March 22, 1966 J. M. KIEFER ETAL 3,241,234

YARN ASPIRATOR WITH SEVERING MEANS

Filed March 10, 1964 2 Sheets-Sheet 1

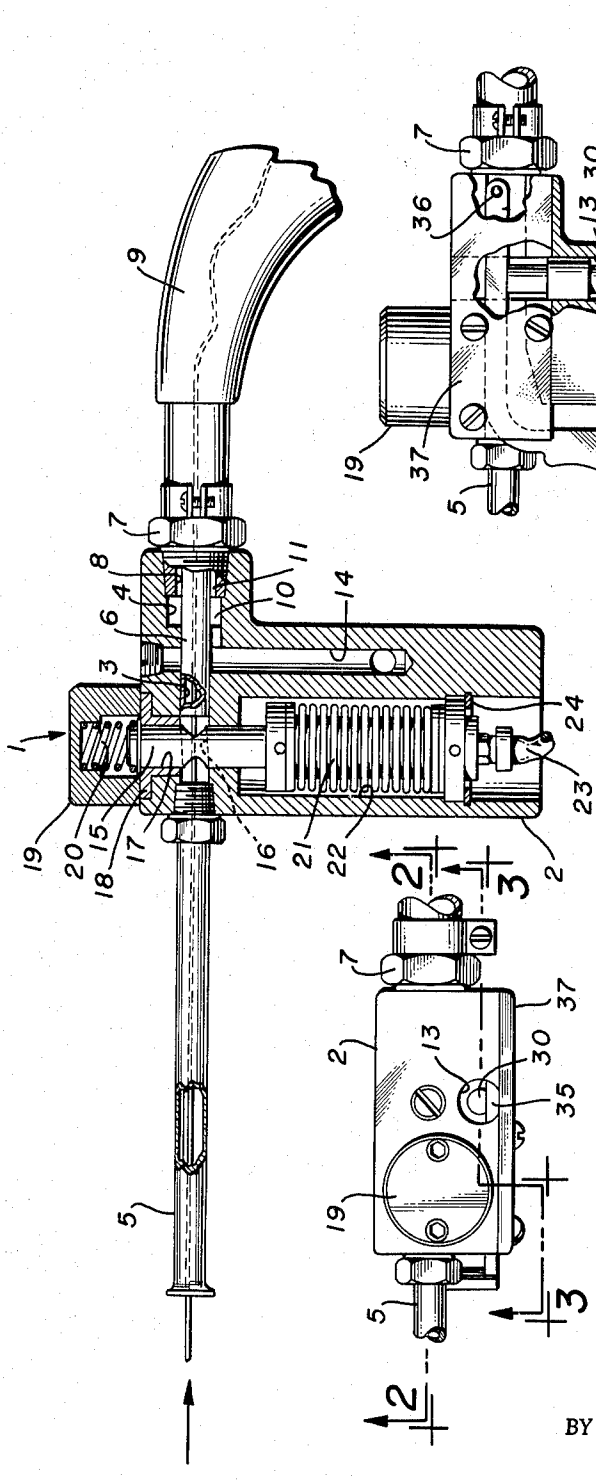


FIG. 1.

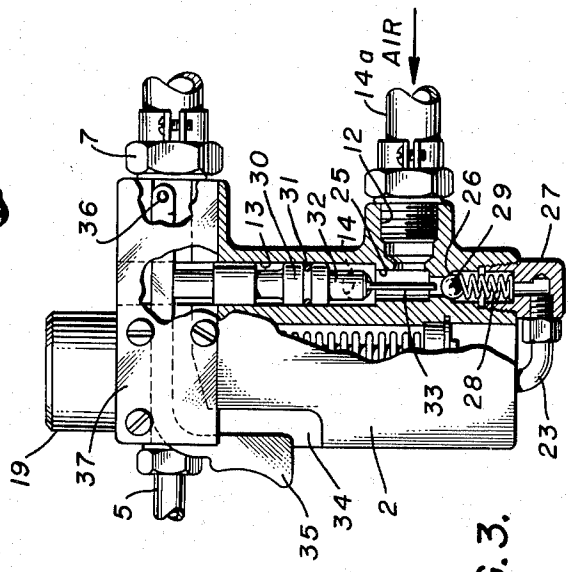


FIG. 3.

FIG. 2.

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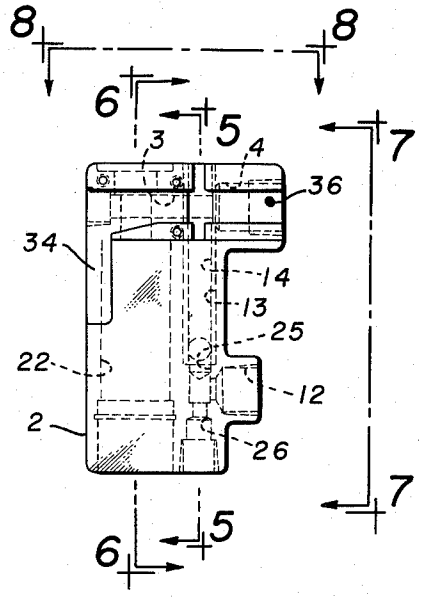


FIG. 4

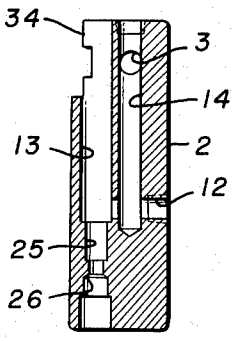


FIG. 5.

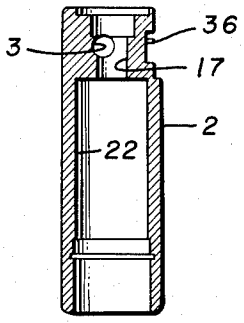


FIG. 6.

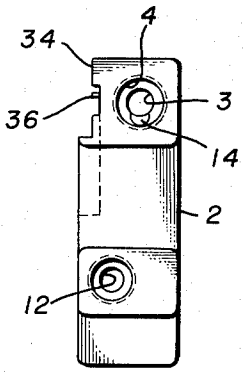


FIG. 7.

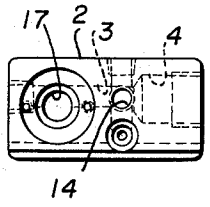


FIG. 8.

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YARN ASPIRATOR WITH SEVERING MEANS

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7 Claims. (Cl. 30—133)

This invention relates to textile devices for handling, collecting, and stringing or lacing yarns onto textile machines, and more particularly relates to an aspirator device provided with severing means for selectably cutting a continuous yarn normally being propelled through the aspirator device.

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. The yarn end is thus maintained under tension and the operator by manipulating the aspirator at will can wind the yarn around godets, guides, drums, bobbins and the like.

Conventional aspirators, however, do not incorporate suitable means for severing the yarn end once control is effected. Consequently, upon completing a string-up of the yarn, the yarn must be cut or broken away from the aspirator by separate operation. The use of scissors and other cutting implements presents a safety hazard. Inconvenience, loss of time and unsafe working circumstances result.

It is the object of this invention to provide a novel yarn aspirator adapted to sever a yarn moving through the aspirator.

Another object of the invention is to provide a portable pneumatic "sucker gun" with selectably operable severing means for efficiently, safely, and expeditiously handling and severing yarns.

Accordingly, a yarn aspirator constructed to accomplish the above objects is provided. The yarn aspirator embodying the invention comprises a housing shaped to be gripped manually as a "gun" and provided with inlet means normally connected to a source of air under pressure. Air under pressure flows through passage means in the housing and thence to tubular suction means therein adapted to create a rarefied air condition for effecting a constant intake of ambient air into a nozzle mounted on the housing. By bringing the aspirator within close range and aiming the nozzle at the yarn, the yarn is pulled into the nozzle, propelled through perforated cutter means in the housing, through the tubular suction means and deposited into a receptaclie which is attached to the aspirator. When desired, the yarn being drawn through the aspirator is cut by pulling on a pivotal trigger means positioned on the housing. The trigger means when "fired" operates valve means in the housing that acts to cut off the flow of pressurized air to the tubular suction means and diverts the pressurized air to flow to actuator means connected to the cutter means. The actuator means acts responsively to air under pressure to rapidly move or ram the perforated cutter means telescopingly into a bushing member for shearing the yarn end normally being aspirated through the perforated cutter means.

A better understanding of the yarn aspirator embodying the invention will be obtained by reference to the following more detailed description and to the accompanying drawings.

In the drawings:

FIGURE 1 is a plan view of the novel yarn aspirator;

FIGURE 2 is a section view taken through 2—2 of FIGURE 1;

FIGURE 3 is a section view taken along 3—3 of FIGURE 1;

FIGURE 4 is an elevation view of the housing of the novel aspirator;

FIGURE 5 is a section view taken through 5—5 of FIGURE 4;

FIGURE 6 is a section view taken through 6—6 of FIGURE 4;

FIGURE 7 is a side view of the housing as viewed in the direction of 7—7 of FIGURE 4; and

FIGURE 8 is a plan view of the housing shown in FIGURE 4.

Referring to the drawings, FIGS. 1–8, the textile aspirator 1 embodying the invention comprises a housing 2 having a bore 3 extending therethrough. Bore 3 is threaded adjacent one end thereof and has a counterbore 4 formed adjacent the opposite end thereof. Counterbore 4 is threaded at its outer end thereof. A nozzle 5 is sealingly and screw-threadingly connected to the threaded end of bore 3. A tube 6 is securely fitted in the end of bore 3 adjacent counterbore 4 and extends through counterbore 4 and outwardly from housing 2.

A hollow fitting 7 is screw-threadingly and sealingly connected to counterbore 4. Fitting 7 has a bore 8 defined therethrough and the wall of bore 8 concentrically and spacially surrounds the end of tube 6. A yarn receiving receptacle or bag 9 is mounted at its open end on fitting 7. An annular chamber 10 is defined at the inner end of counterbore 4 and is open to an annular space 11 formed between tube 6 and bore 8 of fitting 7. Annular space 11 is open to the receptacle 9.

Housing 2 is provided with a threaded inlet port 12 open to a bore 13 defined in housing 2. A passage 14 in housing 2 connects annular chamber 10 to bore 13. A line or pipe 14*a* is screw-threadingly and sealingly connected to port 12 and is normally charged with pressurized air from a suitable source thereof. The air delivered to the inlet port 12 flows to annular chamber 10 via bore 13 and passage 14 and flows restrictedly through annular space 11 before venting into the receptacle 9. The pressure of the air is decreased as it passes through annular space 11 creating a subatmospheric condition or suction adjacent the end of tube 6. The low pressure condition created causes air to be drawn into nozzle 5 and to flow through bore 3 in the direction of the low pressure region thus providing a medium for transporting or propelling yarn brought into close range of nozzle 5 into the waste bag 9.

A reciprocable yarn shearing pin 15 having a transverse opening 16 extending therethrough serves to cut the yarn normally being drawn through the aspirator 1. The shearing pin 15 is slidably operable in a bore 17 that intersects bore 3 between nozzle 5 and tube 6. A bushing 18 having a bore coaxially aligned with bore 17 is retained within housing 2 by a hollow clamping cap 19 suitably secured to housing 2. As viewed in FIG. 2, that portion of pin 15 having opening 16 therein is adapted to move slidingly and telescopingly in and out of the bore 17 of bushing 18. A spring 20 is disposed in hollow cap 19 and acts at one end against the wall of the cap 19 and against the end of pin 15 at its opposite end. Preferably, spring 20 is secured to pin 15 by seating the end of the spring 20 within a groove formed on pin 15.

Pin **15** is connected at its lower end to and is actuated by a bellows actuator **21** operable in a bore **22** aligned with and open to bore **17** in housing **2**. The bellows actuator **21** has a tube **23** connected at its lower end thereof for delivering air under pressure thereto. A retainer ring **24** suitably secures the bellows actuator **21** within bore **22** and the latter is dimensioned to allow expansion and contraction of the bellows actuator **21** therein.

Shearing pin **15** is arranged such that when the bellows actautor **21** is not pressurized, spring **20** will bias pin **15** in a downward position so that the opening **16** therein is axially aligned with bore **3** to permit yarn to travel unrestrictedly through opening **16** when the yarn is being propelled through the aspirator.

To selectably control cutting of the yarn a pair of valve assemblies which are disposed in bore **13** and a trigger lever control are provided as will now be explained.

Bore **13** is threaded at its lower end thereof as viewed in FIG. 3, and has a pair of coaxially arranged spaced valve seats, **25** and **26**, formed therein. A hollow valve fitting **27** is screw-threadingly connected to the threaded end of bore **13**, and tube **23** which is connected at one end thereof to the bellows actuator **21** is connected at its opposite end to the valve fitting **27**. A valve spring **28** disposed in fitting **27** normally acts against a ball valve **29** and biases the ball valve **29** into seating engagement with valve seat **26** for closing off flow of air to the bellows actuator **21** from inlet port **12**.

A slide valve **30** is slidingly operable in bore **13** and is in opposed arrangement to ball valve **29**. Slide valve **30** is provided with an O-ring seal **31** intermediate its ends thereof and has a plunger **32** at its inner end thereof that fits slidably within valve seat **25**. A stem **33** projects from plunger **32** and serves to unseat ball valve **29** from its seated position when plunger **32** is operatively seated in its corresponding valve seat **25** as will be explained in the description of the operation of the aspirator.

Housing **2** has a slot **34** that extends along the side thereof and intersects with bore **13**. A trigger lever **35** is positioned in slot **34** and is fulcrumed at one end thereof about a pin **36** provided on housing **2**. Trigger lever **35** extends over the end of bore **13** and slide valve **30** is normally biased into engagement with the trigger lever **35** by the pressure of air acting against the slide valve **30**. The trigger lever **35** is thus pivoted into contact with the wall of slot **34** and positioned in a "cocked" position.

Passage **14** opens into bore **13** at a point above the valve seat **25**, and the inlet port **12** opens into bore **13** at a point between the valve seats **25** and **26** so that air flowing from the inlet port normally flows past valve seat **25** and plunger **32** and into passage **14**. The seal on slide valve **30** and the close fit of the valve in bore **13** prevent the air from escaping from bore **13**.

The exterior of housing **2** is formed to permit manual gripping and handling in the manner of a pistol.

In operation, aspirator **1** is charged with air under pressure from an established source thereof connected to the inlet port **12** via pipe **14***a*. The pressurized air delivered to the aspirator **1** flows from port **12** to bore **13** and acts against the plunger **32** of slide valve **30** causing the slide valve **30** to unseat from a seated position on seat **25** and to be biased upwardly into engagement with trigger lever **35**. Trigger lever **35** is moved to a "cocked" position as defined by the lever engaging the upper wall of slot **34**, FIG. 3. The air then flows past valve seat **25** and flows into passage **14** and thence to annular chamber **10**. From annular chamber **10** the air flows restrictedly to annular space **11** and exhausts into receptacle **9**. A suction is produced around the end of tube **6** and air is drawn through nozzle **5**, opening **16** of shearing pin **15**, and tube **6**. The aspirator **1** can now be manipulated within close range of and aimed at a moving continuous yarn end. The yarn end will be drawn into nozzle **5**, propelled through opening **16** and tube **6** and deposited into receptacle **9**.

An operator having now gained positive hold of a yarn end can direct or wind the moving yarn threadline around rolls, pins, guides and the like and lace the yarn onto textile apparatus such as drawtwisters and draw-winders. Upon completing a string-up of yarn, the yarn is separated from the aspirator at the will of the operator by pulling on the trigger lever **35** in the manner of firing a pistol. When trigger lever **35** is pulled or "fired" and thus rocked in a counterclockwise direction, as viewed in FIG. 3, the trigger lever **35** pushes the slide valve **30** downwardly to cause plunger **32** to seat within valve seat **25** thereby cutting off flow of air to passage **14** and simultaneously to cause stem **33** to contact ball valve **29** and to unseat the latter against the force of spring **28**. Air under pressure then flows past valve seat **26**, through hollow valve fitting **27**, through tube **23** and into bellows actuator **21**. Air under pressure supplied to the bellows actuator **21** causes rapid expansion of the latter and consequent rapid upward actuation of shearing pin **15**. Shearing pin **15** slides upwardly into the bore of bushing **18**. The yarn passing through opening **16** of pin **15** is carried upwardly into contact with bushing **18** and is sheared or severed by the yarn being caught between the telescoping walls of the shearing pin **15** and bushing **18**. Upon release of trigger lever **35**, air under pressure supplied to bore **12** and bore **13** will bias slide valve **30** upwardly away from its seated position on valve seat **25** and opening inlet **12** to passage **14**. Stem **33** of valve **30** will also be carried away from ball valve **29**. Before ball valve **29** returns to its seated position, spring **20** acts against pin **15** to operatively cause bellows **21** to contract thus forcing the air therein to flow back or to be swept into bore **13** past valve seat **26** so as to vent the bellows **21**. When slide valve **30** is biased into contact with trigger lever **35** and moves the latter into a "cocked" position, then stem **33** of slide valve **30** will have disengaged from ball valve **29** permitting the latter to be seated against valve seat **26**. The aspirator **1** is now in condition to receive another yarn end.

It is thus seen that string-up and cutting of a yarn is expeditiously and easily accomplished with the use of the aspirator **1** of the invention. It is an outstanding feature of the aspirator **1** embodying the invention that heavy denier or so-called "giant denier" yarns of a gauge of 8000 denier and above are readily severed. Ordinarily it is a problem to sever such giant denier yarns by scissor or blade means particularly when the yarn is traveling.

It will be understood that modifications and variations of the illustrated construction of the invention are contemplated within the spirit thereof and that limitations are to be governed by the scope of the following claims.

We claim:

1. A yarn aspirator comprising,

(a) a housing including,

(b) an inlet adapted to be connected to a source of air under pressure,

(c) means defining a bore extending therethrough,

(d) a nozzle open to one end of said bore,

(e) suction means open to the opposite end of said bore,

(f) a passage open to said suction means and to said inlet to flow air under pressure to said suction means for creating a rarefied atmosphere and establishing a flow of air through said nozzle and said bore,

(g) yarn severing means reciprocably operable to intersect said bore,

(h) fluid pressure actuator means connected to said yarn severing means,

(i) conduit means connected to said inlet and said fluid pressure actuator means,

(j) valve means controllable, alternately; to supply air under pressure from said inlet to said fluid pressure actuator means for responsively actuating said yarn severing means to a severing position for cutting

the yarn normally extending through said bore while concurrently cutting off flow of air under pressure to said suction means from said inlet means; and to cut off flow of air under pressure from said inlet to said fluid pressure actuator means while permitting air under pressure to flow from said inlet to said suction means, and

(k) selectably operable control means for selectably controlling said valve means.

2. A yarn aspirator comprising,

(a) a housing including,

(b) an inlet adapted to be connected to a source of air under pressure,

(c) means defining a bore extending therethrough,

(d) a nozzle open to one end of said bore,

(e) suction means open to the opposite end of said bore,

(f) a passage open to said suction means and to said inlet to flow air under pressure to said suction means for creating a rarefied atmosphere and establishing a flow of air through said nozzle and said bore,

(g) yarn severing means including a reciprocable perforated member intersecting said bore,

(h) fluid pressure actuator means connected to said reciprocable perforated member,

(i) conduit means connected to said inlet and said fluid pressure actuator means,

(j) valve means controllable, alternately; to supply air under pressure from said inlet to said fluid pressure actuator means for responsively actuating said reciprocable perforated member to a severing position for cutting the yarn normally extending therethrough while concurrently cutting off flow of air under pressure to said suction means from said inlet means; and to cut off flow of air under pressure from said inlet to said fluid pressure actuator means while permitting air under pressure to flow from said inlet to said suction means, and

(k) selectably operable control means for selectably controlling said valve means.

3. A yarn aspirator as in claim 2, wherein said yarn severing means further includes a bushing member having slideable telescoping engagement with said reciprocable perforated member of said yarn severing means, and spring means for biasing said reciprocable perforated member to a position where the perforation in said latter member is aligned with said bore.

4. A yarn aspirator as in claim 2, wherein said fluid pressure actuator means comprises a bellows actuator.

5. A yarn aspirator as in claim 2, wherein said valve means comprises a pair of valves adapted to operate in apposition.

6. A yarn aspirator as in claim 2, wherein said selectably operable control means comprises a pivotal trigger lever.

7. A yarn aspirator comprising,

(a) a housing formed to be hand gripped,

(b) means defining a valve bore threaded at one end thereof and opening exteriorly of said housing at its other end thereof,

(c) a pair of spaced valve seats provided in said valve bore,

(d) a slide valve positioned in said valve bore and normally biased into one position away from one of said valve seats,

(e) a ball valve normally seated on said other of said valve seats in said valve bore,

(f) a hollow fitting connected to the threaded end of said valve bore,

(g) bias means in said fitting normally biasing said ball valve into a seated position on the other of said valve seats in said valve bore,

(h) an inlet in said housing open to said valve bore and normally connected to a source of fluid under pressure,

(i) means defining a yarn bore in said housing having a counterbore at one end thereof,

(j) a passage in said housing open at one end to said valve bore and open at its opposite end to said counterbore of said yarn bore,

(k) a nozzle projecting from said housing and open to said yarn bore, opposite said counterbore end thereof,

(l) a tube mounted in said yarn bore and extending into said counterbore,

(m) a tubular fitting secured to said housing and concentrically surrounding said tube in spaced relation,

(n) means defining a cutter bore intersecting said yarn bore,

(o) a cutter pin having an opening extending therethrough and being slideably operable in said cutter bore,

(p) an annular bushing in said housing axially aligned with said cutter pin,

(q) a hollow clamp secured to said housing for clamping said annular bushing,

(r) a resilient member disposed between and engaging said hollow clamp and said cutter pin for biasing the latter in one direction,

(s) means defining an actuator bore opening at one end to said cutter bore and opening outwardly of said housing at its opposite end thereof,

(t) an expansible bellows actuator disposed in said actuator bore, said expansible bellows being connected to said cutter pin for actuating said cutter pin slideably into said annular bushing against the force of said spring,

(u) a conduit connected at one end to said expansible bellows and connected at its opposite end to said hollow fitting,

(v) trigger means pivotally mounted on said housing and normally engaging said biased slide valve and being selectably operable to move said slide valve into a second seated position on said one valve seat for cutting off flow of air from said inlet to said passage and to simultaneously unseat said ball valve from said other valve seat for permitting air to flow from said inlet to said bellows actuator for actuating said cutter pin into said annular bushing thereby cutting a yarn normally being aspirated through the opening therein.

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