RIBBON BREAKER FOR FLUID DRIVEN YARN TRAVERSE MECHANISMS

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FIG. 1.

FIG. 2.

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This invention relates to a variable speed controlling device, commonly known in the textile industry as a ribbon breaker, for fluid-driven traverse mechanisms such as hydraulic or pneumatic driven traverse mechanisms.

The ribbon breaker device of the present invention, moreover, is particularly adapted for controlling and varying the speed of the pneumatic rapid traverse device described and claimed in my copending joint application Ser. No. 121,024, filed October 12, 1949, now Patent No. 2,549,923, issued April 10, 1951, entitled Pneumatic Rapid Traverse for Winding Textile Yarns on Cones and Tubes, and can be advantageously described in connection with the operation of that pneumatic device.

In the textile industry yarn is wound on cones and tubes. The mechanism to do this consists of a means for revolving the package holder and a means for traversing a thread guide to and fro along the package axially. The ratio between the package R. P. M. and the traverse cycles per minute is known as the wind ratio. This wind ratio is limited by good practice to values of less than 10 to 1 and preferably close to values of 5 to 1 or 6 to 1 in cases where the ratio can be held fixed. However, in winding at a constant yarn delivery rate, it will be recognized that the package speed must decrease progressively as the yarn diameter increases. This causes the wind ratio to vary from a starting value of roughly 10 to 1 to a value of 4 to 1 at the finish of the winding of a package. Most of the time the ratio will be a complex number, such as 8.749394 to 1. In this case, the yarn is laid on the package in a staggered non-repeating pattern.

However, when a ratio of 5 to 1 or other whole number ratio is encountered, a ribbon effect is apparent. That is, each few turns of the package finds the yarn being wrapped directly on top of the preceding layer and ridges of yarn soon develop on the package. These ridges of yarn are unstable and break down resulting in tangled yarn, and also causing very severe bouncing of the package against the idler roll with consequent yarn damage and poor speed control. The resulting package is of poor appearance. Thus, it will be recognized that a traverse mechanism which is continually varying in speed would be of advantage in winding superior packages of yarn.

An object of the present invention is to provide ribbon breaking devices adapted to vary continually or intermittently the traverse speed of a fluid driven traverse mechanism.

Another object of the invention is to provide ribbon breaking devices adapted to vary continually or intermittently the traverse speed of the pneumatic rapid traverses described and claimed in my above-mentioned copending joint application Ser. No. 121,024.

Other objects will be apparent hereinafter.

In accordance with one form and feature of the invention, an intermittently variable fluid pressure ribbon breaker is provided comprising a common fluid supply pipe which is divided into two branches. Each branch has the same flow capacity as the supply pipe. In one branch pipe is located a pressure regulator which is set for a predetermined pressure. In the other branch pipe another pressure regulator is set at another higher pressure and is located upstream from a solenoid valve. This solenoid valve is alternately opened and closed by a short cycle on-off repeating timer, preferably a micro-switch which is actuated by a motor-driven cam. The branch pipes are rejoined in a common pipe in which a pressure gauge is located to facilitate pressure settings and to check on operation. The latter common pipe supplies fluid to one or more fluid operated traverses. The changes in pressure in the common pipe produced by the operation of the valve cause proportionate changes in traverse movement.

In accordance with another form and feature of the invention, a continuously variable pressure ribbon breaker is provided. This modification of the invention comprises a fluid supply pipe having a solenoid valve located therein and downstream of which is a pressure tank of such size that it can supply a fluid actuated traverse mechanism with fluid for a suitable time with a pressure drop for example of 5 p.s.i. gauge pressure while operating at 40 p.s.i. gauge pressure. The pressure tank is equipped with a pressure sensitive switch which is adapted to open the solenoid valve at, for example, 35 p.s.i. gauge pressure and close it at 40 p.s.i. gauge pressure. Thus, it will be apparent that the fluid pressure which is supplied to the fluid operated yarn traverse is continuously variable up and down between 35 and 40 p.s.i. gauge pressure with resultant variation in traverse operating speed.

The invention will be further understood by reference to the following detailed description and related drawing in which:

Fig. 1 is a schematic view of a dual pipe, intermittently variable pressure ribbon breaker associated with a pneumatically operated traverse.
mechanism, which is shown partly in section; and

Fig. 2 is a schematic view of a single pipe continuously variable pressure ribbon breaker also associated with a similar pneumatically operated traverse mechanism.

Referring to Fig. 1 the ribbon breaker device there shown comprises a pipe 16 through which flows air under a pressure of 50 p. s. i. gauge. Pipe 16 in turn supplies air to branch pipes 11 and 12 each of which has the same flow capacity as the air supply pipe 10. In branch pipe 11, which may be termed the low pressure pipe, is located a pressure regulator 13 of the type available commercially. This regulator, for example, is set for a pressure of 35 p. s. i. gauge. Therefore, pipe 11 delivers air at 35 p. s. i. gauge to common pipe 35 as will be explained more fully hereinafter. In branch pipe 12, which may be termed the high pressure pipe, a similar pressure regulator 14 is set, for example at 40 p. s. i. gauge pressure and is positioned upstream from a solenoid operated valve 22 which is also positioned in pipe 12. The solenoid valve is adapted to operate intermittently at a predetermined interval by means subsequently described. Therefore, periodically the air pressure in pipe 35 will be increased by higher pressure air from pipe 12.

Current for operating the solenoid is supplied through wires 15 and 16 to microswitch 17 and thence through wires 18 and 19 to the solenoid valve 21 of solenoid operated valve 22. The microswitch 17 has a circuit closing button 23 wherein when pushed and held inwardly by hinged arm 24, completes the actuating circuit through the solenoid 21 of valve 22. Movement of hinged arm 24 is caused by cam 25 which contacts the cam follower 26 which is rotatably mounted on hinged arm 24. Hinged arm 24 may be caused to thrust toward cam 28 by any suitable spring means, not shown. Cam 26 is attached to shaft 27 and through a conventional gear box 28 to timer motor 29. Power for motor 29 is obtained through wires 31 and 32 which are respectively attached to power source wires 16 and 18. A conventional switch, not shown, may be placed in lines 15 and 16, for connecting this electrically operated apparatus to a main power source. By varying the cam shape or motor speed, the action of the solenoid valve and hence air pressure in pipe 16 can be controlled within desired limits.

A typical cycle may be high pressure air on, i.e. solenoid valve open, for ten seconds then off, valve closed for ten seconds. This time cycle can be varied considerably but generally best results are obtained with a time cycle of 15 seconds or less. The branch pipes 11 and 12 are connected to common pipe 35 to which a pressure gauge 36 is suitably attached to facilitate pressure settings and indicate operation. Pipe 35 supplies the thus modified and controlled air pressure to branch pipes 37 and 38 of a pneumatic rapid traverse 39. These intermittent changes in line pressure will cause intermittent and proportionate to and fro traverse speeds of thread guide 41 and hence prevent ribbon formation on the yarn package.

This rapid traverse device which, as above mentioned, is the subject of a copending application Ser. No. 121,024, comprises a pair of valve blocks 45 and 46 to which are connected, respectively, pipes 37 and 38.

It will be noted that both valve blocks 45 and 46 are identical and therefore only valve block 45 will be described in detail. The walls of valve block 45, one of which is not shown, enclose an air chamber 47 and one wall provides a valve stem guide 48 in which valve stem 49 is adapted to move back and forth in a horizontal plane. The valve head 51 is adapted to be seated in valve seat 52 which opens into a short open-ended barrel 53 positioned in the valve block wall opposite the valve head. Valve block 45, as stated above, has the same construction as valve block 46 and therefore is not described in further detail.

Positioned between the valve blocks 45 and 46 and in fluid connection with the barrels of each is an open-ended tube 55 having a horizontal slit 56 along its side. Inside the tube 55 is positioned a piston 57 having an extension 41 extending through slit 56, the end of which is turned over and provides a slot through which the yarn 42 being traversed onto cone 43 is passed. Since it is desirable to keep frictional losses of piston energy to a minimum, it will be noted that only a portion of the piston surface at 58 and 59 is in contact with the inner surface of tube 55.

The operating cycle of the traverse as affected by my novel ribbon breaker device will now be described. Assuming the piston 57 is at rest in the position as shown in Fig. 1, then both valves 51 and 56 would be closed. As stated previously the air pressure would be equal in both pipes and in both air chambers in the two valve blocks.

The piston 57 is then manually pulled all the way to the right end of the tube 55 and the piston 57 forces the adjacent valve 51 to open. The pneumatic rapidly takes the position shown in valve block 46. The compressed air then rushes past the valve 51 and into the barrel 53 wherein the piston 57 fits tightly. The compressed air forces the piston 57 out of the barrel 53 in the same manner as an air gun does a bullet from its barrel. The thrust on the piston 57 is sufficient to push the piston to the opposite end of tube 55 where it strikes the head of valve 51. The action on the piston 55 is thus repeated in the opposite direction and the piston first comes to a sudden stop and then travels again through tube 55 in the other direction, and locks open the valve 51, is again reversed, and so on.

The space between the piston and the valve seat is relatively small and a very small air volume fills this space. This high air pressure, however, acts on the piston to stop its motion and reverse its direction and to propel it toward the other end of the tube. The air flow required to move the piston to the end of the barrel is still small. However, as soon as the rear end of the piston clears the barrel end, the high pressure air flow greatly increases. This increased flow of air in the space between the valve produces a low pressure sufficient to overcome the inertia of the open valve and valve stem friction, and the valve closes after the piston clears the barrel in the valve block. The force required to operate the valves can be controlled by the physical properties of the valve, and by the size of the bevel on the forward face of the valve head.

Thus, when, as in Fig. 1, this type of pneumatic rapid traverse is attached to my novel ribbon breaker the piston receives a different propelling force at the intervals determined by the movement of cam 25. The yarn guide 41 thus traverses yarn 42, obtained from a source
not shown, back and forth the package 43. Idler roll 40 contacts the package 43 as it is wound. The formation of ribbon effects on the cone is, therefore, prevented.

Referring to Fig. 2, a modification of my ribbon breaker device is shown. This device comprises an air supply pipe 70 with a solenoid valve 71 located in it and down stream of which is a pressure tank 72 of a size sufficient to supply through pipe 75 a pneumatic traverse mechanism 80 with air for a suitable time, for example, between 10 and 15 seconds, with a pressure drop of about 5 p. s. i. gauge pressure while operating at, for example, 40 p. s. i. gauge pressure. A pressure gauge 85 is attached to pipe 75. The tank 72 is in fluid communication through pipe 73 with a pressure sensitive switch 74 which may be set to open solenoid valve 71, for example, at 35 p. s. i. gauge pressure and close it at 40 p. s. i. gauge pressure. Current for the operation of the solenoid 88 of solenoid valve 71 is supplied through wires 86, 87 and 88, the circuit being opened and closed as above mentioned by switch 74. Thus, this pressure sensitive switch 74 pressures supplied through pipe 75 to branched pipes 76 and 77 of rapid traverse mechanism 80 which is constructed and operates the same as that described in connection with Fig. 1, is continuously variable up and down between 35 and 40 p. s. i. gauge pressures with resultant variation in speed of travel of yarn guide 81 and consequent prevention of ribbon formation as yarn 82 is wound on package 83. An idler roll is shown at 84.

A typical example of the operation of a fluid driven traverse mechanism in accordance with my present invention is the following. Assuming a package speed of 2400 R. P. M. and a traverse speed of 600 cycles per minute, it will be noted that the wind ratio is 4 to 1, and the yarn will loop every four revolutions. If the package diameter is large, a great amount of yarn will be wound, and the package will become ridged in the period of perhaps five minutes it takes to change appreciably the wind ratio due to increase package diameter. If, however, it takes 40 p. s. i. gauge pressure to run the traverse at 600 cycles per minute and 35 p. s. i. will run the traverse at 520 cycles per minute, and a ribbon breaker is employed, the wind ratio will vary from 2400/600 (4 to 1) to 2400/520 (4.67696 plus to 1). Thus, in the case of the device of Fig. 1, the even wind time is cut to less than one-half of the normal time. In the case of the device in Fig. 2, the even wind time is virtually zero since the pressure is steadily changing with a resultant steady change in traverse speed. Generally, the device of Fig. 1 has sufficient ribbon breaking action to eliminate the possibility of sub-standard yarn packages caused by even winds.

While the ribbon breaker has been described herein as particularly applied to the pneumatic traverse shown in co-pending application Ser. No. 121,024, it may also be employed with other types of traverse mechanisms such as gas or hydraulic driven. Needle valves would be substituted for the pressure regulators in the case of hydraulic operation.

In the following claims the term package also includes cones, tubes or similar articles on which yarn or the like is wound.

What I claim and desire to secure by Letters Patent of the United States is:

1. A ribbon breaker device for a fluid operated traverse mechanism which is adapted to wind yarns or the like on a rotating package comprising in combination means for supplying fluid under pressure for operating the traverse mechanism with means for varying said fluid pressure to produce a change in rate of travel of said traverse mechanism whereby ribbon formation during winding is prevented.

2. A ribbon breaker device for a fluid operated traverse mechanism which is adapted to wind yarns or the like on a rotating package comprising in combination means for supplying fluid under pressure for operating the traverse mechanism with means for varying said fluid pressure to produce a change in rate of travel of said traverse mechanism whereby ribbon formation during winding is prevented.

3. A ribbon breaker device for a fluid operated traverse mechanism which is adapted to wind yarns or the like on a rotating package comprising in combination means for supplying fluid under pressure for operating the traverse mechanism with means for varying said fluid pressure to produce a change in rate of travel of said traverse mechanism whereby ribbon formation during winding is prevented.

4. A ribbon breaker device for a fluid operated traverse mechanism which is adapted to wind yarns or the like on a rotating package comprising in combination means for supplying fluid under pressure for operating the traverse mechanism with means for periodically varying said fluid pressure to produce a change in rate of travel of said traverse mechanism whereby ribbon formation during winding is prevented.

5. A ribbon breaker device for a fluid operated traverse mechanism which is adapted to wind yarns or the like on a rotating package comprising in combination means for supplying fluid under pressure for operating the traverse mechanism with means for periodically varying said fluid pressure to produce a change in rate of travel of said traverse mechanism whereby ribbon formation during winding is prevented.

6. A ribbon breaker device for a fluid operated traverse mechanism which is adapted to wind yarns or the like on a rotating package comprising in combination means for supplying fluid under pressure for operating the traverse mechanism with means for periodically varying said fluid pressure to produce a change in rate of travel of said traverse mechanism whereby ribbon formation during winding is prevented.

7. A ribbon breaker device for a fluid operated traverse mechanism which is adapted to wind yarns or the like on a rotating package comprising in combination means for supplying fluid under pressure for operating the traverse mechanism with means for periodically varying said fluid pressure to produce a change in rate of travel of said traverse mechanism whereby ribbon formation during winding is prevented.

8. A ribbon breaker device for a fluid operated traverse mechanism which is adapted to wind yarns or the like on a rotating package comprising in combination means for supplying fluid under pressure for operating the traverse mechanism with means for periodically varying said fluid pressure to produce a change in rate of travel of said traverse mechanism whereby ribbon formation during winding is prevented.
fluid communication therewith and having a pressure reducing valve therein adapted to supply air at a lesser pressure to a fourth pipe which is in fluid connection with the traverse mechanism, a third pipe in fluid communication with said first pipe and having a pressure reducing valve therein adapted to supply air at a pressure intermediate to those pressures in the first and second pipes to said fourth pipe, and an intermittently operated valve in said third pipe adapted to periodically permit air to flow from said first pipe to said fourth pipe and cause a variance in pressure of the air introduced into said fourth pipe from said second pipe whereby the traverse mechanism operates at non-ribbon forming rates.

9. A ribbon breaker for a pneumatically operated traverse mechanism which is adapted to wind yarns or the like on a rotating package comprising in combination a pipe for supplying air under pressure, a tank adapted to receive air from said pipe and for storing air under pressure and for supplying air over a predetermined range of increasing and decreasing pressures to a traverse mechanism, a valve in said pipe, a pressure actu ated member associated with said tank adapted to open said valve at a minimum pressure and to close the valve at a maximum pressure thereby effecting operation of the traverse mechanism at non-ribbon forming rates.

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No references cited.