US 20130334353A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2013/0334353 A1**

(43) **Pub. Date: Dec. 19, 2013**

TAKENOSHITA

(54) **REEL**

(71) Applicant: **FUJIFILM CORPORATION**, Tokyo (JP)

(72) Inventor: **Kenji TAKENOSHITA**, Odawara-shi (JP)

(73) Assignee: **FUJIFILM CORPORATION**, Tokyo (JP)

(21) Appl. No.: **13/971,842**

(22) Filed: **Aug. 21, 2013**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2011/075214, filed on Nov. 1, 2011.

(30) **Foreign Application Priority Data**

Feb. 28, 2011 (JP) 2011-042336

Publication Classification

(51) **Int. Cl.**
B65H 75/14 (2006.01)

(52) **U.S. Cl.**
CPC *B65H 75/14* (2013.01)
USPC **242/118.6**

(57) **ABSTRACT**

The present invention provides a reel which includes: a hub, around an outer periphery face of which a recording tape is wound; an annular first flange disposed at one axial direction end portion of the hub; an annular second flange disposed at the other axial direction end portion of the hub; a plurality of first pad portions protruding into the hub from the first flange, the first pad portions being engaged with the hub to be relatively non-rotatable; and a plurality of second pad portions protruding into the hub from the second flange, the plurality of second pad portions being welded to the plurality of first pad portions.

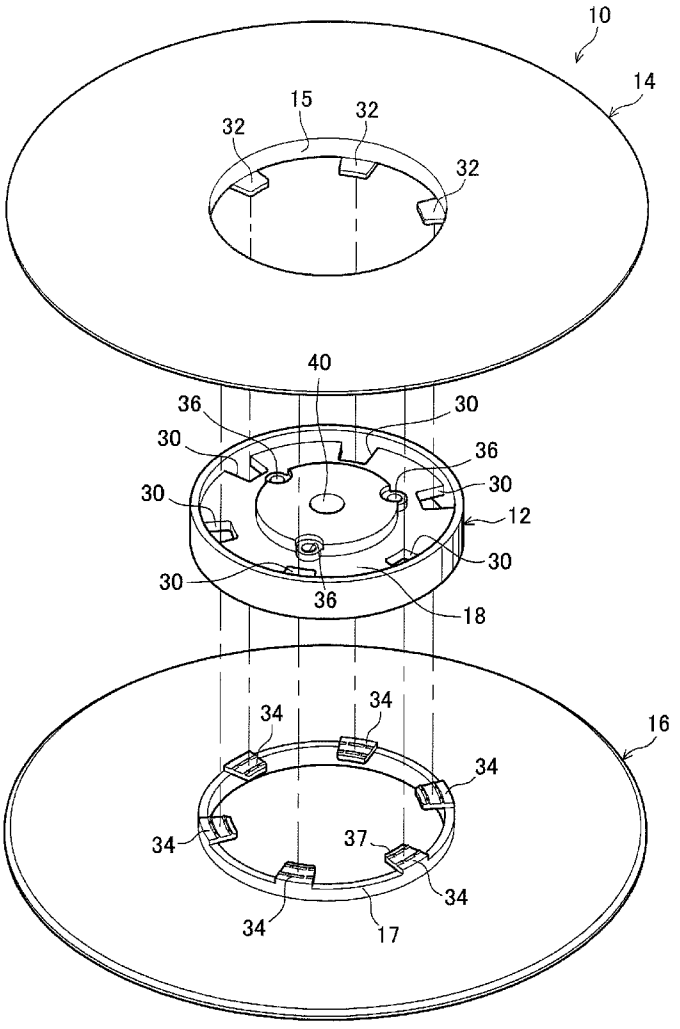


FIG.1

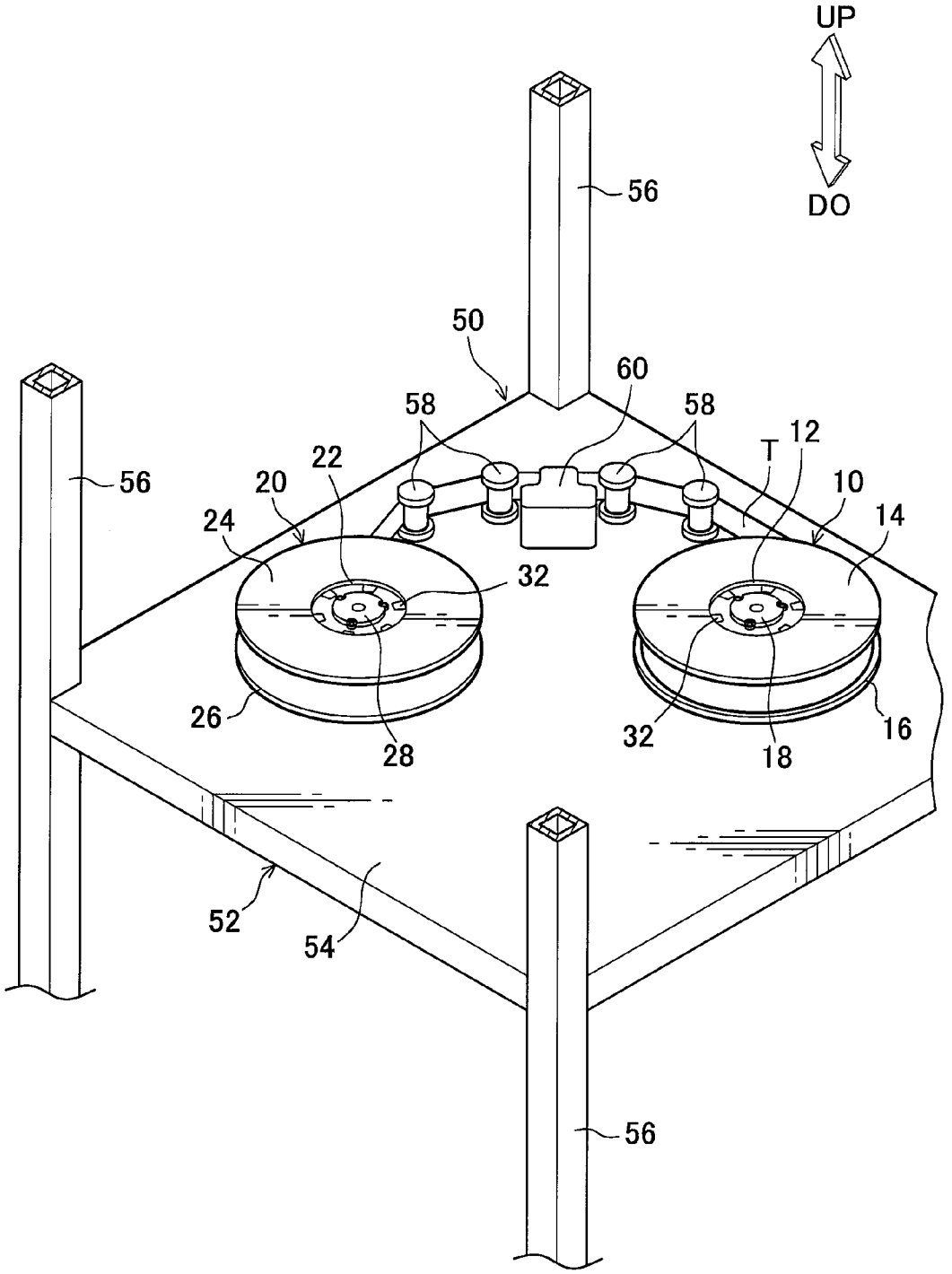


FIG.2

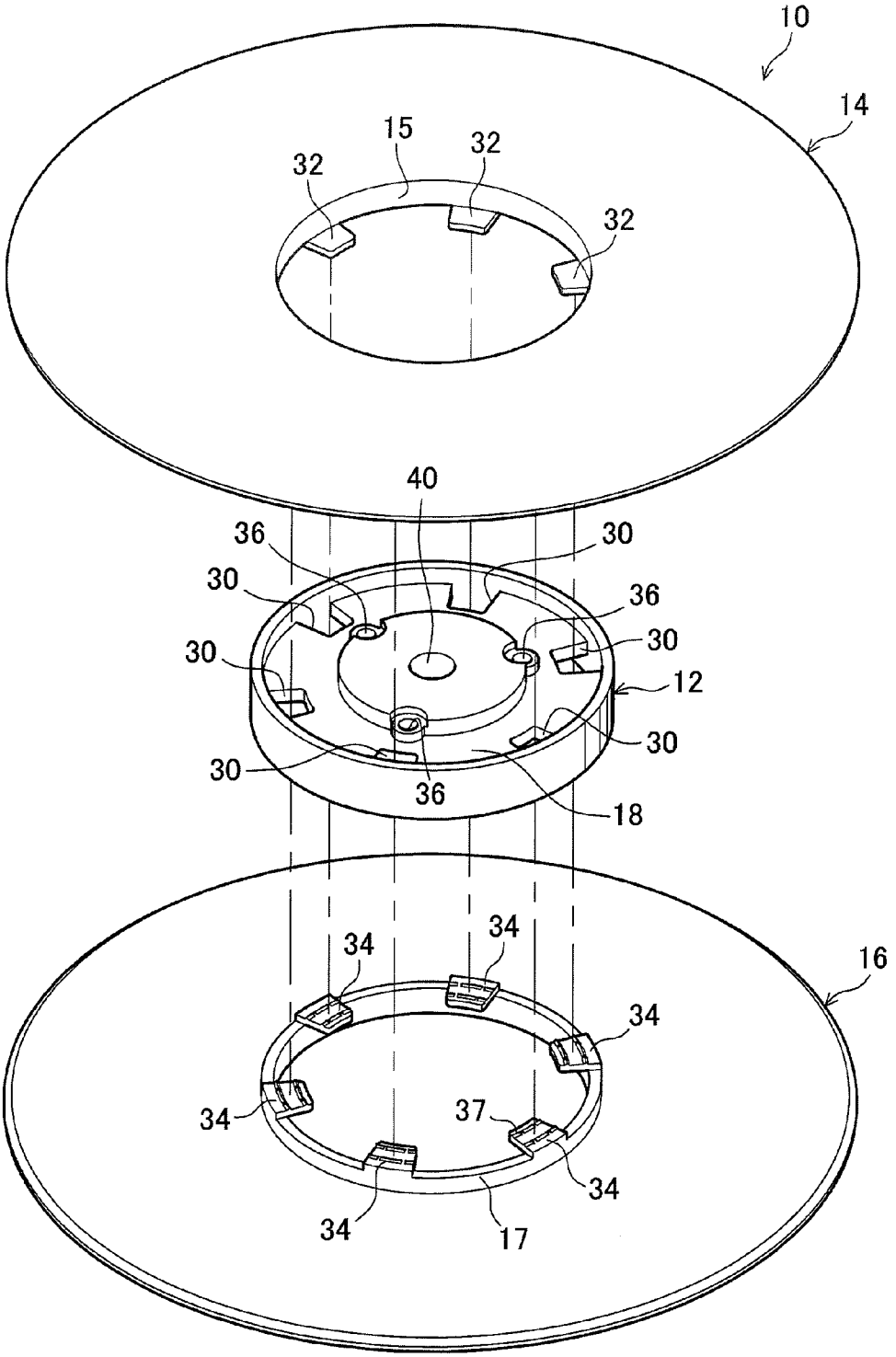

10
14
15
32
32
32
40
36
30
30
36
30
30
12
30
30
36
18
16
34
34
34
34
37
34
34
17

FIG.3

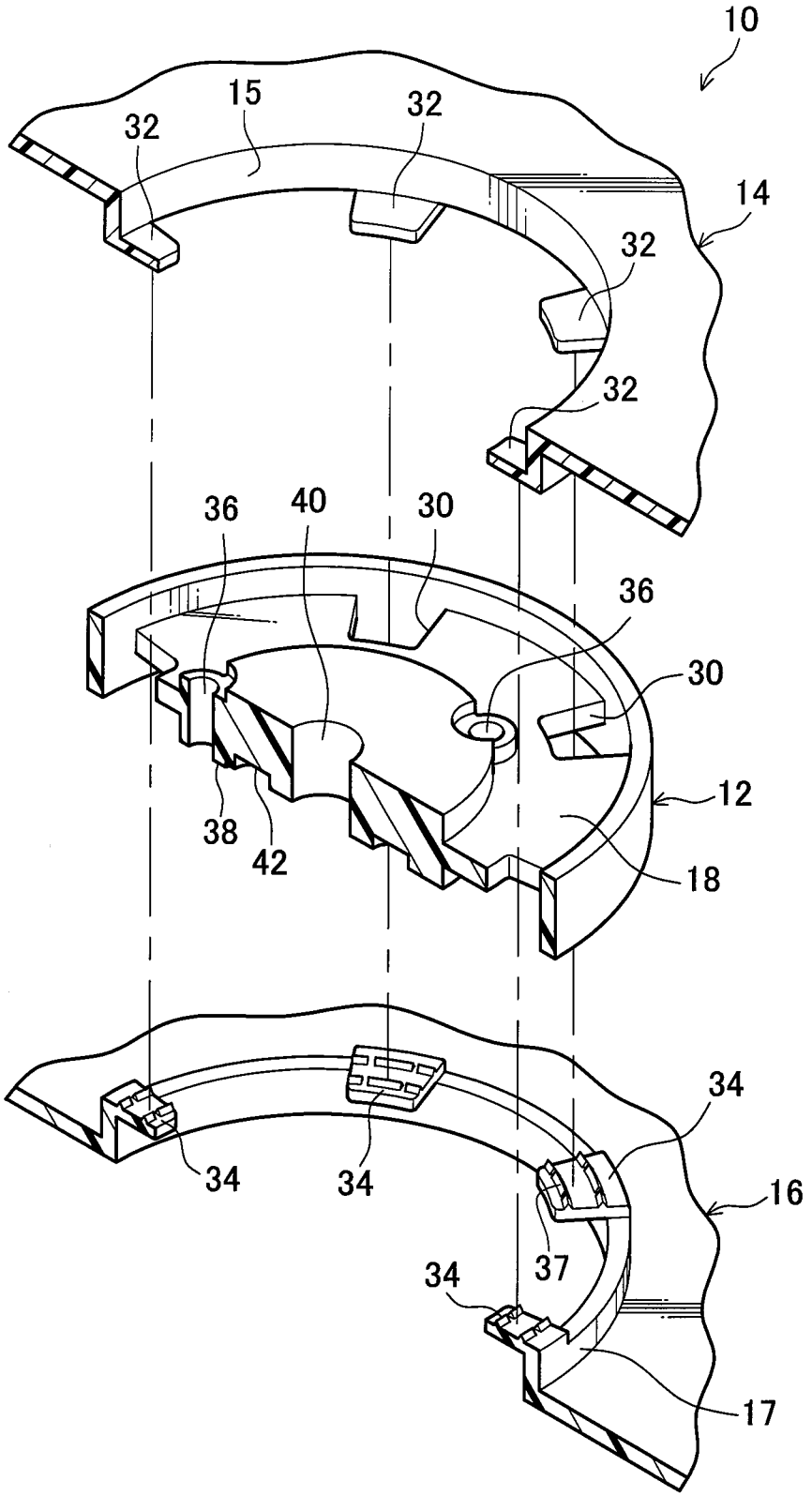


FIG.4

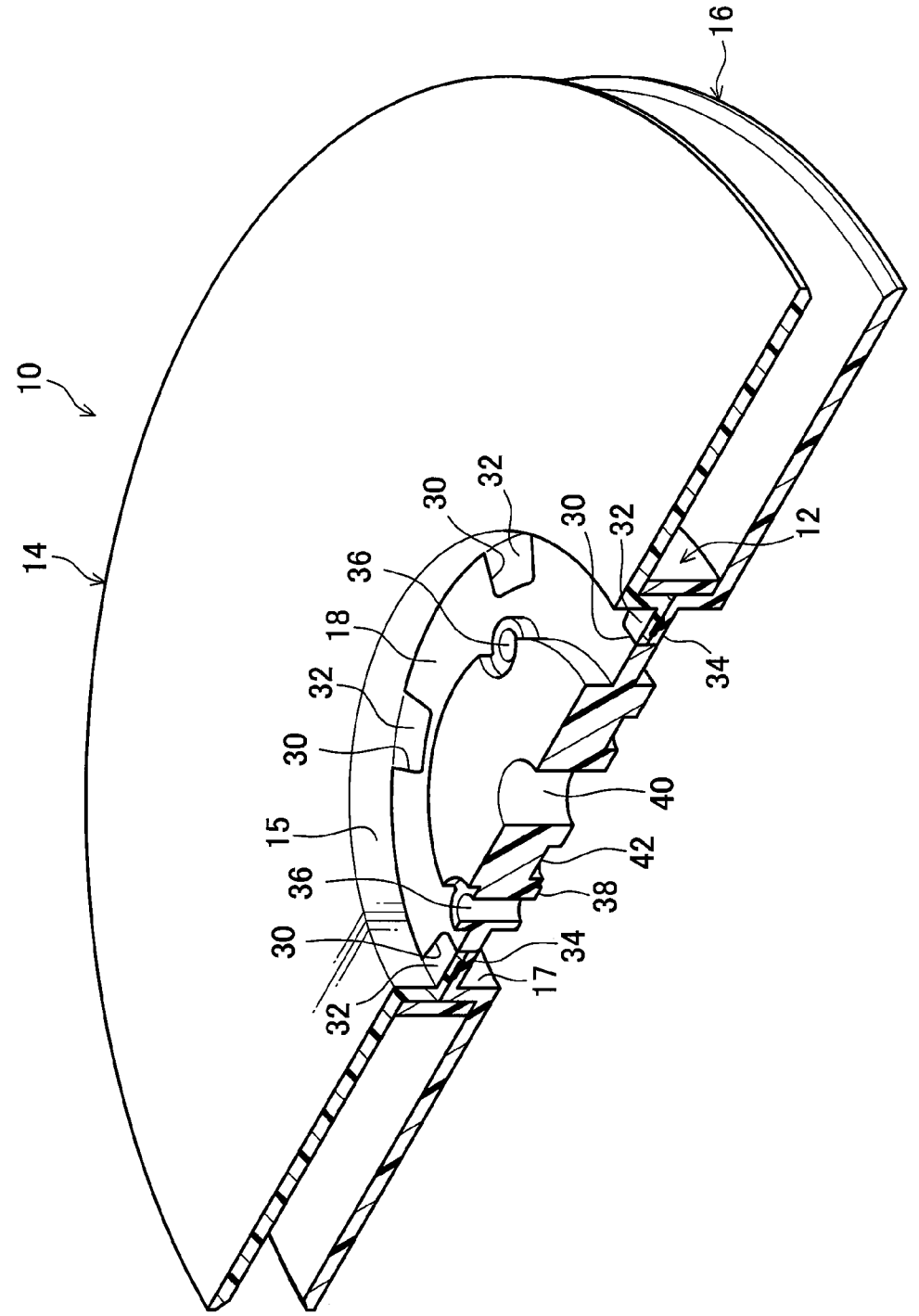


FIG.5

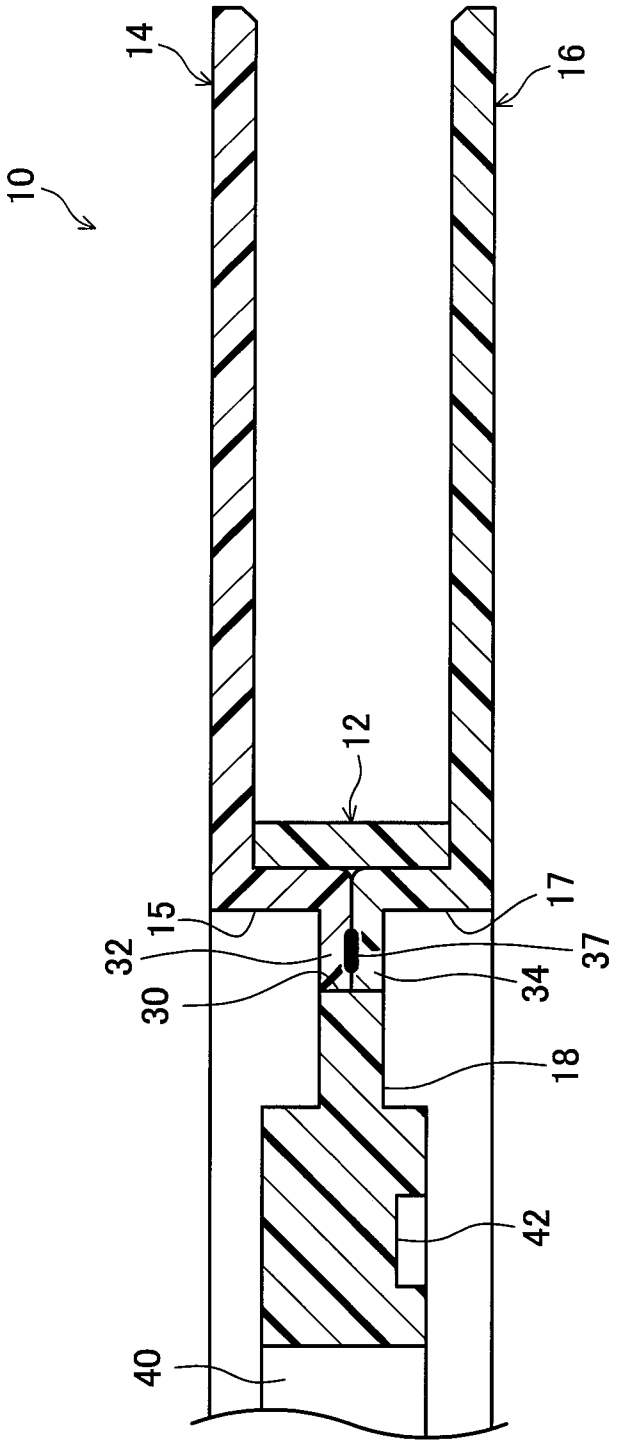


FIG.6A

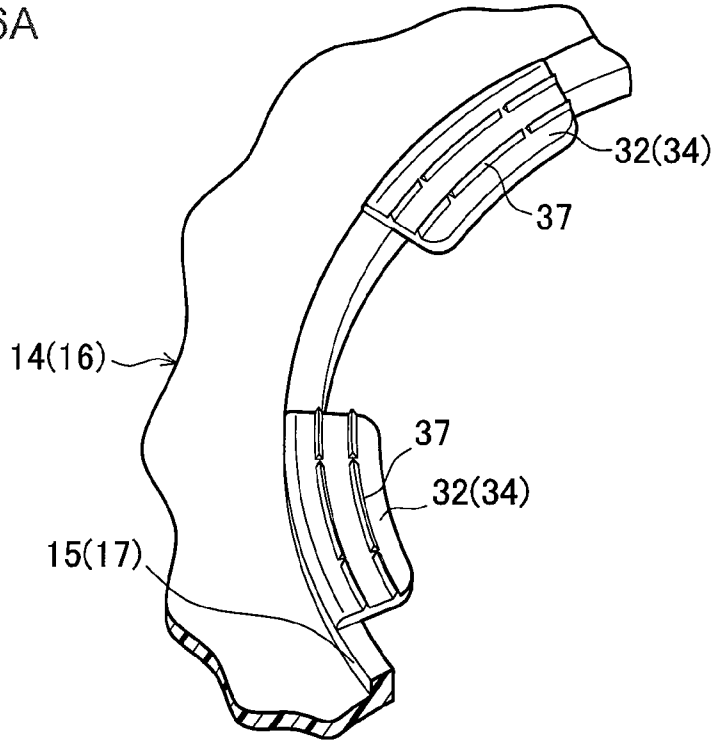


FIG.6B

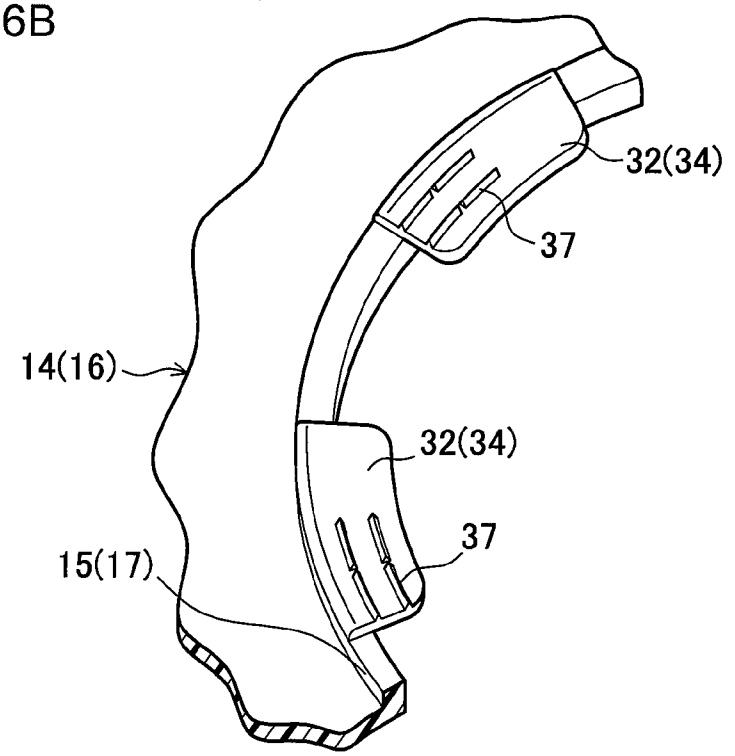


FIG.7

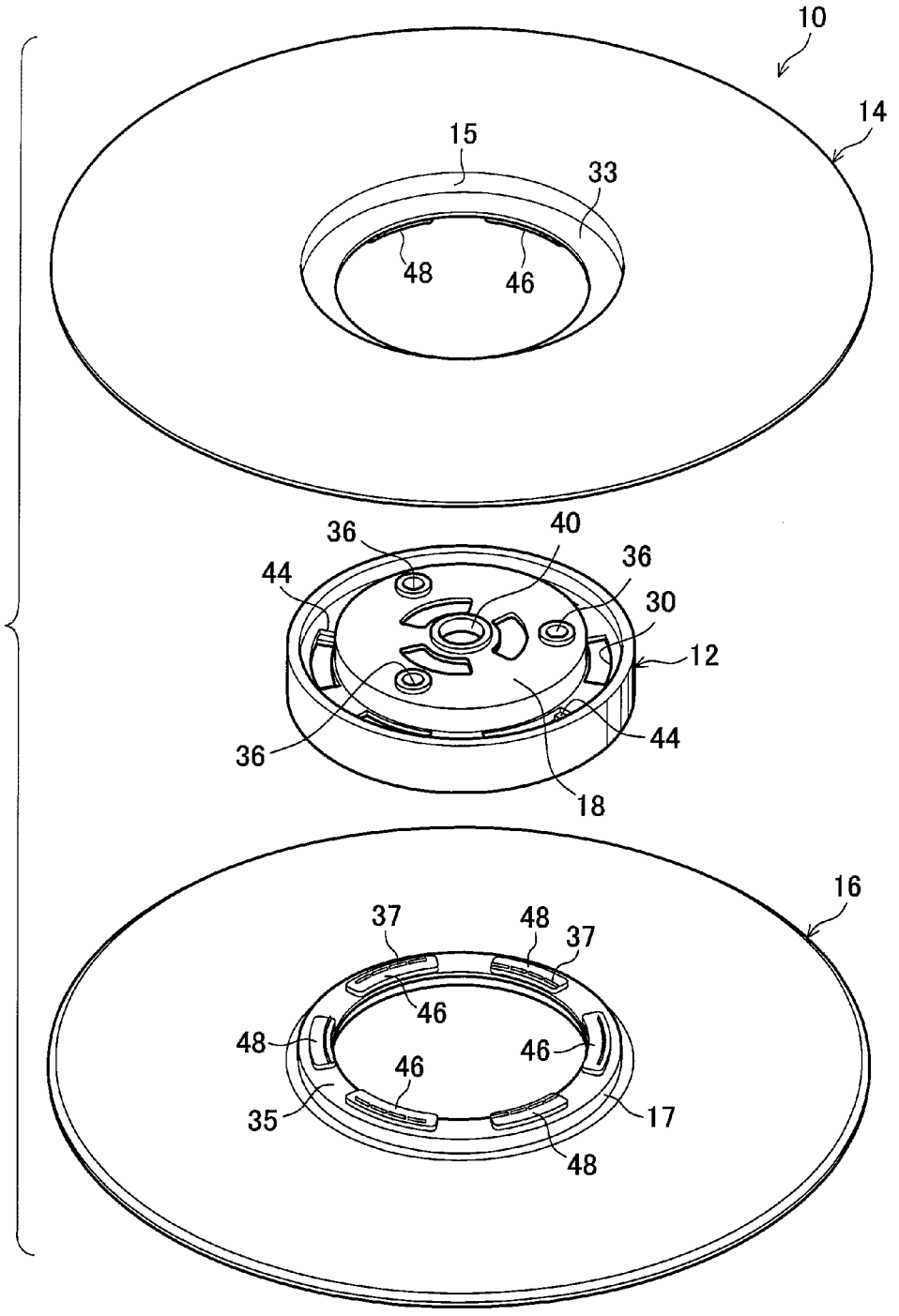

10
14
15
33
48
46
36
40
36
44
30
12
36
44
18
16
37
48
37
46
48
46
46
35
17
48

FIG.8

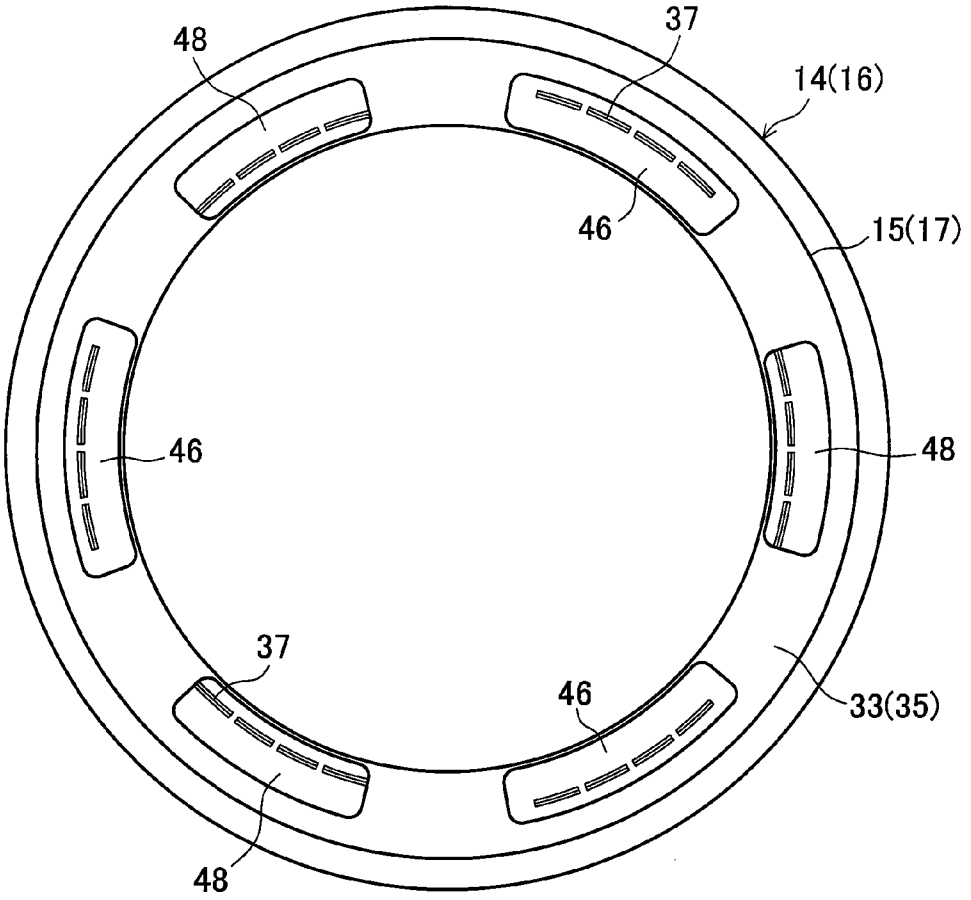


FIG.9

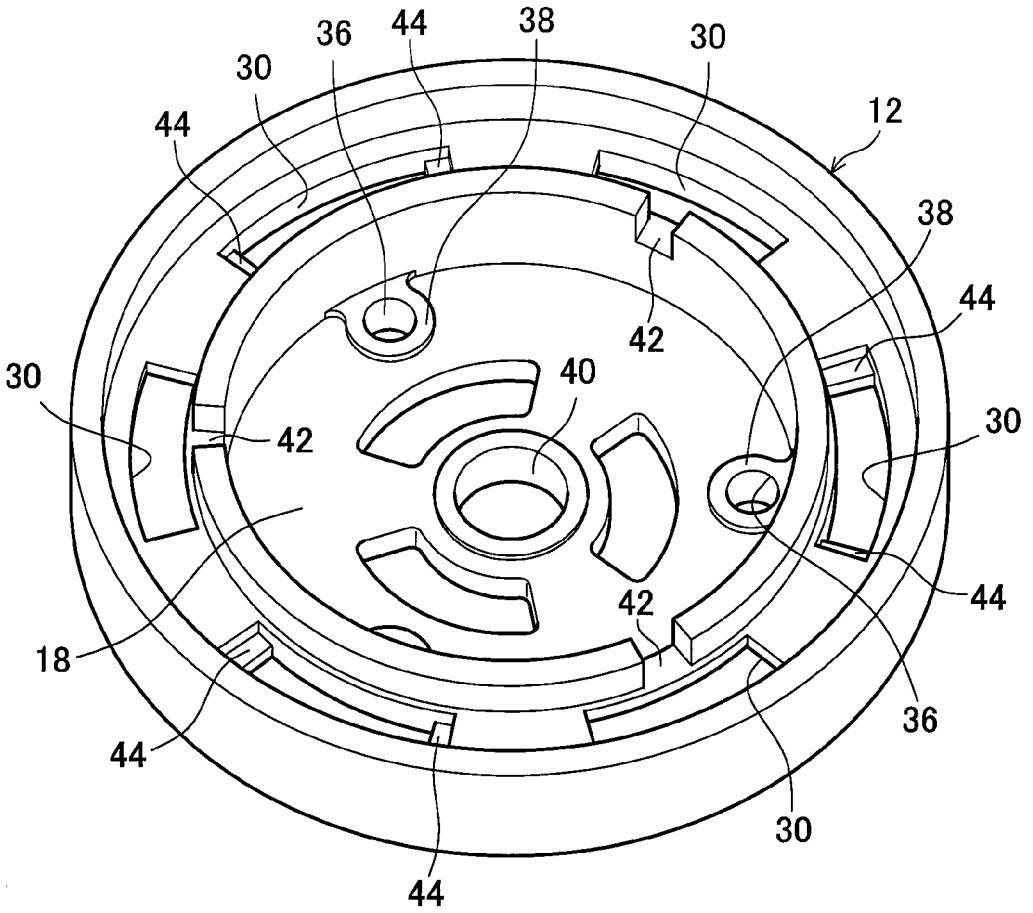


FIG.10

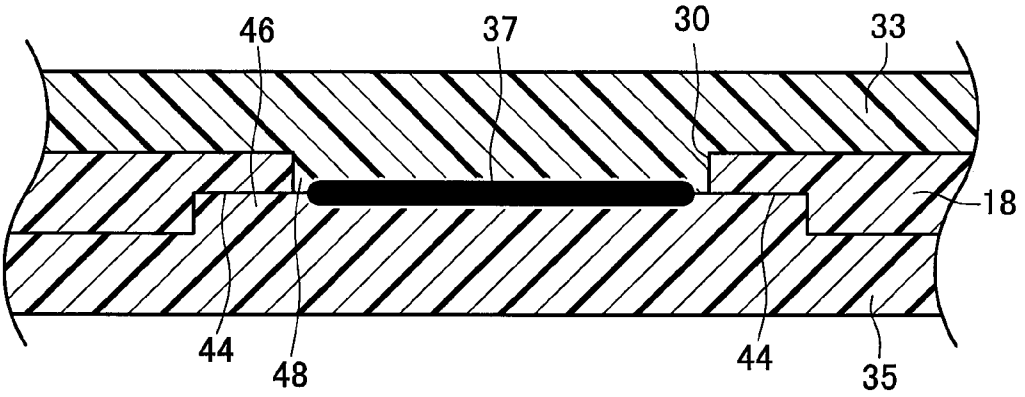
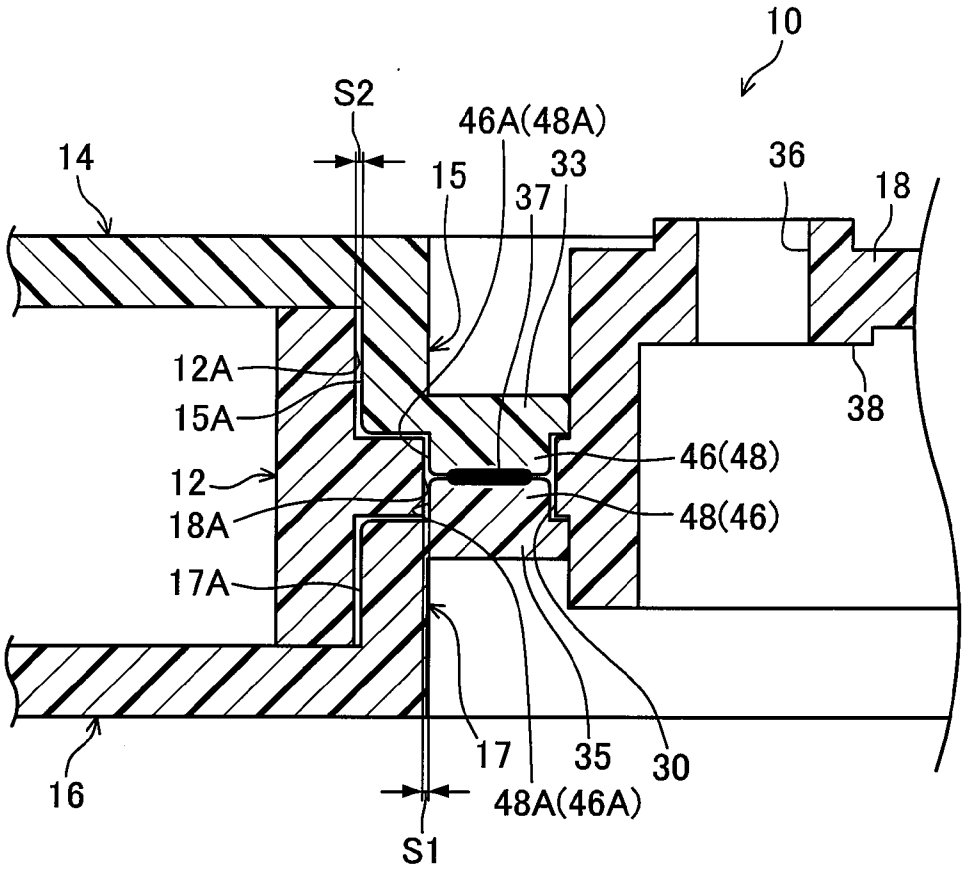


FIG.11


10
S2
46A(48A)
14
15
33
37
36
18
12A
15A
38
46(48)
12
18A
48(46)
17A
17
35
30
16
48A(46A)
S1

REEL

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation application of International Application No. PCT/JP2011/075214, filed Nov. 1, 2011, the disclosure of which is incorporated herein by reference in its entirety. Further, this application claims priority from Japanese Patent Application No. 2011-042336, filed Feb. 28, 2011, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] 1. Technical Field

[0003] The present invention relates to a reel on which a recording tape such as a magnetic tape or the like is wound.

[0004] 2. Related Art

[0005] Heretofore, a recording tape cartridge has been known in which a recording tape such as a magnetic tape or the like, which is principally used as an information recording and replaying medium for computers and the like (data backup), is wound on a reel, and the reel is singly accommodated in a case.

[0006] A reel with a three-piece structure is known as a reel to be accommodated in this recording tape cartridge. In the three-piece structure, an upper circular tube portion is formed at an inner periphery portion of an upper flange, a lower circular tube portion is formed at an inner periphery portion of a lower flange, the upper circular tube portion and lower circular tube portion are welded together, and a hub is sheathed around the outer periphery face side of the upper circular tube portion and lower circular tube portion (for example, see Japanese Patent Application Laid-Open (JP-A) No. 2007-299437).

[0007] However, in the reel disclosed in Japanese Patent Application Laid-Open (JP-A) No. 2007-299437, the upper circular tube portion and lower circular tube portion are welded along the whole periphery thereof. Therefore, process efficiency in a welding process cannot necessarily be considered to be excellent. In addition, a turning preventer that prevents the hub from rotating relative to the upper and lower flanges must be separately formed.

SUMMARY

[0008] The present invention provides a reel that may improve process efficiency in a welding process.

[0009] A reel according to a first aspect of the present invention includes: a hub, around an outer periphery face of which a recording tape is wound; an annular first flange disposed at one axial direction end portion of the hub; an annular second flange disposed at the other axial direction end portion of the hub; plural first pad portions protruding into the hub from the first flange, the first pad portions being engaged with the hub to be relatively non-rotatable; and plural second pad portions protruding into the hub from the second flange, the plural second pad portions being welded to the plural first pad portions.

[0010] According to a reel in accordance with the first aspect, because the reel is assembled by the plural first pad portions protruding into the hub interior from the first flange being welded to the plural second pad portions protruding into the hub interior from the second flange, process efficiency in a welding process may be improved. Moreover, because the first flange and the second flange may be made incapable of rotating relative to the hub by the first pad portions being engaged with the hub to disable relative rotation, there is no need to form a separate turning preventer.

[0011] In a reel according to a second aspect of the present invention, in the reel according to the first aspect, the first pad portions are engaged with an inner periphery face side of the hub.

[0012] According to a reel in accordance with the second aspect, the first pad portions and second pad portions may be welded at the inner periphery face side of the hub. Therefore, the first flange and second flange may be welded more securely than in a structure in which first pad portions and second pad portions are welded at the center side of a hub. The meaning of the term "inner periphery face side of the hub" as used herein is not limited to positions adjacent to the inner periphery face of the hub but includes positions that are a little toward the radial direction inner side from the inner periphery face of the hub.

[0013] In a reel according to a third aspect of the present invention, the reel according to the first aspect further includes a penetrating hole formation portion that is integrally formed at an inner periphery face of the hub and in which penetrating holes are formed, wherein relative rotation between the first flange and second flange and the hub is disabled by at least the first pad portions being fitted into the penetrating holes.

[0014] According to a reel in accordance with the third aspect, the first pad portions and second pad portions may be welded with ease. Moreover, relative rotation between the first flange and second flange and the hub may be disabled with a simple structure.

[0015] In a reel according to a fourth aspect of the present invention, the reel according to the first aspect further includes a circular plate-shaped reinforcement portion that is integrally formed at an inner periphery face of the hub so as to be coaxial with the hub, and in an outer periphery portion of which penetrating holes are formed, wherein relative rotation between the first flange and second flange and the hub is disabled by at least the first pad portions being fitted into the penetrating holes.

[0016] According to a reel in accordance with the fourth aspect, the first pad portions and second pad portions may be welded with ease. Moreover, relative rotation between the first flange and second flange and the hub may be disabled with a simple structure. Further, a hub with a higher stiffness (strength) than a hub that does not include a reinforcement portion can be provided.

[0017] In a reel according to a fifth aspect of the present invention, in the reel according to the fourth aspect, a fastening portion for fastening to a rotary member of a drive device is formed at the reinforcement portion.

[0018] According to a reel in accordance with the fifth aspect, the reel may be directly installed in a drive device.

[0019] In a reel according to a sixth aspect of the present invention, in the reel according to the third aspect, a gap is formed between a radial direction outer side wall face of the penetrating holes and a radial direction outer side wall face of at least the first pad portions.

[0020] According to a reel in accordance with the sixth aspect, because gaps are formed between the radial direction outer side wall faces of the penetrating holes and the radial direction outer side wall faces of the at least the first pad portions, when a recording tape is wound on the hub, a defor-

mation of the hub caused by winding force of the recording tape may be absorbed by the gaps.

[0021] In a reel according to a seventh aspect of the present invention, in the reel according to the third aspect, the first pad portions are structured in plural different kinds of shape, the second pad portions are structured in plural kinds of shape that correspond with the first pad portions, and the penetrating holes are formed in plural kinds of shape that correspond with at least the first pad portions.

[0022] According to a reel in accordance with the seventh aspect, a combination in which the first pad portions of the first flange are welded to the second pad portions of the second flange is specifically determined in the circumferential direction. In particular, if the first pad portions and the second pad portions are respectively formed in corresponding shapes with equal spacings, the first pad portions and second pad portions are unlikely to become slanted. Thus, surface runout of the first flange and the second flange may be suppressed or prevented.

[0023] In a reel according to an eighth aspect of the present invention, in the reel according to the first aspect, the first flange at which the first pad portions are provided and the second flange at which the second pad portions are provided are formed in the same shape.

[0024] According to a reel in accordance with the eighth aspect, the first flange and the second flange may be formed by a single mold. Hence, fabrication costs may be reduced.

[0025] In a reel according to a ninth aspect of the present invention, in the reel according to the seventh aspect, each of the first pad portions and the second pad portions includes an identical flat-shaped plate.

[0026] According to a reel in accordance with the ninth aspect, the first pad portions and second pad portions may be formed with ease. Hence, fabrication costs may be reduced.

[0027] In a reel according to a tenth aspect of the present invention, in the reel according to the ninth aspect, energy directors are provided with a welding surface of each of the first pad portions and the second pad portions, and the energy directors are provided intermittently in a circumferential direction and are spaced by a predetermined interval in a radial direction.

[0028] According to a reel in accordance with the tenth aspect, welding areas are increased and the energy of ultrasonic oscillations for melting the energy directors, may be efficiently transmitted to the energy directors.

[0029] In a reel according to a eleventh aspect of the present invention, in the reel according to the ninth aspect, energy directors are provided from an end portion substantially to a middle portion in a circumferential direction with a welding surface of each of the first pad portions and the second pad portions, such that when the welding surfaces of the first pad portions are superposed with the welding surfaces of the second pad portion, the energy directors of the first pad portions do not face with the energy directors of the second pad portions.

[0030] According to a reel in accordance with the eleventh aspect, welding areas are increased and the energy of ultrasonic oscillations for melting the energy directors, may be efficiently transmitted to the energy directors. Further, the shapes of the energy directors formed on the first pad portion and the second pad portions may be simplified.

[0031] In a reel according to a twelfth aspect of the present invention, in the reel according to the ninth aspect, the penetrating holes are formed with shapes the same as the first pad portions and the second pad portions, and a plate thickness of the penetrating hole formation portion is twice plate thicknesses of the first pad portions and the second pad portions.

[0032] According to a reel in accordance with the twelfth aspect, the penetrating holes may be formed with ease. Hence, fabrication costs may be reduced.

[0033] In a reel according to a thirteenth aspect of the present invention, in the reel according to the seventh aspect, each of the first pad portions and the second pad portions includes first welding ribs that is formed with a longer and narrow shape and second welding ribs that is formed with a shorter and narrow shape, and the first welding ribs and the second welding ribs are provided alternating at equal intervals.

[0034] According to a reel in accordance with the thirteenth aspect, the first pad portions and second pad portions may be formed with ease. Hence, fabrication costs may be reduced.

[0035] In a reel according to a fourteenth aspect of the present invention, in the reel according to the thirteenth aspect, first energy directors are formed at a radial direction outer side on the first welding ribs, and second energy directors are formed at a radial direction inner side on the second welding ribs.

[0036] According to a reel in accordance with the fourteenth aspect, welding areas are increased and the energy of ultrasonic oscillations for melting the energy directors, may be efficiently transmitted to the energy directors.

[0037] In a reel according to a fifteenth aspect of the present invention, in the reel according to the thirteenth aspect, the first welding ribs and the second welding ribs protrude to the same heights, and a plate thickness of the penetrating hole formation portion is twice protrusion height of the first welding ribs and second welding ribs.

[0038] According to a reel in accordance with the fifteenth aspect, the first welding ribs and the second welding ribs are unlikely to cause slanting in the radial direction. Thus, surface runout of the first flange and the second flange may be suppressed or prevented.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039] Exemplary embodiments of the present invention will be described in detail based on the following figures, wherein:

[0040] FIG. **1** is a perspective diagram showing a pair of reels installed in a drive device.

[0041] FIG. **2** is an exploded perspective diagram of a reel in accordance with a first exemplary embodiment.

[0042] FIG. **3** is an exploded perspective sectional diagram in which principal portions of the reel in accordance with the first exemplary embodiment are shown magnified.

[0043] FIG. **4** is a sectional perspective diagram of the reel in accordance with the first exemplary embodiment.

[0044] FIG. **5** is a sectional diagram in which principal portions of the reel in accordance with the first exemplary embodiment are shown magnified.

[0045] FIG. **6**A is a perspective diagram showing an example of the shapes of energy directors formed at protrusion portions of the reel in accordance with the first exemplary embodiment.

[0046] FIG. **6**B is a perspective diagram showing another example of the shapes of the energy directors formed at the protrusion portion of the reel in accordance with the first exemplary embodiment.

[0047] FIG. **7** is an exploded perspective diagram of a reel in accordance with a second exemplary embodiment.

[0048] FIG. **8** is a plan diagram showing welding ribs that are formed at protrusion portions of the reel in accordance with the second exemplary embodiment.

[0049] FIG. **9** is a perspective diagram showing a reel hub of the reel in accordance with the second exemplary embodiment viewed from beneath.

[0050] FIG. **10** is a sectional diagram showing a state in which the welding ribs formed at the protrusion portions of the reel in accordance with the second exemplary embodiment are mutually welded.

[0051] FIG. **11** is a sectional diagram in which principal portions of the reel in accordance with the second exemplary embodiment are shown magnified.

DETAILED DESCRIPTION

[0052] Herebelow, exemplary embodiments relating to the present invention are described in detail in accordance with the drawings. For convenience in the descriptions, the arrow UP in FIG. **1** represents an upward direction, the arrow DO represents a downward direction, and a rotation axis direction of reels **10** and **20** according to the present exemplary embodiments is referred to as an up-and-down direction (or height direction). Firstly, a first exemplary embodiment is described.

[0053] The reels **10** and **20** according to the present exemplary embodiment are fabricated of a synthetic resin such as, for example, polycarbonate (PC). As shown in FIG. **1**, the reels **10** and **20** are provided as a pair inside a casing **52** of a drive device **50** (of which only a floor plate **54** and three support pillars **56** are shown in FIG. **1**).

[0054] The reel **10** is used for feeding out a recording tape T and the reel **20** is used for taking up the recording tape T. While the recording tape T is being fed out from the reel **10** and taken up at the reel **20**, the recording tape T slides against a recording/replay head **60**. Thus, data is recorded on the recording tape T by the recording/replay head **60** and/or data that has been recorded at the recording tape T is replayed.

[0055] A plural number (four in the drawing, in sets of two) of tape guides **58** are rotatably provided on the floor plate **54** at the two sides of the recording/replay head **60**. The recording tape T being unwound from the reel **10** and taken up at the reel **20** is guided by the tape guides **58**.

[0056] The reels **10** and **20** are structured with reel hubs **12** and **22**, upper flanges **14** and **24**, lower flanges **16** and **26**, and reinforcement portions **18** and **28** (see FIG. **2** to FIG. **5**). The reel hubs **12** and **22** structure axial central portions of the reels **10** and **20** and have substantially circular tube shapes. The upper flanges **14** and **24** have annular shapes and serve as first flanges provided at upper end portion sides of the reel hubs **12** and **22**. The lower flanges **16** and **26** have annular shapes and serve as second flanges provided at lower end portion sides of the reel hubs **12** and **22**. The reinforcement portions **18** and **28** have substantially circular plate shapes that serve as penetrating hole formation portions, which are integrally continuous with height (axial) direction middle portions of inner periphery faces of the reel hubs **12** and **22**.

[0057] The recording tape T, which is a magnetic tape or the like and serves as an information recording and replaying medium, is wound around the outer periphery face of the reel hub **12** of the reel **10**. Width direction end portions of the recording tape T are retained by the upper flange **14** and the lower flange **16**. The recording tape T that has been fed out from the reel **10** is taken up onto the outer periphery face of the reel hub **22** of the reel **20**, and the width direction end portions thereof are retained by the upper flange **24** and the lower flange **26**.

[0058] The meaning of the term "substantially circular tube shape" as used in the present exemplary embodiments includes generally circular rod shapes in which the shapes of the outer periphery faces (winding faces) of the reel hubs **12** and **22** on which the recording tape T is wound are formed as bulging cylinder shapes or the like, hollow shapes that are not purely circular tube shapes, in which ribs or the like are provided protruding from the inner periphery face sides of the reel hubs **12** and **22**, and so forth.

[0059] A motor that serves as a drive source (not shown in the drawings) is provided at the drive device **50**. A pair of rotary members (not shown in the drawings) transmit rotary driving force from a rotary shaft of the motor (not shown in the drawings). The respective rotary members are rotatably provided in a pair of aperture portions (not shown in the drawings) that are formed in the casing **52** (the floor plate **54**) of the drive device **50**. The reinforcement portions **18** and **28** of the reels **10** and **20** are integrally fixed (fastened) to the respective rotary members by unillustrated screws.

[0060] The structures of the reel **10** and the reel **20** are identical. Accordingly, the reel **10** is taken as an example and described below. As shown in FIG. **2** to FIG. **5**, an upper circular tube portion **15** is integrally formed at an inner periphery edge portion of the upper flange **14** of the reel **10**. The upper circular tube portion **15** extends downward by a predetermined height, to be inserted into the reel hub **12**. A lower circular tube portion **17** is integrally formed at an inner periphery edge portion of the lower flange **16**. The lower circular tube portion **17** extends upward by a predetermined height, to be inserted into the reel hub **12**.

[0061] A plural number (for example, six) of protrusion portions **32** with flat plate shapes, which serve as first pad portions, are integrally formed at equal intervals at a lower end portion of the upper circular tube portion **15**. The protrusion portions **32** protrude to the radial direction inner side (toward a rotation center portion of the reel **10**). Similarly, a plural number (the same as that of the protrusion portions **32**, which is six in this case) of protrusion portions **34** with flat plate shapes, which serve as second pad portions, are integrally formed at equal intervals at an upper end portion of the lower circular tube portion **17**. The protrusion portions **34** protrude to the radial direction inner side (toward the rotation center portion of the reel **10**).

[0062] The protrusion portions **32** and the protrusion portions **34** have identical shapes, and the height of the upper circular tube portion **15** and the height of the lower circular tube portion **17** are the same. That is, the upper flange **14** and the lower flange **16** are formed in identical shapes. Therefore, the upper flange **14** and the lower flange **16** are structures that may be formed by a single mold, and that may reduce fabrication costs.

[0063] The height of the upper circular tube portion **15** and the height of the lower circular tube portion **17** with respect to the reel hub **12** are set to heights such that, when the reel hub **12** is sheathed around the outer periphery face sides of the upper circular tube portion **15** and the lower circular tube portion **17**, no gap is formed between an upper end face of the reel hub **12** and a lower face of the upper flange **14** or between a lower end face of the reel hub **12** and an upper face of the lower flange **16**, as shown in FIG. **5**. Therefore, deformation

of the upper flange **14** and the lower flange **16** by winding force of the recording tape T can be suppressed.

[0064] As shown in FIG. **2** to FIG. **4**, a plural number (the same as that of the protrusion portions **32** and **34**, which is six in this case) of penetrating holes **30** are formed in the reinforcement portion **18** of the reel hub **12** at an outer periphery edge portion side thereof (positions adjacent to the inner periphery face of the reel hub **12**). The penetrating holes **30** are formed at equal intervals, with shapes the same as the protrusion portions **32** and **34**. A plate thickness of the region of the reinforcement portion **18** in which the penetrating holes **30** are formed is twice the plate thicknesses of the protrusion portions **32** and **34** (see FIG. **5**).

[0065] In this structure, as shown in FIG. **4** and FIG. **5**, the protrusion portions **32** of the upper flange **14** are fitted into the penetrating holes **30** formed in the reinforcement portion **18** from above, and the protrusion portions **34** of the lower flange **16** are fitted into the penetrating holes **30** from below. Thus, the reel hub **12** is made non-rotatable relative to the upper flange **14** and the lower flange **16** (rotating (turning) is prevented). By the protrusion portions **32** and protrusion portions **34** being ultrasonically welded, the upper flange **14** and the lower flange **16** are joined together and the reel hub **12** is integrally mounted at the outer periphery face side of the upper circular tube portion **15** and the lower circular tube portion **17**.

[0066] As shown in FIG. **6**A, two rows of energy directors (hereinafter referred to as EDs **37**) that serve as welding fluxes are provided protruding from a welding surface of each of the protrusion portions **32** and **34**. The EDs **37** of each protrusion portion **32** or **34** are provided intermittently in the circumferential direction (at equal intervals) and are spaced by a predetermined interval in the radial direction. Accordingly, welding areas are increased and the energy of ultrasonic oscillations for melting the EDs **37** may be efficiently transmitted to the EDs **37**.

[0067] As shown in FIG. **6**B, the EDs **37** may be provided from an end portion substantially to a middle portion in the circumferential direction (i.e., on substantially half) of the welding surface of each protrusion portion **32** or **34**. Thus, it may be that when the welding surfaces of the protrusion portions **32** are superposed with the welding surfaces of the protrusion portions **34**, the EDs **37** of the protrusion portions **32** do not face (overlap) with the EDs **37** of the protrusion portions **34**.

[0068] That is, it may be that the EDs **37** formed substantially at a circumferential direction half of the welding surface of one protrusion portion **32** or **34** face the welding surface of another protrusion portion **32** or **34** from the other end portion substantially to the middle portion of the other welding surface (i.e., substantially the other half at which the EDs **37** thereof are not formed). Accordingly, the shapes of the EDs **37** formed on the protrusion portions **32** and **34** may be simplified.

[0069] As shown in FIG. **2** to FIG. **4**, three screw hole portions **36** that serve as a fastening portion are formed at equal intervals on a concentric circumference of the reinforcement portion **18**. Screws for fastening to the rotary member of the drive device **50** are inserted through the screw hole portions **36**. A protrusion portion **38** is integrally formed at a lower face side of each screw hole portion **36**. The protrusion portion **38** protrudes downward in a circular tube shape that is coaxial with the screw hole portion **36** (and communicates with the screw hole portion **36**). With this structure, positioning of the reel **10** (the reinforcement portion **18**) in the up-and-down (height) direction with respect to the rotary member is implemented by the protrusion portions **38** abutting against an upper face of the rotary member.

[0070] A circular hole portion **40** is formed in the rotation center portion of the reinforcement portion **18**. An output shaft portion (not shown in the drawings) protruding from the rotary member of the drive device **50** is inserted (fitted) into the circular hole portion **40**. Thus, with this structure, positioning of the reel **10** (the reinforcement portion **18**) in the radial direction with respect to the rotary member (i.e., centering) is implemented.

[0071] A plural number (for example, three) of protruding portions (not shown in the drawings) are protrudingly provided at equal intervals on a concentric circumference of the rotary member. A plural number of recessed portions **42** (the same number as that of the protruding portions, which is three in this case) are formed at equal intervals on a concentric circumference in the lower face of the reinforcement portion **18**, at the radial direction inner side relative to the screw hole portions **36** (a region at which the plate thickness is large). The protruding portions fit into the recessed portions **42**. Thus, with this structure, positioning of the reel **10** (the reinforcement portion **18**) with respect to the rotary member in the circumferential direction is implemented, and the screw hole portions **36** may be matched up with screw boss portions (not shown in the drawings) formed at the rotary member.

[0072] Now, operation of the reel **10** with the structure described above is described. As mentioned above, the reel **10** is fabricated by the plural (the same number as the penetrating holes **30**) protrusion portions **32** of the upper flange **14** and the plural (the same number as the penetrating holes **30**) protrusion portions **34** of the lower flange **16** being fitted into the plural penetrating holes **30** formed in the reinforcement portion **18**, and the protrusion portions **32** and protrusion portions **34** being joined together by ultrasonic welding.

[0073] That is, in a welding process for fabrication of the reel **10**, it is sufficient for just the protrusion portions **32** and protrusion portions **34** to be ultrasonically welded. Therefore, compared to a structure in which the lower end face of the upper circular tube portion **15** and the upper end face of the lower circular tube portion **17** are ultrasonically welded over the whole periphery, process efficiency may be improved (a process time required for the welding may be shortened). Moreover, because the protrusion portions **32** and **34** are welded at the inner periphery face side of the reel hub **12**, the upper flange **14** and lower flange **16** may be more securely welded than in a structure in which the protrusion portions **32** and **34** are welded at the reel hub **12** center side.

[0074] Furthermore, by the ultrasonic welding of the protrusion portions **32** of the upper flange **14** and the protrusion portions **34** of the lower flange **16** that are fitted into the penetrating holes **30** formed in the reinforcement portion **18** of the reel hub **12**, the upper flange **14** and lower flange **16** may be joined together and may be mounted to make the reel hub **12** non-rotatable with respect to the upper flange **14** and lower flange **16**.

[0075] Therefore, there is no need to separately form a turning preventer to make the reel hub **12** and the upper and lower flanges **14** and **16** relatively non-rotatable. Thus, compared to a structure in which a turning preventer for making the reel hub **12** and the upper and lower flanges **14** and **16** relatively non-rotatable is separately formed, fabrication of

molds for molding the parts may be simplified and mold fabrication costs may be reduced.

[0076] Moreover, because the upper flange **14** and the lower flange **16** have the same shape (symmetry between the upper and the lower), a single mold is sufficient for fabricating the upper flange **14** and the lower flange **16**. Thus, compared to a structure in which the shapes of the upper flange **14** and the lower flange **16** are different and a mold for the upper flange **14** and a mold for the lower flange **16** are separately required, fabrication costs may be further reduced.

[0077] The protrusion portions **32** that are plurally (in the same number as the penetrating holes **30**) formed at equal intervals on the upper flange **14** and the protrusion portions **34** that are plurally (in the same number as the penetrating holes **30**) formed at equal intervals on the lower flange **16** are fitted into the penetrating holes **30** that are plurally formed at equal intervals in the reinforcement portion **18** of the reel hub **12**. Thus, looseness (and axial misalignment) between the reel hub **12** and the upper and lower flanges **14** and **16** may be suppressed or prevented.

[0078] The fastening portion (the screw hole portions **36**) for fastening to the drive device (rotary member) is provided at the reinforcement portion **18** that is formed integrally with the reel hub **12** around which the magnetic tape T is wound. Therefore, compared to a structure in which a portion for fastening to a drive device is a separate body from the reel hub **12**, stiffness (strength) of the reel hub **12** may be assured and running stability of the magnetic tape T may be improved.

[0079] The reel **20** is the same. The reels **10** and **20** are mounted and fixed to the Os of the drive device **50** with screws. That is, screws are inserted through the screw hole portions **36** of the reinforcement portions **18** and **28** of the reels **10** and **20** and threaded into the screw boss portions of the rotary members, and thus the reinforcement portions **18** and **28** of the reels **10** and **20** are fastened to the rotary members. Thus, the reels **10** and **20** may be directly installed in the drive device **50**.

[0080] Next, a second exemplary embodiment is described. Portions that are the same as in the above-described first exemplary embodiment are assigned the same reference numerals and are not described in detail (nor operations thereof). The second exemplary embodiment too is described using the reel **10** as an example, and the reel **20** is again the same.

[0081] As shown in FIG. **7** to FIG. **11**, in the upper flange **14** and the lower flange **16** of the reel **10** according to the second exemplary embodiment, protrusion portions **33** and **35** are integrally formed to protrude from the lower end portion of the upper circular tube portion **15** and the upper end portion of the lower circular tube portion **17**. Each of the protrusion portions **33** and **35** protrudes in an annular shape to the radial direction inner side.

[0082] As shown in more detail in FIG. **8**, long, narrow first welding ribs **46** and shorter, narrow second welding ribs **48** are provided protruding from a welding surface (lower face) of the protrusion portion **33** of the upper flange **14** (i.e., the upper circular tube portion **15**) in plural numbers alternating at equal intervals (in the illustrated case, three of each at 120° intervals, making a total of six ribs). The first welding ribs **46** and second welding ribs **48** serve as the first pad portions.

[0083] Similarly, the long, narrow first welding ribs **46** and shorter, narrow second welding ribs **48** are provided protruding from a welding surface (upper face) of the protrusion portion **35** of the lower flange **16** (i.e., the lower circular tube portion **17**) in plural numbers alternating at equal intervals (in the illustrated case, three of each at 120° intervals, making a total of six ribs). These first welding ribs **46** and second welding ribs **48** serve as the second pad portions. Respective single rows of the EDs **37** are formed at the first welding ribs **46** and the second welding ribs **48**, at the radial direction outer side on the first welding ribs **46** and at the radial direction inner side on the second welding ribs **48**.

[0084] As illustrated in detail in FIG. **9** and FIG. **10**, the penetrating holes **30** in the reinforcement portion **18** of the reel **10** according to the second exemplary embodiment are formed at positions set a little toward the radial direction inner side from the inner periphery face of the reel hub **12**, and are structured such that the first welding ribs **46** and second welding ribs **48** can be respectively fitted therein.

[0085] Thus, the upper flange **14** and the lower flange **16** are joined together by the first welding ribs **46** of the protrusion portion **33** being welded to the second welding ribs **48** of the protrusion portion **35** and the second welding ribs **48** of the protrusion portion **33** being welded to the first welding ribs **46** of the protrusion portion **35**.

[0086] Accordingly, step portions **44** are formed at each penetrating hole **30**, alternating between the upper face side and the lower face side of the reinforcement portion **18**. The step portions **44** are formed at both of circumferential direction end edge portions of each penetrating hole **30**. The step portions **44** are for making up differences in length in the circumferential direction between the first welding ribs **46** and the second welding ribs **48** (allowing for the two circumferential direction end edge portions of each first welding rib **46** being longer in the circumferential direction than the second welding rib **48**).

[0087] That is, the first welding ribs **46** and the second welding ribs **48** protrude to the same heights, and the plate thickness of the reinforcement portion **18** at the region in which the penetrating holes **30** are formed is twice the protrusion height of the first welding ribs **46** and second welding ribs **48**. The height of each step portion **44** is the same as the protrusion height of the first welding rib **46** (which is half of the plate thickness of the reinforcement portion **18** at the region in which the penetrating holes **30** are formed).

[0088] Thus, in this structure, as shown in FIG. **10**, the first welding ribs **46** that are fitted into the penetrating holes **30** and the second welding ribs **48** that are fitted into the penetrating holes **30** may be welded by the respective EDs **37** that have positional relationships so as not to face one another in the up-and-down direction (to be offset from one another in the radial direction and not overlap).

[0089] Thus, with the structure in which the first welding ribs **46** at which the EDs **37** are formed at the radial direction outer side and the second welding ribs **48** at which the EDs **37** are formed at the radial direction inner side are superposed and joined (the structure in which the EDs **37** do not overlap with one another), the first welding ribs **46** and the second welding ribs **48** are unlikely to cause slanting in the radial direction. Thus, surface runout of the upper flange **14** and the lower flange **16** may be suppressed or prevented.

[0090] As shown in FIG. **11**, a gap S1 in the radial direction is formed between each of wall faces **18**A at the radial direction outer sides of the penetrating holes **30** and each of wall faces **46**A and **48**A at the radial direction outer sides of the first welding ribs **46** and second welding ribs **48** fitted into the penetrating holes **30**. A gap S2 in the radial direction is also formed between an inner periphery face **12**A of the reel hub

12 and outer periphery faces 15A and 17A of the upper circular tube portion 15 and the lower circular tube portion 17.

[0091] At the inner periphery face side of the reel hub 12, the substantially circular plate-shaped reinforcement portion 18 that is concentric with the reel hub 12 is integrally provided to be continuous. Therefore, the radial direction stiffness (strength) of the reel hub 12 is improved compared to a reel hub in which the reinforcement portion 18 is not integrally provided to be continuous (not shown in the drawings). Consequently, deformation of the reel hub 12 by winding force of the recording tape T may be suppressed, and effects on the upper flange 14 and the lower flange 16 may be prevented.

[0092] At the same time, because the above-mentioned gaps S1 and S2 are formed in the radial direction, deformation of the reel hub 12 by the winding force of the recording tape T may be absorbed by these gaps S1 and S2. Therefore, effects on the upper flange 14 and the lower flange 16 may be further prevented. Herein, the gaps S1 and S2 are set at, for example, between 0.05 mm and 0.5 mm.

[0093] Hereabove, the reels 10 and 20 according to the present exemplary embodiments are described on the basis of the attached drawings, but the reels 10 and 20 according to the present exemplary embodiments are not limited to the reels shown in the drawings; designs may be modified as appropriate within a scope not departing from the spirit of the present invention. For example, the structures in which both the first pad portions (the protrusion portions 32 or the first welding ribs 46 and second welding ribs 48) and the second pad portions (the protrusion portions 34 or the first welding ribs 46 and second welding ribs 48) are together fitted into the penetrating holes 30 in the reinforcement portion 18 or 28 are not limiting; structures in which one or both of the first pad portions and the second pad portions are fitted in are possible.

[0094] However, in a structure in which both the first pad portions and the second pad portions are together fitted into the penetrating holes 30 of the reinforcement portion 18 or 28, the upper flange 14 at which the first pad portions are provided and the lower flange 16 at which the second pad portions are provided may be formed in the same shape, which is desirable. Further, in the illustrated case the upper flange 14 and lower flange 16 are joined together by the welding ribs 46 and 48 of two kinds with different shapes, but the upper flange 14 and lower flange 16 may be joined together by welding ribs of three or more kinds with different shapes.

[0095] In this case it is desirable for the welding ribs with different shapes to be formed alternatingly at equal intervals. Thus, surface runout of the upper flange 14 and the lower flange 16 may be suppressed or prevented. Further, the protrusion portions 38 are not limited to being formed at the lower faces of the screw hole portions 36 coaxially with the screw hole portions 36, and may be formed at the lower face of the reinforcement portion 18 or 28 on a different concentric circumference from the screw hole portions 36.

[0096] The recessed portions 42 may be formed in the rotary member and the protruding portions formed at the reinforcement portion 18 or 28 to implement positioning in the circumferential direction (matching up the positions of the screw hole portions 36 at the reinforcement position 18 or 28 with the screw boss portions at the rotary member). The numbers of the recessed portions 42 (and protruding portions) and of the screw hole portions 36 (and screw boss portions) are not limited to three. Furthermore, although not shown in the drawings, the reels 10 and 20 according to the present exemplary embodiment may also be employed in recording tape cartridges in which only one reel is accommodated in a case.

What is claimed is:

1. A reel comprising:
- a hub, around an outer periphery face of which a recording tape is wound;
- an annular first flange disposed at one axial direction end portion of the hub;
- an annular second flange disposed at the other axial direction end portion of the hub;
- a plurality of first pad portions protruding into the hub from the first flange, the first pad portions being engaged with the hub to be relatively non-rotatable; and
- a plurality of second pad portions protruding into the hub from the second flange, the plurality of second pad portions being welded to the plurality of first pad portions.

2. The reel according to claim 1, wherein the first pad portions are engaged with an inner periphery face side of the hub.

3. The reel according to claim 1, further comprising a penetrating hole formation portion that is integrally formed at an inner periphery face of the hub and in which penetrating holes are formed,
- wherein relative rotation between the first flange and second flange and the hub is disabled by at least the first pad portions being fitted into the penetrating holes.

4. The reel according to claim 1, further comprising a circular plate-shaped reinforcement portion that is integrally formed at an inner periphery face of the hub so as to be coaxial with the hub, and in an outer periphery portion of which penetrating holes are formed,
- wherein relative rotation between the first flange and second flange and the hub is disabled by at least the first pad portions being fitted into the penetrating holes.

5. The reel according to claim 4, wherein a fastening portion for fastening to a rotary member of a drive device is formed at the reinforcement portion.

6. The reel according to claim 3, wherein a gap is formed between a radial direction outer side wall face of the penetrating holes and a radial direction outer side wall face of at least the first pad portions.

7. The reel according to claim 3, wherein
- the first pad portions are structured in a plurality of different kinds of shape,
- the second pad portions are structured in a plurality of kinds of shape that correspond with the first pad portions, and
- the penetrating holes are formed in a plurality of kinds of shape that correspond with at least the first pad portions.

8. The reel according to claim 1, wherein the first flange at which the first pad portions are provided and the second flange at which the second pad portions are provided are formed in the same shape.

9. The reel according to claim 7, wherein each of the first pad portions and the second pad portions includes an identical flat-shaped plate.

10. The reel according to claim 9, wherein energy directors are provided with a welding surface of each of the first pad portions and the second pad portions, and the energy directors are provided intermittently in a circumferential direction and are spaced by a predetermined interval in a radial direction.

11. The reel according to claim 9, wherein energy directors are provided from an end portion substantially to a middle

portion in a circumferential direction with a welding surface of each of the first pad portions and the second pad portions, such that when the welding surfaces of the first pad portions are superposed with the welding surfaces of the second pad portion, the energy directors of the first pad portions do not face with the energy directors of the second pad portions.

12. The reel according to claim **9**, wherein the penetrating holes are formed with shapes the same as the first pad portions and the second pad portions, and a plate thickness of the penetrating hole formation portion is twice plate thicknesses of the first pad portions and the second pad portions.

13. The reel according to claim **7**, wherein each of the first pad portions and the second pad portions includes first welding ribs that is formed with a longer and narrow shape and second welding ribs that is formed with a shorter and narrow shape, and the first welding ribs and the second welding ribs are provided alternating at equal intervals.

14. The reel according to claim **13**, wherein first energy directors are formed at a radial direction outer side on the first welding ribs, and second energy directors are formed at a radial direction inner side on the second welding ribs.

15. The reel according to claim **13**, wherein the first welding ribs and the second welding ribs protrude to the same heights, and a plate thickness of the penetrating hole formation portion is twice protrusion height of the first welding ribs and second welding ribs.

* * * * *