Centre-feed roll

The present invention relates to a web dispensing centre-feed roll, and in particular to a centre-feed roll such as a paper or nonwoven barrel roll from which sheets are intended to be dispensed singly.

Centre-feed rolls commonly consist of a single web comprising one or more plies of paper or nonwoven material which are perforated such that the web can be separated into individual sheets. The roll is usually installed in a dispenser with the axis of the roll being vertical, and the web is fed from the centre of the roll out of the dispenser through an aperture, usually in the base of the dispenser. This type of roll and dispenser is often found in public toilets, on petrol station forecourts, and in hospitals and industry, either for use as a dispenser for hand towels or for tissues or towels for general cleaning use. US patent numbers 3,150,808 (Vensel), 3,523,653 (Raymond Lee) and 4,274,573 (Finkelstein) disclose examples of centre-feed rolls.

Several problems can occur with known centre-feed roll systems, primarily due to the characteristics of the perforations in the web. If the perforations are too weak, they will often break in or very close to the dispenser aperture as the end of the web is pulled through. This is due to the natural resistance which exists in the system against the web being pulled from the roll through the aperture. Such breakage is acceptable for the user at that time as a single sheet is dispensed, but if this or a subsequent user requires the next sheet, they will have to locate the end of the web in or near the aperture, which might not be readily visible in a vertically-mounted bottom dispensing system, and try to grip and pull out the available web. This is clearly inconvenient, and would be exacerbated

if the user has wet hands as the web could disintegrate on contact.

If, on the other hand, the perforations are made stronger to overcome more reliably the natural resistance against web withdrawal, they have a tendency not to break at all when the end of the web is pulled, resulting in a long stream or rope of web being pulled out of the dispenser. The user will then need to grip the web with both hands and physically part one or more sheets from the web to detach them. Again, this problem is inconvenient and is also worsened if the user has wet hands, and usually results in the withdrawn web being crushed into a tight rope which is unsuitable for the intended purpose. In addition, the remaining web left hanging from the dispenser can look unsightly for the next user, and if already soiled could be unhygienic. There can also be web wastage, in that users tend to withdraw a greater length of web from the dispenser than is necessary for the desired cleaning or drying function. Finally, small pieces of torn web often land on the floor beneath the dispenser which is untidy.

Due to the nature of the material from which the web is formed and due to limitations in the manufacturing process, it is difficult accurately to control the strength of the perforations in the web. Therefore, manufacturers up until now have tended to overcome the above problems by deliberately making the perforations strong enough to cause the web to stream when removed from the dispenser and, in one system, by providing serrations around the edge of the aperture. Once the user has pulled out a sufficient length of web, the web is then pulled at an angle across the serrations which will cause the web to break either at the serrations or at perforations between the user and the serrations, depending on the relative strengths of the web and the perforations. As with the other systems, this can also leave an unsightly torn web behind for the

next user together with small pieces of web on the floor, and if the web breaks at the serrations, can also cause difficulties and risk of injury for the next user in trying to locate and grip the end of the web. A tendency to pull too much out before severing also still exists, as does the possibility of pulling out only half a sheet if the web tears before the next perforations reach the aperture.

The provision of serrations on a dispenser increases the complexity of the dispenser design, increasing the cost of development and production. The size of the dispenser is also increased, with an extra 5cm or so being added to the bottom of the dispenser, which is undesirable.

In another system currently used by the applicants, a V-shaped grip is provided beneath the dispenser. The shape of the aperture is essentially rectangular and has a V-shaped extension at one end. In use, an amount of web is withdrawn down vertically through the aperture and is then pulled at an angle (normally towards the user) such that the web is then wedged into the V-grip and breaks. Many of the problems discussed with the serrated aperture also exist here: remaining unsightly torn web, web pieces on the floor, difficulty in locating and gripping the web, too much or too little web withdrawn, web being bunched and unsuitable for use, complexity and size of dispenser design.

Another attempt to overcome the problem has been to provide a restriction in the aperture of the dispenser, such as a rubber cross-slot, which provides a frictional force when the web is pulled from the dispenser. Therefore, when the frictional force is transmitted through the perforations, provided the perforations have a breaking strength which is less than the frictional force, the web will break. This, however, also has the disadvantage that the web will tend to break as soon as the perforations pass the restriction and experience the

frictional force, resulting in the next sheet being difficult to locate and grip.

Therefore, there is a need for a centre-feed roll in which a single sheet can be dispensed such that the webs do not form a rope, thereby removing the need for serrations, and such that the next sheet is presented for the next user to grasp easily.

Folded, interleaved sheet systems are known to achieve single sheet dispensing, however such systems are more expensive and complex to manufacture than roll products due to the manufacturing machinery involved.

The problem of single sheet dispensing has previously been addressed in external-feed rolls. External-feed systems comprise a roll wound from a perforated web of material, usually around a tube or core, in which the axis of the roll is mounted horizontally, the web being dispensed from the outer surface of the roll and not from the centre. Examples are lavatory and kitchen towel rolls.

US patent number 3,770,172 (Paper Converting Machine Company) discloses an external-feed roll comprising two perforated webs, the perforations of one web being offset from those of the other web. The two webs are fed through grip rollers in the dispenser, and by virtue of the offset perforations, when one web is pulled through, the perforations of that web will break at or near the grip rollers. By this time a portion of the next sheet on the other web is protruding from the rollers and is available to be gripped.

However, such external-feed systems require a complicated dispenser having a spindle for the roll and grip rollers for the webs. The spindle must run in bearings to reduce friction and minimise the force needed to turn the roll. The grip rollers must provide the correct resistive force on the web. In addition, the perforations need to be strong enough to be able to transfer the turning force required to rotate the roll

but at the same time weak enough so that they break relatively easily outside the dispenser or at the grip rollers.

Therefore, this system has a number of disadvantages. The strength of the perforations is in practice difficult to control during manufacture. On the one hand, perforations have to overcome the roll's turning resistance but, on the other hand, they must sever after passing the grip rollers whose resistive force cannot be so high as to make the web too hard to withdraw. If the web breaks inside the dispenser, a complicated re-threading operation through the grip rollers is required. The dispenser requires moving parts which increase the cost of the system, require careful adjustment and increase the risk of mechanical failure. Furthermore, if webs of different thickness are used in the dispenser, the rollers must be adjusted each time to compensate, either manually or by means of an adjusting mechanism. This can increase the complexity of the dispenser, and can be inconvenient for the person refilling the dispenser.

According to one aspect, the invention provides a centre-feed roll formed from two webs each having lines of weakness which allow the web to be separated into a plurality of sheets, the lines of weakness of one web being offset from those of the other such that in use the sheets can be dispensed singly from alternate webs.

Thus, the invention provides a centre-feed roll which allows single-sheet dispensing. In use, both webs feed through an aperture of a dispenser, with one web protruding further than the other due to the offset lines of weakness. A user will grip and pull the outermost web, and the friction between it and the aperture causes the next line of weakness in that web to break when it is at or near the aperture such that a single sheet is dispensed. As this web is being pulled from the dispenser and a sheet detached, so the other

web is also being drawn out from the dispenser. Because the lines of weakness are offset, by the time the line of weakness of one web has broken, the first sheet of the next web is already protruding from the dispenser. Thus, a well-presented and untouched sheet is available for the next user.

The present invention allows one-handed controlled dispensing from a centre-feed roll. No tearing action is needed because the webs do not form a rope, and therefore no serrations or edges around the aperture are needed. The sheet opens out easily, even if it initially comes out slightly rolled up, because the single sheet is twisted through less revolutions (or even through less than one revolution) than when longer lengths are pulled out as in the prior art systems previously discussed.

The lines of weakness may be at any angle across the web relative to the edge of the web. Preferably the lines of weakness are perpendicular to the edge of the web. Preferably, the lines of weakness are in the form of perforations.

The perforation strength is not as critical in the present invention as in prior art systems. Unlike external feed systems, a substantial force to rotate the roll need not be imparted via the perforations; an internal feed web is inherently easier to withdraw from the roll. The minimum acceptable tear strength is therefore reduced. The dispenser aperture can therefore provide a resistive force which is significantly greater than the minimum acceptable strength and the tolerance "window" for the perforation strength is widened.

Preferably, the lines of weakness or perforations are manufactured to be as weak as possible such that the frictional force exerted by the aperture may be minimised and the web will break as soon as the frictional force between the web and the aperture is present across the perforations. When one web breaks at

or near the aperture, a portion of the next sheet on the other web will already be presented. Even if the perforations and aperture are designed so that the web breaks inside the dispenser or aperture, this will not cause the problems encountered in prior art systems because one web should be supported by the other web (which will be protruding from the dispenser at this time) and will be drawn through the aperture when the other web is pulled.

In reality, the perforation strength which can be achieved may depend on the limitations of the manufacturing process. During manufacture of the web, the machines will require a certain tension in the web to be able to run correctly; the perforation strength cannot be less than the required tension otherwise the web will break during manufacture.

The desired perforation strength will also depend on the strength of the web or base sheet. A stronger base sheet will tolerate stronger perforation strengths; in order to cause the perforations to break, the aperture will need to be more restrictive in order to provide a frictional force greater than the perforation strength, but because the web itself is stronger, there is less risk of it shredding in the aperture before a sheet becomes detached. Weaker base sheets will need weaker perforations and a less-restrictive aperture; there is a greater risk of the web shredding, making it necessary to have a lower frictional force provided by the aperture to cause a sheet to detach.

From the above, it can be seen that there is a strong inter-relationship between the strength and size of the web material, the perforation strength and the aperture size. In practice, these parameters will be adjusted in order to provide a satisfactory single-sheet dispensing system in which the detaching force required from the user is not excessive.

Preferably, the force required to detach a sheet

from the web is less than about 3000g. It is possible that a detaching force of this order might cause some webs to shred in the aperture, and therefore a preferred operational value for the detaching force is about 800g or less. The minimum achievable detaching force will depend on the manufacturing process and the minimum tension required by the machinery. It is considered that there is no minimum detaching strength beneath which the web will not perform satisfactorily in use.

The configuration of the perforations across the web can be varied according to the manufacturing process, the characteristics and dimensions of the webs and the particular application. There are essentially two variables involved: the ratio of the width of the remaining uncut web to the total width of one perforation and one uncut portion (the bond ratio), and the number of perforations per unit width of the line of weakness. Both of these parameters can be adjusted to give the desired detaching strength of the sheet, and will be dependent on the thickness of the web, the strength of the web and the dimensions of the aperture through which the web is dispensed. Preferably, the perforations are configured to achieve a detaching strength of 800g or less.

Generally, the wider the perforation, the more consistent the bond ratio will be. When the desired length of each perforation is small, any variation in the perforation length due to the manufacturing process will have a greater effect on the remaining uncut length; when the perforation is longer, the same variations exist, but proportionally the effect on the remaining uncut web is much less, so that the detaching strength is more consistent and reliable. It is also more difficult to cut smaller perforations in some materials, such as thicker materials or those with a number of plies. Preferably, therefore, the perforation width is greater than 1mm.

Furthermore, the tendency of a web having shorter uncut portions to rip during manufacture is greater compared to a web having the same detaching strength but longer uncut portions. This is because the individual remaining portions of uncut web are weaker, and therefore any variation in the tension across the web during manufacture can cause the end uncut portion to tear, resulting in the web "unzipping" across its width. This is undesirable during manufacture. Consequently, webs with low detaching strengths and smaller uncut portions are more difficult to manufacture.

Preferably the bond ratio is about 1:5 (20%) or less. More preferably the bond ratio is about 1:10 (10%) or less. Still more preferably, the bond ratio is about 1:20 (5%) or less. Even more preferably, the bond ratio is about 1:30 (3.33%) or less.

This ratio will clearly be the same as the ratio of the strength of the line of weakness to that of the material itself; if there is a 10% perforation, the sheet detaching strength will be 10% of the material tensile strength. However, if the material strength approaches the perforation strength, the risk of the web shredding at the aperture and not detaching into single sheets is greater. Preferably therefore this ratio is less than 20%.

Preferably, each web has less than about 15 perforations per 10cm width of the roll, more preferably less than about 10 perforations per 10cm and still more preferably less than about 5 perforations per 10cm.

One preferred perforation configuration which the applicants have found to work satisfactorily in practice is a bond ratio of 10% and a perforation width of 18mm, making the uncut web width 2mm. However any suitable perforation configuration which will achieve the desired detaching strength is envisaged.

It is envisaged that any suitable amount of offset may be used for the webs. The offset can be expressed

in terms of a ratio of percentages; the ratio must total 100 because if the offset is uneven, one sheet will have more than half of its length presented whereas the next sheet will have correspondingly less than half its length presented, the sum of both lengths totalling the whole length of one sheet. Preferably, the offset ratio is less than about 70/30, and more preferably the ratio is less than about 60/40. The optimum offset is about 50/50, with each sheet being presented an amount equal to that of the previous and the subsequent sheets. However, any offset in the range between 50/50 and 70/30 has been found to work adequately.

If there is an uneven offset present, it is preferable that the outer web projects more once a sheet has been detached from the inner web than the inner web projects when a sheet has been detached from the outer web. When the outer web is pulled from the roll, it will almost certainly pull the inner one with it because of the way the webs are wound up. Conversely, when the inner web is pulled, the certainty that the outer web will be pulled out is less because the inner web does not surround the outer web; more reliance is placed on the friction between the two webs to pull the outer web out. Therefore, it is preferable that the outer web projects by a greater amount than the inner web each time so that there is more chance that the outer web will be drawn down with the inner web.

The webs may be single-ply or may consist of more than one ply. The size and nature of the aperture to achieve a satisfactory frictional force will then depend on the physical dimensions of the roll and also the thickness of the webs.

The present invention will have applications in many fields. For example, the centre-feed roll of the present invention may be used for sanitary applications such as hand towels and wipes, impregnated wipes, toilet tissue, kitchen towel and facial tissues, but may also

be used in other applications where a single-sheet dispensing system is advantageous. For example, other applications may be dispensers for foil or cling-film, nappy liners, bags such as those found in supermarkets, etc.

The present invention is suitable for any type of material which can be formed into a web, perforated and rolled. For example, the web may be formed from paper, nonwoven or film, and may be natural or synthetic. Because there is less waste with the present invention (individual sheets are dispensed singly and cleanly, and do not rope), the invention can also be applied to dispense more costly materials which have not previously been dispensed from a centre-feed roll. Examples of more expensive materials which can be dispensed in this system are Hydroknit® (a hydraulically entangled nonwoven fabric having high strength and abrasion resistance manufactured by the applicants), Kimtex® (a synthetic thermoplastic fibre fabric for use in industry and other areas, also manufactured by the applicants), and medical sheet having a polyethylene baffle with pulp fluff on one surface for use in operating theatres.

The present invention is also suitable to provide double-sized sheets from a roll whose width is half the sheet width. This is achieved by folding both webs in half along their length (i.e. in the machine direction) before the roll is wound up. Perforation can be carried out either before or after the webs are folded. When a sheet is dispensed, it will be folded in half and can be unfolded to provide a double-width sheet. Triple-sized sheets or larger can also be provided in a similar way.

The centre-feed roll according to the invention can be manufactured by winding up two webs having lines of weakness such as perforations which have the required offset. This offset may be achieved by feeding each unperforated web into offset perforators before they are combined to form the roll. Alternatively, the two webs

can be brought together first and then fed to a single perforator where they are perforated simultaneously. To achieve the offset, the webs are then separated and one web made to travel a further distance than the other before they are again united and wound into a roll. This latter method has the advantage that only one perforator is needed, thus simplifying and reducing the cost of the manufacturing process.

According to another aspect, the invention provides a centre-feed roll dispensing system comprising:

a centre-feed roll formed from two webs each having lines of weakness to allow the web to be separated into a plurality of sheets, the lines of weakness of one web being offset from those of the other such that in use the sheets can be dispensed singly from alternate webs; and

a dispenser for supporting the roll and having an aperture therein through which the webs can pass from the inner surface of the roll, the perforation strength in each web being selected such that the web can be withdrawn from the centre of the roll but is broken as a result of the resistance provided adjacent or within the aperture.

It is envisaged that the centre-feed roll will dispense with its axis in any orientation, however the axis is preferably vertical such that the webs are dispensed from either the top end or the bottom end of the roll. Preferably, the webs are dispensed from bottom end of the roll as this allows the webs to hang down and be more readily grippable.

It is envisaged that the aperture in the dispenser may simply be a hole. As discussed above, serrations are not required around the aperture because it will not be necessary to rip the web to detach a sheet. The size of the aperture will depend on the material characteristics of the webs. The important criterion is that a frictional force is present between the web being

pulled and the aperture which is sufficient to break the line of weakness or perforations in the web when the force is transmitted across the line of weakness. This removes the need for the user to separate physically the sheet from the web.

Therefore, the necessary frictional force and consequently the size of the aperture will depend partly on the strength of the perforations. The stronger the perforations, the smaller the aperture is needed, however this can lead to ripping and creasing of the towel. Therefore for the best performance, the perforations are preferably made as weak as possible such that the aperture can be made larger. As discussed above, the size of the aperture will also depend on the physical dimensions of the web and the individual sheets, such as thickness, flexibility and width.

While it is anticipated that the centre-feed roll of the present invention will work with existing dispensers, the applicants have developed a novel base and aperture which complements the centre-feed roll operation.

This is a new departure, and according to a further aspect, the invention provides a base for use with a centre-feed roll formed from one or more webs each having lines of weakness which allow the web to be separated into a plurality of sheets, wherein the base is provided with a rim extending around an aperture, which rim projects into the centre of the roll in use, whereby the web may pass through the aperture from the inner surface of the roll.

It is envisaged that the rim of the base projecting into the centre of the roll may have any suitable cross-section such as circular, elliptical or polygonal. Preferably, the cross-section is circular, and the rim which projects into the roll is a truncated cone with its narrower section furthest from the base.

Preferably, the centre-feed roll is formed as

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described above from two webs, the lines of weakness of one web being offset from those of the other such that in use the sheets can be dispensed singly from alternate webs.

Thus, this aperture design still permits the single sheet dispensing operation when used with the two-web offset perforation centre-feed roll as described above, however it also has the advantage over a conventional aperture such as a hole formed in the dispenser that lower dispensing forces are needed. The base provides a rim on the upper edge of which the perforations tend to separate sequentially across the width of the web ("zipping") and not simultaneously ("bursting") as would happen with a two-dimensional aperture. As the web is pulled out, one edge of the web drags across the upper edge of the rim around the aperture, and the force with which the web is being withdrawn is concentrated at this point. Therefore, once a line of weakness arrives at the rim, the concentrated force causes the perforations to tear sequentially from that point across the web to the other side. In this way, the dispensing force is reduced as the user does not break all the perforations across the web simultaneously. In practice the tear strength of the perforations can advantageously be increased relative to the dispensing force "felt" by the user since there is a more effective severing action. This has manufacturing advantages.

Incidentally, lines of weakness which are not perpendicular to the edge of the web but are disposed at some other angle can also exhibit "zipping" rather than "bursting" tendencies when dispensed through a conventional planar aperture, realising similar advantages to those achieved with the new aperture design.

It is not necessary for the aperture to be part of the dispenser. For example, the base could be formed as an insert in the end of the roll; the roll plus base

could then be inserted into a conventional dispenser. Alternatively, the base design could be provided as an insert to modify existing dispensers, or it could be incorporated into the dispenser itself.

With a conventional base and aperture which lie adjacent one end of the roll and not inside the centre of the roll, the size of the aperture must be controlled depending on the perforation strength and material dimensions to provide sufficient friction force to achieve bursting. As a result, the sheet can sometimes emerge creased, in a rope or even ripped along its length. It has also been found that this new type of aperture, and in particular the truncated cone shape, can also unravel the sheet to some extent so that the sheet is not in as much of a "rope" as with a conventional aperture.

The advantage of being able to use webs with a higher perforation strength is that less dependency is placed on the manufacturing process limitations; as discussed above, very low perforation strengths are difficult to achieve.

Another advantage of this type of aperture is that a pocket is provided on the external side of the aperture which is a suitable chamber in which to put a seal, such as a resealable cap, which may be useful when the invention is being used to dispense impregnated wipes. The seal will prevent the wipes from drying out and will ensure that the next wipe to be dispensed will still be moist.

The base can be formed from any suitable material such as metal, plastic or card.

According to a fourth aspect, the invention provides a centre-feed roll dispensing system comprising:

a centre-feed roll formed from at least one web having lines of weakness to allow the web to be separated into a plurality of sheets; and

a dispenser for supporting the roll and having a base therein which is provided with a rim extending around an aperture, which rim projects into the centre of the roll in use, the web passing through the aperture from the inner surface of the roll, the perforation strength in the or each web being selected such that the web can be withdrawn from the centre of the roll but is broken as a result of the resistance provided adjacent or within the aperture.

Embodiments of the invention will now be described by way of example only and with reference to the accompanying drawings, in which:

Fig. 1 shows a plan view of a centre-feed roll according to the present invention;

Fig. 2 shows a perspective view of the centre-feed roll of Fig. 1 in use in a dispenser;

Fig. 3A shows in perspective a base according to another aspect of the invention suitable for use with the centre-feed roll of the invention;

Fig. 3B shows the base and centre-feed roll of the invention in use; and

Fig. 4 shows in elevation apparatus for manufacturing the centre-feed roll of the invention.

Fig. 1 shows a centre-feed roll or barrel roll 1 according to the invention. The roll has been unwound slightly from its outer surface to show the offset perforation arrangement. It should be understood that in use, the webs will be fed out from the inner surface, and the webs on the outer surface will usually be secured to one another so that the roll does not unwind as shown in the figure.

The roll comprises an inner web 2 and an outer web 3 each having perforations 4 which allow individual sheets 5 to be detached from the webs. The individual sheets have a length X. The roll is made from paper and is suitable for use as a hand towel or other wiper.

The offset of the perforations is shown as length Y, and in this embodiment has an offset of 50/50.

Fig. 2 shows the roll 1 in use in a dispenser 6. The dispenser is shown in outline only for simplicity of the figure. Inner and outer webs 2 and 3 are fed through aperture 7 of the dispenser, and due to the offset perforations, sheet 8 of inner web 2 protrudes from the dispenser further than sheet 9 of outer web 3. When a sheet is to be dispensed, the user will grip sheet 8 and pull downwards until the friction force between the inner web 2 and the rim of aperture 7 passes across perforations 10. Sheet 8 will then detach leaving the end of the next sheet 11 of the inner web at the aperture 7. While the inner web is being pulled, outer web 3 is simultaneously moved downwards by virtue of it being wound with the inner web, and by the time sheet 8 has become detached, sheet 9 will be protruding from the dispenser by a similar amount to sheet 8 as shown in the diagram. Thus, sheets are presented from alternate webs.

Kimberly-Clark Europe standard test procedure number KCN-060 can be used to test the detaching strength of the line of perforations. This test uses an Instron Universal Testing Instrument to simulate a detaching action between two adjacent sheets of the perforated product. For a 200mm wide roll, the sheets are folded into thirds along the machine direction and placed in the 3 inch (76mm) jaws of the Instron instrument before the test is begun. The jaws initially have a gap of 102 ± 2mm, and the top jaw is moved upwards at a constant rate of 250mm/min away from the bottom jaw until the perforations are broken. Total energy (kg/mm), peak load (g), percentage stretch at peak (%) and total stretch as a percentage (%) can be measured.

The material tensile strength can also be measured in this way, using an unperforated sample, in the chosen

direction (normally the machine direction). In practice a 50mm wide sample is tested, and the result multiplied by 4 to obtain the tensile strength for a 200mm wide roll.

Fig. 3A shows a base 12 according to another aspect of the invention. The base consists of a circular plate 13 having a rim 14 in the form of a hollow truncated cone in the middle. In use, as shown in Fig. 3B, the base is placed adjacent one end of the barrel roll 1 with the rim projecting into the centre void of the roll. Webs 2 and 3 pass through aperture 14, and upper edge 15 of the rim provides an edge on which the perforations separate sequentially across the width of the web.

Apparatus suitable for manufacturing the centre-feed roll of the present invention is shown in Fig. 4. Two base rolls 16 on unwinding stands supply inner and outer webs 17 and 18 which are brought together and fed to a single perforator 19 where the perforations 20 are applied to the webs simultaneously. In order to provide the webs with the necessary offset before the centre-feed roll is wound, the outer web 18 is made to travel a further path than inner web 17 by passing it around roller 21. The position of the roller can be adjusted in a direction perpendicular to the direction of travel of the webs such that the degree of offset can be adjusted for different products. Once the perforations have been offset, the two webs are wound into roll 22.

Claims:

1. A centre-feed roll formed from two webs each having lines of weakness which allow the web to be separated into a plurality of sheets, the lines of weakness of one web being offset from those of the other such that in use the sheets can be dispensed singly from alternate webs.

2. The centre-feed roll of claim 1 wherein the force required to detach a sheet from the web is less than about 3000g.

3. The centre-feed roll of claim 1 wherein the force required to detach a sheet from the web is less than about 800g.

4. The centre-feed roll of any preceding claim wherein the lines of weakness are in the form of perforations.

5. The centre-feed roll of claim 4 wherein the perforation width is greater than 1mm.

6. The centre-feed roll of claim 4 or 5 wherein the bond ratio is about 1:5 or less.

7. The centre-feed roll of claim 4 or 5 wherein the bond ratio is about 1:10 or less.

8. The centre-feed roll of claim 4 or 5 wherein the bond ratio is about 1:20 or less.

9. The centre-feed roll of claim 4 or 5 wherein the bond ratio is about 1:30 or less.

10. The centre-feed roll of any of claims 4 to 9

wherein each web has less than about 15 perforations per 10cm width of the roll.

11. The centre-feed roll of any of claims 4 to 9 wherein each web has less than about 10 perforations per 10cm width of the roll.

12. The centre-feed roll of any of claims 4 to 9 wherein each web has less than about 5 perforations per 10cm width of the roll.

13. The centre-feed roll of any preceding claim wherein the ratio of the line of weakness strength to the web tensile strength is less than about 1:5.

14. The centre-feed roll of any preceding claim wherein the offset ratio of the perforations of one web to those of the other web is less than about 70/30.

15. The centre-feed roll of any preceding claim wherein the offset ratio is less than about 60/40.

16. The centre-feed roll of any preceding claim wherein the offset ratio is about 50/50, such that each sheet is presented an amount equal to that of the previous and the subsequent sheets.

17. The centre-feed roll of any preceding claim wherein the web is formed from paper, nonwoven or film.

18. A centre-feed roll dispensing system comprising:

a centre-feed roll formed from two webs each having lines of weakness to allow the web to be separated into a plurality of sheets, the lines of weakness of one web being offset from those of the other such that in use the sheets can be dispensed singly from alternate webs; and

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a dispenser for supporting the roll and having an aperture therein through which the webs can pass from the inner surface of the roll, the perforation strength in each web being selected such that the web can be withdrawn from the centre of the roll but is broken as a result of the resistance provided adjacent or within the aperture.

19. The centre-feed roll dispensing system of claim 18 wherein the axis of the roll is vertical.

20. The centre-feed roll dispensing system of claim 19 wherein the webs are dispensed from bottom end of the roll.

21. A base for use with a centre-feed roll formed from one or more webs each having lines of weakness which allow the web to be separated into a plurality of sheets, wherein the base is provided with a rim extending around an aperture, which rim projects into the centre of the roll in use, whereby the web may pass through the aperture from the inner surface of the roll.

22. The base of claim 21 wherein the cross-section of the rim is circular.

23. The base of claim 21 wherein the rim is a truncated cone with its narrower section furthest from the base.

24. The base of claim 21, 22 or 23 wherein the centre-feed roll is formed from two webs, the lines of weakness of one web being offset from those of the other such that in use the sheets can be dispensed through the aperture singly from alternate webs.

25. The base of any of claims 21 to 24 wherein the base is formed as an insert in the end of the roll.

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26. The base of any of claims 21 to 25 wherein the base is provided as an insert to modify existing dispensers.

27. The base of any of claims 21 to 26 wherein the base is formed from plastic or card.

28. A dispenser including a base as claimed in any of claims 21 to 27.

29. A centre-feed roll dispensing system comprising:

a centre-feed roll formed from at least one web having lines of weakness to allow the web to be separated into a plurality of sheets; and

a dispenser for supporting the roll and having a base therein which is provided with a rim extending around an aperture, which rim projects into the centre of the roll in use, the or each web passing through the aperture from the inner surface of the roll, the perforation strength in the or each web being selected such that the web can be withdrawn from the centre of the roll but is broken as a result of the resistance provided adjacent or within the aperture.

30. The centre-feed roll dispensing system of claim 29 wherein the centre-feed roll is as claimed in any of claims 1 to 18.

* C L M S *

THIS SHEET HAS BEEN REPLACED