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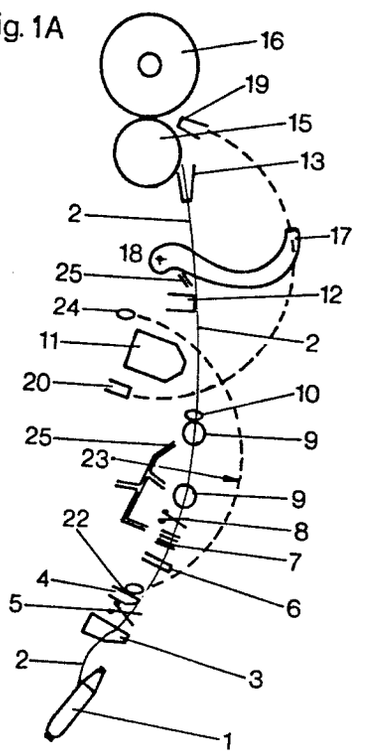
(54) Device and process for the handling and the control of the thread on a coner machine during the operations of spool change and of thread joining.

(57) Device and process for the handling of the thread on a coner machine during the operations of spool change and of thread joining, where the thread route shows, from the spool to the cone, the sequence:
- first cutting device (5)
- pre-slub catcher (6)
- thread feeler (7)
- second cutting device (8)
- thread tensioner (9)
- suction and control nozzle (10)
- thread joining unit (11)
- slub catcher (12)

Fig. 1A



EP 0 281 183 A1

"DEVICE AND PROCESS FOR THE HANDLING AND THE CONTROL OF THE THREAD ON A CONER MACHINE DURING THE OPERATIONS OF SPOOL CHANGE AND OF THREAD JOINING"

The object of present invention is a device and a process for the handling and the control of the thread on an automatic coning machine, in particular during the operations of change of the feeding spool, and/or of restoration of the continuity of the thread by joining or knotting.

The coning operation consists in transferring the thread from a feeding spool to a cone wound up on a tube, detecting the defects thereof and removing any faulty lengths from it, by cutting them and knotting the free ends thereof.

The handling and control of the thread submitted to the coning is accomplished by means of various equipment pieces which the same thread meets according to a precise sequence along its route in the space, and which perform their action according to a sequence in time.

In the prior art, many possible arrangements are reported for such equipment pieces, commonly denominated as the "thread route", in which both the composition of the set of equipment pieces which the thread meets when running along its route from the spool to the cone, and the sequential order according to which they are arranged, vary.

The composition and the order of such sequence of pieces of equipment vary according to the productive choices, which tend to privilege some requirements of the operation, on the basis of different compromises between the various requirements.

DOS 2404035 discloses a technical solution aiming at preventing that on the cone slack turns may be wound after a new start-up following a thread joining. Such a purpose is achieved by inserting along the thread route an auxiliary thread tensioner, interposed between the knotting device and the cone drive cylinder, which is actuated during the start-up step only. In such a way, the formation of a loop of thread inside the knotting device - which is responsible for the above said slack turns - is prevented.

DOS 2824752 discloses a technical solution aiming at preventing that the slub catcher, after the breakage of the thread, may continue to detect the presence of the thread, by being occupied by a free end of the thread, or by a piece of the broken thread.

In such case, the cycle of restoration of thread continuity is not begun.

Such a technical solution consists in placing, between the thread tensioner, on the same side of the spool, and the same slub catcher, an air sucking nozzle, which is movable, and with an air stream moving out of the thread route. Such an air sucking nozzle is controlled by the travelling service car, and cooperates with a cutting device provided between it and the slub catcher, in order to remove the free thread end, or the thread length present inside the slub catcher.

Such nozzle ends its task before the joining of the thread, and does not control the joined thread.

The equipment pieces which constitute the device and which accomplish the process according to the invention are schematically shown in the practical embodiment of Figures 1A and 1B, which respectively show a side view and a front view of the thread route.

The feeding spool 1, installed on a fixed, expandable pivot, not shown, supplies the thread 2, which unwinds according to a spiral commonly called "the balloon". The thread meets the balloon-breaker 3, which contains and limits the amplitude of the balloon, and then the thread guide 4, which defines exactly the position of the thread at the entrance to the thread guided route.

Between the balloon-breaker 3 and the thread guide 4, a cutting device 5 is interposed, which is symbolically indicated with a pair of scissors, but which can have a whatever configuration.

The thread 2 finds then, along its upwards route, a pre-slub catcher 6, which is generally constituted by a slit of adjustable and preset size, for holding the clots or the coarsest imperfections, by tearing the thread. In this case, the point wherein the interruption of the thread occurs cannot be determined a priori, in that it necessarily occurs above the pre-slub catcher 6 due to the pulling by the upper winding-up device, and corresponds to the weakest portion of the overhanging thread. Its position, as well as the length of the free thread ends formed are hence whatever.

The thread 2 meets - after the pre-slub catcher 6 - the thread feeler 7, which is constituted by a detector device for the thread presence. Said thread feeler 7 must "feel" the stationary thread at the beginning of the handling intervention cycle.

In the absence of a thread, the requested intervention is that of spool change and of thread joining; in the presence of the thread, on the contrary, a joining intervention only is requested.

The device 7 is hence that which determines the type of action to be undertaken, and hence the sequence of operations to be carried out.

The thread 2 finds then, along its upwards run, a further cutting device 8, also here symbolically indicated by a pair of cutting devices.

The thread 2 meets subsequently a thread

tensioner 9. Such thread tensioner device performs the function of giving the same thread a tension adjustable and ranging within preset limits, so to secure a regular cone winding up. The thread tensioner performs also the auxiliary function of eliminating the weak thread lengths.

The thread tensioner device can be embodied with one or more tensioning sections, generally constituted by pairs of coaxial washers opposite to each other and urged against each other.

A thread tensioner device capable of maintaining such tension also in the presence of irregularities in the thread is the object of the same Applicant's European patent application No. 87 202275.1.

The thread tensioner device 9 is followed by the suction nozzle 10.

Such suction nozzle is one of the basic components of the device, and in the process according to the present invention the nozzle 10 performs the following functions:

a) it catches the free thread end when the slub catcher detects an irregularity in the thread and commands the cutting. It holds the free thread end and keeps it in a controlled position for the subsequent operations. During such step, the nozzle 10 intakes both the upper free thread end coming from the slub catcher, and a thread length coming from underneath the same nozzle 10, contained inside the tensioner device 9, which, subsequently to the action of the slub catcher opens, intaking also the dust, the clots and the flocks which have possibly accumulated inside the thread tensioner 9.

Such an operation is described in detail hereunder, by referring to Figure 2;

(b) it accompanies and positions the thread end coming from the spool, inside the knotting device 11 which is installed just above the nozzle 10.

Such function is disclosed hereunder, by referring to Figure 3;

c) it accompanies and controls the thread after the joining, for it to take again its normal configuration.

Such function is described in detail hereunder, by referring to Figure 4.

The suction nozzle 10 is therefore subject to move in a direction perpendicular to the route of thread 2.

The thread meets then the slub catcher 12.

Such a device is one of the most important components of the coner machine, and its task is of detecting the defects of the thread 2 and of cutting the thread by means of a cutting device not shown in the figures, but substantially positioned in the same position as of the slub catcher.

The thread 2 runs then upwards and meets a funnel-shaped member 13, which guides the same thread towards the thread guide slits 14 of the cylinder 15, which guide the turns of thread 2 on the cone 16.

The device is completed by further handling devices and auxiliary devices.

A suction nozzle 17 - the suction end of which is given an extended shape, so that it is able to perform its sucking action through the whole generatrix of said cone - collects the free thread end from the cone side and, by moving around the centre 18, reciprocates between the end positions 19 of thread catching and 20 of thread consignment to the knotting device 11.

A further suction nozzle 21 - which, for the sake of clearness in the drawing is shown in Figure 3 - collects the thread end from the side of the feeding spool 1 in an extreme position 22 and, by revolving around the centre 23, takes it to the position 24, for it to be consigned to the knotting device 11.

Said suction nozzle 21 can - according to a preferred form of practical embodiment - be provided in its end portion with a catching cover, which holds the thread by clamping it between the cover and the nozzle edge. This contrivance secures a reliable catch also of short-length thread ends, which otherways would not be reliably caught by the suction effect alone, and allows furthermore economies to be accomplished in the suction.

The devices which are in contact with the thread - such as, e.g., the slub catcher 12, the thread tensioner 9 and the thread feeler 7 - are maintained clean by means of the pressurized air jet ejected from the nozzles 25.

The process of thread handling by the device according to the invention, which allows considerable advantages to be attained, is now disclosed.

As already mentioned, the handling intervention is commanded by the slub catcher, which detects the absence of the thread.

Such a thread absence can be caused by different circumstances:

1) the slub catcher 12 has detected a defect and has cut the thread;

2) the thread tensioner 9 has removed a weak point from the same thread;

3) the spool contained coarse irregularities, stopped by the pre-slub catcher 6: the spool is faulty;

4) the spool is exhausted.

In the first two cases, the matter is of only intervening to join the thread; in the latter two cases, the matter is of replacing the spool and joining the free thread end of the new spool with the free thread end of the cone.

As soon as the slub catcher 12 signals the absence of the thread, the coning operation is

discontinued.

The cone 16 and the driving cylinder 15 are preferably moved apart from each other and independently braked, in order not to damage the already coned thread. When the braking is performed, the cone and the cylinder are approached each other again.

The cycle of intervention according to the following sequence of operations is started.

The thread feeler 7 closes on the thread and, should this latter be absent, gives the command for spool 1 change, which is carried out simultaneously to the first steps of the knotting cycle. If, on the contrary, the thread is present, the knotting cycle only is performed.

After the thread feeling, the feeler 7 opens again.

The spool change is generally automatically carried out by the same machine, which collects the new thread end and takes it to a position, on the thread route, from which it can be collected by the nozzle 21, by means of the action of devices not identified in the figure.

For the purpose of maintaining a high operation factor of the automatic coners, the faulty spools must be replaced, like the exhausted spools. They can be processed by means of lower-productivity machines.

For a correct handling, it is essential that all of the residual thread lengths be removed.

The nozzle 21 is placed in its position 22 already before the operation of change of spool 1.

The cutting device 5 cuts the free thread end of the spool to be discharged, the possible thread length above the cutting device 5 is intaken by the nozzle 21 and is removed.

After the cutting by the cutting device 5, the cutting device 8 is actuated, both whether the thread is present, or not.

If the thread is present, it is subdivided into two lengths, the lower of which is removed by the nozzle 21, and the upper of which is intaken by the nozzle 10.

The thread route up to the slub catcher is now free from thread residues.

When the thread route is cleaned, the nozzle 21 is lifted according to the trajectory as shown by the short-dash line, to a position of non-interference for the change of the spool, and the presentation of the new free thread end.

It moves downwards for suction-collecting said new free thread end and holding it.

Before bringing the lower thread end to the position 24, the upper thread end is positioned inside the knotting device.

This task is performed by the nozzle 17, which comes to the position 19 to collect said upper thread end from the cone, and then keeps it to the position 20, as shown in Figure 3.

The cylinder is actuated to unwind the thread length necessary for that purpose.

The nozzle 21 brings then the new thread end to the position 24 according to the short-dash trajectory.

According to a preferred form of practical embodiment, such route is run along in two lengths, in the presence of limited-length thread ends; along a first, lifting, length some thread turns are unwound from the cone; the nozzle is then lowered again, so as to suck up again the unwound turns, to achieve a reliable hold, and the lifting up to position 24 is then carried out.

Before the new thread end is brought to position 24, the suction nozzle 10 has performed the functions as disclosed under (a) above.

They are now disclosed by referring to Figure 2, which shows a side view.

The nozzle 10, shown in its normal position, after sucking up the thread ends and after the opening of the thread tensioner 9 and of the pre-slub catcher 6, moves to its advanced position 10A, and with the suction being continued, it extracts any dust and flock clots possibly accumulated in other devices.

When the nozzle 10 has come to its advanced position 10A, the nozzle 21 leads the thread to the position 24.

Now, the nozzle 10 moves back from its advanced position 10A to the retracted position 10B of Figures 3 and 4, meeting the new thread end 2 and inserting it into the thread joining unit 11.

The thread joining unit 11 can be constituted by a mechanical knotting device, as well as by a pneumatic or friction joining device, as required.

In order to facilitate such operation, the hold of the thread end 2 is secured not only by the suction action, but also by a extension 26, which leads the thread to the position 2B.

The two thread ends are thus positioned inside the knotting device 11 and the knotting is carried out, with 10 being kept in its position 10B. Before carrying out the joining, both the thread tensioner 9 and the pre-slub catcher 6 are closed again.

When the knotting is ended, the thread is released from the knotting device, but such a release is accompanied by the nozzle 10, which controls it by means of its extension 26, moving gradually back from the position 10B to its normal position, and thus preventing loops from being formed.

In any case, the return of the nozzle 10 from its position 10B must not occur before the coning is resumed.

The knotting process without spool change is now described.

As disclosed above, in that case, the thread feeler 7 signals the presence of the thread 2 inside

it.

That means that the lower thread end - the thread end connected with the spool - ends anyway above the same thread feeler, but in an indeterminate position.

If the interruption is caused by the slub catcher, the thread end is however hold by the nozzle; if, on the contrary, the interruption is due to a weak point interrupted by the thread tensioner, that situation may also not occur.

The knotting cycle takes place exactly as disclosed above, with the difference that the thread caught by the nozzle 21 is not the thread of the new spool which was replaced, but is always the same thread.

In that case, the cutting device 5 is kept inactive and the cutting operation is entrusted to the cutting device 8 only. The remaining operations of the cycle are those as already disclosed referring to the intervention of spool change.

As it can be observed, the present invention provides for an arrangement of equipment pieces, i.e., a thread route, which accomplishes a process for thread handling and control which removes the residual lengths, remove dust and clots collected inside the components before the continuity of the thread being restored, and, when the thread continuity is restored, prevents thread loops from forming at process resumption, by means of a movable suction nozzle synchronized with it, which is moved along the route of the thread.

Claims

1. Device for the handling and the control of the thread on an automatic coner machine during the operations of feeding spool change and/or of thread continuity restoration, characterized in that is comprises the following sequence of devices between the feeding spool and the cone under way of formation:
- a first cutting device 5;
- a pre-slub catcher 6, which holds the coarsest imperfections;
- a thread feeler 7, which detects the presence of the, even stationary, thread;
- a second cutting device 8;
- a thread tensioner device 9;
- a nozzle 10 for thread end suction and control, capable of carrying out movements substantially perpendicular to the thread route;
- a thread joining unit 11 or knotting device;
- a slub catcher 12.

2. Device for the handling and the control of the thread on an automatic coner machine during the operations of change of the feeding spool and/or of restoration of the continuity of the thread according to claim 1, characterized in that it comprises two devices for the thread end catching, constituted by two nozzles capable of rotating on a substantially vertical plane, the lower thread end catching member of which collects said thread end in an intermediate position between the first cutting device 5 and the pre-slub catcher 6.

3. Device for the handling and the control of the thread on an automatic coner machine during the operations of change of the feeding spool and/or of restoration of the continuity of the thread according to one or more of the preceding claims, characterized in that the nozzle 10 is provided, at its catch end, with an extension 26, which holds the lower free thread end to be knotted inside the knotting device 11, in the position 10B.

4. Process for the handling and the control of the thread on an automatic coner machine during the operations of change of the feeding spools and/or of restoration of the continuity of the thread by means of the device according to one or more of the preceding claims, characterized in that the nozzle 21 eliminates - before collecting the new thread end from the replaced spool - the thread residues which were interrupted by the action of the cutting devices 5 and 8.

5. Process for the handling and the control of the thread on an automatic coner machine during the operations of restoration of the continuity of the thread according to claim 4, characterized in that the suction nozzle 10 is advanced to its position 10A, with the suction action being continued, for extracting from the thread tensioner 9 and from the pre-slub catcher 6 the dust and flock clots accumulated in said devices, after their preliminary opening.

6. Process for the handling and the control of the thread on an automatic coner machine during the operations of restoration of the continuity of the thread according to one or more of the preceding claims, characterized in that the suction nozzle 10 is moved backwards to its position 10B, for feeding the hold thread end to the knotting device 11, by the action of the extension 26.

7. Process for the handling and the control of the thread on an automatic coner machine during the operations of restoration of the continuity of the thread according to claim 6, characterized in that the nozzle 10 returns gradually from its position 10B back to its normal position 10 after the coning process resumption.

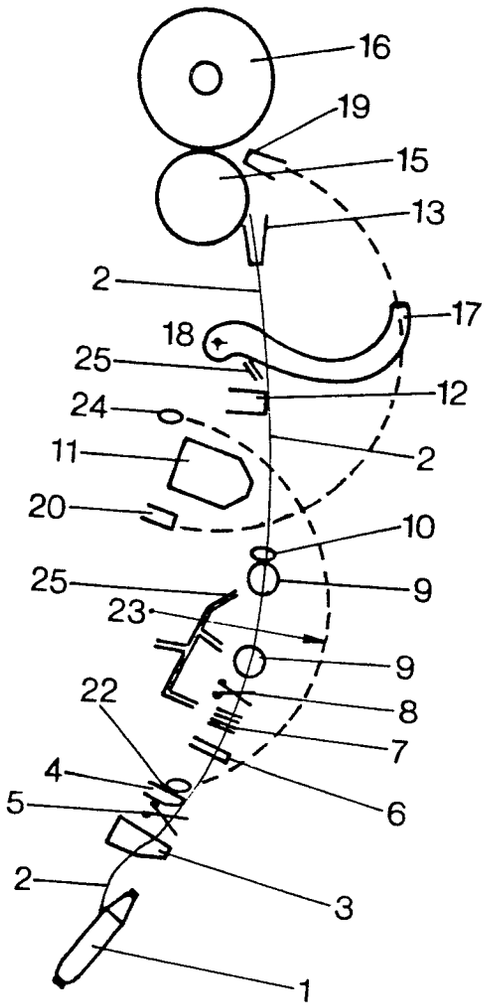


Fig. 1A

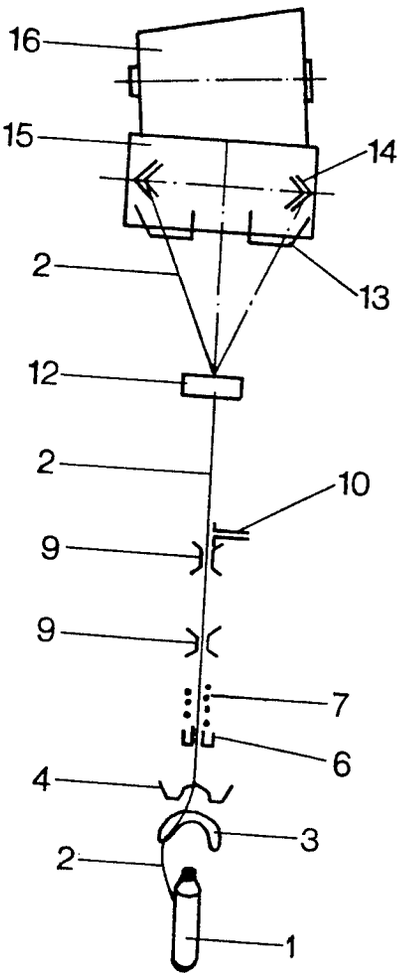


Fig. 1B

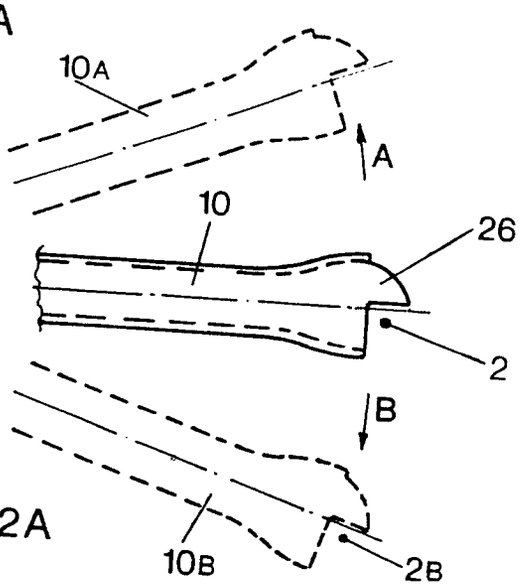


Fig. 2A

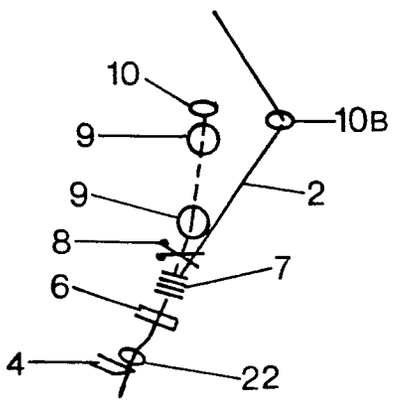


Fig. 2

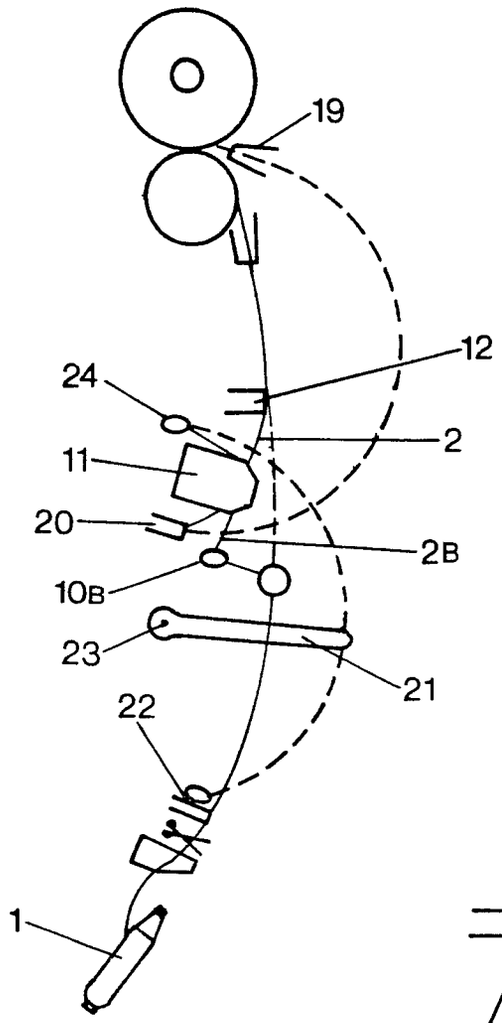


Fig. 3

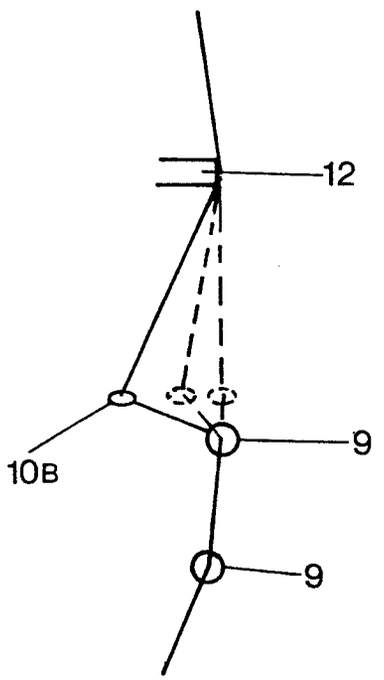


Fig. 4

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EUROPEAN SEARCH REPORT

Application Number

EP 88 20 0285

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.4)
X,D	DE-A-2 824 752 (SCHLAFHORST) * Pages 6-8; figures *	1,4	B 65 H 69/00
Y		2	B 65 H 63/06
A		5,6	B 65 H 54/22
Y,D	DE-A-2 404 035 (SCHLAFHORST) * Whole document *	2	
A		1,4,6	
A	DE-A-2 705 080 (KARL MAYER TEXTIL-MASCHINEN-FABRIK) * Figure 1; page 5, paragraph 1 *	1	
A	DE-B-2 543 983 (KARL MAYER TEXTIL-MASCHINEN-FABRIK) * Whole document *	1	
A	US-A-3 399 840 (HAYASHI et al.) * Whole document *	1,2	
A	DE-C- 912 193 (SCHLAFHORST) * Whole document *	1,2,4	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	DE-C-3 241 280 (KARL MAYER TEXTIL-MASCHINEN-FABRIK) * Whole document *	1,2,4	B 65 H
A	DE-C- 920 055 (SCHLAFHORST) * Whole document *	1,2,4	
A	US-A-3 834 634 (HAVLAS et al.) * Column 2, lines 20-64; figure 1; claim 1 *	1	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	02-06-1988	RAYBOULD B.D.J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

Application Number

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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.4)
A	CH-A- 441 078 (SCHWEITER) * Whole document *	1,2	
A	DE-A-3 213 631 (MURATA KIKAI K.K.) * Page 7, paragraph 1; figure 1 *	1,2	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)

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THE HAGUE	02-06-1988	RAYBOULD B.D.J.

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