner

U.S. Cl. X.R.

66—107, 110