(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 422 179 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.05.2004 Bulletin 2004/22

(51) Int Cl.[7]: **B65H 69/00**, B65H 55/00, B65H 61/00, D02H 3/00

(21) Application number: **03104265.8**

(22) Date of filing: **18.11.2003**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(30) Priority: **19.11.2002 IT UD20020242**

(71) Applicant: **Zamattio, Sergio**
33170 Pordenone (IT)

(72) Inventor: **Zamattio, Sergio**
33170 Pordenone (IT)

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

(54) Method and device to prepare a wound package of a succession of different yarns and package obtained with said method and device

(57) Method and device (10) to prepare a support (14) such as a cone, a spool or a bobbin for mixed yarns to be sent to subsequent treatments such as twisting, warping, weaving and knitting. The support (14) is formed by a succession of threads (16a-16f) different from each other in color, count, physical-mechanical characteristics, composition or nature. The device (10) comprises a plurality of feed cones (12a-12f) that feed the threads (16a-16f), a collection assembly (32) for the support (14), an electronic device (23) to calculate the meters wound on the support (14), a command and control unit which dialogs with the electronic device (23) and determines the moment for the change of thread (16a-16f) being fed to the support (14), a joining device (21) to join the end of one thread (16a-16f) entering and the end of one thread (16a-16f) exiting, and an introduction device (17) to feed the threads (16a-16f) that it feeds one at a time in sequence to the collection assembly (32).

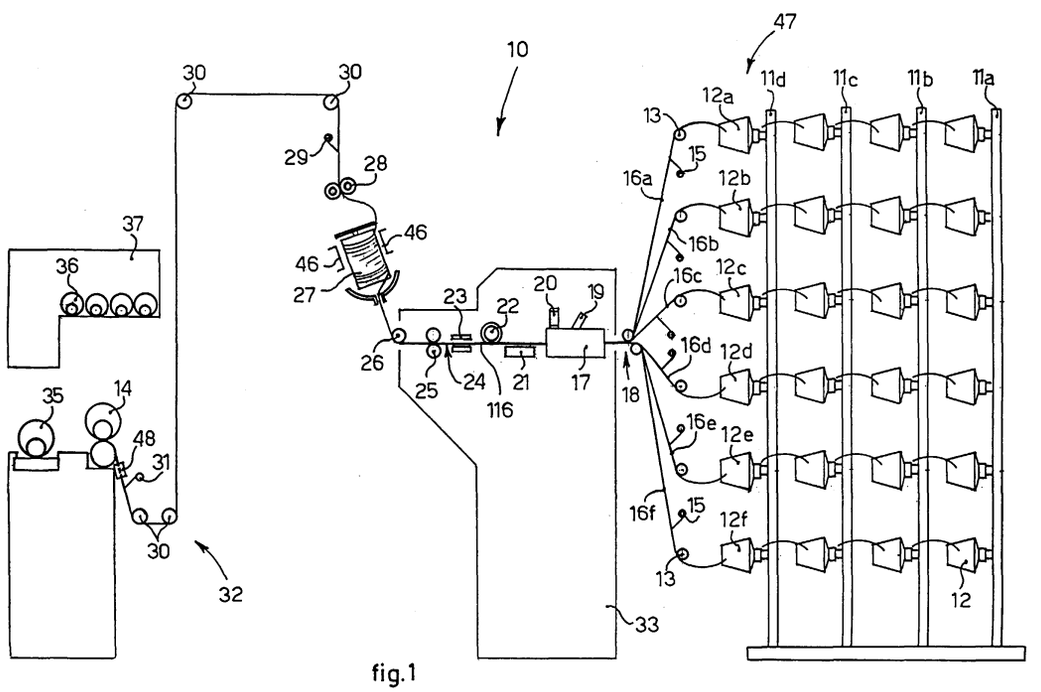

fig.1

EP 1 422 179 A2

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a method and the relative device to prepare wound supports for different and mixed yarns to be sent to subsequent treatments.

[0002] To be more exact, the invention concerns a method to prepare supports, such as cones, spools, bobbins or suchlike, to be sent to subsequent operations, particularly warping, weaving and knitting, wherein the content of each of said supports consists of a succession of threads, compatible with each other, which can however be different in color, count, physical-mechanical characteristics, composition, nature and otherwise.

[0003] The invention is applied for example in cases where, during the warping and weaving step and according to specific requirements of the final users, pieces of a limited size have to be prepared, either for samples or for the preparation of small quantities of fabric of particular value or with patterns and/or colors having deliberately limited characteristics.

[0004] The invention is also applied to prepare supports wherein two or more ends are wound, or even a single end to be sent to a doubling operation with subsequent twisting, wherein each of the threads to be twisted consists in turn of segments of thread with different characteristics, in order to obtain extremely varied and fancy combinations.

[0005] The invention is also applied for combined operations of reeling and/or doubling with several ends, in order to obtain wound bodies with several ends, which allows to load a lesser number of cones with several ends onto the creel of the warping machine, which in this case would be unwound à la déroulé, given the same number of warp threads to be obtained.

[0006] The invention also concerns the supports thus obtained.

BACKGROUND OF THE INVENTION

[0007] It is known that preparing for weaving provides at least a warping step wherein the threads are transferred from suitable spinning cops or from cones onto a beam or similar support, with which the loom is fed. The beam can contain several thousand threads which are normally compatible with each other.

[0008] Before being transferred onto the beam to be sent for weaving, the threads are subjected in sequence to a series of operations. To be more exact, the threads can be first doubled, that is, coupled in two or more ends in order to obtain a made-up piece to be sent to a double twisting machine and then twisted, so that the yarn obtained can be fed both as warp and weft to subsequent treatments.

[0009] The original threads can be single or twisted threads, of the same or different nature, synthetic, artificial, natural, also mixed, with the same or different count and/or color.

[0010] Subsequently, especially if they are intended for warping, the yarns can be subjected to a re-reeling operation, or rewinding, for example to perform a slub-catching operation in which the yarns are cleaned and made as far as possible free of defects and with a better appearance. The rewinding can also serve to halve the cones available and obtain cones with a defined measurement and sufficient in number for warping.

[0011] Then, the warp threads are collected, with the warping operation, on a single beam to be sent to the loom, using even a very high number of cones, up to 500 and more.

[0012] To perform this operation, the threads are first wound for subsequent deliveries onto a drum or reel of the warping machine, until the number of threads for the warp is reached, which can be several thousands. Then the threads, divided and separated into odd and even, are rewound onto the beam. The length of the warp can be a few tens of meters and can reach as much as 4-4,500 meters in the wool industry and up to 6,000 meters and more in the cotton industry.

[0013] When the pre-established warp length is reached, the reel of the warping machine is discharged in order to form the beam, and all the cones located on the feed creel are replaced, and there may be several hundreds of them. The warping machine is then prepared for a new warp by reloading onto the feed creel a new series of cones; the process then starts again with the same method in order to obtain a new warp beam also in the event that the new warp is totally identical to the previous one, except for example the color of the thread. This operation is very burdensome, especially when there are very limited warp lengths involved.

[0014] During weaving, the warp threads divided into odd and even are made to pass through suitable devices, known as "screens", which determine a respective and differentiated displacement thereof, in order to insert the weft thread between the odd and even threads; the order in which the warp threads are inserted into the screens and the succession of movement of the devices, together with the method in which the weft threads are inserted, determines the desired pattern of the fabric.

[0015] When the beam with the warp threads finishes, the fabric produced thus far is discharged and the finished beam is replaced by a new beam. If the new warp threads are compatible with the previous ones, and the setting of the loom is the same or similar, every thread of the finished beam is knotted to a corresponding thread of the new beam. This knotting operation is extremely delicate and must be performed by suitably trained personnel, also considering the extremely high number of threads to be knotted and the need to keep the succession of threads constant. It is also necessary to verify that the threads pass correctly through the rel-

ative devices, that there are no loose knots, and that therefore the loom can be restarted without risks of accidental stoppages and/or a decrease in quality of the product obtained.

[0016] With regard to the demand for more and more limited fabric lengths by market forces, or even for example to prepare samples, test pieces, particular patterns and/or colors, a considerable problem has been found deriving from the great incidence of changing operations in warping and of changing the beam on the loom, which can even require several hours, with a considerable decrease in the production performance of the warping machine and the weaving plant.

[0017] This incidence can entail a loss of production in the range of 20-25% of the possible yield of the warping machines and the weaving plant. Moreover, it entails a considerable use of manpower, both in warping and in weaving, and a great waste of material, both yarn and fabric, which at that stage of the production cycle has a very high value. This problem has been found particularly in the wool and cotton industries, but can easily be verified in other applications of the textile industry too.

[0018] Applicant has devised and embodied the present invention to overcome this problem and to reduce the incidence of the changing operations during warping and of the beam-change operations on the productivity of weaving plants, and also to obtain other advantages in other applications in the textile industry, for example in a doubling and twisting step, or in a warping step starting from wound bodies with several ends, or for the production of yarns intended for knitting.

SUMMARY OF THE INVENTION

[0019] The present invention is set forth and characterized in the main claims, while the dependent claims describe other innovative characteristics of the invention.

[0020] The purpose of the invention is to prepare supports such as cones, spools, bobbins or suchlike, to be sent to warping and weaving operations, already configured in such a manner as to allow the production of limited lengths without entailing frequent interruptions to change the support in the warping step, and to change the beam on the loom during weaving, thus preventing a consequent greater use of manpower and great waste of material.

[0021] Another purpose is to make the operations to combine the threads more efficient, such as doubling and twisting for threads intended for weaving and/or knitting or warping, starting from wound supports with several ends, also allowing greater flexibility and versatility in production.

[0022] The invention is applied particularly in steps of reeling or rewinding, doubling or coupling with two or more ends, and warping, with which the threads arriving from spinning, dyeing or other treatments are transferred from the cops or cones to a support, for example a beam, to be sent to feed the loom.

[0023] The reeling or rewinding operation can be necessary in order to halve, or divide, and size the cones, so as to obtain a number of cones sufficient to constitute a "delivery" with a number of warp threads that represents a sub-multiple of the overall number of threads provided for the warp.

[0024] The invention is also applied when the various threads with which pieces of limited length are to be made are identical or compatible with each other, and do not require particular modifications to the set-up of the weaving loom.

[0025] In accordance with this purpose, the invention provides that in a warping step, that is, in the preparation of at least one support on which the warp threads are loaded, the content of the support consists of a succession of compatible threads, which are however different in color, count, physical-mechanical characteristics, composition, nature or otherwise.

[0026] To be more exact, the invention provides to use a plurality of feed cones to form a support wherein the threads supplied by the individual cones, different from each other at least in one characteristic, are transferred in sequence according to a pre-established order and for a length corresponding to the length of the respective chain of their own warp.

[0027] According to the invention, each of the supports which is then fed in the warping process is produced in a previous step, called cone-warping; in this cone-warping step, a first thread fed from a first cone is wound onto the support for the length of its chain and, and at the end of the pre-established length, the feed from the first cone is interrupted, the thread of a second cone of a different thread is taken and knotted to the tail end of the previous thread, and then wound onto the support for a pre-established length equivalent to the length of its own chain. Then, the same thing is repeated with a third cone and so on for all the feed cones, relating to the various warps, which have been prepared.

[0028] When a first cycle to wind the threads onto the support has been carried out for all the cones, we return to the first cone and the cycle is repeated a second time for all the cones. This operation can be repeated "n" times, where "n" represents the number of "deliveries" needed to make the total warp threads.

[0029] The succession of various types of thread joined in sequence one to another, as they are taken from the individual specific feed cones, goes to form a single wound support which is formed by as many segments of chain as there are various types of thread joined in sequence one to the other, and for a series of times equivalent to the number of "deliveries" provided.

[0030] The number of cones that are produced in the cone-warping step depends on the warping specifications, the color ratio, the creel of the warping machine, and substantially the deliveries that are necessary to complete the number of warp threads required for that particular article.

[0031] The device that achieves the method described above comprises at least:

- a plurality of feed cones, each one carrying its own specific thread;
- a collection assembly, associated with a possible assembly to automatically lift the support produced;
- a possible waxing device for the production of yarns intended for knitting, stocking knitting or similar treatments;
- an electronic device to calculate the meters actually wound on the support being produced, which can be associated with an optical or capacitive electronic slub-catcher of a known type;
- a command and control unit which dialogs with said electronic device, which determines the moment to change the thread being fed when the desired length has been reached, and which establishes the change of the support when the end of the winding program has been reached;
- a joining device to join the end of the entering thread and the end of the exiting thread; and
- an introduction device to feed the threads.

[0032] The introduction device comprises at least:

- a feed device for each collection assembly, suitable to contain a variable number of cones, for example from 1 to 8 and more. The number of feed cones, each of which relating to a specific warp, is defined as a function of the average length of the warp chain and the characteristics of the looms;
- a device to retain the ends of the individual cones on stand-by;
- a device that retains the thread being worked at the moment of change-over with the entering thread;
- a device that frees the entering end of the cone being worked, in the set order and for the pre-determined length;
- a device that introduces the thread being worked and finished into the joining device simultaneously with a device that picks up the end of the entering thread and introduces it into the joining device, so as to connect the entering end of the cone with the tail end of the finishing cone.

[0033] According to a variant, there is also a device that, at the end of each of the "n" cycles of thread wound onto the support, and at the end of winding the last thread programmed, knots to the latter a false thread which later will be eliminated at the end of every delivery, and during the loading of the warping machine; this device provides the possibility of bringing all the threads to the same starting point.

[0034] According to another variant, there is also a device able to automatically wind onto the new cone a false thread to which the first of the threads provided by the program in progress will be joined; the length of each thread being worked will start to be counted from this join.

[0035] According to another variant, the support on which the chains of threads are wound is able to contain a magnetic, electronic or mixed identification element, such as a magnetic band, a bar code, a chip or other similar or comparable means, suitable to memorize all the significant data of the yarns wound, the progressive number of the support and the possible numbering concerning the warp sequence, all data supplied by the information system of the cone-warping unit.

[0036] From the above description, it can be seen that the invention allows to prepare one or more supports consisting of a series of segments of thread all joined together, each series in turn consisting of the join of a series of different segments of thread, each of which consists of the thread corresponding to each individual warp whose length is equal to that of the relative chain.

[0037] The number of supports that are obtained depends on the number of total threads of the warp, the pattern of the warp, the creel of the warping machine, the number of "deliveries" set. Each support contains a quantity of yarn necessary to obtain each individual warp; the length of the thread will be equal to the sum of the length of the individual chains multiplied by the number of "deliveries".

[0038] The whole of the supports constituting a "delivery", multiplied by the number of "deliveries" provided, allows to obtain the number of total threads of the warp to be produced. The warping machine will have to be set to wind a series of "deliveries", the length of which will be equal to the sum of the length of the individual warps, just as they have been wound onto the supports called warp-cones.

[0039] When the "first delivery", consisting of the first segment of thread, in turn consisting of the sum of all the segments of the various warps, has been wound onto the reel of the warping machine, the first delivery is cut, the end of the "second delivery" is knotted to the reel, the reel is re-started and the "second delivery", also consisting of the sum of all the segments of the various warps, is wound. The cycle is then repeated to the last "delivery". The winding of the individual "deliveries" onto the reel of the warping machine allows to obtain a series of layers, each of which will consist of a specific warp and will correspond to a portion of the total warp.

[0040] In this way, it is possible to load the creel of the warping machine once only, a single beam can be produced, a single beam can be loaded onto the loom and a single piece can thus be produced, consisting of the sum of all the individual pieces, possibly changing only the weft threads, each for its own warp, and subsequently dividing the various fabrics thus obtained at the most suitable moment of the subsequent working cycle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] These and other characteristics of the present

invention will become clear from the following description of a preferential form of embodiment, given as a non-restrictive example, with reference to the attached drawings wherein:

- fig. 1 is a lateral view of a device to prepare supports for yarns according to the invention;
- fig. 2 is a front view of the device in fig. 1;
- fig. 3 shows a detail of the device that introduces the threads, as used in the device in fig. 1.

DESCRIPTION OF THE DRAWINGS

[0042] With reference to the attached figures, a device to prepare supports for yarns, called "cone-warping head", is indicated in its entirety by the reference number 10.

[0043] The device 10 comprises a feed device 47 consisting of a plurality of feed creels, in this case four and indicated respectively by 11a, 11b, 11c and 11d, on each of which a plurality of feed cones 12, respectively 12a-12f are mounted, in order to feed the thread. The creels 11a-11d are suitable for the head-to-tail connection of the feed cones 12; on every cone 12 a thread is wound, coming from spinning or dyeing operations and relating to a specific warp.

[0044] The device 10 serves to form a support 14, called warp-cone, associated with a collection assembly 32 and formed by a succession of threads supplied by the individual cones 12a-12f and compatible with each other, although different in at least one of the physical-mechanical characteristics, the color, the count, or otherwise. The collection assembly 32 and the feed and preparation device 47 constitute the device or unit of the cone-warping head 10.

[0045] The threads 16a-16f emerging from the respective cones 12a-12f pass through a tensioning device 13 which regulates the tension thereof and a thread-feeler 15 which stops the cone-warping head 10 should the thread being fed be lacking.

[0046] Then, the threads 16 are sent to a feed bar 18 which centers them with respect to the axis of a feed introduction device 17. The introduction device 17, which will be described in more detail later, allows to feed the individual thread 16, as supplied by a specific cone 12 working at that moment, and to arrange the other threads 16 to replace the one working at the moment the warp is replaced, according to the pre-established program.

[0047] The introduction device 17 comprises in this case at least a compressed air ejector 19, the function of which is to facilitate the feed of the entering thread 16, and a holding/release device 20, which holds the threads 16 on stand-by and lets the working thread 16 pass, according to the sequence set in the program.

[0048] The introduction device 17, together with the assemblies associated therewith, is mounted on a structure 33 inside which can be contained, in a substantially known manner, the motor for the device 17, a ventilator/aspirator to treat the threads, and in general all the automatisms for the functioning of the device and the relative assemblies; to be more exact, there is an electronic part which dialogs with the other functions of the machine and the program that has been set.

[0049] Downstream of the introduction device 17 there is a thread-joining assembly 21 which can be of any known type, for example of the splicer type using air, a joiner for making a fisherman's knot or a weaver's knot, or other suitable type. The thread-joining assembly 21 is also suitable to be easily replaced according to the characteristics of the threads.

[0050] The thread 116, consisting of the join of the threads, for example 16a + 16b, and emerging from the thread-joining assembly 21, then passes in sequence through a centering assembly 22, an electronic device 23 to count the meters of thread that has passed through, and to control the quality of the join, and an outlet thread-feeler 24 which stops the cone-warping head when there is no thread downstream of the introduction device 17.

[0051] The electronic device 23 can also be associated with an electronic slub-catcher, which can be of any known type, to control the quality of the threads being worked.

[0052] Downstream of the thread-feeler 24 there is a drawing assembly 25 which removes the thread 16 being worked from the relative feed creel 11a-11d with which a braking device 26 is associated, suitable to block the thread at the moment of join.

[0053] The device 10 also comprises, downstream of the braking device 26, a supercharge assembly 27, which allows to accumulate a reserve of thread during the normal unwinding step, which is fed to the collection assembly 32 where the warp-cone 14 is formed when the threads are joined. During normal unwinding, the assembly 27 makes possible to not stop the collection assembly downstream, which allows to considerably increase the performance of the device 10, particularly but not only when working warps of a limited length.

[0054] The supercharge assembly 27 is associated with relative photoelectric cells 46 which allow to control the quantity of thread present as a reserve in the assembly 27 in order to command, for example, the collection assembly 32 to slow down, and even stop if necessary, or to increase the feed speed, or again to stop the cone-warping head in the event that the thread being fed goes missing.

[0055] Downstream of the supercharge assembly 27 there is an unwinding assembly 28 which picks up the thread and is associated with a relative thread-feeler 29.

[0056] The thread being worked then passes through diversion bars 30 which allow to define the best path to manage and control the functioning by an operator.

[0057] Then the thread goes to be wound on the warp-cone 14, upstream of which in this case there are a waxing assembly 48, suitable for the production of yarns in-

tended for knitting, and another thread-feeler 31.

[0058] The warp-cone 14 is associated with a cone-discharge belt 35 to discharge the completed cone in cooperation with a lifting trolley 37 which provides to remove the finished warp-cone and to feed a new cop 36 onto the collection assembly 32.

[0059] With reference to fig. 3, the structure and functioning of the feed introduction device 17 is described in more detail.

[0060] The device 17 comprises a box-like supporting structure 38 in which there are the insertion paths for the various threads 16 arriving from the respective cones 12 and relating to the warps to be produced. On every path, and hence for every thread, a holding/release device 20 is inserted. Moreover, on every path there is also a compressed air ejector 19 which can facilitate the introduction of the thread 16 being worked into the path.

[0061] The threads that can be used are indicated in fig. 3 by the numbers 16a, 16b, 16c, 16d, 16e; on the contrary, 16f indicates a false thread which can be inserted either for every delivery change, or at the end (and hence at the beginning) of every warp-cone 14.

[0062] At outlet from the structure 38, for every thread 16, there are cutting devices 45 which enter into action when the machine is set up, in order to eliminate any residual threads.

[0063] The threads 16 are taken to the centering bar 18 which serves to keep all the threads 16 in axis, both the thread being worked and also those on stand-by.

[0064] From the centering bar the threads 16 pass into the thread-joining assembly 21 which, as we said, connects and knots the different threads to each other. The thread-joining assembly 21 is associated with guides 40 which allow to facilitate the introduction of the threads into the thread-joining assembly 21 itself.

[0065] For every thread 16 the thread-joining assembly 21 comprises a so-called thread-presenter device 41 which, in cooperation with a movable gripper 44, has the function of preparing the joining of the various threads which will make up the warp-cone 14.

[0066] The thread-presenter device 41 and the gripper 44 function as follows.

[0067] Each thread-presenter device 41, which is arranged so as to allow the relative thread 16 to slide above the thread-joining assembly 21, consists of two rings 42 mounted on a support 43 which, at the moment of joining, is lowered, inserting the respective thread 16 into the thread-joining assembly 21.

[0068] The thread 16 slides inside the rings 42 and a stop and release device, not shown here, acts on the thread 16; each ring 42 is suitable to open and close in order to allow the relative thread 16 to be introduced.

[0069] Fig. 3 shows the case wherein the thread 16a is being worked and the thread 16b is waiting to be joined to the thread 16a. When the management program signals that it is necessary to change the thread, the thread 16a being worked stops sliding, the thread-presenter device 41 and hence the rings 42 that contain the threads 16a and 16b are lowered, thus introducing the ends of the threads into the thread-joining assembly 21, and the latter performs the join. A suitable cutting device cuts the thread 16a in correspondence with the inlet to the thread-joining assembly 21.

[0070] The device to stop the thread on the feed side clamps the end of the thread 16a before cutting, while the two thread-presenter devices 41 move to the initial position. Then, the devices to stop and release the thread open in correspondence with the thread 16b, and thus the unwinding of the thread 116, consisting of the joined threads 16a and 16b, can start again.

[0071] The movable gripper 44 then picks up the thread 16a from the feed, and presents it to the other side of the thread-presenter device 41, whose guide rings 42 open to allow the entrance of the thread 16a which is immediately clamped by the relative stop devices, arranged inside the rings 42.

[0072] In this situation, the collection can continue with the thread 16b while the thread 16a remains on stand-by.

[0073] The other threads from 16c to 16e all remain on stand-by inside the respective thread-presenter devices 41.

[0074] When the management program signals that it is necessary to change the thread again, the procedure described above is repeated for the thread 16b and the thread 16c, or other thread to be joined according to the program that has been set, and so on with every thread-change.

[0075] The introduction device 17 follows the cycle of operations laid down for the thread-change, during which the relative holding/release device 20 releases the thread at that moment being worked, and clamps the threads on stand-by.

Example 1

[0076] We shall now see an example of how a warp-cone 14 is formed according to the method and with the device as described heretofore.

[0077] Let us suppose that we have to produce some warps that belong to the same article and have the number of total threads, the count and the characteristics of the thread in common; the warps are different only in the color of the threads and in the length of the chain.

[0078] With the traditional method it would have been necessary to produce during the warping step as many beams as there were warps needed; for each warp it would therefore have been necessary to perform all the operations explained above: loading-unloading the creel, loading-unloading the reels from the warping machine, loading the beams, knotting, stopping and restarting the loom, etc.

[0079] With the method and device as described above, a series of threads 16a-16f, joined together, consisting of different segments of thread, are wound on the

warp-cone 14. Each segment consists of the thread corresponding to each individual warp, the length of which is equal to that of the corresponding chain.

[0080] Let us suppose, for example, that we have to produce a determinate article whose warp provides a total number of threads equal to 3960, wherein there are 330 positions of the creel available and the yarn has a count of Nm 2/40. The warps to be produced are characterized, for example, by the following chain lengths: 400 m of blue, 600 m of green, 500 m of red, 700 m of brown, 550 m of ochre, 850 m of gold and 800 m of coffee color, for a total length of 4,400 m warp.

[0081] The number of deliveries is obtained by dividing the total number of threads by the cone-bearing positions of the creel (3960 threads / 330 positions = 12 "deliveries").

[0082] The thread to be wound with the method according to the invention provides that the thread to be wound in each of the warp-cones 14 consists of segments of yarn with a length equal to that of the respective chains. In other words, each warp-cone 14 in this example will comprise a first segment consisting of a segment of blue thread 16 measuring 400 m, joined to a second green segment measuring 600 m, a third red segment measuring 500 m, a fourth brown segment measuring 700 m, a fifth ochre segment measuring 550 m, a sixth gold segment measuring 850 m and a seventh coffee-colored segment measuring 800 m, each one taken from a relative cone 12. Each segment consisting of the join of the seven segments is 4,400 m long. For the second segment, the first thread of the second blue segment will be joined to the last coffee-colored thread, and this sequence of seven segments will be repeated for all the 12 deliveries required.

[0083] The total length of the yarn wound onto the warp-cone will be 4,400 x 12 = 52,800 m.

[0084] In this way, each warp-cone produced contains a length of yarn, for each of the types of yarn, equal to the length of each warp required, multiplied by the number of deliveries, so as to obtain, at the end of the 12 deliveries provided, the total number of threads required.

[0085] It is obvious that, with the present invention, both the warping step and the weaving step have a considerable advantage, from programming the preparation of the warping of all the various articles, obtaining high performance of the plant, with savings in both direct and auxiliary manpower such as the staff responsible for loading the looms and for knotting, a greater and better allocation of the looms per weaver and a greater production of the whole weaving process.

Example 2

[0086] In the production of doubled yarns, as already said, it is possible to couple two or more threads each of which is formed by segments of thread arriving from the cones used for feeding. For example, to feed four threads with a count of Nm 1/40, respectively black, red, azure and white, according to the present invention, we can act as follows: we start by working an end of black thread and a red one, we continue doubling, for example, for 500 m, then the black end is stopped and the introduction device 17 lets the white thread start, which will be knotted to the tail end of the black end, and doubling is continued for another 500 m; then the red end is stopped, and the device 17 lets the azure end start, which will be knotted to the red end, and doubling is continued for another 500 m; therefore, we shall have a white end and an azure end being worked.

[0087] Subsequently we can stop the white end and the device 17 lets the red thread start for another 500 m. In this way all the possible combinations can be obtained which the textile designer or stylist can invent. At the end of the doubling operation we shall obtain a cone suitable for twisting, where the final result is a yarn wherein the combination of colors can be extremely varied and fancy. The yarn thus obtained can also be used to great advantage in knitting, where fancy yarns are much appreciated. This advantage also applies in the case where the wound support contains a single end obtained from the programmed join of diverse and different segments of yarn, and can be employed in knitwear, waxed, without further treatments. Another advantage of the invention is that it is possible to obtain a wound support with one end as described above and be coupled with another yarn of different nature and characteristics in a subsequent doubling step.

[0088] It is obvious that the example of four colors shown above is in no way restrictive, since the invention allows to couple an extremely high number of threads of even very different color and nature, of natural, artificial and synthetic fibers, with the most diverse characteristics.

Example 3

[0089] The invention also allows to obtain a wound support with two or more ends, as described in Example 2, wherein each of the ends is obtained as described in Example 1. This allows to use warp-cones 14 with several ends to great advantage in the creel that feeds the warping machine, in a number proportionally lower than the number of ends present in the warp-cone 14, in order to obtain an equal number of total threads in the warp itself. In this case, the wound supports with several ends would be unwound onto the creel of the warping machine a la déroulée.

[0090] This requires that the creel is prepared with support and containing means suitable to contain the warp-cones 14 with several ends and commanded by an appropriate variable speed drive, like an inverter, associated with means to detect the tension of the yarn being unwound, in order to allow the warp-cones 14 to rotate on their own axis and thus unwind the individual ends à la déroulée in a regular and uniform manner.

Claims

1. Method to prepare a support (14) such as a cone, a spool, or a bobbin for mixed yarns to be sent to subsequent treatments such as twisting, warping, weaving and knitting, **characterized in that** said support (14) is formed by a succession of threads (16a-16f) different from each other in color, count, physical-mechanical characteristics, composition or nature.

2. Method as in claim 1, **characterized in that** threads (16a-16f) supplied from individual cones (12a-12f) are wound onto said support (14), wherein said threads (16a-16f) are transferred in sequence onto the support (14) joined together according to a pre-determined order and on each occasion for a length corresponding to the respective length of the chain of their own warp.

3. Method as in claim 2, **characterized in that** said support (14) is produced starting from a plurality of threads (16a-16f), wherein a first thread (16a) fed from a first cone (12a) is wound onto the support (14) for the length of its own chain and, at the end of the pre-determined length of chain, the unwinding of said first cone (12a) is interrupted, the thread (16b) of a second cone (12b), relating to a different chain, is picked up and knotted to the tail end of the previous thread (16a), to then be wound onto said support (14) for a pre-determined length, and so on then for a third cone (12c), also relating to yet another different chain, and so on for all the cones (12) that have been prepared.

4. Method as in claim 3, **characterized in that**, when a first winding cycle has been performed for all said cones (12a-12f), there is a return to the first cone (12a) and the cycle is repeated a second time for all said cones (12a-12f), this operation being repeated for a desired number of times.

5. Method as in any claim hereinbefore, **characterized in that**, for the warping operation, it provides to produce a number of said supports (14) which is a function at least of the number of deliveries necessary to complete the number of warp threads required for a particular article.

6. Method as in any claim hereinbefore, **characterized in that**, when said supports (14) have to be sent to a doubling operation and hence to a twisting operation, each of the threads (16a-16f) to be coupled and then twisted, wound on a relative support (14), consists in turn of segments of thread with different characteristics in order to obtain extremely varied and fancy combinations.

7. Method as in any claim hereinbefore, **characterized in that** two or more ends of equal threads are wound simultaneously onto said supports (14), each of which threads is formed by a series of threads (116), each of which is in turn formed by different segments of threads (16a-16f).

8. Method as in claim 7, **characterized in that** said supports (14) with several ends are fed onto the creel of the warping machine in a number proportionally lower than the number of wound ends, in order to obtain the same number of total threads of the warp required.

9. Method as in claims 7 and 8, **characterized in that** the creel of the warping machine is equipped with support and containing means to support and contain said supports (14) with one or more ends, said support and containing means being associated with variable speed drive means to cooperate with means to detect the tension of the thread being unwound, in order to allow the supports with several ends to rotate on their own axis and to unwind the thread à la déroulée in a regular and uniform manner.

10. Method as in claim 6, **characterized in that** the supports with two or more ends have the individual ends different from each other, each of which is formed by a series of threads (116), each of which is in turn formed by different segments of thread (16a-16f), so as to obtain extremely varied and fancy combinations of threads in the twisting operations.

11. Method as in any claim hereinbefore, **characterized in that**, when the production of said supports (14) is intended for knitting, stocking knitting and/or similar treatments, the thread (116), consisting of a series of diverse and different segments of threads (16a-16f), joined together in a pre-determined manner, is subjected to at least a waxing operation.

12. Device to prepare supports (14) for mixed yarns to be sent to subsequent treatments such as warping or weaving, **characterized in that** it comprises at least:

    - a plurality of feed cones (12a-12f) each one able to feed a respective thread (16a-16f), said threads (16a-16f) being different from each other in color, count, physical-mechanical characteristics, composition or nature;
    - a collection assembly (32) for at least one support (14);
    - an electronic device (23) to calculate the meters wound on said at least one support (14);
    - a command and control unit able to dialog with

said electronic device (23) and to determine the moment for the change of thread (16a-16f) being fed to said support (14) when the suitable length has been reached;

- a joining device (21) to join together the end of one thread (16a-16f) entering and the end of one thread (16a-16f) exiting; and
- an introduction device (17) to feed the threads able to feed the threads (16a-16f) one at a time in sequence to said collection assembly (32).

13. Device as in claim 12, **characterized in that** said introduction device (17) comprises at least:

- a feed device suitable to cooperate with a plurality of said cones (12a-12f),
- a holding/release device (20) to hold/release the ends of the threads (16a-16f) supplied from the individual stand-by cones (12a-12f);
- a device that retains the thread (16a-16f) being worked at the moment the entering thread is changed;
- a device that frees the entering end of the cone being worked in the set order and for the predetermined length;
- a device (19) that introduces the thread being worked (16a-16f) and finished into the joining device (21) simultaneously with a device that picks up the end of the entering thread and introduces it into the joining device (21), so as to connect the entering end of the cone with the tail end of the finishing cone.

14. Device as in claim 12 or 13, **characterized in that** it also comprises a device which, at the end of each of the desired cycles of thread wound onto said at least one support (14), and at the end of the winding of the last thread programmed, knots to said last thread a false thread (16f) which will subsequently be eliminated at the end of every delivery, and during the loading of the warping machine.

15. Device as in any claim from 12 to 14 inclusive, **characterized in that** it also comprises a device able to automatically wind onto a new support (14) a false thread (16f) to which will be knotted the first (16a) of the programmed threads being worked, from the join of which the counting of the length of each thread being worked will be started.

16. Device as in any claim from 12 to 15 inclusive, **characterized in that** it comprises means to apply on each of said supports (14) a magnetic, electronic or mixed identification element, such as a magnetic band, a bar code, a chip or other similar or comparable means, suitable to memorize all the significant data of the wound threads, the progressive number of the support and the possible numbering concerning the warp sequence.

17. Device as in claim 12, **characterized in that** said collection assembly (32) is associated with an automatic lifting assembly (37) when the cone has been produced.

18. Device as in claim 12, **characterized in that** said electronic control unit is able to establish the change of support (14) when the end of the winding program has been reached.

19. Device as in claim 12, **characterized in that** said introduction device (17) comprises, for every one of said threads (16a-16f), means to deliver compressed air (19) with the function of facilitating the feed of the relative entering thread (16a-16f), and a holding/release device (20) to retain the threads (16a-16f) on stand-by and let pass the thread being worked.

20. Device as in claim 12, **characterized in that** said joining device (21) to join the threads is of the splicer type using air, or for a fisherman's knot or weaver's knot.

21. Device as in any claim from 12 to 20 inclusive, **characterized in that** it also comprises a supercharge assembly (27) able to accumulate a reserve of thread during the normal unwinding step, which is fed to said collection assembly (32) where said support (14) is formed at the moment when said threads (16a-16f) are joined.

22. Device as in claim 21, **characterized in that** said supercharge assembly (27) is associated with photoelectric cells (46) able to control the quantity of yarn present as a reserve in order to command said collection assembly (32) to slow down or increase the feed speed, or also to stop the cone-warping head in the event that the thread being fed should be lacking.

23. Device as in any claim from 12 to 22 inclusive, **characterized in that** said joining device (21) comprises, for every thread (16a-16f), at least a thread-presenter device (41) and movable gripping means (44), with the function of preparing for joining the various threads (16a-16f) that will make up said support (14).

24. Device as in claim 23, **characterized in that** said thread-presenter device (41) is able to allow the relative thread (16a-16f) to slide above said joining device (21), and consists of at least two rings (42) mounted on a support (43) able to be lowered, at the moment of join, in order to insert the respective thread (16a-16f) into the joining device (21).

25. Device as in claim 24, **characterized in that** each of said rings (42) is able to open and close in order to allow the relative thread (16a-16f) to be introduced.

26. Device as in claim 12, **characterized in that** it comprises at least a waxing device (48) for the production of yarns intended for knitting.

27. Support for wound yarns, such as a cone, a spool or a bobbin, **characterized in that** it comprises a succession of threads (16a-16f) different from each other in color, count, physical-mechanical characteristics, composition or nature.

28. Support as in claim 27, **characterized in that** said threads (16a-16f) are wound in sequence and joined together according to a pre-established order and on each occasion for a length corresponding to the respective length of the chain of their own warp.

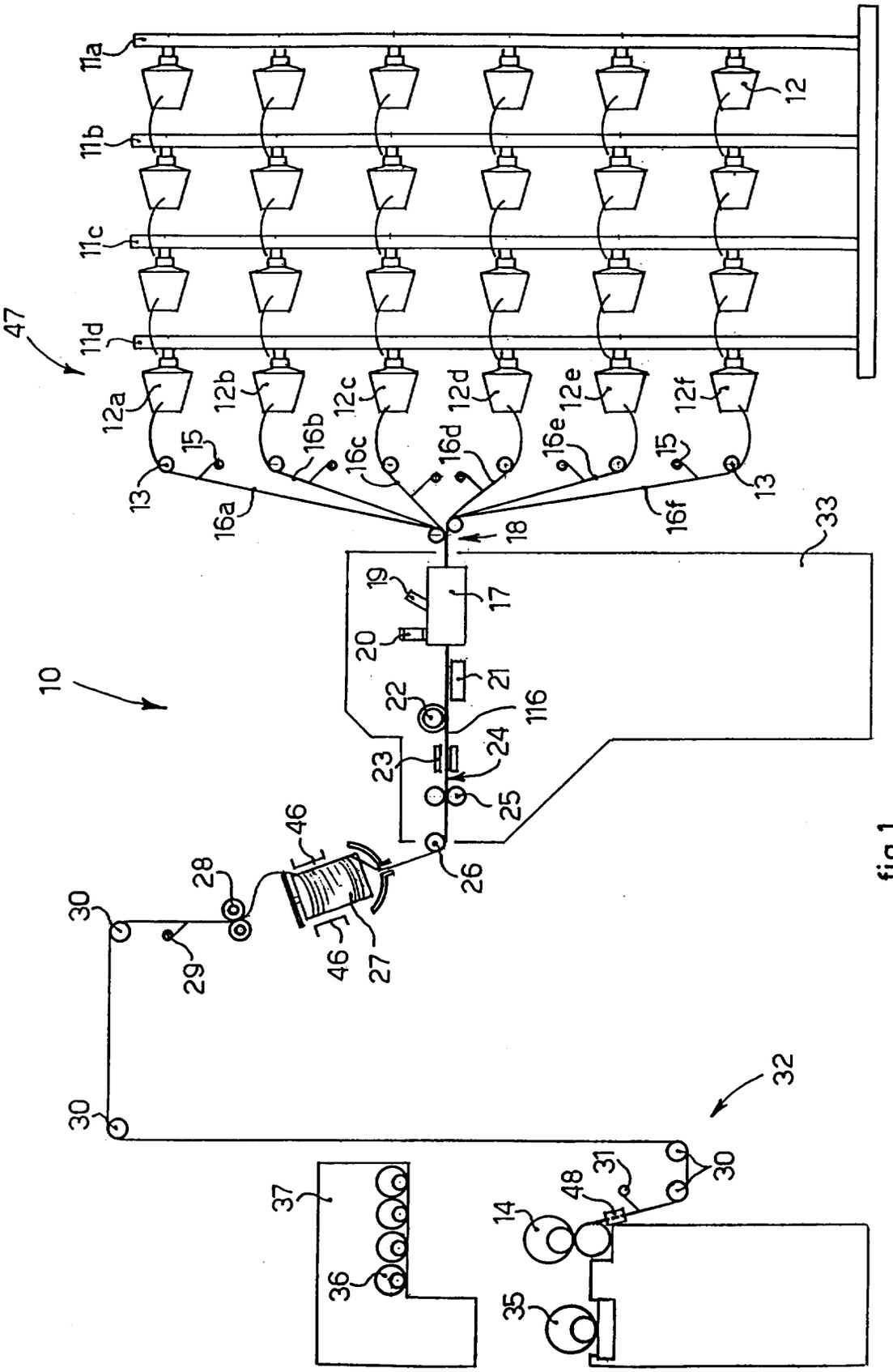
11a
11b
11c
11d
12
47
12a
12b
12c
12d
12e
12f
15
16a
16b
16c
16d
16e
16f
13
18
33
19
17
20
21
22
116
23
24
25
26
10
46
28
30
29
27
32
37
36
48
31
14
35

fig.1

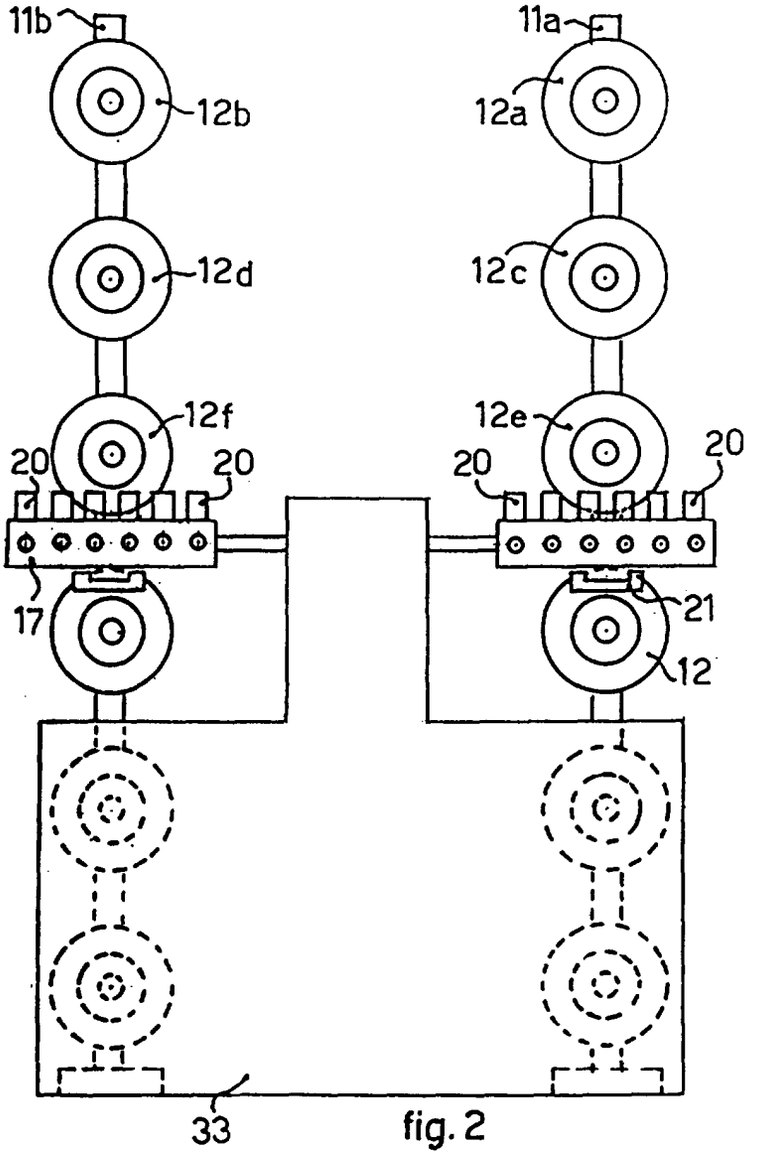

fig. 2

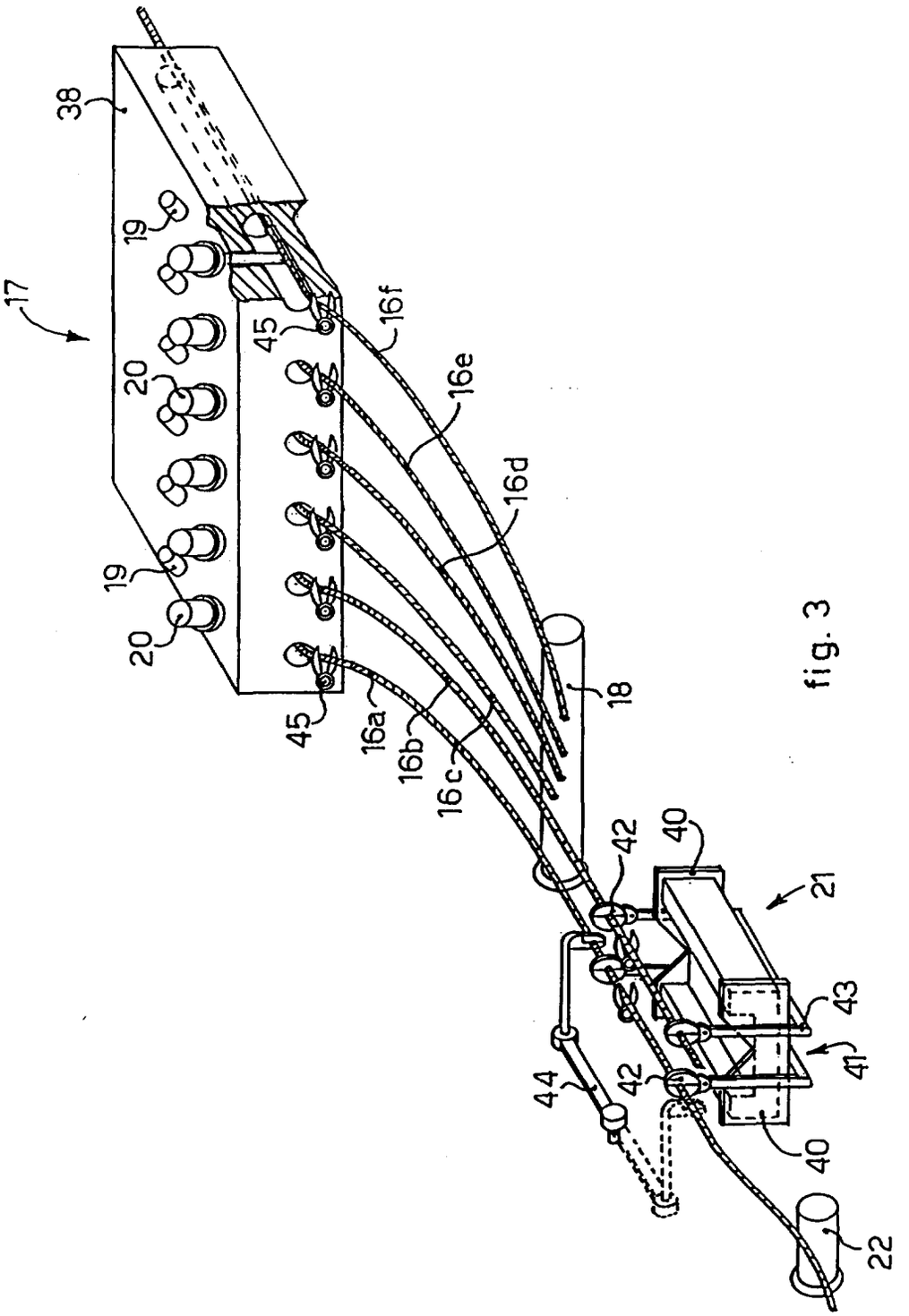

fig. 3