United States Patent [19]

Matsunaga

[11] **3,871,196**

[45] **Mar. 18, 1975**

[54] **APPARATUS FOR CONTINUOUSLY PRINTING YARNS WITH SPLASHED PATTERN OF RANDOM PITCHES**

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[73] Assignee: **Hanegafuchi Boseki Kabushiki Kaisha,** Tokyo, Japan

[22] Filed: **Aug. 22, 1973**

[21] Appl. No.: **390,529**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 213,006, Dec. 28, 1971, abandoned.

[52] **U.S. Cl.** **68/203,** 101/172, 118/247

[51] **Int. Cl.** **B05c 1/08**

[58] **Field of Search** 68/203; 8/14, 149; 101/172; 118/247

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Primary Examiner—Billy J. Wilhite
Assistant Examiner—Philip R. Coe
Attorney, Agent, or Firm—Woodhams, Blanchard and Flynn

[57] **ABSTRACT**

Yarns are running in their longitudinal directions. At different positions along the running yarns are provided, in pairs, a dye carrying roller and a yarn pressing roller, each pair facing the yarns at opposite sides thereof. A plurality of rotary drums are associated with said pairs, respectively, rotating at different speeds relative to each other, each of said rotary drums having circumferentially spaced projecting ridges defining a periodic pattern program. A limit switch associated with its mating drum is actuated by the ridges according to this pattern, generating a control signal, to actuate the pressing roller thereby printing the running yarns. Overlapping of prints is prevented upon detection of the previously printed drum pattern(s) by additional limit switches provided on the drums excepting the last drum.

5 Claims, 13 Drawing Figures

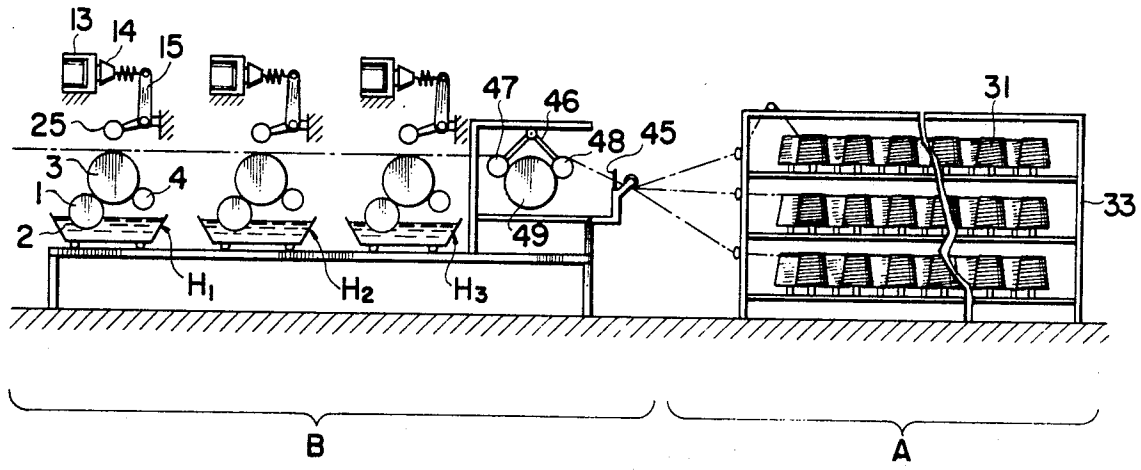


FIG. 1 PRIOR ART

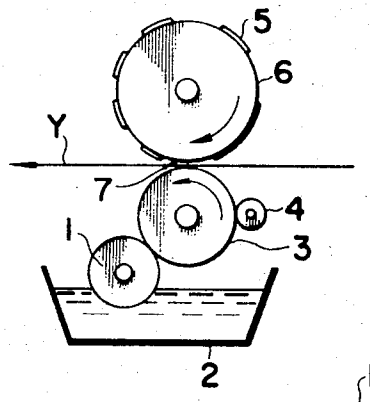


FIG. 2

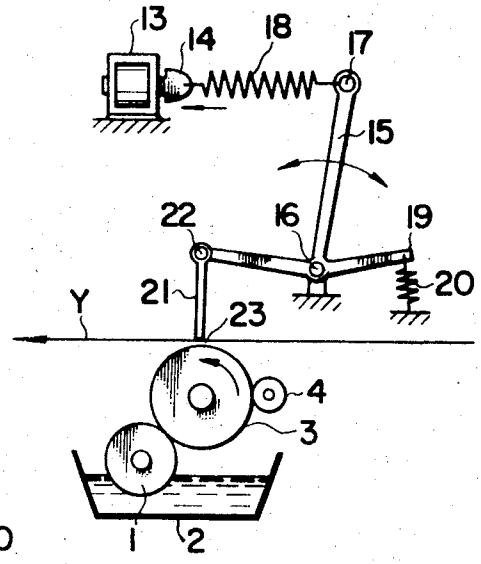


FIG. 3

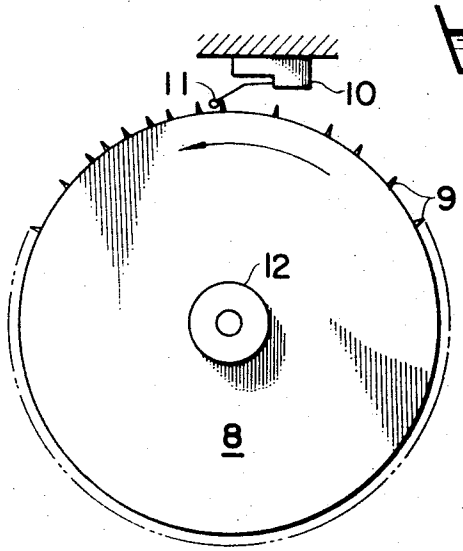


FIG. 4

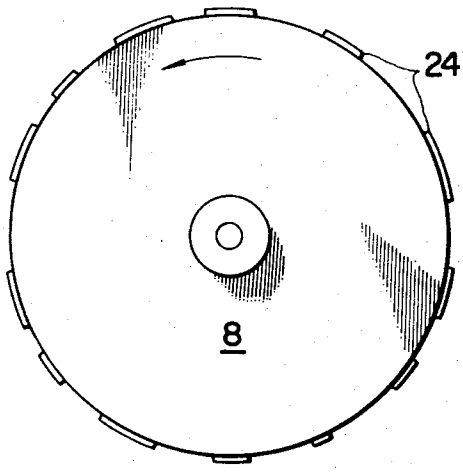


FIG. 5

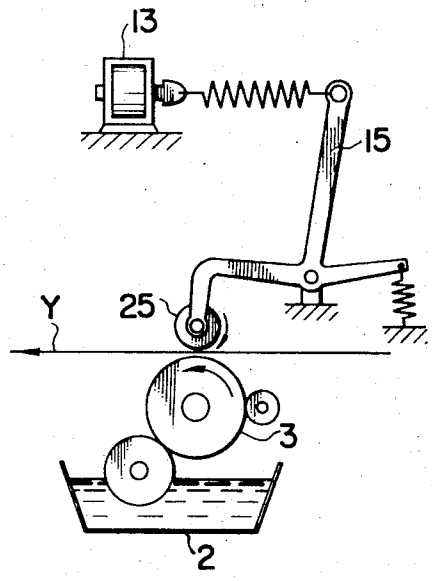


FIG. 6a

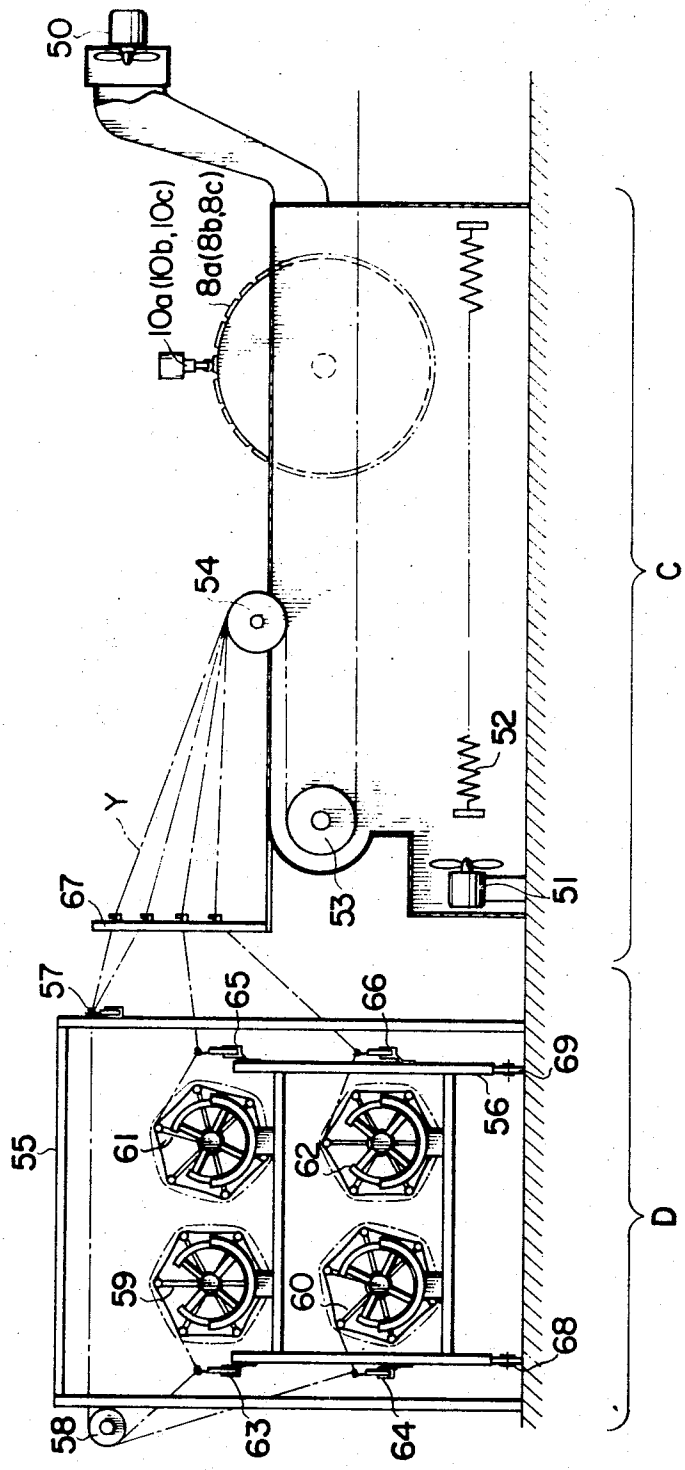

50
10a(10b,10c)
8a(8b,8c)
54
52
Y
67
53
51
C
57
65
66
69
56
55
61
62
59
60
68
D
58
63
64

FIG. 8

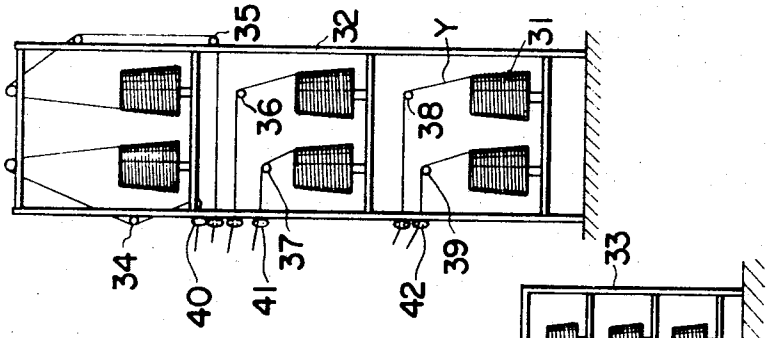

35
32
Y
31
36
38
34
40
41
37
42
39
33

FIG. 6b

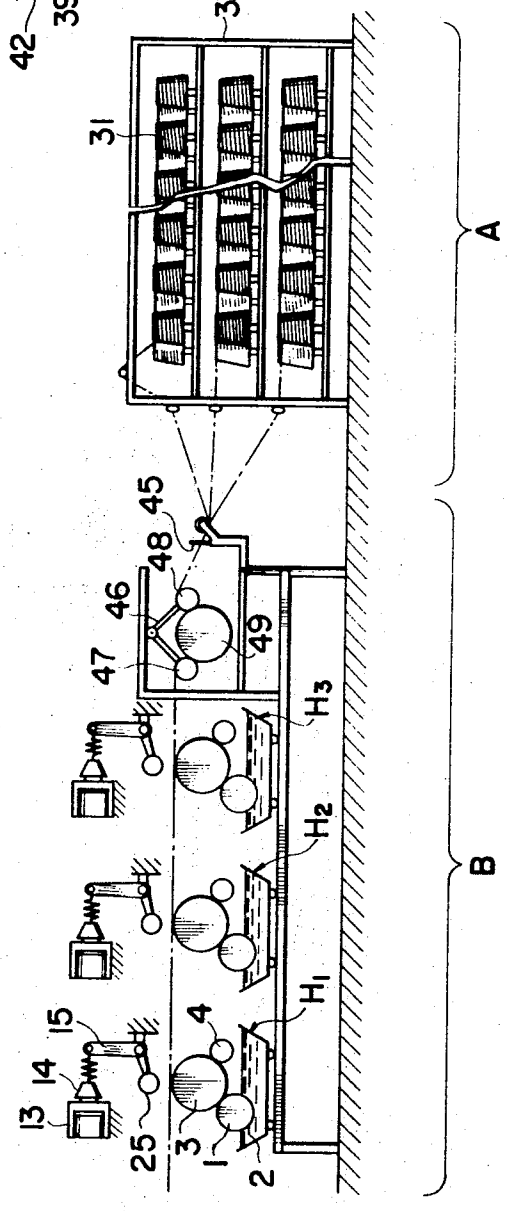
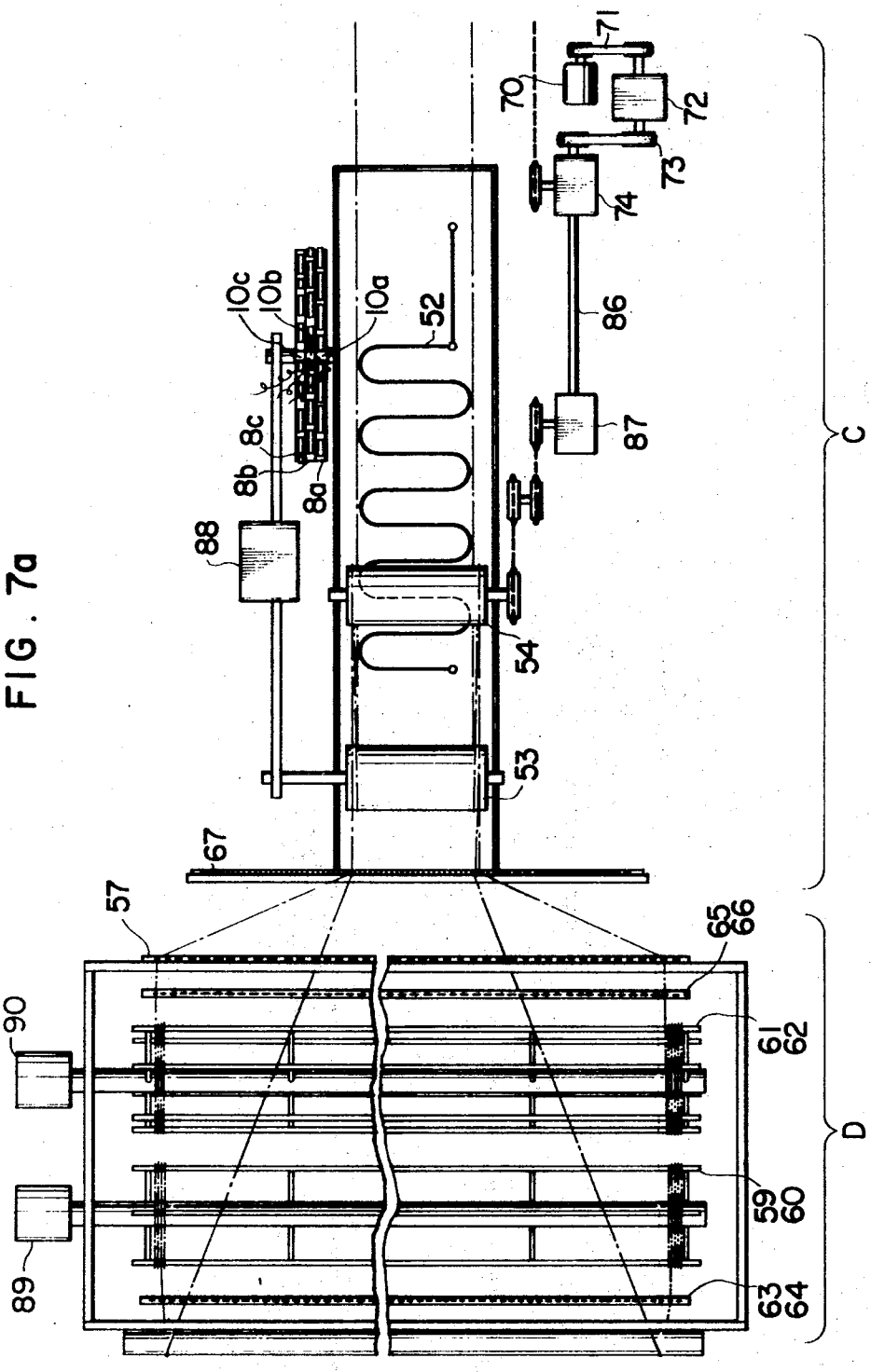

31
A
45
48
46
49
47
H3
H2
H1
B
15
4
14
13
25
3
1
2

FIG. 7a


71
70
72
73
74
86
87
10c
10b
10a
52
8c
8b
8a
88
54
53
67
C
57
65
66
90
61
62
59
60
89
63
64
D

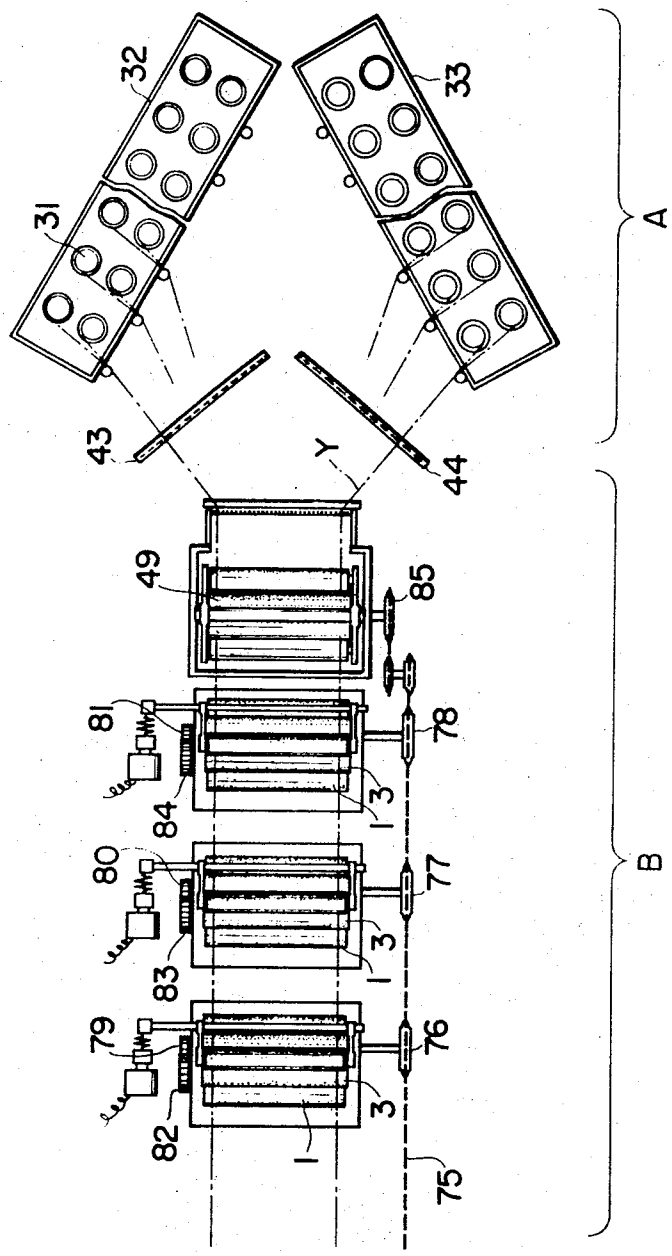


FIG. 7b

FIG. 9

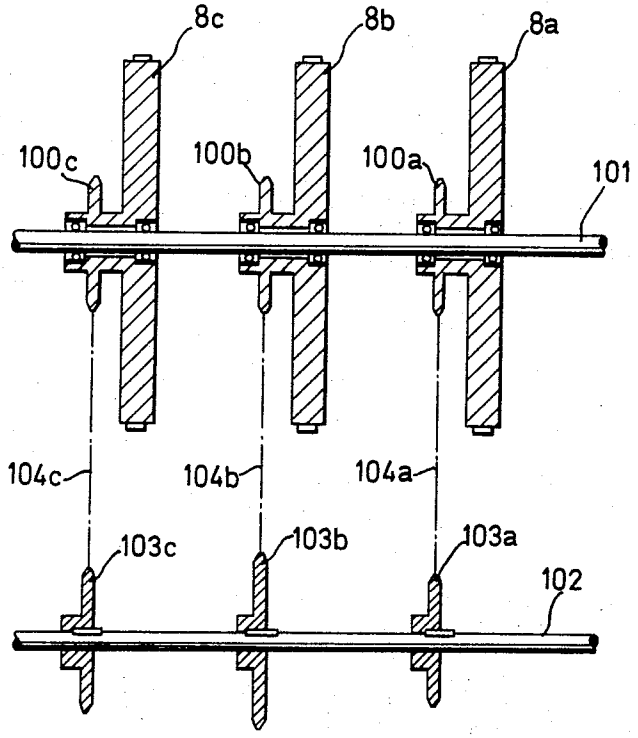


FIG.10

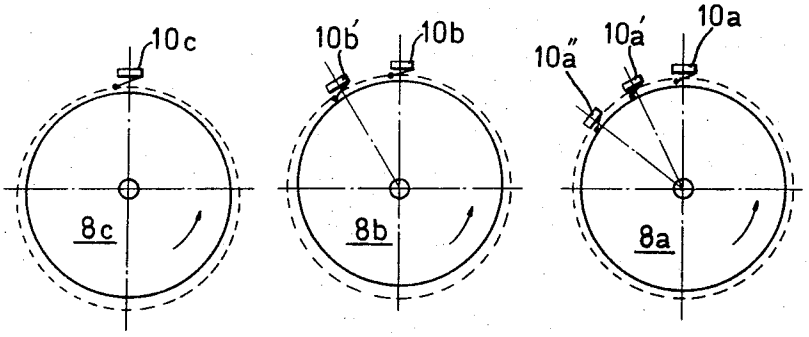
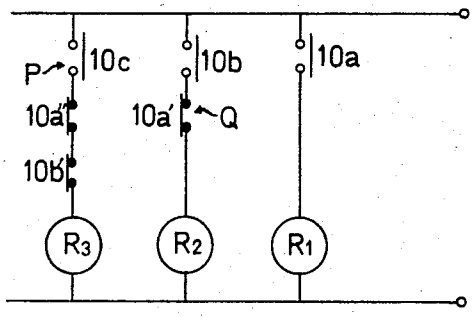

10c
10b'
10b
10a''
10a'
10a
8c
8b
8a

FIG.11


P
10c
10b
10a
10a'
10a'
Q
10b'
R3
R2
R1

APPARATUS FOR CONTINUOUSLY PRINTING YARNS WITH SPLASHED PATTERN OF RANDOM PITCHES

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of my co-pending application Ser. No. 213,006, filed Dec. 28, 1971 now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the invention:

The present invention is concerned with an apparatus for continuously printing yarns or slivers with a given splashed pattern of random pitches, and more particularly, it pertains to an apparatus of the type described which permits this printing to be repeated at a much prolonged period.

2. Description of the prior art:

In knitted and woven fabrics using a yarn having a printed splashed pattern, for example in the finished product such as a sweater which is knitted by the use of such a hand-knitting woolen yarn, the finished article is subjected to a great effect by the condition of recurrence of the pitches of the pattern which is printed on the yarn. Especially, in case the period of this repetition or recurrence is short, there tends to develop undesirable lateral striations in the finished article, constituting a major cause for the degradation of the quality of the finished goods.

Referring now to FIG. 1 there is shown an example of a yarn printing mechanism which has been employed in the past in continuously obtaining such a non-periodic splashed pattern as stated above. More specifically, this prior mechanism is of the arrangement that a furnisher roll **1** is provided in a vessel **2** so as to be partially immersed in the dye bath contained in this vessel **2.** As this furnisher roll **1** is rotated, the dye solution is transferred onto the circumferential surface of a printing roll **3** which is provided above the furnisher roll **1** in contact therewith. The transferred dye solution is then leveled evenly in amount by a doctor roll **4.** Above said printing roll **3,** there is provided — at some distance **7** from the printing roll **3** — a pressing roll **6** having pressing bars **5** fixedly projecting from the entire circumferential surface of the pressing roll **6** at non-uniform intervals. This distance **7** is arranged so that it is substantially equal to the height of the projecting pressing bars **5.** All of these rolls **1, 3, 4,** and **6** are arranged so that they are rotated in harmony with the velocity of advancement of the yarns or slivers Y.

By this mechanism, the yarns (slivers) Y are pressed between a pressing bar **5** and the printing roll **3** successively, and they are thus printed at random periods corresponding to the predetermined pitches of the pressing bars **5.**

This prior mechanism, however, has the disadvantages that, owing to the limitation in the size of the mechanism per se, the diameter of the pressing roll **6** is limited accordingly. In actual apparatuses, the diameter of the pressing roll employed is approximately 200 mm. As a natural consequence, the number of the pressing bars **5** is also limited. Thus, the period of repetition of the splashed patterns obtained is very small. In case a finished article such as a sweater is knitted by the use of such a yarn, there will develop an undesirable effect that the repetition of the same pattern occurs plural times in one knitted sweater, lowering the quality of this finished article.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to eliminate the aforesaid problems of the prior art and to provide a yarn printing mechanism for obtaining printed yarns or slivers having no troubles such as the development of lateral striations in the fabrics knitted or woven with the printed yarns, by prolonging the repetition period of the pattern of random pitches.

Another object of the present invention is to provide an apparatus having the aforesaid yarn printing mechanism incorporated therein, for performing continuous multi-color printing of a number of yarns or slivers.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevation of an example of the conventional apparatus.

FIG. **2** is a side elevation of the yarn printing section of an example of the apparatus embodying the present invention.

FIG. **3** is a side elevation of a pattern signal generating drum employed in the present invention.

FIGS. **4** and **5** are side elevations of the essential parts of another example of the apparatus embodying the present invention.

FIG. **6***a* is a side elevation of the rear half portion of a whole set of machines incorporating the present invention.

FIG. **6***b* is a similar view of the front half portion of same.

FIG. **7***a* is a plan view of FIG. **6***a.*

FIG. **7***b* is a plan view of FIG. **6***b.*

FIG. **8** is a front view of the yarn supply section of the machine.

FIG. **9** is a somewhat diagrammatic illustration, partly in section, to show how the respective rotary drums are driven at different speeds.

FIG. **10** is a somewhat diagrammatic illustration, showing the first and additional limit switch arrangement associated with the respective rotary drums.

FIG. **11** is a diagram of circuit connected with the first and the additional limit switches to inhibit the actuation of limit switches in order to prevent the overlap printing of previously printed portion of yarns.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Description will hereunder be made on the details of the yarn printing mechanism which constitutes an important part of the present invention, with respect to some examples.

FIGS. **2** through **5** show some examples of the yarn printing mechanism according to the present invention. In FIG. **3,** reference numeral **8** represents a pattern signal generating drum. This drum **8** has, circumferentially thereof, a required number of projecting ridges **9** in accordance with the required pattern. A limit switch **10** having an actuating lever **11** is provided close to the circumference of the signal generating drum **8** at a position in which this actuating lever **11** is engageable with the projecting ridges **9** successively as the drumm **8** is rotated. Arrangement is provided so that this drum **8** is rotated interlockingly with the rotation of the printing roll **3** shown in FIG. **2** via an appropriate speed reducing gear **12.** In FIG. **2,** numeral **13** represents a sole-

noid, and numeral **14** represents its movable core. Numeral **15** represents a T-shaped rod which is pivotably attached at **16** to a frame (not shown) so as to be able to make a swinging movement in the directions of the arrows. The end **17** of this pivotable rod **15** is coupled to the movable core **14** via a spring **18.** One end **19** of the arm of this T-shaped rod **15** is coupled to the frame (not shown) via a spring **20.** At the other end of this arm is pivotably supported, at **22,** a stamping bar **21.**

The said stamping bar **21** is provided at a position close to and above the printing roll **3** so as to face the circumference of this roll **3.** There is left an appropriate gap **23** between the working end of the stamping bar **21** and the circumference of the printing roll **3** to insure an easy passage of the yarns (slivers) Y therethrough. This gap can be closed by the stamping bar **21** which is actuated by the solenoid **13.**

The solenoid **13** is electrically connected with the limit switch **10,** in such a way that whenever the actuating lever **11** is brought into engagement with any one of the projecting ridges **9,** the solenoid **13** is energized so that the movable core **14** is attracted to make a sliding movement in the direction of the arrow (leftwardly in FIG. **2**).

Description will next be made on the operation of the mechanism having the above-stated arrangement.

As shown in FIG. **2,** when the actuating lever **11** is not in engagement with the projecting ridge **9,** the solenoid **13** is not energized. Under this condition, the T-shaped rod **15** is urged to rotate clockwise about the shaft **16** by the action of the spring **20.** As a result, the stamping bar **21** is lifted upwardly, to produce a gap between its lower end and the circumference of the printing roll **3.** Thus, the yarn (sliver) Y is allowed to make an advancement in the direction of the arrow without catching the dye. As the pattern signal generating drum **8** is rotated further until the next adjacent projecting ridge **9** provided on the circumference of this drum **8** is brought into engagement with the actuating lever **11** to push the latter, the solenoid **13** is energized. Whereupon, the movable core **14** of this solenoid **13** is attracted to shift its position towards the left in FIG. **2.** As a consequence, the T-shaped rod **15** is given a counter-clockwise rotation force. As a natural result, the stamping bar **21** is lowered in its position and is brought into contact with the yarn printing roll **3** to tightly nip the yarn (sliver) Y therebetween to print it with the dye solution. During this part of operation, the end edge of the stamping bar **21** is caused to move in the direction same as that of the advancement of the yarn (sliver) Y as the yarn printing roll **3** is rotated continuously. Accordingly, the yarn Y is allowed to pass through the said gap without being injured. The projecting ridges **9** are securely provided on the circumference of the pattern signal generating drum **8** with varying intervals corresponding to the pitches of the required pattern printing. Thus, a required random pattern is imparted onto the yarn (sliver) Y.

Alternatively, the said projecting ridges **9** and the stamping bar **21** may be replaced by those projecting plates **24** as shown in FIG. **4** and by a stamping roller **25** as shown in FIG. **5,** and in which the projecting plates **24** are given various different lengths or spans. Therefore, it is possible to produce corresponding different lengths of dyed portions of the yarn (sliver) Y, and to thus obtain further complicated patterns.

Also, by providing — in series on the path of advancement of yarns (slivers) — a plurality of the aforesaid yarn printing mechanisms using dye solutions different in color, respectively, it is possible to obtain yarns or slivers having random patterns printed in different colors.

According to the present invention, the pattern signal generating drum **8** is not of the type as used in the prior art which directly engages the yarn or sliver, but instead this drum **8** only has the function of generating electric signals. For this reason, the drum **8** can be formed into a very compact size, and in addition to this advantage, the repetition period of the printing pitches can be prolonged substantially. Besides, in the event that a plural number of yarn printing mechanisms are employed, their pattern signal generating drums may be arranged so that the lengths of the respective one recurrence period of pattern of these drums are different from each other. In such an arrangement, the resulting period of the patterns printed on the yarn or sliver can be that of the least common multiple of the respective periods of the patterns on these drums. For example, let us assume that three pattern signal generating drums **H1, H2** and **H3,** and that their respective periods are: **H1** 9 minutes, **H2** 10 minutes and **H3** 11 minutes. The eventual pattern recurrent period resulting from these three will be: $9\times10\times11=990$ minutes. Thus, it is possible to obtain a pattern recurrence period which practically can be regarded infinite. Furthermore, it is needless to say that the pattern signal generating drum **8** and the limit switch **10** are replaced by a perforated tape and a photoelectric reading means to thereby generate pattern signals.

Description will hereunder be directed to an apparatus incorporating therein said yarn printing mechanisms, intended for continuously performing multicolor printing of yarns or slivers by referring to FIGS. **6***a* through **8.**

As shown in FIGS. **6***a* to **8,** the entire apparatus comprises: a Yarn Supply Section A having a number of cheeses **31** and being designed to gather those individual yarns Y drawn from said cheeses **31** into the shape of a band and then to divide them and align them into a row; a Printing Section B positioned in the background of Section A adjacently thereto and having serially arranged three yarn printing mechanisms of the aforesaid type and being assigned to print the grouped yarns Y with predetermined pitches of pattern; a Drying Section C provided in the adjacent subsequent stage to dry the group of yarns Y having been printed in random pitches; and a Take-Up Section D provided in the rearmost stage and assigned to wind the yarns Y on reeling frames. These four Sections A, B, C and D are arranged in series in this order.

The aforesaid Yarn Supply Section A comprises two frames **32** and **33** for housing cheeses. These two frames **32** and **33** are positioned so as to form a V-shape lying sideways so that their sides facing the Yarn Printing Section B diverges. Each of these two frames **32** and **33** is provided with three shelves, i.e., upper, middle and lower shelves. Two rows of pegs are provided on each shelf to support a number of cheeses **31** thereon in upright position. Yarns (slivers) are unwound from the respective cheeses **31** via guide bars **34, 35, 36, 37, 38** and **39** and via yarn separating guides **40, 41** and **42** which are provided correspondingly to the guide bars, and these yarns are withdrawn into the

Printing Section B in the form of a band. In the drawings, numerals **43** and **44** represent a pair of symmetrically diverging yarn separating guides intended for preventing entanglement of the yarns being withdrawn.

As stated previously, the Printing Section B comprises: three yarn printing mechanisms **H1, H2** and **H3** arranged in series in the path of travel of the yarns, each of these yarn printing mechanisms comprising a dye solution carrying means having a dye solution vessel **2,** a furnisher roll **1,** a printing roll **3** and a doctor roll **4,** and a yarn pressing means having a solenoid **13,** a movable core **14** and a T-shaped rod **15;** and a tension adjusting mechanism comprising an inverted V-shape arm **46** pivotably supported on the machine frame between the first yarn printing mechanism H3 and the yarn separating guide **45** located adjacent to the Yarn Supply Section A, guide rollers **47** and **48** rotatably mounted at the two ends of said arm **46,** and a feed roll **49** which is rotated in contact with these two rollers **47** and **48.**

The respective solenoids **13, 13** and **13** of the yarn printing mechanisms **H1, H2** and **H3** are arranged electrically, as previously stated, in such a way that they are rendered "on" and "off", independently of each other, by their corresponding pattern signal generating drums **8***a*, **8***b* and **8***c* and also by the drums' mating limit switches **10***a*, **10***b* and **10***c* which are engageable with these drums, to actuate their corresponding stamping rollers **25, 25** and **25** independently.

The Drying Section C has two upper and lower heated air blowers **50** and **51** and a radiator **52** to maintain the atmosphere in the travel path of the yarns at a temperature of about **90**°C. This Drying Section C also has a roll **53** for driving the pattern signal generating drums, and this roll **53** is rotatably supported at the rearward end of this Section C. The Drying Section C further has a positively driven yarn draw-up roll **54** which is positioned above the roll **53** and closer to the Yarn Supply Section A. By these two rolls **53** and **54,** the travelling yarns are caused to make U-turns.

The Take-Up Section D comprises two members, one of which is a frame **55** fixed to the floor, and the other is a wheeled reeling frame carrier **56** which can be moved freely and housed within the frame **55** and fixed thereto. The frame **55** has a yarn guide **57** and a yarn guiding drum **58.** The movable reeling frame carrier **56** has reeling frames **59, 60, 61** and **62** which are provided in two rows on each of two upper and lower shelves of this carrier, and also has traversing guides **63, 64,** and **65, 66** which are adapted to traverse longitudinally of the reeling frames. Thus, the Take-Up Section D is operative so that the grouped yarns Y are divided into individual independent yarns directly from a yarn separating guide **67** of the Drying Section C or via a yarn separating guide **57,** to be taken up by the reeling frames **59, 60, 61** and **62.** In the drawings, numerals **68** and **69** represent casters.

This illustrated example of machine is of the foregoing arrangement. Hereunder is made a description of its driving system.

As shown in FIGS. **7***a* and **7***b*, the driving force of a motor **70** is transmitted to a first speed reducing gear **74** via a belt **71,** a stepless speed change gear **72** and a belt **73,** and therefrom via a chain **75,** chain wheels **76, 77** and **78,** toothed wheels **79, 80** and **81,** and gears **82, 83** and **84,** the resulting driving force will positively rotate both the respective printing rolls **3** and furnishing rolls **1,** and also will rotate, via a chain wheel **85,** the feed roll **49** having a felt wound therearound.

On the other hand, the driving force derived from the first speed reducing gear **74** via a driving shaft **86,** a second speed reducing gear **87,** and a train of chains and chain wheels, will positively rotate the draw-up roll **54** having a felt wound therearound.

Also, the roll **53** which is rotated by the tension of the yarns and which is intended for driving the pattern signal generating drums will rotate, via a third speed reducing gear **88,** the pattern signal generating drums **8***a*, **8***b* and **8***c* simultaneously.

Another motor (not shown) which is fixed to the Take-Up Section D will positively drive the driving shafts **89** and **90** of the reeling frames as well as the traversing guides **63, 64, 65** and **66** through a detachable interlocking mechanism. Since these driving systems are similar to those for known reeling frames, they are not shown here. However, it is necessary that the reeling frames have a peripheral speed which is in harmony with the yarn withdrawing rate.

Description will hereunder be directed to the manner of performing random printing of yarns by the use of the above-stated machine.

As shown in FIGS. **6**a and **6**b, the yarns Y — about **240** in number — which have been withdrawn from the Supply Section A are caused to travel at the yarn speed of 10–15 m/min. and are gathered into the shape of a band in the state of separate individual yarns. Thus they arrive at the separating guide **45.** After being appropriately nipped between the feed roll **49** and the guide rollers **47** and **48,** they are pulled at the tension draft of about **1.1** times which is produced by the draw-up roll **54,** to pass through the Printing Section B and through the Drying Section C. During this passage, the yarns Y are subjected to random printing in three different colors by the three mechanisms **H1, H2** and **H3** of the Printing Section B. Thereafter, the yarns are dried in the Drying Section C. Then, via the roll **53** for driving the pattern signal generating drums and via the draw-up roll **54,** the yarns are taken up on the reeling frames **59, 60, 61** and **62** of the Take-Up Section D.

As stated above, according to the present invention, it is possible to produce, with a good efficiency, yarns having multi-color random-printed patterns which have a prolonged recurrence period. By applying the present invention to hand-knitting yarns in particular, it is possible to produce knitted fabric or articles having unprecedented new aesthetic sense. Thus, the present invention provides a great advantage in this field of art.

In FIG. **9,** there is shown a device for practicing in the most desirable manner the present invention outlined above.

Pattern signal generating drums **8***a*, **8***b* and **8***c* are provided to have sprockets **100***a*, **100***b* and **100***c* integral with the drums, respectively, and these drums are mounted on a fixed common shaft **101** so as to be rotatable relative to this shaft. On a rotary driving shaft **102** provided in parallel relation to said fixed shaft **101,** there are mounted, fixed thereto, driving sprockets **103***a*, **103***b* and **103***c* correspondingly to the aforesaid sprockets **100***a*, **100***b* and **100***c* to drive these latter sprockets. These driven sprockets and driving sprockets are coupled by chains **104***a*, **104***b* and **104***c* applied between the mating sprockets, respectively. The driven sprockets **100***a*, **100***b* and **100***c* invariably have the same number of teeth, whereas the driving sprockets

103*a*, 103*b* and 103*c* are of different diameters and have teeth, the numbers of which are different relative to each other. Therefore, by rotating the driving shaft **102** by an appropriate driving means, which may be, for example, a driving means interlocked, in corresponding proportion, with the feeding means of the filament yarns which are to be processed, these pattern signal generating drums **8***a*, **8***b* and **8***c* will be caused to rotate at slightly different numbers of revolution per unit time relative to each other. Thus, there is accomplished a very great elongation of the previously stated period of recurrence of the same pattern.

One of the problems in terms of quality of the printed yarns is the so-called "overlap" of print which means that that portion of the yarns which has been printed already by a preceding printing means could be printed over again by a subsequent printing means. Depending on the dyes employed and/or the kinds of colors selected, there could occur that such a double — or triple — printed portion of yarns presents a dull color or that such portion shows a dirty, unpleasant color lacking clarity due to the overlap printing of the same portion of yarns with a dye of different color or different shade of color by the subsequent printing means, and there could develop a gradually intensified degree of this undesirable overlapping phenomenon with the lapse of time. Counter-measures against the occurrence of such phenomenon are required particularly in the aforesaid printing system of the present invention which is arranged so that the repeating cycles of the respective pattern signal generating drums gradually and progressively become different relative to each other. One such counter-measure is shown in FIG. **10** by way of example.

By referring now to FIG. **10**, there is shown means for preventing the overlapping of print of the same portion of yarns.

The first pattern signal generating drum **8***a* is provided, on the circumferential surface thereof, with three limit switches positioned at a relatively small distance to each other. They are: a first limit switch **10***a* which generates a command signal of operation to the printing means H_1 corresponding to this drum **8***a*; an additional second limit switch **10***a'* positioned at such a distance from the first limit switch **10***a* as represents a sectorial angle corresponding to the distance covered by the yarn after it leaves the first printing means H_1 till it arrives at the second printing means H_2; and an additional third limit switch **10***a''* positioned at such a distance from said second limit switch **10***a'* as represents a sectorial angle corresponding to the distance covered by the yarn after it leaves the second printing means H_2 till it arrives at the third printing means H_3.

On the other hand, the second pattern signal generating drum **8***b* is provided, on the circumferential surface thereof, two limit switches **10***b* and **10***b'* at such locations, similar in positional relation, as those stated in connection with the limit switches of the first drum **8***a*.

The third pattern signal generating drum **8***c* is provided, on its circumferential surface, with only one limit switch **10***c* for generating command signals to its mating printing means H_3. These respective limit switches are wired to each other in a manner shown in FIG. **11**. In this drawing, R_1, R_2 and R_3 represent relay coils for conducting current to the respective solenoids **13** of the respective printing means H_1, H_2 and H_3. Letters P and Q represent a normally open contact and a normally closed contact, respectively.

The device of this example is operated in the manner as stated hereunder. The first printing means H_1 effects printing of the yarns in exact accordance with the signal received from the first limit switch **10***a*. On the other hand, the second printing means H_2 is arranged to operate, normally, by the signal received from the first limit switch **10***b* of the second drum **8***b*. However, in the event that a signal is received at the same time from the second limit switch **10***a'* of the first drum **8***a* also, in other words if the portion of the yarn which has been printed already by the first printing means H_1 happens to be located within the operative region of the second printing means H_2, this second printing means is adapted to remain inoperative.

In the same manner, the third printing means H_3 is operated, normally, by the signal received from the limit switch **10***c* of the third drum **8***c*. In case, however, this third printing means H_3 receives simultaneously a signal from either one of the limit switches **10***a''* and **10***b'*, this third printing means H_3 will remain inoperative.

According to the arrangement of the device described above, it will be understood clearly that the aforesaid overlapping of colors on the printed yarns can be avoided without a fail.

Though not shown, it should be understood that the arrangement for driving a plurality of pattern signal generating rotary drums at different speeds is not limited to the example as shown. There ought to be conceived various other arrangements for obtaining the same effect.

It should be understood further that this technical concept described above is not limited to the pattern signal generating drums shown in the aforesaid example, but also it can be applied to such signal generation as is performed by the combination of a perforated tape and a photoelectric element, or like means.

I claim:

1. An apparatus for continuously printing yarns with splashed pattern of random pitches, comprising:

yarn running means causing the yarns to run in their longitudinal direction at a given speed;

a plurality of yarn printing means provided at different positions along the running yarns, each including a dye-carrying surface for holding dye thereon and being positioned just adjacent to and a little apart from said running yarns, and also including a yarn pressing member opposing said dye carrying surface to keep the running yarns between said dye carrying surface and said yarn pressing member and being actuated toward and away from said dye carrying surface in response to a control signal applied thereto;

a corresponding plurality of pattern signal generating means respectively associated with respective ones of said yarn printing means, each of said pattern signal generating means including a rotary drum rotating at a speed different from that of a rotary drum included in each other pattern signal generating means and having a plurality of spaced projecting ridges formed circumferentially thereof and defining a given pattern program, and also including a first switch means actuated by being contacted by the projecting ridges of said drum thereby deliver-

ing said control signal to be applied to said yarn pressing member;

said plurality of rotary drums each having first sprocket means formed integrally therewith, said drums and said first sprocket means being mounted on a common fixed shaft for rotation relative to said fixed shaft;

driving means for said drums including second sprocket means drivingly interconnected to mating first sprocket means, respectively, and provided with teeth different in number from each other to drive the respective drums at different speeds relative to each other; and

said pattern signal generating means excepting the last one including additional switch means arranged adjacent the circumference of the mating drums, respectively, at positions corresponding to the positions of said yarn printing means against the running yarns with respect to the running speed thereof, and said additional switch means being connected electrically to each other and to the corresponding first switch means to prevent the first switch means from delivering a control signal when any one of said additional switch means is actuated by any one of said ridges.

2. An apparatus for continuously printing yarns with splashed pattern of random pitches, comprising:

yarn running means causing the yarns to run in their longitudinal direction at a given speed;

a plurality of yarn printing means provided at different positions along the running yarns, each printing means including a dye carrying surface for holding dye thereon and being positioned adjacent to and a little apart from said running yarns, each printing means also including a yarn pressing member opposing the respective dye carrying surface to keep the running yarns between said dye carrying surface and said yarn pressing member and being actuated toward and away from the respective dye carrying surface in response to a control signal applied thereto; and

a corresponding plurality of pattern signal generating means respectively associated with respective ones of said yarn printing means, each of said pattern signal generating means including a rotary drum rotating at a speed different from that of the rotary drum included in each other pattern signal generating means, each drum having a plurality of spaced projecting ridges formed circumferentially thereof and defining a given pattern program, each pattern signal generating means also including switch means actuated by being contacted by the projecting ridges of the respective drum for delivering said control signal to be applied to the corresponding yarn pressing member;

shaft means for supporting the drums associated with said plurality of pattern signal generating means in axial alignment with one another for permitting each drum to rotate at a speed different from that of the rotary drum associated with each other pattern signal generating means;

drive means for rotating each drum at a speed which is different from the rotation speed of the other drums, said drive means including a plurality of driving mechanism each associated with one of said drums; and

control means associated with said switch means for permitting delivery of only a single control signal even though more than one of said switch means are simultaneously actuated, whereby said control means prevents overlap in the printing of the yarns.

3. An apparatus according to claim **2**, wherein said control means includes additional switch means arranged adjacent the circumference of some of said drums and connected electrically to the first-mentioned switch means associated with the same drum to prevent the first-mentioned switch means from delivering a control signal when said additional switch means is actuated by any one of the ridges associated with the respective drum.

4. An apparatus according to claim **3**, wherein said plurality of driving mechanisms includes a set of rotatable toothed driven members, each of said toothed driven members being fixedly interconnected to a respective one of said drums, said plurality of driving mechanisms also including a set of toothed rotatable driving members each being drivingly interconnected with a respective one of said toothed driven members, and the individual toothed members associated with one of said sets each being provided with a different number of teeth whereby the individual drums are driven at different speeds relative to each other.

5. An apparatus according to claim **2**, wherein said plurality of driving mechanisms includes a set of rotatable toothed driven members, each of said toothed driven members being fixedly interconnected to a respective one of said drums, said plurality of driving mechanisms also including a set of toothed rotatable driving members each being drivingly interconnected with a respective one of said toothed driven members, and the individual toothed members associated with one of said sets each being provided with a different number of teeth whereby the individual drums are driven at different speeds relative to each other.

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