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(54) **YARN BRAKE, PARTICULARLY FOR YARN FEEDERS OF LOOMS**

GARNBREMSE, INSBESONDERE FÜR FADENLIEFERVORRICHTUNGEN IN WEBMASCHINEN

FREIN DE FIL, EN PARTICULIER POUR DES FOURNISSEURS DE FILS DANS DES METIERS

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WO-A-94/12420 **WO-A-95/00431**

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Description

[0001] The present invention refers to a yarn brake particularly provided to be applied to yarn feeders for looms.

[0002] The invention relates more particularly to a yarn brake acting on the free end of a feeder storing drum having a rounded withdrawal rim and comprising a frustoconical braking body made of radially deformable material and having an inner, circumferentially continuous brake surface said braking body being supported in a stationary holding device and further comprising a spring assembly consisting at least of circumferentially distributed discrete spring tongues engaging into said holding device for centering and axially biasing said brake surface in relation to said holding device.

[0003] In a known yarn brake (WO 94/12420 - PCT/EP93/03262), a plurality of spring tongues integrated into the frustoconical braking body and continuing the generatrice of the frustocone commonly constitute a spring assembly of said yarn brake. The spring tongues protrude beyond the small diameter end region of the frustocone part of the braking body. The free ends of the spring tongues are loosely engaging to a recessed ring seat of a cup-shaped holding device. The spring tongues yieldably transfer the intentionally generated axial biasing loads from the holding device to the brake surface situated on a brake band inside the braking body such that the brake band is axially pressed against the rounded withdrawal rim of the storage drum of a feeder. A yarn stored in windings on the storage drum is withdrawn through the braking nip between the brake band and the withdrawal rim and simultaneously is rotating around the withdrawal rim. As the free ends of the spring tongues are loosely engaging in the holding device, the brake body is able to fulfil tilting motions in relation to the storage drum axis. Retaining pins of the holding device penetrate through slots between spring tongues or within several spring tongues in order to prevent that the braking body falls off. As the spring tongues are straight, the integrated spring assembly of the braking body is axially relatively stiff. A fine adjustment of the axial biasing force for the brake band is complicated. Moreover, the tilting resistance of the braking body in operation and in its holding device is relatively high and hinders proper selfcentering. The straight spring tongues and their friction loaded support in the holding device obstructs in operation of the yarn feeder a rotational adaptation of the brake band on the withdrawal rim of the storage drum. This might cause additional stress for the yarn and/or wear at the brake band.

[0004] In a similar yarn brake (EP-B1-0668841), the spring tongues integrated into the braking body extend essentially along the generatrices of the frustocone part. The interspaces between the spring tongues are narrow so that the brake body spring assembly is relatively stiff in axial direction. Said stiffness might have negative influence on the necessary radial deformability of the

braking body in the region of the brake surface and might prevent a precise adjustment or variation of the axial biasing force.

[0005] It is a task for the invention to provide a structurally simple yarn brake as disclosed which is easy to manufacture and to mount and allows a precise adjustment and variation of the axial biasing force for the brake surface, and which is relatively soft in axial, lateral and rotational directions.

[0006] This task is achieved with a yarn brake to be applied, for example, to the storing drum of a yarn feeder, having a rounded withdrawal rim of the type already described in the first part of the description. Such a brake is characterised in that the braking body is supported by a group of concentrically arranged bending springs, each being defined by one of said spring tongues bent outwardly from the generatrice of the frustocone part of the braking body.

[0007] A concentric group of bending springs which extend outwardly in relation to the generatrice of the frustocone part constitutes a spring assembly which is soft in axial, lateral and rotational (torsion) directions. The axial softness allows to precisely adjust and vary the axial biasing force for the brake surface, because the bending springs show relatively constant spring characteristics over a wide adjustment range. The lateral softness allows a proper selfcentering of the brake surface on the withdrawal rim of the storage drum. The rotational softness allows the brake surface to follow the friction drag of the rotating yarn over a certain stroke. If necessary, e.g. when a withdrawal cycle starts. This reduces mechanical stress for the yarn. Furthermore, the brake surface is able to easily follow unavoidable rotational vibrations of the storage drum during operation of the yarn feeder without any significant influence on the braking effect between the brake surface and the withdrawal rim. The brake surface either is formed by the inner wall of the braking body itself or by a brake band of wear-resistant material secured to the inner wall of the braking body.

[0008] If, as in claim 2, the bending springs are bent outwardly continuously and in a rounded manner, they are defining a desirably soft spring assembly integrated into the braking body and allow to use a desirably big support diameter for the braking body. As said bending springs transmit the axial biasing load dominantly by their bending elasticity and spring characteristics, they do not significantly stiffen the frustocone part of the braking body which remains extremely radially flexible. Bending springs allow a perfect selfcentering of the braking body on the storage drum. As a consequence of the curved configuration of the bending springs, the soft spring characteristics of the spring assembly can be predetermined easily for optimum operation of the yarn brake. A wide adjustment range can be used for precisely changing the axial biasing load with high resolution.

[0009] According to claim 3, the bending springs are

roundly overbent beyond a radial direction. This leads to enhanced softness of the spring assembly and allows to use in each bending spring a big spring length for force-transmission.

[0010] According to claims 4 or 5, the bending springs either continue the small diameter end region or the big diameter end region of the frustocone of the braking body. In the first case, the bending springs are pushing the brake surface onto the withdrawal rim of the storage drum, i.e. counter to the withdrawal direction of the yarn. In the second case, the bending springs are pulling the brake surface against the withdrawal rim.

[0011] Constant or varying thickness and/or width of each bending spring allows to precisely predetermine the spring characteristics of each bending springs and the entire spring assembly, in order to reach lateral and rotational softness and - if desired - a somewhat higher stiffness in axial direction in order to transmit even high axial biasing loads.

[0012] According to claim 7, the desired softness of the spring assembly can be achieved easily.

[0013] The embodiment according to claim 8 is easy to manufacture and to mount when starting from a plane blank for the braking body. Precise configurations of the bending springs can be formed e.g. by laser cutting methods.

[0014] According to claim 9, the connection of the bending springs with the holding device or a holding ring element can easily be made. This might be advantageous also for easy assembling the yarn brake.

[0015] According to claim 10, the braking body with the brake surface, the bending springs and the common ring element, can be prefabricated as a single structural unit which is easy to be removed or replaced. Firmly securing the bending springs results in a versatile and reliable structural unit. Loosely and positively connecting the bending springs to the common ring element or socket leads to an enhanced degree of freedom of relative movements between the braking body and the holder or ring element.

[0016] According to claim 11, the ends of the bending springs are firmly secured, e.g. by embedding, to a ring element which can easily be inserted in the holding device and positions the free ends of the bending springs in preloaded condition when storing, transporting or mounting the yarn brake units in the holding device of a yarn feeder. Moreover, the ring element is constituting a protector for the vulnerable ends of the bending springs. According to claim 12, the braking body can be made light weighted and extremely flexible in radial direction in the region of the brake band. A plastic frustocone assures high radial flexibility as it is necessary for a proper function of the yarn brake in operation and as well can serve as the carrier for the brake surface. The brake surface can be provided on a brake band either glued to the plastic frustocone or secured in cut-out or preformed pockets of the plastic frustocone, so that the brake band cannot fall out not even as long as the yarn

brake is not installed at a yarn feeder.

[0017] According to claim 13, the interspaces between the bending springs are covered from outside. This avoids dangerous edges along the yarn path through the yarn brake. Furthermore, said ring element can dampen vibrations and prevents lint collection.

[0018] According to claim 14, said ring element is constituting an additional component of the spring assembly of the yarn brake, either in order to assist the bending springs or to dampen their spring behaviour.

[0019] According to claim 15, the brake surface is constituted by a circumferentially continuous brake band of frustoconical shape, e.g. of copper-beryllium or another wear-resistant and flexible metal.

[0020] Preferred embodiments of the yarn brake of the invention will be described in the following, with reference to the enclosed drawings, in which:

Fig. 1 is a side view of a yarn feeder storage drum equipped with a yarn brake, partially in sectional view.

Fig. 2 is an essential portion of the yarn brake in enlarged scale, and

Figs. 3 to 8 are different embodiments in views similar to the view of Fig. 2 of an assembly detail of the brake.

[0021] In Fig. 1, a storage drum D of a yarn feeder (not shown) is defined an essentially cylindrical storage surface 3 for a yarn store (not shown) consisting of several yarn windings of a yarn Y which is withdrawn from storage drum D via its front end 4 and over a convexly rounded, circumferentially continuous withdrawal rim 5 and further downstream through an axially situated eyelet 15 mounted in a stationary carrier 16.

[0022] During withdrawal of yarn Y, the yarn is rotating around withdrawal rim 5 and is braked by yarn brake B installed in the region of front end 4 of yarn storage drum D. Storage drum D is a so-called stationary drum held stationary on a rotating winding arm shaft of the yarn feeder (not shown) e.g. by means of cooperating magnets. In operation of the yarn feeder, storage drum D might carry out small rotational vibrations (double arrow 19) about its axis X.

[0023] Yarn brake B as shown in Fig. 1 can be a structural unit which is inserted in a carrier (not shown) of the housing of the yarn feeder so that said carrier with the yarn brake unit can be shifted parallel to axis X back and forth for adjusting or varying the braking effect of yarn brake B or the axial biasing force L with which the yarn brake B resiliently is pressed against withdrawal rim 5.

[0024] Yarn brake B comprises an essentially frustoconical braking body 1 serving as a carrier for an inner, circumferentially continuous brake surface 2 of frustoconical format contacting withdrawal rim 5 of storage drum D on a smaller diameter than the outer diameter of storing surface 3 (Figs. 1 and 2). Brake surface 2 can be constituted by a brake band 2 made of Beryllium-copper

or another material with high wearing resistance and can have a radial thickness of 0.05 mm or more. Said brake band can be glued or otherwise fixed at the inner side of braking body 1. It is alternatively possible to insert the brake band in pockets of braking body 1 (not shown). As soon as braking body 1 is made of wear-resistant material like inox-steel, brake surface 2 can be the inner wall of braking body 1 itself.

[0025] Braking body 1 is supported in a holding device 11 via a spring assembly S. In the embodiment shown, spring assembly S is defined by a concentrically arranged group of banding springs C, each formed by a spring tongue T unitarily connected to the frustoconical part of braking body 1 at its small diameter end region. Preferably, spring tongues T are formed e.g. by cutting out interspaces 6 between the circumferentially separated discrete spring tongues T. The generatrice G of the frustocone part of braking body 1 is shown in dotted lines in Fig. 1. Each bending spring C can be situated in a radial plane of axis X and is continuously bent outwardly in a rounded manner and away from the generatrice G of the frustocone part of braking body 1. In the embodiment shown in Fig. 1, each bending spring C is overbent beyond a radial plane in rounded manner, i.e. is roundly bent backwards so that the end 7 of each bending spring C is extending approximately parallel to the generatrice G. The bending springs C are regularly distributed in circumferential direction. Their ends 7 are either firmly or loosely secured in holding device H. In the embodiment shown, holding device H is formed with an obliquely formed rear groove 9 into which a ring insert 8 is pressed by fixing elements 14 for clamping or loosely catching ends 7 of the bending springs C.

[0026] Holding device H is provided with a cylindrical extension 10 directed towards storing drum D and terminating with an outwardly projecting flange 11 closely circumscribing the big diameter end region of braking body 1 in order to prevent yarn to hang over the outer circumference of braking body 1. In order to prevent lint collection inside holding device H, exit openings 13 can be provided e.g. in the extension 10.

[0027] In a circular cavity defined by the outer surfaces of bending springs C, a ring element R can be inserted. Ring element R either at least partially is covering the interspaces 6 between the bending springs C in order to avoid sharp edges for the yarn or to avoid the entrance of lint or even to dampen the spring behaviour of spring assembly S. As shown in dotted lines, ring element R, e.g. an inflatable ring tube or a rubber- or foamed plastic ring is inserted in the concave cavity defined by the bending springs C. It can serve as an additional spring component for spring assembly S or to dampen or control the spring behaviour of spring assembly S.

[0028] Bending spring C are defining a spring assembly S with remarkable lateral and rotational or torsional softness and a relatively constant axial spring characteristics over a wide axial adjustment range. Due to the

rotational softness, brake band 2 as well as braking body 1 is able to follow (double arrow 19') rotational vibrations of storage drum D or to somewhat follow the friction drag of the rotating yarn Y when a new withdrawal cycle is starting. Furthermore, spring assembly S is soft in lateral direction. This allows perfect selfcentering of braking body 1 or braking band 2 on withdrawal rim 5 of the storage drum D (double arrow 18).

[0029] In Fig. 2, braking body 1 is made of two components, namely a light weighted frustocone 20, e.g. plastic material, and sheet metal frustocone 21 with its unitarily integrated spring tongues T defining said outwardly bent bending springs C. Brake band 2 is connected to frustocone 20 and/or 21 so that its small diameter edge 22 is situated with axial distance from roots 23 of spring tongues T. However, braking body 1 can be made entirely from a sheet metal component 21, e.g. of inox-steel. The width and/or thickness of each spring tongue T can either be constant or varying. It is alternatively possible to connect e.g. separate spring wire-bending springs C to sheet metal frustocone 21 of braking body 1 instead. Frustocone 20 serves as a balloon limiter integrated into the yarn braking body 1.

[0030] In Fig. 3, bending springs C are firmly secured in a common ring element 24, e.g. of plastic material, so that their ends 7 are embedded therein. Ring element 24 can then be easily inserted in holding device H.

[0031] In Fig. 4, an anchoring element 25 is formed at free end 7 with the shape of outwardly bent hook. Said anchoring element 25 is inserted into a recess 26 of holding device H and is secured therein by clamping ring 27 held by fixing elements 14. It is possible to provide circumferential regularly distributed pockets between components 26 and 27 in order to position and hold ends 7 or anchoring elements 25 respectively.

[0032] In Fig. 5, each bending spring C is bent at its end into a hook-shaped anchoring element 25'. All anchoring elements 25' are hooked over ring 28 fixed by hooks 29 to holding device H or ring element 24, respectively. This greatly simplifies the assembly of the yarn brake.

[0033] In Fig. 6, the end of each bending spring C is bent into a hook-like anchoring element 25' (a round eyelet) almost fully circumscribing holding ring 28 which serves to take up all anchoring elements 25 of the bending springs C. The yarn brake equipped with the inserted holding ring 28 can be a single prefabricated unit for easy replacement. Holding device H or ring element 24, respectively, is provided with circumferentially distributed bosses 30, each having a snap-in mouth 31 for holding ring 28. Bosses 30 might even define spacers for arranging anchoring elements 25' of all bending springs C with proper circumferential distribution.

[0034] In Fig. 4, bending springs C are projecting beyond the big diameter end region of braking body 1. The small diameter end region is forming a circumferential edge. Ends 7 of all bending springs C can be embedded in a common ring element 24 (as in Fig. 3) which ring

element 24 can be easily inserted into stationary holding device H.

[0035] In the embodiments shown, bending springs C are overbent beyond a radial plane in relation to the axis X of storing drum D. However, it is even possible (Fig. 8) to bend bending springs C into an essentially radial position of their ends 7 which then can be held by common ring element 24 as shown in Fig. 8.

[0036] In the embodiments shown in Figs. 1-6, stationary holding device H is pushing brake band 2 in axial direction and in a yieldable manner against withdrawal rim 5 via spring assembly S. In Figs. 7 and 8, to the contrary, spring assembly S defined by the plurality of the bending springs C is pulling the brake band 2 onto withdrawal ring 5.

Claims

1. Yarn brake (B) for a feeder storing drum (D) having a rounded withdrawal rim (5), comprising a frustoconical braking body (1) made of radially deformable material and having an inner, circumferentially continuous brake surface (2), said braking body being supported in a stationary holding device (H), and further comprising a spring assembly (S) consisting at least of circumferentially distributed discrete spring tongues (T) engaging into said holding device (H) for centering and axially biasing said brake surface (2) in relation to said holding device (H), **characterised in that** the braking body (1) is supported by a group of concentrically arranged bending springs (C), each being defined by one of said spring tongues (T) bent outwardly from the generatrix (G) of the frustocone part of the braking body (1).
2. Yarn brake as in claim 1, **characterised in that** said bending springs (C) are roundly and continuously bent outwardly starting from the frustocone-generatrix (G) of said braking body (1) towards their ends (7).
3. Yarn brake as in claim 1, **characterised in that** the bending springs (C) are roundly overbent beyond a radial direction in relation to the axis of the frustocone part of the braking body (1).
4. Yarn brake as in claim 1, **characterised in that** said bending springs (C) continue the small diameter end region of the frustocone part of the braking body (1).
5. Yarn brake as in claim 1, **characterised in that** said bending springs (C) continue the big diameter end region of the frustocone part of said braking body (1).
6. Yarn brake as in claim 1, **characterised in that** each bending spring (C) is formed with constant or varying thickness and/or width.
7. Yarn brake as in claim 1, **characterised in that** the interspaces (6) between said bending springs (C) are of greater width than the bending spring width, preferably by a multiple of the bending spring width.
8. Yarn brake as in claim 1, **characterised in that** said bending springs (C) are unitarily formed with the braking body frustocone part, preferably by cutting out the interspaces (6) from a plane braking body blank.
9. Yarn brake as in at least one of the preceding claims, **characterised in that** the end (7) of each bending spring (C) is formed as a bent anchoring element (25, 25'), preferably with a hook-like configuration.
10. Yarn brake as in claim 1, **characterised in that** the ends (7, 25, 25') of the bending springs (C) are firmly or loosely secured in a common ring element (24) or a socket (8, 9).
11. Yarn brake as in claim 1, **characterised in that** the ends (7, 25, 25') of the bending springs (C) are firmly secured in a common ring element (24), e.g. by embedding, which ring element is removably insertable into said holding device (H).
12. Yarn brake as in claim 1, **characterised in that** said braking body (1) consists of a frustocone (20) of light weight material, e.g. of plastic, and of sheet metal frustocone (21) continuing the plastic frustocone (20), said sheet metal frustocone (21) being made e.g. from inox-steel, said bending springs (C) being unitarily formed with a sheet metal frustocone (21) and protrudes in essentially radial planes in the frustocone axis beyond the small diameter or big diameter and region of the sheet metal frustocone (21).
13. Yarn brake as in claim 1, **characterised in that** outside the bending springs (C) an elastic ring element (R) is provided which at least partially covers, preferably fills out the interspaces (6) between the bending springs (C) from the outer side.
14. Yarn brake as in claim 13, **characterised in that** said ring element (R) is seated in a concave circumferentially extending cavity defined by the outer surfaces of the bending springs (C) and constitutes an additional spring component of spring assembly (S), e.g. in the form of an inflated ring tube, a rubber ring or a plastic foam ring.

15. Yarn brake as in at least one of claims 1 to 14, **characterised in that** said brake surface (2) is constituted by a thin walled circumferentially continuous metal brake band secured to the inner wall of said braking body (1).

Patentansprüche

1. Garnbremse (B) für eine Speisespeichertrommel (D) mit einem abgerundeten Abzugsrand, die einen kegelstumpfförmigen Bremskörper (1) hat, der aus einem radial deformierbaren Material gefertigt ist und eine innere, umlaufende kontinuierliche Bremsfläche (2) hat, wobei der Bremskörper in einer stationären Halteeinrichtung (A) gestützt ist und weiter eine Federanordnung (S) hat, die wenigstens aus einzelnen, umlaufend verteilten Federzungen (T) besteht, die in die Halteeinrichtung (H) zum Zentrieren und axialen Vorspannen gegenüber der Bremsfläche (2) in Beziehung zu der Halteeinrichtung (H) eingreifen, **dadurch gekennzeichnet, dass** der Bremskörper (1) von einer Gruppe von konzentrisch angeordneten Biegefedern (C) gestützt wird, die jeweils durch eine der von der Erzeugenden (G) des kegelstumpfförmigen Teiles des Bremskörpers (1) nach außen gebogenen Federzungen (T) gebildet werden.
2. Garnbremse nach Anspruch 1, **dadurch gekennzeichnet, dass** die Biegefedern (C) gerundet und kontinuierlich nach außen gebogen sind, ausgehend von der Kegelstumpf-Erzeugenden (G) des Bremskörpers (1) in Richtung auf deren Enden (7).
3. Garnbremse nach Anspruch 1, **dadurch gekennzeichnet, dass** die Biegefedern (C) in Bezug auf die Achse des kegelstumpfförmigen Teiles des Bremskörpers (1) über eine radiale Richtung hinaus übergebogen sind.
4. Garnbremse nach Anspruch 1, **dadurch gekennzeichnet, dass** die Biegefedern (C) den Endbereich des kegelstumpfförmigen Teiles des Bremskörpers (1) mit kleinem Durchmesser fortsetzen.
5. Garnbremse nach Anspruch 1, **dadurch gekennzeichnet, dass** die Biegefedern (C) den Endbereich des kegelstumpfförmigen Teiles des Bremskörpers (1) mit großem Durchmesser fortsetzen.
6. Garnbremse nach Anspruch 1, **dadurch gekennzeichnet, dass** jede Biegefeder (C) mit konstanter oder sich ändernder Dicke und/oder Breite ausgebildet ist.
7. Garnbremse nach Anspruch 1, **dadurch gekennzeichnet, dass** die Zwischenräume (6) zwischen

den Biegefedern (C) breiter sind als die Breite der Biegefeder, beispielsweise um ein Mehrfaches der Breite der gebogenen Federn.

8. Garnbremse nach Anspruch 1, **dadurch gekennzeichnet, dass** die Biegefedern (C) einstückig mit dem kegelstumpfförmigen Teil ausgebildet sind, vorzugsweise durch Herausschneiden der Zwischenräume (6) aus einem ebenen Bremskörperrohling.
9. Garnbremse nach wenigstens einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Ende (7) jeder Biegefeder (7) als ein gebogenes Verankerungselement, (25, 25') vorzugsweise mit einer hakenartigen Ausbildung, ausgebildet ist.
10. Garnbremse nach Anspruch 1, **dadurch gekennzeichnet, dass** die Enden (7, 25, 25') der Biegefedern (7) fest oder locker in einem gemeinsamen Ringelement (24) oder einer Hülse (8, 9) gesichert sind.
11. Garnbremse nach Anspruch 1, **dadurch gekennzeichnet, dass** die Enden (7, 25, 25') der Biegefedern (7) fest in einem gemeinsamen Ringelement (24), beispielsweise durch Einbetten, gesichert ist, wobei das Ringelement entfernbar in die Halteeinrichtung (H) einsetzbar ist.
12. Garnbremse nach Anspruch 1, **dadurch gekennzeichnet, dass** jeder Bremskörper (1) aus einem Kegelstumpf (20) aus einem leichten Material gefertigt ist, beispielsweise aus Kunststoff, und ein metallisches, kegelstumpfförmiges Blech (21) den aus Kunststoff bestehenden Kegelstumpf (20) fortsetzt, wobei der Kegelstumpf (21) aus Metallblech, beispielsweise aus rostfreiem Stahl besteht, wobei die Biegefedern (C) einstückig mit einem Metallblech-Kegelstumpf (21) ausgebildet sind und in im wesentlichen radialen Ebenen in die Achse des Kegelstumpfes über den kleineren Durchmesser oder den großen Durchmesser und Bereiche des Metallblech-Kegelstumpfes (21) vorragt.
13. Garnbremse nach Anspruch 1, **dadurch gekennzeichnet, dass** außerhalb der Biegefedern (C) ein elastisches Ringelement (R) vorgesehen ist, dass die Abstände (6) zwischen den Biegefedern (C) von außen wenigstens teilweise abdeckt, vorzugsweise ausfüllt.
14. Garnbremse nach Anspruch 13, **dadurch gekennzeichnet, dass** das Ringelement (R) in eine konkave, sich umlaufend erstreckende Höhlung eingesetzt ist, die durch die äußere Fläche der Biegefedern (C) gebildet ist und eine zusätzliche Feder-

komponente der Federanordnung bildet, beispielsweise in der Form eines aufgeblasenen Ringschlauchs, eines Gummirings oder eines Kunststoffschaumrings.

15. Garnbremse nach wenigstens einem der Ansprüche 1 bis 14, **dadurch gekennzeichnet, dass** die Bremsfläche (2) durch ein dünnes, umlaufendes, kontinuierliches Metallbremsband gebildet wird, das an der inneren Wandung des Bremskörpers (1) gesichert ist.

Revendications

1. Frein (B) de fil pour un tambour d'emmagasinement (D) de fournisseur ayant un rebord arrondi (5) de retrait, comportant un corps tronconique (1) de freinage formé d'une matière pouvant être déformée radialement et ayant une surface intérieure, circonférentiellement continue (2), de frein, ledit corps de freinage étant supporté dans un dispositif de maintien immobile (H), et comportant en outre un ensemble à ressorts (S) constitué au moins de languettes à ressorts (T) distinctes, réparties circonférentiellement, s'engageant dans ledit dispositif de maintien (H) pour centrer et rappeler axialement ladite surface de frein (2) par rapport audit dispositif de maintien (H), **caractérisé en ce que** ledit corps de freinage (1) est supporté par un groupe de ressorts de flexion (C) disposés concentriquement, définis chacun par l'une desdites languettes à ressorts (T) courbées vers l'extérieur depuis la génératrice (G) de la partie tronconique du corps de freinage (1).
2. Frein de fil selon la revendication 1, **caractérisé en ce que** lesdits ressorts de flexion (C) sont courbés de façon arrondie et continue vers l'extérieur en partant de la génératrice (G) du tronc de cône dudit corps de freinage (1) vers leurs extrémités (7).
3. Frein de fil selon la revendication 1, **caractérisé en ce que** les ressorts de flexion (C) sont recourbés davantage de façon arrondie au-delà d'une direction radiale par rapport à l'axe de la partie tronconique du corps de freinage (1).
4. Frein de fil selon la revendication 1, **caractérisé en ce que** lesdits ressorts de flexion (C) prolongent la région extrême de faible diamètre de la partie tronconique du corps de freinage (1).
5. Frein de fil selon la revendication 1, **caractérisé en ce que** lesdits ressorts de flexion (C) prolongent la région extrême de grand diamètre de la partie tronconique dudit corps de freinage (1).

6. Frein de fil selon la revendication 1, **caractérisé en ce que** chaque ressort de flexion (C) est formé de façon à avoir une épaisseur et/ou une largeur constantes ou variables.

7. Frein de fil selon la revendication 1, **caractérisé en ce que** les espaces intermédiaires (6) entre lesdits ressorts de flexion (C) sont d'une largeur supérieure à la largeur des ressorts de flexion, avantageusement d'un multiple de la largeur des ressorts de flexion.

8. Frein de fil selon la revendication 1, **caractérisé en ce que** lesdits ressorts de flexion (C) sont formés d'un seul bloc avec la partie tronconique du corps de freinage, avantageusement par découpage des espaces intermédiaires (6) dans un flan plan du corps de freinage.

9. Frein de fil selon au moins l'une des revendications précédentes, **caractérisé en ce que** l'extrémité (7) de chaque ressort de flexion (C) est réalisée sous la forme d'un élément d'ancrage courbé (25, 25'), ayant avantageusement une configuration analogue à un crochet.

10. Frein de fil selon la revendication 1, **caractérisé en ce que** les extrémités (7, 25, 25') des ressorts de flexion (C) sont fixées fermement ou de façon lâche dans un élément annulaire commun (24) ou une douille (8, 9).

11. Frein de fil selon la revendication 1, **caractérisé en ce que** les extrémités (7, 25, 25') des ressorts de flexion (C) sont fixées fermement dans un élément annulaire commun (24), par exemple en étant encastrés, lequel élément annulaire peut être inséré de façon amovible dans ledit dispositif de maintien (H).

12. Frein de fil selon la revendication 1, **caractérisé en ce que** ledit corps de freinage (1) est constitué d'un tronc de cône (20) en matière légère, par exemple une matière plastique, et d'un tronc de cône (21) en tôle métallique prolongeant le tronc de cône (20) en matière plastique, ledit tronc de cône (21) en tôle métallique étant formé, par exemple, d'acier inoxydable, lesdits ressorts de flexion (C) étant formés d'une seule pièce avec un tronc de cône (21) en tôle métallique et faisant saillie essentiellement dans des plans radiaux de l'axe du tronc de cône au-delà de la région extrême de petit diamètre ou de grand diamètre du tronc de cône (21) en tôle métallique.

13. Frein de fil selon la revendication 1, **caractérisé en ce que**, à l'extérieur des ressorts de flexion (C), il est prévu un élément annulaire élastique (R) qui recouvre au moins partiellement, avantageusement

rempli des espaces intermédiaires (6) entre les ressorts de flexion (C) depuis le côté extérieur.

14. Frein de fil selon la revendication 13, **caractérisé en ce que** ledit élément annulaire (R) est logé dans une cavité concave s'étendant circonférentiellement, définie par les surfaces extérieures des ressorts de flexion (C), et constitue un composant à ressort supplémentaire de l'ensemble à ressorts (S), par exemple sous la forme d'un tube annulaire gonflé, d'un anneau en caoutchouc ou d'un anneau en mousse de matière plastique.
15. Frein de fil selon au moins l'une des revendications 1 à 14, **caractérisé en ce que** ladite surface de frein (2) est constituée par un ruban de frein métallique circonférentiellement continu, à paroi mince, fixé à la paroi intérieure dudit corps de freinage (1).

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FIG. 1

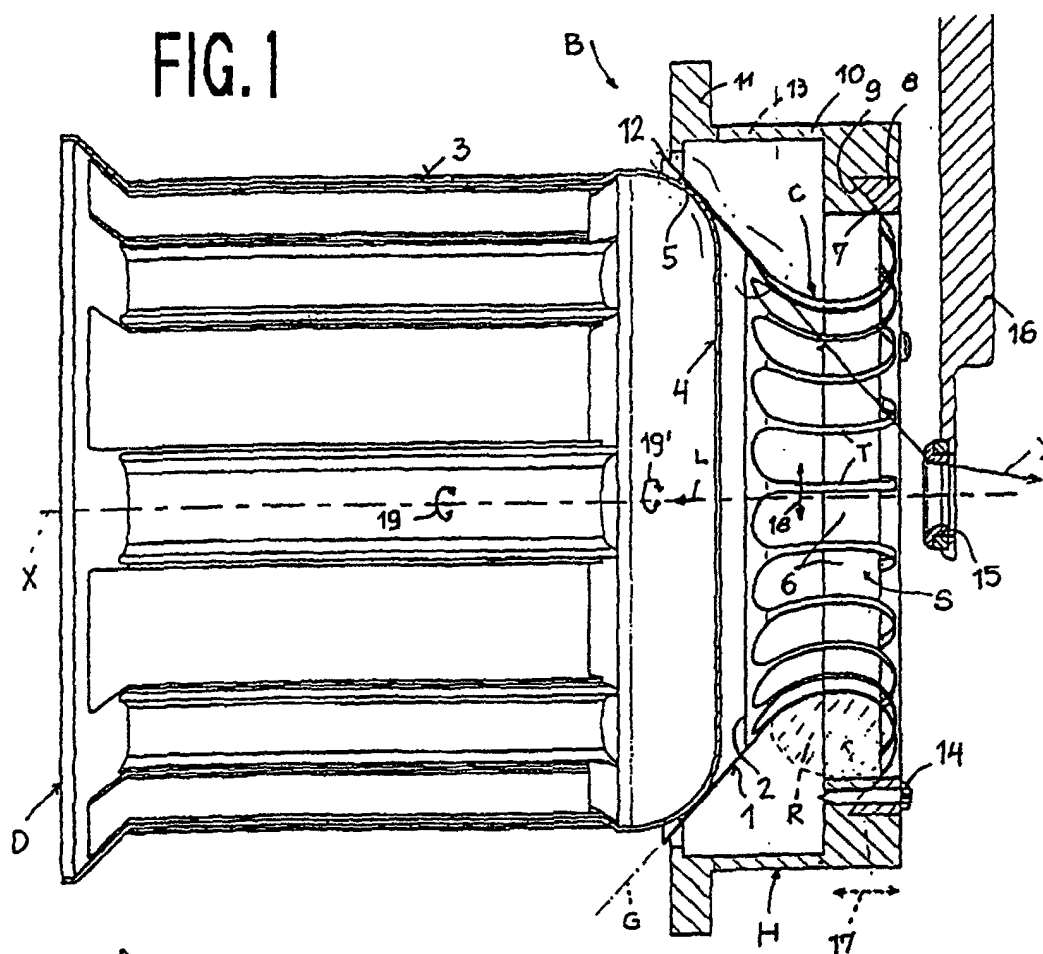


FIG. 3

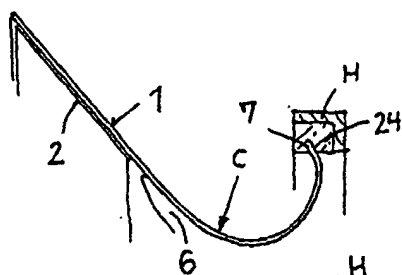


FIG. 4

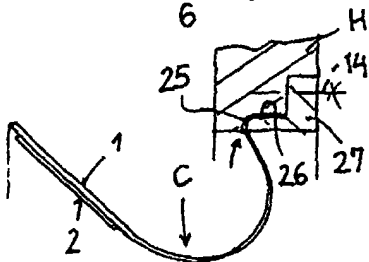


FIG. 5

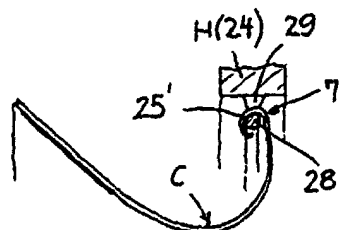
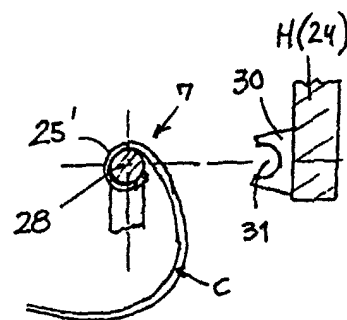


FIG. 6



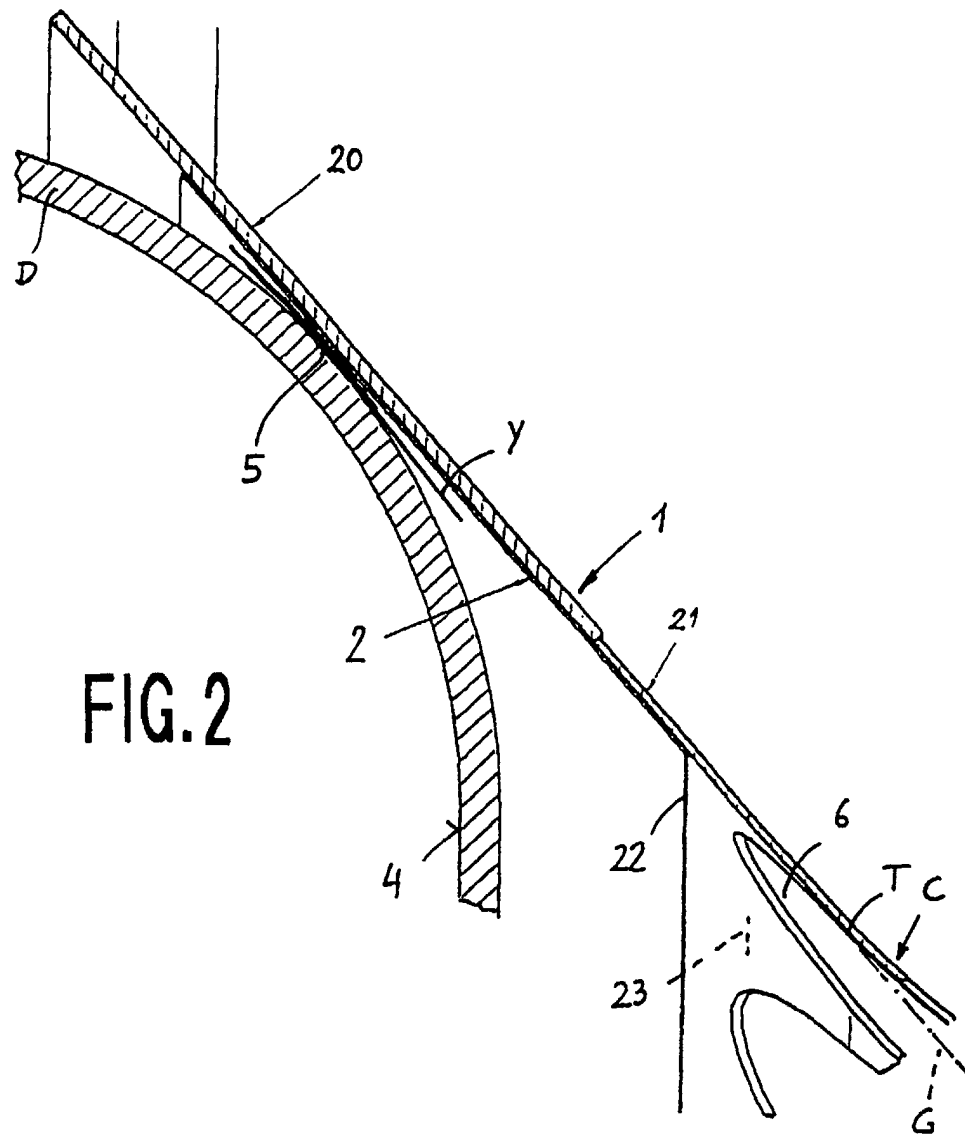


FIG. 2

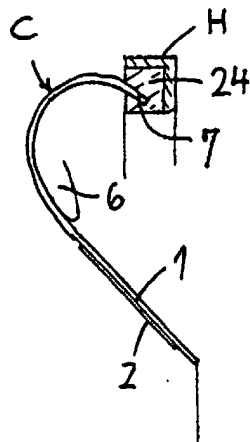


FIG. 7

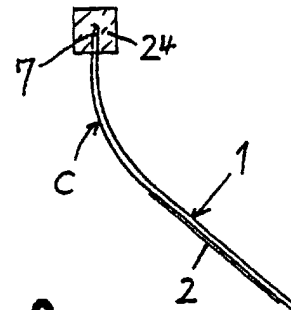


FIG. 8