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(54) **DISPENSER FOR ROLLED PAPER WEBS  
AND A PAPER PRODUCT FOR USE IN SUCH  
A DISPENSER**

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(57) **ABSTRACT**

A centreflow web roll dispenser has a housing including a first section for attaching the dispenser to a support surface, a second section at least partially enclosing a radial circumference of a web roll, a third section enclosing a lower part of the web roll, a fourth section enclosing at least an upper part of the web roll, and an exit port in connection with the third section for dispensing a web from the web roll wherein a cross-section through the dispenser taken perpendicular to a central axis through a hole in the web roll has a major axis and a minor axis, the major axis being substantially parallel to the support surface for the dispenser. A web roll for use in such a dispenser and a method for compressing such a web roll are also disclosed.

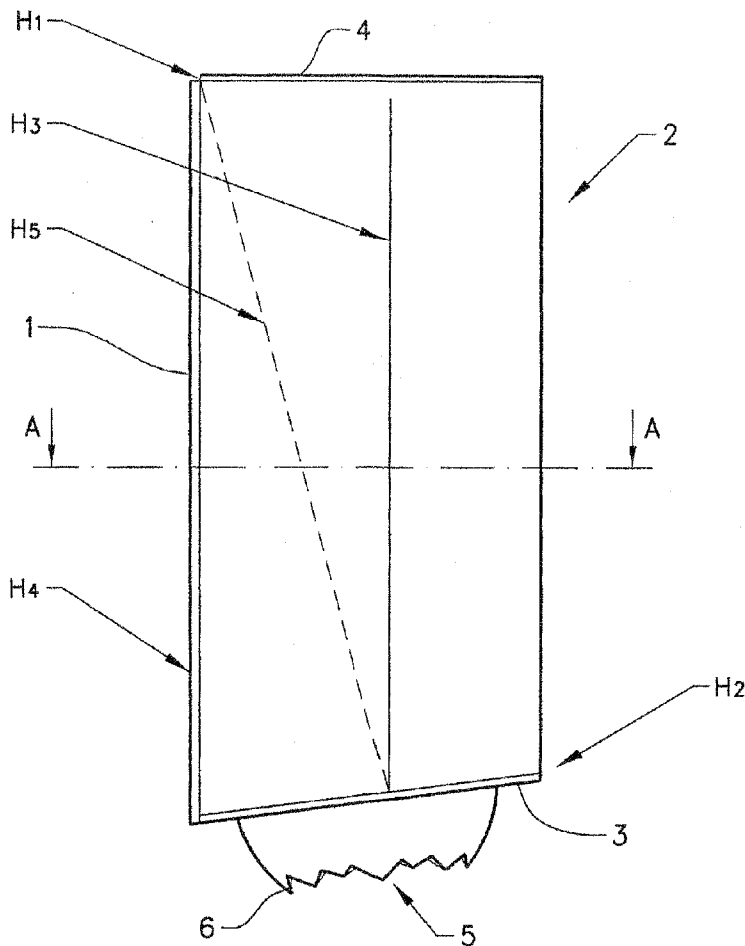
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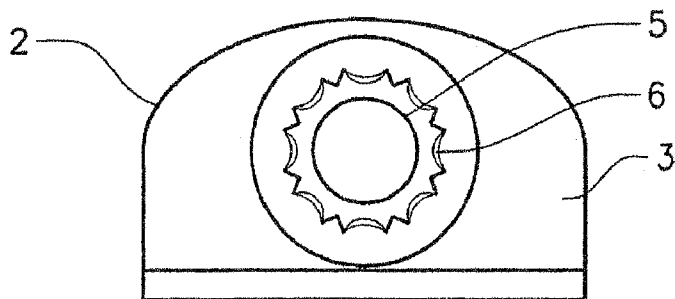
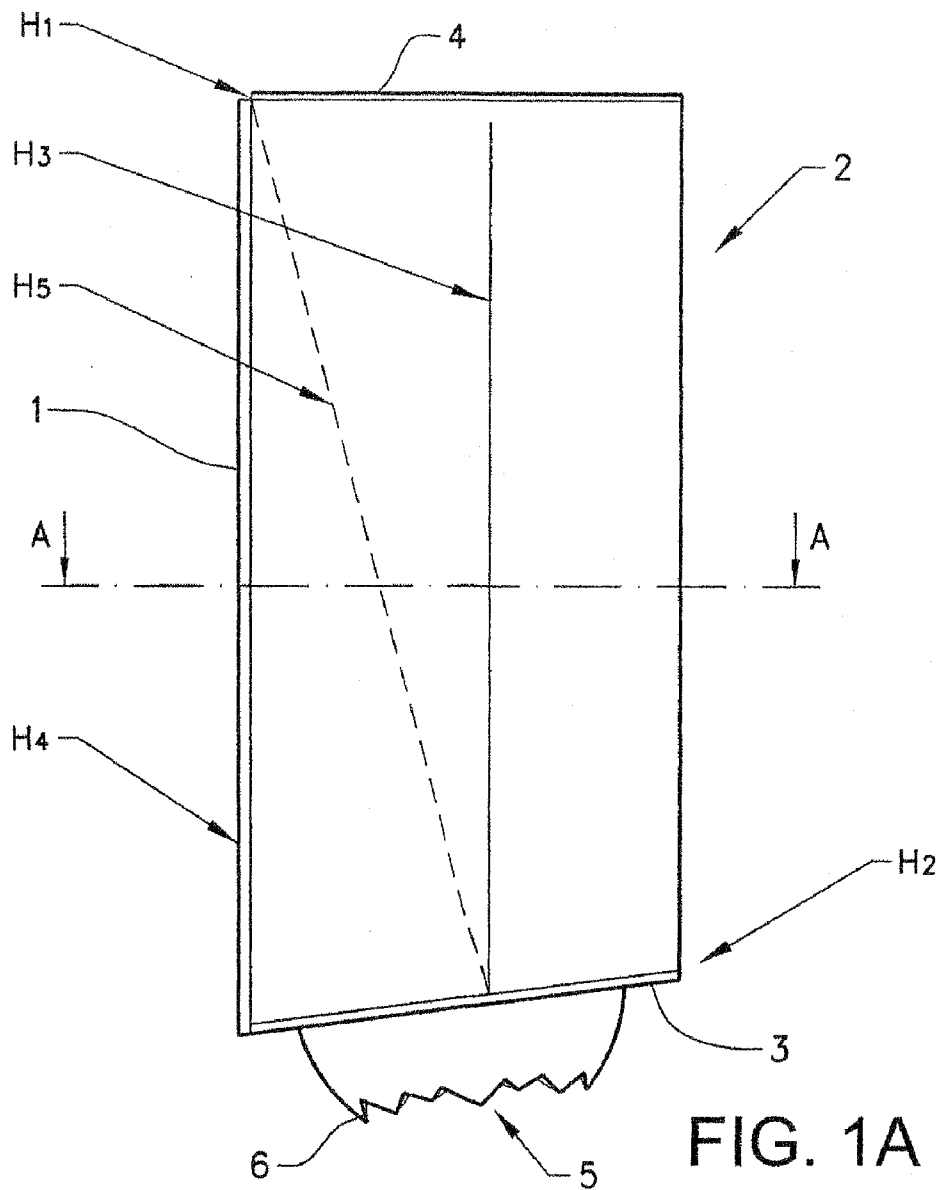


FIG. 1B

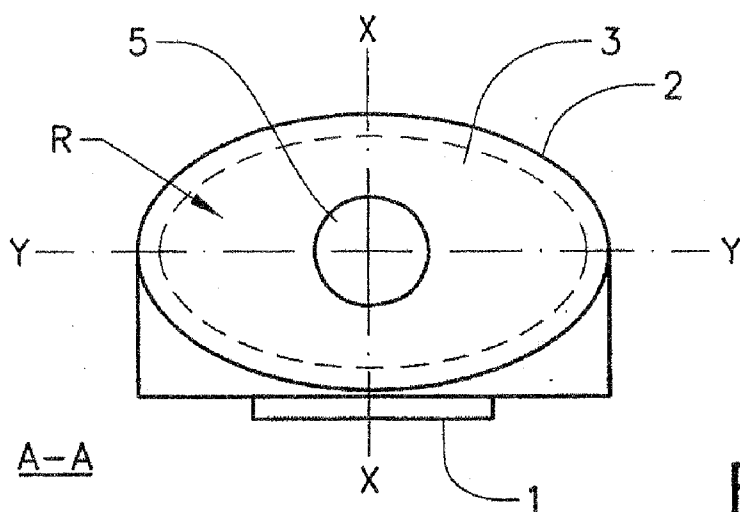


FIG. 2

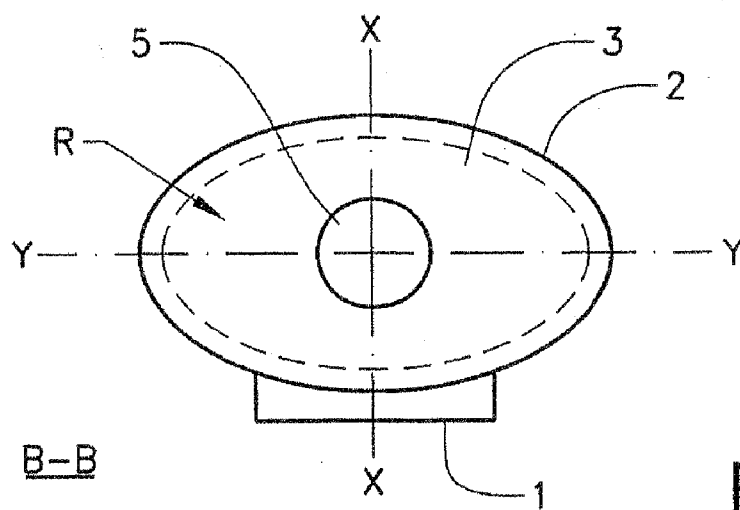


FIG. 3

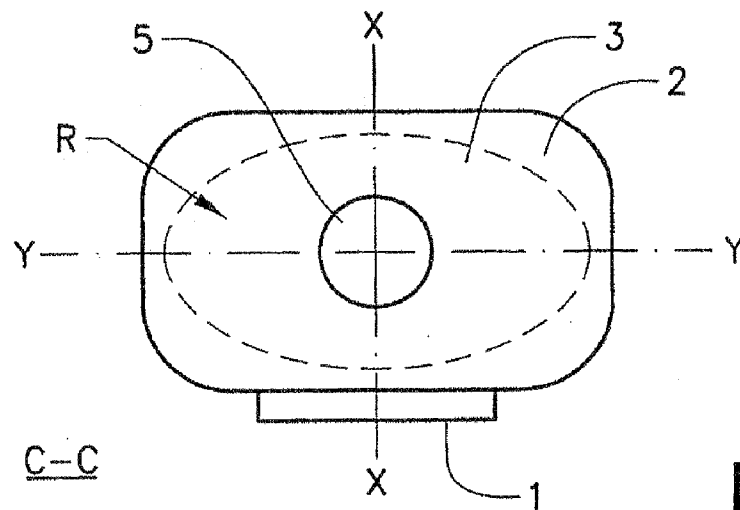


FIG. 4

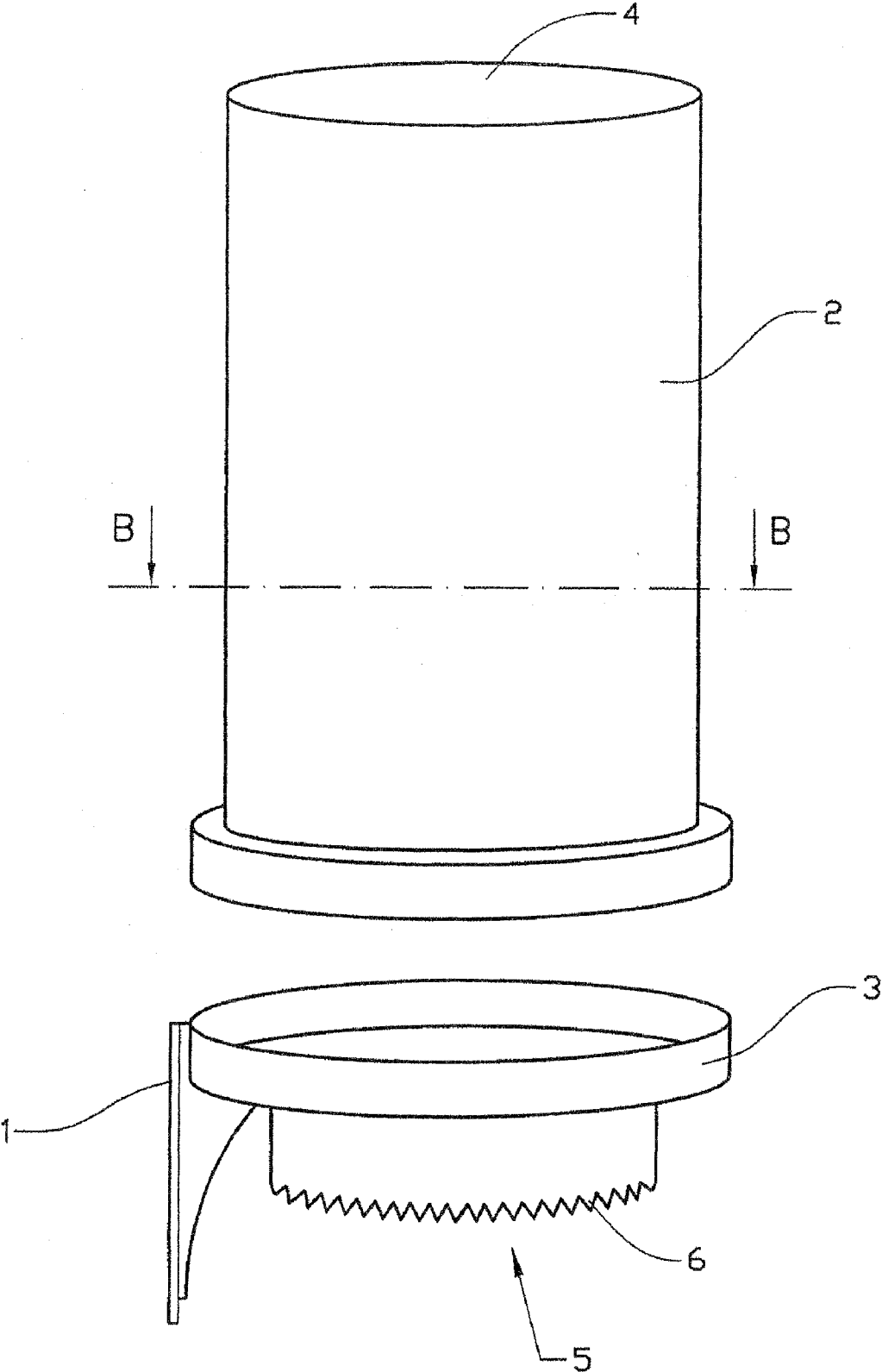


FIG. 5

FIG. 6A

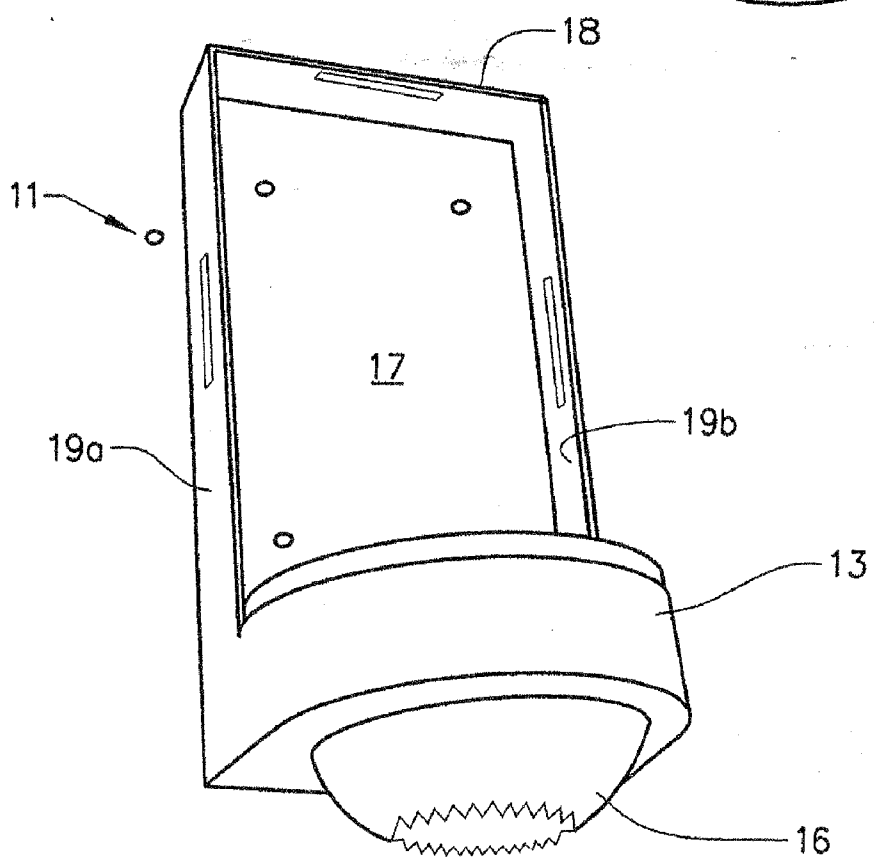
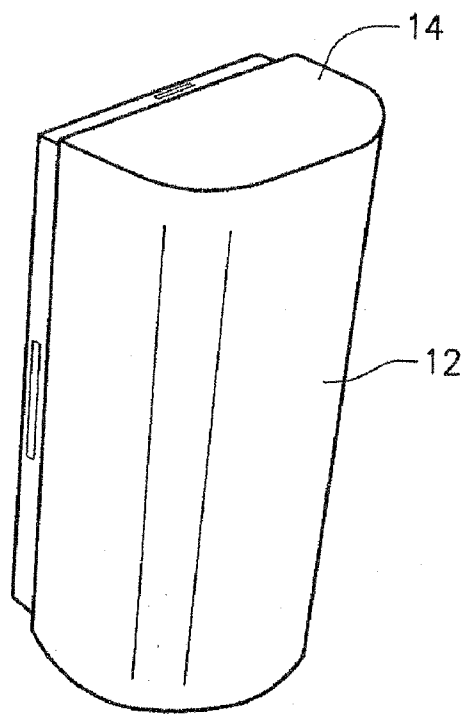


FIG. 6B

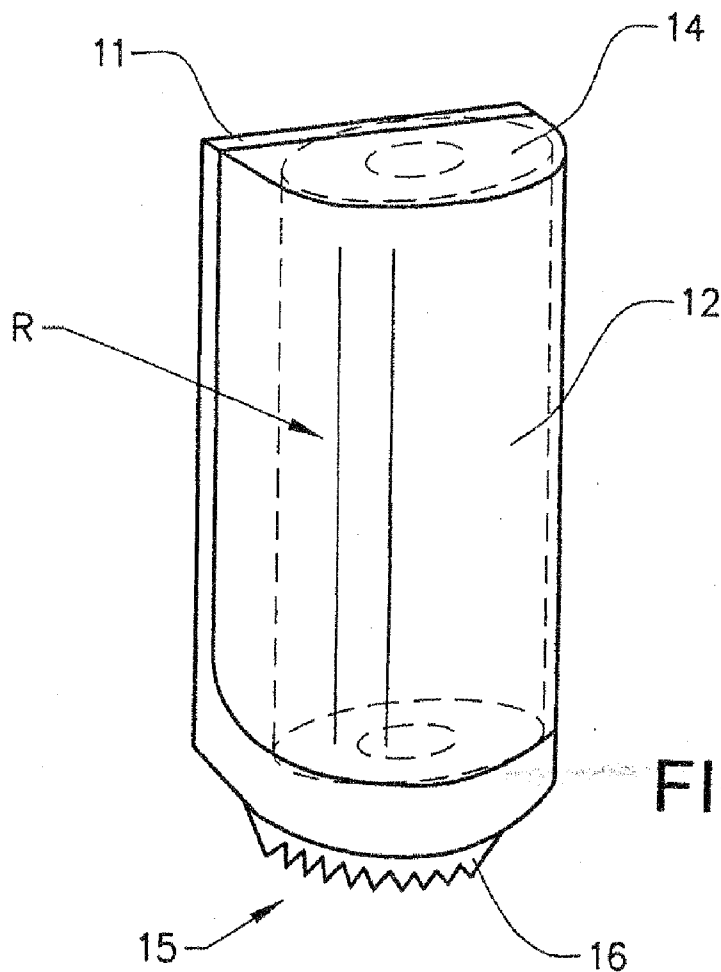


FIG. 7

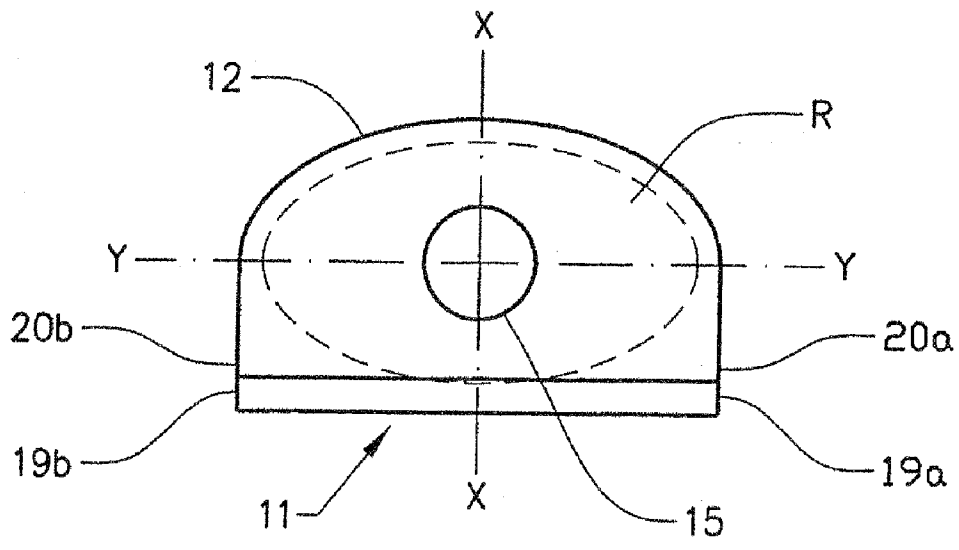


FIG. 8

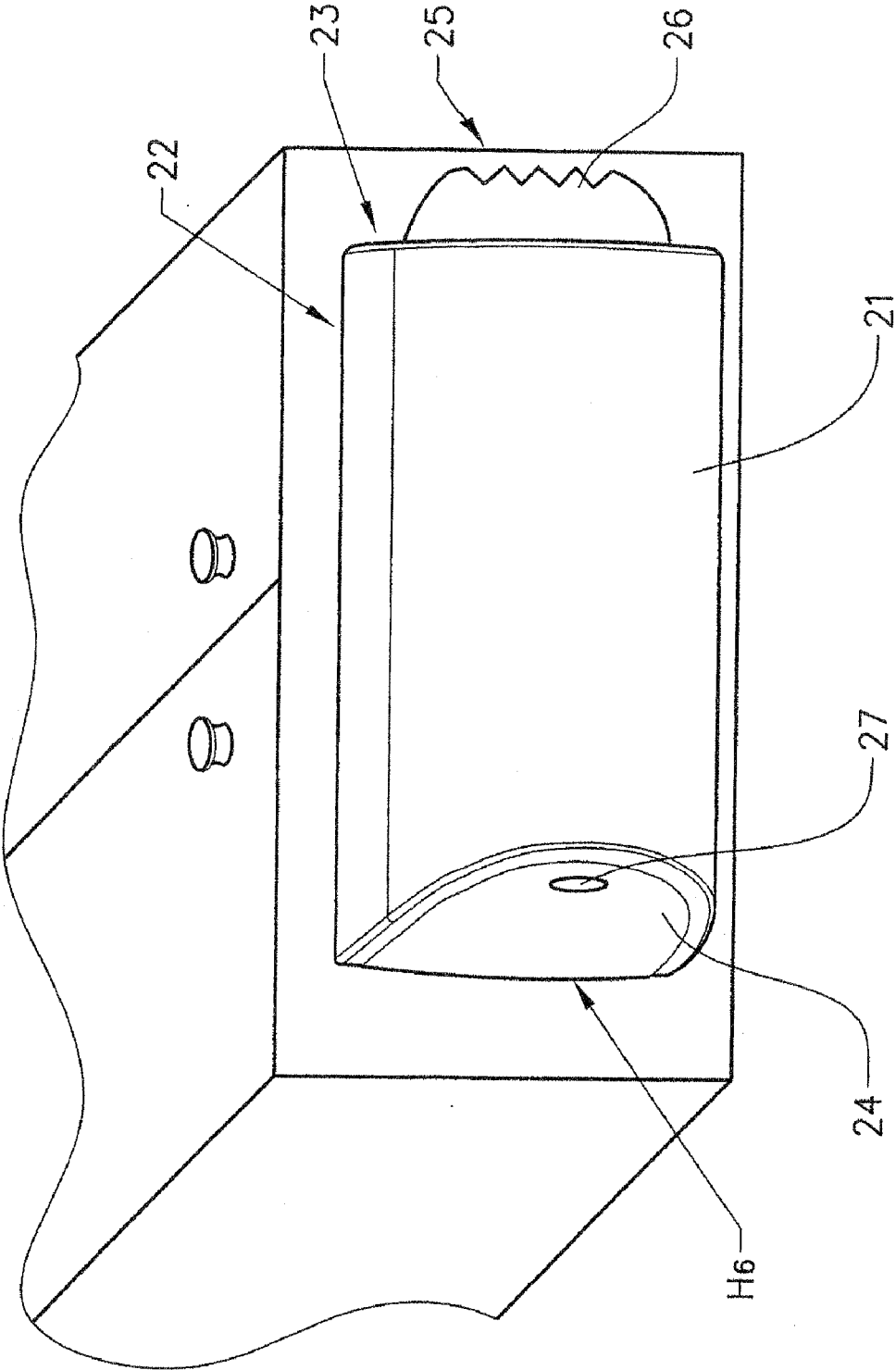


FIG. 9

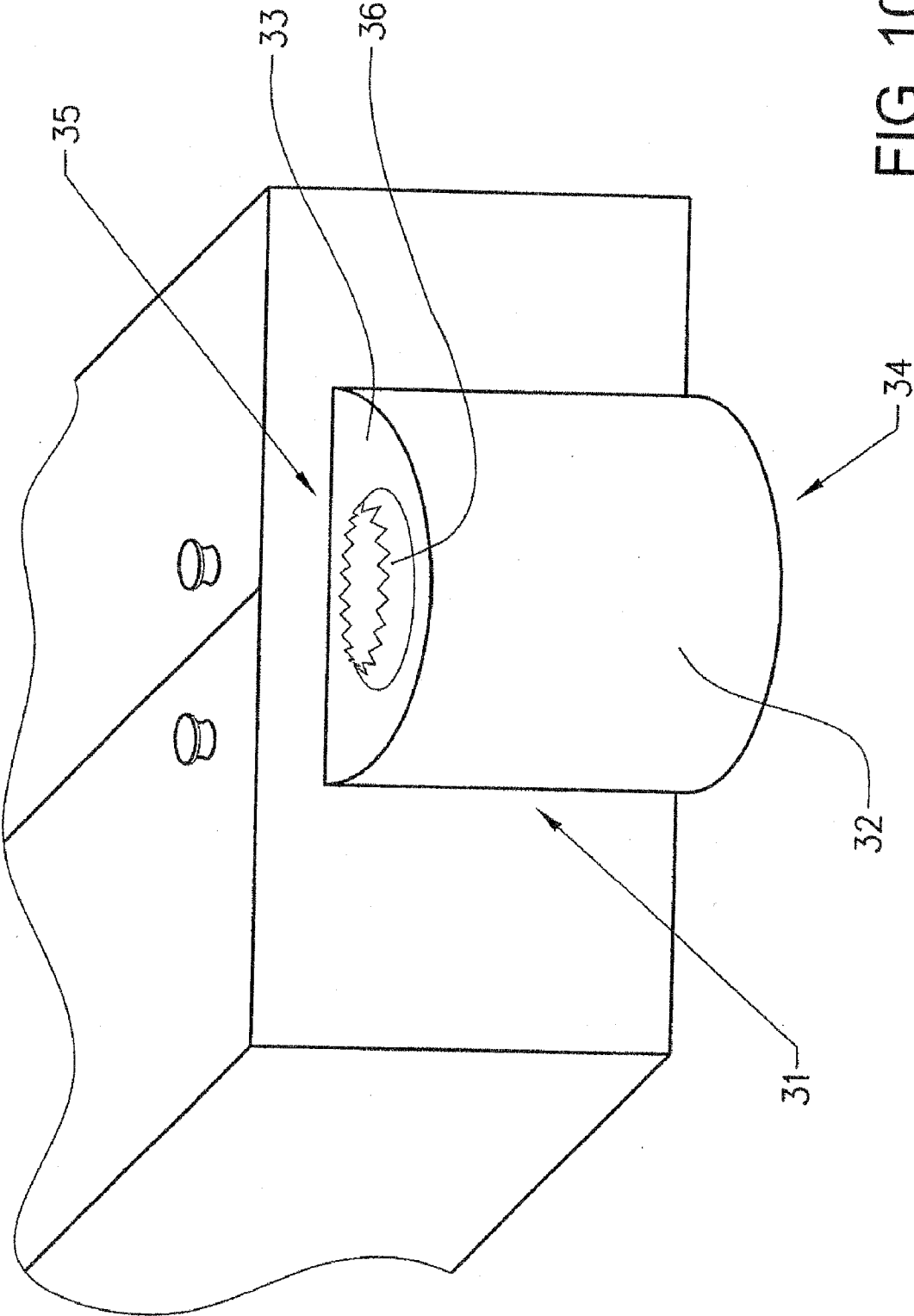


FIG. 10



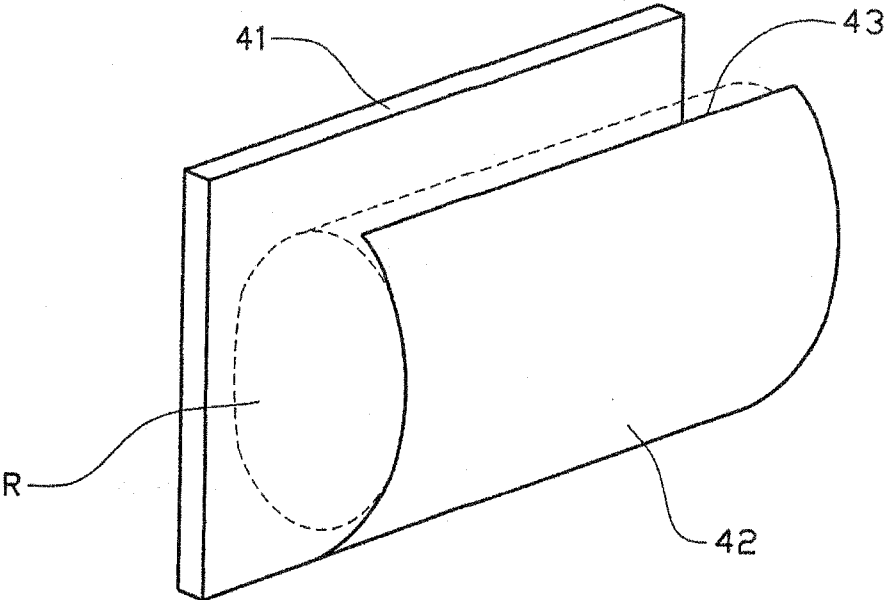


FIG. 11

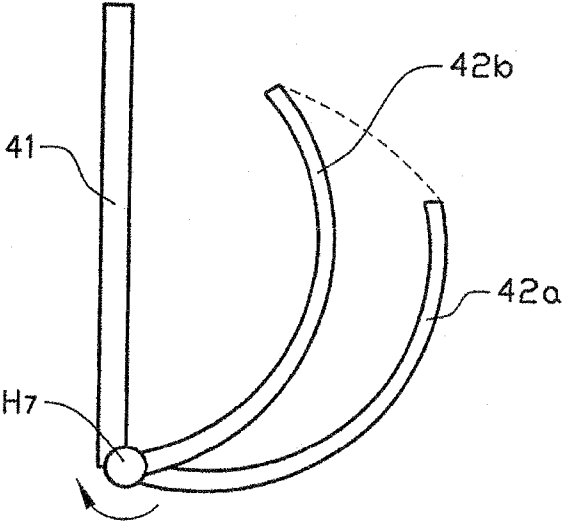


FIG. 12

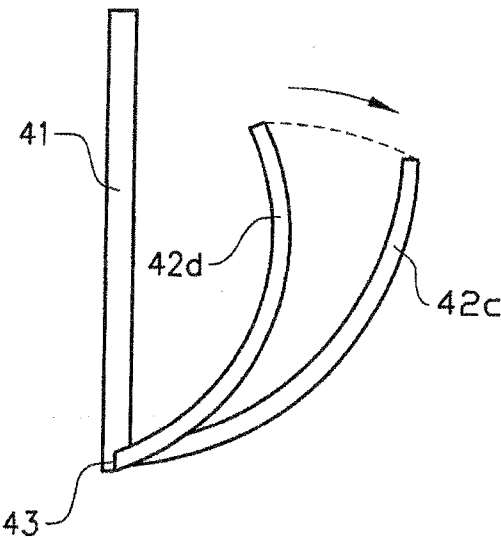


FIG. 13

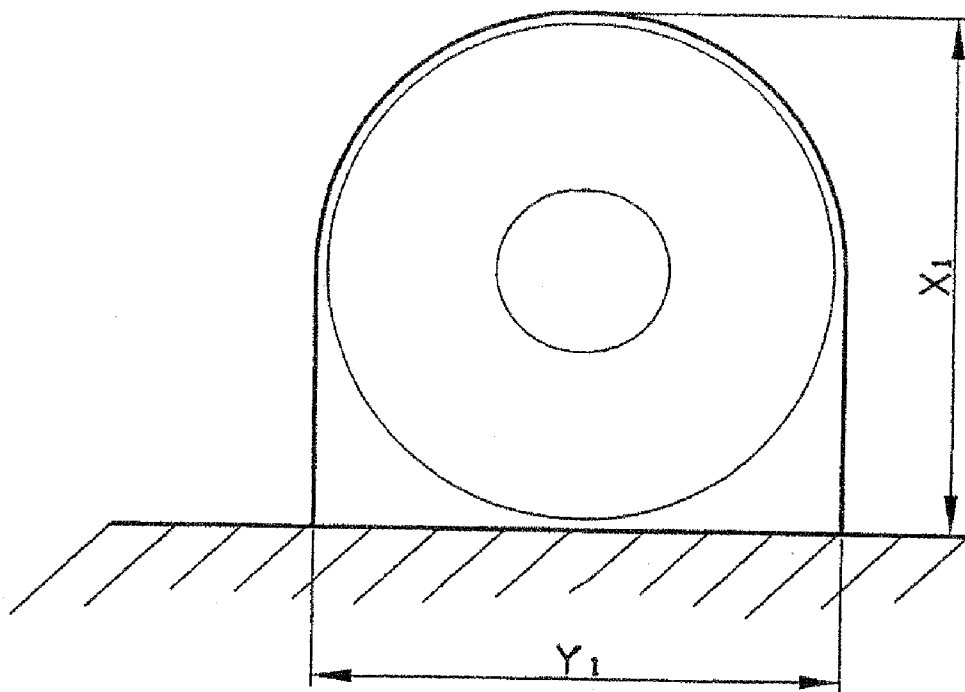


FIG. 14

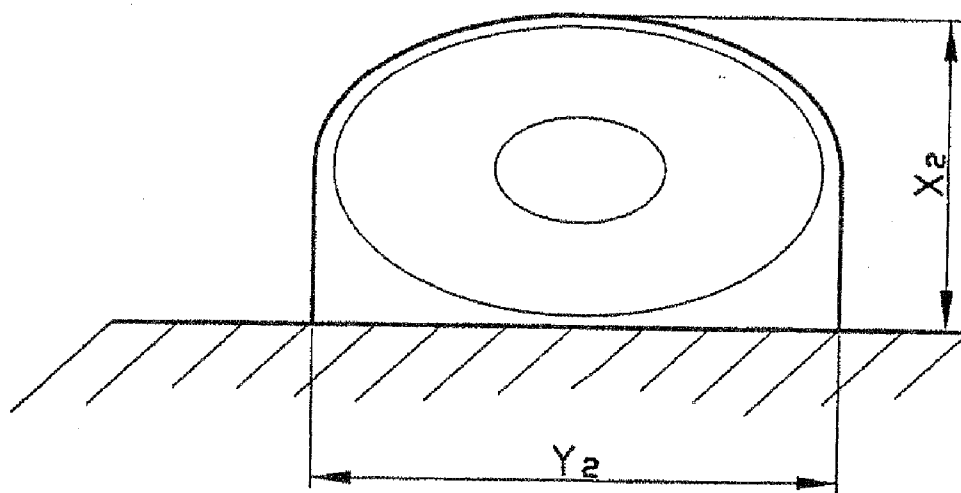


FIG. 15

**DISPENSER FOR ROLLED PAPER WEBS AND A PAPER PRODUCT FOR USE IN SUCH A DISPENSER**

**CROSS-REFERENCE TO RELATED APPLICATION**

[0001] This application is a continuation of International application PCT/SE2005/000360 filed on Mar. 14, 2005, which designated the United States of America.

**FIELD OF THE INVENTION**

[0002] The invention relates to a space saving and compact dispenser for rolled paper webs wherein the dispenser is adapted for a compressed or deformed paper product, as well as a paper product for use in such a dispenser.

**BACKGROUND OF THE INVENTION**

[0003] Paper dispensing devices that dispense paper from the centre of a coreless, spiral or cracked core paper roll are known as centreflow or centrefeed dispensers. The web of paper in such dispensers is fed from the axial portion or centre of the paper roll. A standard rolled paper product for this purpose would have cylindrical shape with a substantially uniform diameter.

[0004] Paper dispensers of this type have a general cylindrical shape substantially conforming to the rolled paper products to be dispensed, both with respect to shape and size, or sizes if several types of rolls are to be accommodated.

[0005] Background art centreflow feed dispensers as shown in U.S. Pat. No. 5,370,338 and U.S. Pat. No. 4,524, 895 provide arrangements for wall mounted paper roll dispensers. As can be seen from both documents, a dispenser of this type has a cross-section that to a large extent is decided by the diameter of the paper roll. When mounted on a wall, standard dispensers will extend a distance from the wall corresponding to the outer diameter of the dispenser casing plus the space taken up by the attachment means at the back of the dispenser. The size of the dispenser casing is dependent on the size of roll to be fitted and the gap space due to manufacturing tolerances from the production of the roll. Hence the size of the paper roll is a major limiting factor when trying to minimize the corresponding size of the dispenser.

[0006] Furthermore, the known dispensers are also adapted for the standard coreless centreflow rolled paper or web product of cylindrical shape with a substantially uniform diameter. Due to factors such as hardness and roll density of the centreflow rolled paper webs it has not been practical to manufacture and transport such rolled paper webs in a deformed or compressed state. First, the rolled paper webs would have to be shaped to resume a cylindrical form before loading it into a dispenser. This could present a problem for the user due to the hardness of the product. Second, due to the necessity for maintaining the rolled paper webs in a substantially cylindrical shape, due to the cylindrical shape of the corresponding dispensers, it has not been possible to transport and/or use such rolled paper webs in a deformed or compressed state.

[0007] It is known to compress some types of wound web rolls, such as toilet paper rolls, for transport purposes, but

such products are not intended for centre-flow dispensing. Products of this type are instead dispensed by unrolling or dispensing the web from the outer periphery of the wound web roll, also termed "perifeed". For this reason, such rolls must often be modulated or re-shaped by hand to restore a substantially cylindrical shape to fit existing dispensers.

[0008] One problem solved by the dispenser according to the invention is to provide a space saving and compact dispenser for centreflow or centrefeed rolled paper products, wherein the dispenser is adapted for such a paper product.

[0009] A further problem solved by the invention is to provide centreflow or centrefeed rolled paper webs allowing substantial space savings when packaging and transporting assembled packages or pallets containing such paper products.

**SUMMARY OF THE INVENTION**

[0010] It is therefore an object of the present invention to provide a space saving and compact dispenser for centreflow rolled paper webs wherein the dispenser is adapted for a compressed or deformed paper product, as well as a paper product for use in such a dispenser.

[0011] In the following text, the general term "paper roll" is intended to encompass all types of centreflow coreless, spiral or cracked core wound products comprising webs of paper, non-woven fibres or other materials suitable for dispensing from a centreflow dispenser. The term "central axis" is used to indicate a longitudinal axis through the central section of such a roll.

[0012] According to a first embodiment, the invention relates to a centreflow paper roll dispenser, which dispenser has a housing comprising a first section for attaching the dispenser to a support surface, and a second section at least partially enclosing a radial circumference of a non-cylindrical centreflow paper roll. This first embodiment is mainly intended for dispensers mounted to hold a paper roll with its central axis in a substantially horizontal position. Such a dispenser can be mounted onto a surface located at practically any angle and allows paper to be fed from either end of the open-ended dispenser. The direction of feed is determined by which end of the rolls is pre-started and the orientation of the roll in the dispenser. Pre-starting of a paper roll before placing it in a dispenser is common practice for centrefeed rolls. Once a desired length of paper has been dispensed from the paper roll, the paper may be torn by hand or by pulling it over an edge provided for this purpose. Such an edge may be located at a suitable position along either or both outer edges of the second section. The edge or edges may be serrated or otherwise shaped to facilitate tearing of the paper.

[0013] A second preferred embodiment further comprises a third section enclosing a first end of the paper roll and preferably, but not necessarily, a fourth section enclosing at least a second end of the paper roll, and an exit port in connection with the third and/or fourth section for dispensing paper from the paper roll. In the following embodiments, it will be assumed that the exit port is located in the third section whenever the dispenser comprises a third or fourth section and no alternatives are given. Once a desired length of paper has been dispensed from the paper roll, the paper may be torn by hand or by pulling it over an edge provided

for this purpose. The edge or edges may be a part of or surround the exit port and may be serrated or otherwise shaped to facilitate tearing of the paper. Two or more of the above sections may also be made in one piece. A cross-section through the dispenser taken perpendicular to a central axis through a hole in the paper roll has a major axis and a minor axis, wherein the major axis is substantially parallel to the support surface for the dispenser.

[0014] In this text, the term 'attached' may be interpreted as including both fixed and removably attached. In addition, the term 'removably attached' may be interpreted as including both completely removable and hinged.

[0015] According to one alternative, a horizontally placed roll may be mounted on a substantially horizontal surface, such as under a cupboard or a similar unit. The central axis of the roll may be arranged either substantially parallel to or at right angles to the front edge of the cupboard or similar unit. According to a further alternative, a horizontally placed roll may also be mounted on a substantially vertical surface, such as a wall. In these cases, dispensing is achieved by pulling the web sideways out of either end, or straight out of a dispenser mounted on the vertical or horizontal surface. Dispensers according to the first embodiment are preferred for this type of arrangement, as a paper roll will as a rule not require support from a lower end surface and may allow dispensing from either end. However, dispensers according to the second preferred embodiment may also be used for horizontally placed rolls. According to a further alternative, a dispenser may be located with the central axis of the centreflow roll placed substantially vertical on a wall or similar. Such a wall is preferably, but not necessarily, vertical or near vertical. A vertically placed roll may typically be dispensed in a vertical downward direction, although an embodiment adapted for vertical upward dispensing is also possible. Dispensers according to the second preferred embodiment are suited for this type of arrangement, as a paper roll will as a rule require support from a lower end surface.

[0016] In order to refill a dispenser, one or more sections of the dispenser may be more or less removable or openable.

[0017] According to a first alternative of the first embodiment, the front second section of a substantially horizontally mounted dispenser is attached to the first section along its lower longitudinal edge. The second section may be curved outwards and upwards, to form a substantially oval dispenser, leaving a substantially parallel gap between its upper longitudinal edge and the first section. Depending on the size of the gap, a paper roll may be inserted from either end of the dispenser, or down through the gap, by allowing at least a part of the second section to be resiliently deformed away from the first section during loading of the dispenser. Such a dispenser may for instance be made in one piece, by stamping and bending a blank made of sheet metal.

[0018] According to a first alternative of the second embodiment, a horizontally placed roll may be mounted on a horizontal surface, such as under a cupboard or a similar unit. In this case, dispensing is achieved by pulling the web sideways out of either end or straight out of a dispenser mounted on the horizontal surface. This dispenser may have a housing comprising a first section for attaching the dispenser to a support surface, a second section at least partially enclosing a radial circumference of a non-cylindrical cen-

treflow paper roll, a third section enclosing one end of the paper roll, a fourth section enclosing the opposite end of the paper roll, and an exit port in connection with the third or fourth sections for dispensing paper from the paper roll. When mounted on a horizontal surface the second section would be facing downwards. Suitable opening arrangements would include either of the third or fourth end sections or a horizontally extending end section of that side of the second section facing the user.

[0019] According to a second alternative of the second embodiment, a vertically placed roll may be mounted on a substantially vertical surface, such as a wall or similar. When mounted on a, such a vertical surface, the second section may be located at the front of the dispenser, facing the user. Similar to the first alternative embodiment the opening arrangements may include either of the third or fourth end sections, arranged as separately removable sections or integrated with at least a part of the vertically extending second section.

[0020] According to a third alternative of the second embodiment, the front second section is removably attached to the first section to allow loading of the paper roll. This can be achieved by arranging a front portion or one or more side portions or a combination thereof, being part of the second section, to be removable from the dispenser. Alternatively, the front second section and/or at least a part of the upper fourth section may be either vertically or horizontally hinged relative to one or more of its adjacent sections. The second section may be hinged to one side using a hinge extending vertically, which hinge may be placed at or adjacent a line where the second section joins the first section. The second section may further comprise two halves, where each half section is hinged to one side using a hinge extending vertically adjacent a line where the respective halves of the second section joins the first section. The two halves may come together at the front of the dispenser, where their mating edges can join along a vertical, angled, irregular or otherwise shaped line.

[0021] According to a fourth alternative of the second embodiment, a unit may be attached to the first section by a horizontal hinge. Such a unit may comprise the front second section and the upper fourth section, with a hinge placed at or adjacent a location where the front second section joins the lower, third section. The unit may also comprise the front second section and the lower third section, with a hinge placed at or adjacent a location where the front second section joins the upper, fourth section. A unit may further comprise the second, third and fourth section, with a hinge placed where the upper, fourth section joins an upper part of the wall mounted first section.

[0022] According to a fifth alternative of the second embodiment, a unit comprising the front second section and the upper fourth section may be removably attached to at least the lower third section to allow loading of the paper roll. In this case the second section encircles the paper roll and is supported by the third section around its lower periphery.

[0023] According to a sixth alternative of the second embodiment, a unit comprising the front second section, the lower third section and the upper fourth section may be removably attached to the first section to allow loading of the paper roll. This can be achieved by using one or more

locking means, which are actuated to release the unit. Alternatively the front surface of the first section may be provided with at least one guide means, such as a single or a parallel dovetail or a similar profiled arrangement. This allows the user to slide the unit horizontally or vertically relative to the first section and in the plane of the section, from a dispensing position to a position where the unit is removed from the first section in order to be refilled.

[0024] In the above alternatives of the second embodiment, the third section may be arranged to enclose a lower part of the paper roll, and arranged to support and bear the weight of the paper roll. Also, the exit port for dispensing paper from the paper roll may be arranged in the third section. The exit port for dispensing paper from the paper roll may alternatively be arranged in a fifth section adjacent from and below the third section. The fifth section may be fixed to the third section, or be removable and replaceable to allow the exit port to be changed or adapted to provide means for tearing off different paper or web qualities.

[0025] The dispenser may be given a substantially oval, elliptical or rectangular cross-section, or any intermediate combination of these cross-sectional shapes. This applies to the case where the second section itself encircles the paper roll, whereby its cross-section is substantially symmetrical around both the major and the minor axis. It also applies to the case where a frontal, outer part of the second section between the points on either side of the dispenser where the second section joins the first section, which is mounted on a supporting wall. In the latter case, the outer part of the second section may have, for instance a generally half-elliptical shape that joins the first section having a rectangular shape attached to the wall. Such a dispenser would be symmetrical around the minor axis only. However, design and manufacturing considerations may necessitate the outer edges of the second sections, substantially coinciding with the major axis of the cross-section of the dispenser, to be extended more or less directly towards the first section adjacent the supporting wall.

[0026] The ratio of the major axis over the minor axis may preferably, but not necessarily, be in the range 1.1:1 to 2:1. The ratio may also be dependent on the diameter and/or thickness of the paper roll and the roll density of the rolled web.

[0027] The invention further relates to a centrefeed paper roll for use in a dispenser as described above. The paper roll may be compressed into a non-cylindrical shape where a cross-section taken perpendicular to a central axis through a centre hole in the paper roll has a major axis and a minor axis, wherein the major axis is substantially parallel to a support surface for the dispenser. The ratio for the major axis over the minor axis for such a roll may be chosen in the above range.

[0028] According to a preferred embodiment the wound web roll is permanently compressed into an elliptical, rectangular or similar cross-section, which allows it to be placed in a dispenser according to the invention. This is the case for relatively large paper rolls and/or paper rolls with a hardness too great to allow a user to deform the roll manually. A paper or web roll of this type may have a roll density in the range 0.2-0.3 g/cm<sup>3</sup> and is compressed to a predetermined shape during manufacture of the roll. Such paper rolls may either be coreless or have a removable cracked core.

[0029] According to a further embodiment the wound web roll is at least temporarily compressed into an elliptical, rectangular or similar cross-section, which allows it to be placed in a dispenser according to the invention. A wound paper or web roll of this type may have a roll density less than approximately 0.2 g/cm<sup>3</sup>, but not less than 0.1 g/cm<sup>3</sup>. This allows compression of the roll or rolls prior to packaging for transport, as well as manual compression of the roll before being loaded into the dispenser. Paper rolls of this type may be used for relatively soft, more compressible paper qualities or relatively loose wound paper rolls. This type of rolls may be retained in compression during transport and storage and may expand at least partially to their original, cylindrical shape when removed from the package.

[0030] Such a compressed or deformed wound web product made from paper, non-woven fibre or similar, may have a substantially elliptical or rectangular cross-section having more or less distinct cross-sectional major and minor axes, as opposed to a standard centreflow rolled web product having a substantially uniform diameter. The centre hole of such a paper roll may either conform to the outer oval, elliptical or rectangular shape of the roll, or be allowed to fully or at least partially collapse. The ratio of the major axis over the minor axis may be up to approximately 2:1. As stated above, this ratio preferably, but not necessarily is in the range 1.1:1 to 2:1, depending on the diameter and/or thickness of the paper roll and the roll density of the rolled web.

[0031] A compressed or deformed wound web product according to the invention will allow a larger number of products to be packaged onto a standard size pallet. For palletizing, one embodiment uses a ratio in the range 3:2 to 5:3. For instance, a standard size pallet measuring 400×600 mm will take 4 rolls of A-Tork® compressed from a 300 mm diameter (Ø) to 300×200 mm. These rolls would normally require a 600×600 mm pallet. Similarly, the 400×600 mm pallet will take 10 rolls of M-Tork® rolls compressed from a 200 mm Ø to 200×120 mm, instead of 6 uncompressed rolls. Finally, the 400×600 mm pallet will take 16 rolls of Mini-Tork® rolls compressed from a 150 mm Ø to 150×100 mm. These rolls would normally require a 600×600 mm pallet.

[0032] A further embodiment relates to a method of making a centreflow rolled web product for use in a dispenser according to the invention. Each the rolled web product comprises a length of material wound on a cylindrical, expandable mandrel that is removed to produce a coreless roll. Such a roll may be somewhat resilient in a substantially radial direction. According to the method, rolls are disposed in a predetermined array having at least one layer of adjacent and mutually parallel central axes, the compressive loading being applied to the rolls to effect a deformation of each roll into a substantially elliptic, square or rectangular cross-section. The method can also be applied to single rolls. The method comprises the steps of:

[0033] placing one or more rolls on a support surface, between opposing punching plates and an upper support plate;

[0034] applying a sufficient directional compressive loading on one or more rolls by actuating the punching

plates, to substantially deform the rolls until the one or more rolls contacts the support plate; and

[0035] relieving the compressive loading.

[0036] It is assumed that the wound web is compressible, and that the step of applying a directional compressive loading is effected by applying a compressive loading that deforms the rolls into a substantially elliptical shape, without flattening the central opening in the centreflow roll or rolls.

[0037] The compressive loading may be applied by placing one single or multiple parallel rolls on a flat support surface between a pair of opposing punching plates, having their main surfaces parallel to the longitudinal axis or axes of the products. Subsequently an adjustable support plate is placed over the product or products, parallel to the support surface. Actuators acting on their respective punching plates are then activated to apply a compressive force onto the product or products. The roll or rolls are compressed into an elliptical cross-sectional shape until the support plate is contacted by the peripheral surface located along the major axis of the cross-section of the roll or rolls. Finally the compressive load is released. Due to a certain spring back effect of the roll or rolls when the load is released, the roll or rolls are compressed a predetermined amount past the desired elliptical shape displayed by the roll or rolls while under compression. In order to achieve the right amount of compression, the support plate is adjusted to a desired distance from the support surface.

[0038] A centreflow dispenser according to the invention may be adaptable for use with centreflow rolled paper or non-woven webs of different bulks, as well as different weights, widths and tensile strengths. Such paper rolls may be coreless or have a cracked central core, allowing centreflow dispensing. The current invention is applicable to any such type of compressed centreflow rolled paper product.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0039] In the following text, the invention will be described in detail with reference to the attached drawings. These drawings are used for illustration only and do not in any way limit the scope of the invention. In the drawings:

[0040] FIGS. 1A/B show a side and lower view of a dispenser for non-cylindrical paper rolls according to a first embodiment of the invention;

[0041] FIG. 2 shows a plan view of a cross-section through the first and second sections of FIG. 1;

[0042] FIG. 3 shows a dispenser according to a second embodiment of the invention;

[0043] FIG. 4 shows a plan view of a cross-section through the first and second sections of FIG. 3;

[0044] FIG. 5 shows a plan view of a cross-section through an alternative embodiment of the second section as shown in FIGS. 1 and 3;

[0045] FIGS. 6A/B show the component parts of a dispenser according to a third embodiment of the invention;

[0046] FIG. 7 shows the component parts of FIGS. 6a and 6b assembled into a dispenser;

[0047] FIG. 8 shows a cross-sectional plan view in through the assembled dispenser in FIG. 7;

[0048] FIG. 9 shows a dispenser according to a fourth embodiment of the invention;

[0049] FIG. 10 shows a dispenser according to a fifth embodiment of the invention;

[0050] FIG. 11 shows perspective view of a dispenser according to a sixth embodiment of the invention;

[0051] FIG. 12 shows a cross-section through a first alternative sixth embodiment of the invention;

[0052] FIG. 13 shows a cross-section through a second alternative sixth embodiment of the invention;

[0053] FIG. 14 shows a show plan view schematically illustrating the cross-section of a known dispenser for cylindrical paper roll;

[0054] FIG. 15 shows a show plan view of a dispenser for non-cylindrical paper rolls according to the invention.

#### DETAILED DESCRIPTION OF THE INVENTION

[0055] FIGS. 1A and 1B show a front and lower view of a dispenser according to a first embodiment of the invention. The dispenser comprises a first section 1 for attaching the dispenser to a wall, a second section 2 attached to the first section 1 and encircling a space for a paper roll, a lower, third section 3 arranged for supporting a non-cylindrical paper roll and an upper, fourth section 4 forming an upper end surface of the dispenser. A front part of the second section 2, facing the user, has an elliptic shape, while a pair of side portions, extending from the widest part of the second section towards the rear first section 1, is substantially perpendicular to the wall. The elliptic shape of the front part of the second section 2 is arranged to conform to the cross-sectional shape of a centreflow web roll placed in the dispenser. The lower, third section 3 is provided with an exit port 5 with a surrounding tear edge 6 for feeding out and tearing off paper from a coreless roll placed in the dispenser. The exit port does not form an essential part of the invention as such, and will not be described in further detail.

[0056] According to a first alternative embodiment, the dispenser is opened by means of a removably attached third section 3, attached to the lower circumference of the second section, in order to load a paper roll into the dispenser. According to a second alternative embodiment, the upper, fourth section 4 is provided with a hinge  $H_1$  along the line where it joins the first section 1. According to a third alternative embodiment, a unit comprising at least a major part of the front section 2 and the upper, fourth section 4 is provided with a hinge  $H_1$  in the same location as the previous embodiment, to allow the unit to be tilted upwards. The unit comprising the second and fourth sections 2, 4 may alternatively be provided with a hinge  $H_2$  at the front of the dispenser, where the front section 2 meets the lower, third section 3, to allow the unit to be tilted forwards. According to a fourth alternative embodiment, the entire, or at least a part of, the second section 2 can be provided with a substantially vertical hinge  $H_3$ ,  $H_4$  located down one side of the dispenser along a line parallel to or coinciding with the line where the front section 2 joins the rear section 1. Alternatively, it is possible to locate a hinge  $H_5$  along the

side of the front section 2 at an angle, starting from an upper or lower corner of either side of the first section 1.

[0057] FIG. 2 shows a plan view of a cross-section through the first and second sections of FIG. 1A. The cross-sectional shape of the encircling second section 2 has a generally elliptical shape, having a major axis Y-Y, which axis is located in a horizontal plane and parallel to the wall onto which the dispenser is attached, and a minor axis X-X, which axis is perpendicular to, and in the same plane as, the major axis Y-Y.

[0058] FIG. 3 shows a dispenser according to a second embodiment of the invention. Using the reference numerals of FIG. 1A, the dispenser comprises a first section 1 for attaching the dispenser to a wall, a second section 2 encircling a space for a paper roll, a lower, third section 3 attached to the first section 1 and arranged for supporting a paper roll, and an upper, fourth section 4 forming an upper end surface of the dispenser. The main difference is that the first section 1 is attached to the supporting third section 3, so that the encircling second section is removed for loading the dispenser, as shown in FIG. 3.

[0059] The encircling second section 2 is lowered down over a roll (not shown) placed on the lower, third section 3 and is held in place by a slight force fit, a snap-lock or a similar locking means.

[0060] FIG. 4 shows a plan view of a cross-section through the first and second sections of FIG. 3. The cross-sectional shape of the encircling second section 2 has a generally elliptical shape, having a major axis Y-Y, which axis is horizontal and parallel to the wall onto which the dispenser is attached, and a minor axis X-X, which axis is perpendicular to and in the same plane as the major axis Y-Y.

[0061] FIG. 5 shows a plan view of a cross-section through an alternative embodiment of the second section as shown in FIGS. 1 and 3, including a paper roll R compressed to a substantially rectangular cross-sectional shape, indicated with dotted lines. The cross-sectional shape of the encircling second section 2 has a generally rectangular shape, having a major axis Y-Y, which axis is horizontal and parallel to the wall onto which the dispenser is attached, and a minor axis X-X, which axis is perpendicular to and in the same plane as the major axis Y-Y.

[0062] FIGS. 6a and 6b show the component parts of a dispenser according to a third embodiment of the invention. The dispenser comprises a first section 11 for attaching the dispenser to a wall, a second section 12 attached to the first section 11 and partially encircling a space for a paper roll, a lower, third section 13 arranged for supporting a non-cylindrical paper roll and an upper, fourth section 14 forming an upper end surface of the dispenser. The lower, third section 13 is provided with an exit port 15 with a surrounding tear edge 16 for feeding out and tearing off paper from a coreless roll placed in the dispenser. The exit port does not form an essential part of the invention as such, and will not be described in further detail. The third section 13 is an integrated part of the first wall mounted section 11, which in turn includes a back panel 17 delimited by one upper 18 and a pair of side edges 19a, 19b. The second and fourth sections 12, 14 form a unit that is removably attached to the upper and side edges 17, 18 of the first section 11 and the outer circumference of the lower third section 13, in order to load

a paper roll into the dispenser. FIG. 6a shows the unit comprising the second and fourth sections 12, 14 removed from the dispenser assembly, while FIG. 6b shows a wall mounted unit comprising first and third sections 11, 13. The wall mounted unit and the removable unit are provided with a number of co-operating resilient snap-on connectors for holding the units together. These connectors will not be described in detail, as they are not part of the invention and are merely indicated in FIGS. 6a and 6b.

[0063] FIG. 7 shows the component parts of FIGS. 6a and 6b assembled into a dispenser, including a paper roll R indicated with dotted lines.

[0064] FIG. 8 shows a plan view of the assembled dispenser in FIG. 7. As can be seen from this figure, only the outer part of the second section 12 has a half-elliptical shape that substantially conforms with the shape of the paper roll R. From the widest part of the second section 12 a pair of substantially vertical side walls 20a, 20b extends towards the wall to join the side edges 19a, 19b of the first section 11, having a rectangular shape and being attached to the wall. The widest part of the dispenser coincides with the major axis Y-Y in this example. Such a dispenser would be symmetrical around the minor axis X-X only.

[0065] FIG. 9 shows a horizontally mounted dispenser according to a fourth embodiment of the invention. As in FIG. 1A, the dispenser comprises a first section 21 for attaching the dispenser to a surface and a second section 22 attached to the first section 21 and encircling a space for a paper roll. In this embodiment the first section 21 is attached underneath a kitchen unit, such as a cupboard, while the second section 22 supports a non-cylindrical paper roll with its central axis parallel to the front surface of the kitchen unit. A third section 23 is arranged at one end of the dispenser and is provided with an exit port 25 with a surrounding tear edge 26 for feeding out and tearing off paper from a coreless roll placed in the dispenser. Opposite the third section, a fourth section 24 forms an end surface that may be opened to refill the dispenser. The fourth section 24 is provided with a hinge H<sub>6</sub> adjacent the line where it joins the first section 21. To open the dispenser a push button 27 on the fourth section 24 is actuated to release a resilient catch means.

[0066] According to an alternative embodiment, a dispenser unit comprising the second third and fourth sections 22, 23, 24 can be attached to the first section 21 by means of one or more guides. This would allow the user to slide the unit in a horizontal direction, either in a direction parallel to the central axis of the roll or at right angles to this direction towards the front of the kitchen unit.

[0067] FIG. 10 shows a horizontally mounted dispenser according to a fifth embodiment of the invention. The embodiment differs from the fourth embodiment in that the dispenser is mounted under a kitchen unit at right angles to the front of the kitchen unit and the fourth embodiment. The dispenser comprises a first section 31 for attaching the dispenser to a surface underneath the kitchen unit and a second section 32 attached to the first section 31 and encircling a space for a paper roll. The second section 32 supports a non-cylindrical paper roll with its central axis at right angles to the front surface of the kitchen unit. A third section 33 is arranged at the end of the dispenser facing the user and is provided with an exit port 35 with a surrounding

tear edge 36 for feeding out and tearing off paper from a coreless roll placed in the dispenser. Opposite the third section, a fourth section 34 forms an end surface that faces a wall onto which the kitchen unit is mounted. For re-filling, a dispenser unit comprising the second third and fourth sections 32, 33, 34 is attached to the first section 31 by means of one or more guides (not shown). This will allow the user to slide the unit in a horizontal direction, either in a direction parallel to the central axis of the roll, towards the front of the kitchen unit, or, according to an alternative embodiment, at right angles to this direction.

[0068] FIG. 11 shows perspective view of a dispenser according to a sixth embodiment of the invention. This dispenser has a housing comprising a first section 41 for attaching the dispenser to a support surface and a second section 42 at least partially enclosing a radial circumference of a web roll R. According to this embodiment, both ends of the dispenser is provided with an opening for dispensing a web from the web roll R, which roll is located with its central axis in a substantially horizontal plane. A dispenser of this type can be re-filled by a user gripping that edge 43 of the second section 42 not joined to the first section 41 and applying a force at right angles to the plane of the first section 41. A new web roll R is inserted from either end of the dispenser, and is held in place by a force applied by the second section 42.

[0069] According to a first alternative, shown in FIG. 12, the second section 42 is attached to the first section 41 by means of a spring loaded hinge  $H_7$ . This hinge allow the second section to be swung into the position indicated at 42a for re-filling, whereby the second section is released to take up the position indicated at 42b to hold the web roll in place. The spring force exerted by the hinge  $H_7$  must be sufficient to prevent the web roll from moving during a dispensing operation. Also, as the roll begins to deplete and partially collapse, the second section 42 must be allowed to swing towards the first section 41 to maintain the spring force.

[0070] According to a second alternative, shown in FIG. 13, the second section 42 is joined to the first section 41 along a line indicated at point 43. In this case the second section is made from a suitable resilient material. When acted on by a user, the second section is resiliently deformed into the position indicated at 42c for re-filling, whereby the second section is released to take up the position indicated at 42d to hold the web roll in place. The resilient properties of the material must be such that the spring force exerted by the second section is sufficient to prevent the web roll from moving during a dispensing operation. Also, as the roll begins to deplete and partially collapse, the second section 42 must be allowed to flex further towards the first section 41 to maintain the spring force.

[0071] According to a preferred embodiment, the first and second sections are made from a single piece of sheet metal, such as stainless steel.

[0072] FIGS. 14 and 15 shows a pair of cross-sectional plan views schematically illustrating the relationship in size between a known dispenser for cylindrical paper rolls and a dispenser for non-cylindrical paper rolls according to the invention. As can be seen from the embodiment shown in these figures, the width  $Y_2$  of the dispenser according to the invention is larger than the corresponding width  $Y_1$  of a known dispenser. However, depending on how the roll is

compressed and the properties of the roll, the width  $Y_2$  can be equal to or larger than  $Y_1$ . It can also be seen that the dispenser depth  $X_2$ , or extension at right angles to the wall, is noticeably less than the depth  $X_1$  of the known dispenser. A typical difference in size would be that  $X_2$  is 25-50% less than  $X_1$ , although the relationship between  $X_1$  and  $X_2$  may typically be within the range  $0.5 X_1 < X_2 < 0.9 X_1$  depending on the size of roll, the inner diameter of the centre hole, the degree of compression, roll density, and/or other parameters. The relationship between  $Y_1$  and  $Y_2$  will of course vary according to the type of compression. For instance, a wound roll compressed to a rectangular shape can give the relationship  $Y_1 = Y_2$ , while a roll that has been flattened with little sideways restraint will give the relationship  $Y_1 > Y_2$ .

[0073] The invention also relates to a method of making a centreflow rolled web product for use in a dispenser according to the invention. Each rolled web product comprises a length of paper wound on a cylindrical, expandable mandrel that is removed to product a coreless roll. Such a roll may be somewhat resilient in a substantially radial direction, dependent on its roll density. According to the method, rolls are disposed in a predetermined array having at least one layer of adjacent and mutually parallel central axes, the compressive loading being applied to the rolls to effect a deformation of each roll into a substantially elliptic, square or rectangular cross-section. The method can also be applied to deformation of single rolls. The method comprises the steps of placing one or more rolls on a support surface, between opposing punching plates and a support plate, applying a sufficient directional compressive loading on the one or more rolls by actuating the punching plates, to substantially deform the rolls until the one or more rolls contacts the support plate and relieving the compressive loading.

[0074] It is assumed that the wound web is compressible, and that the step of applying a directional compressive loading is effected by applying a compressive loading that deforms the rolls into a substantially elliptical shape, without flattening the central opening in the centreflow roll or rolls. The central opening can be deformed, but must be sufficiently open to allow paper to be dispensed there-through.

[0075] The compressive loading may be applied by placing one single or multiple parallel rolls on a flat support surface between a pair of opposing punching plates, having their main surfaces parallel to the longitudinal axis or axes of the products. Subsequently an adjustable support plate is placed over the product or products, parallel to the support surface. The degree of compression, and hence the elliptical shape of the rolls, can be controlled by adjusting the distance between the support surface and support plate. This is achieved by adjustable means comprising hydraulic cylinders, ball screws, threaded elements, or similar. Actuators, such as hydraulic cylinders (not shown), acting on their respective punching plates are then actuated to apply a compressive force onto the products. The roll or rolls are compressed into an elliptical cross-sectional shape until the support plate is contacted by the peripheral surface located along the major axis of the cross-section of the roll or rolls. Finally the compressive load is released. Due to a certain spring back effect of the roll or rolls when the load is released, the roll or rolls are compressed a predetermined amount past the desired elliptical shape displayed by the roll



or rolls while under compression. In order to achieve the right amount of compression, the support plate is adjusted to a desired distance from the support surface.

[0076] By adjusting the distance between the support surface and the support plate and applying a higher compressive force to the punching plates and/or applying additional compressive force by means of the support plate, the final shape of the roll or rolls can be controlled. In this way it is possible to produce rolls having a particular, desired elliptic shape or to produce a rectangular or square shape.

[0077] For instance, by applying higher compressive force to the punching plates without adjusting the relative distance between the support surface and the support plate, it is possible to give the roll or rolls an approximate rectangular shape. Rolls having a rectangular or square shape can be packaged closer and take up less space during transport.

[0078] The invention is not limited to the embodiments described above and may be varied freely within the scope of the appended claims.

1. A centrefeed web roll, structured and arranged to be compressed into a non-cylindrical shape, wherein a cross-section taken perpendicular to a central axis through a centre hole in the web roll has a major axis and a minor axis; the cross-section of the web roll corresponding to a corresponding cross-section through a dispenser for which the web roll is intended; the major axis being substantially parallel to a support surface for the dispenser.

2. The web roll according to claim 1, wherein the web roll has a roll density less than 0.2 g/cm<sup>3</sup>, but not less than 0.1 g/cm<sup>3</sup>, allowing manual compression of the roll before insertion into the dispenser.

3. The web roll according to claim 1, wherein the web roll is permanently compressed.

4. The web roll according to claim 3, wherein the web roll has a roll density in the range 0.2-0.3 g/cm<sup>3</sup>.

5. The web roll according to claim 1, wherein the web roll is compressed into a substantially elliptical cross-section.

6. The web roll according to claim 1, wherein the web roll is compressed into a substantially rectangular cross-section.

7. The web roll according to claim 4, wherein the web roll is compressed so that its centre hole is at least partially collapsed.

8. The web roll according to claim 1, wherein the ratio of the major axis over the minor axis is in the range 1.1:1 to 2:1.

9. A web roll dispenser containing a centrefeed web roll according to claim 1, the dispenser having a housing comprising at least a first section for attaching the dispenser to a support surface and a second section at least partially enclosing a radial circumference of a web roll, whereby at least one end of the dispenser is provided with an opening for dispensing a web from said web roll, wherein a cross-section through the dispenser, taken perpendicular to a central axis through the web roll, has a major axis and a minor axis, the major axis being substantially parallel to the support surface for the dispenser.

10. The dispenser according to claim 9, wherein the second section is connected to the first section by a resilient means.

11. The dispenser according to claim 9, wherein the second section comprises a resilient sheet of material.

12. The dispenser according to claim 9, wherein the dispenser further comprises a third section enclosing a lower part of the web roll, a fourth section enclosing at least an upper part of the web roll, and an exit port in connection with said third section for dispensing a web from said web roll.

13. The dispenser according to claim 12, wherein at least the second section is removably attached to said first section to allow loading of the web roll.

14. The dispenser according to claim 12, wherein a unit comprising the second and the fourth section is removably attached to at least said third section to allow loading of the web roll.

15. The dispenser according to claim 12, wherein the third section, for enclosing a lower part of the web roll, is arranged to support the web roll.

16. The dispenser according to claim 9, wherein the dispenser is configured for web rolls with an elliptical cross-section.

17. The dispenser according to claim 9, wherein the dispenser is configured for web rolls with a substantially rectangular cross-section.

18. The dispenser according to claim 9, wherein the ratio of the major axis over the minor axis is in the range 1.1:1 to 2:1.

19. A method for producing deformed centrefeed web rolls according to claim 1, which method can be applied to single or multiple rolls, the method comprising steps of:

placing one or more rolls on a support surface, between opposing punching plates and an adjustable support plate;

applying a sufficient directional compressive loading on said one or more rolls by actuating said punching plates, to substantially deform said one or more rolls until said rolls contacts the support plate; whereby said one or more rolls are compressed into a non-cylindrical shape where a cross-section taken perpendicular to a central axis through a centre hole in the web roll has a major axis and a minor axis; and

relieving said compressive loading.

20. The method according to claim 19, wherein the web roll is compressed into a substantially elliptical cross-section.

21. The method according to claim 19, wherein the web roll is compressed into a substantially rectangular cross-section.

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