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Damper device

Abstract

A damper device includes a first rotor, a second rotor, and an elastic member. The first rotor includes a contact surface. The contact surface faces a circumferential direction and extends in a radial direction. The second rotor is disposed to be rotatable relative to the first rotor. The second rotor includes a stopper surface extending in the radial direction. The stopper surface is opposed to the contact surface at an interval in the circumferential direction. The elastic member elastically couples the first rotor and the second rotor.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS

(1) This application claims priority to Japanese Patent Application No. 2022-045574 filed Mar. 22, 2022. The entire contents of that application are incorporated by reference herein in their entirety.

TECHNICAL FIELD

(2) The present invention relates to a damper device.

BACKGROUND ART

(3) A damper device is configured to absorb and attenuate fluctuations of a torque outputted from an engine by one or more coil springs. Specifically, the damper device includes a first rotor, a second rotor, and a plurality of coil springs elastically coupling the first and second rotors. Besides, another type of damper device has been also proposed that a hysteresis torque is generated by one or more friction materials.

(4) The first and second rotors are rotated relative to each other. A stopper mechanism is provided

for restricting the angle of relative rotation between the first and second rotors to a predetermined angular range. For example, Japan Laid-open Patent Application Publication No. 2011-226572 describes a damper device that a side plate includes radially extending stopper protrusions, while a hub plate includes axially extending stopper lock tabs. When the stopper protrusions and the stopper lock tabs contact with each other, further relative rotation is restricted between the side plate and the hub plate from the contact state. As a result, excessive compression of the respective coil springs is avoided.

(5) In the damper device configured as described above, both the side plate and the hub plate are processed with carburizing so as not to be damaged by collision between the stopper protrusions and the stopper lock tabs. However, disuse of carburizing has been demanded from the perspectives of cost reduction and so forth. In view of this, it is an object of the present invention to provide a damper device that a stopper mechanism can be inhibited from being damaged without performing carburizing.

BRIEF SUMMARY

(6) A damper device according to an aspect of the present invention includes a first rotor, a second rotor, and an elastic member. The first rotor includes a contact surface. The contact surface faces a circumferential direction and extends in a radial direction. The second rotor is disposed to be rotatable relative to the first rotor. The second rotor includes a stopper surface extending in the radial direction. The stopper surface is opposed to the contact surface at an interval in the circumferential direction. The elastic member elastically couples the first and second rotors.

(7) According to this configuration, when the contact surface contacts with the stopper surface, the first and second rotors are restricted from rotating relative to each other at a greater angle than a predetermined angular range. Besides, both the contact surface and the stopper surface extend in the radial direction; hence, an area of contact between the contact surface and the stopper surface is greater in this configuration than in a well-known configuration that the contact surface and the stopper surface extend in different directions. As a result, a load per unit area, acting on the contact surface and the stopper surface, is made small, whereby a stopper mechanism can be inhibited from being damaged without performing carburizing.

(8) Preferably, the first rotor includes a first plate and a second plate. The first plate is disposed on a first side of the second rotor in an axial direction. The second plate is disposed on a second side of the second rotor in the axial direction. The second rotor is disposed between the first and second plates in the axial direction.

(9) Preferably, the first plate includes a first plate body, a connecting portion, and an attachment portion. The connecting portion extends from an outer peripheral part of the first plate body toward the second plate in the axial direction. The attachment portion extends radially outward from a distal end of the connecting portion. The attachment portion includes the contact surface.

(10) Preferably, the second plate includes a protruding portion protruding toward the first plate in the axial direction. The attachment portion is attached to the protruding portion.

(11) Preferably, the attachment portion protrudes toward the stopper surface in the circumferential direction relative to the connecting portion.

(12) Preferably, the damper device further includes a friction plate, first and second side plates, a pressure plate, and an urging member. The friction plate is attached to the first plate body. The first side plate is disposed on the first side of the friction plate in the axial direction. The first side plate has an annular shape. The second side plate is disposed on the second side of the friction plate in the axial direction. The second side plate has an annular shape. The pressure plate is disposed between the second side plate and the friction plate in the axial direction. The urging member is disposed between the second side plate and the pressure plate. The urging member urges the pressure plate toward the friction plate.

(13) Preferably, the second side plate is disposed radially outside the attachment portion. The second side plate is disposed to overlap with the attachment portion as seen in the radial direction.

(14) Preferably, the urging member is disposed radially outside the connecting portion. The urging member is disposed to overlap with the connecting portion as seen in the radial direction.
(15) Preferably, the second rotor includes a stopper portion protruding radially outward. The stopper portion includes the stopper surface.
(16) Overall, according to the present invention, a stopper mechanism can be inhibited from being damaged without performing carburizing.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is a front view of a damper device.
(2) FIG. **2** is a cross-sectional view of FIG. **1** taken along line II-II.
(3) FIG. **3** is a front view of a first plate.
(4) FIG. **4** is a front view of a hub flange.
(5) FIG. **5** is a side view for showing a stopper mechanism.
DETAILED DESCRIPTION
(6) [Entire Configuration]
(7) FIG. **1** is a front view of a damper device **100** according to a present preferred embodiment, whereas FIG. **2** is a cross-sectional view of FIG. **1** taken along line II-II. It should be noted that in FIG. **1**, a torque limiter unit is detached from the damper device **100**. In FIG. **2**, line O-O indicates a rotational axis of the damper device **100**. In the following explanation, unless specifically stated otherwise, the term “rotation” means rotation about the rotational axis O. In FIG. **2**, an engine (exemplary power source) is disposed on the left side of the damper device **100**, whereas a drive unit, including an electric motor, a transmission, and so forth, is disposed on the right side of the damper device **100**.
(8) It should be noted that in the following explanation, the term “axial direction” refers to an extending direction of the rotational axis O of the damper device **100**. Besides, the term “first side in the axial direction” means the left side in FIG. **2**, whereas the term “second side in the axial direction” means the right side in FIG. **2**. In other words, the term “first side in the axial direction” means an input side, whereas the term “second side in the axial direction” means an output side. On the other hand, the term “circumferential direction” refers to a circumferential direction of an imaginary circle about the rotational axis O, whereas the term “radial direction” refers to a radial direction of the imaginary circle about the rotational axis O. It should be noted that the circumferential direction is not required to be perfectly matched with the circumferential direction of the imaginary circle about the rotational axis O; likewise, the radial direction is not required to be perfectly matched with a diameter direction of the imaginary circle about the rotational axis O.
(9) As shown in FIGS. **1** and **2**, the damper device **100** is provided between a flywheel **110** and an input shaft **111** of the drive unit. The damper device **100** is disposed on the second side of the flywheel **110** in the axial direction. The damper device **100** is attached to the flywheel **110**. In other words, the surface of the damper device **100**, disposed on the first side in the axial direction, is covered with the flywheel **110**. Besides, the damper device **100** is configured to limit a torque transmitted between the engine and the drive unit, and simultaneously, attenuate rotational fluctuations. The damper device **100** includes a damper unit **2** and a torque limiter unit **5**.
(10) [Torque Limiter Unit **5**]
(11) The torque limiter unit **5** is configured to be attached to the flywheel **110**. The torque limiter unit **5** is disposed radially outside the damper unit **2**. The torque limiter unit **5** is configured to limit the torque transmitted between the flywheel **110** and the damper unit **2**.
(12) The torque limiter unit **5** includes a first side plate **51**, a second side plate **52**, a pressure plate **53**, a cone spring **54** (exemplary urging member), a first friction material **55***a*, a second friction

material **55***b*, and a friction plate **56**.
(13) <First Side Plate>
(14) The first side plate **51** has an annular shape. The first side plate **51** is attached to the flywheel **110**. In other words, the first side plate **51** receives the torque transmitted thereto from the flywheel **110**. The first side plate **51** is disposed on the first side of the friction plate **56** in the axial direction.
(15) The first side plate **51** includes an outer peripheral portion **511** and an inner peripheral portion **512**. The outer peripheral portion **511** is attached to the flywheel **110**. The inner peripheral portion **512** is disposed on the first side of the outer peripheral portion **511** in the axial direction. The first side plate **51** receives an urging force applied by the cone spring **54** at the inner peripheral portion **512** thereof.
(16) <Second Side Plate>
(17) The second side plate **52** has an annular shape. The second side plate **52** is disposed on the second side of the friction plate **56** in the axial direction. The second side plate **52** is fixed to the first side plate **51** by rivets (not shown in the drawings) and/or so forth. Because of this, the second side plate **52** is unitarily rotated with the first side plate **51**.
(18) The second side plate **52** is disposed apart from the first side plate **51** at an interval in the axial direction. When described in detail, the second side plate **52** includes an outer peripheral portion **521** and an inner peripheral portion **522**. Besides, the inner peripheral portion **522** of the second side plate **52** is disposed apart from the inner peripheral portion **512** of the first side plate **51** at the interval in the axial direction. It should be noted that the outer peripheral portion **521** of the second side plate **52** is in contact with the outer peripheral portion **511** of the first side plate **51**.
(19) The second side plate **52** has a lesser outer diameter than the first side plate **51**. It should be noted that the outer diameter of the second side plate **52** can be equal to or greater than that of the first side plate **51**. The second side plate **52** has a greater inner diameter than the first side plate **51**. The second side plate **52** has a lesser plate thickness than the first side plate **51**.
(20) The first side plate **51** and the second side plate **52** are disposed radially outside attachment portions **214** (to be described). Further, the first side plate **51** is disposed to overlap with the attachment portions **214** as seen in the radial direction.
(21) <Friction Plate>
(22) The friction plate **56** has an annular shape. The friction plate **56** is configured to be unitarily rotated with first and second plates **21** and **22** (to be described). The friction plate **56** is attached to the first plate **21**. When described in detail, the friction plate **56** is attached to a first plate body **212** (to be described) by rivets **101**.
(23) The friction plate **56** is disposed on the first side of the first plate **21** in the axial direction. The friction plate **56** has a lesser thickness than the first plate **21**. The friction plate **56** is disposed axially between the first side plate **51** and the second side plate **52**.
(24) <Friction Materials>
(25) Each of the first and second friction materials **55***a* and **55***b* has an annular shape. The first friction material **55***a* is disposed axially between the friction plate **56** and the first side plate **51**. The second friction material **55***b* is disposed axially between the friction plate **56** and the second side plate **52**. When described in detail, the second friction material **55***b* is disposed axially between the friction plate **56** and the pressure plate **53**.
(26) The first and second friction materials **55***a* and **55***b* are attached to the friction plate **56**. The first friction material **55***a* is engaged by friction with the first side plate **51**. On the other hand, the second friction material **55***b* is engaged by friction with the pressure plate **53**. When a torque having a predetermined value or greater is inputted, the first friction material **55***a* is slid against the first side plate **51**, while the second friction material **55***b* is slid against the pressure plate **53**. As a result, the first side plate **51** and the friction plate **56** are rotated relative to each other. It should be noted that the first friction material **55***a* can be engaged by friction with the friction plate **56**, while being fixed to the first side plate **51**. On the other hand, the second friction material **55***b* can be

engaged by friction with the friction plate **56**, while being fixed to the pressure plate **53**.
(27) <Pressure Plate>
(28) The pressure plate **53** has an annular shape. The pressure plate **53** is disposed axially between the second side plate **52** and the friction plate **56**. When described in detail, the pressure plate **53** is disposed axially between the second friction material **55***b* and the cone spring **54**.
(29) <Cone Spring>
(30) The cone spring **54** is disposed axially between the second side plate **52** and the pressure plate **53**. The cone spring **54** urges the pressure plate **53** to the first side in the axial direction. In other words, the cone spring **54** urges the pressure plate **53** toward the friction plate **56**. Accordingly, the friction plate **56** and both the first and second friction materials **55***a* and **55***b* are interposed between and held by the pressure plate **53** and the first side plate **51**.
(31) The cone spring **54** is disposed radially outside connecting portions **213** (to be described). Besides, the cone spring **54** is disposed to overlap with the connecting portions **213** as seen in the radial direction.
(32) [Damper Unit **2**]
(33) The damper unit **2** includes an input rotor **20** (exemplary first rotor), a hub flange **23** (exemplary second rotor), and a plurality of elastic members **24**. Besides, the damper unit **2** includes a hysteresis generating mechanism **25** and a plurality of fastening portions **26**. The damper unit **2** is configured to attenuate rotational fluctuations.
(34) <Input Rotor>
(35) The input rotor **20** is a member into which a mechanical power, outputted from the engine, is inputted. When described in detail, the mechanical power, outputted from the engine, is transmitted to the input rotor **20** through the torque limiter unit **5**. The input rotor **20** is disposed to be rotatable.
(36) The input rotor **20** is composed of the first and second plates **21** and **22**. Each of the first and second plates **21** and **22** is an annular member having a center hole.
(37) <First Plate>
(38) The first plate **21** is disposed on the first side of the hub flange **23** in the axial direction. The second plate **22** is disposed on the second side of the hub flange **23** in the axial direction. The first and second plates **21** and **22** are disposed apart from each other at an interval in the axial direction. Besides, the first and second plates **21** and **22** are disposed apart from the hub flange **23** at intervals in the axial direction. The first and second plates **21** and **22** are unitarily rotated with each other. Besides, the first and second plates **21** and **22** are immovable relative to each other in the axial direction.
(39) FIG. **3** is a front view of the first plate **21** seen from the second side in the axial direction. As shown in FIG. **3**, the first plate **21** includes a plurality of first window portions **211**. It should be noted that in the present preferred embodiment, the first plate **21** includes four first window portions **211**. The first window portions **211** are aligned apart from each other at intervals in the circumferential direction.
(40) As shown in FIGS. **2** and **3**, the first plate **21** includes the first plate body **212**, the plural connecting portions **213**, and the plural attachment portions **214**. It should be noted that in the present preferred embodiment, the first plate **21** includes four connecting portions **213** and four attachment portions **214**.
(41) The first plate body **212** has an annular shape. The connecting portions **213** protrude from the outer peripheral part of the first plate body **212** to the second side in the axial direction. In other words, the connecting portions **213** extend from the outer peripheral part of the first plate body **212** toward the second plate **22** in the axial direction. The connecting portions **213** are disposed apart from each other at intervals in the circumferential direction.
(42) The attachment portions **214** extend radially outward from the distal ends of the connecting portions **213**. It should be noted that the distal ends of the connecting portions **213** mean the axially second-side ends of the connecting portions **213**. The attachment portions **214** are disposed apart

from each other at intervals in the circumferential direction.
(43) Each attachment portion **214** includes at least one contact surface **215**. It should be noted that in the present preferred embodiment, each attachment portion **214** includes a pair of contact surfaces **215**. In other words, each attachment portion **214** includes a first contact surface **215***a* and a second contact surface **215***b*.
(44) The first and second contact surfaces **215***a* and **215***b* face in the circumferential direction. When described in detail, the first contact surface **215***a* faces a first rotational direction R**1**, whereas the second contact surface **215***b* faces a second rotational direction R**2**. The first rotational direction R**1** herein means a direction in which the damper device **100** is rotated by the mechanical power outputted from the engine. The second rotational direction R**2** means a reverse rotational direction to the first rotational direction R**1**. The first rotational direction R**1** refers to the counter-clockwise direction in FIG. **3**, whereas the second rotational direction R**2** refers to the clockwise direction in FIG. **3**.
(45) Each contact surface **215** extends in the radial direction. Because of this, each contact surface **215** has a greater dimension in the radial direction than in the axial direction.
(46) Each attachment portion **214** is greater in the circumferential dimension than each connecting portion **213**. Because of this, each attachment portion **214** protrudes toward each stopper surface **235** (to be described) in the circumferential direction relative to each connecting portion **213**. When described in detail, each attachment portion **214** protrudes relative to each connecting portion **213** in the first rotational direction R**1**. Further, each attachment portion **214** protrudes relative to each connecting portion **213** in the second rotational direction R**2** as well; however, it should be noted that each attachment portion **214** may be designed not to protrude in the second rotational direction R**2**.
(47) <Second Plate>
(48) As shown in FIG. **1**, the second plate **22** includes a plurality of second window portions **221**. It should be noted that in the present preferred embodiment, the second plate **22** includes four second window portions **221**. The second window portions **221** are aligned apart from each other at intervals in the circumferential direction. As seen in the axial direction, the second window portions **221** are disposed to overlap with the first window portions **211**, respectively.
(49) As shown in FIGS. **1** and **2**, the second plate **22** includes a plurality of protruding portions **222**. It should be noted that in the present preferred embodiment, the second plate **22** includes four protruding portions **222**.
(50) The second plate **22** has an annular shape. The protruding portions **222** are disposed in the outer peripheral end of the second plate **22**. The protruding portions **222** protrude toward the first plate **21** in the axial direction as portions of the second plate **22**. In other words, the protruding portions **222** protrude to the first side in the axial direction. It should be noted that portions of the second plate **22**, overlapping with the attachment portions **214** as seen in the axial direction, protrude to the first side in the axial direction. In other words, the protruding portions **222** overlap with the attachment portions **214** as seen in the axial direction.
(51) The protruding portions **222** are not opposed to the stopper surfaces **235** (to be described) in the circumferential direction but can be opposed to the stopper surfaces **235**. The protruding portions **222** are disposed apart from each other at intervals in the circumferential direction.
(52) The protruding portions **222** are disposed to overlap with the attachment portions **214** as seen in the axial direction. Besides, the attachment portions **214** are attached to the protruding portions **222**, respectively, by the fastening portions **26**. The fastening portions **26** are, for instance, rivets.
(53) <Hub Flange>
(54) As shown in FIGS. **2** and **4**, the hub flange **23** is configured to transmit a torque, inputted thereto from the input rotor **20**, to an output-side device. The hub flange **23** is disposed to be rotatable relative to the input rotor **20**.
(55) The hub flange **23** includes a hub portion **231**, a flange portion **232**, and a plurality of

accommodation holes **233**. The hub portion **231** and the flange portion **232** are integrated as a single member but can be separated as different members.

(56) The hub portion **231** has a tubular shape and is disposed within the center holes of the first and second plates **21** and **22**. The hub portion **231** is provided with a spline hole axially extending in the inner peripheral part thereof. The spline hole enables the input shaft **111**, which is an output-side member, to be spline-coupled thereto.

(57) The flange portion **232** radially extends from the outer peripheral surface of the hub portion **231**. The flange portion **232** has an annular shape. The flange portion **232** is disposed axially between the first and second input plates **21** and **22**.

(58) The accommodation holes **233** are provided in the flange portion **232**. It should be noted that in the present preferred embodiment, four accommodation holes **233** are provided in the flange portion **232**. The accommodation holes **233** are aligned in the circumferential direction. Each accommodation hole **233** is disposed to overlap with each first window portion **211** and each second window portion **221** as seen in the axial direction.

(59) The hub flange **23** includes a plurality of stopper portions **234**. In the present preferred embodiment, the hub flange **23** includes four stopper portions **234**. The stopper portions **234** protrude radially outward from the outer peripheral surface of the flange portion **232**.

(60) Each stopper portion **234** includes at least one stopper surface **235**. It should be noted that in the present preferred embodiment, each stopper portion **234** includes a pair of stopper surfaces **235**. In other words, each stopper portion **234** includes a first stopper surface **235***a* and a second stopper surface **235***b*.

(61) The first and second stopper surfaces **235***a* and **235***b* are identical in extending direction to the first and second contact surfaces **215***a* and **215***b*. When described in detail, each of the first and second stopper surfaces **235***a* and **235***b* extends in a radial direction. Because of this, each of the first and second stopper surfaces **235***a* and **235***b* has a greater dimension in the radial direction than in the axial direction.

(62) FIG. **5** is a side view of the damper device for showing stopper mechanisms. It should be noted that FIG. **5** omits illustration of members other than the input rotor **20** and the hub flange **23** for easy understanding of the drawing. As shown in FIGS. **4** and **5**, each of the first and second stopper surfaces **235***a* and **235***b* faces the circumferential direction. When described in detail, each first stopper surface **235***a* faces the second rotational direction R**2**. Besides, each first stopper surface **235***a* is opposed to each first contact surface **215***a* at an interval in the circumferential direction. Because of this, when the input rotor **20** is rotated relative to the hub flange **23** in the first rotational direction R**1**, each first contact surface **215***a* contacts with each first stopper surface **235***a*. When each first contact surface **215***a* thus contacts with each first stopper surface **235***a*, the input rotor **20** is restricted from rotating relative to the hub flange **23** in the first rotational direction R**1**. It should be noted that each first stopper surface **235***a* does not contact with each protruding portion **222** but the structure can be modified so that contact can be made therewith. Each first stopper surface **235***a* and each first contact surface **215***a* compose a stopper mechanism functioning in the first rotational direction R**1**.

(63) Each second stopper surface **235***b* faces the first rotational direction R**1**. Besides, each second stopper surface **235***b* is opposed to each second contact surface **215***b* at an interval in the circumferential direction. Because of this, when the input rotor **20** is rotated relative to the hub flange **23** in the second rotational direction R**2**, each second contact surface **215***b* contacts with each second stopper surface **235***b*. When each second contact surface **215***b* thus contacts with each second stopper surface **235***b*, the input rotor **20** is restricted from rotating relative to the hub flange **23** in the second rotational direction R**2**. It should be noted that each second stopper surface **235***b* does not contact with each protruding portion **222** but can contact therewith. Each second stopper surface **235***b* and each second contact surface **215***b* compose a stopper mechanism functioning in the second rotational direction R**2**.

(64) <Elastic Members
(65) As shown in FIGS. **1** and **2**, the elastic members **24** are configured to elastically couple the input rotor **20** and the hub flange **23** in the rotational direction. The elastic members **24** are, for instance, coil springs.
(66) The elastic members **24** are accommodated in the accommodation holes **233** of the flange portion **232**, respectively. Besides, the elastic members **24** are accommodated in the first window portions **211** of the first plate **21**, respectively, while being accommodated in the second window portions **221** of the second plate **22**, respectively.
(67) <Hysteresis Generating Mechanism>
(68) The hysteresis generating mechanism **25** is configured to generate a hysteresis torque when relative rotation is caused between the input rotor **20** and the hub flange **23**.
(69) [Actions]
(70) A torque, transmitted from the engine to the flywheel **110**, is inputted to the damper unit **2** through the torque limiter unit **5**. In the damper unit **2**, the torque is inputted to the first rotor **20** and is then transmitted to the hub flange **23** through the elastic members **24**. Subsequently, the mechanical power is transmitted from the hub flange **23** through the input shaft **111** to the electric motor, the transmission, a power generator, and so forth that are disposed on the output side.
(71) Incidentally, chances are that an excessive torque is transmitted from the output side to the engine in, for instance, engine start. In such a case, the magnitude of torque to be transmitted to the engine side is limited to a predetermined value or less by the torque limiter unit **5**.
(72) [Modifications]
(73) The present invention is not limited to the preferred embodiment described above and a variety of changes or modifications can be made without departing from the scope of the present invention. Besides, modifications to be described are applicable simultaneously.
(74) (a) In the preferred embodiment described above, the input rotor **20** has been exemplified as the first rotor, while the hub flange **23** has been exemplified as the second rotor; however, the configuration of the damper device is not limited to this. For example, the hub flange **23** can be set as the first rotor, while the input rotor **20** can be set as the second rotor. In this case, the input rotor **20** is provided with stopper portions, while the hub flange **23** is provided with coupling portions and attachment portions.
(75) (b) In the preferred embodiment described above, the input rotor **20** includes the first plate **21** and the second plate **22**; however, the configuration of the input rotor **20** is not limited to this. For example, the input rotor **20** can include only the first plate **21** without including the second plate **22**.
(76) (c) In the preferred embodiment described above, the damper device **100** includes the first and second contact surfaces **215***a* and **215***b* and the first and second stopper surfaces **235***a* and **235***b*; however, the configuration of the damper device **100** is not limited to this. For example, the damper device **100** can include the first contact surfaces **215***a* and the first stopper surfaces **235***a* without including the second contact surfaces **215***b* and the second stopper surfaces **235***b*. Contrarily, the damper device **100** can include the second contact surfaces **215***b* and the second stopper surfaces **235***b* without including the first contact surfaces **215***a* and the first stopper surfaces **235***a*.
REFERENCE SIGNS LIST
(77) **20**: Input rotor **21**: First plate **212**: First plate body **213**: Connecting portion **214**: Attachment portion **215**: Contact surface **222**: Protruding portion **234**: Stopper portion **235**: Stopper surface **22**: Second plate **23**: Hub flange **24**: Elastic member **51**: First side plate **52**: Second side plate **53**: Pressure plate **56**: Friction plate **100**: Damper device

Claims

1. A damper device comprising: a first rotor including a contact surface, the contact surface facing a circumferential direction, the contact surface extending in a radial direction; a second rotor disposed to be rotatable relative to the first rotor, the second rotor including a stopper surface extending in the radial direction, the stopper surface opposed to the contact surface at an interval in the circumferential direction; and an elastic member configured to elastically couple the first and second rotors, the first rotor including a first plate and a second plate, the first plate being disposed on a first side of the second rotor in an axial direction, the second plate being disposed on a second side of the second rotor in the axial direction, and the second rotor being disposed between the first plate and second plate in the axial direction, the first plate including a first plate body, a connecting portion, and an attachment portion, the connecting portion extending from an outer peripheral part of the first plate body toward the second plate in the axial direction, the attachment portion extending radially outward from a distal end of the connecting portion, and the attachment portion including the contact surface and protruding toward the stopper surface in the circumferential direction relative to the connecting portion such that the attachment portion is wider than the connecting portion in the circumferential direction.
2. The damper device according to claim 1, wherein the second plate includes a protruding portion protruding toward the first plate in the axial direction, and the attachment portion is attached to the protruding portion.
3. The damper device according to claim 1, wherein the second rotor includes a stopper portion protruding radially outward, and the stopper portion includes the stopper surface.
4. A damper device comprising: a first rotor including a contact surface, the contact surface facing a circumferential direction, the contact surface extending in a radial direction; a second rotor disposed to be rotatable relative to the first rotor, the second rotor including a stopper surface extending in the radial direction, the stopper surface opposed to the contact surface at an interval in the circumferential direction; and an elastic member configured to elastically couple the first and second rotors, the first rotor including a first plate and a second plate, the first plate being disposed on a first side of the second rotor in an axial direction, the second plate being disposed on a second side of the second rotor in the axial direction, and the second rotor being disposed between the first plate and second plate in the axial direction, the first plate including a first plate body, a connecting portion, and an attachment portion, the connecting portion extending from an outer peripheral part of the first plate body toward the second plate in the axial direction, the attachment portion extending radially outward from a distal end of the connecting portion, and the attachment portion including the contact surface a friction plate attached to the first plate body; a first side plate having an annular shape, the first side plate disposed on an input side of the friction plate in the axial direction; a second side plate having an annular shape, the second side plate disposed on an output side of the friction plate in the axial direction; a pressure plate disposed between the second side plate and the friction plate in the axial direction; and an urging member disposed between the second side plate and the pressure plate, the urging member configured to urge the pressure plate toward the friction plate.
5. The damper device according to claim 4, wherein the second side plate is disposed radially outside the attachment portion, a portion of the second side plate and the attachment portion are on a same radius extending perpendicular to an axis of rotation of the damper device as seen in the radial direction.
6. The damper device according to claim 4, wherein the urging member is disposed radially outside the connecting portion, the urging member disposed to overlap with the connecting portion as seen in the radial direction.