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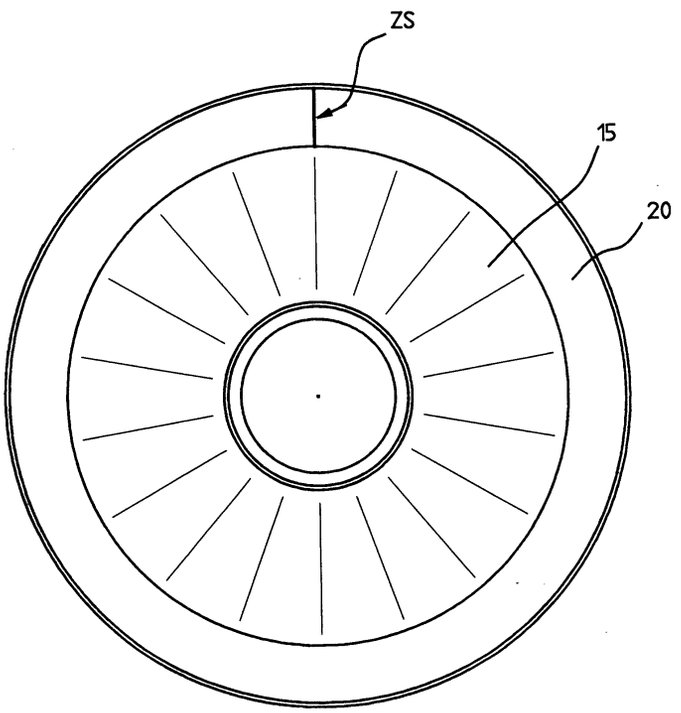
(54) An improved braking body for self-governing thread-braking devices in weft feeder apparatus and a process for its manufature

(57) A frusto-conical body (15) of a tissue or foil impregnated with a synthetic resin carries inside a wear-resistant metal coating (20), intended for directly contacting the thread, made from a planar foil (20') cut by photoetching from a planar stainless steel sheet having a high surface hardness and shaped to a continuous, frusto-conical ring (20") by mutually joining the ends (20a-20b) of the foil. The joint is obtained by a welding strip (ZS) formed by a laser beam.

Fig. 2



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Description

[0001] This invention is concerned with a braking body for self-governing thread-braking devices in weft feeder apparatus for weaving machines and more particularly for gripper-type or projectile-type looms, and with a process for the manufacture of said braking body.

[0002] More particularly, the invention is concerned with self-governing thread-braking devices of the kind disclosed in prior IT-A-1 251 209 and IT-A-1 259 567, and referred to below as known devices.

[0003] Weft feeders are apparatuses typically comprising a cylindrical stationary drum, around which a swivelling arm winds a plurality of loops of thread constituting a weft stock, means for causing the loops that are being wound to shift forward from the base to the end of the drum, and a braking device for braking the thread unwinding from the drum on request of the loom and for imparting it the appropriate mechanical tension, as necessary for proper unwinding of the thread.

[0004] In known self-governing braking devices, the braking member typically comprises a frusto-conical braking body which is elastically and frontally suspended with respect to the stationary drum of the feeder, and which is pushed against the drum by its elastic suspension, or by equivalent elastic means, and is tangent to the drum at an output circle slightly smaller than the maximum circumference of the drum. The thread runs between the drum and the braking body and transfers the axial component of its own tension on the latter. Whenever the tension is increased -- due to an increase of the the running speed of the weft -- said axial component of the tension tends to shift the braking body against the elastic action of the elastic means and causes it, or tends to cause it, to move away from the drum, with an attendant decrease of the braking action.

[0005] Braking is therefore self-governed according to the running speed, and therefore to the mechanical tension, of the thread.

[0006] For a proper operation as explained above, it is necessary that the braking body has appropriate mechanical characteristics, among which a high radial elasticity and a substantial axial rigidity are particularly important, as well as a low inertia and a high resistance to wear, at least in the area of the braking body which is tangent to the feeder drum.

[0007] To this purpose, it is known to manufacture the braking body from a tissue that is impregnated with a synthetic, preferably two-component resin, or, alternatively, from a rolled or calendered sheet of a typically thermosetting polymeric material. The braking body is then provided with a wear-resistant metal coating on its inner side and substantially in a limited area straddling the drum contact circle, the coating being intended for directly contacting the thread that is to be braked by the body.

[0008] In known braking bodies, the above metal coating typically comprises a flat foil of stainless steel, preferably AISI 301 or 11R51, the former having a 400 HV hardness and the latter 600 HV. Said foil, which is advantageously cut by photoetching from a flat plate, is applied on the frusto-conical body, possibly cement, and possibly after shaping a shallow housing recess, so that the active surface of the foil is level with the inner surface of the braking body. While the known metal coating is effective and substantially adequate as far as its wear-resistance is concerned, it does have the drawback that the joint area at the opposite ends of the foil shows a notable discontinuity. The discontinuous area is typically a line lying parallel to a generatrix of the frusto-conical braking body, and it causes considerable irregularities in the braking action imparted by said body. In fact, such discontinuity, as it becomes more pronounced due to wear, may in time give rise to peaks of mechanical tension in the thread, of sufficient intensity to cause its rupture.

[0009] In order to palliate to the above serious drawback, it has been proposed to make the metal coating of the braking body from a continuous foil of malleable material which is shaped by drawing. Typically, the drawable material for a coating of this known type is a copper-beryllium alloy, and the foil, after being drawn, is subjected to treatments of annealing and hardening under vacuum. Alternatively, it is also known to use stainless steel AISI 304 as a drawable material and to subject the drawn foil to chrome-plating in order to increase its resistance to wear. Both of the above described coatings made from continuous drawn foils have some disadvantages, mainly a high manufacturing cost and also an excessive liability to warping, which is inherent to the malleability of the metal support -- whether it is copper-beryllium or stainless steel AISI 304 -- and which makes the braking body liable to damage in case of bumps or other accidental causes. Furthermore, the surface hardness achieved by such foils after the above mentioned expensive treatments is still poor, being in the range 370 to 380 HV in the case of copper-beryllium and 240 to 250 HV in the case of stainless steel.

[0010] The present invention aims at eliminating the drawbacks mentioned above, and, more particularly, to provide an improved braking body exhibiting a high mechanical resistance and a high surface hardness with attendant high resistance to wear, while having, at the same time, a thread running surface which is substantially free from any discontinuities which might alter the proper operation of the braking body.

[0011] The invention achieves the above and other objects, such as will appear from the following detailed disclosure, by providing an improved braking body having the features set out in the attached claims.

[0012] Substantially, the invention provides a braking body wherein the wear-resistant metal coating comprises a planar foil, cut by photoetching from a planar stainless steel sheet exhibiting a high surface hardness, and having its ends joined to each other along a welding strip produced by a laser beam, so that a continuous frusto-

conical ring is formed.

[0013] Preferably, the stainless steel of said foil is chosen fron the group comprising the following steels: 11R51 - AISI 301 and highly tempered steels having a surface hardness higher than or equal to 600 HV.

[0014] The features, aims and advantages of the invention will appear more clearly from the following detailed disclosure, with reference to the attached drawings, wherein:

Fig. 1 is a side view in elevation of a weft feeder having a self-governing braking device provided with an improved braking body according to the invention;

Fig. 2 is a view, on an enlarged scale, in the direction of arrows II-II on Fig. 1, showing the inner surface of the improved braking body of Fig. 1;

Fig. 3 is a plan view of a foil cut by photoetching and used for building the metal coating of the braking body of Fig. 1;

Fig. 4 is a side view in elevation of a frusto-conical ring resulting by welding together the ends of the photoengraved foil of Fig. 2.

[0015] With reference to Fig. 1, a weft feeder 10 of a known type comprises a stationary drum 11 and a hollow swiveling arm, integral with a turning disc 12 located at the base of the drum, for winding a plurality of loops of thread SF around the drum to form a weft stock. As known per se, thread F unwinds from the drum, as called for by the loom or other weaving machine (not shown), by passing through a thread guide coaxial to the drum, and while unwinding it is subjected to a self-governing braking device, generally referenced with 14, and having the task of maintaining the tension of the thread by automatically adjusting the braking action as the running speed of the thread varies.

[0016] To such an end, device 14, placed between thread guide 13 and drum 11, includes a braking member comprising a frusto-conical braking body 15, made of a synthetic tissue or foil impregnated with typically two-component polymeric resins and arranged facing drum 11, being tangent to it along an output circle slightly smaller than the maximum circumference. Body 15 is pressed against drum 11 by am annular holder 16 and an elastic suspension 17, so that it brakes the thread unwinding from the drum with a predetermined elastic force, so-called static tension. Holder 16 is supported on a carriage 18 which can be displaced axially with respect to drum 11 by a screw mechanism 19, in order to adjust said static tension.

[0017] In the area of contact with drum 11, the inner surface of braking body 15 is provided with a wear-resistant metal coating 20, for direct contact with the thread upon which said body applies its braking action.

[0018] According to the invention, coating 20 consists in a planar foil 20' (Fig. 3) cut by photoetching from a planar sheet of a stainless steeel having a high surface hardness. The etched planar foil 20' has a substantially annulus-shaped profile interrupted by a segment T of a length depending on the taper i of frusto-conical ring 20" obtained from said foil when its ends 20a-20b are connected together. Preferably, the stainless steel constituting said foil is chosen from the group comprising the following steels: 11R51 - AISI301 and highly tempered steels having a surface hardness higher than or equal to 600 HV.

[0019] Furthermore, according to the invention, ring 20" is obtained by abutting the ends 20a-20b of the photoetched planar foil 20' to each other and by welding such ends to each other by laser-beam welding. The strip ZS (Fig. 2) defining the joining weld of said ends is substantially rectilinear and has a width of 2 to 3 tenths of one millimeter, so that it is substantially imperceptible to the touch. The strip may lie parallel to the generatrices of ring 20" or it may be oblique to said generatrices in the direction of unwinding of thread F from drum 11 of weft feeder 10.

[0020] Ring 20", obtained as specified above, or at least its inner frusto-conical surface which will contact thread F, may then be chrome-plated in order to further increase its surface hardness.

[0021] It should be understood that the details of the design and the embodiments could be widely changed, within the principles of the invention, from what has been disclosed and illustrated by way of nonlimiting example, without leaving the scope of the invention.

Claims

1. An improved braking body for self-governing thread-braking devices (14) in weft feeder apparatus (10), made of a tissue or foil impregnated with a synthetic resin and carrying a wear-resistant metal coating (20) for direct contact with the thread, **characterized in that** said wear-resistant metal coating is made from a planar foil (20') cut by photoetching from a planar stainless steel sheet having a high surface hardness and shaped to a continuous, frusto-conical ring (20") by mutually joining the ends (20a-20b) of the foil; the joint being obtained by a welding strip (ZS) formed by a laser beam.

2. The braking body of claim 1, **characterized in that** the stainless steel of said photoetched planar foil (20') is chosen from the group comprising the following steels: 11R51 - AISI301 and highly tempered steels having a surface hardness higher than or equal to 600 HV.

3. The braking body of claim 1 or 2, **characterized in that** said continuous frusto-conical ring (20"), or at

least its inner side, is superficially treated by chrome-plating.

4. The braking body of any one of the preceding claims, **characterized in that** the strip (ZS) of the continuous frusto-conical ring (20") defining the joining weld between the ends of the planar foil (20') is substantially rectilinear and has a width of 2 to 3 tenths of one millimeter.

5. The braking body of any one of the preceding claims, **characterized in that** said rectilinear welding strip (ZS) lies parallel to the generatrices of said continuous frusto-conical ring (20").

6. The improved braking body of claim 4, **characterized in that** said rectilinear welding strip (ZS) lies obliquely to the generatrices of said continuous frusto-conical ring (20") in the direction of unwinding of the thread (F) from the drum of the weft feeder (10).

7. A process for manufacturing an improved braking body according to any one of claims 1 to 6, **characterized in that** it comprises the steps of:

- cutting a planar foil (20') by photoetching from a planar sheet, the planar foil having an annulus-shaped profile interrupted by a segment (T) of a length depending on the taper (i) of the frusto-conical ring (20") obtained from said foil when its ends are connected together;

- abutting the ends (20a-20b) of the planar photoetched foil (20') together and welding said ends to each other by laser-beam welding whereby a continuous frusto-conical ring (20") is formed, in which the strip (ZS) defining the joint welding of said ends is substantially rectilinear, and has a width of 2 to 3 tenths of one millimeter.

8. The process of claim 7, **characterized in** ar that the strip (ZS) defining the joint welding of said ends lies parallel to the generatrices of said ring (20").

9. The process of claim 6, **characterized in that** the strip (ZS) defining the joint welding of said ends lies oblique to the generatrices of said ring (20").

10. The process of any of claims 7 to 9, **characterized in that** at least the inner side of the continuous frusto-conical ring (20) is chrome-plated.

11. The process of any of claims 7 to 9, **characterized in that** at least the entire continuous frusto-conical ring (20) is chrome-plated.

Fig. 1

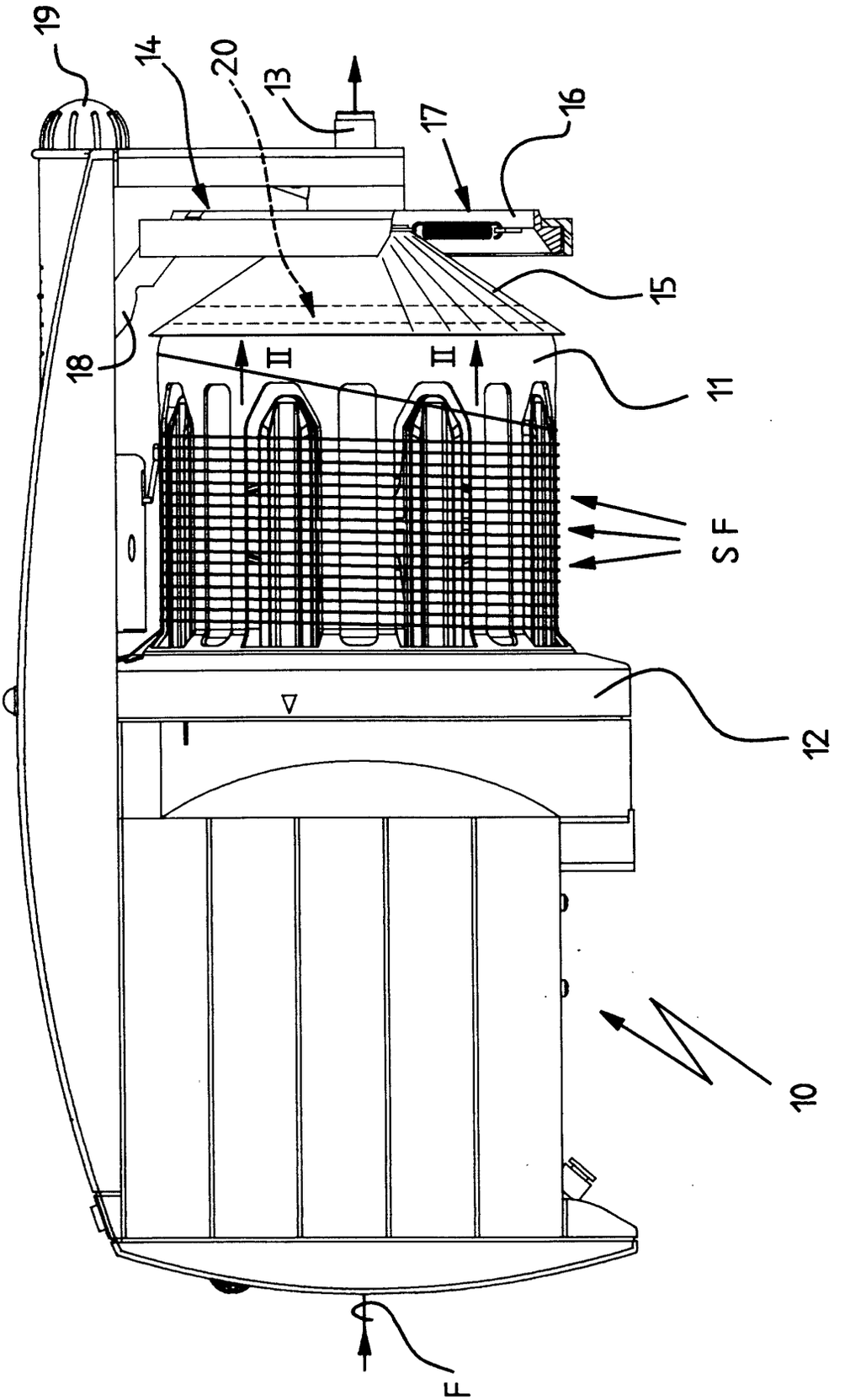

Fig. 2

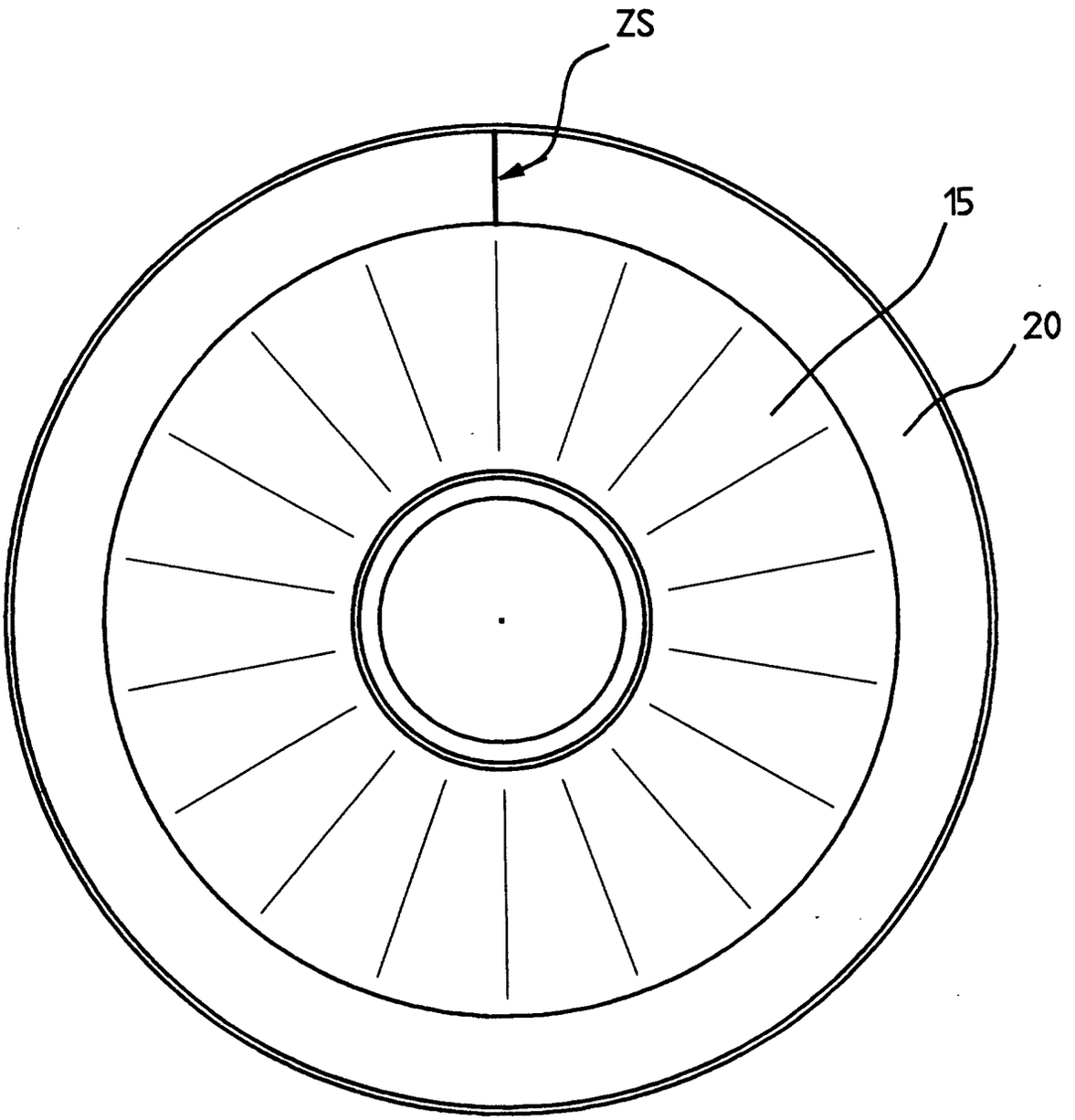

Fig. 3

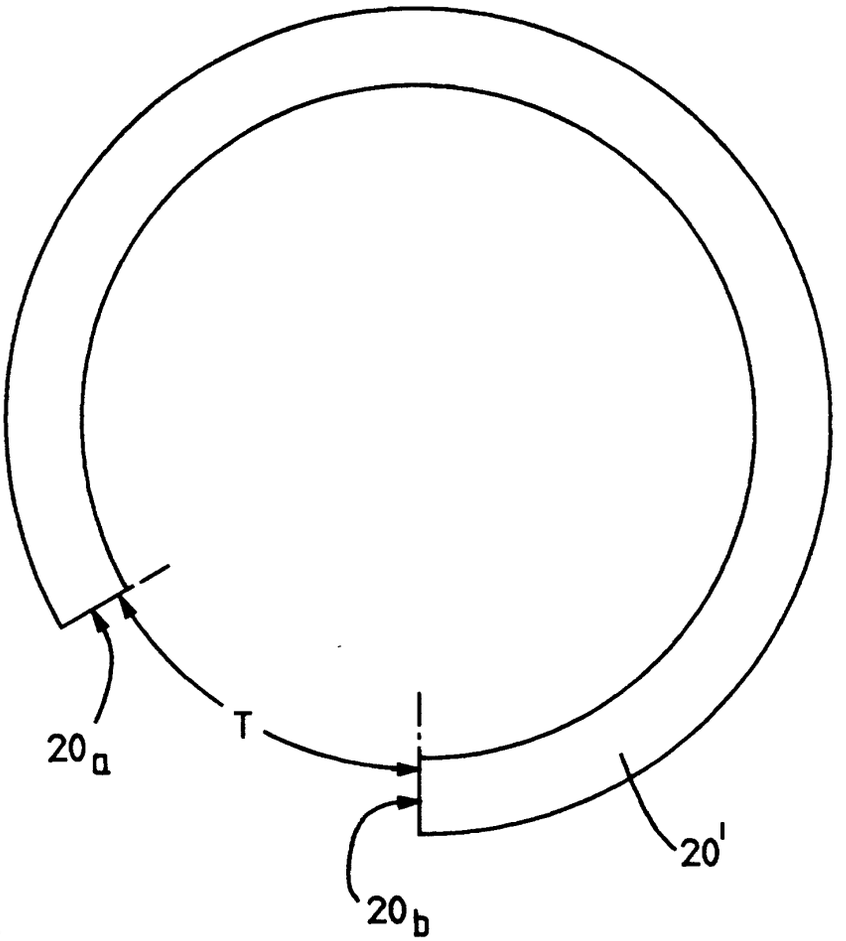

Fig. 4