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DESCRIPTION

[0001] The invention relates to a band saw device according to the introductory clauses of the independent claims 1 and 10. Such a band saw device can be seen from WO 91/12 937 A1.

[0002] In the sawing process, in particular at the start of the first cut process into the workpiece which is to be sawn, frequently a turbulent and oscillating position of the band saw blade occurs. This leads to shape deviations and to a greater value of the surface roughness in the first cut region. For this reason, in most cases guides are provided, in order to allow the saw band to run in a defined manner. By a play in the guides, however, a certain freedom of movement of the band saw blade is made possible. However, these known guides, which can also be constructed as metal rollers, do not damp the vibration behaviour of the saw band during the first cut. When the guides are constructed as metal rollers, owing to a lack of static friction between roller and band saw band, a sliding of the band saw band on these rollers can occur, which can lead to a one-sided and uncontrolled flattening of the rollers. In order to damp the vibrations themselves, hitherto so-called first cut ramps were used. A first cut ramp is understood to mean here the increase of the cut speed and of the feed of the band saw blade from a lower value up to a higher value compared thereto. Therefore, in the first cut region a reduced feed- and cut speed of the band saw blade occurs compared with a position of the saw blade situated in the block. This leads to an increased production time, because one can not operate from the start with a maximum feed- and cut speed. Furthermore, a high noise development can also occur during the sawing process.

[0003] DE 10 2006 037 705 A describes a sawing device with a sawing tool with a bearing in which the sawing tool is mounted. Furthermore, drive means are provided for generating a movement of the sawing tool relative to the bearing. Here, the bearing guiding the sawing tool is constructed as a fluid bearing. To produce the fluid bearing, a fluid cushion is built up between the bearing and the sawing tool. A disadvantage here is, above all, the complex structure and that a usage is not possible in all cases of application owing to the fluid which is supplied.

[0004] A band saw device of the type mentioned in the introduction has also become known from WO 91/1293. A further device has also become known for example from JP 2008/229742. The latter device has a damping roller, in which magnets are arranged on its circumferential surface on the face side. The magnets act here on a flank of the band saw and attract the latter in the direction of the face side ("running surface") of the damping roller. A disadvantage in the known embodiment is, above all, that by means of the damping roller no feed force can be exerted in the direction of the cutting edge of the band saw blade onto the back of the band, and no reliable lateral guidance of the band saw blade is provided.

[0005] The present invention is based on the problem of creating a band saw device, by which already at the start of the first cut process an improved surface quality is able to be achieved with increased shape accuracy in the cut region, and an increased productivity.

[0006] This problem is solved according to the invention by a band saw device of the type mentioned in the introduction, in that the damping roller has at

least one insert element of an elastomer, in particular rubber-elastic, material, which is pressed against a flank of the band saw blade. Owing to the frictional engagement between the band saw blade and the damping roller, an entrainment occurs of the damping roller in the direction of movement of the band saw blade. The adhesion limit between band saw blade and damping roller is not exceeded here. Therefore, the roller is set in rotation as soon as the band saw band moves, whereby an uncontrolled sliding of the back of the band on a track guide of the roller can be prevented. A slip between damping roller and band saw blade can be entirely prevented owing to the invention or respectively can be reduced to a very small amount (less than 10%).

[0007] In order to achieve an arrangement of the band saw in the damping roller which is as free from play as possible, the at least one insert element can be pressed against the flank of a band saw blade against a restoring force brought about by the elastomer material.

[0008] A preferred variant of the invention, guaranteeing a very good frictional engagement which is simple to realize, makes provision that the at least one insert element is constructed as an O-ring. According to an advantageous further development of the invention, provision can be made that the damping roller has at least two insert elements which lie on flanks, lying opposite one another, of the band saw blade, and a normal distance between the insert elements is smaller than a normal distance between the flanks of the band saw blade, wherein the band saw blade is held in a manner free from play between and by the insert elements. This variant of the invention is distinguished by a structure which enables a simple and

reliable arrangement of the back of the band of the band saw blade in the damping roller.

[0009] A further advantageous variant of the invention, which enables an adaptation of the frictional force to changing circumstances, makes provision that the at least one insert element is constructed as a membrane, which is able to be acted upon by means of a fluid, in particular air or a liquid, and is able to be pressed against the flank of the band saw blade.

[0010] According to an advantageous further development of the invention, provision can be made that the at least one damping roller is pivotably arranged about an axis running normally to a section plane, and a safety switch is provided for switching off the band saw machine, which switch is actuated by a pivoting of the damping roller about a predeterminable deflection. In this way, an uncontrolled behaviour of the band saw blade and a damage to the band cutting device, resulting therefrom, can be prevented, because with a predefined deflection of the band saw blade from a nominal position, an automatic switching off of the band saw device is brought about.

[0011] Furthermore, the damping roller can be mounted rotatably on at least one arm loaded with an elastic force, wherein the arm can be arranged rotatably about the axis running normally to the section plane.

[0012] According to a further advantageous variant of the invention, provision can also be made to use, instead of the spring, a force sensor, for example a load cell or weighing cell, connected with the arm, in order to detect a wear of the cutting edge of the band saw blade. This embodiment has the advantage that the band is always held approximately in the same position.

On pressing back the arm onto a spring, for example approximately 2-4 mm can be necessary, whereas with the use of a load cell a path of substantially less than 0.1 mm is covered. Thereby, the tool is always in the same ideal position and tooth feed of the band saw blade is always constant.

[0013] According to an advantageous variant of the invention, the at least one damping roller can be arranged on the base frame.

[0014] Alternatively to a purely passive entrainment of the damping roller by the band saw blade, the at least one damping roller can also be driven according to a further preferred embodiment of the invention.

[0015] The problem of the present invention is also solved by a band saw device of the type named in the introduction according to the invention in that the damping roller has at least one magnet, in order to draw or respectively press the band saw blade in the region of the damping roller against a flank of the damping roller, wherein the magnet is arranged on an inner flank of the damping roller. With this alternative of the invention, a very good damping of the band saw blade can be achieved in a simple manner.

[0016] The invention together with further advantages is explained in further detail below with the aid of some non-restricting example embodiments, which are illustrated in the figures.

[0017] There are shown respectively in a highly diagrammatically simplified illustration:

Fig. 1 a perspective illustration of a band saw device according to the invention;

Fig. 2 a section through a portion of a base frame and of a damping roller of the band saw device of Fig. 1;

Fig. 3 a lateral view of a further embodiment of a damping roller according to the invention;

Fig. 4 a lateral view of a further variant of a damping roller according to the invention and

Fig. 5 a lateral view of a half of a damping roller according to the invention, in which magnets are inserted.

[0018] By way of introduction, it is noted that in the differently described embodiments the same parts are given identical reference numbers or respectively identical component designations, wherein the disclosures contained in the entire description can be transferred analogously to identical parts with identical reference numbers or respectively with identical component designations. Also, the information regarding position, selected in the description, such as e.g. above, below, lateral etc. refer to the directly described and illustrated figure and in the case of a change of position are to be transferred analogously to the new position.

[0019] According to Fig. 1, a band saw device 1 according to the invention has a base frame 2 and two deflection wheels 3, 4 which are arranged at a distance from each other. Furthermore, a drive means 5 is provided, which is in a driving engagement with one of the deflection wheels 3, 4. Around the deflection wheels 3, 4 a continuously circulating band saw blade 6 is provided. According to the invention, the band saw

blade 6 is frictionally engaged with its back of the band or respectively with lateral flanks with one or more damping rollers 7 in the region of one side of the saw of the band saw blade 6 arranged between both deflection rollers. In the embodiment illustrated here, two damping rollers 7 and 8 are provided. The damping rollers 7, 8 can be arranged on the base frame 2.

[0020] Furthermore, the damping rollers 7 and 8 each have a track guide 9, 10 for the back of the band and lateral regions of the band saw blade 6 adjoining thereto. Additionally, one or more insert elements of an elastomer, in particular rubber-elastic, material, given the reference numbers 11, 12 in Fig. 2, are provided. The insert elements 11, 12 are pressed against the flanks 13, 14 of the band saw blade 6 for producing a frictional engagement with the band saw blade 6. The pressing force, by which the insert elements 11 and 12 are pressed against the band saw blade 6 or respectively against its flanks 13, 14, can be a restoring force brought about by compression of the elastomer material of the insert elements 11 and 12.

[0021] A compression of the elastomer material can be brought about for example in that, as illustrated in Fig. 2, a normal distance between the insert elements 11, 12, which can be constructed as O-rings, is smaller than a normal distance between the flanks of the band saw blade 6. In other words, the free distance between the two insert elements 11 and 12 is less than the thickness of the band saw blade 6. By inserting the band saw blade 6 into the damping rollers 7, 8, the insert elements 11 and 12 are then compressed, so that the band saw blade 6 is held in a manner free from play between and by the insert elements 11, 12.

[0022] As can be seen further from Fig. 2, the damping roller 7 or 8 can have an inner roller body 15, which has on its face side two circumferential insert grooves 16, 17 for the insert elements 11 and 12 which are constructed as O-rings. In the middle between the insert grooves 16, 17, a track guide 18, likewise circumferential around the face side of the roller body 15, can be provided for the back 19 of the band of the band saw blade 6. Furthermore, the roller body 15 can be penetrated by an opening through which a rotation axis 20 of the damping roller 7 can be guided. Two cover shells 21, 22 can be fastened on the lateral flanks of the roller body 15, for example by screwing with the roller body 15. In the illustrated embodiment, the two cover shells 21 and 22 at least partially overlap the two insert elements 11 and 12, in order to prevent an undesired removal of the O-rings from the roller body 15 during operation.

[0023] According to a further embodiment of the invention illustrated in Fig. 3, the insert element can be constructed as a membrane 23, which is able to be acted upon by means of a fluid, in particular air or a liquid, and is able to be pressed against the flank 13, 14 of the band saw blade 6. For this, a damping roller can have a cover shell 24, in which openings are provided which are covered by the membrane 23. By acting upon the membrane 23 with pressure, the latter can be pressed against one of the flanks 13, 14 of the band saw blade 6. Thus, for example, a fan can be installed, which on a rotating past of the membrane 23 in front of the fan presses the membrane 23 against the band saw blade 6 by means of the generated fluid flow. In this case, it is particularly advantageous if at least two openings, covered by the membranes 23, are provided on the cover shell 24, so that a permanent exertion of pressure onto the band saw blade 6 and a

continuous frictional engagement between the damping roller with the band saw blade 6 is ensured.

[0024] A further alternative embodiment, illustrated in Fig. 4, can consist in drawing in the band saw blade 6 via suction holes 25 in a cover shell 26, wherein in this case the insert element is also arranged between band saw blade 6 and cover shell 26. In this embodiment, the insert element 26 or respectively the insert elements can be constructed for example as an O-ring, as extensions lying against the flanks 13, 14 of the band saw blade 6 or as a flat insert element with holes which correspond with the suction holes 25 of the cover shell 26.

[0025] In particular in the embodiments illustrated in Figs. 3 and 4, it can be advantageous if the damping roller is driven.

[0026] It can be seen in addition from Fig. 1 that the at least one damping roller 8 is pivotably arranged about an axis c running normally to a section- or respectively saw plane, and a safety switch 27 is provided for switching off the band saw device 1, which switch is actuated by a pivoting of the damping roller 8 about a predeterminable deflection about the axis c.

[0027] The damping roller 8 can be mounted rotatably on an arm 28 loaded with an elastic force. For generating the elastic force on the arm for example a pneumatic, hydropneumatic or helical spring can be provided. The arm 28, in turn, can be rotatably arranged about the axis c running normally to the section plane. The term section plane is understood in the present context to mean the plane in which the band saw blade 6 lies and in which a separation takes place of the workpiece which is to be sawn up. The feed force necessary for

the sawing process increases with decreasing sharpness of the cutting teeth of the band saw blade 6. When the necessary feed force exceeds particular value, the band saw blade 6 can be pressed out from its nominal position and can come in contact with its cutting teeth with a machine part of the band saw device 1, for example with one of the deflection wheels 3, 4. This can result in a damage to the band cutting device. On exceeding of a predeterminable value for the feed force, the pivotably arranged damping roller 8 can be urged back so far that the safety switch 27 is actuated by the damping roller 8 or respectively by the arm 28 or by a further component connected with the damping roller 8 or with the arm 28.

[0028] Instead of the spring, a force sensor, for example a load cell or a weighing cell, connected with the arm, can also be provided, in order to detect a wear of the cutting edge of the band saw blade. A signal generated by the force sensor can be passed on to an evaluation unit, which actuates a safety switch and brings about a switching off of the band saw device on exceeding a predetermined threshold value. The evaluation unit can be realized for example as a microprocessor, signal processor or as an electronic circuit, in particular as an integrated switching circuit. Provision can also be made that the sensor is constructed so that a signal is generated only on exceeding a predeterminable value of the received force. This signal can be passed on for example directly to the safety switch and can bring the switch into a switching state which results in a switching off of the band saw device 1.

[0029] As can be seen from Fig. 5, magnets 29 can also be arranged on at least one side of the damping roller. The magnets 29 do not have to be situated here on the

surface of an inner flank of the damping roller. They can also be arranged entirely beneath the surface, i.e. within the damping roller. Through the magnets 29, a force running substantially transversely to the movement direction of the band saw blade 6 is exerted onto the band saw blade 6, by which the band saw blade 6 is drawn or respectively pressed against a flank of the damping roller.

[0030] Although here several magnets 29 are illustrated, it is also possible that only one single magnet 29 is used, arranged in a ring shape around an axis of the damping roller. The magnets 29 can be permanent magnets, but also electromagnets. Permanent magnets have the advantage that they are very maintenance-free and their installation only requires a small structural effort. Electromagnets, such as for example coils flowed through by current, have the advantage that with them the generated magnetic field can be altered, so that a control is possible of the magnetic field acting on the band saw blade 6 and therefore the intensity of the damping of the band saw blade 6 can also be adjusted in running operation.

[0031] For the sake of good order, it is finally also pointed out that for a better understanding of the structure of the band saw device according to the invention, the latter or respectively its components were illustrated partially not to scale and/or enlarged and/or reduced in size.

REFERENCE LIST

[0032]

1	band saw device
2	base frame
3	deflection wheel
4	deflection wheel
5	drive means
6	band saw blade
7	damping roller
8	damping roller
9	track guide
10	track guide
11	insert element
12	insert element
13	flank
14	flank
15	roller body
16	insert groove
17	insert groove
18	track guide
19	back of the band
20	rotation axis
21	cover shell
22	cover shell
23	membrane
24	cover shell
25	suction holes
26	cover shell
27	safety switch
28	arm
29	magnet

Csillapító görgő

Szabadalmi igénypontok

1. Szalagfűrész berendezés (1), amely tartalmaz alapvázat (2), legalább két, egymástól térközzel elrendezett terelőkereket (3, 4), meghajtó eszközt (5), amely a terelőkerekek (3, 4) legalább egyikével hajtókapcsolatban van, továbbá a terelőkerekek (3, 4) körül körbefutó végtelenített szalagfűrészlapot (6), amely szalagfűrészlap (6) a két terelőgörgő közötti részen lévő fűrészoldal tartományában legalább egy csillapító görgővel (7, 8) dörzskapcsolatban van és a csillapító görgő (7, 8) nyomvonal vezetést (9, 10) tartalmaz a szalag-háthoz és a szalagfűrészlapnak (6) az arra csatlakozó oldalsó tartományaihoz, **azzal jellemezve, hogy** a csillapító görgő (7, 8) elasztomerből, különösen gumirugalmas anyagból lévő legalább egy betételemet (11, 12) tartalmaz, amely a szalagfűrészlap (6) oldalához nyomódik.

2. Az 1. igénypont szerinti szalagfűrész berendezés, **azzal jellemezve, hogy** legalább egy betételem (11, 12) az elasztomer anyag által kiváltott visszatérítő erővel van a szalagfűrészlap (6) oldalához nyomva.

3. A 2. igénypont szerinti szalagfűrész berendezés, **azzal jellemezve, hogy** legalább egy betételem O-gyűrűként van kialakítva.

4. A 2. vagy 3. igénypont szerinti szalagfűrész berendezés, **azzal jellemezve, hogy** a csillapító görgő (7, 8) legalább két betételemet (11, 12) tartalmaz, amelyek a szalagfűrészlapnak (6) az egymással szembelévő oldalaira (13, 14) fekszenek fel, a betételemek (11, 12) közötti normális térköz kisebb, mint a szalagfűrészlap (6) oldalai közötti normális térköz, és a szalagfűrészlap (6) a betételemek (11, 12) között és által játékmentesen van megtartva.

5. A 2. vagy 4. igénypont szerinti szalagfűrész berendezés, **azzal jellemezve, hogy** legalább egy betételem membránként (23) van kialakítva, amely közeggel, különösen levegővel vagy folyadékkal látható el és a szalagfűrészlap (6) oldalaira (13, 14) rányomható.

6. Az 1-5. igénypontok bármelyike szerinti szalagfűrész berendezés, **azzal jellemezve, hogy** a legalább egy csillapító görgő (8) a vágósík normálisa körül futó tengely (c) körül elbillenthetően van elrendezve, és a szalagfűrész berendezést (1) lekapcsoló biztonsági kapcsolót (27) tartalmaz, amely a csillapító görgő (8) elbillenésének megadott kitérésekor lép működésbe és/vagy a szalagfűrészlap kopásának detektálására karral (28) összekötött erőmérőt, például erőmérő cellát vagy erőmérő szelencét tartalmaz.

7. A 6. igénypont szerinti szalagfűrész berendezés, **azzal jellemezve, hogy** a csillapító görgő (8) legalább egy, rugóerővel terhelt karon (28) forgathatóan van csapágyazva, amely kar (28) a vágósík normálisa körül futó tengelyen (c) forgathatóan van elrendezve.

8. Az 1-7. igénypontok bármelyike szerinti szalagfűrész berendezés, **azzal jellemezve, hogy** a legalább egy csillapító görgő (7, 8) az alapvázon (2) van elrendezve.

9. Az 1-8. igénypontok bármelyike szerinti szalagfűrész berendezés, **azzal jellemezve, hogy** a legalább egyik csillapító görgő (7, 8) hajtott.

10. Szalagfűrész berendezés (1), amely tartalmaz alapvázat (2), legalább két, egymástól térközzel elrendezett terelőkereket (3, 4), meghajtó eszközt (5), amely a terelőkerekek (3, 4) legalább egyikével hajtókapcsolatban van, továbbá a terelőkerekek (3, 4) körül körbefutó végtelenített szalagfűrészlapot (6), amely szalagfűrészlap (6) a két terelőgörgő közötti részen lévő fűrészoldal tartományában legalább egy csillapító görgővel (7, 8) dörzskapcsolatban van és a csillapító görgő (7, 8) nyomvonal vezetést (9, 10) tartalmaz a szalag-háthoz és a szalagfűrészlapnak (6) az arra csatlakozó oldalsó tartományaihoz, **azzal jellemezve, hogy** a legalább egy csillapító görgő (7, 8) legalább egy mágnest (29) tartalmaz és a mágnes (29) a csillapító görgő belső oldalán van elrendezve.

Fig.1

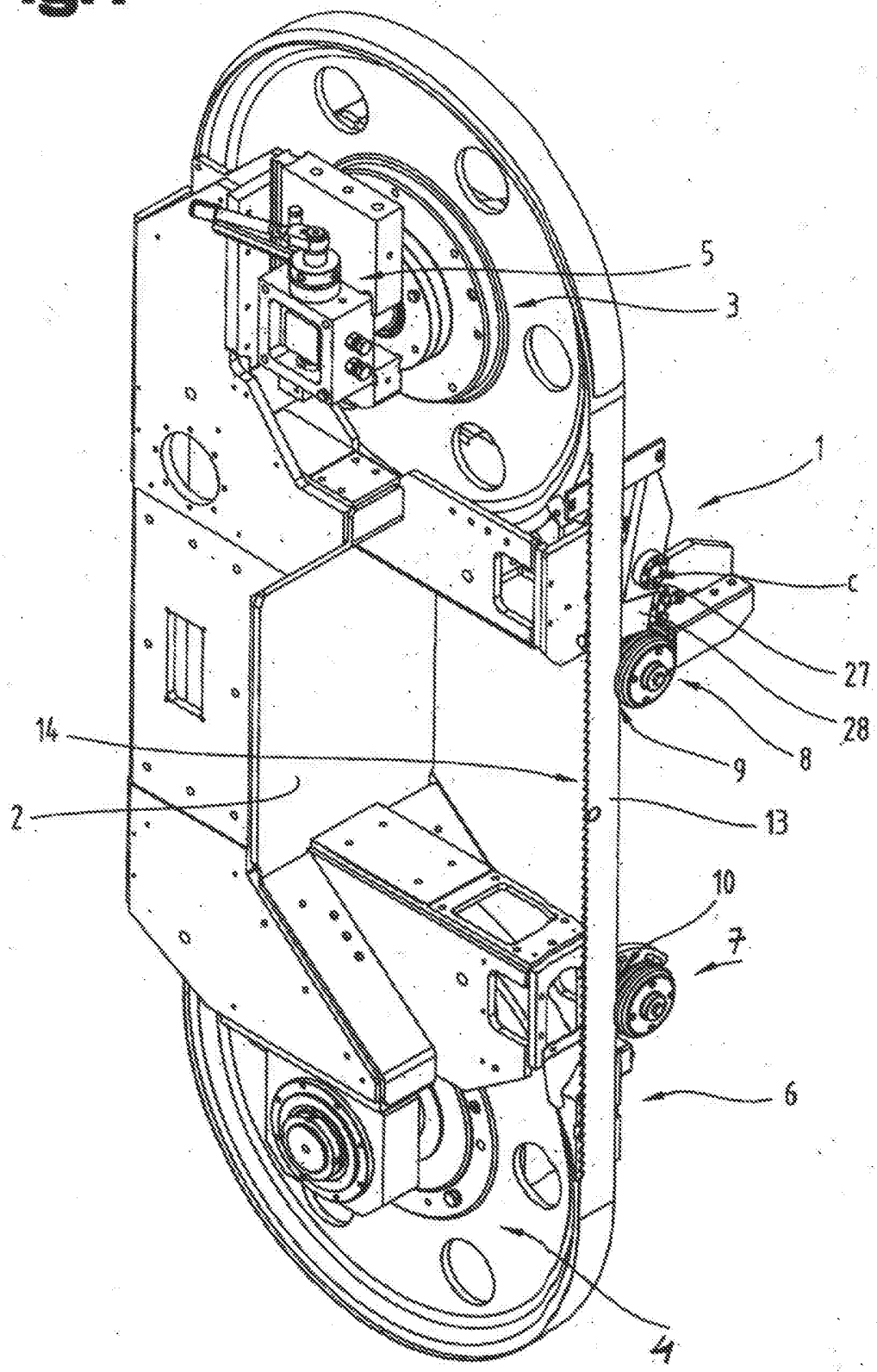

Fig.2

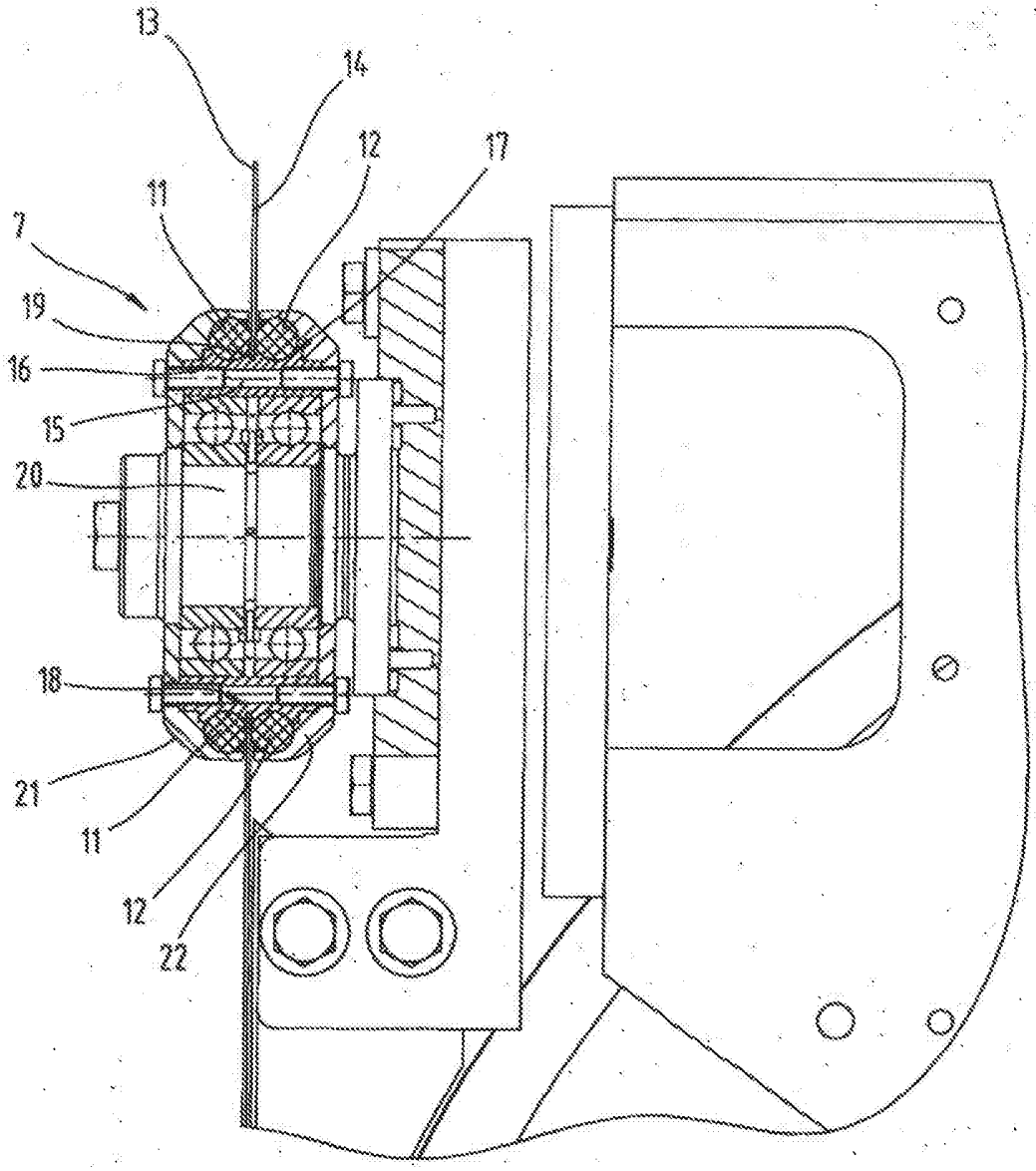

Fig.3

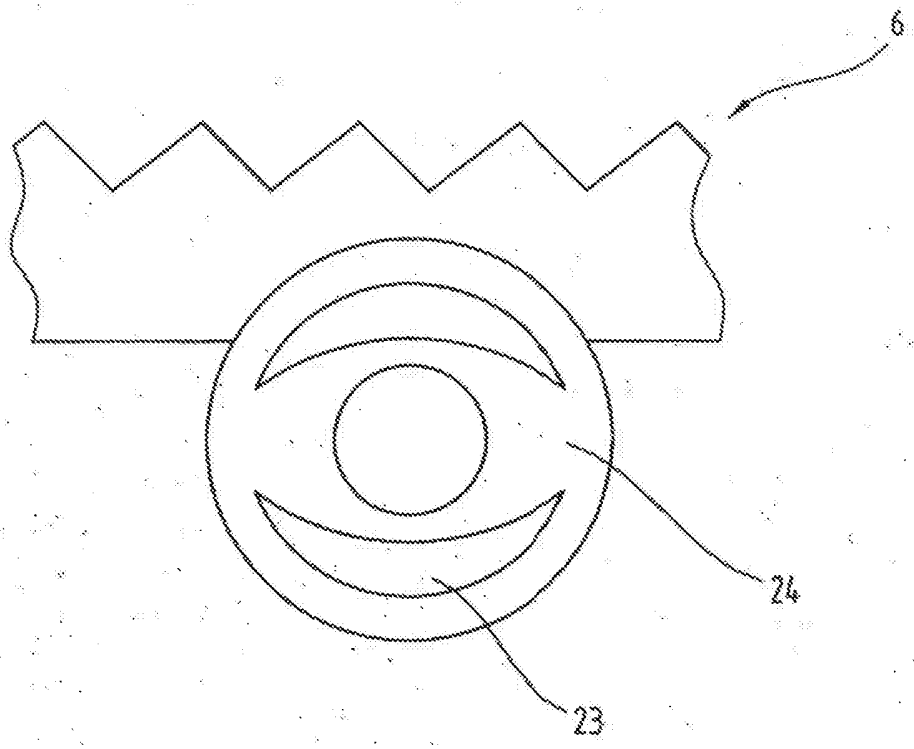

Fig.4

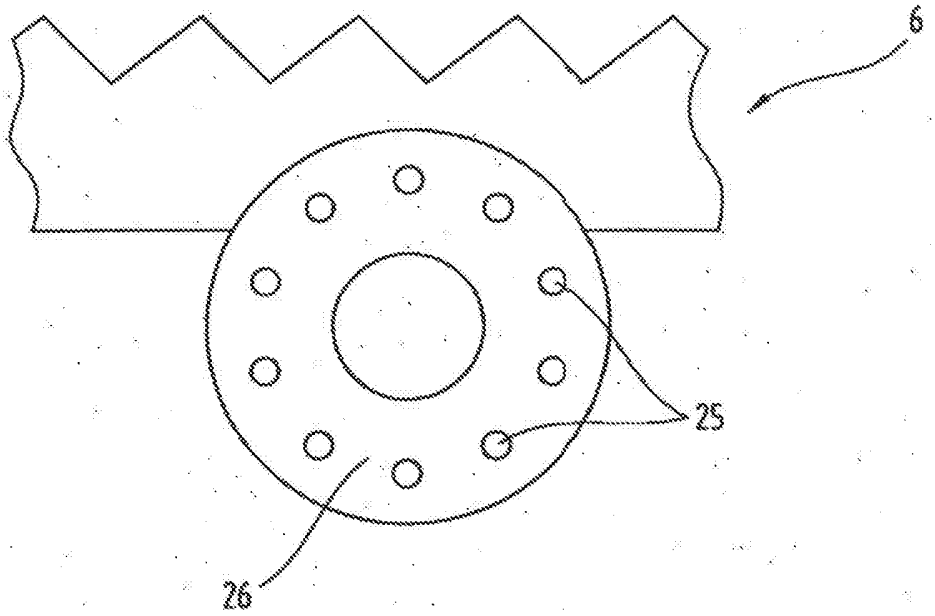

Fig.5