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(54) **COMPACTING DEVICE FOR A SPINNING MACHINE**

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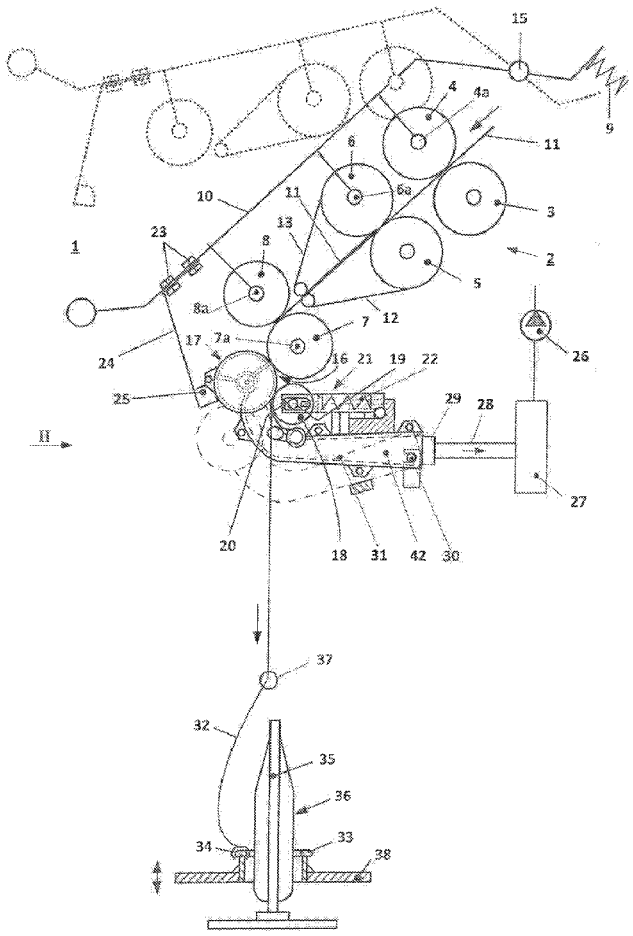
(57) **ABSTRACT**

The invention relates to a compacting device, comprising two suction drums (**17**), wherein a suction drum (**17**) in each case is associatable with a pair of delivery rollers (**7**, **8**) of drafting unit (**2**) of a spinning machine, wherein the pair of delivery rollers (**7**, **8**) is made up of a bottom delivery roller (**7**) and a top delivery roller (**8**); wherein the suction drums (**17**) are rotatably supported, via a bearing, on a shaft that is fastened to a carrier element (**41**); wherein a suction channel (**31**) extends within the carrier element (**41**), and wherein the suction drums (**17**) each have a drive element (**40**) which in the operating position forms a drive connection with the bottom delivery roller (**7**). The invention is characterized in that a protective shield (**42**) for preventing lap formation is situated on the axle (**19**) of the clamping rollers (**18**). The invention further relates to a protective shield (**42**) and a corresponding textile machine.



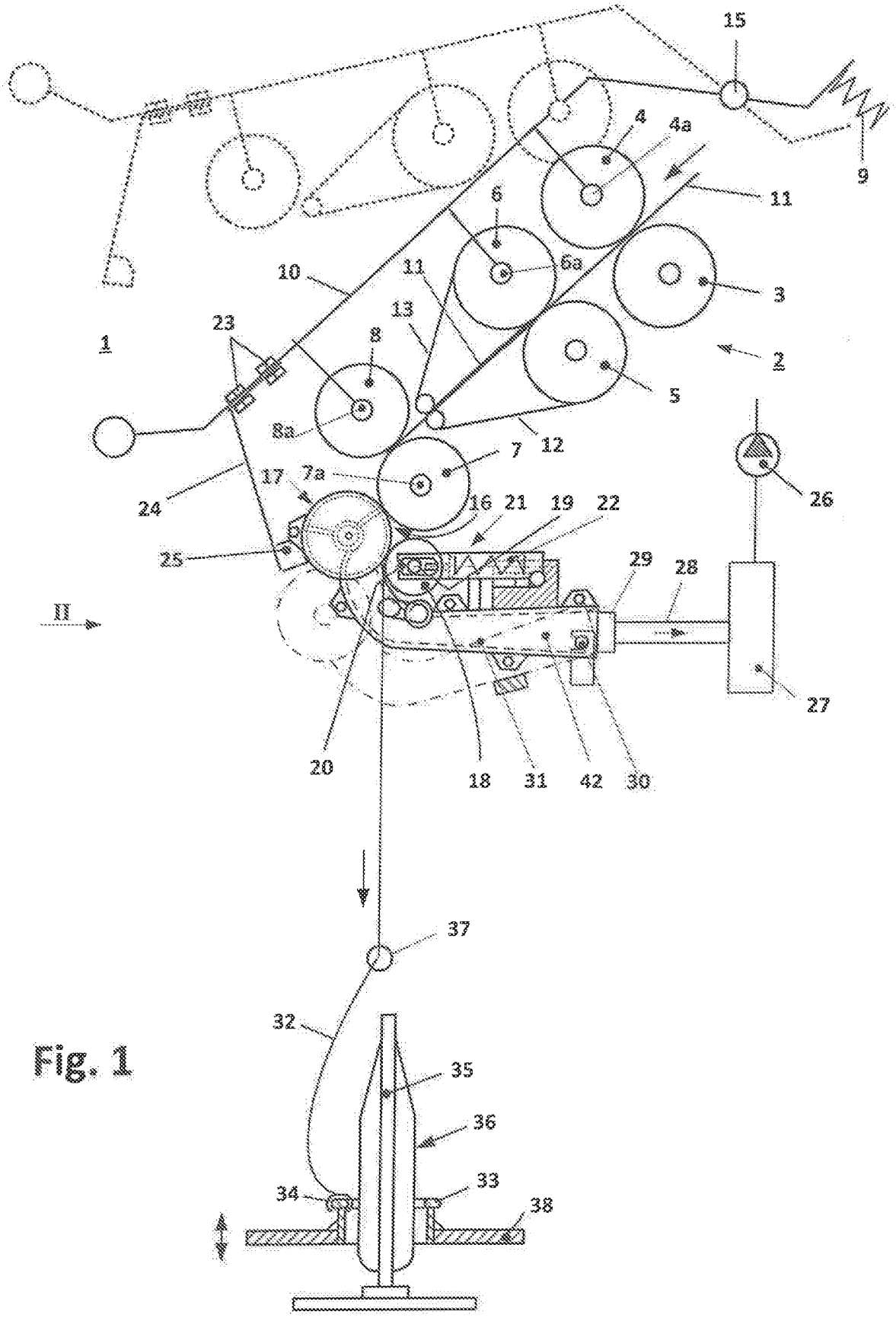

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Fig. 1

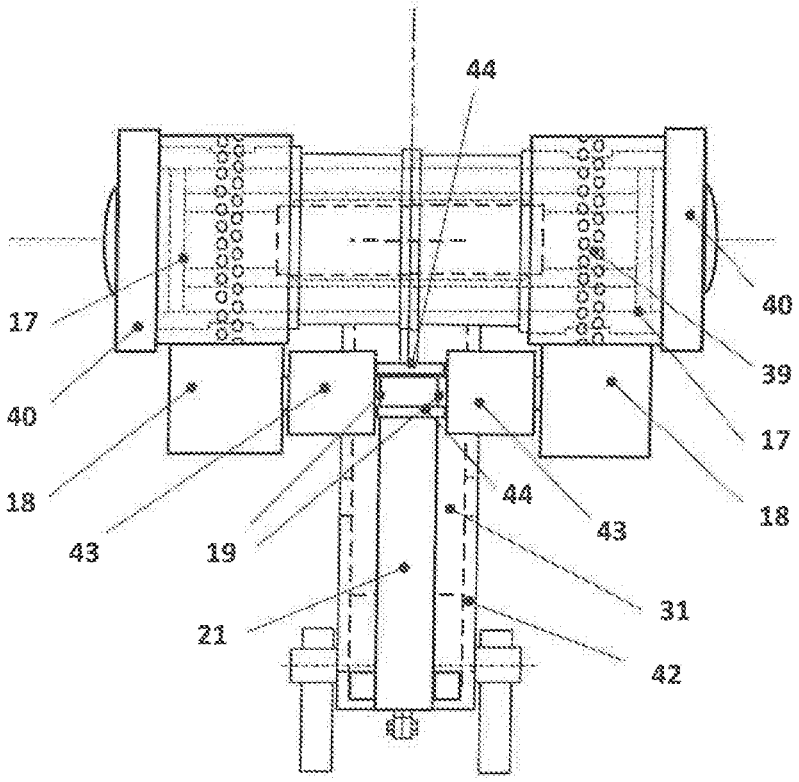

Fig. 2

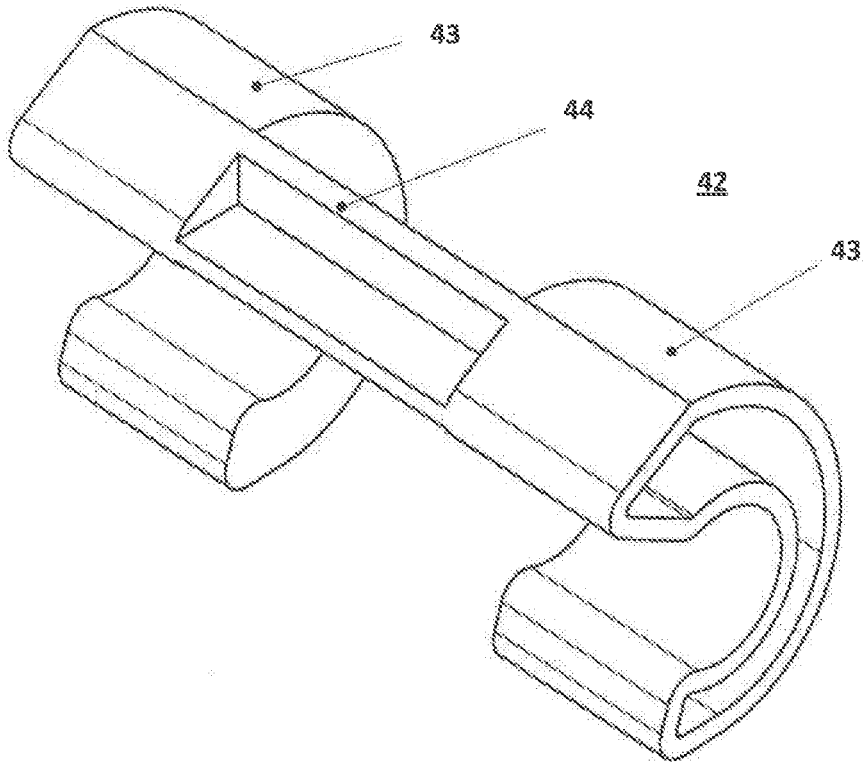

Fig. 3

COMPACTING DEVICE FOR A SPINNING MACHINE

TECHNICAL FIELD

[0001] The invention relates to a compacting device for two adjacently situated drafting units of a spinning machine according to the preamble of the independent claim, and a textile machine that is equipped with a compacting device.

PRIOR ART

[0002] Numerous designs are already known in practice, wherein for compacting the fiber material (fiber strand) discharged by a drafting unit, a compacting unit is situated downstream. Following such a compacting unit, the compacted fiber material, after passing through a clamping point, is fed to a twist generator. Such a twist generator in a ring spinning machine, for example, is composed of a traveler which revolves on a ring, and the yarn produced is wound onto a rotating bobbin. Suctioned revolving, perforated suction drums or revolving aprons provided with perforations are essentially used as compacting units. A specialized suction area on the compacting element is thus defined by using appropriate inserts inside the suction drum or inside the revolving apron. These types of inserts may be provided, for example, with appropriately shaped suction slits to which a negative pressure is applied, thus generating a corresponding air flow at the periphery of the particular compacting element. In particular, protruding fibers are incorporated as a result of this air flow, which is oriented essentially transversely with respect to the direction of transport.

[0003] In the known approaches, the fiber material delivered by the drafting unit is guided above or below the compacting devices used. In particular for use on a ring spinning machine, it is necessary to provide an additional clamping point downstream from the suction zone in order to obtain a twist stop.

[0004] Such types of devices have been illustrated and described in the publications EP 947614 B1, DE 102005010903 A1, DE 19846268 C2, EP 1612309 B1, DE 10018480 A1, and CN 1712588 A, for example. These cited publications essentially involve compacting units which are installed following the particular drafting system. The drive of these compacting units is sometimes achieved via specialized drive shafts which are situated over the length of the spinning machine and which are in drive connection with either a suction roller or a revolving apron, or via a fixedly installed drive connection to appropriately situated pressure rollers of the compacting device.

[0005] In practice, it is necessary to retrofit existing spinning machines with a conventional drafting unit having such a compacting device in order to ensure the possibility of producing high-quality yarns for these machines as well. Therefore, devices have been proposed by means of which conventional drafting systems may be retrofitted with such a compacting device. One such example is found in DE 102 27 463 C1, for example, in which the punch of the drafting unit is extended in order to support an additional drive roller. The drive roller, which extends over the entire length of the spinning machine, is provided for the drive of the retrofitted compacting device. The mounting and installation of such a retrofit unit is very time-consuming and inflexible; i.e., a desired dismantling to a standard drafting system without a compacting device is in turn very time-consuming.

[0006] Published DE 10050089 A1 discloses an embodiment of a compacting device that is provided for retrofitting on a conventional drafting unit.

[0007] A device is known from CN 2851298 Y in which a compacting roller together with a twist stop roller are accommodated in a bearing element which is connected by means of a plate to a pivotable weighting arm of a drafting system device via screws. In the installed and locked position, the drive is transmitted via friction from a delivery roller connected directly to a drive and its associated pressure roller to the compacting roller and the twist stop roller. The compacting device disclosed here is likewise provided for retrofitting on existing drafting units of spinning machines without compaction. The mounting of the compacting unit disclosed therein on an existing drafting unit via a screw connection, as well as the threading for the axle of the pressure roller, is relatively time-consuming, and requires additional adjustment of the distances. In addition, the connection to a negative pressure source must also be established separately.

[0008] In the designs described above, the suction elements associated with a defined compacting area for compressing the fiber material are acted on by negative pressure via additionally mounted lines that are connected to a negative pressure source.

[0009] In order to simplify such compacting devices by making it possible to easily and quickly install conventional drafting units without having to install additional drive elements, WO 2012/068692 A1 proposes a design in which the compacting element in the form of a suction drum and the clamping roller are rotationally supported on a carrier element. The carrier element is detachably mounted to the spinning machine via fastening means. To establish a drive connection between the drafting system rollers and the detachably mounted compacting device, the compacting device is swiveled about a swivel axis in the direction of the pair of delivery rollers of the drafting system via the carrier element, wherein in each case a friction wheel that is coaxially fastened to the particular suction drum is frictionally connected (via friction) to the bottom roller of the pair of delivery rollers of the drafting system. The compacting device is held in this drive connection via appropriately arranged spring elements (for example, on the weighting arm of the drafting system). For a more flexible design for the drive of the compacting device, WO 2012/068692 A1 further proposes to provide a second gearing stage between the drive element of the compacting element of the first gearing stage and the compacting element. One disadvantage of this embodiment, however, is that lap formation sometimes occurs on the clamp axle of the nip roller.

DESCRIPTION OF THE INVENTION

[0010] The object of the invention is to simplify and improve the compacting devices for two adjacently situated drafting units, known from WO 2012/068692 A1, in order to prevent lap formation on the axle of the clamping roller.

[0011] In particular, this object is achieved by a compacting device according to the preamble of the independent claim, which is characterized in that a protective shield for preventing lap formation is situated on the axle of the clamping rollers.

[0012] The protective shield may advantageously be made up of two protective elements situated on both sides of the bearing, between the particular clamping roller and the middle bearing. The two protective elements may have a U-shape and may be connected to one another via at least one web. They may be detachably connected to the clamping roller. The protective shield may thus be easily fastened to the clamping roller and removed for cleaning purposes, for example. The two protective elements may be connected to one another via two webs, wherein the geometry of the webs ensures on the one hand anti-twist protection of the protective shield on the clamping roller, and on the other hand that the protective shield can be detachably fastened to the clamping roller in only one way. Lap formation on the clamping roller may be advantageously prevented as a result of this simple embodiment.

[0013] The object is further achieved by a protective shield for preventing lap formation on the axle of the clamping rollers of a compacting device, wherein the protective shield is detachably fastenable to the clamping axle. The protective shield may be made up of two U-shaped protective elements that are detachably fastenable to the axle of the clamping rollers and connected to one another via a web. The protective shield may advantageously be made of plastic, with a design of the two protective elements as a hollow profile. The protective shield may be manufactured by injection molding.

[0014] The above-mentioned object is further achieved by a textile machine according to the preamble of the independent textile machine claim, which is characterized in that a protective shield for preventing lap formation is situated on the axle of the clamping rollers.

[0015] Further advantages of the invention will become apparent from one exemplary embodiment, which is described and illustrated below.

BRIEF DESCRIPTION OF THE FIGURES

[0016] The invention is explained in greater detail with reference to the appended figures, in which:

[0017] FIG. **1** shows a schematic side view of a drafting system having a carrier element according to the invention;

[0018] FIG. **2** shows a top view of a compacting device according to the invention, having a protective shield on the shaft of the clamping axle; and

[0019] FIG. **3** shows a protective shield according to the present invention.

[0020] Only those features that are essential to the invention are illustrated. Identical features are denoted by the same reference numerals in the various figures.

APPROACHES FOR CARRYING OUT THE INVENTION

[0021] FIG. **1** shows a schematic side view of a spinning station **1** of a spinning machine (ring spinning machine), having a drafting unit **2** which is provided with a pair of feed rollers **3**, **4**, a pair of middle rollers **5**, **6**, and a pair of delivery rollers **7**, **8**. An apron **12**, **13** is guided around the middle rollers **5**, **6**, respectively, each of which is held in its illustrated position around a cage, not shown in greater detail. The top rollers **4**, **6**, **8** of the mentioned roller pairs are designed as pressure rollers that are rotatably supported on a pivotably supported pressure arm **10** via the axles **4***a*, **6***a*, **8***a*, respectively. Two adjacent drafting units **2** (twin drafting system) are associated with a pressure arm **10**. The pressure arm **10** is supported so as to be pivotable about an axle **15**, and, as schematically illustrated, is acted on by a spring element **9**. This spring element may also be an air hose, for example. The rollers **4**, **6**, **8** are pressed against the bottom rollers **3**, **5**, and **7**, respectively, of the roller pairs via the schematically shown spring loading. The roller pairs **3**, **5**, **7** are driven via a drive, not shown. Individual drives as well as other forms of drives (gearwheels, toothed belts, etc.) may be used. The pressure rollers **4**, **6**, **8** are driven via the driven bottom rollers **3**, **5**, **7**, respectively, and the apron **13** is driven via the apron **12**, by friction. The peripheral speed of the driven roller **5** is slightly greater than the peripheral speed of the driven roller **3**, so that the fiber material **11** in the form of a sliver fed to the drafting unit **2** is subjected to a break draft between the pair of feed rollers **3**, **4** and the pair of middle rollers **5**, **6**. The main draft of the fiber material **11** results between the middle roller pair **5**, **6** and the pair of delivery rollers **7**, **8**, the delivery roller **7** having a significantly higher peripheral speed than the middle roller **5**.

[0022] The drafted fiber material **11** delivered by the particular pair of delivery rollers **7**, **8** is deflected downwardly and passes into the area of a suction zone **16** of a subsequent suction drum **17**, which is part of the compacting device according to the invention. The particular suction drum **17** is provided with perforations or openings **39** extending on its periphery. Following the suction zone **16**, for each of the suction drums **17** a clamping roller **18** is provided which rests on the respective suction drum **17** via a pressure load and which with this suction drum forms a clamping line. The particular clamping roller **18** is rotatably supported on an axle **19** which is held in a guide slot **20** of a U-shaped receptacle in a pressure arm **21**. The axle **19** is displaceably supported within the guide slot **20**, transversely with respect to its longitudinal axis. A tappet that rests on the outer circumference of the axle **19** and is acted on by a schematically indicated compression spring **22** protrudes into the guide slot **20** through an opening in the pressure arm **21**. The opening is provided approximately centrally at the end of the guide slot **20**, and opens into an essentially closed cavity in the pressure arm **21** in which the compression spring **22** is situated. The compression spring is supported on the closed end of the cavity, and with its opposite end rests on a head of the tappet.

[0023] The pressure arm **21** is supported so as to be pivotable about an axis in a bearing element that is mounted on the end of the pressure arm. In this pivot position, the axes are held at the end of particular guide via a stop edge, schematically shown in FIG. **1**, transverse to their swivel axis. The clamping rollers **18** rotatably supported on the pressure arm **21** are then loaded against the particular suction drum **17** via the force of the compression spring **22**, thus forming the clamping line. The pressure arm **21** is pivoted past dead center until it rests on a stop. In this position, the axle **19** of the clamping rollers **18** is situated below the plane that extends through the swivel axis and the center axis of the suction drums **17**; i.e., the clamping roller **33** is held in this position past top dead center. Further details with regard to the mounting and design of the clamping rollers **18** may be found in CH 705308.

[0024] The pressure lever **10** is subsequently pivoted about its swivel axis **15** from an upper position, indicated by dashed lines, into a lower position in which a pressure force is exerted on the compacting device in the direction of the

roller **7** via a leaf spring **24**, fastened to the pressure lever **10** by means of screws **23**, and the web **25** that is fastened to the leaf spring. The suction drum **17** thus connected is driven by the roller **7** by means of friction via a drive element **40**, described below.

[0025] In this "operating position," the warped fiber material **11** that is delivered by the drafting system **2** is supplied to the subsequent suction zone **16** of the particular suction drum **17**, and compacted in a known manner under the influence of the generated suction air flow. A deflection shield situated at a distance, as illustrated and described in DE 4426249, for example, may be mounted above the suction zone **16**. The cited publication also describes the process for compacting the fiber material.

[0026] For generating the required negative pressure in the area of the suction zone **16**, a negative pressure source **26** is provided which is connected to a central suction channel **27**. The suction channel **27** is connected via a line **28** and a flexible coupling element **29** to the respective end of the suction channel **31** of the compacting device that protrudes in the direction of the suction channel **27**. The pivotability of the compacting device about an axis **30** is facilitated by the flexibility of the coupling element **29**. The schematically shown coupling element **29** may be designed on its outer circumference in such a way that when two half-shells are joined together, the coupling element is connected in a form-fit manner to a formed suction channel **31**, with tight sealing with respect to the outside. The design and composition of the half-shells in such a carrier element are known from WO 2012/068692 A1. The spinning machine may be advantageously retrofitted with the compacting device.

[0027] At the same time, the clamping line created by the clamping roller **18** forms a so-called "twist stop gap" from which the fiber material **11**, in the form of a compressed yarn **32**, is fed in the conveying direction to a schematically shown ring spinning device. The ring spinning device is provided with a ring **33** and a traveler **34**, the yarn being wound onto a bobbin **35** to form a spool **36** (cop). A thread guide **37** is situated between the clamping line and the traveler **34**. The ring **33** is fastened to a ring frame **38** that undergoes an up-and-down motion during the spinning process.

[0028] FIG. **2** shows a top view of a compacting device according to the invention, having a protective shield **42** on the shaft on the axle **19** of the clamping rollers **18**, and FIG. **3** shows the protective shield **42** in an isolated illustration. The protective shield **42** is made up of two protective elements **43** situated on both sides of the bearing/guide slot **20**, between the particular clamping roller **18** and the middle bearing **20**. The two protective elements **43** have a U-shape and are connected to one another via two webs **44**. The geometry of the webs **44** ensures on the one hand anti-twist protection of the protective shield **42** on the clamping roller **18**, and on the other hand, that the protective shield **42** can be detachably fastened to the clamping roller in only one way. The two protective elements **43** are detachably connected to the axle **19** of the clamping roller **18**. The protective shield **42** may thus be easily fastened to the axle **19** and removed for cleaning purposes or replacement, for example. The two protective elements **43** may be designed as a hollow profile, which allows simple, cost-effective manufacture. The protective shield may be made of plastic, and manufactured by injection molding. As a result of this embodiment according to the invention, lap formation due to accumulation of fiber material may be advantageously prevented during operation by means of the protective shield **42** on the axle **19** of the clamping rollers **18**.

LIST OF REFERENCE NUMERALS

[0029] **1** spinning station
[0030] **2** drafting unit
[0031] **3** bottom feed roller
[0032] **4** top feed roller
[0033] **4***a* axle
[0034] **5** bottom middle roller
[0035] **6** top middle roller
[0036] **6***a* axle
[0037] **7** bottom delivery roller
[0038] **7***a* axle
[0039] **8** top delivery roller
[0040] **8***a* axle
[0041] **9** spring element
[0042] **10** pressure arm
[0043] **11** fiber sliver
[0044] **12** apron
[0045] **13** apron
[0046] **14** suction zone
[0047] **15** axle
[0048] **16** suction zone
[0049] **17** suction drum
[0050] **18** clamping roller
[0051] **19** axle of the clamping rollers **19** [sic; **18**]
[0052] **20** guide slot/bearing
[0053] **21** pressure arm
[0054] **22** compression spring
[0055] **23** screws
[0056] **24** leaf spring
[0057] **25** web
[0058] **26** negative pressure source
[0059] **27** suction channel
[0060] **28** line
[0061] **29** coupling element
[0062] **30** axis
[0063] **31** suction channel
[0064] **32** yarn
[0065] **33** ring
[0066] **34** ring traveler
[0067] **35** cops
[0068] **36** spool
[0069] **37** thread guide
[0070] **38** ring frame
[0071] **39** openings
[0072] **40** friction wheel, drive wheel
[0073] **41** carrier element
[0074] **42** protective shield
[0075] **43** protective element of the protective shield **42**
[0076] **44** web between the protective elements **43**

1. A compacting device, comprising

two suction drums (**17**), wherein a suction drum (**17**) in each case is associatable with a pair of delivery rollers (**7**, **8**) of a drafting unit (**2**) of a spinning machine, wherein the pair of delivery rollers (**7**, **8**) is made up of a bottom delivery roller (**7**) and a top delivery roller (**8**);

wherein the suction drums (**17**) are rotatably supported, via a bearing, on a shaft that is fastened to a carrier element (**41**);

wherein a suction channel (**31**) extends within the carrier element (**41**),

wherein the suction drums (**17**) each have a drive element (**40**) which in the operating position forms a drive connection with the bottom delivery roller (**7**), and

wherein on the carrier element (**41**) two clamping rollers (**18**) are rotatably supported centrally in a bearing (**20**) on a shared axle (**19**), wherein for forming a clamping line, each of the clamping rollers (**18**) rests on the outer circumference of one of the two suction drums (**17**) under the action of a spring load,

characterized in that

a protective shield (**42**) for preventing lap formation is situated on the axle (**19**) of the clamping rollers (**18**).

2-15. (canceled)

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