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[54] **METHOD AND APPARATUS FOR THE
PNEUMATIC REMOVAL OF THE FOOT WINDING
OR LAP FROM COPS**
9 Claims, 4 Drawing Figs.

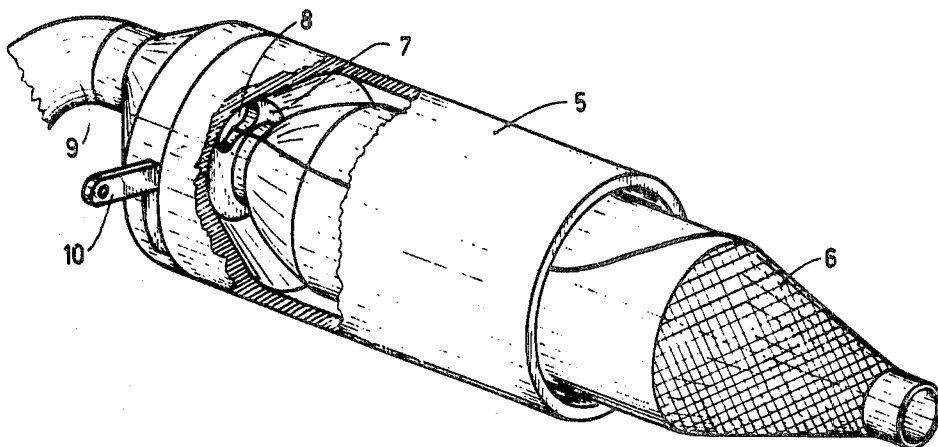
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[50] Field of Search 242/35.6,
35.6 E, 18 EW, 18

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ABSTRACT: A novel method and apparatus for pneumatically removing the foot winding or lap from spinning cops or bobbins is disclosed. The method aspects of the invention contemplate exposing the foot lap, as the cop rotates, to an airstream over a portion of its circumference, the airstream acting upon the section of the foot lap in an essentially axial direction. The novel apparatus comprises a rotatable support and clamping installation for replaceably receiving the cop as well as a suction tube for surrounding the free end of the cop. The suction tube is tapered in the area of the cop foot and is closed off by a bottom portion at the conical end thereof, the bottom portion having a nozzlelike opening eccentrically disposed outside of the axis of the suction tube, the opening being aligned with the foot lap section acted upon by the airstream when a cop is inserted in the suction tube.



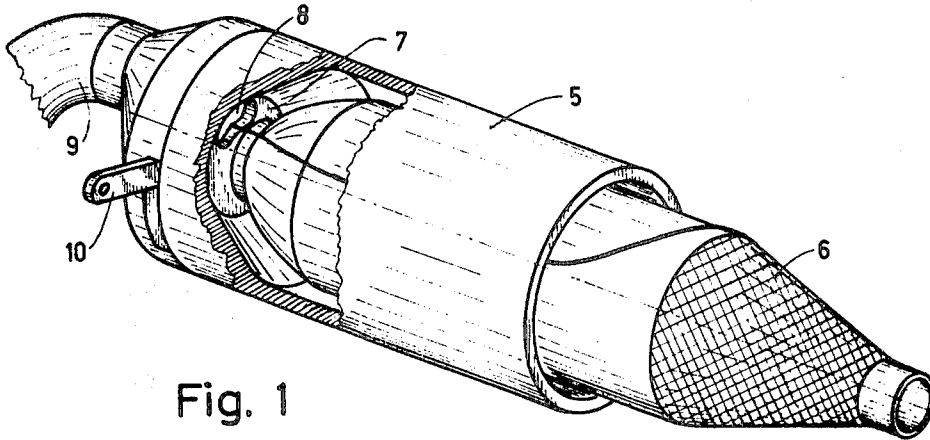


Fig. 1

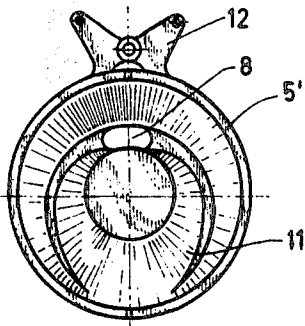


Fig. 2

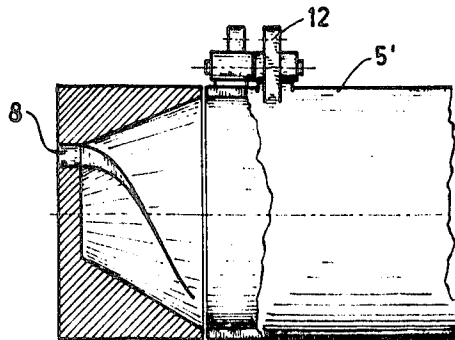


Fig. 3

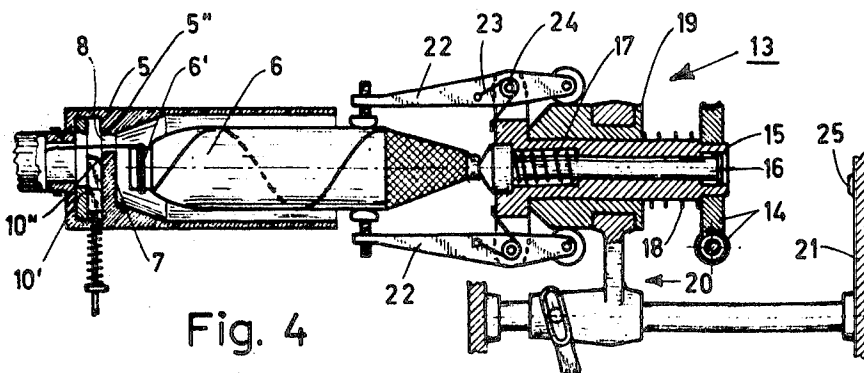


Fig. 4

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METHOD AND APPARATUS FOR THE PNEUMATIC REMOVAL OF THE FOOT WINDING OR LAP FROM COPS

BACKGROUND OF THE INVENTION

The instant invention generally relates to the removal of foot lap from cops and specifically concerns a novel method and apparatus for pneumatically removing the foot laps from spinning cops or bobbins.

The removal of the foot lap from a cop is necessary so that the beginning or initial end of the yarn can be made ready for further processing of the cop, such as in a winding machine, where such end is taken up by a suitable yarn gripper means of the winding machine. This operation, of course, is done automatically.

Methods are known in the prior art for pneumatically removing foot laps from cops, such methods seeking to strip the yarn from the cop jacket or sleeve through the utilization of mechanical removal means in a careful manner. So as to accomplish this purpose, the cop was placed into a suction tube with the end of the cop bearing the foot lap and the foot lap itself being exposed from all sides to an air stream which removed the foot lap from the cop sleeve or jacket.

Yet, it has been seen in practice that stripping off the foot lap can rarely be accomplished since, during the course of such prior art methods, the individual yarn windings forming the foot lap, of which a great number are densely wound next to and on top of each other, slide even more strongly upon one another. As a result of this action, the foot lap is pressed even more strongly onto its supporting means. So as to prevent this, the prior art now utilizes the practice of combining a pneumatic removal means along with a mechanical removal means, such practice inevitably leading to a substantially greater expenditure in the foot lap removal apparatus.

SUMMARY OF THE INVENTION

Thus, the need exists in the art for a method and apparatus for removing the foot winding or lap from spinning cops or bobbins which eliminates the aforesaid drawbacks. It is the primary object of the instant invention to provide such a method and apparatus which will pneumatically remove the foot lap from cops and further, will guarantee that each foot lap can be stripped off its supporting means solely under the influence of air.

These objects as well as other objects of the instant invention which will become apparent as the description proceeds, are implemented by exposing the foot lap, as the cop rotates, to an airstream over a portion of its circumference, the airstream acting upon the section of the foot lap in an essentially axial direction.

By virtue of this novel method, it is now possible that the foot lap which represents a plastically or deformably shapeable ring, can be slipped off the supporting means in a stepwise fashion. Initially, the foot lap section which was first acted upon by the airstream is moved forward. Thereafter, the foot lap section following the cop in a rotational direction is moved, and so forth, until the foot lap has reached the edge of the supporting means whereupon it jumps off the supporting means and thereafter the yarn is then forcibly carried along by the airstream. At the same time as the foot lap is stepwise moved forwardly, the yarn windings of the foot lap are widened such that the foot lap is additionally loosened relative to its supporting means which serves to further facilitate the onward moving of the foot lap sections in each stepwise operation.

Moreover, the instant invention also concerns and discloses a novel apparatus for carrying out the above-described method for pneumatically removing foot lap from cops. This novel apparatus itself is equipped with a rotatable support and clamping installation serving to replaceably receive the cop and is further equipped with a suction tube surrounding the free end of the cop. In accordance with the instant invention, this apparatus is characterized such that the suction tube is

tapered in the area of the cop foot and is further closed off by a bottom portion at its conical end. The bottom portion has a nozzlelike or jetlike opening disposed outside or eccentrically of the axis of the suction tube, this opening being aligned with the foot lap section acted upon by the airstream when a cop is inserted into the suction tube.

As should be apparent, the nozzlelike or jetlike opening provided eccentrically in the bottom portion of the suction tube permits a concentration of the airstream achieved through suitably aligning the positioning of the nozzle opening with a foot lap section in the area of the foot lap section to be acted upon. So as to even further concentrate the airstream in the tube toward the respective foot lap sections, the inside of the conical end of the suction tube can be provided with guide surfaces or baffles, such as by setting off or inwardly tapering the cones' interior surface, such guide surfaces or baffles being directed toward the nozzle opening.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention itself as well as further advantageous features thereof will become apparent from the following detailed description of preferred inventive embodiments, such description referring to the appended drawings wherein:

FIG. 1 depicts a perspective illustration, partially in section, of a suction tube constructed in accordance with the instant invention having an inserted cop;

FIG. 2 depicts a front plan view of a further embodiment of the inventive suction tube;

FIG. 3 depicts a side elevational view, partially in cross section, of the novel suction tube depicted in FIG. 2; and,

FIG. 4 schematically depicts a partial illustration of an apparatus for the pneumatic removal of the foot lap from cops, such view being illustrated in cross section.

DETAILED DESCRIPTION OF PREFERRED INVENTIVE EMBODIMENTS

For purposes of removing in a pneumatic fashion the foot lap from cops, reference is initially made to FIG. 1 wherein a suction tube 5 is depicted having a sufficient inside width or diameter so as to surround a cop 6 with radial play. Suction tube 5 exhibits an internal conical shape in the area of the inside end of the cop which also tapers conically. Suction tube 5 is closed off by a bottom portion 7 at its tapered end. Bottom portion 7 is provided with a nozzlelike or jetlike opening 8 disposed outside or eccentric of the axis of the suction tube, opening 8 being aligned with the section of foot lap 6' which is to be acted upon by the airstream, this feature being particularly well illustrated in FIG. 4. Nozzlelike opening 8 is provided with a shape which is suitably curved and slit in its circumferential direction. As illustrated, suction tube 5 merges into a suitable suction duct 9 to the side of the bottom portion 7 opposite the cop. Additionally, provision is made for a knife on the side of the suction duct disposed beneath the bottom portion 7, this knife being operable by a lever 10 so as to be able to cut off yarn which has been suctioned off by the nozzle 8 in a manner as will be described below in still greater detail.

By virtue of the coaxial positioning between the cop 6 and the suction tube 5, a stray flow of the airstream is developed in the suction tube 5 towards the nozzle 8 in the area of the foot lap and the bottom portion 7, this stray flow generally weakening the airstream which acts upon the foot lap section itself which has been predetermined by the extension of nozzle 8.

So as to reduce this stray flow or, in other words, so as to possibly deflect the entire airstream prior to its emergence from the nozzle 8 in such a manner that it impacts upon the foot lap section in a truly jetlike fashion and, as far as possible parallel to the axis of the suction tube, the conical end of the suction tube is preferably suitably provided with guide surfaces or baffles. Reference is made here to FIGS. 2 and 3 wherein this type of varied embodiment of the instant invention is depicted. As is illustrated, the conical inside surface of the suction tube is set off or inwardly tapering so as to achieve

a stronger inclination of the surface portion 11 disposed below the nozzle or jet 8 toward the nozzle 8. As can further be seen from FIGS. 2 and 3, the jacket of the cylindrical section 5' of the suction tube is preferably constructed such that it can be pivoted or folded out about a suitable hinge joint 12 such that the cop 6 can be inserted into the suction tube 5 from the side. In this manner, the stroke for loading and unloading the apparatus is substantially shortened as will be described in still further detail hereinbelow.

The apparatus as schematically depicted in FIG. 4 for pneumatically removing the foot lap from the cops comprises, in addition to the suction tube 5 having a nozzle 8 and a cutting knife 10' discussed above, a support and clamping device 13 for replaceably taking up the cop 6. The support and clamping device 13 can be seen to comprise a shaft 15 which is set in motion by a drive means 14, shaft 15 suitably rotated in a direction counter to the winding direction of the cop. A centering head 16 is mounted in shaft 15 in an axially displaceable manner against the action of a spring 17. On the other hand, a carriage 19 is disposed on shaft 15 and is axially displaceable against the action of a spring 18. Carriage 19 can be controlled via a linkage 20 disposed on the machine frame 21. Moreover, three clamping jaws 22 are preferably provided, each clamping jaw being structured as a lever arm and being mounted rotatably at the free end of shaft 15 against spring 23 and support bolt 24. Again, as can best be seen from FIG. 4, lever arms 22 cooperate with suitable guide surfaces at carriage 19.

So as to suitably and automatically feed a cop 6 to the apparatus, initially the apparatus 13 as depicted in the drawings displaced toward the right until it reaches a stop 25 by means of the carriage 19. Thereafter, carriage 19 further moves against the action of spring 18 and, as a result of which, the clamping jaws 22 open under the action of springs 23. Simultaneously therewith, the foldable suction tube, if such type be used, is folded open in the manner seen in FIGS. 2 and 3. The apparatus is now prepared for receiving a cop.

If the inserted cop then extends along the longitudinal axis of the apparatus, carriage 19 is moved to the left. At first, shaft 15 with centering head 16 follows this movement due to the greater pretension of springs 23 relative to spring 18. In this manner, centering head 16 takes up cop 6 and by acting upon the head end of the cop pushes it against the bottom portion 7 of the suction tube 5 thereby centering cop 6. Further displacement of carriage 19 now serves to bring the guide surfaces of the carriage into contact with the clamping jaws 22 as a result of which, such jaws bear at the circumference of cop 6 as depicted in FIG. 4. Now the support and clamping device 13 is slightly moved to the right by further movement of carriage 19 to the right such that cop 6 is freed by means of its free end from the bottom section 7 of suction sleeve or tube 5. Now, the foot lap 6' can be suctioned off as the cop 6 rotates, and thereafter, the yarn thus suctioned off can be cut off by means of a knife 10' in the above-described manner.

If dealing with critical types of yarn, it may be desirable that the pneumatical removal of the foot lap be accelerated by so-called "plucking" which can be achieved in the above-described embodiment without the necessity of additional auxiliary means. So as to accomplish this, the end of the yarn of foot lap 6' which has previously been suctioned in by nozzle 8 is briefly and firmly clamped with the blunt back side 10'' of knife 10' at the appropriate upper edge 5'' at the outlet side of nozzle 8 and there is plucked briefly by a relatively slight reversal movement to the right of apparatus 13 with cop 6.

Additionally, untwisting of the foot lap 6' is accomplished with the end of the yarn being clamped firmly, through the rotational direction of cop 6 running counter to the winding direction.

The synchronous operation of apparatus 13, suction tube or sleeve 5 and knife 10' along with the nonillustrated loading and unloading means for the cop can be performed in known manner by control members which need not further be described herein for an understanding of the instant invention.

As should now be apparent, the objects initially set forth at the outset of this specification have now been successfully achieved. Accordingly,

What is claimed is:

1. A method for pneumatically removing the foot lap from cops having a foot, said method comprising the steps of, rotating the cop, exposing the foot lap at the foot of the cop to an airstream as the cop rotates and constraining the airstream in an essentially axial direction upon a portion of the foot lap over a portion of the circumference of the cop, forwardly displacing that circumferential portion of the foot lap exposed to the axially directed airstream in a direction towards the end of the foot of the cop, then as the cop rotates exposing a further circumferential portion of the foot lap trailing the previously forwardly displaced foot lap portion to the axially directed airstream to again forwardly displace such further portion of the foot lap, and repeatedly subjecting the trailing portions of the foot lap during rotation of the cop to the action of the axially directed airstream to loosen windings of the foot lap and finally to move such foot lap completely off the foot of the cop.
2. An apparatus for pneumatically removing the foot lap from cops having a foot end, and a head end, said apparatus comprising a rotatable support and clamping device for replaceably receiving and rotatably clamping the region of said head end of the cop, a suction tube surrounding said foot end of the cop, said suction tube conically tapering off in the area of said foot end of the cop and being closed off by a bottom portion at its conical end, said bottom portion having a substantially nozzlelike opening outside and eccentric to the axis of said suction tube, said opening being aligned with the foot lap section to be acted upon by the airstream when the cop is inserted in said suction tube.
3. An apparatus pursuant to claim 2 wherein the conical end of said suction tube is, on its inside, provided with guide surfaces leading towards said nozzlelike opening.
4. An apparatus pursuant to claim 3 wherein said conical end of said suction tube possesses an inwardly tapered inside surface defining said guide surfaces.
5. An apparatus pursuant to claim 2 further including a yarn-cutting knife disposed on the suction side of said bottom portion immediately following the same.
6. An apparatus pursuant to claim 2 wherein said bottom portion defines a stop means for centering and firmly clamping the cop on said support and clamping device.
7. An apparatus pursuant to claim 6, further including means for axially displacing said support and clamping device relative to said suction tube.
8. An apparatus pursuant to claim 7 wherein said support and clamping device further includes clamping jaws for the cop, said clamping jaws being operable in dependency upon said axial displacement of said support and clamping device.
9. An apparatus pursuant to claim 2 wherein said suction tube comprises a cylindrical jacket foldable in halves.