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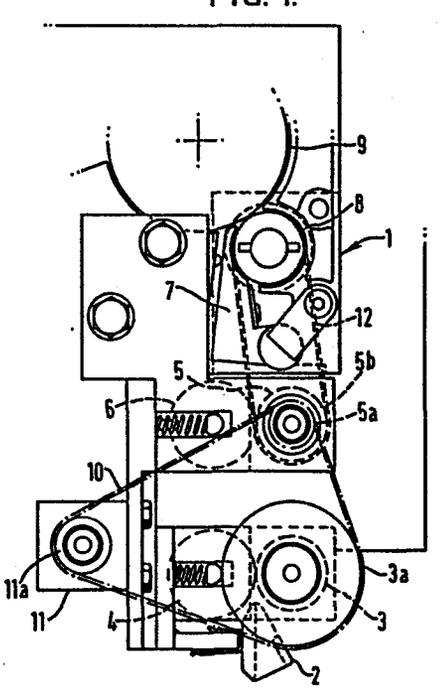
(54) **Fibre-opening unit for an open-end spinning machine.**

(57) A fibre-opening unit for an open-end spinner comprises first pre-drafting rolls (3, 4) and second pre-drafting rolls (5, 6) with a variable velocity ratio between the first and second pairs of rolls whereby the pre-draft can be changed in order to adapt the open-end spinning unit to the quality of the sliver supplied.

FIG. 1.



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TITLE MODIFIED
see front page

"IMPROVEMENTS IN OR RELATING TO OPEN-END SPINNING"

The present invention provides an improvement in open-end spinning, and in one aspect relates to a fibre opening unit for open-end spinning. Another aspect of the invention relates to a process of open-end spinning.

There are various forms of open-end spinning known to date, the two principal ones of which are rotor spinning such as is disclosed in our British Patent Specification No. 1,191,668, and friction spinning such as is disclosed in our Published British Patent Application No. 2,042,599A. Other forms of open-end spinning include fluid jet spinning and electrostatic spinning.

Open-end spinning systems have in common the fact that an incoming sliver is broken down into its constituent fibres which are then conveyed, usually by fluid entrainment, to a reconstitution zone where the fibres are twisted together to form a yarn. The diameter of the delivered yarn is much smaller than that of the incident sliver, and thus the open-end spinning unit can be considered analogous to a drafting system in that the fibrous material undergoes a considerable draft between arrival of the sliver and departure of the spun yarn.

It is known, from GB-A-1,326,200 to subject a sliver being fed to an open-end spinning process to a pre-draft operation in order to improve the orientation of the individual fibres in the sliver. In that prior proposal the drafted sliver is then advanced towards the beater feed roll and feed pedal in the conventional manner.

One aspect of the present invention provides an open-end spinning process comprising taking a sliver, subjecting it to a pre-drafting operation, presenting the pre-drafted sliver to the sliver guide means of a fibre-opening unit, separating the fibres from the sliver

by the action of the beater roll, and re-constituting the thus withdrawn fibres to form a yarn, characterised in that the final drafting pair of the pre-drafting means is directly adjacent the feed nip to the beater roll and serves to guide the sliver directly into the feed nip such that the fibres of the pre-drafted sliver are applied at a predetermined location along the axis of the beater roll.

Open-end spinning has used a drafted sliver as feed material and is itself analogous to drafting means, but nevertheless we believe it is a most surprising step to incorporate a conventional drafting operation in the fibre supply means constituted by the fibre-opening unit.

A second aspect of the present invention provides a fibre-opening unit for open-end spinning, comprising a toothed or pinned beater roll, a feed nip for presenting sliver to the beater roll, and pre-drafting means for the sliver fed to the feed nip, characterised in that the pre-drafting means has its final drafting pair directly adjacent the sliver feed nip to the beater roll to control the positioning of the sliver axially along the beater roll.

The invention also provides an open-end spinning unit including the fibre-opening unit of the second aspect.

In order that the present invention may more readily be understood the following description is given, merely by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a front view of a fibre-opening unit for use in open-end spinning; and

FIGURE 2 is a side view of the fibre-opening unit of Figure 1, as viewed from the righthand side thereof.

Traditionally, sliver is prepared for spinning by being drawn in a drawing frame where various slivers are themselves doubled together and stretched to effect blending and straightening of the fibres.

Because of mismatch between the production rates of the drawing frame and the individual spinning heads, the sliver is coiled in storage cans and the individual cans are then subsequently transported to spinning heads where the coiled sliver is unpacked and fed to the fibre-opening unit to allow the individual fibres to be extracted from the sliver and fed to the reconstitution zone.

Throughout the following description, we shall refer to a friction spinning head as the open-end spinning head in question, but it will of course be appreciated that the open-end spinning head could be of any type, i.e.a spinning head in which the individual fibres of the sliver are subsequently reconstituted to form a yarn.

In the case of the fibre-opening unit of Figure 1, the sliver is introduced to the fibre-opening unit 1 by way of a sliver feed guide 2 which directs the sliver into the nip between a first pair of drafting rolls comprising a driven drafting roll 3 and an idler drafting roll 4 which is spring-biased towards the driven roll 3. The peripheral velocity of the rolls 3 and 4 will be the same, by virtue of their frictional contact with the sliver and will be less than the peripheral velocity of a second pair of drafting rolls comprising a driven drafting roll 5 and an idler drafting roll 6, again spring-biased towards the driven roll for frictional drive.

From the second pair of drafting rolls 5 and 6, the pre-drafted sliver is introduced into a fibre-opening unit of a known kind, of the form generally illustrated in British Patent Specification No. 1368886. Such a fibre-opening unit includes a feed pedal 7, pressing the sliver against a ribbed sliver feed roll 8,

and thereby guiding it onto a toothed or pinned beater roll or opener roll 9. As is conventional, trash extraction means are provided around the periphery of the beater roll 9 and a fibre discharge opening of the beater housing will convey the airborne fibres into the fibre feed duct of a friction spinning machine which may be generally of the kind disclosed in our said Published British Patent Application No. 2,042,599A.

The two driven drafting rolls 3 and 5 are drivingly interconnected by a common timing belt 10 with the necessary peripheral velocity ratio between the drafting rolls being achieved by way of having on the first driven drafting roll a toothed pulley 3a which is smaller in diameter than the drafting roll 3 itself, and on the second driven drafting roll a toothed pulley 5a which is larger than the drafting roll 5 itself.

These toothed pulleys 3a and 5a are replaceable, and the apparatus will be supplied with a selection of toothed pulleys of different sizes which allow the timing belt to span each of the pulleys. As an example, the toothed pulley 5a may be one having ten teeth or one having fourteen teeth, and the toothed pulley 3a may be one having thirty teeth, twentyfour teeth or twelve teeth, the tooth pitch being the same in each case.

Other combinations of pulley sizes are possible but it may, for this purpose, be necessary to adjust the tensioning pulley 11a in its mounting 11 thereby to spread the toothed belt 10 taut over the three pulleys 3a, 5a, and 11a.

The sliver feed roll 8 in this case has its own toothed pulley 8a(Figure 2) driven from a secondary toothed pulley 5b connected to the second driven drafting roll 5. A further timing belt 12 connects the pulleys 5b and 8a.

Drive to the fibre-opening unit is thus in this case by way of drive input to the shaft of the second driven drafting roll 5.

The different ranges of pre-drafts available with the mentioned alternative pulleys for use as 3a and 5a would give a range of from 1.2:1 in the case of a pulley 3a with twelve teeth and a pulley 5a with ten teeth, to 3:1 in the case of a pulley 3a having thirty teeth and 5a having ten teeth. Intermediate ratios of 2.4:1 (for pulleys 3a of twentyfour teeth and 5a of ten teeth) and 1.7:1 (for pulleys 3a of twentyfour teeth and 5a of fourteen teeth) are also achievable within this range.

Generally, we prefer the pre-draft to be in excess of 1.1:1 and up to 30:1. This preferred range embraces the values 1.2:1,1.7:1,2.4:1,and 3:1 mentioned above.

It will of course be understood that the effective draft of the open-end spinning unit is multiplied by the pre-draft value to give the total effective draft. Thus for a friction spinning head with an effective draft of 120:1 (between the sliver at the sliver feed roll 8 and the yarn at the withdrawal rolls (not shown) of the spinning head) and with the upper pre-draft value of 3:1 (with a pulley 3a of thirty teeth and a pulley 5a of ten teeth) there will be an overall effective draft of 360:1.

Conventionally a rotor spinning process has a lower effective draft, normally of the order of 80:1, and again the overall effective draft will be increased by use of the pre-draft step in accordance with this invention.

By comparison, a ring frame spinning process (which is not open-end spinning) has a draft of only 40:1.

A first important advantage of having pre-draft

at the beater unit is that the delivery of drafted sliver from the second drafting rolls 5 and 6 to the guide means of the fibre-opening unit (in this case the feed pedal 7 and the sliver feed roll 8) is always in exactly the same position along the axis of the beater 9 (and in this case along the parallel axis of the sliver feed roll 8). Thus, the stream of discrete fibres delivered from the beater 9 is always accurately positioned in relation to the axis of the beater 9. This is particularly important in the case of a friction spinning machine such as that disclosed in our said Published U.K. Patent Application No. 2042599A where the fibre feed duct from the beater 9 to the friction spinning rollers is inclined to the plane common to the axes of rotation of the friction spinning rollers, because any slight lateral shift of the sliver on the beater of such a machine will cause a magnified disadvantageous shift of the fibres along the yarn formation line and this is undesirable because the location of and the stability of the point at which the fibres arrive at the yarn formation line is an important parameter of the friction spinning process. This location and stability are all the more important in the case of composite yarn spinning such as the core yarn process disclosed in our European Patent Publication No. 0,031,250, and of the blended friction spun yarn disclosed in our British Patent Publication No. 2,103,665A.

Another important advantage of the pre-draft of the fibres is that this operation gives more accurate orientation of the fibres parallel to the direction of advance of the sliver; and consequently parallel to a plane which is perpendicular to the axis of rotation of the beater 9. As a result the fibres leaving the beater 9 are more likely to be parallel to the general

longitudinal axis of the fibre feed duct carrying them in airborne form towards the yarn formation throat between the friction spinning rollers. It will be understood that this latter advantage is also important in the case of rotor spinning where the parallelism of the fibres helps to give a generally stronger yarn.

The individual fibres in a drafted sliver which has just been withdrawn from a coiled build-up in a storage can will be parallel to one another at any one point along the yarn, but with time the orientation of the fibres arriving at the beater roll will vary due to the influence of the coiling and uncoiling action on the sliver. By applying pre-draft just as the sliver approaches the sliver feed roller or equivalent guide means it will be ensured that the fibres are also at a constant orientation i.e. parallel to the direction of sliver advance, and preferably also parallel with respect to the path of movement of the teeth or pins of the beater roll.

A further advantage of having pre-draft is that the incoming sliver can be more bulky than would otherwise be tolerated, and the fact that the pre-draft is adjustable makes it possible for sliver from various different sources to be equally well spun on a particular open-end spinning machine.

It is a further valuable attribute of the fibre-opening unit in accordance with the present invention that the sliver presented to the beater is absolutely uniform in that it has just been drawn before presentation to the guide means to the beater (in this case the feed pedal 7 and the sliver feed roller 8) and, despite any residual signs of its having previously been coiled in the storage cans in which it has been confined after the drawing frame process, the drafted sliver presented to the beater is absolutely straight and free of kinks.

It is not essential for the axes of the drafting rolls 3, 4, 5, 6 to be parallel to the axes of the sliver feed roller 8 and beater roll 9. For example the drafting rolls 5, 6, while being parallel to one another may be skew to the axes of the sliver feed roller 8 and beater roll 9 but such that the direction of movement of the surfaces of the final drafting rolls at the nip between them is directly towards the passage between the feed pedal 7 and sliver feed rollers 8. The axes of rolls 5, 6 may even be perpendicular to that of beater roll 9.

Although in this application a roller type of pre-drafting system is described, it may instead be possible to incorporate an alternative drafting system such as an apron drafting system.

CLAIMS

1. An open-end spinning process comprising taking a sliver, subjecting it to a pre-drafting operation, presenting the pre-drafted sliver to the sliver guide means of a fibre-opening unit, separating the fibres from the sliver by the action of the beater roll, and re-constituting the thus withdrawn fibres to form a yarn, characterised in that the final drafting pair (5b, 6) of the pre-drafting means is directly adjacent the feed nip (7, 8) to the beater roll (9) and serves to guide the sliver directly into the feed nip such that the fibres of the pre-drafted sliver are applied at a predetermined location along the axis of the beater roll.

2. A process according to claim 1, characterised in that the individual fibres of the pre-drafted sliver at the sliver guide means extend substantially in a plane perpendicular to the axis of rotation of the beater roll.

3. A process according to claim 1 or claim 2, characterised in that the pre-draft is from 1.1:1 to 30:1.

4. A process according to claim 3, characterised in that the pre-draft is from 1.2:1 to 3:1.

5. A process according to any one of the preceding claims, characterised in that the re-constitution of the separated fibres to form a yarn is effected by friction spinning, and in that the fibre feed direction from the beater roll to the yarn formation line of the friction spinning head is inclined to the direction of yarn take-off from the friction spinning surfaces of the friction spinning head such that one end of the beater roll (9) is nearer the friction spinning surfaces than is the other end.

6. A fibre-opening unit for open-end spinning, comprising a toothed or pinned beater roll (9),

a feed nip (7,8) for presenting sliver to the beater roll, and pre-drafting means (3-6) for the sliver fed to the feed nip, characterised in that the pre-drafting means has its final drafting pair directly adjacent the sliver feed nip (7,8) to the beater roll to control the positioning of the sliver axially along the beater roll (9).

7. A fibre-opening unit according to claim 6, characterised in that the pre-drafting means comprise several pre-drafting roll pairs which have associated respective toothed drive-transmitting rotors which are replaceable to change the pre-draft ratio.

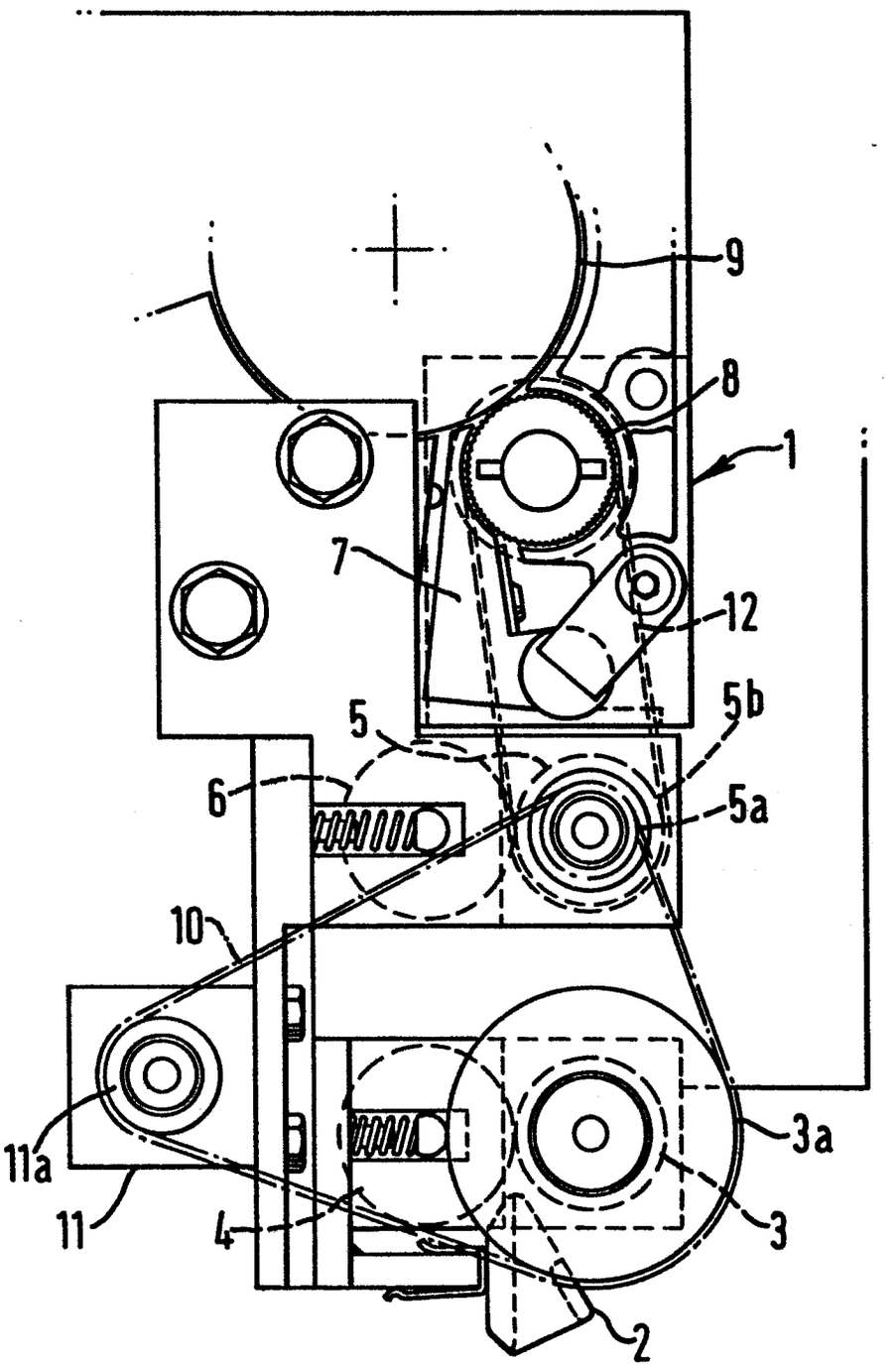
8. A fibre-opening unit according to claim 10, characterised in that the toothed drive-transmitting rotors are toothed pulleys interconnected by a toothed timing belt.

9. A fibre-opening unit according to claim 10 or 11, characterised in that the beater roll is driven from the final pre-drafting rolls.

10. A fibre-opening unit according to claim 8 or claim 9, characterised in that the drafting means comprise an apron drafting system.

11. An open-end spinning unit characterised by including the fibre-opening unit of any one of claims 6 to 10.

FIG. 1.



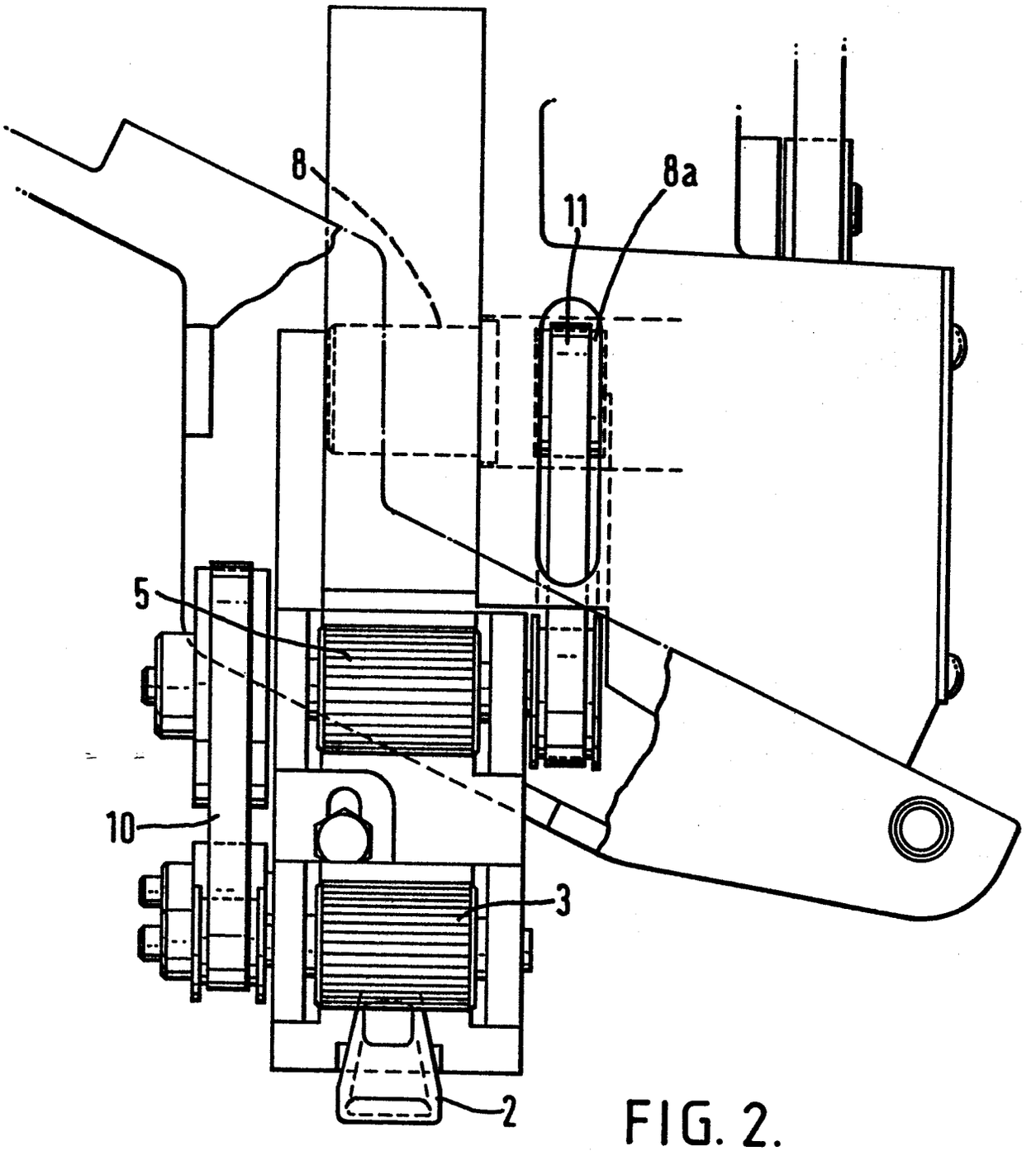


FIG. 2.

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EUROPEAN SEARCH REPORT

0131385
Application number

EP 84 30 3887

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. ³)
X	US-A-4 067 181 (E. FEHRER) * column 4, lines 13-31; figure 2 * ---	1,5,6	D 01 H 7/895 D 01 H 1/135
X	FR-A-2 298 626 (E. FEHRER) * the whole document * ---	1,5,6	
X	DE-A-1 941 084 (T.M.M.) * the whole document * ---	1,5,6	
X,D	GB-A-1 326 200 (T.M.M.) * the whole document * ---	1,5,6	
A	GB-A-1 580 427 (J. MACKIE) * the whole document * ---	1,5,6, 10	TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
A	DE-A-2 115 484 (W. STAHLECKER) * page 10; figure 5 * ---	1,5,6	D 01 H
A	DE-A-2 036 007 (W. STAHLECKER) * page 12; figures 8,9 * -----	1,5,6, 10	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06-09-1984	DEPRUN M.

CATEGORY OF CITED DOCUMENTS

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