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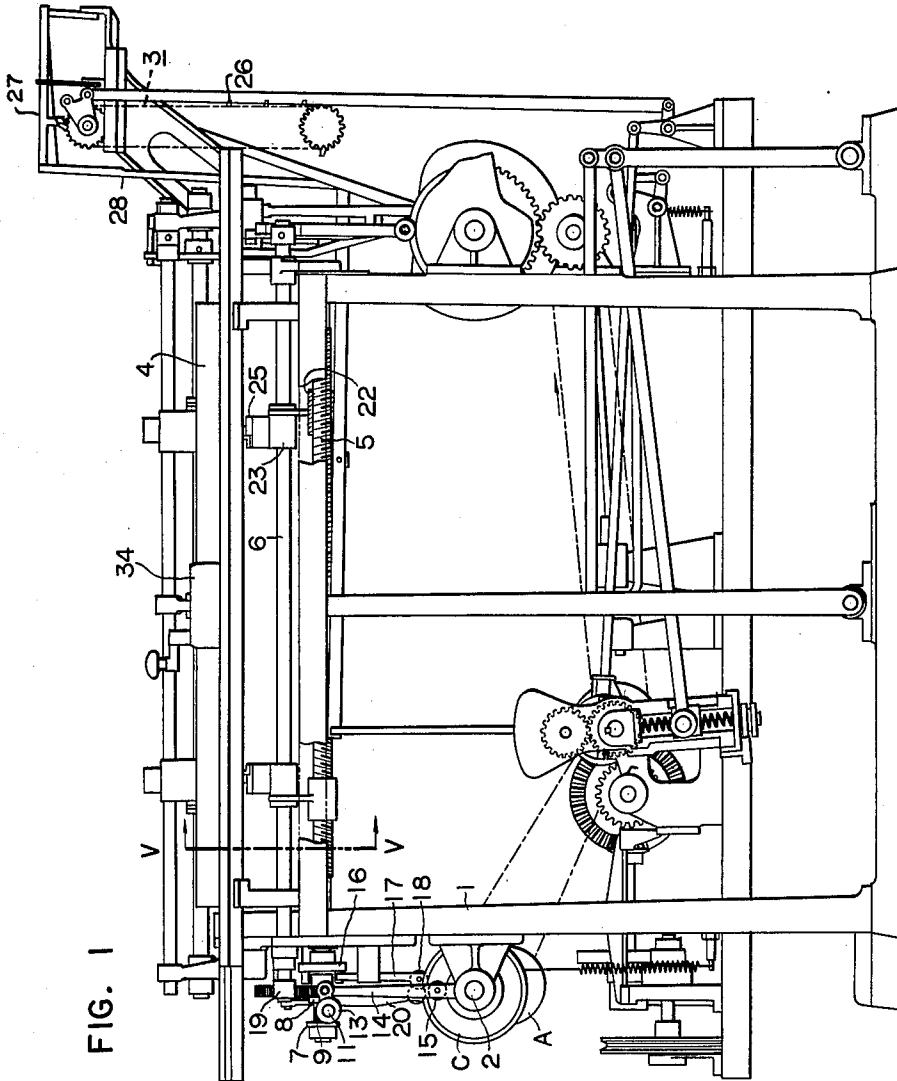
SADAMI IMON

3,220,220

AUTOMATIC INCREASING MECHANISM IN A FLAT KNITTING MACHINE

Filed Aug. 2, 1963

3 Sheets-Sheet 1



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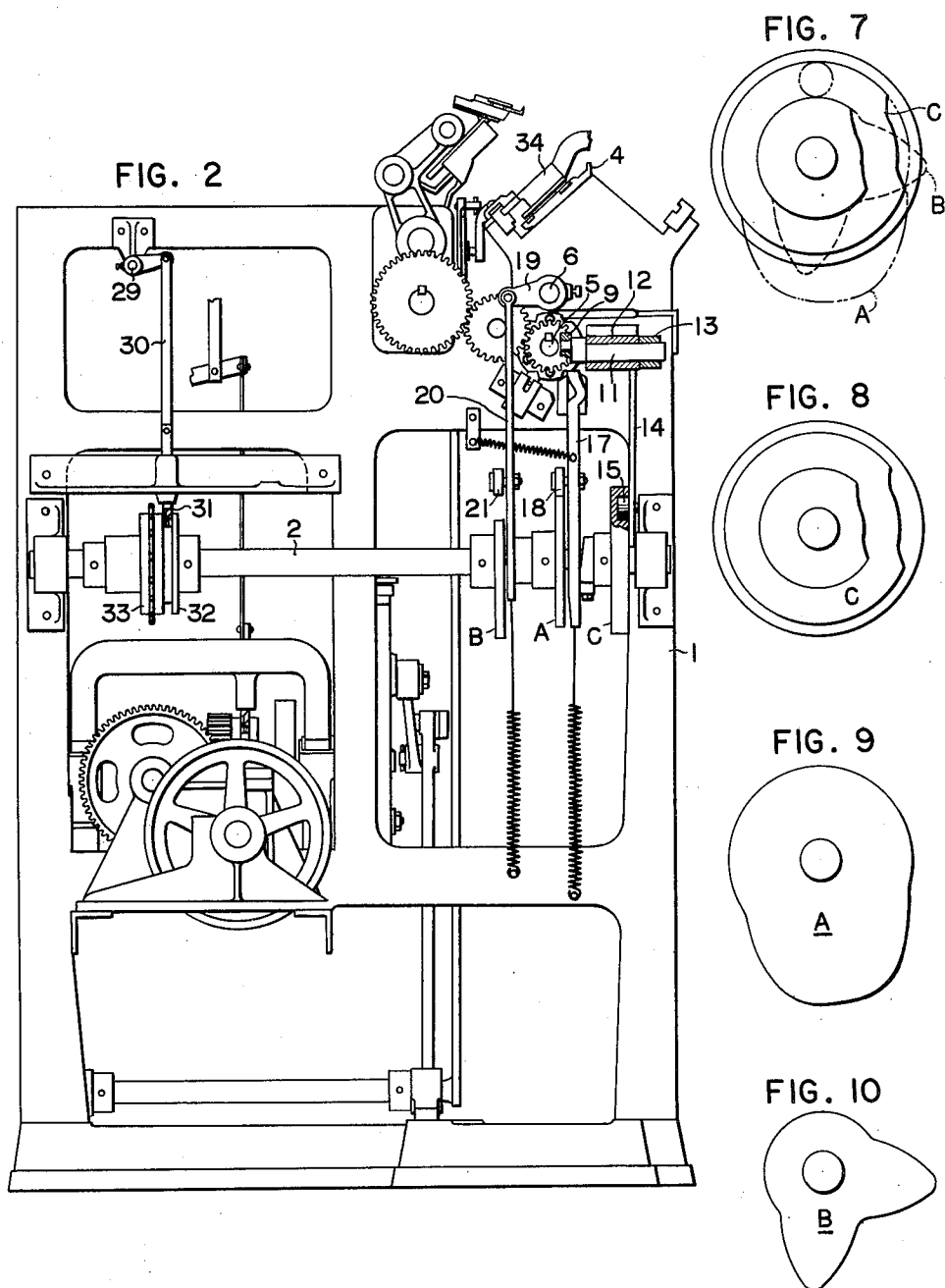
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3 Sheets-Sheet 2



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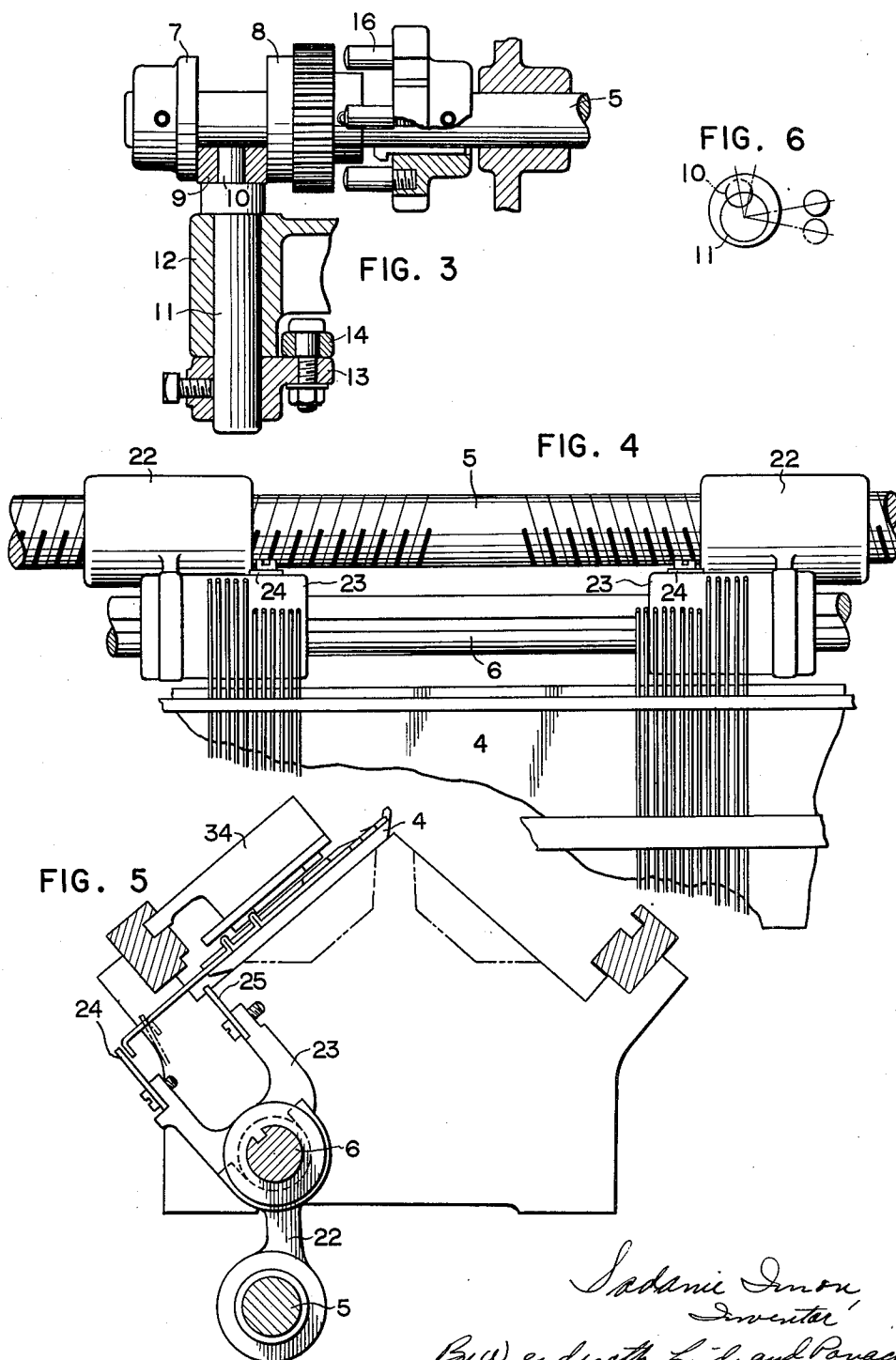
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AUTOMATIC INCREASING MECHANISM IN A FLAT KNITTING MACHINE

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3 Sheets-Sheet 3



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AUTOMATIC INCREASING MECHANISM IN A FLAT KNITTING MACHINE

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1 Claim. (Cl. 66—76)

This invention relates to a flat knitting machine, particularly to an automatic mechanism for effecting so-called "increasing" of the number of wales or "widening" of the fabric.

In the usual flat knitting machine, for increasing the number of wales (or the number of operative knitting needles) it is necessary to raise the knitting needles when the carriage is positioned outside of the row of the knitting needles. For instance, the knitting needles on the lefthand side should be raised immediately before the start of the return movement of the carriage which has reached the lefthand end of its stroke. Similarly, the knitting needles on the righthand side should be raised immediately before the start of the returning movement of the carriage which has reached the righthand end of its stroke. If the knitting needle is raised before the carriage reaches the lefthand or righthand end of its stroke, the yarn will not be engaged by said needle. In case it is desired to effect the increasing or widening on both sides of the knitted fabric, it is necessary to provide the same increasing mechanisms at both sides of the knitting machine and, consequently, a complicated construction cannot be avoided.

The object of the present invention is to provide an improved automatic increasing or widening mechanism of simple construction, whereby the automatic increasing operation can be effected on both sides of the fabric.

In the accompanying drawings:

FIG. 1 is a front view of a flat knitting machine equipped with an automatic increasing or widening mechanism constructed according to the present invention;

FIG. 2 is a side elevation as viewed from the left of FIG. 1;

FIG. 3 is a view partly in section of the lefthand end portion of the screw shaft shown in FIG. 1;

FIG. 4 is a plan view of the mid portion of said screw shaft;

FIG. 5 is a longitudinal section taken along line V—V of FIG. 1;

FIG. 6 is an end view of the eccentric trunnion shown in FIG. 3;

FIG. 7 is a view showing the configuration of three cams used in the mechanism; and

FIGS. 8 to 10 are views showing the configurations of individual cams.

Referring to the drawing, 1 designates a frame of a flat knitting machine, on which on one side (lefthand side) there is journaled a horizontal shaft 2 which is adapted to perform one rotation during a predetermined period as controlled by a card or chain mechanism 3. The shaft 2 carries a groove cam C and disc cams A, B securely mounted thereon. Beneath a needle bed 4 there are provided a screw shaft 5 and a guide shaft 6 having a key slot. Said screw shaft 5 is so supported as to be axially movable to some extent, and at its lefthand end are provided collars 7 and 8. A roller 9 is inserted between said collars 7 and 8. A trunnion 10 carrying said roller

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9 is integrally formed with and is disposed eccentrically with a stud 11. The stud 11 is supported by a bearing 12 fixed to the machine frame 1. On the other end of the stud 11 there is secured an arm 13, the free end of which is pivoted to a vertical connection rod 14 having at its lower end a cam follower rollers 15 engaging with the groove cam C. A pin wheel 16 is fixed on one end (lefthand end) of the screw shaft 5, and the upper end of a lifting rod 17 engages with said pin wheel. The lower end of said rod 17 is associated with the cam A through a cam follower roller 18. The guide shaft 6 has at its one end (lefthand end) an arm 19 fixed thereon, and a connecting rod 20 pivoted to the free end of said arm is associated with the cam B through a cam follower roller 21. By means of forked arms 22 engaging with the screw shaft 5, members 23 which carry needle raising and lowering elements 24 and 25 are adapted to be slid laterally along the guide shaft 6. Said members 23 are keyed to and supported by the shaft 6 against rotation. There are two forked arms 22 and two members 23 which are symmetrically disposed in the lefthand and righthand portions. One half of the screw shaft 5 is screw threaded in the reverse direction as compared with the screw thread on the other half thereof as shown.

When a pawl 26 on the chain mechanism 3 moving upwardly is turned upwardly, a lever 27 is oscillated upwardly. A connecting rod 28 pivoted to the free end of said lever is lifted, so that a vertical rod 30 (see FIG. 2) is also lifted through an armed shaft 29. Said rod 30 carries at its lower end an arcuate fork 31. As the carriage 34 reaches the lefthand end of its stroke, a driving wheel 32 and a sprocket wheel 33 will be coupled, being released from the arcuate fork 31, so that the cam shaft 2 starts its rotation. When the carriage 34 reaches the righthand end of its stroke, the shaft 11 is rotated by means of the groove cam C (through the roller 15, the connecting rod 14 and the arm 13) and, by the action of the eccentric trunnion 10, the screw shaft 5 is axially shifted to the right for one pitch of the row of the knitting needles. At the same time, the guide shaft 6 is rotated being controlled by the disc cam B (through the roller 21, connecting rod 20 and the arm 19), and the needle raiser 24 turns and raises a righthand needle, so that the yarn may engage with the same when the carriage 34 performs the left stroke. When the carriage 34 reaches the mid point of its stroke, the screw shaft 5 returns to its initial position by the action of the groove cam C. When the carriage reaches the lefthand end of its stroke, the lifting rod 17 is lifted, and the pin wheel 16 together with the screw shaft 5 will be rotated for one pitch (of the pinion wheel), and the lefthand and righthand needle raisers 24 will be shifted for one pitch of the row of the needles. Next, the guide shaft 6 is rotated by the action of the cam B in the similar manner as mentioned above, so that the needle raiser 24 turns and raises a lefthand needle. As the righthand resting needle has already been raised, in this case the righthand needle raiser is inoperatively moved. When the carriage 34 moves to the right, the knitting needle thus raised will be engaged by the yarn.

From the foregoing, it will be seen that in this invention any desired increasing or widening may be automatically effected on both edges of the knitted fabric according to the position of the pawls of the card or chain mechanism 3, and that the mechanism is extremely simple in

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construction because of the fact that the both lefthand and righthand needle raisers are adapted to be controlled by a common screw shaft and guide shaft and by means of a common cam device.

What I claim is:

An automatic increasing mechanism in a flat knitting machine which is controlled by a controlling mechanism, comprising a screw shaft capable of being axially shifted to some extent and having one half thereof screw threaded in reverse direction as compared with the screw thread of the other half thereof, a guide shaft having a key groove, said two shafts being disposed beneath the needle bed and being parallel with each other, means comprising a first cam for axially shifting said screw shaft for one pitch of the row of the knitting needles, a first member carrying needle raising and lowering elements and engaged

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with one half of said screw shaft, a second member carrying needle raising and lowering elements and engaged with the other half of said screw shaft, said first and second members being slidably guided by said guide shaft having a key groove and rigidly supported by a key with respect to rotation, and means comprising a further cam for rotating said screw shaft and guide shaft at predetermined period.

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