United States Patent

Beddoe et al.

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[54] **ENTRAINMENT MEANS**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **226/7,** 226/97, 226/91

[51] **Int. Cl.** **B65h 25/06**

[58] **Field of Search**.....226/113, 91, 97, 7

[56] **References Cited**

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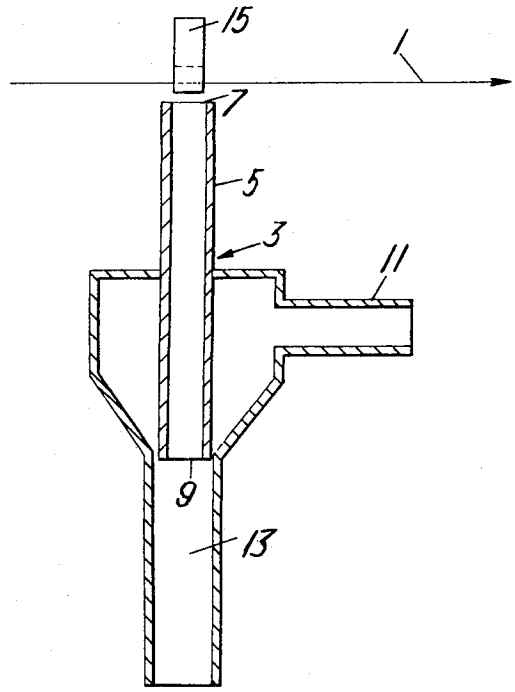
[57] **ABSTRACT**

A process for entraining a filament or yarn passing across the induction end of a suction gun comprising mechanically introducing a device into the induction end of the gun so that the device is sucked into the gun, catching the filament or yarn with the device so that the latter drags the filament or yarn into the gun, and passing the device and the filament or yarn through and out of the gun to a filament or yarn collecting location.

8 Claims, 5 Drawing Figures



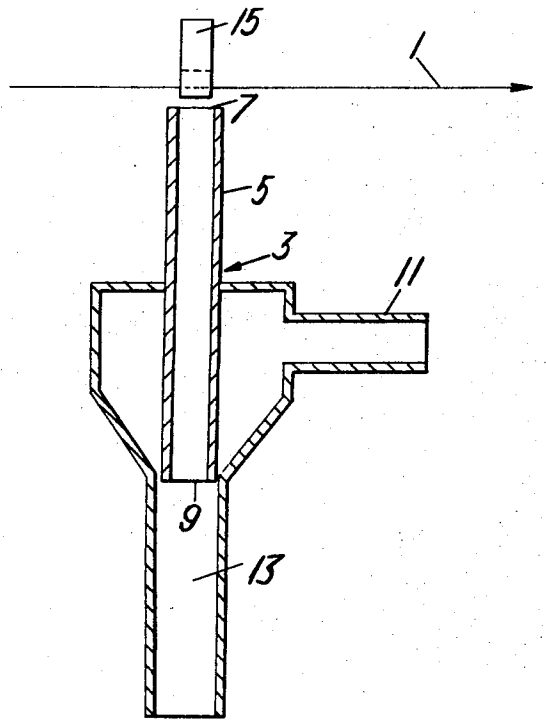


Fig. 1

Fig. 2.

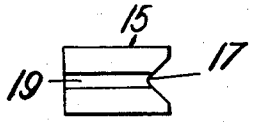


Fig. 3.

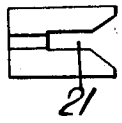


Fig. 4.

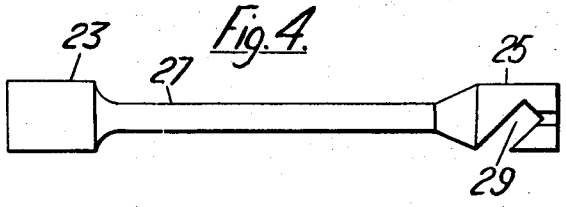


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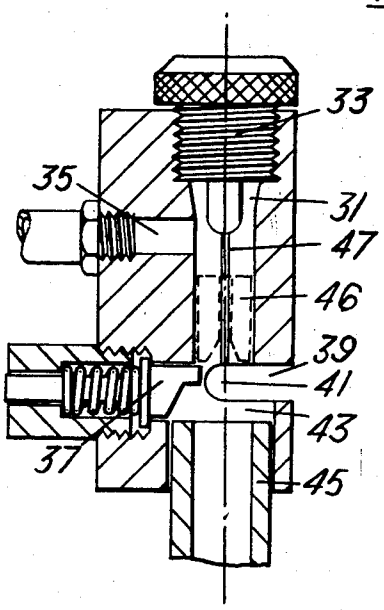
Fig. 5.



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ENTRAINMENT MEANS

The present invention relates to improved means for the entrainment of a filament or yarn threadline away from the normal path it traverses during processing to a collecting location.

Two necessary requirements for a good suction entrainment gun are the ability to entrain yarn from a running threadline and, having got the yarn into the suction gun, to hold the threadline under sufficient tension to prevent wrap-backs on the equipment on which the threadline is being processed. The ability to entrain yarn (known as induction) is related to the suction capacity of the gun, that is, the quantity and speed of the air sucked into the inlet tube of the gun. On the other hand, the tension established in the threadline after entraining the yarn chiefly depends upon the high-velocity air in the body of the gun exerting drag on the yarn. Most prior art suction entrainment guns have not proved entirely satisfactory since they have shown a bias towards high induction with consequently low tension or vice versa. Further, the entrainment devices of the prior art have not proved suitable for entraining filaments or yarns of high denier per filament such as, for example, 500 d.p.f. or for entraining elastomeric filaments or yarns.

We now provide an improved entrainment means which overcomes the above deficiencies of known means.

Accordingly, the present invention provides a process for entraining a filament or yarn comprising causing the filament or yarn to pass across the induction end of a suction gun and mechanically introducing the filament or yarn into said induction end of said suction gun by a device such that the filament or yarn and the device are carried through the suction gun to a filament or yarn collecting location.

In a preferred embodiment of the process, the filament or yarn is caused to pass substantially normal to the induction end of the suction gun.

The process is particularly useful for entraining a running high tension filament or yarn threadline.

In one embodiment of the invention, the device is of a diameter such that at least one yarn-carrying air passage in the suction gun is substantially closed by the device.

The device used in the process of the invention to introduce the yarn into the suction gun may be a pellet designed to pass through the suction gun to a waste-collecting location. The pellet may be retrieved from there, or, if it is made from the same materials as the yarn, it may be disposed of with the waste yarn through normal waste-recovery channels. If the pellet is to be retrieved from the waste yarn then it is desirable to color the pellet such that it stands out from the waste yarn.

The pellet may be short and designed to be sucked into the suction gun and to drag the yarn in with it. This type of pellet may have a diameter only slightly less than the smallest bore in the yarn passage of the suction gun thus offering a larger area to the induced moving airstream than the threadline and hence a low induction is possible to introduce the yarn into the suction gun.

An elongated pellet, comprising two end pieces connected together by a waisted shank, may be used in another embodiment of the invention. The length of the waisted shank is preferably slightly longer than the length of the induction tube from entry to the throat. One end piece of the elongated pellet has a diameter only slightly less than the smallest bore in the yarn passage of the suction gun and the other end piece is provided with a notch for catching the yarn. The former end piece is inserted into the suction gun until it reaches the body of the gun, i.e., beyond the throat of the induction tube portion of the gun, at which point the high speed air causes the pellet to be projected through the gun and to drag the yarn behind it. Obviously, when using an elongated pellet, the take away hose of the suction gun should have no sharp bends before the waste-collecting location.

In yet another embodiment of the invention a pellet is fired into the suction gun. The pellet may be a short pellet as described previously and may be fired for example by compressed air from a pellet housing or by pneumatic means, to catch the yarn and pass with the yarn into the suction gun. The speed of the pellet is governed by the air pressure firing it. Obviously, the pellet velocity must be kept below the yarn speed to prevent unpredictable breaking of the yarn during entrainment.

In the case of the fired pellet process, it is preferred that the pellet housing and the induction tube of the suction gun be locked in fixed disposition one to the other. The firing of the pellet may be designed to be automatic and to be triggered, for example, by the insertion of the end of the suction gun in the housing.

The short or elongated pellets described herein may be made of, for example, a plastics material or metal. In the case of the elongated pellet, the material should be such as to give some flexibility to the pellet. The pellets may be made, for example, by machining from solid rod, fabricating or injection molding.

The process of the invention may include cutting the yarn downstream of the device. The cutting means may be separate from the device or may be associated therewith so that cutting of the yarn is automatic. Cutting is only necessary with very heavy denier or very stiff yarns. For smaller deniers the yarn is severed by the sudden increase in tension towards the wind-up side of the device.

Several embodiments of the invention will now be described with reference to the accompanying drawings, in which:

FIG. 1 is a sectional view of one embodiment of the invention.

FIGS. 2 and 3 are plan views of short pellets.

FIG. 4 is a plan view of an elongated pellet.

FIG. 5 is a part-sectional view of a housing for firing a pellet.

Referring now to FIG. 1, there is shown a running low denier yarn 1 passing substantially normal to the end of a suction gun 3. The suction gun 3 contains an induction tube 5 having an entry end 7 and a throat end 9. Air is supplied to the suction gun through tube 11 and passes into the body 13 of the suction gun. The yarn 1 is introduced into the end 7 of the induction tube 5 by means of a short pellet 15. The pellet 15 has a diameter only slightly less than the diameter of the induction tube 5. The suction in the induction tube 5 causes the pellet 15 together with the yarn to be sucked into the gun. The yarn is severed downstream of the

pellet by the sudden increase in yarn tension. The pellet **15** and the yarn pass through the suction gun to a waste-collecting means not shown.

Referring to FIG. **2**, there is shown in more detail a short pellet **15** having a yarn-entraining slot **17** and a longitudinal clearance groove **19** along the sides of the pellet to allow room for the yarn to enter the suction gun.

Referring to FIG. **3**, there is shown a short pellet, similar to that shown in FIG. **2** but having an enlarged yarn-entraining slot **21**. This type of pellet is particularly useful for entraining multi-filament yarn comprising a large number of filaments.

Referring to FIG. **4**, there is shown an elongated pellet comprising end pieces **23** and **25** connected together by a waisted shank **27**. The end piece **23** is designed to have a diameter only slightly less than the smallest bore in the yarn passage of the suction gun. The end piece **25** is provided with a notch **29** for catching the yarn.

Referring to FIG. **5**, there is shown a housing for firing a small pellet, such as is illustrated in FIGS. **2** or **3**. The housing essentially consists of an entry passage **31** for the pellet, the passage being tapered to facilitate loading and accessible by means of a threaded bolt **33**, an air inlet tube **35**, a simple trigger mechanism **37**, a slot **39** for the running yarn **41** and an entry passage **43** for the induction end **45** of a suction gun.

To load the housing, the threaded bolt **33** is removed and a pellet **46** is inserted in the entry passage **31**. A ridge **47** in the passage ensures that the pellet **46** stays in the correct orientation with respect to the yarn **41** by engaging in the longitudinal groove (shown as **19** in FIG. **2**) of the pellet. The bolt is then screwed into the passage and pushes the pellet past the air inlet tube **35** to ensure that all the force is behind the pellet. The air supply is governed by a pressure regulator/filter assembly, not shown, and the air flow to the housing is controlled by a micro-valve, not shown, which is activated by the suction gun **45** as it enters the housing. The air supply system is designed to give full pressure behind the pellet as the suction gun **45** triggers the pellet by forcing trigger mechanism **37** to move outwards.

The slot **39** in the housing allows for the yarn **41** to run through the housing prior to entrainment and, when entrained, for it to be removed from the housing through the suction gun **45**.

What we claim is:

1. A process for entraining a filament or yarn passing across the induction end of a suction gun comprising mechanically introducing a device into the induction end of the gun so that the device is sucked into the gun, catching the filament or yarn with the device so that the latter drags the filament or yarn into the gun, and passing the device and the filament or yarn through and out of the gun to a filament or yarn collecting location.

2. A process according to claim **1**, in which the device is of a diameter such that at least one yarn-carrying air passage in the suction gun is substantially closed by the device.

3. A process according to claim **1** in which the filament or yarn is cut downstream of the device.

4. In a process for entraining a filament or yarn caused to pass across the induction end of a suction gun the improvement being comprised in that the filament or yarn is mechanically introduced into said induction end of said suction gun by a pellet such that the filament or yarn and the device are carried through the suction gun to a filament or yarn collecting location.

5. A process according to claim **4** in which the pellet is a short pellet.

6. A process according to claim **4**, in which the pellet is an elongated pellet comprising two end pieces connected together by a waisted shank.

7. In a process for entraining a filament or yarn caused to pass across the induction end of a suction gun the improvement being comprised in that the filament or yarn is mechanically introduced into said induction end of said suction gun by firing the device from a housing into the induction end of the gun such that the filament or yarn and the device are carried through the suction gun to a filament or yarn collecting location.

8. A process according to claim **7**, in which the firing of the device is designed to be triggered by insertion of the end of the suction gun in the housing.

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