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Schrader et al.

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[54] **PROGRAMMER FOR AIR JET TEXTURING APPARATUS**

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[52] **U.S. Cl.** ..... **28/1.4,** 57/34 B

[51] **Int. Cl.** **D02g 1/16**

[58] **Field of Search** ..... 28/1.4; 57/34 R, 34 B; 226/108; 239/69

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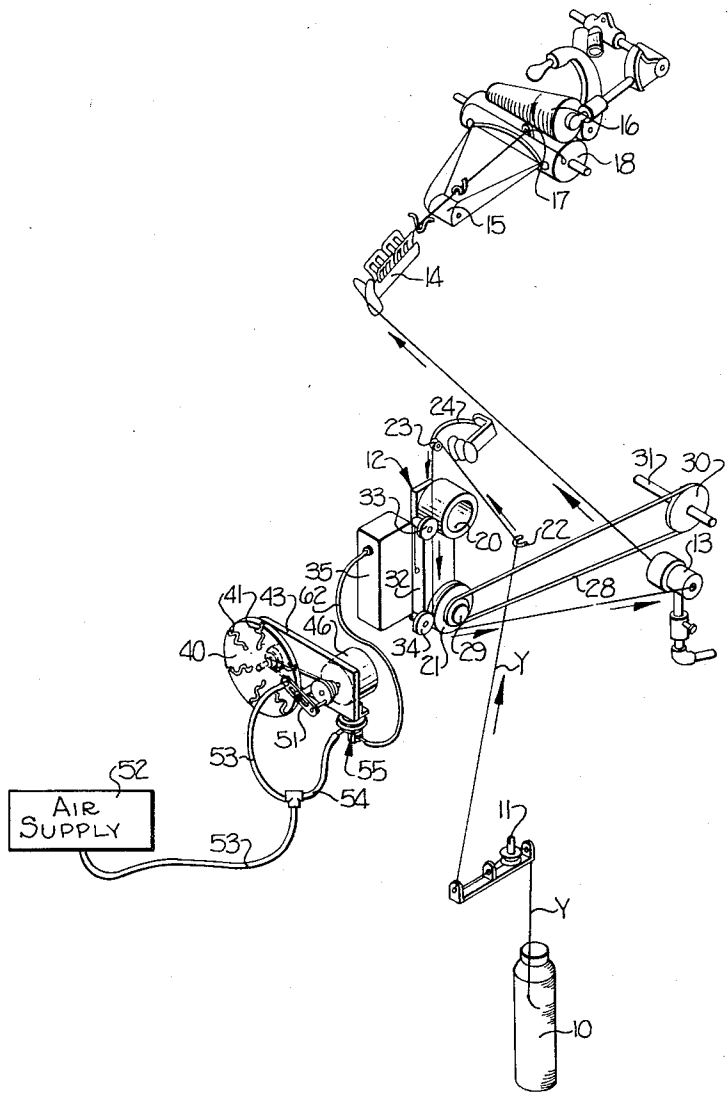
Primary Examiner—Louis K. Rimrodt

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[57] **ABSTRACT**

The present programmer operates to produce variations in the bulkiness along the length of air jet textured yarns by producing an irregular pattern of impulses which does not repeat for a long length of time. The programmer includes a rotatable pattern wheel having depressions in the form of substantially radially extending grooves of irregular width and configuration on one face thereof. An air nozzle sensor is supported for movement in a generally radial direction of the pattern wheel to "read" the grooves as the pattern wheel rotates and to thereby produce periods of reduced air pressure in the system. An air pressure switch is operated by these reductions in the air pressure to cause the air jet texturing unit to form irregularly spaced slubs along the length of the yarn.

14 Claims, 9 Drawing Figures



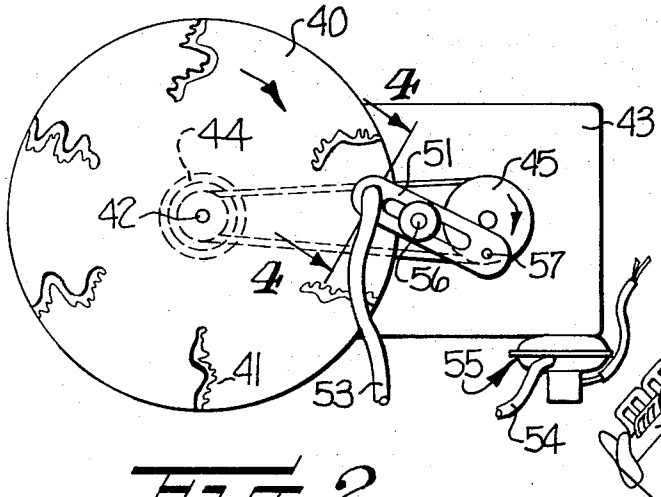


Fig-2

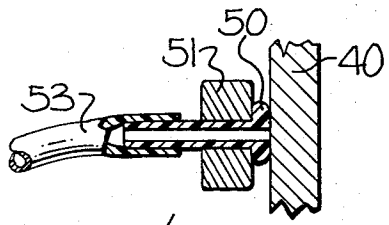


Fig-4

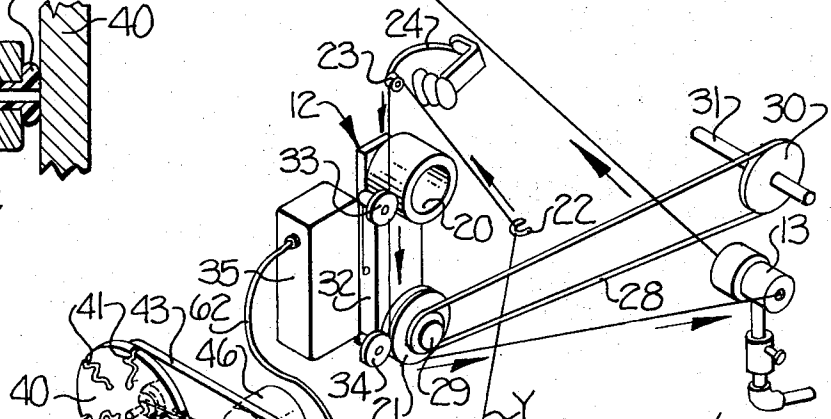
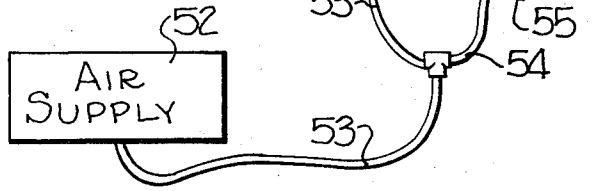
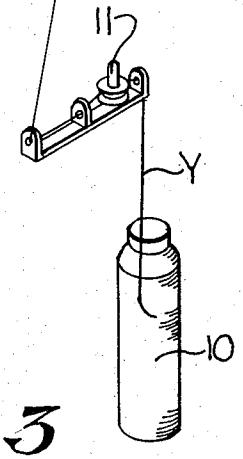


Fig-1





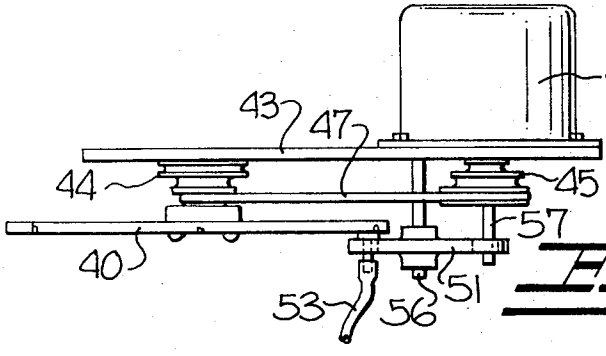


Fig-3

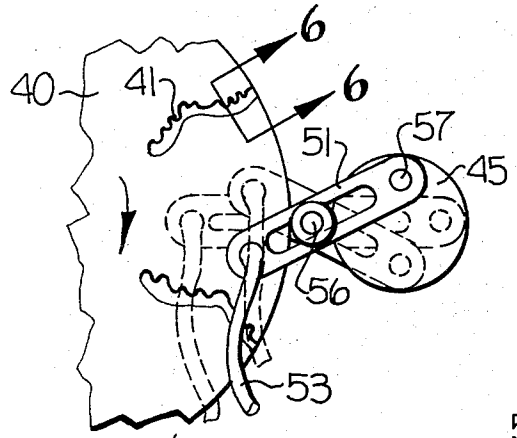


Fig-5

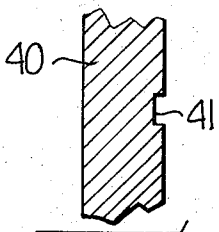


Fig-6

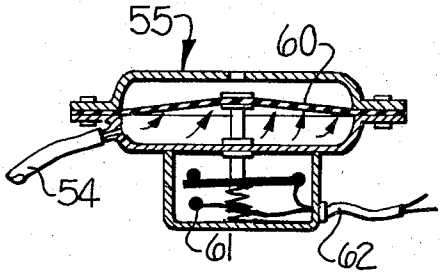


Fig-7

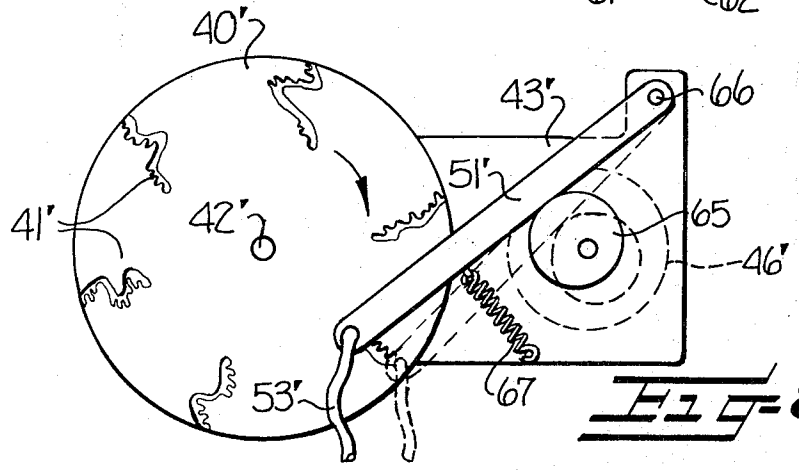


Fig-8

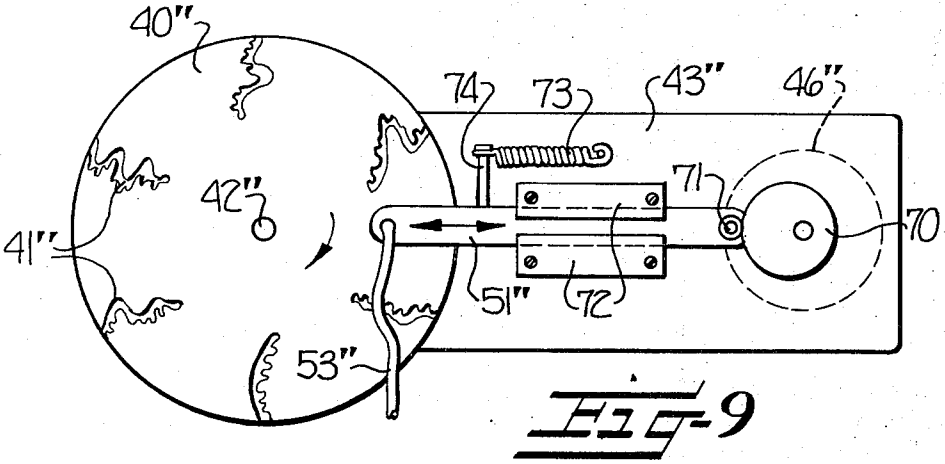


Fig-9

PROGRAMMER FOR AIR JET TEXTURING APPARATUS

This invention relates generally to a programmer for an air jet texturing apparatus for producing variations in the bulkiness along the length of fluid jet textured yarns and more particularly to a programmer for producing irregularly spaced slubs along the length of the yarn.

Several different types of devices have been proposed for producing slubs along the length of an air jet textured yarn. Certain of these devices operate to vary the amount of air supplied to the air jet to thereby form slubs along the length of the yarn as it is being textured. Other program devices operate to vary the speed of the yarn being fed to the air jet to thereby form slubs along the yarn. In either case, the program device produces impulses which change either the air supply or the yarn feed. However, these known types of pattern devices have not been entirely satisfactory because they either do not provide a sufficiently long repeat of the pattern or they are too complicated and expensive, requiring highly skilled personnel to maintain pattern device in proper operating order.

With the foregoing in mind, it is an object of the present invention to provide a programming apparatus for producing irregularly spaced slubs along the length of air jet textured yarn which is simple in construction, easily applied to the usual jet texturing apparatus, and requires very little attention over long periods of operation.

The present programmer includes a rotatable pattern wheel having a substantially smooth flat surface on one face thereof and a plurality of spaced-apart depressions in the form of grooves extending in a generally radial direction of the pattern wheel and being of irregular width and configuration. An air nozzle sensor is supported to direct air against the face of the pattern wheel as it is rotated at a predetermined speed so that a predetermined pressure is produced when the smooth surface of the face of the pattern wheel is passing the air nozzle and a reduced pressure is produced when one of the grooves passes the air nozzle sensor. An air pressure switch is operated by the variations produced in the air pressure to either change the amount of air being supplied to the air jet texturing unit or to change the speed of the yarn being fed to the air jet texturing unit so that slubs are formed at irregular intervals along the yarn. The air nozzle sensor is supported for movement across the face of the pattern wheel in timed relationship to rotation of the pattern wheel and in a generally radial direction so that different portions of the grooves are engaged by the air nozzle sensor during successive rotations of the pattern wheel to thereby increase the length of repeat of the pattern of slubs.

Other objects and advantages of the invention will appear as the description proceeds, when taken in connection with the accompanying drawings, in which

FIG. 1 is a somewhat schematic isometric view of one station of a jet texturing apparatus and illustrating the programmer of the present invention associated therewith;

FIG. 2 is an enlarged front elevational view of the programmer illustrated in FIG. 1;

FIG. 3 is a top plan view of the programmer shown in FIG. 2;

FIG. 4 is an enlarged fragmentary sectional view through the air nozzle sensor, being taken substantially along the line 44 in FIG. 2;

FIG. 5 is an enlarged fragmentary view of one portion of the pattern wheel shown in FIG. 2 and illustrating the manner in which the air nozzle sensor is moved inwardly and outwardly relative to the pattern wheel;

FIG. 6 is a fragmentary sectional view taken substantially along the line 6—6 of FIG. 5;

FIG. 7 is a vertical sectional view through the air pressure switch of the programmer;

FIG. 8 is a modified form of programmer wherein the air nozzle sensor is moved across the face of the pattern wheel by a different type of control; and

FIG. 9 is another modified form of programmer illustrating a different type of control for moving the air nozzle sensor across the face of the pattern wheel.

The programmer of the present invention is illustrated in FIG. 1 as being associated with a particular type of air jet texturing apparatus wherein the rate of feed of the yarn is varied to thereby produce slubs along the length of the yarn. However, it is to be understood that the present programmer may be associated with air jet texturing devices which include means to vary the amount of air supplied to the air jet to thereby produce slubs along the length of the yarn.

The air jet texturing apparatus includes a yarn supply source in the form of a yarn supply package or bobbin **10** from which the yarn Y is withdrawn. The yarn Y passes through a conventional type of tension device, in the form of a tension disc **11,** passes through a variable feed device, broadly indicated at **12,** which will be presently described in detail, and is fed thereby into an air or fluid texturing jet **13.** From the jet **13,** the yarn Y passes through a tension device, in the form of a tension fork **14,** passes over a roll **15** where a suitable lubricant is applied to the yarn, and is then wound onto a suitable take-up package, indicated at **16.** The yarn Y is guided onto the yarn take-up package **16** by a yarn traversing guide **17** and the yarn take-up package **16** is rotated by a suitable drive roll **18.**

The variable feed device **12** includes a first feed roll **20** and a second yarn feed roll **21,** both of which are positioned between the yarn supply package **10** and the air jet **13.** The yarn Y is directed above the upper peripheral surface of feed roller **20** by suitable yarn guide means, in the form of a yarn guide eye **22** and a yarn guide roller **23** supported on the outer end of a spring wire **24.**

The first feed roll **20** is rotated at a relatively slow speed from any suitable driven portion of the texturing machine. The second yarn feed roll **21** is rotated at a relatively fast speed by means of a drive belt **28,** which may engage different diameters of a stepped drive pulley **29** fixed on the feed roll **21.** The drive belt **28** is driven by a pulley **30** fixed on a drive shaft **31.** A rocker bracket **32** is pivotally supported intermediate its ends and rotatably supports a first idler roll **33** at its upper end and a second idler roll **34** at its lower end. The rocker bracket **32** is normally urged inwardly at its upper end, by resilient means not shown, so that the first idler roller **33** engages the yarn Y and moves the same into driving engagement with the first feed roll **20** and the yarn is fed to the jet **13** at the relatively slow rate to impart a predetermined bulkiness to the yarn. The idler roller **34** is normally maintained out of en-

gagement with the lower feed roll **21** and the yarn Y.

Operator means, not shown, is supported in a housing **35** and is operably connected to the rocker bracket **32** and, when the operator means is actuated in a manner to be presently described from the programmer of the present invention, the rocker bracket is moved inwardly at its lower end so that the second idler roller **34** engages and moves the yarn Y into driven engagement with the lower feed roll **21** to drive the yarn at the faster rate. When the yarn is fed to the jet **13** at the faster rate, an increased amount of bulk is imparted to the yarn to thereby produce a slub. The sudden increases in the rate at which the yarn is fed to the jet **13** causes greatly increased bulking of the yarn to form neps or slubs along the length of the yarn. The yarn is normally driven by the fast feed roll **21** for a very short period of time and the rocker bracket **32** then moves the upper idler roll **32** in engagement with the slow feed roll **21** so that the yarn is then again fed to the jet **13** by the first feed roll **20** and at the relatively slow speed.

The variable feed device **12** is disclosed in detail in copending application Ser. No. 289,106, filed Sept. 4, 1972, to which reference may be made for details thereof. The type of feed device illustrated is only one of several different types of feed devices which may be employed with the programmer of the present invention. Also, as has been mentioned, the programmer of the present invention may be utilized in connection with a device for varying the amount of air supplied to the air jet **13** for producing slubs at irregular intervals along the length of the yarn.

The programmer of the present invention includes a rotatable pattern wheel **40** with a flat substantially smooth surface on one face thereof and having a plurality of spaced apart openings, hollows, or depressions provided therein. The depressions are illustrated as being in the form of grooves **41** in the flat smooth face of the pattern wheel. As shown in FIG. **6**, the grooves **41** are cut or etched inwardly on the smooth face of the pattern wheel to a small depth. However it is to be understood that the grooves **41** may be cut entirely through the pattern wheel **40** if desired. As shown in FIGS. **2** and **5** the grooves **41** may be irregularly spaced apart, may be of irregular width and configuration and extend in a direction generally radially of the pattern wheel **40.** However, it is to be understood that the grooves **41** may be equally spaced, may be of the same width, and/or may extend inwardly of the pattern wheel **40** at any desired angle. Also, openings or depressions of other configurations may be provided on the smooth face of the pattern wheel **40.** For example, a series of irregularly spaced holes of the same or different sizes may be formed in the smooth face of the pattern wheel **40.**

Drive means is provided for rotating the pattern wheel **40** at a predetermined speed and includes a stub shaft **42** (FIG. **2**) on one end of which the pattern wheel **40** is supported for rotation. The other end of the stub shaft **42** is fixed in a support plate **43** and a stepped pulley **44** is rotatably supported on the stub shaft **42** and fixed to the pattern wheel **40.** A stepped drive pulley **45** is fixed on the output shaft of an electric motor **46** which is fixed to the support plate **43.** A drive belt **47** drivingly connects the stepped pulleys **44, 45** and may be shifted between the different steps of the pulleys to thereby vary the rotational speed of the pattern wheel **40** relative to the electric motor **46.**

Air nozzle means in the form of an air nozzle sensor **50** in provided with an air outlet for directing air against one face of the pattern wheel **40** (FIG. **4**). The air nozzle sensor **50** is supported in one end of a control arm **51** for moving the air nozzle in a generally radial direction across the face of the pattern wheel **40.** Operator means is provided for moving the control arm in the generally radial direction along one face of the pattern wheel and in timed relationship to rotation of the pattern wheel **40,** in a manner to be presently described.

Air supply means, schematically illustrated at **52** in FIG. **1,** includes an air supply line **53** for directing air under a predetermined pressure to the air nozzle sensor **50.** A branch supply line **54** is communicatively connected at one end to the air supply line **53** and its other end is suitably connected to an air pressure operated switch, broadly indicated at **55.**

The medial portion of the control arm **51** is provided with a longitudinal slot which surrounds a pivot shaft **56** and pivotally supports the medial portion of the control arm **51.** The inner end of the pivot shaft **56** is fixed in the support plate **43.** The inner end of a drive pin **57** is fixed in and is eccentrically supported on the stepped drive pulley **45** and its outer end is drivingly connected to the other end of the control arm **51.** The stepped drive pulley **45** thus is used as a drive wheel for imparting motion to the control arm **51** to move the air nozzle sensor **50** inwardly and outwardly across the face of the pattern wheel **40** and in a generally radial direction, as illustrated in dotted lines in FIG. **5.**

The air pressure switch **55** may be of any suitable conventional type and is shown in a somewhat schematic manner in FIG. **7** as including a flexible diaphragm **60** which is operatively connected to an electric switch **61.** Electric wires **62** are connected at one end to the switch **61** and at the other end to the operator means of the feed control device **12** which is supported in the housing **35.** The air from the air supply **52** is directed through line **53** and out of the air outlet of the air nozzle sensor **50** against the smooth face of the pattern wheel **40.** A predetermined amount of air pressure is thus provided in the supply line **53,** the branch line **54,** and in the air pressure switch **55.**

When the air nozzle sensor **50** is passing over the smooth face of the pattern wheel **40,** the air pressure is relatively high and maintains the diaphragm **60** in the raised position shown in FIG. **7** so that the electric switch **61** is in the open position and the feed device **12** is feeding the yarn at a relatively slow rate by the first feed wheel **20** and the idler roller **33.** When a portion of one of the grooves **41** passes the air nozzle sensor **50,** the air pressure in the system is momentarily reduced as the air can escape through the groove **41.** The diaphragm **60** in the air pressure switch **55** then moves downwardly to the level position so that the electric switch **61** is closed and the control means in the feed device **12** is actuated to move the idler roller **34** into engagement with the second feed roller **21** and feed the yarn at a fast rate of speed so.that a slub is produced by the air jet **13.** As soon as the groove **41** has passed the air nozzle sensor **50,** the air pressure in the system is again increased and the air switch **55** is opened so that the yarn is again fed at the slow rate by the first feed roll **20** and the idler roll **33.**

As the pattern wheel **40** and the stepped pulley **45** rotate, the control arm **51** is moved forwardly and rearwardly on the pivot shaft **56** to move the air nozzle sensor **50** in a generally radial direction across the face of the pattern wheel, as illustrated in solid and dotted lines in FIG. **5**, to thereby vary the radial position at which the air nozzle sensor **50** passes over the irregular grooves **41** in the pattern wheel **40.** Thus, as one groove passes the air nozzle sensor **50,** the sensor may be positioned near the outer periphery of the pattern wheel **40** and as the next groove **41** passes the air nozzle, it may be positioned at a medial point or at an inner point on the pattern wheel **40.** During the next successive rotation of the pattern wheel **40,** the same groove may be engaged by the air nozzle sensor **50** at a different location to thereby produce a different type of slub. By varying the position of the drive belt **47** in the grooves of the stepped pulleys **44, 45,** the rotational speed of the pattern wheel **40** may be varied, relative to the rotational speed of the drive wheel or stepped pulley **45** to thereby vary the position of the air nozzle sensor **50** during rotation of the pattern wheel **40.**

Many of the parts of the modified form of programmer shown in FIG. **8** are identical to the corresponding parts of the programmer shown in FIGS. **1–7** and corresponding parts will bear like reference characters with the prime notation added. The operator means for moving the inner end of the control arm **51′** and the air nozzle in a generally radial direction along the face of the pattern wheel **40′** includes an eccentric cam wheel **65** which is rotated by the electric motor **46′** and engages the medial portion of the control arm **51′**. The control arm **51′** supports the air nozzle sensor at its inner end and its outer end is pivotally supported on the outer end of a pivot post **66** connected at its inner end to the support plate **43′**.

Resilient means, in the form of a tension spring **67,** is connected at one end to the medial portion of the control arm **51′** and its other end is connected to a suitable spring perch on the support plate **43.** The spring **67** normally urges the medial portion of the control arm **51′** into engagement with the eccentric cam wheel **65.** The eccentric cam wheel **65** imparts movement to the air nozzle sensor in a generally radial direction as the pattern wheel **40′** is rotated so that the radial position of the air nozzle sensor is varied while the pattern wheel **40′** is rotated.

The modified type of programmer illustrated in FIG. **9** is also very similar to the first two types of programmers and corresponding parts will bear like reference characters with the double prime notation added. An eccentric cam wheel **70** is fixed on the output shaft of the electric motor **46″** and engages a roller **71** fixed on the outer end of the control arm **51″**. The medial portion of the control arm **51″** is supported for longitudinal sliding movement in slide plates **72** fixed on the support plate **43″**. Resilient means, in the form of a tension spring **73,** maintains the roller **71** in contact with the eccentric cam wheel **70.** One end of the spring **73** is supported on a rod **74** connected to the control arm **51″** and the other end is supported on a suitable spring perch connected to the support plate **43″**. Thus, as the eccentric cam wheel **70** rotates in timed relationship to rotation of the pattern wheel **40″**, the control arm **51″** moves inwardly and outwardly in a radial direction over the face of the pattern wheel **40″** so that the air nozzle sensor supported thereby will pass the grooves **41″** at varying radial positions.

The particular pattern of slubs which are to be produced by the programmer of the present invention may be easily varied by changing the position of the drive belt **47** on the stepped pulleys **44, 45.** Also, it is to be understood that pattern wheels having a different configuration of grooves, openings or depressions of other configurations may be provided for use if entirely different patterns are utilized. In any event, the programmer of the present invention is adapted to produce slubs in the air jet textured yarn at irregular intervals over a long pattern repeat. Also, the programmer of the present invention is relatively simple in operation and construction and may be maintained by an operator with very little training.

In the drawings and specification, there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation.

That which is claimed is:

1. A pattern device for controlling the formation of slubs produced by an air jet unit during a yarn texturing operation comprising

a. a rotatable pattern wheel having a flat substantially smooth surface on one face thereof, and including a plurality of spaced-apart depressions in said one face,

b. drive means for rotating said pattern wheel at a predetermined speed,

c. air nozzle means having an air outlet for directing air against said one face of said pattern wheel,

d. air supply means for directing air to said air nozzle means to provide a predetermined pressure when said smooth surface of said one face is passing said air nozzle means and to provide a reduced pressure when one of said depressions passes said air nozzle means, and

e. an air pressure switch operated by variations in air pressure in said air supply means and being operable to cause the formation of slubs by said air jet in accordance with the variations in air pressure produced by said depressions in said pattern wheel.

2. A pattern device according to claim **1** wherein said depressions comprise extending in a direction generally radially of said pattern wheel.

3. A pattern device according to claim **2** wherein the grooves in said one face of said pattern wheel are of irregular width and configuration.

4. A pattern device according to claim **1** including a control arm having one end supporting said air nozzle means for generally radial movement across said one face of said pattern wheel, and operator means for moving said one end of said control arm and said nozzle in a generally radial direction along said one face of said pattern wheel in timed relationship to rotation of said pattern wheel.

5. A pattern device according to claim **4** wherein said operator means comprises a drive wheel, for imparting movement to said control arm, and drive means for rotating said drive wheel in timed relationship with rotation of said pattern wheel.

6. A pattern device according to claim **5** wherein said drive means for said drive wheel is an electric motor.

7. A pattern device according to claim 5 wherein said drive means (b) for rotating said pattern wheel comprises a first stepped pulley fixed to said pattern wheel, a second stepped pulley fixed to said drive wheel, and an endless belt drivingly connecting said first and second pulleys whereby the position of said belt may be varied on said stepped pulleys to vary the speed of rotation of said pattern wheel relative to the speed of said drive wheel.

8. A pattern device according to claim 7 including a drive pin eccentrically supported at one end on said drive wheel and being connected to the other end of said control arm, and a pivot shaft supporting a medial portion of said control arm for longitudinal movement on said pivot shaft as movement is imparted to said control arm by said drive pin.

9. A pattern device according to claim 5 including means pivotally supporting the other end of said control arm, and wherein said drive wheel comprises an eccentric cam wheel engaging a medial portion of said control arm for imparting movement to said control arm, and resilient means maintaining the medial portion of said control arm in engagement with said eccentric cam wheel.

10. A pattern device according to claim 5 including means supporting the medial portion of said control arm for longitudinal sliding movement, and wherein said drive wheel comprises an eccentric cam wheel engaging the other end of said control arm for imparting longitudinal movement thereto, and resilient means maintaining the said other end portion of said control arm in engagement with said eccentric cam wheel.

11. In a yarn texturing device including a yarn supply, a yarn take-up spaced from said yarn supply, an air jet between said supply and take-up, means for feeding the yarn from said supply to said take-up and through said air jet, and slub forming means operable to form slubs in the yarn and at spaced intervals therealong, the combination therewith of pattern means for controlling the formation of the slubs in an irregular manner, said pattern means comprising

a. a rotatably pattern wheel having a flat substantially smooth surface on one face thereof, and including a plurality of spaced-apart depressions in said one face,

b. drive means for rotating said pattern wheel at a predetermined speed,

c. air nozzle means having an air outlet for directing air against said one face of said pattern wheel,

d. air supply means for directing air to said air nozzle means to provide a predetermined pressure when said smooth surface of said one face is passing said air nozzle means and to provide a reduced pressure when one of said depressions passes said air nozzle means, and

f. an air pressure switch operated by variations in air pressure in said air supply means for actuating said slub forming means.

12. A yarn texturing device according to claim 11 wherein said depressions comprise grooves extending in a direction generally radially of said pattern wheel.

13. A yarn texturing device according to claim 11 wherein said slub forming means comprises yarn feed control means for increasing the rate of feed of the yarn to said air jet to form slubs when said yarn feed control means is actuated and wherein said air pressure switch is operatively connected to said yarn feed control means to actuate the same each time one of said depressions passes said air nozzle means.

14. A yarn texturing device according to claim 12 wherein the grooves in said one face of said pattern wheel are of irregular width and configuration.

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