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⑪ Publication number:

**0 252 569 B1**

⑫

## EUROPEAN PATENT SPECIFICATION

⑯ Date of publication of patent specification: **12.01.94** ⑮ Int. Cl.<sup>5</sup>: **D01G 15/62, D01H 13/04, B65H 59/10**  
⑯ Application number: **87201296.8**  
⑯ Date of filing: **07.07.87**

⑯ Improvements to carding process.

⑯ Priority: **09.07.86 GB 8616728**  
⑯ Date of publication of application:  
**13.01.88 Bulletin 88/02**  
⑯ Publication of the grant of the patent:  
**12.01.94 Bulletin 94/02**  
⑯ Designated Contracting States:  
**AT BE CH DE ES FR GB GR IT LI NL**  
⑯ References cited:  
**EP-A- 0 181 697**  
**FR-A- 2 232 503**  
**OA-A- 631 689**  
**US-A- 2 750 130**

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## Description

The present invention relates generally to the manufacture of spun yarns by the woollen system and more particularly relates to a woollen carding process and the production of denser spools of woollen slubbings or slivers.

In conventional processing the raw material or blend of staple fibres is carded with the objects of disentangling the fibres from each other, freeing dirt, vegetable matter and other unwanted contaminants, improving the mixing of fibres, particularly when more than one fibre type is included in the blend, evening out the flow of material to produce a web of fibres as uniform as possible in density, and finally splitting the web into parallel ribbons, consolidating those ribbons into slubbings, slivers and rubbing them between two oscillating surfaces, and winding the slubbings into packages suitable for spinning. The raw material may consist of 100% wool or other natural fibre, blends of natural fibres with man-made or synthetic fibres, or 100% synthetic fibres. However, irrespective of the raw material processed such a process is commonly known as the woollen process by historical tradition.

Slubbings are normally wound on to spools, empty spools being creelied on the card relative to a series of guides which ensure that the slubbings are wound side by side on the spools in an orderly fashion. The spools are creelied on the card such that they rest on driven rollers which in turn drive the spools by frictional contact to effect winding. In conventional practice several ends of slubbing are wound on to one spool, and a regular traverse oscillation is provided between the spools and the slubbing guides such that 'cheeses' of slubbing are wound. The number of cheeses of slubbing wound on to each spool varies according to the gauge of the spinning machine on which the yarn is to be spun and is thus governed largely by the count of the yarn.

Slubbings are produced and wound on the card as soft twistless strands having low tensile strength. Some tensile strength is derived from interfibre entanglements and consolidation of the fibres assembly in the rubbing process and this strength is sufficient to enable winding of the slubbings at a low tension draft of about 6% without irregularly stretching the slubbings or in any way reducing their evenness. Thus spools of slubbings tend to be soft with the density in the material of the order of 0.15 g/cc, depending on the raw material being processed. This low density of material limits the amount of slubbing which can be wound on a full spool of reasonable and acceptable diameter. Spools of woollen slubbings are handled at the card and again at the spinning frame, and in

practice spool-related tasks form a high proportion of the total labour requirement in both carding and spinning. The material capacity of the spool thus has a limiting effect on the economic efficiencies of both the carding process and the spinning process.

European patent publication 0181697 discloses a method of handling slubbings in the woollen process which includes positioning one or more finger guides in the path of the same number of slubbings, and wrapping a slubbing round each finger guide to thereby create a stress or tension therein before the slubbings are directed for further processing.

This method has been found to work generally very well except for two disadvantages. The first is that jemming up of the finger guides either at the start of the process or after an end breakage is tricky and therefore slows down the production of slubbings. Secondly, with a given finger guide tension is only adjustable in steps according to the number of wraps of slubbing around the guide.

Fr-A-2232503 discloses an annular segment having a groove for guiding a moving filament. The segment is blown by the action of air and pivots allowing the filament to be tensioned between the segment and adjacent abutments. US-A-3631689 discloses plates of resistant material over which threads in a warp to be laid into a knitting machine are passed. The plates can be deformed to vary the tension applied to the threads.

The invention seeks to provide a method and apparatus for winding slubbings tightly improved in the above respects.

According to the present invention there is provided a method of handling slubbings in the woollen process which comprises placing a guide in the path of the slubbing to create a stress of tension therein before the slubbing is directed for further processing characterised in that the guide comprises a curved flume along which the slubbing passes and the point at which the slubbing enters the flume, and thereby the amount of tension created in the slubbing, is varied by means of a variable slubbing guide.

The curved flume will be generally V-shaped in section and positioned in the vicinity of the condenser drum and condenser bobbin or spool of a woollen card with one end of the flume being close to the nip between the condenser drum and bobbin. The or each slubbing passing from the condenser rubbing apron of the card passes through an associated flume where tension is created by the frictional engagement between the slubbing and the flume. The point at which the slubbing enters the flume, and thereby the amount of tension created in the slubbing, may be varied continuously by means of a variable slubbing guide.

It has been found that in the method of the invention a satisfactorily dense and compact spool of slubbing can be built up on the condenser bobbin but in order to achieve this some modifications need to be made to the normal arrangement.

It is important that the distance from the end of the flume closest to the nip between the condenser drum and the spool be kept substantially constant as the bobbin fills to thereby avoid the possibility of yarn property variations within the bobbin. This is achieved by modifying the standard track of the bobbin so that the nip remains in the same place as the bobbin fills. It has also been found that the raddle traverse for winding the slubbing on the spool, which is normally a simple harmonic motion controlled by an offset cam or pin, requires modification since the slowing down of the normal motion at each end of the traverse causes a concave package to be formed. The raddle cam in the method of the invention is therefore preferably modified to a cardioid cam giving substantially constant speed of movement over the bulk of the traverse combined with rapid deceleration and acceleration at each end.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic view of a woollen card modified in accordance with the invention; Figure 2 is a similar view to figure 1 from the other side;

Figure 3 is a diagrammatic view of the raddle traverse mechanism; and

Figure 4 is a diagrammatic perspective view of another embodiment.

Referring to the drawings, a standard woollen card comprises a condenser drum 10 and associated condenser take-up spool or bobbin 12. Slubbing 14 is fed from condenser rubbing aprons 16 in the normal way. As the slubbing 14 winds on the bobbin 12 its effective diameter increases and, in order to keep the nip 18 between the condenser drum 10 and the bobbin 12 in a constant position, the axis of rotation 20 of the bobbin is arranged to run on an inclined track 22 positioned so as to achieve this end.

In accordance with the invention a curved flume 24 is located on the card raddle shaft 26 in the region of the condenser drum 10, the distal end 28 of which flume is located at a short distance 'D' from the nip 18. The flume is generally 'V' shaped in section over the bulk of its length but may have a further constriction illustrated in figure 1 at 30 adjacent its distal end 28.

The slubbing 14 is led into the flume 24 by means of a slubbing guide 32 whose position is adjustable so as to change the length of travel of the slubbing 14 within the flume 24 and thereby the

tension created in the slubbing.

In use, the slubbing 14 is led through the guide 32 into the flume 24 and thence to the nip 18 where it is taken up on the bobbin 12. The differential speed between the condenser drum and take up spool on the one hand and the condenser rubbing aprons on the other causes the slubbing 14 to pull against the arcuate surface of the flume. The frictional contact in turn creates the tension within the slubbing and causes it to exit from the distal end 28 of the flume in a compacted form. Adjustment of the guide 32 varies the length of the flume in contact with the slubbing and thereby the degree of tension and degree of compactness created in the slubbing. It has been found that in order to avoid variations in the property of a finished yarn the distance D should be kept constant and this is achieved as discussed above by arranging the track 22 so that the axis 20 of the gradually filling bobbin 12 moves away from the nip 18 in a direction normal to the circumference of the condenser drum at the point.

The flume 24 is connected to the raddle shaft 26 which is caused to traverse by a mechanism described best by reference to figure 3. In this, the standard raddle traverse cam is replaced by a cardioid cam 32 driving a cam follower 34 pivoted at one end 36 to the framework of the card. The cam follower 34 includes a slot within which is located a pin 38 of a traverse follower member 40 attached to one end of the raddle shaft at 42.

The cam 32 ensures that the raddle traverse motion has substantially constant speed over the greater part of its travel, rapidly decelerating and then accelerating again at the reversal points at each end of the traverse. The length of traverse can be adjusted by adjusting the traverse follower 40 by means of the attachment 42. Moving the traverse follower 40 to the right as viewed in figure 3 shortens the raddle traverse and vice versa.

The apparatus of the invention incorporates a self adjusting facility. The slubbing travels over the arcuate flume which has a restriction 30 at its delivery end 28. The effect of the restriction is to present a more condensed slubbing to the take up spool 12 increasing its tensile strength and avoiding breakages. The frictional drive on the remainder of the slubbing 14 and contact with the flume 24 is created by the speed differential between the rubbing apron 16 and the take-up spool 12 in effect trying to straighten out the slubbing 14 over the arcuate section of the flume 24. Should the slubbing 14 between the rubbing apron 16 and condensing zone become slack, then the friction round the flume 24 will reduce allowing the take-up spool 12 to absorb the slack. Furthermore, the frictional adjustment, by means of the slubbing guide 32, is in effect infinitely variable by applying more or less

slubbing to the surface of the flume 24.

Referring now to figure 4, in this embodiment the flumes 24 are formed by pressing or moulding from a continuous sheet 44 fixed to the raddle shaft 26 as before. One advantage of this configuration, apart from ease of manufacture, is that it aids threading up of broken slubbings since the free ends are retained on the sheet. Furthermore, should a slubbing accidentally move from its flume 24 it will be retained on the sheet 44 rather than get tangled up in the machinery and it will tend to move back into its proper flume 24 as the sheet is traversed.

The apparatus of the invention is considerably easier to thread up than the fingers of European patent publication 0181697 and furthermore provides continuous adjustment of tension. It thus provides the benefits of that apparatus without the disadvantages.

## Claims

1. A method of handling slubbings (14) in the woollen process which comprises placing a guide (24) in the path of the slubbing to create a stress of tension therein before the slubbing is directed for further processing characterised in that the guide comprises a curved flume (24) along which the slubbing (14) passes and the point at which the slubbing enters the flume, and thereby the amount of tension created in the slubbing, is varied by means of a variable slubbing guide (32).
2. A method as claimed in claim 1 in which the curved flume (24) is generally V-shaped in section.
3. A method as claimed in claims 1 or 2 in which the flume (24) is positioned in the vicinity of the condenser drum (10) and the condenser bobbin or spool (12) of a woollen card with one end of the flume being close to the nip (18) between the condenser drum and bobbin.
4. A method as claimed in any of claims 1 to 3 in which the distance from the end of the flume (24) closest to the nip (18) between the condenser drum and the spool is kept substantially constant as the bobbin fills.
5. A method as claimed in claim 4 in which the axis (20) of the bobbin is arranged to run on an inclined track (22) as the bobbin fills.
6. A method as claimed in any of claims 1 to 5 in which the raddle traverse for winding the slubbing on the spool is modified so as to give

substantially constant speed of movement over the bulk of the traverse combined with rapid deceleration and acceleration at each end.

- 5 7. A method as claimed in any of claims 1 to 6 in which the or each flume (24) is formed as a depression in a continuous sheet of material.

## Patentansprüche

- 10 1. Verfahren zur Handhabung von Vorgarn (14) in der Streichgarnverarbeitung, umfassend das Einbringen einer Führung (24) in den Vorgarnablauf zur Erzeugung einer Zugspannung darin, bevor das Vorgarn zur weiteren Verarbeitung weitergeleitet wird, dadurch gekennzeichnet, dass die Führung einen gekrümmten Kanal (24) umfasst, durch den das Vorgarn (14) läuft, und dass die Stelle, an der das Vorgarn in den Kanal eintritt, und somit die Menge an in dem Vorgarn erzeugter Spannung, durch eine verstellbare Vorgarnführung (32) variiert wird.
- 15 2. Verfahren nach Anspruch 1, bei dem der gekrümmte Kanal (24) einen allgemein V-förmigen Querschnitt aufweist.
- 20 3. Verfahren nach Anspruch 1 oder 2, wobei sich der Kanal (24) in der Nähe der Vorgarntrömmel (10) und dem Vorgarnwickel oder der Vorgarnspule (12) eines Streichgarnkempels befindet, wobei sich ein Ende des Kanals nahe an dem Berührungs punkt (18) zwischen der Vorgarntrömmel und dem Wickel befindet.
- 25 4. Verfahren nach Ansprüchen 1 bis 3, wobei der Abstand von dem Berührungs punkt (18) zwischen der Vorgarntrömmel und der Vorgarnspule am nächsten liegenden Ende des Kanals (24) im Zuge des Aufwickelns des Vorgarnwickels im wesentlichen konstant gehalten wird.
- 30 5. Verfahren nach Anspruch 4, wobei die Achse (20) des Vorgarnwickels so angeordnet ist, dass sie im Zuge des Aufwickelvorganges des Vorgarnwickels über eine geneigte Spur (22) verläuft.
- 35 6. Verfahren nach einem der Ansprüche 1 bis 5, wobei die Reihkammbewegung zum Aufwickeln des Vorgarns auf die Spule so modifiziert wird, dass sich eine im wesentlichen konstante Bewegungsgeschwindigkeit über einen Großteil des Weges ergibt, mit rascher Verlangsamung und Beschleunigung an beiden Enden.
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7. Verfahren nach einem der Ansprüche 1 bis 6, bei dem der bzw. jeder Kanal (24) als Vertiefung in einer kontinuierlichen Materialbahn ausgebildet ist.

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**Revendications**

1. Procédé de traitement de mèches (14) dans le processus de préparation de la laine suivant lequel on place un guide (24) dans le trajet de la mèche en vue de créer une contrainte de tension dans cette mèche avant de la diriger vers un traitement ultérieur, caractérisé en ce que le guide comprend un chenal courbe (24) le long duquel la mèche (14) passe et le point où la mèche pénètre dans le chenal et ainsi le degré de tension créé dans cette mèche étant modifié au moyen d'un guide de mèche variable (32).

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2. Procédé suivant la revendication 1, dans lequel le chenal courbe (24) a d'une manière générale une section en V.

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3. Procédé suivant la revendication 1 ou 2, dans lequel le chenal (24) est positionné au voisinage du tambour de préparation (10) et de la bobine de préparation (12) d'une carte pour la laine, une extrémité du chenal étant proche de l'espacement (18) entre le tambour et la bobine de préparation.

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4. Procédé suivant l'une quelconque des revendications 1 à 3, dans lequel la distance entre l'extrémité du chenal (24) la plus proche de l'espacement (18) entre le tambour et la bobine de préparation et cet espacement même est maintenue en substance constante à mesure que la bobine se garnit.

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5. Procédé suivant la revendication 4, dans lequel l'axe (20) de la bobine se déplace sur une glissière inclinée (22) à mesure que la bobine se garnit.

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6. Procédé suivant l'une quelconque des revendications 1 à 5, dans lequel la course du répartiteur pour le bobinage de la mèche sur la bobine est modifiée de manière à donner une vitesse de déplacement en substance constante sur la majeure partie de la course, en combinaison avec une décélération et une accélération rapides à chaque extrémité.

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7. Procédé suivant l'une quelconque des revendications 1 à 6, dans lequel le chenal (24), ou chaque chenal, est formé par un creux dans une feuille de matière continue.

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Fig.1.

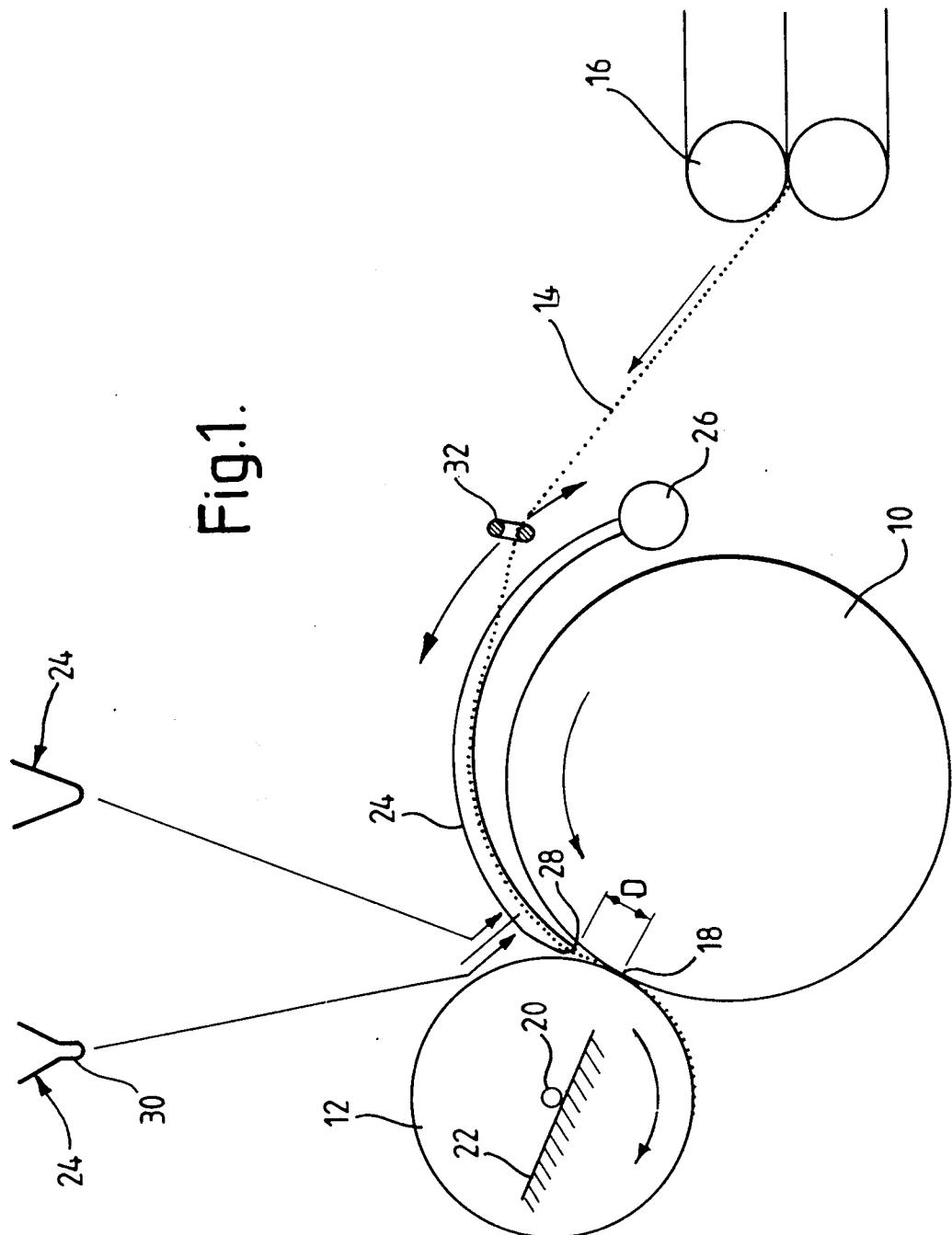


Fig.2.

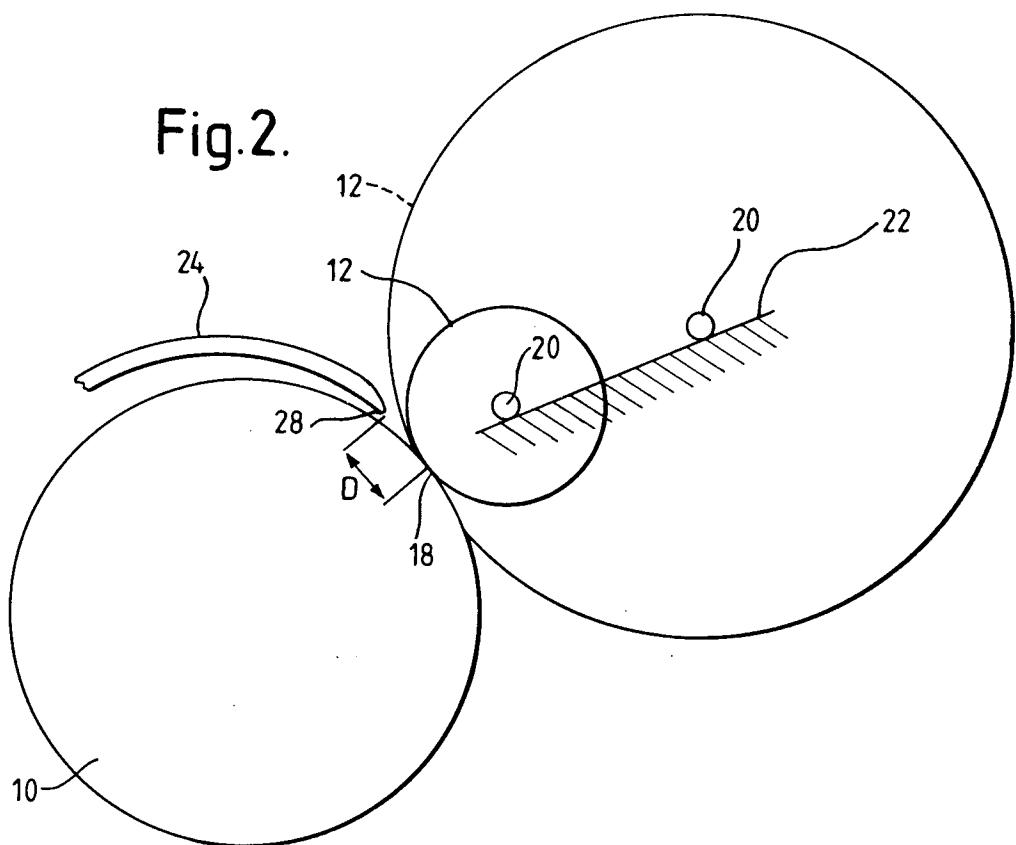
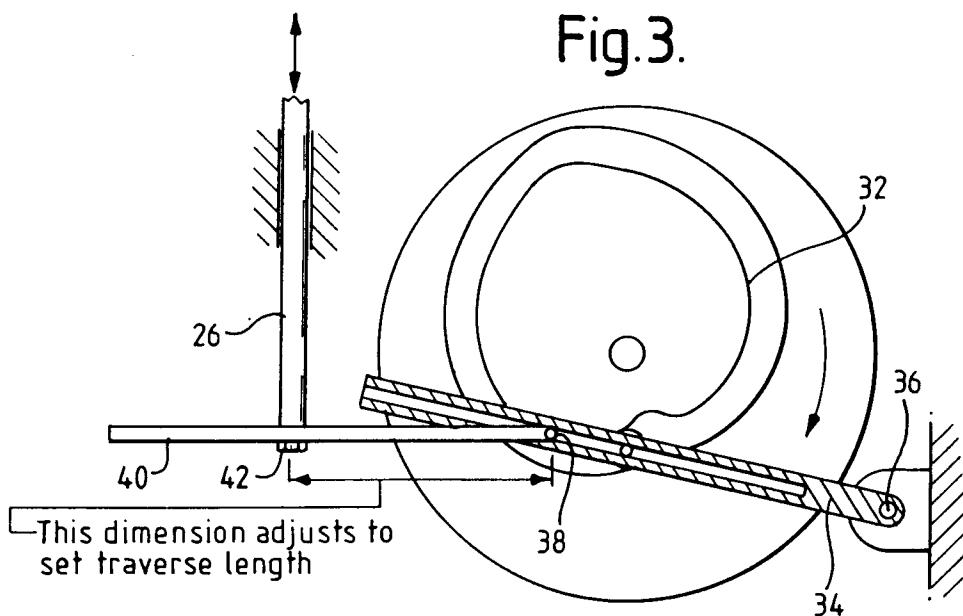


Fig.3.



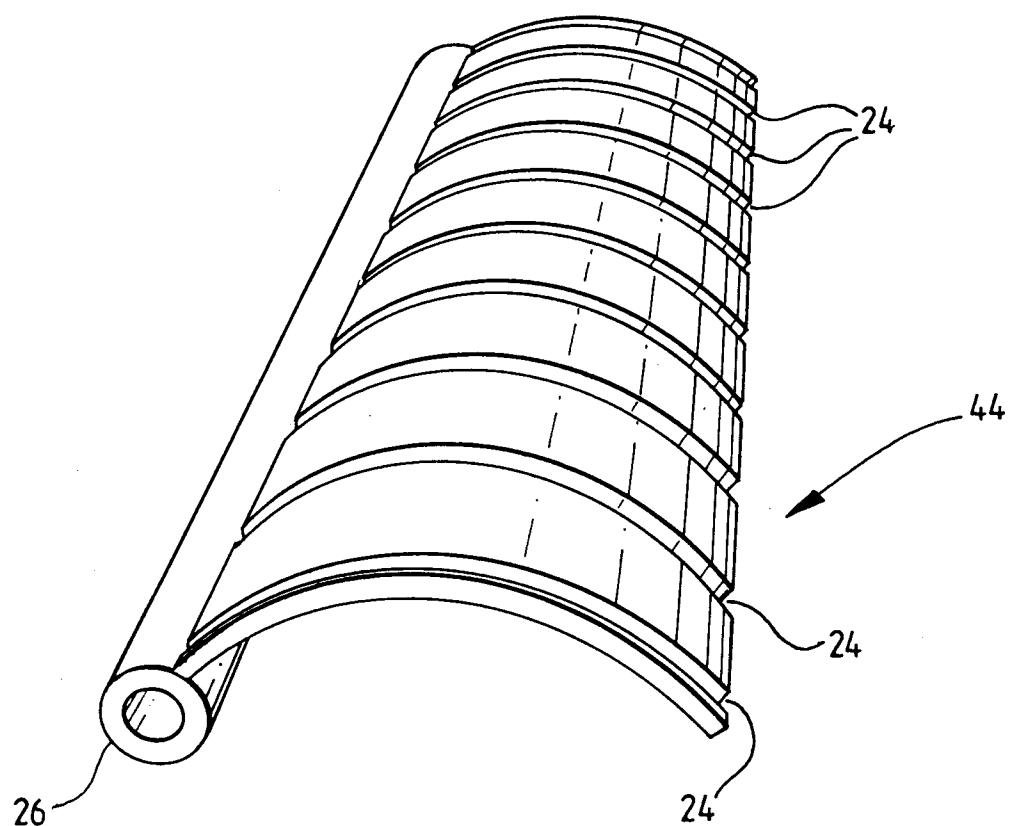


Fig.4.