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(54) **CORE MEMBER FOR AN ABSORBENT SHEET ROLL**

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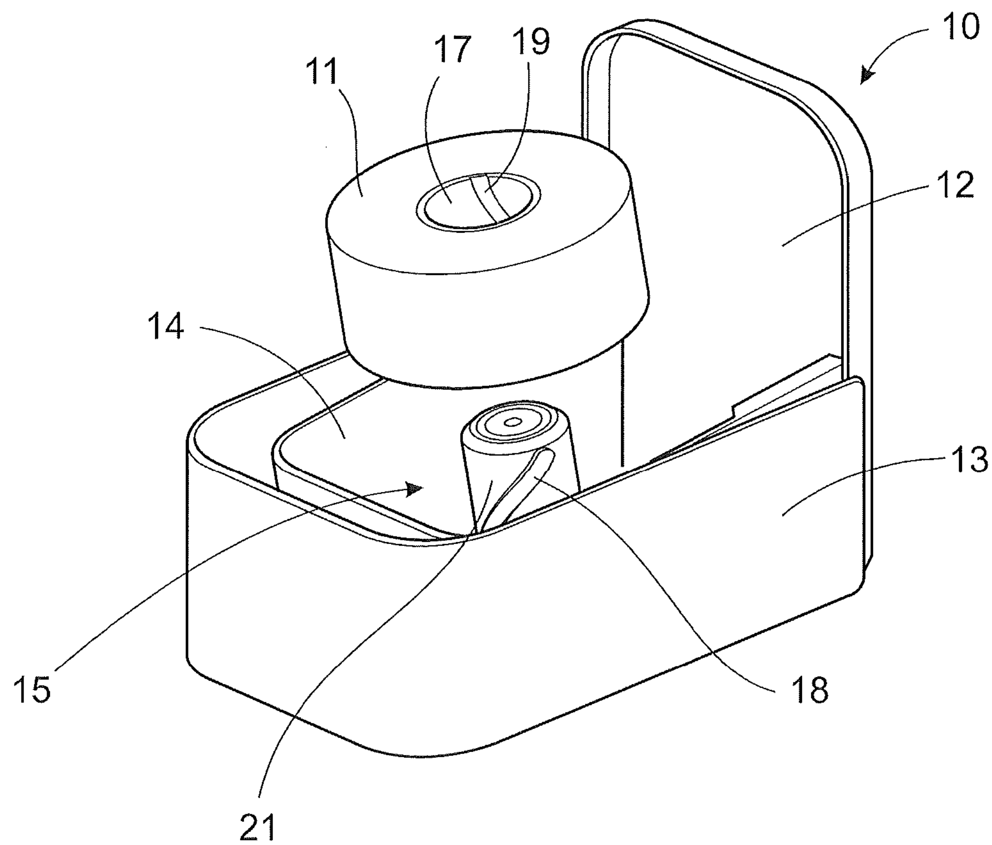
(57) **ABSTRACT**

A hollow cylindrical core member (**17**) suitable for supporting a roll (**11**) of absorbent sheet material. The core member (**17**) includes a central axis (**22**), an outer cylindrical surface (**20**), and an inner cylindrical surface (**23**). The inner cylindrical surface (**23**) includes engagement means suitable for rotationally locking said core member (**17**). The engagement means include at least one elongated recess (**19**) and/or projection (**29**) extending helically along said inner cylindrical surface (**23**), or at least one elongated projection (**29**) extending in a direction of said central axis (**22**).



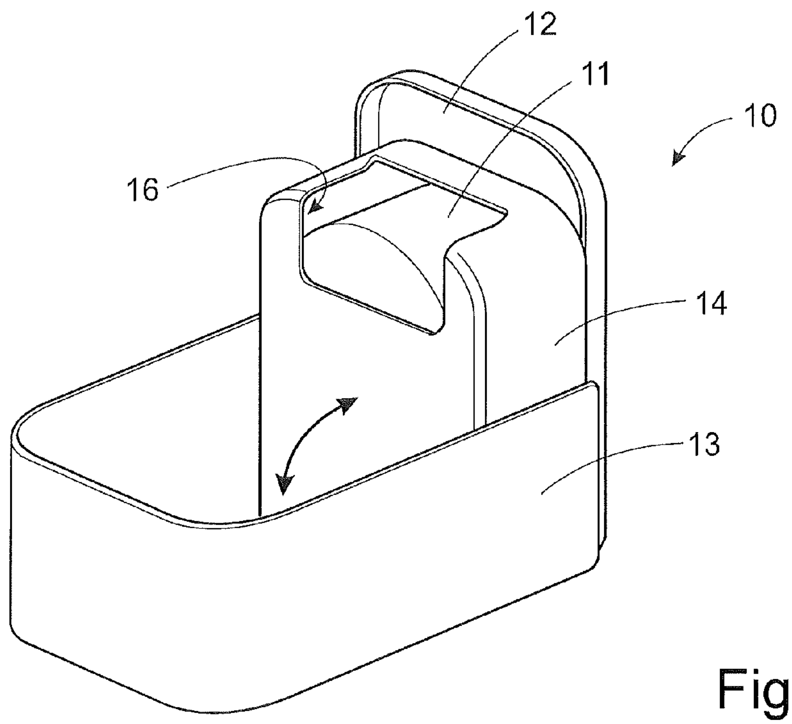


Fig.2

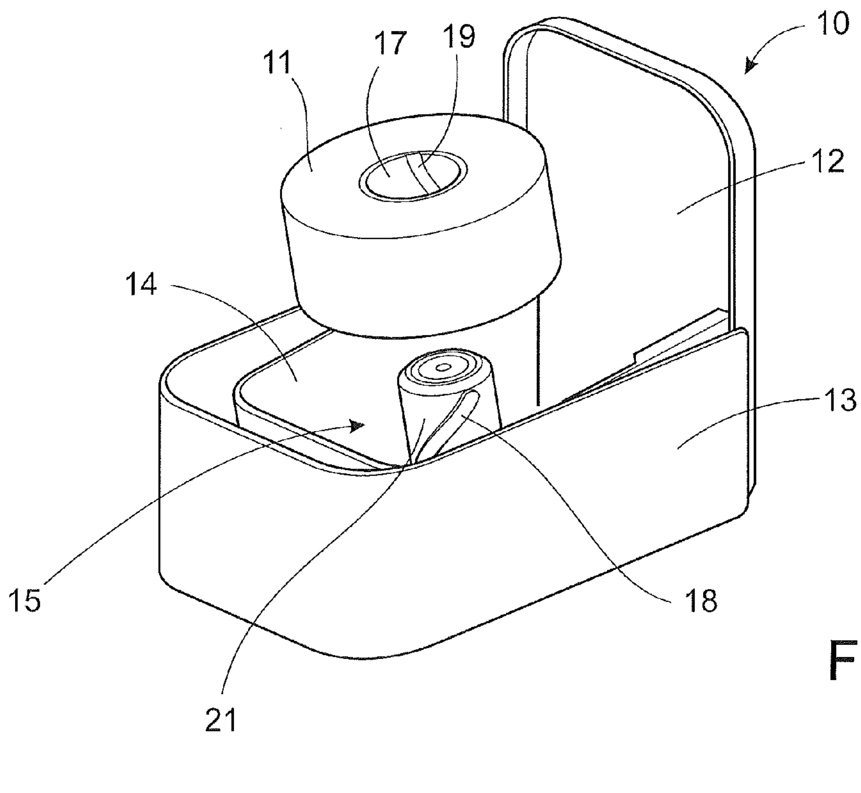


Fig.1

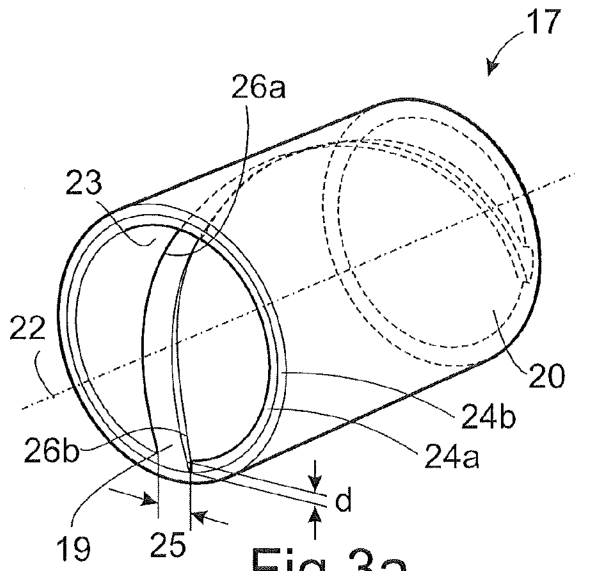


Fig.3a

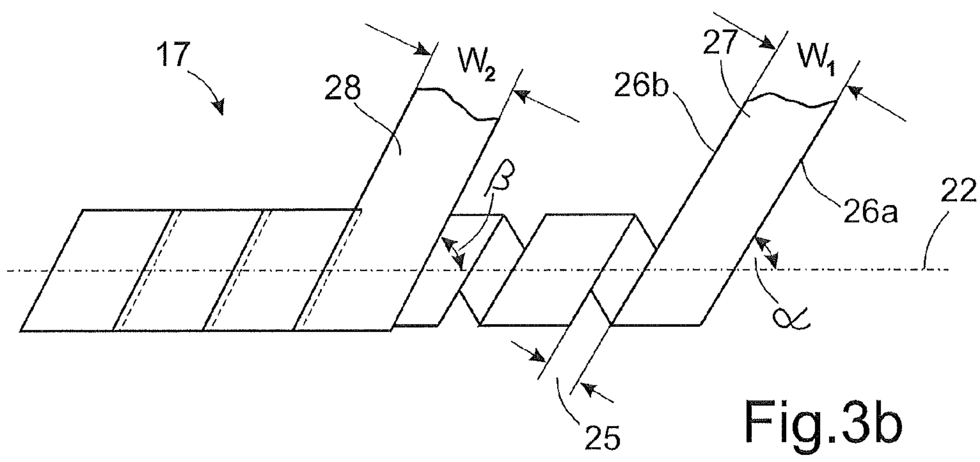


Fig.3b

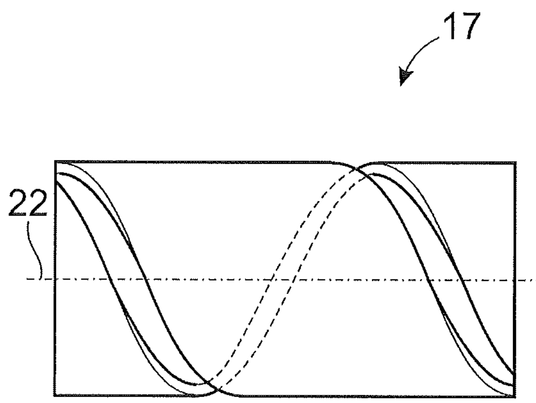


Fig.4

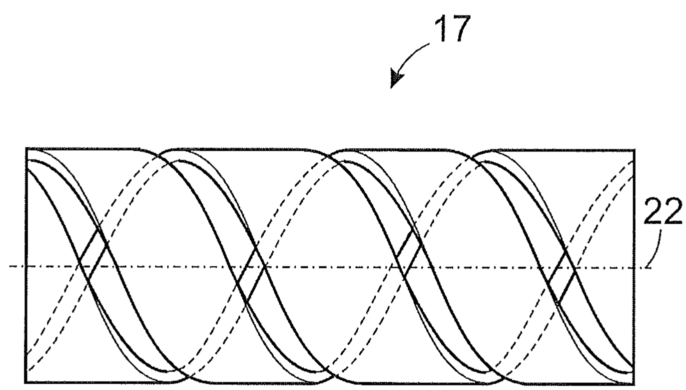


Fig.5

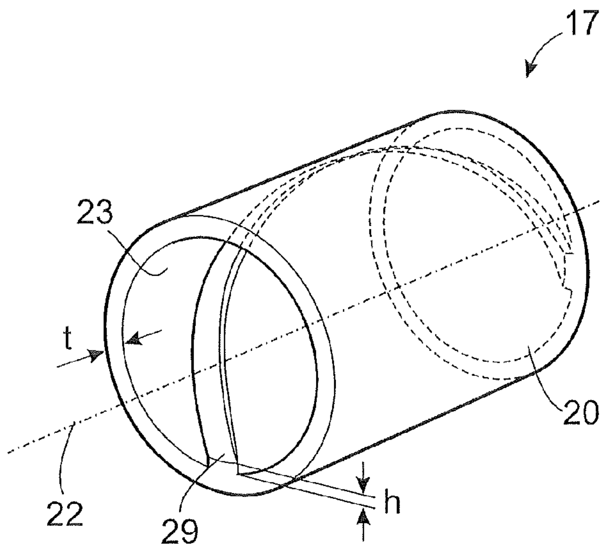


Fig.6

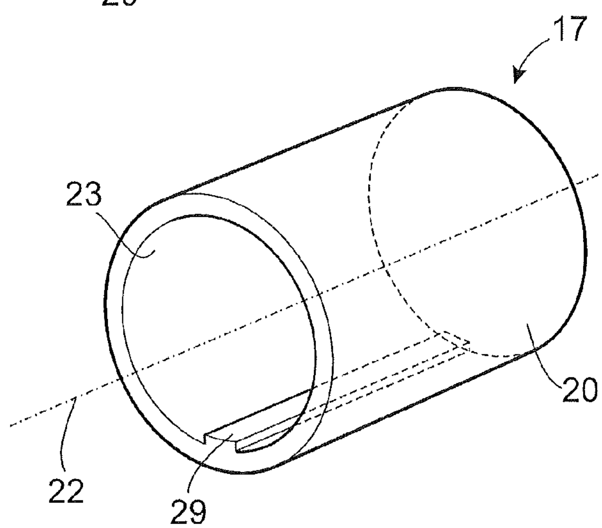


Fig.7

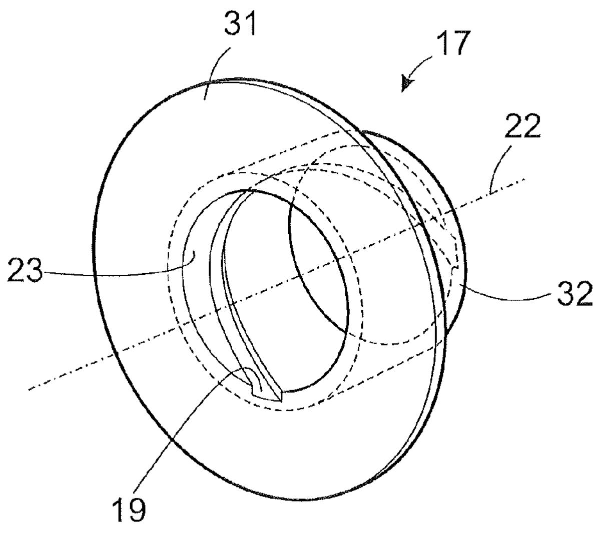


Fig.8

CORE MEMBER FOR AN ABSORBENT SHEET ROLL

TECHNICAL FIELD

[0001] This invention relates to a hollow cylindrical core member suitable for supporting a roll of absorbent sheet material, wherein the core member comprising a central axis, an outer cylindrical surface, and an inner cylindrical surface. The invention also relates to roll of absorbent sheet material being wound up and supported by a core member, as well as a dispenser assembly comprising a dispenser carrying a roll with a hollow cylindrical core member.

BACKGROUND OF THE INVENTION

[0002] One problem frequently occurring during use of an absorbent sheet material dispenser is lack of an easily visible leading tail of the sheet material. The user must then search for the leading tail and subsequently pull the sheet material from the roll and out of the dispenser. Dispenser with electrical feeding functions of the leading tail are known, and feeding of sheet material is for example initiated upon detection of a user by a proximity sensor, or a leading tail of the sheet material is automatically fed out of the dispenser after withdrawal of sheet material by a user. However, such dispensers require electrical energy, which normally is supplied by connection to an electrical supply network, or by electrical storage system including batteries. The connection to the electrical supply network is costly and limits the installation location, and batteries must be regularly replaced.

[0003] Document US2010/0051737A1, which discloses a rolled material dispenser with energy harvesting, solves these problems. By recuperation of energy from the user that pulls the sheet material, feeding of the leading tail of the sheet material is possible without connection to an external electrical supply network or batteries that must be regularly replaced.

SUMMARY OF THE INVENTION

[0004] An object of the present invention is to provide a hollow cylindrical core member for an absorbent sheet roll, which core member enables quick and simple replacement of the core member while still providing capability of rotational locking to the shaft of the dispenser. The core member should be suitable for supporting a roll of absorbent sheet material, and comprising a central axis, an outer cylindrical surface, and an inner cylindrical surface. The object of the present invention is achieved by providing the inner cylindrical surface with engagement means suitable for rotationally locking said core member. The engagement means comprising at least one elongated recess and/or at least one elongated projection, which at least one recess and/or projection extends helically along said inner cylindrical surface. Alternatively, the engagement means comprising at least one elongated projection extending in a direction of said central axis.

[0005] This type of engagement means potentially provides automatic rotational locking of the roll including the core member to the shaft upon axial penetration of the shaft in the central hole of the roll. There is consequently no additional time consuming and complex manual locking step necessary upon mounting of the new roll. Moreover, the engagement means according to the invention potentially prevents erroneous mounting of the roll. For example, the elongated recess and/or projection intuitively guides the service personnel to perform the correct mounting. Also, incorrect axial mounting of the roll during mounting is difficult or even impossible when the shaft of the dispenser is provided with corresponding engagement means. There appears to be no explicit disclosure in the above mentioned prior art concerning the arrangement of the roll on the shaft, except that the roll is mounted on the shaft. Consequently, the inventive solution exhibits many advantageous aspects over the prior art.

[0006] Further advantages are achieved by implementing one or several of the features of the dependent claims.

[0007] The engagement means are suitable for rotationally locking said core member with a shaft of a dispenser that is suitable for dispensing absorbent sheet material. Rotational locking of the core member to the shaft allows recuperation of energy by means of the shaft, as well as electrically actuated advancement of a leading tail of the absorbent sheet material of the roll arranged in the dispenser.

[0008] The at least one recess or projection may extend continuously over at least 20% of the total axial length of said core member, specifically over at least 50%, and more specifically over the entire axial length of said core member. When the corresponding engagement means of the shaft comprises discrete spring-loaded projections, it is advantageous to have a recess that extends at least 20% of the total axial length of said core member to increase the likelihood of automatic mutual locking merely upon relative rotation of the core member and shaft, because less accuracy of the axial relative positioning of the core member and shaft is required for the recess to coincide with the projection. Furthermore, increased axial length of the recess or projection potentially results in increased rotational torque transfer capacity between core member and shaft due to the potentially increased engagement surface. Finally, engagement means extending over the entire axial length of the core member simplifies manufacturing of the core member.

[0009] The radial depth of said at least one recess may be smaller than a wall thickness of said core member at a location without a recess. This corresponds to a recess that does not extend through the wall of the core member, i.e. a recess having a bottom. This increases the structural stability of the core member, which stability is important especially during the winding process where absorbent sheet material is being wound-up onto the core member.

[0010] The at least one recess may extend completely through the cylindrical wall of said core member, such that a through hole is formed in said core member.

[0011] This configuration may have advantages in terms of manufacturing, and generally leads to increased rotational torque transfer capacity between core member and shaft, because any projection of the shaft may also extend radially completely through the core member, thereby reducing the likelihood of relative slipping engagement.

[0012] The core member may be formed from a helically wound first band having a width and forming a helical winding angle with respect to said central axis, wherein said helical winding angle and said width is selected such that a gap is formed between edges of consecutive windings of said first band, which gap at least partly forms said recess. This configuration of the core member allows cost-effective manufacturing of the core member because traditionally core member manufacturing equipment may be used to a large extent, varying mainly the manufacturing parameters, such as the width of said first band and its winding angle. At least the innermost layer, in case of a multiple layered core member, must be formed with the specific configuration to realise a continuous recess.

[0013] The core member may comprise at least one additional material layer arranged on a circumferential outer surface of said helically wound first band wherein said at least one additional material layer covers said gap. This layout increases core member stability due to stabilisation of the gap distance, as well as the general increase in wall thickness. Alternatively or in addition, the core member stability may be enhanced through adhesive bonding to the absorbent sheet material that is wound on the core member.

[0014] The width of said gap may be smaller than half the width of said first band in a direction perpendicular to the winding direction of said first band, and specifically smaller than 25% of the width of the first band. The gap merely serves to interact with the engagement means of the shaft for mutual rotational locking, and the gap size, shape and dimension may be selected correspondingly. As a result, there is normally no reason to have a gap width that is significantly larger that the width of the shaft engagement means. Instead, the width of the gap may be selected relatively small. Large band width results in a good support surface for the absorbent sheet material wound up thereon, as well as good stability. Core member stability is important during manufacturing of the roll, when the core member is rotationally mounted in a machine and receiving sheet material that is wound up on the rotating core member.

[0015] The core member may be formed of at least two layers of helically wound band, and both said layers of wound band being wound in the same winding direction. This configuration results in cost-effective manufacturing. Moreover, the outer layer of said two layers may form said at least one additional material layer.

[0016] The recess may be formed by mechanically processing the inner surface of said core member, such as cutting and/or milling. This configuration allows a large degree of freedom with respect to form, location, size, etc, of the recess.

[0017] The core member may be made of one or more layers of band shaped material wound to form the core member. Alternatively, the core member may be made of moulded pulp or plastic material. A core moulded in pulp or plastic is equally simply provided with one or more recess as one or more projections, or simply a combination of at least one recess and one projection. The recess and/or projection preferably extend continuously from at least one end of the core member for allowing simplified moulding equipment without an undercut.

[0018] The core member may comprise a single material layer, or multiple material layers. The band shaped material may be selected from a paperboard material, cardboard material, fibrous ply, or similar.

[0019] The core member may be formed by at least one hollow cylindrical plug element that is suitable to be inserted into a central hole of a coreless roll, wherein said engagement means is formed at an inner cylindrical surface of said plug element. This configuration is particularly adapted to be used with coreless rolls, i.e. rolls that are manufactured without a core member inside the roll. To allow the required rotational locking between the roll and shaft, an intermediate member is required, namely the plug element.

[0020] The core member may be formed by two hollow cylindrical plug elements, each of which being suitable to be inserted into a central hole of a coreless roll. Instead of a single plug element extending through more than half the length of the coreless roll, two relatively short plug elements may be used instead, thereby simplifying insertion of the plug elements centrally within the coreless roll.

[0021] The height of said projection may be substantially larger than a wall thickness of said core member at a location without a projection. Thereby, the amount of engagement surface is potentially increased, such that the rotational locking torque is increased.

[0022] The invention further includes a roll comprising a hollow cylindrical core member as described above, and with absorbent sheet material wound upon said core member.

[0023] The invention further includes a dispenser assembly comprising a dispenser suitable for dispensing absorbent sheet material from a roll, and a core member, wherein said dispenser assembly comprising: a dispenser body, a shaft on which said core member is arranged, wherein said shaft is rotatably coupled to said dispenser body, wherein each of said shaft and said core member comprising engagement means that are in cooperating mating position, such that said shaft is rotationally locked with said core member.

[0024] The dispenser assembly may further comprise an electrical machine and an electrical storage system for storing electrical energy, wherein said electrical machine is rotatably coupled to said shaft, wherein externally caused rotation of said core member drives said electrical machine, thereby facilitating generation of electrical energy that is stored in said electrical storage system, and wherein said electrical machine is configured to be powered by electrical energy from said electrical storage system for temporarily rotating said core member.

BRIEF DESCRIPTION OF DRAWINGS

[0025] In the detailed description of the invention given below reference is made to the following figure, in which:

[0026] FIG. **1** shows a dispenser in a semi-opened state;

[0027] FIG. **2** shows the dispenser of FIG. **1** in an opened state;

[0028] FIG. **3***a* shows the core member formed by two overlapping helically wound bands;

[0029] FIG. **3***b* shows the structural composition of the core member of FIG. **3***a*;

[0030] FIG. **4** shows the core member formed by a helically wound band;

[0031] FIG. **5** shows the core member formed by two non-overlapping helically wound bands;

[0032] FIG. **6** shows the core member having a helically extending projection;

[0033] FIG. **7** shows the core member having an axially extending projection;

[0034] FIG. **8** shows a plug element having a helically extending recess.

DESCRIPTION OF EXAMPLE EMBODIMENTS OF THE INVENTION

[0035] Various aspects of the invention will hereinafter be described in conjunction with the appended drawings to illustrate and not to limit the invention, wherein like designations denote like elements, and variations of the inventive aspects are not restricted to the specifically shown embodiments, but are applicable on other variations of the invention.

[0036] FIG. **1** shows a first embodiment of the core member **17** according to the invention. The core member **17** is provided with engagement means in form of a helically extending recess **19** that extends over the complete axial length of the core member **17**. An absorbent sheet material is wound on the outer cylindrical surface of the core member forming a roll **11** of sheet material. The roll with the core member is here illustrated disengaged from a shaft **15** of an opened dispenser **10**, which is suitable for dispensing absorbent sheet material from the roll **11**, when the roll **11** is arranged on the shaft within the closed dispenser **10**.

[0037] The dispenser comprises a dispenser body, which comprises a dispenser console **12**, an outer hood **13** pivotally connected to said dispenser console **12**, and an inner hood **14** also pivotally connected to said dispenser console **12**. The dispenser **10** is here shown with both the outer and inner hood **13**, **14** pivoted to an open position, representing an open state, in which the roll easily may be replaced. FIG. **2** illustrates the same dispenser as FIG. **1**, but with the inner hood **14** in a closed position, i.e. in a semi-open state. In a completely closed state, both hoods **13**, **14** are in a closed state.

[0038] The shaft **15** is rotatably coupled to inner hood **14** and configured to penetrate at least part of the hollow core member **17** of the roll **11**. The shaft **15** comprises corresponding engagement means that are suitable for rotationally locking the shaft **15** with the engagement means of the core member **17**. Although not illustrated in FIG. **1** or **2**, the dispenser **10** may further comprise an electrical machine rotatably coupled to said shaft, and an electrical storage system for storing electrical energy electrically connected to the electrical machine.

[0039] When a user wants a piece of absorbent sheet material, the user can grab a leading tail of the sheet material, which is wound on the core member **17** to form the roll **11**. The leading tail preferably is arranged at least partly outside the dispenser **10**, for example hanging down a certain length through a dispensing opening at the lower part of the dispenser **10**. Upon pulling the leading tail, the roll **11** starts to rotate due to the pulling force actuated by the user, and sheet material is removed from the roll **11**. Due to the engagement means of the core member **17** and the corresponding engagement means on the shaft **15**, the shaft **15** may be rotationally locked with the core member **17**. The externally caused rotation of the roll **11** consequently causes the shaft **15** to rotate as well. The shaft **15** is rotationally connected to an electrical machine, which is configured to transform the pulling energy originating from the user into electrical energy that is supplied to an electrical storage system. The pulling and withdrawal of sheet material from the roll **11** thus drives the electrical machine, thereby enabling generation of electrical energy that is stored in the electrical storage system.

[0040] When the user has withdrawn a desired amount of sheet material, he may tear the sheet material on a tearing segment arranged on the dispenser **10**, or the like, to separate the withdrawn sheet material from the roll **11**. As a result, the roll **11** begins to stop rotating due to lack of external pulling force and the rotational resistance caused mainly by the electrical machine operating as an electrical generator. After a certain delay, the electrical machine may be controlled, for example by means of an electrical control unit, to operate as an electrical motor and rotationally drive the shaft **15** a certain time period. The driving of the shaft **15** causes the shaft **15** to rotate, and consequently to feed a certain length of sheet material from the roll **11**. The certain length of sheet material being fed is selected to provide a graspable leading tail of the sheet material, such that the user can easily find, grasp and pull the leading tail next occasion sheet material is requested. Without the feeding of a certain length of sheet material after finished withdrawal by the user, the leading tail of the sheet material is likely difficult the find and difficult to grasp, because the leading tail of the sheet material likely will be positioned close to the tearing segment of the dispenser **10**. The tearing segment may for example be formed by a tooth-shaped tearing rim on a lower end of a hood **13**, **14**.

[0041] In FIG. **1**, the engagement means of the core member **17** is formed as a helically extending groove **19**, and the corresponding engagement means of the shaft **15** is formed by a helically extending projection **18** extending in a helical winding direction on the outer cylindrical surface **21** of the shaft **15**. During mounting of the roll **11**, the service personnel handling the replacement of rolls **11** rotate the roll **11** and/or shaft **15** until the projection **18** and groove **19** coincides at the first mutual engagement location. Then, the roll **11** is simply pushed onto the shaft **15** whilst the roll **11** is rotated in the direction of the helical winding. Possibly, when inserting the roll **11** substantially vertically, gravity may give raise to sufficient down force to the roll **11** such that insertion of the roll **11** onto the shaft **15** does not require any additional force.

[0042] The core member **17** of FIG. **1** is shown more in detail in FIG. **3***a*. The core member **17** is hollow and at least the external surface **20** thereof has a cylindrical shape. The core member **17** is suitable for supporting a roll of absorbent sheet material, and the core member **17** comprises a central axis **22**, and an inner cylindrical surface **23**. The inner cylindrical surface **23** comprising engagement means suitable for rotationally locking the core member **17** with the shaft **15** of the dispenser **10**. The engagement means may have various configurations, shape, size, but the engagement means must be suitable for enabling safe and efficient rotational locking to the shaft **15**. The recess **19** extends helically along the inner cylindrical surface **23**, thereby forming an elongated recess **19**. The recess **19** preferably extends continuously along the entire core member **17** along the direction of the central axis **22**, but the recess may alternatively extend continuously over only a part of the core member **17**, such as over at least 20% of the total axial length of said core member **17**, or over at least 50%.

[0043] In the core member embodiment of FIG. **3***a*, the radial depth d of the recess **19** is smaller than the wall thickness of the core member **17** at a location without a recess **19**, i.e. the recess **19** has a bottom wall that limits the recess in a radial outward direction, such that the recess **19** does not form a through hole in the wall of the core member **17**. Furthermore, the cylindrical wall of the core member **17** is formed by two separate layers **24***a*, **24***b*, as illustrated in conjunction with FIG. **3***b*. The inner layer **24***a* is formed from a helically wound first band **27** having a width w_1 and forming a helical winding angle α with respect to the central axis **22**, wherein said helical winding angle α and said width w are selected such that a gap **25** is formed between edges **26***a*, **26***b* of consecutive windings of the first band **27**. The gap **25**, and more precisely the edges **26***a*, **26***b*, consequently form the side walls of the recess **19**. The outer layer **24***b* is formed from a helically wound second band **28**, which is wound in the same winding direction as the first band **27**. The second band **28** has a width w_2 and forming a helical winding angle β with respect to the central axis **22**. The helical winding angle β is identical to winding angle α, and the width w_2 and positioning of the second band **28** are selected such that the second band **28** at least covers the gap **25** formed by the first band **27**.

A certain overlapping area of the first and second band **27**, **28** in a direction perpendicular to the helical winding angle, on both sides of the gap **25** is necessary along the gap extension to give the core member **17** the desired strength and stability.

[0044] Obviously, the thickness of the inner layer **24***a* is easily adapted by the thickness of the first band, which may consist of one or more layers. Optionally or in addition, several layers of first band are overlappingly wound to form the desired thickness of the inner layer **24***a,* and consequently the desired depth d of the recess **19**. The outer layer **24***b* is optional.

[0045] In the core member **17** shown in FIG. **3***a*, the width w_2 and helical winding angle β are set such that consecutive windings of the outer band **28** partly overlaps with the previous winding for further increased strength and stability of the core member **17**. The inner and outer layers **24***a*, **24***b*, as well as overlapping portions of consecutive windings of the outer layer **24***b*, are preferably mutually attached, for example by means of adhesive at selected regions.

[0046] The width of the gap **25** is preferably less than half the width w_1 of the first band **27** in a direction perpendicular to the winding direction of the first band **27**. Specifically, the width of the gap **25** may even be less than 25% of the width w_1 of the first band **27**. Moreover, the width of the gap **25** is preferably larger than 3 mm, more specifically at least 5 mm. In all, the width of the gap **25** is preferably in the range of 3 mm-15 mm, specifically, in the range of 3 mm-10 mm. The width of the gap **25** is preferably adapted to the size, shape and form of the corresponding engagement means of the shaft **15** of the dispenser **10**. The width of the gap **25** can thus normally not be too small due to the difficulties in providing a sufficiently strong mutual rotational locking, and for allowing certain manufacturing tolerances. However, considering that the corresponding engagement means of the shaft **15** interact with different side walls **26***a*, **26***b* of the recess **19** during charging of the electrical storage system and driving of the core member **17** by means of the electrical machine, it is considered advantageous to have a width of the gap **25** that corresponds to the width of the corresponding engagement means, in order to reduce rotational play between the engagement means of the core member **17** and the corresponding engagement means of the shaft **15**.

[0047] Many alternative configurations of the core member **17** are of course possible within the scope of the appended claims. The outer layer **24***b* may for example be assembled with zero winding angle, further layers may be provided in addition to the inner and outer layer **24***a*, **24***b*, or the outer layer **24***b* may be completely omitted, such that the gap **25** forms a through hole on the cylindrical wall of the core member **17**, as illustrated in FIG. **4**. The gap **25**, which forms the recess **19**, is formed by the edges **26***a*, **26***b* of consecutive windings of the first band **27**, and the recess lacks a radially outwardly limiting wall. According to still a further embodiment as shown in FIG. **5**, the core member **17** is formed from two helically wound bands, each having a width w_3 and forming a helical winding angle α with respect to the central axis **22**. The width w_3 of the bands, the helical winding angle α, and their mutual axial offset, are selected such that two helically extending gaps are formed in a shape of a double helix, wherein each gap being formed between neighbouring edges of said bands. Also this configuration may of course be provided with one or more additional outer layers for increased strength and stability.

[0048] Still a further embodiment of the invention is illustrated in FIG. **6**, in which the engagement means of the inner cylindrical surface **23** comprising an elongated projection **29** extending helically along the inner cylindrical surface **23**. The height h of the projection **29** and wall thickness t are here only schematically shown and not to scale. The height h of the projection **29** may be substantially larger than the wall thickness t of said core member at a location without a projection, for example 2-5 times the wall thickness.

[0049] In the embodiment of FIG. **7**, the elongated projection **29** extends linearly in an axial direction of the core member **17**. Also here may the radial height h of the projection **29** be substantially larger than a wall thickness t of said core member **17** at a location without a projection **29**.

[0050] The core member **17** is preferably made of one or more helically wound bands **27**, **18**, as shown in FIGS. **3***a* and **3***b* because of the cost effective and proven design. However, the core member **17** may alternatively be made of moulded pulp material or plastic material, in particular if the engagement means is not realised by a helically extending recess **19**, because a helically extending recess **19** is particularly easy to realise when forming the core member **17** by a helically wound band **27**, **28**. Alternatively, the recess may be formed by mechanically processing the inner surface **23** of a single or multi layered core member **17**, such as cutting and/or milling the inner surface **23**. A projection **29** on the inner cylindrical surface **23** is preferably realised by moulding the core member **17** in a single piece.

[0051] FIG. **8** illustrates still a further embodiment of the core member **17** according to the invention, in which the core member **17** is formed by two plug elements that are arranged to at least partly penetrate the centre hole of a coreless sheet material roll (not showed) on opposite sides thereof. A coreless sheet material roll is a roll that is manufactured, packed, and transported to customer without a central core member **17** onto which the sheet material is wound. Instead, different manufacturing techniques are used to form the sheet material roll without a centrally arranged core member **17**. In order to rotatably arrange a coreless roll in a dispenser, one, or preferably two plug elements are inserted into the central hole on opposite sides of the roll, which plug elements form attachment means for engagement with a rotational shaft **15** of the dispenser **10**.

[0052] In FIG. **8**, one plug element is disclosed having an abutment collar **31** for abutting the axial side of the coreless roll upon insertion of the plug element into the central hole of the coreless roll. The plug element further comprises a sleeve **32** for penetrating the axial hole, as well as a helically extending recess **19** formed on an inner cylindrical surface **23** of the sleeve **32** and collar **31**. The plug element may be moulded in pulp or plastic material.

[0053] Upon mounting of a core member **17** having a longitudinally extending projection **29**, the roll **11** and core member **17** assembly is simply pushed axially onto the shaft **15** of the dispenser **10**. In case one or more corresponding engagement means of the shaft **15** are retracted to a depressed position, in which they do not interact with the core member **17**, such as spring loaded or mechanically actuated retractable engagement means provided on the shaft **15**, these may possibly require manual actuation, unless they are configured to automatically retract upon penetration of the shaft **15**. Moreover, retractable corresponding engagement means on the shaft **15** may allow the roll **11** to be inserted on the shaft **15** at all angular positions, and rotational locking of the core member **17** and the shaft **15** is then realised first upon internal relative rotation of the core member **17** and shaft **15**. Upon arrival at the correct internal angular position, the retractable corresponding engagement means may be actuated, manually or automatically, to engage with the engagement means of the core member **17** to rotationally interlock said parts **15**, **17**. When the engagement means of the core member **17** are fixed, i.e. not retractable, and extends in the axial direction, the roll **11** is mounted on the shaft **15** without simultaneous internal relative rotation, but when the engagement means of the core member **17** is fixed and extends helically, the roll **11** is mounted on the shaft **15** with simultaneous internal relative rotation.

[0054] The core member **17** according to the invention may be equally applied to dispensers having shafts without corresponding engagement means, such that no rotational locking between the core member **17** and shaft **15** is realised, in particular if the engagement means are formed by a recess **19**. The core member **17** is preferably configured to be more or less freely rotatable on a shaft **15** having no corresponding engagement means.

[0055] The pulp that may be used for moulding the core member **17** may be a lignocellulosic fibrous material prepared by chemically or mechanically separating cellulose fibres from wood, fibre crops or waste paper. Alternatively, the core member **17** may be formed of plastic material by moulding or similar production method.

[0056] The term "elongated" herein refers to an elongated recess **19** and/or projection **29** that extends at least two times longer in a first direction than a second direction that is perpendicular to the first direction, and specifically at least five times longer, and more specifically at least ten times longer. The first direction corresponds here to the extension direction of the engagement means. The recess **19** as such may have a rectangular cross-sectional form as seen in a radial plane, to provide distinct and reliable engagement surfaces **26***a*, **26***b* for the rotational locking. The recess **19** may have a radial depth d of at least 0.5 mm, specifically at least 1.0 mm, wherein the radial depth d is the minimum radial distance between the recess **19** and a cylinder defined by the internal cylindrical surface **23**. Correspondingly, the projection **29** as such may have a rectangular cross-sectional form as seen in a radial plane, to provide distinct and reliable engagement surfaces for the rotational locking. The projection **29** may have a radial height h of at least 0.5 mm, specifically at least 1.0, and more specifically at least 2.0 mm, wherein the radial height h is the minimum radial distance between the projection and a cylinder defined by the internal cylindrical surface **23**.

[0057] The term "helical winding angle" herein refers to the angle between a tangent of the helix curve and a central axis of the core member. The helical winding angle is >0 degrees centigrade and <90 degrees centigrade. Moreover, the helical angle is preferably <60 degrees centigrade to simplify mounting of core member onto the shaft of the dispenser.

[0058] In all of the described embodiments, the core member may comprise one or more recesses and/or one or more projections. The core member may be formed by a single layer or multiple layers, and each of the first and second bands described above may be formed by one or more layers.

[0059] The phrase "rotatably coupled" used herein means that the shaft is a separate part from the dispenser body, and that the shaft has been mounted on the dispenser such that shaft may be rotated while the dispenser body is stationary. Furthermore, the phrase "rotationally locking" used herein means that the roll and the shaft are separate parts, and that they may be interlocked with each other rotationally around a common rotational axis, such that the roll may not be rotated without causing rotation also of the shaft, and vice versa.

[0060] Reference signs mentioned in the claims should not be seen as limiting the extent of the matter protected by the claims, and their sole function is to make claims easier to understand.

[0061] As will be realised, the invention is capable of modification in various obvious respects, all without departing from the scope of the appended claims. Accordingly, the drawings and the description thereto are to be regarded as illustrative in nature, and not restrictive.

1. A hollow cylindrical core member suitable for supporting a roll of absorbent sheet material, said core member comprising a central axis, an outer cylindrical surface, and an inner cylindrical surface, said inner cylindrical surface comprising engagement means configured for rotationally locking said core member with a shaft of a dispenser that is configured for dispensing absorbent sheet material, said engagement means comprising:

at least one elongated recess and/or projection extending helically along said inner cylindrical surface, or

at least one elongated projection extending in a direction of said central axis.

2. The core member according to claim **1**, wherein said at least one elongated recess and/or projection extends continuously over at least 20% of the total axial length of said core member.

3. The core member according to claim **1**, wherein a radial depth of said at least one elongated recess is smaller than a wall thickness of said core member at a location without a recess.

4. The core member according to claim **1**, wherein said at least one elongated recess extends completely through a cylindrical wall of said core member, such that a through hole is formed in said core member.

5. The core member according to claim **1**, wherein said core member is formed from a helically wound first band having a width and forming a helical winding angle with respect to said central axis, wherein said helical winding angle and said width is selected such that a gap is formed between edges of consecutive windings of said first band, which gap at least partly forms said recess.

6. The core member according to claim **5**, wherein said core member comprises at least one additional material layer being arranged on a circumferential outer surface of said helically wound first band, wherein said at least one additional material layer covers said gap.

7. The core member according to claim **5**, wherein a width of said gap is smaller than half the width of said first band in a direction perpendicular to the helical winding direction of said first band.

8. The core member according to claim **1**, wherein said core member is formed of at least two layers of helically wound band, and both said layers of wound band being wound in the same winding direction.

9. The core member according to claim **1**, wherein said elongated recess is formed by mechanically processing the inner surface of said core member.

10. The core member according to claim **1**, wherein said core member is made of moulded pulp or plastic material.

11. The core member according to claim **1**, wherein said core member comprises a single material layer, or multiple material layers.

12. The core member according to claim **1**, wherein said core member is formed by at least one hollow cylindrical plug element that is configured to be inserted into a central hole of a coreless roll, wherein said engagement means is formed at an inner cylindrical surface of said plug element.

13. The core member according to claim **12**, wherein said core member is formed by two hollow cylindrical plug elements, each of which being suitable to be inserted into a central hole of a coreless roll.

14. The core member according to claim **1**, wherein a height of said elongated projection is substantially larger than a wall thickness of said core member at a location without an elongated projection.

15. Dispenser assembly comprising a dispenser suitable for dispensing absorbent sheet material from a roll, and a core member according to claim **1**, wherein said dispenser assembly comprises: a dispenser body, a shaft on which said core member is arranged, wherein said shaft is rotatably coupled to said dispenser body, each of said shaft and said core member comprising engagement means that are in cooperating mating position, such that said shaft is rotationally locked with said core member.

16. Dispenser assembly according claim **15**, wherein said dispenser assembly further comprising: an electrical machine and an electrical storage system for storing electrical energy, wherein said electrical machine is rotatably coupled to said shaft, wherein externally caused rotation of said core member drives said electrical machine, thereby facilitating generation of electrical energy that is stored in said electrical storage system, and wherein said electrical machine is configured to be powered by electrical energy from said electrical storage system for temporarily rotating said core member.

17. The core member according to claim **1**, wherein said at least one elongated recess and/or projection extends continuously over at least 50% of the entire axial length of said core member.

18. The core member according to claim **1**, wherein said at least one elongated recess and/or projection extends continuously over the entire axial length of said core member.

19. The core member according to claim **5**, wherein a width of said gap is smaller than 25% of the width of said first band in a direction perpendicular to the helical winding direction of said first band.

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