United States Patent [19]

Bethea et al.

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[45] **Aug. 7, 1973**

[54] **ASPIRATOR**

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[21] Appl. No.: **213,862**

[52] **U.S. Cl.** **226/97,** 28/1.4

[51] **Int. Cl.** **B65h 17/32**

[58] **Field of Search** 239/424.5; 226/97; 28/1.4; 57/52, 54

[56] **References Cited**

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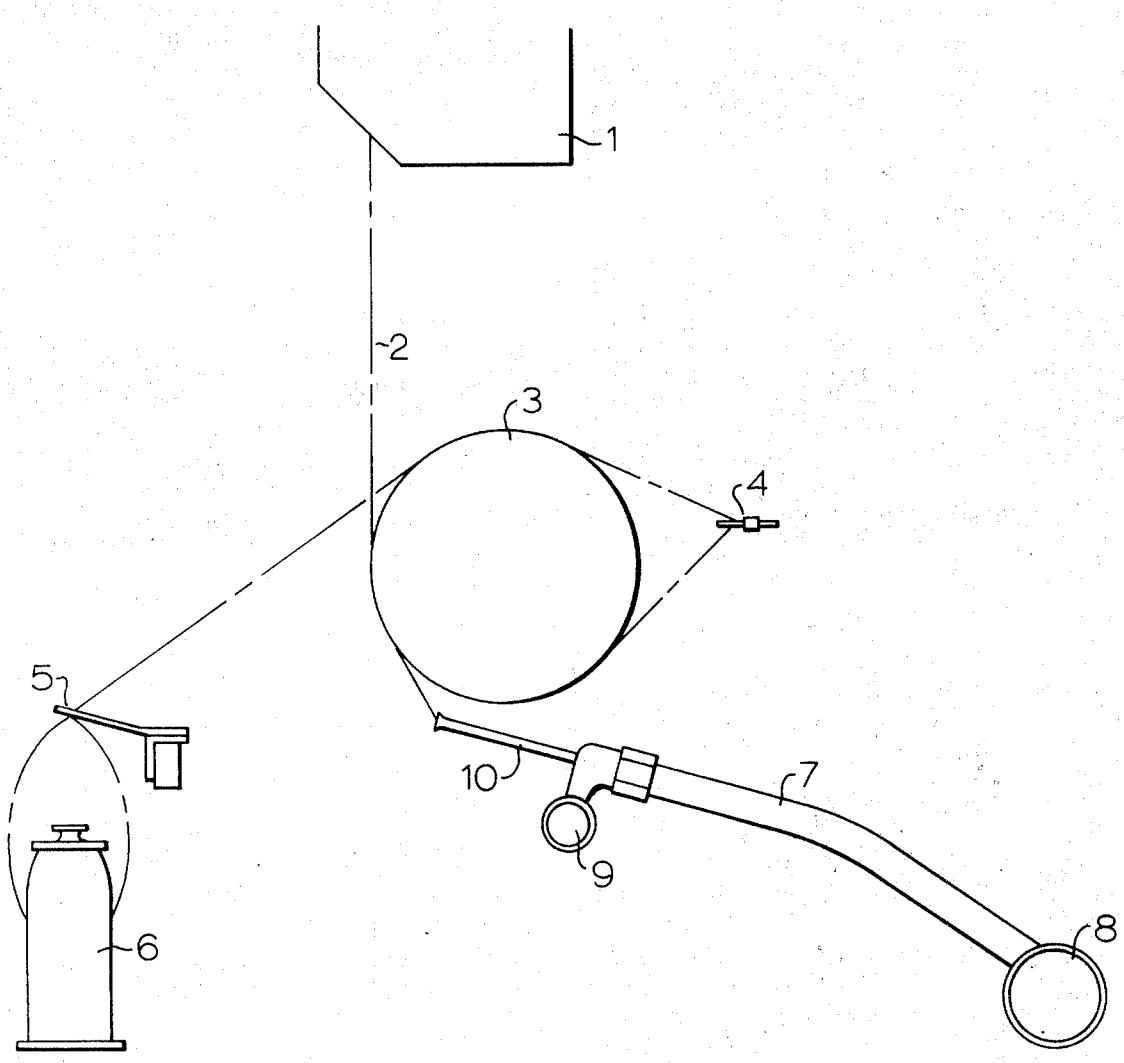
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[57] **ABSTRACT**

An aspirating device suitable for use in conjunction with the doffing of yarn wound members, the device employing a vacuum to pick up a yarn end and a selective compressed air supply to increase yarn threadline tensions only during initial yarn attachment to the next member to be wound. The compressed air is fed through a bushing member which serves to create a rarefield atmosphere and to spread the yarn filament bundle, increasing yarn cross-sectional area and consequently yarn tension.

4 Claims, 5 Drawing Figures



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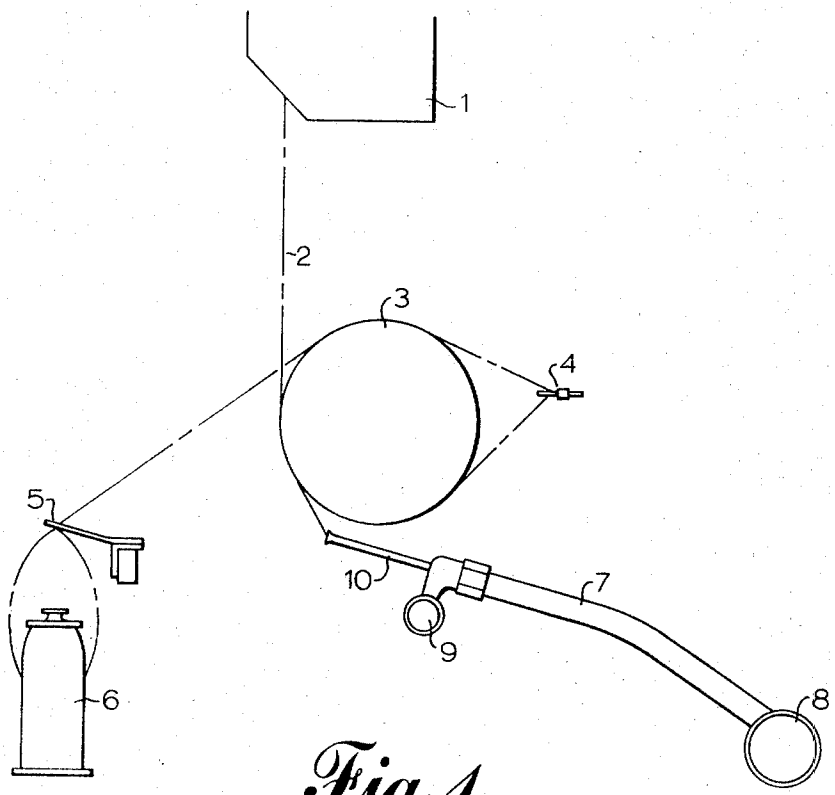


Fig. 1

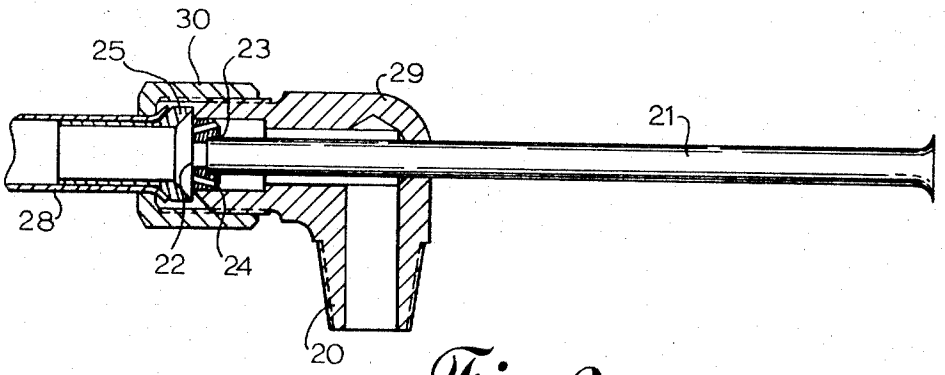


Fig. 2

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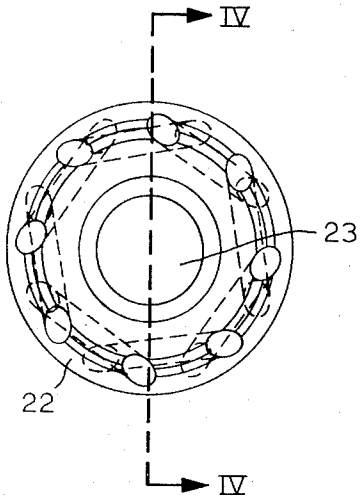


Fig. 3

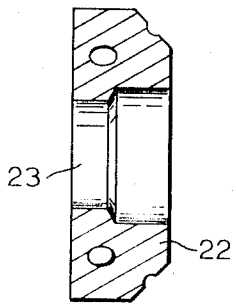


Fig. 4

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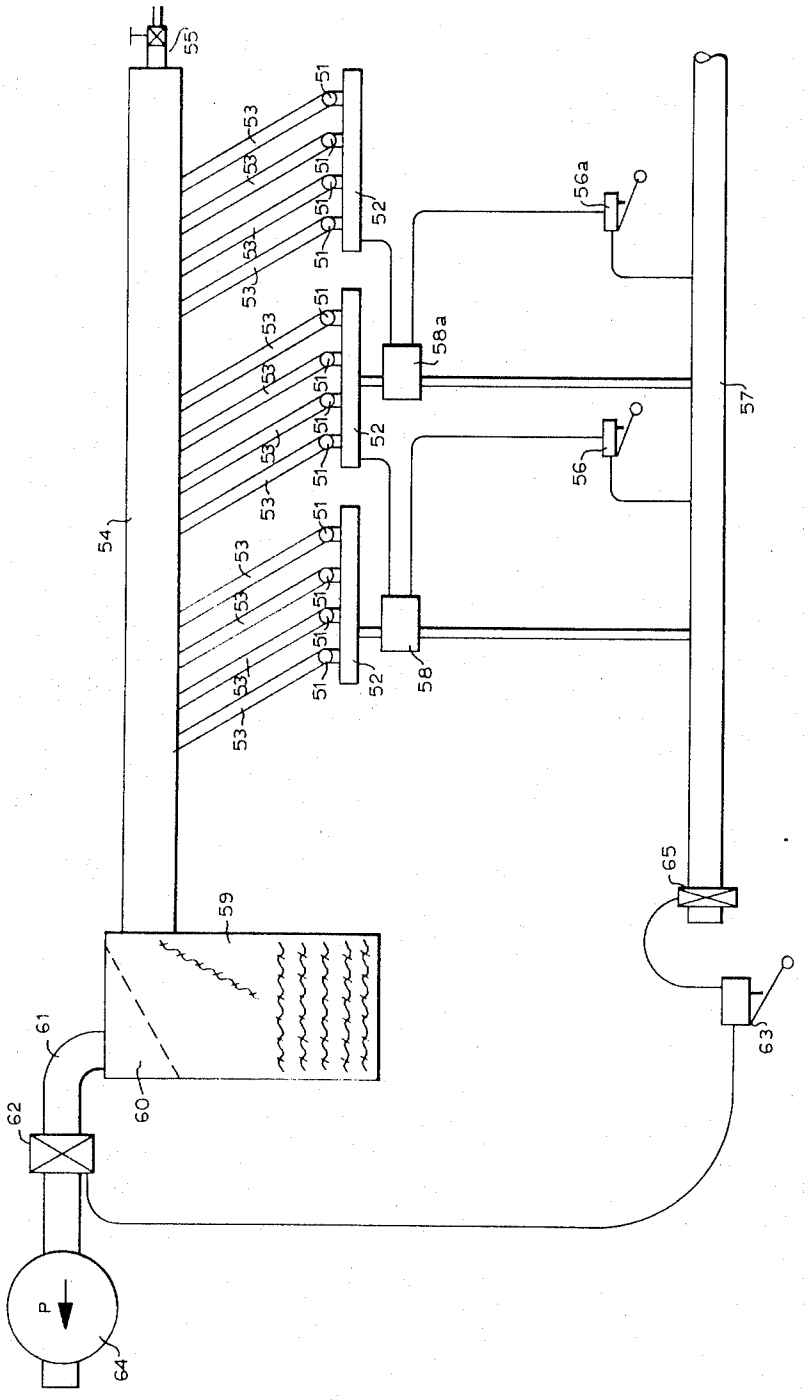


Fig. 5

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ASPIRATOR

This invention relates to devices for clearing textile machines of the general type wherein continuous lengths formed from textile fibers are continuously wound and doffed. Examples of such machines are spinning frames and synthetic filament yarn spinning take-up means or any wound yarn packaging system which is subject to manual or automatic doffing.

In a doffing operation, the free yarn end must be caught and removed or the free yarn end will wrap on the feed roll to form waste which is often wound into the next package being wound. Even when waste yarn is cut from a feed roll, the lint formed by the cutting operation may damage the next package being wound.

In textile practice, a typical portable yarn aspirator of the type generally referred to as a "sucker gun" is designed as a hand tool to be manually handled and manipulated by an operator. The aspirator is connected to a source of air under pressure which is employed to create a rarefied pressure atmosphere for producing an intake or draft of air into a nozzle on the aspirator. Control over a continuous moving threadline or yarn end is readily obtained by bringing the aspirator within close proximity of and aiming the nozzle at the yarn end. The yarn end is pulled into the aspirator, carried therethrough and deposited in a receptacle or bag. Conventional aspirators, however, do not develop sufficient threadline tension to consistently allow the lacing of a new bobbin; that is to say, when attempting to wind a yarn end on a fresh bobbin, the yarn will frequently lap about the feed roll due to insufficient threadline tensions. While such devices have sufficient vacuum to pick up a loose yarn end, yarn tensions are below that level necessary to affect a "throw on" or initial attachment to the next bobbin to be wound. The tension is important inasmuch as in lacing the bobbin, the running loop is pulled from the vacuum orifice instead of the feed roll.

In addition to the varying requirements placed on an aspirator, it is necessary that the air consumption be minimized due to operating expenses.

It is therefore an object of this invention to provide a yarn aspirator which has the ability to pick up a free yarn end and when necessary generate yarn tensions suitable to affect the lacing of a new bobbin.

It is another object of this invention to provide an apparatus wherein yarn pick-up and yarn tensioning actions are controlled in conjunction with the action of an automatic doffing device.

These and other objects of the invention will be more readily apparent from the following detailed description of the invention.

The yarn aspirator of this invention comprises a housing provided with an inlet means connected to a valve actuated source of air under pressure and connected to a vacuum source. When said valve is in the open position, air under pressure flows through passage means in the housing and thence to a bushing means therein adapted to create a rarefied air condition for effecting an increased intake of air into a nozzle mounted on the housing. The nozzle is directly connected to a vacuum source which is in substantially continuous operation. A yarn end resulting from a doffing operation may be readily picked up by relying on the vacuum source alone with threadline tensions being increased for a lacing operation by subsequent actuation of the source of air under pressure. When lacing is complete, the flow of air under pressure is stopped.

A better understanding of the invention may be had from the following detailed description of the invention wherein:

FIG. 1 is a schematic view of the yarn aspirator device of this invention as employed in conjunction with a synthetic filament spinning apparatus employing a balloon twisting device;

FIG. 2 is a cross-section of the yarn aspirator device of this invention;

FIG. 3 is an enlarged top view of the aspirator jet bushing component of the aspirator device of this invention;

FIG. 4 is a cross-sectional view taken along the line IV,IV of FIG. 3;

FIG. 5 is a schematic view of the air valve arrangement of the aspirator device of this invention.

Referring to FIG. 1, a take-up means for a filament spinning cabinet is illustrated diagrammatically, a yarn 2 issuing from cabinet 1 is passed about a feed roll 3 pigtail guide member 4 being employed to center the yarn on feed roll member 3. In winding operations, the yarn then progresses from feed roll member 3 through balloon guide member 5 onto bobbin 6. When bobbin 6 is fully wound, the bobbin is either doffed manually or automatically whereupon the broken yarn end is picked up by aspirator device 7, aspirator device 7 being connected with a vacuum line 8 and a compressed air line 9. The broken yarn end is then caused to pass from feed roll member 3 into the nozzle member 10 of the aspirator device by use of vacuum alone and unaided by compressed air. A "throw on" or lacing of a new bobbin is then effected by increasing threadline tension by use of compressed air and taking the yarn from the area between feed roll member 3 and nozzle member 10 and securing it to the new bobbin. As previously noted, prior art aspirators or sucker guns fail to maintain sufficient tension so as to permit an effective lace-up subsequent to the yarn being aspirated into the sucker gun and consequently the yarn would frequently lap about the feed roll. A better understanding of the improved apparatus of this invention may be had from FIG. 2 of the drawings which is a cross-sectional view of the aspirator of this invention, the aspirator comprising a flared nozzle member 21, which is secured to housing member 29 being equipped with an air supply header 20. Compression nut 30 secures vacuum line 28 to housing member 29. Housed within compression nut 30 is bushing member 22. Bushing member 22 has an axially disposed orifice 23 and a plurality of aspirating holes 24 positioned about said axial orifice 23, and tapped through bushing member 22 in a manner such that an extension of the longitudinal axis of axial orifice 23 and the longitudinal axis of each of aspirating holes 24 will intersect the inside surface of the sleeve insert 25 near the sleeve insert entrance. Bushing member 22 is held in position by engaging nozzle member 21 on one face and sleeve insert member 25 on the other face. Sleeve insert member 25 engages the flared end of vacuum line 28 and the periphery of bushing member 22. Vacuum line 28 also serves as a yarn transport line. Sleeve insert member 25 serves to form a throat in vacuum line 28 and thereby improve the function of bushing member 22 upon the application of compressed air.

The construction of bushing member **22** may be seen in greater detail in FIGS. **3** and **4** of the drawings. As can be seen in FIG. **4**, the bushing member has its axially disposed orifice **23** counter sunk to receive the nozzle member. A plurality of aspirating holes are evenly spaced about axial orifice **23** on an equal radius. The longitudinal axis of aspirating holes **24** are as shown in FIGS. **3** and **4**, preferably canted at a slight angle from the horizontal. Preferably aspirating holes **24** are disposed every 45° about axial orifice **23** and are canted at an angle of 40° from the horizontal. Bushing member **22**, in addition to creating a rarefied air condition on the application of compressed air, spreads apart the filaments of the aspirated yarn bundle to produce additional cross-sectional area. The result of this spreading is increased yarn tension as the compressed air performs work on the filament bundle.

The aspirator device of this invention may employ continuous or intermittent use of vacuum, the vacuum alway being activated to pick up the free yarn end. Subsequent to picking up the threadline, yarn tension is increased by actuating the compressed air line. The use of compressed air is continued until bobbin replacement and "throw on" is complete. While the aspirator device of this invention may be manually operated, a preferred embodiment is automatic operation in conjunction with an automatic doffing device. Exemplary of automatic doffing devices with which this invention is concerned are doffing devices of the type set forth in U.S. Pat. application Ser. No. 147,951, filed May 28, 1971. Bobbin handling apparatus of this type includes a carriage that moves along the length of the spinning machine and in time sequence removes a plurality of filled bobbins from their spindles, transfers the filled bobbins to a rack or bobbin transports, picks up a plurality of empty bobbins, transfers the empty bobbins to the previously doffed spindles, and then travels to the next position, where the process is repeated.

In the production of synthetic yarns, a plurality of filaments emerge from the extrusion cabinet and pass over a feed roll and are then twisted together and wound on a bobbin. Typically, as many as a hundred spindles, or more, are mounted vertically in a row that extends longitudinally of the machine from below the extrusion cabinet. A plurality of filaments are looped around the feed roll and contacted through a balloon guide and a ring and traveler and are wound on the bobbins. Each bobbin is rotated by a drive mechanism connected with the spindles. A clutch and brake under each spindle allows the spindles to be individually stopped. When the aspirator device of this invention is employed for automatic operation in conjunction with a doffing device, the aspirator is activated automatically by the bobbin handler which opens an air valve mounted near the brake setter track. The bobbin handler then activates the air supply valve and then the bobbin brake on each metier position. When throw-on has been completed, the aspirator is de-activated by turning the aspirator air supply valve off manually, or automatically by the bobbin handler when it traverses to the next position. Excellent tension characteristics during the critical time interval are thereby achieved.

The means by which automatic actuation and deactuation of the aspirator air supply is achieved may be better understood from a discussion of FIG. **5** of the drawings. As can be seen in FIG. **5**, a plurality of aspirators **51** are joined to aspirator manifolds **52**, the aspirator manifolds **52** being supplied with compressed air flowing through air supply header **57** pressurized by compressed air valve **65** and diverted to aspirator manifold **52** by means of compressed air control valve **58**. The compressed air control valve **58** is controlled in turn by air switch valve **56**, which as previously mentioned, is actuated by the bobbin handler. On completion of the doff, the bobbin handler, as previously mentioned, moves to the next position whereupon it actuates a downstream air switch valve **56*a*** which in turn opens a downstream compressed air control valve **58*a*** causing compressed air to flow through aspirator manifold **52** and back into compressed air control valve **58**. The effect of this equalizing air flow is to cause compressed air valve **58** to close, thereby cutting off the compressed air supply to the now doffed bobbin positions. Waste yarn collected by individual aspirators **51** is transferred through individual vacuum lines **53** to vacuum header **54**. The intensity of the vacuum header **54** is regulated by means of valve member **55**, which is positioned at the extremity of vacuum header **54**. At the other terminus of vacuum header **54**, a yarn waste tank **59** is secured, yarn waste tank **59** being provided with a screen separator **60** which is disposed in advance of vacuum line **61**, which is joined to vacuum valve **62**. Vacuum valve **62** is joined to a vacuum pump **64**. Screen separator **60** thereby prevents waste yarn from being drawn into either the vacuum valve **62** or the vacuum pump **64**. As previously mentioned, the vacuum may be operated continuously or alternatively, a switch member **63** may be actuated manually or automatically at the start of a doffing cycle.

Having thus disclosed the invention, what is claimed is:

1. An aspirating device suitable for use in conjunction with yarn doffing operations, said device comprising a housing, said housing provided with an inlet means connected to a valve actuated source of air under pressure, a yarn receiving nozzle member secured thereto, said nozzle being connected to a vacuum source, a bushing means disposed in said housing and fitted to said nozzle, said bushing having an axially disposed orifice fitted to said nozzle member and a plurality of aspirating holes evenly positioned about said orifice on an equal radius whereby a rarified air condition may be created.

2. The apparatus of claim **1** wherein said aspirating holes are 45° apart.

3. The apparatus of claim **1** wherein said aspirating holes are at an angle of 40° from the horizontal.

4. The apparatus of claim **1** wherein the face of said bushing opposite the nozzle fitted face is secured to a sleeve member which forms a throat in a vacuum line.

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