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(54) **Package support device**

(57) A package support device (10, 40) in the form of an end cap for supporting a tube (11) in a cradle of a textile machine, on which tube (11) a package of yarn is to be wound, is formed of two members (12, 13, 42, 43). A first member (12, 42) has a frusto-conical outer surface (14, 44) which in use is inside and co-operates with a tapered bore (17, 47) in the second member (13, 43). The second member (13, 43) has a slit (25, 55) so that it can expand as the cylindrical outer surface (20, 50) of the second member (13, 43) engages the bore (21) of the tube (11) and moves the second member (13, 43) towards the larger diameter end (16, 46) of the first member (12, 42). Crushing of the tube (11) on the end cap (10, 40) as yarn is wound on the tube (11) is avoided by movement of the second part (13, 43) towards the smaller end (15, 45) of the first part (12, 42), thereby facilitating automatic doffing of the package from the machine.

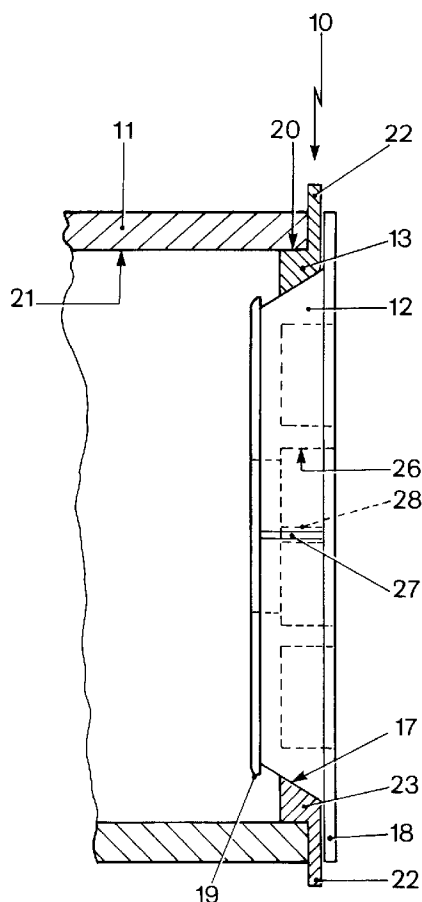


Fig. 2

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## Description

This invention relates to a package support device for packages of textile yarns. In particular the invention relates to a package support device in a yarn winding mechanism in which a running yarn is fed to a tube to form a package thereon by means of a yarn guide reciprocating along a path parallel to the axis of the tube, the periphery of the tube or package being driven by contact with a driving bowl.

In textile machines having such mechanisms, the tube on which the yarn is wound is supported by end caps which enter the ends of the tube and are themselves supported on stub shafts in a cradle mounted in the machine. Conventionally such an end cap is of a cylindrical form with an outer diameter that is closely matched to the internal diameter of the tube it is to support, and a flange at one end against which the end of the tube abuts when the cap and tube are engaged. Although the diameters of the tube and cylindrical part of the end cap are such that the end cap freely enters the tube when no yarn is on the tube, the winding of yarn onto the tube can compress the tube so that the ends of the tube become crushed on the end caps. Apart from the damage to the tube and hence the continual need for their replacement, a problem occurs if automatic doffing of the package is required since a crushed tube will not release from the end caps easily.

It is an object of the present invention to provide a package support device which avoids or substantially reduces the risk of the above described crushing of a tube on the end caps used to support it during package winding.

The invention provides a package support device for supporting a tube during the winding of yarn thereon, comprising an end cap having first and second members, the first member having a frusto-conical outer surface providing smaller and larger outer diameter ends of the first member, and the second member having a tapered bore adapted to fit on the first member and being deformable so as to allow movement of the second member along the first member between the smaller and larger diameter ends thereof.

The second member may have a longitudinal slit therein whose width changes as the second member is deformed and moved between the smaller and larger outer diameter ends of the first member. Preferably the second member is adapted when not deformed to fit on the smaller outer diameter end of the first member, and the width of the slit increases as the second member is deformed and moved towards the larger outer diameter end of the first member.

The first member may have a first flange extending radially outwardly of the larger outer diameter end thereof, and may also have a second flange extending radially outwardly of the smaller outer diameter end. The second member may have a constant outer diameter part and may have a flange extending radially outwardly

of that end thereof having the larger internal diameter. The constant outer diameter part of the second member may have a tube gripping arrangement thereon, which may comprise a plurality of axially extending serrations disposed around the circumference thereof.

The invention will now be described with reference to the accompanying drawings in which:

- Fig. 1. is a section on a diameter of the first member of a first embodiment,
- Fig. 2. is a side view of the two members of the first embodiment in their assembled configuration with the second member in section,
- Fig. 3. is an end view of the members of Figs. 1 and 2 in their assembled configuration,
- Fig. 4. is a sectional elevation of a second embodiment,
- Fig. 5. is an end view of the second member of the second embodiment, and
- Fig. 6. is an end view of the first member of the second embodiment

Referring now to Figs 1 to 3, there is shown a package support device 10 for supporting a tube 11 in a cradle (not shown) of a textile machine during the winding of yarn on the tube 11 to form a package. The package support device 10 comprises a first member 12 and a second member 13.

The first member 12 is of cylindrical form having a frusto-conical outer surface 14 providing smaller 15 and larger 16 outer diameter ends. The second member 13 is also of cylindrical form having a tapered bore 17 adapted, when the second member 13 is not deformed, to fit on the smaller outer diameter end 15 of the first member 12. A longitudinal slit 25 is provided in the second member 13 to enable it to deform radially. The first member 12 has a first flange 18 extending radially outwardly of its larger outer diameter end 16, and also has a second flange 19 extending radially outwardly of the smaller outer diameter end 15. These flanges 18, 19 normally retain the second member 13 on the first member 12. The second member 13 has a cylindrical outer surface 20 whose diameter when the second member 13 is not deformed is slightly smaller than the diameter of the bore 21 of the tube 11 which it is intended to support. A flange 22 is provided on the second member 13 to extend radially outwardly of the outer surface 20 at the end 23 having the larger internal diameter. A bearing 24 is located in a stepped bore 26 of the first member 12 to receive a stub shaft attached to an arm of a cradle (not shown).

The second member 13 may be deformed initially by increasing the width of the slit 25 to pass the second member 13 over the second flange 19 of the first member 12 in order to assemble the end cap 10. The second member 13 when released will rest abutting the second flange 19. The diameter of the outer surface 20 of the second member 13 at this stage is such that it will readily

enter the bore 21 of the tube 1 as in use two end caps 10 mounted on the arms of a cradle are moved inwardly by means of or against resilient biasing, or by pneumatic or electric actuation. When the second member 13 enters the bore 21 of the tube 11, the tube 11 will abut the flange 22 and force the second member 13 of each end cap 10 to deform and move up the frusto-conical surface 14 of the respective first member 12. The second member 13 of each end cap 10 will move until its outer surface 20 tightly engages the bore 21 of the tube 11, and the dimensions of the members is such that this will occur before the flanges 22, 18 are in contact. In fact the flange 18 may be dispensed with if desired. This second member 13 to bore 21 contact will ensure that the tube 10 is securely gripped by the end caps 10 and bounce is eliminated. To prevent rotation of the second member 13 relative to the first member 12, one or more ribs 27 may be provided on the frusto-conical surface 14 of the first member 12 with a corresponding groove or grooves 28 in the tapered bore 17 of the second member 13 as shown, or vice-versa.

Referring now to Figs 4 to 6, there is shown a package support device 40 for supporting a tube 11, comprising a first member 42 and a second member 43. The first member 42 is of cylindrical form having a frusto-conical outer surface 44 providing smaller 45 and larger 46 outer diameter ends. The second member 43 is also of cylindrical form having a tapered bore 47 adapted, when the second member 43 is not deformed, to fit on the smaller outer diameter end 45 of the first member 42. A longitudinal slit 55 is provided in the second member 43 to enable it to deform radially. The first member 42 has a flange 49 extending radially outwardly of the smaller outer diameter end 45. The flange 49 normally retains the second member 43 on the first member 42. The second member 43 has a cylindrical outer surface 50 whose diameter when the second member 43 is not deformed is slightly smaller than the diameter of the bore 21 of the tube 11 which it is intended to support, but has serrations 48 on the surface 50 to engage the inside of the tube 11 and prevent relative rotation of the tube 11 and second member 43 particularly during stopping rotation of the high inertia package on the tube 11. As an alternative to the serrations 48, an O-ring may be located on the outer surface 50. A flange 52 is provided on the second member 43 to extend radially outwardly of the outer surface 50 at the end 53 having the larger internal diameter.

The second member 43 may be deformed initially by increasing the width of the slit 55 to pass the second member 43 over the second flange 49 of the first member 42 in order to assemble the end cap 40. The second member 43 when released will rest abutting the flange 49. The diameter of the outer surface 50 of the second member 43 at this stage is such that it will readily enter the bore 21 of the tube 11 as in use two end caps 40 mounted on the arms of a cradle are moved inwardly. When the second member 43 enters the bore 21 of the

tube 11, the tube 11 will engage the outer surface 50 and force the second member 43 of each end cap 40 to deform and move up the frusto-conical surface 44 of the respective first member 42. The second member 43 of each end cap 40 will move until the serrations 48 on its outer surface 50 tightly engage the bore 21 of the tube 11. This second member 43 to bore 21 contact will ensure that the tube 40 is securely gripped by the end caps 40 and bounce is eliminated. To prevent rotation of the second member 43 relative to the first member 42 one or more radial pins 57 may be provided in the first member 42 with a corresponding groove or grooves 58 in the tapered bore 47 of the second member 43 as shown.

As the yarn is wound on the tube 11 to form a package, the compressive force on the tube 11 increases. In consequence, there is a tendency for the diameter of the bore 21 of the tube 11 to decrease. With known end caps this often caused crushing of the ends of the tubes firmly onto the end caps, but in this case the second member 13, 43 can slide down the frusto-conical surface 14, 44, of the first member 12, 42, with the first members 12, 42 of the two end caps 10, 40 moving apart slightly together with the cradle arms. By this means crushing of the ends of the tube 11 is avoided or at least the risk of such crushing is substantially reduced. Even if some crushing does occur, the present arrangement enables the tube 11 to be released from the end caps 10, 40 more easily than would be the case if the ends of the tube 11 were crushed firmly onto the known end caps, which is particularly a very important factor when automatic doffing is in operation.

### Claims

1. A package support device (10, 40) for supporting a tube (11) during the winding of yarn thereon, comprising an end cap characterised by having first (12, 42) and second (13, 43) members, the first member (12, 42) having a frusto-conical outer surface (14, 44) providing smaller (15, 45) and larger (16, 46) outer diameter ends of the first member (12, 42), and the second member (13, 43) having a tapered bore (17, 47) adapted to fit on the first member (12, 42) and being deformable so as to allow movement of the second member (13, 43) along the first member (12, 42) between the smaller (15, 45) and larger (16, 46) diameter ends thereof.
2. A package support device according to claim 1, characterised in that the second member (13, 43) has a longitudinal slit (25, 55) therein whose width changes as the second member (13, 43) is deformed and moved between the smaller (15, 45) and larger (16, 46) outer diameter ends of the first member (12, 42).
3. A package support device according to claim 1 or

claim 2, characterised in that the second member (13, 43) is adapted when not deformed to fit on the smaller outer diameter end (15, 45) of the first member (12, 42), and the width of the slit (25, 55) increases as the second member (13, 43) is deformed and moved towards the larger outer diameter end (16, 46) of the first member (12, 42).

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4. A package support device according to any one of claims 1 to 3, characterised in that the first member (12) has a flange (18) extending radially outwardly of the larger outer diameter end (16) thereof. 10
5. A package support device according to any one of claims 1 to 4, characterised in that the first member (12, 42) has a flange (19, 49) extending radially outwardly of the smaller outer diameter end (15, 45). 15
6. A package support device according to any one of claims 1 to 5, characterised in that the second member (13, 43) has a flange (22, 52) extending radially outwardly of that end (23, 53) thereof having the larger internal diameter 20
7. A package support device according to any one of claims 1 to 6, characterised in that the second member (13, 43) has a constant outer diameter part (20, 50). 25
8. A package support device according to claim 7, characterised in that the constant outer diameter part (50) of the second member (43) has a tube gripping arrangement (48) thereon 30
9. A package support device according to claim 8, characterised in that the tube gripping arrangement (48) comprises a plurality of axially extending serrations disposed around the circumference of the constant diameter part (50). 35

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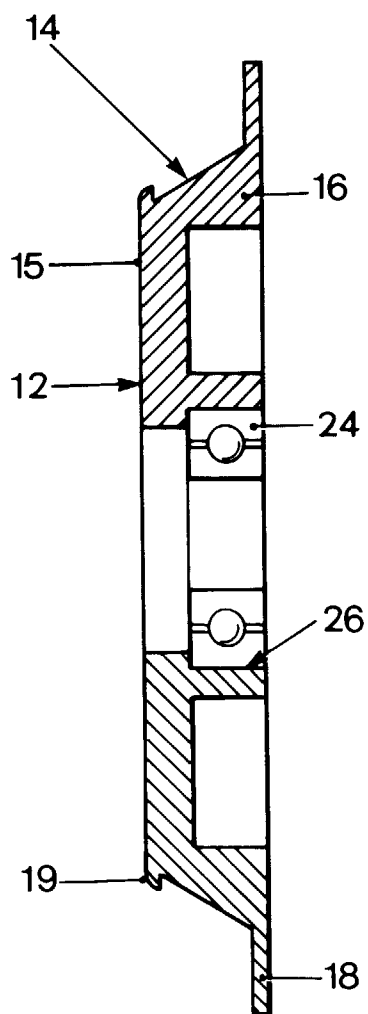


Fig. 1

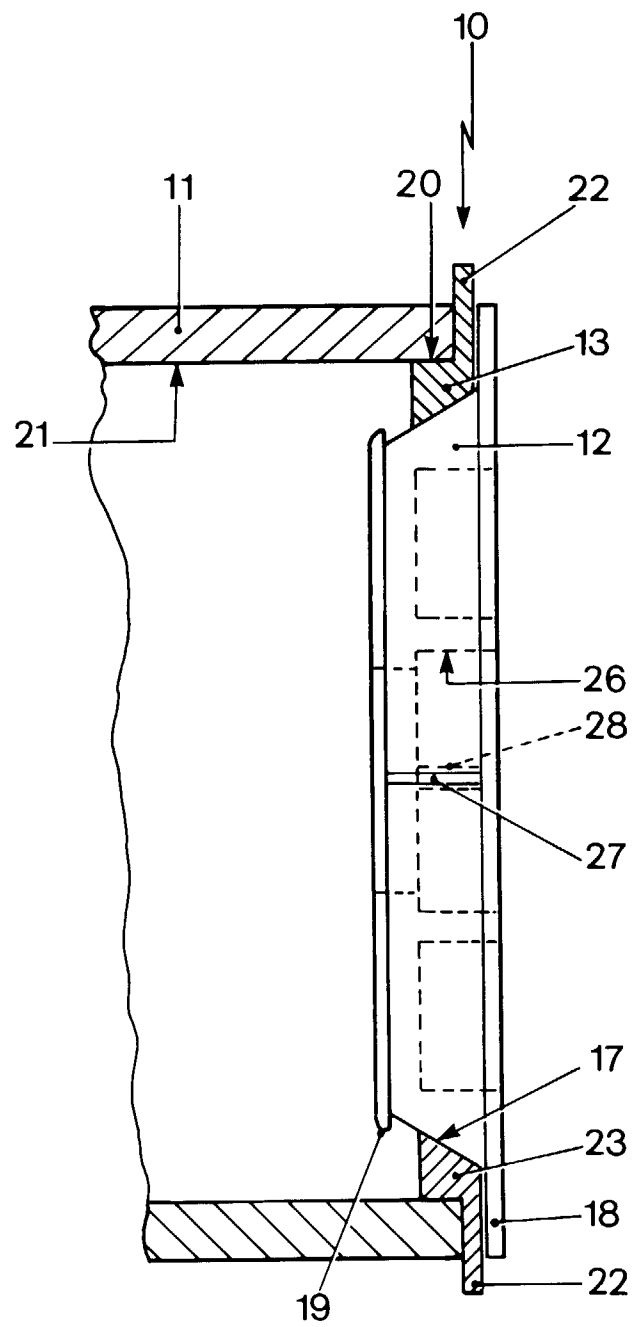


Fig. 2

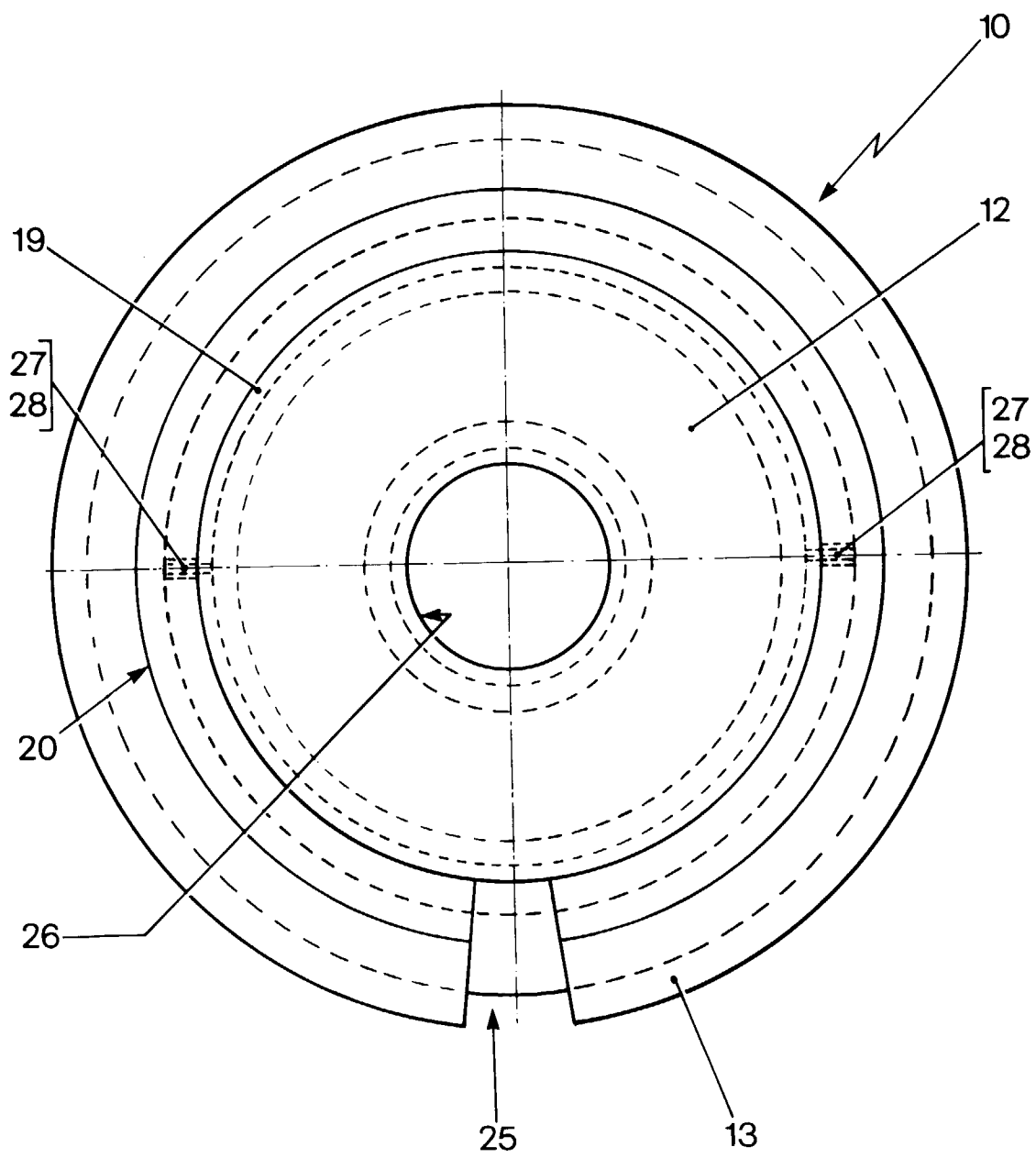


Fig. 3

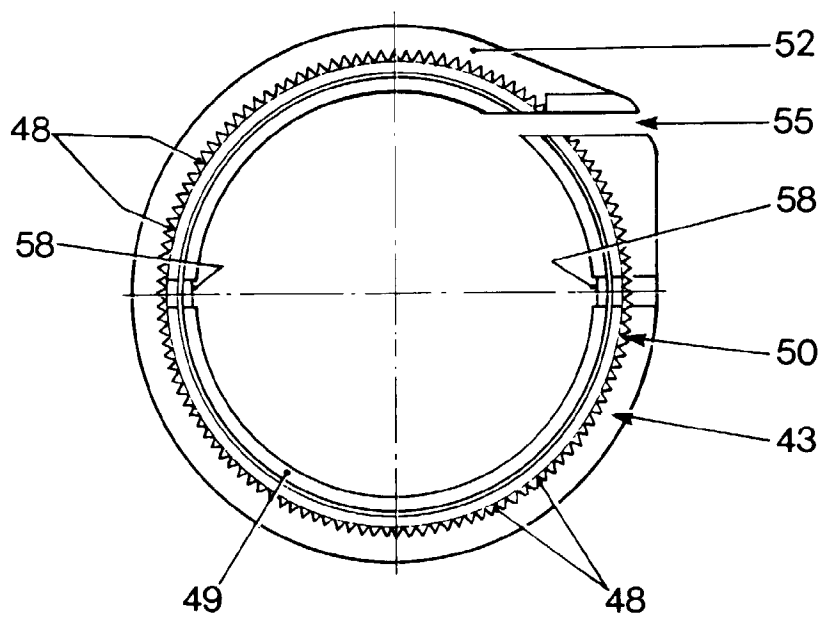


Fig. 5

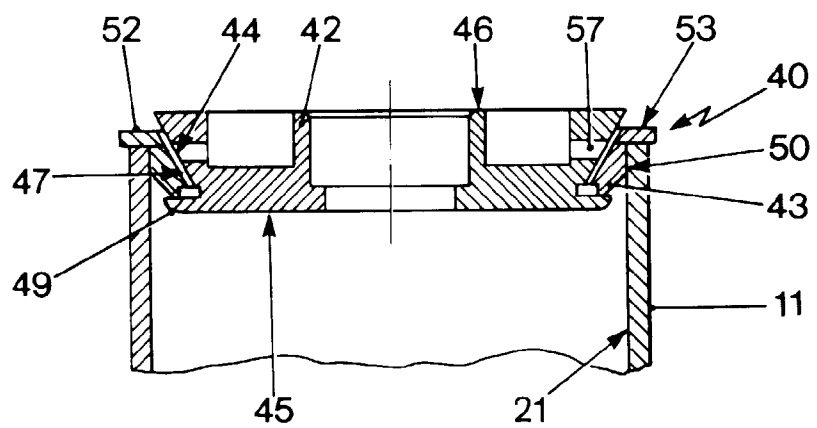


Fig. 4

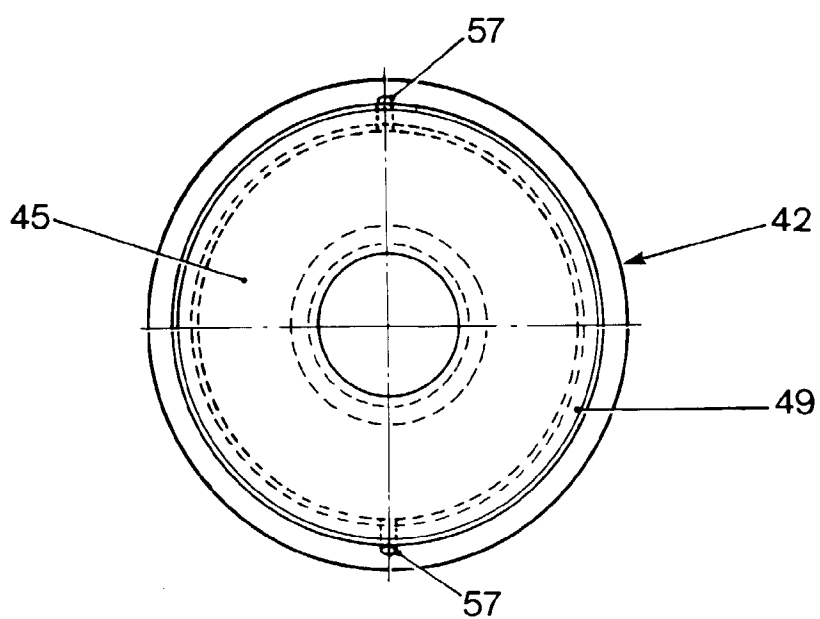


Fig. 6



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## EUROPEAN SEARCH REPORT

Application Number  
EP 96 30 3237

| 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) |
| A   | GB-A-2 044 813 (NORWESCO INC)<br>* page 1, line 91 - line 96 *<br>* page 3, line 13 - line 84 *<br>---                                  | 1  | B65H54/553                                   |
| A   | PATENT ABSTRACTS OF JAPAN<br>vol. 6, no. 220 (M-169), 5 November 1982<br>& JP-A-57 126351 (ASAHI KASEI KOGYO KK)<br>* abstract *<br>--- | 1  |  |
| A   | US-A-4 359 194 (BUEHLER ET AL.)<br>* the whole document *<br>-----  | 1-9  |  |
|   |   |  | TECHNICAL FIELDS<br>SEARCHED (Int.Cl.6)      |
|   |   |  | B65H<br>D01H                                 |
| The present search report has been drawn up for all claims  |   |  |  |
| Place of search<br>THE HAGUE  |   | Date of completion of the search<br>6 September 1996 | Examiner<br>Tamme, H-M                       |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |   |  |  |

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