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DEVICE FOR ACCUMULATING FILAMENTS DURING SPOOL-CHANGE

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FIG. 1

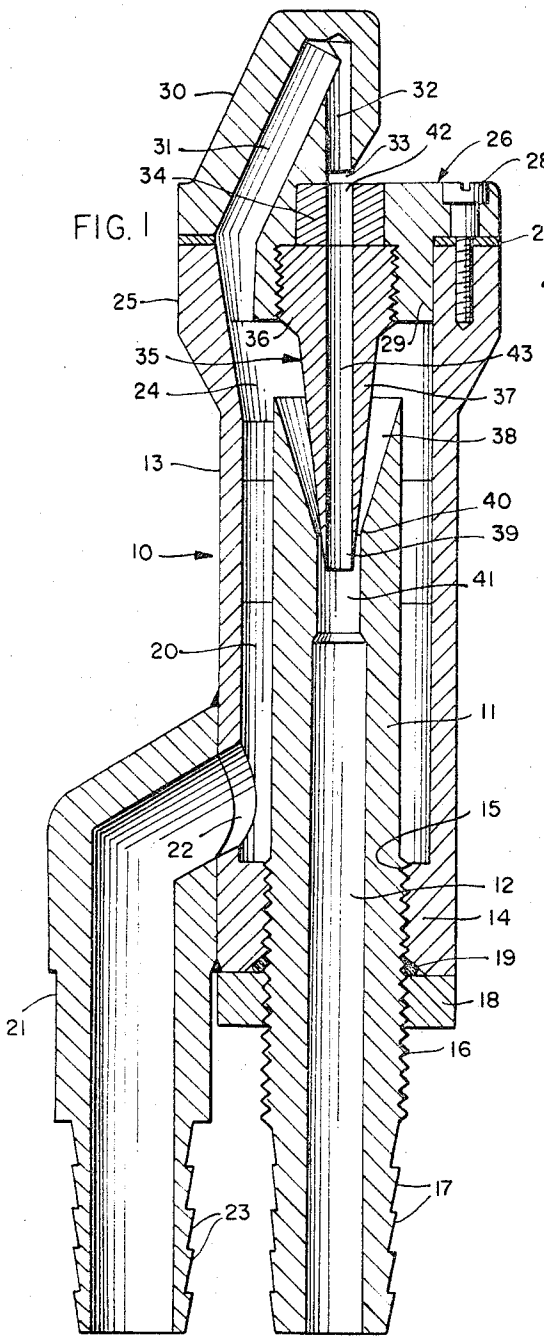
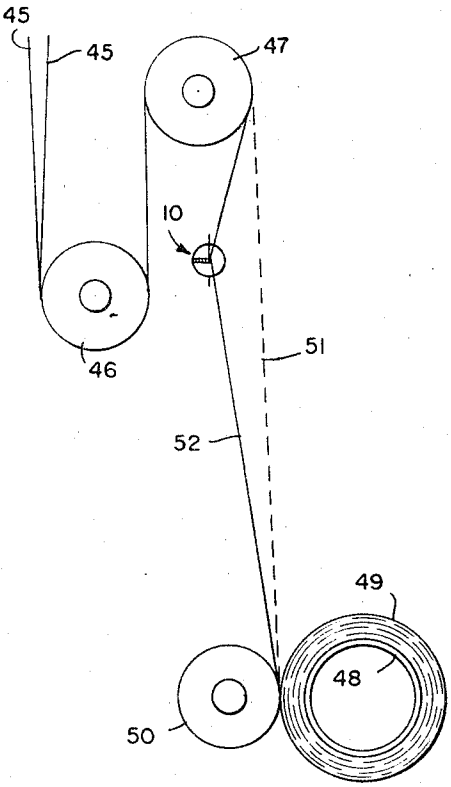


FIG. 2



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DEVICE FOR ACCUMULATING FILAMENTS DURING SPOOL-CHANGE

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ABSTRACT OF THE DISCLOSURE

Thread or filament accumulator device embodying a tubular base member with an axial thread passage therethrough, a gas blast nozzle spaced from and directing its blast toward the upstream end of the passage, a tapered, annular suction nozzle in the upstream portion of said passage, a common manifold for conveying gas (air) at superatmospheric pressure to the two nozzles, and passage means spaced slightly downstream of said blast-nozzle between said blast-nozzle and said axial passage and substantially coaxial with said axial passage for conveying thread or filaments through said passage means into said axial passage in the gas stream from said blast-nozzle.

This invention in general relates to a device used in connection with the changing of take-up spools in winding mechanisms for filaments or threads, and in particular on spinning machines with winding spools operating at high reeling speed.

As is well known with regard to continuously fed filaments, the reception or draw-off of the filaments is not to be interrupted during the spool-change process. Generally, this is done by means of an accumulating godet onto which the filaments are placed before the spool-change and are taken up thereafter until the spool-change is finished.

This method has achieved general acceptance in industry but has, however, one big disadvantage. As soon as the spool-change process is terminated, the waste filaments wound on the godet need to be removed. Generally, this is done by destruction and drawing off of the irregularly taken-up winding by means of a special tool. During this process of filament removal, it is unavoidable that a quantity of small fiber-particles is formed. The latter drift through the air and may be deposited on the filaments being wound or on the newly resulting winding. It can be easily understood that because of this, to some extent, disturbances may occur during the subsequent treatment of the filaments or threads.

The principal objective of the device according to this invention is to accumulate or receive the thread or filaments during the process of changing spools in the place of the customary godet and to thereby eliminate the disadvantage of the latter. According to the invention, the device operates in such a manner that through use of a sharply-defined air-jet of a blast nozzle into a calibrated mouthpiece, the thread or filaments are pressed into the passage of the mouthpiece against the filament or thread-tension and are conveyed by means of vacuum pressure produced by an ejector-like suction-nozzle. This is done by the combination of respectively one blast-nozzle and suction-nozzle, operating from air streams flowing in the same axial direction. The two air streams are coincident in their effect, and the two nozzles are connected to a common pressure chamber. The two nozzles are arranged in coaxial sequence, and their performances are coordinated in such a manner that the effect of the suction-nozzle overcomes that of the blast-nozzle completely.

It was found that the effect according to the invention takes place only if the cross sections of the blast-nozzle, of the mouthpiece and of the ejector suction-part are tuned one upon another in such a manner that the entire flow of gas leaving the blast-nozzle is received in the suction-part and is still additionally accelerated there. For this purpose, it is necessary according to the invention that the cross section planes of the blast-nozzle passage, of the mouthpiece passage, and its subsequent coaxial suction-passage and of the suction-tube passage are approximately at a respective ratio of 1:1.8 to 2.5:3 to 5, preferably approximately at a ratio of 1:2.2:4 in relation to one another.

In order to operate the device, a gas pressure between 3 and 8 atmospheres, preferably one between 5 and 7 atmospheres, can be used. With regard to this, it has become evident that when the individual passages of the device according to the invention are proportioned according to the specified ratios and when employing a gas-pressure lying within the specified limits, the combined blast-effect and suction-effect suffices in order to snap the thread or filaments between spool and device during insertion into the device at the full spool stage of winding as well as during the stage of re-joining of the thread or filaments onto the empty spool.

Advantageously the device according to the invention, in addition to being used in spinning machines, may be employed throughout where threads or filaments are continuously wound up and where the period necessary for the spool-change has to be bridged over by a device maintaining thread or filament take-up or accumulation. It may be mounted—for example in the spinning machine frames—in a stationary position close to the normal thread-route and, when required, activated by means of any control whatsoever known in itself, or it may be hand fed.

By means of the drawing, the features, advantages, and objects of the invention are explained in greater detail, in which drawing:

FIG. 1 is a cross-section through a preferred embodiment of a filament accumulator of the invention; and

FIG. 2 is a semi-diagrammatic view of a filament winding arrangement with the accumulator device according to the invention stationed close to the wind-up place.

Referring to the drawing, the preferred embodiment of the thread or filament accumulator **10** comprises a tubular base member **11** having an axial gas passage **12** extending longitudinally therethrough. The upstream portion of the tubular base member **11** has a hollow housing **13** thereabout, which housing projects beyond the upstream portion of the base member. The downstream wall **14** of the housing **13** has an axial, tapped hole **15** receiving the external threads **16** of the downstream portion of the tubular base member **11**. The downstream end of the tubular base member has annular ribs **17** and is adapted to be connected to a hose or other tube-like member. The threaded connection between the downstream wall **14** and the threads **16** is made gas-tight by the provision of a nut **18** threaded on the threads **16** and a seal ring **19** pressed by nut **18** against the lower end of wall **14**.

The hollow housing **13** about the tubular base member **11** provides an annular gas passage **20** for gas fed via the gas feed tube **21** through the opening **22** into annular passage **20**. The outer end of the gas feed tube **21** has annular ribs **23** to facilitate connection of the tube **21** to a hose or other conduit connected to a source of high pressure gas, usually nitrogen or air.

The portion of the housing **13** which projects beyond the upstream end of the tubular base member **11** provides a manifold section **24** in communication with the annular passage **20**. The enlarged upstream end **25** of the housing

13 has mounted thereon a cap 26, which is maintained in gas-tight fit with the upper edge of the enlarged upstream end 25 by seal ring 27 and bolts 28, one of which is shown in FIG. 1.

The base 29 of the cap 26 seats inside the upstream edge of the enlarged end 25 of the housing 13. The cap 26 also has a blast-nozzle 30 projecting outwardly from the base 29. The blast-nozzle has a gas passage 31 in communication with the manifold section 24 at one end thereof and in communication with a gas-blast orifice 32 at the other end thereof. The gas-blast orifice 32 is directed toward and is substantially coaxial with the axial gas passage 12. The exit end of the blast orifice 32 is spaced in substantially contiguous relationship, as is shown by the space 33, with a cylindrical mouthpiece 34, the mouthpiece 34 thus being spaced contiguously downstream of the blast orifice 32. A tube member 35 has its base 36 threadedly mounted in the cap 26 immediately downstream of the mouthpiece. This tube member has a frusto-conical tube 37 extending downstream from the base and projecting into the frusto-conical passage 38 in the upstream end of the tubular base member 11.

The frusto-conical tube 37 and the frusto-conical passage 38 both taper in the downstream direction, the former at a lesser angle of taper than the latter, and are substantially coaxial with the axial gas passage 12 in the tubular base member 11. The tip portion 39 of the frusto-conical tube 37 extends through the neck 40 of frusto-conical passage 38 and into the throat 41 in the upstream end of the axial gas passage 12. The tip portion 39 defines with the neck 40 and throat 41 a narrow, annular space through which gas under pressure in the manifold section 24 will flow into the throat 41 of the axial passage 12. This structure provides an ejector-type suction nozzle which provides a low pressure area in the throat 41 adjacent the tip 39.

Air or other gas is blasted from the blast orifice 32 through the aligned gas passages 42 and 43 of the mouthpiece 34 and the tube member 35, respectively. This gas is conveyed into the throat 41 via the latter passages. Thread or filaments are inserted in the space 33 immediately downstream of the blast orifice 32 and are conveyed by the gas stream through the passages 42 and 43 into the axial passage 12. The axial passage 12 is connected by hose or other conduit to a waste container in which the thread or filaments are accumulated.

For purposes of the invention, it is desirable that the gas-blast from blast orifice 32 have essentially no lateral deflection, and that essentially all of the blasted gas enter the opening of mouthpiece 34. Hence, the thread or filament accumulator device of the invention is designed so that the suction effect of the injector-type suction-nozzle at the throat 41 completely overcomes or overbalances the blast effect of the blast-nozzle 30. This is achieved by proper relative proportioning of the cross sections of the blast orifice 32, the passages 42 and 43, and the axial gas passage 12 at the throat portion 41 in a manner whereby the aforesaid effect is achieved. The respective cross sections are progressively larger than the one preceding and are proportioned to supply flow of gas with essentially no lateral escape of the gas blasted into the mouthpiece 34 by the blast orifice 32 and with essentially complete predominance of the effect of the suction-nozzle at the throat 41 over the blast-nozzle 30 whereby the blasted gas flowing through the mouthpiece 34 and the tubular member 35 is accelerated by the suction effect of the suction nozzle.

For purposes of the invention, the relative cross-sectional areas of the blast orifice 32, the gas passages 42 and 43, and the throat 41 have the respective approximate ratio in the range of 1:1.8 to 2.5:3 to 5, the most preferred ratio being 1:2.2:4. These proportions provide the functions aforesaid when the pressure of the gas fed to the thread or filament accumulator device 10 is in the order of 3 to 8 atmospheres, preferably between 5 and 7 atmospheres.

Referring to FIG. 2, which shows the use of the accumulator device of the invention in schematic relationship to the winding portion of the spinning machine, two thread or filament bundles 45 from the spinning portion of the machine are conveyed separately or collectively over a pair of draw-off godets 46 and 47 to a winding tube or spool 48. In the embodiment illustrated, the winding tube 48 is rotatably driven by a friction drive roller 50 in driving contact with the winding 49 on the winding tube 48. The threads or filaments normally follow the thread path 51 as shown in dotted lines in FIG. 2.

When a full winding is achieved, the winding tube or spool 48 must be changed. However, threads or filaments continue to be supplied from the spinning machine. Means is provided adjacent the thread path for accumulation of the thread or filaments during the period required to change the spool or winding tube 48. In accordance with the instant invention, the thread path 51 is deflected into thread path 52 by inserting the running thread or filaments into the space 33 of the accumulator device 10. The blast effect from blast orifice 32 conveys the threads or filaments through the accumulator device as aforedescribed, whereupon the threads or filaments break at a point between accumulator device 10 and the winding 49 and continue to be drawn into and through the accumulator device during the spool change process.

When the full spool has been replaced by an empty spool, the threads or filaments are deflected at a point between the accumulator device 10 and the draw-off godet 47 by means of the appropriate tool, usually a simple spinning hook, and the thread or filaments are wound several times on the empty spool. As the winding process begins again, the threads or filaments between the accumulator device 10 and the spool or winding tube 48 break, whereupon the threads or filaments again assume the thread path 51.

The invention is hereby claimed as follows:

1. A thread or filament accumulator device comprising a base member having an axial passage therethrough, means forming a gas-blast nozzle spaced from the upstream end of said axial passage and directing the gas-blast axially toward said passage, means forming a suction-nozzle in the upstream portion of said base member in an orientation providing gas flow through said suction-nozzle into said axial passage coaxially with the gas stream from said blast-nozzle at a flow rate whereby the vacuum effect of the suction-nozzle essentially completely overpowers the gas-blast of the blast-nozzle, common manifold means for said nozzles, means for conveying air at superatmospheric pressure from said manifold means respectively to said blast-nozzle and said suction-nozzle, and passage means spaced slightly downstream of said blast-nozzle between said blast-nozzle and said axial passage and substantially coaxial with said axial passage for conveying thread or filaments through said passage means in said axial passage in the gas stream from said blast-nozzle.

2. An accumulator device as claimed in claim 1, wherein said means forming said suction-nozzle comprises a frusto-conical passage in the upstream end of base member, the latter passage tapering in the downstream direction, being substantially coaxial with said axial passage, and having its upstream end in communication with said manifold means, and a tubular member of said passage means extending substantially coaxially through said frusto-conical passage into the upstream end of said axial passage with narrow, annular space between the neck of said frusto-conical passage and the outer side of said tubular member.

3. An accumulator device as claimed in claim 2, wherein said passage means also includes a thread or filament-receiving mouthpiece, said mouthpiece having a passage therethrough communicating with the passage of

said tubular member and being substantially coaxial therewith, and said mouthpiece being spaced slightly downstream of said blast-nozzle.

4. An accumulator device as claimed in claim 3, wherein the respective ratios of cross sections of said blast-nozzle, said mouthpiece and passage of said tubular member, and upstream end of said axial passage are 1:1.8 to 2.5:3 to 5.

5. An accumulator device as claimed in claim 1, and means for supplying gas to said manifold means at a gas pressure between 3 and 8 atmospheres.

6. A thread or filament accumulator device comprising a tubular base member having an axial gas passage therethrough, a hollow housing about said tubular member and projecting beyond the upstream portion of said base member, means forming a substantially gas-tight seal between the downstream end of said housing and said base member, said housing being spaced from said base member to provide an annular gas passage therebetween, a cap closing the upstream end of said housing, a blast-nozzle in said cap, said blast-nozzle having a gas passage communicating with said annular gas passage and a blast orifice directed toward and substantially coaxial with said axial gas passage, a mouthpiece in said cap and spaced contiguously downstream of said blast orifice, a tube member having its base mounted in said cap immediately downstream of said mouthpiece and a frusto-conical tube extending downstream from said base, the upstream end of said tubular base member having a frusto-conical passage which tapers in the downstream direction, is substantially coaxial with said axial passage, and has its upstream end in communication with said annular passage, said frusto-conical tube extending substantially coaxially through said frusto-conical passage with its downstream tip portion in the upstream end of said axial passage with a narrow, annular space between said tip portion and said

upstream end of said annular passage, said mouthpiece and tube member having aligned gas passages which convey gas from said blast-nozzle into said axial passage, the transverse cross sectional areas of said blast orifice, said gas passages of said mouthpiece and said tube member, and said axial passage being respectively larger than the one preceding, the gas flowing through said narrow annular space between said tip portion of said tube and said upstream end of said axial passage providing an ejector-type suction nozzle in the upstream portion of said annular passage, and the respective gas passages being proportioned to provide flow of gas with essentially no lateral escape of the gas blasted into said mouthpiece by said blast orifice and with essentially complete predominance of the effect of the suction-nozzle over the blast-nozzle whereby the blasted gas flowing through said tube member is accelerated by the suction effect of said suction-nozzle.

7. An accumulator device as claimed in claim 6, wherein said cross sectional areas have the respective approximate ratios of 1:1.8 to 2.5:3 to 5.

8. An accumulator device as claimed in claim 7, wherein said cross sectional areas have the respective approximate ratios of 1:2.2:4.

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U.S. Cl. X.R.

57—34.5; 28—1