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(54)

DRAWING METHOD AND APPARATUS FOR AIR SPINNING MACHINES WITH MULTIPLE FEEDS

- (57)
- A drawing method for air spinning machines with multiple feeds, comprising the steps of:

 - preparing at least two webs of textile fibers to be fed by at least a respective first introducer element and a second introducer element, upstream of an air spinning device,
 - feeding with said webs, separate from each other, a plurality of pairs of drawing rollers, comprising at least one drive roller per pair, said drawing rollers being suitable to progressively draw each web simultaneously intercepted by them.
 - feeding said webs, drawn and separate from each other, into a spinning chamber so as to blend them within said chamber and to obtain a single yarn with the desired features.

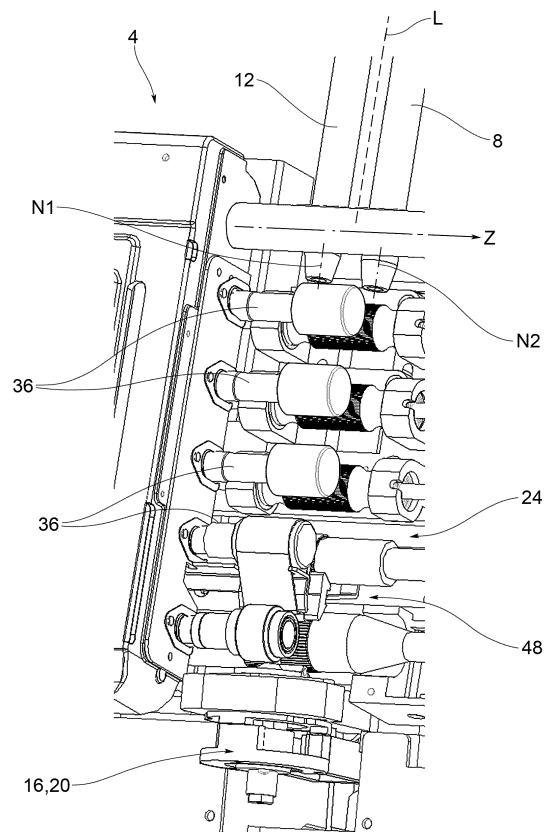


FIG.2

Description

SCOPE

[0001] The present invention relates to a method and a drawing apparatus for air spinning machines, for example of the air-jet type, with multiple feeds.

STATE OF THE ART

[0002] As is well known, air-jet type spinning apparatuses produce yarn from a single fiber web. The specific area of development of the present invention is that of yarns obtained from multiple webs of fibers, which may be of different materials with different colors (mélange) or different quality, or even of the same material. These multiple feed webs must be appropriately drawn and blended in order to make a yarn with the desired features.

[0003] To date, the process for obtaining webs with different color or material may be of two types. The first involves weighing the raw materials based on the percentage ratio one wishes to obtain, for example 50% cotton and 50% polyester, and then introducing the web into the standard production cycle. The second type involves the preparation of several webs, usually in the number of six or eight, and of suitable yarn count, which are then processed repeatedly on a drawing frame until a homogeneous web is obtained. The result, in both cases, is a blended web of material with good blending of the different fibers to be used to feed the air spinners, e.g. of the air-jet type. The conventional processes described above, while guaranteeing good quality in the yarn obtained, are, however, expensive, since the combining of the various blends requires additional care and processing. This known type of processing is currently used for mélange-type yarns and for blended yarns (cotton/polyester, cotton/viscose, etc.).

[0004] Moreover, the known solution has the drawback of requiring processing blended material as a single web: in this way, the introducer tube of such a blended web within the drawing devices is subject to fiber contamination, for example, colored material embedded within the blended web itself. This means that the transit from one blended web to another requires first cleaning the introducer tube to prevent contamination of the subsequent web.

[0005] In addition, the known solutions require the need to modify the spinning machine's calibration according to the blended yarn to be processed: this means that it is necessary to change the machine settings from time to time depending on the yarn count of the blended web to be drawn.

[0006] Moreover, the known solutions do not allow the use of carded cotton for spinning with air-jet-type systems, as the fiber lengths are too short and the low homogeneity make the processing thereof impossible on current air drawing systems; whereas with the proposed solution, by blending carded fiber with combed fiber at a

suitable percentage, carded-type cotton may be spun even with air-jet-type spinning systems.

PRESENTATION OF THE INVENTION

[0007] The need is therefore perceived to resolve the drawbacks and limitations cited with reference to the known art.

[0008] Such requirement is met by a drawing method for air spinning machines with multiple feeds in accordance with claim 1 and a drawing apparatus for air spinning machines according to claim 8.

DESCRIPTION OF THE DRAWINGS

[0009] Further features and advantages of the present invention will become more understandable from the following description of its preferred and non-limiting embodiments, wherein:

figures 1a-1b are plan views, with different orientations, of a drawing apparatus for blended yarn air spinning machines, in accordance with an embodiment of the present invention;

figure 2 is a perspective view of the drawing apparatus for air spinning machines of figures 1a-1b;

figure 3 is a perspective view of a drawing apparatus for air spinning machines according to a further embodiment of the present invention;

figures 4 to 5 are perspective views of a drawing device according to possible embodiments of the present invention.

[0010] The elements or parts of elements in common between the embodiments described hereinafter will be indicated with the same numerical references.

DETAILED DESCRIPTION

[0011] With reference to the aforementioned figures, a drawing apparatus for air spinning machines with multiple feeds is indicated collectively at 4.

[0012] Said apparatus 4 comprises at least a first and a second introducer element, independent of each other, so as to be able to feed simultaneously at least two separate webs of textile fiber N1, N2. Said webs of textile fibers N1, N2 may either be the same or different in quality, yarn count, color and/or material.

[0013] The apparatus 4 further comprises an air spinning device 16, fed with said webs of textile fiber N1, N2, suitable to produce yarn with certain features.

[0014] For the purposes of the present invention, the air spinning device 16 may be of any type, shape and size.

[0015] For example, the air spinning device 16 comprises a spinning chamber 20, which comprises a plurality of air jets (not shown) oriented in a direction substantially tangential to the same webs N1, N2 input in the same spinning chamber 20, so as to interweave said webs N1,

N2 together to obtain a single yarn F in output from the air spinning chamber 20.

[0016] As possible variants of embodiment, the spinning chamber 20 may also comprise movable mechanical parts powered by compressed air.

[0017] The apparatus 4 comprises furthermore a drawing device 24, placed between the introducer elements 8, 12 and the air spinning device 16, comprising a plurality of pairs of drawing rollers 28, comprising at least one drive roller 32 per pair 28, said drawing rollers being suitable to perform a progressive drawing of each web simultaneously intercepted by them, in a known manner.

[0018] "Drive roller" 32 means a roller operatively connected to drive means typically electric motors; usually to each drive roller 32 is juxtaposed an idle roller 36 which presses on the webs N1, N2 with a suitable pressure and is put in motion by the drive roller 32 coupled thereto.

[0019] According to one embodiment, at least one drive roller 32 of a pair of said drawing rollers 28 of the spinning apparatus 4 is mechanically split into a first drive roller 40 which intercepts a first web N1 and a second drive roller 44 which intercepts the second web N2.

[0020] Said first and second drive rollers 40,44 are operatively connected to separate drive means so that they may be operated at different speeds of rotation, to perform different degrees of drawing of the two webs N1, N2 intercepted by said first and second drive rollers 40,44.

[0021] In the same way, the idle roller 36 juxtaposed to the first and second split drive rollers 40,44 is in turn split into two idle rollers 37,38 so as not to tear or pinch one of the two webs N1, N2.

[0022] In other words, each idle roller 37, 38, by virtue of such splitting, will be able to follow, independently of the other, the degree of drawing (i.e. the speed of rotation) imposed by the corresponding drive roller 40,44.

[0023] According to one embodiment, the first and second split drive rollers 40,44 are arranged facing in output with respect to the introducer elements 8,12. In other words, the first and second split drive rollers 40,44 are the first rollers that intercept the N1,N2 webs in output from the respective introducer elements 8,12.

[0024] Preferably, the webs N1, N2 are fed according to a longitudinal feed direction L, the introducer elements 8,12 are juxtaposed to each other along a transverse direction Z, perpendicular to said longitudinal feed direction L.

[0025] It is to be noted that the longitudinal direction L is typically inclined with respect to a vertical direction Y, perpendicular to a horizontal direction X, parallel to a support plane of the spinning apparatus 4.

[0026] The first and second split drive rollers 40,44 are aligned parallel to said transverse direction Z and rotate around the transverse rotation axes parallel to the transverse direction Z.

[0027] The number of pairs of drawing rollers 28 may be varied according to the total drawing ratio to be obtained and is not binding for the purposes of the present

invention.

[0028] For example, the use of two or more webs in the feed and the consequent increase in the size of the incoming web may require the addition of a fifth pair of drawing rollers to ensure the correct distribution of the drawing along its path (where usually 4 pairs of drawing rollers are used). The drawing ratio is given by the ratio between the incoming yarn count and the outgoing yarn count.

[0029] In general, the addition of a fifth pair of drawing rollers allows the main drawing ratio to be kept constant and does not require the other ratios to be significantly increased, which is much less efficient than carrying out the main drawing with a belt 48.

[0030] Preferably, said main drawing is between 20 and 50; each pair of drawing rollers or cylinders 28 carries out a drawing between 1 and 4 times. In total, the drawing should be less than 350. It should be noted that the above values are indicative and not exclusive: for these reasons, such values may be modified without thereby departing from the scope of the present invention.

[0031] The operation and therefore the drawing method for spinning machines according to the present invention will now be described.

[0032] In particular, the drawing method for multiple-feed air spinning machines with the present invention comprises the steps of:

- preparing at least two webs N1, N2 of textile fibers to be fed by at least one respective first introducer element 8 and a respective second introducer element 12, upstream of an air spinning device 16,
- drawing said webs N1, N2, separated from each other, with a plurality of pairs of drawing rollers 28, comprising at least one drive roller 32 per pair 28, said drawing rollers 28 being suitable to perform a progressive drawing of each web N1, N2 simultaneously intercepted by them,
- feeding said webs N1, N2, drawn and separate from each other, into a spinning chamber 20 of the air spinning chamber 16, so as to blend them within said spinning chamber 20 and to obtain a desired blended yarn F.

[0033] Said two webs N1, N2 of textile fibers may either be the same or different from each other in quality, yarn count, color and/or material.

[0034] Regardless of whether the individual webs N1, N2 are the same or different, even if only partially from each other, a single blended yarn F will be obtained by the spinning chamber 20: in other words, the concept of blended yarn is to be understood as yarn consisting of at least two starting webs, suitably drawn, regardless of whether the webs are the same or different from each other. Some examples of commonly used blended yarns may be a yarn with a certain yarn count with 50% cotton and 50% polyester or mélange yarns with 60% white and 40% black.

[0035] Such examples are purely indicative and not limitative of the possible applications of the present invention.

[0036] According to a possible embodiment, the method comprises the step of modifying the degree of drawing of the two webs N1, N2, at the transit of the same webs through said pairs of drawing rollers 28, so as to feed into the entry to the spinning chamber 20 webs that are distinct from each other and drawn with different degrees of drawing, i.e. in a particular ratio, e.g. 60% cotton and 40% polyester.

[0037] It is also possible to provide for the step of drawing the two webs N1, N2 with the same drawing.

[0038] According to a possible embodiment, the method comprises the steps of:

- mechanically splitting at least one drive roller 32 of a pair of said drawing rollers 28, mutually facing each other, so as to have a first split drive roller 40 which intercepts a first web N1 and a second split drive roller 44 which intercepts the second web N2,
- operating the first and the second split drive rollers 40, 44 in rotation at different speeds of rotation so as to obtain different degrees of drawing of the two webs N1, N2 intercepted by them.

[0039] According to a possible embodiment, the method comprises the steps of:

mechanically splitting at least two drive rollers 28 of two different pairs of drawing rollers respectively into a first, a second, a third and a fourth split drive roller, in order to operate said split drive rollers 28 at different speeds of rotation to obtain different degrees of drawing between the two webs N1, N2 intercepted by them.

[0040] Preferably, the webs N1, N2 are fed in a longitudinal feed direction L; the introducer elements 8, 12 are juxtaposed in a transverse direction Z, perpendicular to said longitudinal feed direction L; the split drive rollers 40, 44 are aligned with each other parallel to said transverse direction Z and rotate around transverse rotation axes, parallel to the transverse direction Z.

[0041] According to a possible embodiment, the method comprises the steps of:

- establishing the final yarn count of the blended yarn F and the possible desired percentage blend ratio to be obtained after spinning, starting from at least two distinct webs N1, N2,
- fixing a separate starting yarn count of the webs N1, N2, said starting yarn count being the same for both webs N1, N2,
- differentiating the degree of drawing of the two webs N1, N2 from each other, acting on a differentiated adjustment of the speed of the drawing rollers 28 acting independently on the separate webs N1, N2

to obtain, following the blending of the webs in the spinning chamber 20, a final blended yarn F having the final predefined yarn count and the possible desired blend percentage ratio.

[0042] It should be noted that the use of base webs N1, N2 having the same yarn count is not mandatory, although it represents an advantage over the known solutions, as further described hereinafter. It is, however, possible to use base webs having any starting yarn count and to modify the degree of drawing according to the yarn count of the final yarn F to be obtained.

[0043] As seen, the spinning method comprises the step of directing jets of air onto the webs inside the spinning chamber 20, in a direction substantially tangential to the same webs, so as to interweave said webs N1, N2 together and obtain a single yarn F in output from the air spinning chamber 20.

[0044] As may be appreciated from the foregoing, the method and the air-jet type spinning device according to the invention allow the drawbacks presented in the prior art to be overcome.

[0045] In particular, the present invention allows blended yarns to be obtained by maintaining individual webs and merging them only when feeding into the air spinning device, which will blend them in the chamber and thus obtain the same result as traditional methods while skipping all the additional operations (which increase the production times and costs).

[0046] Furthermore, this method allows the use of combed cotton webs in appropriate blends with carded cotton webs allowing the cotton to be spun with materials that cannot be processed with conventional air spinning systems.

[0047] Such method also allows the use of two equal webs, having, for example, a single drawing passage instead of the three currently used in conventional air spinning machines, insofar as the defects of the individual webs are statistically reduced in their combining and subsequent blending.

[0048] In the production of blended yarns, the desired percentage of individual materials in the final yarn is obtained by working on the yarn counts of the individual input webs. For example, to obtain a yarn with 60% cotton and 40% polyester, it would be sufficient to feed the machine with two webs having yarn counts Ne 0.18 and Ne 0.27 respectively.

[0049] The present invention allows the use of webs having all the same yarn count and varying the degree of drawing thereof directly on the spinning machine, obtaining a final yarn having the final predefined yarn count and any blend percentage desired. For example, to obtain a blended 60% cotton 40% polyester yarn, one could use two webs of the same yarn count, for example Ne 0.18, and then draw them 100 and 150 times (or at a ratio of 1.5:1), respectively.

[0050] This methodology represents a remarkable simplification with respect to the known solutions for the

production of blended yarns, because it allows the degree of drawing to be varied without increasing the preparation work, as it is possible to use basic webs having all the same yarn count and to change the degree of drawing according to the final yarn count one desires to obtain and the blend percentage. The different degree of drawing will be calculated automatically by the processing and control unit, after entering the initial yarn count values and the final yarn count value desired.

[0051] A particularly advantageous application of the present invention is spinning with webs of different quality. It is possible, for example, to insert a carded cotton web, typical of open-end systems, and a combed cotton web (with 1, 2 or 3 drawing passages), typical of air spinning and more "valuable", in variable percentages (from 70% -30% to 90%-10% depending on the quality of the two webs), and be able to process in the air system materials that are typical of open-end systems, obtaining good yarn features which are better than those of the open-end systems at almost double the speed and with lower processing costs. Currently, on the other hand, air spinning machines provide for feeding with combed cotton webs with three drawing passages to obtain fiber lengths that are both extremely homogeneous and the longest possible. Clearly, this has, as a drawback, a high cost because it discards much valuable material and increases the overall duration of the processing cycle.

[0052] Moreover, the present invention finds an advantageous application also for mono-material yarns (i.e. non-blended), because it provides the possibility of using the feed with a single drawing passage rather than the highly recommended three passages used by the machines currently present in the market with the same final quality of yarn. In fact, from a statistical point of view, the defects of the individual webs are added algebraically, giving a resulting web that allows spinning with improved characteristics (especially spinnability).

[0053] A person skilled in the art, to satisfy contingent and specific requirements, may make numerous modifications and variations to the air-jet type spinning method and devices for blended yarns described above, all of which are within the scope of the invention as defined by the following claims.

Claims

1. Drawing method for air spinning machines with multiple feeds, comprising the steps of:

- preparing at least two webs of textile fibers (N1, N2), to be fed by at least a respective first introducer element (8) and a second introducer element (12), upstream of an air spinning device (16),
- drawing said webs (N1, N2), separate from each other, with a plurality of pairs of drawing rollers (28), comprising one drive roller (32) and

one idle roller (36) per pair, said drawing rollers (28) being suitable to perform a progressive drawing of each web (N1, N2) simultaneously intercepted by them,

- feeding said webs (N1, N2) drawn and separate from each other into a spinning chamber (20) of the air spinning device (4) to obtain a desired blended yarn.

2. Drawing method for air spinning machines with multiple feeds according to claim 1, wherein said at least two webs (N1, N2) of textile fibers are the same as each other.

3. Drawing method for air spinning machines with multiple feeds according to claim 1, wherein said at least two webs (N1, N2) of textile fibers are different from each other in terms of quality, color, yarn count and/or material.

4. Drawing method for air spinning machines with multiple feeds according to claim 1, 2 or 3, comprising the step of:

- modifying the degree of drawing of the two webs (N1, N2), upon transit through said pairs of drawing rollers (28), so as to feed to the spinning chamber (20) webs different from each other and with a different degree of drawing.

5. Drawing method for air spinning machines with multiple feeds according to claim 1, 2 or 3, comprising the step of drawing both webs (N1, N2) with the same drawing.

6. Drawing method for air spinning machines with multiple feeds according to any of the claims from 1 to 5, comprising the steps of:

- mechanically splitting at least one drives roller (32) of a pair of said drawing rollers (28), mutually facing each other, so as to have a first split drive roller (40) which intercepts a first web (N1) and a second split drive roller (44) which intercepts the second web (N2),
- operating in rotation, at different speeds of rotation, the first and the second split drive rollers (40, 44), so as to obtain different degrees of drawing of the two webs (N1, N2) intercepted by them.

7. Drawing method for air spinning machines with multiple feeds according to claim 6, wherein the idle roller (36) facing the first and second split drive rollers (40, 44) is in turn divided into two idle rollers (37, 38) so as not to tear or pinch one of the two webs (N1, N2).

8. Drawing method for air spinning machines with multiple feeds according to any of the preceding claims, comprising the step of:

mechanically splitting at least two drive rollers (40,44) of two different pairs of drawing rollers (28) respectively into a first, a second, a third and a fourth split drive roller (32), in order to operate at different speeds of rotation said split drive rollers (32) to obtain different degrees of drawing between the two webs (N1, N2) intercepted by them.

9. Drawing method for air spinning machines with multiple feeds according to any of the preceding claims, wherein the webs (N1, N2) are fed in a longitudinal feed direction (L), the introducer elements (8,12) are juxtaposed in a transverse direction (Z), perpendicular to said longitudinal feed direction (L), the split drive rollers (32) are aligned with each other parallel to said transverse direction (Z) and revolve around transverse rotation axes, parallel to the transverse direction (Z).

10. Drawing method for air spinning machines with multiple feeds according to any of the preceding claims, comprising the steps of:

- establishing the final yarn count of the yarn and possible desired percentage blend ratio to be obtained after spinning, starting from at least two different webs (N1, N2),
- establishing a separate starting yarn count of the webs, said starting yarn count being the same for both webs (N1, N2)
- differentiating the degree of drawing of the two webs (N1, N2) from each other, acting on a differentiated speed regulation of the drawing rollers (28) acting independently on the separate webs (N1, N2) to obtain, following blending of the webs (N1, N2) in the spinning chamber (20), a yarn (F) having the final predefined yarn count and possible desired blend percentage ratio.

11. Drawing method for air spinning machines with multiple feeds according to any of the preceding claims, comprising the step of:

directing jets of air on the webs (N1, N2), inside the spinning chamber (20), in a direction substantially tangential to said webs, so as to interweave said webs (N1, N2) together and obtain a single yarn (F) in output from the air spinning chamber (20).

12. Drawing apparatus for air spinning machines with multiple feeds, comprising:

- at least a first and a second introducer element (8, 12), independent of each other, so as to be able to feed simultaneously at least two separate webs (N1, N2) of textile fiber,
- an air spinning device (16) suitable to spin said webs of textile fiber,
- a drawing device (24) placed between the introducer elements (8, 12) and the air spinning device (16), comprising a plurality of pairs of drawing rollers (28), comprising one drive roller (32) and one idle roller (36) per pair, said drawing rollers (28) being suitable to perform a progressive drawing of each web simultaneously intercepted by them.

13. Drawing apparatus for air spinning machines with multiple feeds according to claim 12, comprising:

- at least one drive roller (32) of a pair of said drawing rollers (28), mechanically split into a first drive roller (40) which intercepts a first web (N1) and a second drive roller (44) which intercepts the second web (N2),
- said first and second drive rollers (40,44) being operatively connected to separate drive means so that they can be operated at different speeds of rotation, to perform different degrees of drawing of the two webs (N1, N2) intercepted by said first and second drive rollers (40,44).

14. Drawing apparatus for air spinning machines for blended yarns according to claim 13, wherein said first and second split drive rollers (40,44) are arranged facing in output with respect to the introducer elements (8, 12).

15. Drawing apparatus for air spinning machines for blended yarns according to claim 12, 13 or 14, wherein the idle roller (36) facing the first and second split drive rollers (40,44) is in turn split into two idle rollers (37,38) so as not to tear or pinch one of the two webs (N1, N2).

16. Drawing apparatus for air spinning machines with multiple feeds according to any of the claims from 12 to 15, wherein the webs (N1, N2) are fed in a longitudinal feed direction (L), the introducer elements (8,12) are juxtaposed in a transverse direction (Z), perpendicular to said longitudinal feed direction (L), the split drive rollers (32) are aligned with each other parallel to said transverse direction (Z) and revolve around transverse rotation axes, parallel to the transverse direction (Z).

17. Drawing apparatus for air spinning machines for blended yarns according to any of the claims from 12 to 16, wherein said spinning chamber (20) comprises a plurality of jets of air oriented in a direction

substantially tangential to said webs in input in the spinning chamber (20), so as to interweave said webs (N1, N2) and obtain a single yarn (F) in output from the air spinning chamber (20).

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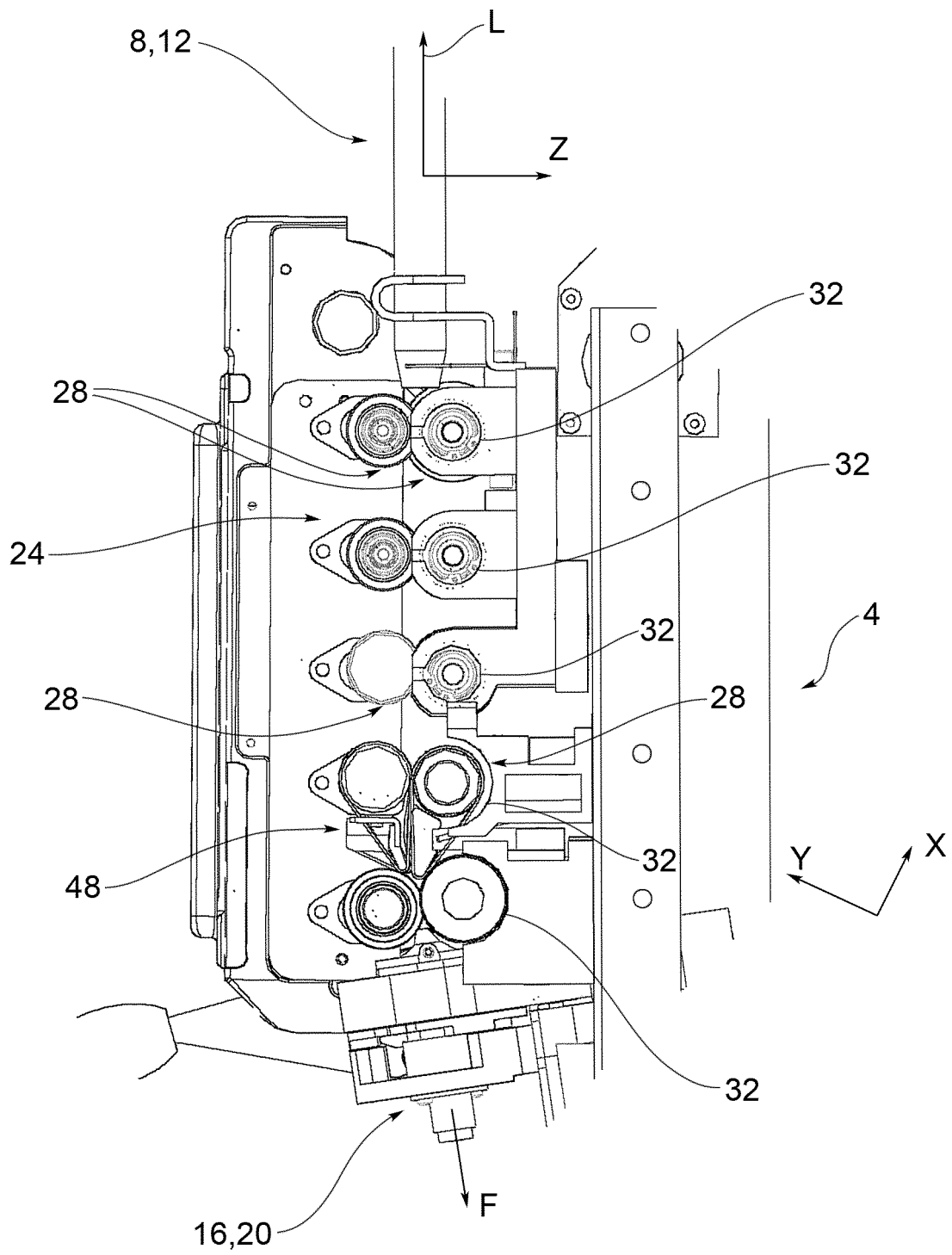


FIG.1

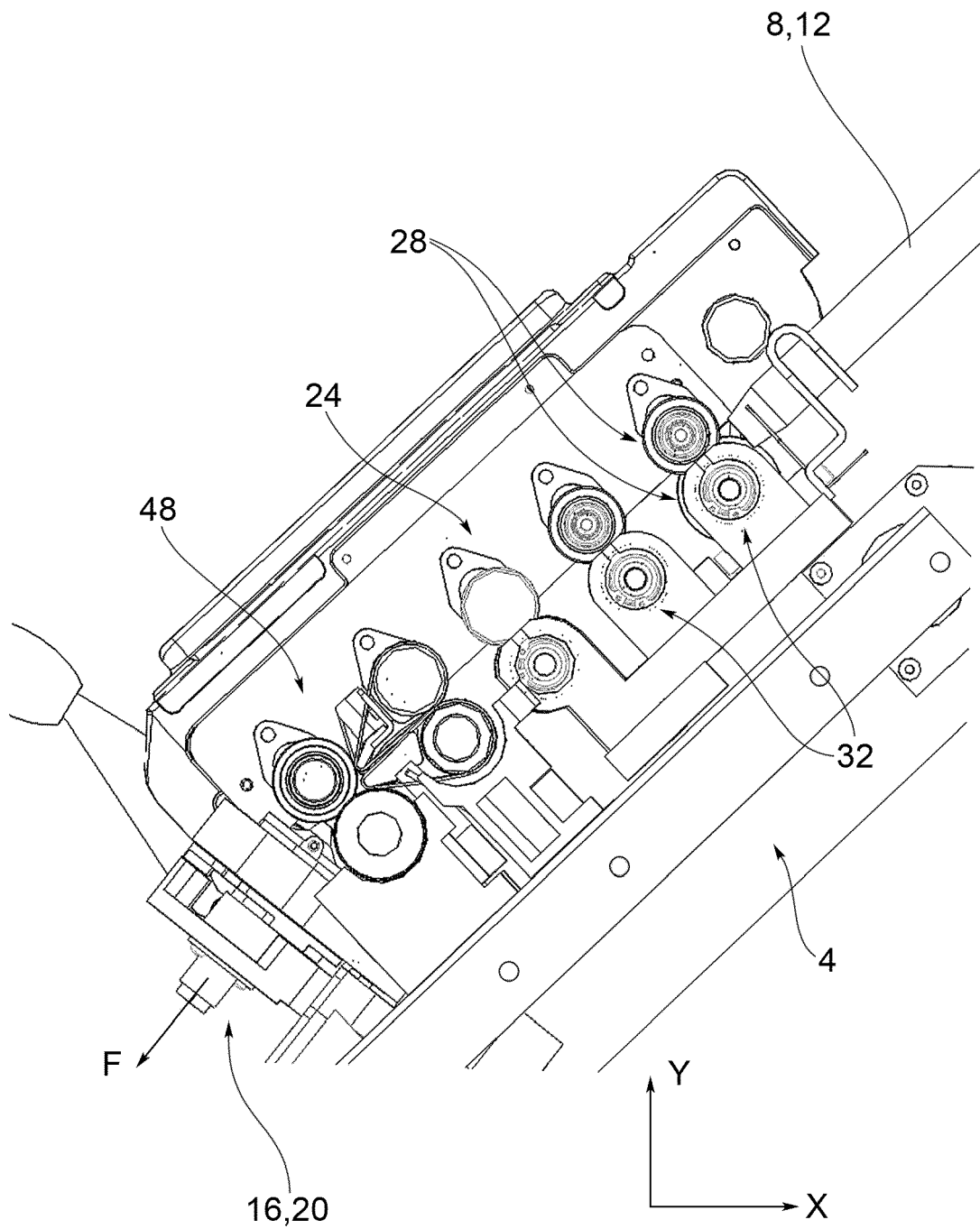


FIG.1b

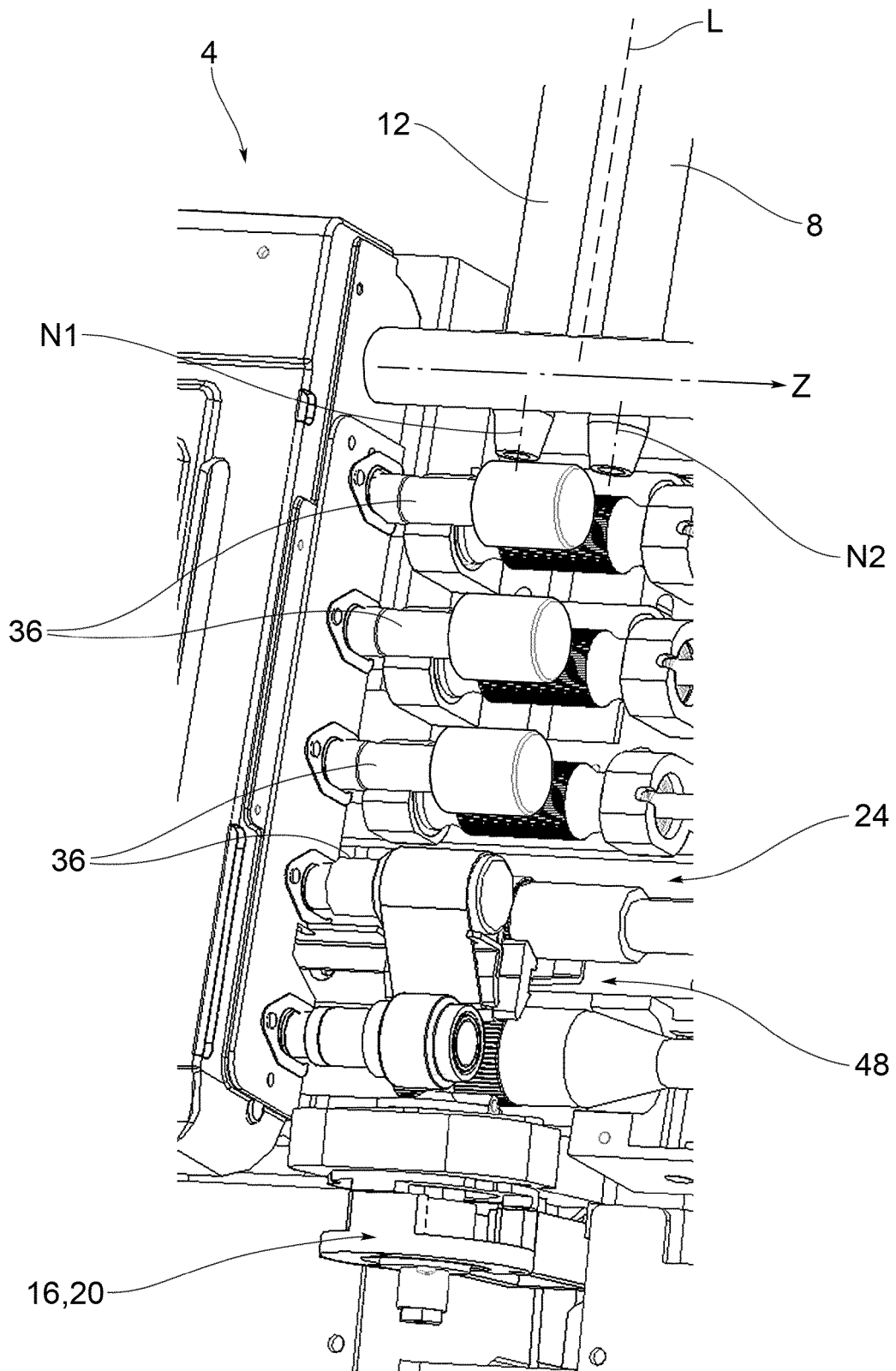


FIG.2

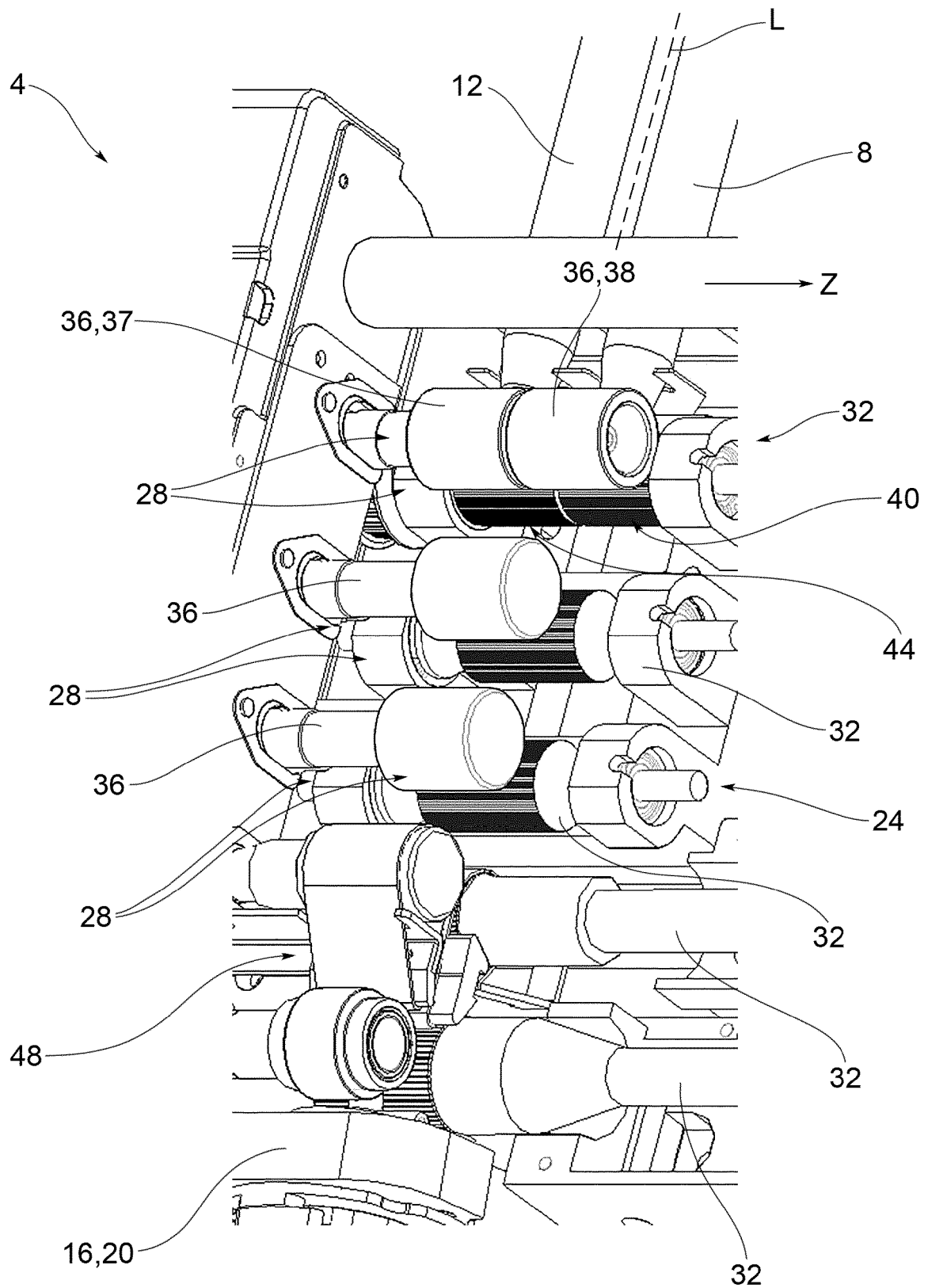


FIG.3

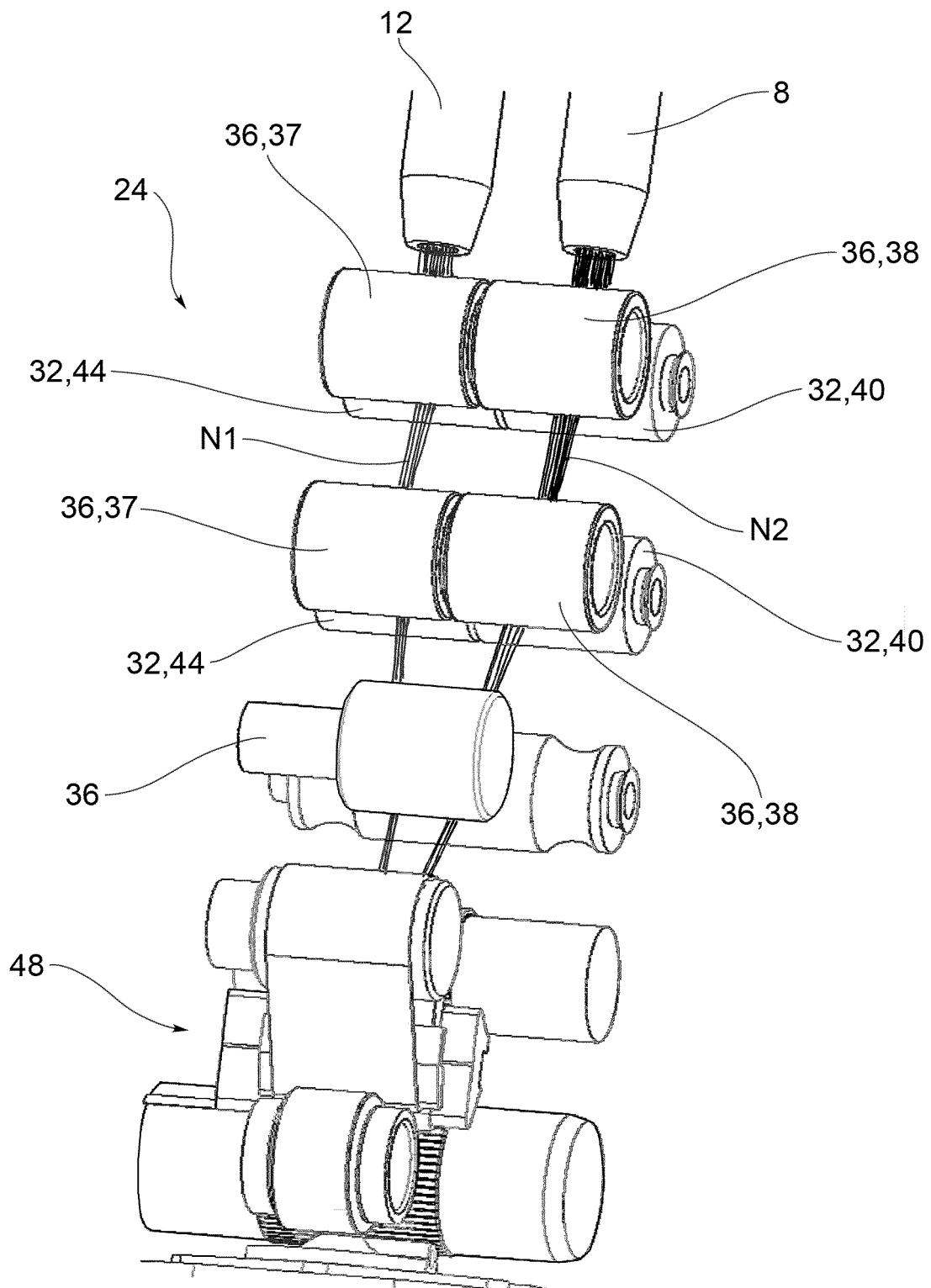


FIG.4

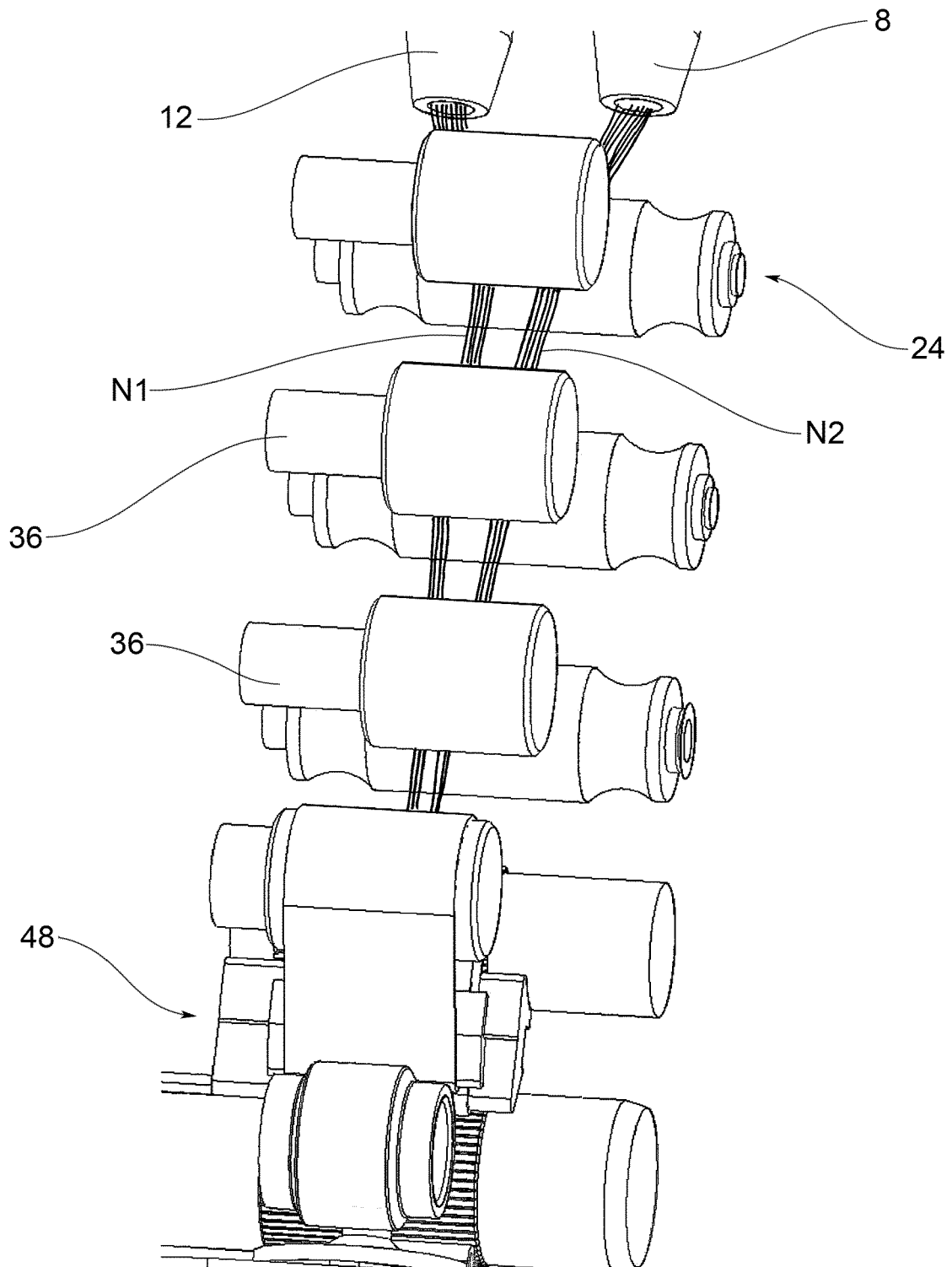


FIG.5



EUROPEAN SEARCH REPORT

 Application Number
 EP 17 19 8457

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 March 2018	Examiner Humbert, Thomas
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EUROPEAN SEARCH REPORT

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