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(54) **Tank for the continuous treatment of yarns or threads arranged in bands in a liquid bath**

Behälter zur kontinuierlichen Nassbehandlung von in Bandform angeordneten Fäden oder Garnen

Cuve pour le traitement au mouillé en continu de fils disposés en bandes

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(73) Proprietor: **JAEGGLI S.p.A.**
I-20123 Milano (IT)

(72) Inventors:
• **De Capitani, Enzo**
I-22043 Galbiate (LC) (IT)

• **Lancerotto, Fabio**
I-20131 Milano (IT)
• **Minto, Luigi**
I-31025 S. Lucia di Piave (TV) (IT)

(74) Representative: **Petraz, Gilberto Luigi**
GLP S.r.l.
Piazzale Cavedalis 6/2
33100 Udine (IT)

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EP-A- 0 489 191 **BE-A- 491 067**
DE-A- 4 307 787 **DE-C- 469 838**
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Description

[0001] This invention concerns a tank for the continuous treatment of yarns or threads arranged in bands in a liquid bath, as set forth in the main claim.

[0002] To be more exact, the tank of this invention is employed to carry out substantially every type of process whereby a plurality of parallel yarns or threads lying on the same plane and being unwound continuously from at least one feeder beam or another analogous element are immersed in a tank containing a treatment liquid.

[0003] The most common of these processes concern the washing, pre-washing and rinsing of the yarn or thread in hot or cold water, the mercerisation in caustic soda, the neutralisation in an acid bath, etc.

[0004] The tank according to the invention can also be employed for continuous dyeing processes and also for various treatments involving the immersion of the yarn or thread in a liquid bath.

[0005] In the description that follows we shall speak generically of yarns and shall mean thereby that this invention can be applied to the treatment of cotton yarns or threads, manmade yarns or threads such as polyester, wool yarns or threads or linen yarns or threads or other types of yarns or threads suitable to undergo this treatment.

[0006] The state of the art covers various methods for subjecting yarns to continuous or discontinuous treatments in a liquid bath by immersing the yarns in tanks containing the treatment liquid.

[0007] A method has been disclosed in particular for continuously passing a band of parallel yarns, consisting even of 800 yarns or more positioned extremely close to each other, into a plurality of tanks containing a treatment liquid such as caustic soda for mercerisation, water for washing and rinsing, an acid for neutralisation, etc.

[0008] Each tank is equipped with a plurality of drawing rolls which define the path of the band of yarns and which at the same time maintain the required tension on the yarns passing through; the band of yarns is free between one drawing roll and the next one.

[0009] The configuration of this tank of the state of the art is shown in EP-A-0 489 191 upon which the preamble of claim 1 is based.

[0010] The present applicants have found that with this type of method the yarns, as soon as they begin to be impregnated in the bath, tend to approach each other and to form cords consisting of groups of yarns superimposed on each other and bestriding each other and also tend to twist about their axis.

[0011] Since comb means conformed reciprocally in a mating manner are generally included at the beginning and end of the treatment path, the above occurrence caused by impregnation of the yarns in the bath causes a situation which cannot be remedied and which leads to continuous stoppages of the treatment.

[0012] In fact the yarns, after being arranged in an orderly and aligned manner by the upstream comb means, arrive twisted astride each other at the downstream comb means.

5 [0013] This leads to the breakage of an appreciable number of yarns with the result that the treatment has to be continuously interrupted.

[0014] The present applicants have designed, tested and embodied this invention to overcome this severe problem, which has so far not made possible the completion and setting-up of an efficient plant to carry out continuous treatment of yarns arranged in bands in liquid baths, and also to achieve further advantages.

10 [0015] This invention is set forth and characterised in the main claim, while the dependent claims describe variants of the idea of the main embodiment.

[0016] The purpose of the invention is to provide a tank for the continuous treatment of yarns arranged in bands in liquid baths, the yarns being unwound parallel from one or more feeder beams, whereby the problems of the superimposing, bestriding and twisting of the yarns in the step of impregnation in the treatment liquid within the tank are avoided.

20 [0017] The band of yarns comprises typically up to 800 yarns arranged side by side and parallel on one single plane and positioned very close to each other.

[0018] According to the invention, along the path within the specific treatment tank and in particular in the space between one drawing roll and the next drawing roll the yarns forming the band are supported by supporting means suitable to define a supporting surface for the yarns.

25 [0019] These supporting means are arranged spaced apart with their axes substantially perpendicular to the axis of the band and cover the whole extent of the band so as to support all the yarns.

[0020] These supporting means are arranged advantageously spaced apart from each other at equal distances and have a suitable pitch.

30 [0021] This pitch depends on the working parameters of the yarn treatment plant and in particular on the dimensions of the tank, the type of treatment, the distance between the drawing rolls, the working speed, etc.

[0022] According to a preferred embodiment of the invention the supporting means consist of idler rolls set in rotation by the yarns passing over them and have their ends secured to the sidewalls of the treatment tank or to equivalent means.

35 [0023] According to a variant the supporting means consist of stationary rolls.

[0024] According to other variants of the embodiment the supporting means consist of strips, rods, brackets, etc. and have at least their surface cooperating with the yarns of the band conformed spherically or at least widely rounded.

40 [0025] The supporting means are advantageously outwardly lined with a non-friction material so as to disturb as little as possible the sliding of the yarns.

[0026] According to a variant of the invention, at least where the supporting means are stationary and have a cylindrical or partly cylindrical conformation, means are included which are suitable to rotate the supporting means periodically according to a desired sequence and angle in order to vary periodically the surface supporting the yarns on the supporting means within the treatment tank.

[0027] The present applicants have found, in fact, that, as the processing proceeds, deposits of dust or other dirt form between the yarns and the surface of the supporting means, especially along the last straight segments within the tank.

[0028] When these deposits reach a given value, the dirt tends to be carried away by the yarns and can even be fixed to the yarns, thereby creating considerable problems for the processing downstream.

[0029] If the supporting means are rotated periodically in a direction opposite to the direction of feed of the yarns, the surface supporting the yarns being fed is changed and the dirt is detached by gravity.

[0030] According to a variant, scraper means are included in cooperation with the working surface of the relative supporting means and are able to detach the dirt from the surface of the supporting means during the rotation of the latter.

[0031] According to another variant the scraper means can be moved and can be brought closer to or farther from the relative supporting means so as to remove the dirt.

[0032] The frequency of the changing of the supporting surface of the supporting means and the angle of rotation for each actuation can be determined experimentally according to the working conditions and the specific requirements.

[0033] The attached figures are given as a non-restrictive example and show some preferred embodiments of the invention as follows:-

Fig.1 is a diagram of a plant for the continuous treatment of yarns arranged in bands;

Fig.2 is a front view of the tank according to the invention for the continuous treatment in a liquid bath;

Fig.3 shows a section along the line A-A of Fig.2;

Fig.4 is a diagram of a first possible system to vary the supporting surface supporting the yarns within the bath, this system being used in this invention;

Fig.5 shows a second possible system to vary the supporting surface according to the invention.

[0034] Fig.1 shows diagrammatically a continuous treatment plant 10 to which is applied a treatment tank 14 according to the invention.

[0035] The treatment plant 10 processes continuously a plurality of parallel yarns 11 lying on the same plane and being unwound in a band from at least one beam 12

[0036] The yarns 11 unwound from the beam 12 are generally fed to a pre-washing assembly 13 comprising a plurality of tanks 14 according to the invention after passing through comb means 15, which pre-arrange the individual yarns 11 in a perfectly coplanar and aligned manner for the subsequent processes.

[0037] The yarns 11 are fed from the pre-washing assembly 13 to a mercerisation assembly 16 including one or more tanks 14.

[0038] Downstream of the mercerisation assembly 16 is positioned a possible stabilisation and tensioning assembly 18, in which the yarns 11 undergo a series of passes over rolls which prevent their shrinkage.

[0039] The tension of the yarns 11 may possibly be controlled in the stabilisation and tensioning assembly 18.

[0040] Next, there is a washing step in a washing assembly 19, which is followed by a neutralisation assembly 20 with an acid bath and by a rinsing assembly 21;

[0041] The yarns 11 are fed from the rinsing assembly 21 to a drying assembly 17 and thence to a take-up zone 22.

[0042] Immediately upstream of the take-up zone 22 are positioned second comb means 41, the configuration and position of the teeth of which are coordinated with those of the first comb means 15.

[0043] Since the aforesaid problems of bestriding, twisting, formation of cords, etc. have taken place during the treatment in the liquid baths to which we referred above, the positioning of the yarns 11 at the second comb means 41 is no longer correct.

[0044] This leads to a great number of breakages of the yarns 11 as well as to the impossibility of unwinding the single yarns 11 individually so as to direct them correctly to respective beams 42 positioned in the take-up zone 22.

[0045] Thus, the treatment has to be continually interrupted, and this fact makes the method itself substantially impossible to apply.

[0046] The treatment tank 14 according to the invention, which has been embodied to overcome this problem, is shown in Figs.2 and 3; it includes a container 23 for the specific treatment liquid such as water, caustic soda, acid, dyestuff, etc.; a supporting structure 24 for the drawing rolls of the yarns 11 is lodged within the container 23.

[0047] In particular, there are included a pair of upper powered transverse drawing rolls 25, namely an intake roll 25a and offtake roll 25b respectively, a pair of lower transverse idler rolls 26, namely 26a and 26b respectively, positioned substantially at the bottom of the tank 14, and a possible intermediate transmission roll 27, which is generally an idler roll.

[0048] At least the upper rolls 25 can cooperate with thrust means (not shown here) for maintaining the required tension of the yarns 11 passing through the tank 14.

[0049] According to the invention supporting rolls 28

are included along the path in the treatment tank 14 and are positioned between the upper drawing rolls 25 and the driven rolls 26 and 27 and advantageously are of a smaller size than the rolls 25, 26 and 27; these supporting rolls 28 are arranged with their axes substantially perpendicular to the axis of the band of yarns 11 and are suitable to form a temporary supporting surface for the yarns 11 passing through.

[0050] In this case the supporting rolls 28 are secured at their ends by anchorage means 36 to the supporting structure 24 of the rolls 25, 26 and 27.

[0051] These supporting rolls 28 are positioned at substantially equal distances apart and have a suitable pitch "l" depending on the processing parameters.

[0052] A typical pitch "l" found in a specific processing case and providing satisfactory results is advantageously between 50 and 100 mm.

[0053] The present applicants have found, in fact, in this specific case that a greater distance without providing a supporting surface for the yarns 11 leads to the problems of the neighbouring yarns 11 bestriding each other, as we described above.

[0054] The inclusion of temporary supporting surfaces along the whole path of the yarns 11 within the treatment tank 14 enables these problems to be avoided and ensures that the yarns leaving the tank 14 can be treated and handled with a great enough safety.

[0055] According to a first embodiment of the invention the supporting rolls 28 are idler rolls and are set in rotation by the movement of the yarns 11.

[0056] According to a variant the supporting rolls 28 are at least momentarily stationary.

[0057] According to the invention, in this latter case the supporting rolls 28 cooperate advantageously with means able to alter, advantageously periodically, the part of the surface of the rolls 28 on which the yarns 11 are supported within the treatment tank 14.

[0058] According to a variant this alteration takes place continuously.

[0059] It has been found that this alteration, whether periodical or continuous, is necessary to prevent, especially at the last straight segments of the path of the yarns 11 within the treatment tank 14, the depositing of dirt in the zone where the yarns 11 rest on the supporting rolls 28.

[0060] This dirt build-up zone is referenced with 29 in Fig.4; in fact it has been found that in the long term, if stationary supporting rolls 28 are used of which the supporting surface remains the same for a long time, this dirt arrives at a considerable value and may be carried away by the yarns 11 passing through and be fixed thereon, thus entailing problems in the downstream processes.

[0061] The embodiment of Fig.4 provides for the equipment of each supporting roll 28 with a toothed wheel 30 with which suitable tines 31 cooperate; in this particular embodiment the tines 31 have their front end shaped so as to mate with and be able to cooperate with

the teeth of the toothed wheel 30 and are associated at their rear with one single actuation bar 32.

[0062] This actuation bar 32 is associated with actuation means (not shown here) which are suitable to impart, according to desired parameters of frequency and of extent of displacement, a first straight displacement, towards the right in this case, so that the tines 31 acting on the toothed wheel 30 cause a rotation of the supporting rolls 28 in a clockwise direction 33 in this case.

[0063] The direction 33 has of necessity to be in the opposite direction to the direction 44 of feed of the yarn 11.

[0064] In this example the tines 31 consist of two parts, mainly a front part 31a and a rear part 31b respectively, which are hinged to each other and associated by means of a spring 40.

[0065] A first straight rightward displacement of the actuation bar 32 causes rotation of the supporting rolls 28 by a desired angle and at least a partial lifting of the front part 31a of the tines 31, this lifting being resisted by the spring 40.

[0066] The toothed wheels 30 are associated with a resilient abutment 39, which prevents a return movement in a direction opposite to the clockwise direction 33 during the backward travel of the tines 31.

[0067] A second straight leftward displacement brings the actuation bar 32 back to its starting position and places the front part 31a of the tines 31 against a successive tooth of the toothed wheel 30 owing to the return movement caused by the spring 40.

[0068] This periodical variation of the supporting surface restricts the likelihood of the depositing of dirt at the build-up zone 29 and enables any dirt accumulated there to fall to the ground by gravity without any need of manual cleaning and maintenance work.

[0069] According to a variant each supporting roll 28 is associated with a relative scraper 43 immovably placed in cooperation with the supporting surface and suitable to remove the dirt from that surface during the rotation of the supporting roll 28 induced by the actuation bar 32.

[0070] According to a further variant these scrapers 43 can be moved and be brought into cooperation, according to desired methods, with parts of the supporting surface of the relative supporting rolls 28 during periods in which those parts are not affected by the passage of the yarns 11.

[0071] The frequency of actuation of the actuation bar 32 and the angle of rotation imparted to the supporting rolls 28 for each cycle can be determined experimentally according to the particular individual cases.

[0072] According to the embodiment shown in Fig.5 the end of each supporting roll 28 outside the lateral wall 34 of the container 23 is associated with advantageously removable gearwheel means 35.

[0073] These gearwheel means 35 are caused to cooperate with a worm 37 driven by suitable actuation means, which are not shown in the figure.

[0074] It is also possible to use toothed belt or chain means or other actuation means of a known type.

[0075] This worm 37 can be driven step-by-step to impart periodical rotations of a desired value in each cycle to the supporting rollers 28 or can be capable of continuous movement so as to alter continuously, and possibly at a low speed, the supporting surface supporting the yarns 11.

Claims

1. Tank for the continuous treatment of yarns or threads arranged in bands in a liquid bath, the yarns or threads (11) lying on the same plane and being able to be 800 or more in number and unwinding continuously and parallel to each other from one least one beam (12), the tank (14) comprising at least one removable container (23) for the treatment liquid, a pair of upper powered transverse drawing rolls (25a, 25b) and a pair of lower drawing transverse rolls (26a, 26b), an intermediate transverse drawing, transmission roll (27) being included in the path between the two lower transverse drawing rolls (26a, 26b) the tank being characterised in that a plurality of supporting means (28) are included between one drawing roll (25a, 26a, 27, 26b, 25b) and the next drawing roll and have their axes substantially perpendicular to the axis of the band of yarns or threads (11) and cover at least the width of that band of yarns or threads (11).
2. Tank as in Claim 1, in which the supporting means (28) are distanced from each other.
3. Tank as in Claim 1 or 2, in which the supporting means (28) consist of idler rolls.
4. Tank as in Claim 1 or 2, in which the supporting means (28) consist of momentarily stationary rolls.
5. Tank as in Claim 1 or 2, in which the supporting means (28) consist of strips, brackets or analogous elements having at least their surface in contact with the yarns (11) spherical or widely rounded.
6. Tank as in Claim 4, in which the momentarily stationary supporting rolls (28) are associated with means that alter the zone of contact of the yarns or threads (11) on the rolls (28).
7. Tank as in Claim 6, in which the means that alter the zone of contact of the yarns or threads (11) are actuated periodically.
8. Tank as in Claim 6, in which the means that alter the zone of contact of the yarns or threads (11) are actuated continuously.

9. Tank as in any of Claims 6 to 8 inclusive, in which the means that alter the zone of contact of the yarns or threads (11) comprise toothed wheel means (30) and displacement time means (31).

10. Tank as in any of Claims 6 to 8 inclusive, in which the means that alter the zone of contact of the yarns or threads (11) comprise gearwheel means (35) and worm means (37).

11. Tank as in any claim hereinbefore, in which each supporting means (28) is associated with a relative scraper (43).

12. Tank as in Claim 11, in which the scrapers (43) are stationary and act on the surface of the supporting means (28) during rotation of the latter (28).

13. Tank as in Claim 11, in which the scrapers (43) are movable and are actuated in a required manner in cooperation with the surface of the supporting means (28).

14. Tank as in any claim hereinbefore, in which the supporting means (28) have at least their surface of contact with the yarns or threads (11) outwardly lined with a non-friction material.

Patentansprüche

1. Behälter zur kontinuierlichen Naßbehandlung von in Bandform angeordneten Fäden oder Garnen, die Fäden oder Garne (11) liegen in der gleichen Ebene, und es können 800 oder mehr sein und werden kontinuierlich und parallel zueinander von wenigstens einem Balken (12) abgespult, der Behälter (14) weist wenigstens einen austauschbaren Behälter (23) für die Behandlungsflüssigkeit auf, ein paar von oberen angetriebenen querlaufenden Zugrollen (25a, 25b) und ein paar von unteren querlaufenden Zugrollen (26a, 26b), eine dazwischen angeordnete querlaufende Transmissions-Zugrolle (27) sind eingeschlossen in das Bad zwischen den zwei unteren querlaufenden Zugrollen (26a, 26b), der Tank ist gekennzeichnet durch eine Vielzahl von Trägermitteln (28) zwischen einer Zugrolle (25a, 26a, 27, 26b, 25b) und der nächsten Zugrolle, und ihre Achsen verlaufen senkrecht zu den Achsen der Fäden oder Garne (11) und haben wenigstens die Breite von dem Band der Fäden oder Garne (11).
2. Behälter nach Anspruch 1, bei dem die Trägermittel (28) im Abstand zueinander angeordnet sind.
3. Behälter nach Anspruch 1 oder 2, bei dem die Trägermittel (28) Leitrollen aufweisen.

4. Behälter nach Anspruch 1 oder 2, bei dem die Trägermittel (28) vorübergehend feststehende Rollen sind.
5. Behälter nach Anspruch 1 oder 2, bei dem die Trägermittel (28) Bandeisen, Auflagen oder ähnliche Elemente aufweisen, deren Oberfläche sphärisch oder umfassend abgerundet mit den Garnen (11) in Kontakt ist.
6. Behälter nach Anspruch 4, bei dem die feststehenden Trägerrollen (28) mit Mitteln verbunden sind, die die Berührungszone der Fäden oder Garne (11) auf den Rollen (28) ändern.
7. Behälter nach Anspruch 6, bei dem die Mittel zum Ändern der Kontaktzone der Fäden oder Garne (11) periodisch betätigt werden.
8. Behälter nach Anspruch 6, bei dem die Mittel zum Ändern der Kontaktzone für die Fäden oder Garne (11) kontinuierlich betätigt werden.
9. Behälter nach einem der Ansprüche 6 bis 8, bei dem die Mittel zum Ändern der Kontaktzone für die Fäden oder Garne (11) gezahnte Radmittel (30) und zinkenförmige Mittel zum Verschieben (31) aufweisen.
10. Behälter nach einem der Ansprüche 6 bis 8, bei dem die Mittel zum Verändern der Kontaktzone für die Fäden oder Garne (11) zahnradförmige Mittel (35) und schneckenförmige Mittel (37) aufweisen.
11. Behälter nach einem der vorstehenden Ansprüche, bei dem jedes Trägermittel (28) mit einem zugehörigen Kratzer (43) versehen ist.
12. Behälter nach Anspruch 11, bei dem die Kratzer (43) stationär und mit der Oberfläche der Trägermittel (28) während deren Rotation zusammenwirken.
13. Behälter nach Anspruch 11, bei dem die Kratzer (43) beweglich sind und in der gewünschten Weise im Zusammenwirken mit der Oberfläche der Trägermittel (28) wirken.
14. Behälter nach einem der vorstehenden Ansprüche, bei dem die Trägermittel (28) wenigstens ihre Kontaktfläche mit den Fäden oder Garnen (11) außerhalb mit einem nicht reibenden Material unterlegt haben.
- Revendications**
1. Cuve pour le traitement en continu au mouillé de fils disposés en bandes, les fils (11) reposant sur le même plan et pouvant être au nombre de 800 ou plus, et se dévidant en continu et parallèlement les uns aux autres depuis au moins une ensouple (12), la cuve (14) comprenant au moins un réservoir mobile (23) pour le liquide de traitement, une paire de cylindres d'étirage transversaux supérieurs commandés par un moteur (25a, 25b) et une paire de cylindres d'étirage transversaux inférieurs (26a, 26b), un cylindre de transmission d'étirage transversal intermédiaire (27) étant disposé sur la trajectoire entre les deux cylindres d'étirage transversaux inférieurs (26a, 26b), la cuve étant caractérisée en ce qu'une pluralité de moyens formant support (28) est disposée entre un cylindre d'étirage (25a, 26a, 27, 26b, 25b) et le cylindre d'étirage suivant et leur axe est sensiblement perpendiculaire à l'axe de la bande de fils (11) et elle couvre au moins la largeur de cette bande de fils (11).
2. Cuve selon la revendication 1, dans laquelle les moyens formant support (28) sont espacés les uns des autres.
3. Cuve selon la revendication 1 ou 2, dans laquelle les moyens formant support (28) sont des cylindres mobiles.
4. Cuve selon la revendication 1 ou 2, dans laquelle les moyens formant support (28) sont des cylindres momentanément immobiles.
5. Cuve selon la revendication 1 ou 2, dans laquelle les moyens formant support (28) sont des tôles en ruban, des étriers et autres éléments analogues dont au moins la surface est en contact avec les fils (11), présentant une forme sphérique ou sensiblement arrondie.
6. Cuve selon la revendication 4, dans laquelle les cylindres de support momentanément immobiles (28) sont associés à des moyens qui modifient la zone de contact des fils (11) sur les cylindres (28).
7. Cuve selon la revendication 6, dans laquelle les moyens qui modifient la zone de contact des fils (11) sont actionnés périodiquement.
8. Cuve selon la revendication 6, dans laquelle les moyens qui modifient la zone de contact des fils (11) sont actionnés en continu.
9. Cuve selon l'une quelconque des revendications 6 à 8, dans laquelle les moyens qui modifient la zone de contact des fils (11) comprennent des moyens formant roue dentée (30) et des moyens dentés assurant le déplacement (31).
10. Cuve selon l'une quelconque des revendications 6

à 8, dans laquelle les moyens qui modifient la zone de contact des fils (11) comprennent des moyens formant engrenage (35) et des moyens formant vis sans fin (37).

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11. Cuve selon l'une quelconque des revendications précédentes, dans laquelle tous les moyens formant support (28) sont associés à un racloir relatif (43).

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12. Cuve selon la revendication 11, dans laquelle les racloirs (43) sont immobiles et agissent sur la surface des moyens formant support (28) lors de la rotation de ces derniers (28).

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13. Cuve selon la revendication 11, dans laquelle les racloirs (43) sont mobiles et peuvent être actionnés d'une manière requise en coopération avec la surface des moyens formant support (28).

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14. Cuve selon l'une quelconque des revendications précédentes, dans laquelle au moins la surface des moyens formant support (28) est en contact avec les fils (11) recouverts, sur l'extérieur, d'un matériau anti-frottement.

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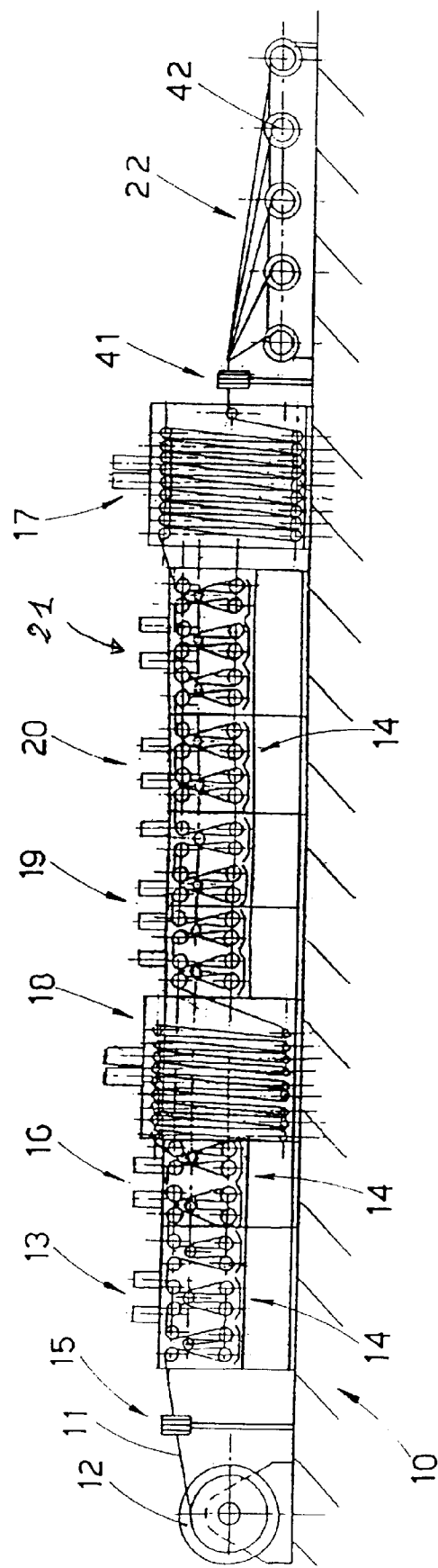


fig.1

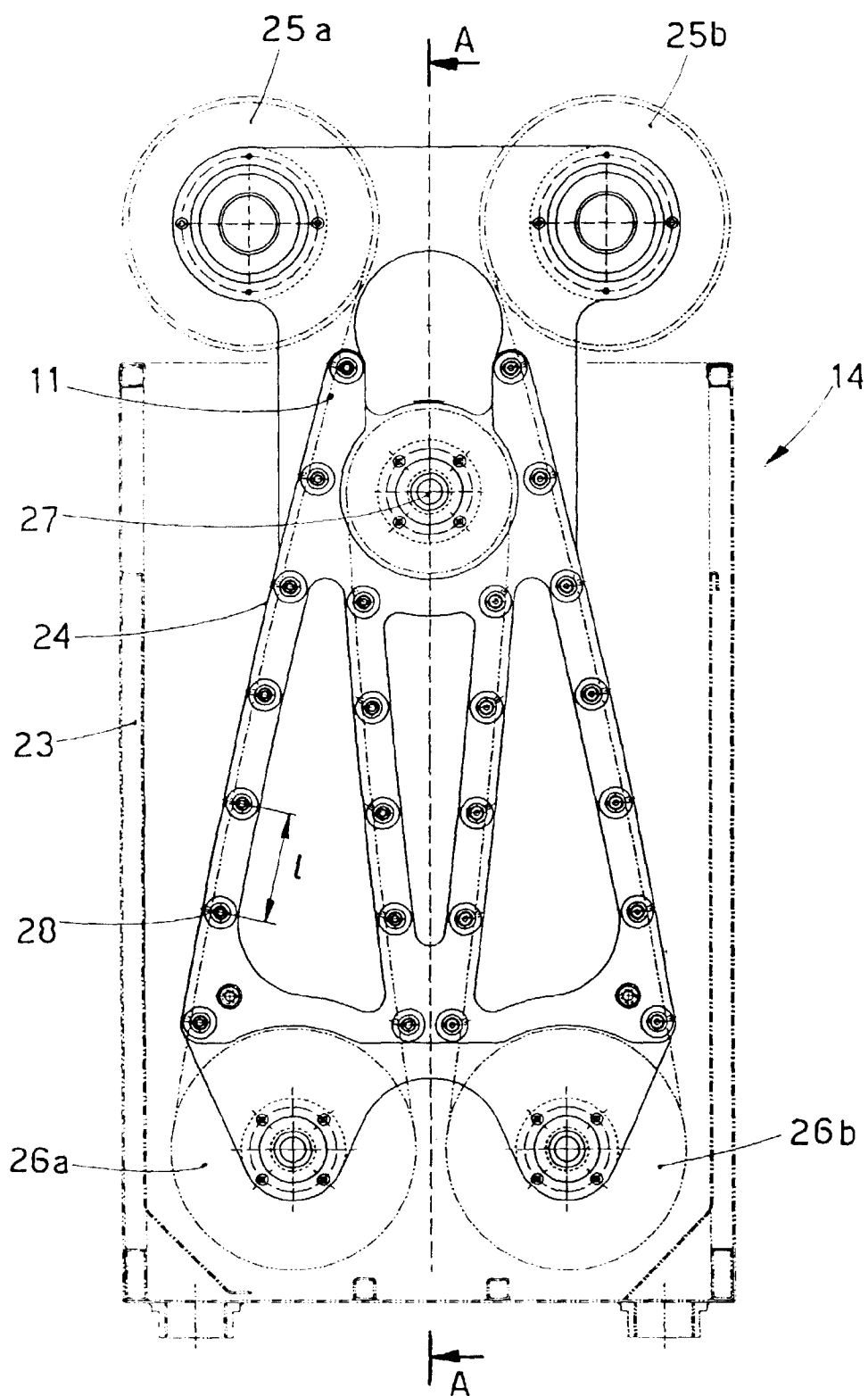


fig. 2

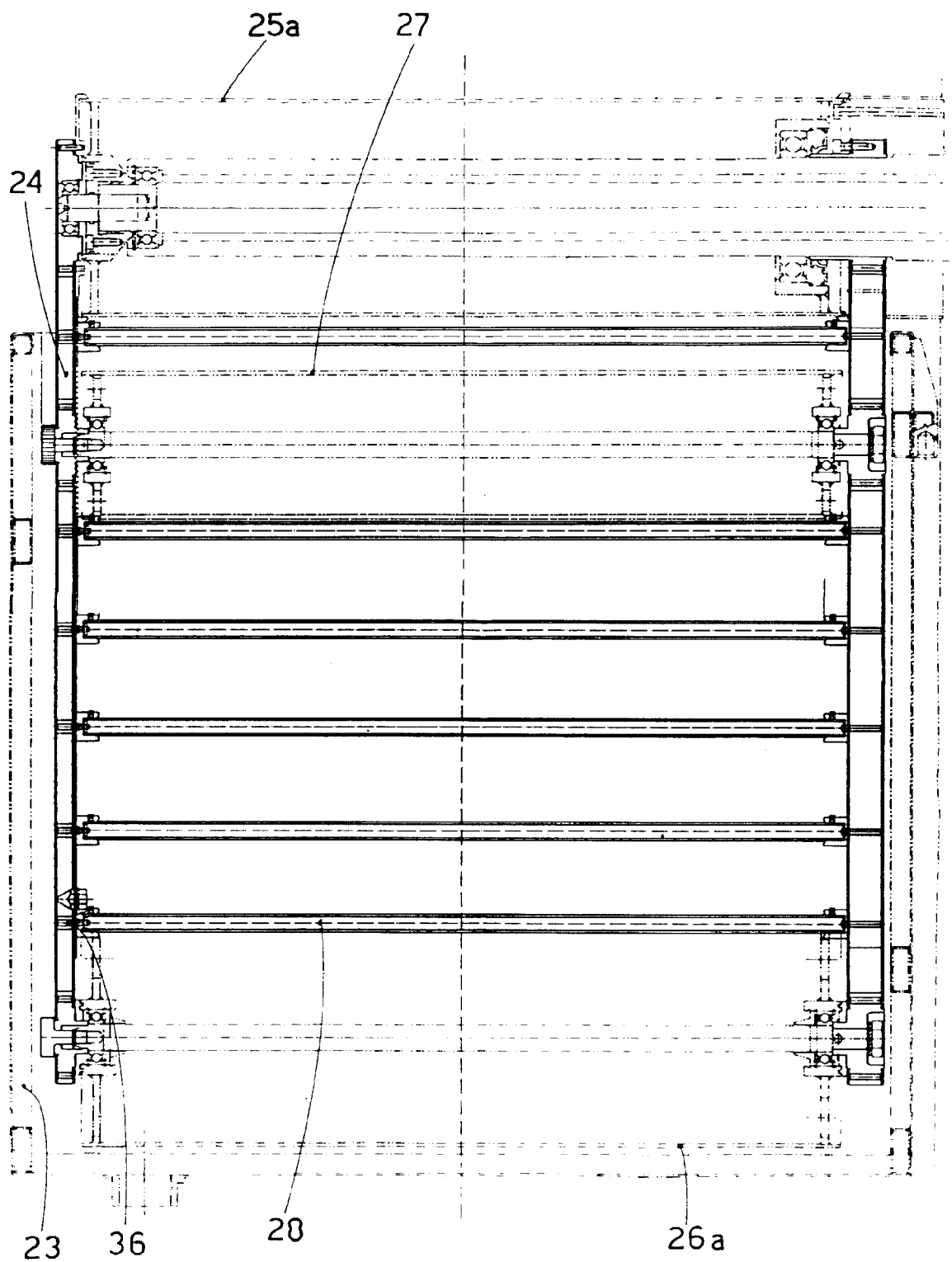


fig. 3

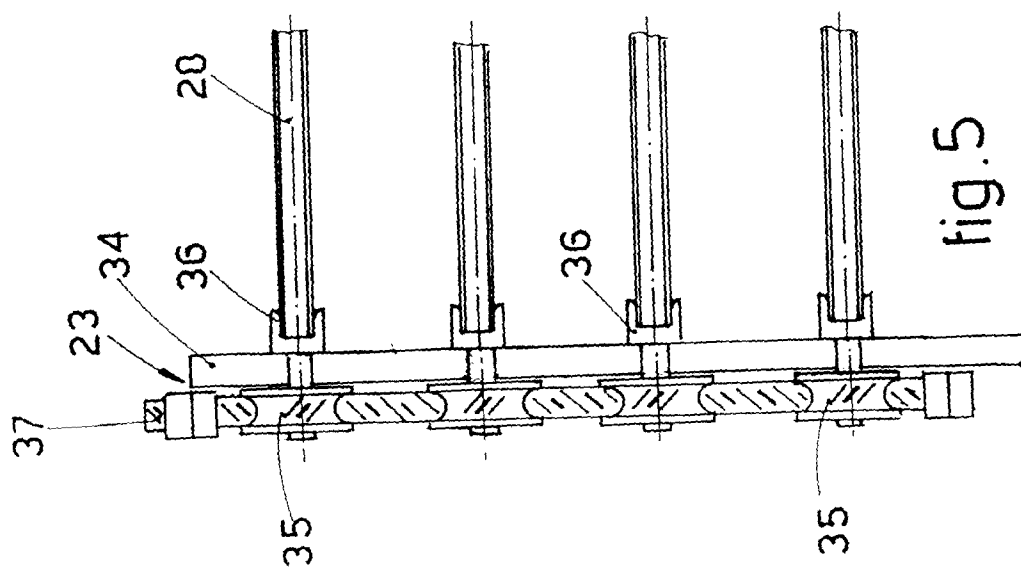


fig.5

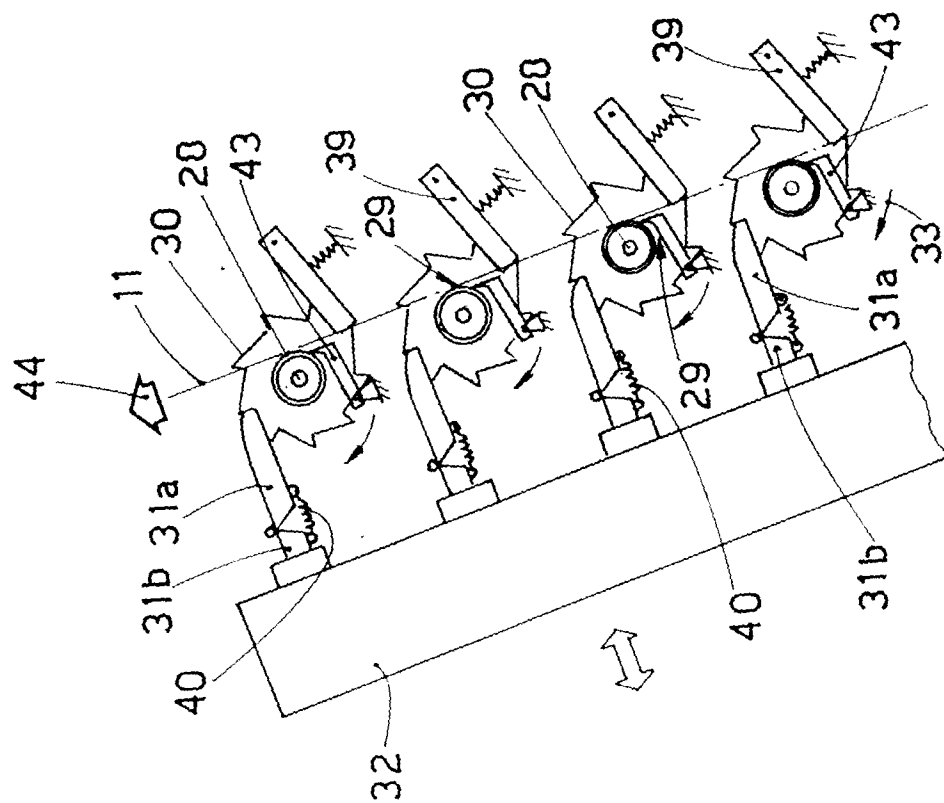


fig.4