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

(11) Publication number: **0 224 765**
**A2**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **86115689.1**

(51) Int. Cl.⁴: **D 04 B 15/32**

(22) Date of filing: **12.11.86**

(30) Priority: **02.12.85 IT 2304885**

(43) Date of publication of application:
**10.06.87 Bulletin 87/24**

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

(71) Applicant: **LONATI S.p.A.**
**Via S. Polo, 11**
**I-25123 Brescia(IT)**

(72) Inventor: **Lonati, Francesco**
**Via S.Polo 11**
**I-25123 Brescia(IT)**

(74) Representative: **Modiano, Guido et al,**
**MODIANO, JOSIF, PISANTY & STAUB Modiano & Associati Via Meravigli, 16**
**I-20123 Milan(IT)**

(54) **Cam Assembly for controlling the needles in a circular knitting machine and the like.**

(57) The present invention relates to a cam assembly for controlling the needles in a circular knitting machine and the like, with at least one casting-off cam (6) at one feed of the machine. The cam assembly according to the invention has the peculiarity of comprising an auxiliary descent cam (13) arranged upstream of the casting-off cam (6) according to the direction of rotation of the machine and a descending portion (13a) which is engageable with an element (8) for controlling the needles which are not operating at said feed to carry the needle control element (8) below the descending portion (7) of the casting-off cam (6).

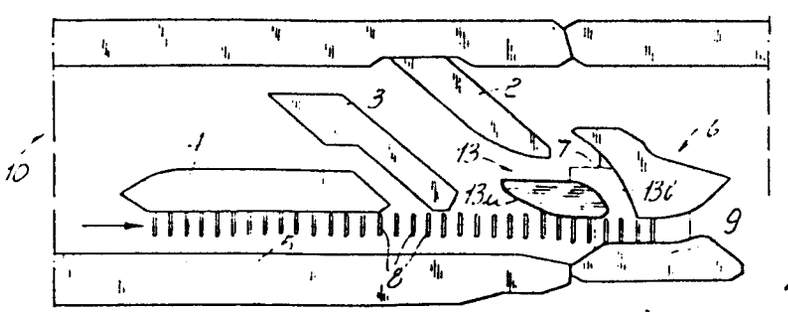



Fig.2

EP 0 224 765 A2

0224765

# CAM ASSEMBLY FOR CONTROLLING THE NEEDLES IN A CIRCULAR KNITTING MACHINE AND THE LIKE

The present invention relates to a cam assembly for controlling the needles in a circular knitting machine and the like.

As is known, in knitting machines at every feed of the machine there is a casting-off cam which engages with the heel of the needles, or with the heel of the sliders or sub-needles in twin-cylinder stocking machines which have taken thread from said feed and causes a preset lowering of the needles for forming a new loop of knitting, with the casting off of the loops formed previously.

The heels of the needles or of the sliders which do not operate at said feed are kept in a track which passes below the corresponding casting-off cam and therefore, theoretically, they should not interfere with the descending portion followed instead by the heels corresponding to the needles which have captured the thread.

In practice, however, the tensioning of the previously formed knitting or the tensioning caused by the needles which are working purl in the upper cylinder of twin-cylinder machines, causes a slight rise also of the needles which do not operate at the feed being considered and the heel of these needles, or respectively of the sliders in twin-cylinder machines, interferes with the terminal end of the descending portion of the matching casting-off cam.

This contact, which is theoretically prevented, is the source of disadvantages, particularly in the case of high rotation speeds such as those currently achieved by stocking-making machines.

In single-cylinder machines this contact, which becomes a true collision, can cause rapid wear of the heel of the needle, making its replacement mandatory.

In twin-cylinder machines this collision is even harder, and can lead to the damage, if not to the breakage, of the lower head of the needle hooked to the slider which is jerked downwards by the contact of its heel with the casting-off cam.

Again in twin-cylinder machines, furthermore, the unwanted raising of the needles which operate at the feed being considered is the cause of a loosening of the loops formed by the needles which operate purl in the upper cylinder; as a consequence of this loosening, during the casting-off phase, difficulties arise in unloading the knitting formed on the purl needles.

The main aim of the present invention is to eliminate the above described disadvantages by providing a cam assembly for controlling the needles in a circular knitting machine with which to avoid the collision of the heel of the needles, or of the sliders, which do not operate at a feed with the descending portion of the matching casting-off cam.

Within the scope of the above described aim, an object of the invention is to provide a cam assembly for controlling the needles which allows the machine high productive speeds without causing damage to the heels which engage therewith or breakage of the needles in the case of twin-cylinder machines.

This aim, as well as this and other objects which will become apparent hereinafter, are achieved by a cam assembly

for controlling the needles in a circular knitting machine and the like, comprising at least one casting-off cam at a feed of the machine, characterized in that it comprises, upstream of said casting-off cam, according to the direction of rotation of the machine, an auxiliary descending cam having a descending portion, engageable with a control element for the needles which do not operate at said feed to carry said control element substantially below the lower end of the descending portion of said casting-off cam.

Further characteristics and advantages of the invention will become apparent from the description of a preferred, but not exclusive, embodiment of the cam assembly according to the invention, illustrated by way of non-limitative example in the accompanying drawings, where:

Fig. 1 is a see-through view from the outside of a portion of the skirt of the cams of the lower cylinder of a circular twin-cylinder machine for stockings of a known kind proximate to one feed;

Fig. 2 is a view of a portion of the skirt of the cams of the lower cylinder of a circular twin-cylinder stocking machine proximate to one feed with the lock according to the invention; and

Fig. 3 is a development view of a portion of the needle-bearing cylinders in a circular twin-cylinder machine for stockings with the cam assembly according to the invention mounted on the lower cylinder and superimposed thereon for greater clarity.

Fig. 1 illustrates a portion of the skirt of the cams,

generally indicated by the reference numeral 1, as it is provided in current twin-cylinder machines for stockings.

Omitting the description of the cams designated with the numerals 2 and 3 which are respectively assigned to the lowering of the sliders which have taken the needles to capture the thread at the feed being considered and to particular patterns, as well as that of the containment cams 4 and 5, at one feed is arranged a casting-off cam 6 with a descending portion 7 which engages with the heels of the sliders which have taken the matching needles to capture the thread to the feed to cause the descent of the same so as to form new loops of knitting. Downwardly with respect to the casting-off cam is arranged a countercam 9 for delimiting the track followed by the heels.

The heels 8 of the sliders 20, the needles 21 of which must not capture the knitting at the feed being considered, are kept in a track termed "floating" and delimited by the cams 4 and 5. As is clearly seen in Fig. 1, the heels 8 after the cam 3 have the possibility of raising and collide with the lower portion of the descending section 7 of the casting-off cam 6.

This does not occur if a cam assembly according to the invention is employed, which is illustrated in Figs. 2 and 3 and is indicated by the reference numeral 10, wherein is provided, upstream of the casting-off cam 6 according to the direction of rotation of the cylinders 11 and 12, an auxiliary descending cam 13 having a descending portion or tract 13a which is engageable with a needle controlling element, composed, in the case shown, of the heels of the sliders 20 which are accommodated in the floating track, so

as to cause a slight lowering of the same to carry them below the lower end of the casting-off cam 6. Naturally this fact does not entail variations regarding the other cams, which are left substantially as those illustrated in Fig. 1 and are therefore indicated by the same reference numerals.

Advantageously, the auxiliary descending cam 13 is provided with a descending portion 13a with tangents in the various points having inclinations, with respect to a horizontal plane, or to a plane perpendicular to the axis of the cylinders, which are smaller than the tangents of the points of the descending portion 7 of the casting-off cam 6.

This fact significantly reduces the impact of the heels of the sliders against the profile of the auxiliary descending cam and rules out any damage to the heels and to the needle carried by the sliders.

The auxiliary descending cam 13, the casting-off cam 6 and the countercam 9 are mounted on a single cam-holder block, of a known kind, which is movable parallel to the axis of the cylinders to vary the density of the knitting.

Furthermore, the portion 13b of the auxiliary descending cam 13 which faces the descending portion 7 of the casting-off cam 6 is advantageously provided with a profile which acts as a countercam for the heels of the sliders which have carried the needles to capture the thread at the feed being considered.

In this manner, a very rapid damping is achieved of the vibrations to which these sliders are subject as a consequence of the contact with the casting-off cam.

The arrangement of the auxiliary descending cam is performed so that the descending portion 13a is upstream of

the cam 14 which in the upper cylinder causes the unloading of the knitting formed by the purl-working needles 15; in this manner, since the knitting is tensioned by the slight lowering of the sliders in the lower cylinder, this unloading operation is made easier.

For the sake of descriptive completeness, Fig. 3 also illustrates the plate 16 for keeping in an open position the tabs of the needles which are to take knitting at the feed being considered.

After what has been described, the operation of the cam assembly according to the invention is evident.

The heels 8 of the sliders 20, which control the needles 21 which must not form knitting at the feed being considered, are in the floating track between the cams 4 and 5. By virtue of the elasticity of the knitting formed previously, or of the processing performed by the needles 15 which operate in the upper cylinder, i.e. purl, there may occur a slight raising of the sliders 20. As processing continues, the heels 8 of the sliders 20 make contact with the auxiliary descending cam 13 and are lowered below the lower end of the casting-off cam 6 and therefore the impact of these heels with the cam 6 is avoided.

In practice, it has been observed that the cam assembly according to the invention fully achieves the intended aim, since the impact is avoided between the heels of the sliders of the needles which do not operate at a machine feed and the descending portion of the corresponding casting-off cam. thus allowing to achieve greater operating speeds.

Greater speeds, with respect to the prior art, are furthermore achieved also by virtue of the damping of the

vibration of the sliders as described above and of the simplifying of the unloading of the knitting formed by the purl needles.

The cam assembly according to the present invention has been described exclusively with reference to a twin-cylinder machine for stockings, wherein the problems described in the introduction of this description are most severely felt, but it is understood that a cam assembly provided according to the above described inventive concept, with the necessary variations for adapting, can be successfully provided also for single-cylinder machines, with large or small diameters, to overcome similar problems.

Naturally, in this case the control element for the needles, which engages with the auxiliary descending cam, will be composed of the heel itself of the various needles.

Similarly, in twin-cylinder machines it is possible to provide in the skirt of the cams of the upper cylinder a cam similar to the auxiliary descending cam 13; in this case, there would be an auxiliary ascending cam arranged upstream of the cam 14 which corresponds to the casting-off cam 6.

Furthermore, in those feeds wherein the needles capture the thread in the alternating motion during the forming of the heel and of the point of the stocking, it is possible to provide two auxiliary descending cams substantially like the one described, arranged upstream, with reference to the two directions of rotation, of the respective casting-off cams.

The cam assembly thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept; furthermore, all the details can be replaced by technically equivalent

elements. In practice, the materials employed, as well as the dimensions, may be any according to the requirements and to the state of the art.

## CLAIMS

1. A cam assembly for controlling the needles in a circular knitting machine and the like, comprising at least a casting-off cam (6) at a feed of the machine, characterized in that it comprises, upstream of said casting-off cam (6) according to the direction of rotation of the machine, an auxiliary descending cam (13) having a descending portion (13a), engageable with a control element (8) for the needles which do not operate at said feed, to carry said control element (8) substantially below the lower end of the descending portion (7) of said casting-off cam (6).

2. A cam assembly according to claim 1, characterized in that said descending portion (13a) of said auxiliary descending cam (13) has a profile with tangents in the various points which have an inclination, with respect to a horizontal plane, substantially smaller than the respective tangents of the various points of the descending portion (7) of said casting-off cam (6).

3. A cam assembly according to claim 1, characterized in that said auxiliary descending cam (13) is rigidly associated, in motion, parallel to the axis of the needle-bearing cylinder, with said casting-off cam (6) for varying the density of the knitting.

4. A cam assembly according to claim 1, characterized in that said descending portion (13a) of said auxiliary descending cam (13), in a twin-cylinder circular machine, is arranged in the skirt of the cams (10) of the lower cylinder (11) substantially upstream of a knitting-unloading cam (14)

accommodated in the skirt of the cams of the upper cylinder (12) for tensioning the knitting during the unloading of the knitting formed by the needles (15) operating in the upper cylinder (12).

5. A cam assembly according to claim 1, characterized in that said auxiliary descending cam (13) has, on its portion facing said casting-off cam (6), a profile (13b) which is engageable with the control element (8) of the needles operating at said feed.

0224755

Fig. 1

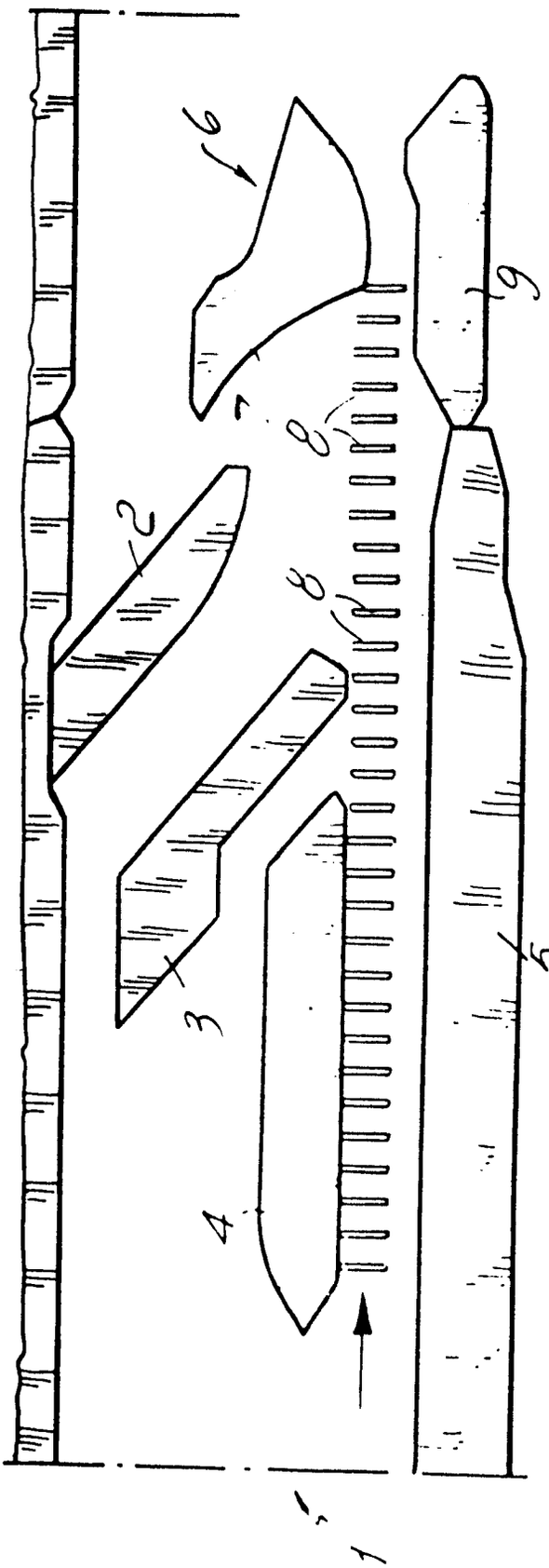
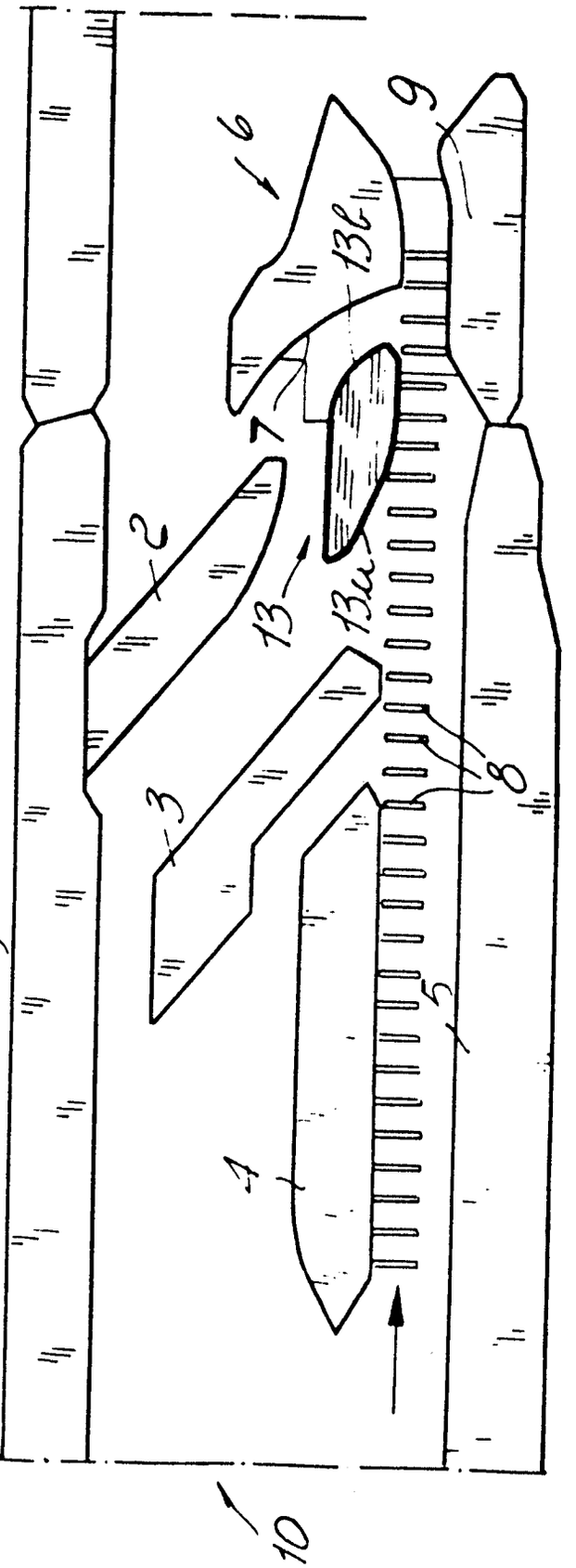



Fig. 2



0224765

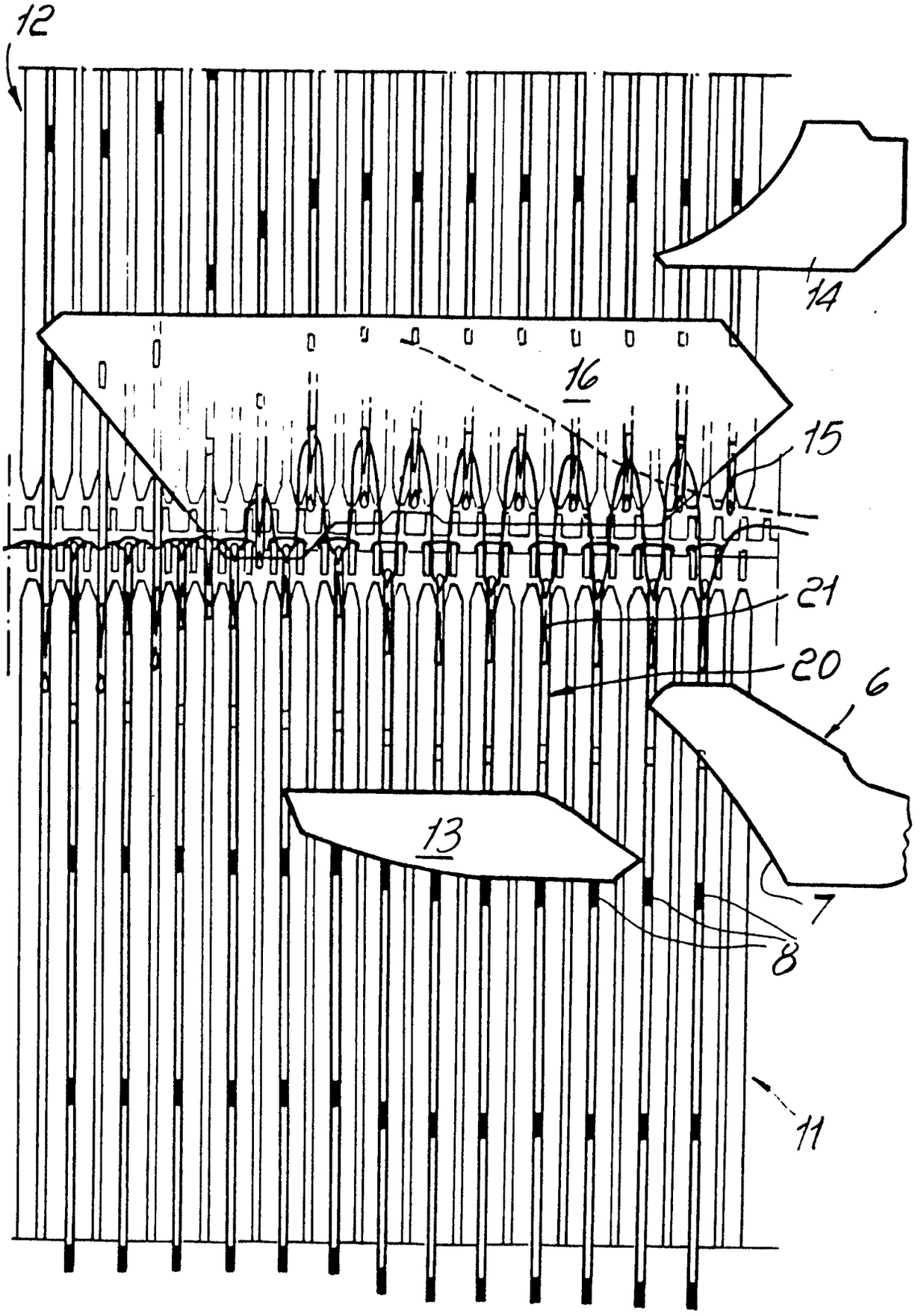



Fig. 3