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(54) **WIPER BLADE LINKING STRUCTURE**

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(57) **ABSTRACT**

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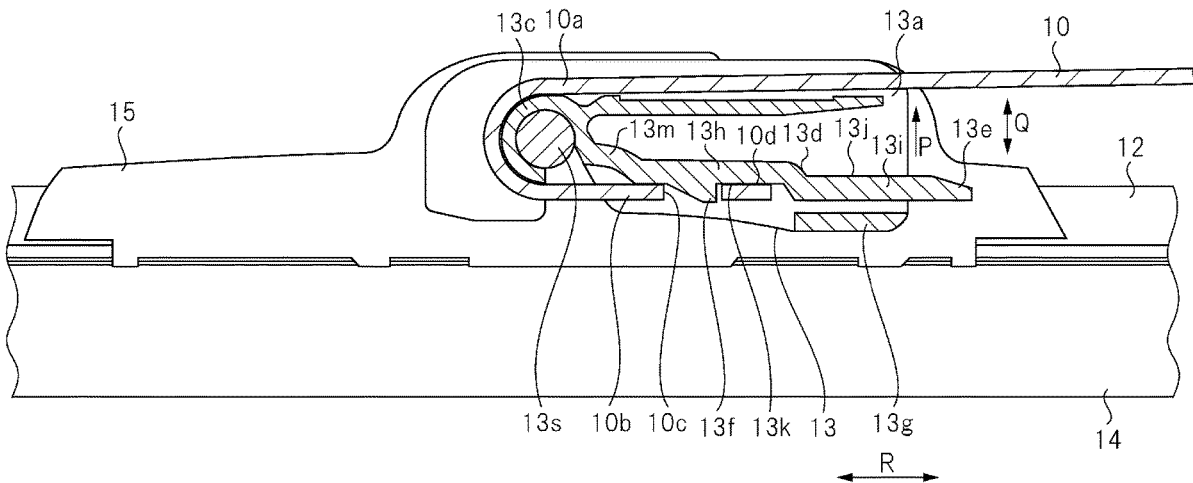
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A linking structure of a wiper blade **12** includes a wiper arm **10**, the wiper blade **12**, a hook part **10a** provided at the wiper arm **10**, and a linking part **13** provided at the wiper blade **12**. The hook part **10a** has a tip side extension part **10b** in which a through hole **10c** is formed. The linking part **13** has: a pair of sidewalls **13a**, **13b** facing each other; a cylindrical part **13c** bonded to the pair of sidewalls **13a**, **13b** and engaged with the hook part **10a**; a release lever **13d** provided at the cylindrical part **13c**; and a bridging part **13g** bonded to the pair of sidewalls **13a**, **13b**. The release lever **13d** is flexible, and includes a protrusion part **13f** fittable with the through hole **10c**. The tip part **13e** of the release lever **13d** protrudes to the outside of the linking part **13**.

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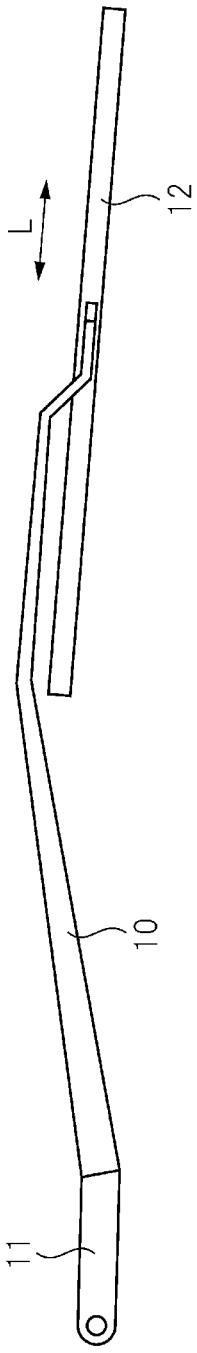


FIG. 1

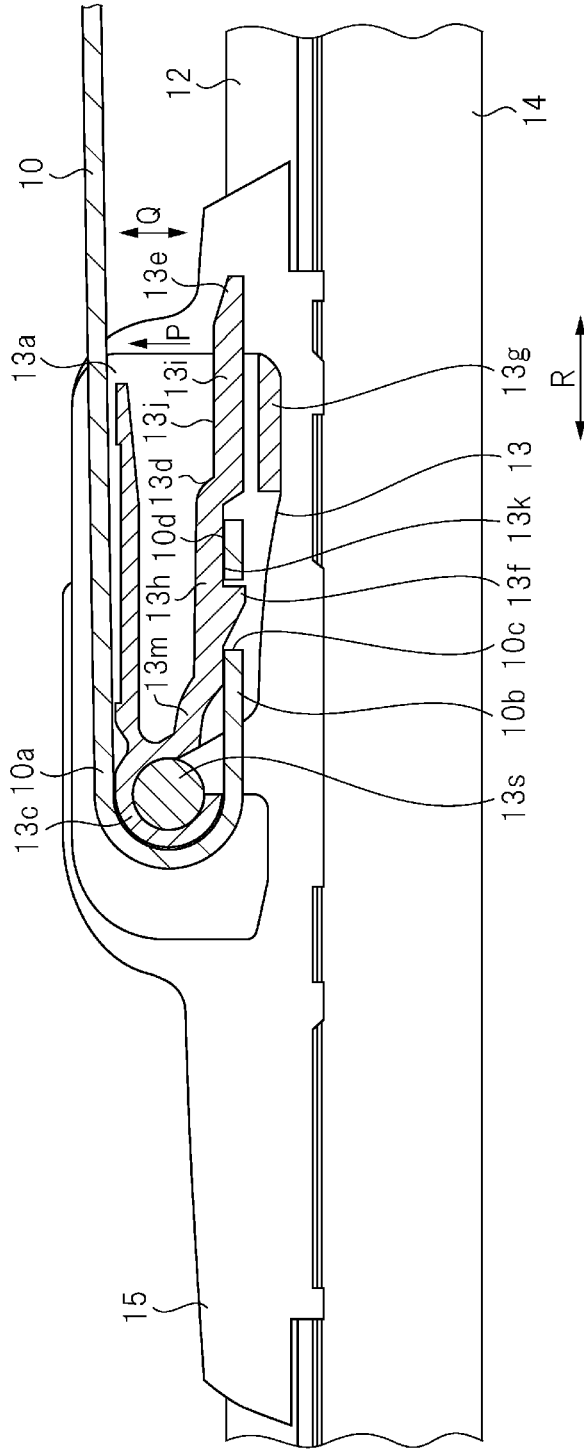


FIG. 2

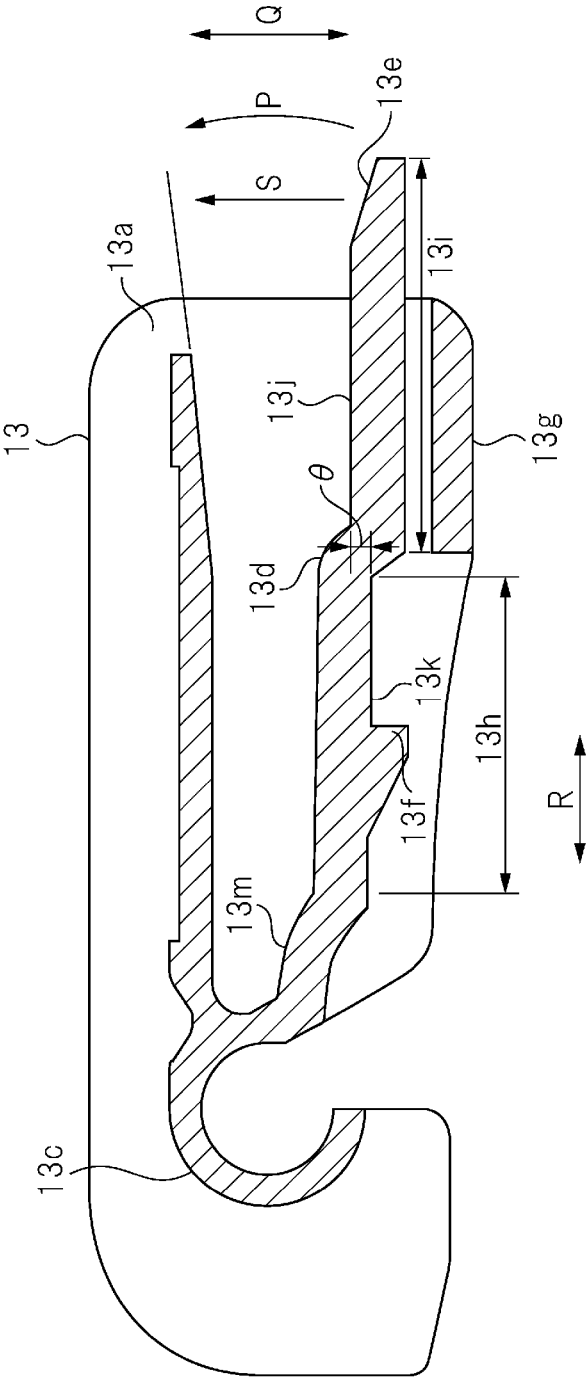


FIG. 3

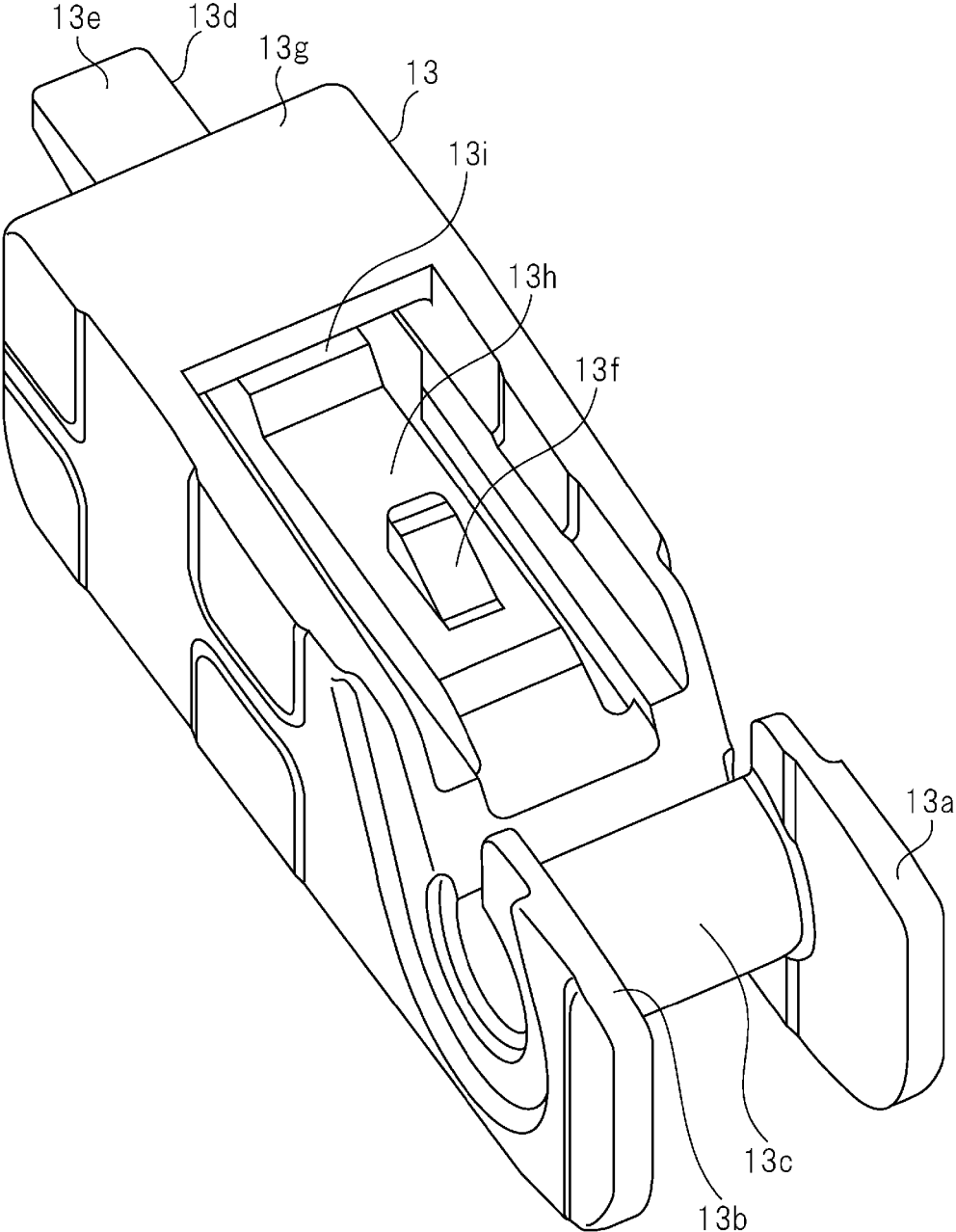


FIG. 4

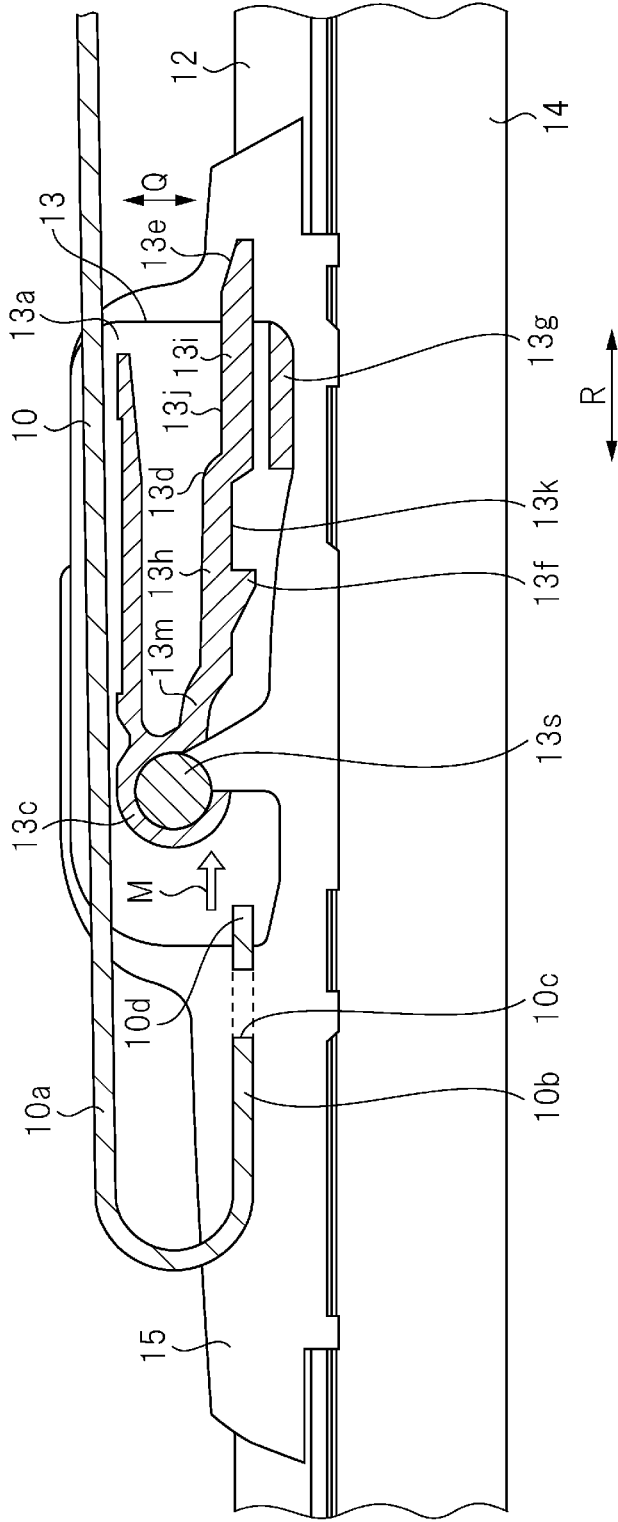


FIG. 5

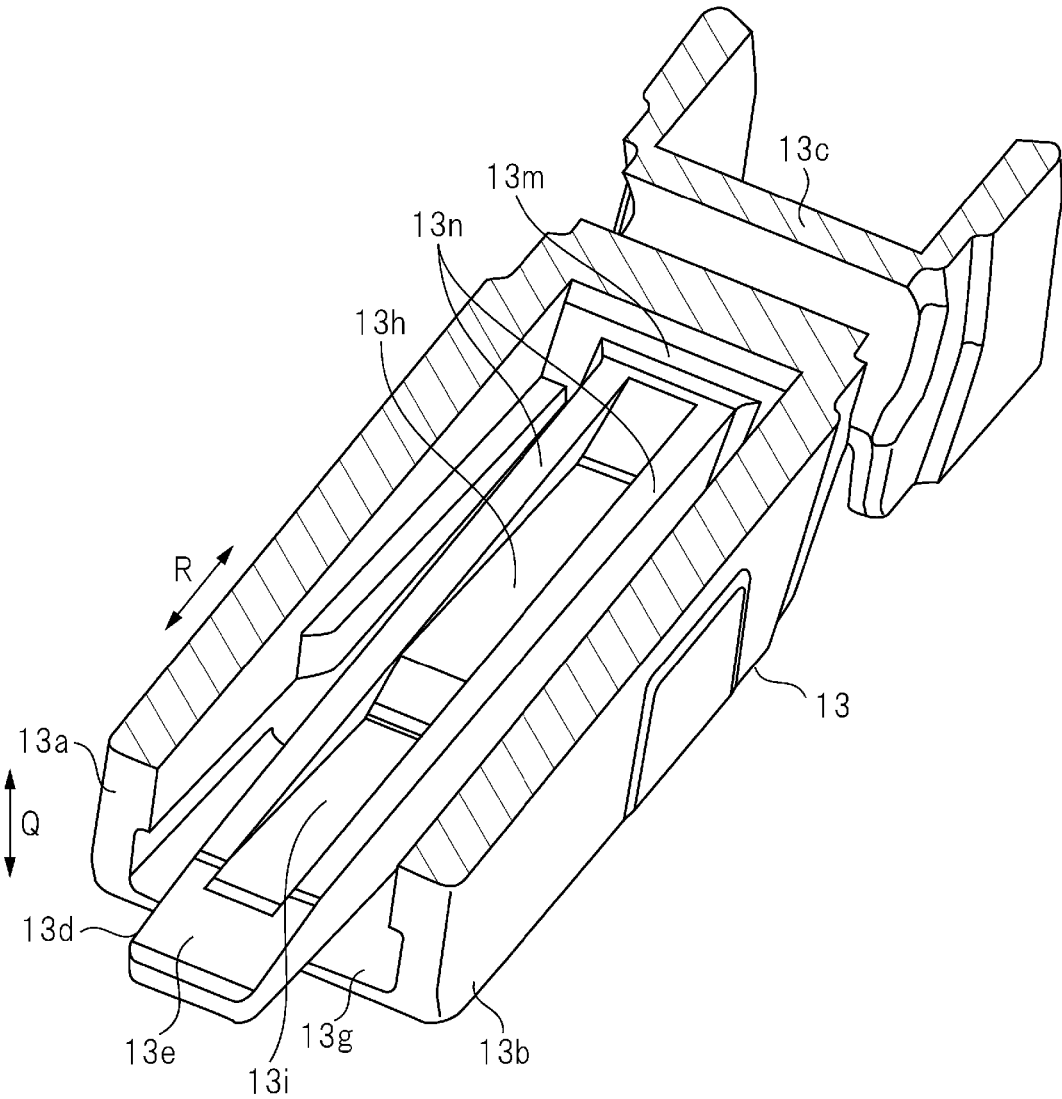


FIG. 6

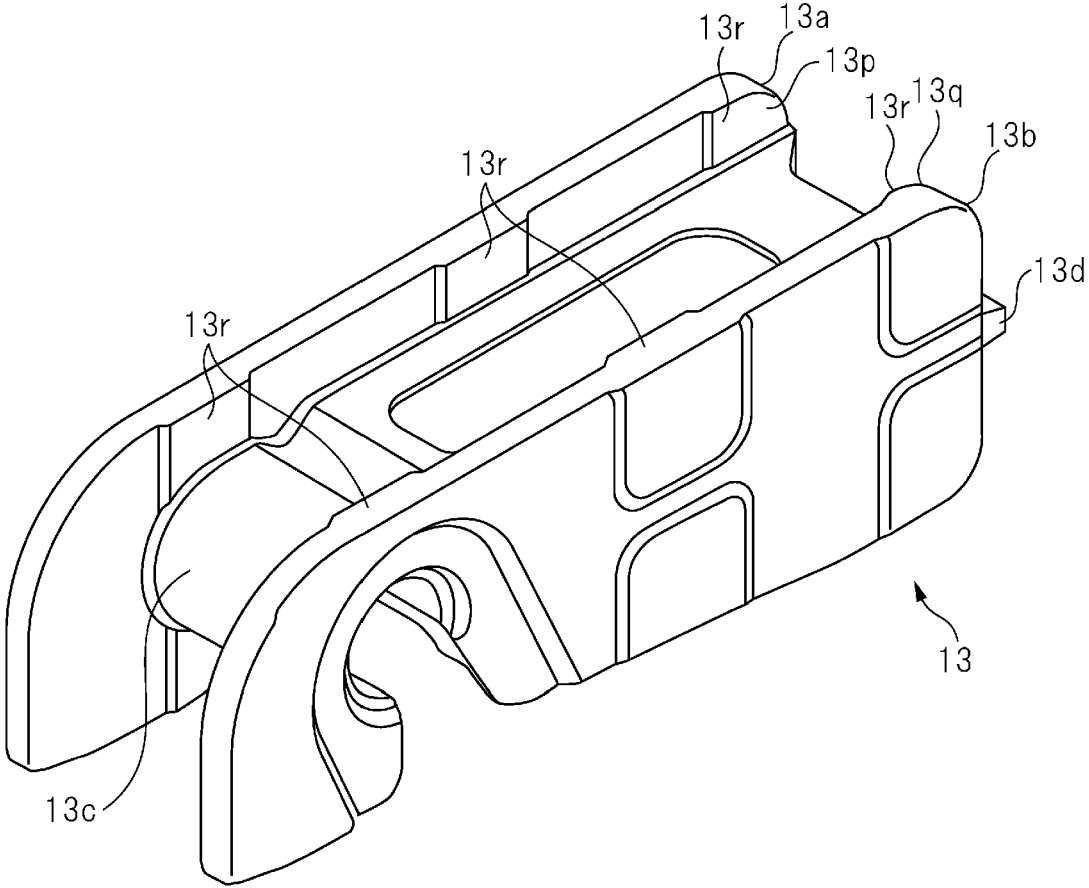


FIG. 7



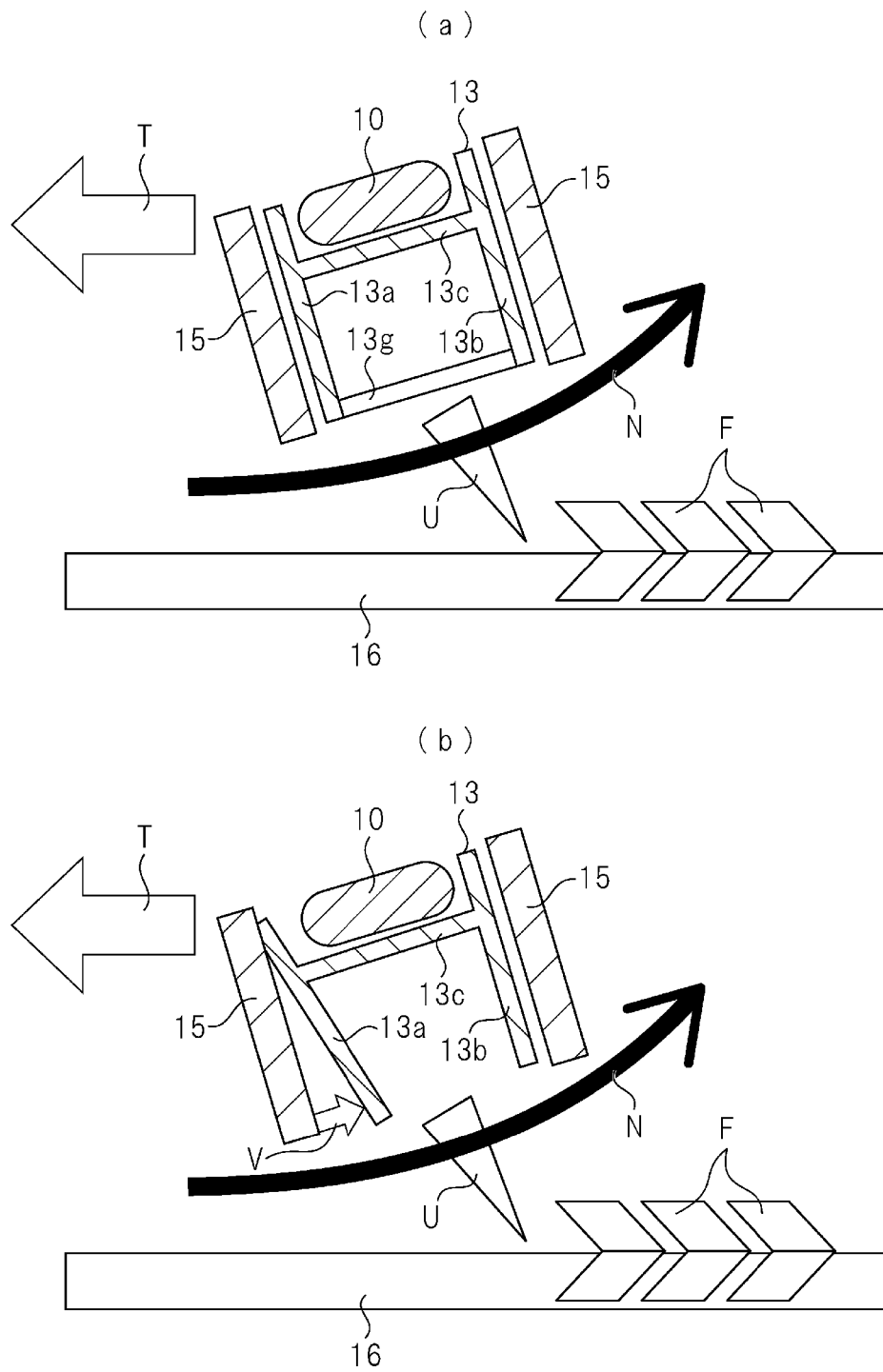


FIG. 8

## WIPER BLADE LINKING STRUCTURE

### TECHNICAL FIELD

[0001] The invention relates to a wiper blade linking structure.

### RELATED ART

[0002] Wiper devices are mounted in vehicles, such as automobiles. A wiper device includes a wiper motor as a driving source, a wiper arm swung through driving of the wiper motor, and a wiper blade mounted on the tip side of the wiper arm. The wiper arm and the wiper blade are linked by a linking structure as disclosed in Patent Document 1. In the linking structure disclosed in Patent Document 1, the wiper arm and the wiper blade are linked by connecting a U-shaped hook part of the wiper arm to a connector provided at the wiper blade.

### CITATION LIST

#### Patent Literature

[0003] [Patent Document 1] Japanese Laid-open No. 2012-532790

### SUMMARY OF INVENTION

#### Technical Problem

[0004] In the linking structure of the wiper arm and the wiper blade disclosed in Patent Document 1, the linking between the wiper arm and the wiper blade is removed by operating a release lever for linking removal that is provided at the connector on the side of the wiper blade for the wiper arm and the wiper blade that are linked.

[0005] However, the tip part of the release lever is disposed to be recessed to the inner side of the connector. Therefore, it is difficult to operate at the time of removing the linking between the wiper arm and the wiper lever, and the operability at the time of removing the linking is poor.

[0006] An objective of the invention is to provide a wiper blade linking structure with improved operability at the time of removing the linking between the wiper arm and the wiper blade.

#### Solution to Problem

[0007] A wiper blade linking structure according to an aspect of the invention includes: a wiper arm; a wiper blade, linked to the wiper arm; an engagement part, having a U shape and provided at the wiper arm; and a linking part, provided at the wiper blade and linked with the engagement part. The engagement part has a tip side extension part in which a through hole is formed. The linking part includes: a pair of sidewalls facing each other; a cylindrical part bonded to the pair of sidewalls and engaged with the engagement part; a lever part provided at the cylindrical part and extending along the pair of sidewalls; and a bridging part disposed to face the lever part and bonded to the pair of sidewalls. The lever part is flexible to bend toward a direction away from the bridging part, and includes a protrusion part fittable with the through hole, and The tip part of the lever part protrudes to outside of the linking part.

### Effects of Invention

[0008] According to the invention, in the linking structure between the wiper arm and the wiper blade, the operability at the time of removing the linking can be improved.

### BRIEF DESCRIPTION OF DRAWINGS

[0009] FIG. 1 is a view illustrating the appearance of a linking structure of a wiper blade according to the invention.

[0010] FIG. 2 is a partially enlarged cross-sectional view illustrating a detailed structure of the linking structure of the wiper blade shown in FIG. 1.

[0011] FIG. 3 is a cross-sectional view illustrating the structure of a linking part of the wiper blade shown in FIG. 2.

[0012] FIG. 4 is a perspective view illustrating a structure of a protrusion part in the linking part shown in FIG. 2.

[0013] FIG. 5 is a partial cross-sectional view illustrating a state in which a wiper arm is mounted to the linking part of the wiper blade shown in FIG. 2.

[0014] FIG. 6 is a partial cutaway view illustrating a structure of a rib provided at a lever part of the linking part shown in FIG. 2.

[0015] FIG. 7 is a perspective view illustrating a contact surface in the linking part shown in FIG. 2. (a) and (b) of FIG. 8 are views illustrating a state of the linking part when the wiper arm shown in FIG. 2 wipes. (a) of FIG. 8 is a schematic view illustrating an effect of the linking part, and (b) is a schematic view illustrating a defect of the linking part.

### DESCRIPTION OF EMBODIMENTS

[0016] In the following, the embodiments of the invention will be described in detail with reference to the drawings.

[0017] A linking structure of a wiper blade 12 shown in FIG. 1, for example, forms a wiper device (not shown) wiping a glass 16 (see FIG. 8) provided in a vehicle, such as an automobile. The linking structure of the wiper blade 12 includes an elongated wiper arm 10 shown in FIG. 2, a wiper blade 12 linked to the wiper arm 10, a hook part (engagement part) 10a having a U shape and provided at the wiper arm 10, and a linking part 13 provided at the wiper blade 12 and linked with the hook part 10a. The wiper arm 10 is rotatably supported by an arm head 11.

[0018] In addition, as shown in FIG. 1, the wiper blade 12 is rotatably linked to a position in the vicinity of the tip part of the wiper arm 10 in a longitudinal direction L of the wiper blade 12. Meanwhile, an output shaft (not shown) of a wiper motor forming the wiper device is fixed to the base end side of the wiper arm 10.

[0019] In addition, by performing an ON operation on a wiper switch provided in a vehicle interior, for example, the output shaft of the wiper motor rotates in a forward/backward direction to swing the wiper arm 10. Accordingly, as shown in FIG. 2, a blade lever 14 provided in the wiper blade 12 reciprocally wipes within a predetermined range on the glass 16. As a result, the rainwater, etc., attached to a wipe surface of the glass 16 is wiped away.

[0020] The wiper arm 10 and the wiper blade 12 are linked by engaging the hook part 10a of the wiper arm 10 and the linking part 13 of the wiper blade 12. Specifically, by fitting a protrusion part 13f provided at a release lever (lever part) 13d of the linking part 13 of the wiper blade 12 into a through hole 10c provided at a tip side extension part 10b of

the hook part 10a of the wiper arm 10, the wiper arm 10 and the wiper blade 12 are linked.

[0021] Firstly, the hook part 10a of the wiper arm 10 is described. As shown in FIG. 2, the hook part 10a, which is the engagement part of the wiper arm 10, is formed in an U shape, and the tip side extension part 10b is provided on the tip side of the hook part 10a. In the tip side extension part 10b, an upper surface 10d is a flat surface. In addition, the through hole 10c is provided in a region where the upper surface 10d of the tip side extension part 10b is formed.

[0022] Meanwhile, as shown in FIGS. 3 and 4, the linking part 13 provided at the wiper blade 12 includes a pair of sidewalls 13a, 13b facing each other and a cylindrical part 13c bonded to the pair of sidewalls 13a, 13b and engaged with the hook part 10a. Inside the cylindrical part 13c, a shaft part 13s shown in FIG. 2 is disposed, and the sidewalls 13a, 13b are bearing parts. In addition, the linking part 13 includes the release lever 13d provided at the cylindrical part 13c and extending along the pair of sidewalls 13a, 13b, and a bridging part 13g having a plate shape disposed to face a portion of the release lever 13d and bonded to the pair of sidewalls 13a, 13b. In addition, as shown in FIG. 2, the linking part 13 is covered by a cover 15.

[0023] Moreover, the release lever 13d is flexible to bend toward a direction (bending direction P) away from the bridging part 13g. In addition, the release lever 13d includes the protrusion part 13f fittable with the through hole 10c of the tip side of the wiper arm 10. The protrusion 13f is provided on the lower surface 13k that is a surface on the side of the bridging part 13g of the release lever 13d.

[0024] Here, the release lever 13d is a component operated to remove the linking between the wiper arm 10 and the wiper blade 12. By bending the release lever 13d in the bending direction P, the protrusion part 13f of the release lever 13d is disengaged from the through hole 10c of the wiper arm 10 to release the wiper arm 10. Accordingly, the linking between the wiper arm 10 and the wiper blade 12 is removed.

[0025] In the linking part 13, a tip part 13e of the release lever 13d protrudes to the outside of the linking part 13. Specifically, the tip part 13e of the release lever 13d protrudes toward the outer side with respect to the sidewalls 13a, 13b and the bridging part 13g of the linking part 13.

[0026] Therefore, at the time of removing the linking between the wiper arm 10 and the wiper blade 12, it is easy to operate the tip part 13e of the release lever 13d, and the operability of the release lever 13d at the time of removing the linking can be improved.

[0027] In addition, the bridging part 13g is a component bonded to both of the sidewalls 13a, 13b and increases the rigidity of the sidewalls 13a, 13b as the bearing parts of the linking part 13. As shown in FIG. 3, the bridging part 13g may be provided in a thin plate shape so as not to obstruct a stroke S of the release lever 13d. However, the bridging part 13g is not limited to being plate-shaped.

[0028] In addition, the release lever 13d includes a root part 13m provided at the cylindrical part 13c, a first portion 13h connected to the root part 13m and disposed on the side of the cylindrical part 13c, and a second portion 13i disposed on a tip side opposite to the side of the cylindrical part 13c and connected to the first portion 13h. That is, the release lever 13d is formed by the root part 13m, the first portion 13h, and the second portion 13i, and the tip part 13e is included in the second portion 13i. In other words, the

portion protruding to the outer side of the linking part 13 in the release lever 13d is a portion of the second portion 13i including the tip part 13e. Specifically, a portion of the second portion 13i of the release lever 13d disposed inside the linking part 13 faces the bridging part 13g, and rest portions of the second portion 13i protrude to the outer side from the linking part 13.

[0029] In addition, as shown in FIG. 2, in the first portion 13h of the release lever 13d, the lower surface 13k, which is a surface of the first portion 13h on the side of the bridging part 13g, is able to abut against the tip side extension part 10b of the wiper arm 10. Specifically, when the wiper arm 10 and the wiper blade 12 are linked to the linking part 13, the lower surface 13k of the first portion 13h of the release lever 13d abuts against the upper surface 10d of the tip side extension part 10b of the wiper arm 10. Specifically, the lower surface 13k of the first portion 13h of the release lever 13d is inclined at an angle  $\theta$  toward the tip of the release lever 13d with respect to a horizontal surface. For example, as shown in FIG. 3, the lower surface 13k of the first portion 13h of the release lever 13d is inclined at an angle  $\theta$  toward the tip side of the release lever 13d with respect to the upper surface 13j of the second portion 13i that is a surface parallel to the horizontal surface. As an example, the angle is 1 degree. That is, the lower surface 13k of the first portion 13h is inclined at 1 degree in a direction opposite to the bending direction P toward the tip of the release lever 13d. Accordingly, when the wiper arm 10 and the wiper blade 12 are linked, as shown in FIG. 2, the protrusion part 13f of the first portion 13h of the release lever 13d can be fit into the through hole 10c of the tip side extension part 10b of the wiper arm 10. In addition, the lower surface 13k of the first portion 13h of the release lever 13d can abut against the upper surface 10d of the tip side extension part 10b of the wiper arm 10.

[0030] Moreover, as shown in FIGS. 3 and 4, the second portion 13i of the release lever 13d is disposed on the side of the bridging part 13g with respect to the first portion 13h in a first direction Q parallel to the bending direction P of the release lever 13d. In other words, the second portion 13i is disposed in a direction closer to the bridging part 13g than the first portion 13h. Furthermore, when expressed in a different way, the second portion 13i is disposed in a direction opposite to the bending direction P with respect to the first portion 13h. That is, the second portion 13i is provided to form a step difference toward a direction opposite to the bending direction P with respect to the first portion 13h.

[0031] By adopting the shape of the release lever 13d according to the above, in the structure in which the wiper arm 10 and the wiper blade 12 are linked as shown in FIG. 2, the tip side extension part 10b of the wiper arm 10 and the second portion 13i of the release lever 13d are at least partially overlapped with each other in a second direction R intersecting with the first direction Q. Specifically, in the second direction R, at least a portion of a thickness portion of the tip side extension part 10b of the wiper arm 10 and at least a portion of a thickness portion of the second portion 13i of the release lever 13d are overlapped. Accordingly, the tip side extension part 10b of the wiper arm 10 can be disposed in a space on the side of the lower surface 13k formed from the step difference between the first portion 13h and the second portion 13i. As a result, the lower surface 13k of the first portion 13h of the release lever 13d can abut

against the upper surface **10d** of the tip side extension part **10b** of the wiper arm **10**, and the stroke **S** toward the bending direction **P** of the release lever **13d** as shown in FIG. 3 can be secured.

[0032] When the wiper arm **10** and the wiper blade **12** are linked, as shown in FIG. 5, the wiper arm **10** is inserted from an insertion direction **M** with respect to the linking part **13** provided at the wiper blade **12**, and, as shown in FIG. 2, the wiper arm **10** and the wiper blade **12** are linked. At this time, the lower surface **13k** of the first portion **13h** of the release lever **13d** is inclined toward a direction opposite to the bending direction **P**. Therefore, when the protrusion part **13f** of the first portion **13h** is fit into the through hole **10c** of the wiper arm **10**, the lower surface **13k** of the first portion **13h** of the release lever **13d** can abut against the upper surface **10d** of the tip side extension part **10b** of the wiper arm **10**, and a click sound can be generated due to the abutting. Accordingly, a sense of operation when the wiper arm **10** and the wiper blade **12** are linked can be facilitated.

[0033] Moreover, as shown in FIG. 6, on each of the two side parts of the first portion **13h** and the second portion **13i** of the release lever **13d**, a rib **13n** extending in the second direction **R** is provided. Specifically, the rib **13n** raised along the first direction **Q** is provided at each of the two side end parts of the first portion **13h** and the second portion **13i** of the release lever **13d** in the width direction. The ribs **13n** are provided at the two side parts of the first portion **13h** and the second portion **13i** only, but are not provided at the root part **13m**.

[0034] The release lever **13d** of the embodiment is provided so that the vicinity of the tip part **13e** of the release lever **13d** protrudes toward the outer side from the linking part **13**, and the length of the release lever **13d** is increased. Moreover, since the release lever **13d** is long, when removing the linking between the wiper arm **10** and the wiper blade **12**, even if an operation of pushing up the release lever **13d** toward the bending direction **P** is performed, it is possible that the protrusion part **13f** does not follow. Moreover, in the release lever **13d**, a step difference is provided between the first portion **13h** and the second portion **13i**. Therefore, there is a concern that the strength of the release lever **13d** may be reduced.

[0035] Therefore, in the release lever **13d** of the embodiment, the ribs **13n** are provided at the two side parts (two side end parts) of the first portion **13h** and the second portion **13i** only, but are not provided at the root part **13m**. That is, only the rigidity of the first portion **13h** and the second portion **13i** are increased by the ribs **13n**, and the rigidity of the root part **13m** is not increased. Accordingly, at the time of performing the operation of pushing up the release lever **13d** toward the bending direction **P**, the release lever **13d** can be reliably bent toward the bending direction **P**, and the rigidity of the first portion **13h** and the second portion **13i** is increased. Therefore, the protrusion part **13f** can be made to follow.

[0036] In detail, in the release lever **13d** of the embodiment, the tip part **13e** protrudes toward the outer side of the linking part **13** to facilitate operability, and the length from the root part **13m** to the tip part **13e** is increased. Meanwhile, in the linking part **13**, in order to increase the rigidity of the sidewalls **13a**, **13b** as the bearing parts, the bridging part **13g** connecting the sidewalls **13a** and **13b** is provided to face a portion of the release lever **13d** (a portion of the second portion **13i**). Therefore, by providing the bridging part **13g**,

it is difficult to sufficiently secure the stroke **S** of the second portion **13i** including the tip part **13e** of the release lever **13d** toward the bending direction **P**. If the stroke amount of the release lever **13d** toward the bending direction **P** is insufficient, when removing the linking between the wiper arm **10** and the wiper blade **12**, the protrusion part **13f** is disengaged from the through hole **10c** of the wiper blade **12**. Therefore, with the step difference between the first portion **13h** and the second portion **13i** in the release lever **13d**, the stroke amount of the release lever **13d** toward the bending direction **P** is secured, and with the ribs **13n** at the two side parts (two side end parts) of the first portion **13h** and the second portion **13i**, the rigidity of the first portion **13h** and the second portion **13i** is increased. Nevertheless, since the ribs **13n** are not provided at the root part **13m** of the release lever **13d**, the rigidity of the root part **13m** is low, and it is possible to bend the release lever **13d** by using the root part **13m**. According to the above, at the time when the release lever **13d** is bent toward the bending direction **P** when the linking between the wiper arm **10** and the wiper blade **12** is removed, by increasing the rigidity of the first portion **13h** and the second portion **13i**, the protrusion part **13f** can be made to follow and move, and the protrusion **13f** can be disengaged from the through hole **10c** to remove the linking between the wiper arm **10** and the wiper blade **12**. Therefore, by adopting the release lever **13d** of the embodiment, the operability of the release lever **13d** is increased at the time of removing the linking between the wiper arm **10** and the wiper blade **12**, and the removal of the linking between the wiper arm **10** and the wiper blade **12** can be carried out reliably.

[0037] Moreover, as shown in FIG. 7, abutting surfaces **13r** (protruding parts) protruding with respect to respective facing surfaces **13p**, **13q** of the pair sidewalls **13a**, **13b** of the linking part **13** are provided on the facing surfaces **13p**, **13q**. Specifically, multiple abutting surfaces **13r** protruding with respect to the facing surface **13p** are provided on the facing surface **13p** of the sidewall **13a**, and multiple abutting surfaces **13r** protruding with respect to the facing surface **13q** are also provided on the facing surface **13q** of the sidewall **13b**.

[0038] Accordingly, at the time of linking the wiper arm **10** to the linking part **13**, the side part of the wiper arm **10** can abut against the abutting surface **13r**, and the vibration of the wiper arm when the wiper arm **10** wipes the glass **16** (see FIG. 8) can be suppressed. Accordingly, the damage to the wiper arm **10** or the linking part **13** can be reduced.

[0039] As shown in (a) of FIG. 8, in the linking structure of the wiper blade **12** of the embodiment, the bridging part **13g** respectively connected with the pair of sidewalls **13a**, **13b** facing each other is provided in the linking part **13**. Accordingly, the rigidity of the sidewalls **13a**, **13b** as the bearing parts can be increased.

[0040] Here, in the wipe operation of the wiper arm **10**, as shown in (b) of FIG. 8, when the wiper arm **10** moves in an arm traveling direction **T** along the wipe surface of the glass **16**, a load **N** due to a friction force **F** with the wipe surface and a pushing force **U** to the wipe surface is generated, and a large stress **V** is applied to the sidewall **13a** on the side of the arm traveling direction **T**. The linking part **13** has a relatively large number of cavities inside, and as a result, the rigidity of the sidewalls **13a** and **13b** is low. Therefore, when the large stress **V** is applied to the sidewall **13a**, an issue that the sidewall **13a** collapse and the wipe performance of the wiper arm **10** is deteriorated occurs.

[0041] Therefore, in the linking part **13** of the embodiment, as shown in (a) of FIG. **8**, by providing the bridging part **13g** connecting the sidewall **13a** and the sidewall **13b**, the rigidity of the sidewalls **13a**, **13b** is increased. Accordingly, in the wipe operation of the wiper arm **10**, even if the large stress **V** is applied to the sidewall **13a** or the sidewall **13b** as shown in (b) of FIG. **8**, the sidewall **13a** and the sidewall **13b** neither collapse nor be damaged, and the wipe performance of the wiper arm **10** is not affected.

[0042] Thus, in the linking structure between the wiper arm **10** and the wiper blade **12** according to the embodiment, the strength of the linking part **13** is increased, and the tip part **13e** of the release lever **13d** protrudes to the outside of the linking part **13**. Therefore, the operability at the time of removing the linking between the wiper arm **10** and the wiper blade **12** can be facilitated.

[0043] It goes without saying that the invention is not limited to the above-described embodiments, and various modifications can be made without departing from the gist of the invention. For example, in the embodiment, the linking structure of the wiper blade **12** may also be applied to a rear wiper device wiping the rear glass of a vehicle such as an automobile, or be applied to a wiper device mounted on the front side of a vehicle such as an automobile. Moreover, it is also possible to apply the linking structure to a wiper device mounted in a ship, an airplane, a rail vehicle, etc. Furthermore, the wiper arm **10** according to the embodiment may be molded by using a resin material or by using a metal material.

#### REFERENCE SIGNS LIST

[0044] **10**: Wiper arm; **10a**: Hook part (engagement part); **10b**: Tip side extension part; **10c**: Through hole; **10d**: Upper surface; **11**: Arm head; **12**: Wiper blade; **13**: Linking part; **13a**, **13b**: Sidewall; **13c**: Cylindrical part; **13d**: Release lever (Lever part); **13e**: Tip part; **13f**: Protrusion part; **13g**: Bridging part; **13h**: First portion; **13i**: Second portion; **13j**: Upper surface; **13k**: Lower surface (surface on the side of the bridging part); **13m**: Root part; **13n**: Rib; **13p**, **13q**: Facing surface; **13r**: Abutting surface (protrusion part); **13s**: Shaft part; **14**: Blade lever; **15**: Cover; **16**: Glass.

1. A wiper blade linking structure, comprising:
  - a wiper arm;
  - a wiper blade, linked to the wiper arm;
  - an engagement part, having a U shape and provided at the wiper arm; and
  - a linking part, provided at the wiper blade and linked with the engagement part,
 wherein the engagement part has a tip side extension part in which a through hole is formed,
  - the linking part comprises: a pair of sidewalls facing each other; a cylindrical part bonded to the pair of sidewalls and engaged with the engagement part; a lever part provided at the cylindrical part and extending along the pair of sidewalls; and a bridging part disposed to face the lever part and bonded to the pair of sidewalls, wherein the lever part is flexible to bend toward a direction away from the bridging part, and comprises a protrusion part fittable with the through hole, and
  - a tip part of the lever part protrudes to outside of the linking part.
2. The wiper blade linking structure as claimed in claim 1, wherein the lever part comprises a first portion disposed on a side of the cylindrical part and a second portion disposed on a side opposite to the side of the cylindrical part and connected to the first portion,
  - in the first portion, a surface of the first portion on a side of the bridging part is abutable with the tip side extension part, and
  - the second portion is disposed on the side of the bridging part with respect to the first portion in a first direction parallel to a direction in which the lever part is bent.
3. The wiper blade linking structure as claimed in claim 2, wherein the tip side extension part and the second portion are at least partially overlapped with each other in a second direction intersecting with the first direction.
4. The wiper blade linking structure as claimed in claim 3, wherein ribs are provided along the second direction at two side end parts of each of the first portion and the second portion in a width direction.
5. The wiper blade linking structure as claimed in claim 1, wherein on a facing surface of each of the pair of sidewalls, a protruding part protruding with respect to the facing surface is provided.

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