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(56) Documents Cited
EP 0665388 A1 US 5358086 A US 4585096 A
US 3978955 A

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(54) Friction clutch for an automobile

(57) A friction clutch has a friction lining ring (16) which fixed to a support (13) by means of rivets (20) and extends radially outwardly from the support (13) to be positioned directly between a flywheel mass (2) and a pressing plate (6). The support (13) is keyed to a hub optionally through the intermediary or a torsion damping device.

Fig.1

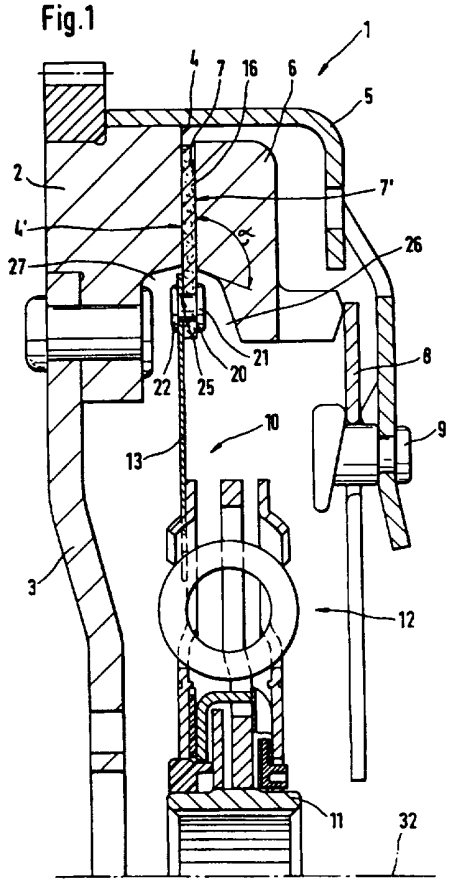

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Fig.1

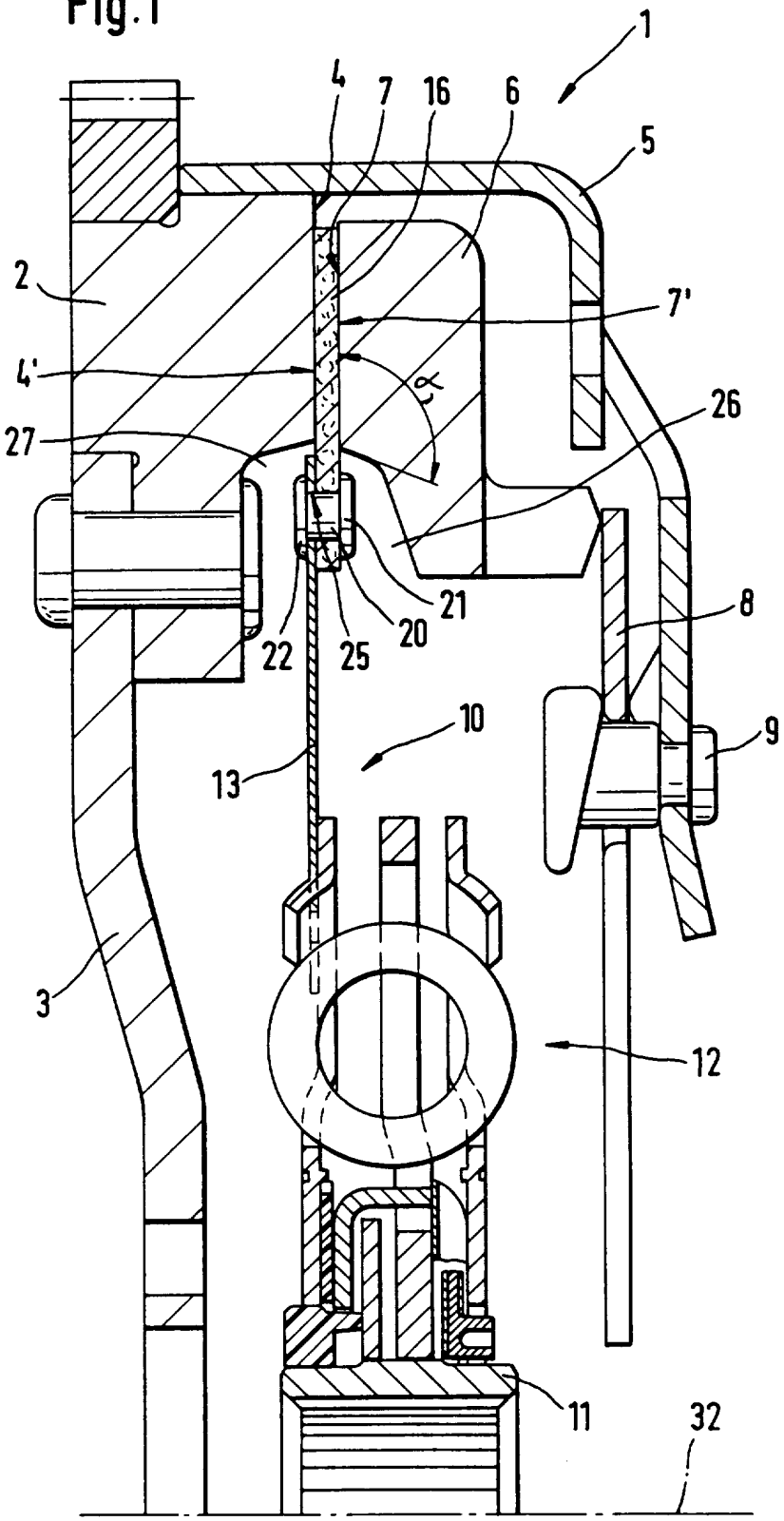


Fig.2

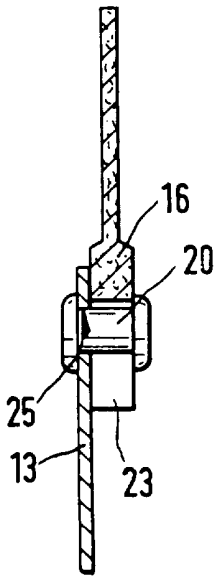


Fig.3

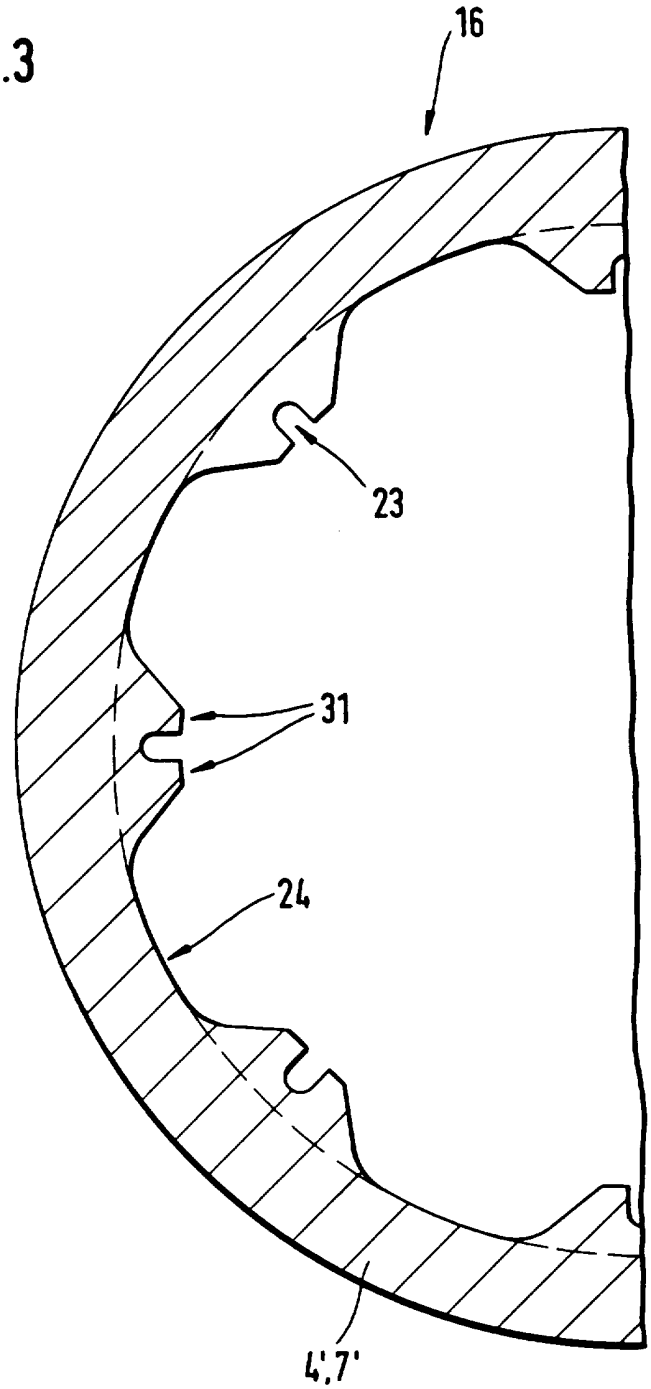


Fig.4

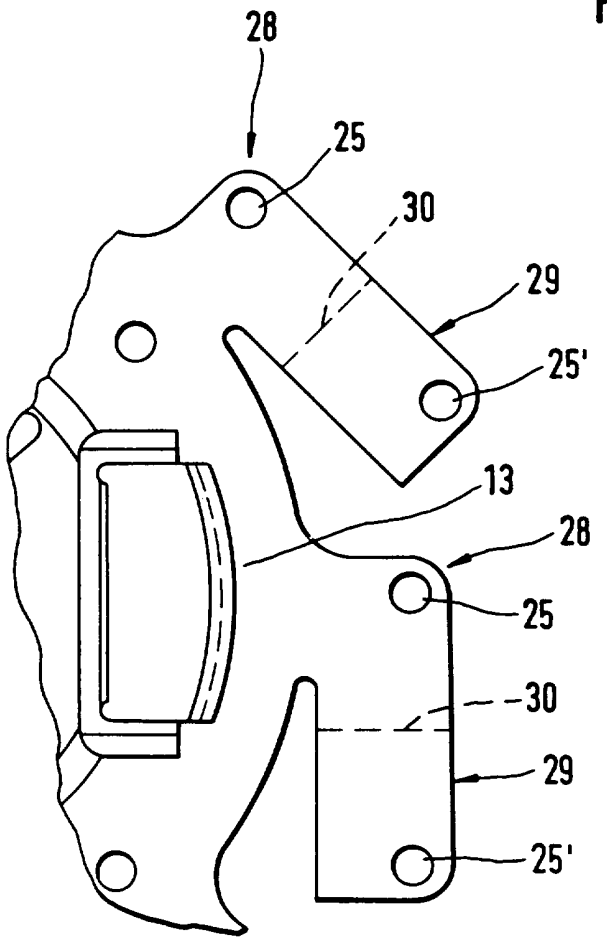


Fig. 5

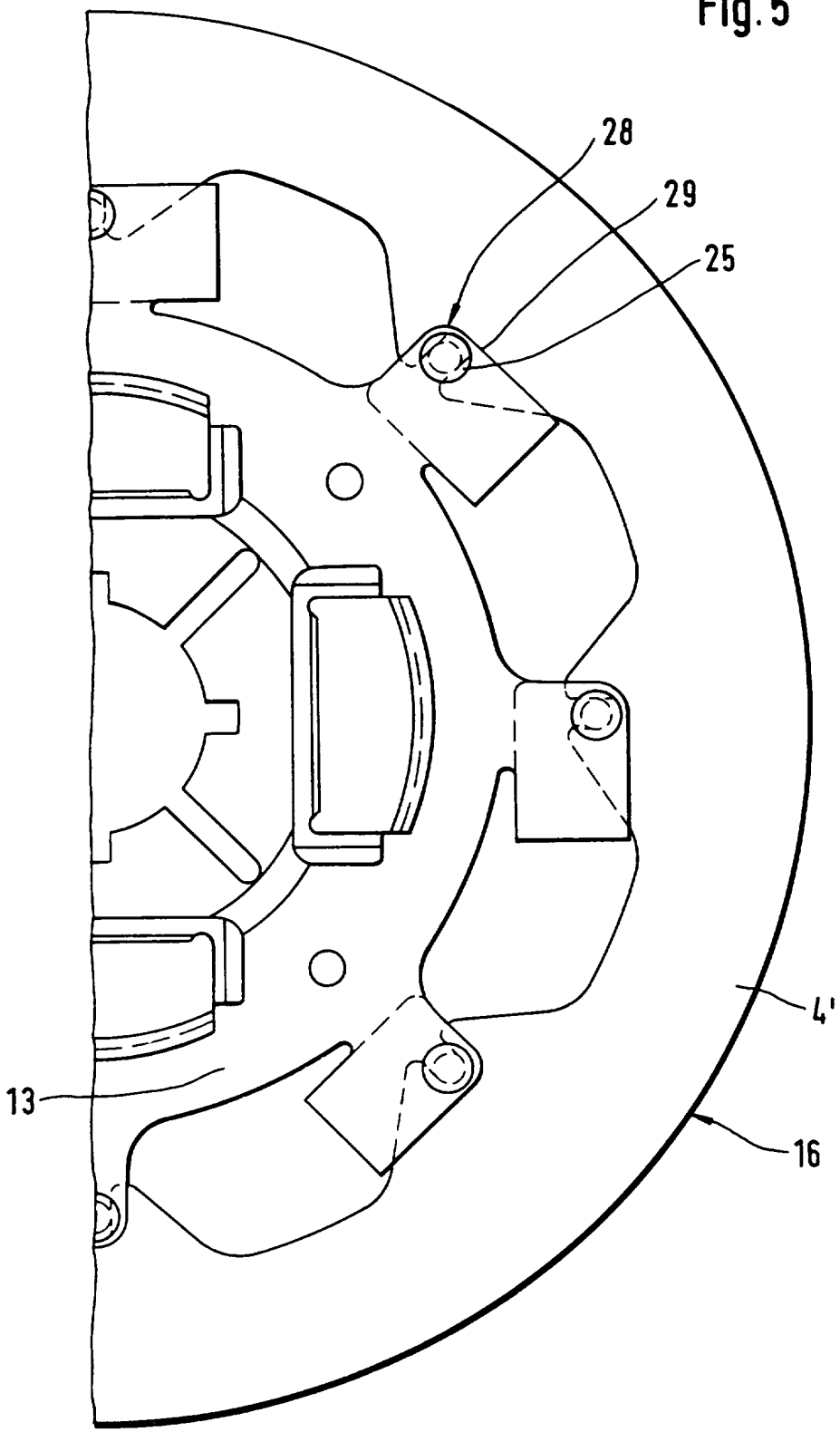
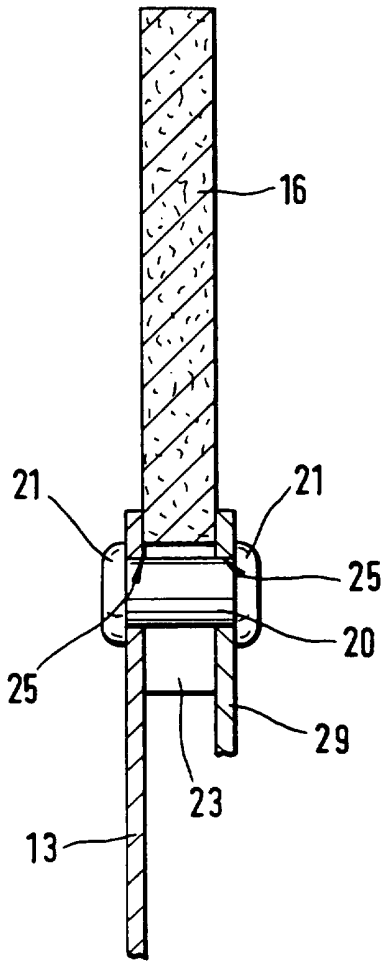


Fig. 6



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Friction clutch for an automobile

This invention relates to a friction clutch for an automobile.

A friction clutch is known, for example, from DE OS 23 02 808 which comprises a flywheel mass connected to a crankshaft and having an annular friction surface and, a clutch casing fixed to the mass and containing a pressing plate axially displaceable and having an annular friction surface in register with the friction surface of the mass. A clutch spring exerts axial force on the pressing plate to urge the friction surfaces towards one another and a clutch disc with counter friction surfaces is interposed between the friction surfaces of the mass and the pressing plate. In this known friction clutch, lining supports are mounted on a component of the clutch disc, which supports are provided at either side with a friction lining ring. The lining supports and the friction lining rings are connected to one another by rivets, which are situated in the region of the friction surfaces between the friction lining rings and the pressing plate or flywheel mass respectively. A construction according to this state of the art consists of many individual parts and, due to the provision of two friction lining rings, possesses a relatively high mass moment of inertia.

From EP-A- 0 554 472, it is furthermore known to use, for shifting clutches in gears, friction lining rings which possess a friction surface and in which, concentrically to the friction surface, axially recessed regions are provided which are equipped with openings for the passage of rivets.

It is the objective of the present invention, in clutch discs of friction clutches, to achieve a reduction in the mass moment of inertia at the least possible expense.

According to the invention there is provided a friction clutch comprising a flywheel mass for connection to the crankshaft of an internal combustion engine and having an annular friction surface, a clutch casing fixed to the flywheel mass, a pressing plate mounted torsionally locked in the clutch casing but axially displaceable, having an annular friction surface substantially in axial register with the friction surface of the flywheel mass, a clutch spring for applying an axial force to the pressing plate towards the flywheel mass and a clutch disc having counter-friction surfaces interposed between the pressing plate and the flywheel mass, wherein the clutch disc is composed of a support which is torsionally keyed to a hub, which support, starting from the hub, extends radially outwards until just before the region of the friction surfaces and a friction lining ring having mutually spaced apart counter-friction surfaces has over its entire radial extent substantially a constant material thickness and projects radially inwards beyond the friction surfaces and, in this region, bears laterally against the support and is riveted to it.

According to the form of construction of the invention, a friction lining ring having two counter-friction surfaces and a substantially uniform material thickness over the entire radial extent is provided, which projects radially inwards beyond the friction surfaces and is fastened to the support with rivets outside the area of the friction surfces. The support may be either a separate component or, however, a part of a torsion damping device in the clutch disc, e.g. a cover plate. Such a form of construction is, on the one hand, very economical because of the small number of parts, while on the other hand a large mass is saved compared with the state of the art especially in the diameter zone that is important for the moment of inertia. Furthermore, the friction lining ring continues over its entire radial extent with its counter-friction surfaces without interruptions, which cannot be avoided in the known designs due to rivet openings.

According to a further feature of the invention, it is advantageous for the support and the friction lining ring to possess, at the same mean diameter, fixing openings for rivets and for each rivet to bear with its set head on the side of the friction lining ring remote from the support, to pass with its shank through the fixing openings of the friction lining ring and support and to possess its closing head on the side of the support remote from the friction lining ring. By this arrangement, it is ensured that the already formed set head bears directly on the material of the friction ring and no relative movements any longer take place here during the riveting operation. The closing head is provided on the outer side of the support, where it can be freely supported during the riveting operation.

It is, however, also possible to provide, on the side of the friction lining ring remote from the support, one lining disc or one peripheral sheet metal ring with corresponding fixing openings, the direction of assembly of the rivets being unimportant.

It is furthermore proposed that the fixing openings be formed in the friction lining ring preferably as radially inwardly open slits. Such a form of construction is especially advantageous in the manufacture of the friction lining ring, because these slits can be provided during the pressing operation in the pressing mould. The friction material is thereby not weakened at this point by later chip-removal machining.

According to a further proposal of the invention, it is advantageous that pressing plate and flywheel mass possess apertures in the region of the rivets for fixing friction lining ring and support and that these apertures lead, via inclined surfaces or radii with obtuse angles, into the friction surfaces. Such an arrangement ensures that, with increasing wear of the friction lining ring in the region of its counter-friction surfaces, a rectangular step is avoided, which on the one hand reduces the torque transmission properties due to

notch effect and on the other hand is accompanied by a risk that, during the release operation of the friction clutch, the free movement of the clutch plate may not be reliably assured.

The invention furthermore provides that the friction lining ring possesses, on a mean diameter, fixing openings which may be formed as radially inwardly open slits, recesses or apertures are disposed circumferentially between the openings, which recesses or apertures extend substantially to the internal diameter of the counter-friction surfaces, the support comprises arms extending radially from a basic body and corresponding to the fixing openings, which arms possess fixing openings in the form of rivet holes, wherein at least some arms continue into a fin pointing in the tangential direction, which is folded over at a substantially radial bending edge to a U-shape around the fixing zone comprising the fixing opening in the friction lining ring and possesses a second fixing opening for the provision of a rivet, which passes also through the fixing openings in the friction lining ring and in the arm. By this form of construction of the support, it is ensured that both the set head and also the closing head of the fixing rivets bear against a part of the support and thus intermediate elements of the material of the support lie between each of the rivet heads and the friction lining ring. In this way an especially reliable riveting is possible, the closing head side being not necessarily predetermined.

The invention is explained in more detail below with reference to various embodiments. In the drawings:

Fig. 1 is a longitudinal section through the upper half of a friction clutch constructed in accordance with the invention;

Fig. 2 is a partial section through the clutch disc with friction lining ring worn

away;

Fig. 3 is a view of part of a friction lining ring;

Fig. 4 is a partial view of a support in the form of a cover plate;

Fig. 5 is a partial view of a clutch disc with a support according to Fig. 4; and

Fig. 6 is a partial view of a clutch disc corresponding to Figures 4 and 5.

Fig. 1 shows the upper half of a friction clutch 1. The clutch 1 employs a flywheel mass 2, which is fixed by a disc 3 to a crankshaft, not illustrated, of an internal combustion engine. To the flywheel mass 2, the clutch casing 5 is fixed, which is drawn in a pot-shape around a pressing plate 6. The pressing plate 6 is spring-loaded by a diaphragm spring 8 towards the flywheel mass 2, the diaphragm spring 8 being pivotally mounted by spacer pins 9 on the clutch casing 5. The pressing plate 6 and the flywheel mass 2 possess, in the mutually facing zones, annular friction surfaces 4, 7 respectively. Between these annular friction surfaces 4 and 7, in the engaged state of the friction clutch 1 a friction lining ring 16 is clamped, which possesses counter-friction surfaces 4', 7' respectively opposite the annular friction surfaces 4, 7 respectively. From Fig. 3, one possible form of the friction lining ring can be seen in elevation. The friction lining ring 16 is continued radially inwards beyond the counter-friction surfaces and possesses, in these regions, fixing openings 23. These fixing openings 23 may advantageously be constructed as radially inwardly open slits. Circumferentially between these fixing

regions 31, recesses or apertures 24 are located. These reduce the mass moment of inertia of the friction lining ring 16. The friction lining ring 16 is part of a clutch disc 10, which together with the friction clutch 1 can revolve about the common axis of rotation 32. The friction lining ring 16 is torsionally keyed to the hub 11 of the clutch disc 10. As shown in Fig. 1, a torsion damper 12 can be provided between the ring 16 and the hub 11. This makes possible a predetermined relative rotation between the friction lining ring 16 and the hub 11 against the force of a spring device and, possibly also, a friction device. In the present case, a support 13 is provided, which makes the connection between the torsion damper 12 and the friction lining ring 16, it being of course possible for the support 13 also to be formed in one piece with a component of the torsion damper 12. The support 13 comprises several fixing openings 25, distributed around the periphery, which have the same mean diameter as the fixing openings 23 in the friction lining ring 16. The connection between the support 13 and the friction lining ring 16 is made by rivets 20, which are each introduced from the side of the counter-friction surface 7' through the fixing openings 23 and 25 in such a manner that the set head 21 bears against the outer face of the friction lining ring 16. The closing head 22 is formed on the side of the support 13 remote from the friction lining ring 16. In this way a type of fixing is created which, having regard to the relatively sensitive material of the friction lining ring 16, makes possible a permanent connection. Both the pressing plate 6 and the flywheel mass 2 are provided, in the region of the transition of the friction surfaces 4, 7 respectively radially inwards into the fixing region between the friction lining ring 16 and the support 13, with recesses 26, 27 respectively, which lead into the radially inner region of the friction surfaces 4, 7 respectively at an obtuse angle α. Such a form of construction as can be seen particularly in connection with Fig. 2, provides a high functional reliability even when the friction lining ring 16 is worn. In Fig. 2, an already worn friction lining ring 16 is illustrated, which is already substantially thinner in the

region of the friction surfaces 4 and 7 than in its fixing region. By the configuration of the pressing plate 6 and the flywheel mass 2, a rough step between the worn and the non-worn regions of the friction lining ring 16 is avoided, so that on the one hand, even with increasing wear, the torque transmission is assured and, on the other hand, the release operation is not impeded by the pressing plate or flywheel mass impeding the free working of the clutch disc 10. By the inclined shape of the recesses 26, 27 respectively, a chamfered edge is produced in the material of the friction lining ring 16, by which the release movements of the pressing plate 6 and of the friction lining ring 16 are not impeded.

A further variant of the friction clutch is illustrated in Figures 4 to 6. Fig. 4 shows the partial view of a cover plate of the torsion damper 12, which serves at the same time for directly fixing the friction lining ring 16. For this purpose, several arms 28, distributed around the circumference, are provided on the support 13 in the form of the cover plate, these arms projecting radially outwards. Each of these arms 28 is provided with a fixing opening 25 for mounting the rivets 20. The number of the arms 28 corresponds to the number of the fixing regions 31 of the friction lining ring 16 according to Fig. 3. Several, preferably all, of the arms 28 have fins 29 projecting in the tangential direction, which each possess at the distance of the fixing openings 25 a further fixing opening 25'. For mounting the fixing lining ring 16, each of the fins 29 is bent around a substantially radial bending edge 30, extending between the fixing openings 25 and 25', in such a way that the fin finally fits U-shaped in its bent region around each fixing region 31 of the friction lining ring 16. After connection according to Fig. 5 and 6, each rivet 20 passes through both the fixing opening 25' in the fin 29 and also through the fixing opening 25 in the support 13. Thus, the two heads 21 and 22 make the connection to the friction lining ring 16 through the intermediary of the material of the support 13.

Claims

1. A friction clutch for an automobile, comprising a flywheel mass for connection to the crankshaft of an internal combustion engine and having an annular friction surface, a clutch casing fixed to the flywheel mass, a pressing plate mounted torsionally locked in the clutch casing but axially displaceable, having an annular friction surface substantially in axial register with the friction surface of the flywheel mass, a clutch spring for applying an axial force to the pressing plate towards the flywheel mass and a clutch disc having counter-friction surfaces interposed between the pressing plate and the flywheel mass, wherein a clutch disc is composed of a support which is torsionally keyed to a hub which support, starting from the hub, extends radially outwards until just before the region of the friction surfaces and a friction lining ring having mutually spaced apart counter-friction surfaces has over its entire radial extent substantially a constant material thickness and projects radially inwards beyond the friction surfaces and, in this region, bears laterally against the support and is riveted to it.

2. A friction clutch according to claim 1, wherein the support and the friction lining ring possess, on the same mean diameter, fixing openings for rivets and each rivet bears with its set head on the side of the friction lining ring remote from the support, passes with its shank through the fixing openings of the friction lining ring and the support and has its closing head on the side of the support remote from the friction lining ring.

3. A friction clutch according to claim 1, wherein the support and the friction lining ring possess, on the same mean diameter, fixing openings for rivets and each rivet bears with its one head on the outer side of the support, passes with its shank through the

fixing openings of the support and the friction lining ring, and bears with its other head on the side of the friction lining ring remote from the support through the intermediary of a lining disc or of a peripheral sheet metal ring having corresponding fixing openings.

4. A friction clutch according to claim 2 of 3, wherein the fixing openings in the friction lining ring are formed as radially inwardly open slits.

5. A friction clutch according to claim 2 or 3, wherein the pressing plate and the flywheel mass possess recesses in the region of the rivets for fixing the friction lining ring and the support and that these recesses lead via inclined surfaces at obtuse angles into the friction surfaces.

6. A friction clutch according to claim 1, wherein the friction lining ring possesses, on a mean diameter, fixing openings in the form of radially inwardly open slits, further apertures or recesses are disposed circumferentially between the openings, which apertures or recesses extend substantially to the internal diameter of the counter-friction surfaces, the support possesses arms extending radially from a basic body and corresponding to the fixing openings, which arms have fixing openings in the form of rivet holes, and wherein at least some arms each continue into a fin projecting in a tangential direction, which is folded at a substantially radially extending bending edge in to a U-shape around the fixing region comprising the fixing opening in the friction lining ring, and possesses a second fixing opening for the mounting of a rivet which passes also through the fixing openings.

7. A friction clutch substantially as described with reference to, and as illustrated in any one or more of the Figures of the accompanying drawings.

The Patent Office

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Application No: GB 9607827.4 **Examiner:** Brian Denton
Claims searched: 1-7 **Date of search:** 7 June 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): F2C

Int Cl (Ed.6): F16D 13/60 13/64 13/68 69/00

Other: Online : WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
P	EP 0665388	(RAYBESTOS) whole document published 2 August 1995	1
Y	US 5358086	(MULLER ET AL) whole document	1
A	US 4585096	(LOWELL) whole document	
Y	US 3978955	(NAGANO) whole document	1

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Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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