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(54) Automatic system to replace yarn feed packages on textile machines.

(57) Automatic system to replace yarn feed packages on textile machines (10) which consist of a plurality of production units (11) arranged in succession along the machines (10) and comprise a working side (13), the production units (11) being fed by yarn feed package (14) of any yarn (32) and of any geometric conformation and winding the yarn (32) onto yarn packages (17) containing the yarn (32) in a quantity coordinated or not coordinated with the quantity held on the yarn feed packages (14), the system comprising a movable carriage (22) able to run to and fro along the working side (13) of the machine (10) and suitable to replace the feed packages (14) automatically and to replace automatically the full yarn packages (17) already wound on each production unit (11), the movable carriage (22) comprising a yarn package store (28) cooperating with a conveyor device (26) for the replacement feed packages (25), the conveyor device (26) having a length coordinated with the lengthwise extent of the textile machine (10).

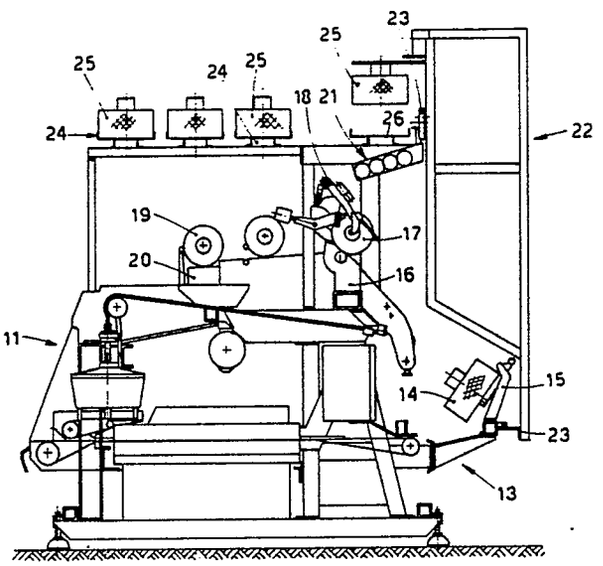

fig.2

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AUTOMATIC SYSTEM TO REPLACE YARN FEED PACKAGES ON TEXTILE MACHINES

This invention concerns an automatic system to replace yarn packages on textile machines. To be more exact, the invention concerns a system for the automatic replacement of yarn packages which feed the production units of textile machines as soon as these packages are exhausted, and for the automatic replacement of the yarn packages being wound on the production units as soon as these packages have been completed.

The system according to the invention is suitable to replace packages of yarn of any type as regards shape, size and quality of the yarn contained in the packages.

The system can also perform the replacement of yarn packages having differentiated characteristics and being processed at one and the same time in different sections of the same textile machine.

The system is applied advantageously to textile machines employed in the winding of the yarn; during the winding various processes may be applied to the yarn such as drying, relaxation and other processes.

More generally, the system according to the invention is employed in all textile machines on which the yarn wound in yarn packages is processed.

Many systems, apparatuses and devices are known in the state of the art which are suitable to replace automatically the yarn packages which have been completely wound.

In particular, stationary devices on each production unit of a machine or devices able to move along the machine and employed for the automatic replacement of yarn packages are well known in the field of winding machines and open-end spinning machines.

Such devices carry out only the replacement of completed yarn packages on the production units and the re-starting of such units after a new tube has been positioned.

Where the textile machine is also fed with yarn wound in packages, no devices are known which are employed for the automatic replacement of an empty or almost empty tube with a new yarn feed package. These operations are always performed by hand by the machine operative.

Moreover, where machines are fed with yarn wound in packages, it is often necessary to have to process yarns of different types or colours on the same machine at one and the same time.

This has always been an unsurmountable obstacle to the embodiment of an automatic device to replace feed packages and to service several production units owing to reasons of economy, for such a device entails the problem of having to handle alternatively, in sequences which cannot be foreseen, yarn packages of various types according to the requirements of each production unit of the machine.

The present applicant has designed, tested and embodied an automatic system for replacement of yarn packages which is able to carry out at each production unit the replacement of feed packages as well as of packages being wound.

Such replacements can be performed simultaneously where the package being wound requires the same content of yarn as the feed package or in momentarily separated steps where the package being wound requires a quantity of yarn different from that on the feed package.

The system performs also the automatic re-starting of the production unit in question in each replacement operation.

The system provides also the ability to replace packages automatically even if the textile machine is employed in the simultaneous processing of yarns of different characteristics in different sections of the same machine. This is the case where yarns dyed in the yarn package are wound, for a quantity of 100-300 yarn packages corresponds generally to each dyeing batch in one colour. Such a quantity by itself is too small to feed economically a whole winding machine and is therefore processed on one section of the machine while the other sections are fed with other batches dyed in a different colour.

The system according to the invention comprises a carriage able to move lengthwise along the working side of the textile machine.

The movable carriage is able to run to and fro along the production units of the machine according to a typical logic for such an operation in the state of the art.

The carriage comprises in its upper part a store of yarn packages intended to replace the package feeding the machine as soon as they are exhausted.

Such a store may hold one or more packages, depending on the requirements necessitated by the characteristics of the machine and of the yarn being processed thereon.

At least one yarn packages per every colour of yarn which can be processed at the same time in different sections of the machine will be held advantageously in the store.

The end of the yarn of the packages on the store will have been pre-positioned beforehand within the tube of the package or in other positions readily accessible to an element which engages

that end.

The carriage cooperates with the production unit of the machine in halting before that unit when some event has taken place at that unit.

After halting, the carriage proceeds to find out by means of sensors the degree of emptiness of the feed package. If the latter is not exhausted but something else has happened such as the breakage of the yarn during the winding, the carriage begins moving to and fro again along the side of the machine after having actuated a suitable signal to summon the machine operative to the production unit in question.

If the feed package is exhausted or almost exhausted, the carriage arranges to replace that feed package.

In the performance of this operation and during the course of this description we shall refer to the more complex situation where the machine is processing yarns of various colours in different sections of the machine, obvious simplifications being obtained when only one and the same type of yarn is being processed.

The carriage identifies the section where it is to work, and therefore pre-arranges the store of packages and the elements cooperating therewith so as to take a yarn package having the characteristics suitable for the section thus identified.

The carriage is equipped with devices which operate on the pin supporting the feed package so as to withdraw the empty or almost empty tube of that package and so as to pre-arrange such support pin to accept a new feed package.

The empty tube thus withdrawn is dropped and stored in an appropriate space provided at the feed zone of the production unit or on a conveyor belt which removes empty tubes or in a store included on the carriage itself.

The new feed package with the end of the yarn extracted from within its tube or from another readily accessible position and suitably positioned is taken by a transfer assembly from the store at the top of the carriage to the lower feed zone and positioned there on the support pin, which has been freed of the empty or almost empty tube.

When the new feed package has been located on the support pin, the transfer assembly repositions itself at the store at the top of the carriage and awaits its next operation.

The new feed package on the support pin is arranged to feed the production unit in cooperation with devices positioned in the carriage which engage and transfer the end of the yarn.

These devices which engage and transfer the end of the yarn are substantially oscillatory arms with elements to retain the yarn and have the task of arranging to transfer the end of the yarn of the new feed package to elements of the production unit cooperating with those arms.

In this way the production unit is prepared for re-starting and processing the new feed package.

If the package being wound needs to be replaced at the same time, the carriage is equipped with devices suitable to remove the fully wound package onto a device able to discharge that package from the machine and arranges thereafter a new tube on the assembly employed for winding the yarn package on the production unit in question.

This new tube may be taken advantageously from an appropriate store on each production unit.

The carriage is equipped also with means to position the end of the yarn of the new feed package in correspondence with the new tube to be packaged, so that the reserve of yarn can be provided on that tube and the production unit can be restarted.

If a yarn package completely wound is not to be replaced at the same time, the production unit itself will arrange, as is known with automatic winding machines for instance, to engage the end of the yarn of the package being wound and to knot that end to the end of the yarn of the new feed package and to restart the working cycle.

The system provides for the carriage to be able to cooperate with the production unit in repeating the above operations in the event of an unsuccessful outcome before restarting the to-and-fro movement.

The system according to the invention arranges for the store of yarn packages at the top of the carriage to cooperate with a package conveyor device positioned above and along the length of the machine. This conveyor device has the task of replacing in the store of the carriage the yarn package taken therefrom to form the new feed package for the production unit. This replacement is carried out while the carriage is halted and is working on the production unit according to the signal emitted by the carriage itself.

The conveyor device in turn cooperates with package stores which may be positioned away from the machine or inside the machine. If these package stores are located away from the machine, they may consist advantageously of vertical belts or chains with compartments lodging a plurality of yarn packages and loaded beforehand by hand by the machine operative or automatically from stores holding a greater number of packages.

The belts or chains with their compartments are actuated by a command sent out by the carriage and can supply the yarn package to a connected station which searches for and positions the end of the yarn within the relative tube or at another accessible position when this operation is not carried out by hand by the machine operative.

The package is then transferred onto the conveyor device and is taken to the production unit where the carriage is working.

As we said earlier, if the machine has to process yarns having different characteristics, several colours for instance, the system provides advantageousy for the inclusion of package transport elements in a number equal to the number of colours to be processed, such elements being positioned above and along the machine and parallel to the conveyor device cooperating with the carriage.

In this case the transport elements form the store of packages and are loaded by hand by the machine operative, for instance, when the packages are nearly used up.

The transport elements may also cooperate with package stores located away from the machine, as is also the case with the conveyor device.

The transport elements are actuated, now one of them and now the other, by the carriage according to the characteristics of the yarn package identified by the carriage as being required for the production unit on which it is necessary to work.

The first yarn package to reach an end of the transport element thus actuated is transferred by a suitable engagement means to the conveyor device, which in turn takes the package to the neighbourhood of the carriage.

The invention is therefore embodied according to the contents of Claim 1 and the dependent claims.

The attached figures, which are given as a non-restrictive example, show the following:-

Fig.1 is a front view of a textile machine employing the system according to the invention;

Fig.2 is a side view of a production unit of the machine of Fig.1;

Figs.3 and 4 give diagrams of the functional sequences of the operations to replace yarn packages and re-start the production unit according to the invention.

The sytem according to the invention is shown in Figs.1 and 2 as being applied to a machine that dries and finishes yarns, the machine being of the type disclosed in IT-A-83459 belonging to the present applicant.

As is usual in the textile field, a machine 10 comprises a plurality of equivalent production units 11 arranged along the structure of the machine 10.

The machine 10 includes a control assembly 12 for the functions common to all the production units 11.

Yarn feed packages 14 are positioned on appropriate feed supports 15 on a working side 13 of the machine 10 in correspondence with each production unit 11.

Each production unit 11 is provided with a take-up unit 16 for the formation of packages 17 being wound and supported on package holder arms 18.

Each fully wound package 19 discharged by the take-up unit 16 is conveyed on a removal element 20 to one end of the machine 10 to be taken away.

Each production unit 11 may include a store of empty tubes 21 which can be taken when a fully wound package 19 has to be replaced, as in the state of the art.

A carriage 22 is positioned on the working side 13 of the machine 10 and can move along the machine 10 on elements 23 of a known type which are able to slide.

Transport elements 24, which are advantageously conveyor belts and which transport replacement yarn packages 25 that will become feed packages 14 in subsequent momentary phases, are comprised above the machine 10.

Fig.2 shows an embodiment with three conveyor belts 24 used advantageously for three types of differentiated colours of yarn packages 25.

These transport elements 24 cooperate at one of the ends of the machine 10 with an engagement device (not shown in the figures) which transfers onto a conveyor device 26 the replacement feed package 25 required.

The conveyor device 26 takes the feed package 25 in the upper part of the carriage 22 to the production unit 11 at which the carriage 22 is carrying out its working cycle with the equivalent feed package 25 held on the carriage 22.

Figs.3 and 4 show diagrams of the functional sequences of the operation to replace a feed package 14 and re-start the production unit 11.

The replacement feed package 25 brought to the carriage 22 by the conveyor device 26 is transferred by suitable lifting means 27 onto a feed package store 28 to replace the equivalent feed package 25 already taken for use.

The store 28 consists of a feed package support 29 able to rotate on its own axis by an angular amount required to bring the feed package or packages 25 to an operational position within the carriage 22.

In the example shown in the figures the feed packages 25 have been shown with their axis in a vertical position, but the spirit of the invention covers also the movement and handling of the feed packages 25 with their axis in a horizontal position.

The feed package support 29 is equipped with elements 30 to engage and support the feed packages, these elements 30 cooperating with the lifting means 27.

The feed package support 29 comprises also an assembly 31 to aspirate yarn 32 of the feed

package 25; this assembly 31 draws the pre-positioned end of the yarn 32 from the inside of the relative tube 33 or another readily accessible position.

The feed package support 29 in its operational position inside the carriage 22 cooperates with a movable support 34 able to slide vertically in guides 35.

The feed package 25 now released by the engagement elements 30 is brought by means of the movable support 34 towards the lower part of the carriage 22, the end of the yarn 32 remaining in the aspiration assembly 31.

Before completing the descent of the movable support 34 the carriage 22 acts on the feed support 15 of the feed package 14 now unwound.

When an oscillatory rod 36 is operated, the empty tube 33 of the feed package 14 in the feed position is positioned vertically and is then removed by a discharge assembly 37 included on the carriage 32. The rod 36 with its pin 44 is arranged to lodge a new feed package 14.

The movable support 34 is suitably conformed to transfer automatically, during its descent to coincide with the feed package feed support 15, onto the pin 44 of the rod 36 the new feed package 14 which now undertakes the feeding task.

Thereafter the movable support 34 re-ascends with a suitable lateral and vertical movement to be positioned once more in cooperation with the rotary feed package support 29, and the rod 36 rotates to its position for the feeding of the production unit 11.

Fig.4 gives a diagram of the operations carried out on the yarn 32.

The carriage 22 is equipped with three arms 38, 39 and 40 which cooperate with the yarn 32.

In its inactive position 38A the first arm 38 engages the yarn 32 of the feed package 25 during the descent of the latter on the movable support 34, the yarn 32 still being held in the aspiration assembly 31.

When the feed package 25 has been positioned on the pin 44 of the rod 36, the first arm 38 conveys the yarn 32 from the inactive position 38A to position 38B, where the yarn 32 is cut by suitable means, scissors for instance, on the first arm 38, the portion of yarn thus cut being aspirated and removed in the aspiration assembly 31.

Position 38B corresponds with a device 42 for the automatic feed of yarn 32 with aspiration, as comprised on machines 10 for the drying and finishing of yarn with a high quality finish.

The yarn 32, transferred from the first arm 38 to the device 42 and having completed its movement of insertion, is placed on a treatment conveyor 43 and taken to the working side 13 of the production unit 11.

The second arm 39, which is advantageously of a type applying aspiration, is brought from its inactive position 39A to position 39B, where it engages the yarn 32 placed on the terminal part of the processing conveyor 43.

The second arm 39 re-ascends to position 39C, where it consigns the yarn 32 to a third aspiration arm 40 in the inactive position 40A thereof.

The third arm 40 is moved to position 40B to insert the yarn 32 between the mandrels of the feed package holder arm 18 and to perform the cutting and positioning of the yarn 32 on the new tube of the next package to be wound.

Claims

1 - Automatic system to replace yarn feed packages on textile machines (10) which consist of a plurality of production units (11) arranged in succession along the machines (10) and comprise a working side (13), the production units (11) being fed by yarn feed package (14) of any yarn (32) and of any geometric conformation and winding the yarn (32) onto yarn packages (17) containing the yarn (32) in a quantity coordinated or not coordinated with the quantity held on the yarn feed packages (14), the system being characterized in that it comprises a movable carriage (22) able to run to-and-fro along the working side (13) of the machine (10) and suitable to replace the feed packages (14) automatically and to replace automatically the full yarn packages (17) already wound on each production unit (11), the movable carriage (22) comprising a yarn package store (28) cooperating with a conveyor device (26) for the replacement feed packages (25), the conveyor device (26) having a length coordinated with the lengthwise extent of the textile machine (10).

2 - System as claimed in Claim 1, in which the yarn package store (28) comprises a rotatable support (29) having at least one position to engage and hold (30) a replacement feed package (25) taken from the conveyor device (26).

3 - System as claimed in Claim1, in which the rotatable support (29) of the yarn package store (28) has at least one position to engage and hold (30) a replacement feed package (25) for each different quality of yarn (32) processed on the different production units (11) of the same machine (10).

4 - System as claimed in Claim 3, in which the movable carriage (22) selects on the rotatable support (29) a replacement feed package (25) suitable to replace the yarn feed package (14) on the production unit (11) on which the movable carriage (22) has to work.

5 - System as claimed in any claim hereinbefore, in which the replacement feed package (25) is transported (26) and handled (30) with its axis in a vertical position.

6 - System as claimed in any of Claims 1 to 4 inclusive, in which the replacement feed package (25) is transported (26) and handled (30) with its axis in a horizontal position.

7 - System as claimed in any claim hereinbefore, in which the yarn package store (28) comprises an aspiration assembly (31) to aspirate the end of the yarn (32) pre-positioned in the tube (33) of each feed package (25) supported on the rotatable support (29).

8 - System as claimed in any claim hereinbefore, in which the yarn package store (28) of the movable carriage (22) lies above the vertical bulk of the machine (10).

9 - System as claimed in any claim hereinbefore, in which the conveyor device (26) lies in correspondence with the upper horizontal surface of the machine (10).

10 - System as claimed in any claim hereinbefore, in which the conveyor device (26) cooperates with stocks of feed packages (25) positioned outside the machine (10).

11 - System as claimed in any claim hereinbefore, in which the conveyor device (26) cooperates with feed package transport elements (24) which constitute stores of feed packages (25) and lie above and along the machine (10).

12 - System as claimed in Claim 11, in which the feed package transport elements (24) cooperate with stores of feed packages (25) positioned outside the machine (10).

13 - System as claimed in any claim hereinbefore, in which the conveyor device and transport elements (26-24) for the feed packages (25) are actuated by the movable carriage (22) so as to carry one single feed package (25) to the production unit (11) at which the movable carriage (22) halts.

14 - System as claimed in any claim hereinbefore, in which the conveyor device and transport elements (26-24) carry feed packages (25) having the end of the yarn (32) positioned at a determined position on the tube (33) of the feed package (25).

15 - System as claimed in any claim hereinbefore, in which the movable carriage (22) comprises a movable support (34) to take the feed packages (25) from the upper feed package store (28) to the support (15) of the feed packages (14) when feeding yarn.

16 - System as claimed in any claim hereinbefore, in which the movable carriage (22) comprises an assembly (37) to discharge empty tubes (33) from a pin (44) that supports the feed packages (14) when feeding yarn.

17 - System as claimed in any claim hereinbefore, in which the movable carriage (22) comprises arm elements (38-39-40) to engage and transfer the yarn (32) onto the elements of the production unit (11) for automatic re-starting of the production unit (11) after a new feed package (14) has been positioned in its feeding position.

18 - System as claimed in any claim hereinbefore, in which the movable carriage (22) comprises means to find out the degree of emptiness of the feed package on each production unit (11).

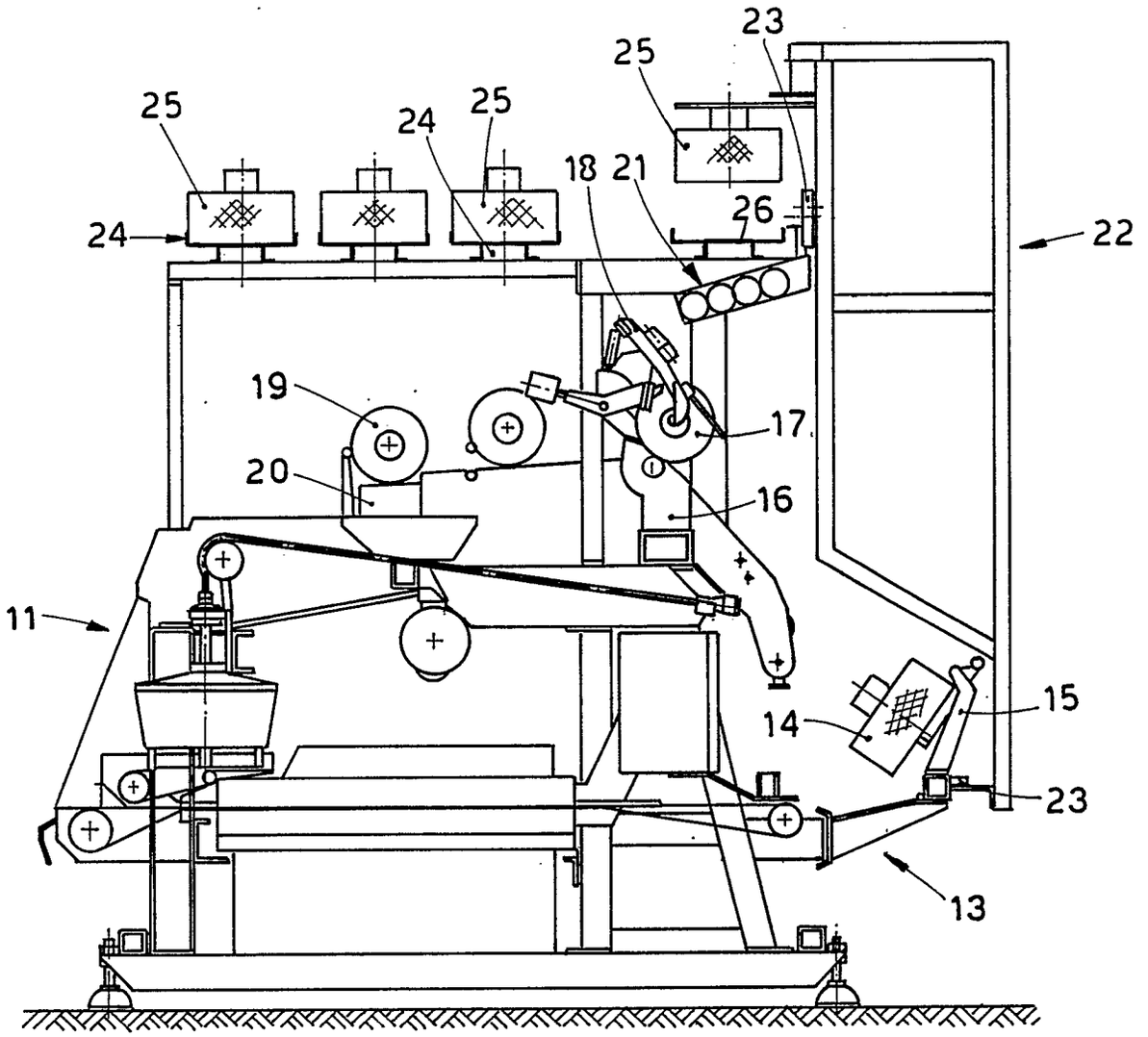
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fig.2

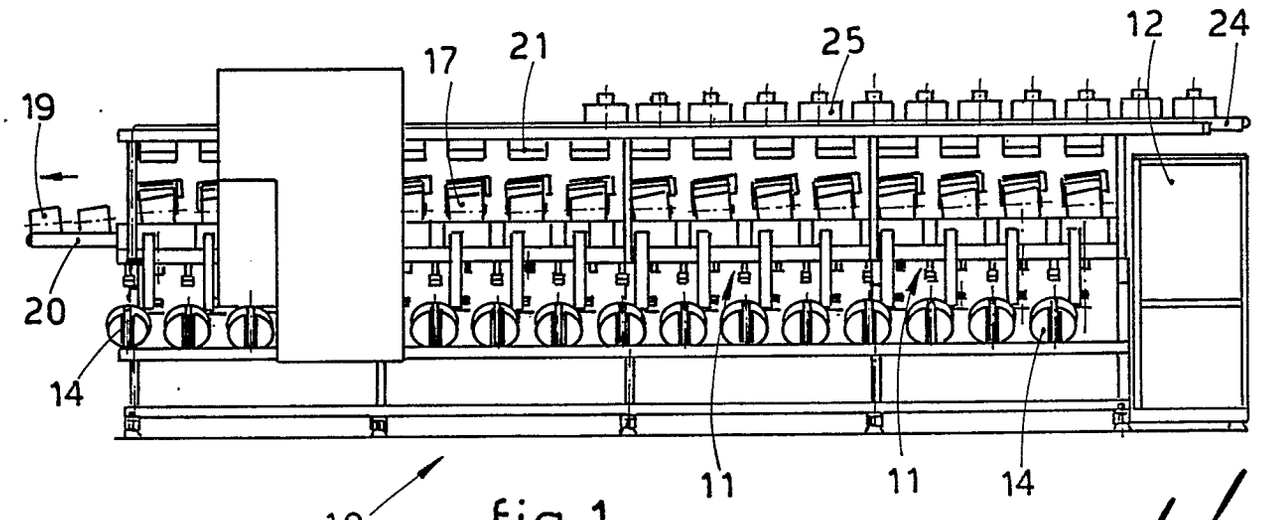
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fig.1

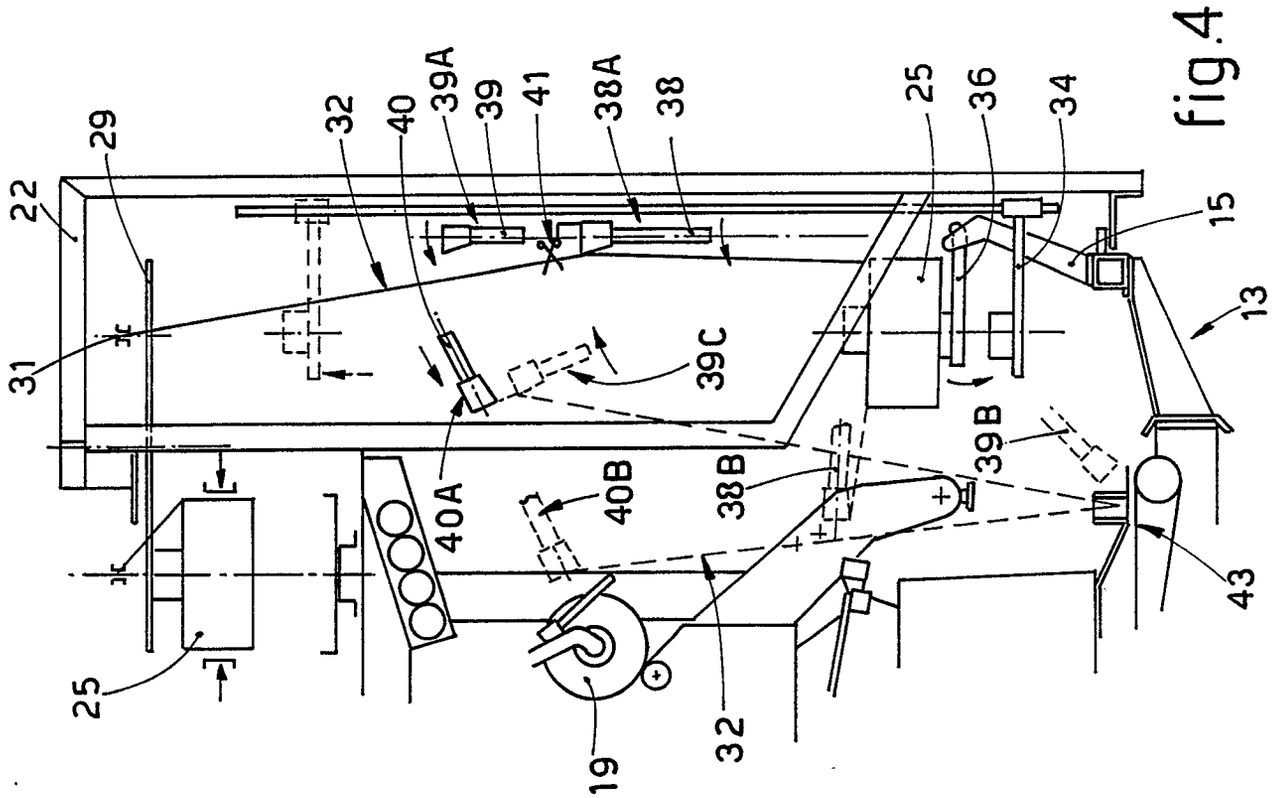
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fig.4

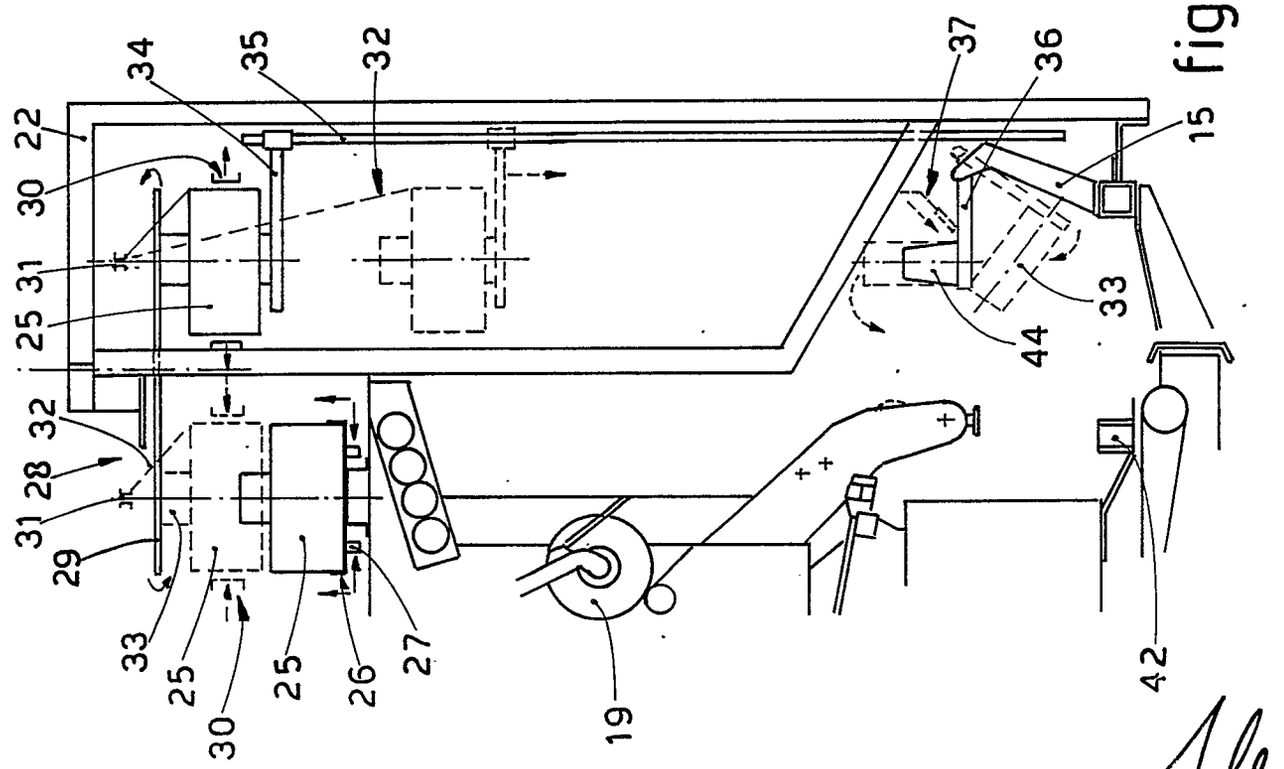
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fig.3