

Feb. 13, 1934.

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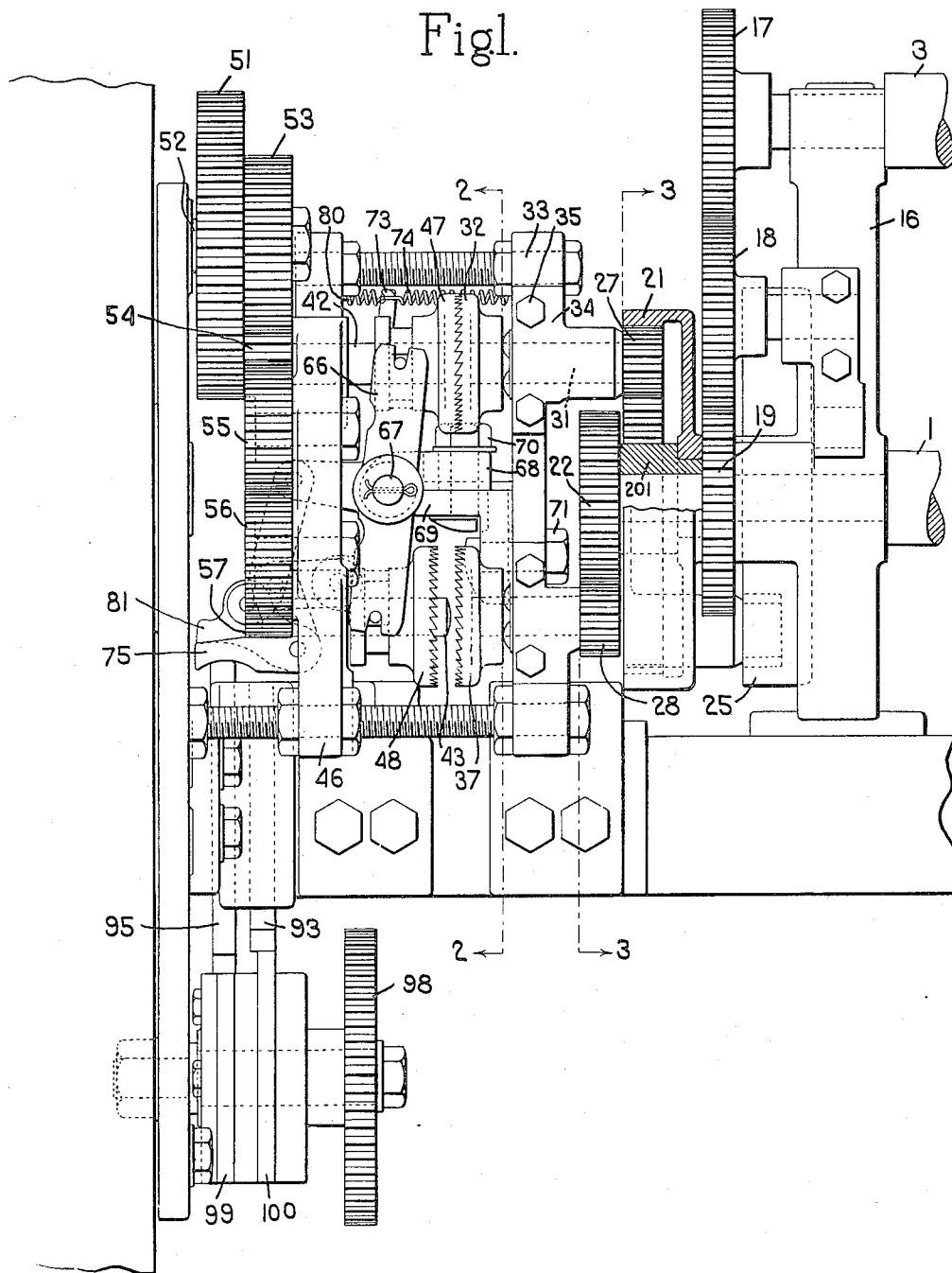
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YARN TWISTING APPARATUS FOR FANCY YARNS

Filed July 18, 1933

4 Sheets-Sheet 1

Figl.



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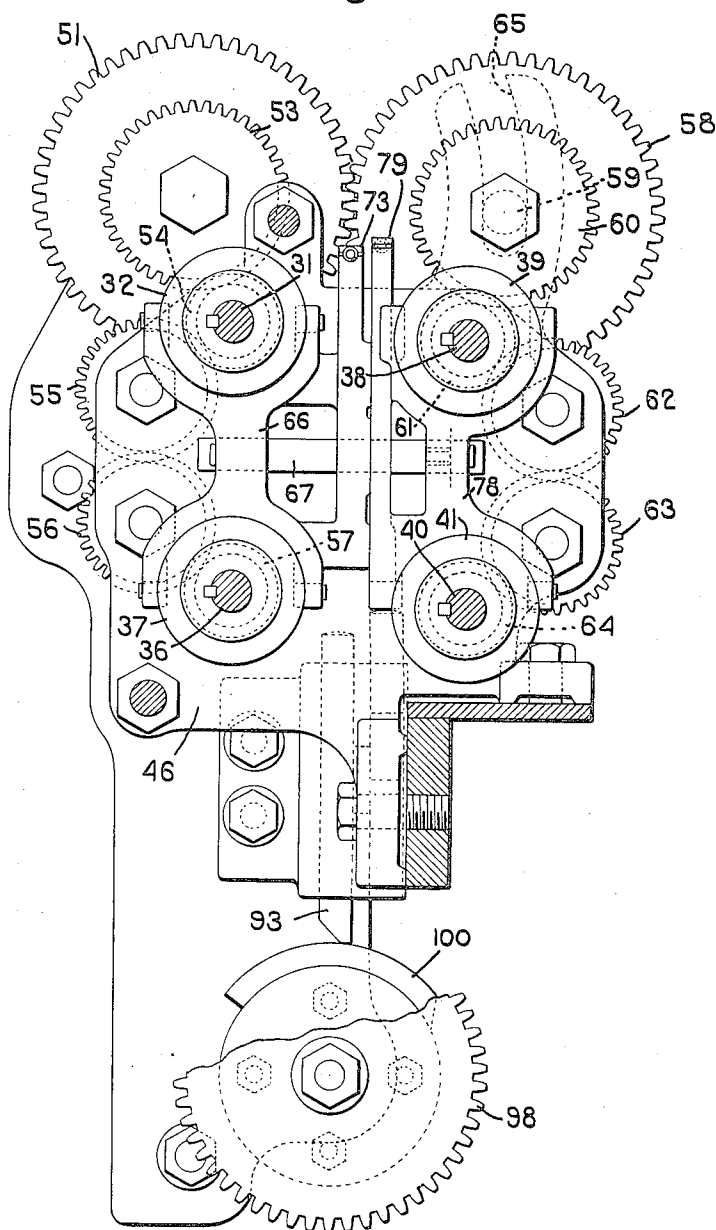
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4 Sheets-Sheet 2

Fig2.



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4 Sheets-Sheet 3

Fig.3.

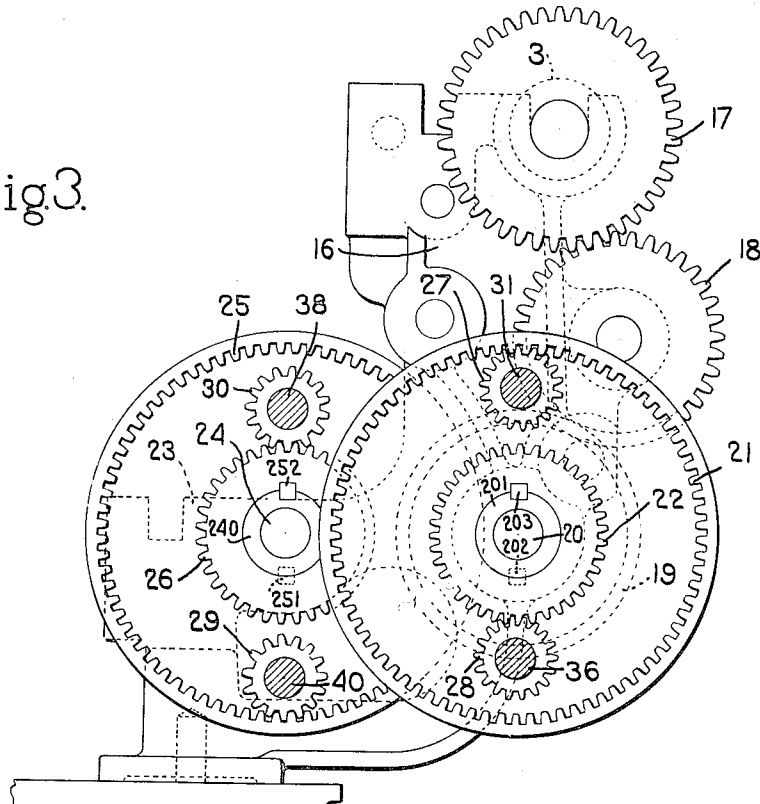
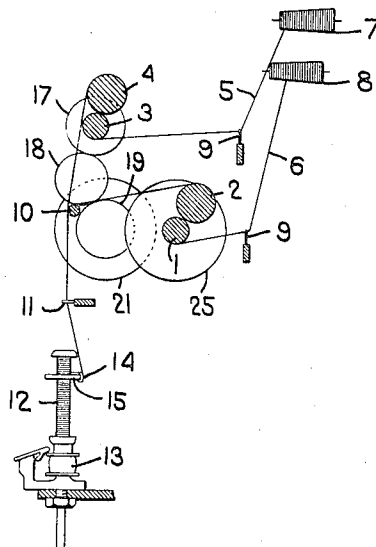


Fig.4.



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4 Sheets-Sheet 4

Fig. 5.

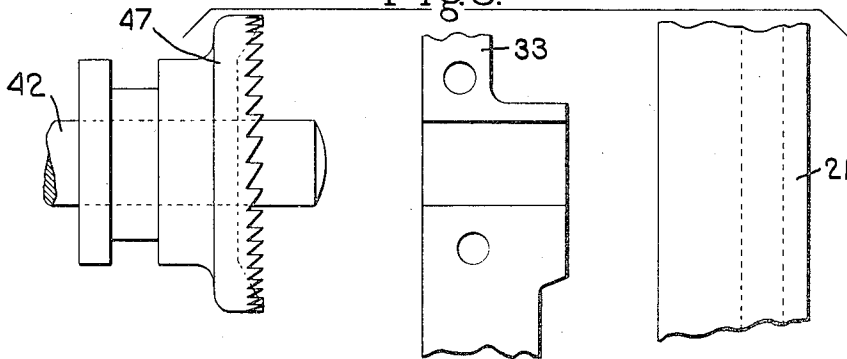


Fig. 6.

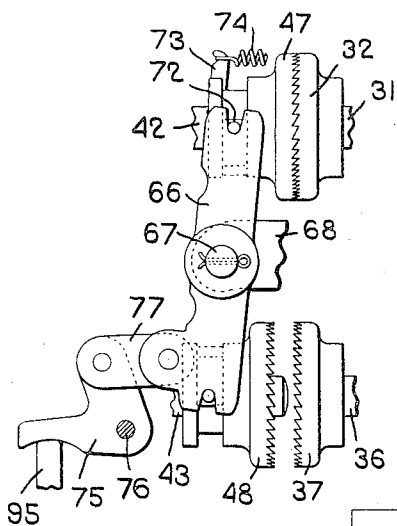


Fig. 7.

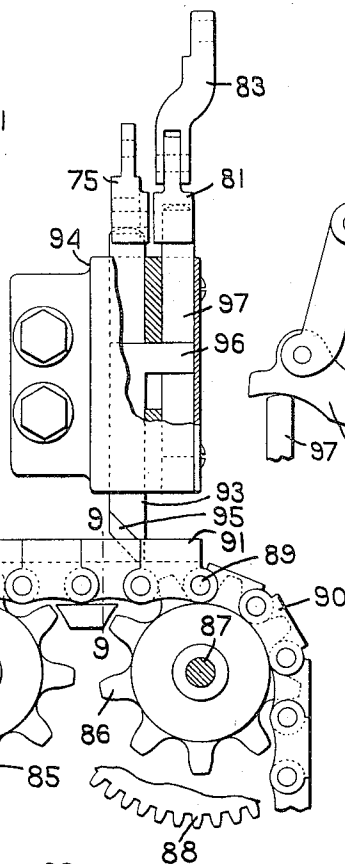


Fig. 8.

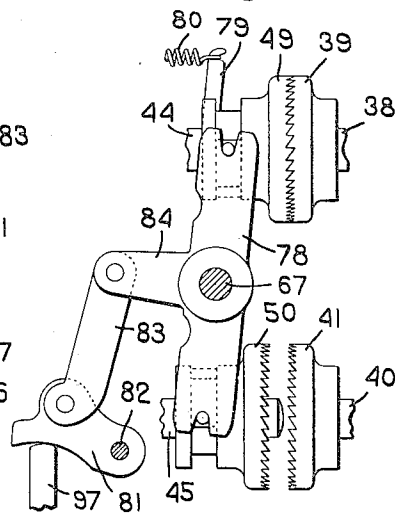
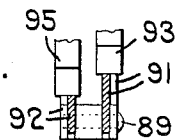


Fig. 9.



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YARN TWISTING APPARATUS FOR FANCY YARNS

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8 Claims. (Cl. 117—22)

This invention relates to a yarn twisting apparatus and has for its object to enable the production on a single machine of an extremely wide variety of fancy yarns made by twisting together two strands of yarn, each of which may be single or in multiple and of any desired character.

The object of the invention is to enable the feed of the strands by the two sets of delivery rolls to be automatically controlled to produce a wide variety of fancy yarns extending, when the invention is employed to its fullest extent, to a practically infinite number.

The invention enables, among other things, the strands to be given any desired degree of twist from loose to tight, any desired length of pitch of twist, either strand to cover the other strand, either strand to form bunches of any size and either hard or soft and any of these formations to extend for any length and to occur at any intervals desired in the production of the yarn.

These and other objects of the invention will appear more fully in the accompanying description and drawings and will be particularly pointed out in the claims.

The drawings illustrate so much of a twister frame as is necessary to a disclosure of the invention. It will be understood that the frame, as usual, may be of any desired length and contain any desired number of twisting means or units and that these twisting units may be arranged in two rows or banks. It will also be understood that while the twisting units are shown as of the ring or traveler type, other types may be employed as desired.

In the drawings:

Fig. 1 is a front elevation of the left-hand portion of the machine with which the invention is particularly concerned with some of the parts in cross section and some broken away.

Fig. 2 is a view in vertical cross section taken on the line 2—2 of Fig. 1 looking toward the left.

Fig. 3 is a view in vertical cross section taken on the line 3—3 of Fig. 1.

Fig. 4 is a diagrammatic view in vertical cross section showing the general relation of the elements concerned in a single twisting unit.

Fig. 5 is a detail in front elevation of a portion of the machine with one of the clutch elements and its cooperating pinion removed.

Fig. 6 is a detail in front elevation showing the construction illustrated for operating the clutches of the front delivery rolls.

Fig. 7 is a detail in left-hand elevation illustrating one form of pattern-controlled means for operating the clutches.

Fig. 8 is a detail in front elevation showing the construction illustrated for operating the clutches of the back delivery rolls.

Fig. 9 is a detail in cross section on the line 9—9 of Fig. 7.

The machine as illustrated comprises two sets of delivery rolls. The back set comprises the usual lower roll 1 extending lengthwise of the frame and the usual series of top rolls 2 resting upon and driven by the lower roll. The front set of delivery rolls is conveniently placed not only in front of but above the back set and likewise comprises the usual lower roll 3 and the cooperating series of top rolls 4 driven thereby. The strands 5 and 6 of yarn, each of which may be single or in multiple and of any desired character, extend from suitable supplies 7 and 8 mounted on the frame respectively through guides 9 and pass respectively around the lower rolls 3 and 1, thence between the delivery rolls and over the respective top rolls 4 and 2, thence over a guide bar 10, and thence through a guide eye 11, all as shown in Fig. 4, to the twisting unit. The twisting unit is shown of the ring and traveler type in which a bobbin or other yarn carrier 12 is mounted on a spindle, the whirl 13 of which is rotated by usual and suitable means. The yarn strands pass from the guide eye 11 through the traveler 14 mounted on the ring 15 and the ring 15 is reciprocated vertically in the usual manner to wind the twisted yarn on the bobbin.

The character of the twist imparted to the yarn, as is well understood, depends upon the relation between the speeds of the two sets of delivery rolls. Consequently by causing the one set to run relatively fast and the other relatively slow and by stopping the rotation of the one or the other set and by varying the time periods during which any of these conditions continue, it is possible to produce twisted yarns of an almost infinite variety, and, as already pointed out, the invention has to do with the means for controlling the operation of the two sets of delivery rolls to secure these results and thus enable a single machine or twister frame to produce an infinite variety of fancy yarns or a wide variety of twist in the same yarn, either or both as may be desired.

The mechanism in which the preferred embodiment of the invention is disclosed is shown as located at the left-hand end or head of the machine and is supported by and contained in a suitable rigid frame work.

The lower roll 3 of the front set of delivery

rolls is shown as journaled in the upper portion of a standard 16 of the frame and has secured to its left-hand end the gear 17. The gear 17 meshes with an idler 18 journaled beneath in the standard 16 and this idler in turn meshes with a gear 19. A stub shaft 20 is fixedly mounted in the standard 16 of the frame and has journaled thereon a shouldered sleeve 201. This sleeve 201 has concentrically secured thereto at the inner end thereof as by a key 202 the large internal gear 21 and the gear 19, while the relatively small external gear 22 is keyed at 203 to the outer end thereof.

The lower roll 1 of the back set of delivery rolls is journaled in a portion of the frame 23 directly in the rear of and in the same plane as the stub shaft 20 and the end of the shaft 24 of this lower roll 1 has secured thereto a shouldered sleeve 240. This sleeve 240 has concentrically secured thereto at the inner end thereof a large internal gear 25 as by a key 251 and to the outer end thereof as by a key 252 a relatively small external gear 26 of the same character as those secured to the sleeve 201. In order to make the machine more compact, the gears 25 and 26 are mounted to the right of the gears 21 and 19 so as to overlap as shown in Fig. 3.

Each internal gear and each external gear has meshing therewith a pinion, these pinions being shown at 27, 28, 29 and 30. Consequently it will be seen that when the pinions 27 and 29 are rotated, the front and back delivery rolls will be driven at the slow speed and, when the pinions 28 and 30 are rotated, at the fast speed, while if either pinion is removed or not operated, the drive of the set of rolls corresponding thereto will be stopped.

The shaft of each pinion by which it is driven is formed in two sections with an interposed clutch. The pinion 27 is secured to the right-hand end of a shaft section 31 and to the opposite end is secured a clutch member 32. This unit consisting of the pinion, shaft section and clutch member is shown as removably mounted in an upright 33 of the frame. For this purpose the bearing for the shaft section 31 is formed half in the upright 33 and half in a removable bearing block 34 bolted at 35 to the standard 33. The construction of these units is preferably the same in each case, that is, the pinion 28 with its shaft section 36 and clutch member 37, the pinion 30 with its shaft section 38 and clutch member 39, and the pinion 29 with its shaft section 40 and clutch member 41 are each removably mounted in the frame. In Fig. 5, to illustrate this, one of these units, such as the pinion 27, shaft section 31 and clutch member 32, together with the bearing block 34, are shown as removed.

The shaft sections 42, 43, 44 and 45 which are aligned respectively with the shaft sections 31, 36, 38, and 40 are journaled in a standard 46 of the frame and have keyed respectively thereto, so as to slide longitudinally thereon, the clutch members 47, 48, 49 and 50 cooperating, respectively, with the clutch members 32, 37, 39 and 41. The clutch members are shown as having suitable cooperating clutch faces herein illustrated as of the toothed or corrugated type.

Suitable means are provided for driving the various pinion shafts with their interposed clutches and for that purpose a system of gearing is illustrated. As shown, a gear 51 journaled at 52 in the frame is driven in any suitable manner by a suitable source of power. This gear has

secured thereto a gear 53 which meshes with and drives a pinion 54 on the left-hand end of the shaft section 42. The pinion 54 meshes with an idler gear 55 journaled in the frame, which in turn meshes with a second idler gear 56 journaled in the frame, which in turn meshes with a pinion 57 on the pinion shaft section 43. The gear 51 also meshes with a gear 58 journaled on a shaft 59. The gear 58 has secured thereto the gear 60 which meshes with and drives a pinion 61 on the left-hand end of the shaft section 44. This pinion 61 meshes with an idler gear 62 journaled in the frame, which in turn meshes with a second idler gear 63 journaled in the frame which in turn meshes with a pinion 64 on the pinion shaft section 45.

It will be obvious that the speed of rotation of the two sets of delivery rolls is determined, in the construction illustrated, by the various gear ratios and particularly that in each case the ratio between the "fast" speed of the delivery rolls and the "slow" speed depends primarily upon the relative sizes of the external and internal gears 22, 21 and 26, 25. The ratio between the gears 22 and 21 on the one hand and 26 and 25 on the other hand may readily be changed since either external gear 26 or 22 may readily be removed from the outer end of its supporting sleeve and the cooperating pinion 29 or 28 may also readily be removed by means of the construction described and an external gear and cooperating pinion of different size substituted therefor.

The trains of gearing leading from the main driving gear 51 to the respective pinion shafts are shown as similar and so arranged that each pinion shaft rotates at the same speed, but this may obviously be altered as desired by changing the gears in the train. As illustrated, for example, in Fig. 2, the gears 51 and 58 are of the same size and character as are also the gears 53 and 60, so that the "fast" speed and "slow" speed of each set of delivery rolls is the same. But special provision is here made to enable the "fast" and "slow" speed of the one set of delivery rolls to be different from the "fast" and "slow" speed of the other set. This is secured by adjustably mounting the shaft 59 in an arc-shaped slot 65 in the frame concentric with the axis of rotation of the gear 51 and making the gear 60 of any desired diameter and removably mounting it upon the shaft 59. This enables the gear 58 always to be in mesh with the gear 51, while by adjusting the shaft 59 up or down in the slot 65, any desired size of gear 60 may be brought into mesh with the pinion 61.

It will now be apparent that by controlling the operation of the clutches interposed in the pinion shafts by which the external gears 22, 26 and the internal gears 21, 25 are driven, the drives of the two sets of delivery rolls are under complete control, thus enabling an infinite variety of fancy twisted yarns to be produced. Various means may be employed within the scope of the invention for thus controlling the operation of these clutching means. Simple and preferred constructions are here illustrated which enable the advantages of the invention to be secured.

In the construction illustrated, a clutch actuator is provided for the pair of clutches for the pinions of each set of delivery rolls and each of these actuators is placed under the control of a suitable pattern-controlled means which may take the form, for example, of a series of cams

or of a pattern chain or chains provided with suitable risers.

The clutch-actuating mechanism for the front set of delivery rolls in its main parts is shown in Fig. 6 and that for the back set of delivery rolls in Fig. 8. The clutch actuator 66 for the front rolls is shown as a lever fulcrumed on the horizontal shaft 67 which is carried by the two-part bracket 68 and 69 bolted together by the bolt 70 and secured by the bolt 71 to the frame. Each arm of the lever 66 is bifurcated and pivotally engages at its ends pins 72 on a collar riding in an annular groove of the clutch member which is keyed to and longitudinally movable on its shaft section. An arm 73 is shown secured to and extending upwardly from and parallel with the actuator 66. A spring 74 connecting the upper end of this arm with the frame acts to move the clutch actuator so as to effect the clutch action of the clutch members 47 and 32 and the unclutching action of the clutch members 48 and 37. The movement of the clutch actuator in the opposite direction is effected by a bell crank lever 75 fulcrumed in the frame at 76 and connected by a link 77 to the lower arm of the actuator and this bell crank lever in turn is operated by the pattern mechanism. The construction and operation of the actuator for the clutches of the back set of delivery rolls, shown in Fig. 8, is similar and needs no detailed description. In this case the clutch actuator lever 78 also fulcrumed on the shaft 67 similarly engages the clutch members 49 and 50 and is provided with a similar upstanding arm 79, also connected by a spring 80 to the frame. This spring acts to effect the clutching action of the clutch members 50 and 41 and the unclutching action of the clutch members 49 and 39. The movement of the clutch actuator 78 to effect the opposite operation is secured by the lever 81 fulcrumed in the frame at 82 and connected by the link 83 to the arm 84 projecting centrally from the clutch actuator. Consequently when the lever 81 is raised by the pattern mechanism, the clutch actuator is rocked in opposition to the spring 80.

The levers 75 and 81 for operating the clutch actuators may be raised to give the required positions of the clutches by a variety of suitable means. In Figs. 7 and 9 a pattern control of the type of a pattern chain provided with risers is illustrated and affords a means for securing any desired operation of the clutches for any desired predetermined periods by changing the position, number and character of the risers on the chain. The pattern chain is shown as running over an idler sprocket 85 and thence over a driven sprocket 86 carried on the shaft 87 and driven by a gear 88 in any suitable manner. As illustrated, the chain is made double so that one part cooperates to move one clutch actuator and the other part the other clutch actuator. The links of the chain are connected by pivots 89 and the links are formed as required to present three types of risers, "Low" as at 90, "High" as at 91, and "Medium" as at 92. The path of the chain is such that the links at one side pass beneath a plunger 93 mounted to slide vertically in a bracket 94 secured to the frame while the links at the other side pass beneath a plunger 95 mounted to slide vertically in the same bracket. The plunger 95 is aligned directly with the end of the lever 75 and acts when moved upward to operate this lever. The plunger 93 is provided with an offset portion 96 engaging a parallel vertically sliding plunger 97 which is aligned with the

lever 81 and consequently the plunger 93 acts through the plunger 97 when moved upwardly to operate the lever 81. It will thus be seen that by suitably arranging the risers as desired on the pattern chain, each clutch actuator may be moved to either extreme position or to a neutral position and that these positions may be maintained for any predetermined period. Consequently with a mechanism of this type a practically infinite number of variations in the twist of the yarn may be secured.

Another form of pattern-controlling mechanism is illustrated in Figs. 1 and 2. In this case a gear 98 driven in any suitable manner drives two cams 99 and 100 secured thereto, the cam 99 passing beneath the plunger 95 and the cam 100 beneath the plunger 93. The periphery of these cams is constructed to give the required movements to the respective levers 75 and 81. While this is a less elastic means than the pattern chain with risers, a very large variety of yarns may be twisted by this mechanism.

The pattern-controlled mechanism of either type may be arranged to move the clutch actuators only between their extreme positions so that when the clutches are in place, one clutch of each pair associated with a set of delivery rolls is always clutched and the other is always unclutched so that there is no neutral position. This is sometimes desirable with certain types of clutches but in such cases it is obvious that neither set of delivery rolls will at any time be stopped. Under such conditions if it is desirable to have one set or the other set of delivery rolls stopped for certain periods, this result is secured by removably mounting the clutch elements and cooperating pinions as described in connection with Fig. 5. This construction enables either of the pinions 27, 28, 29 and 30 with its cooperating clutch element to be removed. Consequently when one of these clutch elements for one set of delivery rolls is removed, the movement of the clutch actuator will cause that set of delivery rolls to run or to stop for predetermined periods and at the fast speed or the slow speed according to which clutch has had its element removed.

The types of pattern control described are merely for the purpose of illustrating the principle of operation and may be varied as desired and in the case of the pattern chain suitable drives and multiplying mechanism may be employed.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. A yarn twister comprising twisting means, two sets of delivery rolls for the yarn strands leading to the twisting means, a shaft for driving each set of delivery rolls, an internal gear and a concentric external gear for and having a driving connection with each of said shafts, a pinion for and meshing with each internal gear, a second pinion for and meshing with each external gear, driving means, clutching means between the driving means and the four pinions, and pattern-controlled means for operating the clutching means simultaneously to clutch either pinion of one set of delivery rolls and either pinion of the other set of delivery rolls to the driving means in each case for predetermined periods.

2. A yarn twister comprising twisting means, two sets of delivery rolls for the yarn strands leading to the twisting means, a shaft for driving each set of delivery rolls, an internal gear and a concentric external gear for and having a driving

connection with each of said shafts, a pinion for and meshing with each internal gear, a second pinion for and meshing with each external gear, driving means, clutching means between the driving means and the four pinions, and pattern-controlled means for operating the clutching means simultaneously to clutch the first pinion of either set of delivery rolls and the second pinion of the other set of delivery rolls to the driving means in each case for predetermined periods.

3. A yarn twister comprising twisting means, two sets of delivery rolls for the yarn strands leading to the twisting means, a shaft for driving each set of delivery rolls, an internal gear and a concentric external gear for and having a driving connection with each of said shafts, a pinion for and meshing with each internal gear, a second pinion for and meshing with each external gear, driving means, clutching means between the driving means and the four pinions, and pattern-controlled means for operating the clutching means simultaneously to clutch either pinion of either set of delivery rolls and neither or either pinion of the other set of delivery rolls to the driving means in each case for predetermined periods.

4. A yarn twister comprising twisting means, two sets of delivery rolls for the yarn strands leading to the twisting means, a shaft for driving each set of delivery rolls, an internal gear and a concentric external gear for and having a driving connection with each of said shafts, a pinion for and meshing with each internal gear, a second pinion for and meshing with each external gear, driving means, a clutch for each of said pinions movable to clutch its pinion to or unclutch it from the driving means, a clutch actuator for each pair of clutches for the pinions of each set of delivery rolls, and pattern-controlled means for operating the two clutch actuators to cause each actuator to move either one of its clutches into clutching position and the other into unclutching position in each case for predetermined periods.

5. A yarn twister comprising twisting means, two sets of delivery rolls for the yarn strands leading to the twisting means, a shaft for driving each set of delivery rolls, an internal gear and a concentric external gear for and having a driving connection with each of said shafts, a pinion for and meshing with each internal gear, a second pinion for and meshing with each external gear, driving means, a clutch for each of said pinions movable to clutch its pinion to or unclutch it from the driving means, a clutch actuator for each pair of clutches for the pinions of each set of delivery rolls, and pattern-controlled means for operating the two clutch actuators to cause either actuator to move either one of its clutches into clutching position and the other into unclutching position or both into unclutching position in each case for predetermined periods.

6. A yarn twister comprising twisting means, two sets of delivery rolls for the yarn strands leading to the twisting means, a shaft for driving each set of delivery rolls, an internal gear and a concentric external gear for and having a driving connection with each of said shafts, a pinion for and meshing with each internal gear, a second pinion for and meshing with each external gear, driving means, and a separate two-element clutch between the driving means and each of the four pinions.

7. A yarn twister comprising the construction and arrangement defined in claim 6, together with means for removably mounting one element of each clutch thus to enable the drive through said clutch to be stopped by the removal of said element.

8. A yarn twister comprising the construction and arrangement defined in claim 6, together with means for removably mounting one element of one of the two clutches for the drive for each set of delivery rolls thus to enable the drives through said clutches to be stopped by the removal of said elements.

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