Feb. 20, 1968 H. WHITTAKER ET AL 3,369,764

BUILDER MOTION FOR TEXTILE MACHINES

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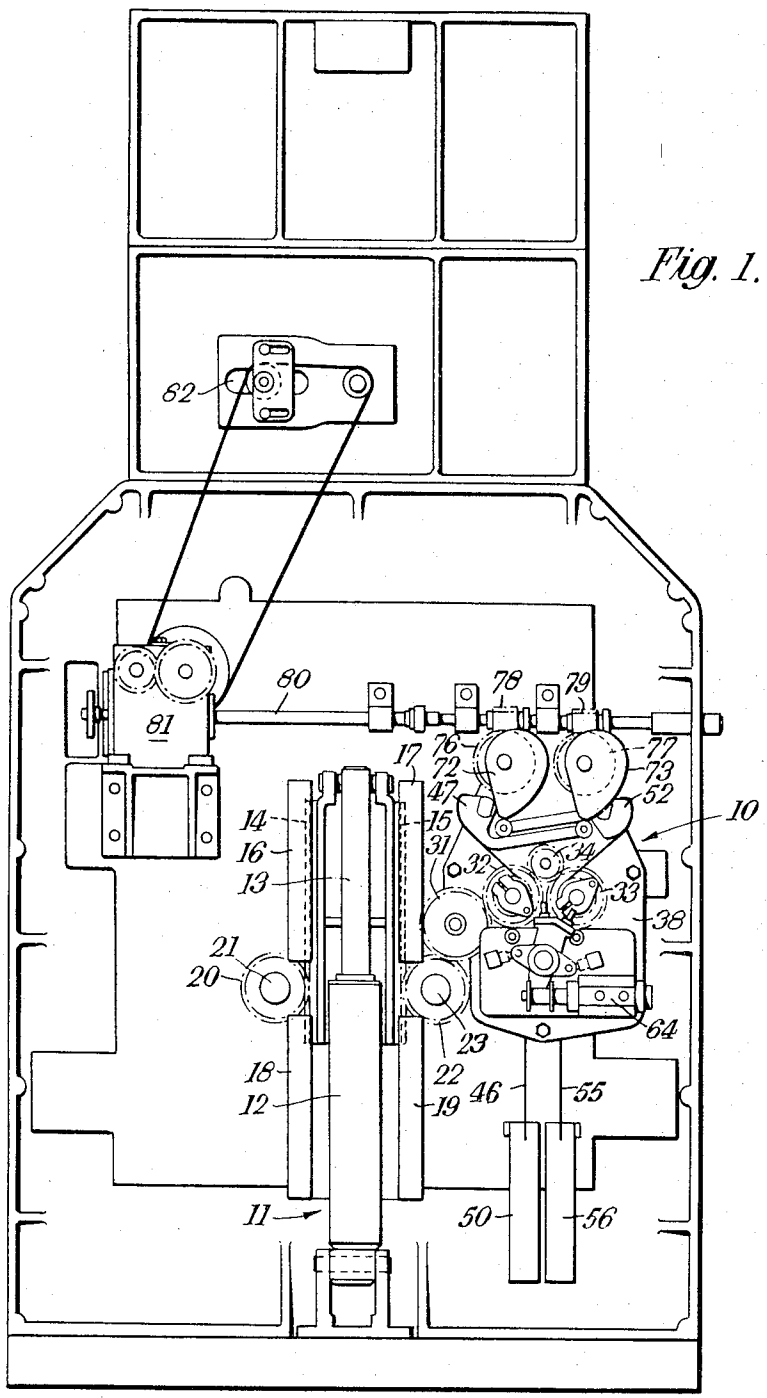



Fig. 1.

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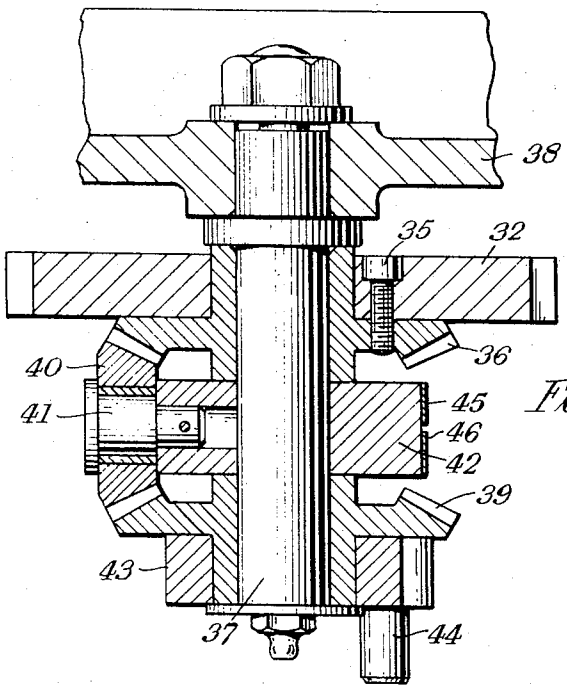



Fig. 4

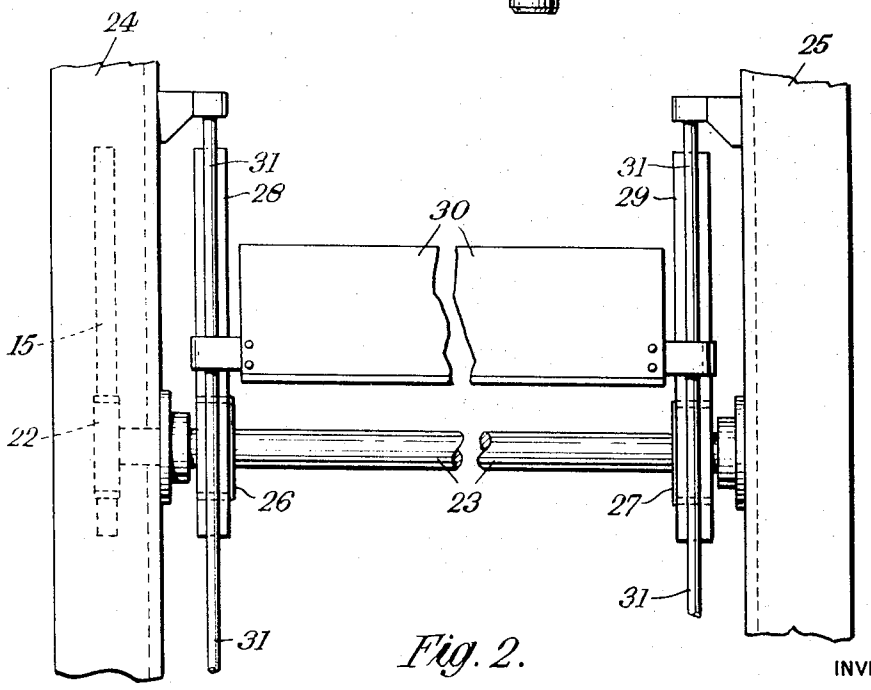



Fig. 2.

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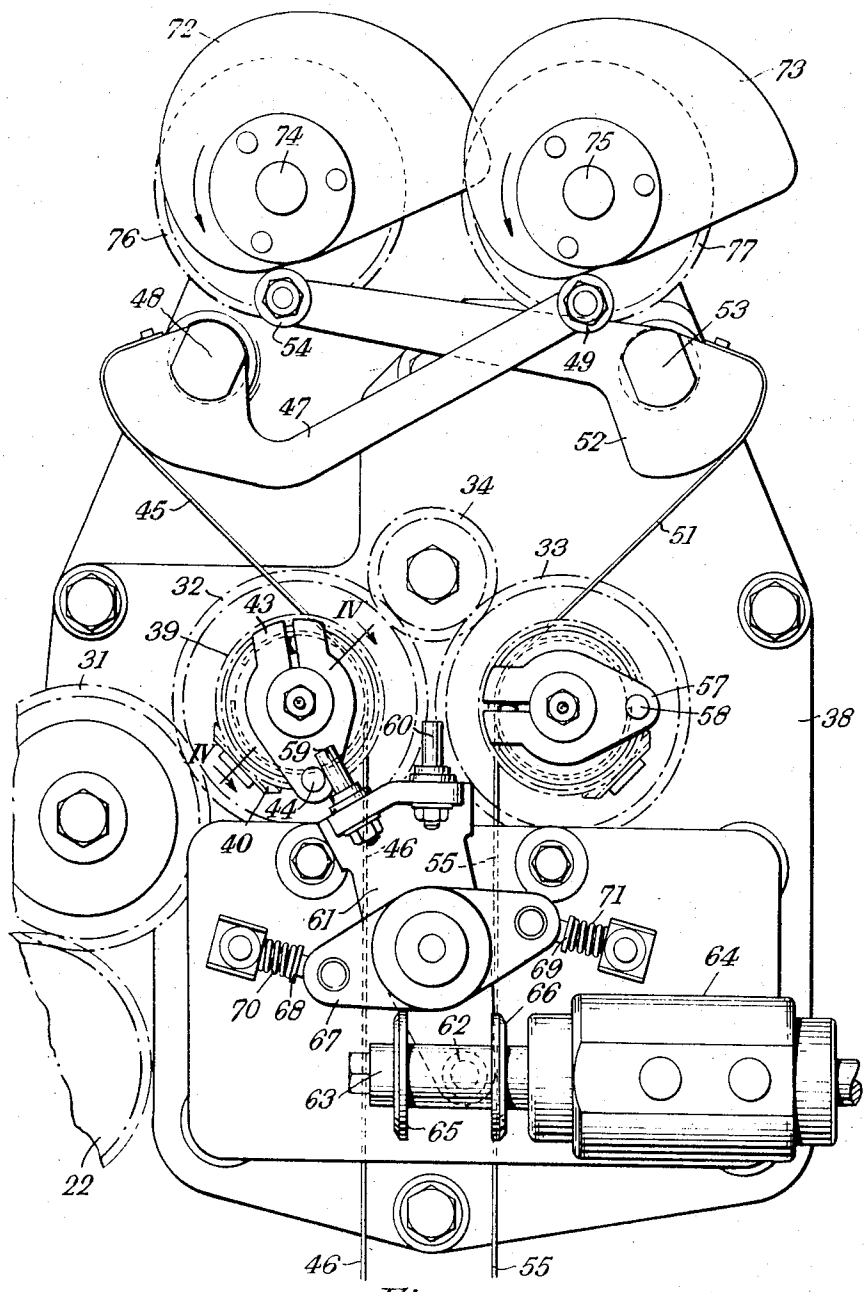



Fig. 3.

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United States Patent Office 3,369,764
Patented Feb. 20, 1968



3,369,764

# BUILDER MOTION FOR TEXTILE MACHINES

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Filed Mar. 28, 1966, Ser. No. 537,947
11 Claims. (Cl. 242—26.3)

## ABSTRACT OF THE DISCLOSURE

The invention provides a builder motion for a textile machine, said builder motion including a traverse rail drive switchable between first and second conditions in which said rail is driven in one direction and in the opposite direction respectively. Means for switching said drive alternately from one condition to the other which comprises two differential mechanisms each having a first rotary input member oscillated in synchronism with said rail, a second rotary input member responsive to a build adjusting mechanism, and a rotary output member. The two rotary output members, one in each differential mechanism, respectively initiate switching of said rail drive from said first to said second condition, and from said second to said first condition.

The present invention relates to builder motions for textile machines of the type in which yarn or filament is wound on to a bobbin and caused relatively to advance therealong to form a package by the traversing of a traverse rail.

On some ring spinning and twisting machines and particularly on drawtwisters it is desirable that provision should be made for building packages of different types and it is an object of the present invention to provide a builder motion of the type specified, which will facilitate the production of a variety of different builds.

According to the present invention, there is provided a builder motion for a textile machine of the type specified, comprising a traverse rail drive which can be switched between a first condition in which it imparts a drive to the traverse rail in one sense and a second condition in which it imparts a drive to the rail in the opposite sense, and switching means for switching the drive alternately from one of its conditions to the other, said switching means comprising two differential mechanisms each having a first rotary input member arranged to be oscillated in synchronism with the movement of the traverse rail, a second rotary input member responsive to a build adjusting mechanism and a rotary output member, the rotary output member of one of the mechanisms initiating the switching of the traverse rail drive from the first condition to the second condition and the rotary output member of the other mechanism initiating the switching of the traverse rail drive from the second condition to the first condition.

The build adjusting mechanism may with advantage comprise a cam operated from a rotary member of the machine and arranged to displace a cam follower causing a predetermined turning movement of the second rotary input member. The cam is preferably driven from the rotary member of the machine through an arrangement of gears which can readily be interchanged for the purpose of modifying the build of the package.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawing in which:

FIG. 1 is an end elevation of a drawtwister embodying a builder motion according to the invention,

FIG. 2 is a broken scrap view showing one of the traverse rails of the drawtwister shown in FIG. 1,



FIG. 3 is an end elevation of the builder motion shown in FIG. 1, drawn to a larger scale, and

FIG. 4 is a section taken on the line IV—IV in FIG. 3.

Referring first to FIG. 1, this shows a builder motion **10**, according to the invention, mounted at the end of a drawtwister in which drawn synthetic filaments are conventionally wound on to packages on vertical rotary spindles by means of rings and travellers carried by a ring on each side of the machine to which a variable traverse is imparted by the builder motion. The drive for the builder motion is provided by a hydraulic ram **11** comprising a cylinder **12** and a piston element **13**. The lower end of the cylinder **12** is anchored to the machine frame and the upper end of the piston element **13** is connected to two racks **14** and **15** which are guided for vertical reciprocatory movement in upper guide channels **16** and **17** and lower guide channels **18** and **19**. The rack **14** is engaged by a pinion **20** fixedly mounted on the end of a horizontal driving shaft **21** which extends the full length of the machine, and the rack **15** is engaged by a pinion **22** likewise fixedly mounted on the end of a further horizontal driving shaft **23** extending the full length of the machine. As shown in FIG. 2, the shaft **23** is rotatably supported at its end in frame members **24** and **25** and has fixedly mounted thereon pinions **26** and **27** which drivingly engage vertically arranged racks **28** and **29** supporting the ends of a ring rail **30** which is guided for vertical reciprocating movement on guide rods **31** secured to the machine frame.

In operation, hydraulic fluid is alternately fed to one side and then the other side of the piston element **13**, causing the piston element **13** to raise and lower the racks **14** and **15**. The pinions **20** and **22** are thus rotated first in one sense and then in the opposite sense, the oscillatory motion imparted to the shaft **23** serving to reciprocate the racks **28** and **29** and cause the raising and lowering of the ring rail **30** and the oscillatory motion imparted to the shaft **20** serving to reciprocate corresponding racks for the other ring rail and cause the raising and lowering thereof.

The pinion **22** as best seen in FIG. 3 drivingly engages an idler pinion **31** which transmits the oscillatory motion of the pinion **22** to a pair of gear wheels **32** and **33** drivingly interconnected by an idler pinion **34**. The gear wheel **32** is, as shown in FIG. 4, anchored by a screw **35** to a bevel gear wheel **36** rotatably mounted on a stub axle **37** secured to a back plate **38**. The bevel gear wheel **36** forms part of a differential comprising a further bevel gear wheel **39** rotatably mounted on the stub axle **37** and a bevel pinion **40** rotatably mounted on a shaft **41** extending radially from a drum **42** rotatably mounted on the axle **37**. The bevel gear wheel **39** is provided with an arm **43** which is secured thereto and which is fitted with an actuating pin **44**. The drum **42** has secured thereto the ends of two steel tapes **45** and **46**. The tape **45**, as shown in FIG. 3, extends upwardly from the drum and is secured at its upper end to a cam follower arm **47** pivotally mounted on a shaft **48** and carrying a cam bowl **49**. The steel tape **46**, as shown in FIG. 1, depends from the drum and supports a weight **50**.

Referring to FIG. 3, the gear wheel **33** is fixedly mounted on a bevel gear wheel of a further differential of the form shown in FIG. 4, the drum of the further differential being provided with a steel tape **51** corresponding to the tape **45** and secured to a cam follower arm **52** pivoted on a shaft **53** and carrying a cam bowl **54**, and a further steel tape **55** supporting, as shown in FIG. 1, a weight **56**. The output bevel pinion of the further differential is provided with an arm **57** carrying an actuating pin **58**.

Referring again to FIG. 3 the actuating pins **44** and **58** engage in turn a pair of abutments **59** and **60** at the re-

spective ends of the oscillation of the gear wheels 32 and 33. The two abutments 59 and 60 are mounted side by side on one end of a lever 61 pivoted near its middle on the back plate 38 and provided at its opposite end with a bowl 62 which is arranged to move the stem 63 of a slide valve 64 by engaging one or the other of a pair of collars 65 and 66 disposed on the stem 63. A quick change over of the position of the slide valve 64 is achieved by a second lever 67 secured to the lever 61 and extending at right angles across the pivot axis, each end of the lever 67 being connected to fixed points on the back plate 38 by extensible links 68 and 69 urged into the extended position by springs 70 and 71. When one of the pins 44 and 58 engages its respective abutment 59 or 60 it moves the two levers 61 and 67 about the pivot and when the lever 67 is thereby moved past its dead centre position a toggle effect is provided by the extensible links 68 and 69 which rapidly urges the bowl 62 into contact with one of the collars 65 and 66 to move the stem 63 of the slide valve 64 to one of its end positions.

The slide valve 64 controls the flow of fluid to the ram 11 which operates the ring rail 30 so that when the valve 64 is changed over in the manner just described the fluid flows to the opposite side of the piston element 13 of the ram 11 and reverses the direction of movement of the rail 30.

The points of reversal at the top and bottom of the traverse are determined by the points at which the pins 44 and 58 engage their respective abutments 59 and 60 and effect change over of the valve 64.

Referring to FIG. 4, in the absence of any turning movement of the drum 42 the oscillatory motion of the gear wheel 32 is transmitted through the planet bevel pinion 40 to the bevel pinion 39, causing the actuating pin 44 to move in an arcuate path with a constant regular stroke, the oscillatory motion of the gear wheel 33 imparting a like motion to the actuating pinion 58 but in opposition to the pin 44. Such motion of the pins 44 and 58 would cause the slide valve 64 to switch over as the ring rail 30 reaches a predetermined uppermost point and a predetermined lowermost point, and would result in a constant traverse of the rail.

In order to provide a build with tapered ends, the traverse of the ring rail must be gradually reduced. This is achieved by imparting to the drum 42 a continuous slow turning movement which will cause the arm 43 to advance and bring the pin 44 to a position in which it causes an earlier switching over of the valve 64, the drum associated with the differential driving the pin 58 likewise being rotated to advance the pin 58. The required turning movement of the drum is effected by the angular turning of the cam follower arms 47 and 52 controlled by cams 72 and 73 fixed on shafts 74 and 75, which as shown in FIG. 1 carry worm wheels 76 and 77 driven by worms 78 and 79 fixed on a cross shaft 80 driven from a reduction gear box 81, the input to which is provided by the drive to the draw roll 82 of the machine.

The building motion as illustrated is set out to provide a warp or roving type build in which each successive chase on the bobbin is gradually reduced in length. In one complete bobbin build the cams 72 and 73 are driven through only part of a revolution so that only the curved portion of each cam surface engages the cam bowl. The effect of this cam action will be to gradually move actuating pins 44 and 58 towards each other so that the reversal point at each end of the traverse will occur earlier on each successive stroke throughout the build. Cams of any desired shape may be employed. The cam surface may be shaped to control the build through one part of a revolution or the cam may make several revolutions to give a repetition of a certain building operation throughout the build. A circular cam may if desired be employed so that there will be no gradual advance of the pins 44 and 58 and the ring rail will be reversed at the same position after each excursion. The gear box 81 is preferably made such that the reduction ratio can readily be changed to provide any one of a variety of time cycles for the rotation of the cams 72 and 73 to suit various builds.



What we claim as our invention and desire to secure by Letters Patent is:

1. A builder motion for a textile machine of the type specified, comprising a traverse rail drive which can be switched between a first condition in which it imparts a drive to the traverse rail in one sense and a second condition in which it imparts a drive to the rail in the opposite sense, and switching means for switching the drive alternately from one of its conditions to the other, said switching means comprising two differential mechanisms each having a first rotary input member arranged to be oscillated in synchronism with the movement of the traverse rail, a second rotary input member responsive to a build adjusting mechanism, and a rotary output member, the rotary output member of one of the differential mechanisms initiating the switching of the traverse rail drive from the first condition to the second condition and the rotary output member of the other differential mechanism initiating the switching of the traverse rail drive from the second condition to the first condition.

2. A builder motion according to claim 1, wherein said rotary output member includes a pin mounted eccentrically with respect to the rotary axis of the output member and adapted upon turning movement of the latter to deflect a control element initiating the switching of the traverse rail drive.

3. A builder motion according to claim 2, wherein the control element when deflected moves to either of two rest positions under the control of a mechanism ensuring a quick change over from one position to the other.

4. A builder motion according to claim 2, wherein the drive to the traverse rail comprises hydraulic ram means which in said first condition is fed with pressure fluid to impart a drive to the traverse rail in one sense and in said second condition is fed with pressure fluid to impart a drive to the traverse rail in the opposite sense, and wherein said control element serves to operate a pilot valve controlling the feeding of pressure fluid to the hydraulic ram means.

5. A builder motion according to claim 2, wherein the control element is provided with spaced studs one of which is adapted to be engaged by the eccentrically located pin on the rotary output member of one of the differential mechanism to cause displacement of the control element to one of its two rest positions and the other of which is adapted to be engaged by an eccentrically located pin on the rotary output member of the other differential mechanism to cause displacement of the control element to the other of the two positions.

6. A builder motion according to claim 1, wherein the first rotary input member of each differential mechanism comprises an input bevel gear wheel mounted for rotation about a predetermined axis and arranged to be oscillated in synchronism with the movement of the traverse rail, wherein the rotary output member of the differential mechanism comprises an output bevel gear wheel mounted for rotation about the said predetermined axis and spaced from the input bevel gear wheel, and wherein the secondary rotary input member comprises a planetary bevel pinion meshing with the input and output bevel gear wheels and rotatably mounted on a rotary input element for rotation about an axis passing through said predetermined axis at right angles thereto, said rotary input element being mounted for rotation about said predetermined axis.

7. A builder motion according to claim 6, wherein said rotary element comprises a drum to which are secured and upon which are wound in opposite senses the ends of two elongate flexible elements, one of which extends from the drum and is secured at its other end to a cam

follower and the other of which extends from the drum in the opposite sense and is subjected to a biasing force maintaining it under tension.

**8.** A builder motion according to claim **7**, wherein the said other of the flexible elements supports a weight providing said biasing force.

**9.** A building motion according to claim **1**, wherein a separate build adjusting mechanism is provided for controlling the movement of the second rotary input member of each of the differential mechanisms.

**10.** A builder motion according to claim **1**, wherein the build adjusting mechanism comprises a cam operated from a rotary element of the machine and arranged to displace a cam follower to cause a predetermined turning movement of the secondary rotary input member.



**11.** A builder motion according to claim **10**, wherein said cam is driven from the rotary element of the machine through an arrangement of gears which can be interchanged for the purpose of modifying the build of a package.


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