

Description

BACKGROUND OF THE INVENTION

The present invention relates to a reel for transporting elongate articles, wherein the reel is composed of a pair of discs connected one to another by a middle hub. The elongate articles such as flexible tapes, wires and chains will be wound up on the hub so as to be transported to a site where they are used. At the site, an axle will be inserted in a central bore of the hub so that the reel rotates to unwind the article therefrom.

The reels of this kind have widely been used to wind up thereon and unwind therefrom the elongate articles used in the industries. The size of and distance between each pair of the discs as well as the diameter of the hubs connecting them should match the varied dimension of those articles. Usually, empty reels from which the articles have been unwound are collected at the site and returned to the suppliers for the purpose of reuse.

Although not only the reels once used but also new ones delivered from a reel maker are empty, they have occupied within a cargo the same large space as they were loaded with the articles. Therefore, some proposals were made to enable the empty or new reels to be disassembled and reassembled to be shipped in sections so as to reduce the space which the empty reels will occupy.

Such a collapsible reel of one type currently available is illustrated in Fig. 7. It comprises a plurality of arrow-shaped lugs 8A protruding from the end surfaces of a hub 3A. Small apertures 10A that are formed in discs 2A will engage with the lugs, forcing the long body portions thereof to temporarily rock against their resiliency in a manner shown at the phantom lines 'c'. This structure relies only on the elastic recovery of said portions to keep the lugs engaged with the apertures. Those lugs have to be rocked again when it is desired to disengage the discs from the hub of an emptied reel. Further, such resilient lugs 8A should act on the discs 2A so as to inhibit the latter from rotating relative to the hub 3A while the reel is operating. Thus, the effect of elastic recovery will early become weaker due to the mechanical fatigue of said lugs. As a consequence, the assembled state of the reel is rendered less firm and less reliable, thereby disabling the repeated reuse of such a reel.

SUMMARY OF THE INVENTION

An object of the present invention made in view of the described problems is therefore to provide a reel for transporting elongate articles and of such a novel structure that it can be repeatedly assembled and disassembled easily and readily, without rendering less reliable the engagement of its discs with its hub.

The reel provided herein for transporting elongate articles comprises: a pair of substantially flat and round discs; a hub composed of an external cylinder and an

internal cylinder; the cylinders being arranged around and coaxially with an axial bore penetrating the internal cylinder that is connected by a tie plate to the external cylinder, both the cylinders being interposed between the discs to connect them one to another; hooks each having a hooking head and a body secured to an inner periphery of the external cylinder of the hub; at least one resilient pawl provided for each disc and each having a locking end and a body; the hooking heads bent perpendicular to the respective bodies, arranged in the same circular direction and protruding from open ends of the hub beyond an outer face of each disc; the locking end of the pawl being disposed adjacent to and within the external cylinder and being elastically and temporarily displaceable in an axial or radial direction of the hub; slots formed in each disc so as to engage with the respective ends of the hooks; and at least one aperture also formed in each disc and capable of engaging with the locking end of the resilient pawl.

In a first preferable mode, the locking end of the resilient pawl is elastically displaceable in the axial direction of the hub. The bodies of the hooks as well as the body of the pawl are formed integral with the inner periphery of the hub.

In a second preferable mode, the locking end of the resilient pawl is elastically displaceable in the radial direction of the hub. The body of each pawl in this mode extends axially of and in parallel with the external cylinder. Therefore, an appropriate guiding means is indispensable for forcing the locking end of each resilient pawl into engagement with the aperture when the disc is rotated relative to the disc. The locking end of each resilient pawl may be constricted relative to the body thereof.

In a third preferable mode, the locking end of the resilient pawl is elastically displaceable in the axial direction of the hub. The body of the pawl may extend radially of the hub and indirectly connected to the internal cylinder by and through an axial extension of said body, or directly connected to said internal cylinder. Alternatively, the body of the pawl may extend axially of the hub and along the external cylinder so as to be connected to the internal cylinder by and through a radial extension of the body. In any case, the locking ends of the resilient pawls are desirably accompanied by such stoppers that will inhibit said ends from rotating in a reverse direction in which the discs would be loosened relative to the hub.

In any mode summarized above, it is preferable that the hub and the discs are made by molding a synthetic resin or synthetic resins, and each of the discs can be removed from the hub with use of a manual releaser comprising projections that are engageable with the locking ends of the at least one resilient pawls so as to force them out of the apertures, while the releaser is held at a correct position on the disc.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a reel that is provided as a first example of a first embodiment and shown in a disassembled state;

Fig. 2 is a perspective view of the reel shown in its assembled state;

Fig. 3 is an enlarged cross section taken along the line A - A in Fig. 2;

Fig. 4 is a perspective view of a reel disassembled in a second example of the first embodiment, with some parts being shown fragmentarily;

Fig. 5 is a perspective view of a hub included in a reel that is provided in a third example of the first embodiment;

Fig. 6 is a perspective view of a hub included in a reel that is provided in a fourth example of the first embodiment;

Fig. 7 is a perspective view of a reel that is provided in a first example of a second embodiment and shown in its disassembled state, with some parts being shown fragmentarily;

Fig. 8 is an enlarged cross section taken along the line B - B in Fig. 7;

Fig. 9 is an enlarged cross section taken along the line C - C in Fig. 7;

Figs. 10a to 10e are schemes illustrating sequential steps of connecting a disc to a hub and disconnecting the disc from the hub in the second embodiment;

Fig. 11 is a perspective view of a hub included in a reel that is provided in a second example of the second embodiment;

Fig. 12 is a perspective view of a reel that is provided in a first example of a third embodiment and shown in its assembled state;

Fig. 13 is an enlarged cross section taken along the line A - a in Fig. 12;

Fig. 14 is an enlarged perspective view of the reel disassembled in the first example of third embodiment, with some parts being shown fragmentarily;

Fig. 15 is a further enlarged perspective view of a hub included in the reel shown in Fig. 14;

Fig. 16 is a manual releaser adapted for use to disassemble the reel shown in Fig. 12;

Fig. 17 is a perspective view corresponding to Fig. 14 but showing a reel that is provided in second example of the third embodiment;

Fig. 18 is a cross section of a hub included in a reel that is provided in a third example of the third embodiment;

Fig. 19 is a perspective view corresponding to Fig. 15 but showing a reel that is provided in fourth example of the third embodiment; and

Fig. 20 is a fragmentary and cross-sectional view of a prior art reel.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A reel provided in some embodiments of the present invention described below referring to the drawings is not intended for use with such as the fishing lines or textile yarns but for use with other industrial elongate articles. The reel 1 comprises a pair of discs 2 facing one another and connected by a hub 3 that serves as a core for winding up an elongate article.

[First Embodiment]

In the first embodiment, the locking end of each resilient pawl is elastically displaceable in the axial direction of the hub. The body of each hook as well as the body of each pawl are formed integral with the inner periphery of the hub. In a first example of the first embodiment shown in Figs. 1 to 3, the hub 3 is interposed between the flat and round discs 2.

The hub 3 consists of an external cylinder 4, an internal cylinder 5 and a tie plate 6. This plate 6 firmly connects the external cylinder 4 to the internal one 5. An axial bore 7 extends through and axially of the internal cylinder. The hub 3 has six hooks 8 and two resilient pawls 9 for each disc, wherein the hooks protrude upwardly and downwardly (in the drawings) from opposite open ends of the hub. Each hook 8 has a body 8a that extends inwardly from a hooking head and is integral with the inner periphery of the outer cylinder 4 and the tie plate 6. Similarly, each resilient pawl 9 has a body 9a that extends inwardly from a locking end of said pawl and also is integral with said periphery and said plate. Thus, the hooks 8 and the pawls 9 are firmly held at their axially extending bodies in place in the hub 3. The hooking heads of the hooks 8 are bent to be perpendicular to the respective bodies 8a and in the same circular direction. The locking end of each of the pawls 9 arranged in the same circular direction has a stepped thin region 9b transferring to the body 9a, such that said end as a whole extends perpendicular to said body. Thus, the resilient pawls can rock up and down (in the drawings) due to the elastic and temporary movement of those thin regions 9b.

Each disc 2 has a central opening 13 in alignment with the axial bore 7 of the hub. An outer peripheral edge of the disc is reinforced with a circular rib 12. Slots 10 formed in each disc are intended to engage with the respective heads of the hooks 8, and apertures 11 also formed in each disc are intended to engage with the locking ends of the resilient pawls 9. The reference numeral 6a (as best seen in Fig. 4) denotes cutouts which the tie plate 6 has for the convenience of a mold forming those hooks 8 and pawls 9.

The size of this collapsible reel 1 depends on the length of elongate article to be wound up. Typically, the discs 2 may be 300 - 600 mm in diameter and 3 - 10 mm in thickness. The hub 3 may be 100 - 250 mm in diam-

eter and 40 - 180 mm in width.

When assembling the reel, the hooking heads of the hooks 8 protruding upwardly and downwardly (in the drawings) will be inserted in the slots 10 at first. Subsequently the upper one of the discs 2 will be twisted clockwise a small angle (with the lower one twisted anticlockwise). Consequently, a free edge of the hook's head 8 will be brought into engagement with a radial edge of the corresponding slot 10, with the elastic thin region 9b of the pawl simultaneously causing its locking end 9 to snap into the aperture 11. As a result, the discs 2 are secured to the hub 3 to provide an assembled reel shown in Fig. 2. The heads of the hooks 8 as well as the ends of the pawls 9 do not protrude beyond a plane in which the annular rib 12 is included, so that the reels can be stacked snugly one on another. The reference numeral 5a in Figs. 1 and 3 denotes an annular shoulder formed around an end face of the internal cylinder 5. The periphery defining the central opening will fit on this shoulder so as to protect the disc 2 from moving radially relative to the hub 3.

The reel assembled in the described manner is ready for an elongate article to be wound up, if the former matches to the latter. If they do not match one to another, any of discs of different diameters may be combined with any of hubs of different widths. The reel from which the article has been unwound completely will be disassembled into sections. For this purpose, a pointed tool such as a driver may be used to push and force the pawls 9 out of engagement with the apertures 11 while the upper disc 2 is being twisted counterclockwise. The reels collapsed in this manner can be packed compact for return to a winding site.

Fig. 4 shows on an enlarged scale a reel in a second example of the first embodiment. The thinned regions 9b of the resilient pawls 9 extend in a circular direction opposite to that in which the hooking heads 8 extend from the hook bodies. The numeral 5b denotes axial ribs for supporting the central portion of each disc.

Fig. 5 shows a third example of the first embodiment in which the bodies 8a and 9a of the pawls are of shapes differing from those which the hooks 8 and pawls 9 in the first and second embodiments have. These bodies protrude radially and inwardly from the inner peripheral edge of the external cylinder 4. Further, the locking heads of the pawls 9 are short columns, and internal cylinder 5 is accompanied by three outer axial ridges. The number of the hooks 8 is not six but four for each disc in this case.

Fig. 6 shows a fourth example of the first embodiment in which the hub 3 consists of only one cylinder 4 that corresponds to the external one in the preceding embodiments. In other words, the internal cylinder 5 and tie plate 6 are dispensed with. The central opening 13 formed in the discs 2 serves as an axial bore of this reel. Further, these discs may not have any central openings under certain circumstances in use. A pair of hooking heads 8 located up and down (in the drawings) are in-

tegral with one body 8a that in turn is integral with the inner periphery of the hub 3.

It will be understood that only one pawl 9 in addition to two hooks 8 suffice well for each disc in order to temporarily secure same on the hub.

[Second Embodiment]

In the second embodiment, the locking end of each resilient pawl is elastically displaceable in the radial direction of the hub. The body of each pawl extends along and in parallel with the external cylinder. The hooks 8 in this embodiment are also L-shaped in side elevation to protrude upwardly and downwardly (in the drawings) from opposite open ends of the hub.

In a first example of the second embodiment, each hook 8 facing one disc and the corresponding other hook 8 facing the other disc are integral with a rib that in turn is integral with the inner periphery of the external cylinder 4. In such a pair of the hooks 8, their hooking heads are bent in opposite directions so that they assume a Z-shape as a whole. All the hooking heads on each disc 2 are bent in the same circular direction. Each resilient pawl 9 is integral with a base 9a that protrudes inwardly from a peripheral portion of the external cylinder 4 at one open end of the hub. The pawl 9 extends to the other open end so as to form a locking end that can rock relative to the external cylinder in a radial direction of the hub. As best seen in Fig. 7, the two bases 9a of resilient pawls 9 are located at one side of hub 3 in a diagonal relationship, and the other two bases 9a are also diagonally disposed at the other side of the hub.

Each disc 2 has a central opening 13 to fit on the internal cylinder 5. Six slots 10 formed in each disc are intended to engage with the respective heads of the hooks 8. Two accessible apertures 11 also formed in each disc are intended to receive the locking ends of the resilient pawls 9. Those apertures 11 will allow insertion of a tool when the locking ends are manually forced in the direction to remove each disc from the hub. Two guiding cams 14 as the guiding means mentioned above are provided in this embodiment. These cams 14 capable of respectively coming into a sliding contact with the locking ends of resilient pawls 9 are formed integral with and protrude from the inner face of each disc 2. An inner edge of each guiding cam 14 disposed close to the corresponding accessible aperture 11 is aligned with the inner tangential edge thereof, as seen at the lower part of Fig. 7.

When assembling the reel, the hooking heads of the hooks 8 protruding up and down in Fig. 7 will be inserted in the slots 10 at first. Subsequently the upper one of the discs 2 will be twisted clockwise a small angle (with the lower one twisted anti-clockwise). Thus, a free edge of each hook's head 8 will be brought into engagement with a radial edge of the corresponding slot 10. Phantom lines in Fig. 7 show that the hooking heads 8a, 8b and 8c are inserted at first into the slots 10a, 10b and 10c,

respectively, in the manner described above. With the disc 2 shown at the upper part of Fig. 7 being twisted clockwise, those heads overlies and firmly engage with the radial edges of slots.

Simultaneously with such a hooking process, the guiding cams 14 will act on the respective resilient pawls 9, in a sequential manner illustrated in Figs. 10a to 10e (in which for an easier understanding the cam 14 shown at the lowermost part in Fig. 7 is taken as an example). The cam 14 and the pawl 9 are in their position shown in Fig. 10a when the hooks 8 have been inserted in the slots 10. With the hub 3 then being twisted clockwise, the pawl's locking end 9 will be brought into a sliding contact with a slanted face 14a of the cam 14 as shown in Figs. 10b and 10c so that said end is forced downwards in the drawings. As the locking end of pawl 9 gets over the slanted face 14a, the former will snap in the accessible aperture 11 to take a rest position shown in Fig. 10d, due to the elastic recovery of the pawl. In this state, the discs 2 are inhibited from a further angular displacement relative to the hub 3, because a rear face 14b of the cam 14 bears against the pawl 9 tending to twist in a reverse direction.

In addition to this mechanism of preventing the hub 3 and discs 2 from relative rotation, the hooks 8 will protect the discs from any translational motion away from the hub in an axial direction thereof. The assembled reel 1 in such a stable state is as generally shown in Fig. 2.

Fig. 10e shows a manner of disassembling the reel after it has become empty and is not intended for a subsequent use at the same site. A pointed tool like a driver or any special tool may be put in each accessible aperture 11 so as to displace the resilient pawl 9 in a direction denoted by the arrow in Fig. 10e. With the pawls thus having been disengaged from the cams 14, the discs 2 will be rotated in an angular direction opposite to the direction mentioned above until the hooks 8 are disengaged from the respective slots 10, thereby enabling the discs to be separated from the disc in axial direction.

Fig. 11 shows a reel provided in a second example of the second embodiment. This reel has resilient pawls 9 whose locking ends are made smaller in size in a circular direction such that they nevertheless are of a strength sufficient to inhibit the discs from rotating in a reverse direction. Thanks to the constricted locking ends contacting the guiding cam, the discs need be twisted a much smaller angle as compared with the first embodiment. Other features that are the same as those adopted in the first embodiment are not described again.

[Third Embodiment]

In the third embodiment, the locking end of the resilient pawl is elastically displaceable in the axial direction of the hub. In a first and second examples of this embodiment, the body of the pawl extends radially of the hub and indirectly connected to the internal cylinder by and through an axial extension of said body. In a third

example of the third embodiment, such a radial body of each pawl is directly connected to said internal cylinder. In fourth example, the body of each pawl extends axially of the hub and along the external cylinder so as to be connected to the internal cylinder by and through a radial extension of said body.

In the first example shown in Figs. 12 to 15, similarly to the foregoing first and second embodiments and the examples thereof, the hub 3 consists of an external cylinder 4, an internal cylinder 5 and a tie plate 6. This plate 6 is located at a middle height (in the drawings) of the hub so as to firmly connect the external cylinder 4 to the internal one 5. An axial bore 7 extends through and axially of the internal cylinder. The hub 3 has six hooks 8 and two resilient pawls 9 respectively accompanied by stoppers 9A cooperating therewith for each disc in this embodiment. The hooks 8 L-shaped in side elevation protrude upwardly and downwardly (in the drawings) from opposite open ends of the hub.

Each hook 8 facing one disc and the corresponding other hook 8 facing the other disc are integral with a rib that in turn is integral with the inner periphery of the external cylinder 4. In such a pair of the hooks 8, their hooking heads are bent in opposite directions so that they assume a Z-shape as a whole. All the hooking heads on each disc 2 are bent in the same circular direction. Each resilient pawl 9 has a radial rockable body 9a integral therewith and continuing to an upright extension 9b. This extension 9b extending from the tie plate's 6 portion near the internal cylinder 5 extends axially thereof and is bent radially at right angle at its upper or lower end to form the rockable body 9a, which extends to a proximity of the inner periphery of the external cylinder 4. The locking end of the resilient pawl 9 is a small lug that is formed on an outer end of the rockable body and protrudes axially a slight distance from the open end of the external cylinder 4. Therefore, the resilient pawl 9 in this embodiment can rock in the axial direction of the hub 3. As will be best seen in Fig. 15, the two resilient pawls 9 are located at one side of hub 3 in a diagonal relationship, and two more resilient pawls 9 are also diagonally disposed at the other side of the hub, respectively at positions close to those where the first mentioned two pawls are disposed. Each stopper 9A is disposed close to the corresponding resilient pawl 9 to be in the same positional relationship with same as that which is present between the hooking heads and their bodies 8. A rib-shaped lug protruding centripetally from the inner periphery of the external cylinder 4 has an end that protrudes outwardly from the open end the hub 3, this end of the lug being the stopper referred to above.

Each disc 2 has a central opening 13 to fit on the internal cylinder 5, as shown in Fig. 14 on an enlarged scale. Six slots 10 formed in each disc and surrounding the central opening are intended to engage with the respective heads of the hooks 8. Two accessible apertures 11 also formed in each disc are intended to receive the locking ends of the resilient pawls 9 (together with

the stoppers 9A). Further, a small hole 19 as well as a plurality of windows 15 are formed in each disc. This hole 19 is for insertion of a small protrusion 21 which a manual releaser 20 comprises as described later. A rim of the disc 2, each slot 10, each accessible aperture 11, the central opening 13 and each window 15 are respectively surrounded by ribs 12 jutting outwards. Formed inside the rib 12 surrounding each slot 10 is a shoulder 10a for engagement with the hooking head of each hook 8.

When assembling the reel, the hooking heads of the hooks 8 protruding up and down in Fig. 14 will be inserted in the slots 10 at first, with the stoppers 9A being also inserted in the accessible aperture 11. Subsequently, the upper one of the discs 2 will be twisted clockwise a small angle (with the lower one twisted anti-clockwise). Thus, a free edge of each hook's head 8 will be brought into engagement with the shoulder 10a adjoining to the slot 10.

Simultaneously with such a hooking process of the hooks 8 engaging with the slots 10, the resilient pawls 9 will be urged inwards by the disc's inner face 2 to be elastically deformed temporarily and axially of the hub, as the broken lines indicate in Fig. 13. With the disc 2 being subsequently twisted clockwise, the pawl's locking end 9 will be freed from the forced contact with the disc's inner face and snap in the accessible aperture 11 so that the disc can no more rotate forward relative to the hub. In this state, the discs 2 are inhibited from making a further angular displacement relative to the hub 3, because the locking end of the pawl 9 pressed by a rear wall of the aperture 11 in a reverse direction will immediately bear against the stopper 9A.

In addition to this effect of the resilient pawls 9 themselves and the stoppers 9A cooperating with same to hinder the hub 3 and discs 2 from rotating relative to each other, the hooks 8 will protect the discs from any translational motion away from the hub in an axial direction thereof. The assembled reel 1 being in such a stable state is shown in Fig. 12.

A manual releaser 20 shown in Fig. 16 may be used to disassemble the reel 1 when it is not reused at the same site. An operator may grip the releaser at its handle 24 to bring it into a position such that its small protrusion 21 fits in the small hole 19 of the disc 2, and such that the middle lug 22 of the releaser fits in the axial bore 7 of the internal cylinder. Then, projections 23 of the releaser will be forced into the accessible apertures 11 so that the locking ends of the resilient pawls 9 are retracted inwardly of the disc 2 and disengaged from the apertures. With the releaser 20 being kept in this state, the operator may rotate it anti-clockwise (in Fig. 4) to disengage the hooks 8 from the respective slots 10 and separate the disc 2 from the hub. If such a manual releaser is not available, any pointed tools such as drivers may be inserted in the apertures 11 in order to remove the discs from the core in the same manner as described just above.

The second example shown in Fig. 17 differs from the first example only in that only each resilient pawl 9 is engageable with one of the accessible apertures 11. In detail, the resilient pawls 9 protrude outwardly from the open end of the hub 3, with outer ends of the stoppers 9A disposed adjacent to the pawls being included in a plane of the open end of said hub. Thus, each stopper 9A is capable of bearing against the corresponding pawl 9 at its inner body portion located behind its locking end. Therefore, the accessible apertures 11 are of a size sufficient to receive only the locking ends of resilient pawls 9. The second example is the same as the first one in all the other structures, and accordingly description thereof being appreciated.

In the third example shown in Fig 18, the radial rockable bodies 9a in the first embodiment are here directly connected to the outer periphery of the external cylinder 5 and integral therewith.

In the fourth example shown in Fig. 19, the rockable bodies 9a do not extend radially but axially of the hub 3. The rockable body 9a in the first embodiment is replaced here with a rockable body 9c that extends axially of the hub 3. This rockable body 9c also defining at its free end the locking end and extending near and along the inner periphery of external cylinder of the hub 3 is connected to the internal cylinder by and through an extension 9a. This extension in the fourth embodiment is however formed as a part of the tie plate 6, with the part being separated except for its inner extremity from the remainder of the tie plate.

It will be understood that at least one resilient pawl 9 in addition to at least two hooks 8 suffice well for each disc in order to temporarily and firmly secure same on the hub.

The foregoing embodiments and examples thereof may be modified in any manner insofar as the functions of the parts as well as the effects of the overall structure are ensured to achieve the objects also set forth above.

In summary, two discs and one hub all prepared separately can now be united by the connecting mechanism to form a durable and stable reel that can be readily disassembled on demand. The hooks as the members formed in the hub to constitute said mechanism have their heads protruding a small distance sideways from the ends of hub, and at least one resilient pawl also formed in the hub to serve as the other connecting member is capable of rocking in an axial or radial direction with respect to the hub. Those hooks engaging with the slots formed in the discs are effective to protect the discs from a high outward pressure which the elongate wound up on the hub will impart to said discs. On the other hand, the pawls engaging with the apertures formed in the discs do protect the discs from an angular displacement around the hub, since the direction in which the pawls can elastically move is perpendicular to a circular direction in which the discs tend to rotate. This feature that the hooks and the pawls play their own roles different in nature from each other and the directions just

mentioned above are perpendicular to each other, is advantageous in that these members will not become fatigued so early even if the operations of assembling and disassembling this reel would be repeated many times, thus remarkably improving the durability thereof.

In the second embodiment wherein the resilient pawls have bodies integral therewith and extending axially of the hub, the locking ends of those pawls can rock a greater distance transversely of said hub when the bodies are forced to swing, whereby the locking effect of those pawls is enhanced.

Further in the third embodiment wherein the resilient pawls located adjacent to the external cylinder have their bodies connected to the internal cylinder by their radial bodies, or by the radial extension of their axial bodies, the locking ends of those pawls can rock a much greater distance axially of said hub when the bodies are forced to swing, whereby the locking effect of those pawls is enhanced furthermore.

This collapsible reel can readily be modified in its distance between the discs and in its effective diameter, by selecting discs of a desired diameter and combining them with a hub of an appropriate diameter and proper width. Molds for forming the discs having the slots and apertures and for forming the hub having the hooks and pawls can be comparatively simple in structure, so that the reels of the present invention can be manufactured easily and efficiently.

Claims

1. A reel for transporting elongate articles comprising:

a pair of substantially flat and round discs (2, 2);
 a hub (3) composed of an external cylinder (4) and an internal cylinder (5);
 the cylinders (4, 5) being arranged around and coaxially with an axial bore (7) penetrating the internal cylinder (5) that is connected by a tie plate (6) to the external cylinder (4), both the cylinders being interposed between the discs (2, 2) to connect them one to another;
 hooks (8) each having a hooking head and a body (8a) secured to an inner periphery of the external cylinder (4) of the hub;
 at least one resilient pawl (9) provided for each disc (2) and each having a locking end and a body (9a);
 the hooking heads bent perpendicular to the respective bodies (8a), arranged in the same circular direction and protruding from open ends of the hub (3) beyond an outer face of each disc (2);
 the locking end of the pawl (9) being disposed adjacent to and within the external cylinder (4) and being elastically and temporarily displaceable in an axial or radial direction of the hub (3);

slots (10) formed in each disc (2) so as to engage with the respective ends of the hooks (8); and

at least one aperture (11) also formed in each disc (2) and capable of engaging with the locking end of the resilient pawl (9).

2. A reel as defined in claim 1, wherein the locking end of the resilient pawl (9) is elastically displaceable in the axial direction of the hub (3), and the bodies (8a) of the hooks (8) as well as the body (9a) of the pawl (9) are formed integral with the inner periphery of the external cylinder (4) of the hub.

3. A reel as defined in claim 1, wherein the locking end of the resilient pawl (9) is elastically displaceable in the radial direction of the hub (3), and the body (9a) of the pawl extends along and in parallel with the external cylinder, further comprising a guiding means for forcing the locking end of each resilient pawl (9) into engagement with the aperture (11) when the disc (2) is rotated relative to the hub.

4. A reel as defined in claim 3, wherein the guiding means is a guiding cam (14) formed on the inner face of the disc (2) and located adjacent to each aperture (11).

5. A reel as defined in claim 3 or 4, wherein the locking end of each resilient pawl (9) is constricted relative to the body (9a) thereof.

6. A reel as defined in claim 1, wherein the locking end of the resilient pawl (9) is elastically displaceable in the axial direction of the hub (3), and the body (9a) of the pawl (9) extends radially of the hub (3) and indirectly connected to the internal cylinder (5) by and through an axial extension (9b) of said body.

7. A reel as defined in claim 1, wherein the locking end of the resilient pawl (9) is elastically displaceable in the axial direction of the hub (3), and the body (9a) of the pawl (9) extends radially of the hub (3) and directly connected to the internal cylinder (5).

8. A reel as defined in claim 1, wherein the locking end of the resilient pawl (9) is elastically displaceable in the axial direction of the hub (3), and the body (9a) of the pawl (9) extends axially of the hub and along the external cylinder (4) so as to be connected to the internal cylinder (5) by and through a radial extension (9c) of said body.

9. A reel as defined in any of the preceding claims 6 to 8, wherein the locking end of the resilient pawl (9) is accompanied by such a stopper (9A) that inhibits the end from rotating in a reverse direction in which the discs (2) is loosened relative to the hub

(3).

10. A reel as defined in any of the preceding claims 1 to 9, wherein the hub (3) and the discs (2) are made by molding a synthetic resin or synthetic resins, and each disc (2) is capable of being removed from the hub (3) with use of a manual releaser (20) that comprises projections engageable with the locking ends of the at least one resilient pawls so as to force them out of the apertures (11), while the releaser is at a correct position on the disc.

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Fig. 1

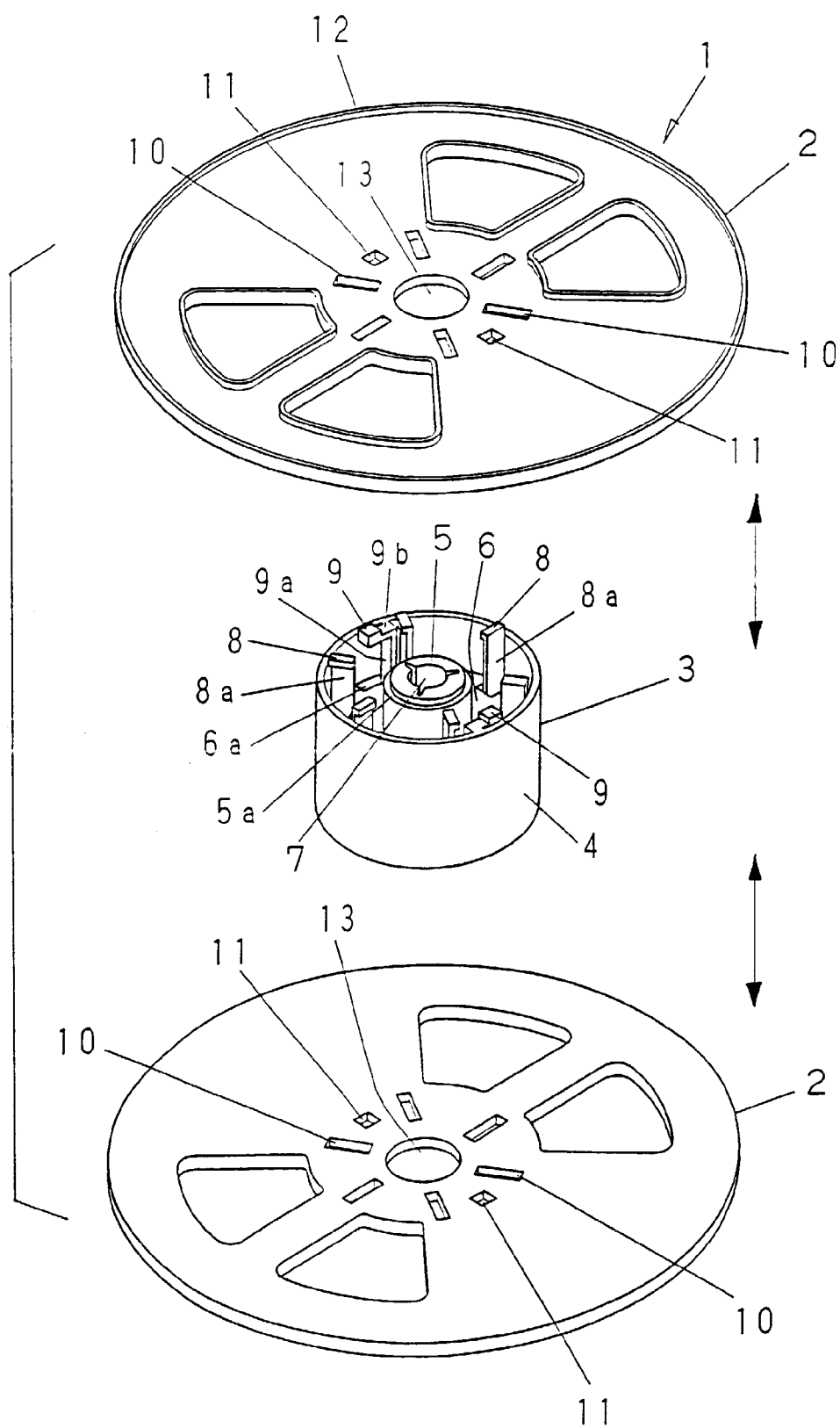


Fig. 2

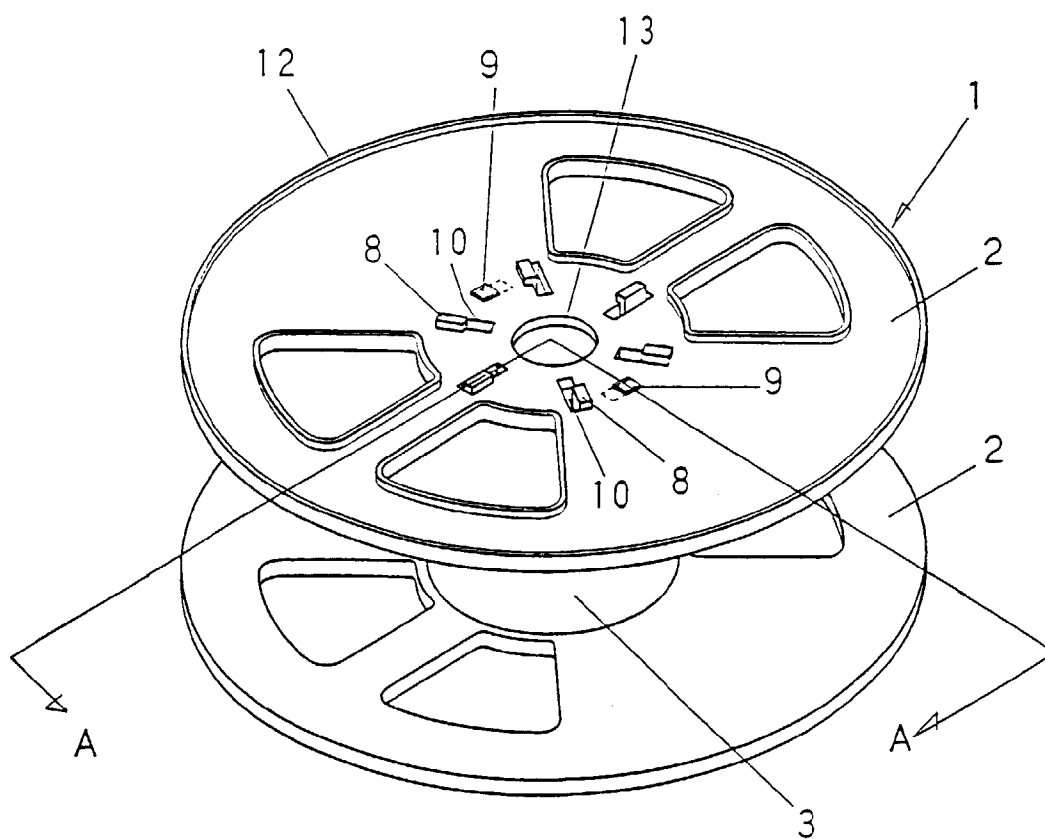


Fig. 3

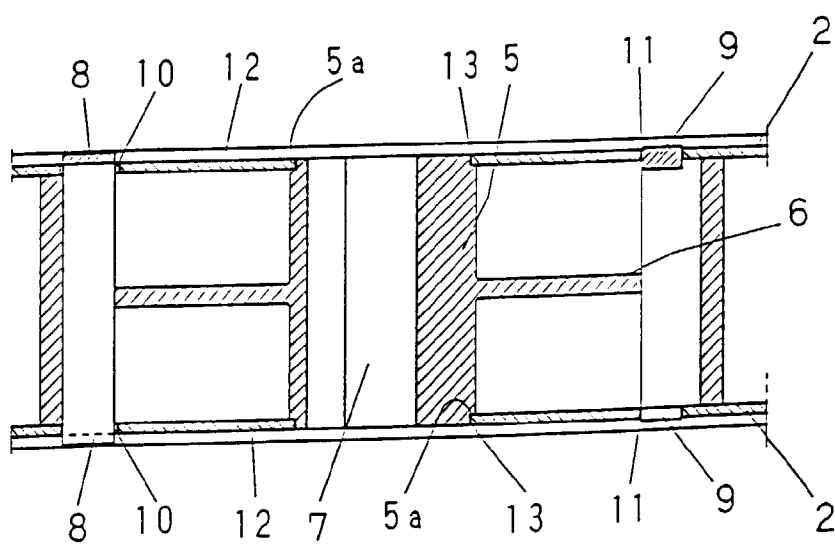


Fig. 4

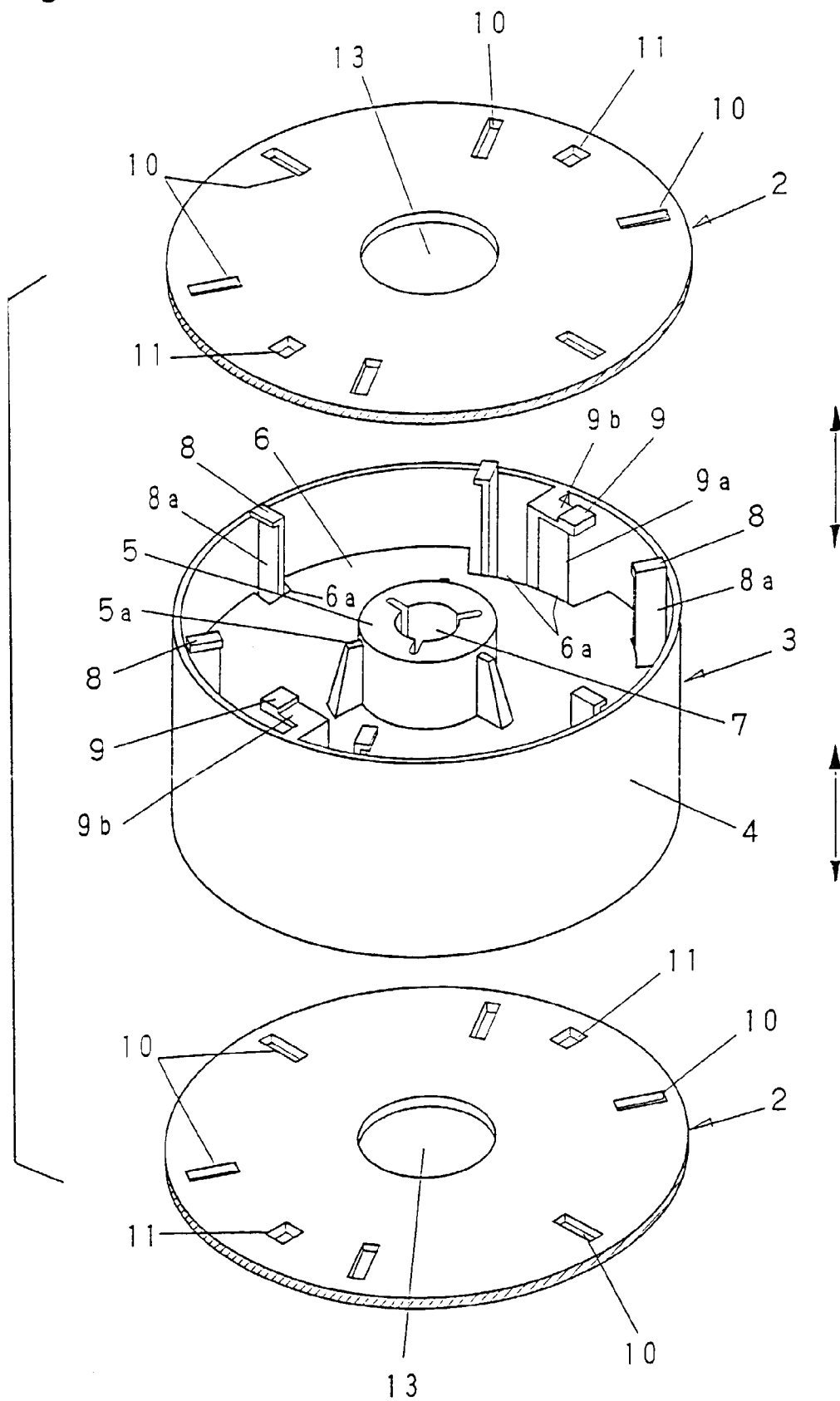


Fig. 5

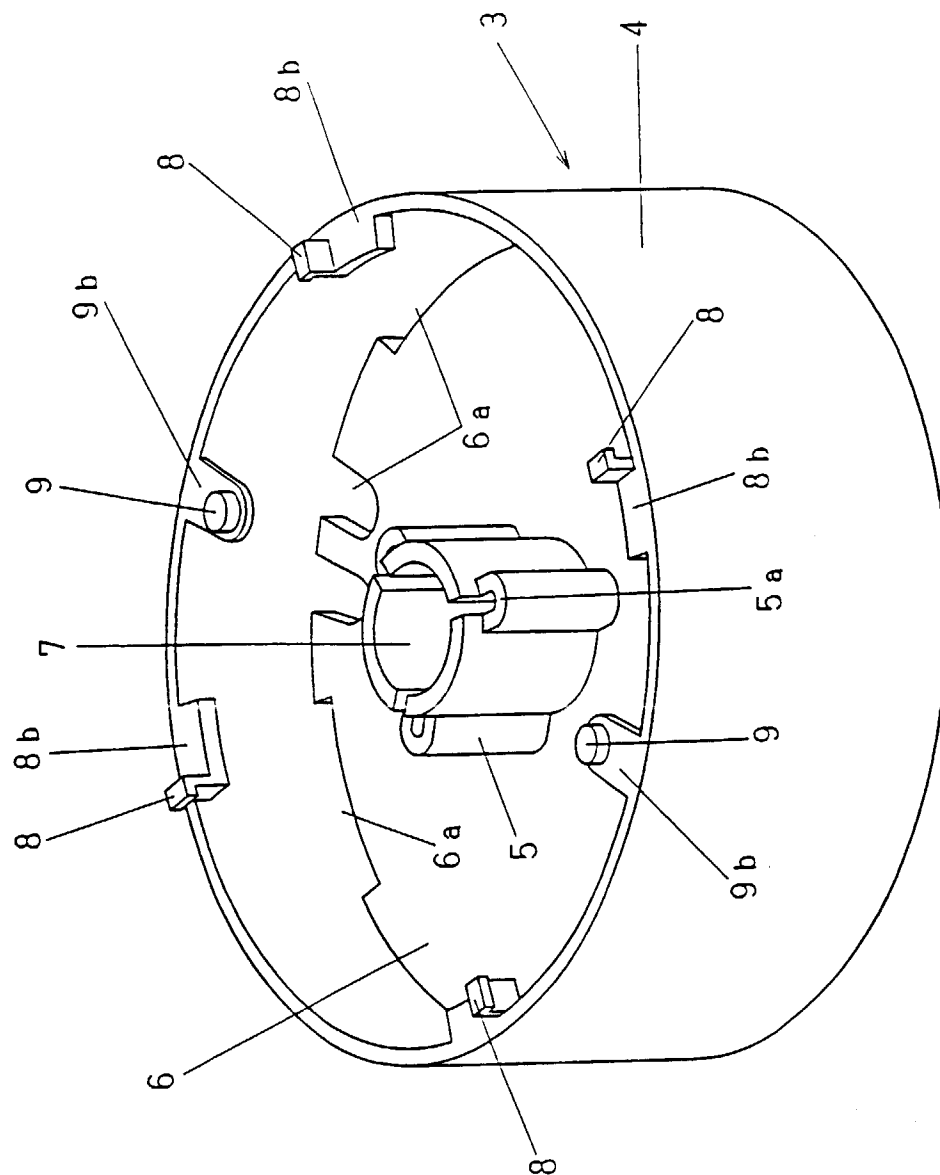


Fig. 6

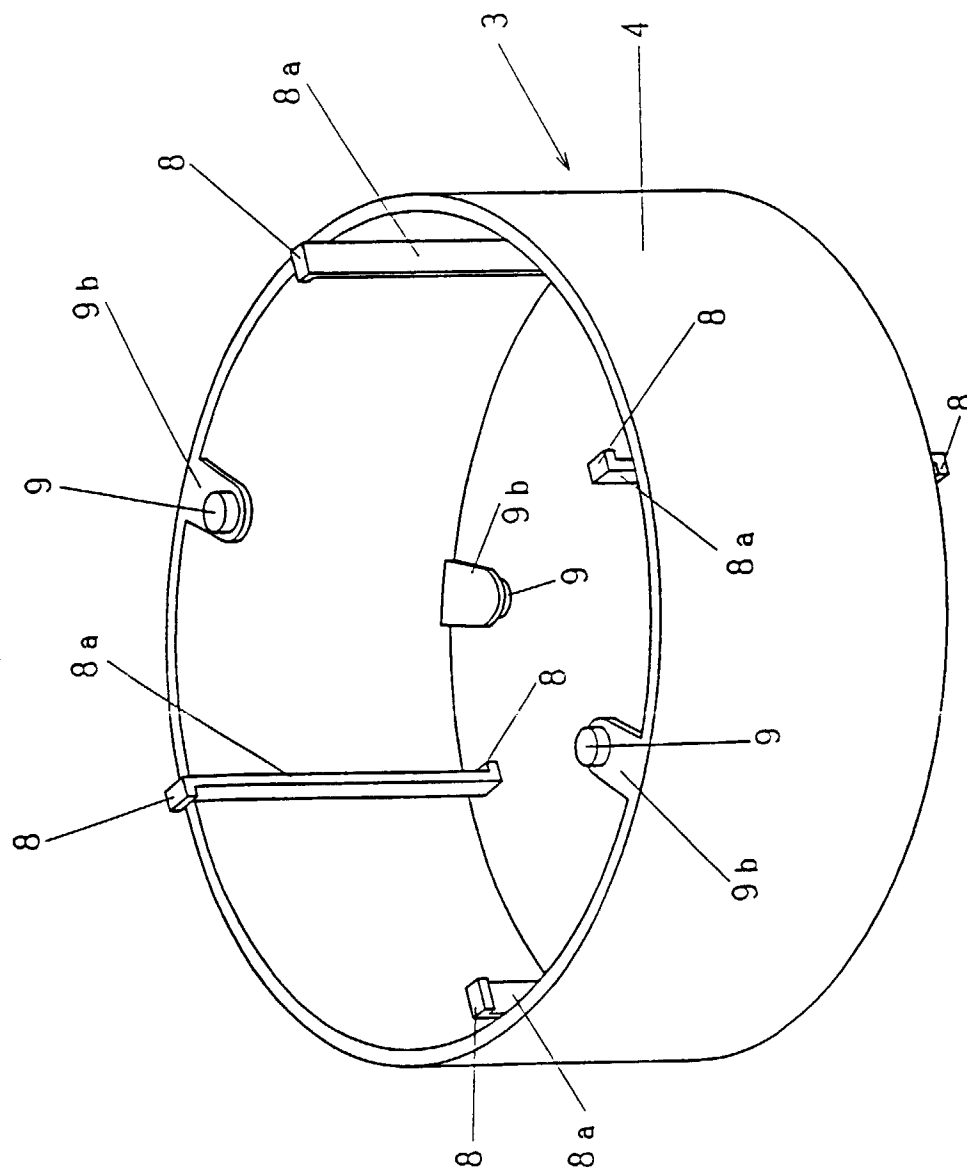


Fig. 7

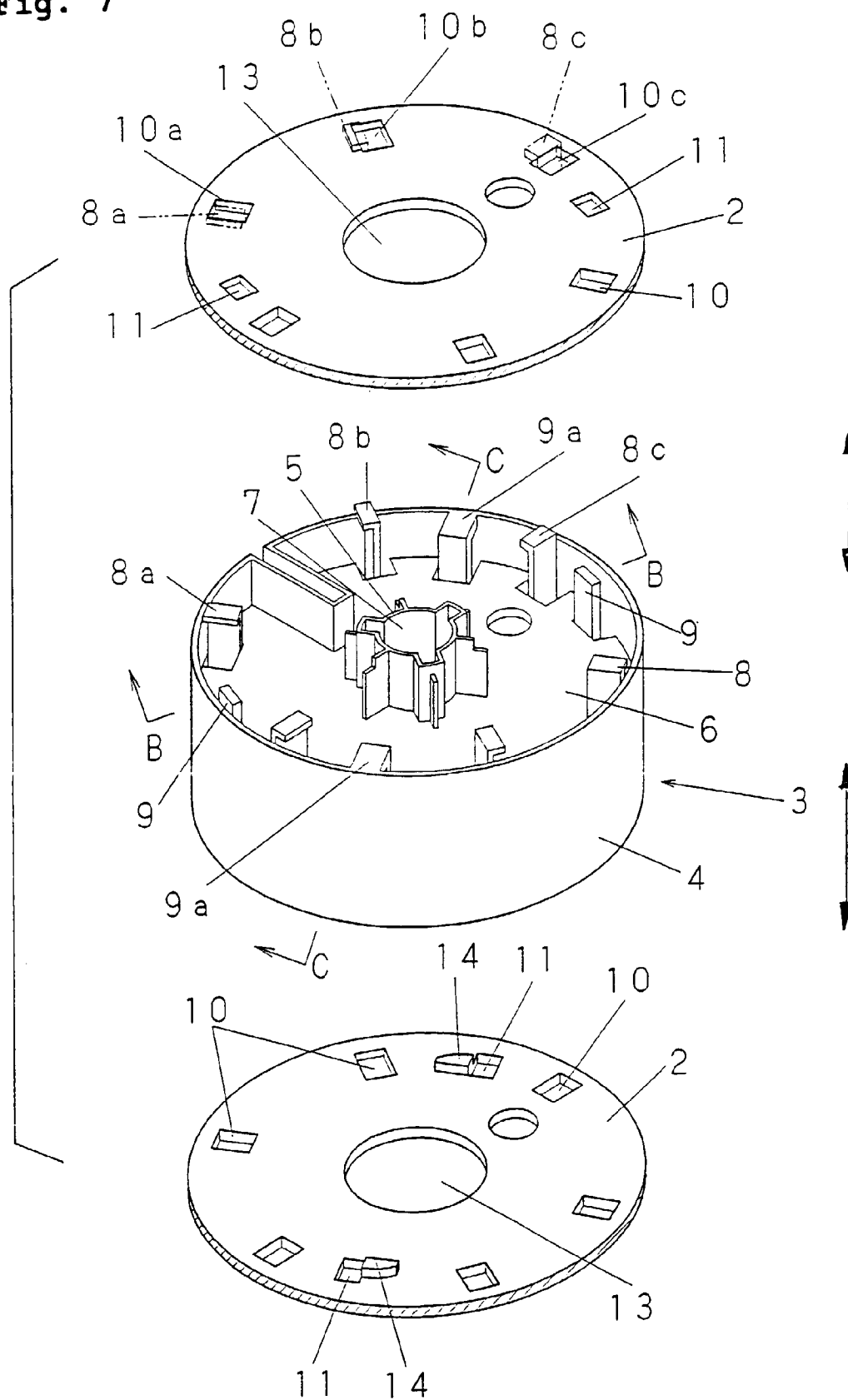


Fig. 8

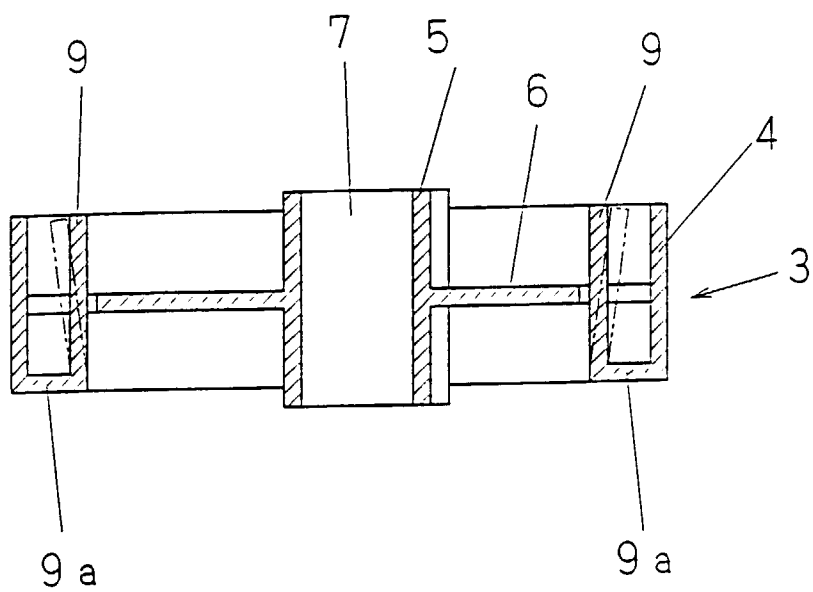


Fig. 9

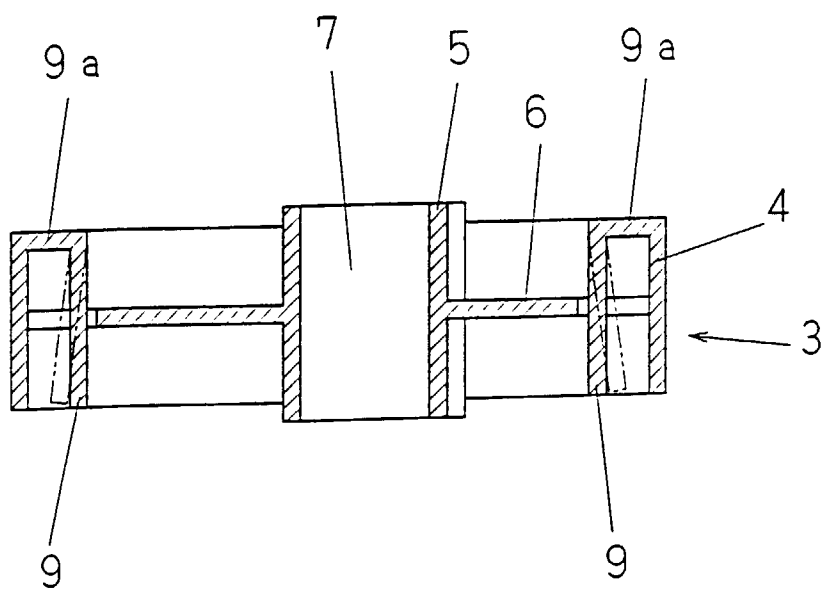


Fig. 10a

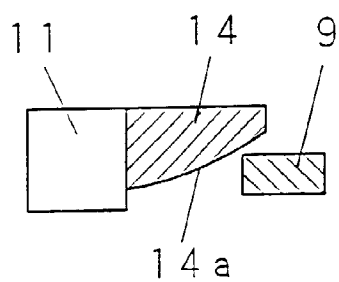


Fig. 10b

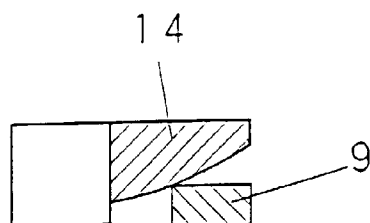


Fig. 10c

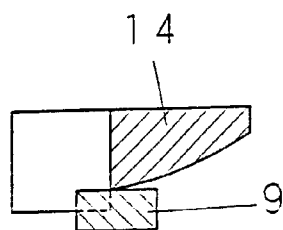


Fig. 10d

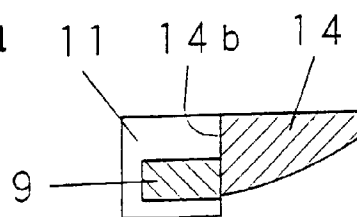


Fig. 10e

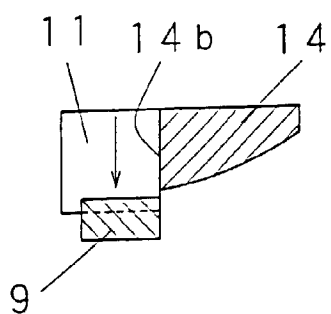


Fig. 11

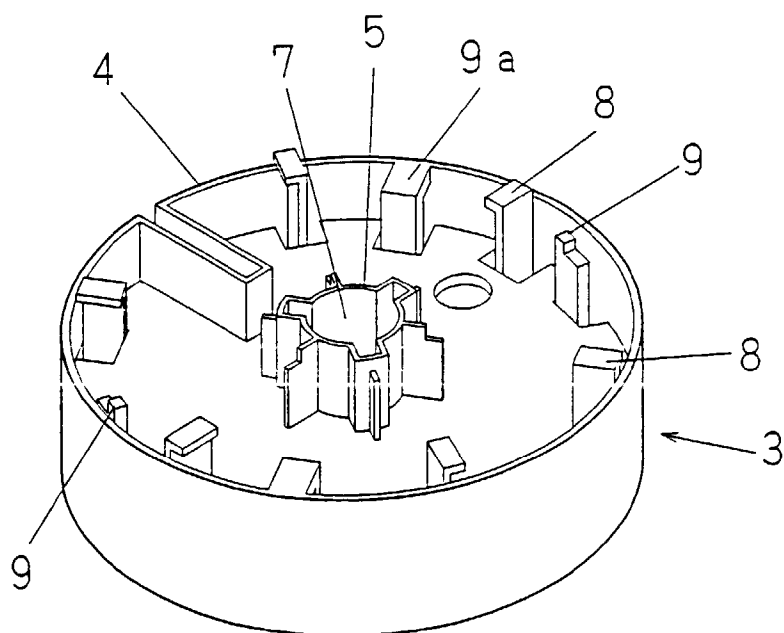


Fig. 12

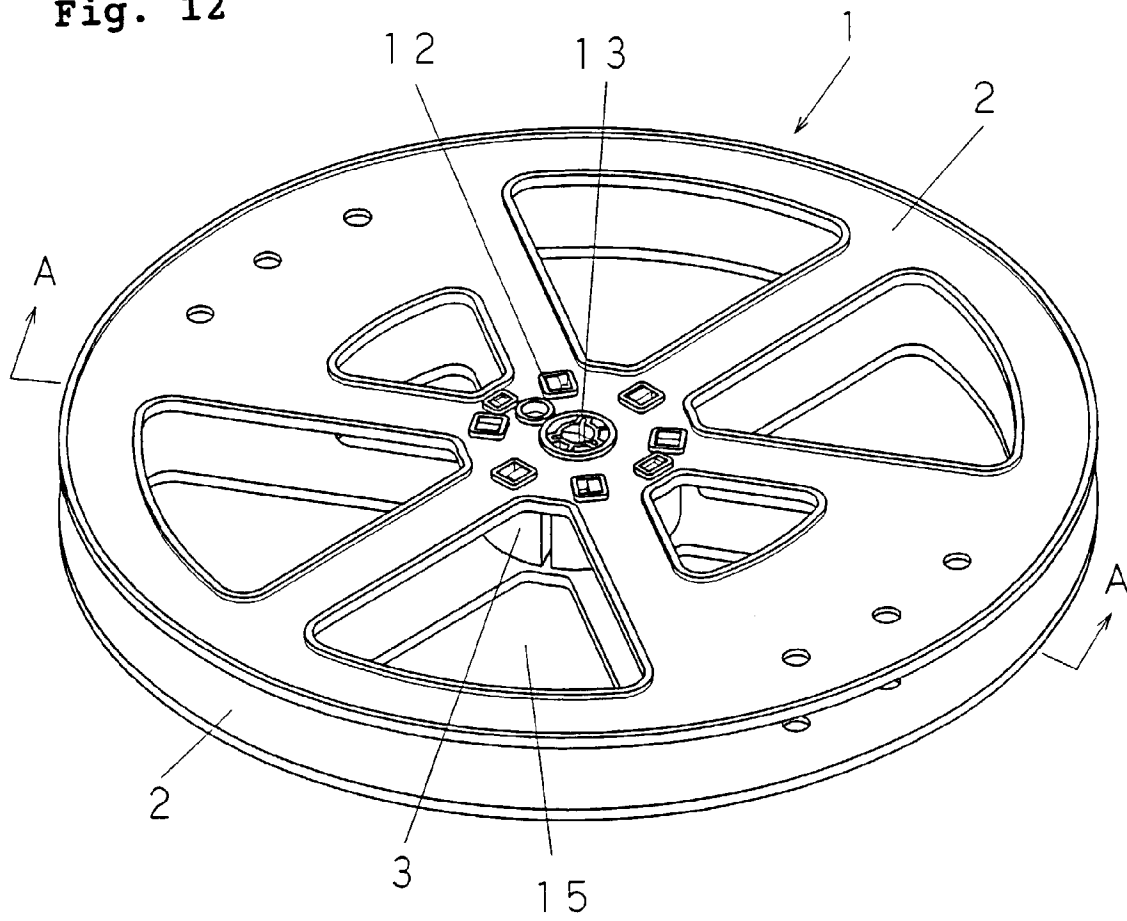


Fig. 13

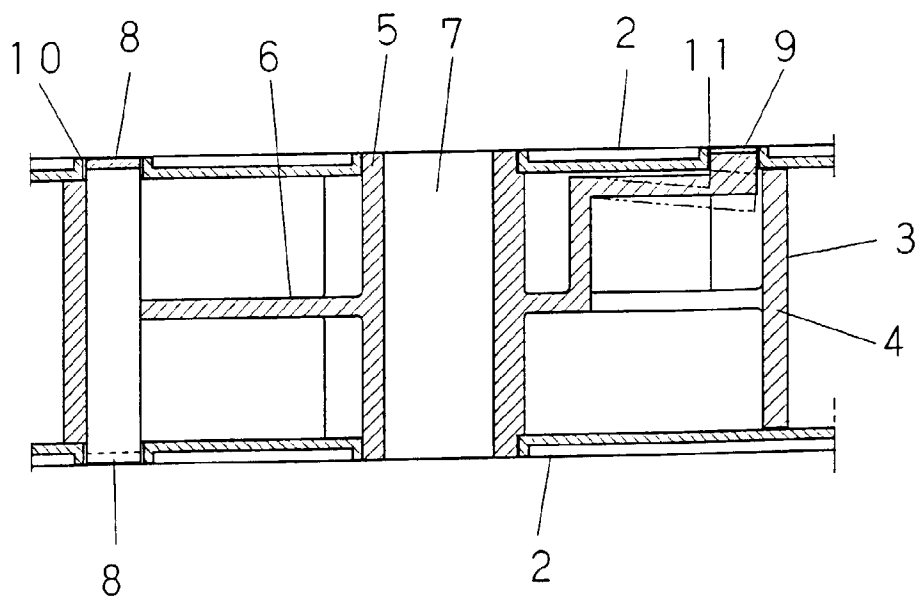


Fig. 14

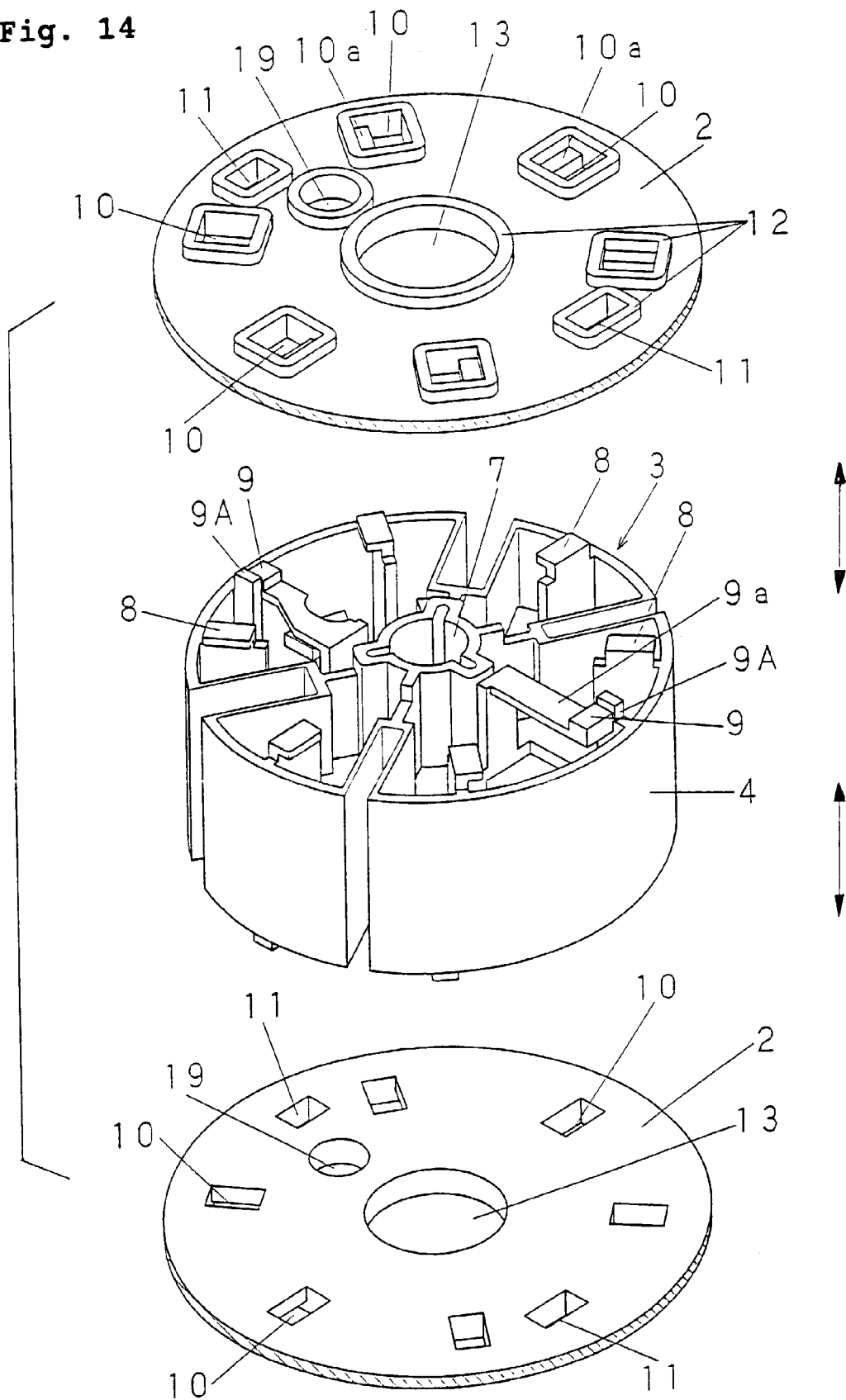


Fig. 15

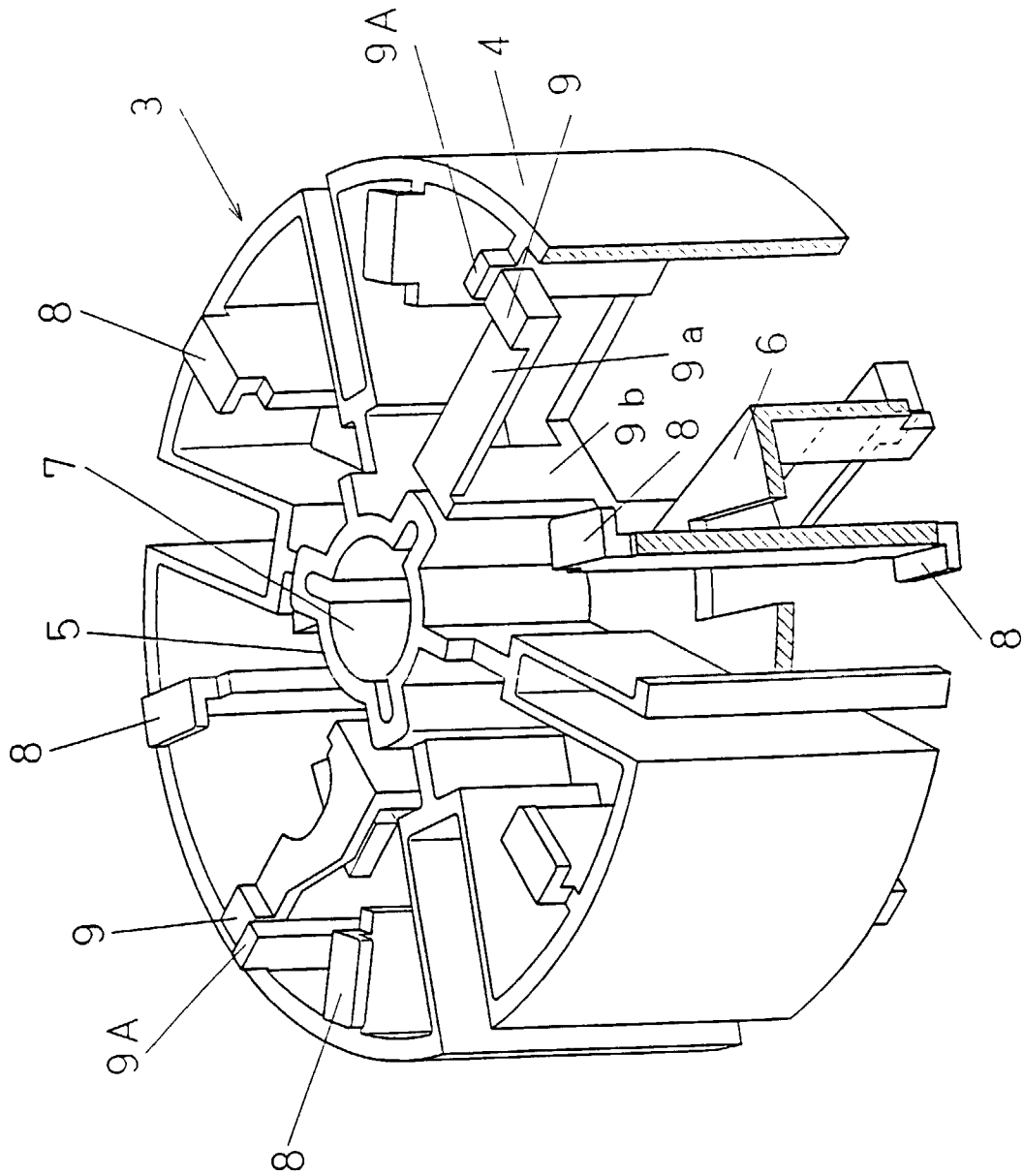


Fig. 18

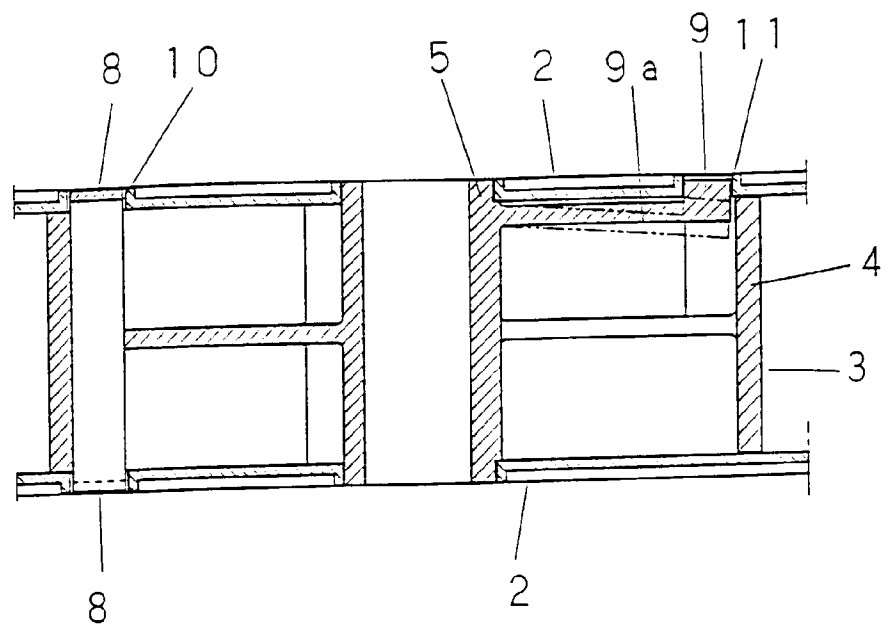


Fig. 16

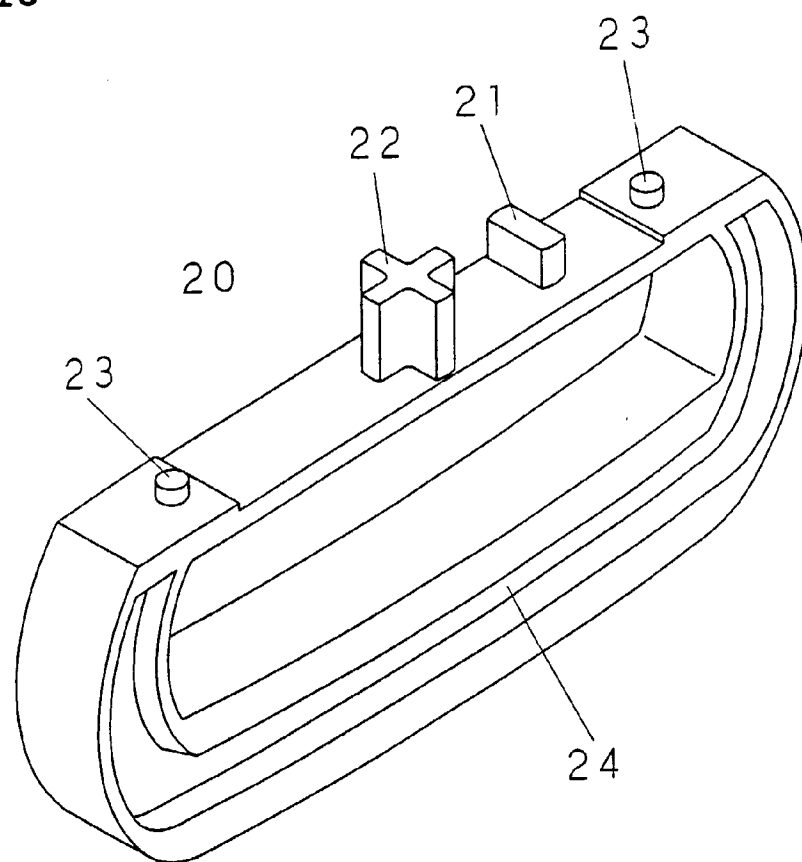


Fig. 17

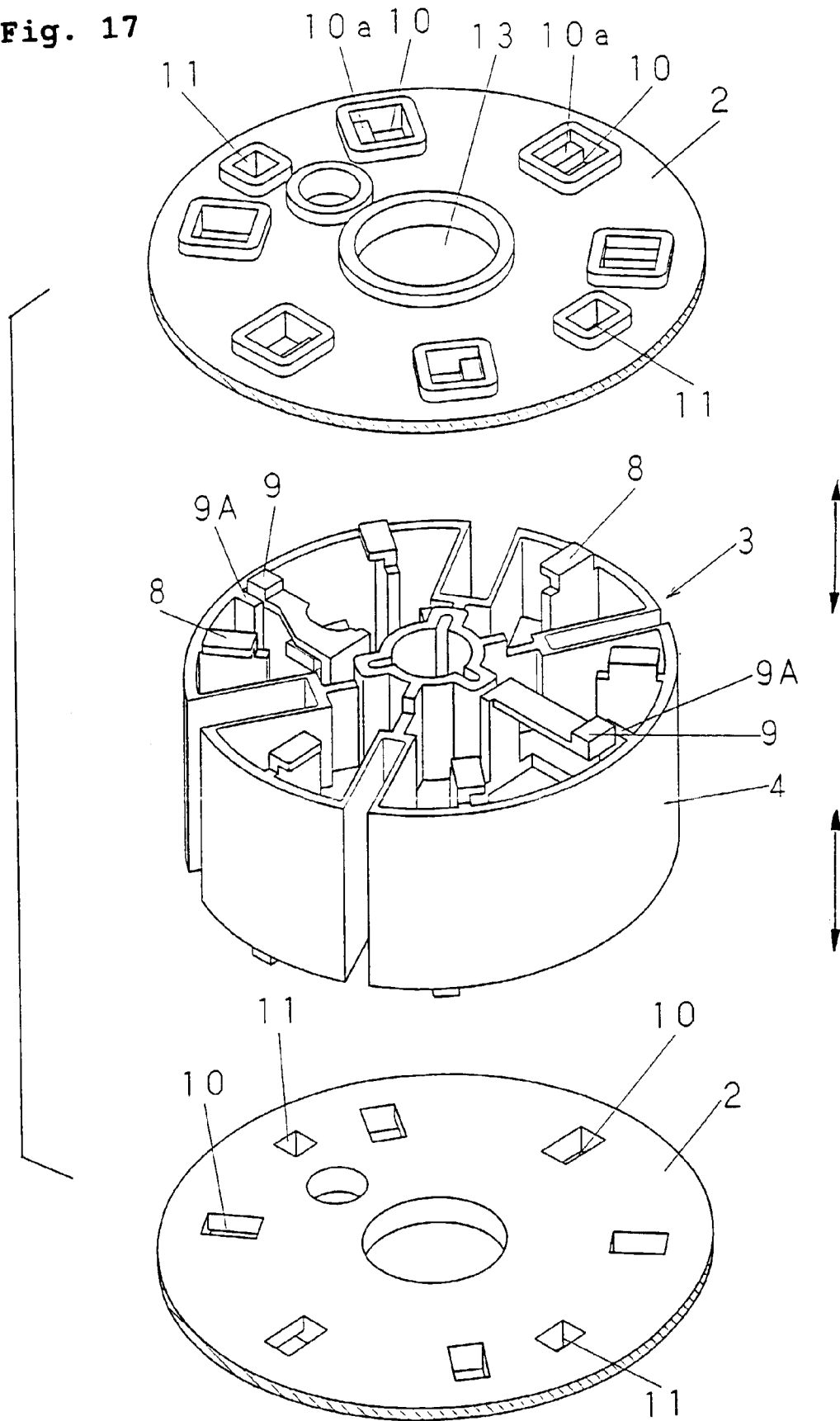


Fig. 19

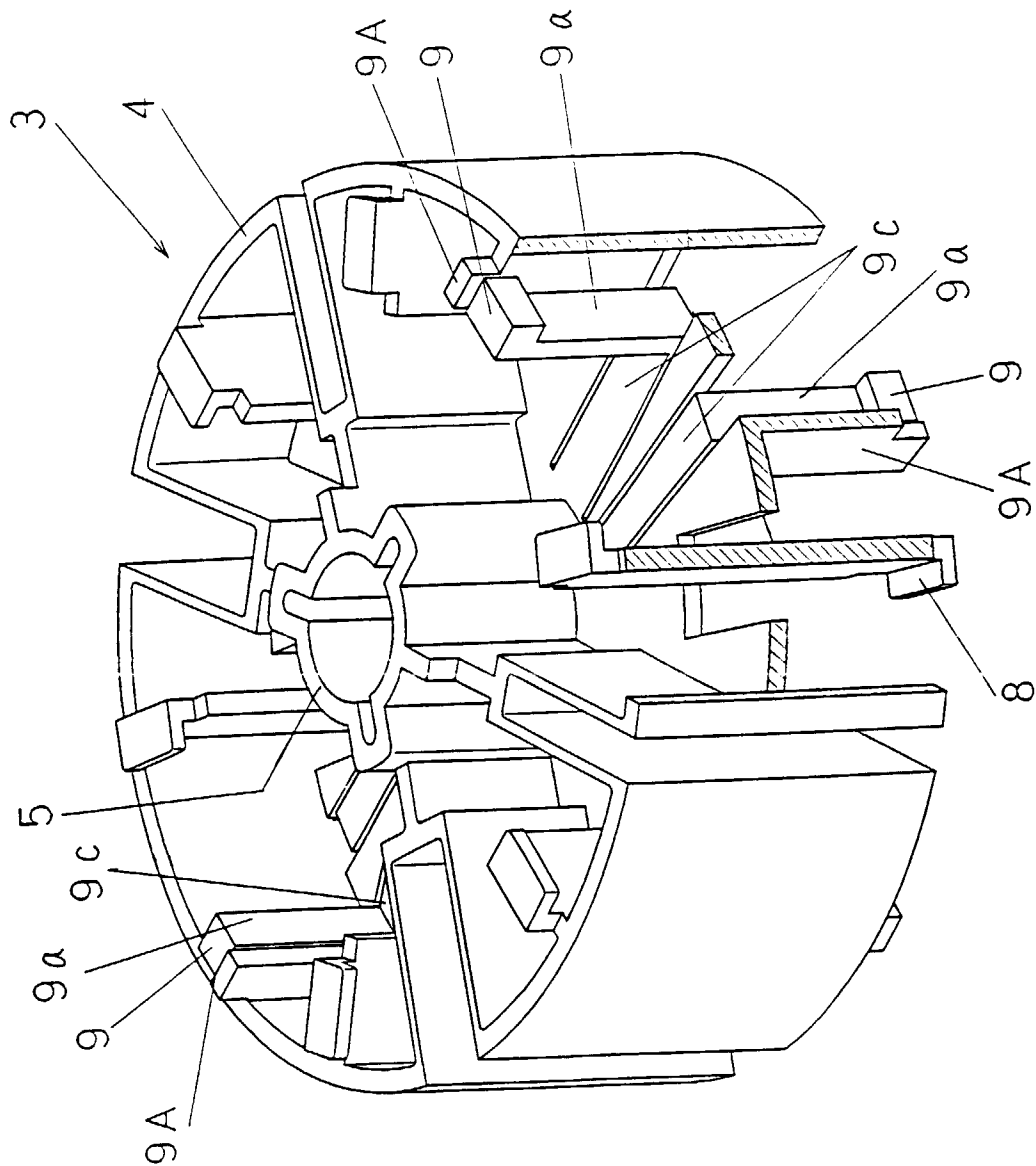
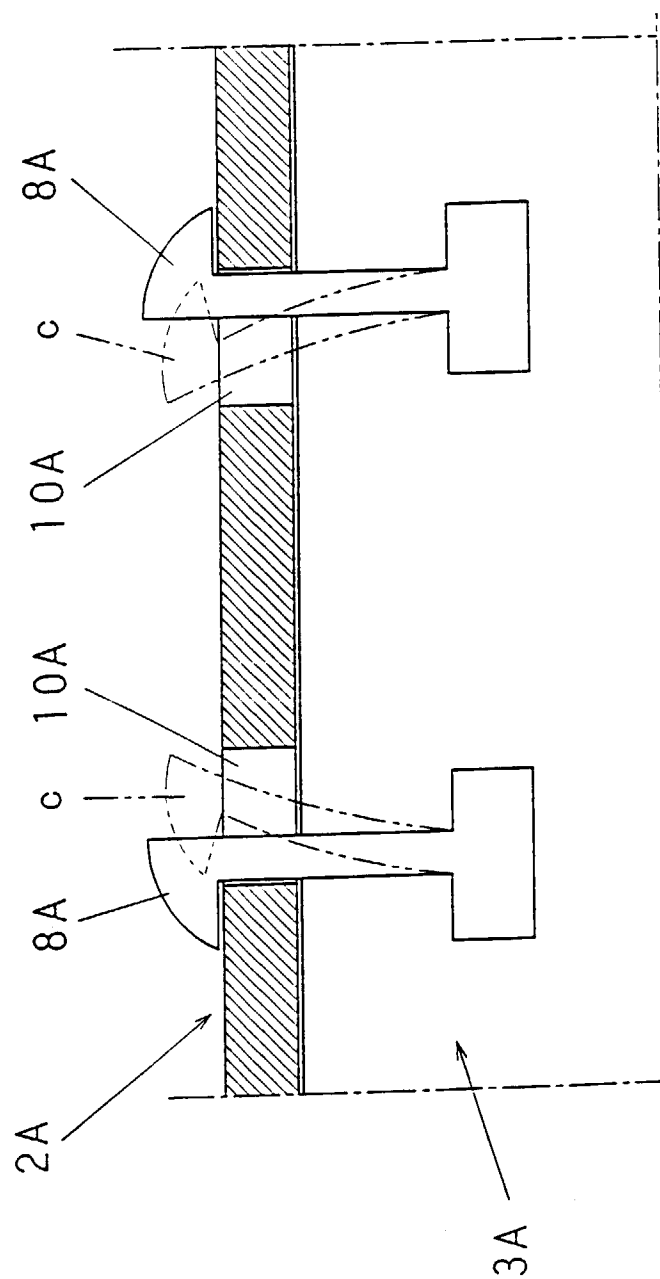


Fig. 20





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 30 8706

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	PATENT ABSTRACTS OF JAPAN vol. 014, no. 482 (P-1119), 19 October 1990 & JP 02 193380 A (SONY CORP), 31 July 1990, * abstract *	1	B65H75/22
A	EP 0 404 043 A (ESSEBI S.R.L.) * figures 1-6 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65H G11B G03B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 2 April 1997	Examiner Tamme, H-M
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p>			

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