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

(11) **EP 2 393 969 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
02.09.2015 Bulletin 2015/36

(21) Application number: **10706769.6**

(22) Date of filing: **19.01.2010**

(51) Int Cl.:
D04B 9/06 *(2006.01)* ***D04B 15/06*** *(2006.01)*

(86) International application number:
PCT/IT2010/000012

(87) International publication number:
WO 2010/089786 (12.08.2010 Gazette 2010/32)

(54) CIRCULAR KNITTING MACHINE FOR HOSIERY

RUNDSTRICKMASCHINE FÜR STRUMPFWAREN

MACHINE À TRICOTER CIRCULAIRE POUR BONNETERIE

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR

(30) Priority: **04.02.2009 IT BS20090017**

(43) Date of publication of application:
14.12.2011 Bulletin 2011/50

(73) Proprietor: **Busi Giovanni S.r.l.**
25082 Botticino Sera (Brescia) (IT)

(72) Inventor: **BUSI, Gianmario**
I-25082 Botticino Sera (Brescia) (IT)

(74) Representative: **Mitola, Marco et al**
Jacobacci & Partners S.p.A.
Piazza della Vittoria, 11
25122 Brescia (IT)

(56) References cited:
EP-A- 0 683 257
DE-A1- 1 965 943
DE-T5-112005 003 287
GB-A- 2 140 829
US-A- 3 595 032
WO-A-2009/013773
DE-A1- 2 117 125
GB-A- 823 500
US-A- 1 829 094

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 2 393 969 B1

Description

Field of the Invention

[0001] This invention concerns, in general, the field of the circular knitting machine for hosiery and knitwear using the needles on the dial, and, in particular, relates to the disposition of the devices for the control of the formation of the stitches by the needles on the dial.

State of the technique

[0002] Some single cylinder circular machines for hosiery and/or knitwear comprise a rotating cylinder, that carries a plurality of needles which are arranged and vertically movable on its periphery, and a dial positioned above the cylinder, rotating with it and carrying in turn a series of operating members, which are arranged horizontally and movable in radial grooves provided in the body of the dial on directrixes passing between the vertical needles of the cylinder.

[0003] The operating members mounted on the dial are usually in the form of hooks or needles when stitches have to be carried out; or else they are usually in the form of sinkers for terry knitting.

[0004] However it has been found that in some knitting processes with needles on the dial, difficulties and drawbacks may arise when casting off the relative stitches, creating unacceptable defects in the resulting knitting. This, in particular, when the needles on the dial have to create stitches separately from the needles of the cylinder and more particularly when different yarns are used from those made of synthetic elastomeric fibre known as Lycra or also Elastane. Furthermore, document EP0683257A discloses a knitting machine according to the preamble of claim 1.

Objective and Summary of the Invention

[0005] This invention has been conceived to avoid these difficulties and drawbacks and correspondently it proposes to provide the dial needles of a hosiery and/or knitwear circular machine with auxiliary elements to facilitate the casting of the stitches from said needles independently from the type of thread being used from time to time and also, for example, to facilitate where required, the transfer of the stitches between the needles on the dial and those on the cylinder.

[0006] The objective of the invention is reached by associating each one of at least a part of the needles on the dial, with a sinker configured to interact with the hook of the respective needle during the formation and casting of each stitch, according to the features of claim 1.

[0007] The sinker may be placed alongside the respective needle, directly in the guide groove of the latter either on its left or right side. Or the sinker can be positioned separately from the respective needle, in a proper radial guide groove provided between the grooves of two consecutive needles.

[0008] In each case, then, each sinker is susceptible to oscillations in a vertical plane relatively to the associated needle between two initial and final extreme work positions and is provided with means for causing said oscillations, said means being provided to interact with cam tracks defined by the body of the dial and by a ring/cover located above the latter.

Brief Description of the Drawings

[0009] More details of the invention will however become more evident in the following description made in reference to the enclosed indicative and not limiting drawings, in which:

Fig. 1 shows a side view of a sinker;
Fig. 2 shows an enlarged detail of the head of the sinker, circled in Fig. 1;
Fig. 3 shows a side view of a needle of the dial;
Fig. 4 shows an first arrangement of the paired needles and sinkers on the body of the dial;
Fig. 5 shows a second arrangement of the needles and sinkers on the body of the dial;
Fig. 6 shows an inner side view of the ring/cover of the dial provided with guide and control tracks for the sinkers;
Fig. 7 shows a sinker, and its oscillating movements, located between body and ring/cover of the dial;
Figs. 8, 9 and 10 show as many views in cross-section respectively according to arrows "A", "B" and "C" of the whole of the dial with needles and sinkers;
Figs. from 11 to 17 show a sequence of positions of a sinker with respect to a relative needle during the construction and casting of each stitch (the needle being reproduced frontally and overlapping the relative sinker); and
Fig. 14a shows an enlarged part of Fig. 14.

Detailed Description of the Invention

[0010] As shown, the dial for a monocylinder circular machine for hosiery and knitwear is indicated basically by number 11. Said dial 11 carries a plurality of needles 12 and a plurality of casting-off sinkers 13, each disposed radially and horizontally and which can be equal or different in number, for example equal to half, with respect to the vertical needles on the machine cylinder and alternating with them.

[0011] The dial 11 is composed of a dial body 14 mounted and controlled, besides in a known way, to turn on a vertical axis 15 and an overlooking ring or cover 16, stationary compared to said dial body. The dial body 14 is provided with a plurality of radial grooves 17 each of which designed to receive and guide a needle 12, having a needle head 12' facing towards the periphery of the dial and comprising a hook 18 and a latch 19 for opening and closing the hook (Fig. 3). The needles 12 on the dial

are susceptible to radial operating movements between two advanced and retracted extreme positions in which its head 12' is protruding and respectively retracted with respect to the periphery of the dial body. To cause these movements, each needle 12 is provided with a needle heel 20 which is engaged and compelled to move in an appropriate cam track 21 (Figs. 6 - 8) provided on the internal face of the stationary ring or cover 16 of the dial.

[0012] A needle 12 corresponds to each sinker 13. It can be placed directly in the same guide groove 17 of the needle 12 which it is associated with and at the side of the latter, as shown in Fig. 4. As an alternative, the sinker 13 can be separated from the respective needle 12 and placed in this case in an additional radial groove 17' provided in the space between the guide grooves 17 for two consecutive needles 12 as shown in Fig. 5.

[0013] In the example shown, the sinkers 13 are not movable radially on the dial, but each of them is susceptible to oscillating movements, that is balancing, in a vertical plane. Moreover each sinker 13 has a sinker head 13' facing towards, and designed to interact with, the needle head 12' of the needle 12 it is paired with.

[0014] To prevent its radial movements, each sinker 13 has a foot 22 which is radially confined but, all the same moving vertically, in a slot or recess 23 on the bottom of the guide grooves 17 or 17' in which it is housed. For its operating oscillation movements, each sinker 13 has a an intermediate oscillating fulcrum 24 and at least one control sinker heel, or better two sinker heels near their opposite ends: a first sinker heel 25 at the sinker head 13' and a second sinker heel at the tail of the sinker itself (Fig. 1).

[0015] The oscillating fulcrum 24 can be on the lower edge of the sinker 13 and find support on the bottom of the guide grove17 or 17', whereas the control sinker heels 25, 26 can be on the upper edge of the sinker 13, facing upwards and made to follow correlated cam tracks 27, 28, respectively, provided on the internal face of the stationary ring or cover 16 on the dial body 14. In order to cause effectively the oscillating movements of the sinker, the cam tracks 27, 28 have opposite courses so as to apply a vertical thrust alternatively on the first and second control sinker heels without engaging the other. In other words, where the first cam track 27 has a depression 27', the second cam track 28 has a hump 28'; on the contrary where the first cam track has a hump 27" the second cam track has a depression 28" (Figs. 6-10). This is provided so as to lower and raise the sinker head13' in order to be able to conveniently position it near or away from the needle head 12'.

[0016] As regards to the head 13'of the sinker, on its lower side (Fig. 2) it can have a thread beater plane 29 and a thread retainer nose 30 whose functions will become evident in the description that follows. On an upper plane of the dial body, along its peripheral margin, where necessary, a lowering 14' to allow the oscillating movements of the head of the sinker can also be provided.

[0017] In Figs. 11-17 is illustrated, also with the indication of the respective arrows F, G, a sequence of the oscillating movements of a casting-off sinker 13, in particular of its head 13', in relation to a respective needle 12 on the dial during a formation cycle of each stitch 31 by a thread 32 fed by a thread guide 33.

[0018] In particular, in Fig. 11 the needle 12 is in a retracted position; its hook 18, that has picked up the thread 32 for the formation of a new stitch 31, is closed by the respective latch 19; the sinker head 13' is lowered towards the head 12' of the needle 12, with its beater mechanism 29 that rests on a previously formed stitch, while its retainer nose 30 engages and retains the thread 32 in order to prevent said thread from moving away from the needle head..

[0019] In Fig. 12 the needle 12 is partially advanced from the retracted position, whereas the sinker head 13' remains lowered practically as before so that its retainer nose 30 continues to retain the thread 32 in the same way.

[0020] In Fig. 13 the needle 12 is in an extreme advanced position, in which the needle latch 19 is opened by the new stitch 31 that passes towards the back of the needle12; the sinker head 13' remains lowered always retaining the thread 32 as before, until the new stitch 31 has fully moved over the needle latch 19 and dropped behind the latter, on the shaft of the needle; the hook 18 of the needle, now open, is in the condition to pick up a new length of thread 32 for the formation of a subsequent stitch 31'.

[0021] In Fig. 14, respectively 14a, the needle begins to retract towards the download position of the new stitch 31; the head 13' of the sinker is always lowered to hold the thread 32 with its sinker nose 30; following the retraction of the needle, the stitch previously cast on the shaft of the needle, causes the latch 19 to rotate towards the hook 18 of the needle 12; and the hook of the needle has picked up the new length of thread 32 for the formation of a subsequent stitch 31'.

[0022] In Fig. 15 the needle is retracted even further in a position in which the needle latch 19 closes the hook 18 of the needle; the new stitch 31 now has to pass over the closed latch 19, falling on a previous stitch; the hook of the needle picks up and drags with it the new length of thread, forming the next stitch 31'.

[0023] In Fig. 16 the needle continues to retract, completing the dropping of the new stitch 31 on the new length of thread 32 taken from the hook of the needle, while the head 13' of the sinker 13 rises upwards disengaging the thread 32.

[0024] In Fig. 17 the needle completes its retreating movement; the retainer nose 30 of the head of the sinker 13' is on such a level as to retain the stitch 31 just dropped in position so that it does not follow the new length of thread that is picked up by the hook of the needle for the formation of the subsequent stitch 31'.

[0025] At this stage the formation cycle of a stitch 31 using the needles on the dial is completed and the operating sequence of the sinker just described will then be repeated for each subsequent stitch.

Claims

1. Circular knitting machine for hosiery and/or knitwear, comprising a rotating cylinder having a plurality of needles disposed and vertically movable on its periphery, and a dial made up of a dial body subject to rotation together with said cylinder around a vertical axis and a stationary ring or cover above said dial body, and where the dial carries a series of needles placed in radial grooves provided in said dial body and moveable horizontally on directrixes passing between the vertical needles of the cylinder, wherein each of at least one part of the needles (12) on the dial is associated with a casting-off sinker (13) adapted to be controlled and to interact with said horizontal needle during the formation and slipping of each stitch, when the needles on the dial are working independently from the cylinder needles; wherein each casting-off sinker (13) is arranged to oscillate in a vertical plane relatively to its respective dial needle (12) between two initial and final extreme work positions, and wherein each casting-off sinker (13) has an oscillation fulcrum and at least a control sinker heel (25, 26) interacting with at least a cam track (27, 28) provided on a lower face of the stationary ring or cover of the dial to cause the casting-off sinker to oscillate, wherein each casting-off sinker (13) has two sinker heels each one conducted in a respective cam track (27, 28), said cam tracks having courses opposite from each other, with a first cam track (27) that has a depression (27') while a second cam track (28) has a hump (28') and, on the contrary, while the first cam track has a hump (27") the second cam track has a depression (28");
   said machine being **characterized in that** each casting-off sinker (13) has a sinker foot (22) which is inserted in a slot or recess (23) provided on the top face of the dial body to prevent the radial translation movements of the casting-off sinker.

2. Circular knitting machine for hosiery and/or knitwear according to claim 1, wherein each casting-off sinker (13) is placed directly in the guide groove (17) as the respective horizontal dial needle (12) and alongside the latter.

3. Circular knitting machine for hosiery and/or knitwear according to claim 1, wherein each casting-off sinker (13) is separated from the respective horizontal dial needle (12), placed in a proprer radial groove (17') provided in the space between the grooves for two consecutive needles.

4. Circular knitting machine for hosiery and/or knitwear according to any of the previous claims, wherein each casting-off sinker (13) has a sinker head (13') facing towards a hook of the respective horizontal dial needle (12) and designed to engage with the thread hooked by said respective horizontal needle to form each time a stitch.

Patentansprüche

1. Rundstrickmaschine für Strumpfwaren und/oder Strickwaren, umfassend einen drehenden Zylinder, der eine Mehrzahl von Nadeln aufweist, die an seinem Umfang angeordnet und daran vertikal beweglich sind, und eine Scheibe, gebildet aus einem Scheibenkörper, der sich zusammen mit dem Zylinder um eine vertikale Achse dreht und einem stationären Ring oder einer Abdeckung oberhalb des Scheibenkörpers, und wobei die Scheibe eine Reihe von Nadeln trägt, angeordnet in radialen Nuten, die in dem Scheibenkörper vorgesehen sind, und horizontal auf Mantellinien, beweglich die zwischen den vertikalen Nadeln des Zylinders hindurchverlaufen, wobei jeweils wenigstens ein Teil der Nadeln (12) an der Scheibe einer Abnahmeplatine (13) zugeordnet sind, die ausgebildet ist gesteuert zu werden und mit horizontalen Nadeln während der Bildung und Abnahme jeder Masche zusammenwirkt, wenn die Nadeln an der Scheibe unabhängig von den Zylindernadeln arbeiten; wobei jede Abnahmeplatine (13) eingerichtet ist, in einer vertikalen Ebene bezüglich der jeweiligen zugehörigen Scheibennadel (12) zwischen zwei Arbeitspositionen, einer Anfangs- und einer Endposition zu pendeln, und wobei jede Abnahmeplatine (13) einen Pendeldrehpunkt und wenigstens einen Steuerplatinensporn (25, 26) aufweist, der mit wenigstens einer Steuerkurve (27, 28) zusammenwirkt, die an einer unteren Fläche des stationären Rings oder der Abdeckung der Scheibe vorgesehen ist, um die Abnahmeplatine pendeln zu lassen, wobei jede Abnahmeplatine (13) zwei Platinensporne aufweist, die jeweils in einer jeweiligen Steuerkurve (27, 28) geführt sind, wobei die Steuerkurven gegensätzliche Verläufe aufweisen, mit einer ersten Steuerkurve (27), die eine Vertiefung (27') aufweist, während eine zweite Steuerkurve (28) eine Aufwölbung (28') aufweist und umgekehrt, wenn die erste Steuerkurve eine Aufwölbung (27") aufweist, die zweite Steuerkurve eine Vertiefung (28") aufweist;
   wobei die Maschine **dadurch gekennzeichnet ist, dass** jede Abnahmeplatine (13) einen Platinenfuß (22) aufweist, der in einen Schlitz oder eine Vertiefung (23) eingeführt ist, welche an der oberen Fläche des Scheibenkörpers vorgesehen ist, um radiale Translationsbewegungen der Abnahmeplatine zu verhindern.

2. Rundstrickmaschine für Strumpfwaren und/oder Strickwaren gemäß Anspruch 1, wobei jede Abnahmeplatine (13) genau so wie die jeweilige horizontale Scheibennadel (12) unmittelbar benachbart zu die-

ser in der Führungsnut (17) angeordnet ist.

3. Rundstrickmaschine für Strumpfwaren und/oder Strickwaren gemäß Anspruch 1, wobei jede Abnahmeplatine (13) von der zugehörigen horizontalen Scheibennadel (12) getrennt ist, die in einer geeigneten Radialnut (17') angeordnet ist, die in dem Freiraum zwischen den Nuten für zwei aufeinander folgende Nadeln vorgesehen ist.

4. Rundstrickmaschine für Strumpfwaren und/oder Strickwaren gemäß irgend einem der vorangehenden Ansprüche, wobei jede Abnahmeplatine (13) einen Platinenkopf (13') aufweist, der einem Haken der zugehörigen horizontalen Scheibennadel (12) zugewandt ist und ausgebildet ist, um mit dem Faden, der durch die jeweilige horizontale Nadel gefangen ist, in Eingriff zu gelangen, so dass jedes Mal eine Masche gebildet wird.

Revendications

1. Machine à tricoter circulaire pour bonneterie et/ou tricot comprenant un cylindre rotatif ayant une pluralité d'aiguilles disposées et mobiles verticalement sur sa périphérie, et un cadran constitué d'un corps de cadran soumis à une rotation en conjugaison avec ledit cylindre autour d'un axe vertical et d'un anneau ou cache fixe au-dessus dudit corps de cadran, le cadran portant une série d'aiguilles placées dans des gorges radiales disposées dans ledit corps de cadran et mobiles horizontalement sur des directrices passant entre les aiguilles verticales du cylindre, dans laquelle chacune d'au moins une partie des aiguilles (12) sur le cadran est associée à une platine de rabattement (13) conçue pour être commandée et pour interagir avec ladite aiguille horizontale lors de la formation et du glissement de chaque maille, lorsque les aiguilles sur le cadran travaillent indépendamment des aiguilles du cylindre ;
dans laquelle chaque platine de rabattement (13) est agencée pour osciller dans un plan vertical par rapport à son aiguille de cadran respective (12) entre deux positions de travail extrêmes initiale et finale, et dans laquelle chaque platine de rabattement (13) présente un pivot d'oscillation et au moins un talon de platine de commande (25, 26) interagissant avec au moins un chemin de came (27, 28) prévu sur une face inférieure de l'anneau ou du cache fixe du cadran pour amener la platine de rabattement à osciller, dans laquelle chaque platine de rabattement (13) possède deux talons de platine, chacun étant conduit dans un chemin de came respectif (27, 28), lesdits chemins de came ayant des trajets opposés l'un à l'autre, avec un premier chemin de came (27) qui présente une dépression (27') alors qu'un second chemin de came (28) présente une bosse (28') et ; au contraire, alors que le premier chemin de came présente une bosse (27"), le second chemin de came présente une dépression (28") ;
ladite machine étant **caractérisée en ce que** chaque platine de rabattement (13) possède un pied de platine (22) qui est inséré dans une fente ou un creux (23) prévu (e) sur la face supérieure du corps de cadran pour empêcher les mouvements de translation radiaux de la platine de rabattement.

2. Machine à tricoter circulaire pour bonneterie et/ou tricot selon la revendication 1, dans laquelle chaque platine de rabattement (13) est placée directement dans la gorge de guidage (17) comme l'aiguille de cadran horizontale respective (12) et le long de cette dernière.

3. Machine à tricoter circulaire pour bonneterie et/ou tricot selon la revendication 1, dans laquelle chaque platine de rabattement (13) est séparée de l'aiguille de cadran horizontale respective (12), placée dans une gorge radiale propre (17') prévue dans l'espace entre les gorges pour deux aiguilles consécutives.

4. Machine à tricoter circulaire pour bonneterie et/ou tricot selon l'une quelconque des revendications précédentes, dans laquelle chaque platine de rabattement (13) possède une tête de platine (13') faisant face à un crochet de l'aiguille de cadran horizontale respective (12) et conçue pour se mettre en prise avec le fil accroché par ladite aiguille horizontale respective pour former chaque fois une maille.

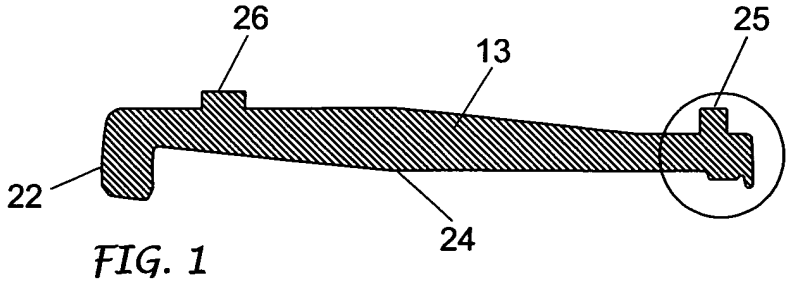


FIG. 1

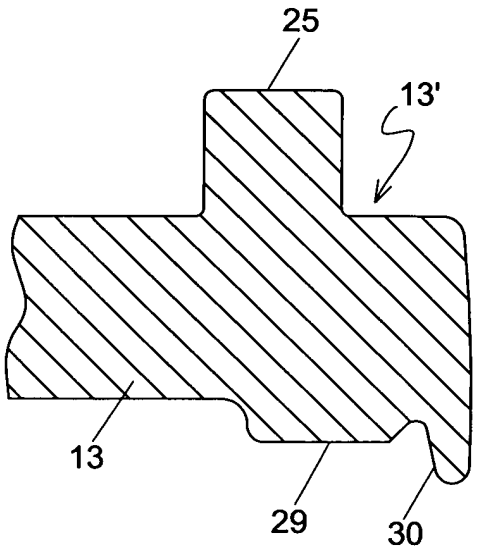


FIG. 2

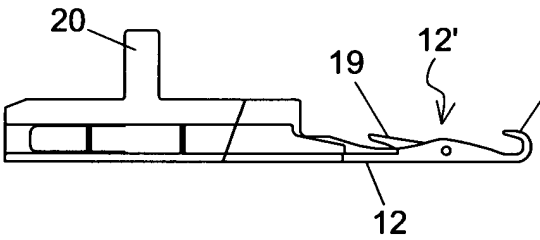


FIG. 3

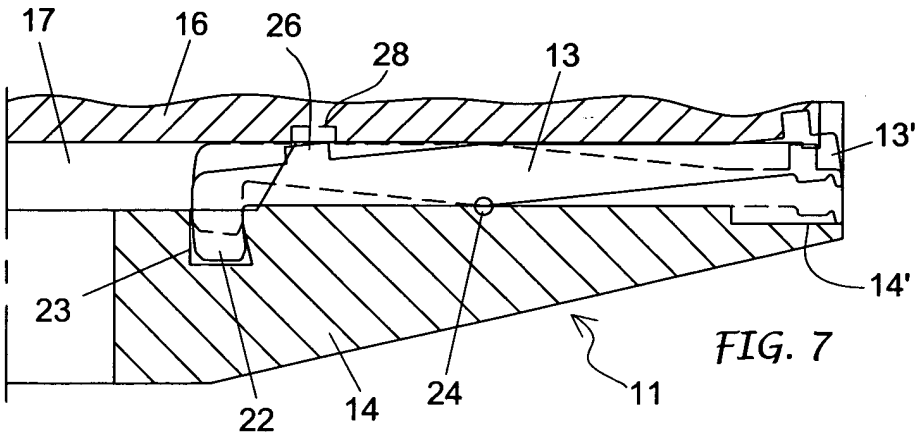


FIG. 7

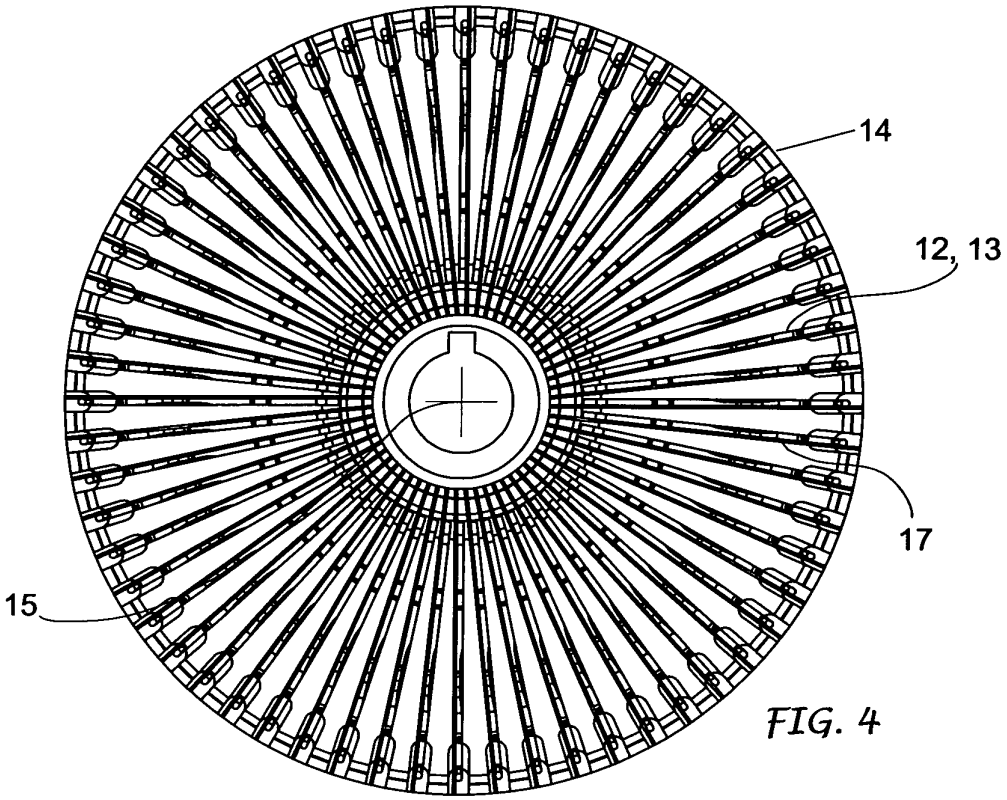


FIG. 4

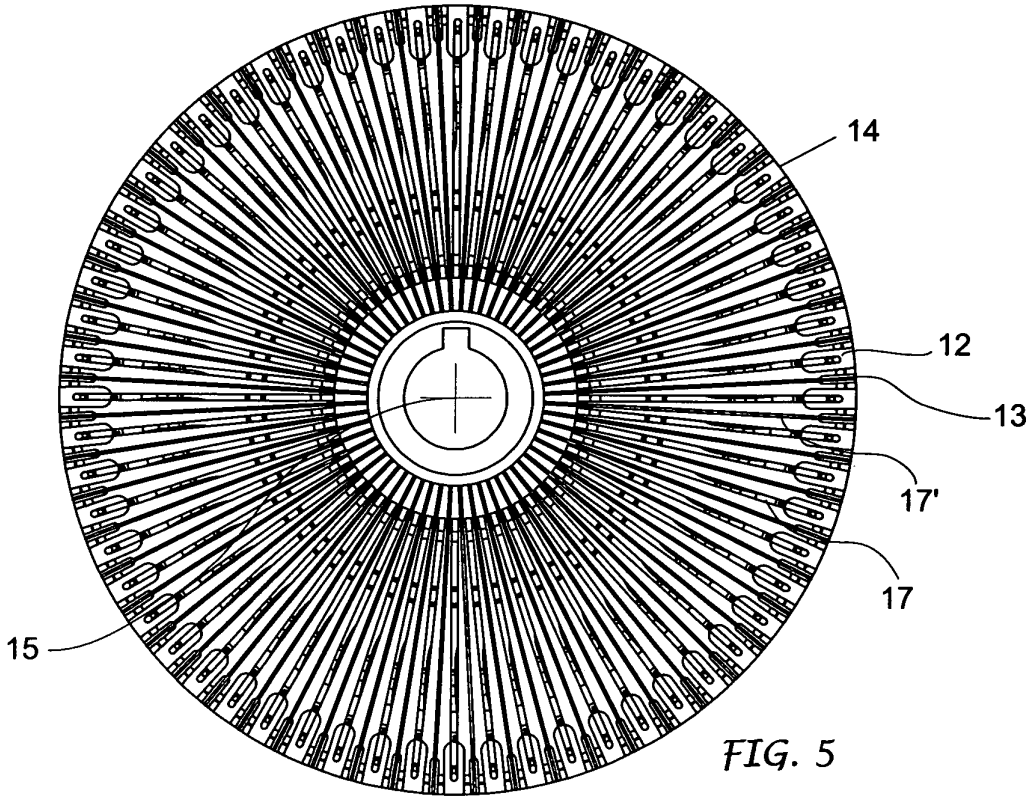


FIG. 5

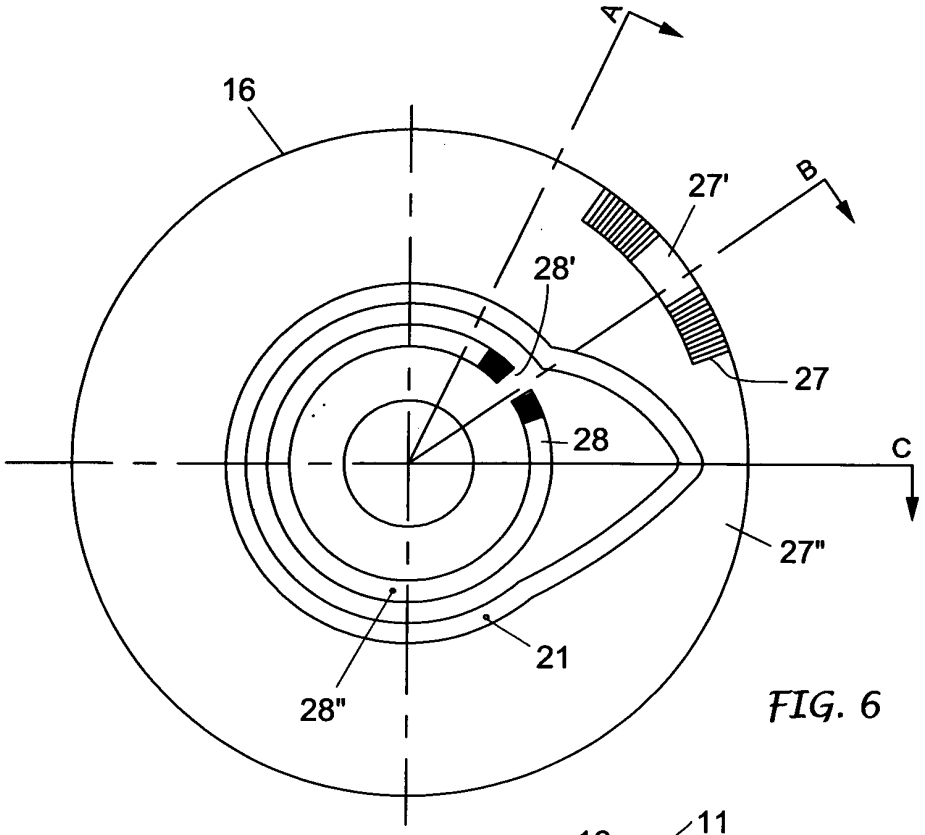


FIG. 6

FIG. 8

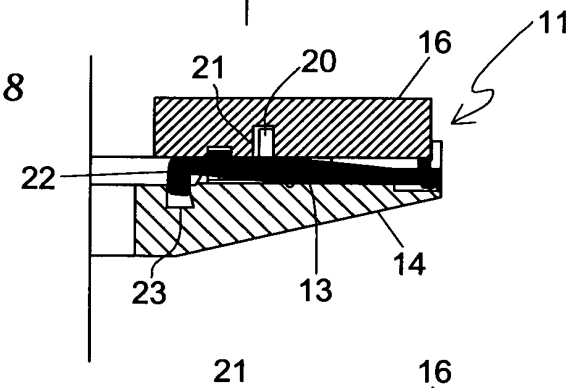


FIG. 9

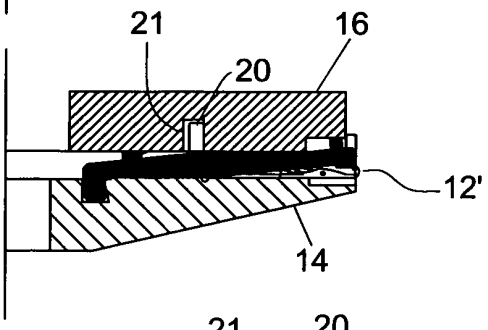
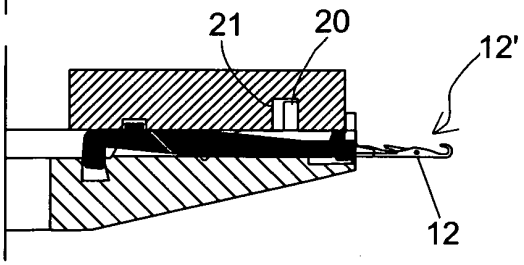


FIG. 10



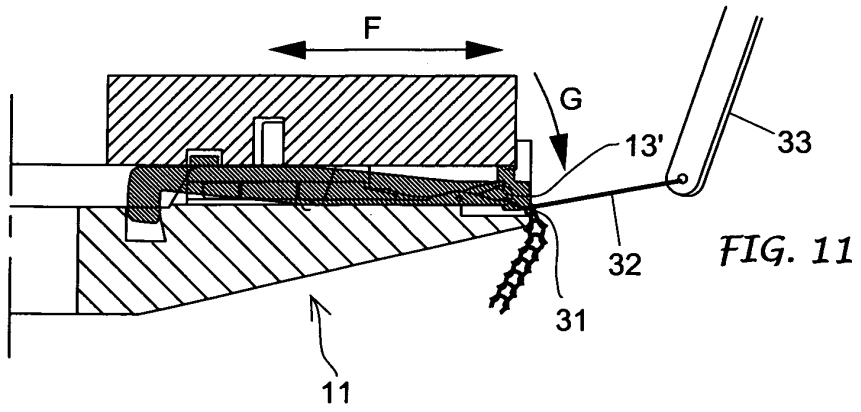


FIG. 11

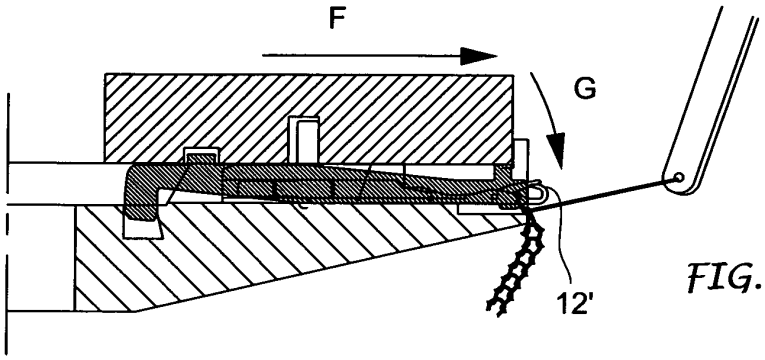


FIG. 12

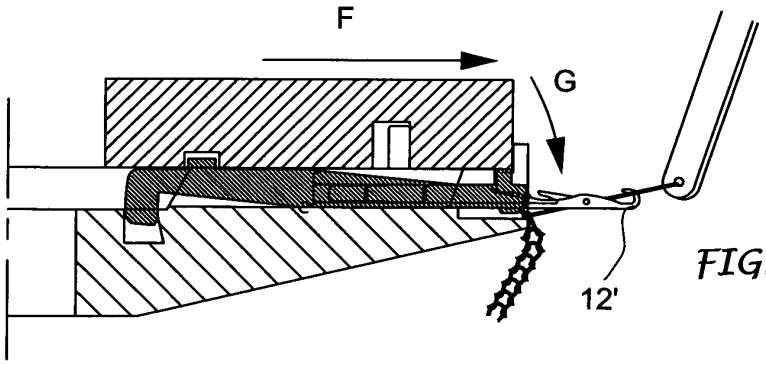


FIG. 13

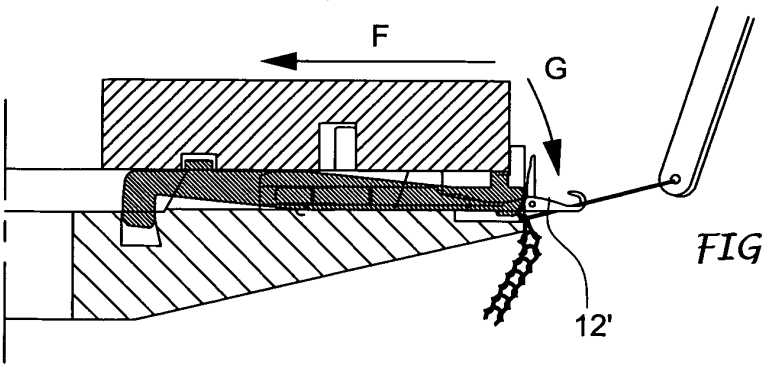


FIG. 14

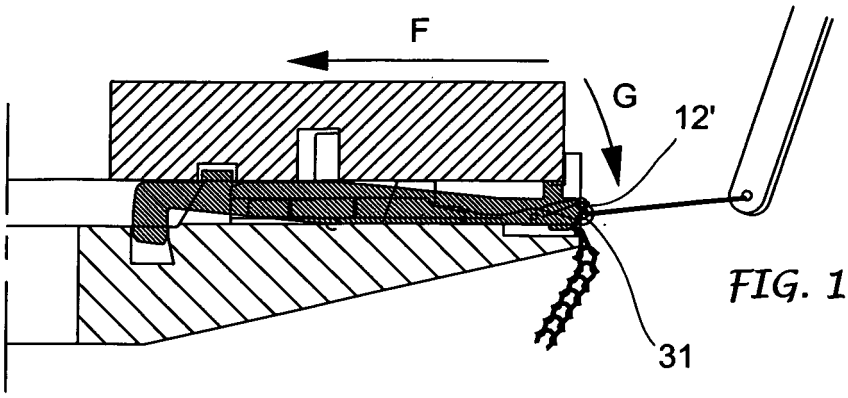


FIG. 15

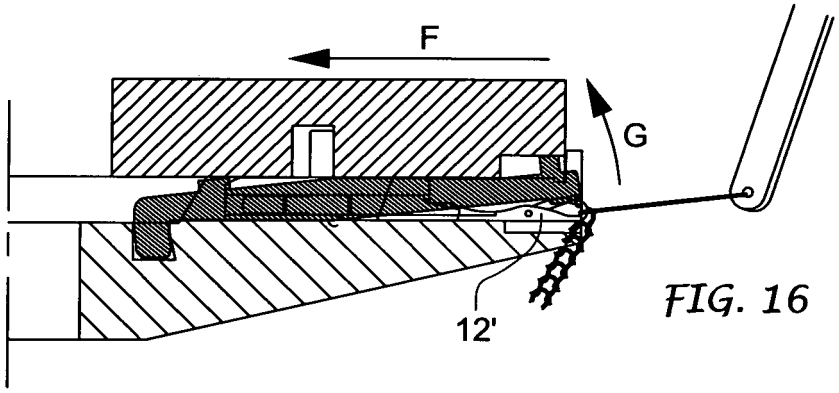


FIG. 16

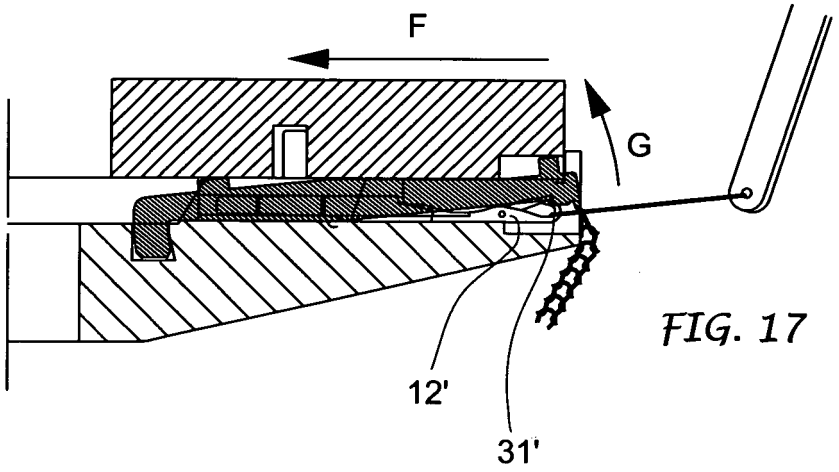


FIG. 17

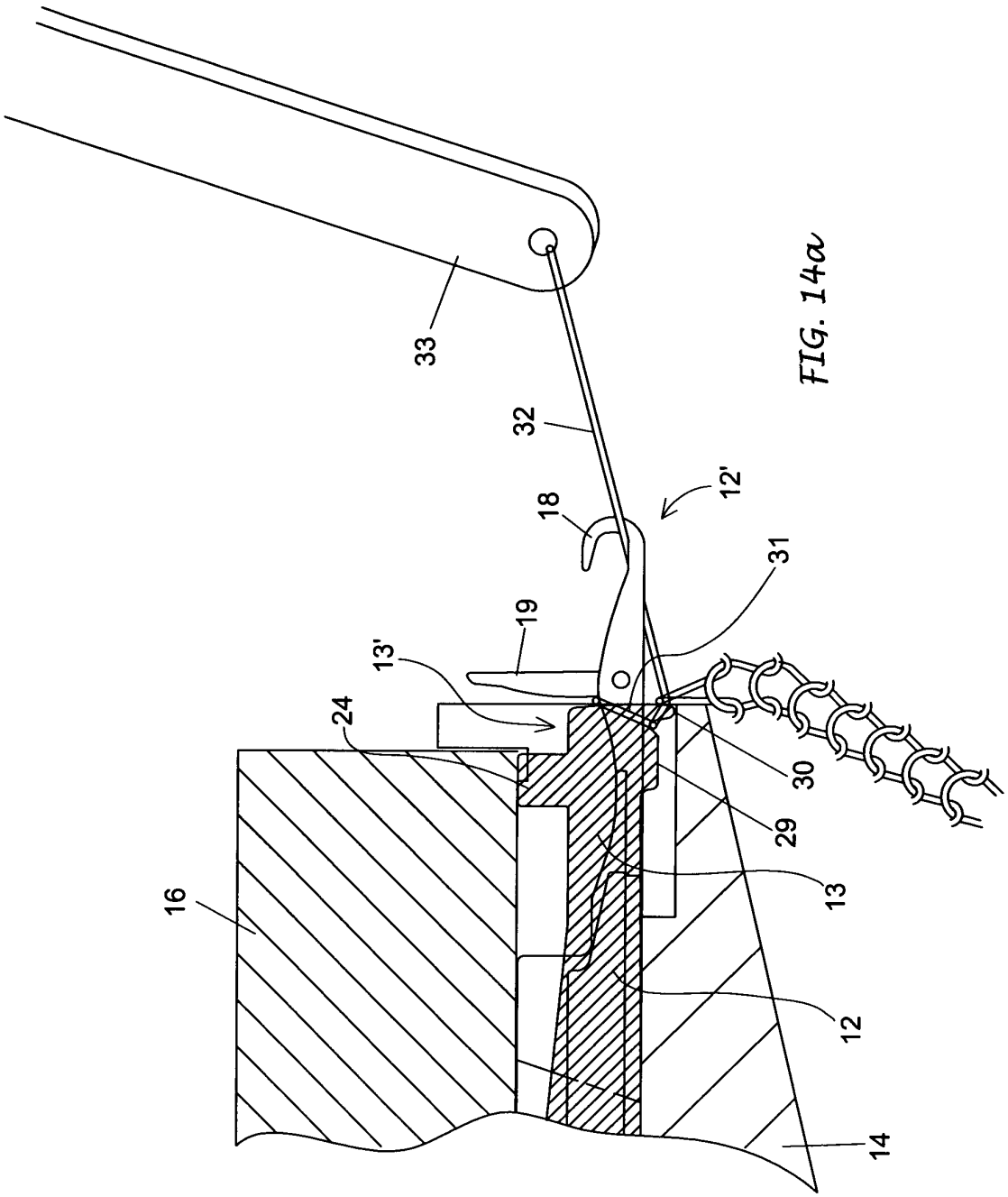


FIG. 14a

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0683257 A **[0004]**