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E. EISSNER

2,175,184

FLAT-KNITTING MACHINE

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2 Sheets-Sheet 1

Fig. 1

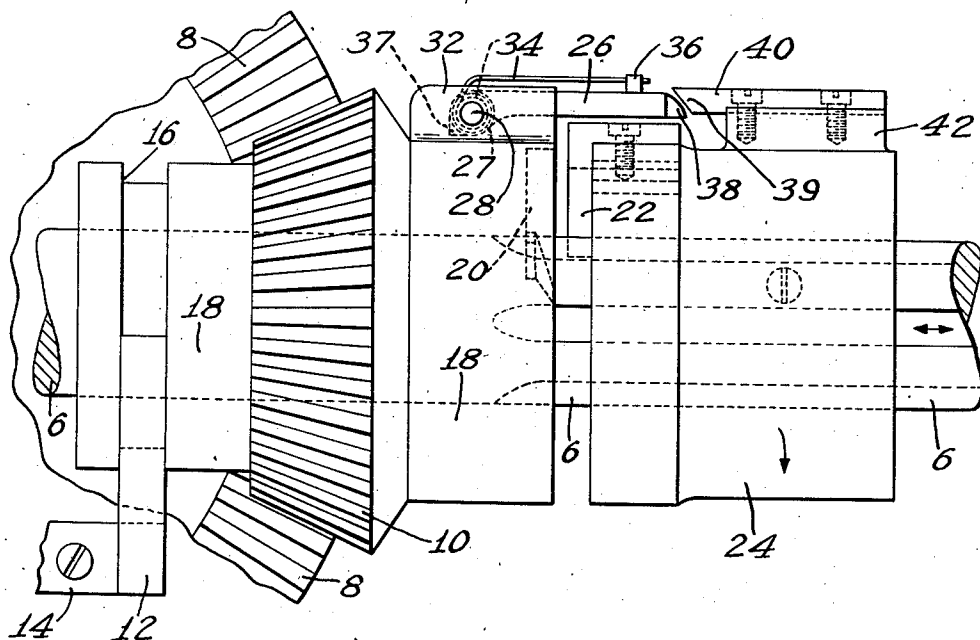
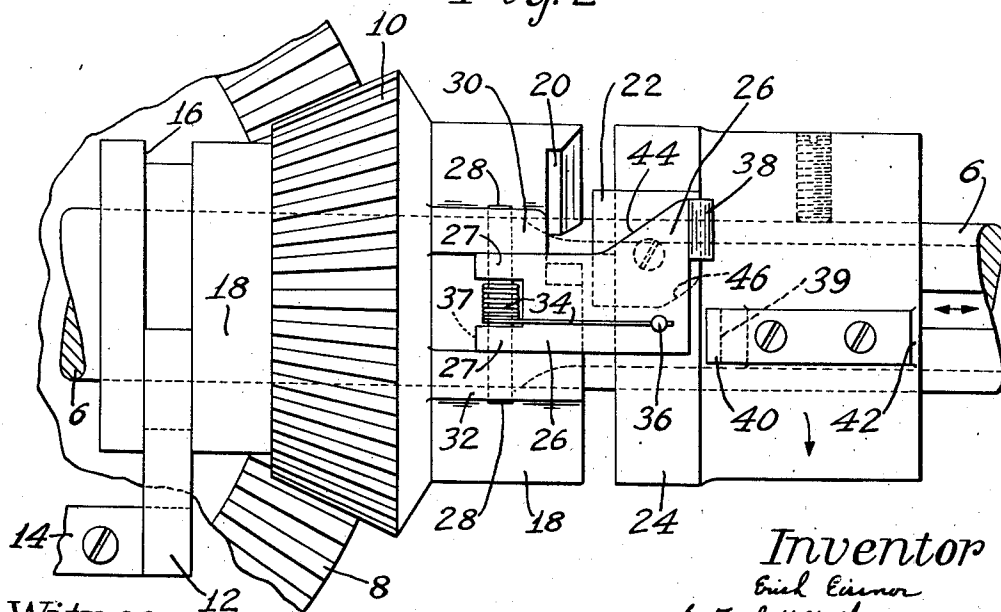


Fig. 2



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Fig. 3

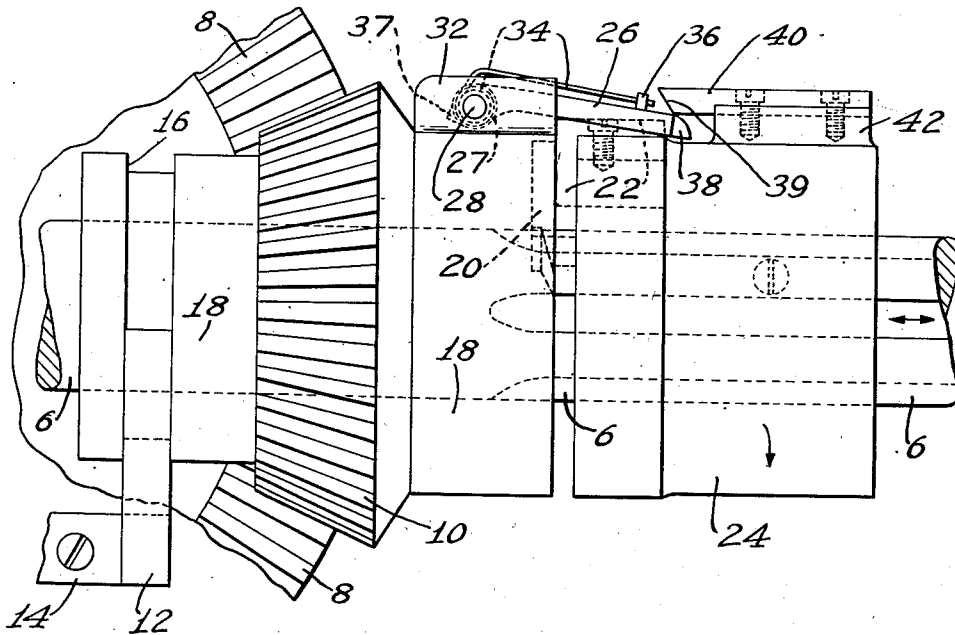
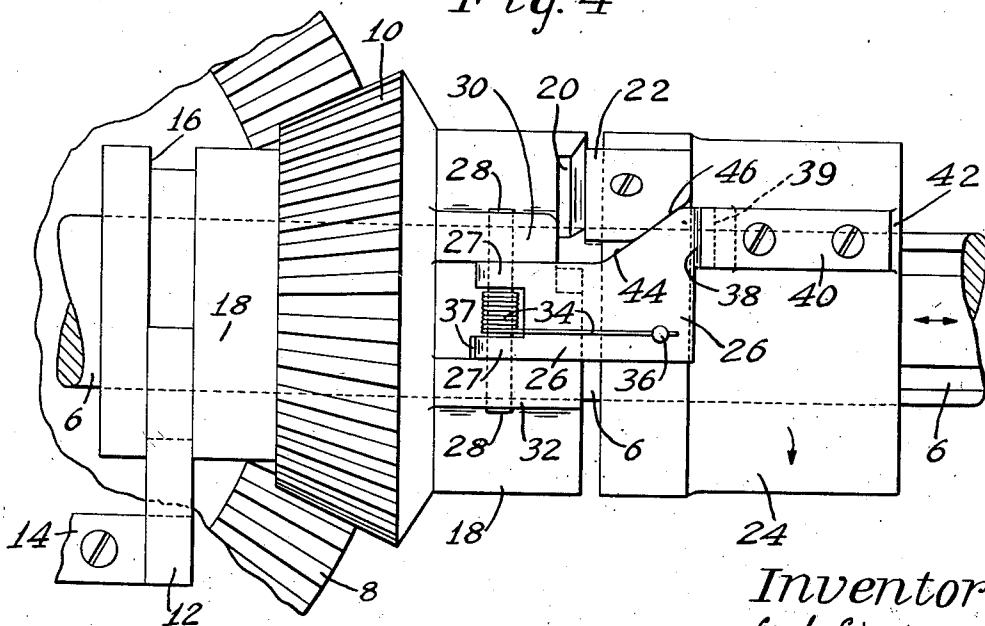


Fig. 4



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UNITED STATES PATENT OFFICE

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FLAT-KNITTING MACHINE

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6 Claims. (Cl. 66—82)

The present invention relates to flat full-fashioned knitting machines, and more particularly to a novel and improved clutch mechanism adapted for disconnecting and connecting the coulier mechanism of such machines to be driven from the main cam shaft of the machine.

In flat full-fashioned hosiery machines of the general type referred to, the motions of the several cooperating instrumentalities for the performance of the normal knitting and auxiliary loop transfer operations are derived from separate sets of cams on the main cam shaft, a lengthwise shifting of the shaft being employed to bring one or the other of said sets of cams into operative position during continued operation of the machine. In order that the usual sinker slurcock cams and yarn carriers may be rendered idle during the performance of narrowing or other loop transfer operations, and may be again connected to be driven in synchronous relation to the main cam shaft for continued knitting on the machine, it is the usual practice to drive the coulier cam which forms the usual motion transmitting means for these parts from the main cam shaft through a single tooth clutch, the cooperating members of which are disconnected as the cam shaft is shifted to narrowing position, and which are again thrown into mesh as the cam shaft is returned to its usual knitting position. This construction as employed particularly in modern high speed machines, has been found to have serious objections in that an extremely harsh clutching action is produced between the two members of the single tooth clutch which operates to suddenly start the coulier mechanism moving in timed relation to the rapidly rotating cam shaft of the machine.

It is a principal object of the present invention to provide in a machine of this general description, a novel and improved single position clutching device adapted for clutching and unclutching the coulier mechanism from the main cam shaft of the machine, which will operate prior to the engagement of the clutch members to start and to gradually accelerate the motion of the coulier mechanism, which is then clutched in the desired angular position to the rotating cam shaft, with consequent improvement in machine operation, and with the elimination of excessive shock and strain on the machine parts.

With these and other objects in view as may hereinafter appear, a principal feature of the invention consists in the provision of a single position clutching device comprising the cooperating parts of a single tooth clutch and an auxil-

iary clutching device which is rendered operative during the shifting of the main cam shaft of the machine from narrowing to knitting position to produce a gradual pick-up of the driven clutch member and associated coulier mechanism, and thus to eliminate the harsh clutching action which would otherwise be produced by the engagement of the cooperating clutch members.

The several features of the invention consist also in the devices, combinations and arrangement of parts hereinafter described and claimed, which together with the advantages to be obtained thereby will be readily understood by one skilled in the art from the following description taken in connection with the accompanying drawings, in which Fig. 1 is a detail view in front elevation showing the main cam shaft of a flat full-fashioned type knitting machine, the meshing bevel gears of the coulier mechanism, and the one position clutching device through which the coulier mechanism is driven from the main cam shaft, the parts being shown immediately following a shift to the right of the main cam shaft of the machine at the beginning of a narrowing operation; Fig. 2 is a plan view of the parts shown in Fig. 1; Fig. 3 is a view similar to Fig. 1, but with the parts shown in position during the return shift of the cam shaft to knitting position, and just prior to the closing of the single position clutch; and Fig. 4 is a plan view of the parts in the position shown in Fig. 3.

Referring specifically to the drawings, the main cam shaft of the flat full-fashioned knitting machine which may be of ordinary description, is designated at 6. In accordance with the usual operation of these machines, the cam shaft 6 is arranged to be driven continuously in one direction during machine operation, and is further arranged to be shifted axially between alternative knitting and narrowing positions, the shifting of the cam shaft 6 from left to right as shown in Figs. 1 and 2, acting to bring into operative position the usual narrowing cams for the performance of the usual narrowing or similar loop transfer operations. It will be understood that the shifting of the cam shaft may be controlled in the usual manner through automatic mechanism actuated from the pattern chain of the machine (not shown).

The coulier mechanism of the machine is driven in accordance with the usual practice from the main cam shaft 6 through a pair of bevel gears 8 and 10, the gear 8 being connected through positive driving connections with the usual coulier cam (not shown), the driving gear 10 being

loosely sleeved on the main cam shaft 6. The bevel gear 10 is maintained in meshing relation with the gear 8 by means of a shoe 12 supported on a stationary bracket 14 of the machine, and arranged to ride in a groove 16 in the sleeve hub 18 of the driving bevel gear 10.

The coulier mechanism of the machine, of which the bevel gears 8 and 10 form an integral part, is driven from the cam shaft 6 through a single tooth clutch which comprises a female clutch member 20 formed on the right hand end of the sleeve hub 18, and a cooperating male clutch member 22 secured to a driving clutch sleeve 24 rigidly secured to the drive shaft 6.

The driving connections for the coulier mechanism of the machine as thus far described, are similar to constructions ordinarily employed in these machines, in which the movement of the cam shaft 6 to the right to narrowing position, serves to disengage the cooperating parts of the clutch, and subsequent movement of the cam shaft 6 to the left to normal knitting position, serves to bring the clutch members 20 and 22 into operating engagement, thus re-connecting the coulier mechanism for active operation.

In accordance with the present invention, there is provided an auxiliary clutch mechanism which acts automatically during the return movement of the cam shaft to the left to knitting position, and prior to the engagement of the clutch tooth members 20 and 22 to start and to gradually accelerate the motion of the coulier mechanism, while at the same time the cooperating clutch members 20 and 22 are accurately guided into their closed or clutching position to positively connect the coulier mechanism to be driven from the cam shaft 6. The auxiliary clutching device comprises an auxiliary clutch member 26 in the form of a plate having two ears 27 which are pivotally supported on a pin 28 journaled in and secured against turning movement with relation to lugs 30 and 32 on the periphery of the sleeve hub 18 of the bevel gear 10. The lugs 30 and 32 are arranged to engage against opposite sides of the plate 26 to provide a strong lateral support therefor. A spring 34 coiled about and secured to the pin 28, and having the end thereof extending forwardly into engagement with a pin 36 on the upper side of the plate 26, tends to turn the auxiliary clutch member or plate 26 in a counter-clockwise direction to a normally inoperative raised position determined by the engagement of an abutment 37 on the member 26 against the peripheral surface of the sleeve hub 18. The auxiliary cam member 26 is provided at its outer end with a downwardly sloping cam surface 38 which is arranged during the return movement of the cam shaft 6 to the left, to be engaged by a correspondingly shaped cam surface 39 on an actuating member 40 which is rigidly secured to an axially extending rib 42 on the peripheral surface of the driving clutch sleeve 24. There is also provided on one side of the auxiliary clutch member 26, an inclined cam surface 44 which is arranged to be brought into engagement with a correspondingly inclined cam surface 46 formed on a portion of the clutch member 22 overlying the peripheral surface of the clutch sleeve 24.

The operation of applicant's improved clutching device for connecting the coulier mechanism to be driven from the cam shaft 6, may be briefly described as follows:

Assuming that the cam shaft has been shifted to the right to the usual narrowing position, the cooperating members 20 and 22 of the one tooth

clutch are disengaged. The auxiliary clutch member 26 occupies a relatively raised inoperative position in which the cam surface 44 is out of the path of movement of the clutch member 22 including the inclined cam surface 46, and is also out of engagement with the cam surface 39 of the actuating member 40. When the cam shaft 6 is now moved to the left as shown in Figs. 3 and 4 for the resumption of ordinary knitting, the surface 39 of the actuating member 40 is brought into engagement with the cam surface 38, thus causing the auxiliary clutch member 26 to be depressed, so that continued rotational movement of the shaft 6, clutch sleeve 24, and toothed clutch member 22, will cause the inclined surface 46 to be brought into positive engagement with the correspondingly inclined surface 44 of the auxiliary clutch member 26. Inasmuch as the cam shaft 6 is at this time moving toward the left, a sliding contact is produced between the surfaces 44 and 46, which causes the driven elements of the one tooth clutch including the auxiliary member 26 and gear 10 to be started rotating at a relatively slow rate which is gradually increased as the shaft 6 approaches its fully shifted position to the left. From an inspection of Fig. 4, it will be seen that the inclined surfaces 44 and 46 are so arranged that continued movement of the cam shaft 6 to the left, will cause the toothed clutch member 22 riding down the inclined surface 44 to be guided accurately and certainly into engagement with the cooperating female member 20 to positively connect the coulier mechanism to the cam shaft 6, thus insuring the proper engagement of the clutch members. From an inspection particularly of Figs. 3 and 4, it will be readily appreciated that engagement of the inclined surfaces 44 and 46 takes place while the cam shaft 6 is moving to the left at its maximum rate to insure an easy and effortless pick-up of the coulier mechanism by the auxiliary clutch member 26. As the cam shaft 6 approaches its fully shifted position to the left, the movement of the shaft is necessarily slowed, so that relative movement of the toothed clutch member 22 and the auxiliary member 26 is correspondingly slowed to provide a comparatively gradual acceleration of the coulier mechanism as the toothed member 22 is brought into operative engagement with the co-operating clutch member 20.

With this construction and arrangement of the parts, it will readily be seen that the excessive shock and strain upon the driving mechanism which would be caused by a direct meshing of the single tooth clutch members, is avoided, while at the same time an increased accuracy and certainty in the operation of the clutch mechanism is insured.

It will be understood that the invention is not limited to the specific embodiment shown, and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What is claimed is:

1. For use in a flat full-fashioned knitting machine having a main cam shaft shiftable axially between knitting and narrowing positions, and a coulier mechanism associated therewith, of a single position clutch mechanism for driving the coulier mechanism from the cam shaft constructed and arranged to be disengaged upon movement of the cam shaft to narrowing position, and to be re-engaged upon movement of the shaft to knitting position, said clutch mecha-

nism including means rendered operative upon shifting of the cam shaft to knitting position to produce an acceleration of the coulier mechanism from stop position prior to the engagement of the single position clutch.

2. For use in a flat full-fashioned knitting machine having a main cam shaft shiftable axially between knitting and narrowing positions, and a coulier mechanism associated therewith, of a single position clutch mechanism for driving the coulier mechanism from the cam shaft constructed and arranged to be disengaged upon movement of the cam shaft to narrowing position, and to be re-engaged upon movement of the shaft to knitting position, said clutch mechanism including an auxiliary clutching device rendered operative by movement of the cam shaft to knitting position to start the coulier mechanism but at a relatively slower rate than the cam shaft prior to the engagement of said single position clutch.

3. For use in a flat full-fashioned knitting machine having a main cam shaft shiftable axially between knitting and narrowing positions, and a coulier mechanism associated therewith, of connections for driving the coulier mechanism from the cam shaft including a single tooth clutch constructed and arranged to be disengaged upon movement of the cam shaft to narrowing position, and to be re-engaged upon movement of the shaft to knitting position, and an auxiliary clutch mechanism including cooperating cam surfaces operative during shifting movement of the cam shaft to knitting position to effect a gradual acceleration of the coulier mechanism from stop position prior to the engagement of said single tooth clutch.

4. For use in a flat full-fashioned knitting machine having a main cam shaft shiftable axially between knitting and narrowing positions, and a coulier mechanism associated therewith, of connections for driving the coulier mechanism from the cam shaft including a driven single tooth clutch member associated with the coulier mechanism, a cooperating driving single tooth clutch member secured to the cam shaft, and arranged to be moved out of engagement with the cooperating clutch member upon movement of the shaft to narrowing position, an auxiliary clutch member movably supported on one of said clutch members, and a cooperating auxiliary cam-shaped clutch element on the other of said clutch members, and means ren-

dered operative by movement of the cam shaft to knitting position to position said movable auxiliary clutch member for engagement with the other of said auxiliary clutch members to effect gradual acceleration of the coulier mechanism prior to the engagement of said single tooth clutch members.

5. For use in a flat full-fashioned knitting machine having a main cam shaft shiftable axially between knitting and narrowing positions, and a coulier mechanism associated therewith, of a single position clutch mechanism for driving the coulier mechanism from the cam shaft constructed and arranged to be disengaged upon movement of the cam shaft to narrowing position, and to be re-engaged upon movement of the shaft to knitting position, and means rendered operative upon shifting of the cam shaft to knitting position to put the coulier mechanism in motion prior to the engagement of the single position clutch.

6. For use in a flat full-fashioned knitting machine having a main cam shaft shiftable axially between knitting and narrowing positions, and a coulier mechanism associated therewith, of connections for driving the coulier mechanism from the cam shaft including a driven single tooth clutch member associated with the coulier mechanism, a cooperating driving single tooth clutch member secured to the cam shaft, and arranged to be moved out of engagement with the cooperating clutch member upon movement of the shaft to narrowing position, an auxiliary clutch member extending axially of the shaft and pivotally supported on the driven clutch member for movement toward and away from the shaft, an inclined contacting surface formed on one side of said auxiliary clutch member, and a correspondingly inclined contacting surface associated with the driving clutch member, spring means for maintaining the auxiliary clutch member in a raised inoperative position out of the path of movement of said latter inclined surface, an actuating member on the driving clutch member, and cooperating cam surfaces on the auxiliary clutch member and on the actuating member rendered operative by movement of the cam shaft to knitting position to depress said auxiliary clutch member whereby a sliding contact is effected between said inclined surfaces to start the coulier mechanism prior to engagement of said single tooth clutch members.

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