March 28, 1939. W. I. TAYLOR ET AL 2,152,222

MEANS FOR EFFECTING INTERMITTENT TREATMENT OF RUNNING YARNS AND THE LIKE

Filed Sept. 18, 1937 2 Sheets-Sheet 1

FIG. 1

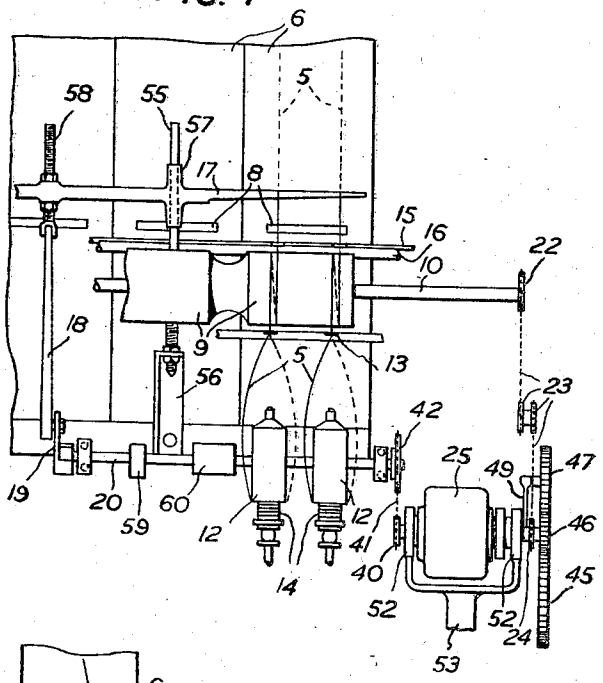
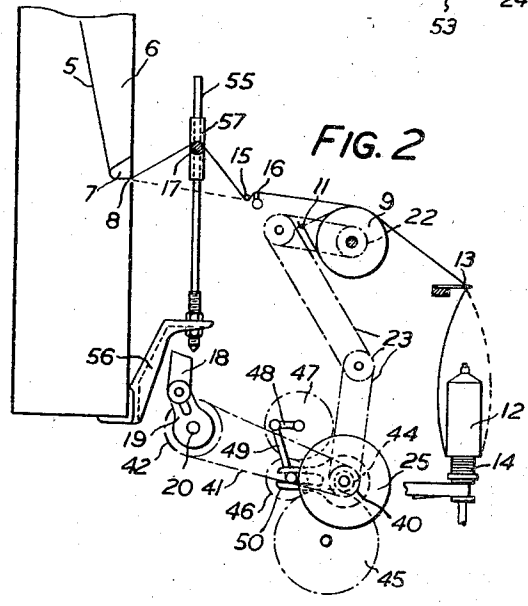


FIG. 2



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FIG. 3

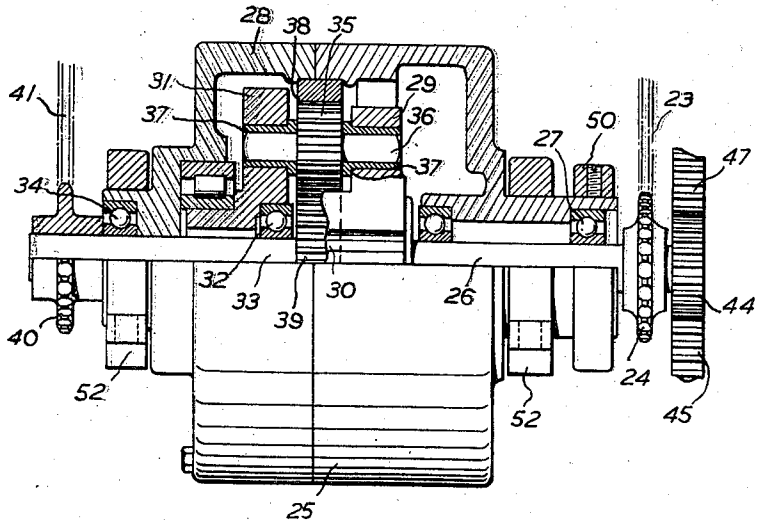
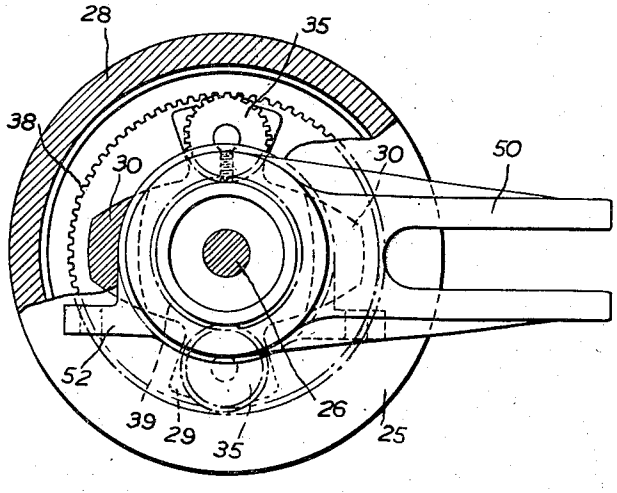


FIG. 4



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2,152,222

MEANS FOR EFFECTING INTERMITTENT TREATMENT OF RUNNING YARNS AND THE LIKE

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Application September 18, 1937, Serial No. 164,444
In Great Britain September 26, 1936

11 Claims. (Cl. 117—22)

This invention relates to the intermittent treatment of running yarns, filaments and the like, the object of the invention being to effect intermittent treatments of such materials which, if they recur at all, do so only after relatively long lengths of the materials have been treated.

According to the invention means for intermittently treating a running yarn or the like, hereafter referred to as "yarn", comprises a yarn-engaging member movable in a direction transverse to the path of the yarn, an epicyclic gear adapted to move said member at intervals, and a speed-controlling member in association with said epicyclic gear and adapted to vary the rate of operation of the gear so as to vary the frequency of movement of the yarn-engaging member. Thus, one moving part of the epicyclic gear may be given a rocking motion with respect to another. A member driven by the epicyclic gear is thus given an irregular motion and thus is enabled to treat the yarn in such a manner that the intermittently treated portions do not recur in such a way as to form undesired "patterns" when the yarn is made into fabric. For example, the invention may be used in conjunction with the production of variable denier yarn as described in U. S. Patent No. 1,898,085, according to which artificial filaments are subjected to a variable drawing action during their production so that thin and thick places are formed in alternation in the yarn.

This variable drawing action may be effected by means of a bar reciprocated so as to divert the path of the filaments in a spinning machine and cause a consequent increase and decrease to greater or lesser degrees in the length of the path followed by the filaments issuing from the jet. The bar is conveniently operated from a crank which, according to the present invention, is driven from a planetary gear, the gear in turn being driven at any desired speed and conveniently from the driving means to the feed roller of the spinning machine. Also driven by or in conjunction with a planetary gear is a gear train terminating in a crank connected to part of the planetary gear, for example either the housing of the gear or the wheels meshing with the internal gear inside the housing. The oscillatory motion imparted by the crank may be relatively slow as compared with the rate of rotation of the crank driving the yarn diverting bar. Because of the oscillatory motion applied to part of the planetary gear, the driving of the crank is not steady but varies in an irregular way over a cycle of considerable length. The frequency with which the yarn is diverted is therefore uneven so that the portions of the yarn receiving the irregular drawing action are not regular in occurrence.

A form of apparatus according to the invention will now be described in greater detail with reference to the accompanying diagrammatic drawings of which:

Fig. 1 is a front elevation of the apparatus shown applied to a portion of a dry spinning machine;

Fig. 2 is a part cross-sectional end elevation of the apparatus shown in Fig. 1; and

Figs. 3 and 4 are part cross-sectional front and end elevations, respectively, of a detail of Figs. 1 and 2.

Referring to Figs. 1 and 2, filamentary bundles or yarns 5 extruded from jets (not shown) disposed in cells 6 of a dry spinning machine pass over a guide 7 and through a "letter-box" opening 8 formed in each cell. From the openings 8 the yarns proceed to a common godet roller 9 mounted on a driving shaft 10, each yarn being guided around the roller by a back guide 11 prior to passing to a cap twisting device 12 by way of a balloon guide 13. The yarns are thus drawn from the spinning cells 6 by the godet roller 9 which forwards the yarns to the cap twisting device 12, each yarn being twisted by a corresponding device 12 and wound by the device on a bobbin 14. In proceeding from the opening 8 to the godet roller 9 each yarn passes under a guide rod 15 and in contact with a wick lubricating device 16 arranged near to the guide rod.

Disposed transversely with respect to the path of the yarns between the openings 8 and the guide rod 15 is a deflecting bar 17 which is raised and lowered at intervals (in a manner to be described later) by a connecting rod 18 operated by a crank 19 secured to a shaft 20. On being raised, the deflecting bar 17 engages the yarns and causes them to follow a longer path between the openings 8 and the guide rod 15 (see Fig. 2) the sudden lengthening of the path subjecting the yarns to added tension which results in the forming in each yarn, of a length of reduced denier. On lowering of the bar the yarns are permitted to follow a straight path (indicated by a dotted line in Fig. 2) between the openings 8 and the guide rod 15, the consequent reduction in the tension in the yarns allowing of the yarns resuming a greater denier. The deflecting bar 17 is formed with a polished surface in order to avoid damaging the yarns.

In the manner described above the yarns are formed with portions of greater denier alternating with portions of reduced denier along their length, the portions of greater denier imparting a slub effect to the yarns. The incidence of the reduced portions depends on the frequency with which the deflecting bar 17 is raised and lowered, regular raising and lowering of the deflecting bar 17 producing correspondingly regular portions of reduced denier in the yarns. Such regularity, however, may result in the formation of undesirable "patterns" in fabric containing the yarn, and in order to destroy the regularity, and thus enable pattern-free fabrics to be produced, the rate of movement of the deflecting bar 17 is constantly varied throughout the yarn-forming operation in such a manner that if a repeat does occur in the incidence of the portions of greater and less denier along the yarns such repeat appears only after relatively long lengths of the yarns have been treated.

The deflecting bar 17 is therefore driven in the following manner:

A chain sprocket 22 mounted on the godet roller shaft 10 drives through chain and sprocket gearing 23 the driving sprocket 24 of an epicyclic gear box, generally indicated by the reference numeral 25 (see in particular Figs. 3 and 4). The sprocket 24 is mounted on a shaft 26 supported in ball-bearings 27 housed within the casing 28 of the gear box, the shaft driving a rotatable member 29 which is secured to the shaft.

The member 29 is joined by arms 30 to a further rotatable member 31 which rides in a ball-bearing 32 mounted on the driven shaft 33 of the gear box, the driven shaft being supported in the bearing 32 and in a further bearing 34 housed in the casing 28. The two rotatable members 29, 31 support between them two planetary gears 35 mounted on spindles 36 which are rotatably borne in bushes 37 formed in the members. The member 29 is of smaller diameter than the member 31 for ease of assembly in the gear box.

The planetary gears 35 engage both the teeth of an inverted annular rack 38 secured in the casing 28 and a central sun wheel 39 which is secured to the driven shaft 33, the planetary gears thus transmitting drive from the driving shaft 26 to the driven shaft 33 at a rate which can be varied by movement of the annular rack 38. The driven shaft drives by means of a chain sprocket 40 and chain 41 a sprocket 42 secured to the end of the crank shaft 20, and in this manner the deflecting bar 17 is caused to be raised and lowered during the passage of the yarns 5 from the spinning cells 6.

In order to vary the rate of movement of the deflecting bar 17 a pinion 44 secured to the end of the driving shaft 26 of the gear box 25, drives a gear wheel 45, the gear wheel 45 driving in turn through an intermediate pinion 46 a further gear wheel 47 to which is attached a crank 48. The crank is connected by a connecting rod 49 to a bifurcated arm 50 secured to the casing 28 of the gear box 25.

In this manner the gear box 25, which is rotatably mounted in bearings 52 supported by a bracket 53, is caused to rock in its bearings while driving the deflecting bar 17. Rocking of the gear box (and consequently the rack 38) in the direction of rotation of the shaft 26 positively accelerates the rate of rotation of the driven shaft 33 and hence the rate of movement of the deflecting bar 17, while rocking of the box in the direction opposite to that of the rotation of the shaft 26 negatively accelerates the rate of rotation of the shaft 26 and thus retards the rate of movement of the deflecting bar 17.

The rate of movement of the bar is thus alternately increased above and decreased below a mean value which obtains only when the gear-casing 27 is momentarily stationary at the end of each rocking movement, the continued variation being sufficient to prevent regularity in the incidence of the portions of reduced and increased denier in the yarns. In other words, the apparatus functions in a manner such that exactly similar tensioning cycles, if occurring at all, occur only after relatively long lengths of the yarns have been treated, and are insufficient to create pattern effects in fabrics formed from the yarns.

The deflecting bar 17 is guided in a vertical path by guide bars or spindles 55 mounted on brackets 56 and sliding within elongated sleeves 57 formed in the bar. The height of the deflecting bar relatively to the connecting rod 18 may be adjusted by a screw device 58 in order to regulate the degree of tension to which the yarns 5 are subjected.

While the deflecting bar 17 is shown applied to a part only of a spinning machine and to be driven by a single crank 19, it will be understood that the bar could be extended along the whole length of the machine so as to operate on all the yarns produced in the machine, the shaft 20 being lengthened accordingly and equipped with an appropriate number of cranks 19.

In order to neutralize the unbalancing effect on the shaft 20 of the movement of the bar 17 the shaft is provided with an eccentrically mounted balance boss 59, and a heavy boss 60 which has the effect of a fly-wheel on the shaft.

The varying of the rate of movement of the deflecting bar 17 may be increased or reduced by varying the position of the pivot of the connecting rod 49 in the bifurcated arm 50 attached to the casing of the gear box 25. Thus by setting the pivot near the outer end of the arm the gear box 25 will be caused to rock through a greater angle, and by setting the pivot nearer to the gear box (i. e. towards the left in Fig. 4) the gear box will be caused to rock through a less angle. Further variation may be obtained by slightly varying the rate of rotation of the godet roller shaft 10. A small variation in the rate of rotation of the shaft 10, while being insufficient to bring about any substantial change in the denier of the yarns spun, may, nevertheless, produce an appreciable variation in the rate of movement of the deflecting bar 17.

While the above description has been directed more particularly to the intermittent stretching of yarns in the course of their production, it will be understood that similar apparatus could be employed in the stretching of yarns in a bobbin-to-bobbin or like operation. Again, the invention may be applied in a similar manner to other operations for the intermittent treatment of yarns, as, for example, intermittent dyeing, intermittent application of sizes or other resists, and the intermittent saponification of cellulose acetate or other cellulose ester yarns.

Having described our invention, what we desire to secure by Letters Patent is:

1. Apparatus for intermittently treating a running yarn, comprising a yarn-engaging member, an epicyclic gear adapted to move said member in a direction transverse to the path of the yarn so as to displace said path at intervals, and

a speed-controlling member in association with said epicyclic gear and adapted to vary the rate of operation of the gear so as to vary the frequency of movement of the yarn-engaging member.

2. Apparatus for intermittently treating a running yarn, comprising a movable yarn-engaging member in a direction transverse to the path of the yarn so as to displace said path, a crank for operating said member, an epicyclic gear adapted to rotate the crank so as to move the yarn-engaging member at intervals, and a speed-controlling member in association with said epicyclic gear and adapted to vary the rate of operation of the gear so as to vary the frequency of movement of the yarn-engaging member.

3. Apparatus for intermittently treating a running yarn, comprising a movable yarn-engaging member, an epicyclic gear adapted to move said member in a direction transverse to the path of the yarn so as to displace said path at intervals, said gear comprising a portion capable of rocking relatively to the rest of the gear so as to impart positive and negative acceleration in turn to the gear, and means for rocking said portion of the gear so as to vary the frequency of movement of the yarn-engaging member.

4. Apparatus for intermittently treating a running yarn, comprising an epicyclic gear adapted to move said member in a direction transverse to the path of the yarn so as to displace said path at intervals, said gear comprising a portion capable of rocking relatively to the rest of the gear so as to impart positive and negative acceleration in turn to the gear, means for rocking said portion of the gear so as to vary the frequency of movement of the yarn-engaging member, and means for regulating the angle through which said portion is rocked.

5. Apparatus for intermittently treating a running yarn, comprising a movable yarn-engaging member, an epicyclic gear adapted to move said member in a direction transverse to the path of the yarn so as to displace said path at intervals, said gear comprising an annular gear in engagement with the planetary wheels of the epicyclic gear, said annular gear being capable of rocking relatively to the planetary wheels so as to impart positive and negative acceleration in turn to such wheels, and means for rocking the annular gear so as to vary the frequency of movement of the yarn-engaging member.

6. The combination with a spinning machine of a movable bar disposed near the yarn outlet of the machine, an epicyclic gear adapted to move the bar in a direction transverse to the path of the yarn so as to displace said path at intervals so as to draw the yarn from the machine at varying linear speeds, and a speed-controlling member in association with said epicyclic gear and adapted to vary the rate of operation of the gear so as to vary the frequency of movement of the yarn-engaging bar.

7. The combination with a spinning machine of a movable bar disposed near the yarn outlet of the machine, an epicyclic gear adapted to move the bar in a direction transverse to the path of the yarn so as to displace said path at intervals so as to draw the yarn from the machine at varying linear speeds, means for transmitting drive from the feed roller of the spinning machine to the gear and a speed controlling member in association with said epicyclic gear and adapted to vary the rate of operation of the gear so as to vary the frequency of movement of the yarn-engaging bar.

8. The combination with a spinning machine of a movable bar disposed near the yarn outlet of the machine, an epicyclic gear adapted to move the bar in a direction transverse to the path of the yarn so as to displace said path at intervals so as to draw the yarn from the machine at varying linear speeds, means for transmitting drive from the feed roller of the spinning machine to the gear and a speed-controlling member in association with the gear and adapted to vary the rate of operation of the gear so as to vary the frequency of movement of the yarn-engaging bar, and means for transmitting drive from the feed roller of the spinning machine to the speed-controlling member.

9. The combination with a spinning machine of a movable bar disposed near the yarn outlet of the machine, an epicyclic gear adapted to move the bar in a direction transverse to the path of the yarn so as to displace said path at intervals so as to draw the yarn from the machine at varying linear speeds, said gear comprising an annular gear in engagement with the planetary wheels of the epicyclic gear, said annular gear being capable of rocking relatively to the planetary wheels so as to impart positive and negative acceleration in turn to such wheels, and means for rocking the annular gear so as to vary the frequency of movement of the yarn-engaging bar.

10. The combination with a spinning machine of a movable bar disposed near the yarn outlet of the machine, an epicyclic gear adapted to move the bar in a direction transverse to the path of the yarn so as to displace said path at intervals so as to draw the yarn from the machine at varying linear speeds, said gear comprising an internal annular gear in engagement with the planetary wheels of the epicyclic gear, said annular gear being capable of rocking relatively to the planetary wheels so as to impart positive and negative acceleration in turn to such wheels, means for transmitting drive from the feed roller of the spinning machine to the gear, a crank for rocking the annular gear so as to vary the frequency of movement of the yarn-engaging bar, and means for transmitting drive from the feed roller of the spinning machine to the crank.

11. Apparatus for intermittently treating a running yarn, comprising a yarn-engaging member, an epicyclic gear adapted to move said member in a direction transverse to the path of the yarn so as to displace said path at intervals, said epicyclic gear comprising an annular gear secured within a casing, the casing being supported in bearings so as to be free to rock and thus rock the annular gear relatively to the rest of the gear so as to impart positive and negative acceleration in turn to the gear and means for rocking said annular gear so as to vary the frequency of movement of the yarn-engaging member.

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ALFRED HERBERT WOODRUFF.

CERTIFICATE OF CORRECTION.

Patent No. 2,152,222. March 28, 1939.

WILLIAM IVAN TAYLOR, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, lines 8 and 9, claim 2, strike out the words "in a direction transverse to the path of the yarn so as to displace said path" and insert the same after "member", line 12, same claim; line 29, claim 4, after "comprising" insert the words and comma a movable yarn-engaging member,; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of May, A. D. 1939.

Henry Van Arsda
Acting Commissioner of Patents.

(Seal)