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(11) Publication number:

0 412 453 A1

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: **90114955.9**

(51) Int. Cl.⁵: **D03D 47/27, D03D 47/12**

(22) Date of filing: **03.08.90**

(30) Priority: **09.08.89 IT 2148289**

(43) Date of publication of application:
13.02.91 Bulletin 91/07

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

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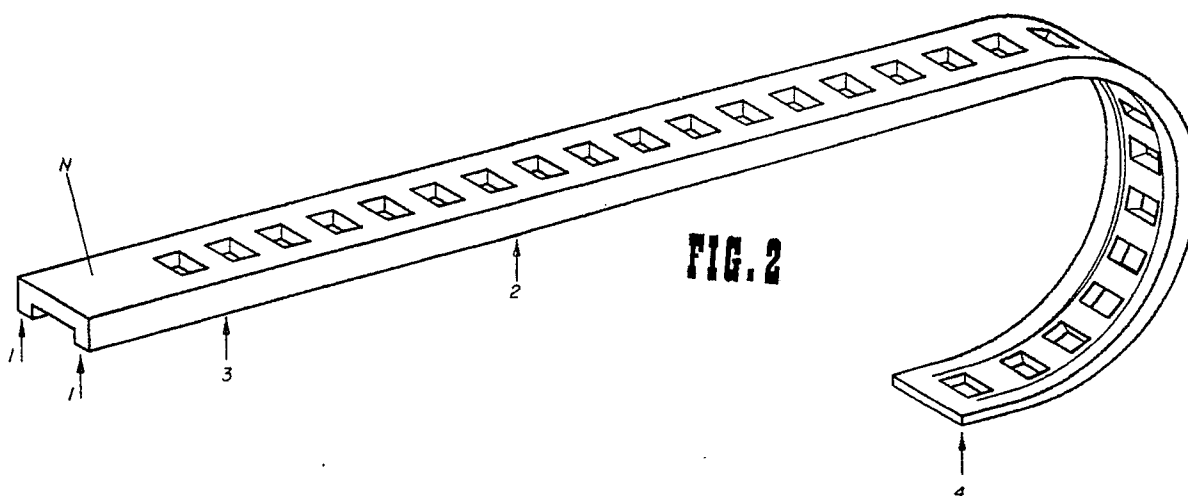
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(54) **Gripper strap with variable thickness for gripper looms.**

(57) In a gripper strap (N) for gripper looms, the thickness of the strap (N) is gradually reduced, over at least part of its cross section, starting from an area (2) close to the end (3) carrying the gripper and extending towards the opposite end (4). In said strap

(N), the notches into which engage the teeth of the wheel moving the strap follow at a variable distance, depending on the position taken up therein by the neutral bending axis.



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GRIPPER STRAP WITH VARIABLE THICKNESS FOR GRIPPER LOOMS

The present invention concerns improvements in gripper straps for gripper looms, that is, in the straps which control the motion of the grippers and thus of the weft yarns through the shed of modern looms.

As known, with the improvement in the performances of these looms - which technological progress has made considerable in the last years - it has become particularly important to give to the strap a configuration which, while providing for a very efficient guiding of the gripper, also ensures conditions of high flexibility in the areas of maximum speed, so as to reduce to a minimum the torque required to adapt the strap around the toothed wheel causing the motion thereof and engaging into its notches, with consequent reduction in the friction and wear, as well as in the pressure on the surfaces contacting a possible curved strap guide.

The EP-81-102588 has already supplied a solution to the problem of varying the stiffness of gripper straps along their length: this solution consists in incorporating into a conventional strap of normal stiffness a core or lining of variable thickness and/or width along the strap length.

This solution is adopted on a strap of conventional characteristics, in order to increase the stiffness in the areas of the strap which turn out to be more flexible than desirable (for instance close to the grippers).

Technique has besides provided in the meantime highly rigid gripper straps (usually with ribbed section), which are thus apt to ensure a very precise guiding of the gripper, but for which the opposite problem arises, namely that of reducing the stiffness in correspondence of the strap areas where a high flexibility thereof is required. This is what happens for example in straps equipping looms wherein the system to control strap motion inside the shed is that object of the EP-A1-275479, this system being characterized by using gripper straps with ribbed section having at least one longitudinal recess, and strap guiding elements having bilateral guides engaging said recess of the straps. The straps used for this system are in fact particularly rigid because of their ribbed section with great overall thickness (required to form said recess and allow proper engagement with said guides and precise guiding of the gripper at the centre of the shed). Similar situations can besides arise also with other types and arrangements of gripper straps.

The problem of varying the stiffness of gripper straps along their length is now solved in a fully original way by the present invention, which supplies a gripper strap for looms characterized in that

its thickness is gradually reduced, over at least part of its cross section, starting from an area close to the end carrying the gripper and extending towards the opposite end.

If - as it usually happens - the strap is of the type moved by a toothed wheel with reciprocating motion, the teeth of which engage into notches formed along said strap, the distance between said notches in the strap according to the invention can be varied according to the position taken up therein by the neutral bending axis.

Preferably, the gripper strap according to the invention is of the type having longitudinal stiffening ribs, and its thickness will advantageously be reduced only in correspondence of said longitudinal ribs, as far as causing the end of the strap opposite to that carrying the gripper to take up a flat rectangular shape.

The decrease in thickness of the strap (or of its ribs) can be continuous and uniform or, alternatively, discontinuous by steps, along the length of the strap. It can furthermore be uniform, or not uniform, across the width of the strap, giving rise to symmetrical or asymmetrical sections, according to cases.

In a particularly preferred embodiment, the gripper strap according to the invention has the following cross section: a channel or C section whose flanges forming said ribs have a constant thickness in the area of the strap end carrying the gripper; a channel or C section whose flanges forming said ribs have a gradually decreasing thickness in an area adjacent to the previous one and extending therefrom; and a rectangular or T section in the area of the strap end opposite to that carrying the gripper.

The invention will now be described in further detail, with reference to the accompanying drawings, which illustrate some preferred embodiments thereof and in which:

Fig. 1 is a diagram showing part of the winding path of a gripper strap in a gripper loom;

Fig. 2 is a perspective view of a first embodiment of the strap according to the invention, with continuously varying thickness;

Fig. 3 is a side view of the strap embodiment shown in fig. 2;

Figs. 4 and 5 are cross section views in correspondence of the ends of the strap embodiment of fig. 2 (respectively along the lines IV-IV and V-V of fig. 3);

Fig. 6 is a perspective view of a second embodiment of the strap according to the invention, wherein the thickness varies discontinuously by steps;

Figs. 7 and 8, 9, 10, are a side view of the strap embodiment of fig. 6, and three cross section views in correspondence of its ends and of its central part;

Fig. 11 is a perspective view of a third embodiment of the strap according to the invention;

Figs. 12 and 13, 14, are a side view of the strap embodiment of fig. 11, and two cross section views in correspondence of its ends;

Fig. 15 shows the strap of fig. 2 into engagement with the toothed wheel causing its motion; and

Fig. 16 is a plan view of any one of the strap embodiments of figs. 2 to 15, placing in evidence the varying distances between the notches into which engage the wheel teeth.

With reference to the drawings, it can be seen from fig. 1 how the gripper strap N, carrying the gripper P through the warp shed of the loom T, has to be particularly flexible in correspondence of its part caused to adhere - by conventional guide means P1 and P2 - to the wheel R controlling its motion, the teeth of which engage into its notches. According to the invention, this is obtained - in the case of particularly rigid straps - by gradually reducing the thickness of the strap over at least part of its section, starting from an area 2 close to the end 3 carrying the gripper and extending towards the opposite end 4.

In the embodiments illustrated on the accompanying drawings, the strap N according to the invention is of the type with channel section, having lateral longitudinal stiffening ribs 1, for the gripper to be properly guided at the centre of the shed.

The configuration of the strap N shown in figs. 2 to 5 is such that only the ribs 1 are gradually and evenly reduced in thickness, so as to be totally eliminated in correspondence of its end 4, while the remaining part of the strap N keeps its thickness unvaried. Said strap end 4 thus takes up a perfectly rectangular and relatively thin symmetrical section (fig. 5), which is fully apt to guarantee a high flexibility of the strap in this area. In the adjacent areas the flexibility will be similar, while the strap will then gradually stiffen towards its end 3 carrying the gripper, taking up its maximum thickness between said end 3 and the area 2 from which the ribs 1 start to grow thinner.

A gripper strap, similar to that shown in figs. 2 to 5, is illustrated in figs. 6 to 10: the only difference in respect of the previous embodiment is that the thickness of this strap varies discontinuously, by steps, along its full length. Thus, a first length 5 of maximum uniform thickness, in correspondence of the end area carrying the gripper (its cross section is shown in fig. 8), is followed - between points 6 and 7 - by a length 8 of reduced thickness of the ribs 1 (cross section shown in fig.

9) and then - beyond point 7 - by a final length 9 wherein the ribs 1 are eliminated and the strap takes up a thin rectangular section (fig. 10). Also in this case, the strap always keeps a symmetrical cross section.

Finally, in the embodiment of figs. 11 to 14, the ribs 1 of the strap are again gradually and evenly reduced in thickness, but said reduction is more pronounced - in respect of the strap embodiment of figs. 2 to 5 - whereby the strap end 10, opposite to the end 3 carrying the gripper, takes up a T section, as shown in fig. 14.

In all the straps described and illustrated so far, the cross section is perfectly symmetrical. It could however be provided for the strap - having a ribbed or non-ribbed section - to be unevenly reduced in thickness across its width, in which case, the cross section of the strap would be asymmetrical.

In straps as those described and illustrated heretofore, particular care has to be taken in distributing along their length the notches into which engage the teeth of the wheel controlling their motion.

It is known in fact that, on winding the strap N around the toothed wheel R, the position of the neutral bending axis of the strap coincides with the pitch circle of the wheel (fig. 15). Consequently, the distance between the notches along the strap is determined by the ratio between pitch circle and number of teeth of said wheel.

On the other hand, as the strap varies in shape, dimensions and material, its neutral bending axis takes up different positions. This particularly happens when - according to the invention - the strap thickness varies over its length in the ways seen heretofore, or in different ways.

Thus, in order to prevent strap elongation when it winds around the toothed wheel controlling its motion - seen that the pitch winding circle varies on varying of the position of the neutral bending axis - the distance between the notches into which engage the wheel teeth should vary over the length of the strap.

This is provided for by the invention, for a correct motion of the strap, by positioning - as shown in fig. 16 - the notches 11, formed along the strap N, at an equal reciprocal distance (p) in the area 3 of uniform thickness carrying the gripper, and by positioning instead said notches 11 at increasing distances (pv) in the strap area 2 of gradually decreasing thickness (particularly, in the case illustrated, the thickness of its two lateral ribs 1).

Claims

1) Gripper strap for gripper looms, characterized in

that its thickness is gradually reduced, over at least part of its cross section, starting from an area close to the end carrying the gripper and extending towards the opposite end.

2) Gripper strap as in claim 1), wherein the decrease in thickness is continuous and uniform along the length of the strap. 5

3) Gripper strap as in claim 1), wherein the decrease in thickness is discontinuous, by steps, along the length of the strap. 10

4) Gripper strap as in claim 1), wherein the decrease in thickness is uniform across the width of the strap.

5) Gripper strap as in claim 1), of the type moved by a toothed wheel with reciprocating motion, the teeth of which engage into notches formed along the strap, characterized in that the distances between said notches in the strap are varied according to the position taken up therein by the neutral bending axis. 15 20

6) Gripper strap for gripper looms, of the type having longitudinal stiffening ribs, characterized in that the thickness of the strap is gradually reduced in correspondence of said longitudinal ribs, starting from an area close to the end carrying the gripper and extending towards the opposite end. 25

7) Gripper strap as in claim 6), wherein the decrease in thickness is continuous and uniform along the length of the strap.

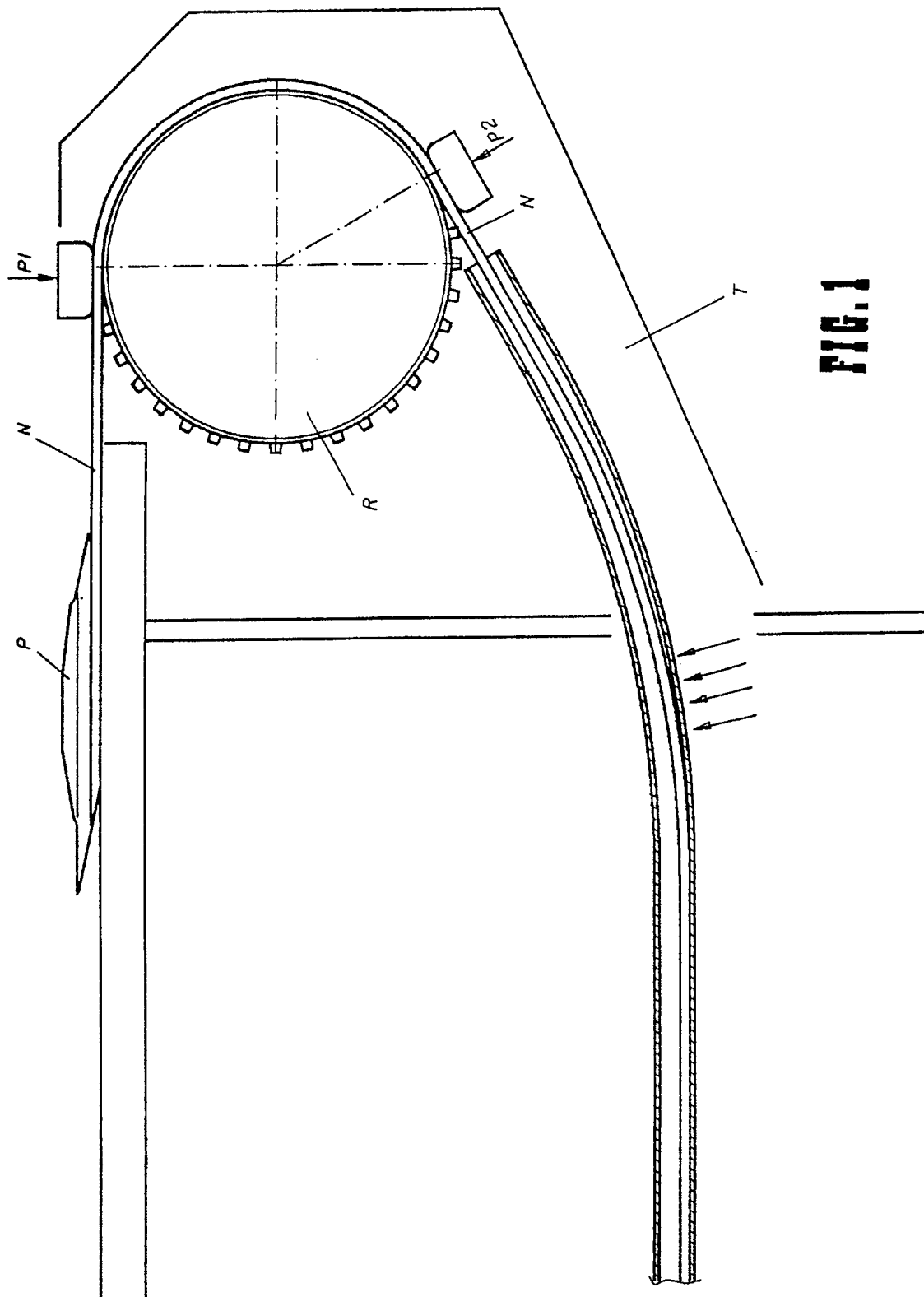
8) Gripper strap as in claim 6), wherein the decrease in thickness is discontinuous, by steps, along the length of the strap. 30

9) Gripper strap as in claim 6), wherein the decrease in thickness is uniform across the width of the strap. 35

10) Gripper strap as in claim 6) having: a channel or C section whose flanges forming said ribs have a constant thickness in the area of the strap end carrying the gripper; a channel or C section whose flanges forming said ribs have a gradually decreasing thickness in an area adjacent to the previous one and extending therefrom; and a rectangular section in the area of the strap end opposite to that carrying the gripper. 40

11) Gripper strap as in claim 6) having: a channel or C section whose flanges forming said ribs have a constant thickness in the area of the strap end carrying the gripper; a channel or C section with flanges of decreasing thickness, followed by a rectangular section and then by a T section, in an area adjacent to the previous one and extending therefrom; and a T section in the area of the strap end opposite to that carrying the gripper. 45 50

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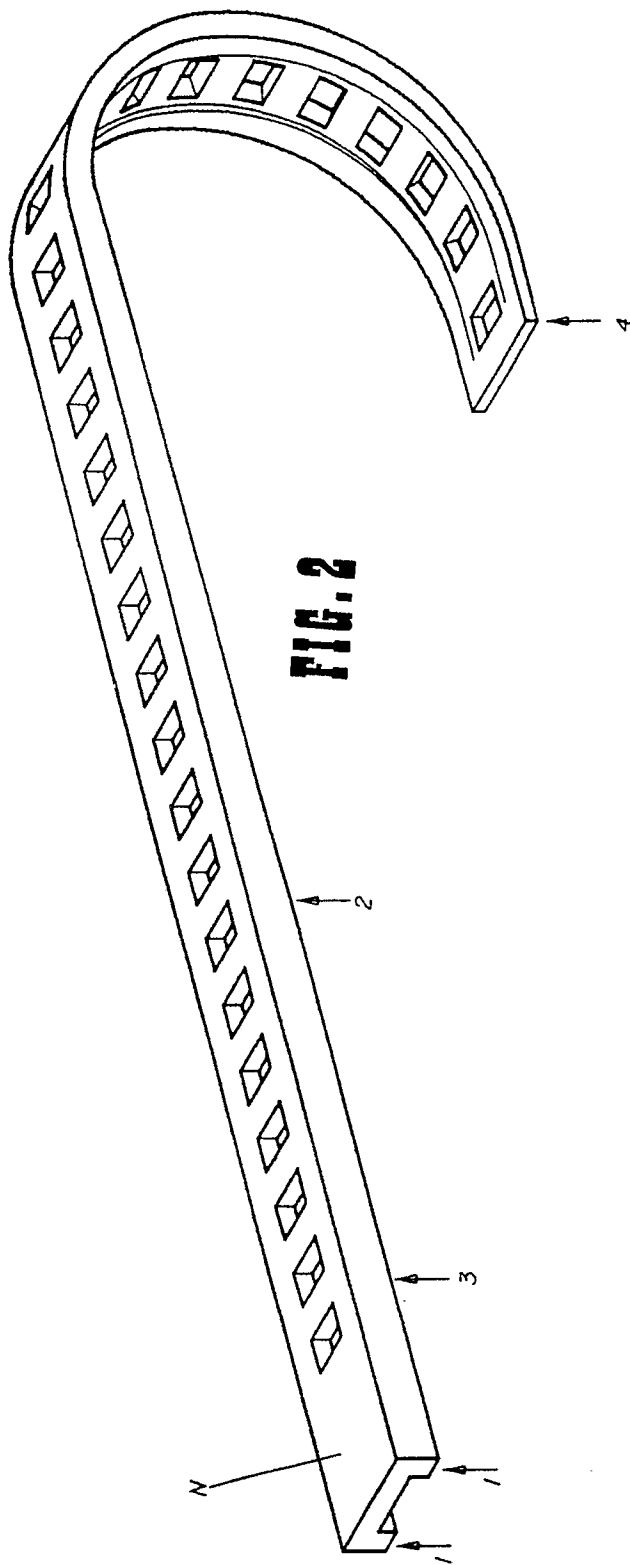


FIG. 3

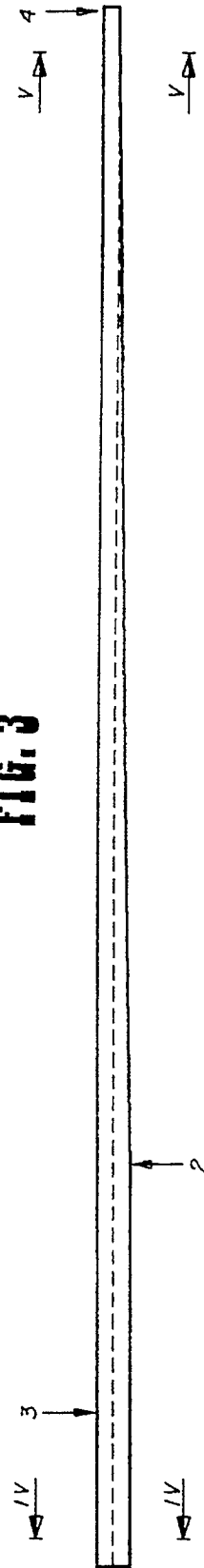


FIG. 4

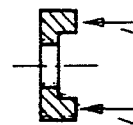


FIG. 5



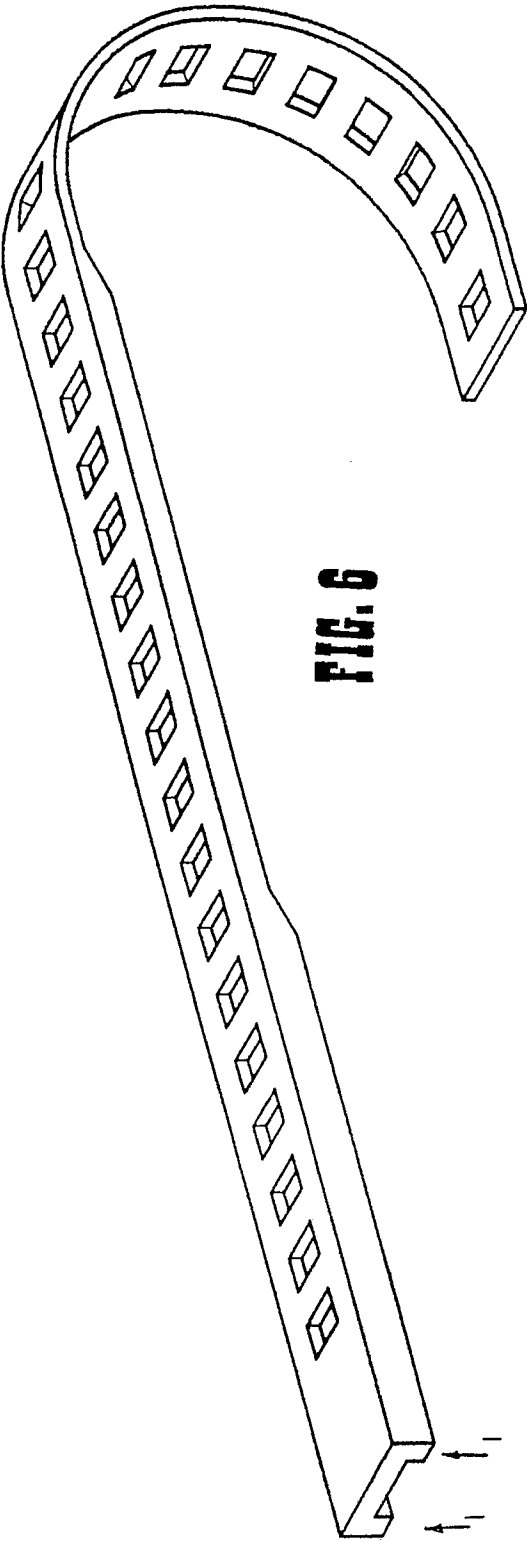


FIG. 6

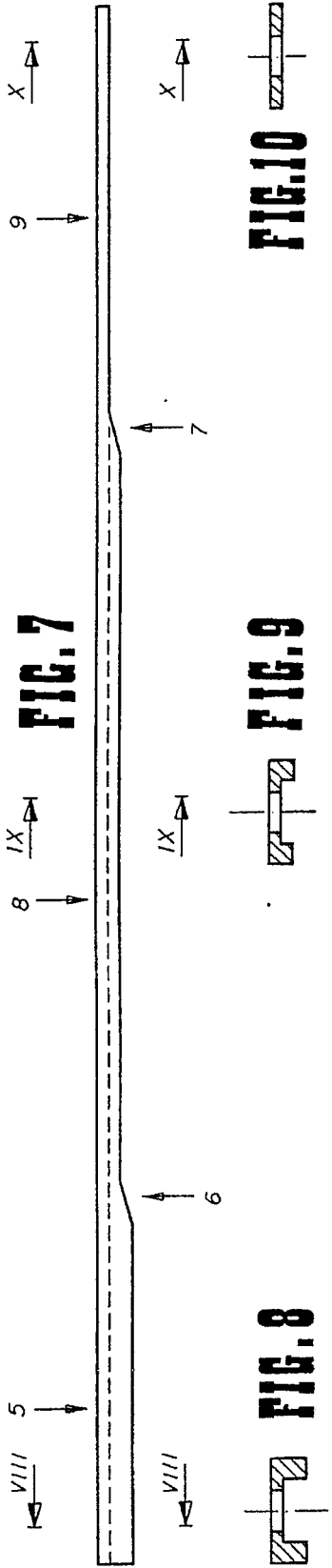
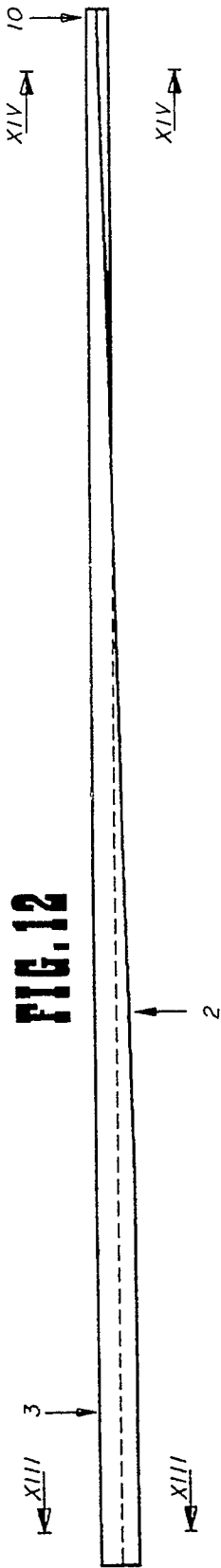
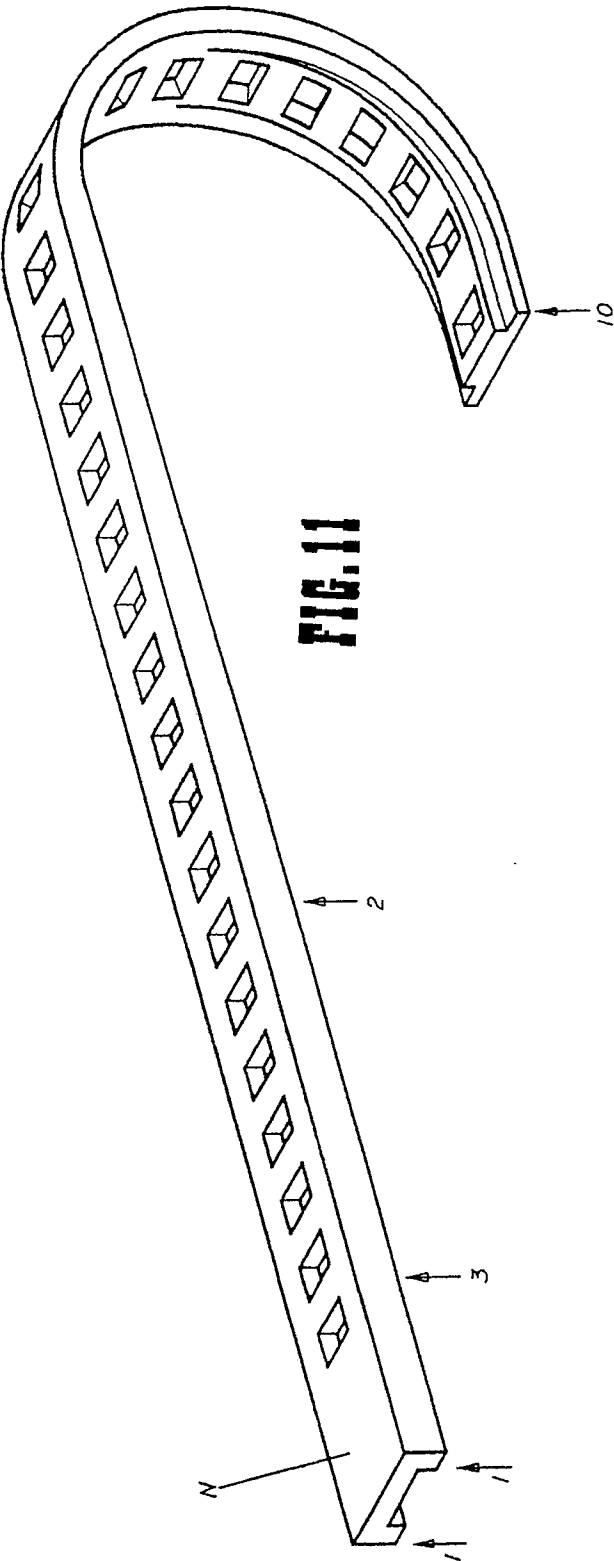


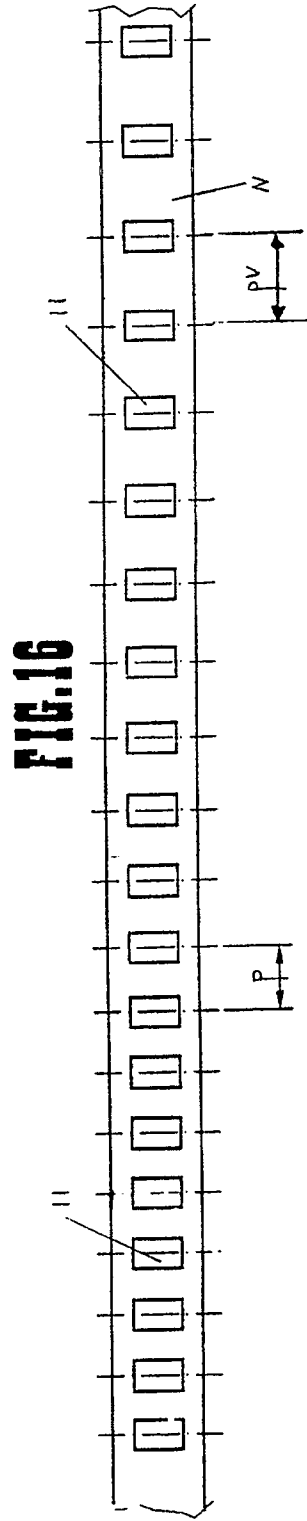
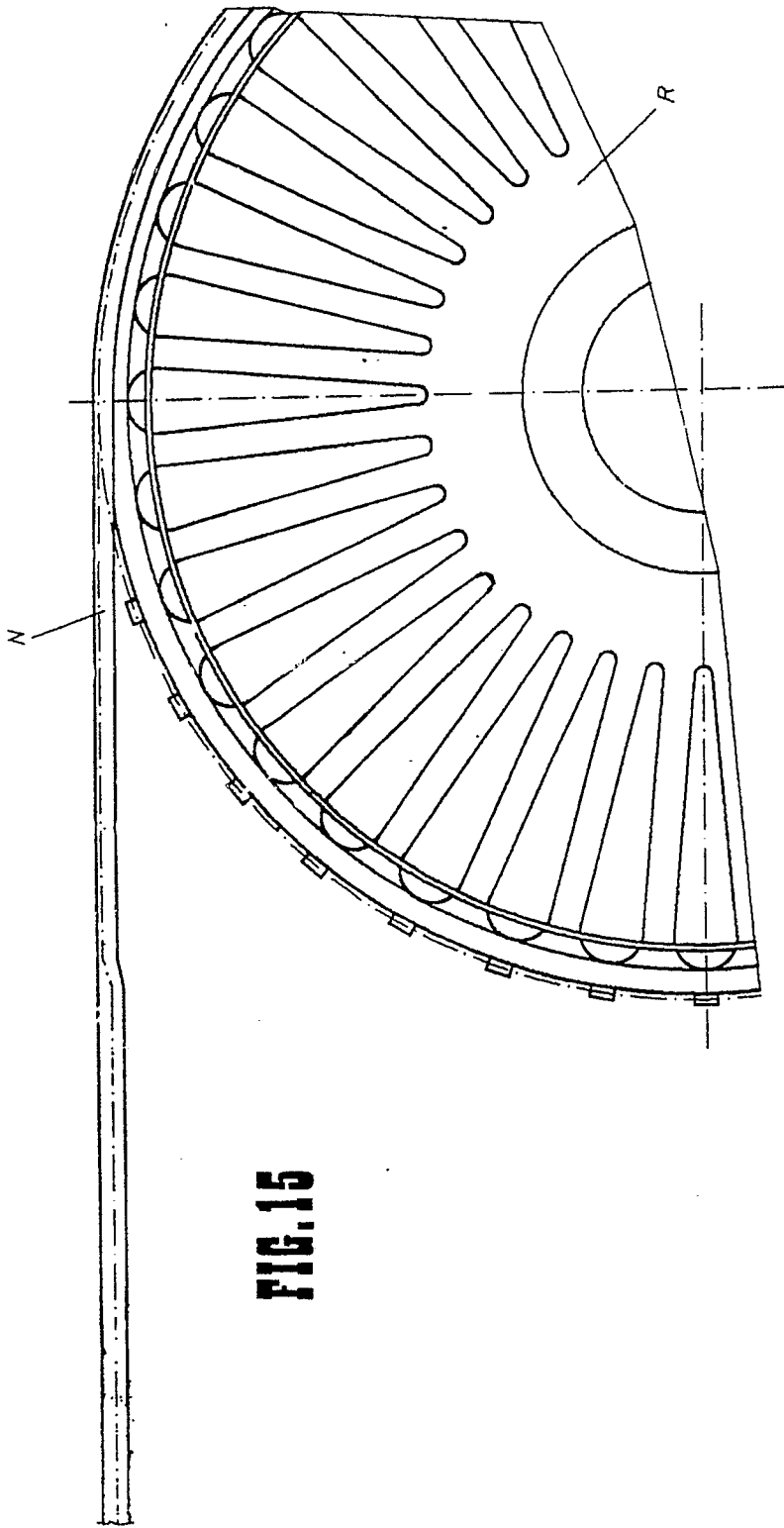
FIG. 7

FIG. 8

FIG. 9

FIG. 10







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EUROPEAN SEARCH REPORT

Application Number

EP 90 11 4955

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.5)
A	FR-A-1 397 230 (DEWAS) * the whole document * - - - -	1	D 03 D 47/27 D 03 D 47/12
A	DE-A-2 030 433 (WANGNER) - - - -		
A	DE-B-2 902 729 (LINDAUER-DORNIER) - - - -		
A	FR-A-2 582 322 (LAMIFLEX) - - - -		
A	NL-C-8 963 9 (PROTOTYPA NARODNI PODNIK) - - - -		
A,D	EP-A-0 102 588 (O.M.V.) - - - -		
A,D	EP-A-0 275 479 (VAMATEX) - - - - -		
The present search report has been drawn up for all claims			
Place of search		Date of completion of search	Examiner
The Hague		09 November 90	BOUTELEGIER C.H.H.
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