Feb. 17, 1970 W. C. ARNOLD 3,495,632

NEEDLE LOOMS

Filed Nov. 15, 1967 3 Sheets-Sheet 1

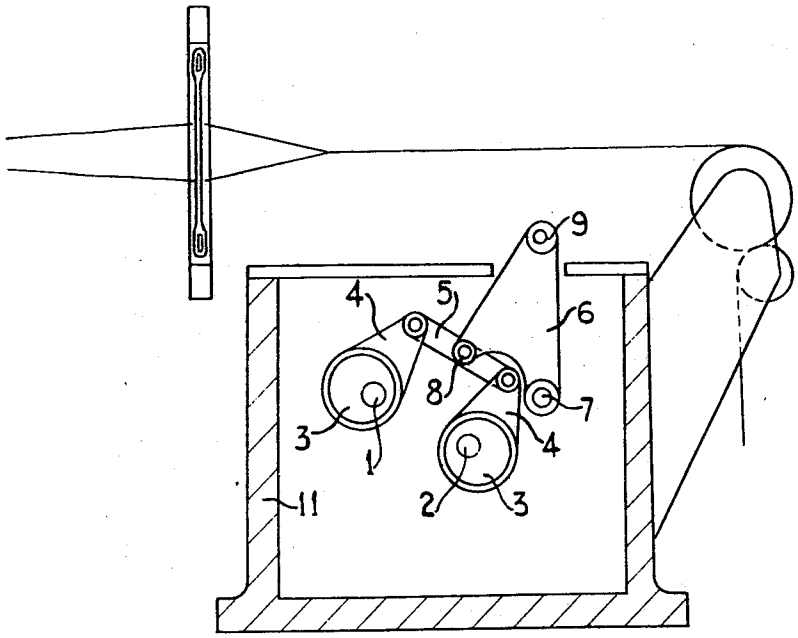

FIG. 1.

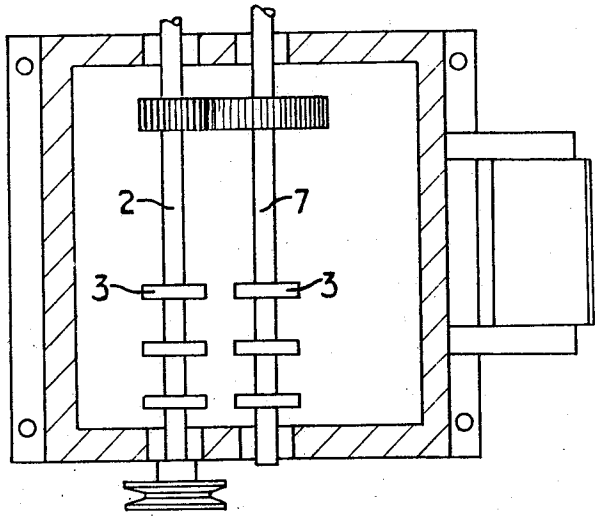

FIG. 2.

WILLIAM C ARNOLD INVENTOR:

BY

Bierman & Bierman

Feb. 17, 1970 W. C. ARNOLD 3,495,632

NEEDLE LOOMS

Filed Nov. 15, 1967 3 Sheets-Sheet 2

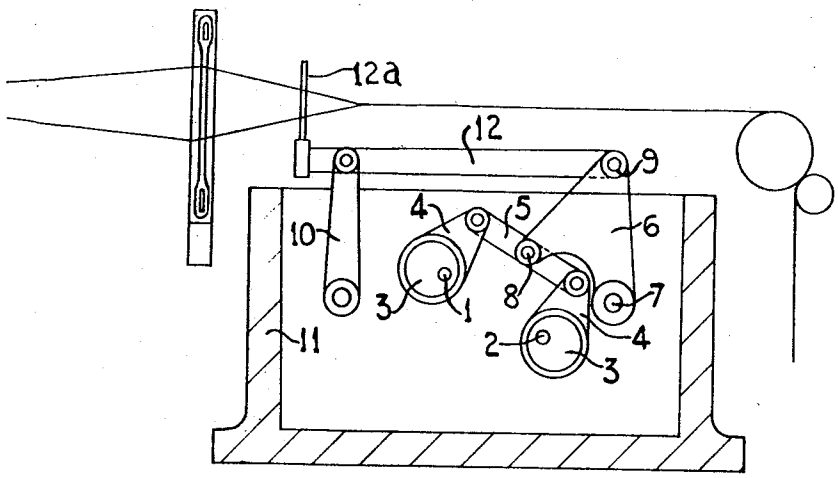

FIG. 3.

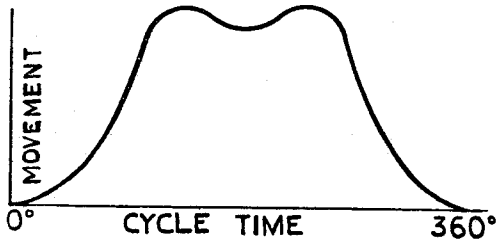

FIG. 4.

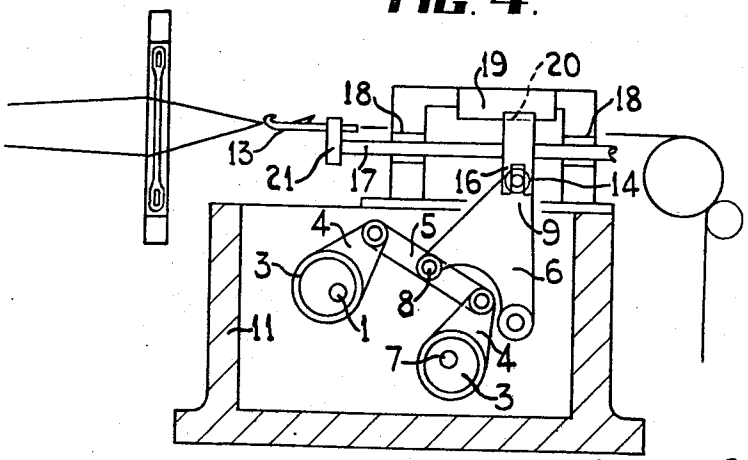

FIG. 5.

WILLIAM C ARNOLD INVENTOR:

BY

Berman & Berman

Feb. 17, 1970 W. C. ARNOLD 3,495,632

NEEDLE LOOMS

Filed Nov. 15, 1967 3 Sheets-Sheet 3

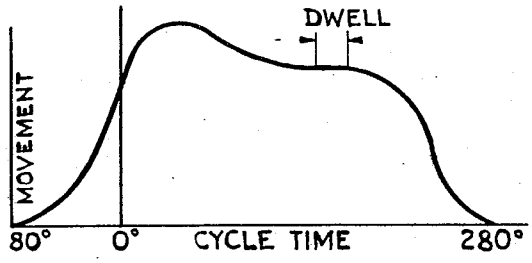

FIG. 6.

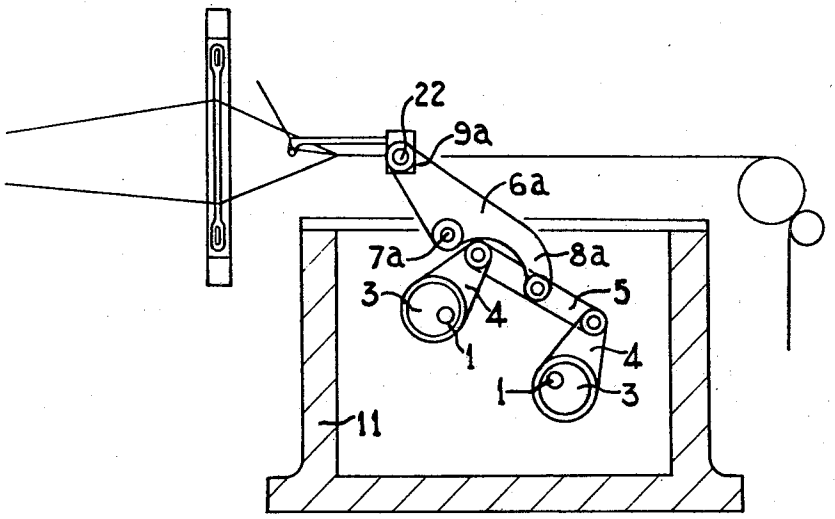

FIG. 7.

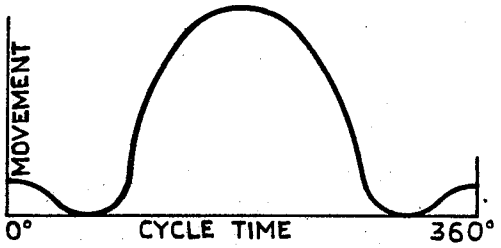

FIG. 8.

WILLIAM C ARNOLD INVENTOR:

BY Brennan & Brennan

United States Patent Office 3,495,632 Patented Feb. 17, 1970

3,495,632

NEEDLE LOOMS

William C. Arnold, Burton-on-Trent, England, assignor to Bonas Bros. Weavematic Looms (England) Limited, a corporation of Great Britain

Filed Nov. 15, 1967, Ser. No. 683,216
Int. Cl. D03d 47/44
U.S. Cl. 139—124 11 Claims

ABSTRACT OF THE DISCLOSURE

A needleloom having the normal operating parts, namely reed, weft inserting needle and latch needle, in which the motions of these parts are controlled by pairs of phased eccentrics synchronised to the loom speed. The speed of one of the eccentrics being arranged to be twice that of the other to give the required motion to a linkage which includes a bell crank lever and bridge link connecting the eccentrics and either reed weft inserter needle or latch needle.

This invention concerns smallware looms of the kind in which the weft is inserted by a needle, hereinafter called "needle looms."

In needle looms of the generally accepted type it has been usual to control the operating movement of parts such as the weft inserting needle, the beat-up reed, the selvedge knitting needle (in most but not all cases a latch needle) and the locking thread inserting member by means of a lever system actuated by a cam follower moving in a cam groove machined in the face of a cam.

When it is desired to operate the machine at high speed it is found that the use of cams is a serious disadvantage since a high load is imposed on the cam track and the follower and thus the cam track and the follower must be of substantial proportions; this in turn necessitates the provision of a large cam so that cam track cutting errors may be obviated, these errors being most likely to occur when the minimum radius of curvature of the cam track relative to the width of the track becomes small. It also follows that high speed operation results in high inertia and high rate of wear in the cam track and on the cam follower.

The principal object of the present invention is to provide a driving means for a needle loom which is capable of operation at high speed and does not suffer from the above outlined disadvantages.

According to the present invention a needle loom operating mechanism for controlling some or all of the operating movements required for weaving and for the knitting of one or both selvedges is characterised in that the operating movements for one, some or all of the members effecting the weaving and/or knitting is derived from pairs of phased eccentric bearings in which one member of the pair is adapted to rotate at a higher velocity than the other, the said higher velocity being a multiple of the velocity of the other member of the pair, there being individual connecting rods journalled one on each of the said eccentric bearings, the free ends of said connecting rods being connected by a bridge link which carries at a point intermediate its ends a constraining member adapted to control weaving and/or knitting motions, the linkage as a whole comprising a seven bar linkage sysem.

Preferably the velocity of the fast moving member of the pair is twice that of the other member of the pair.

The invention will be described further, by way of example with reference to the drawings in which:

FIG. 1 is an end elevation of part of a needle loom made in accordance with the invention,

FIG. 2 is a plan view of FIG. 1,

FIG. 3 is a view corresponding to FIGS. 1 and 2 illustrating in addition the linkage used to control the reed of a needle loom,

FIG. 4 is a graph of the motion obtained by the mechanism of FIG. 3.

FIG. 5 is a modification of the mechanism illustrated in FIGS. 1, 2 and 3,

FIG. 6 is a graph of the motion obtained by the mechanism of FIG. 5,

FIG. 7 is a view of a further modification of the mechanism and,

FIG. 8 is a graph of the motion obtained by the mechanism of FIG. 7.

Referring firstly to FIGS. 1 and 2 it will be seen that there are provided two driving shafts **1** and **2**, mounted transversely of a loom frame. The shafts **1** and **2** are arranged to rotate in opposite directions. One shaft is arranged to rotate at a speed twice that of the other. Carried on each of the shafts **1** and **2** are phased eccentrics **3**, the degree of eccentricity and phasing being the subject of exact consideration. On the eccentrics **3** are journalled connecting rods **4**, one connecting rod from each eccentric **3** being together considered a pair. At least one pair of connecting rods are provided for each operating movement required. If desired the direction of rotation of the shafts **1** and **2** can be the same.

The connecting rods are tied together at their little ends by means of a bridge link **5** and from a point, preferably but not necessarily, the midpoint of this link connection is made with the end of one arm **8** of a rocking bell crank lever **6**, or constraining member. The lever **6** is pivoted on a fixed shaft **7**, located outside the line of action of the connecting rods **4**. The other arm **9** of the rocking lever **6** projects in an attitude such as to provide the means of driving the appropriate loom element, either directly as shown for example in FIGS. 3, 5 and 7, or indirectly by means of push rods and additional levers not illustrated.

In the above description reference has been made generally to the disposition of parts of the loom which, by slight modification of the phasing of the eccentrics and the distances between pivot points and centres can be utilized for obtaining various motions illustrated in FIGS. 4, 6 and 8.

The linkage referred to above comprises, with the loom frame, what is known as a seven bar geared linkage and the seven bars of the mechanism described are as follows:

Bar **1**—loom frame
Bar **2**—primary eccentric (preferably the one rotating at machine speed)
Bar **3**—secondary eccentric
Bar **4**—primary connecting rod
Bar **5**—secondary connecting rod
Bar **6**—bridge link
Bar **7**—constraining member

Referring now to a first specific use of the mechanism generally described, and with reference to FIGS. 3 and 4, when used to control the movement of the loom reed it will be seen that the projecting arm **9** of the rocking lever **6** is used as one member of a parallel motion linkage as shown in FIG. 3. In addition to the arm **9** a trailing link **10** pivotally mounted to the loom frame **11** is provided together with a connecting link **12**. The link **12** forms a bridge between the rocking lever **6** and the trailing link **10** and serves to carry the reed **12***a*. An oscillatory movement of the rocking lever **6** about its axis shaft **7** causes the reed **12***a* to move forwardly to beat-up an inserted weft loop and then return to a "safe" position, when the weft of the next loop can be inserted. It has been customary to accord to the reed **12***a* a motion

such that on its return to the "safe" position it remains completely stationary during a pre-determined period until it commences to move to the beat-up position. The motion provided by the use of the previously described double eccentric shafts **1** and **2** however, will, because of inherent characteristics, give, in the "safe" region a small reciprocatory movement. The degree of reciprocation is, however, quite small in relation to the total travel of the reed and results in a period which is substantially a dwell period. This motion is graphically illustrated in FIG. 4 and the phasing of the eccentrics is designed for this purpose.

The mechanism referred to in FIGS. 1 and 2 is again illustrated in FIG. 5 and in this case the modification made enables the motion obtained (and graphically illustrated in FIG. 6) to be utilized for controlling the movement of a latch needle **13** used to knit the selvedge of a woven tape of fabric. In this case the projecting arm **9** of the rocking lever **6** causes reciprocation of a slide on which is carried for example, the conventional hosiery latch needle **13**. At the end of the arm **9** there is provided a square sided block **14** pivotally mounted on a pin not shown.

A fork piece **16** carried on a sliding rod **17** embraces this block **14** which is capable of sliding therein to accommodate the change in height which occurs as the tip of the rocking lever arm **9** swings through the arc. The rod **17** slides in bushes **18** and is restrained from turning about its own axis by providing a hardened guide strip **19** which locates in a groove **20** machined in an extension of the fork piece **16**. At its extremity the rod **17** carried a needle holder **21** into which the latch needle **13** is adapted to be secured.

The motion provided can be substantially as graphically illustrated in FIG. 6 and is again derived from suitable phased eccentrics. Variation of the motion is possible. It will be seen from FIG. 6 that the knitting needle is given an overall motion arranged to ensure that the needle instead of remaining stationary during the major part of the operating cycle it is caused, on its return stroke after casting off a loop, to travel beyond the point at which the hook is in line with the weft inserter needle. This additional travel ensures that the weft loop which has been newly drawn and is lying around the needle is caused to slip rapidly down and off the latch and onto the shank of the needle in a positive manner thus overcoming the slight impediment to transfer offered by the broadened tip of the latch. The latch needle then starts again on its forward stroke without any dwell period, coming to rest after a short return movement and remaining stationary during the time whilst the weft inserter passes across the throat of the latch needle, and before continuing its movement when its hook will take the newly inserted weft pick and knit it through the previous loop in the conventional manner. Modification of the phasing of the eccentric bearings **3** would produce a variation in the obtained motion which would enable the knitting form to be changed if desired.

In a third modification of the arrangement of FIGS. 1 and 2, as illustrated in FIG. 7 there is provided a means for obtaining the motion illustrated graphically in FIG. 8. This motion is used to control the movement of a device which introduces into the selvedge a locking thread arranged to prevent unravelling of the loops of the selvedge and in the arrangement shown, forms part of a modified bell-crank lever **6**. The bell-crank lever **6***a* is pivoted outside of the line of action of the connecting rods such that one arm **8***a* is connected to the bridge link **5** of the pair of connecting rods **4** as previously described. The other arm **9***a*, which carries a thread guide eye **22**, projects in such a manner that as the lever **6***a* oscillates about the shaft **7***a* due to the motion of the eccentrics **3**, the thread guide eye **22** is caused to move fore-and-aft of the loom and at the same time to rise and fall due to the arcuate movement of the lever arm **9***a*. In a preferred, timing of the eccentrics **3** the additional locking thread (not shown) is thereby lifted as the latch needle moves away from the guide eye **22** and falls as the latch needle approaches it. The motion is substantially as shown in the time/distance graph and is derived from suitably phased eccentrics.

The weft inserting needle of a needle loom can be caused to operate from a pair of eccentrically mounted connecting rods having a motion substantially as shown in FIG. 4.

Although all the weaving and selvedge knitting operations of a needle loom have been described as being actuated from phased eccentrics it is not essential that all the movements should be so obtained. For example, any one or more of the desired movements may be derived from conventional mechanisms, such as cams, whilst others are derived from phased eccentrics as described.

What is claimed is:

1. A drive mechanism for a loom which produces a beat-up motion, a selvedge needle motion, and is adapted to produce a selvedge thread presenting means motion; which mechanism comprises a loom frame, at least one pair of phased eccentric members, means for rotating one member of said pair at a velocity in excess of the other member, the eccentrics being mounted on rotatable rods journalled in said frame; connecting rods journalled one on each of said eccentrics; a bridge link journalled to each of said connecting rods; a constraining member connected to said bridge link intermediate its ends and journalled on said frame for controlling said motion; the loom frame, the pair of phased eccentric members; the connecting rods, the bridge link and the constraining member comprising as a whole a seven bar linkage system.

2. A drive mechanism as described in claim **1** in which said one eccentric member is rotated at twice the speed of said other eccentric member.

3. A drive mechanism as described in claim **1** in which the rotatable rods are parallel spaced-apart shafts provided for receiving said eccentrics.

4. A drive mechanism as described in claim **1** in which the constraining member controls a loom reed beat-up.

5. A drive mechanism as described in claim **1** in which the constraining member is a bell-crank member pivotally mounted on the loom frame, there being a reed on said loom and a connecting link between said bell-crank lever and said reed.

6. A drive mechanism as described in claim **5** in which a trailing link supports the end of said connecting link at its end remote from said bell-crank lever.

7. A drive mechanism as described in claim **5** wherein said bell-crank lever is slidably and pivotally connected to a selvedge knitting needle operating rod.

8. A drive mechanism as described in claim **1** in which at least one pair of phased eccentrics is provided to control the movement of a weft inserting needle.

9. A drive mechanism as described in claim **1** in which at least one pair of phased eccentrics is provided to control the movement of a selvedge knitting needle.

10. A drive mechanism as described in claim **1** in which said pair of phased eccentrics is provided to control the insertion of a selvedge locking thread.

11. A drive mechanism for controlling a selvedge needle, which mechanism comprises a loom frame; a pair of phased eccentrics rotatably mounted on rods which are journalled in said loom frame; means to rotate one of said pair at a velocity in excess of the other; connecting rods journalled one on each of said eccentrics; a bridge link journalled to said connecting rods; a constraining member connected to said bridge link intermediate its ends and journalled on said frame for controlling a selvedge needle, said constraining member being a bell-crank lever pivotally mounted on the loom frame, a sliding pivoting connection between said bell-crank lever and a selvedge knitting needle operating rod, said sliding pivoting connection including a forked piece on said selvedge knitting

needle operating rod, a pivotally mounted connection piece on said bell-crank lever connecting with said forked piece and bushings for mounting said selvedge knitting needle operating rod restraining said operating rod to reciprocate.

References Cited

UNITED STATES PATENTS

2,013,230	9/1935	Best	139—124
2,561,416	7/1951	Robinson	139—124
3,064,689	11/1962	Piazzolla et al.	139—124
3,320,980	5/1967	Gustavson	139—124

HENRY S. JAUDON, Primary Examiner

U.S. Cl. X.R.

139—190