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

(11) Publication number: **0 448 917 B1**

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **07.09.94**

(51) Int. Cl.[5]: **D04B 15/66**, F16G 13/07

(21) Application number: **90830336.5**

(22) Date of filing: **19.07.90**

(54) **Cam element for the accomplishment of driving chains in knitting machines.**

(30) Priority: **30.03.90 IT 1987590**

(43) Date of publication of application:
02.10.91 Bulletin 91/40

(45) Publication of the grant of the patent:
07.09.94 Bulletin 94/36

(84) Designated Contracting States:
CH DE ES FR LI

(56) References cited:
DE-A- 2 050 399
FR-A- 2 540 208
GB-A- 819 838

(73) Proprietor: **COMEZ S.p.A.**
Via Enrico Fermi, 5
I-27024 Cilavegna (PV) (IT)

(72) Inventor: **Omodeo, Zorini Luigi**
Via Dei Mille 71
I-27024 Cilavegna, Pavia (IT)

(74) Representative: **Righetti, Giuseppe**
Bugnion S.p.A.
Via Carlo Farini, 81
I-20159 Milano (IT)

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EP 0 448 917 B1

Description

The present invention relates to a cam element for the accomplishment of driving chains, currently named "Glieder chains" in knitting machines of the type comprising: a male portion of a flat plate-like conformation; a female portion having an engagement seat disposed in alignment with said male portion and into which the male portion of a contiguous cam element can be fitted, which male portion is adapted to be oscillatably linked to the female portion by a pivot pin extending through respective through holes formed in said male and female portions.

It is known that in knitting machines the operation of the different cooperating members for the accomplishment of a manufactured article such as for example tubular guide carriers, tubular weft yarn guides and so on, is achieved by means of driving mechanisms taking the movement from driving chains, the so-called "Glieder chains". Said Glieder chains, consisting of cam elements linked together one after the other so as to form an endless loop, are operatively engaged on a driving wheel and optionally on one or more idler rollers mounted in the knitting machine structure.

The driving wheel when taken in rotation drags the Glieder chains so that the cam elements forming it are forced to act upon respective cam followers in order to transmit the due movements to the different members of the knitting machine. In fact each cam element on its lateral profile exhibits a base side having an arcuate extension and adapted to abut against the bottom of the respective race provided on the driving wheel, and a top side which is suitably shaped depending upon the movement to be transmitted to the corresponding cam follower.

According to GB-A 819 838 which describes one type of Glieder chain currently used, a substantially plate-like male portion and a female portion provided with an engagement seat substantially matching the shape of the male portion and disposed in alignment therewith are defined on the longitudinal extension of each cam element. The mutual engagement of the different cam elements takes place by fitting the male portion of one element in the engagement seat provided in the female portion of another element and afterwards mutually hinging the two elements by means of a pivot pin passing through suitable holes formed in the male and female portions respectively of each cam element.

In most cases it is provided that each pin, suitably sized in length, should link two cam elements of each of the Gleider chains present in the knitting machine. In addition, at the locations comprised between two chains each pivot pin operatively engages with a grip notch formed sideways to the driving wheel races in order to ensure the constant dragging of the Glieder chains, without the risk that undesired slippings may occur.

It is to be noted however that the use of Glieder chains formed with cam elements of the above described type has some drawbacks both as regards manufacturing costs and operative level.

In this connection it is to be pointed out that for manufacturing the above described cam elements it is necessary first to continuously extrude a bar the section of which corresponds to the longitudinal section profile of the cam element which must be obtained. Therefore, the male portion and female portion with its respective engagement seat will have to be already defined in the extruded bar.

It is from the above bar that the single lengths will be afterwards cut and in each single length the base side and top side will be subsequently formed by mechanical working so as to create the finished cam element.

The manufacture of the extruded bar needs the semifinished product to undergo many passages through as many extruders and therefore involves the use of very complicated extrusion equipments which results in high costs.

In addition it is to be noted that the extrusion processes do not allow the engagement seat to have a longitudinal extension greater than given values.

This restriction appears disadvantageous in connection with the workability of the cam element when the mechanical removal of material must be carried out in order to define the base and top sides. This material removal must in fact take place on very extended surfaces.

The reduced extension of the engagement seat also limits the possibility of reducing the weight of the cam element and therefore of the Glieder chain assembly used in the knitting machine. Obviously this fact brings about a greater energy consumption when the Glieder chains are taken in rotation during the operation of the knitting machine.

In addition said impossibility of obtaining sufficiently wide engagement seats appears particularly disadvantageous in the cases in which the Glieder chains must follow a substantially S-shaped path between different idler rollers for the purpose of achieving a reduced bulkiness. Under this situation in fact the rollers around which the chains are wrapped according to an opposite bending direction relative to the direction of the driving wheel cannot be manufactured with sufficiently reduced diametrical sizes. Actually, between different consecutive cam elements mechanical interferences occur which limit the possibility of mutual oscillation of the same in the way opposite that in which the training of the Glieder chain on the driving

wheel takes place.

Presently, Glieder chains are also available which consist of an alternate succession of first cam elements substantially comprised of a shaped plate, and second cam elements comprised of a pair of shaped plates the ends of which are disposed in side-by-side relation and linked to the ends of the first cam elements contiguous thereto. The Glieder chains in which this type of cam elements are used are also adapted to be wrapped on idler rollers of reduced sizes in an opposite way relative to their training direction on the driving wheel. However manufacturing chains of the above type is rather hard and the assembling of a much greater number of components than in the previously described Glieder chains is required.

The main object of the present invention is substantially to solve the problems of the known art by providing a cam element for Glieder chains which can be manufactured in a very simple and cheap manner and is adapted to form chains which can be wrapped also on idler rollers of reduced diameters in an opposite way relative to the training direction of the chain itself on the driving wheel.

The foregoing and further objects which will become more apparent in the course of the present description are substantially attained by a cam element for the accomplishment of Glieder chains in knitting machines, characterized in that said male portion and female portion are formed by a suitably bent and shaped plate-like element exhibiting, on its longitudinal extension: two first rectilinear lengths consecutively connected by a U-shaped bending and disposed parallelly to each other in side by side relation in order to define said male portion; two connecting lengths diverging symmetrically from the respective first rectilinear lengths; and two second rectilinear lengths each extending parallelly from one of said connecting lengths in order to define said female portion.

Further features and advantages will be best understood from the detailed description of a preferred embodiment of a cam element for the accomplishment of Glieder chains in knitting machines in accordance with the present invention, given hereinafter by way of non-limiting example with reference to the accompanying drawings, in which:

- Fig. 1 is a perspective view showing a cam element according to the invention;
- Fig. 2 is a perspective partly sectional view given by way of example only, of a Glieder chain formed with the inventive cam elements, operatively engaged on a respective driving wheel of a knitting machine;
- Fig. 3 is a side view of the driving wheel engaging a Glieder chain formed with cam elements in accordance with the invention;
- Fig. 4 is a side view showing, still by way of example only, a Glieder chain formed with the inventive cam elements, disposed in engagement on an idler roller causing its being wrapped thereabout in an opposite way relative to its training direction on the driving wheel;
- Fig. 5 is a perspective view of a second embodiment of the cam element in question.

Referring particularly to Figs. 1 to 4, a cam element for the accomplishment of Glieder chains in knitting machines in accordance with the present invention has been generally identified by reference numeral 1. The cam element conventionally comprises a male portion 2 of flat plate-like conformation and a female portion 2 provided with an engagement seat 4 disposed in alignment with the male portion 2. Still in known manner, the cam element 1 on its lateral profile exhibits a base side 1a having an arcuate extension and arranged so as to abut against the bottom of a race 6 exhibited by a driving wheel 7 installed on a knitting machine not shown as not of importance to the ends of the invention. The driving wheel 7, operated in rotation, is conventionally arranged so as to ensure the dragging of a Glieder chain B formed with the linkage of a number of cam elements 1 in succession.

Also defined on the lateral profile of the cam element 1 is a top side 1b which, suitably shaped depending upon requirements, is designed to slidably act on a cam follower, not shown as known per se, operating close to the driving wheel 7 in order to transmit given movements to one or more members of the knitting machine connected thereto.

As clearly shown in Fig. 2, the mutual engagement of the single cam elements 1 is achieved by fitting the male portion 2 of each cam element 1 into the engagement seat 4 provided in the female portion 3 of the contiguous cam element.

Also provided is a plurality of pivot pins 9 passing through holes 10, 11 formed in the male portion 2 and female portion 3 respectively, in order to link the different cam elements 1 to one another. In the embodiment shown in Fig. 2, pins 9 as well as the driving wheel 7 are designed to engage other Glieder chains not shown as not of importance to the ends of the invention, adapted to be fitted in auxiliary races 6a exhibited by the driving wheel itself. In addition each pin 9 lends itself to be operatively engaged by grip notches 12 formed on the driving wheel 7 sideways to the races 6, 6a, in order to ensure the correct dragging of the Glieder chains B by the driving wheel itself.

In an original manner, in accordance with the present invention, the male portion 2 and female portion 3 of each cam element 1 consist of at least

a plate-like element suitably bent and shaped.

More precisely, in the embodiment shown in Fig. 1 the cam element 1 consists of a single plate-like element 13 which, by appropriate bending operations known per se and therefore not described, is so shaped that on its longitudinal extension it exhibits two first rectilinear lengths 14 consecutively connected by a U-shaped bending 15 and disposed parallelly to each other in side by side relation in order to define the male portion 2. Symmetrically diverging from the first rectilinear lengths 14 are two short connecting lengths 16 followed by two second rectilinear lengths 17 extending parallelly to each other so as to define the female portion 3.

Preferably the first rectilinear lengths 14 match each other and are made integral by at least a welding area 18. Obviously, the U-shaped bending connecting the first rectilinear lengths 14 to each other may also be made so that said first rectilinear lengths are parallelly spaced apart from each other by a predetermined amount.

In Fig 5 a different embodiment of the cam element has been generally identified by 21. It is substantially identical to the one shown in Fig. 1 apart from the fact that in this case the presence of the U-shaped bending 15 connecting the first rectilinear lengths 14 to each other is not provided. Therefore the cam element 21 is formed with a pair of suitably bent and shaped plate-like elements, the first rectilinear length 14 of one plate-like element 13 being disposed parallelly to and in side by side relation with the first rectilinear length of the other plate-like element 13 to which it is fixedly engaged preferably by means of welding areas 18.

Advantageously, according to a further feature of the present invention, in both embodiments the cam element 1, 21 is so structured that its engagement seat 4 has a length "l" corresponding to the whole length of the female portion 3, the amount of which is at least half the amount of the overall length "L" of the cam element itself. Due to this particular expedient the consecutively hinged cam elements 1, 21 are free to carry out very wide oscillations about the axes of the respective pivot pins 9. Therefore the Glieder chain 8 consisting of the cam elements of the invention will be adapted to be wrapped on idler rollers having a very reduced diameter in the opposite way relative to the training direction of the driving wheel 7. For the sake of clarity this operating condition of the Glieder chain 8 is shown in Fig. 4.

As shown in said figure, under this situation the pivot pins 9 engage on the idler roller 19 so as to make the Glieder chain 8 follow an arcuate path, its wrapping direction being opposite with respect to the training direction of the driving wheel 7. As can be easily understood the wrapping arc of chain 8 has a very reduced radius.

The present invention attains the intended purposes.

It is to be noted in fact that the manufacture of the cam elements 1, 21 in accordance with the invention merely involves continuous bending operations carried out on a sheet, followed by optional welding and subsequent cutting so as to obtain a plurality of shaped lengths which will then be submitted to conventional mechanical workings in order to define the base side 1a and top side 1b thereof.

Advantageously workings related to sheet bending and welding will involve much lower costs than the extrusion workings hitherto used for manufacturing the cam elements of the known art.

In addition, as the engagement seat 4 formed in the cam element of the invention is relatively wide, Glieder chains adapted to be wrapped on idler rollers of very reduced diameter can be accomplished and the wrapping can even take place in a direction opposite that of the driving wheel.

It will be understood that, being the engagement seat wide, the weight of the cam element will be greatly reduced as well as, as a result, the weight of the Glieder chain assembly used in knitting machines. Due to the reduced weight, the running of the Glieder chains will require less consumption of energy.

It will also be appreciated that, being the engagement seat wide, the amount of material to be removed during the mechanical workings for defining the base 1a and top 1b sides will be less than in the known art. As a result time will be saved too in carrying out said mechanical workings.

Obviuously the present invention is susceptible of many modifications and variations, all falling within the scope of the invention idea characterizing it.

Claims

1. A cam element (1) for the accomplishment of driving chains currently named "Glieder chains" (8), in knitting machines comprising;

- a male portion (2) of a flat plate-like conformation;
- a female portion (3) having an engagement seat (4) disposed in alignment with said male portion (2) and into which the male portion (2) of a contiguous cam element can be fitted, which male portion (2) is adapted to be oscillatably linked to the female portion (3) by a pivot pin (9) extending through respective through holes (10, 11) formed in said male (2) and female (3) portions,

characterized in that said male portion (2) and

female portion (3) are formed by a suitably bent and shaped plate-like element (13) exhibiting, on its longitudinal extension:

- two first rectilinear lengths (14) consecutively connected by a U-shaped bending (15) and disposed parallelly to each other in side by side relation in order to define said male portion (2);
- two connecting lengths (16) diverging symmetrically from the respective first rectilinear lengths (14); and
- two second rectilinear lengths (17) each extending parallelly from one of said connecting lengths (16) in order to define said female portion (3).

2. A cam element (21) for the accomplishment of driving chains currently named "Glieder chains" (8), in knitting machines comprising:

- a male portion (2) of a flat plate-like conformation;
- a female portion (3) having an engagement seat (4) disposed in alignment with said male portion (2) and into which the male portion (2) of a contiguous cam element can be fitted, which male portion (2) is adapted to be oscillatably linked to the female portion (3) by a pivot pin (9) extending through respective through holes (10, 11) formed in said male (2) and female (3) portions,

characterized in that said male portion (2) and female portion (3) are formed by a pair of suitably bent and shaped plate-like elements (13) exhibiting, on their longitudinal extension:

- two first rectilinear lengths (14) disposed parallelly to each other in side by side relation and fixedly engaged with each other in order to define said male portion (2);
- two connecting lengths (16) diverging symmethrically from the respective first rectilinear lengths (14); and
- two second rectilinear lengths (17) each extending parallelly from one of said connecting lengths (16) in order to define said female portion (3).

3. A cam element (1, 21) according to claim 1 or 2, characterized in that said first rectilinear lengths (14) match each other and are mutually fastened by welding (18).

Patentansprüche

1. Nockenelement (1) zur Verbesserung von Antriebsketten, den sogenannten "Gliederketten" (8) in Strickmaschinen, bestehend aus

- einem Zungenteil (2) mit flacher, blattförmiger Ausbildung;
- einem Nutenteil (3) mit einer Eingriffsaufnahme (4), die mit dem Zungenteil (2) ausgerichtet ist und in der der Zungenteil (2) eines angrenzenden Nockenelementes einführbar ist, wobei der Zungenteil (2) mit dem Nutenteil (3) mittels eines Bolzens (9) verschwenkbar verbunden werden kann, der sich durch jeweilige, durchgehende Bohrungen (10, 11) erstreckt, die in den genannten Zungen (2) - und Nuten (3) - Teil ausgenommen sind,

dadurch gekennzeichnet, daß der Zungenteil (2) und der Nutenteil (3) durch ein plattenförmiges Element (13) erhalten werden, das, passend umgebogen und geformt, in seiner Längsabwicklung:

- zwei erste gerade Abschnitte (14), die nacheinander mittels einer "U"-förmigen Kröpfung (15) verbunden und zueinander parallel anliegen, um den Zungenteil (2) festzulegen;
- zwei Verbindungsabschnitte (16), die symmetrisch von den jeweiligen ersten, geraden Abschnitten (14) aus auseinandergehen; und
- zwei zweite gerade Abschnitte (17), die sich jeweils von einem der Verbindungsabschnitte (16) erstrecken, um den Nutenteil (3) festzulegen,

aufweist.

2. Nockenelement (21) zur Ausführung von Antriebsketten, den sogenannten "Gliederketten" (8) für Strickmaschinen, bestehend aus:

- einem Zungenteil (2), mit flacher, blattförmiger Ausbildung;
- einem Nutenteil (3) mit einer Eingriffsaufnahme (4), die mit dem Zungenteil (2) ausgerichtet ist und in die der Zungenteil (2) eines anliegenden Nockenelementes einführbar ist, wobei der Zungenteil (2) mit dem Nutenteil (3) mittels eines Bolzens (9) verschwenkbar verbunden werden kann, der sich durch jeweilige, durchgehende Bohrungen (10, 11) erstreckt, die aus dem Zungenteil (2) und Nutenteil (3) ausgenommen sind,

dadurch gekennzeichnet, daß der Zungenteil (2) und der Nutenteil (3) durch ein Paar von blattförmigen Elementen (13) erhalten werden, die, zweckmäßig umgebogen und geformt, in ihrer Längsabwicklung:

- zwei erste gerade Abschnitte (14), die parallel zueinander anliegen und starr miteinander eingreifen, um den Zungen-

abschnitt (2) festzulegen;
- zwei Verbindungsabschnitte (16), die symmetrisch von den jeweiligen ersten geraden Abschnitten (14) aus auseinandergehen;
  und
- zwei zweite geradlinige Abschnitte (17), die sich jeweils parallel von einem der Verbindungsabschnitte (16) erstrecken, um den Nutenteil (3) festzulegen,

aufweisen.

3. Nockenelement (1, 21) nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die ersten geradlinigen Abschnitte (14) aufeinandergepaßt sind und durch Verschweißung (18) miteinander befestigt sind.

Revendications

1. Elément de came pour l'amélioration de chaînes d'entraînement, couramment appelées "chaînes Glieder" (8), sur des machines à tricoter, comprenant:
- une portion mâle (2) conformée en forme de lame plate;
- une portion femelle (3) ayant un siège d'engagement (4) disposé en alignement avec ladite portion mâle (2) et dans lequel peut être insérée la portion mâle (2) d'un élément à came contigu, laquelle portion mâle (2) est destinée à être liée à la portion femelle (3) de manière oscillante par un pivot (9) s'étendant à travers de respectifs trous de passage (10, 11) ménagés dans lesdites portions mâle (2) et femelle (3),

caractérisé en ce que lesdites portions mâle (2) et femelle (3) sont formées par un élément (13) en forme de plaque convenablement replié et conformé présentant, sur son extension longitudinale:
- deux premiers tronçons rectilignes (14) reliés consécutivement par une pièce courbée en forme de "U" (15) et disposés parallèles l'un à l'autre et côte à côte, dans le but de définir ladite portion mâle (2);
- deux tronçons de liaison (16) divergeant symétriquement des respectifs premiers tronçons rectilignes (14); et
- deux seconds tronçons rectilignes (17) chacun desquels s'étend parallèlement à partir de l'un desdits tronçons de liaison (16) dans le but de définir ladite portion femelle (3).

2. Elément de came (21) pour l'amélioration de chaînes d'entraînement couramment appelées "chaînes Glieder" (8), sur des machines à tricoter comprenant:
- une portion mâle (2) conformée en forme de lame plate;
- une portion femelle (3) ayant un siège d'engagement (4) disposé en alignement avec ladite portion mâle (2) et dans lequel peut être insérée la portion mâle (2) d'un élément a came contigu, laquelle portion mâle (2) est destinée à être liée à la portion femelle (3) de manière oscillante par un pivot (9) s'étendant à travers de respectifs trous de passage (10, 11) ménagés dans lesdites portions mâle (2) et femelle (3),

caractérisé en ce que lesdites portions mâle (2) et femelle (3) sont formées par une paire d'éléments (13) en forme de plaque convenablement repliés et conformés présentant, sur leur extension longitudinale:
- deux premiers tronçons rectilignes (14) disposés parallèlement l'un a côté de l'autre et engagés rigidement l'un à l'autre dans le but de définir ladite portion mâle (2);
- deux tronçons de liaison (16) divergeant symétriquement des respectifs premiers tronçons rectilignes (14); et
- deux seconds tronçons rectilignes (17) chacun desquels s'étend parallèlement à partir de l'un desdits tronçons de liaison (16) dans le but de définir ladite portion femelle (3).

3. Elément de came (1, 21) selon la revendication 1 ou 2, caractérisé en ce que lesdits premiers tronçons rectilignes (14) sont disposés l'un contre l'autre de manière à coïncider parfaitement et sont fixés l'un à l'autre par une soudure (18).

FIG.1

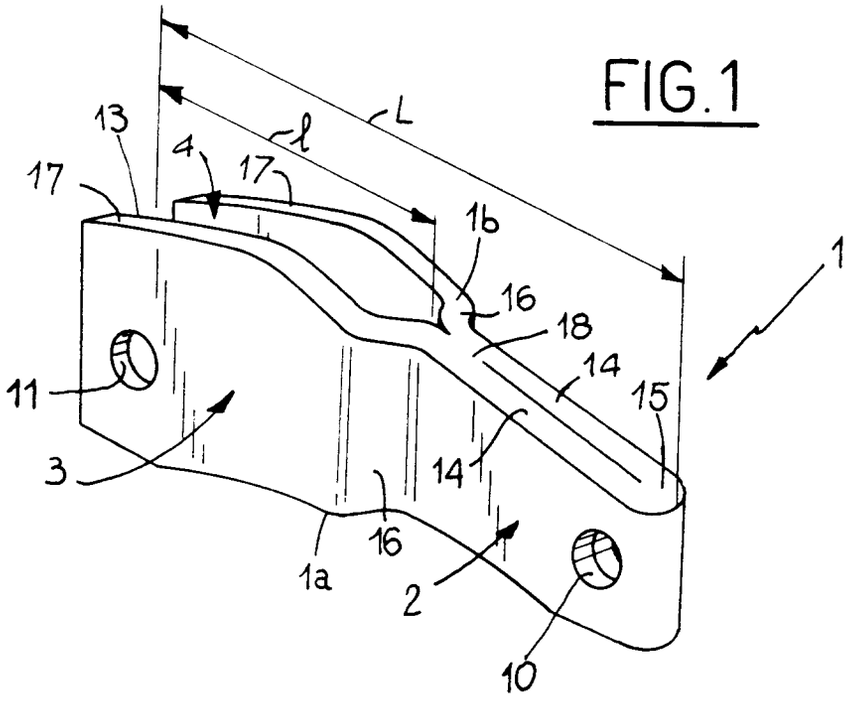

L
l
13
4
17
17
1b
16
18
14
15
1
11
3
14
16
1a
2
10

FIG.5

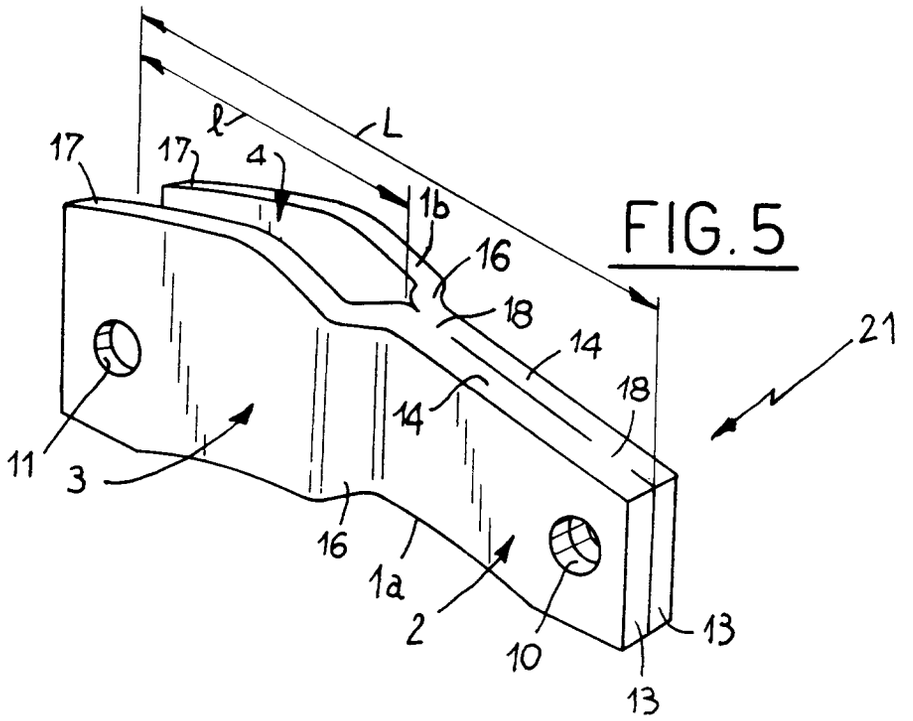
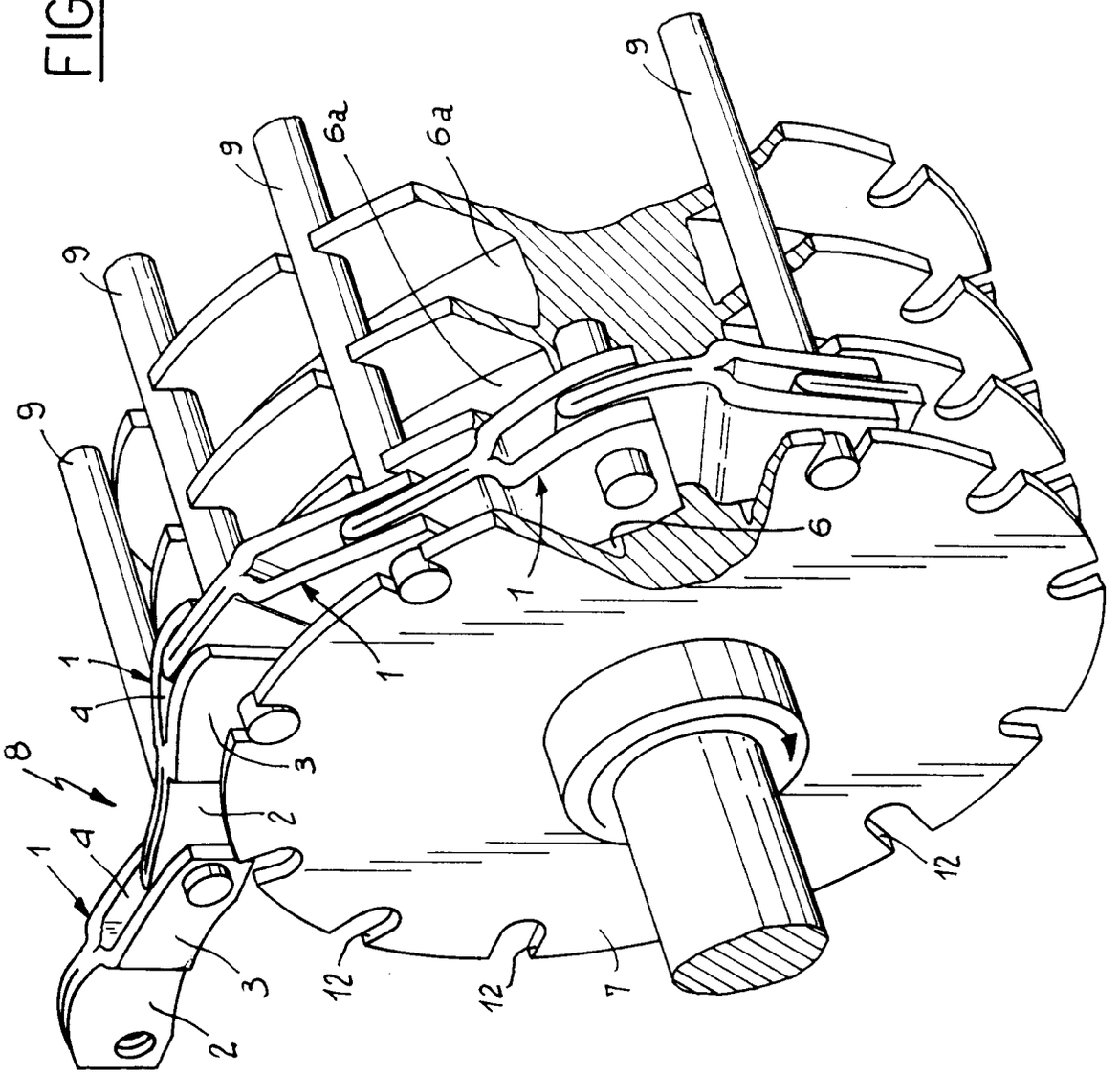

l
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17
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4
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16
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14
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21
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1a
2
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13
13

FIG.2



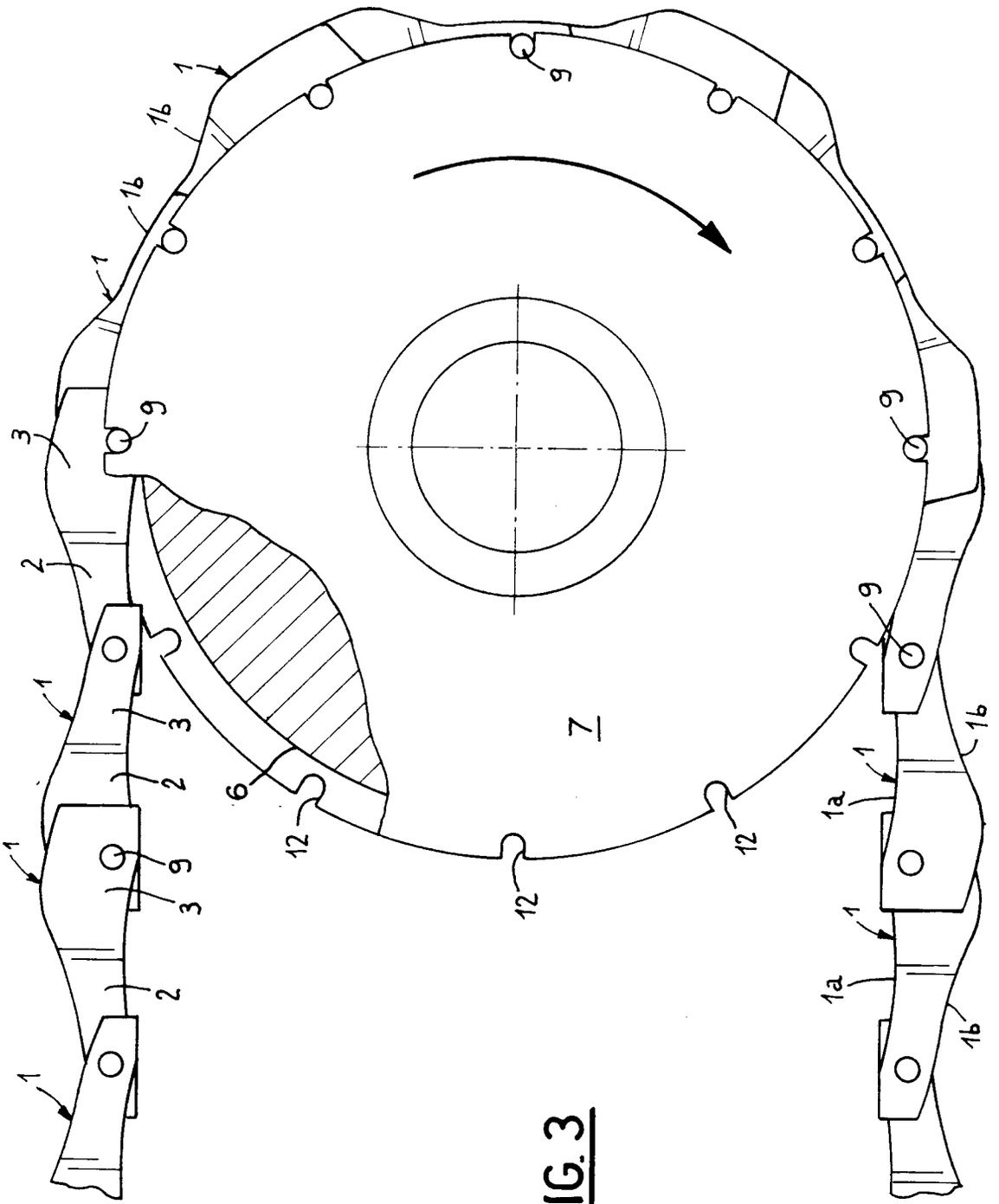


FIG.3

FIG. 4

