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(54) **SHEET METAL PRESSURE PLATE AND PRESSURE POT AS JOINT COMPONENT**

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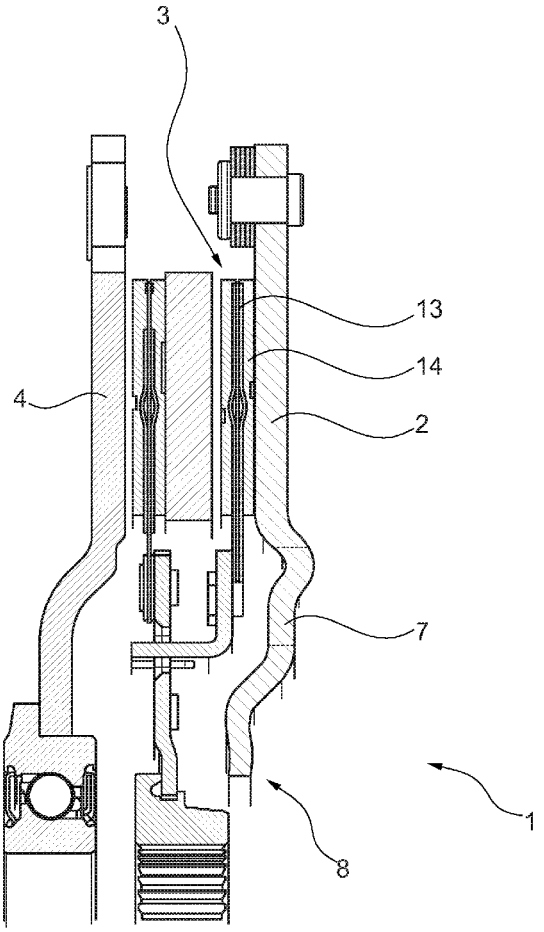
(57) **ABSTRACT**

The invention relates to a clutch for a motor vehicle, having a pressure plate which is set up to clamp a torque transmission member, such as a disk or friction disk, together with a counterpressure plate, wherein a force transmission path is provided between an actuating unit via a pressure transmission member, wherein the pressure transmission member is configured as an integral part of the pressure plate. The invention also relates to a method for producing a pressure plate for a clutch, wherein the pressure plate is formed with an integrated pressure transmission member from a sheet metal plate via a chipless forming process.



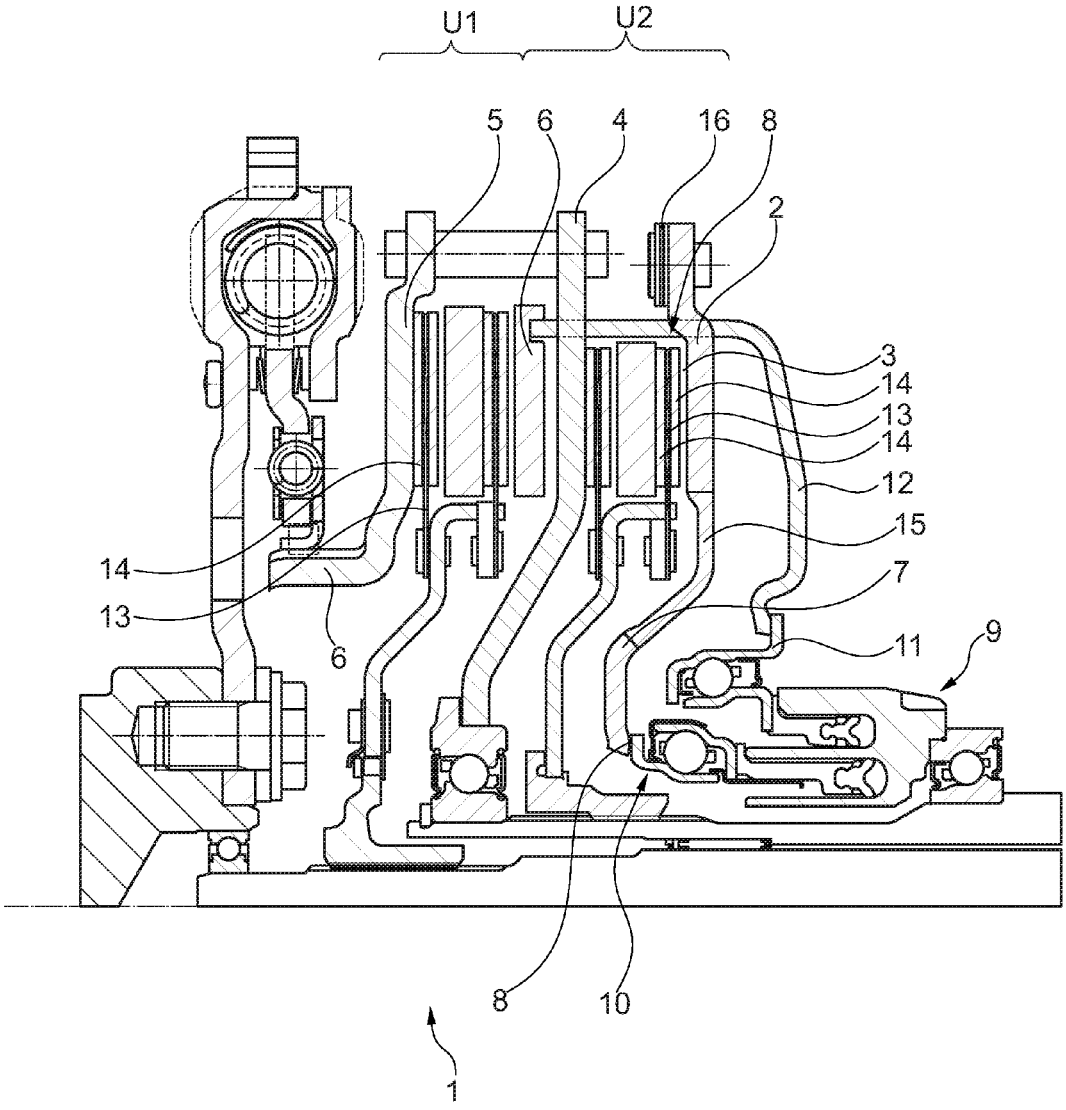


Fig. 1

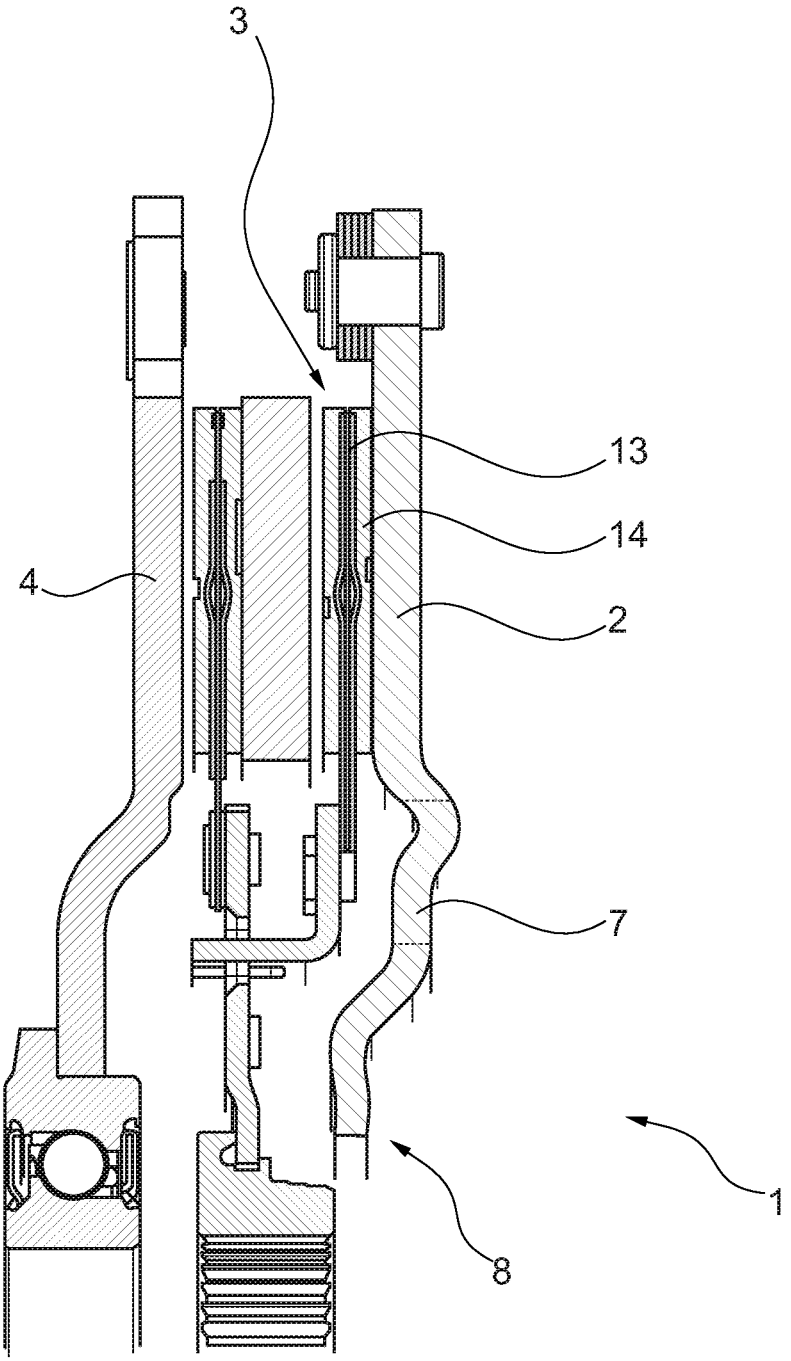


Fig. 2

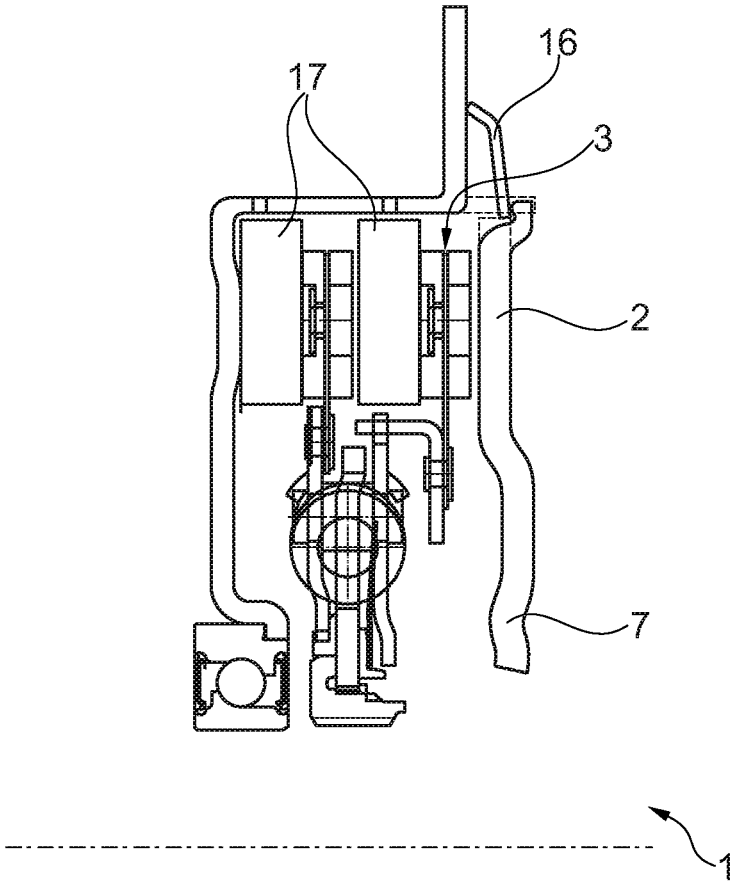


Fig. 3

SHEET METAL PRESSURE PLATE AND PRESSURE POT AS JOINT COMPONENT

BACKGROUND

[0001] The invention relates to a clutch, such as a dry or wet single-disk or multi-disk clutch, particularly a duplex clutch, for a motor vehicle comprising a pressure plate prepared for clamping a torque transmission member, such as a blade or a friction disk, together with a counter pressure plate, with via a pressure transmission member a force transmission path being provided between an actuating unit, such as an actuator like a hydraulic, mechanical, or electric extendable piston or a concentric slave cylinder (CSC).

[0002] Such clutches, i.e. single-disk clutches, multi-disk clutches, particularly duplex clutches are well known from prior art.

[0003] For example, EP 1 524 446 B1 discloses a clutch arrangement with at least two friction clutches, each having at least one clutch disk, allowing the two clutch disks to be connected to a separate shaft that can be driven, and the two clutches being capable to engage or disengage independent from each other via respectively an actuating mechanism, with the closing force of the clutches being applied directly by said actuating mechanism. In this patent publication it is particularly emphasized that the combination of certain features is given, namely that both clutches can be respectively operated by an annularly embodied piston-cylinder unit of the actuating mechanism such that the piston-cylinder units are nested coaxially and at least partially axially inside each other and that for transferring the compression force between the respective pressure plate and a clutch and the allocated actuating mechanism a pot-shaped or plate-shaped, practically stiff intermediate element is provided.

[0004] In directly operated clutches the force for transmitting the torque from the engaging system via a pressure pot is commonly transmitted as an actuating element upon a pressure plate/blade and then further to the friction disks/friction blades. Unfortunately, due to the presently required technical optimization of clutches the structural space available in the axial direction becomes increasingly smaller. This was more and more negative effects for the conventional pressure plates and pressure pot designs, for example pressure pot units. Further it is disadvantageous, for example in disk clutches, that the pressure plate or the blade is not actively ventilated when the clutch is opened.

[0005] Although it has been possible to lift the pressure pot using a leaf spring or a cup spring, however the pressure plate or a blade similar to a pressure plate could not be lifted this way. Additionally, strong wear and tear develops between the common pressure pot coatings and the pressure plate/blade. This considerably extends the engagement path of the clutch. Therefore, here additional actuating energy is required for transmitting the torque. Further, the assembly expense is presently still excessive because at least two-part solutions must be used, perhaps with the integration of additional connection elements between the pressure pot and the pressure plate. The production costs are also too high, since a lot of material must be used in order to realize the presently known solutions. The pressure pot must also be separately centered and aligned, which is laborious and costly. When this step is omitted, the efficiency of the clutch becomes inappropriately low. Even during the transportation to the place of assembly a disadvantage is discernible, so that in prior art separate transportation safety has been required and/or separate protection from loss.

SUMMARY

[0006] The objective of the present invention is therefore to avoid the disadvantages of prior art and to provide a simplified clutch. This objective is attained in a generic clutch according to the invention in that the pressure transmission member is embodied as an integral component of the pressure plate, preferably designed to be directly contacted by the actuating unit.

[0007] This way the number of components can be reduced and/or component functions can be integrated in already existing parts. Additionally, the axial construction space is better utilized. The integration of component functions in other parts reduces costs.

[0008] It could be said that the solution of the objective according to the invention comprises to combine the pressure pot and the pressure plate to one component in order to this way counteract the above-mentioned disadvantages. Furthermore, better material use and reduced weight and thus also lower inertia is achieved. A separate protection to prevent loss is no longer required. It shall be mentioned that an integral component includes a one-piece, embodiment made from a single material, if possible.

[0009] Advantageous embodiments are claimed in the dependent claims, and are explained in greater detail in the following.

[0010] For example, it is advantageous for the pressure plate to be embodied with a section/projection representing the pressure transmission member in the form of a sheet metal part. A simple but highly functional component can then be produced with simple means.

[0011] Further it is advantageous if the sheet metal plate is brought into its final shape with a chipless forming process, for example by one or more deformation processes, for example cold forming processes, such as deep-drawing processes or punching processes. Then, expensive cutting processing steps can be avoided. The production output is increased and the costs are therefore reduced.

[0012] It is also beneficial for the sheet metal plate to have a homogenous/even thickness or to have a reducing thickness towards the contact area of the pressure transmission member with the actuating unit, for example at a radially inward section. On the one hand, here simple source materials can be used, and on the other hand spring-elastic features can be yielded.

[0013] Here it is advantageous if the sheet metal plate has a spring-elastic section, namely in the area of a part of the pressure transmission member, in the transitional section between the pressure transmission member and the pressure plate or in the entire area of the pressure transmission member. In this case the contact area is not embodied as a closed ring but slotted. It is also advantageous for the pressure transmission member to be alternatively or additionally embodied like a tongue. The pressure plate and the pressure pot are jointly punched out of sheet metal and deformed. They form an integral component. The actuating element can here have spring-like features and can also be embodied as a lever, particularly when for example a friction area of the pressure plate is not arranged radially outwardly but for example radially inwardly (and allowing contacting in the axial direction) and the actuating element being able to rest on a lid. A directly actuated duplex clutch can then

easily be produced. At least in one partial clutch the actuating element and the pressure plate/a pressure plate made from a single metal sheet are embodied as a continuous, integrally connected element.

[0014] A pressure plate with an integrated actuating element can also be easily implemented when the pressure plate is embodied as a component comprising a (specially) prepared friction area for cooperating with the torque transmission member and/or an actuating group.

[0015] An advantageous exemplary embodiment is also characterized in that the pressure transmission member is perforated by recesses in order to allow the supply of cooling fluid in the direction of the torque transmission member. Such a cooling fluid can be for example air or a liquid, such as oil.

[0016] In order to allow active cooling of the clutch, it is advantageous when a spring element, such as a leaf spring, a leaf spring assembly, or a cup spring engages the pressure plate, preferably radially at the outside, acting primarily in the axial direction and/or opening or closing the clutch.

[0017] When the individual components are adjusted and arranged in reference to each other such that energy is absorbed in a slippage phase, here an efficient utilization of the clutch is simplified over the life span.

[0018] Last but not least the invention also relates to a method for producing a pressure plate for a clutch, with here by the use of a chipless formation process from (only) a (single) sheet metal plate a pressure plate is formed with a pressure transmission member integrated therein, for example like a pressure pot.

[0019] The present invention represents an improvement of directly actuated clutch systems, which are operated with a pressure pot. By the integration of the pressure pot in the pressure plate, here the axial design space required, the weight, and the inertia of the clutch can be reduced. The assembly is simplified by the reduction of individual components and the omission of positioning and centering steps. This fact reduces costs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] In the following the figure is explained in greater detail with the help of a drawing, in which different exemplary embodiments are illustrated. Shown are:

[0021] FIG. **1** a duplex clutch according to the invention with a friction disk contacting a pressure plate of a partial clutch K**2**, showing a section of a pressure transmission member like a pressure pot in a partial longitudinal cross-section,

[0022] FIG. **2** a second exemplary embodiment of a multi-disk clutch with only a section of a longitudinal cross-section and only one of the partial clutches being shown,

[0023] FIG. **3** another exemplary embodiment of a clutch according to the invention, in which a one-piece pressure pot forms the pressure plate in the multi-disk clutch system in a manner comparable to the illustration of FIG. **2**.

[0024] The drawing only serves for illustrating purposes and to understand the invention. Identical elements are marked with the same reference characters. Features of the individual examples can also be interchanged.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] FIG. **1** shows a first exemplary embodiment of a clutch **1** according to the invention. It comprises a pressure plate **2**, which is prepared to clamp a torque transmission member **3** between itself and a counter pressure plate **4**. The counter-pressure plate **4** is here embodied as an intermediate plate, to separate another counter-plate **5**, which cooperates with a pressure plate **6**. The counter-plate **5** and the pressure plate **6** are parts of a first partial clutch K**1**, while the pressure plate **2** and the counter-pressure plate **4** are parts of a second partial clutch K**2**.

[0026] A pressure transmission member **7** is an integral component of the pressure plate **2** and has a contact section **8** which contacts an actuating unit **9**. The actuating unit **9** is embodied like a concentric slave cylinder (CSC). An inner actuator section **10** is particularly directly contacting the contact area **8**. An exterior actuator section **11** contacts a pressure pot **12** or the pressure transmission member **7**, which acts upon the pressure plate **6** in a pressure transmitting fashion.

[0027] At least one torque transmission member **3**, embodied as a friction disk **13** with friction coatings **14**, can be clamped between the pressure plate **2** and the counter-pressure plate **4** as well as between the counter-plate **5** and the pressure plate **6**.

[0028] The pressure plate **2** and the pressure transmission member **7**, thus the section similar to a pressure pot, are connected, particularly representing integral components of each other, thus connected to each other in one piece, made from one material, and inseparable. They are formed from a single sheet metal material, which however has a thinned section **15**, thus an area with lower thickness. They are made from a metal sheet by way of punching and/or deep-drawing and/or compression and/or bending. A spring element **16** is directly contacting the pressure plate **2** and allows an active lifting of the partial clutch K**2**.

[0029] FIG. **2** shows a detail of a multi-disk clutch system. Here, too the pressure plate **2** is connected in one piece with the pressure transmission member **3** or the pressure transmission member **7** is an integral component of the pressure plate **2** and vice versa. Here, the sheet metal plate forming the pressure plate **2** and the pressure transmission member **7** are embodied towards the radially inner edge in a tapering fashion, however it may also have a consistent thickness. The thinning area **15** therefore acts like a spring-elastic section.

[0030] A similar implementation of the concept according to the invention is discernible from FIG. **3**, in which a multiple-disk clutch is shown. Here, the pressure plate **2**, which in turn has a radially inwardly projecting section, namely the pressure transmission member **7**, presses upon the torque transmission member **3**, abutting the disks **17**. The spring element **16** used in this solution is embodied as a cup spring. Thus, here a dry clutch is realized which represents a special form of a clutch **1** according to the invention.

LIST OF REFERENCE CHARACTERS

[0031] **1** Clutch
[0032] **2** Pressure plate
[0033] **3** Torque transmission member
[0034] **4** Counter-pressure plate
[0035] **5** Counter plate

[0036] **6** Pressure plate
[0037] **7** Pressure transmission member
[0038] **8** Contact area
[0039] **9** Actuating unit
[0040] **10** Inner actuator section
[0041] **11** Exterior actuator section
[0042] **12** Pressure pot
[0043] **13** Friction disk
[0044] **14** Friction coating
[0045] **15** Tapering section
[0046] **16** Spring element
[0047] **17** Disk

1. A clutch for a motor vehicle, comprising a pressure plate adapted for clamping a torque transmission member together with a counter-pressure plate, with a force transmission path being provided via a pressure transmission member to an actuator unit, wherein the pressure transmission member is an integral component of the pressure plate.

2. The clutch according to claim **1**, wherein the pressure plate is formed as a metal plate and includes a section providing the pressure transmission member.

3. The clutch according to claim **2**, wherein the metal plate is formed in a chipless fashion.

4. The clutch according to claim **2**, wherein the metal plate has a constant thickness or a reducing thickness towards a contact area of the pressure transmission member with the actuating unit.

5. The clutch according to claim **2**, wherein the metal plate comprises a spring-elastic section.

6. The clutch according to claim **1**, wherein the pressure plate comprises a friction area adapted to cooperate with at least one of the torque transmission member or an actuator group.

7. The clutch according to claim **1**, wherein the pressure transmission member is perforated by recesses in order to allow a supply of cooling fluid in a direction of the torque transmission member.

8. The clutch according to claim **1**, wherein a spring element engages the pressure plate acting primarily in an axial direction.

9. The clutch according to claim **1**, wherein individual parts are adjusted and arranged in reference to each other such that in a slippage phase energy is absorbed.

10. A method for producing a pressure plate for a clutch, comprising forming the pressure plate from a metal plate via a chipless formation process with a pressure transmission member integrated therein.

11. The clutch according to claim **2**, wherein the pressure transmission member is embodied like a tongue.

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