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(54) STORAGE AND TRANSPORTATION DEVICE

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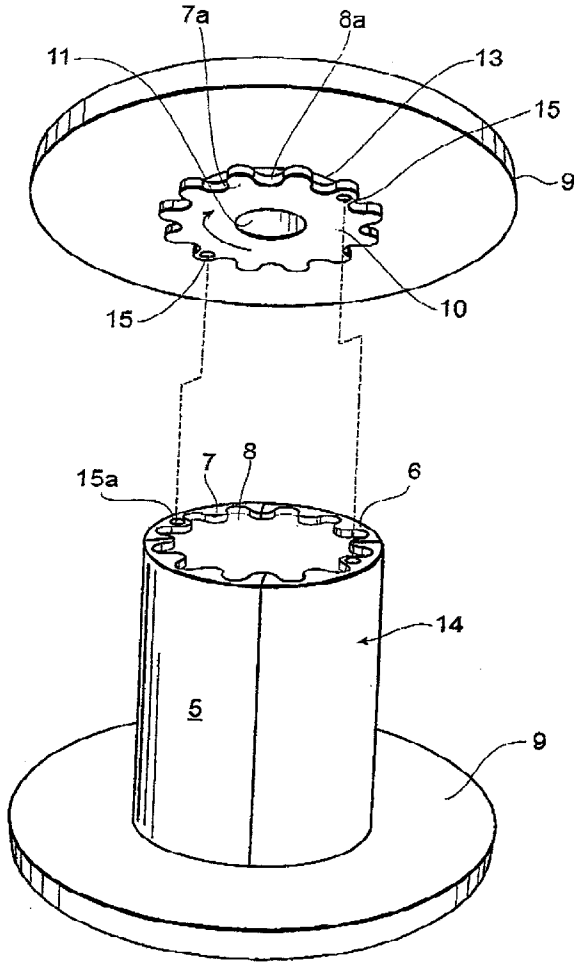
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(57) **ABSTRACT**

A demountable cable reel comprising a pair of end flanges, each end flange having an inwardly facing spool connecting boss, and a generally cylindrical spool having two or more spool elements. The spool connecting boss of each end flange is engagable with the spool by axial alignment of complementary teeth on each boss and a respective spool element. A damaged spool element may be removed and replaced without having to unwind a cable on the reel.



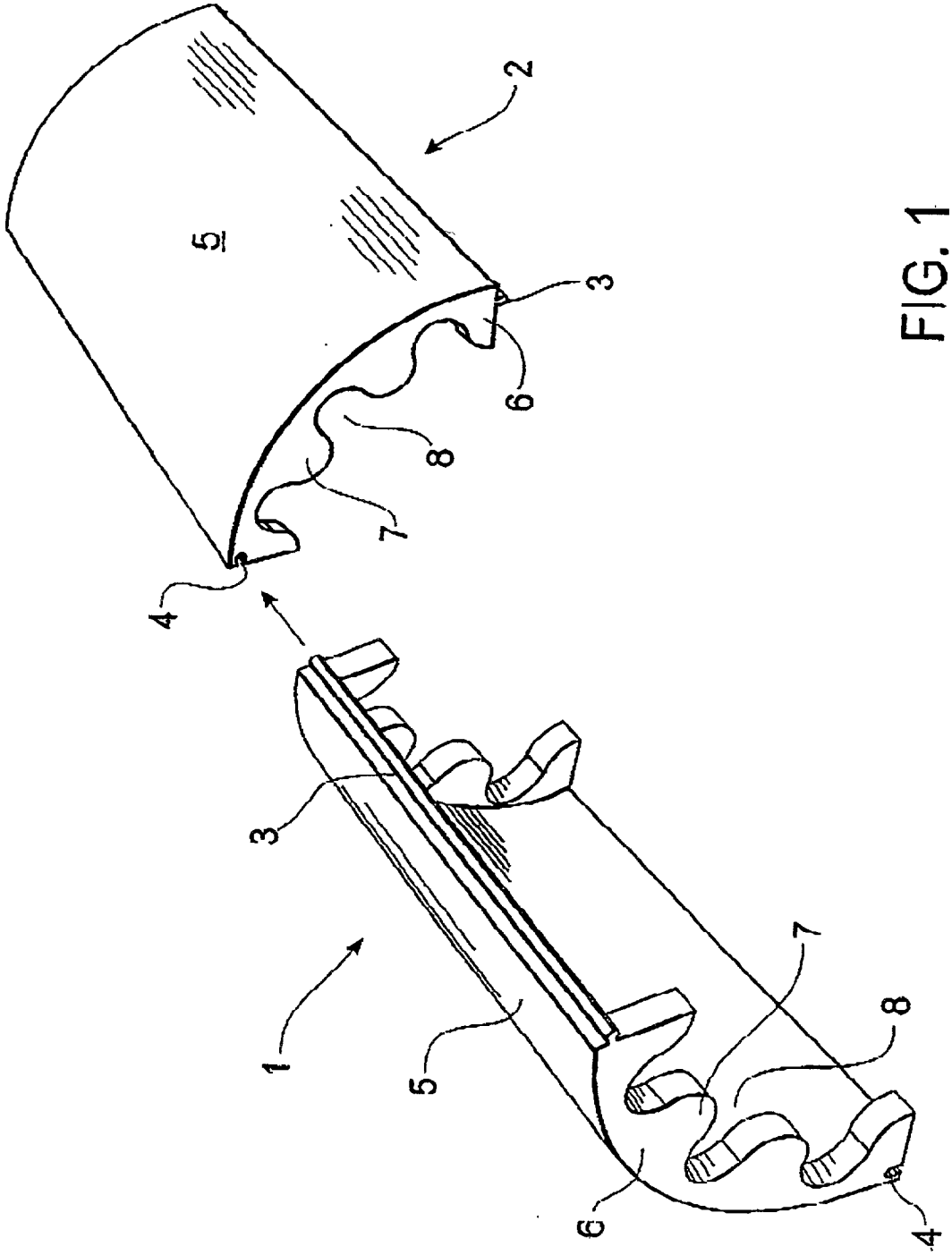


FIG. 1

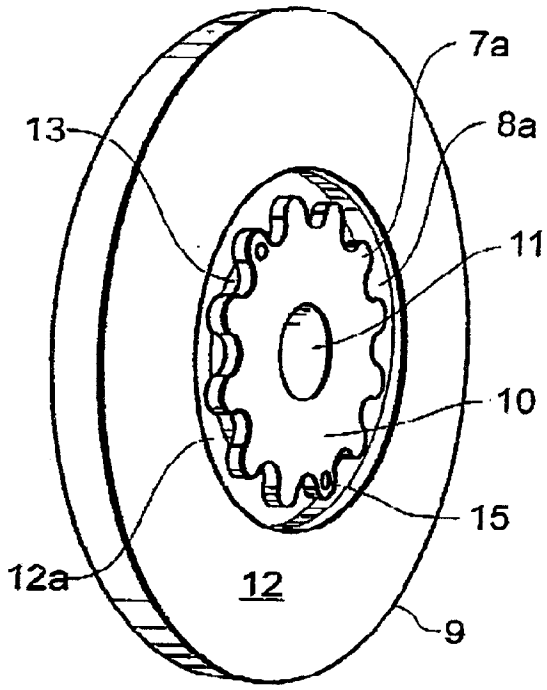


FIG. 2

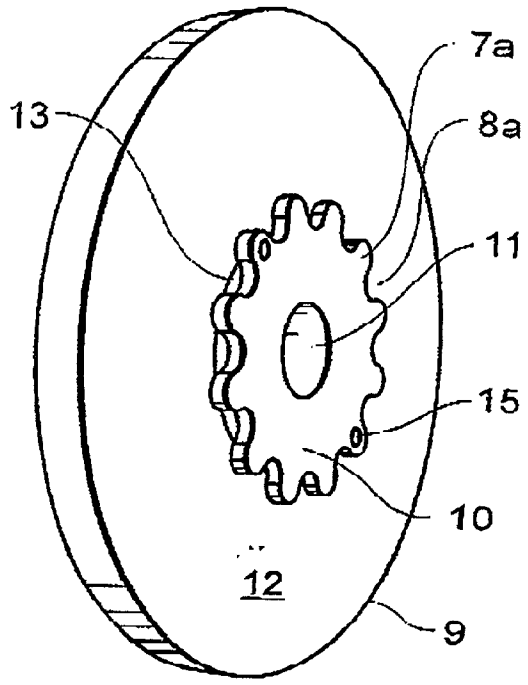


FIG. 3

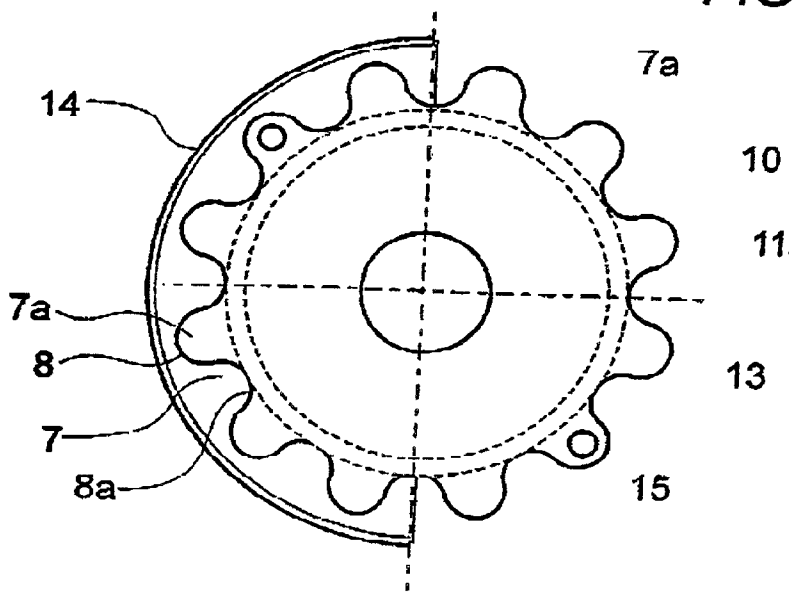


FIG. 4

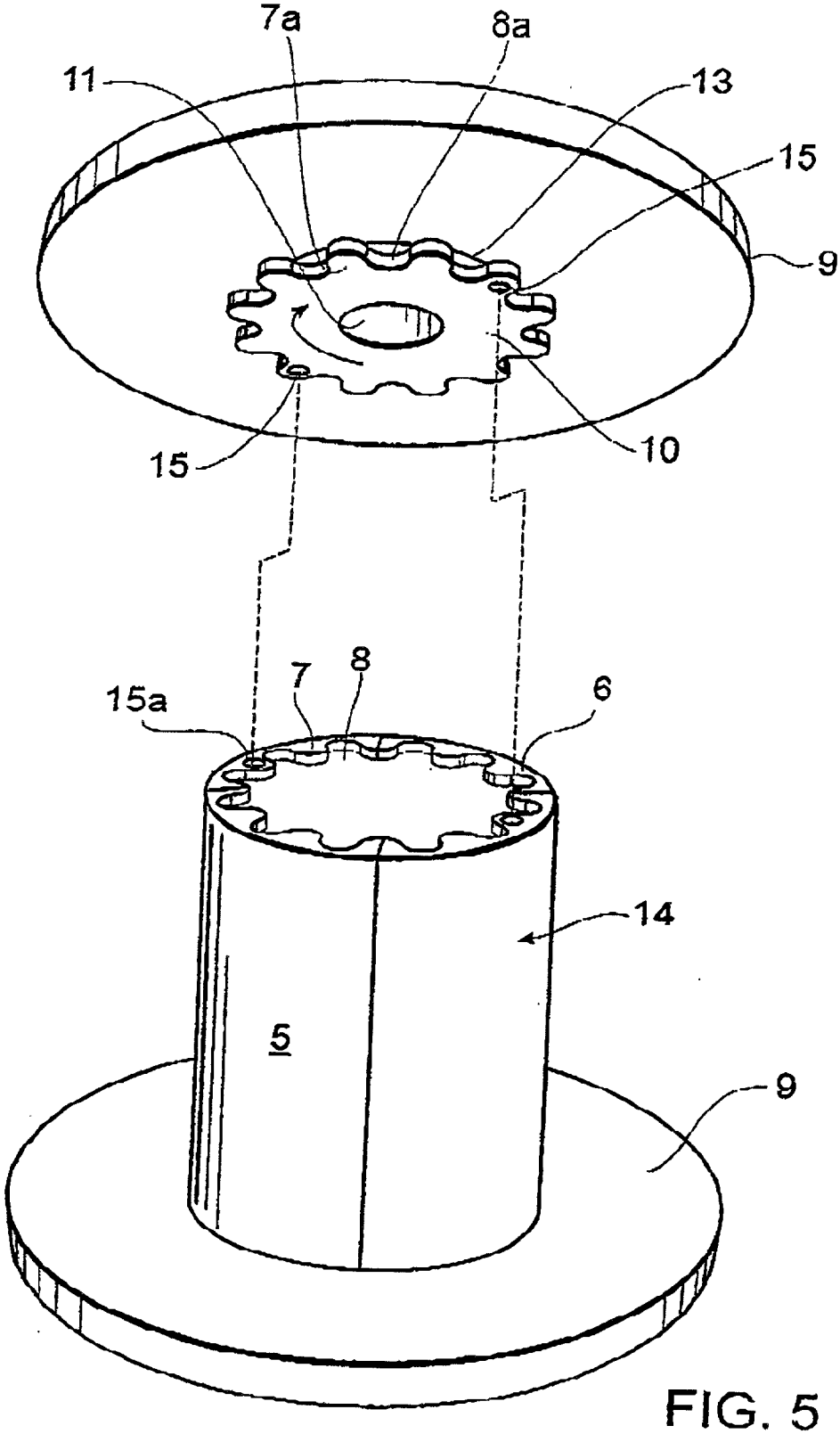


FIG. 5

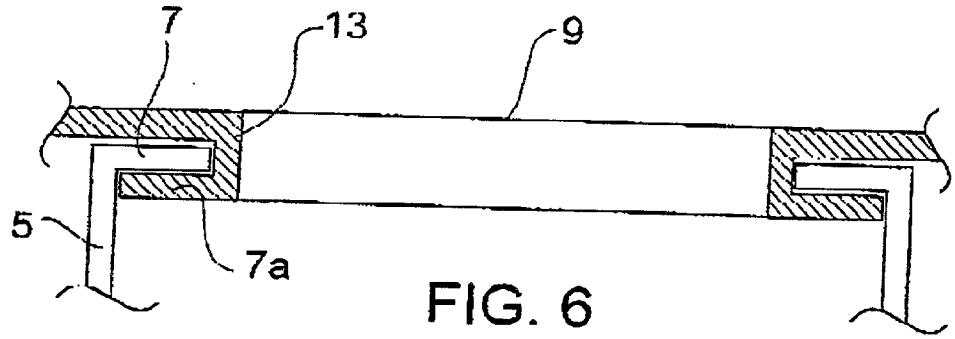


FIG. 6

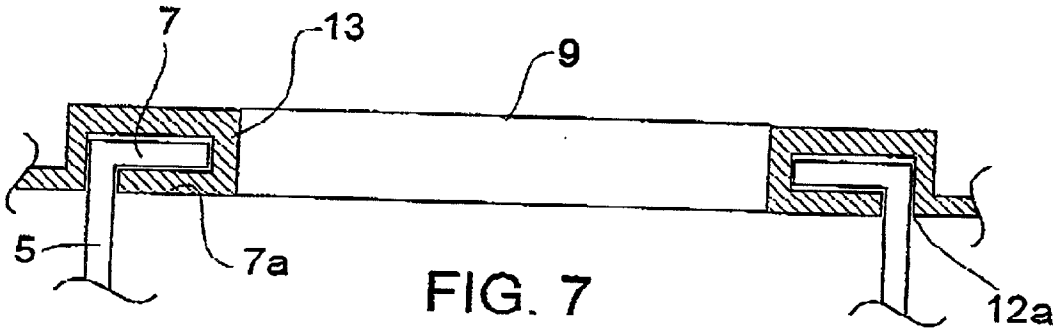


FIG. 7

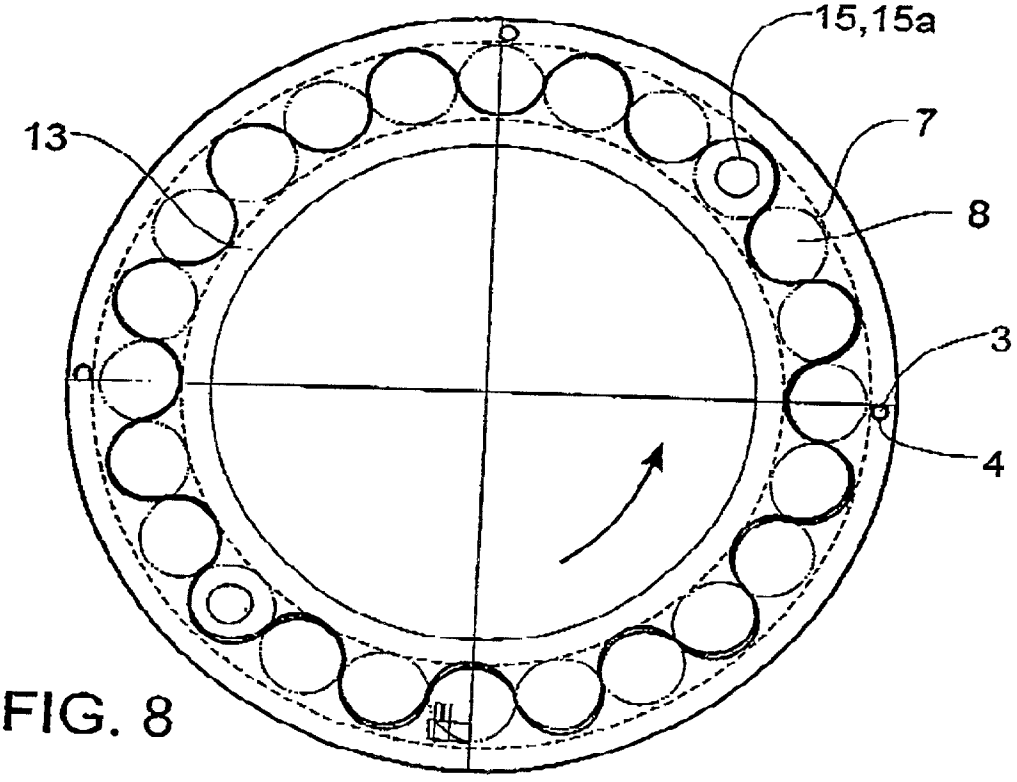


FIG. 8

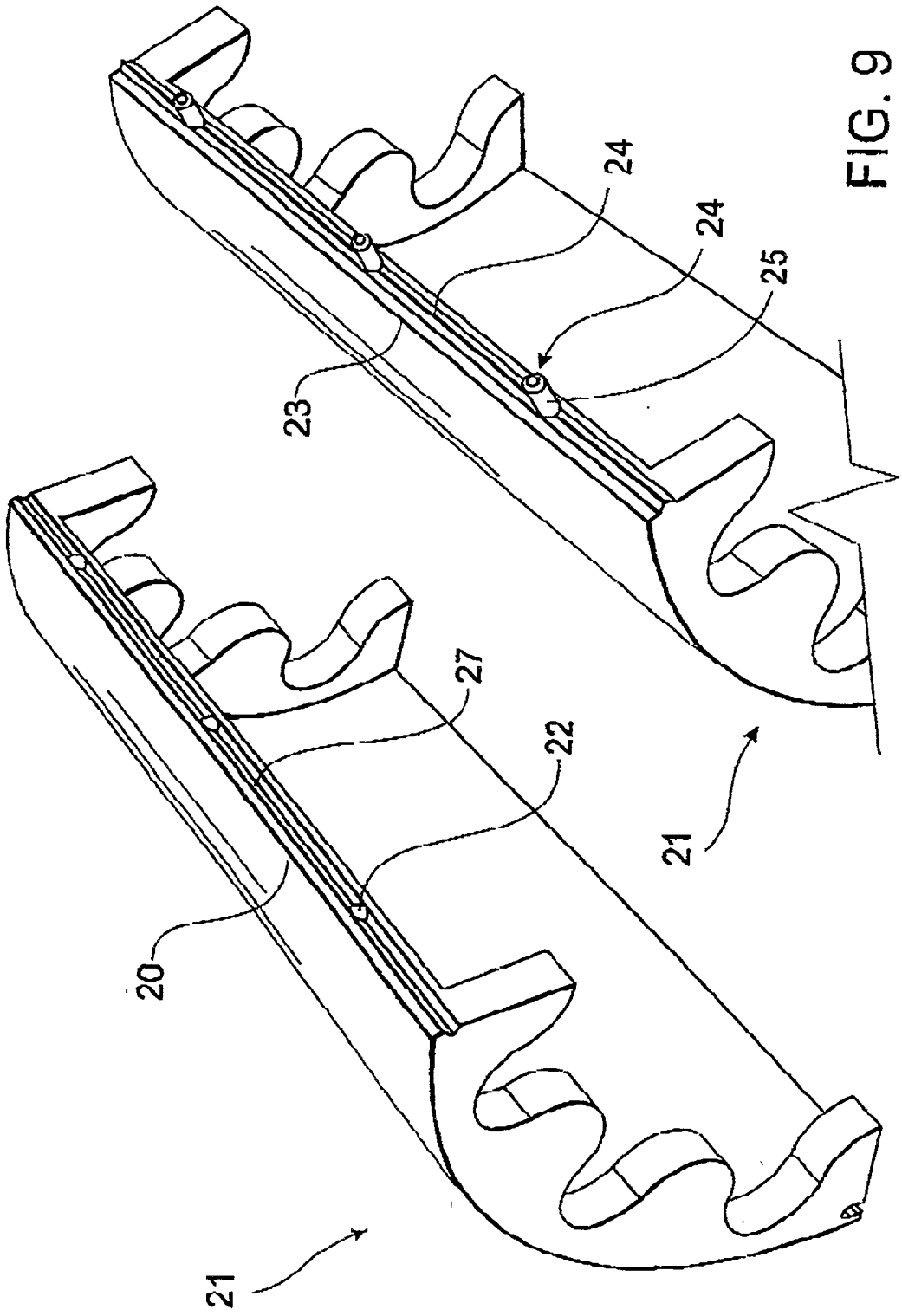


FIG. 9

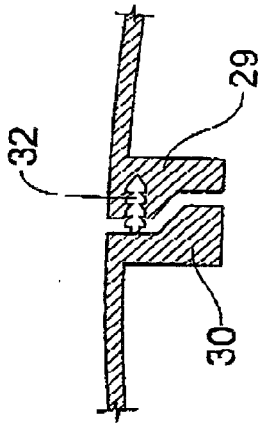


FIG. 10a

FIG. 10

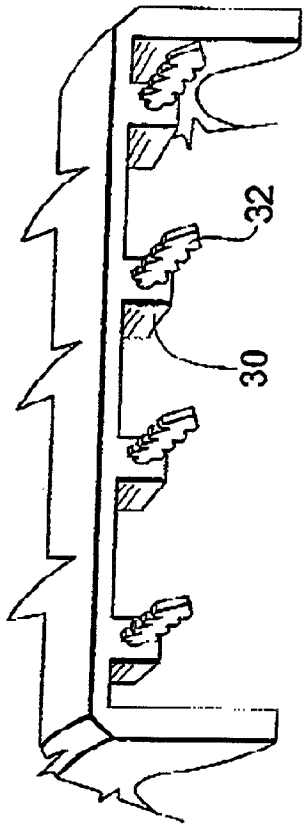


FIG. 10b

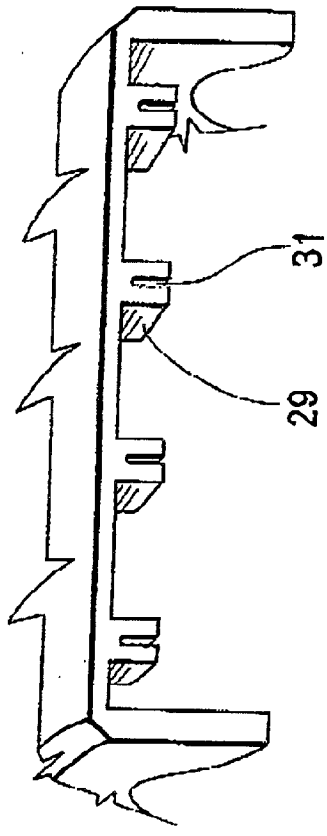


FIG. 10c

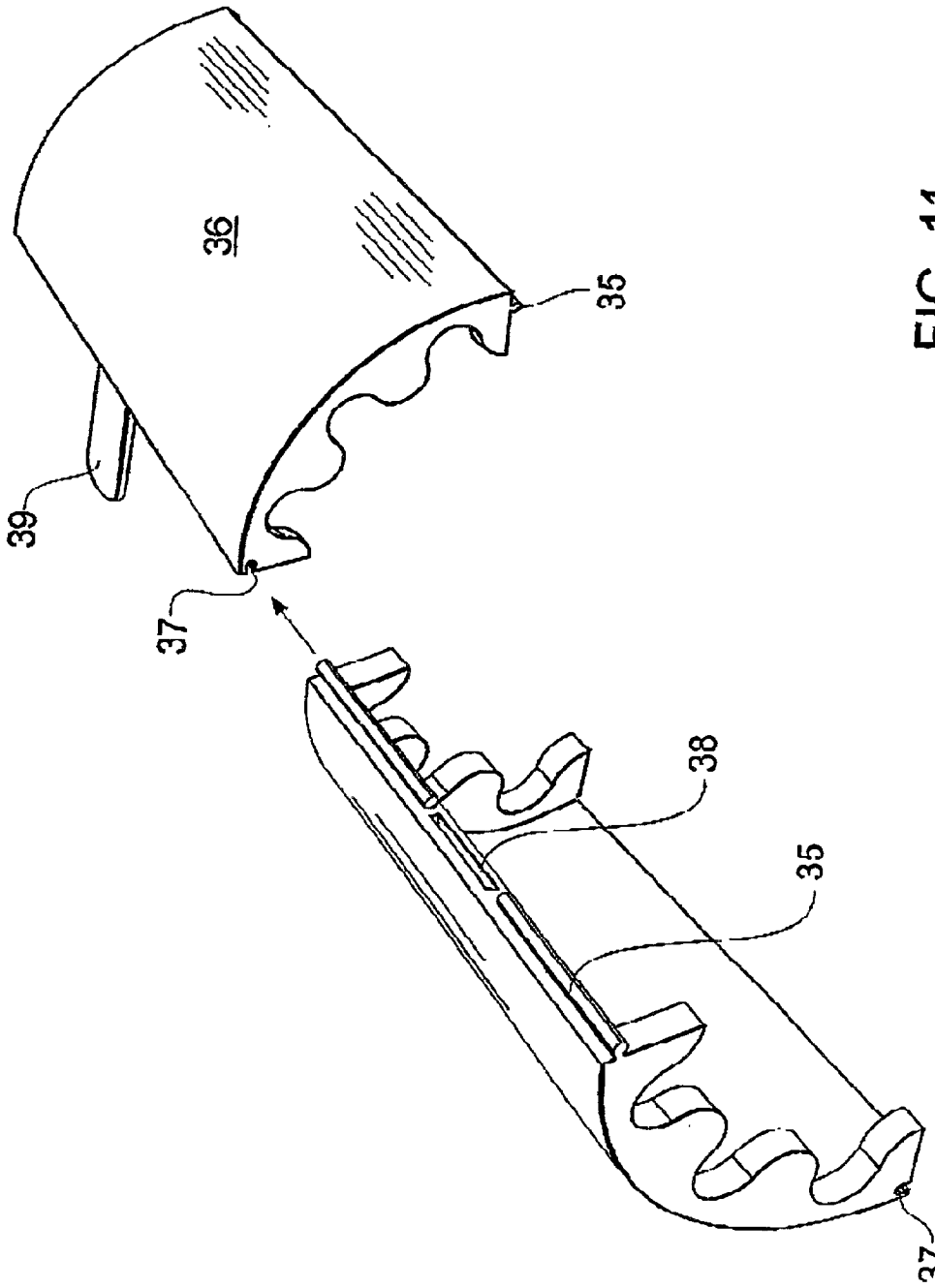


FIG. 11

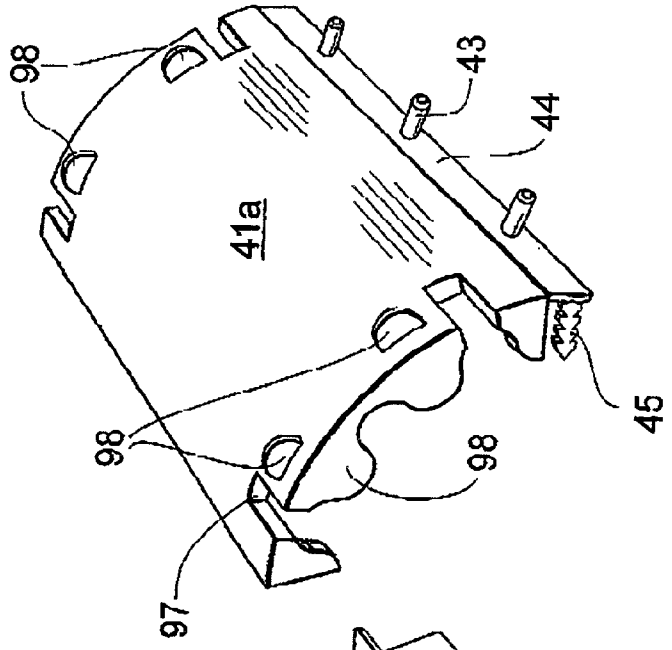


FIG. 12

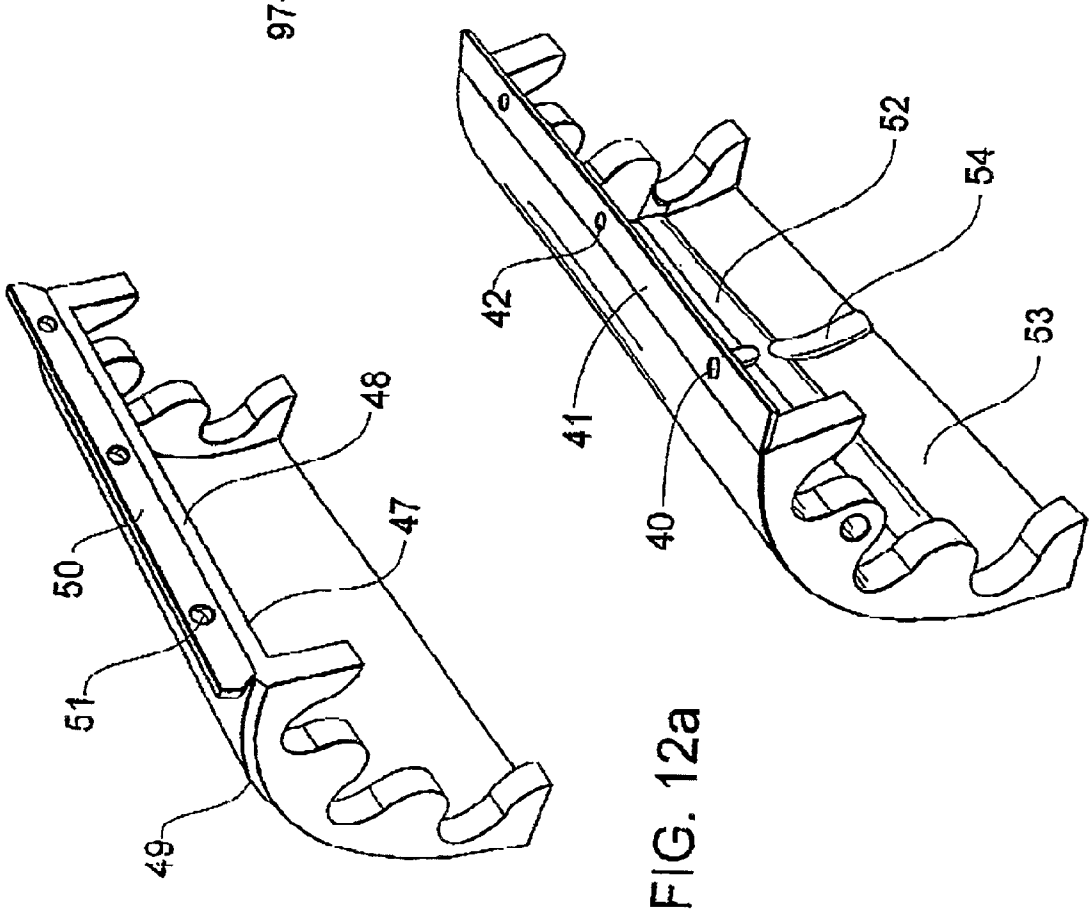


FIG. 12a

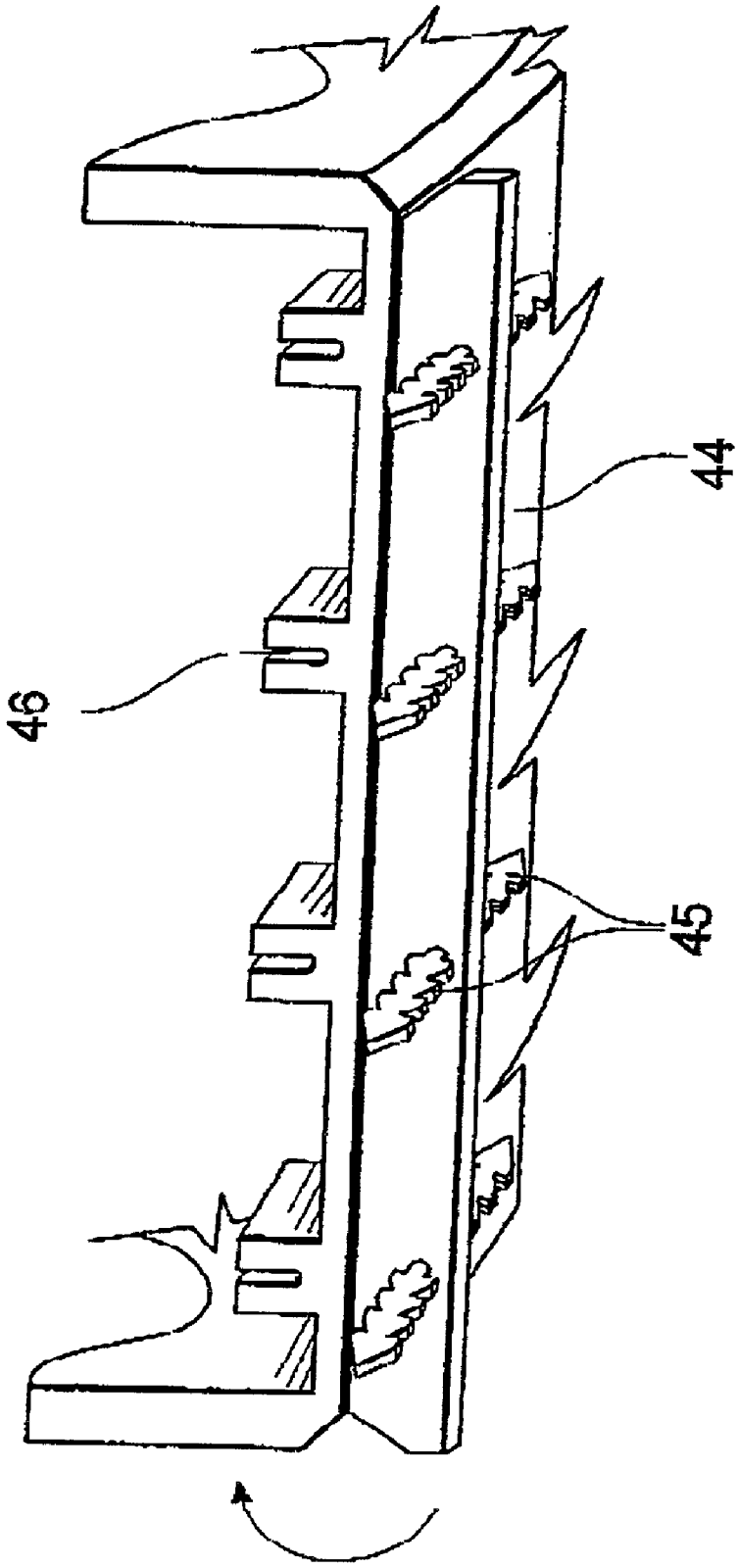


FIG. 12b

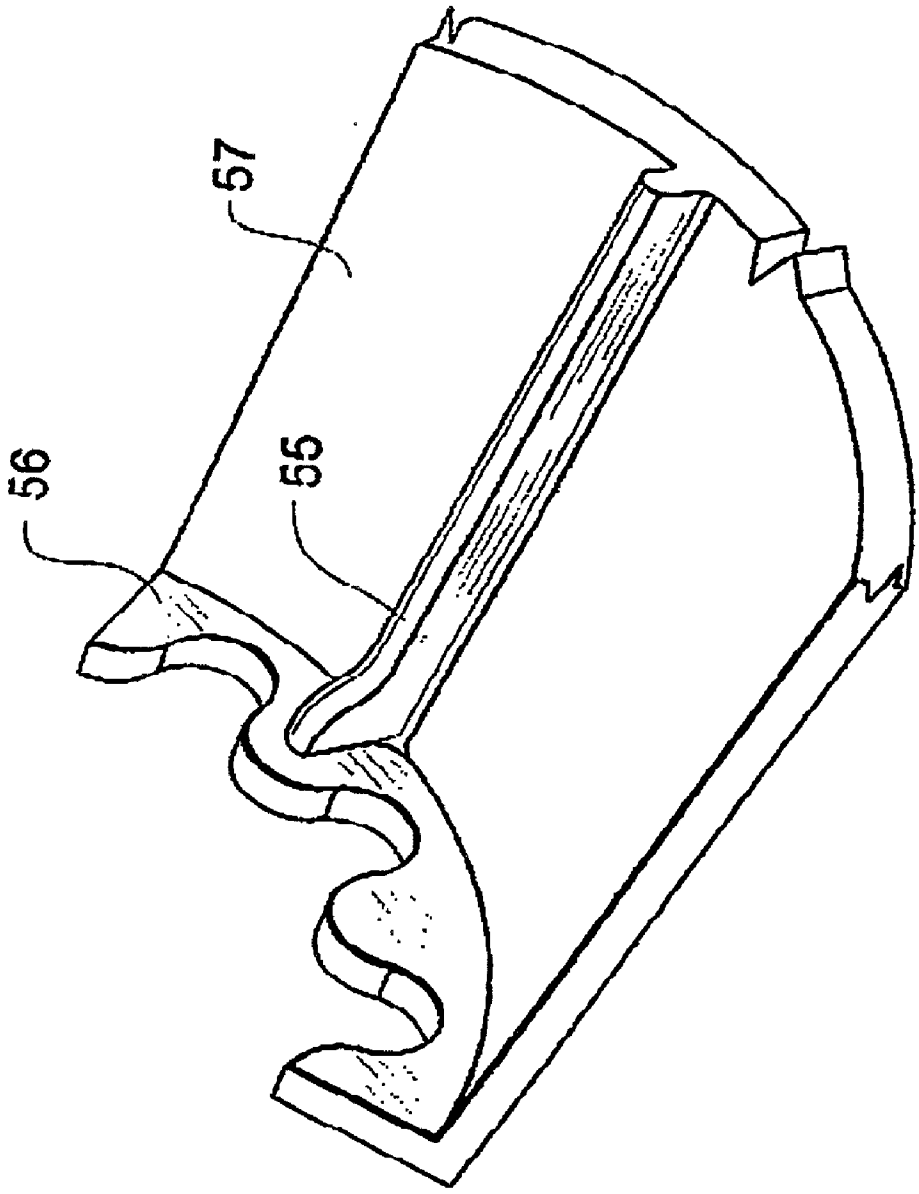


FIG. 13

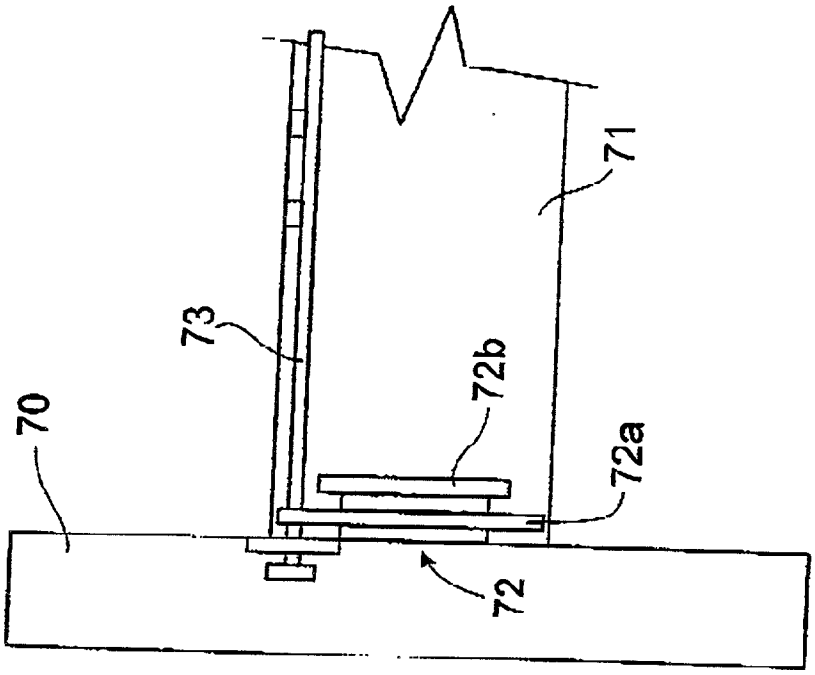


FIG. 15

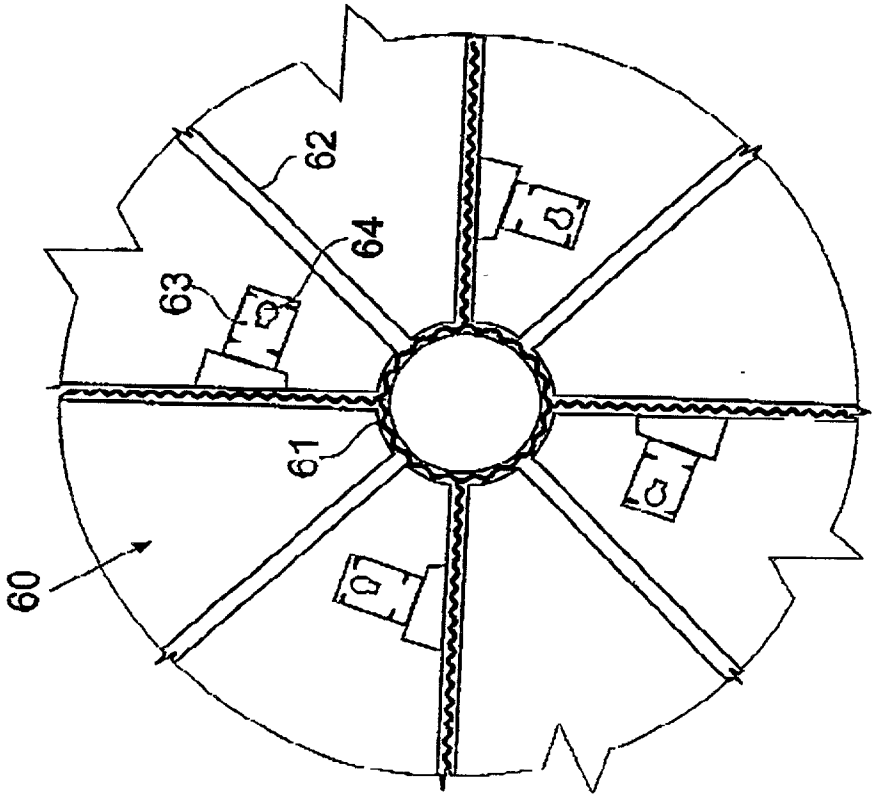


FIG. 14

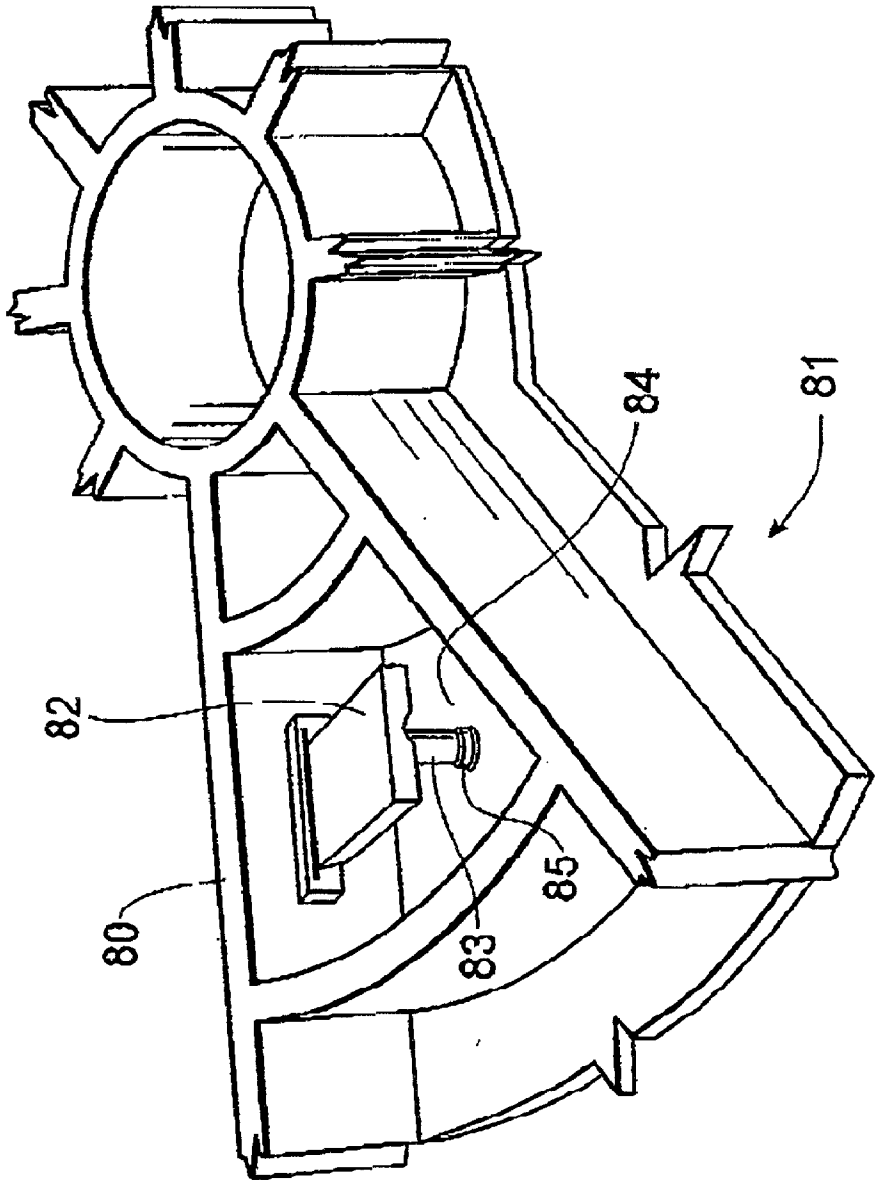


FIG. 16

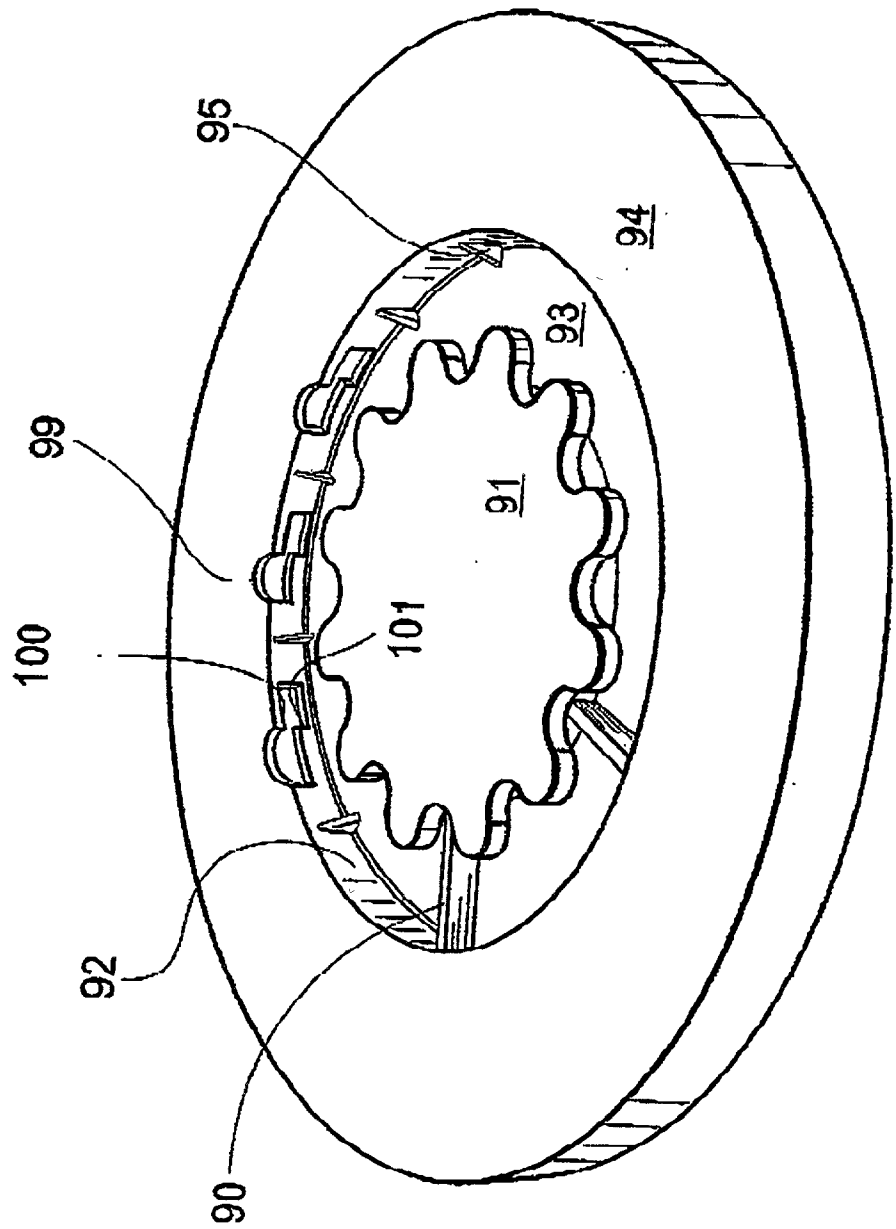


FIG. 17

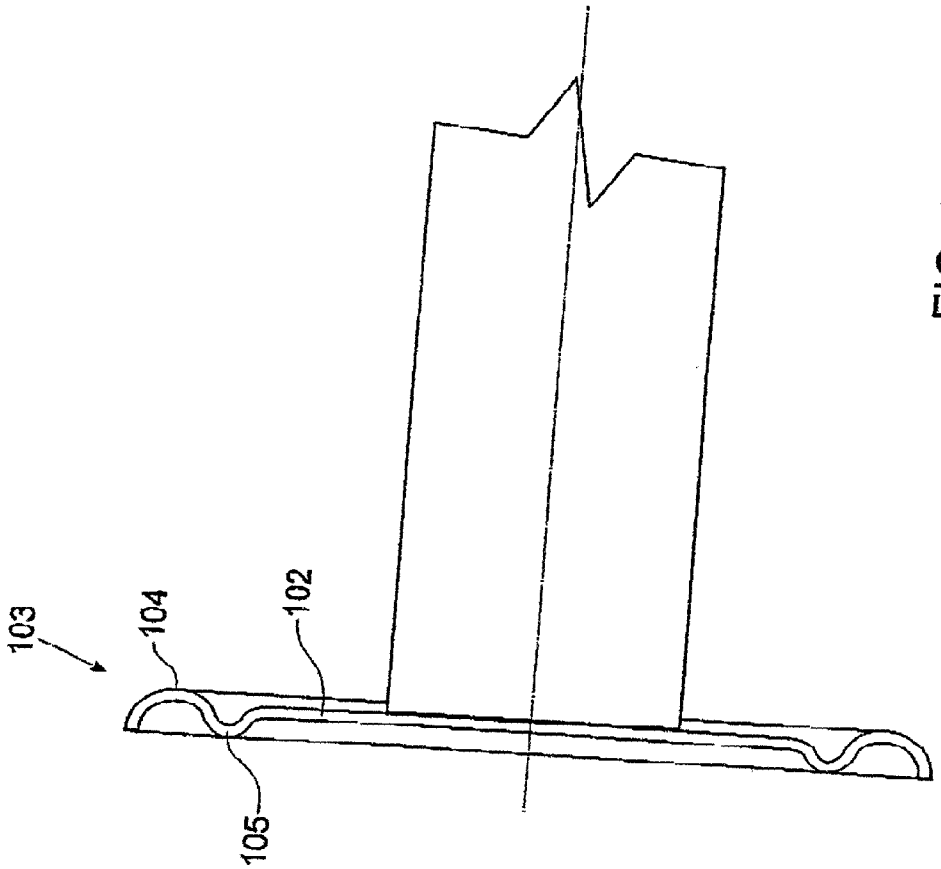


FIG. 18

STORAGE AND TRANSPORTATION DEVICE

[0001] This invention relates to an apparatus for storage and transportation of elongate coilable members such as tubing, cables and the like.

[0002] In particular, the invention is concerned with a demountable cable reel.

[0003] Timber cable reels are well known but the majority of these are expensive to construct in terms of labour content and due to their shape and size, there is a high cost of transportation to a cable manufacturer in the first instance and subsequently when being returned for rewinding. Moreover, empty reels are prone to damage during storage and transportation.

[0004] To reduce shipping and storage costs of empty cable reels, it has been proposed to provide a demountable reel where the generally circular end flanges are removable from the spool, and in some cases the spool itself is demountable to a more compact shape. Many of these demountable cable reels rely upon elongate bolts extending via the hollow interior of the spool between opposed flanges for their structural integrity when wound with cable or the like.

[0005] Demountable cable reels which rely primarily for structural integrity in an assembled state only on bolts extending between opposed flanges are described in U.S. Pat. No. 2,652,992, U.S. Pat. No. 1,767,710, U.S. Pat. No. 1,915,825, U.S. Pat. No. 2,266,903, German Patent DE 2439488, European Patent Application EP 1987000401297 (Publication No. EP 250295) and U.S. Pat. No. 5,588,628.

[0006] French Patent Application 88 04881 describes a demountable cable reel wherein structural integrity in an assembled state relies partially upon bolts extending between opposed flanges and partially upon interengagement between spool elements and the opposed flanges.

[0007] European Patent Application 91121835.2 (Publication No. 0491400 A1) describes a demountable cable reel having core elements bolted at opposite ends to the opposed end flanges.

[0008] Demountable cable reels having foldable core elements and/or flange elements are described in U.S. Pat. No. 5,409,179, U.S. Pat. No. 5,467,939, European Patent Application 94401537.9 (Publication No. EP 0636567 A1) and British Patent 1170714.

[0009] U.S. Pat. No. 5,464,171 describes a demountable cable reel where integrally formed flange/spool members interconnect intermediate the ends of the spool.

[0010] International Patent Application No. PCT/US97/13809 (Publication No. WO 96/06654) describes a spool comprised of a plurality of interlocking elements.

[0011] In the interest of both cost and convenience, there is a requirement for a simple demountable cable reel with integral locking or fastening means to avoid the need for separate fasteners such as bolts or the like which are easily lost in transit.

[0012] Australian Patent 442191 describes a cable reel comprising a pair of circular end flanges, each with an array or radial slots spaced about a central shaft aperture. Core elements comprising a disc like member with radially extending arms which are insertable through the slots of a respective flange for connection with corresponding arms of a core element extending through an opposite flange. A cylindrical spool acts as a spacer to keep the flanges apart.

[0013] Other demountable cable reels having circular end flanges and non-demountable cylindrical spools are described in U.S. Pat. Nos. 5,868,348, 5,743,486, 5,242,129, 5,660,354 and 5,727,752.

[0014] Demountable cable reels having planar flanges and demountable or collapsible spools but otherwise with integral connecting means are described in Australian Patent 224780, British Patent GB 2269157. Australian Patent 592112, U.S. Pat. No. 5,806,788 and Australian Patent 678296.

[0015] Although the last mentioned group of prior art cable reels has some advantages over the previously mentioned prior art cable reels, each suffers one or more practical shortcomings in use.

[0016] For example, the cable reels of British Patent 2269157, Australian Patent 592112, Australian Patent 442191 and Australian Patent 224780 are not considered sufficiently robust for larger capacity cables.

[0017] While the cable reels of U.S. Pat. No. 5,806,788 and Australian Patent 678296 are better suited to more robust duty, each suffers the disadvantage that in order to replace a flange damaged in handling or transportation, the reel must first be emptied of cable which is time consuming and inconvenient.

[0018] With a move by cable manufacturers towards moulded plastics demountable cable reels of ever increasing capacity, it is not uncommon for an end flange to be damaged due to rough handling or insecure shipping.

[0019] In the event of damage to a flange on a fully wound cable reel, there is a need to be able to replace that flange without the need to first remove the cable and then to rewind the cable onto the repaired reel as remote site reel repairs may be carried out without having to return the loaded reel to the cable manufacturer.

[0020] It is an aim of the present invention to overcome or ameliorate at least some of the shortcomings associated with prior art cable reels and otherwise to provide users with a convenient choice.

[0021] According to one aspect of the invention there is provided a demountable reel for elongate coilable objects, said reel comprising:

[0022] a pair of end flanges, said end flanges each including an inwardly facing spool connecting boss;

[0023] a generally cylindrical spool comprising two or more spool elements, each said spool connecting boss and said spool being engagable by axial alignment of complementary engagement members and releasably selectable by axial misalignment between said complementary engagement means, said reel being characterised in that an end flange may be removably replaced by a substitute end flange with an elongate object coiled in situ about said spool.

[0024] Suitably each said end flange includes reinforcement means adjacent a perimetral rim member.

[0025] If required said spool connecting boss may be recessed below an inner face of said flange.

[0026] Preferably said spool connecting boss projects outwardly from an inner face of said flange.

[0027] Suitably said boss includes a central shaft aperture.

[0028] If required each said flange may include a plurality of radially spaced apertures to locate, in use, tensionable members extending between opposed flanges.

[0029] Suitably said radially spaced apertures include reinforcing means.

[0030] If required said spool may comprise two or more separate elements releasably connectable adjacent transverse edges to form a cylindrical spool.

[0031] Alternatively said spool may comprise two or more spool elements with an integrally formed hinge joint, said two or more spool elements being movable between an extended storage and/or transportation position and a contracted position forming a cylindrical spool.

[0032] If required said spool elements may include axially extending reinforcing members. Additionally or alternatively said elements may include radially extending reinforcing elements.

[0033] Preferably said reinforcing elements are integrally formed adjacent an inner surface of said spools elements.

[0034] Said spool elements preferably comprise shouldered end portions.

[0035] Suitably, said complementary engagement members associated with said flanges comprise a plurality of circumferentially spaced radially oriented projections and/or recesses on said boss.

[0036] The complementary engagement means associated with said spool elements comprise circumferentially spaced radially oriented projections and/or recesses in said shouldered end portions.

[0037] The spool and respective flanges may be releasably secured by engagement of projections on said boss behind projections on said spool by at least partial relative rotation between said flanges and said spool.

[0038] Suitably at least one cam member is provided to wedgingly engage said spool with respective end flanges.

[0039] If required said cam member may be operative in a radial direction.

[0040] Suitably stop means is provided to limit relative rotation between said spool and respective flanges.

[0041] Preferably, releasable locking means is provided to prevent disengagement between said spool and a respective flange.

[0042] Suitably said locking means is adapted to prevent relative rotation between said spool and a respective flange when said complementary engagement means are engaged.

[0043] Most preferably, said locking means is actuable from an exterior region of each said flange.

[0044] In order that the invention may be more fully understood and put into practical effect, reference will now be made to preferred embodiments illustrated in the accompanying drawings in which:

[0045] **FIG. 1** shows elements of a cable reel spool according to the invention;

[0046] **FIG. 2** shows one embodiment of a cable reel end flange;

[0047] **FIG. 3** shows a second embodiment of a cable reel end flange;

[0048] **FIG. 4** shows schematically the alignment of engagement members of an end flange and a spool;

[0049] **FIG. 5** shows an exploded reel assembly;

[0050] **FIG. 6** shows a partial cross sectional engagement between a spool and the flange of **FIG. 3**;

[0051] **FIG. 7** shows a partial cross sectional engagement between a spool and the flange of **FIG. 2**;

[0052] **FIG. 8** shows a plan view of the engagement between a spool and a flange;

[0053] **FIG. 9** shows one embodiment of the connection means of a spool element;

[0054] **FIG. 10** shows an alternative embodiment of the connection means of a spool element;

[0055] **FIG. 11** shows yet another embodiment of a connection means of a spool element;

[0056] **FIG. 12** shows still another embodiment of a connection means of a spool element;

[0057] **FIG. 13** shows a partial inner view of a spool element;

[0058] **FIG. 14** shows a reinforcing insert for a flange;

[0059] **FIG. 15** shows a part cross sectional view of engagement between a flange and a spool;

[0060] **FIG. 16** shows one embodiment of a flange locking means;

[0061] **FIG. 17** shows a flange; and

[0062] **FIG. 18** shows a part cross sectional view of a reinforced flange rim.

[0063] In **FIG. 1** spool elements **1, 2** have a keyed rib **3** on one edge and a complimentary keyhole slotted aperture **4** on an opposite edge to enable a cylindrical spool to be assembled from four identical elements by slidable engagement of a rib **3** of one element with the slotted aperture **4** of an adjacent element.

[0064] Each spool element has a smooth arcuate outer surface **5** and arcuate end walls **6** comprising a series of alternately spaced tooth **7** and apertures **8**.

[0065] **FIGS. 2 and 3** show alternative embodiments of an end flange **9** having a spool supporting boss **10** and a central shaft aperture **11**.

[0066] In **FIG. 2**, the boss **10** is located in a recess **12***a* in inner flange wall **12** whereas in **FIG. 3**, the boss **10** sits proud of inner flange wall **12**.

[0067] In both cases, boss **10** comprises a cylindrical base **13** with a spaced array of teeth **7***a* extending radially from the outer end of base **13** to form a recessed region between teeth **7** and flange wall **12**.

[0068] **FIG. 4** shows schematically the engagement of a cylindrical spool **14**, formed from the elements shown in **FIG. 1** and the boss **10** of the flange **9** shown in either of **FIG. 2** or **FIG. 3**.

[0069] As can be seen, when the teeth **7***a* of boss **10** are aligned with apertures **8** of the end wall of spool **14** and similarly the apertures **8***a* of boss **10** are aligned with teeth **7** of the end wall of spool **14**, the complementary shapes of the respective teeth and apertures enables, the spool **14** to engage over boss **10**.

[0070] Apertures **15** are optionally provided in teeth **7***a*, the purpose of which apertures **15** will be described later.

[0071] **FIG. 5** shows an exploded view of a cable reel assembly comprising spool **14** assembled from the elements shown in **FIG. 1** and the flanges of **FIG. 3**.

[0072] After the respective teeth and apertures of the spool end walls and the flange are aligned and the teeth **7***a* of flange **9** are located within apertures **8** of the spool end wall **6**, the flange **9** is partially rotated relative to spool **14** such that teeth **7***a* of flange **9** are located behind teeth **7** of spool **14**, thereby removably securing the flange **9** to spool **14**.

[0073] **FIG. 6** is a part cross sectional view of the securement of flange **9** of **FIG. 3** to spool **14**.

[0074] **FIG. 7** is a part cross sectional view of the securement of flange **9** of **FIG. 2** to spool **14**.

[0075] **FIG. 8** is a plan view of the assembly shown in **FIG. 6** with the teeth **7** of spool **14** engaged behind teeth **7***a* of flange **9** with apertures **15** in teeth **7***a* aligned with apertures **15***a* in teeth **7** aligned to receive an elongate bolt (not shown) if required.

[0076] Apertures **15**, **15***a* permit the use of tensionable bolts between opposed flanges of a cable reel for additional reinforcement, particularly on larger diameter/capacity reels.

[0077] **FIG. 9** shows an alternative form of connection for spool elements.

[0078] As shown, one edge **20** of spool element **21** is formed with a V-shaped channel **27** having spaced apertures **22** therein.

[0079] The opposite edge **23** is formed with a complementary V-shaped rib **24** having pins **25** with enlarged deformable heads **26** thereon.

[0080] As can be seen, when the respective adjacent edges of spool elements **21** are brought together, the initial engagement between channel **27** and rib **24** guides the headed pins **25** into alignment with respective apertures **22**. When fully engaged the rib **24** and channel **27** reinforce the connection between the edges **21** and **23** of adjacent spool elements to prevent deformation when wound with a cable or the like.

[0081] **FIG. 10** shows an alternative means of connecting spool elements.

[0082] In this embodiment, opposed edges of each spool element **28** are formed with alignable abutments **29**, **30**, one abutment **29** having a slotted recess **31** and the other having a barbed deformable pin **32** for engagement therein.

[0083] **FIG. 11** shows a modification to the embodiment of **FIG. 1**.

[0084] In this embodiment, short keyed ribs **35** on one edge of a spool element **36** are adapted for insertion into corresponding keyhole slots **37** of an adjacent spool element. The short keyhole slots **37** permit resilient deformation to receive the keyed ribs **35** when pushed together in a generally tangential direction.

[0085] Located between keyed ribs **35** are one or more slotted apertures **38** to receive one or more tongues **39** which assist in alignment and reinforcement of the edges when assembled.

[0086] **FIGS. 12, 12***a* and **12***b* shows yet another means of connecting spool elements.

[0087] In this embodiment one edge **40** of a spool element **41** is provided with spaced apertures **42** to receive deformable head pins **43** mounted on an integrally hinged flap **44** of an adjacent spool element **41**.

[0088] On the inner side of flap **44** are deformable barbed pins **45**, which, when the two spool elements are rotated together about hinged flap **44**, engage in apertures **46** in abutments formed on the underside of an opposite edge of a spool element.

[0089] **FIG. 12***a* shows a variation wherein the heads of pins **43** are located in a recess **17** formed between inclined edge **48** of spool element **49** and the integrally hinged flap **50** having apertures **51** to receive pins **43**.

[0090] **FIG. 12** also shows optional reinforcing ribs **52** extending axially along the inner wall **53** of spool element **41** and radially extending ribs **54** also or alternatively extending along inner wall **53**.

[0091] **FIG. 13** shows schematically a transversely extending reinforcing rib **66** extending between opposed end walls **56** of a spool element **57**.

[0092] **FIG. 14** shows a steel reinforcing element **60** which may be employed in the flanges of larger capacity cable reels according to the invention.

[0093] The reinforcing element comprises a central shaft reinforcing tube **61**, a plurality of radially spaced webs **62** and retaining plates **63** for tensionable bolts not shown which extend between opposed reel flanges.

[0094] Retaining plates **63** have keyhole apertures **64** for ease of inserting and connection of the tensionable bolts.

[0095] Suitably, the reinforcing element **60** is placed into an injection moulding die for the reel flange and is encapsulated in the moulding process.

[0096] **FIG. 15** shows a port cross sectional view of a reel assembly showing a flange **70**, a spool **71** mounted on flange boss **72** and a tensionable steel bolt **73** extending between opposed flanges.

[0097] In this view, an alternative embodiment is illustrated in that a dual diameter boss **72** comprises a larger diameter portion **72***a* and a smaller diameter portion **72***b* to accommodate a smaller diameter spool if required.

[0098] **FIG. 16** shows a locking means to prevent disengagement between the end flange and a spool of a cable reel.

[0099] In a radially directed reinforcing rib **80** of flange **81**, there is formed an integrally hinged tab **82** having a pin **83** extending from an underside thereof.

[0100] In the locked position shown, tab **82** lies against the outer face **84** of flange **81** with pin **83** extending through an aperture **83** in face **84** and thence into an aligned aperture (not shown) into an end wall portion of a spool (not shown) to prevent relative rotation therebetween when the flange and spool are secured.

[0101] **FIG. 17** shows a variation in flange design incorporating reinforcing ribs **90** extending radially between boss **91** and the inner wall **92** of a recess **93** in flange **94**.

[0102] Buttressed ribs **95** reinforce the region of the join between the floor **96** and side wall **92** of recess **93**.

[0103] In this embodiment reference is made to the spool element **51***a* of **FIG. 12**.

[0104] For additional reinforcement of the connection between a spool assembled from elements **41***a* and flange **94** of **FIG. 17**, cavities **97** are provided in the end walls of spool elements **41***a* to accommodate ribs **90** yet allow sufficient relative rotation between the spool and flange for securement.

[0105] Additionally tabs **98**, upstanding from the outer surface of the spool initially engage in aligned recesses **99** when the respective teeth and apertures therebetween of the flange and spool when first engaged. As the flange and spool are secured by relative rotation therebetween tabs **98** locate within slotted apertures **100** and, by resilient recovery, drop below shouldered edges **101** to form a locking means to prevent accidental disengagement between the spool and flange. The locking tabs are accessible from the outer face of opposed flanges to release the locking means.

[0106] **FIG. 18** shows a means of reinforcing the outer rims of flanges on larger capacity cable reels.

[0107] In this embodiment, rather than have right angle joints between a flange wall **102** and the outer rim **103**, (and any adjacent circumferential reinforcing ribs) which are prone to damage arising from stress concentration at the right angle joint, the rim **103** as shown has oppositely directed gently undulating ribs **104**, **105** with radially disposed reinforcing ribs therebetween.

[0108] It will be appreciated that many modifications and variations may be made to the various embodiments of the invention without departing from the spirit and scope thereof.

I claim:

1. A demountable reel for elongate coilable objects, said reel comprising:

a) a pair of end flanges, said end flanges each including an inwardly facing spool connecting boss;

b) a generally cylindrical spool comprising two or more spool elements, each said spool connecting boss and said spool being engagable by axial alignment of complementary engagement members and releasably securable by axial misalignment between said complimentary engagement means, said reel being characterised in that an end flange may be removably replaced by a substitute end flange with an elongate object coiled in situ about said spool.

1. The demountable reel as claimed in claim 1, wherein each said end flange includes reinforcement means adjacent a perimetral rim member.

2. The demountable reel as claimed in claim 1, wherein said spool connecting boss is recessed below an inner face of said flange.

3. The demountable reel as claimed in claim 1, wherein, said spool connecting boss projects outwardly from an inner face of said flange.

4. The demountable reel as claimed in claim 1, wherein said boss includes a central shaft aperture.

5. The demountable reel as claimed in claim 1, wherein each said flange includes a plurality of radially spaced apertures to locate, in use, tensionable members extending between opposed flanges.

6. The demountable reel as claimed in claim 6, wherein said radially spaced apertures include reinforcing means.

7. The demountable reel as claimed in claim 1, wherein said spool comprises two or more separate elements releasably connectable adjacent transverse edges to form a cylindrical spool.

8. The demountable reel as claimed in claim 1, wherein said spool comprises two or more spool elements with an integrally formed hinge joint, said two or more spool elements being movable between an extended storage and/or transportation position and a contracted position forming a cylindrical spool.

9. The demountable reel as claimed in claim 1, wherein said spool elements includes axially extending reinforcing members.

10. The demountable reel as claimed in claim 1, wherein said spool elements includes radially extending reinforcing elements.

11. The demountable reel as claimed in claim 10, wherein said reinforcing elements are integrally formed adjacent an inner surface of said spool elements.

12. The demountable reel as claimed in claim 1, wherein said spool elements include shouldered end portions.

13. The demountable reel as claimed in claim 1, wherein said complementary engagement members associated with said flanges include a plurality of circumferentially spaced radially oriented projections and/or recesses on said boss.

14. The demountable reel as claimed in claim 1, wherein the complementary engagement means associated with said spool elements includes circumferentially spaced radially oriented projections and/or recesses in said shouldered end portions.

15. The demountable reel as claimed in claim 14, wherein the spool and respective flanges are releasably secured by engagement of projections on said boss behind projections on said spool by at least partial relative rotation between said flanges and said spool.

16. The demountable reel as claimed in claim 1, wherein at least one cam member is provided to wedgingly engage said spool with respective end flanges.

17. The demountable reel as claimed in claim 17, wherein said cam member is operative in a radial direction.

18. The demountable reel as claimed in claim 16, wherein stop means is provided to limit relative rotation between said spool and respective flanges.

19. The demountable reel as claimed in claim 1, wherein releasable locking means is provided to prevent disengagement between said spool and a respective flange.

20. The demountable reel as claimed in claim **20**, wherein said locking means is adapted to prevent relative rotation between said spool and a respective flange when said complementary engagement means are engaged.

21. The demountable reel as claimed in claim **20**, wherein said locking means is actuable from an exterior region of each said flange.

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