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(54) **Lap-forming machine and process**

(57) A sliver drawing winder apparatus (1) is intended for processing textile fibres in sliver form (N) and forming a lap with a prepared end intended for processing on a combing machine downstream of the said apparatus.

The sliver drawing winder apparatus comprises a device (34) for preparing the end of the lap in such a way that, when the lap has been transferred to the combing machines downstream, the piecing of the said prepared end to a tail end of a nearly-finished lap is facilitated.

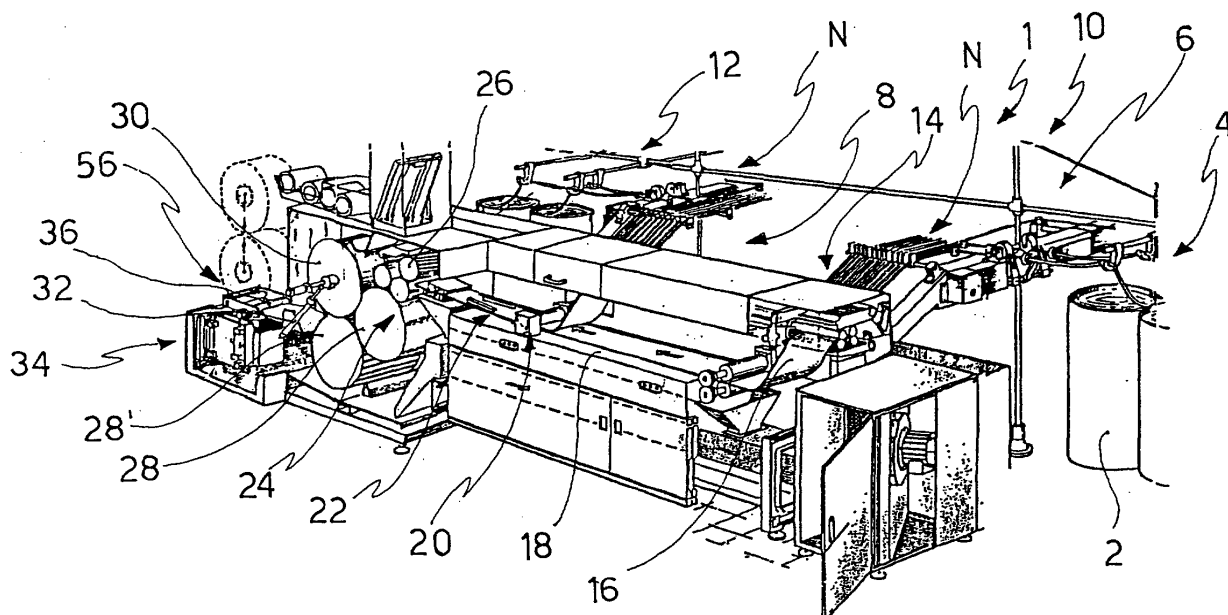


FIG. 1

Description

[0001] The present invention relates to a sliver drawing winder apparatus for processing slivers of fibre, winding them, in web form, around a rigid tube to form a lap, and preparing the said lap for subsequent processing, e.g. on combing machines.

[0002] Typically, a textile process for producing a yarn involves, after the initial steps of opening and cleaning the fibre, a carding operation on carding machines, from which the fibre emerges in the form of a sliver cleaned of its dirt, free of neps or tangles, and with the fibres made parallel.

[0003] This sliver is intended to then be sent for processing on a sliver drawing winder in which two or more separate slivers are brought together, superimposed and compressed together to produce a web that is wound onto a rigid tube to form a roll of fibre known as a "lap", having a predetermined length of wound web.

[0004] The lap is intended to be sent for processing on a combing machine which will prepare its end, superpose the sliver on the sliver of a nearly-finished lap, and comb it.

[0005] It is known that a combing machine processes several laps simultaneously and one after the other to produce a continuous sliver. The piecing of the tail end of an outgoing lap to the head end of an incoming lap that is ready for processing is therefore a fundamental part of the whole process.

[0006] Piecing is preceded by preparing the head end of the incoming lap (fraying), to assist with piecing it to the tail end of the outgoing lap by eliminating irregularities in the web.

[0007] There is an established tendency in the industry to equip each combing machine with suitable devices for carrying out end preparation, positioning the prepared end of the lap and piecing it, in what is by now a completely automated manner.

[0008] Modern yarn production lines, however, have a plurality of combing machines arranged in series or in parallel. Each of these machines has its own device for end-preparation and piecing of the lap, comprising, among numerous other pieces of equipment, systems for evacuating the residues of these end-preparation processes (frayed fibres), systems for setting the angular position of the lap and so on.

[0009] It is clear, therefore, that a production line with such characteristics is complex in terms of the synchronized management of the automatic mechanisms and expensive in installation terms.

[0010] There is therefore a felt need to provide yarn production lines, especially combing-machine feedlines which, although automated, will be simpler in terms of structure and in the control of the automatic mechanisms as well as cheaper to build.

[0011] The problem addressed by the present invention is the provision of a sliver drawing winder apparatus that must have structural and functional characteristics

such as to satisfy the abovementioned needs and at the same time obviate the disadvantages discussed with reference to the drawbacks of known systems.

[0012] This problem is solved by a sliver drawing winder apparatus in accordance with Claim 1. Further alternative embodiments are described in the dependent claims.

[0013] The characteristics and advantages of the sliver drawing winder apparatus according to the present invention will become apparent upon perusal of the following description of a preferred embodiment, offered by way of non-restrictive indication, with reference to the appended figures, in which:

[0014] Figure 1 is a perspective view of a sliver drawing winder apparatus provided with a lap end-preparing device;

[0015] Figure 2 is a schematic side view of the sliver drawing winder apparatus of Figure 1;

[0016] Figures 3a to 3b show a sequence in which a lap is transferred by transfer means belonging to the sliver drawing winder apparatus of Figure 1;

[0017] Figures 4a and 4b show a diagram of lap end-preparing means belonging to the sliver drawing winder apparatus of Figure 1;

[0018] Figure 5 shows a diagram in plan view of a spinning line comprising the sliver drawing winder apparatus and combing machines, and

[0019] Figures 6, 7 and 8 show further alternative embodiments of the sliver drawing winder apparatus according to the invention.

[0020] Referring to the accompanying figures, 1 is a general reference for a sliver drawing winder apparatus according to the invention.

[0021] The sliver drawing winder apparatus 1 is fed by a plurality of slivers N resulting from the processing carried out on fibres partially opened and cleaned by carding machines (not shown) and deposited in separate accumulations, each in a can 2.

[0022] One or more cans 2 form regions of deposition 4 of the sliver, being set in positions adjacent to means 6 which guide and feed the sliver N to a machine body 8 belonging to the said sliver drawing winder apparatus 1.

[0023] The means 6 which guide and feed the sliver N to the machine body 8 of the sliver drawing winder apparatus 1 comprise a plurality of control can calendars and sliver guide devices for taking the said slivers N from each can 2 and directing them to the said machine body 8, laying them side by side and approximately parallel with each other.

[0024] The said sliver cans 2 and the said means for guiding and feeding the sliver to the machine body 8 form one so-called creel 10 or unit for feeding the sliver N to the sliver drawing winder apparatus 1.

[0025] In a preferred embodiment, the sliver drawing winder apparatus 1 works with a plurality of sliver feed creels which are lined up next to the machine body 8 of the said sliver drawing winder apparatus and feed the

said machine body in parallel. In the illustrative embodiment of a sliver drawing winder apparatus described, the said sliver drawing winder apparatus operates with a first feed creel 10 and with a second feed creel 12.

[0026] The slivers carried by the creel 10 are fed to a drafting unit 14 of the sliver drawing winder apparatus 1, in which suitable guides bring the said slivers together to form a web. In other words the slivers fed by the creel 10 are placed side by side by the channelling action of the said guides, and the said web is the result.

[0027] The drafting unit 14 also includes pairs of opposing drafting rollers through which the said web is passed in order to apply a predefined draft. The drafted web is conveyed on a chute 16 which deflects it onto a bed 18 of the machine body 8 of the said sliver drawing winder.

[0028] In a preferred embodiment, the said web is deflected through an angle of 90° with respect to the direction at which it comes out of the drafting unit 14, and is laid on the said bed.

[0029] In exactly the same way the second creel 12 feeds a second draft unit from which a web emerges and is deflected by a second chute onto the said bed 18.

[0030] The web that emerges from the second chute is laid on top of the web from the first chute 16, and together they are pressed to a suitable degree by a pair of calenders 20 to produce a web which is then fed to a tapering device 22.

[0031] The tapering device 22 comprises a plurality of opposing guides which work on the web with a tapering action that compacts the lateral edges of the said web. In other words the said guides compact the outermost slivers making up the web, i.e. the extreme lateral slivers, so that they do not peel off from the rest of the fibres.

[0032] After being passed through the opposing rollers of a surface-smoothing frame, in order to further compact the web, the web is sent to the lap forming unit 24.

[0033] The lap forming unit 24 comprises a plurality of pressure calenders and at least one forming roller.

[0034] In the example described, of a sliver drawing winder apparatus, the said forming unit 24 comprises three pressure calenders 26, set against each other in such a way that the lap undergoes two calendering passes, and two forming rollers 28 and 28'.

[0035] The said forming unit also comprises a pair of lateral containment plates 30 and a piston 32 for moving the said plates.

[0036] In the initial phase of winding, the tube, which is coaxial with the plates, is pressed by the action of the said plates against the forming rollers 28 and 28'.

[0037] In the course of winding the said tube is rotated by the rotation of the forming rollers 28 and 28' and the plates adjust their position as the thickness of the growing web increases, in such a way that the said web is always pressed against the said forming rollers.

[0038] When winding is complete, that is when the lap has reached a desired length of wound web, the ma-

chine is stopped.

[0039] The plates lift the lap to detach it from the forming rollers 28 and 28' and the web is torn by a rotating pneumatic roller which turns the plate assembly in the tearing direction.

[0040] The containment plates are moved away from the lap along the axis of the tube so that the said lap is free to roll towards a device 34 which will prepare the end of the lap, preferably in abutment against the stop shoulder 35, in an end-preparing position.

[0041] In a preferred embodiment, the said end-preparing device 34 comprises lap-unwinding means comprising a pair of unwinding rollers.

[0042] In particular, the said end-preparing device 34 comprising a first unwinding roller 36 and a second unwinding roller 38. In addition, the said lap-unwinding means comprise a suction device 39.

[0043] Additionally, the sliver drawing winder apparatus 1 comprises a device 34' for positioning the prepared end of the lap relative to the said lap, for example relative to its axis.

[0044] The said positioning device 34' preferably comprises the said unwinding rollers 36, 38 and positioning sensors for detecting the completion of a predetermined rotation of the said unwinding rollers 36, 38.

[0045] Sensors for detecting the presence of the lap at the unwinding means, that is at the unwinding rollers 36, 38, detect the said presence so that actuation of the unwinding rollers and of the suction device 39 causes unwinding of the lap.

[0046] In other words, the rotation of the unwinding rollers 36, 38 and the suction applied by the suction device 39 unwinds the lap, introducing the free end of the lap into fraying means 40.

[0047] The said means comprise means for gripping the web 42, tearing means 44 and means for detecting the position of the free end of the lap 46.

[0048] In a preferred embodiment, the said tearing means are downstream of the said gripping means with respect to the direction of forward travel of the free end of the unwinding web, while the said means for detecting the position of the free end of the lap are downstream of the said tearing means.

[0049] The said gripping means comprise a pair consisting of a grip 48 with an opposing wall 50, while the said tearing means comprise a pair of tearing rollers 52 and 52'. Additionally, the said means for detecting the position of the free end of the lap comprise a position sensor 54.

[0050] The said position sensor 54 preferably comprises a photoelectric cell.

[0051] The rotation of the unwinding rollers 36, 38 and the suction of the suction device 39 unwinds the lap, which passes between the tearing rollers 52, 52' until the said position detecting sensors 54 detects that the free end of the web has reached a predefined position.

[0052] At this point the rotation of the unwinding rollers is stopped, while the grip 48 is advanced towards

the opposing wall 50 in order to grip the web between the said wall and the said grip.

[0053] The said web is gripped by the said gripping means along a so-called grip line Lp.

[0054] At the same time the tearing rollers 52 and 52' are brought towards each other so that the web is squeezed between them.

[0055] The said web is squeezed by the tearing means along a pull line Lt.

[0056] The rotation of the tearing rollers 52, 52' causes the said lap to be frayed. The two rollers are turned in opposite directions so as to stretch the portion of lap lying between the grip line Lp and the pull line Lt.

[0057] Between the grip line and the pull line, a frayed tear line Ls is produced by the action of the tearing means. The position of this line is determined by, among other things, the length of the fibres of which the web is composed.

[0058] In other words, the frayed tear line Ls occurs between the grip line Lp and the pull line Lt of the tearing rollers, which gives the lap a prepared end whose position with respect to the lap itself (for example with respect to the lap's axis) is sufficiently defined for subsequent processing of the lap.

[0059] After executing the tear, the tearing means are deactivated and the gripping means released.

[0060] In this configuration the tear line of the web, which is the new prepared end, has a defined position between the position of the grip line and the position of the pull line.

[0061] The positioning device 34' is activated in order to move the prepared end of the lap out of the fraying means 40 and into a position defined by the said predetermined rotation.

[0062] The unwinding rollers 36, 38 perform a predetermined rotation in the opposite direction to the rotation carried out for the introduction of the free end of the lap into the fraying means 40, in order to move the prepared end of the lap out of the fraying means 40 and into a position defined by the said predetermined rotation.

[0063] The position of the prepared end of the lap with respect to the lap itself (for example with respect to the lap's axis) is sufficiently defined for the subsequent processing of the lap.

[0064] Advantageously, the sufficiently defined position of the prepared end of the lap is maintained without variation in the course of the subsequent movements of the lap to the combing machines.

[0065] The said lap preparing apparatus 34 also includes means for lifting the lap with its prepared end, which comprises, for example, a lifting carriage 56.

[0066] In a preferred embodiment, the said lifting carriage 56 is integrated with the said unwinding rollers 36, 38 of the end-preparing and positioning device 34.

[0067] In a preferred embodiment, the said sliver drawing winder apparatus also comprises means 58 for transferring the lap from the sliver drawing winder apparatus to the machines downstream of the said sliver

drawing winder apparatus.

[0068] In particular, once the lap is frayed, the carriage 56 rises, carrying the lap from the end-preparing position to a loading position, the said loading position being such as to engage the said lap with the transfer means 58, which will transfer the said lap from the loading position on the sliver drawing winder apparatus to a feeding position in which the lap is fed towards textile machines downstream of the said sliver drawing winder apparatus.

[0069] The said transfer means comprise a preferably L-shaped supporting frame 60 comprising a cantilever portion 62 that supports a hook-supporting column 64 capable of translational movement (Figures 3a to 3d).

[0070] A hook 66 is capable of translational movement on the said column 64 between a lowered position, suitable for picking up the lap, and a raised position, suitable for transferring the lap to the feeding position.

[0071] In particular, the hook 66, in the lowered position, moves towards the lap which is in the loading position by virtue of the displacement of the column 64 towards the said lap, until a rod 68 on the said hook 66 is inserted into the tube of the lap.

[0072] The hook rises to the raised position on the column 64, taking the lap to an intermediate position.

[0073] A further translational movement of the column 64, and preferably a translational movement of accommodation of the hook 66 on the said column, bring the lap from the loading position to the position from which it will be fed to the downstream machines.

[0074] In a preferred embodiment, the said position from which the lap is to be fed to the downstream machines is provided with means for thus feeding the lap to the said downstream machines, such as a conveyor belt 70.

[0075] The said transfer means advantageously carry the said lap from the end-preparing position to the feeding-to-downstream-machines position without any change in the position of the prepared end relative to the lap.

[0076] The said conveyor belt 70 is preferably provided with lap holding means.

[0077] In an alternative embodiment of the said conveyor belt 70, the said lap holding means comprise a supporting surface 72 and holding shoulders 72' and 72'' set at a certain distance apart to prevent the lap from rolling.

[0078] The said holding means advantageously enable the lap to be transported towards the downstream machines without any change to the relative position of the prepared end of the lap, that is of the new free end.

[0079] In another alternative embodiment, the said conveyor belt 70 is located near the floor on which the said sliver drawing winder apparatus stands or is positioned in such a way that the laps placed on the belt are at a height above the said floor approximately equal to the height of the prepared laps (Figure 8).

[0080] The said sliver drawing winder apparatus also

comprises a device 74 for feeding the tubes to the lap forming unit 24.

[0081] The said feeding device 74 is fed with tubes cleaned by machinery (not shown) and conveyed by means to a feeding station.

[0082] A feeding path 78, consisting for example of tracks and chutes, connects the said feeding station to the lap forming unit 24, allowing the said tubes to be fed to the said unit for lap formation.

[0083] The spinning line is advantageously simplified in terms of construction by virtue of the integration of a single tube feeding device 74 into the said sliver drawing winder apparatus.

[0084] In a preferred embodiment of a spinning line, the said sliver drawing winding apparatus 1 is situated upstream of textile machines such as, for example, a plurality of combing machines 100 (Figure 5).

[0085] The said combing machines are preferably arranged in parallel. In other words they work separate laps independently of each other. Each combing machine is preferably equipped with a station 102 for receiving a set of laps with prepared ends, e.g. a set composed of eight laps with prepared ends.

[0086] The means of feeding the laps to the combing machines 104 feed the said laps to the combing machines at the said stations 102, moving along at least one transfer path 106, which at least partly branches off towards the said combing machines.

[0087] The said feeding means, equipped with the said holding means, advantageously enable the said laps, with their prepared ends, to be transferred to the station 102 of each combing machine 100 without any change in the position of the prepared end.

[0088] At the combing machines 100, and in particular at the station 102 of each of these, there are unloading means (not shown) for transferring the said set of laps with their prepared ends from the conveyor belt 70 to the stations 102 of each combing machine.

[0089] In normal operation of the spinning line, the lap is produced by the sliver drawing winder apparatus 1 or by a plurality of apparatus.

[0090] In the end-preparing device 34, the end of the lap is prepared, that is to say, its free end is frayed, resulting in a prepared end which is in a predefined position with respect to the axis of the lap.

[0091] The laps with their prepared ends are fed to the combing machines 100, which may for example be laid out in parallel, arriving at the stations 102 of these machines, using lap transferring, feeding and unloading means which do not change the position of the prepared end of the lap with respect to the lap axis.

[0092] The lap positioned on combing machine 100 has a prepared end which is already in a sufficiently predefined position with respect to the lap itself, so that the web can be reattached to the web of a nearly-finished lap.

[0093] Advantageously, the spinning line has a sliver drawing winder apparatus or a plurality of apparatus ca-

pable of feeding laps with ready-prepared ends to the combing machines. The said combing machines do not have special apparatus for preparing the lap, so their structure is simplified.

[0094] Unusually, with the sliver drawing winder apparatus according to the invention it is possible to create yarn manufacturing lines, and in particular comb feeding lines, which, automated, are simple in terms of structure and of control of the automatic mechanisms, and, in fine, more economically advantageous to build.

[0095] Advantageously, that is to say, a single sliver drawing winder apparatus or a plurality of sliver drawing winders, arranged upstream of the combing machines in a spinning line, feed laps with prepared ends to the combing machines downstream, thus simplifying the structure and functionality of the said combing machines.

[0096] Another advantageous aspect is that the said sliver drawing winder apparatus avoids line synchronizing problems arising from the feeding of the laps and the preparing of their ends in the case in which end preparation occurs directly at the combing machine itself.

[0097] Another advantage of the sliver drawing winder apparatus according to the invention is the provision of lap unwinding means integrated into lifting means which move it to a position suitable for transfer to the comb feeding means. The benefit of this is that it avoids further rolling or rotation of the lap so that the position of the prepared end with respect to the axis of the lap cannot change. It also safeguards the integrity of the web against knocks due to its displacement.

[0098] Advantageously, the spinning line has means of transferring the lap to the combing machines that do not modify the position of the prepared end with respect to the lap's axis.

[0099] Another advantageous aspect is that the spinning line has means of feeding the lap with its prepared end to the combing machines which do not modify the position of the prepared end with respect to the lap's axis.

[0100] In this way, at the combing machine the operation of reattaching the lap to the web of a nearly-finished lap does not require a separate process of correctly positioning the prepared end.

[0101] It will be clear that a person skilled in the art will be able to make numerous modifications and alterations to the sliver drawing winder apparatus described above to satisfy any specific requirements that may arise.

[0102] In an alternative embodiment, the said sliver drawing winder apparatus operates with a carriage for transporting the lap to the combing machines in the conventional way, e.g. by pushing the carriage.

[0103] It will be clear that such alternative embodiments must all be considered to fall within the scope of protection of the invention as defined in the following claims.

Claims

1. Sliver drawing winder apparatus (1) for processing textile fibres in sliver form (N) and forming a web of fibres wound to form a lap with a prepared end, the said lap being intended for processing on a combing machine (100) and the like, the said apparatus comprising
 - at least one forming unit (24) fed with the said web to form the lap,
 - the said sliver drawing winder apparatus being **characterized in that** it also comprises at least one lap end-preparing device (34) able to form a prepared end of the web, in order to prepare, in subsequent processings, the piecing of the said prepared end to a tail end of another, nearly-finished lap.
2. Sliver drawing winder apparatus (1) according to Claim 1, in which the said end-preparing device (34) comprises lap-unwinding means.
3. Sliver drawing winder apparatus (1) according to Claim 2, in which the said lap-unwinding means comprise a pair of unwinding rollers (36, 38).
4. Sliver drawing winder apparatus (1) according to Claim 2 or 3, in which the said lap-unwinding means comprise a suction device (39).
5. Sliver drawing winder apparatus (1) according to any one of the preceding claims, in which the said end-preparing device (34) also comprises fraying means (40) capable of forming a prepared end to the lap.
6. Sliver drawing winder apparatus (1) according to Claim 5, in which the said fraying means (40) comprise means (42) for gripping the web of the lap.
7. Sliver drawing winder apparatus (1) according to Claim 6, in which the said gripping means comprise a system composed of a grip (48) and, opposite the latter, an opposing wall (50).
8. Sliver drawing winder apparatus (1) according to one of Claims 5 to 7, in which the said fraying means (40) comprise means (44) for tearing the lap web.
9. Sliver drawing winder apparatus (1) according to Claim 8, in which the said tearing means comprise a pair of tearing rollers (52, 52').
10. Sliver drawing winder apparatus (1) according to one of Claims 5 to 9, in which the said fraying means (40) comprise means (46) for detecting the position of the free end of the lap.
11. Sliver drawing winder apparatus (1) according to any one of the preceding claims, also comprising a device for positioning the prepared end of the lap.
12. Sliver drawing winder apparatus (1) according to Claim 11, in which the said positioning device comprises unwinding rollers (36, 38).
13. Sliver drawing winder apparatus (1) according to any one of the preceding claims, also comprising lap lifting means.
14. Sliver drawing winder apparatus (1) according to Claim 13, in which the said lifting means comprise a lifting carriage (56).
15. Sliver drawing winder apparatus (1) according to Claim 13 or 14, in which the said lifting means are integrated into lap unwinding means.
16. Sliver drawing winder apparatus (1) according to Claim 15, in which the said integrated lifting means comprise a pair of unwinding rollers (36, 38).
17. Sliver drawing winder apparatus (1) according to any one of the preceding claims, also comprising a device (74) for feeding tubes to the said lap forming unit (24).
18. Sliver drawing winder apparatus (1) according to any one of the preceding claims, in which the said apparatus works with means (58) for transferring the lap from the sliver drawing winder apparatus (1) to machines, downstream of the said apparatus, designed not to modify the relative position of the prepared end of the lap relative to the said lap.
19. Spinning line comprising at least one sliver drawing winder apparatus (1) according to any one of the preceding claims.
20. Spinning line according to Claim 19, also comprising means (58) for transferring the lap from the sliver drawing winder apparatus (1) to machines downstream of the said apparatus.
21. Spinning line according to Claim 20, in which the said transfer means comprise a supporting frame (60).
22. Spinning line according to Claim 20, in which the said transfer means comprise a hook-supporting column (64) and a hook (66) capable of translational movement on the said column.
23. Spinning line according to any one of Claims 19 to 22, also comprising a conveyor belt (70) for transferring the said lap from the said sliver drawing

winder apparatus (1) to the said machines downstream.

- 24.** Spinning line according to any one of Claims 19 to 23, also comprising at least combing machine downstream of the said sliver drawing winder apparatus (1) . 5
- 25.** Method of processing a lap in a spinning line comprising at least one sliver drawing winder apparatus (1), in accordance with any one of Claims 1 to 18, and at least one combing machine (100) arranged downstream of the said sliver drawing winder apparatus (1), comprising the following steps in succession: 10 15
- forming the said lap from a plurality of slivers (N) in a forming device (24) belonging to the said sliver drawing winder apparatus (1);
 - preparing the free end of the said lap by making a prepared end capable of reattachment on the said combing machine to an outgoing tail end of a nearly-finished lap; and 20
 - transporting the said lap from the said sliver drawing winder apparatus (1) to a feeding station (102) of the said combing machine (100). 25
- 26.** Method of processing a lap according to Claim 24, in which, between the steps of preparing the end of the lap and transporting the said lap with its prepared end, the following step is carried out: 30
- positioning the said prepared end of the lap in a predefined position with respect to the axis of the said lap. 35
- 27.** Method of processing a lap according to Claim 25 or 26, in which the said lap transporting step is carried out by keeping the said prepared end in a predefined position relative to the axis of the lap. 40
- 28.** Method of processing a lap according to any one of Claims 25 to 27, also comprising the subsequent step of reattaching the prepared end of the said lap to the tail end of a nearly-finished lap. 45

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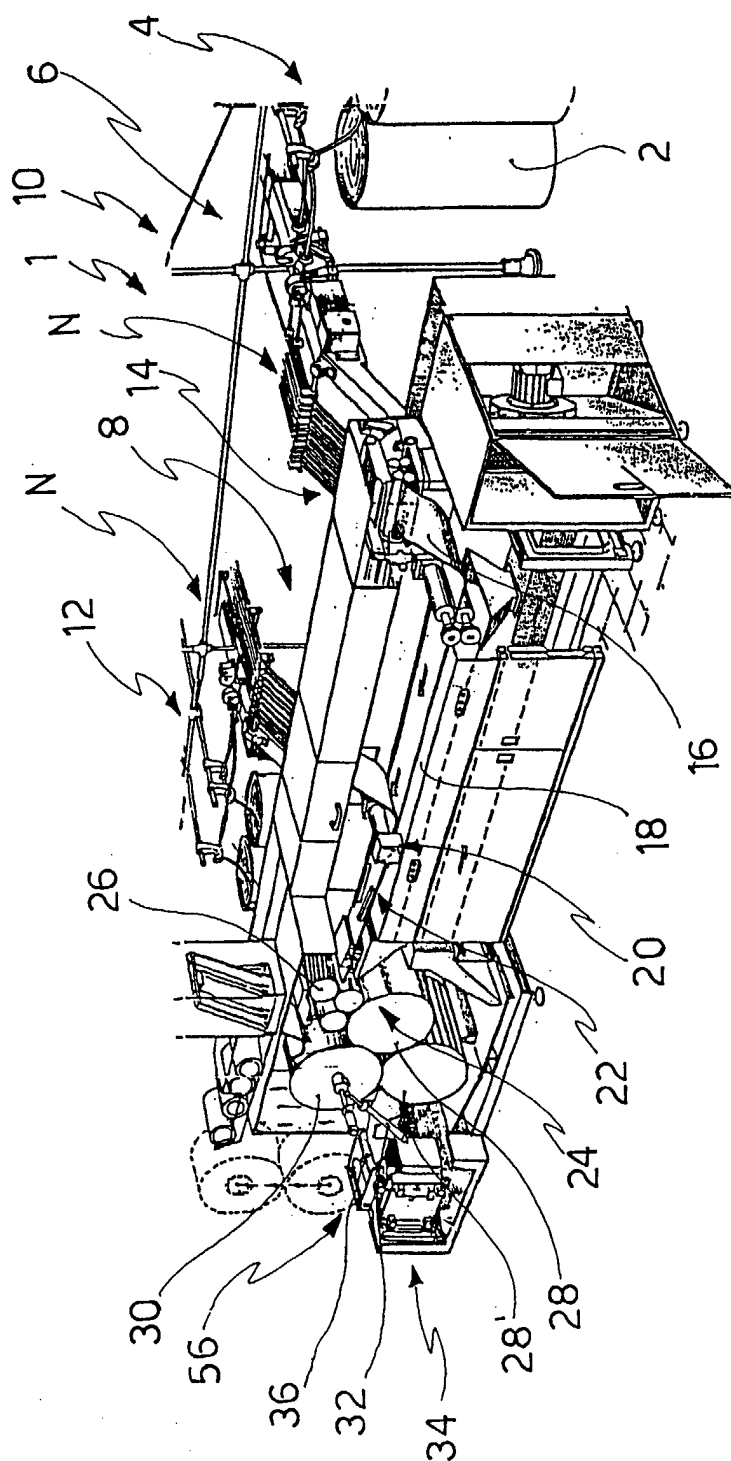


FIG. 1

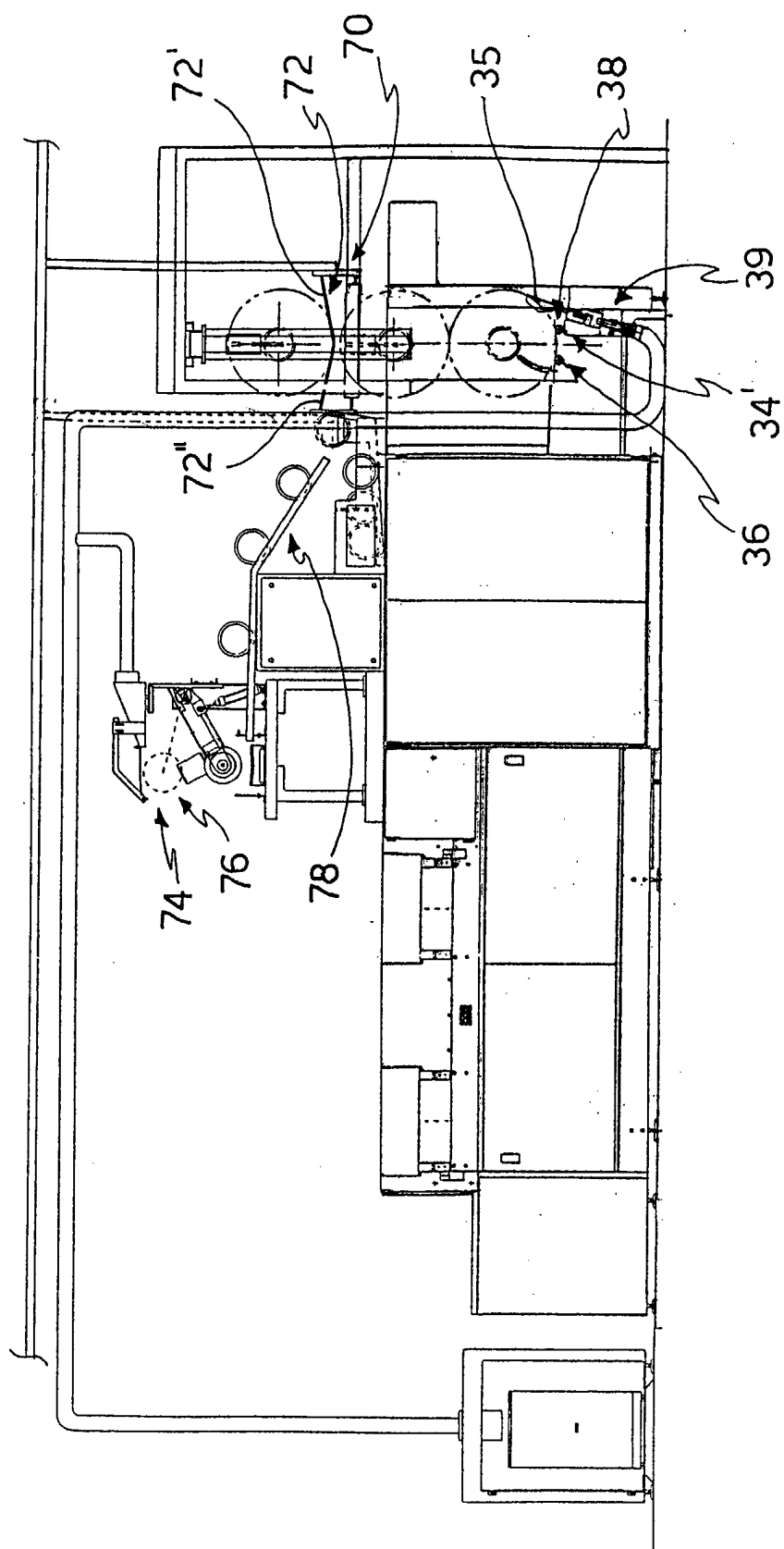


FIG. 2

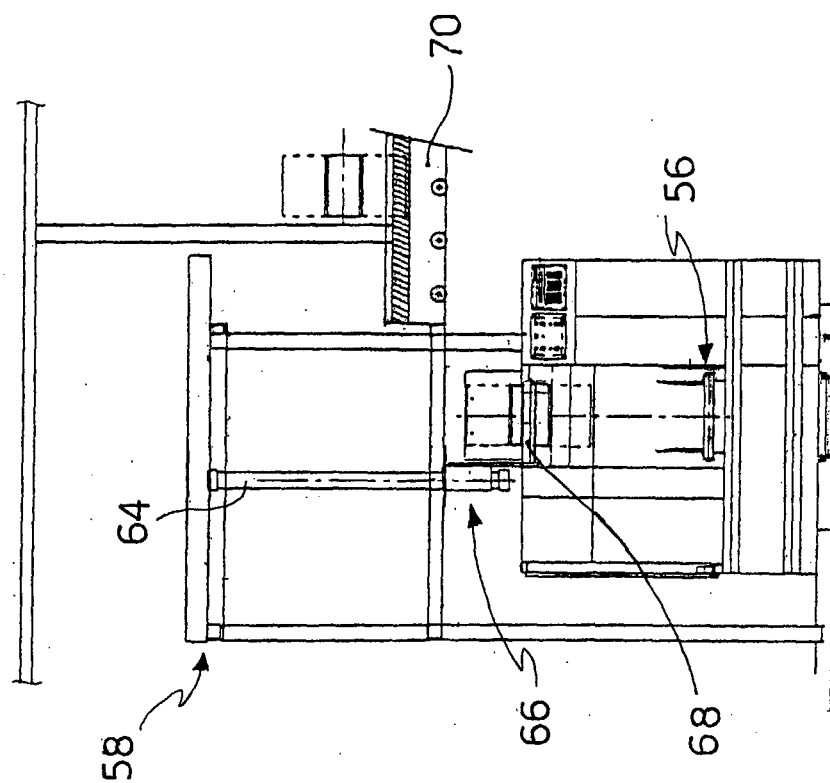


FIG. 3a

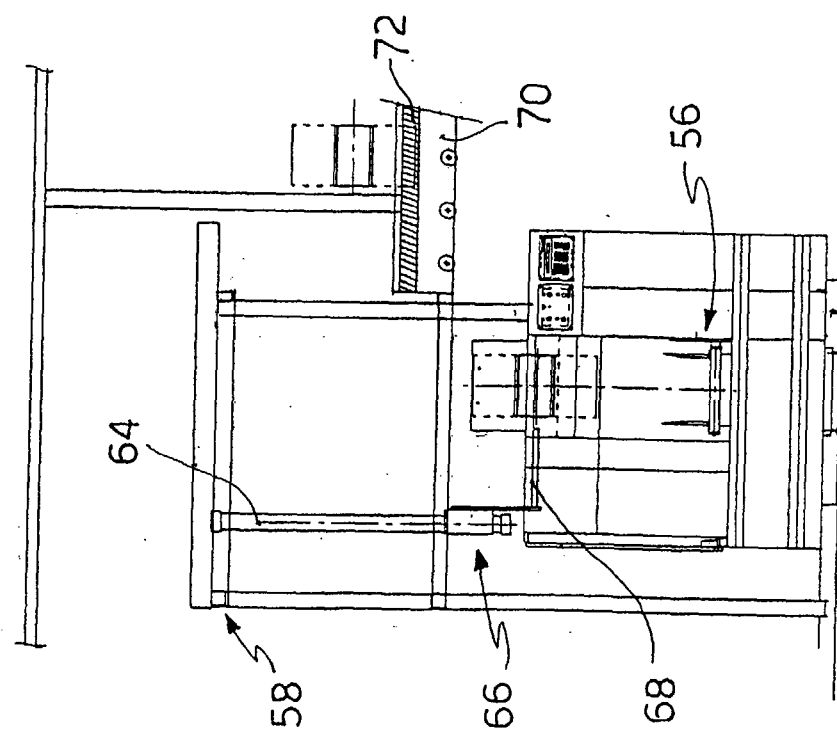


FIG. 3b

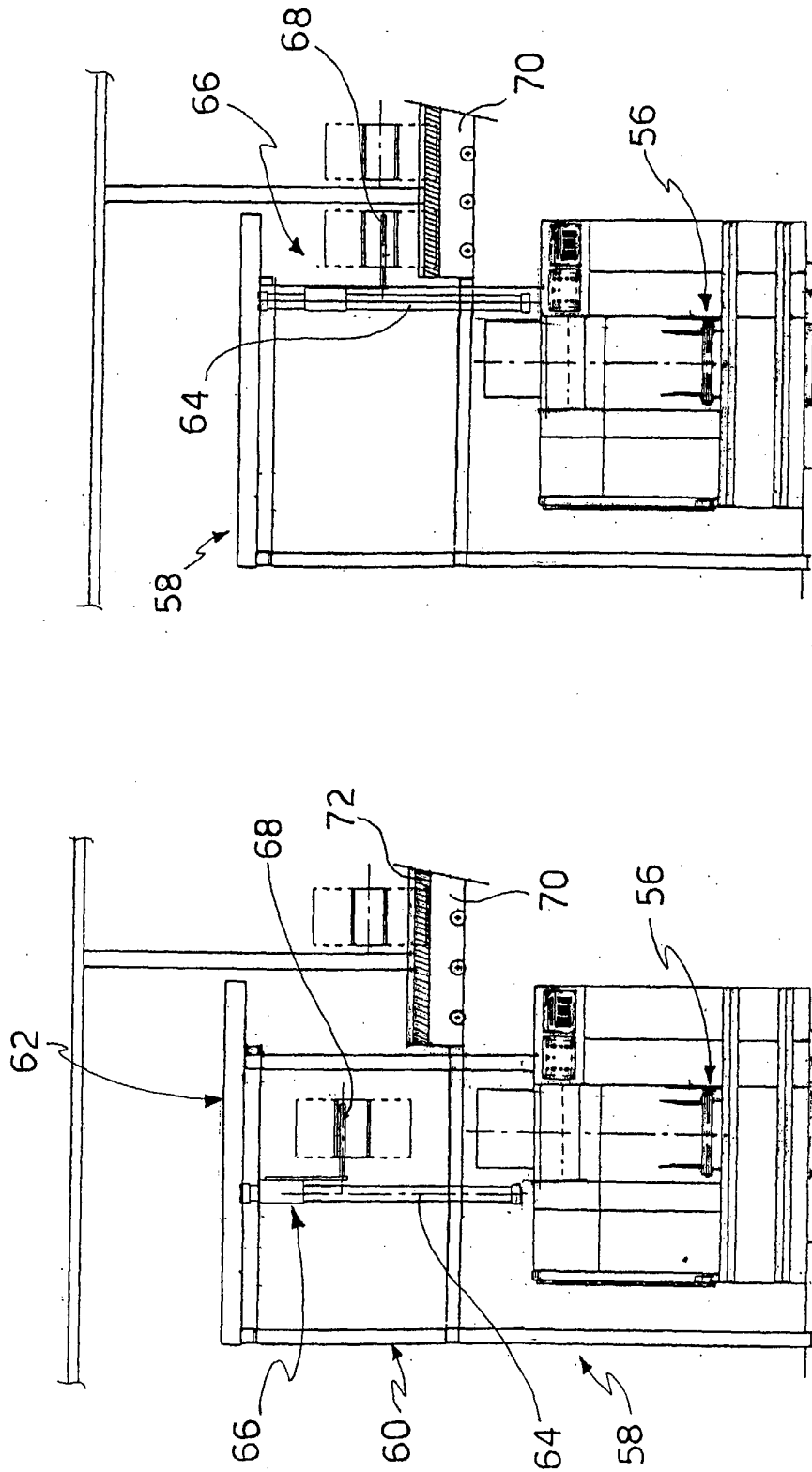
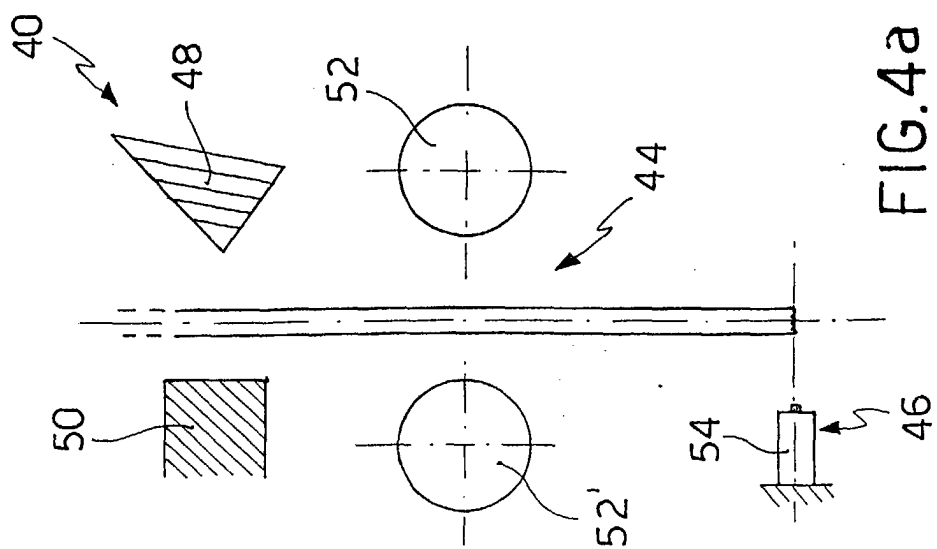
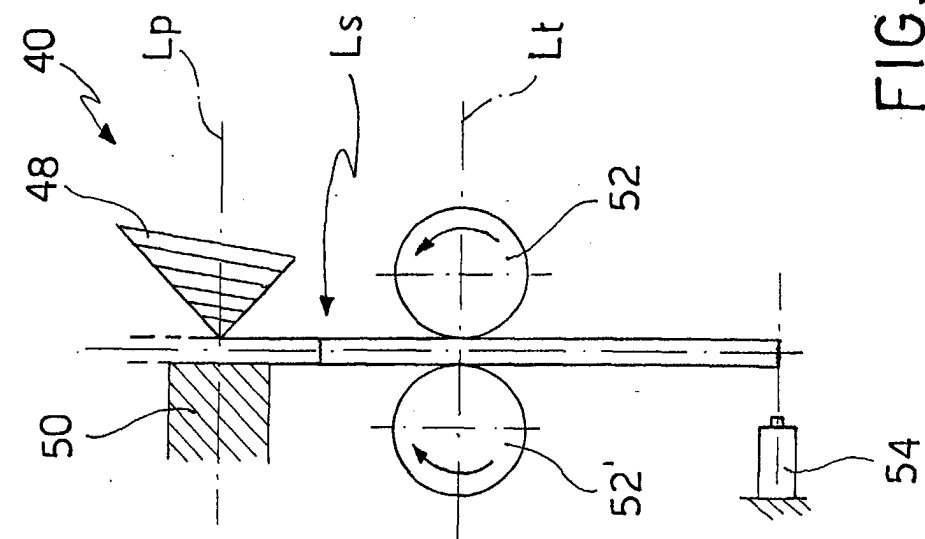


FIG.3d

FIG.3c



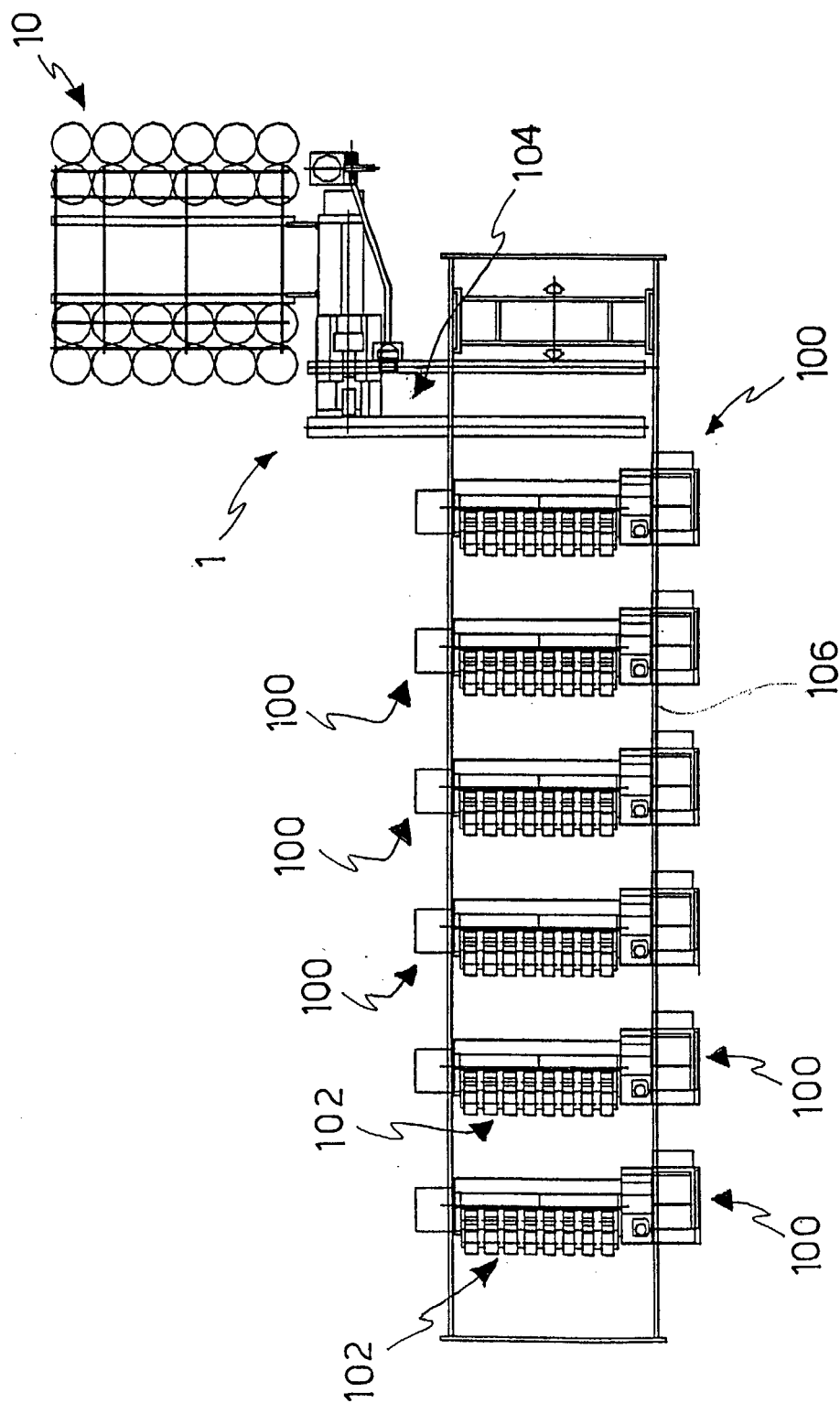


FIG. 5

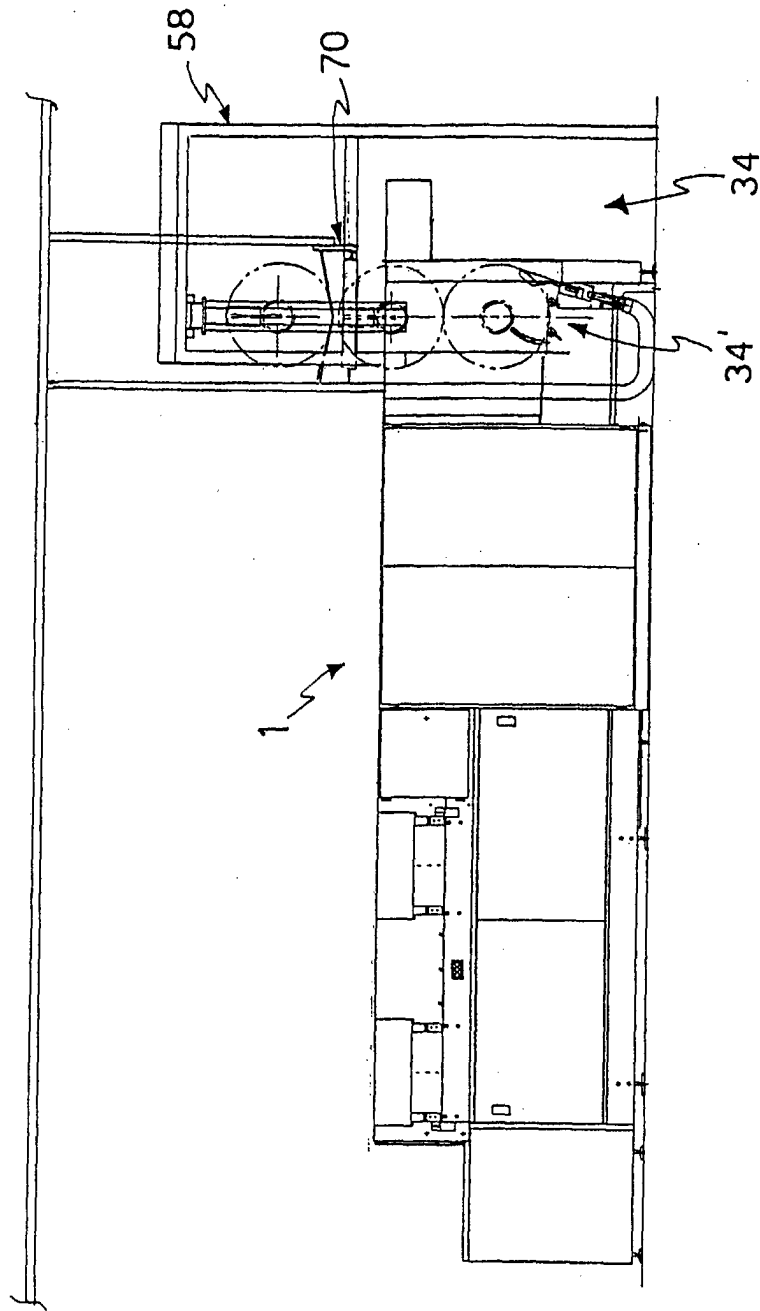


FIG. 6

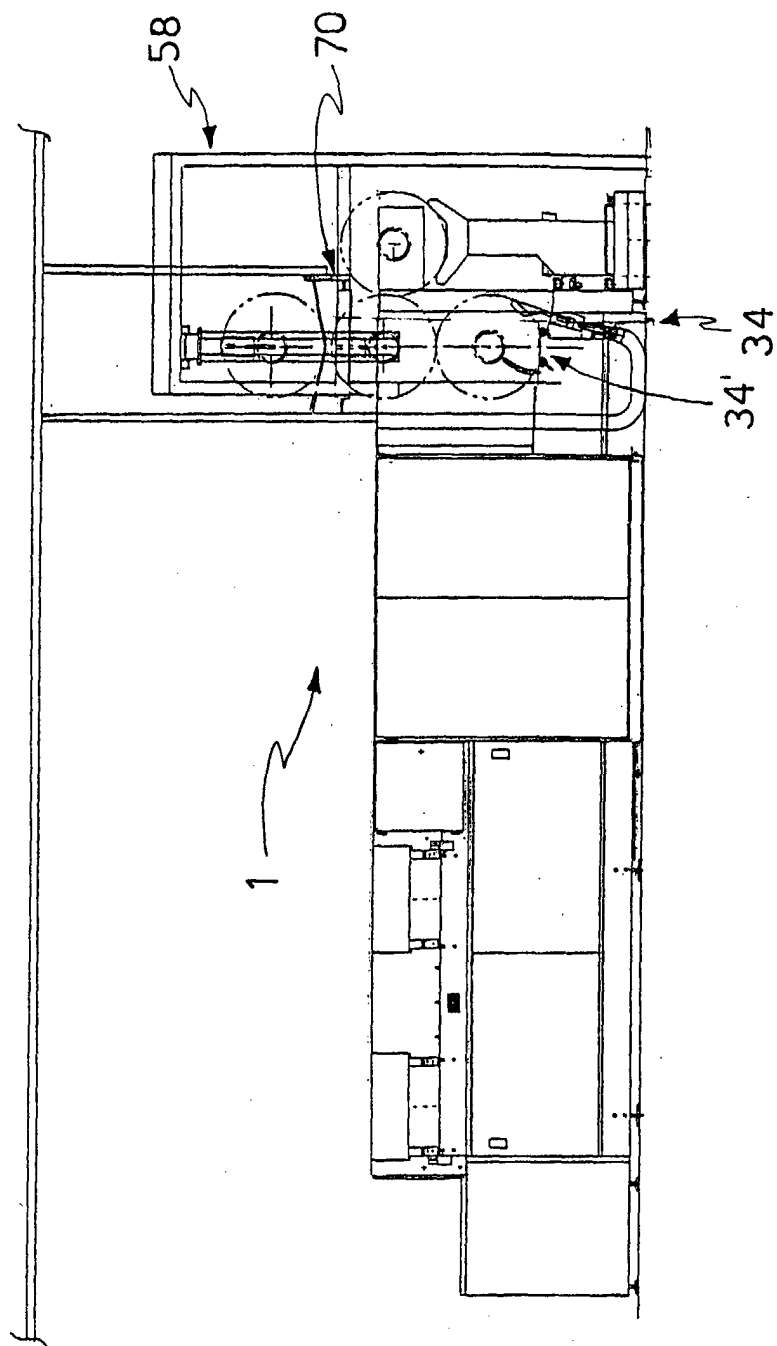
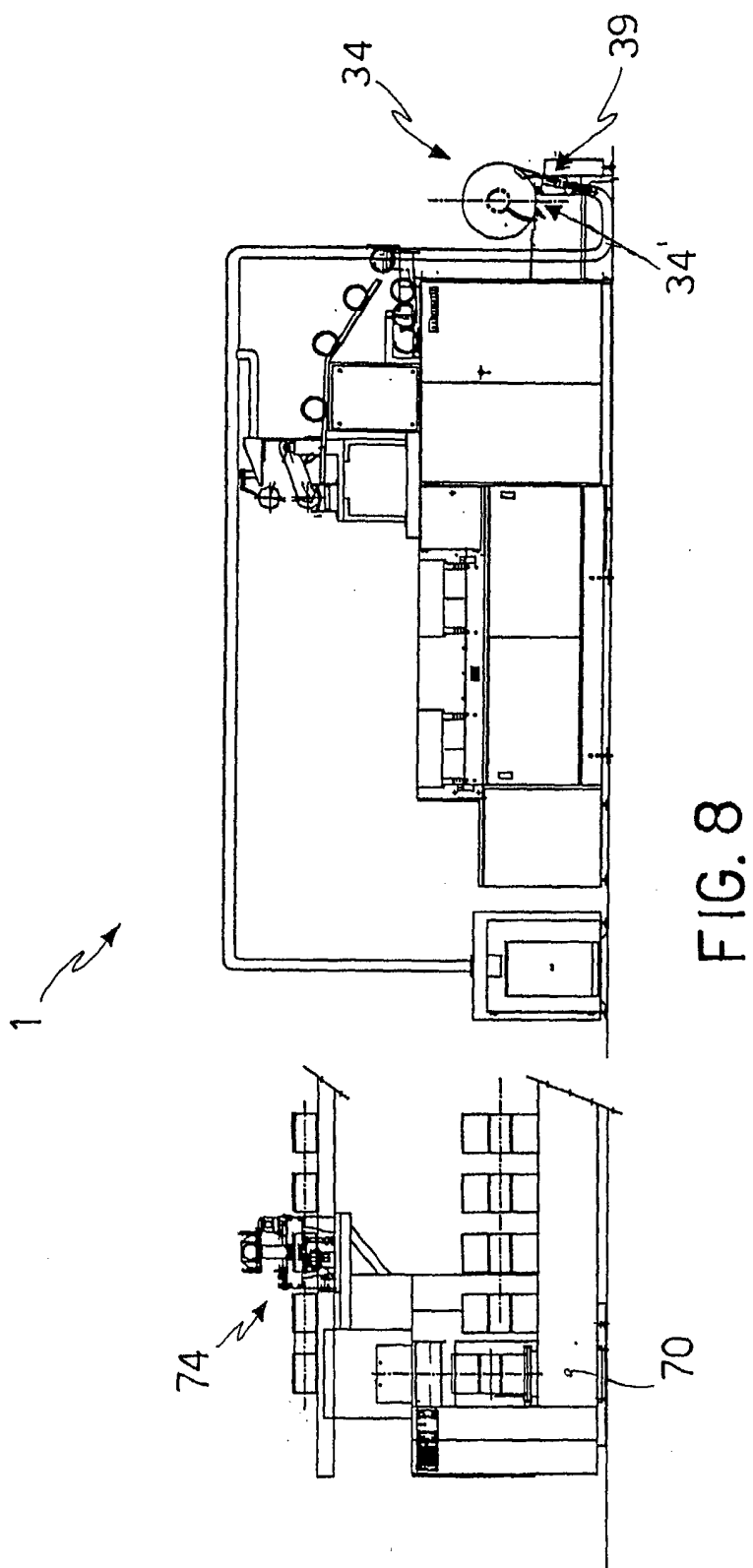


FIG. 7





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 42 5209

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Place of search MUNICH		Date of completion of the search 21 August 2003	Examiner Dreyer, C
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