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

(11) EP 0 819 505 A1

# (12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
**21.01.1998 Bulletin 1998/04**

(51) Int. Cl.[6]: **B26D 7/18**, B26D 1/38

(21) Application number: **96111729.8**

(22) Date of filing: **20.07.1996**

(84) Designated Contracting States:
**DE GB IT**

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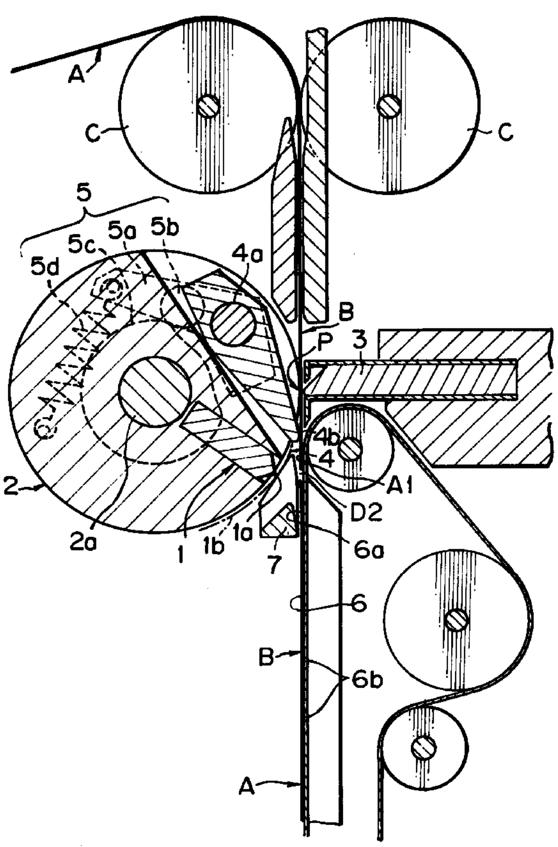
## (54) Film cutting machine

(57) According to the present invention relating to a film cutting machine, a band-like film (A) which is passing a film cutting position (P) is cut by both rotary blade (1) and fixed backup blade (3), and in a predetermined section after passage through the film cutting position (P) a push piece (4) is ejected from a rotation track (1b) of an edge (1a) of the rotary blade (1) toward a feed path (B) of the band-like film (A) by an eject means (5), so that the push piece (4) strikes against the front end (A1) of the band-like film (A) to separate the front end (A1) from a rotary holder (2), which front end is conducted to the feed path (B).

FIG. 1

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## Description

### TECHNICAL FIELD OF THE INVENTION

The present invention relates to a film cutting machine for use in forming a package film with tear tape such as a cellophane or polypropylene film which is for covering a packaged article such as a package of cigarettes. More particularly, the invention is concerned with a film cutting machine wherein a rotary blade and a fixed backup blade are disposed opposingly so as to sandwich a band-like film feed path, whereby a band-like film being conveyed is held between the rotary blade and the fixed backup blade and is thereby cut linearly in the width direction and is separated from the film band.

### BACKGROUND ART

According to a conventional film cutting machine of this type, as disclosed for example in Japanese Patent Publication No. Sho 29-1349 or Japanese Patent Laid-Open No. Hei 5-154793, a band-like film with tear tape is continuously fed downward with operation of a pair of feed rollers disposed downstream of a rotary roller and a backup roller, the rotary roller being projectingly provided with a generally U-shaped cutting edge portion, the band-like film passes in a sandwiched fashion between the rotary roller and the backup roller, whereupon the cutting edge portion of the rotary roller is pressed against the backup roller through the film to make a generally U-shaped cut in the film. The rotary blade and the fixed backup blade are disposed opposingly to each other, and on a downstream side thereof is provided a transfer path for an article to be packaged perpendicularly to the band-like film feed path. The front face of the to-be-packaged article is moved horizontally and pushed against the band-like film which has been fed up to a predetermined position, whereby the band-like film is wound in ⊃ shape around the article while being pulled down. At the same time, the rotary blade and the fixed backup blade sandwich the band-like film therebetween to make a linear cut continuous to the aforesaid generally U-shaped cut, which cut portion is separated from the band- like film.

In such conventional film cutting machine, however, a guide for the band-like film cannot be mounted on the rotary blade side because it comes into abutment with the edge of the rotary blade, so the front end portion of the band-like film as delivered after the cutting becomes free, not supported, which free end may be wound onto the outer periphery of a rotary holder provided projectingly with the rotary blade. Even when edge speed of the rotary blade is lower than the film feed rate, there is a likelihood of the film front end becoming adhered and wound onto the blade edge.

Upon occurrence of such problems it is necessary to urgently stop the operation of the cutting machine for removal of the entangled band-like film. There also occurs the problem of defect package because the band-like film cannot be fed along the feed path up to the to-be-packaged article transfer path which is an object position.

### DISCLOSURE OF THE INVENTION

Accordingly, it is the first object of the present invention to hold the front end portion of a band-like film along the film feed path without being entangled after cutting.

It is the second object of the present invention to deliver the band- like film after cutting up to an object position surely while completely preventing the entanglement of the film front end portion.

In order to achieve the first object mentioned above the present invention is characterized in that a push piece for opposition to and abutment with the film front end portion which has been moved after cutting is attached to a rotary holder provided projectingly with a rotary blade so that it is positioned on an upstream side in the rotating direction with respect to the rotary blade, and that there is provided an eject means for ejecting the push piece, with rotation of the rotary holder, toward a band-like film feed path from a rotation track of the rotary blade edge in a predetermined section after passage of the film through the film cutting position between the rotary blade and a fixed backup blade.

It is preferable for the eject means to have a fixed cam for engagement with a follower connected to the push piece.

According to the above construction, the band-like film which is passing between the rotary blade and the fixed backup blade is cut by both blades, and in a predetermined section after passage of the film through the film cutting position the push piece is ejected from the rotation track of the rotary blade edge toward the band-like film feed path by means of the eject means, so that the push piece strikes against the front end portion of the band-like film being delivered after cutting and separates it from the rotary holder, which film is then conducted to the feed path.

In this way the front end portion of the band-like film delivered after cutting can be conducted along the film feed path without entanglement. Thus, in comparison with the conventional like cutting machine wherein the front end portion of a band-like film delivered after cutting may be wound onto the outer periphery of the rotary holder, or the film front end may be adhered to and entangled on the rotary blade edge when the edge speed is lower than the film delivery speed, it is not necessary to urgently stop the operation of the cutting machine for removal of the entangled film, thus permitting continuous operation.

According to the present invention, in order to achieve the second object mentioned above, it is preferable that a hold and transfer means for holding the band-like film delivered after cutting and transferring it in the film delivery direction be disposed on a downstream side in the film delivery direction with respect to the fixed backup blade and along the band-like film feed path so as to become opposed to the film front end pushed by the push piece.

According to the above construction, since the hold and transfer means for holding the band-like film delivered after cutting and transferring it in the film delivery direction is disposed on a downstream side in the film delivery direction with respect to the fixed backup blade and along the film delivery path so as to become opposed to the film front end which is pushed by the push piece, the film front end pushed in a direction away from the rotary holder by the push piece is conducted along the film feed path and is delivered to the hold and transfer means.

Thus, the front end portion of the band-like film delivered after cutting can be transferred surely up to the object position while preventing entanglement thereof completely, and consequently it is possible to prevent accidents, e.g. defective package.

## BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1 is a front view in longitudinal section of a cutting machine according to an embodiment of the present invention, showing an ejected state of a push piece;

Fig.2 is a front view in longitudinal section of the film cutting machine, showing a film cutting state;

Fig.3 is a partial side view in longitudinal section on a reduced scale, partly broken away, taken along (Ⅲ)- (Ⅲ) in Fig.2;

Fig.4 is a front view in longitudinal section of the film cutting machine, showing a state just after cutting of film; and

Fig.5 is a front view in longitudinal section of the film cutting machine, showing a most ejected state of a push piece.

## DESCRIPTION OF EMBODIMENT

An embodiment of the present invention will be described below with reference to the accompanying drawings.

According to this embodiment, as illustrated in Figs.1 to 3, a pair of feed rollers C, C are disposed in a sandwiching relation to a feed path B for a band-like film A, and on the upstream side of the feed rollers C, C are disposed a rotary roller (not shown) and a backup roller (not shown), whereby the band-like film A, which is provided with tear tape A having a generally U-shaped cut D1, is fed downward in a continuous manner. Further, on the downstream side of the feed rollers C, C are disposed in a face-to-face relation a rotary holder 2 provided projectingly with a rotary blade 1 and a fixed backup blade 3, and further downstream of the rotary blade 1 and fixed backup blade 3 is horizontally disposed a to-be-packaged article transfer path (not shown) orthogonal to the feed path B, whereby the front face of the article to be packaged which has been moved horizontally is pushed against the band-like film A which has been fed up to a predetermined position, thereby allowing the film A to be wound in U shape around the body of the article while pulling the film downward. At the same time, the rotary blade 1 and the fixed backup blade 3 sandwich the film A therebetween, make a linear cut D2 therein in the width direction which cut is continuous to the generally U- shaped cut D1.

In this embodiment the rotary holder 2 is formed in a cylindrical shape, and a push piece 4 for opposition to and abutment with a front end A1 of the band-like film A delivered after cutting with the rotary blade 1 and fixed backup blade 3 is disposed on the rotary holder on an upstream side in the rotating direction of the rotary holder with respect to the position where the rotary blade 1 is mounted movably for adjustment.

The push piece 4 is projectingly provided horizontally at the base end of the push piece 4 and rotatably in parallel with the rotary blade 1 and a central rotating shaft 2a of the rotary holder 2, whereby the push piece 4 is supported pivotably so that a front end portion 4b thereof pops in and out of a rotation track 1b of an edge 1a of the rotary blade 1.

In this embodiment, as shown in Fig.3, the push piece 4 is arranged in a plural number at appropriate intervals in the axial direction of the support shaft 4a. To the push pieces 4 is connected an eject means 5 for ejecting the push pieces 4 from the rotation track 1b of the blade edge 1a toward the feed path B in a predetermined section after passage of the film through a film cutting position P where the film is cut by both rotary blade and fixed backup blade 3 with rotation of the rotary holder 2.

As shown in Figs.2 and 3, the eject means 5 is composed of a swing lever 5a provided projectingly at one end of the support shaft 4a, a follower 5b, e.g. driven roller, connected to the swing lever 5a, a fixed cam 5c, e.g. plate cam, connected to a bearing portion 2b which supports the rotating shaft 2a of the rotary holder 2, and a resilient member 5d, e.g. spring, for urging the follower 5b toward the fixed cam 5c at all times.

In the position where the front end 4b of the push piece 4 passes the film cutting position P with rotation of the rotary holder 2, the fixed cam 4c controls the position of the follower 5c so that the front end 4b stands by inside the rotation track 1b of the blade edge 1a as in Fig.4. Further, in a predetermined section after passage of the push piece front end 4b through the film cutting position P, more specifically, until when the front end A1 of the band-like film A delivered after cutting reaches a position opposed to an upstream end 6a of a hold and transfer means 6 to be described later, the fixed cam 5c controls the position of the follower 5b so that the front end 4b of the push piece 4 is projected little by little toward the feed path B from the rotation track 1b of the edge 1a of the rotary blade 1 as in Figs.1 and 5. And before arrival of the push piece front end 4b from this position again at the film cutting position P the fixed cam 5c controls the position of the follower 5b so that the front end 4b sinks inside the rotation track 1b of the blade edge 1a gradually.

The hold and transfer means 6 is for holding the band-like film A delivered after cutting and transferring it in the film feed direction. It is disposed along the film feed path B on the downstream side in the film feed direction with respect to the mounted position of the fixed backup blade 3 in such a manner that an upstream end 6a thereof is opposed to the front end A1 of the band-like film A which is pushed with the front end 4b of the push piece 4 ejected by the eject means 5.

In this embodiment, the hold and transfer means is a vacuum belt having a plurality of suction holes 6, as shown in Fig.1, and is arranged in a plural number in the width direction of the band-like film A, whereby the band-like film A which has been fed by the operation of the feed rollers C, C is held by suction and it front end A1 is transferred up to a predetermined position below the transfer path of the article to be conveyed.

In a position opposed to the upstream end 6a of the hold and transfer means 6, on the downstream side in the film feed direction with respect to the film cutting position P, there is disposed a fixed guide 7 with the film feed path B interposed between it and the upstream end 6a. The guide 7 is positioned as close as possible to a projecting rotation track 4c of the front end 4b of the push piece 4 within a range not interfering with the rotation track 4c, as shown in Fig.5.

The operation of the film cutting machine constructed as above will be described below.

First, when the band-like film A with tear tape is continuously fed downward by the operation of the feed rollers C, C, the edge 1a of the rotary blade 1 reaches the film cutting position with rotation of the rotary holder 2 and sandwiches the band-like film A between it and the fixed backup blade 3, as shown in Figs.2 and 3, whereby a linear cut D2 continuous to the generally U-shaped cut D1 is made in the width direction for separation.

Subsequently, the front end 4b of the push piece approaches the film cutting position P. At this time, however, since the front end 4b is held inside the rotation track 1b of the edge 1a of the rotary blade 1 by the fixed cam 5c and the follower 5b of the eject means 5, as shown in Fig.4, it passes the position P without abutment with the fixed backup blade 3.

After the front end 4b of the push piece 4 has passed the film cutting position P, it is gradually projected from the rotation track 1b of the blade edge 1a toward the feed path B by the fixed cam 5c and the follower 5b of the eject means 5, as shown in Fig.1, and strikes against the front end A1 of the band-like film A delivered after cutting to push it out away from the rotary holder 2, with the result that the front end portion A1 of the band- like film A is delivered downward along the feed path B.

Also thereafter, the front end 4b of the push piece 4 continue to project under the operation of the fixed cam 5c and the follower 5b of the eject means 5, so that a portion A2 near the front end A1 of the band-like film A delivered after cutting is also pushed toward the feed path B. By this time, the front end A1 of the band-like film A which has been delivered downward along the feed path B gets in between the fixed guide 7 and the upstream end 6a of the hold and transfer means 6 along the feed path B, whereby the film front end A1 is delivered to the hold and transfer means 6.

Thereafter, the front end A1 of the cut band-like film A is conveyed from the to-be-packaged article transfer path to a predetermined downward position along the feed path B while being held by the hold and transfer means 6. Then, the front face of the article to be packaged strikes against the band- like film A thus transferred, whereby the film is wound in ⊃ shape around the article while being pulled downward. At the same time, as shown in Figs.2 and 3, the rotary blade 1 and the fixed backup blade 3 sandwich the rear end of the band-like film A and the front end A-1 of the succeeding film A in the film cutting position P and separate the two from each other. Thereafter, the above operations are repeated.

The construction of the eject means 5 is not limited to the above construction. There may be adopted any construction if only the push piece 4 can project from the rotation track 1b of the edge 1a of the rotary blade 1 toward the film feed path B in a predetermined section after passage through the film cutting position P between the rotary blade 1 and the fixed backup blade 3 with rotation of the rotary holder 2. The construction of the hold and transfer means 6 is not limited to the above construction, either, if only the band-like film A delivered after cutting can be held and conveyed in the film transfer direction.

Although the band-like film A used in the above embodiment has the generally U-shaped cut D1 and the tear tape A', this constitutes no limitation. There may be used a band-like film not having such cut D1 or tear tape A'.

Having described specific preferred embodiments of the invention with reference to the accompanying drawings, it will be appreciated that the present invention is not limited to those precise embodiments, and that various changes and modifications can be effected therein by one of ordinary skill in the art without departing from the scope and spirit of the invention as defined by the appended claims.

## Claims

1. In a film cutting machine wherein a rotary blade (1) and a fixed backup blade (3) are disposed opposingly to each other in a sandwiching relation to a

feed path (B) of a band-like film (A), and the band-like film (A) being fed is sandwiched in between the rotary blade (1) and the fixed backup blade (3), thereby making a linear cut (D2) in the width direction of the film and separating the cut film at a predetermined length, the improvement characterized in that:

a push piece (4) adapted to come into opposition to and abutment with a front end (A1) of the band-like film (A) which has been delivered after cutting is mounted on a rotary holder (2) on an upstream side in the rotation direction with respect to the rotary blade (1) which is projectingly provided on the rotary holder (2); and there is provided an eject means for ejecting the push piece (4) from a rotation track (1b) of an edge (1a) of the rotary blade (1) toward the feed path (B) of the band-like film (A) in a predetermined section after passage of the push piece through a film cutting position (P) between the rotary blade (1) and the fixed backup blade (3) with rotation of the rotary holder (2)

2. A film cutting machine according to claim 1, wherein said eject means (5) has a fixed cam (5c) engaged with a follower (5b) which is connected to the push piece (4).

3. A film cutting machine according to claim 1 or claim 2, wherein a hold and transfer means (6) for holding the band- like film (A) which has been delivered after cutting and transferring it in the film feed direction is disposed on a downstream side in the film feed direction and along the feed path (B) of the band-like film (A) so as to become opposed to the front end (A1) of the film.

4. A film cutting machine according to claim 1, wherein the push piece (4) is supported pivotably on the rotary holder (2) through a support shaft (4a) so that a front end (4b) thereof pops in and out of the rotation track (1b) of the edge (1a) of the rotary blade (1).

5. A film cutting machine according to claim 2, wherein said ejector means (5) comprises a swing lever (5a) mounted projectingly on a support shaft (4) of the push piece (4), a follower (5b) connected to the swing lever (5a), the fixed cam (5c) connected to a bearing portion (2b) which supports a central rotating shaft (2a) of the rotary holder (2) rotatably, and a resilient member (5d) for urging the follower (5b) toward the fixed cam (5c) at all times.

6. A film cutting machine according to claim 5, wherein in the position where the front end (4b) of the push piece (4) passes the film cutting position (P) with rotation of the rotary holder (2), the fixed cam (5c) controls the position of the follower (5b) so that the front end (4b) of the push piece (4) stands by inside the rotation track (1b) of the edge (1a) of the rotary blade (1), also controls the position of the follower (5b) so that the front end (4b) of the push piece (4) projects little by little from the rotation track (1b) of the rotary blade edge (1a) toward the feed path (B) during the period after passage of the front end (4b) of the push piece (4) through the film cutting position (P) until when the front end (A1) of the band-like film (A) delivered after the cutting reaches a position opposed to an upstream end (6a) of said hold and transfer means (6), and further controls the follower (5b) so that the front end (4b) of the push piece (4) gradually sinks inside the rotation track (1b) of the rotary blade edge (1a) before the front end (4b) moves from that position and again reaches the film cutting position (P).

7. A film cutting machine according to claim 3, wherein the hold and transfer means (6) is a vacuum belt having a plurality of suction holes (6b).

8. A film cutting machine according to claim 3, wherein in a position opposite to an upstream end (6a) of the hold and transfer means (6) on the downstream side in the film feed direction with respect to the film cutting position (P) there is disposed a fixed guide (7) with the feed path (B) interposed between it and the upstream end (6a) and close to a projecting rotation track (4c) of a front end (4b) of the push piece (4) but in a range not interfering with the rotation track (4c).

9. A film cutting machine according to claim 1, wherein the band-like film (A) is provided with a tear tape (A ' ) having a generally U-shaped cut (D1), and feed rollers (C) for feeding the band-like film (A) downward are disposed on the upstream side of the rotary blade (1) and the fixed backup blade (3) in a sandwiching relation to the feed path (B) of the band-like film (A)

10. A film cutting machine according to claim 9, wherein a to-be-packaged article transfer path orthogonal to the film feed path (B) is provided horizontally on the downstream side of the rotary blade (1) and the fixed backup blade (3) so that the front face of an article to be packaged which has been moved horizontally is knocked against the band-like film (A) which has been fed up to a predetermined position, thereby allowing the film (A) to be wound in U shape around the body of the article while being pulled downward, and at the same time the rotary blade (1) and the fixed backup blade (3) sandwich the band-like film (A) therebetween to

make a linear cut (D2) contiguous to the cut (D1) in the width direction and allow the cut film portion to be separated from the succeeding band-like film.

FIG. 1

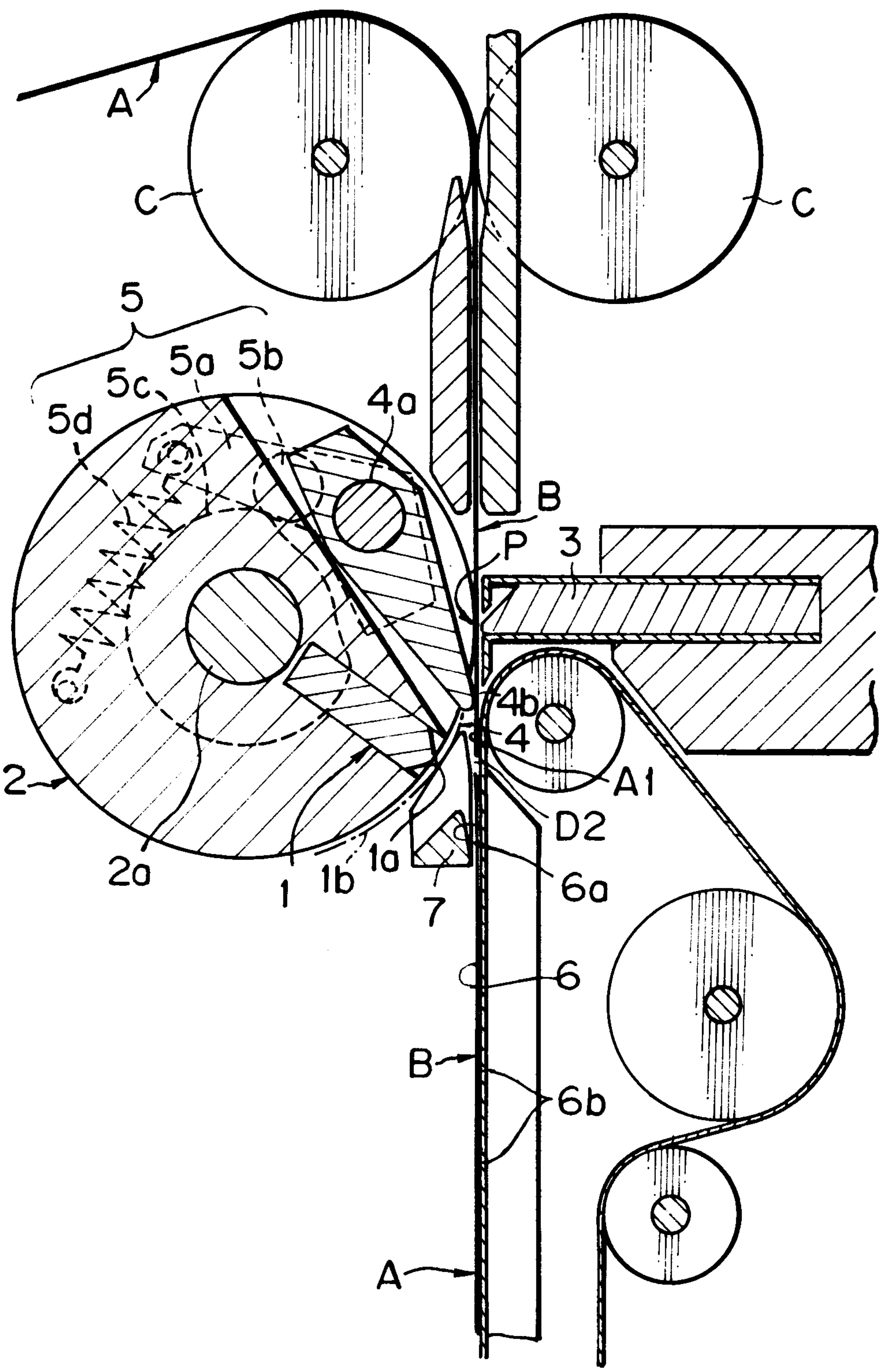
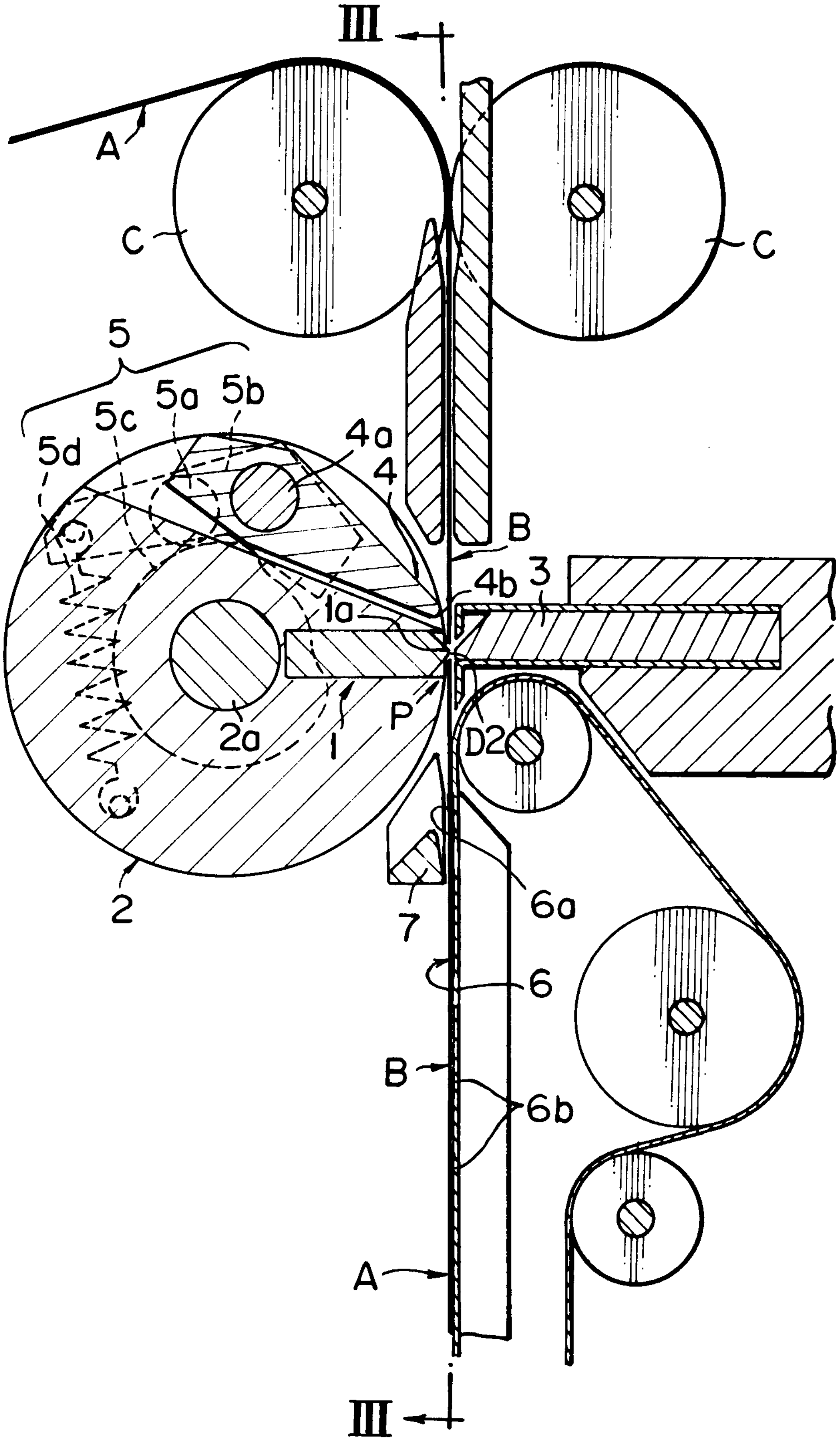


FIG. 2



# FIG. 3

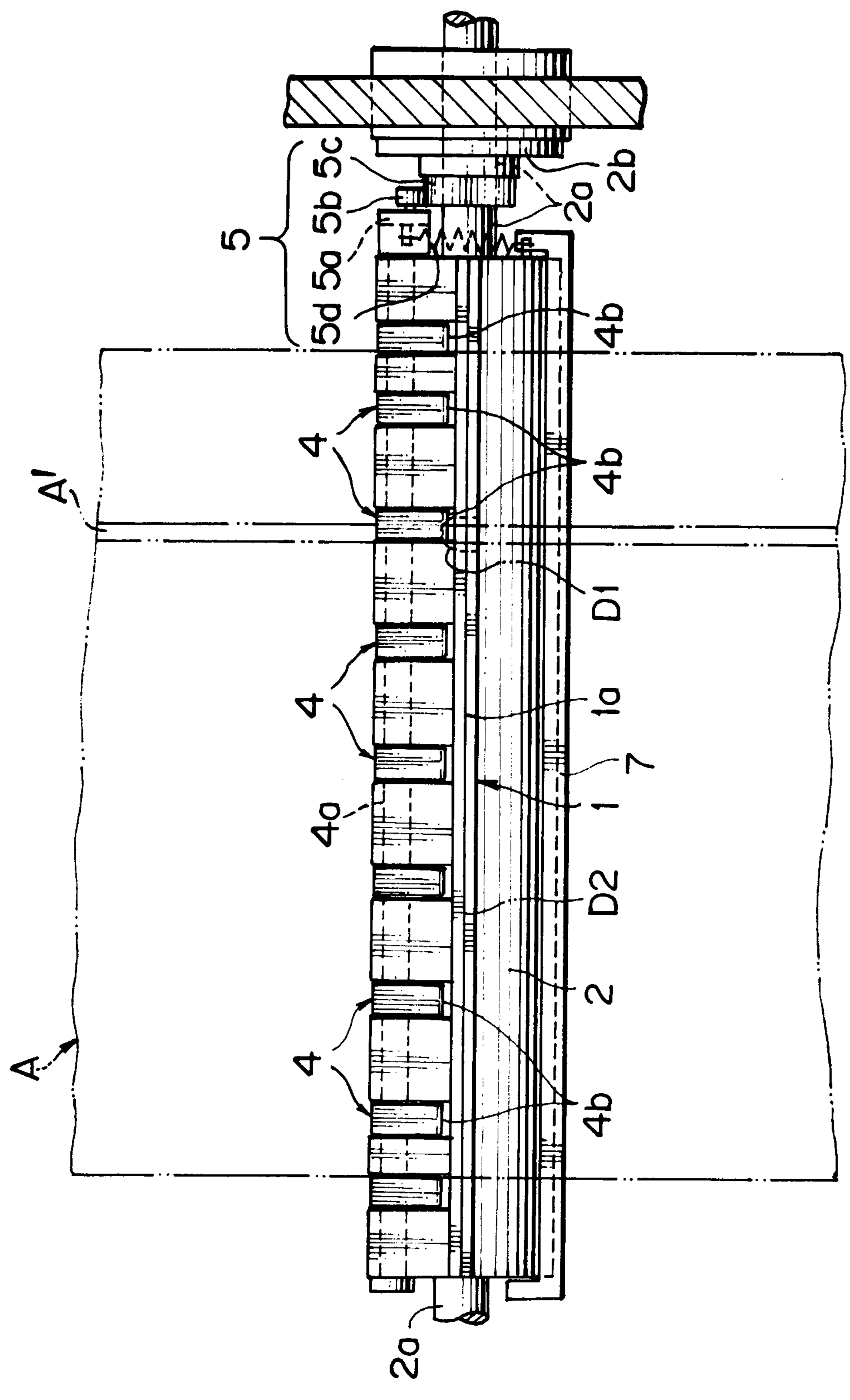


FIG. 4

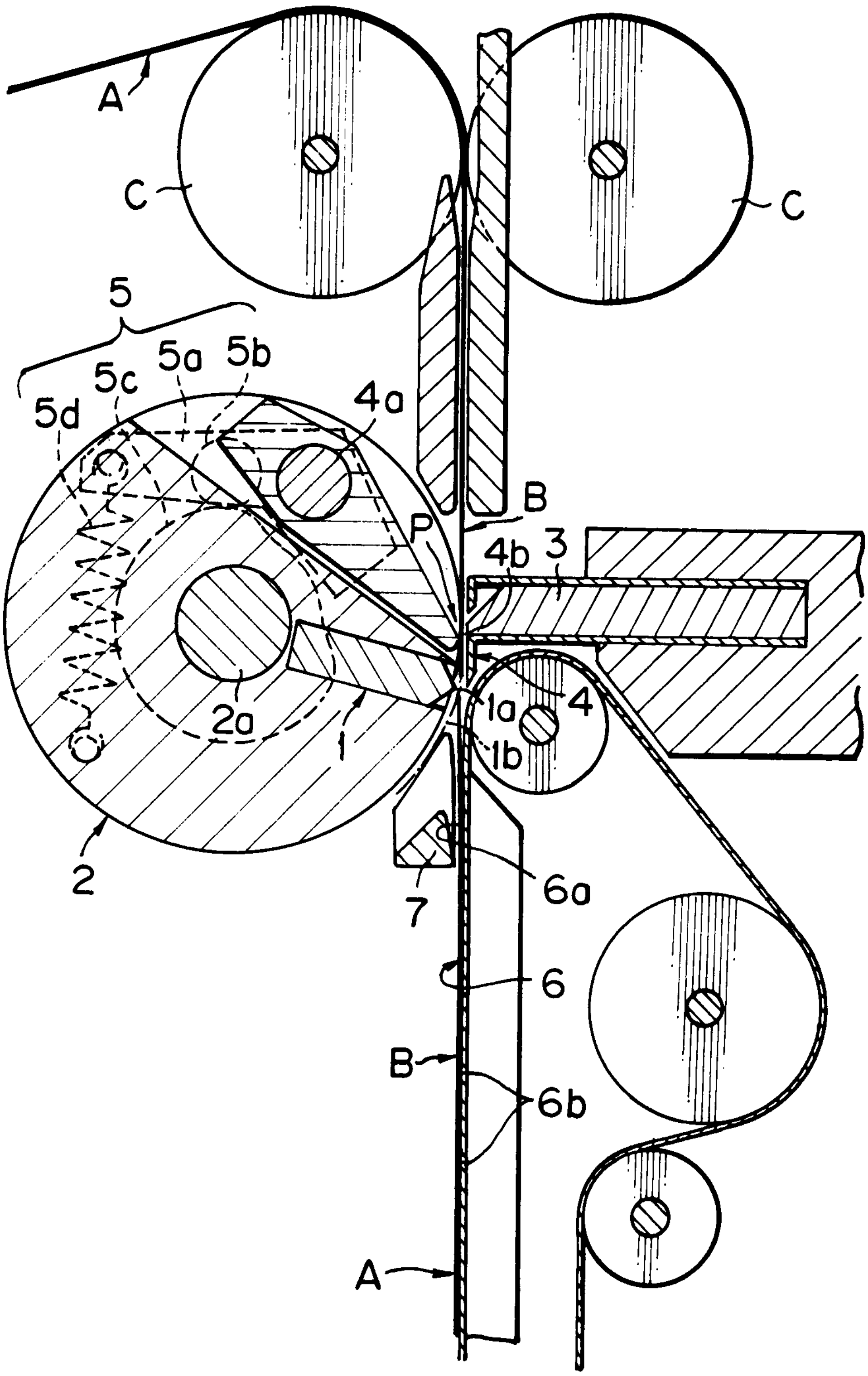
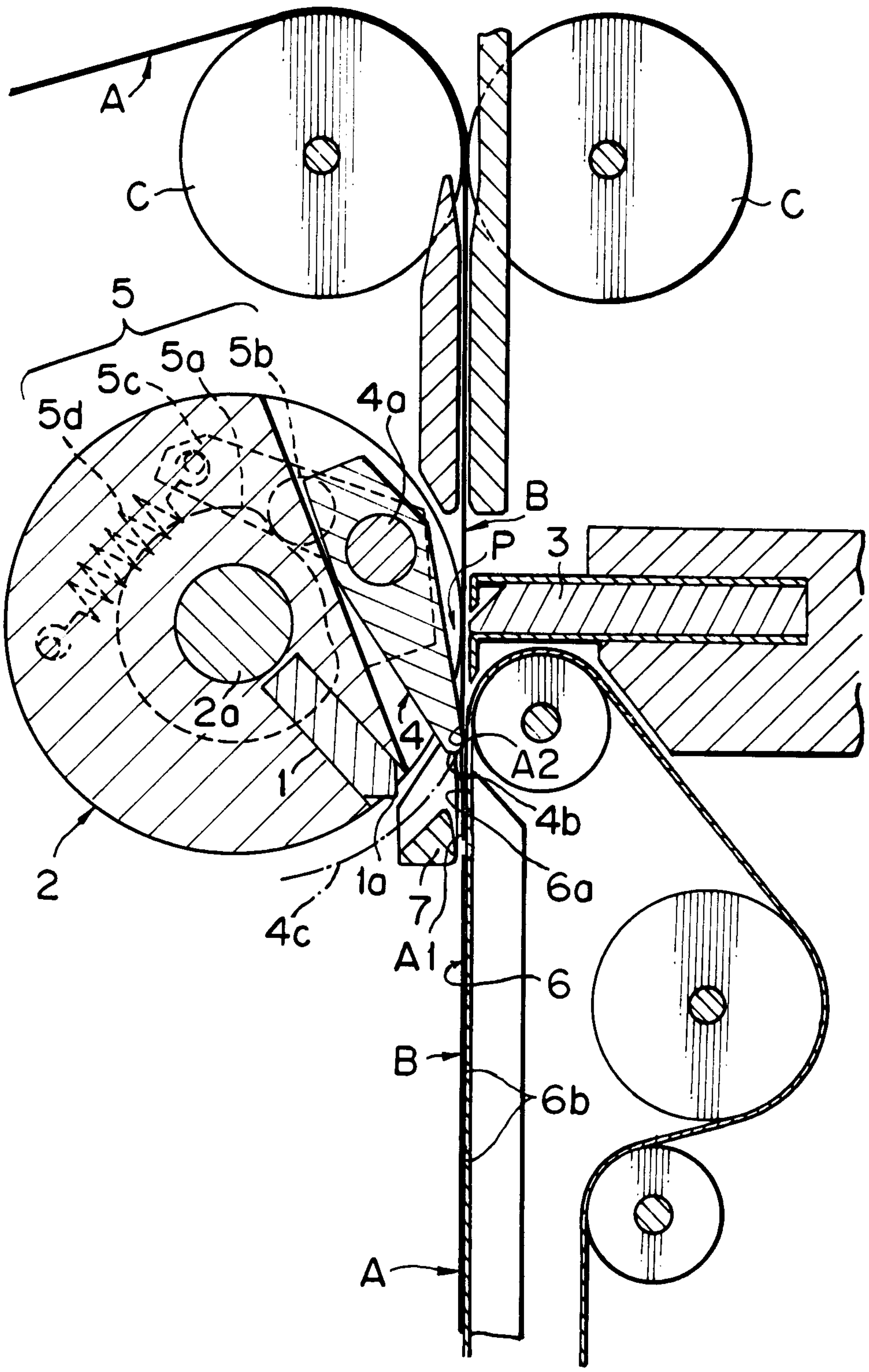


FIG. 5



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# EUROPEAN SEARCH REPORT

Application Number
EP 96 11 1729

## 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.6) |
|---|---|---|---|
| X<br>Y | GB-A-281 772 (MOLINS)<br>* the whole document * | 1-5<br>6-10 | B26D7/18<br>B26D1/38 |
| Y | DE-A-39 00 414 (FA. E.C.H. WILL)<br>* page 1, line 12 *<br>* page 4, line 35 - line 64; figures 1-4 * | 6,8 | |
| Y | US-A-5 327 702 (TAYLOR)<br>* column 3, line 28 - line 60; figures * | 7,10 | |
| Y | DE-A-40 37 269 (KÖRBER AG)<br>* figures * | 9,10 | |
| A | GB-A-245 261 (MOLINS) | | |
| A | GB-A-262 975 (MOLINS) | | |

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
B26D
B65H

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 5 December 1996 | Vaglienti, G |

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