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(54) Benævnelse: **SKIVEBREMSE MED EN METALPLADEINDRETNING TIL ET KØRETØJ SAMT METALPLADEINDRETNING TIL EN SKIVEBREMSE**

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Description

The invention relates to a disc brake for a vehicle according to the preamble of claim 1.

The invention furthermore relates according to claim 7 to a sheet metal arrangement for such a disc brake, comprising a central sheet metal plate and a sheet metal ring arranged coaxially therewith and integrally bonded thereto and serves for protection against heat radiation.

Commercial vehicles, in particular commercial vehicle trailers and so-called semi-trailers typically are of modular construction and adapted to a chassis which is received thereon. The running gear arrangement of the commercial vehicle comprises at least one axle device, wherein the at least one axle device is assembled from a plurality of modules. The axle device is in particular assembled from the actual wheel axle with the vehicle road wheels, the brakes, the elements of the vehicle suspension, and the shock absorbers. In the production of a running gear arrangement for a commercial vehicle semi-trailer, for example, three axle devices are fastened to the vehicle frame of the commercial vehicle semi-trailer, this in most instances taking place by screw-fitting or in some instances also by welding.

A protective cap for a piston of a disc brake with a partial pad, having a ring made from an elastic material, is derived from DE 21 34 940 A1 The ring on the external ring circumference is fixedly connectable to the brake cylinder housing. The ring furthermore has a ring crease which fits into an annular space configured between the

cylinder wall and an annular shoulder on the disc-proximal piston end, the inner rim thereof being supported on the piston. The opening of the ring is provided with a sheet metal disc which all around is tightly connected to the inner rim of the ring. Furthermore, a sheet metal ring is welded to the sheet metal disc, wherein the sheet metal ring covers the elastic ring up to the outer rim of the latter and protects the elastic ring against the thermal radiation of a brake shoe.

A generic disc brake and plate arrangement for a disc brake is known from DE 20 2006 021 267 U1. It proposes a shield element in the form of a funnel to protect the bellows. As the funnel shape is rather unfavorable in the area of the elements transmitting the brake pressure, additional pressure pieces are attached to the rear of the brake pad support plate. Due to their thickness, the additional pressure pieces offer the advantage that no braking forces influence the funnel-shaped shield element. However, the additional pressure pieces lead to an increased overall length when applying the disk brake.

DE 31 43 165 A1 and WO 2010/049133 A1 also disclose ring-shaped metallic elements in the area between a bellows to be protected and the immediately adjacent brake pad of the disc brake.

The invention is based on the object of providing an improved sheet metal arrangement for a disc brake as well as an improved disc brake having a sheet metal arrangement.

In order for the object to be achieved, a disc brake having the features of claim 1 as well as a sheet metal arrangement having the features of claim 7 are proposed. Further advantageous embodiments are to be derived from the dependent claims.

A disc brake for a vehicle according to the invention has the features of claim 1.

A brake application device is understood to be those components of the disc brake by means of which the drive force generated by a force element, for example a compressed-air cylinder, is converted to a clamping force which acts on the brake pads. In the case of air-operated disc brakes, this brake application device includes a pressure-boosting brake lever pivotably mounted in the brake calliper housing.

A sheet metal arrangement according to the invention for a disk brake of a vehicle has the features of claim 7.

In other words, the at least one cut-out is provided for generating a structural weakness in the sheet metal ring, wherein the flexural rigidity of the sheet metal ring is reduced on account thereof, and the sheet metal ring thus can be more readily elastically deformed. On account of the reduction in terms of the flexural rigidity of the sheet metal ring, the materially integral connection, or the connection point, respectively, between the sheet metal plate and the sheet metal ring is protected against an increase in terms of a force acting thereon in that a force introduced into the sheet metal ring is converted to a deformation of the sheet metal ring. Furthermore,

the flexural rigidity as well as the properties of thermal insulation or thermal reflection, respectively, can be set in a targeted manner by way of a targeted selection of the material of the sheet metal ring, so as to increase the protection of the bellows. The sheet metal ring is preferably configured from a spring steel. The sheet metal ring can preferably at least in part have a heat-resistant, in particular heat-reflecting, coating.

The sheet metal plate and the sheet metal ring are in particular connected to one another by welding or adhesive bonding, wherein the weld seam or the adhesive joint, respectively, is preferably configured in an encircling manner. Alternatively, a plurality of weld seam portions or adhesive joint portions, respectively, can be disposed so as to be uniformly distributed across the circumference between the sheet metal plate and the sheet metal ring, so as to configure the sheet metal arrangement.

Preferably, the sheet metal ring has a cylindrical portion and an annular disc-shaped portion in one piece. The cylindrical portion can be formed essentially perpendicular to the annular disc-shaped portion. In particular, the sheet metal ring is produced by cold forming, wherein the cylindrical portion is preferably deep-drawn. Due to its function, the cylindrical portion has, in particular, a higher flexural rigidity than the annular disc-shaped portion, because the cylindrical portion is intended to hold the sheet metal ring.

An encircling annular gap is preferably configured between the cylindrical portion and a longitudinal

portion of the pressure piece that is disposed in the cylindrical portion. Consequently, the cylindrical portion of the sheet metal ring is not supported on a circumferential face of the pressure piece.

The bellows is preferably fastened to the cylindrical portion of the sheet metal ring by means of a clamping ring. The bellows thus comes to bear in a radial manner on an external circumferential face of the cylindrical portion, wherein the clamping ring secures the second end region of the bellows on the cylindrical portion of the sheet metal ring in a positionally fixed manner, consequently in relation to an axial displacement as well as in relation to rotation. In particular, a further clamping ring which secures a first end region of the bellows on the brake caliper housing is provided. An annular sheet metal receptacle plate is preferably disposed between the brake caliper housing and the bellows so as to be in an opening of the brake caliper housing.

Furthermore preferably, a disc having a non-stick effect is disposed on the annular disc-shaped portion, between the bellows and the annular disc-shaped portion. Consequently, the disc at least in part has a non-stick configuration, or non-stick properties, respectively. For example, at least an end face of the disc that is oriented towards the bellows has a non-stick coating. At least an end face of the disc that is oriented toward the annular disc-shaped portion preferably has a heat-resistant, in particular heat-reflecting, coating. The disc is in particular configured from a plastics material. The disc, or the coating on the disc, is

preferably at least partially or completely comprised of polytetrafluoroethylene (PTFE). The disc thus serves for preventing the bellows from adhering or sticking in the case of contact, on the one hand, and for further reducing the thermal radiation in the direction of the bellows, on the other hand.

The disc having the non-stick effect is in particular connected to the sheet metal ring in a materially integral and/or form-fitting manner. For example, at least the annular disc-shaped portion is coated, overmolded or overcast with a plastics material that configures the disc in such a manner that at least the end face that is oriented toward the bellows has non-stick properties.

According to one preferred embodiment, the annular disc-shaped portion in the direction toward the bellows is disposed so as to be axially recessed in relation to the sheet metal plate. In other words, the annular disc-shaped portion is disposed in a first plane, and the sheet metal plate is disposed in a second plane, wherein the two planes are configured so as to be substantially parallel and thus are not identical. Consequently, the two planes are mutually spaced apart by a gap, wherein the axial spacing between the two planes represents the gap, or the offset, respectively, between the annular disc-shaped portion and the sheet metal plate. Under normal conditions, this gap prevents any contact between the annular disc-shaped portion and the first brake pad.

A plurality of cut-outs can be configured on the annular disc-shaped portion so as to be uniformly distributed in

the circumferential direction. The cut-outs are preferably disposed so as to be uniformly distributed in the circumferential direction and so as to be mutually adjacent on at least one circular path. The uniform distribution of the cut-outs on the annular disc-shaped portion enables the flexural rigidity of the annular disc-shaped portion to be set in a homogeneous and thus uniform manner.

The cut-outs are preferably configured in the shape of elongate slots or slits. For example, the cut-outs can be configured so as to be of different sizes or lengths, respectively. All cut-outs are preferably configured so as to be mutually identical.

Furthermore preferably, the cut-outs extend predominantly in the circumferential direction.

The cut-outs are in particular filled with the plastics material that forms the disc. In other words, at least the annular disc-shaped portion of the sheet metal ring is overmolded with plastics material in such a manner that the plastics material penetrates and closes the cut-outs. The flexibility of the annular disc-shaped portion is preserved herein.

Further measures improving the invention are shown in more detail below together with the description of preferred embodiments of the invention with reference to the figures, in which:

FIG. 1 shows a simplified schematic sectional illustration of a partially illustrated disc

brake according to the invention having a sheet metal arrangement according to the invention, wherein a brake pad of the disc brake is not yet worn;

FIG. 2 shows a simplified schematic sectional illustration of the partially illustrated disc brake according to the invention and according to FIG. 1, wherein the brake pad of the disc brake is heavily worn;

FIG. 3 shows a simplified schematic view of the end side of the sheet metal arrangement according to the invention and according to FIG. 1 and FIG. 2;

FIG. 4 shows a simplified schematic view of the end side of a non-inventive sheet metal arrangement; and

FIG. 5 shows a simplified schematic view of the end side of the sheet metal arrangement according to the invention.

Fig. 1 shows a disc brake, in particular a pneumatic disc brake for a vehicle, especially a commercial vehicle. Components of the disc brake are a brake caliper, not shown, which can be designed as a fixed caliper or as a floating caliper, and a brake disc 1, on both sides of which brake pads 2a, 2b are arranged in the brake caliper. The brake pads 2a, 2b each consist of a friction pad 14a, 14b and a pad support plate 15a, 15b on the rear. When the disc brake is actuated, the friction pads

14a, 14b come into abutment with the brake disc 1 in order to generate a frictional torque for braking the vehicle. The brake caliper, which is not shown, consists of a brake caliper bridge, which surrounds the brake disc 1 in a U-shape, and a brake caliper housing 6, of which only a sheet metal part is shown in Fig. 1 and Fig. 2. A brake calliper housing 6 of the brake calliper contains a brake application device.

A readjustment installation is moreover a component part of the disc brake. The readjustment installation serves for compensating the play of the disc brake which increases as a result of the ongoing wear on the brake pads 2a, 2b and the brake disc 1. As the disc brake is being readjusted, a pressure piece 3 which is a component part of the brake application device is repositioned along the longitudinal central axis 4 thereof toward the brake disc 1 over time. This becomes particularly evident when comparing FIG. 1 and FIG. 2.

According to FIG. 1, the brake pads 2a, 2b of the disc brake are not yet worn, wherein the pressure piece 3 is completely retracted. As per FIG. 2, the brake pads 2a, 2b of the disc brake are heavily worn, wherein the pressure piece 3 is completely deployed.

The pressure piece 3 is configured so as to be substantially rotationally symmetrical. On the external side thereof, on part of the length thereof, it is provided with an external thread 16 and conjointly with a threaded nut, not illustrated here, forms a screw drive. A rotation of the pressure piece 3, which is configured as a threaded spindle, takes place during the

readjustment for example, wherein the pressure piece 3 is furthermore imparted a translatory movement along the longitudinal central axis 4 toward the brake disc 1 so as to correct the play. The threaded nut is fixed stationary. Since the pressure piece 3 moves out of the brake caliper housing 6 as the wear on the pad increases, a protection of the interior of the brake caliper housing 6 against external contamination is required to meet this potential for movement. This is because an atmosphere which is heavily charged with dust and humidity prevails specifically in the region of the brake pads 2a, 2b. For this reason, the brake caliper housing 6 is provided with a seal in relation to the first brake pad 2a, which is onboard the vehicle. This seal is assembled substantially from a deformable bellows 5 which is inserted in an opening of the brake caliper housing 6 and from a sheet metal arrangement 7 which closes the bellows 5 toward the brake disc 1. The bellows 5, which is comprised of rubber or an elastomer, by way of a first end region 5a is fastened to the brake caliper housing 6 so as to be secured against rotation. This fastening presently takes place by means of a clamping ring 12b which clamps the first end region 5a in relation to the surrounding opening of the brake caliper housing 6. The bellows 5 by way of the second end region 5b thereof is fastened to the sheet metal arrangement 7 so as to be secured against rotation by way of a further clamping ring 12a.

The sheet metal arrangement 7 is comprised of a sheet metal plate 8 and a sheet metal ring 9 which is disposed so as to be coaxial with the sheet metal plate 8 and connected to the sheet metal plate 8 in a materially integral manner. The sheet metal plate 8 is disposed

between an end side of the pressure piece 3 and the first brake pad 2a, and has a brake pad pressure face 17a as well as a contact face 17b for the pressure piece 3 that is configured opposite the brake pad pressure face 17a. The brake pad pressure face 17a comes to bear on the pad support plate 15a of the first brake pad 2a, and the contact face 17b for the pressure piece 3 comes to bear on the pressure piece 3. The pressure piece 3 is disposed so as to be freely movable in the longitudinal direction in relation to the sheet metal plate 8.

The sheet metal ring 9 is disposed between the bellows 5 and the first brake pad 2a for protecting the bellows 5 against thermal radiation which is generated on the brake pads 2a, 2b and the brake disc 1 by braking procedures.

The sheet metal ring 9 has a substantially cylindrical portion 9a and a flat, annular disc-shaped portion 9b, wherein the cylindrical portion 9a is configured so as to be substantially perpendicular to the annular disc-shaped portion 9b and is integrally connected to the latter. Presently, the bellows 5 is fastened to the cylindrical portion 9a of the sheet metal ring 9 by means of the clamping ring 12a. The disc-shaped portion 9b is disposed in the radial extension of the sheet metal plate 8. At the same time, the disc-shaped portion 9b in the direction toward the bellows 5 is disposed so as to be slightly axially recessed in relation to the sheet metal plate 8 so that a heat shield face 18 of the disc-shaped portion 9b that is oriented toward the first brake pad 2a typically does not come to bear on the first brake pad 2a.

An encircling annular gap 19 is configured between the cylindrical portion 9a and a longitudinal portion of the pressure piece (FIG. 2). Consequently, the cylindrical portion 9a of the sheet metal ring 9 is not externally supported on the circumferential face of the pressure piece 3. The pressure piece 3 can thus freely rotate during readjustment, without the sheet metal ring 9 conjointly rotating.

Under certain circumstances, contact between the first brake pad 2a and the sheet metal ring 9 can arise on account of contamination, for example. In the case of such contact, the connection point between the sheet metal plate 8 and the sheet metal ring 9 must be protected against stress by deformation, so as to prevent any damage to the materially integral connection. To this end, the sheet metal ring 9 has a plurality of cut-outs 11 which are provided for reducing the flexural rigidity of the sheet metal ring 9. These cut-outs 11 are more clearly illustrated in FIG. 3. Furthermore, further exemplary embodiments for the cut-outs 11 are illustrated in FIG. 4 and FIG. 5. Under certain circumstances, it may also arise that the annular disc-shaped portion 9b of the sheet metal ring 9, by virtue of the reduced flexural rigidity thereof, is elastically deformed under the influence of force, for example by contamination, in such a manner that the annular disc-shaped portion 9b comes to bear on the bellows 5. In order for the bellows 5 to be even better protected against the thermal radiation during braking procedures, or to further reduce the thermal radiation acting on the bellows 5, respectively, a disc 13 is disposed on the end side on the annular disc-shaped portion 9b, so as to be between the bellows 5

and the disc-shaped portion 9b. This disc 13 in the present case is configured from a plastics material having a non-stick effect so as to additionally prevent the bellows 5 from sticking during contact with the disc 13. In other words, the disc 13 reduces the thermal radiation from the first brake pad 2a toward the bellows 5, on the one hand, and enables the bellows 5 to be released without any residue upon contact with the disc 13, on the other hand.

According to FIG. 2, the brake pad 2a of the disc brake is heavily worn. In particular, the friction pads 14a, 14b as well as the brake disc 1 have been worn through use, wherein only the first friction pad 14a is presently illustrated. The pressure piece 3 is therefore fully deployed. The bellows 5 is likewise completely deployed. The first end region 5a of the bellows 5 herein has remained on the brake caliper housing 6, and the second end region 5b of the bellows 5, conjointly with the sheet metal arrangement 7 and the disc 13, has been axially displaced along the longitudinal central axis 4 by the pressure piece 3.

FIG. 3 shows the sheet metal arrangement 7 according to FIG. 1 and FIG. 2 in isolation, wherein the view takes place at the end side onto the brake pad pressure face 17a of the sheet metal plate 8 and the heat shield face 18 of the sheet metal ring 9. By virtue of the illustration of the end side, only the annular disc-shaped portion 9b of the sheet metal ring 9 is visible. A plurality of cut-outs 11 are configured so as to be uniformly distributed in the circumferential direction in the annular disc-shaped portion 9b. The cut-outs 11 are

configured in the shape of elongate slots and extend in a bent or curved manner, respectively, in the circumferential direction. In other words, the cut-outs 11 are disposed so as to be uniformly distributed in the circumferential direction and so as to be mutually adjacent on a shared circular path.

Fig. 4 shows an isolated sheet metal arrangement 7 not according to the invention. The view is from the end side onto the brake pad pressure face 17a of the sheet metal plate 8 and the heat shield face 18 of the sheet metal ring 9. By virtue of the illustration of the end side, only the annular disc-shaped portion 9b of the sheet metal ring 9 is visible. A plurality of cut-outs 11 are configured so as to be uniformly distributed in the circumferential direction in the annular disc-shaped portion 9b. The cut-outs 11 are radial slots. In the radial direction, they extend inward from the external circumference of the annular disc-shaped portion 9b. With a view to a positive elasticity and flexural capability, the length of the outwardly open slots 11 is more than half the radial extent of the annular disc-shaped portion 9b.

FIG. 5 shows a third embodiment of the sheet metal arrangement 7 in isolation, wherein the view is from the end side onto the brake pad pressure face 17a of the sheet metal plate 8 and the heat shield face 18 of the sheet metal ring 9. By virtue of the illustration of the end side, only the annular disc-shaped portion 9b of the sheet metal ring 9 is visible. A plurality of cut-outs 11 are configured so as to be uniformly distributed in the circumferential direction in the annular disc-shaped

portion 9b. The cut-outs 11 are configured in the shape of elongate slots and extend in a bent or curved manner, respectively, in the circumferential direction. The cut-outs 11 according to FIG. 5 are configured so as to be narrower than the cut-outs 11 according to FIG. 3, wherein the cut-outs 11 according to FIG. 5 are disposed so as to be distributed on two circular paths. The cut-outs 11 on the outer circular path in the circumferential direction are configured so as to be slightly longer than the cut-outs 11 on the inner circular path. Furthermore, the cut-outs 11 on the outer circular path are configured so as to be out-of-phase, or so as to be offset in the circumferential direction, respectively, in relation to the cut-outs 11 on the inner circular path.

LIST OF REFERENCE SIGNS

1	Brake disc
2a, 2b	Brake pad
3	Pressure piece
4	Longitudinal central axis
5	Bellows
5a, 5b	End region
6	Brake caliper housing
7	Sheet metal arrangement
8	Sheet metal plate
9	Sheet metal ring
9a	Cylindrical portion
9b	Annular disc-shaped portion
10	Pressure piece
11	Cut-out
12a, 12b	Clamping ring
13	Disc

14a, 14b	Friction pad
15a, 15b	Pad support plate
16	External thread
17a	Brake pad pressure face
17b	Contact face for the pressure piece
18	Heat shield face
19	Annular gap

Patentkrav

1. Skivebremse til et køretøj, med en første og anden bremsebelægning (2a, 2b) samt en bremseskive (1) anbragt derimellem og en bremsekaliber, der griber ind over bremseskiven (1), med et bremsekaliberhus (6), i hvilket der er anbragt en tilspændingsanordning, hvor tilspændingsanordningen omfatter et trykstykke (3), som kan tilspændes mod den første bremsebelægning (2a), hvor der er tilvejebragt en foldebælg (5) til at beskytte det indre af bremsekaliberhuset (6) mod urenheder, hvor foldebælgen (5) er fastgjort med et første endeområde (5a) på bremsekaliberhuset (6) og med et andet endeområde (5b) på en metalpladeindretning (7) af en metalplade (8) og en metalpladering (9) anbragt koaksialt hertil samt fast forbundet hermed, hvor metalpladen (8) er anbragt mellem en endeside af trykstykket (3) og den første bremsebelægning (2a), hvor metalpladeringen (9) er anbragt mellem foldebælgen (5) og bremsebelægningen (2a) til at beskytte foldebælgen (5) mod varmestråling, der genereres ved bremseprocesser på bremsebelægningerne (2a, 2b) og bremseskiven (1), kendetegnet ved, at metalpladeringen (9) har et ringskiveformet afsnit (9b), som er anbragt i radial forlængelse af metalpladen (8), og udsparinger (11) udformet som lange huller til reducering af sin bøjningsstivhed, og at udsparingerne (11) er jævnt fordelt i omkredsretningen og er udformet ved siden af hinanden på mindst en cirkelbane på det ringskiveformede afsnit (9b).

2. Skivebremse ifølge krav 1, kendetegnet ved, at metalpladeringen (9) har et cylindrisk afsnit (9a) udført i ét stykke med det ringskiveformede afsnit (9b), som i det væsentlige er udformet vinkelret på det ringskiveformede afsnit (9b).

3. Skivebremse ifølge krav 2, kendetegnet ved, at metalpladeringen (9) med det cylindriske afsnit (9a) omslutter et længdeafsnit af trykstykket (3).

4. Skivebremse ifølge krav 2 eller 3, kendetegnet ved, at foldebælgen (5) er fastgjort på metalpladeringens (9) cylindriske afsnit (9a) ved hjælp af en spændering (12a).

5. Skivebremse ifølge et af kravene 1 til 4, kendetegnet ved, at der mellem foldebælgen (5) og det ringskiveformede afsnit (9b) er anbragt en skive (13)

med anti-klæbende funktion på det ringskiveformede afsnit (9b).

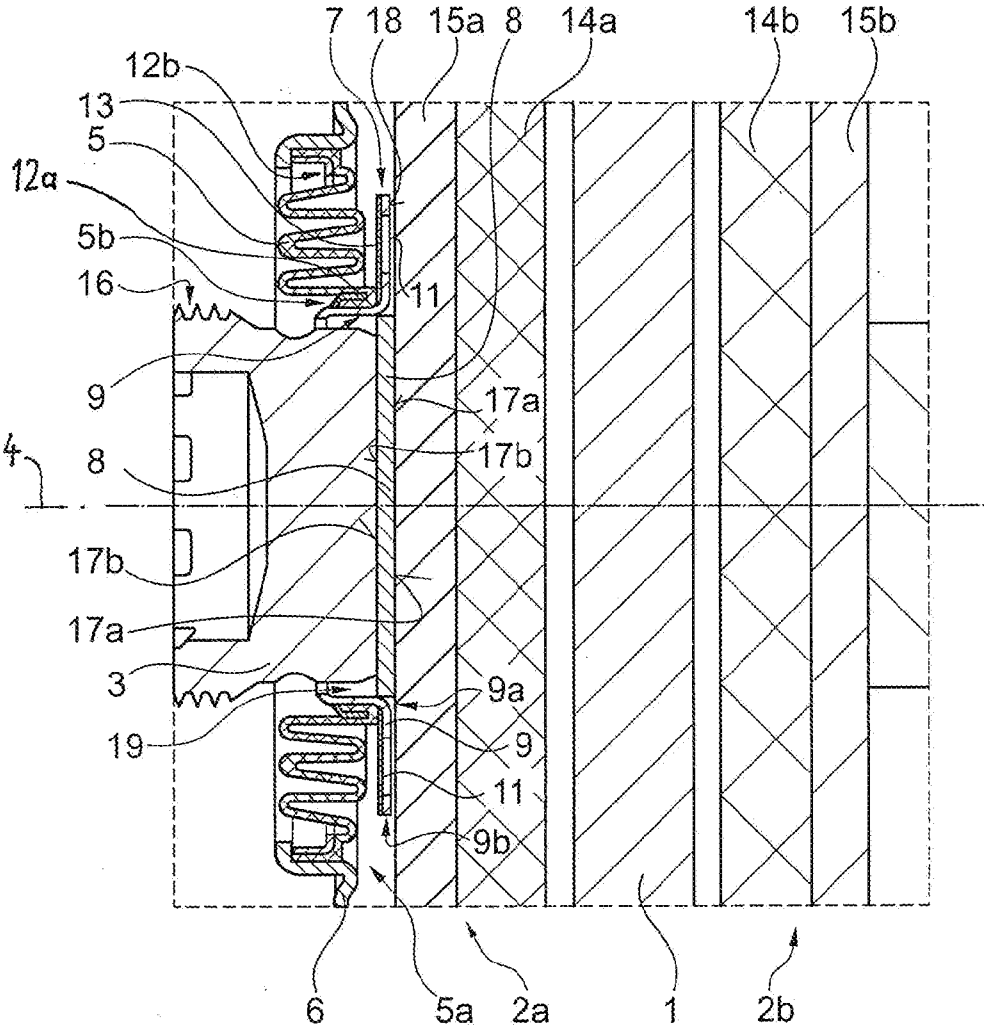
6. Skivebremse ifølge et af kravene 1 til 5, kendetegnet ved, at det ringskiveformede afsnit (9b) i forhold til metalpladen (8) er anbragt aksialt tilbagetrukket i retning mod foldebælgen (5).

7. Metalpladeindretning (7) til en skivebremse på et køretøj, omfattende en central metalplade (8) og en metalpladering (9), anbragt koaksialt i forhold hertil og fast forbundet hermed, hvor metalpladen (8) er tilvejebragt til at være anbragt mellem en endeside af et trykstykke og en bremsebelægning, hvor metalpladeringen (9) er tilvejebragt til at være anbragt mellem en foldebælg og bremsebelægningen og anvendes til at beskytte foldebælgen mod varmestråling, kendetegnet ved, at metalpladeringen (9) har et ringskiveformet afsnit (9b), som er anbragt i radial forlængelse af metalpladen (8), og har udsparinger (11), udformet som lange huller, til reducering af sin bøjningsstivhed, og at udsparingerne (11) er jævnt fordelt i omkredsretningen og er udformet ved siden af hinanden på mindst en cirkelbane på det ringskiveformede afsnit (9b).

8. Metalpladeindretning ifølge krav 7, kendetegnet ved, at metalpladeringen (9) har et cylindrisk afsnit (9a) udført i ét stykke med det ringskiveformede afsnit (9b), som i det væsentlige er udformet vinkelret på det ringskiveformede afsnit (9b).

9. Metalpladeindretning (7) ifølge et af kravene 7 eller 8, kendetegnet ved, at der på det ringskiveformede afsnit (9b) er anbragt en skive (13) med anti-klæbende funktion.

10. Metalpladeindretning ifølge et af kravene 7 til 9, kendetegnet ved, at det ringskiveformede afsnit (9b) i forhold til metalpladen (8) er anbragt aksialt tilbagetrukket i retning mod foldebælgen (5).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18
15a
8
14a
14b
15b
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13
5
12a
5b
16
11
9
17a
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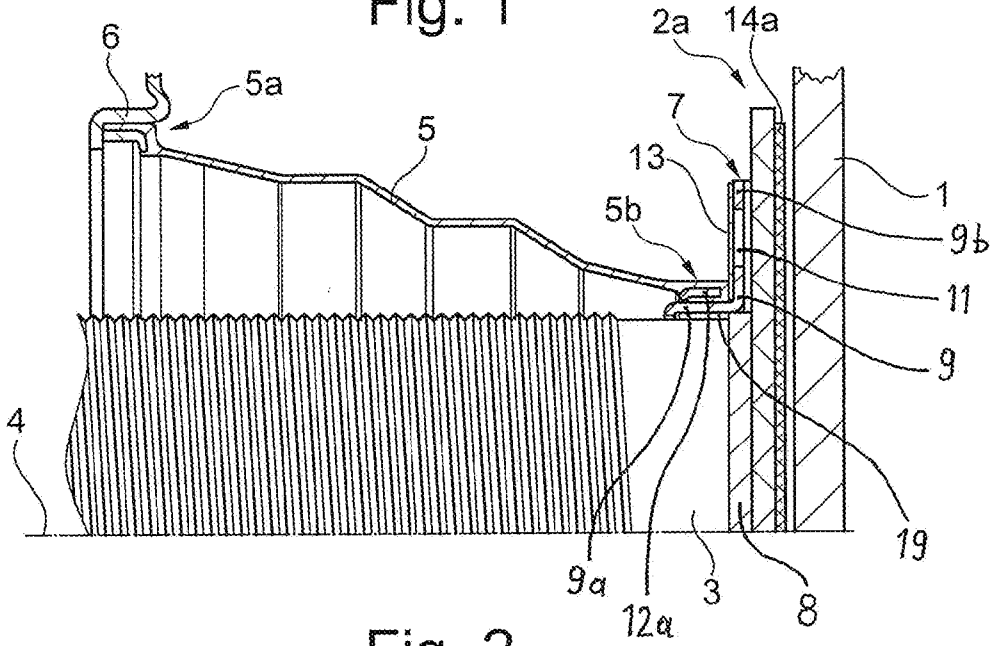
2a
1
2b

Fig. 1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5a
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4
9a
12a
3
8

Fig. 2

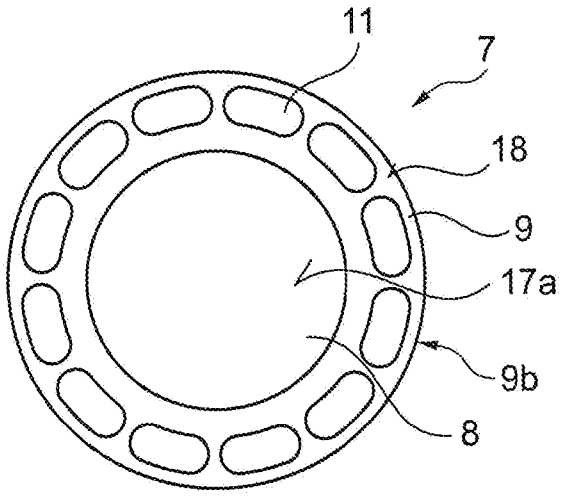

Fig. 3

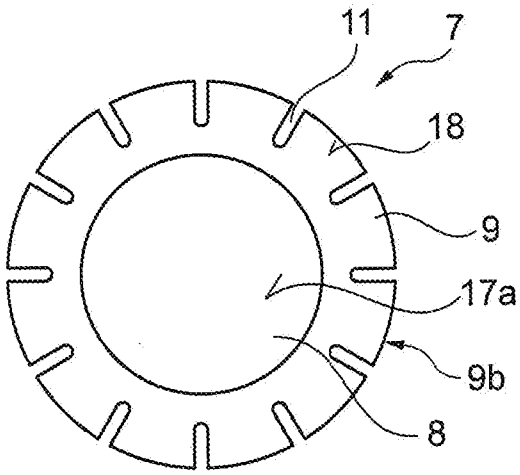

Fig. 4

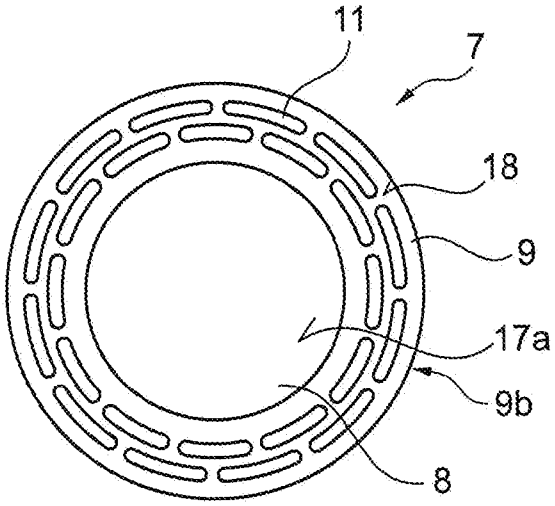

Fig. 5