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(54) Title: DISK BRAKE, IN PARTICULAR FOR A UTILITY VEHICLE, AND BRAKE LINING FOR A DISK BRAKE

(54) Bezeichnung : SCHEIBENBREMSE, INSBESONDERE FÜR EIN NUTZFAHRZEUG, SOWIE BREMSBELAG FÜR EINE SCHEIBENBREMSE

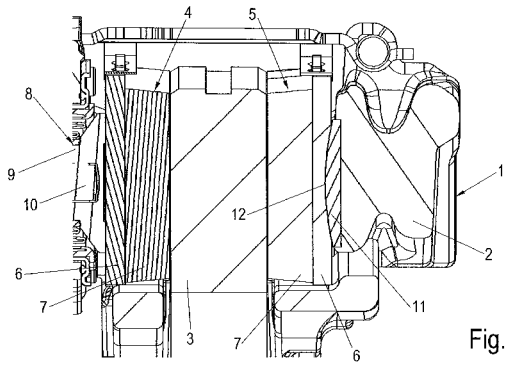

Fig. 1

(57) Abstract: The invention relates to a disk brake, in particular for a utility vehicle, comprising a brake caliper (1), which reaches over a brake disk (3) and in which brake linings (4, 5) are positioned that can be pressed against the brake disk (3) on both sides by means of at least one brake application device and that each have a lining carrier plate (6) and a friction lining (7) fastened thereto, wherein the brake application device has at least one brake piston (8) that acts on the lining carrier plate (6) at the end face of the brake piston. Said disk brake is designed in such a way that at least one of the brake linings (4, 5) is supported in an articulated, preferably tiltable manner in the radial direction of the brake disk (3).

(57) Zusammenfassung:

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Eine Scheibenbremse, insbesondere für ein Nutzfahrzeug, mit einem eine Bremsscheibe (3) übergreifenden Bremssattel (1), in dem beidseitig mittels wenigstens einer Zuspanneinrichtung gegen die Bremsscheibe (3) pressbare, jeweils eine Belagträgerplatte (6) und einen darauf befestigten Reibbelag (7) aufweisende Bremsbeläge (4, 5) positioniert sind, wobei die Zuspanneinrichtung mindestens einen, stirnseitig an der Belagträgerplatte (6) angreifenden Bremsstempel (8) aufweist, ist so ausgebildet, dass zumindest einer der Bremsbeläge (4, 5) in radialer Richtung der Bremsscheibe (3) gelenkig, vorzugsweise kippbar gelagert ist.

Disk brake, in particular for a utility vehicle, and brake lining for a disk brake

The invention relates to a disk brake, in particular for a utility vehicle, according to the preamble of claim 1 and to a brake lining for a disk brake.

To brake a vehicle, brake linings are pressed with their friction linings against a brake disk on both sides by means of a pneumatically or electromotively driven brake application device, frictional heat arising due to conversion of the kinetic energy and resulting in considerable heating of the brake disk.

This introduction of heat causes radial expansion of the brake disk which is usually of ring-shaped design.

In conventional brake disks with a tubular or conical neck portion, however, this expansion is obstructed, and because of this the brake disk is deformed reversibly in a way also likened to an "umbrella".

High thermal load, in conjunction with a suppressed radial expansion of the brake disk, may lead to high mechanical compressive stresses with the overshooting of the material yield strength. Upon cooling and when the stresses are reduced, overshooting of the tensile strength of the material may then occur, thus giving rise to surface cracks which are propagated ever further.

On the other hand, the "umbrella" action results in an uneven contact pattern of the brake linings, along with a concentration in the introduction of heat and local overheating of the brake disk.

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In order to prevent this, solutions have already been proposed in which a structural separation of the friction ring of the brake disk from the brake disk neck allows uniform expansion, as a result of which not such high stresses occur in the material and the brake disk remains flat. However, these solutions can be implemented only with considerable outlay in manufacturing terms.

Optimization of the introduction of heat, particularly in order to prevent local overheating of the brake disk, is achieved by means of an elastic isobar brake lining, as it is known, which, however, necessitates a highly complicated and space-consuming lining concept and, moreover, is also suitable only for low brake application forces, such as take effect in the case of railroad brakes.

The object on which the invention is based is to develop further a disk brake and a brake lining of the generic type, such that the functional reliability of the disk brake is improved and the service life both of the brake disk and of the brake linings is prolonged.

In a first aspect, the present invention provides a disk brake, in particular for a utility vehicle, with a brake caliper which engages over a brake disk and in which brake linings capable of being pressed against the brake disk by means of a pneumatically or electromotively driven brake application device and having in each case a lining carrier plate and a friction lining fastened thereon, are positioned on both sides, the brake application device having at least one brake piston engaging on the lining carrier plate on the end face, wherein at least one of the brake linings is mounted in an articulated manner in the radial direction of the brake disk, the lining carrier plate and a thrust piece of the brake piston or a rear wall of the brake caliper having tilting elements corresponding to one another the tilting elements being composed of an elevation and of a recess adapted thereto the elevation being formed convexly in cross section; and wherein the elevation, is in the form of a strip shape, and is arranged in the lining carrier plate or an

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adjacent thrust plate, the thrust piece or the rear wall.

In a second aspect, the present invention provides a brake lining for a disk brake, with a lining carrier plate and with a friction lining fastened thereon, the lining carrier plate having at least one recess with a curved base, the recess being designed as a channel extending over the length of the lining carrier plate.

The invention makes it possible to have a thermally induced radial expansion of the brake disk, so that the effects described above when this expansion is obstructed cannot occur. The mounting of the brake linings corresponds in its action to the part-lining brake disks mentioned, but, in contrast to these, in terms of its load-bearing capacity, that is to say the ability to transmit brake application forces, is unchanged, as compared with the brake linings conventionally used in utility vehicles.

In addition to more uniform heat and pressure distribution during the umbrella action of the brake disk, with an optimal design oblique radial wear of the brake disk and brake linings, such as has occurred hitherto, can also be reduced.

It should be emphasized especially that the invention can be implemented at a low outlay in structural and manufacturing terms, that is to say is basically cost-neutral.

Against this, there are the substantially longer service life of the brake disk and a gain in terms of functional reliability. This is due, above all, to the fact that the formation of cracks in the brake disk or brake disk ring is avoided and there is no need for a premature exchange of the brake disk.

In this context, mention may also be made of the increased operating reliability of the disk brake overall, which arises, in particular, from the fact that the hitherto existing risk of destruction of the brake disk, sometimes even of the entire disk brake, occurring as a result of the formation of cracks during the operation of the disk brake is prevented.

Whereas, in a fixed-caliper disk brake, both brake linings are pressed onto the brake disk by two brake application devices equipped in each case with at least one brake piston, a sliding-caliper disk brake functions according to the reaction principle. In this case, first, an application-side brake lining is pressed by means of the brake application device onto the brake disk which then forms an abutment for the sliding caliper which, at the same time driving the opposite reaction-side brake lining, is pushed opposite to the first application direction, until the

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reaction-side brake lining comes to bear frictionally on the brake disk.

In this case, according to the invention, the reaction-side lining carrier plate is mounted in an articulated manner, preferably tiltably, on the rear wall of the brake caliper, for which purpose the wall of the brake caliper and the lining carrier plate facing said wall are configured correspondingly.

For this purpose, an elevation curved convexly in cross section is integrally formed onto the lining carrier plate or the wall of the brake caliper and matches with a recess, adapted to the contour of the projection, of the opposite part supported thereon. In this case, the elevation extends virtually in the form of a strip in the longitudinal direction of the brake lining transversely to the axis of the brake disk.

Instead of a strip, the lining carrier plate or the wall of the brake caliper may be provided with a plurality of crowned protuberances which engage into spherical-cap-shaped recesses of the opposite side which are adapted thereto.

Such a design is appropriate in the press-on region of the brake piston on the application-side lining carrier plate, the brake piston being composed of an adjusting spindle held rotatably in a bridge and of a thrust piece which is held fixedly in terms of rotation on the lining carrier plate and is connected rotatably to the adjusting spindle and of which the free end face bearing against the lining carrier plate either is shaped as a crowned protuberance or has the spherical-cap-shaped receptacle.

It is also conceivable, however, to tie the thrust piece to the adjusting spindle in an articulated manner in such a way that a tilting movement in the radial direction of the brake disk is possible. In this case, the contact surfaces of the thrust piece and of the lining carrier plate may be planar or have another contour.

The elevation or recess may also be provided, instead of directly on or in the lining carrier plate, in a separate thrust plate bearing against the latter.

Further advantageous designs of the invention are characterized in the subclaims.

Exemplary embodiments of the invention are described below by means of the accompanying drawings in which:

figures 1-3	show various exemplary embodiments of a disk brake according to the invention, in each case in a sectional part view,
figures 4 and 5	show exemplary embodiments of a brake lining according to the invention,
figure 6	shows a detail of the disk brake in a side view.

Figures 1-3 illustrate in each case an extract of a disk brake, in particular for a utility vehicle, with a brake caliper 1 engaging over a brake disk 3 and designed as a sliding caliper with two brake linings 4, 5 which can be pressed against the brake disk 3 on both sides and which have in each case a lining carrier plate 6 and a friction lining 7 fastened thereon.

A brake piston 8 engages in the brake lining 4 arranged on the application side and has an adjusting spindle 9 and a thrust piece 10 which is held rotatably thereon and which bears against the lining carrier plate 6 of the brake lining 4, the brake piston 8 being an integral part of a brake application device, by means of which the brake piston 8 can be pressed against the brake lining 4 and consequently against the brake disk 3 in the event of braking.

In the exemplary embodiment shown in figure 1, the reaction-side brake lining 5 is mounted tiltably in the radial direction of the brake disk 3.

For this purpose, the lining carrier plate 6 has spherical-cap-shaped recesses 12, as can be seen in figure 5 as an exemplary embodiment of the brake lining 5, two recesses 12 being provided here which are arranged at a distance from one another and in which elevations 11, shaped as a crowned protuberance, of a rear wall of the brake caliper 1 are seated.

In this case, the elevations 11 are formed by inserts which are introduced into the wall 2 which are connected thereto positively, frictionally or in a materially integral manner.

In the variant shown in figure 2, to which that shown in figure 4 as a brake lining corresponds, the elevation 11 is designed as a strip which is shaped convexly in cross section and which engages into a recess 12 adapted thereto, extending over the entire length of the lining carrier plate 6 and formed as a channel.

Whereas the elevation 11 may be integrally formed, during casting, into the brake caliper 1 composed of cast iron, the recess 12 in the brake lining according

to figures 4 and 5 can be introduced by cutting or by stamping if the lining carrier plate 6 is composed of sheet metal. With a version as a casting, the recesses 12 are likewise to be introduced during casting. It can be seen in figure 3 that the lining carrier plate 6 of the application-side brake lining 4 is provided, correspondingly to figure 5, with spherical-cap-shaped recesses 12 in which the end faces of crowned shape of the thrust pieces 10 are seated, so that, here too, the brake lining 4 is mounted slidably.

An adjusting spindle 8 having the crowned thrust piece 10 is illustrated as a detail in figure 6.

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Claims

1. A disk brake, in particular for a utility vehicle, with a brake caliper which engages over a brake disk and in which brake linings capable of being pressed against the brake disk by means of a pneumatically or electromotively driven brake application device and having in each case a lining carrier plate and a friction lining fastened thereon, are positioned on both sides, the brake application device having at least one brake piston engaging on the lining carrier plate on the end face,

wherein at least one of the brake linings is mounted in an articulated manner in the radial direction of the brake disk, the lining carrier plate and a thrust piece of the brake piston or a rear wall of the brake caliper having tilting elements corresponding to one another, the tilting elements being composed of an elevation and of a recess adapted thereto the elevation being formed convexly in cross section; and

wherein the elevation, is in the form of a strip shape, and is arranged in the lining carrier plate or an adjacent thrust plate, the thrust piece or the rear wall.

2. The disk brake as claimed in claim 1, wherein the brake lining is tiltably mounted.

3. The disk brake as claimed in claims 1 or 2, **characterized in that** the elevation is held as an insert in the rear wall or the thrust piece.

4. The disk brake as claimed in any one of the preceding claims, **characterized in that** the elevation is integrally formed with the thrust piece.

5. The disk brake as claimed in any one of the preceding claims, **characterized in that** the recess extends over the entire length or a sub region of the lining carrier plate or the thrust plate.

6. The disk brake as claimed in any one of the preceding claims, **characterized in that** the thrust piece is fastened

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tiltably to an adjusting spindle of the brake piston.

7. The disk brake as claimed in any one of the preceding claims wherein the strip shape corresponds to only a portion of the rear surface of the lining carrier plate such that a height of the strip shape is substantially less than an overall height of the lining carrier plate.

8. A brake lining for a disk brake, with a lining carrier plate and with a friction lining fastened thereon, the lining carrier plate having at least one recess with a curved base, the recess being designed as a channel extending over the length of the lining carrier plate.

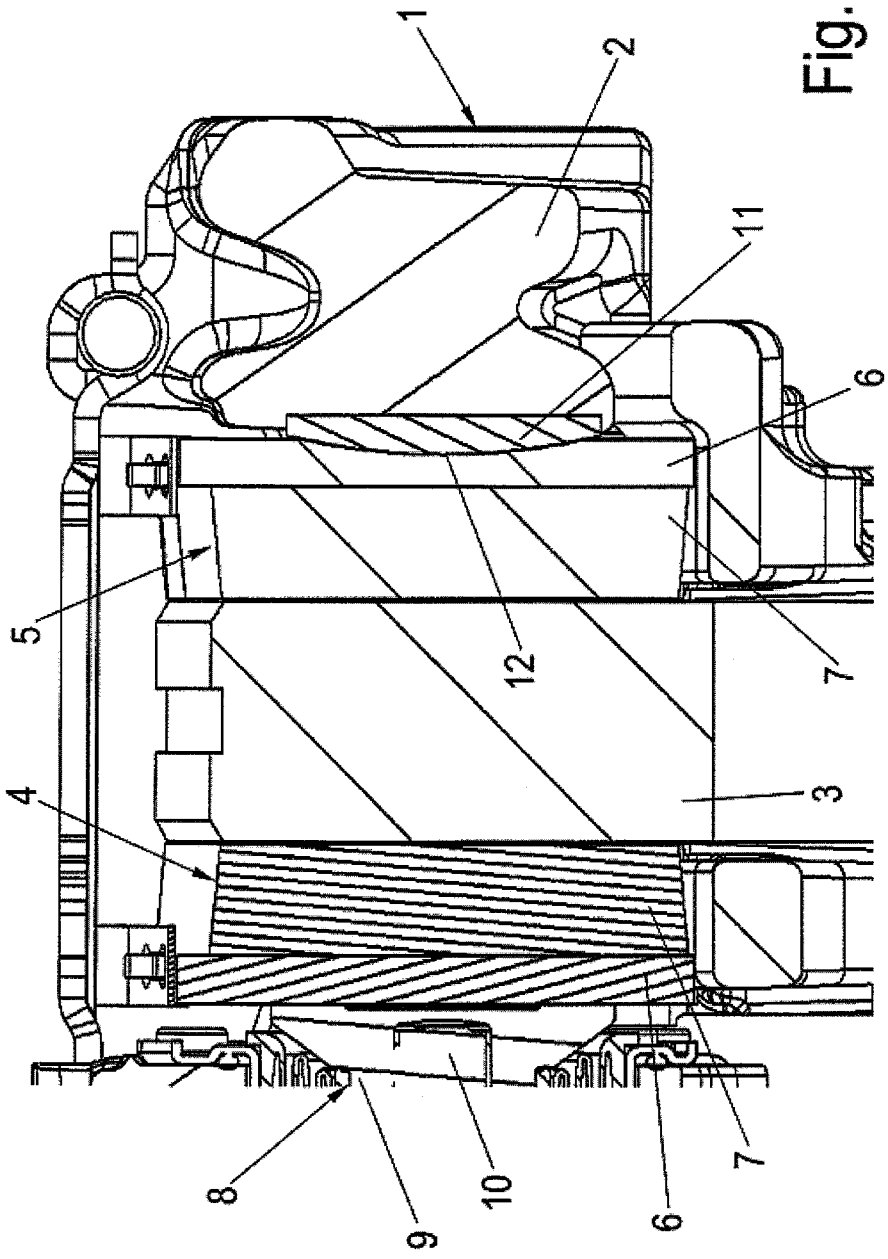


Fig. 1

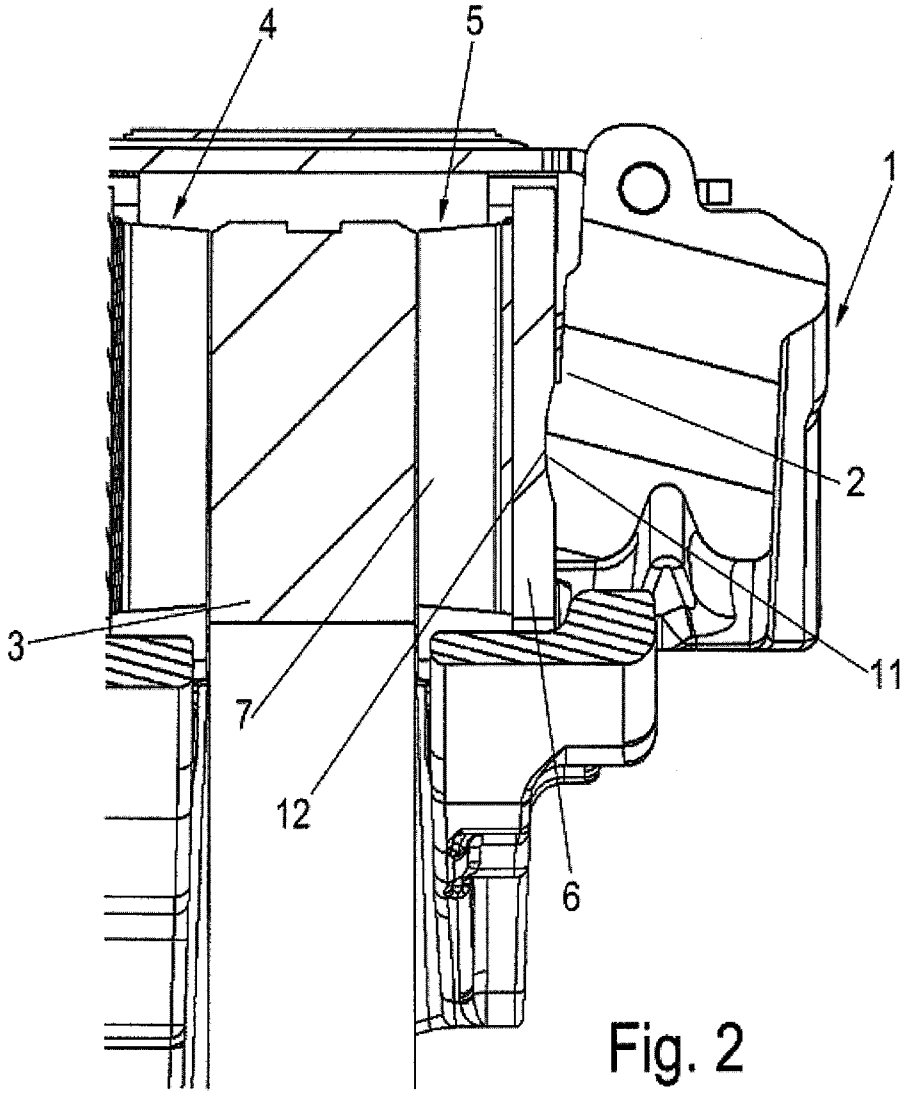
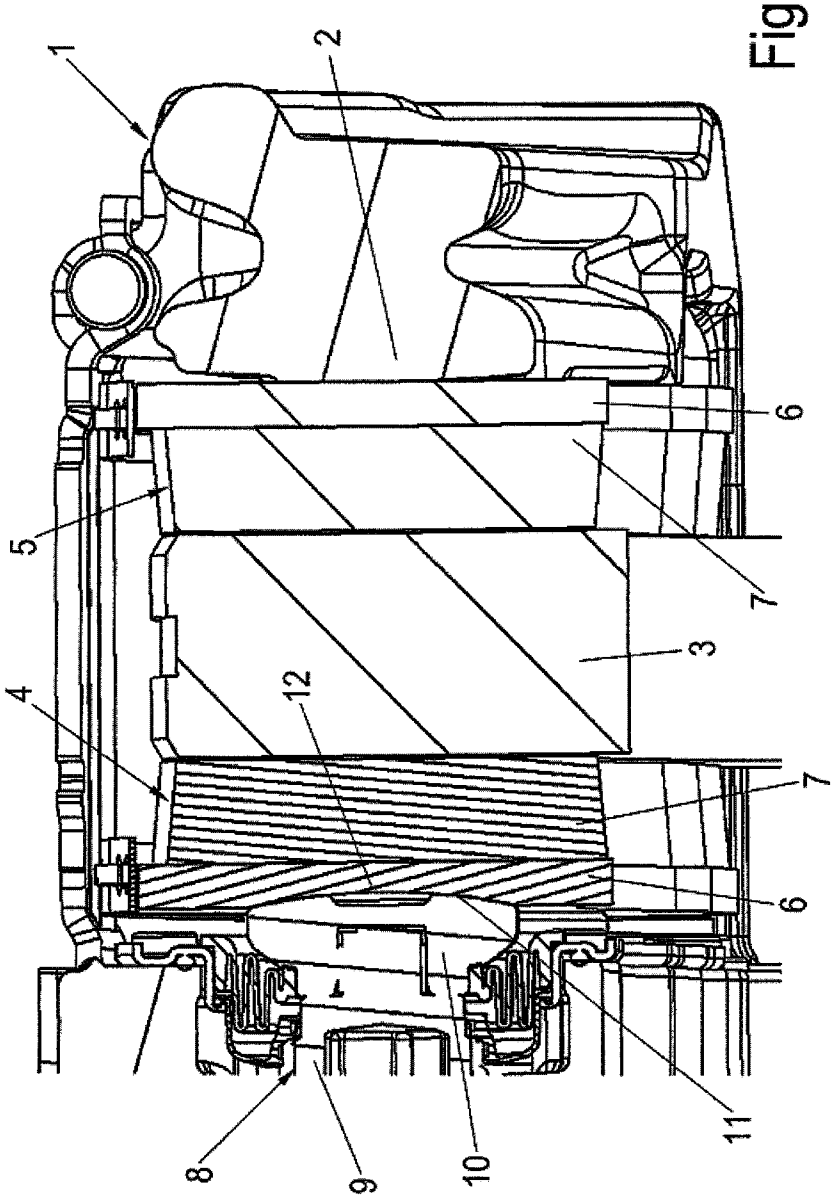


Fig. 2

Fig. 3



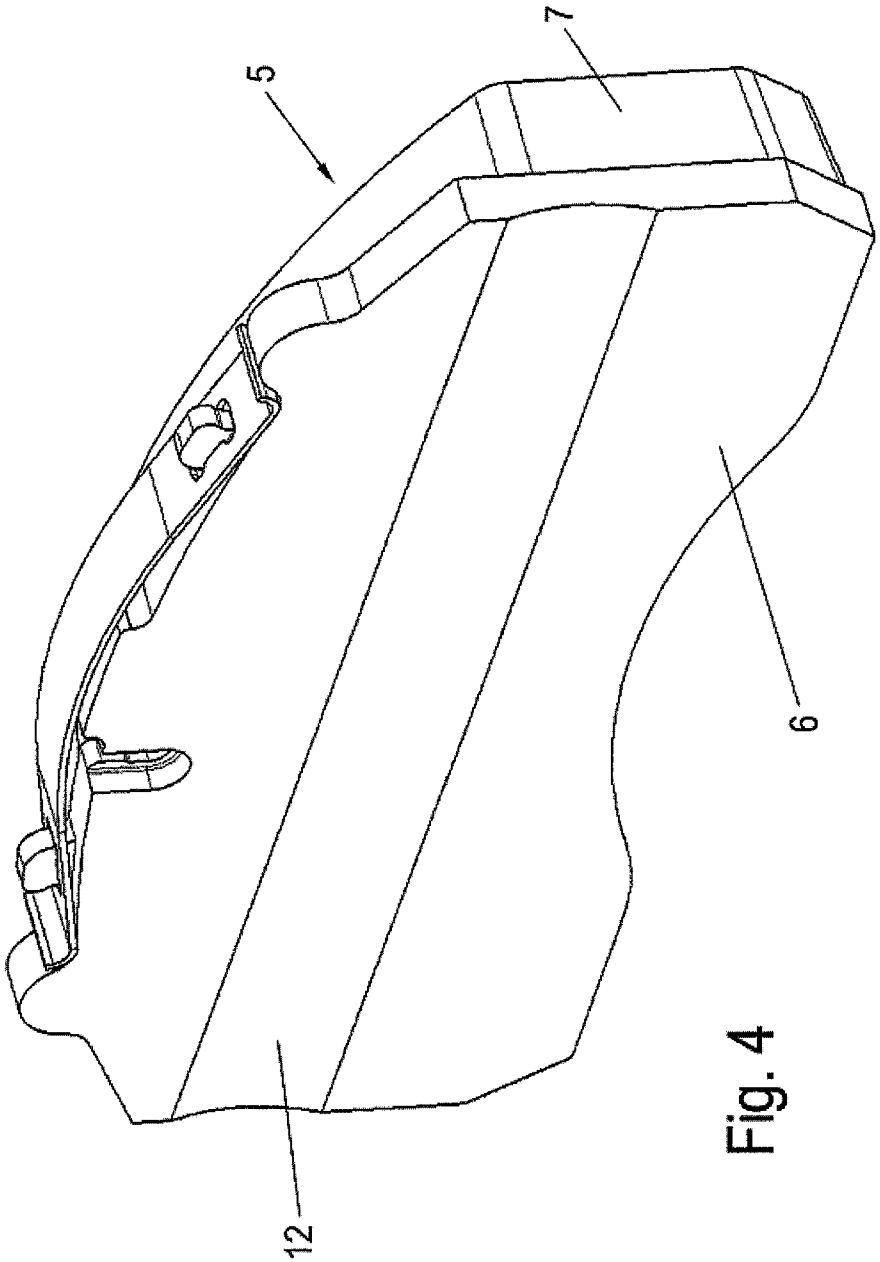


Fig. 4

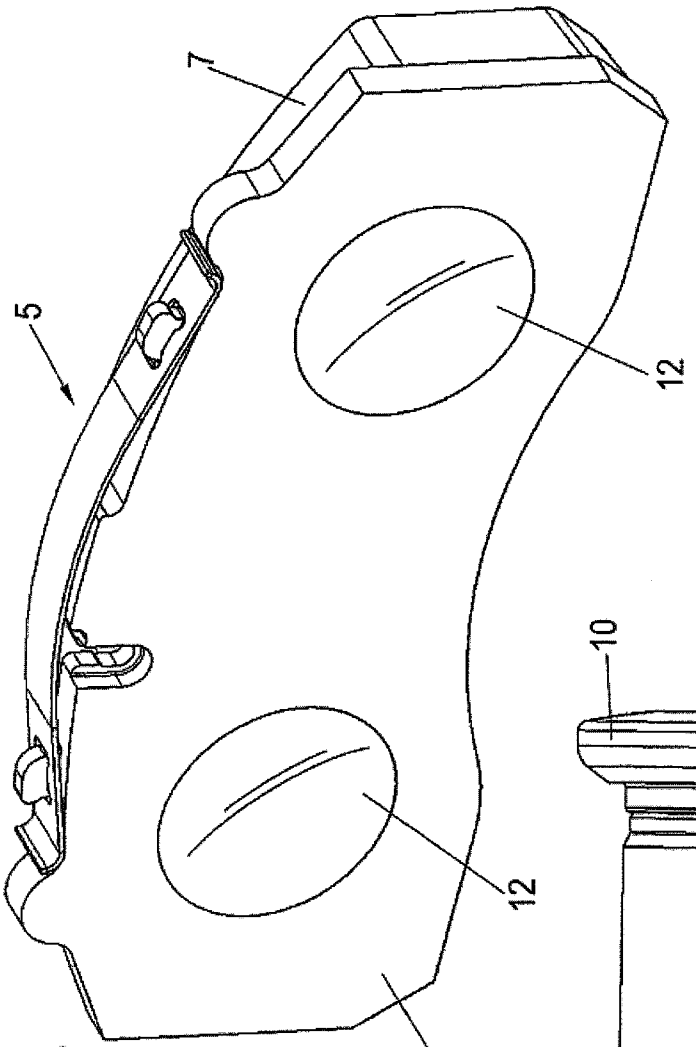


Fig. 5

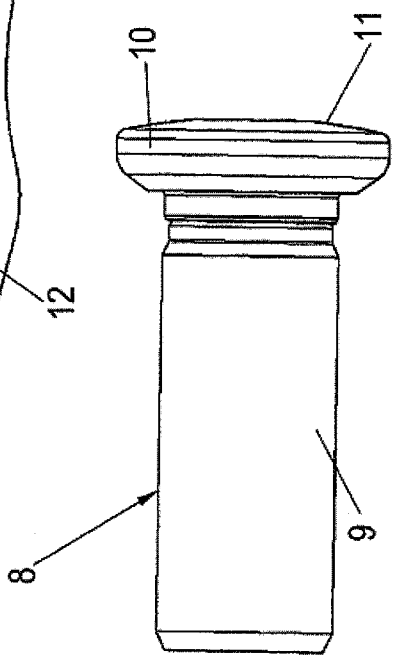


Fig. 6