Nov. 12, 1957 H. E. PAPE 2,812,850

LACE-UP DEVICE

Filed July 29, 1952

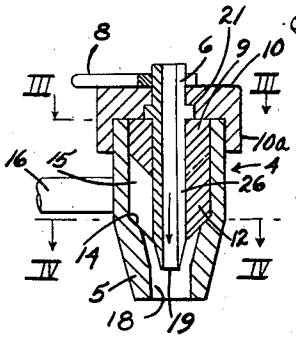


Fig. 1

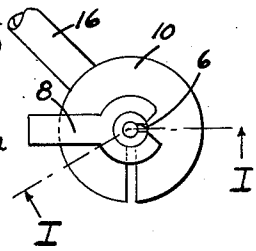


Fig. 2

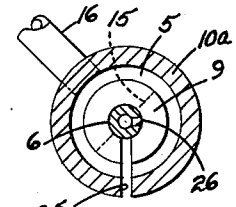


Fig. 3

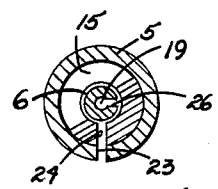


Fig. 4

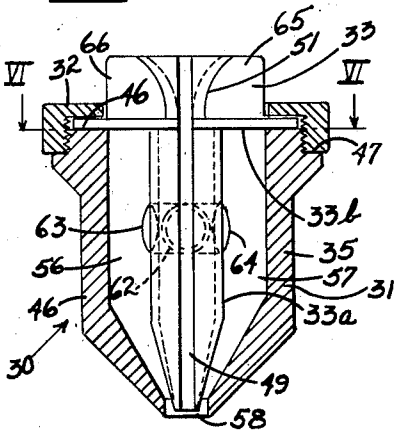


Fig. 5

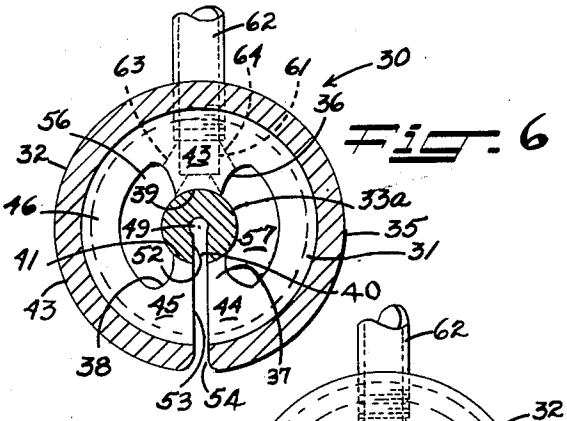


Fig. 6

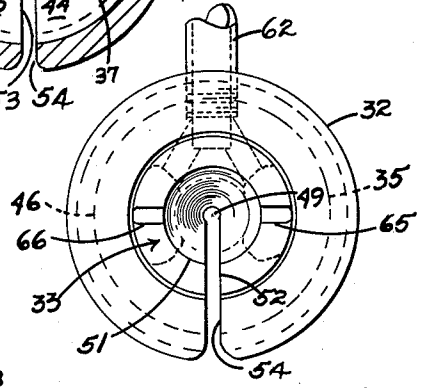


Fig. 7

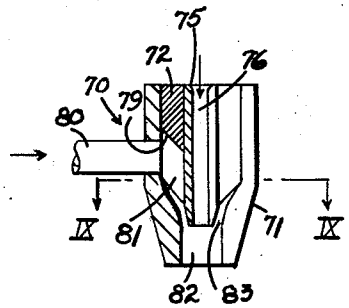


Fig. 8

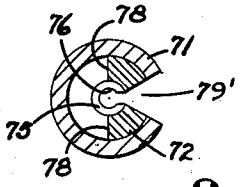


Fig. 9

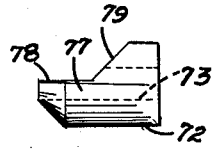


Fig. 10

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LACE-UP DEVICE

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2 Claims. (Cl. 203—65)

The present invention relates to apparatus for handling running strands and particularly to a portable device that may be used to capture a continuous strand carried by one piece of equipment wherefrom the strand is transferred or laced to another piece of equipment and the device then detached from the running strand without the necessity of breaking it.

Continuous strand processing machinery may be laced by manual manipulation at speeds up to approximately 100 meters per minute whereas mechanical lacing devices are required at substantially higher speeds. In the prior art, various devices, such as suction tubes, jets, picking wheels, and strand-leading belts, are resorted to in transferring rapidly running strands from one process station to another. However, no system is heretofore disclosed which enables a relatively unskilled operator to lace a strand through a series of process stations by means of a single article of equipment when such lacing involves repeatedly capturing the strand from one station and then separating it from the lacing apparatus after applying it to a desired point of entry to another station without breaking the strand.

It is an object of the present invention to provide a device for continuously advancing a running yarn which may be disengaged from the yarn while the yarn is moving with respect to the device. It is another object to provide a device in accordance with the object just recited which requires little skill to operate and may be used in as leisurely a manner as required within the skill of the operator to apply yarn accurately to a desired point of engagement with another strand-forwarding member. It is still another object to provide a portable lacing-up device capable of accomplishing the aforenamed objects, that may be used repeatedly to lace a strand through a series of process stations. Still another object is to provide an inexpensive portable apparatus for facilitating lacing procedures that may be used in lieu of stationary lacing aids which are necessarily more complicated, plural in occurrence when more than one lacing station is required, and therefore relatively expensive. Other objects, features, and advantages will become apparent from the following description of the invention and the drawing relating thereto in which:

Fig. 1 is a section taken along line I—I of Fig. 2 of a device constructed in accordance with one embodiment of the invention;

Fig. 2 is an end view of the device shown in Fig. 1;

Fig. 3 is a section taken along line III—III of Fig. 1;

Fig. 4 is another section of the device of Fig. 1 taken along line IV—IV thereof;

Fig. 5 is a longitudinal section of a modified device;

Fig. 6 is a section taken along line VI—VI of Fig. 5;

Fig. 7 is an end view of the device illustrated in Figs. 5 and 6;

Fig. 8 is a longitudinal section of another modified device;

Fig. 9 is a transverse section taken along line IX—IX of Fig. 8; and

Fig. 10 is a side view of a part of the device shown in Figs. 8 and 9.

In furtherance of the above-stated objects of the invention, a device is provided for temporarily receiving a running yarn and constructed so that the yarn may be released from the device without being broken, such as when it is transferred to a take-up mechanism. The device has a body provided with a passageway for the movement of a strand therethrough and structure for directing a fluid supplied to the device under pressure along a path extending within the device and past the end of the passageway in intersecting relation therewith so as to either induce by vacuum the passage of air or other fluid through the passageway and/or to pull the strand by frictional contact of the fluid discharged from the device at high velocity whereby the strand is propelled lengthwise through the passageway. A portion of the device may be movable with respect to another portion to open the passageway in a lateral direction along its entire length.

Figs. 1 to 4 illustrate one embodiment of the invention, namely, a device **4** which comprises an outer wall member or casing **5** of circular cross section, a rotatable tubular element **6** having secured thereto a control handle **8**, a sleeve member **9** secured within the casing **5**, and a cap **10** having a flange **10***a* which overlaps the outer surface of the casing **5**. The sleeve member **9** may be shaped to provide a press fit between its exterior surface and the interior surface of the casing. The sleeve member also has a central bore which is complementary to the outer surface of the tubular element **6**, i. e., the element fits the bore preferably within about 0.003 inch to prevent appreciable leakage but to permit turning of the element with the member **9**. The member **9** has a generally semi-circular section **12** which engages a tapered interior surface **14** of the casing. Portion **12** thus does not completely occupy the space surrounding the element **6** and leaves a hollow region **15** within the casing for receiving compressed air or other stored gas through a tube **16** which is attached to the casing and extends through its wall to connect the region **15** with an air supply. The casing **5** has an aperture or passageway **18** contiguous with a clearance between the adjacent end portion of the element **6** and the surrounding interior surface of the casing through which air may escape from the region **15**. Rapid discharge of air past the end **19** of the tubular element tends to lower the pressure within the passageway of the element **6** below atmospheric and to induce the travel of air or other fluid therethrough in the direction indicated by the arrow. The disposition of the element **6** lengthwise of the other portions of the device is determined by a shoulder **21** of the element **6** which seats on the annular end surface of the sleeve member **9** and fits within a complementary annular recess of the cap **10**.

The members **5** and **9** have longitudinal slots **23** and **24** which are maintained permanently in radial alignment with the longitudinal axis of the device **4**. The cap **10** also has a slot **25** extending in the same general radially extending plane as slots **23** and **24**. The tubular element **6** also has a slot **26** such as shown in Figs. 3 and 4. By manipulation of the handle **8**, the element **6** may be rotated to bring the slot **26** into radial alignment with the slots **23**, **24**, and **25** to make the passageway of the tubular element **6** accessible from a lateral direction along the entire length of the device. A strand may be then transferred into and aligned to pass lengthwise through the element **6**.

The separate portions of the device **4** may be fabricated in any convenient manner such as molding them from any of a great variety of organic synthetic thermoplastic or thermosetting resins, hard rubber, or by casting

or machining the parts from metal that is non-corrosive with respect to the materials encountered in a selected strand processing system.

Figs. 5, 6, and 7 illustrate a modified device **30** for handling continuous running strands which comprise an outer wall member or casing **31**, a flanged coupling **32**, and a strand conducting member **33** which is rotatable with respect to the casing and the coupling. The device **30** comprises a structure which enables the separate portions thereof to be readily molded from vulcanizable materials, or thermosetting or thermoplastic synthetic resins. The casing **31** is generally symmetrical and annular with respect to a longitudinal axis and comprises a substantially annular wall **35** with radially inwardly extending projections **36**, **37**, and **38** which terminate (in the longitudinal direction) at the section line **6—6** of Fig. 5. The projections have inner arcuate surfaces **39**, **40**, and **41** disposed concentrically with respect to the axis of the casing to center the portion **33***a* of the strand-conducting member **33** shown in Fig. 6. The projections also have end surfaces **43**, **44**, and **45** which lie in the same plane as the end surface **46** of the casing upon which a disc portion **33***b* of the member **33** seats when held in loose frictional contact and rotatable relationship therewith by the coupling **32** which screws onto the end portion of the casing **31** against a shoulder **47** thereof. The threaded section of the coupling preferably has sufficient length so that its radially inwardly extending flange portion has a slight clearance (measured in an axial direction) with the surface of the disc portion which it overlaps to allow the member **33** to turn freely.

The member **33** has a central passageway **49** which extends entirely lengthwise thereof and terminates at one end within a trumpet-shaped portion **51** of the member **33**. The member **33** has a slot **52** extending its entire length which opens all portions of the passageway **49** in a lateral direction. The casing **31** also has a slot **53** extending along its entire length which separates the projections **37** and **38** and is radially aligned with the slot **54** formed in the coupling **32**. The portion **33***a* of the strand conducting member, by filling the central region between the inward projections of the casing, divides the interior of the casing into two regions **56** and **57** which extend into the discharge aperture **58** provided at the end of the casing. Within the wall **35** is a threaded recess **61** in threaded relationship with a tube **62** connected to a fluid supplying means (not shown). Branch ducts **63** and **64** connect the recess **61** with the regions **56** and **57** respectively so that air or other fluid may be passed into these regions and then discharged outwardly therefrom past the end portion of the member **33** through the aperture **58**. Rapid passage of fluid from the regions **56** and **57** reduces the pressure in the passageway **49** below that of the atmosphere and thus suction is produced at the large end of the passageway within the flared portion **51** of the member **33**.

The device **30** is illustrated with the member **33** in the position wherein its slot **52** is aligned with the slot **53** of the casing **31**, thereby adapting the device to receive a strand from a lateral direction. The device may be used, when adjusted in this manner, by applying it to a running strand traveling continuously between spaced objects without breaking the strand in order to lace the device. Once the strand is passing through the passageway **49**, the member **33** is turned approximately 180° until the slot **52** is closed by the surface **39**. Flat handles or fins **65** and **66** provide gripping surfaces which facilitate turning of the member **33**. The strand, thus captured, is continuously transferred therethrough by the action of the fluid passing from the tube **62** through the device and then from the aperture **58**. The strand may be broken along a portion discharged from the device and then the free end contiguous with the portion advancing through the device applied, by manipulation of the device **30**, to any desired strand advancing equipment. When this is accomplished, the strand may be separated from the device **30** by simply turning the member **33** until the slots are in the alignment shown in Figs. 5 to 7 whereupon the device **30** may be maneuvered to remove the running strand from its passageway **49**. The device **30**, on account of the flared entrance-port of the passageway **49** within the portion **51** of the member **33**, may be used to capture the leading end of a running yarn as well as continuous unbroken yarns.

A third embodiment of the invention is illustrated in Figs. 8 to 10. It has been discovered that when water or some liquid of similar viscosity is used as the fluid for operating a device constructed in accordance with the present invention, sufficient draft for pulling a running yarn through the device and keeping the slack out of a running yarn advancing thereinto may be created without the necessity of closing the laterally opened portion of the wall which defines the passageway through which the strand is advanced. That is to say, the provision of a center tube member having a slot along one side thereof as provided in the previously described embodiments may be fixed relative to other portions of the device (rather than being rotatable) with the slots thereof in permanent alignment with respect to an axially extending single plane. Such a device may thus have a simpler construction than the devices hereinbefore described. The device **70** of Figs. 8 to 10 comprises an outer wall member or casing **71** having an apertured frustoconical strand-discharging section and a generally cylindrical section for receiving a sleeve member **72**. The inner contour of the casing is of the same general shape as its outer surface. The sleeve member **72** has a central bore **73** (see Fig. 10) in which a generally tubular member **75** is secured. As shown in Figure 9, the longitudinal opening in the tubular member **75** forms a central passageway through the device. The sleeve member **72** has a semi-circular portion **77** partially defined by a pair of surfaces **78** extending parallel to its axis. These surfaces join with another surface **79** which terminates in the peripheral surface of the sleeve and extends at some angle such as 135° with the surfaces **78**. The exterior cylindrical surface of the sleeve adapts it to be press-fitted within the member **70**. The tubular member **75** is in turn press-fitted within the bore of the sleeve. The casing **71**, sleeve **72**, and the tubular member **75** are slotted to provide as access **79'** to the passageway **76** from a lateral direction along the entire length of the device. Since the tubular member does not turn within the sleeve, the aligned slots in the three concentric parts of the device may be constructed with diverging surfaces, as shown in Fig. 9, to facilitate the transfer of strands into and out of the passageway **76**. If desired, the members **72** and **75** may be fabricated as a single part by application of conventional molding techniques relating to the molding of synthetic thermo-plastic resins.

Such a device works quite efficiently when it is supplied with water under pressure through an open region **81** which is formed between the member **75** and the inner surface of the member **71** by the cutaway construction of member **72** resulting in the surfaces **78** and **79**. A tube **80** is screwed or otherwise fastened within an aperture through the portion of the wall of the casing **71** overlying the open region **81**. Water is supplied under pressure through the tube **80** and discharged from region **81** through the clearance **83** between adjacent concentric tapered surfaces of the casing **71** and the end portion of the tubular member **75**, and through the aperture **82**. The strand is transferred through the passageway **76** in the direction of the arrow of Fig. 8; the stream of water discharged from the aperture **82** carrying the strand may be utilized to aim the strand at any point desired along the moving strand-advancing surface of a take-up device. The strand-advancing draft developed in the use of the device **70** is derived primarily from the frictional contact of the liquid stream discharged therefrom with the strand which

is placed within the passageway **76**, although there is some suction developed within the passageway and the slot **79'**.

While preferred embodiments of the invention have been shown and described, it is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appending claims.

I claim:

1. A device for advancing a continuously running yarn comprising a casing having an opening extending lengthwise therethrough and terminating in an exit aperture of reduced size, a sleeve disposed within said casing and having a central passageway extending lengthwise therethrough, said sleeve having one end terminating within said casing in adjacent and spaced relationship with said casing exit aperture, said one end of said sleeve having its external surface tapering toward said exit aperture and cooperating with the adjacent internal surface of said casing to form an annular orifice therebetween which extends concentrically about said one end of the sleeve and communicates with said exit aperture, a fluid delivery duct having one end passing through a wall of said casing, at least one fluid receiving chamber formed between portions of said casing and sleeve and adjacent said one end of said fluid delivery duct, said chamber extending partially about said sleeve and communicating with said annular orifice, and a slot extending radially through said casing and sleeve along the entire length of said device and communicating with said passageway.

2. A device as set forth in claim 1 further including radially directed projections formed on the inner wall surface of said casing and extending substantially lengthwise thereof, said projections having concentric arcuate surfaces in engagement with said sleeve, a pair of said projections being separated by said radially extending slot, an enlarged centrally apertured member disposed against the end portions of said casing and sleeve remote from said exit aperture, a slot extending radially through said member and in alignment with said first mentioned slot, and a pair of fluid receiving chambers defined by said projections and disposed in opposed relationship and on opposite sides of said sleeve.

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