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(54) **INDUSTRIAL PLANT FOR DRYING AND/OR CONDITIONING FLEXIBLE LAMINAR SURFACES**

INDUSTRIEANLAGE ZUM TROCKNEN UND/ODER KONDITIONIEREN FLEXIBLER LAMINARER OBERFLÄCHEN

INSTALLATION INDUSTRIELLE POUR SÉCHER ET/OU CONDITIONNER DES SURFACES LAMINAIRES SOUPLES

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Description

[0001] The present invention relates to an industrial plant for drying and/or conditioning flexible laminar surfaces, such as the animals skins (or leathers) treated in the tanning industry, typically although not exclusively wet leathers just undergone working of re-tanning, dyeing and greasing for example in a machine known in the field as drum or the leathers still partially soaked with moisture that must stabilized by an operation known in the jargon of the field as conditioning.

[0002] As known, drying or desiccation of flexible laminar surfaces, such as leathers of the tanning industry, is a very important processing which typically occurs in the central step of the entire tannery production process, wherein leathers are already taken the connotation of semi-finished products, with the object to dry them from the excess of water accumulated in the preceding working steps.

[0003] When they have to undergo the working of drying or desiccation, leathers, indeed, have been already subjected to at least chemical and mechanical workings such as soakage, liming, fleshing, split, de-liming, degreasing, tanning, re-tanning, shaving, dyeing and greasing, in their appropriate and consolidated operating sequence, and are presented as wet semi-finished products (of so-called "wet-blue" or "blue-white" type, depending on the type of tanning chosen).

[0004] At the current state of the art, working of drying is carried out with various plant solutions, depending on the type of leathers and the final destination of the finished product: in this regard drying by suspension or hanging, drying by nailing, drying by "pasting", vacuum drying using steel plates on which the leathers have been previously stuck, are herein cited, for example. Some illustrative examples of these drying plant solutions are generically known from prior art patent documents published as US2,152,312 A, EP1310572 A1 and GB2,335,438 A.

[0005] On the other hand, the conditioning is an operation by which a flexible laminar surface, such as the animal leather, is kept in an environment at standard temperature (T) and relative humidity (RH) (for example T = 20°C and RH = 65%) so that equilibrium conditions with the environment are reached and desired physical tests can thus be performed.

[0006] In general term and in the essential traits, a typical industrial plant for drying and/or conditioning flexible laminar surfaces of the prior art comprise an operating tunnel which mainly develops along a linear direction Z and is provided with air conditioning devices, such as, for example fans of axial type and/or traction organs, such as for example hydraulic organs installed in the operating tunnel), suitable to act on the flexible laminar surfaces so as to dry them and/or spread them according to predetermined cycles treatment and/or tensioning.

[0007] Furthermore, an industrial drying and/or conditioning plant of known type includes a plurality of support frames, each of which appropriately receives a pair of flexible laminar surfaces so as to keep them stretched vertically, as well as moving means, operatively connected with the support frames in order to convey them along the aforesaid linear direction according to a predetermined speed inside the operating tunnel, to allow drying and/or tensioning of the flexible laminar surfaces, and outside the operating tunnel to allow discharging of these flexible laminar surfaces dried and/or tensioned in a working cycle and loading of other flexible laminar surfaces to be dried and/or tensioned in the next working cycle.

[0008] The leathers, coupled by nailing with the respective support frame, enter one by one inside the operating tunnel of the industrial plant and their drying (or their conditioning) is obtained by properly varying and modulating, depending on the selected settings, the internal temperature and humidity conditions along the longitudinal extension of the operating tunnel.

[0009] Although being currently available on the market in many, even technically advanced, types of construction, the known industrial plants drying (or desiccating) and/or conditioning of flexible laminar surfaces - such as animal leathers of the tanning industry - have some recognized and self-evident drawbacks.

[0010] In particular, the main drawback derives from the fact that the industrial drying and/or conditioning plants of the prior art do not guarantee, in relation to the temperature and/or humidity conditions, a uniform, homogeneous, constant in time or otherwise established by setting curves or diagrams treatment for all the flexible laminar surfaces that make up every single lot (or batch) and which are substantially identical each other in type, thickness, colour, degree of humidity, intended use and other parameters traditionally considered in a laminar surface as an animal leather.

[0011] Indeed, hygrometric and thermal conditions hardly remain constant during a given treatment cycle of drying, for example owing to transitory periods due to the temporary stop of the plant for the lunch or weekend break or even for faults which cannot be solved at once.

[0012] In these transitory periods, as well as during inertial periods of turning off and on of the industrial drying plant, some flexible laminar surfaces, which it is confirmed enter one by one the operating tunnel, inevitably remain still inside the latter, thus subject to temperature and humidity conditions that are profoundly different from those designed and deemed optimal for the entire batch.

[0013] This undeniably affects the uniformity of treatment of a given batch of flexible laminar surfaces equal each other, with the consequent reduction in the efficiency of the industrial drying plant which creates always undesirable productive inefficiency.

[0014] It should be added the fact that the flexible laminar surfaces, such as preferably the animal leathers, of a certain batch are never equal to those ones of another batch, so that it is necessary to provide not only thermal and hygrometric conditions different from batch to batch

inside the operating tunnel, but also run speed and, in return, stay times of the flexible laminar surfaces inside the operating tunnel different from batch to batch.

[0015] However, in the known industrial drying plant it has been found that leathers of a new batch to be treated entering the operating tunnel for drying are subject to the same and unfortunately not fully appropriate humidity and thermal conditions of the last leathers of the previous different batch almost completely treated, as well as to the same inappropriate run speed set for the previous batch, unless a different run speed is set for the incoming batch of leathers to be treated, as it usually happens: the latter case, however, clearly goes to the detriment of the leathers of the previous batch which still remain present inside the operating tunnel.

[0016] Consider, for example, a classic case in which the industrial drying and/or conditioning plant is treating, in a certain operating cycle, 40 leathers at a run speed of the operating tunnel equal to 60 leathers per hour, while the batch to be treated in the next phase is made up of 80 leathers whose correct run speed of the operating tunnel is established to be equal to 40 leathers per hour: it is evident that the latest leathers of the first batch concerned, which are still inside the operating tunnel when the first leathers of the second batch come inside, undergo a treatment in improper conditions and in any case different from those ones of the leathers that have been already treated, and it is unavoidable that for them the result of the working of drying and/or conditioning deviates from that one expected and desired, achieved instead by the leathers already conveyed outside the operating tunnel.

[0017] The necessity that cannot be disregarded for a company of treating in the same industrial drying plant different batches of flexible laminar surfaces, such as leathers, amplifies the problem suffered in the prior art about uniformity of treatment of flexible laminar surfaces by these plants, contributing to the creation of production inefficiencies.

[0018] A last but not least drawback of the industrial plants for drying flexible laminar surfaces of the prior art is represented by the fact that the thermal and hygrometric subdivision of the operating tunnel in various and consecutive inner drying chambers, found in some known executive solutions, is merely theoretical and the conditions of treatment in a given chamber inevitably and also only restrictively affect the conditions of the adjacent chamber, since the various inner chambers directly communicate each other: event such an aspect contributes to the lack of homogeneity of treatment of the leathers in the known drying plants.

[0019] Starting, therefore, from the knowledge of the abovementioned drawbacks of the current state of the art, the present invention intends to fully remedy them.

[0020] In particular, main purpose of the present invention is to provide an industrial plant for drying and/or conditioning flexible laminar surfaces, such as animal leathers, which allows to obtain a treatment of the flexible laminar surfaces themselves more homogeneous and uniform compared to that one ensured by equivalent plants of known type.

[0021] Within this purpose, it is a first task of the present invention to devise an industrial plant for drying and/or conditioning flexible laminar surfaces which presents a performance better than that one of the industrial drying plants of the prior art.

[0022] It is another task of the invention to give substance to an industrial plant for drying and/or conditioning that, in general, allows to obtain flexible laminar surfaces qualitatively better than those ones treated with known industrial drying plants.

[0023] Ii is a further purpose of the invention to provide an industrial plant for drying and/or conditioning flexible laminar surfaces which can be installed in any, also yet existing, factory and that, in this respect, for its constructive dimensions, does not require specific or substantial construction investments.

[0024] It is a last but not least purpose of the invention to provide a technologically advanced, versatile and reliable industrial plant for drying flexible laminar surfaces.

[0025] The aforesaid purposes are achieved by means of an industrial plant for drying and/or conditioning flexible laminar surfaces according to the attached claim 1, as hereinafter referred for the sake of exhibition brevity.

[0026] Further technical features of detail of the industrial drying and/or conditioning plant of the invention are set forth in the corresponding dependent claims.

[0027] The above claims, in the following specifically and concretely defined, must be intended as integral part of the present description.

[0028] Advantageously, the industrial plant for drying and/or conditioning of the invention determines a treatment of the flexible laminar surfaces, such as animal leathers, more uniform and homogeneous than similar plants of the prior art.

[0029] This is because, in the industrial plant for drying and/or conditioning of the invention, the support frames that hold the flexible laminar surfaces are transferred in pre-established blocks (or groups) inside the operating tunnel, after being accumulated in the programmed number at the buffer loading station (buffer) placed upstream the operating tunnel.

[0030] This constructive arrangement ensures a complete uniformity of treatment at least to the flexible laminar surfaces retained by the support frames of each pre-established group introduced into the operating tunnel, without this negatively affecting the number of flexible laminar surfaces processed per time unit inside the operating tunnel.

[0031] Achieving a greater uniformity of treatment of flexible laminar surfaces inside the operating tunnel with respect to the known art, together with the high number of flexible laminar surfaces which can be processed per time unit, make the industrial plant for drying and/or conditioning of the present invention more efficient than equivalent plants of the current state of the art.

[0032] Still advantageously, the industrial plant for drying and/or conditioning of the present invention is somewhat advanced from a technological point of view, versatile, being able to treat with the aforesaid effectiveness any type of flexible laminar surfaces and, therefore, extremely reliable in terms of the final result to be achieved.

[0033] Equally advantageously, the industrial plant for drying and/or conditioning object of the invention can be installed in any, also already existing, factory without requiring special or expensive constructive investments.

[0034] According to a preferred embodiment of the industrial plant for drying and/or conditioning of the present invention, in an advantageous manner the operating tunnel is divided into a plurality of consecutive drying chambers, physically distinct and operatively independent each other, separated each other by dividing means in such a way as to still make the drying chambers communicating and allow the passage of the support frames: each of the aforesaid drying chambers receives in bulk the pre-established group of support frames initially present in the buffer loading station and is provided of own and dedicated air conditioning devices and/or traction organs suitable to be adjusted independently for each of the drying chambers in such a way as to ensure a more effective control of the tension of the flexible laminar surfaces during the drying phase into the operating tunnel.

[0035] This constructive expedient extremely increases the uniformity and homogeneity of the treatment of drying offered by industrial drying plant of the invention.

[0036] Said purposes and advantages, as well as other ones that will emerge during the elaborate, will appear more evident from the description that follows, relating to a preferred embodiment of the industrial plant for drying and/or conditioning of the invention, given by indicative and illustrative, but not limitative, way with the help of the attached drawing tables, in which:

- figure 1 is a simplified assonometric view of the industrial plant for drying and/or conditioning flexible laminar surfaces of the invention;
- figures 2-6 are simplified and partial assonometric views of the plant of figure 1 in as many different and distinct operating steps;
- figure 7, in its various compositional figures 7a-7e, is a schematic and simplified view of the operation system of the plant of the invention;
- figure 8 is an assonometric view of the construction components belonging to the moving means of the support frames of the plant of figures 2-6;
- figure 8a is a first enlarged detail of figure 8;
- figure 8b is a second enlarged detail of figure 8;
- figure 8c is a third enlarged detail of figure 8;
- figure 9 is a partial, truncated and simplified side view of figure 8;
- figure 10 is the view of figure 9 in a different operating condition;
- figure 11 is a partial and truncated view of the plant of figures 2-6 according to a first longitudinal section plane, made at the moving means of the support frames and at the head portion of the thrust means interfering with the support frames to determine their advancement along the base framework;
- figure 12 is a partial and truncated front view of the plant of figures 2-6 according to a second longitudinal section plane, parallel to the first section plane of figure 11 and made at the tail portion of the thrust means interfering with the support frames to determine their advancement along the base framework.

[0037] The industrial plant for drying and/or conditioning flexible laminar surfaces, such as skins or leathers of the tanning industry, is shown in figure 1 where it is globally numbered with 1. As it can be seen, the industrial plant for drying and/or conditioning 1 comprises:

- an operating tunnel, as a whole indicated with 2, which mainly develops according to a linear direction Z and is provided with air conditioning devices 3, such as for example axial fans 26 and/or traction organs (not visible, and for example consisting of hydraulic organs mounted in the operating tunnel 2) suitable to act on the flexible laminar surfaces so as to dry them and/or spread them according to predetermined treatment and/or tensioning cycles;
- a plurality of support frames 4, each of which suitable to receive a pair of flexible laminar surfaces, not represented for the sake of simplicity, so as to keep them in a spread and vertical position;
- moving means, as a whole numbered with 5, operatively connected with the support frame 4 for conveying them along the linear direction Z according to a predefined speed within the operating tunnel 2, to allow drying and/or tensioning of the flexible laminar surfaces, and outside the operating tunnel 2 to allow discharging of the flexible laminar surfaces dried and/or tensioned in a working cycle and loading of the flexible laminar surfaces to be dried and/or tensioned in the next processing cycle.

[0038] In accordance with the invention, the industrial plant 1 comprises a buffer loading (or accumulation) station 6, arranged upstream the operating tunnel 2 with which it communicates, suitable to integrally receive a pre-established group 7 of support frames 4 before the pre-established group 7 itself of the support frames 4 is transferred in bulk within the operating tunnel 2 by the moving means 5, in such a way that the support frame 4 of the pre-established group 7 simultaneously reach the inside of the operating tunnel 2 and the flexible laminar surfaces supported by the support frames 4 of the pre-established group 7 are simultaneously subjected to the processing and treatment of the air conditioning devices 3 and/or the traction organs associated with the operating tunnel 2.

[0039] In more detailed way, the buffer loading station

6 faces the operating tunnel 2 and is defined in the initial portion 8 of a base framework, marked as a whole with 9, contributing to define the operating tunnel 2 and supporting the support frames 4 so as to keep them suspended at a given distance (usually in the order of about ten centimeters) from a reference surface S (such as a flooring of an industrial plant) on which the base framework 9 rests.

[0040] Figure 1 also shows that, according to the custom of the sector, also the industrial plant for drying and/or conditioning 1 of the invention includes a work station, as a whole indicated with 27, arranged frontally to the operating tunnel 2 and accessible to the operator for loading the leathers to be conveyed to the operating tunnel 2 itself for drying and for discharging the dried leathers coming from the operating tunnel 2.

[0041] The support frames 4 retaining the leathers to be dried (or conditioned) are moved one at a time from the work station 27 to the buffer loading station 6, as well as from the operating tunnel 2 to the work station 27, through actuation means, not shown for the simplicity sake, that move every support frame 4 along a guide rail 28 coupled with the base framework 9 and having a substantially C-shaped profile departing from the buffer loading station 6 to terminate at an unloading station 29 located downstream the operating tunnel 2.

[0042] In this case, the support frames 4 move suspended inside the operating tunnel 2 and, more generally, along the entire industrial plant 1, present a metallic structure of reticular type with perimetrical reinforcement frame and, typically although not necessarily, retain by nailing two flexible laminar surfaces, one coupled with each of the opposite faces of each support frame 4.

[0043] It should be noted in figures 1 and 2 that the support frames 4 are arranged according to a vertical plane which is orthogonal to the linear direction Z when from the buffer loading station 6 the support frames 4 advance to enter the operating tunnel 2, while the aforesaid support frames 4 are arranged according to a vertical plane which is parallel to the linear direction Z when the support frames 4 are placed in said work station 27 to be handled by the operator for the separation/application of the leathers.

[0044] Preferably but not necessarily, the operating tunnel 2 is divided into a plurality of successive drying chambers 30, physically distinct and operatively independent each other as separated each other by dividing means, such as a transverse passageway 31 and possibly bulkheads (not visible) flexible or hidden-movable in order to still make the drying chambers 30 communicating and allow, therefore, the passage of the support frames 4, as well it is derived from figures 1-6.

[0045] By means of a central processing and control unit, the operator is thus able to adjust the functioning of the various consecutive drying chambers 30 independently one from another and without that the hygrometric, thermal and mechanical conditions of one affect the hygrometric, thermal and mechanical conditions of the other one directly adjacent.

[0046] Each of these drying chambers 30 receives in bulk the pre-established group 7 of the support frame 4 initially present in the buffer loading station 6 and is provided with autonomous air conditioning devices 3 and/or traction organs suitable to be independently adjusted for each of the drying chambers 30 in such a way to ensure a more effective control of the tension of the flexible laminar surfaces during the drying phase into the operating tunnel 2.

[0047] Purely by way of indication, the support frame 4 of the pre-established group 7 which from time to time are received into the buffer station 6 and, in this case, into the various drying chambers 30 of the operating tunnel 2 where they are moved in bulk by the moving means 5, are in number of twenty: therefore, since generally each of the support frames 4 of the type described herein firmly receives two leathers, the maximum number of leathers themselves which in turn is moved between the buffer loading station 6 and the operating tunnel 2 (and, inside the operating tunnel 2, among the various drying chamber 30) is forty.

[0048] Ii is in any case understood that in other embodiments, not shown, of the industrial plant for drying of the invention the maximum number of support frames that from time to time is received into the buffer loading station and moved by the moving means from the latter to the various drying chambers of the operating tunnel could be different from that one described above, this number varying depending on the use requirements and/or design choices up to reach, for example, in the largest drying plants even fifty units.

[0049] The moving means 5 impart to the support frames 4 of the pre-established group 7 a first longitudinal stroke suitable to allow their complete introduction into the tunnel operation 2: such a first longitudinal stroke, generally, presents a value not exceeding 4.5 meters. According to the preferred embodiment described herein of the invention, the moving means 5 comprise:

- movable translation means, overall indicated with 10, coupled with the base framework 9 through support members, as a whole numbered with 11;
- motorization means, overall numbered with 12 and comprising for example a motor gear, arranged at the initial portion 8 of the base framework 9 and facing the buffer loading station 6, coupled through transmission means, generally indicated with 13, with the movable translation means 10 in order to make them sliding along the linear direction Z according to a first way (which in this case is directed from left to right, looking at the plane of the sheet of figures 1-6), causing advancing of the support frames 4 inside the operating tunnel 2;
- thrust means, generally indicated with 14, coupled with the movable translation means 10 and cooperating directly with the support frame 4 in order to determine their advancement along the linear direc-

tion Z as a result of the actuation of the motorization means 12.

[0050] In the present case, the motorization means 12 act on the movable translation means 10 in such a way as to make them sliding along aforesaid linear direction Z even according to a second way, opposite to the first way, causing retraction of the movable translation means 10 when the drying cycle of the pre-established group 7 of the support frames 4 is terminated and such pre-established group 7 of the support frames 4 is conveyed to an unloading station 29 located downstream and outside the operating tunnel 2.

[0051] Thus, retraction of the movable translation means 10 makes them available for advancing, along the first way of the linear direction Z, a following pre-established group 7 of support frames 4 meanwhile introduced and accumulated into the buffer loading station 6.

[0052] As far as the mobile translation means 10 are concerned, figure 8 shows that, in a preferred though not exclusive manner, they include:

- two upper longitudinal bars 15 parallel and spaced apart each other, each of which supports the transmission means 13, extends for a length equal at least to the sum of the length of the operating tunnel 2 and the length of the buffer loading station 6 and is made movable by the motorization means 12 for the aforementioned first longitudinal stroke along the first way of the linear direction Z, and for a second longitudinal stroke along the opposite second way of the linear direction Z;
- as many two lower longitudinal bars 16 parallel and spaced apart each other, fixed to the base framework 9, each of which having a length slightly greater than the length of the respective upper longitudinal bar 15 with respect to which is positioned below and with which is firmly coupled.

[0053] In particular, as it can be well observed in the detail of figure 8a, the upper longitudinal bar 15 is coupled with the lower longitudinal bar 16 through a mechanical restraining element 32 disposed above the lower longitudinal bar 16 and at the front end 15a, facing said buffer loading station 6, of the upper longitudinal bar 15.

[0054] The mechanical restraining element 32 is constrained to the lower longitudinal bar 16 by a pair of support brackets 33 arranged close to the side wall 16a, 16b opposite each other of the lower longitudinal bar 16.

[0055] In relation to the transmission means 13, again figure 8 shows that preferably, but not necessarily, they comprise:

- a pair of rotating force pinions 17 keyed on opposite sides to an intermediate shaft 18 which in this case synchronizes them: this intermediate shaft 18 defines a rotation axis X, orthogonal to the linear direction Z, and is coupled with the motorization means 12 that rotate it in a first rotation way, for example clockwise, in order to move the movable translation 10 means - in particular, the upper longitudinal bar 15 and the lower longitudinal bar 16 - in the first way causing advancing of the support frames 4 along the linear direction Z;
- a pair of fixed reference racks 19, on which the respective rotating pinions 17 engages and which are positioned on the upper wall 15b and at the front end 15a of the corresponding upper longitudinal bars 15, said front end 15a facing or being at least partly contained into the buffer loading station 6 when the support frames 4 advance along the linear direction Z.

[0056] It is understood that in further alternative solutions of the industrial plant for drying and/or conditioning of the invention, here not accompanied by drawings of reference, the movable translation means, suitably designed and dimensioned, could include only an upper longitudinal bar and only a lower longitudinal bar; in turn, the transmission means, if comprising components of the same type described above, could in such a case include only a rotating force pinion and only a fixed reference rack.

[0057] Always in figure 8 and, more clearly, in the details of figures 8a-8c relating to it is observed that the thrust means 14 yet introduced include preferably a first thrust bolt 20, projecting downwardly from a first joint block 21 side-by-side to each of the lower longitudinal bars 16 along the linear direction Z, and a second abutment bolt 22, projecting downwardly from a second joint block 23 side-by-side to each of the upper longitudinal bars 15 along the linear direction Z so that the right side edge of the second joint block 23 is always separated from the left side edge of the first joint block 21 for a prefixed distance having a value substantially equal to half the length of each of the upper longitudinal bars 15.

[0058] Therefore, the prefixed distance that separates each other the first joint block 21 and the second joint block 23 remains always substantially the same, either when the longitudinal bars 15, 16 advance along the linear direction Z to cause advancing of the support frames 4 of a given pre-established group 7 hooked to them or when the longitudinal bars 15, 16 move back along the linear direction Z until the buffer loading station 6 for picking up a next pre-established group 7 of support frames 4.

[0059] More in detail, assuming an imaginary Cartesian reference axis whose point of origin is located at the buffer loading station 6, the first joint block 21 which supports the first thrust bolt 20 is disposed at the final end 16c of the lower longitudinal bar 16 while the second joint block 23 which supports the second abutment bolt 22 is disposed at the front end 15a of the upper longitudinal bar 15, interposing itself between the mechanical restraining element 32 and the upper longitudinal bar 15.

[0060] In addition, the details of figures 8a-8c emphasize that, constructively, the upper face of the first joint

block 21 and the upper face of the second joint block 23 lie on horizontal planes parallel and staggered each other.

[0061] As clearly illustrated in figures 9 and 10, the first thrust bolt 20 is fixed and coupled with the first joint block 21 through fixing means, as a whole indicated with 24, while the second abutment bolt 22 is rotatable and coupled with the second joint block 23 through a transverse pin 25 defining an auxiliary rotation X' axis around which the second abutment bolt 23 rotates (for example according to the way indicated by the arrow F_1) in order to almost totally re-enter into the lower longitudinal bar 16 when the motorization means 12, by reversing their motion after the completion of the insertion of the support frames 4 of the pre-established group 7 into the operating tunnel 2, rotate the intermediate synchronization shaft 18 and, with it, the rotating force pinions 17 in a second rotation way (opposite to the first rotation way and then counterclockwise) causing retraction of the movable translation means 10 - mainly, the upper longitudinal bar 15 and the lower longitudinal bar 16 - along the second way (indicated by the arrow F_3) of the linear direction Z.

[0062] In a suitable although not binding way, the thrust means 14 also include a strike element 34 which contrasts externally against the first thrust bolt 20 at the upper end 20a of the latter coupled with the first joint block 21 in order to prevent rotation of the first thrust bolt 20 when the motorization means 12 rotate the intermediate synchronization shaft 18 and the rotating force pinions 17 in the first rotation way, causing advancing of the pre-established group 7 of support frames 4 along the first way (indicated by the arrow F_2 in figure 10) of the aforesaid linear direction Z.

[0063] In figures 9 and 10 it is, also, highlighted that, in an advantageous but not binding way, the second swivel abutment bolt 22 presents a transverse through slot 46, having a rounded stretched profile and in which a traction pin 47 is inserted, having a circular profile and which occupies only a part of the transverse through slot 46 inside of which it slides during rotation of the second abutment bolt 22 around the auxiliary rotation axis X' both clockwise and counterclockwise.

[0064] Advantageously, both the first thrust bolt 20 as the second abutment bolt 22 present in side view a profile substantially in the shape of an isosceles trapezoid such that the oblique side 36 belongs to the protruding portion of these first and second bolts 20 and 22 and:

- the first thrust bolt 20 contrasts with its own side wall 35a of the larger base 35 of the isosceles trapezoid against the upper part of the head support frame 41 of the pre-established group 7 during the advancement of the support frames 4 along the linear direction Z, so as to properly perform the thrust action;
- the second abutment bolt 22 contrasts with its own side wall 35a of the larger base 35 of the isosceles trapezoid against the upper part of the tail support frame 42 of the pre-established group 7 during the advancement of the support frames 4 along the linear direction Z in order to serve as a simple abutment.

[0065] More specifically, the oblique side 36 of the profile of the first thrust bolt 20 is directed towards the oblique side 36 of the profile of the second abutment bolt 22, in such a way that the hypothetical extensions of these oblique sides 36 meet each other above the upper longitudinal bar 15, as it is derived from figure 9.

[0066] Therefore, through the series of constructive expedients described above for the first thrust bolt 20 and the second abutment bolt 22, during the phase of advancement of the support frames 4 of the pre-established group 7 towards the operating tunnel 2 and inside this (along the way indicated by the arrow F_2 in figure 10), the first bolt 20 and second bolt 22 suitably interfere with their side wall 35a at greater surface extension against the head support frame 41 and the tail support frame 42 respectively, allowing to achieve an effective thrust action of the entire pre-established group 7 of support frames 4.

[0067] During retraction phase of the movable translation means 10 according to the way indicated by the arrow F_3 in figure 10, instead, the second thrust bolt 22 re-enters almost totally in the second longitudinal bar 16 and the first thrust bolt 20 still projects from the lower longitudinal bar 16, interfering against the support frames 4 of the following pre-established group 7 which it meets in its path by means of the side wall 36a of its own oblique side 36 which, for orientation, favours releasing or overcoming of the first thrust bolt 20 from the support frames 4, avoiding damages to even movable components which come into mutual contact.

[0068] Subsequent figures 11 and 12 illustrate in detail not only the composition of the support members 11, of the type per se known to the man skilled in the art, with which the movable translation means 10 are coupled with the base framework 9, but also that the support frames 4 are coupled with the base framework 9 through sliding means, on the whole indicated with 37 and arranged beneath the moving means 5.

[0069] In preferred but not exclusive way, the sliding means 37 comprise:

- a pair of rollers 38 fixed to the free end 39a of the hooking rod 39 which protrudes from each of the opposite upper ends of each of the support frames 4 and defines a vertical axis Y with respect to which the rollers 38 are symmetrically opposite;
- a pair of auxiliary longitudinal bars 40, coupled with the base framework 9, each of which receives one of the rollers 38 to allow their rolling along the linear direction Z, in a rotation way (clockwise for example) associated with the first way with which the support frames 4 advance along such linear direction Z.

[0070] Preferably but not exclusively, the hooking rod

39 includes at the free end 39a a protective cap 43 made of high smoothness plastic material, against which interferes the first thrust bolt 20 and second abutment bolt 22 during the thrust action of the support frames 4 and only the first thrust bolt 20 during the retraction action of the movable translation means 10.

[0071] In the embodiment described, at purely preferred title, the upper longitudinal bar 15 and lower longitudinal bar 16 of the movable translation means 10 have a modular structure so as to vary the operating tunnel 2 length depending on operative needs and available space. Particularly, the upper longitudinal bar 15 is formed by a series of upper modular bars 44 adjacent each other along the linear direction Z and connected one to another through the second joint block 22, the first upper modular bars 44 facing the buffer loading station 6, supporting the fixed reference rack 19 of the transmission means 13 and being coupled with the lower longitudinal bar 16 through the mechanical restraining element 33 yet defined.

[0072] As the upper longitudinal bar 15, also the lower longitudinal bar 16 is formed of a plurality of as many lower modular bars 45 adjacent to one another along the linear direction Z and connected each other through the first joint block 20, the first one and the last one of these lower modular bars 45 being fixed to the base framework 9.

[0073] More in detail, the upper modular bars 44 are mechanically coupled with the lower modular bars 45 through mechanical stops, not visible in the attached figures, arranged at the first joint block 21 and the second joint block 23.

[0074] Operatively, the industrial plant for drying and/or conditioning 1 provides for the movement of the support frames 4, and flexible laminar surfaces firmly and temporarily coupled with each of them, according to the schematization illustrated in figures 1-6 which clearly show the peculiar and principal innovative technical concept of the current invention.

[0075] In particular, the operation of the industrial plant for drying and/or conditioning plant 1 of the invention is described hereinafter, with the help of figures 1-7, in relation to an operating tunnel 2 which, solely by way of example, is composed of three drying chambers 30 and in which the hypothesized starting situation provides that the buffer loading station 6 is empty and each of these drying chambers 30 is full of a pre-established group 7 of support frames 4 so that the flexible laminar surfaces associated with a pre-established group 7 are simultaneously subjected, in a given drying chamber 30, to a specific treatment phase by the respective air conditioning devices 3 and/or traction organs, according to temperature/time and humidity/time diagrams set for such a drying chamber 30 and which are distinct from those ones of the adjacent drying chambers 30.

[0076] The various support frames 4 of the new pre-established group 7 to be formed, each of which bearing in this case two flexible laminar surfaces, are transferred one by one from the work station 27 to the buffer loading station 6, where they remain until the pre-established group 7 (normally composed of 20 ÷ 50 units for a total, therefore, of a minimum of twenty to a maximum of one hundred flexible laminar surfaces) has been definitively completed (see in this respect figures 1-5).

[0077] At that point, the moving means 5 move forward in bulk the just formed pre-established group 7 of support frames 4 along the first way (arrow F_2 in figure 10) of the linear direction Z, introducing the pre-established group 7, that one that in figure 5 is located in the buffer loading station 6, inside the operating tunnel 2 and, more precisely, inside the first drying chamber 30, after having completed the first longitudinal stroke cited above (for example equal to 4 meters).

[0078] In doing so, the automatic and simultaneous translation of the other three pre-established groups 7 of support frames 4 is obtained, the last one of which in this case escapes from the operating tunnel 2 to be conveyed to an unloading station 29 from where the support frames element 4, by sliding along the guide rail 28, are transferred one by one to the work station 27 in which the operator withdraws or remove the dried flexible laminar surfaces (such as animal leathers) from the respective support frames 4.

[0079] In turn, the pre-established group 7 of support frames 4 present in the first drying chamber 30 of figure 5 and the second pre-established group 7 of support frames 4 present in the second drying chamber 30 of figure 5 translate forward in bulk along the linear direction Z for a respective drying chamber 4, in such a way that the schematic operative situation of figure 6 is defined.

[0080] The processing cycle of the further flexible laminar surfaces to be dried in the industrial plant for drying and/or conditioning 1 of the current invention proceeds similarly to what has just been pointed out, again using the specific provision of introducing from time to time in the operating tunnel 2 pre-established groups 7 of support frames 4 and not continuously single support frames, as it traditionally occurs in similar industrial plants of known type.

[0081] Figure 7 shows, in the simplified schematization operated by the relative figures 7a-7e that composed it, illustrates with more detail the operation system of the moving means 5 during the transfer phases of the various pre-established groups 7 of support frames 4 towards the operating tunnel 2, as just explained above by means of the figures 1-6.

[0082] In particular, the scheme of figure 7 shows an exemplified situation in which each pre-established group 7 is made up of just five support frames 4.

[0083] Figure 7a shows how the support frames 4, provided with flexible laminar surfaces to be dried and individually coming from the work station 27, are accumulated in the buffer loading station 6 until the pre-established group 7 of support frames 4 is completed; simultaneously, the support frames 4 of a same pre-established group 7, provided with flexible laminar surfaces dried and

present at the unloading station 29, after having escaped from the operating tunnel 2 are sent still individually to the work station 27 to be handled by the operator.

[0084] Meanwhile, in the drying chambers 30 of the operating tunnel 2, the drying, tensioning and de-tensioning cycle of the flexible laminar surfaces is started, with all the pre-established group 7 of support frames 4 held in position by the respective first thrust bolts 20 and second abutment bolts 22 of the thrust means 14.

[0085] Figure 7b shows the subsequent situation in which the buffer loading station 6 has reached the expected number of support frames 4 with the flexible laminar surfaces to be dried, the unloading station 29 with the dried flexible laminar surfaces has been completely evacuated and the drying cycle for the flexible laminar surfaces of the pre-established groups 7 of the support frames 4 in the various drying chambers 30 of the operating tunnel 2 is terminated: in such a situation, the motorization means 12 reverse the motion so that the intermediate shaft 18 and, with it, the rotating force pinions 17, rotate in the second rotation way (counterclockwise) around the rotation axis X, causing a minimal longitudinal stroke of retraction C_a (for example of about 100 mm) of the upper longitudinal bars 15 in the second way (indicated by the arrow F_3 in figure 10) of the linear direction Z, in any case sufficient to cause re-entering by rotation of the second abutment bolts 22 in the lower longitudinal bars 16, as illustrates the arrow F_1 in figure 10.

[0086] The motorization means 12 continue to retract the upper longitudinal bars 15 along the second way (arrow F_3 in figure 10) of the linear direction Z for a length equal to aforesaid second longitudinal stroke C_2 (for example of about 4 meters, see figure 7c): in this withdrawal movement, the upper longitudinal bars 15 drag with them also the lower longitudinal bars 16 (as mentioned, coupled with the upper longitudinal bar 15 by means of mechanical stops) with the related first thrust bolts 20.

[0087] The withdrawal movement of the longitudinal bars 15, 16 of the movable translation means 10 along the linear direction Z stops when the first of the second abutment bolts 22 is located close to the head support frame 41 present in the buffer loading station 6: in this way, the moving means 5, in their base components consisting of the movable translation means 10, the thrust means 14 and of course the motorization means 12, are available to the advancement of the pre-established group 7 of support frames 4 present in the buffer loading station 6 and supporting the flexible laminar surfaces to be dried.

[0088] At that instant (figure 7d), the motorization means 12 again reverse the motion in such a way that the intermediate shaft 18 and, with it, the rotating force pinions 17, rotate in the first rotation way (clockwise) around the rotation axis X, firstly causing a minimal longitudinal stroke of advancement C_a only of the lower longitudinal bars 16 in the first way (arrow F_2 in figure 10) of the linear direction Z, in any case sufficient to cause the output of the first thrust bolts 20 from the lower longitudinal bars 16 in order to place them close to the head support frame 41 of the various pre-established groups 7.

[0089] Subsequently and without solution of continuity, the motorization means 12, through the intermediation of the rotating force pinions 17, cause advancing in the first way (arrow F_2 in figure 10) of the linear direction Z also of upper longitudinal bars 15: this leads the second abutment bolts 22 in the final work position, i.e. close to the tail support frame 42 of the various pre-established groups 7.

[0090] As figure 7e shows, under the action of the motorization means 12, the two longitudinal bars 15 and 16 then continue together along their advancing movement along the first way (arrow F_2 in figure 10) of the linear direction Z for the first longitudinal stroke C_1 having a value substantially equal to that one of the second longitudinal stroke C_2.

[0091] It follows that the support frames 4 of the pre-established group 7 that, initially, in the figures had been accumulated in the buffer loading station 6, are moved in bulk inside the operating tunnel in order to be entirely contained into the drying chamber 30 adjacent to the buffer loading station 6, while the support frames 4 of the pre-established groups 7 yet present inside the operating tunnel 2 are translated forward along the linear direction Z for a respective drying chamber 30, with the exception of the last pre-established group 7 of support frames 4 which escapes from the operating tunnel 2 to enter in bulk into the unloading station 29.

[0092] The operating logic of the industrial plant for drying and/or conditioning 1 of the invention and, in particular, of the operating tunnel 2 belonging to it, may be indifferently of progressive and sequential treatment type in the various drying chambers 30 (defined as "horizontal processing" logic) or individual type in the various drying chambers 30 (defined as "vertical processing" logic).

[0093] The first operating logic involves that the flexible laminar surfaces of a given batch are progressively treated in two or more different and adjacent drying chambers 30 of the operating tunnel 2 according to respective different hygrometric, thermal and mechanical conditions, while the second logic involves that the flexible laminar surfaces of a given batch are treated only in a specific drying chamber 30 where the hygrometric, thermal and mechanical conditions are suitably and possibly varied over time, according to appropriate treatment digraphs.

[0094] It is thus evident that the preferred embodiment of the invention, comprising an operating tunnel divided into a series of consecutive, independent, separate and distinct drying chambers allows to treat simultaneously and effectively also distinct batches which differ each other for type of flexible laminar surfaces, such as animal leathers, and which provide treatment conditions different each other, in combination with the other significant advantage of the invention according to which in any given treatment cycle, the flexible laminar surfaces are processed by pre-established groups, at full advantage of the uniformity and homogeneity of the final result.

[0095] On the basis of the foregoing, it is understood, therefore, that the industrial plant for drying and/or conditioning flexible laminar surfaces, such as, for example and typically animal leathers of the tanning industry, of the present invention achieves the purposes and reaches the advantages previously mentioned.

[0096] Upon implementation, changes could be made to the industrial plant for drying and/or conditioning flexible laminar surfaces of the invention, consisting, for example, in moving means of constructive conception different from that one just described and shown in the drawings that follow.

[0097] Furthermore, additional executive solutions of the industrial plant for drying and/or conditioning of the invention, not shown, could provide that at least one of the support frames retain only one flexible laminar surface.

[0098] In addition, in other embodiments of the industrial plant for drying and/or conditioning claimed herein, not illustrated, the support frames could be of another type than that one previously described and shown in the enclosed drawings, which does not affect the advantage brought by the present invention.

[0099] It should be noted, also, that the number of support frames, complete with at least one flexible laminar surface, which can be received in bulk in the buffer loading station and in the operating tunnel (and eventually in each of the drying chambers that preferably compose it) could be any, that number varying according to the manufacturer's constructive choices, operative needs and/or space available in the customer's factory.

[0100] It is, finally, clear that several other changes could be made to the industrial drying and/or conditioning plant concerned, without departing from the principle of novelty intrinsic in the inventive idea expressed herein, as it is clear that, in the practical implementation of the invention, materials, shapes and sizes of the illustrated details could be changed, as needed, and replaced with others technically equivalent.

[0101] Where the constructive features and techniques mentioned in the following claims are followed by reference numbers or signs, those reference signs have been introduced with the sole objective of increasing the intelligibility of the claims themselves and therefore they have no limiting effect on the interpretation of each element identified, by way of example only, by these reference signs.

Claims

1. Industrial plant for drying and/or conditioning (1) flexible laminar surfaces comprising:

   - an operating tunnel (2) mainly developing according to a linear direction (Z) and provided with air conditioning devices (3) and/or traction organs suitable to act on said flexible laminar surfaces so as to dry them and/or spread them according to predetermined treatment and/or tensioning cycles;
   - a plurality of support frames (4), each of which suitable to receive at least one of said flexible laminar surfaces in such a way as to keep it in a spread and vertical position;
   - moving means (5), operatively connected with said support frames (4) in order to convey them along said linear direction (Z) according to a predefined speed within said operative tunnel (2), to allow drying and/or tensioning of said flexible laminar surfaces, and outside said operative tunnel (2) to allow discharging of said flexible laminar surfaces dried and/or tensioned in a working cycle and loading of said flexible laminar surfaces to be dried and/or tensioned in the following processing cycle,

   characterized in that it comprises a buffer loading station (6), arranged upstream said operative tunnel (2) with which it communicates, suitable to integrally receive a pre-established group (7) of said support frames (4) before said pre-established group (7) of said support frames (4) is transferred in bulk within said operative tunnel (2) by said moving means (5), in such a way that said support frames (4) of said pre-established group (7) simultaneously reach the inside of said operating tunnel (2) and said flexible laminar surfaces supported by said support frames (4) of said pre-established group (7) are simultaneously subjected to the processing of said air conditioning devices (3) and/or of said traction organs.

2. Plant (1) according to claim 1) **characterized in that** said operative tunnel (2) is divided into a plurality of successive drying chambers (30), physically distinct and operatively independent each other being separated by dividing means (31), communicating each other in order to allow passage of said support frames (4), each of which is suitable to receive in bulk said pre-established group (7) of said support frames (4) initially present in said buffer loading station (6) and provided with said air conditioning devices (3) and/or traction organs suitable to be adjusted independently for each of said drying chambers (25) in such a way as to ensure a more effective control of the tension of said flexible laminar surfaces during drying phase into said operative tunnel (2).

3. Plant (1) according to claim 1) or 2) **characterized in that** said buffer loading station (6) faces said operating tunnel (2) and is defined in the initial portion (8) of a base framework (9) that contributes to define said operating tunnel (2) and which supports said support frames (4) in such a way as to keep them suspended from a reference surface (S) on which said base framework (9) is suitable to rest.

4. Plant (1) according to any of the preceding claims **characterized in that** said moving means (5) impart to said support frames (4) of said pre-established group (7) a first longitudinal stroke suitable to allow their complete introduction into said operative tunnel (2).

5. Plant (1) according to claim 3) **characterized in that** said moving means (5) comprise:

- movable translation means (10) coupled through support members (11) with said base framework (9);
- motorization means (12), arranged at said initial portion (8) of said base framework (9) and facing said buffer loading station (6), coupled through transmission means (13) with said movable translation means (10) in order to make them sliding along said linear direction (Z) according to a first way, causing advancing of said support frames (4) inside said operative tunnel (2);
- thrust means (14), coupled with said movable translation means (10) and cooperating directly with said support frames (4) in order to determine their advancement along said linear direction (Z) as a result of the actuation of said motorization means (12).

6. Plant (1) according to claim 5) **characterized in that** said motorization means (12) act on said movable translation means (10) so as to make them sliding along said linear direction (Z) according to a second way, opposite to said first way, causing retracting of said movable translation means (10), when the drying cycle of said pre-established group (7) of said support frames (4) is finished and said pre-established group (7) of said frames support (4) is conveyed to an unloading station (29) located downstream and outside said operative tunnel (2), in order to make said movable translation means (10) available to the advancement along said first way of said linear direction (Z) of a following pre-established group (7) of said support frames (4) meanwhile introduced into said buffer loading station (6).

7. Plant (1) according to claim 6) **characterized in that** said movable translation means (10) include:

- at least one upper longitudinal bar (15) supporting said transmission means (13), extending for a length equal at least to the sum of the length of said operating tunnel (2) and the length of said buffer loading station (6) and is made movable by said motorization means (12) for a first longitudinal stroke, along said first way of said linear direction (Z), and for a second longitudinal stroke along said second way of said linear direction (Z);
- at least one lower longitudinal bar (16), fixed to said base framework (9), having a length slightly greater than said length of said upper longitudinal bar (15) and positioned below said upper longitudinal bar (16) with which is firmly coupled.

8. Plant (1) according to claim 7) **characterized in that** said transmission means (13) comprise:

- a rotating force pinion (17) keyed to an intermediate shaft (18) defining a rotation axis (X) orthogonal to said linear direction (Z) and coupled with said motorization means (12) suitable to rotate it in a first rotation way around said rotation axis in order to move said upper longitudinal bar (15) and said lower longitudinal bar (16) in said first way causing advancing of said support frames (4) along said linear direction (Z);
- a fixed reference rack (19), on which said rotating pinion (17) engages and which is positioned on the upper wall (15b) and at a front end (15a) of said upper longitudinal bar (15), said front end (15a) facing or being at least partly contained into said buffer loading station (6) when said support frames (4) advance along said linear direction (Z).

9. Plant (1) according to claim 7) or 8) **characterized in that** said thrust means (14) comprise a first thrust bolt (20), projecting downwardly from a first joint block (21) side-by-side to said lower longitudinal bar (16) along said linear direction (Z), and a second abutment bolt (22), projecting downwardly from a second joint block (23) side-by-side to said upper longitudinal bar (15) along said linear direction (Z) so that the right side edge of said second joint block (23) is separated from the left side edge of said first joint block (21) for a prefixed distance having a value substantially equal to half the length of said bar upper longitudinal (15).

10. Plant (1) according to claim 9) when dependent on claim 8) **characterized in that** said first thrust bolt (20) is fixed and coupled with said first joint block (21) through fixing means (24), while said second abutment bolt (22) is rotatable and coupled with said second joint block (23) through a transverse pin (25) defining an auxiliary rotation axis (X') around which said second abutment bolt (22) rotates in order to at least partly re-enter into said lower longitudinal bar (16) when said motorization means (12), by reversing their motion after the completion of the insertion of said support frames (4) of said pre-established group (7) into said operating tunnel (2), rotate said intermediate shaft (18) and said rotating force pinion (17) in a second rotation way, opposite to said first

rotation way, causing retracting of said upper longitudinal bar (15) and said lower longitudinal bar (16) along said linear direction (Z).

11. Plant (1) according to claim 10) **characterized in that** said thrust means (14) include a strike element (34) that contrasts externally against said first thrust bolt (20) at the upper end (20a) of said first thrust bolt (20) coupled with said first joint block (21) in order to prevent rotation of said first thrust bolt (20) when said motorization means (12) rotate said intermediate shaft (18) and said rotating force pinion (17) in said first rotation way causing advancing of said pre-established group (7) of said support frames (4) along said linear direction (Z).

12. Plant (1) according to any of the claims from 9) to 11) **characterized in that** each of said first thrust bolt (20) and said second abutment bolt (22) presents in side view a profile in the shape of an isosceles trapezium such that the oblique side (36) belongs to the protruding portion of said first and second bolts (20, 22) and:

- said first thrust bolt (20) contrasts with the side wall (35a) of the larger base (35) of said isosceles trapezium against the upper part of the head support frame (41) of said pre-established group (7) during the advancement of said support frames (4) along said linear direction (Z), so as to properly perform the thrust action;
- said second abutment bolt (22) contrasts with the side wall (35a) of the larger base (35) of said isosceles trapezium against the upper part of the tail support frame (42) of said pre-established group (7) during the advancement of said support frames (4) along said linear direction (Z) in order to serve as simple abutment.

13. Plant (1) according to any of the claims from 3) to 12) **characterized in that** said support frames (4) are coupled with said base framework (9) through sliding means (37) arranged beneath said moving means (5).

14. Plant (1) according to claim 13) when dependent on claim 9) **characterized in that** said sliding means (37) comprise:

- a pair of rollers (38) fixed to the free end (39a) of the hooking rod (39) projecting from each of the opposite upper ends of each of said support frames (4) and defining a vertical axis (Y) with respect to which said rollers (38) are symmetrically opposite;
- a pair of auxiliary longitudinal bars (40), coupled with said base framework (9), each of which receives one of said rollers (38) to allow their rolling along said linear direction (Z) in a first rotation way associated with said first way through which said support frames (4) advance along said linear direction (Z).

15. Plant (1) according to claim 9) when dependent on claim 8) **characterized in that** said upper longitudinal bar (15) and said lower longitudinal bar (16) of said movable translation means (10) have a modular structure in order to vary the length of said operative tunnel (2) depending on operative needs and available spaces, said upper longitudinal bar (15) being composed of a plurality of upper modular bars (44) adjacent one to another along said linear direction (Z) and connected each other through said second joint block (23), the first one of said upper modular bars (44) facing said buffer loading station (6), supporting said fixed reference rack (19) of said transmission means (13) and being coupled with said lower longitudinal bar (16) through a mechanical restraint element (33) positioned above said lower longitudinal bar (16) and in said front end (15a) of said upper longitudinal bar (15), and said lower longitudinal bar (16) being composed of a plurality of lower modular bars (45) adjacent one to another along said linear direction (Z) and connected each other through said first joint block (21), the first one and the last one of said lower modular bars (45) being fixed to said base framework (9).

Patentansprüche

1. Industrielle Anlage (1) zum Trocknen und/oder Konditionieren flexibler laminarer Oberflächen, welche Folgendes umfasst:

- einen Betriebstunnel (2), der sich hauptsächlich in einer Längsrichtung (Z) erstreckt und mit Luftaufbereitungsvorrichtungen (3) und/oder Traktionsorganen versehen ist, die geeignet sind, auf die flexiblen laminaren Oberflächen einzuwirken, um sie entsprechend vorgegebenen Behandlungs- und/oder Spannzyklen zu trocknen und/oder auszubreiten,
- mehrere Tragrahmen (4), die jeweils geeignet sind, um wenigstens eine der flexiblen laminaren Oberflächen aufzunehmen, um sie in einer ausgebreiteten und vertikalen Stellung zu halten,
- Bewegungsmittel (5), welche operativ mit den Tragrahmen (4) verbunden sind, um sie mit einer vorgegebenen Geschwindigkeit innerhalb des Betriebstunnels (2) in Längsrichtung (Z) zu befördern, um das Trocknen und/oder Spannen der flexiblen laminaren Oberflächen zu ermöglichen, und um sie außerhalb des Betriebstunnels (2) zu befördern, um das Ausstoßen der in

einem Arbeitszyklus getrockneten und/oder gespannten flexiblen laminaren Oberflächen und das Laden der im folgenden Verarbeitungszyklus zu trocknenden und/oder zu spannenden flexiblen laminaren Oberflächen zu ermöglichen,

dadurch gekennzeichnet, dass sie eine Pufferladestation (6) umfasst, die stromaufwärts des Betriebstunnels (2) angeordnet ist, mit dem sie kommuniziert, welche geeignet ist, um eine vorgegebene Gruppe (7) der Tragrahmen (4) integral zu empfangen, bevor die vorgegebene Gruppe (7) der Tragrahmen (4) durch die Bewegungsmittel (5) gemeinsam innerhalb des Betriebstunnels (2) übertragen wird, so dass die Tragrahmen (4) der vorgegebenen Gruppe (7) gleichzeitig das Innere des Betriebstunnels (2) erreichen und die flexiblen laminaren Oberflächen, welche von den Tragrahmen (4) der vorgegebenen Gruppe (7) getragen werden, gleichzeitig der Verarbeitung durch die Luftaufbereitungsvorrichtungen (3) und/oder die Traktionsorgane unterzogen werden.

2. Anlage (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Betriebstunnel (2) in mehrere aufeinander folgende Trocknungskammern (30) unterteilt ist, die physikalisch gegeneinander unterteilt und operativ unabhängig voneinander sind, indem sie durch Unterteilungsmittel (31) getrennt sind, wobei sie miteinander kommunizieren, um den Durchgang der Tragrahmen (4) zu ermöglichen, die jeweils geeignet sind, um die vorgegebene Gruppe (7) der Tragrahmen (4), die zunächst in der Pufferladestation (6) vorhanden war, gemeinsam aufzunehmen, und mit den Luftaufbereitungsvorrichtungen (3) und/oder den Traktionsorganen versehen sind, welche für jede der Trocknungskammern (25) unabhängig eingestellt werden können, um eine wirksamere Steuerung der Spannung der flexiblen laminaren Oberflächen während der Trocknungsphase im Betriebstunnel (2) zu gewährleisten.

3. Anlage (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Pufferladestation (6) dem Betriebstunnel (2) gegenübersteht und im Anfangsabschnitt (8) eines Basisgerüsts (9) definiert ist, welches dazu beiträgt, den Betriebstunnel (2) zu definieren, und welches die Tragrahmen (4) trägt, um sie gegenüber einer Referenzfläche (S), auf der das Basisgerüst (9) aufliegen kann, aufgehängt zu halten.

4. Anlage (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Bewegungsmittel (5) auf die Tragrahmen (4) der vorgegebenen Gruppe (7) einen ersten Längshub ausüben, der geeignet ist, um sie vollständig in den Betriebstunnel (2) einzuführen.

5. Anlage (1) nach Anspruch 3, **dadurch gekennzeichnet, dass** die Bewegungsmittel (5) Folgendes umfassen:

- bewegliche Verschiebemittel (10), welche durch Tragelemente (11) mit dem Basisgerüst (9) gekoppelt sind,
- Motorisierungsmittel (12), die am Anfangsabschnitt (8) des Basisgerüsts (9) angeordnet sind und der Pufferladestation (6) gegenüberstehen, welche durch Übertragungsmittel (13) mit den beweglichen Verschiebemitteln (10) gekoppelt sind, um sie in Längsrichtung (Z) entsprechend einem ersten Weg zu verschieben, wodurch die Tragrahmen (4) im Betriebstunnel (2) vorbewegt werden,
- Schubmittel (14), die mit den beweglichen Verschiebemitteln (10) gekoppelt sind und direkt mit den Tragrahmen (4) zusammenwirken, um ihre Vorbewegung in Längsrichtung (Z) infolge der Betätigung der Motorisierungsmittel (12) festzulegen.

6. Anlage (1) nach Anspruch 5, **dadurch gekennzeichnet, dass** die Motorisierungsmittel (12) auf die beweglichen Verschiebemittel (10) einwirken, um zu bewirken, dass sie entsprechend einem zweiten Weg, entgegengesetzt zum ersten Weg, in Längsrichtung (Z) verschoben werden, wodurch ein Zurückziehen der beweglichen Verschiebemittel (10) hervorgerufen wird, wenn der Trocknungszyklus der vorgegebenen Gruppe (7) der Tragrahmen (4) beendet ist, und die vorgegebene Gruppe (7) der Tragrahmen (4) zu einer Entladestation (29) befördert wird, die sich hinter und außerhalb des Betriebstunnels (2) befindet, um die beweglichen Verschiebemittel (10) für das Vorbewegen einer folgenden vorgegebenen Gruppe (7) der Tragrahmen (4), die inzwischen in die Pufferladestation (6) eingeführt wurde, entlang dem ersten Weg in Längsrichtung (Z) verfügbar zu machen.

7. Anlage (1) nach Anspruch 6, **dadurch gekennzeichnet, dass** die beweglichen Verschiebemittel (10) Folgendes aufweisen:

- wenigstens eine obere Längsstange (15), welche die Übertragungsmittel (13) trägt und sich über eine Länge erstreckt, die wenigstens gleich der Summe aus der Länge des Betriebstunnels (2) und der Länge der Pufferladestation (6) ist und durch die Motorisierungsmittel (12) für einen ersten Längshub entlang dem ersten Weg in Längsrichtung (Z) und für einen zweiten Längshub entlang dem zweiten Weg in Längsrichtung (Z) beweglich gemacht ist,
- wenigstens eine untere Längsstange (16), die am Basisgerüst (9) befestigt ist und eine Länge

aufweist, die etwas größer ist als die Länge der oberen Längsstange (15), und unterhalb der unteren Längsstange (16), mit der sie fest gekoppelt ist, angeordnet ist.

8. Anlage (1) nach Anspruch 7, **dadurch gekennzeichnet, dass** die Übertragungsmittel (13) Folgendes umfassen:

- ein Drehkraftritzel (17), das an eine Zwischenwelle (18) angekeilt ist, welche eine Drehachse (X) orthogonal zur Längsrichtung (Z) definiert, und mit den Motorisierungsmitteln (12) gekoppelt ist, um sie in einer ersten Drehrichtung um die Drehachse zu drehen und so die obere Längsstange (15) und die untere Längsstange (16) in der ersten Richtung zu bewegen, wodurch die Tragrahmen (4) in Längsrichtung (Z) vorbewegt werden,
- ein erstes Referenzgestell (19), worin das Drehritzel (17) eingreift und welches an der oberen Wand (15b) und an einem vorderen Ende (15a) der oberen Längsstange (15) angeordnet ist, wobei das vordere Ende (15a) der Pufferladestation (6) gegenübersteht oder zumindest teilweise darin enthalten ist, wenn sich die Tragrahmen (4) in Längsrichtung (Z) vorbewegen.

9. Anlage (1) nach Anspruch 7 oder 8, **dadurch gekennzeichnet, dass** die Schubmittel (14) einen ersten Schubbolzen (20), der von einem ersten Verbindungsblock (21) Seite an Seite mit der unteren Längsstange (16) in Längsrichtung (Z) nach unten vorsteht, und einen zweiten Anschlagsbolzen (22), der von einem zweiten Verbindungsblock (23) Seite an Seite mit der oberen Längsstange (15) in Längsrichtung (Z) nach unten vorsteht, umfassen, so dass die rechte Seitenkante des zweiten Verbindungsblocks (23) von der linken Seitenkante des ersten Verbindungsblocks (21) um einen vorgegebenen Abstand mit einem Wert getrennt ist, der im Wesentlichen gleich der Hälfte der Länge der oberen Längsstange (15) ist.

10. Anlage (1) nach Anspruch 9, sofern abhängig von Anspruch 8, **dadurch gekennzeichnet, dass** der erste Schubbolzen (20) durch Befestigungsmittel (24) am ersten Verbindungsblock (21) befestigt ist und damit gekoppelt ist, während der zweite Anschlagsbolzen (22) durch einen Querstift (25), welcher eine Hilfsdrehachse (X') um den zweiten Anschlagsbolzen (22) definiert, drehbar und mit dem zweiten Verbindungsblock (23) gekoppelt ist und sich dreht, um zumindest teilweise wieder in die untere Längsstange (16) einzutreten, wenn die Motorisierungsmittel (12) durch Umkehren ihrer Bewegung nach Abschluss des Einführens der Tragrahmen (4) der vorgegebenen Gruppe (7) in den Betriebstunnel (2) die Zwischenwelle (18) und das Drehkraftritzel (17) in einer zweiten Drehrichtung entgegengesetzt zur ersten Drehrichtung drehen, wodurch das Zurückziehen der oberen Längsstange (15) und der unteren Längsstange (16) in Längsrichtung (Z) hervorgerufen wird.

11. Anlage (1) nach Anspruch 10, **dadurch gekennzeichnet, dass** die Schubmittel (14) ein Auftreffelement (34) aufweisen, das dem ersten Schubbolzen (20) am oberen Ende (20a) des ersten Schubbolzens (20), der mit dem ersten Verbindungsblock (21) gekoppelt ist, außen gegenübersteht, um eine Drehung des ersten Schubbolzens (20) zu verhindern, wenn die Motorisierungsmittel (12) die Zwischenwelle (18) und das Drehkraftritzel (17) in der ersten Drehrichtung drehen, wodurch das Vorbewegen der vorgegebenen Gruppe (7) der Tragrahmen (4) in Längsrichtung (Z) hervorgerufen wird.

12. Anlage (1) nach einem der Ansprüche 9 bis 11, **dadurch gekennzeichnet, dass** sowohl der erste Schubbolzen (20) als auch der zweite Anschlagsbolzen (22) in Seitenansicht ein Profil mit der Form eines gleichschenkligen Trapezes aufweisen, so dass die schräge Seite (36) zum vorstehenden Abschnitt des ersten und des zweiten Bolzens (20, 22) gehört, und

- der erste Schubbolzen (20) während des Vorbewegens der Tragrahmen (4) in Längsrichtung (Z) der Seitenwand (35a) der größeren Basis (35) des gleichschenkligen Trapezes gegenüber dem oberen Teil des Kopftragrahmens (41) der vorgegebenen Gruppe (7) gegenübersteht, um die Schubwirkung geeignet auszuführen,
- der zweite Anschlagsbolzen (22) während des Vorbewegens der Tragrahmen (4) in Längsrichtung (Z) der Seitenwand (35a) der größeren Basis (35) des gleichschenkligen Trapezes gegenüber dem oberen Teil des hinteren Tragrahmens (42) der vorgegebenen Gruppe (7) gegenübersteht, um als einfacher Anschlag zu dienen.

13. Anlage (1) nach einem der Ansprüche 3 bis 12, **dadurch gekennzeichnet, dass** die Tragrahmen (4) durch Gleitmittel (37), die unterhalb der Bewegungsmittel (5) angeordnet sind, mit dem Basisgerüst (9) gekoppelt sind.

14. Anlage (1) nach Anspruch 13, sofern abhängig von Anspruch 9, **dadurch gekennzeichnet, dass** die Gleitmittel (37) Folgendes umfassen:

- ein Paar von Rollen (38), die am freien Ende (39a) der Einhakstange (39) befestigt sind, welche von jedem der entgegengesetzten oberen Enden von jedem der Tragrahmen (4) vorsteht

und eine vertikale Achse (Y) definiert, in Bezug worauf die Rollen (38) symmetrisch entgegengesetzt sind,

- ein Paar von Hilfslängsstangen (40), welche mit dem Basisgerüst (9) gekoppelt sind, welche jeweils eine der Rollen (38) aufnehmen, um zu ermöglichen, dass sie in Längsrichtung (Z) auf einem ersten Drehweg in Zusammenhang mit dem ersten Weg, durch den sich die Tragrahmen (4) in Längsrichtung (Z) vorbewegen, rollen können.

15. Anlage (1) nach Anspruch 9, sofern abhängig von Anspruch 8), **dadurch gekennzeichnet, dass** die obere Längsstange (15) und die untere Längsstange (16) der beweglichen Verschiebemittel (10) eine modulare Struktur aufweisen, um die Länge des Betriebstunnels (2) abhängig von Betriebsanforderungen und verfügbaren Räumen zu ändern, wobei die obere Längsstange (15) aus mehreren oberen modularen Stangen (44) zusammengesetzt ist, welche in Längsrichtung (Z) benachbart sind und durch den zweiten Verbindungsblock (23) miteinander verbunden sind, wobei die erste der oberen modularen Stangen (44), welche der Pufferladestation (6) gegenübersteht, das feste Referenzgestell (19) der Übertragungsmittel (13) trägt und mit der unteren Längsstange (16) durch ein mechanisches Festhalteelement (33) gekoppelt ist, das oberhalb der unteren Längsstange (16) und am vorderen Ende (15a) der oberen Längsstange (15) angeordnet ist, und wobei die untere Längsstange (16) aus mehreren unteren modularen Stangen (45) zusammengesetzt ist, welche in Längsrichtung (Z) benachbart sind und durch den ersten Verbindungsblock (21) miteinander verbunden sind, wobei die erste und die letzte der unteren modularen Stangen (45) am Basisgerüst (9) befestigt ist.

Revendications

1. Installation industrielle pour sécher et/ou conditionner (1) des surfaces laminaires souples, comprenant :

- un tunnel fonctionnel (2) se développant principalement selon une direction linéaire (Z) et muni de dispositifs de conditionnement d'air (3) et/ou d'organes de traction appropriés pour agir sur lesdites surfaces laminaires souples de façon à les sécher et/ou les étendre selon des cycles de traitement et/ou de mise en tension prédéterminés ;
- une pluralité de cadres de support (4), chacun d'eux étant approprié pour recevoir au moins une desdites surfaces laminaires souples de manière à la maintenir dans une position étendue et verticale ;
- des moyens de déplacement (5), reliés de façon fonctionnelle auxdits cadres de support (4) afin les transporter le long de ladite direction linéaire (Z) selon une vitesse prédéfinie à l'intérieur dudit tunnel fonctionnel (2), pour permettre le séchage et/ou la mise en tension desdites surfaces laminaires souples, et à l'extérieur dudit tunnel fonctionnel (2) pour permettre le déchargement desdites surfaces laminaires souples séchées et/ou tendues dans un cycle de travail et le chargement desdites surfaces laminaires souples à sécher et/ou tendre dans le cycle de traitement suivant, **caractérisée par le fait qu'**elle comprend une station de chargement tampon (6), agencée en amont dudit tunnel fonctionnel (2) avec lequel elle communique, appropriée pour recevoir d'un seul tenant un groupe préétabli (7) desdits cadres de support (4) avant que ledit groupe préétabli (7) desdits cadres de support (4) ne soit transféré en vrac à l'intérieur dudit tunnel fonctionnel (2) par lesdits moyens de déplacement (5), de telle manière que lesdits cadres de support (4) dudit groupe préétabli (7) atteignent simultanément l'intérieur dudit tunnel fonctionnel (2) et que lesdites surfaces laminaires souples supportées par lesdits cadres de support (4) dudit groupe préétabli (7) sont soumises simultanément au traitement desdits dispositifs de conditionnement d'air (3) et/ou desdits organes de traction.

2. Installation (1) selon la revendication 1), **caractérisée par le fait que** ledit tunnel fonctionnel (2) est divisé en une pluralité de chambres de séchage successives (30), physiquement distinctes et fonctionnellement indépendantes les unes des autres, séparées par des moyens de division (31), communiquant les unes avec les autres afin de permettre le passage desdits cadres de support (4), chacun d'eux étant approprié pour recevoir en vrac ledit groupe préétabli (7) desdits cadres de support (4) initialement présents dans ladite station de chargement tampon (6), et comportant lesdits dispositifs de conditionnement d'air (3) et/ou organes de traction appropriés pour être ajustés indépendamment pour chacune desdites chambres de séchage (25) de manière à assurer un contrôle plus efficace de la tension desdites surfaces laminaires souples pendant une phase de séchage dans ledit tunnel fonctionnel (2).

3. Installation (1) selon la revendication 1) ou 2), **caractérisée par le fait que** ladite station de chargement tampon (6) fait face audit tunnel fonctionnel (2) et est définie dans la partie initiale (8) d'une ossature de base (9) qui contribue à définir ledit tunnel fonctionnel (2) et qui supporte lesdits cadres de support (4) de manière à les maintenir suspendus à partir

d'une surface de référence (S) sur laquelle ladite ossature de base (9) est apte à reposer.

4. Installation (1) selon l'une quelconque des revendications précédentes, **caractérisée par le fait que** lesdits moyens de déplacement (5) confèrent auxdits cadres de support (4) dudit groupe préétabli (7) une première course longitudinale appropriée pour permettre leur introduction complète dans ledit tunnel fonctionnel (2).

5. Installation (1) selon la revendication 3), **caractérisée par le fait que** lesdits moyens de déplacement (5) comprennent :

- des moyens de translation mobiles (10) couplés, par l'intermédiaire d'éléments de support (11), à ladite ossature de base (9) ;
- des moyens de motorisation (12), agencés à ladite partie initiale (8) de ladite ossature de base (9) et faisant face à ladite station de chargement tampon (6), couplés par l'intermédiaire de moyens de transmission (13) auxdits moyens de translation mobiles (10) afin de les amener à coulisser le long de ladite direction linéaire (Z) suivant un premier sens, entraînant l'avancée desdits cadres de support (4) à l'intérieur dudit tunnel fonctionnel (2) ;
- des moyens de poussée (14), couplés auxdits moyens de translation mobiles (10) et coopérant directement avec lesdits cadres de support (4) afin de déterminer leur avancée le long de ladite direction linéaire (Z) en conséquence de l'actionnement desdits moyens de motorisation (12).

6. Installation (1) selon la revendication 5), **caractérisée par le fait que** lesdits moyens de motorisation (12) agissent sur lesdits moyens de translation mobiles (10) de façon à les amener à coulisser le long de ladite direction linéaire (Z) suivant un second sens, opposé audit premier sens, entraînant la rétractation desdits moyens de translation mobiles (10), lorsque le cycle de séchage dudit groupe préétabli (7) desdits cadres de support (4) est fini et que ledit groupe préétabli (7) desdits cadres de support (4) est transporté vers une station de déchargement (29) située en aval et à l'extérieur dudit tunnel fonctionnel (2), afin de rendre lesdits moyens de translation mobiles (10) disponibles pour l'avancée suivant ledit premier sens de ladite direction linéaire (Z) d'un groupe préétabli suivant (7) desdits cadres de support (4) introduits entretemps dans ladite station de chargement tampon (6).

7. Installation (1) selon la revendication 6), **caractérisée par le fait que** lesdits moyens de translation mobiles (10) comprennent :

- au moins une barre longitudinale supérieure (15) supportant lesdits moyens de transmission (13), s'étendant sur une longueur égale à au moins la somme de la longueur dudit tunnel fonctionnel (2) et de la longueur de ladite station de chargement tampon (6), et qui est rendue mobile par lesdits moyens de motorisation (12) pour une première course longitudinale, le long dudit premier sens de ladite direction linéaire (Z), et pour une seconde course longitudinale le long dudit second sens de ladite direction linéaire (Z) ;
- au moins une barre longitudinale inférieure (16), fixée à ladite ossature de base (9), ayant une longueur légèrement plus grande que ladite longueur de ladite barre longitudinale supérieure (15) et positionnée au-dessous de ladite barre longitudinale supérieure (16) avec laquelle elle est fermement couplée.

8. Installation (1) selon la revendication 7), **caractérisée par le fait que** lesdits moyens de transmission (13) comprennent :

- un pignon d'entraînement en rotation (17) claveté à un arbre intermédiaire (18) définissant un axe de rotation (X) orthogonal à ladite direction linéaire (Z) et couplé auxdits moyens de motorisation (12) appropriés pour le tourner dans un premier sens de rotation autour dudit axe de rotation afin de déplacer ladite barre longitudinale supérieure (15) et ladite barre longitudinale inférieure (16) dans ledit premier sens, entraînant l'avancée desdits cadres de support (4) le long de ladite direction linéaire (Z) ;
- une crémaillère de référence fixe (19), avec laquelle est en prise ledit pignon (17) et qui est positionnée sur la paroi supérieure (15b) et à une extrémité avant (15a) de ladite barre longitudinale supérieure (15), ladite extrémité avant (15a) faisant face ou étant au moins partiellement contenue dans ladite station de chargement tampon (6) lorsque lesdits cadres de support (4) avancent le long de ladite direction linéaire (Z).

9. Installation (1) selon la revendication 7) ou 8), **caractérisée par le fait que** lesdits moyens de poussée (14) comprennent un premier boulon de poussée (20), se projetant vers le bas à partir d'un premier bloc de liaison (21) à côté de ladite barre longitudinale inférieure (16) le long de ladite direction linéaire (Z), et un second boulon de butée (22), se projetant vers le bas à partir d'un second bloc de liaison (23) à côté de ladite barre longitudinale supérieure (15) le long de ladite direction linéaire (Z), de telle sorte que le côté latéral droit dudit second bloc de liaison (23) est séparé du bord latéral gauche dudit premier

bloc de liaison (21) d'une distance préfixée ayant une valeur sensiblement égale à la moitié de la longueur de ladite barre longitudinale supérieure (15).

10. Installation (1) selon la revendication 9) prise en dépendance de la revendication 8), **caractérisée par le fait que** ledit premier boulon de poussée (20) est fixé et couplé audit premier bloc de liaison (21) par l'intermédiaire de moyens de fixation (24), tandis que ledit second boulon de butée (22) est apte à tourner et couplé audit second bloc de liaison (23) par l'intermédiaire d'une goupille transversale (25) définissant un axe de rotation auxiliaire (X') autour duquel ledit second boulon de butée (22) tourne afin d'entrer à nouveau au moins partiellement dans ladite barre longitudinale inférieure (16) lorsque lesdits moyens de motorisation (12), en inversant leur mouvement après l'achèvement de l'introduction desdits cadres de support (4) dudit groupe préétabli (7) dans ledit tunnel fonctionnel (2), font tourner ledit arbre intermédiaire (18) et ledit pignon d'entraînement en rotation (17) dans un seconde sens de rotation, opposé audit premier sens de rotation, entraînant une rétractation de ladite barre longitudinale supérieure (15) et de ladite barre longitudinale inférieure (16) le long de ladite direction linéaire (Z).

11. Installation (1) selon la revendication 10), **caractérisée par le fait que** lesdits moyens de poussée (14) comprennent un élément de frappe (34) qui s'oppose à l'extérieur audit premier boulon de poussée (20) à l'extrémité supérieure (20a) dudit premier boulon de poussée (20) couplé audit premier bloc de liaison (21), afin d'empêcher une rotation dudit premier boulon de poussée (20) lorsque lesdits moyens de motorisation (12) font tourner ledit arbre intermédiaire (18) et ledit pignon d'entraînement en rotation (17) dans ledit premier sens de rotation, entraînant l'avancée dudit groupe préétabli (7) desdits cadres de support (4) le long de ladite direction linéaire (Z).

12. Installation (1) selon l'une quelconque des revendications 9) à 11), **caractérisée par le fait que** chacun dudit premier boulon de poussée (20) et dudit second boulon de butée (22) présente, en vue de côté, un profil sous la forme d'un trapèze isocèle de telle sorte que le côté oblique (36) appartient à la partie saillante desdits premier et second boulons (20, 22), et :

- ledit premier boulon de poussée (20) s'oppose, avec la paroi latérale (35a) de la base plus grande (35) dudit trapèze isocèle, à la partie supérieure du cadre de support avant (41) dudit groupe préétabli (7) pendant l'avancée desdits cadres de support (4) le long de ladite direction linéaire (Z), de façon à réaliser de façon appropriée l'action de poussée ;
- ledit second boulon de butée (22) s'oppose, avec la paroi latérale (35a) de la base plus grande (35) dudit trapèze isocèle, à la partie supérieure du cadre de support arrière (42) dudit groupe préétabli (7) pendant l'avancée desdits cadres de support (4) le long de ladite direction linéaire (Z), afin de servir de butée simple.

13. Installation (1) selon l'une quelconque des revendications 3) à 12), **caractérisée par le fait que** lesdits cadres de support (4) sont couplés à ladite ossature de base (9) par l'intermédiaire de moyens de coulissement (37) disposés sous lesdits moyens de déplacement (5).

14. Installation (1) selon la revendication 13) prise en dépendance de la revendication 9), **caractérisée par le fait que** lesdits moyens de coulissement (37) comprennent :

- une paire de galets (38) fixés à l'extrémité libre (39a) de la tige d'accrochage (39) se projetant à partir de chacune des extrémités supérieures opposées de chacun desdits cadres de support (4) et définissant un axe vertical (Y) par rapport auquel lesdits galets (38) sont symétriquement opposés ;
- une paire de barres longitudinales auxiliaires (40), couplées à ladite ossature de base (9), chacune d'elles recevant l'un desdits galets (38) pour permettre leur roulement le long de ladite direction linéaire (Z) dans un premier sens de rotation associé audit premier sens suivant lequel lesdits cadres de support (4) avancent le long de ladite direction linéaire (Z).

15. Installation (1) selon la revendication 9) prise en dépendance de la revendication 8), **caractérisée par le fait que** ladite barre longitudinale supérieure (15) et ladite barre longitudinale inférieure (16) desdits moyens de translation mobiles (10) ont une structure modulaire afin de faire varier la longueur dudit tunnel fonctionnel (2) en fonction des besoins fonctionnels et des espaces disponibles, ladite barre longitudinale supérieure (15) étant composée d'une pluralité de barres modulaires supérieures (44) adjacentes les unes aux autres le long de ladite direction linéaire (Z) et reliées les unes aux autres par l'intermédiaire dudit second bloc de liaison (23), la première desdites barres modulaires supérieures (44) faisant face à ladite station de chargement tampon (6), supportant ladite crémaillère de référence fixe (19) desdits moyens de transmission (13) et étant couplée à ladite barre longitudinale inférieure (16) par l'intermédiaire d'un élément de retenue mécanique (33) positionné au-dessus de ladite barre longitudinale inférieure (16) et dans ladite extrémité avant (15a) de ladite barre longitudinale supérieure (15), et ladite

barre longitudinale inférieure (16) étant composée d'une pluralité de barres modulaires inférieures (45) adjacentes les unes aux autres le long de ladite direction linéaire (Z) et reliées les unes aux autres par l'intermédiaire dudit premier bloc de liaison (21), la première et la dernière desdites barres modulaires inférieures (45) étant fixées à ladite ossature de base (9).

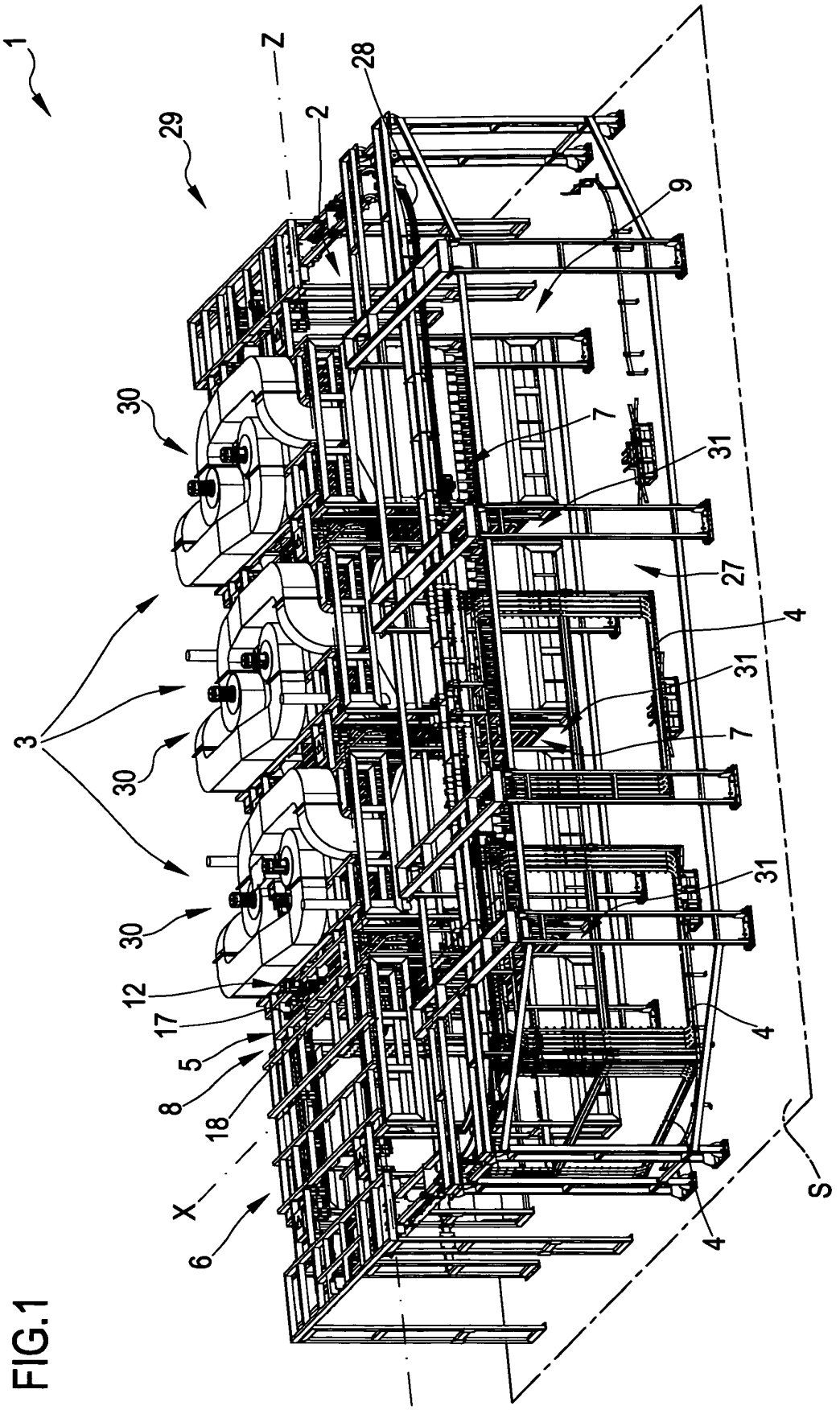

FIG.1

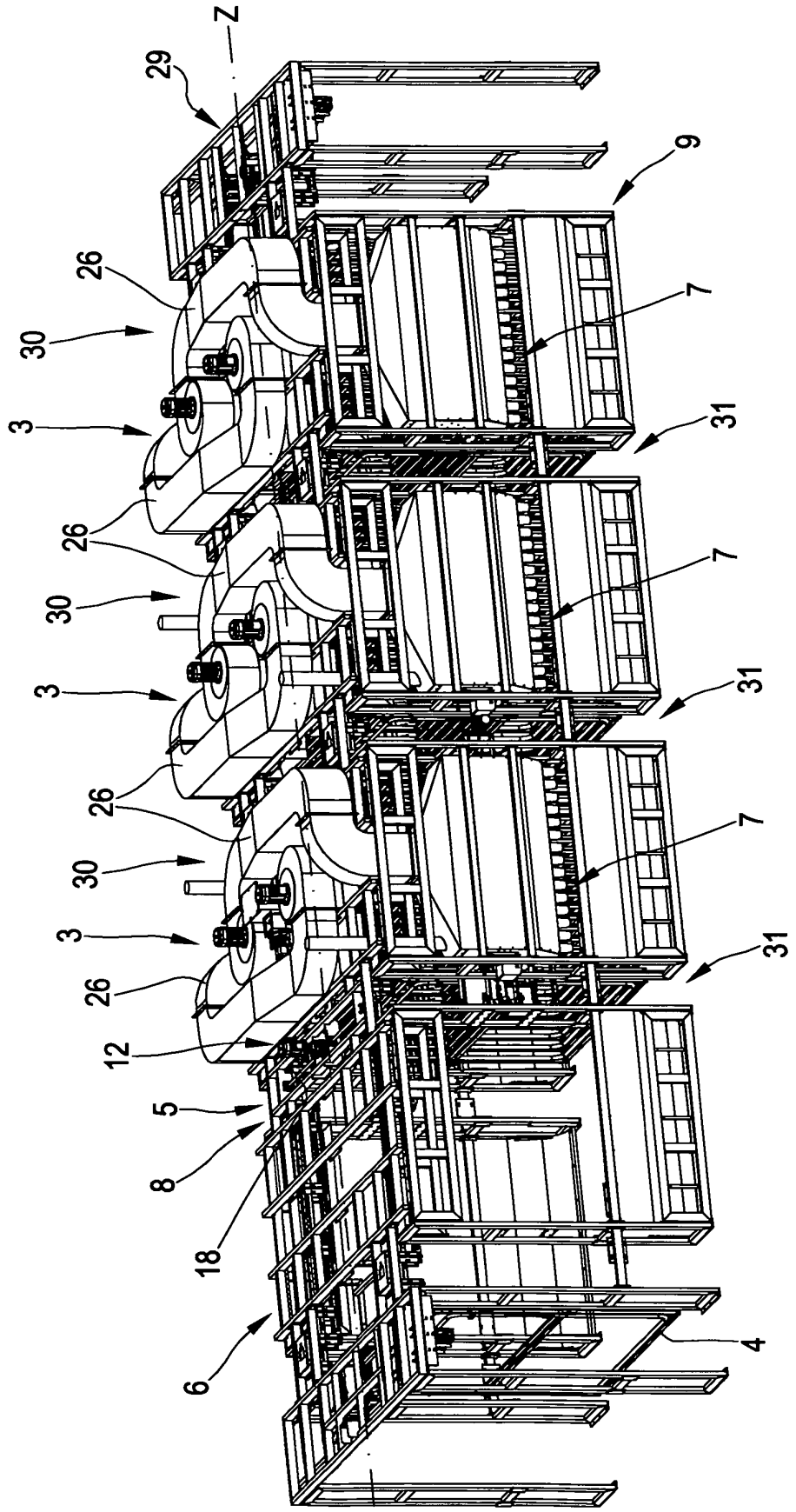

FIG.2

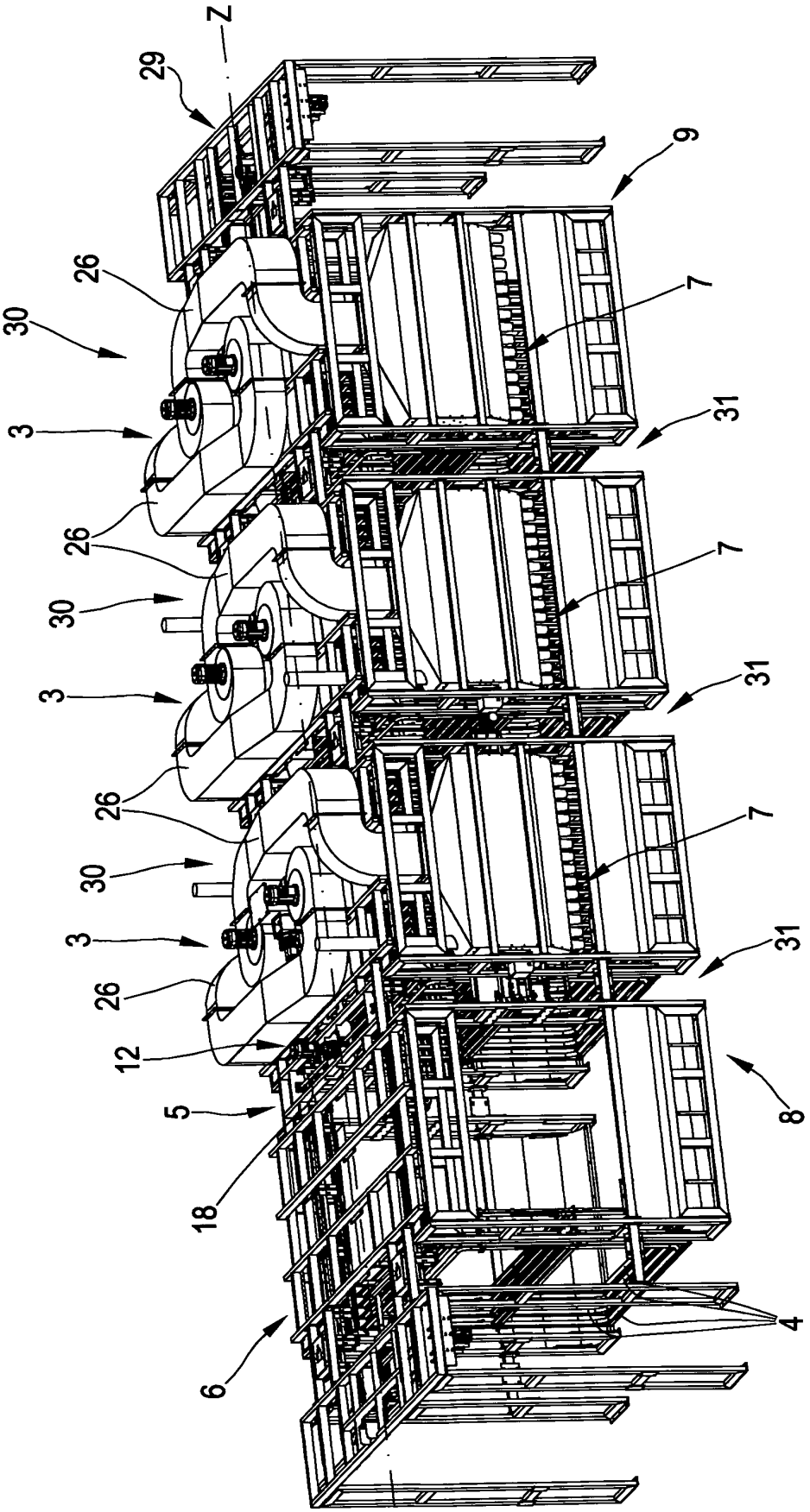

FIG.3

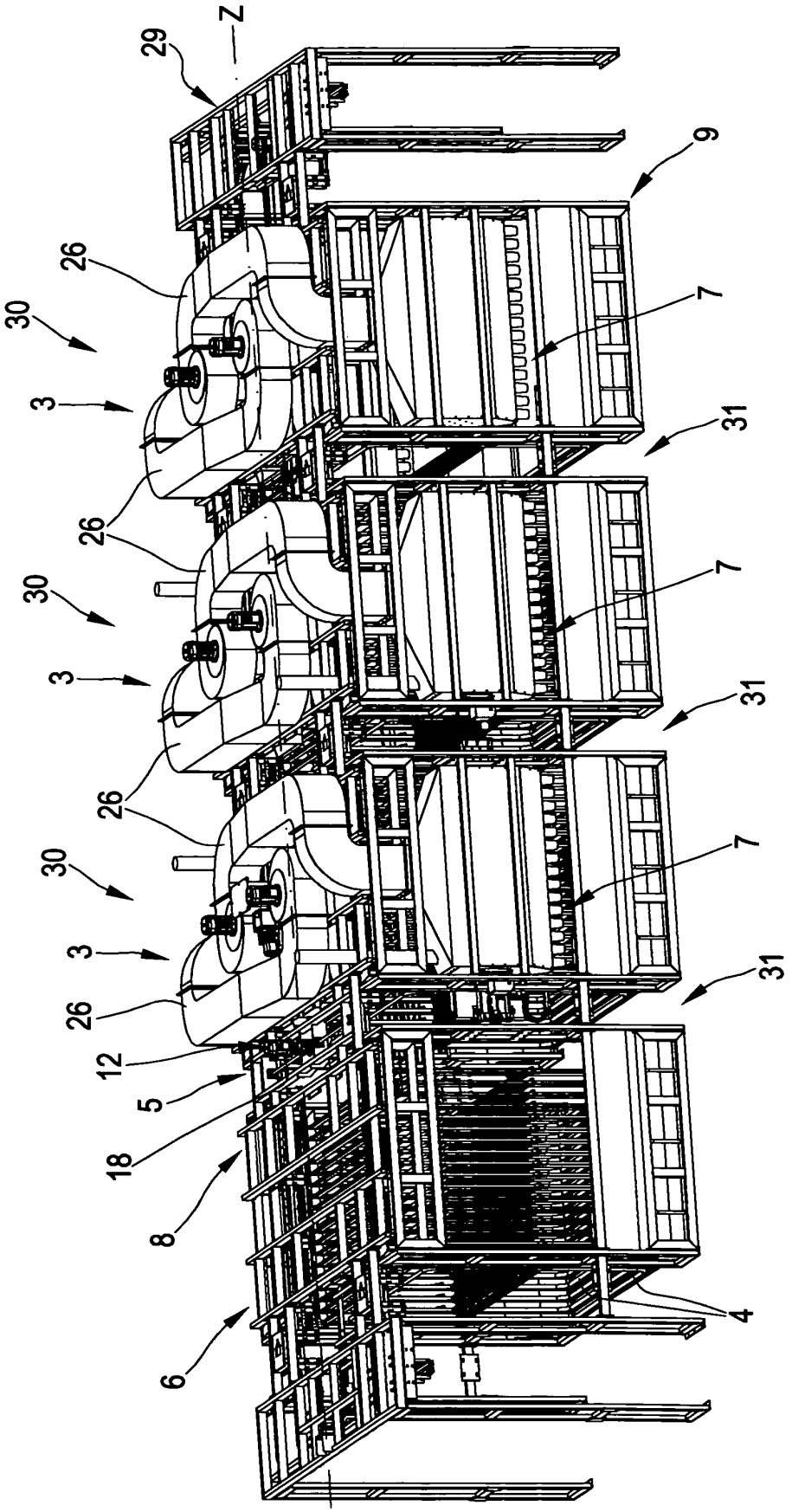

FIG.4

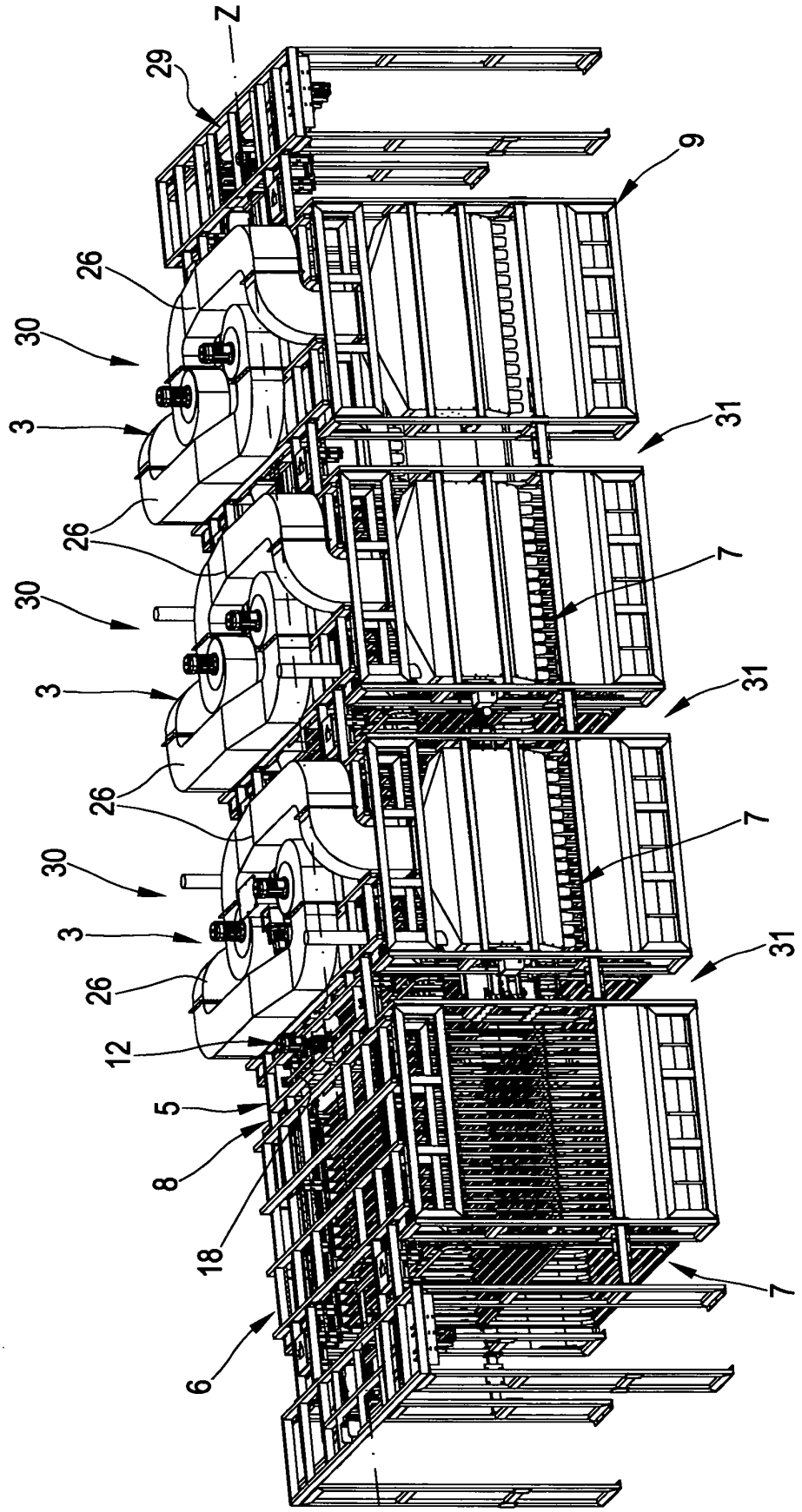

FIG.5

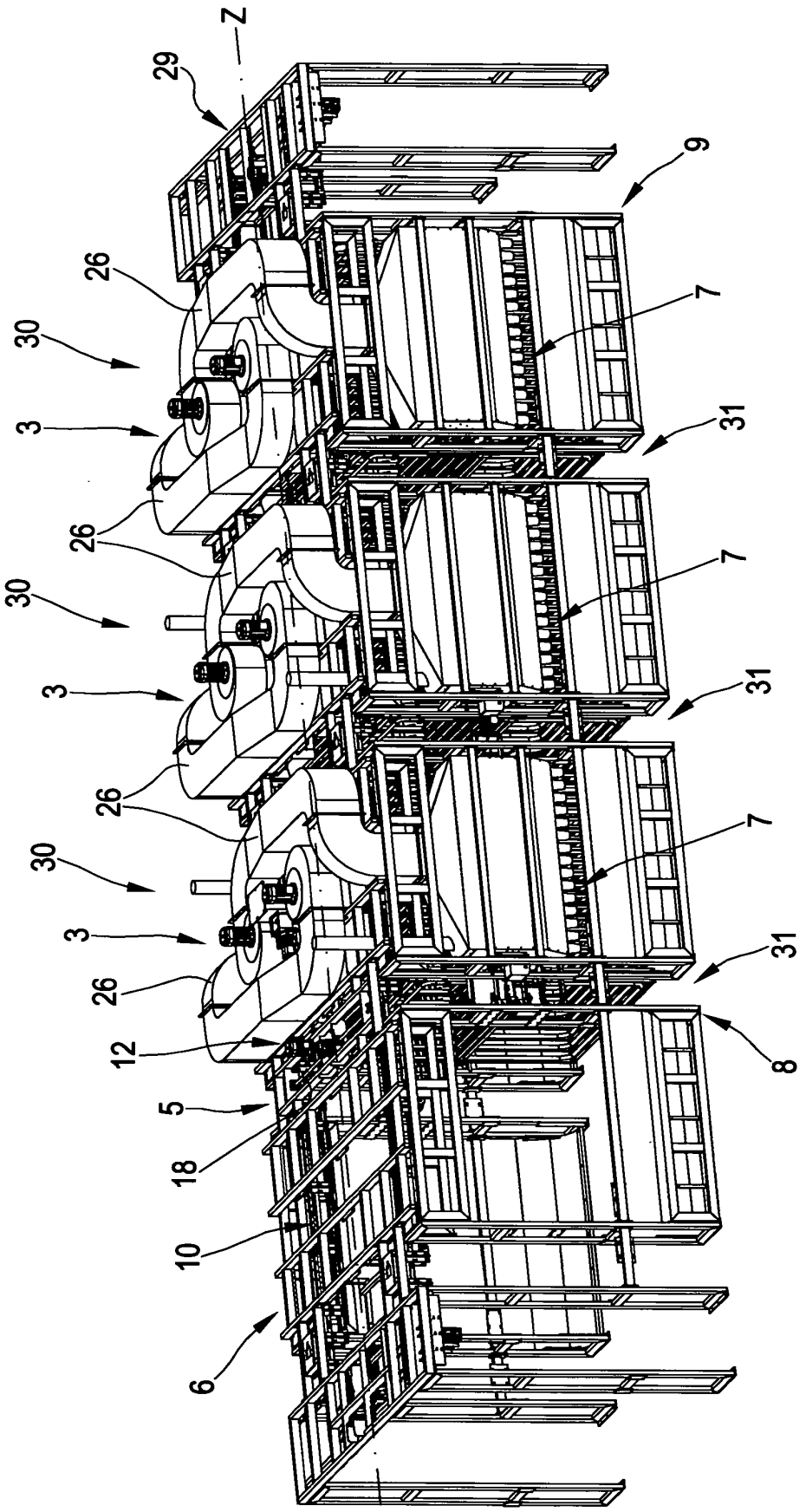

FIG.6

FIG.7a FIG.7b FIG.7c FIG.7e FIG.7d

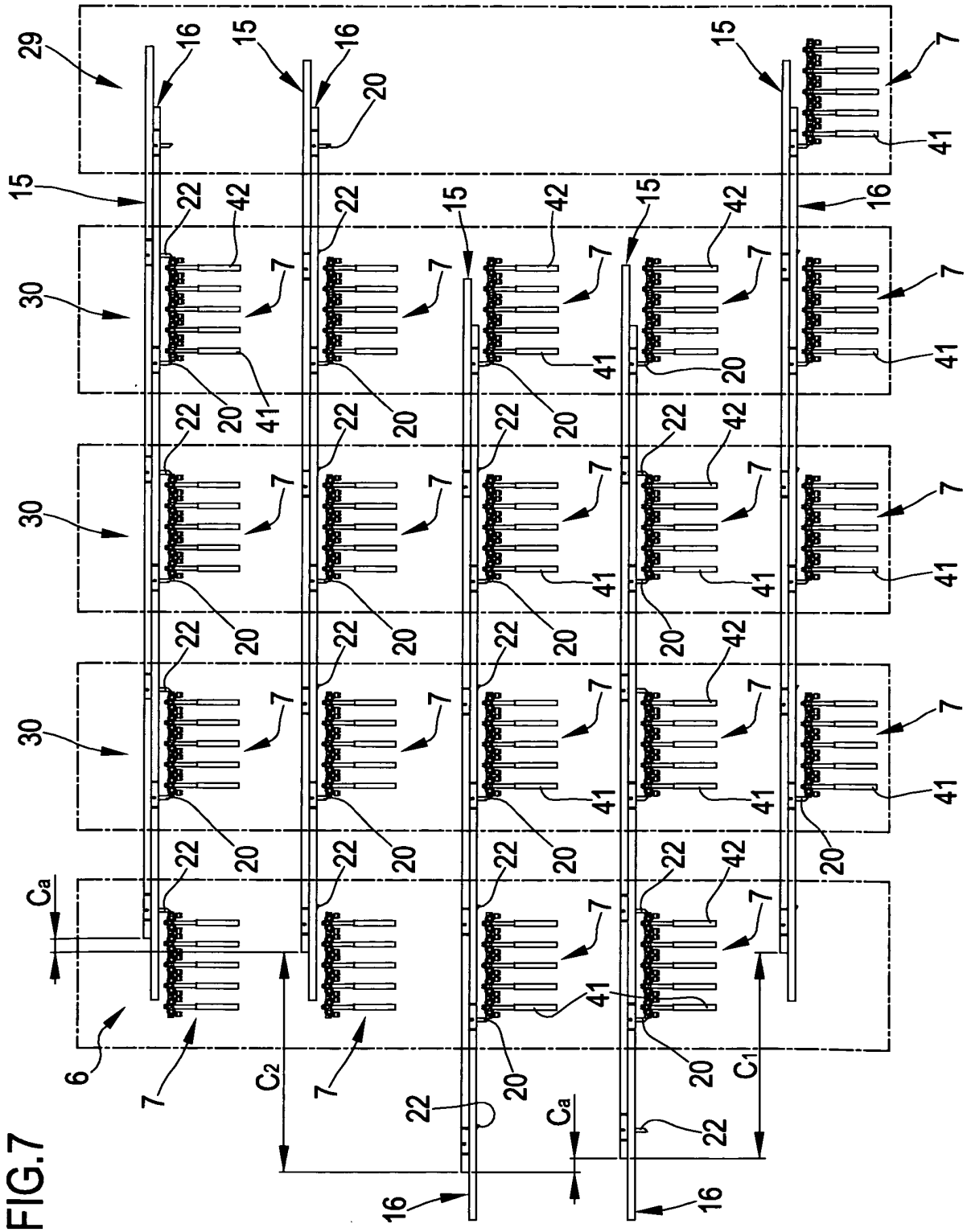

FIG.7

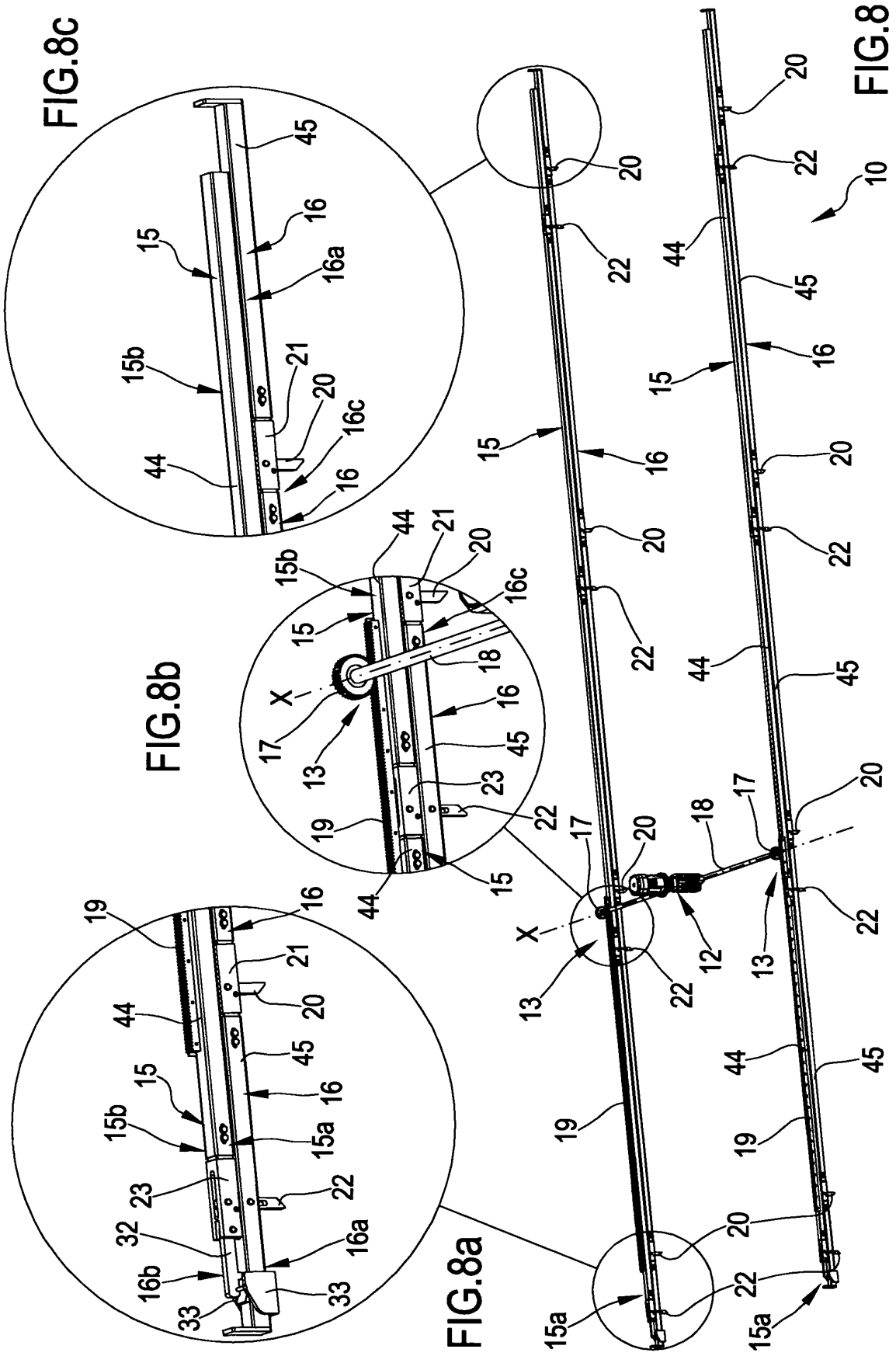
FIG.8
FIG.8a
FIG.8b
FIG.8c
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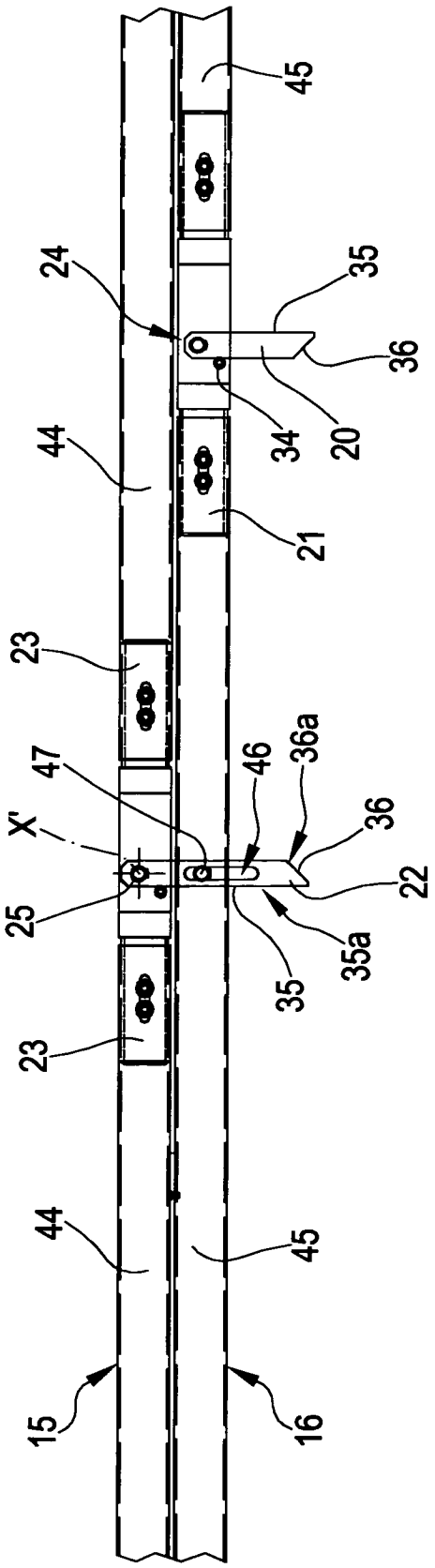
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16

FIG.9

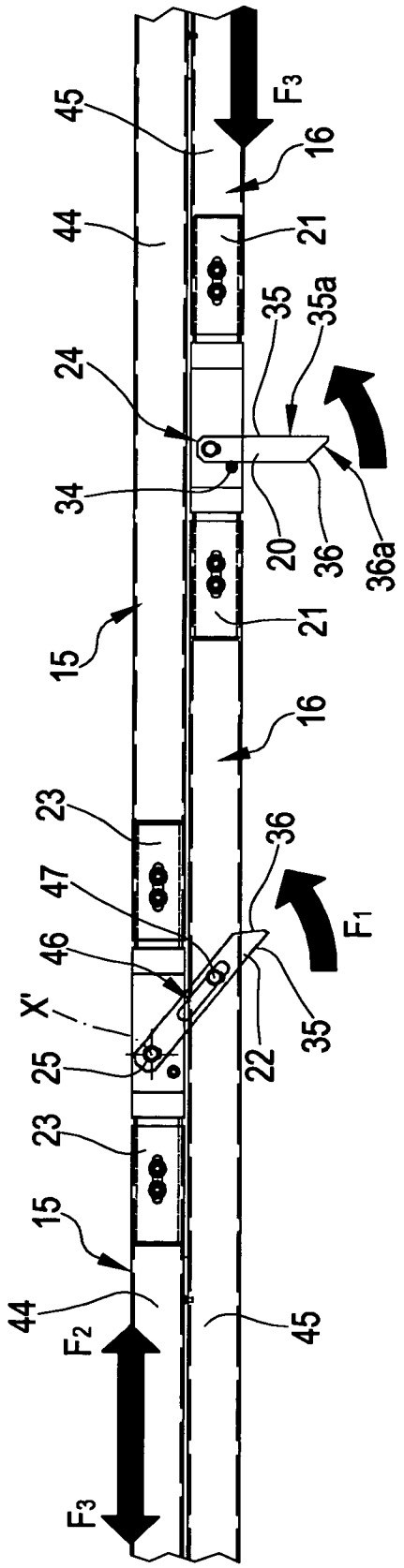
F3
45
16
44
21
35
35a
24
34
20
36
36a
15
21
16
23
36
47
F1
46
X'
35
22
25
23
15
44
F2
45
F3

FIG.10

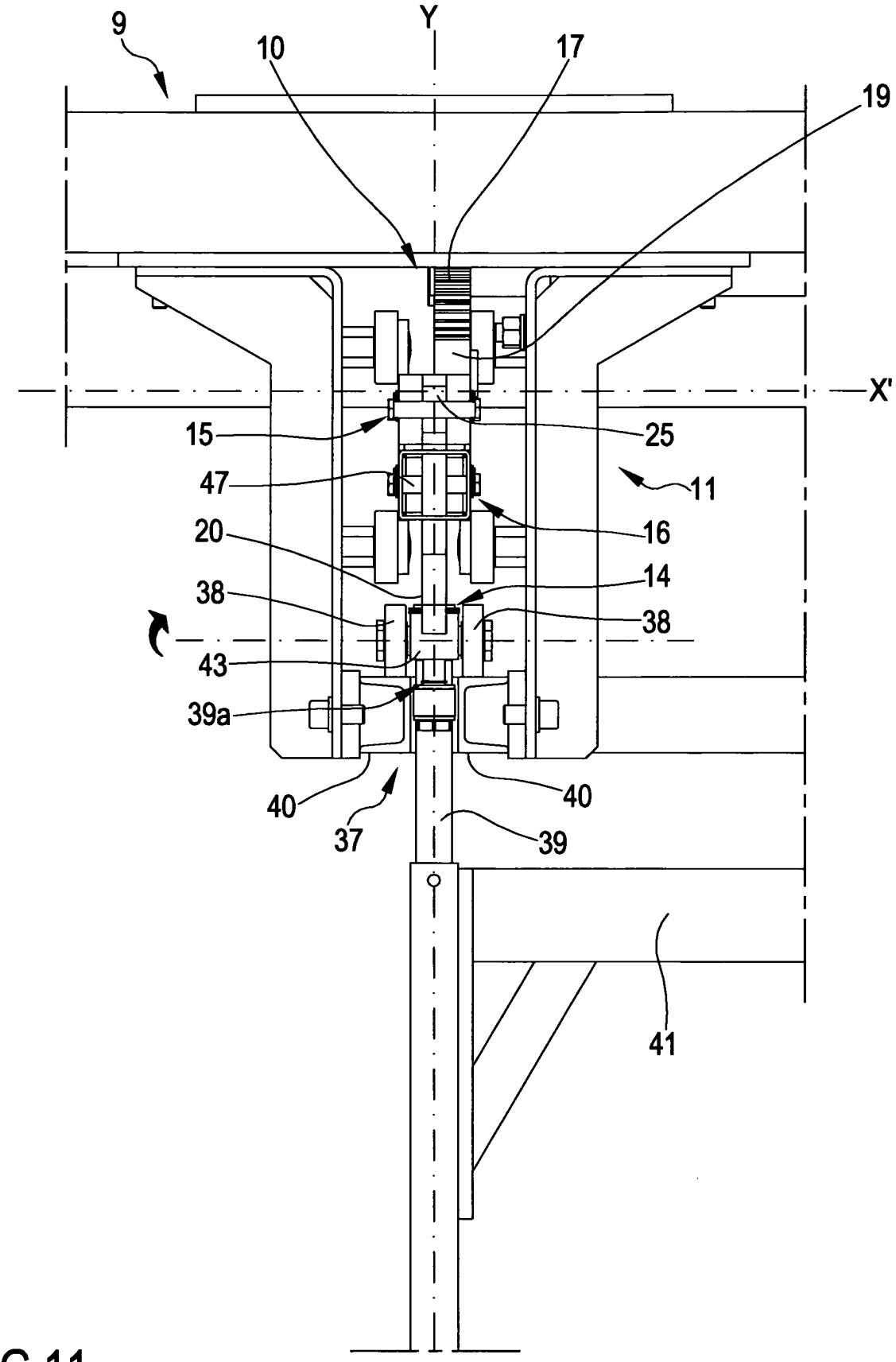

FIG.11

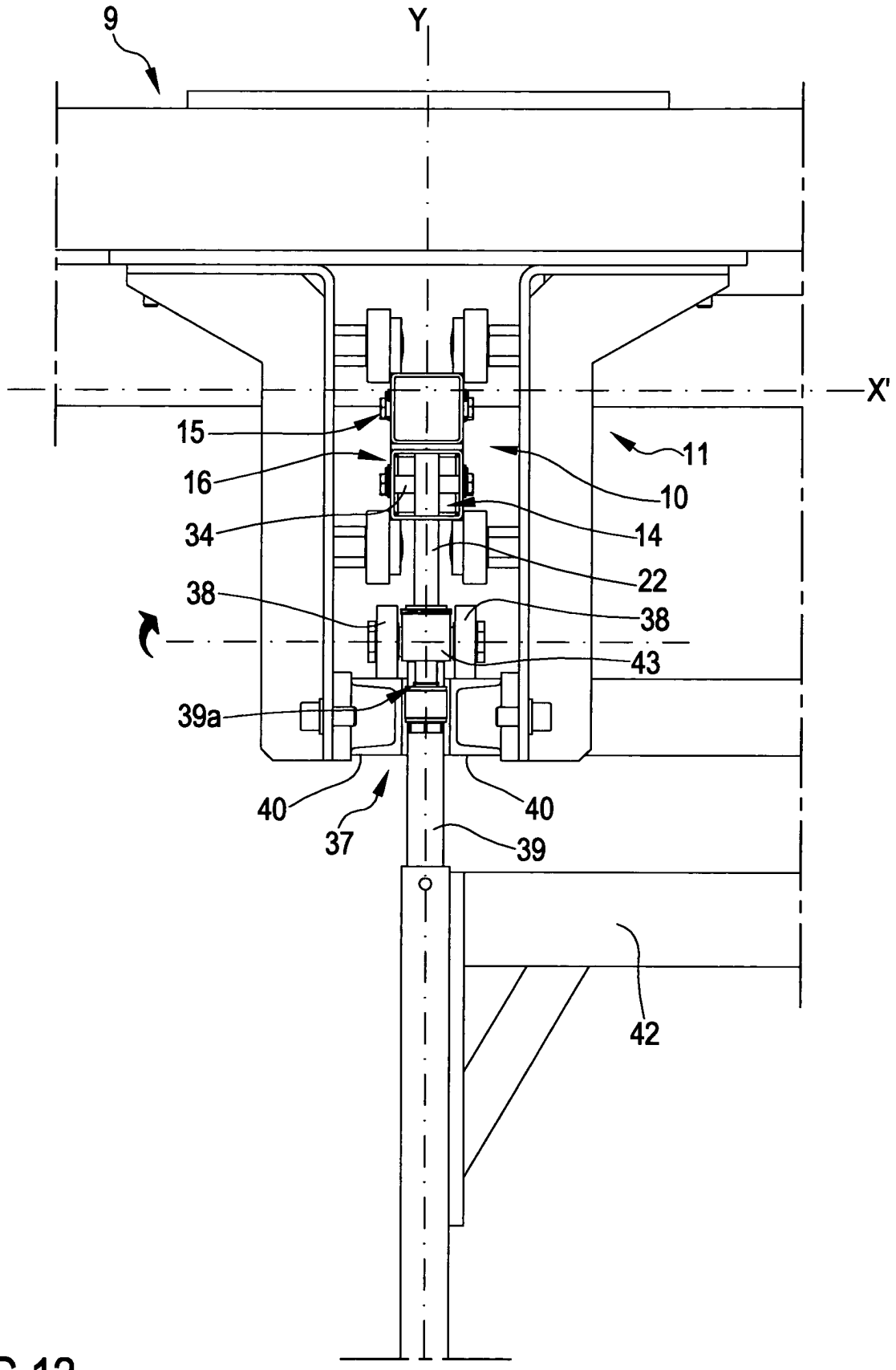

FIG.12

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- EP 1310572 A1 **[0004]**
- GB 2335438 A **[0004]**