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**Crerar**(10) **Pub. No.: US 2007/0257427 A1**(43) **Pub. Date: Nov. 8, 2007**(54) **STACKER WHEEL****Publication Classification**(75) Inventor: **Roy A. Crerar**, Edinburgh (GB)(51) **Int. Cl.**  
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**DAYTON, OH 45479-0001 (US)**(73) Assignee: **NCR Corporation**(21) Appl. No.: **11/305,754**(22) Filed: **Dec. 16, 2005**(57) **ABSTRACT**

The invention relates to a stacker wheel for handling media, suitable for use in a media dispenser within an automated teller machine. The stacker wheel comprises a plurality of curved tines attached to a central hub. Each curved tine has a thickness that reduces with increased distance from the central hub over substantially the whole length of the tine, such that the spacing between adjacent tines increases with increased distance from the central hub over substantially the whole length of the tine.

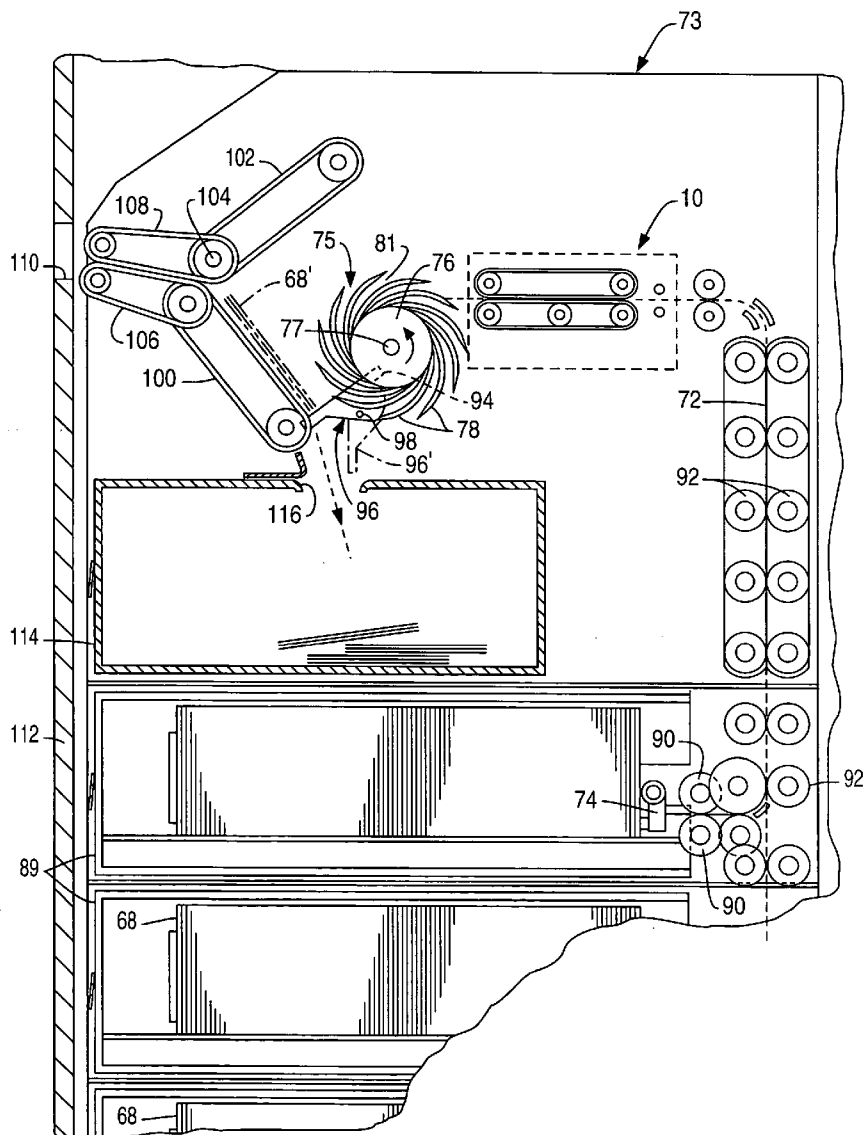
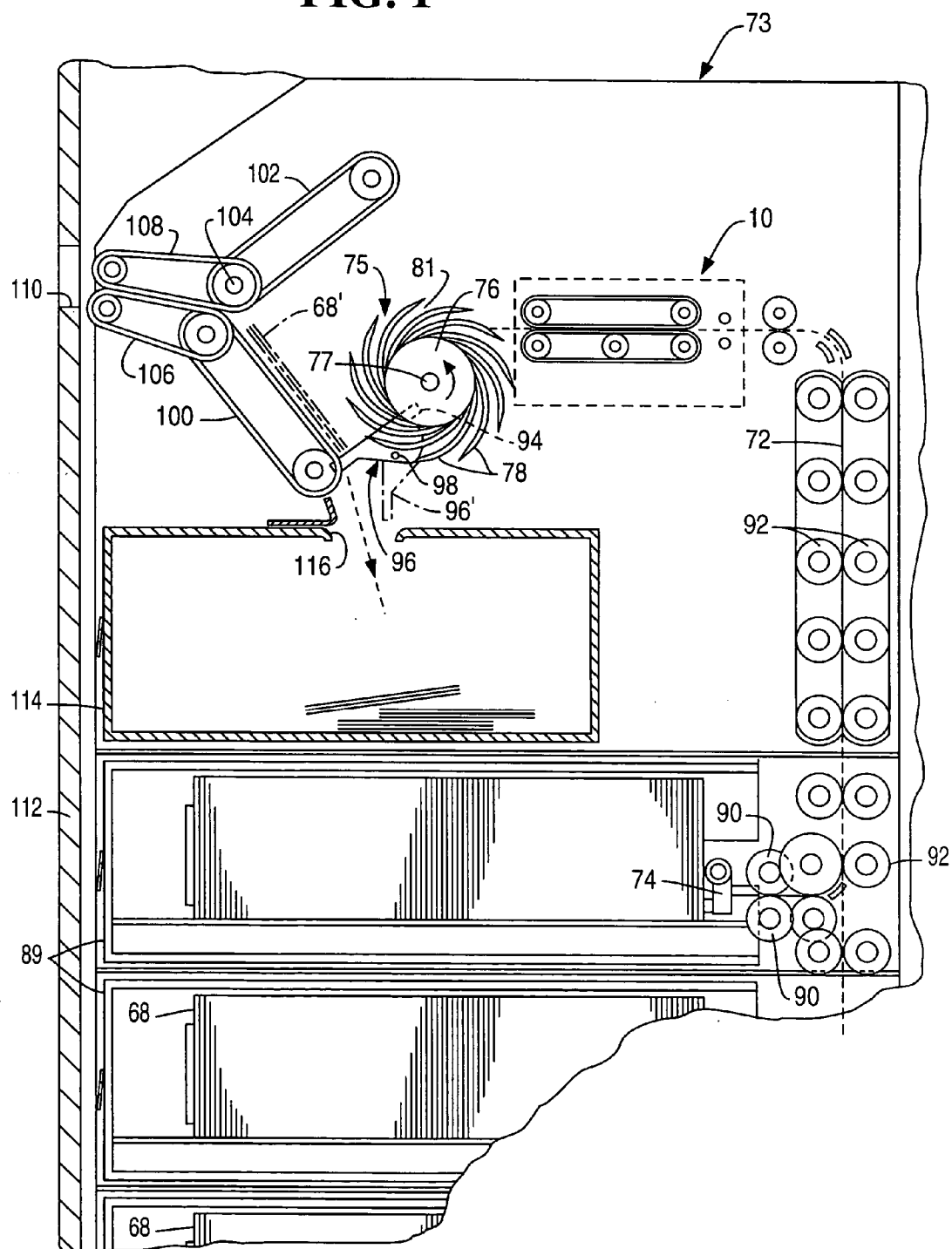
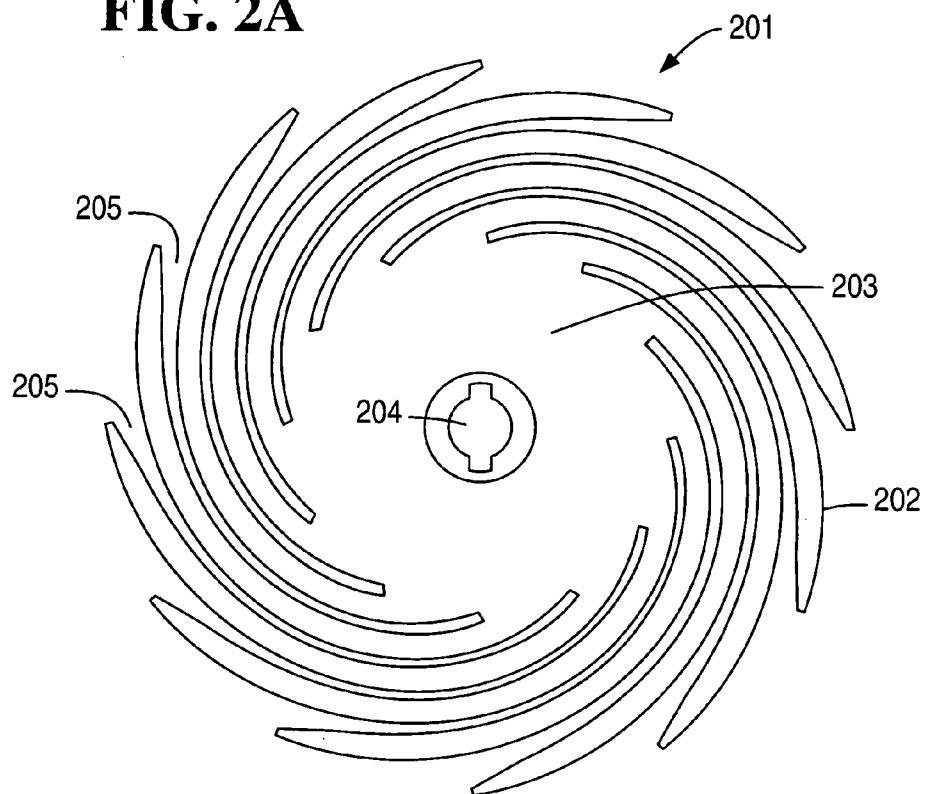


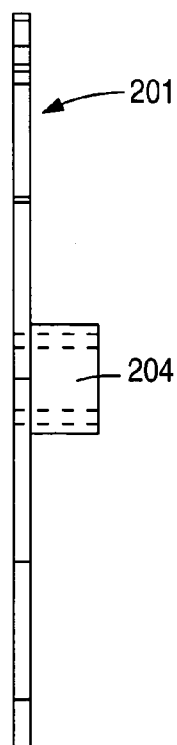
FIG. 1

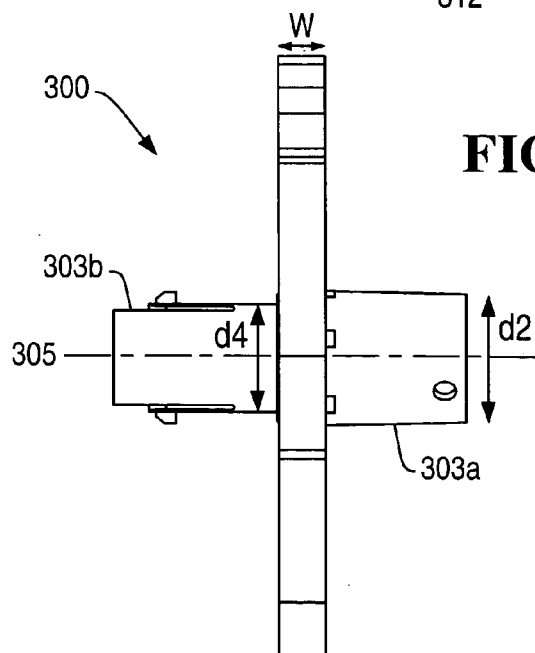
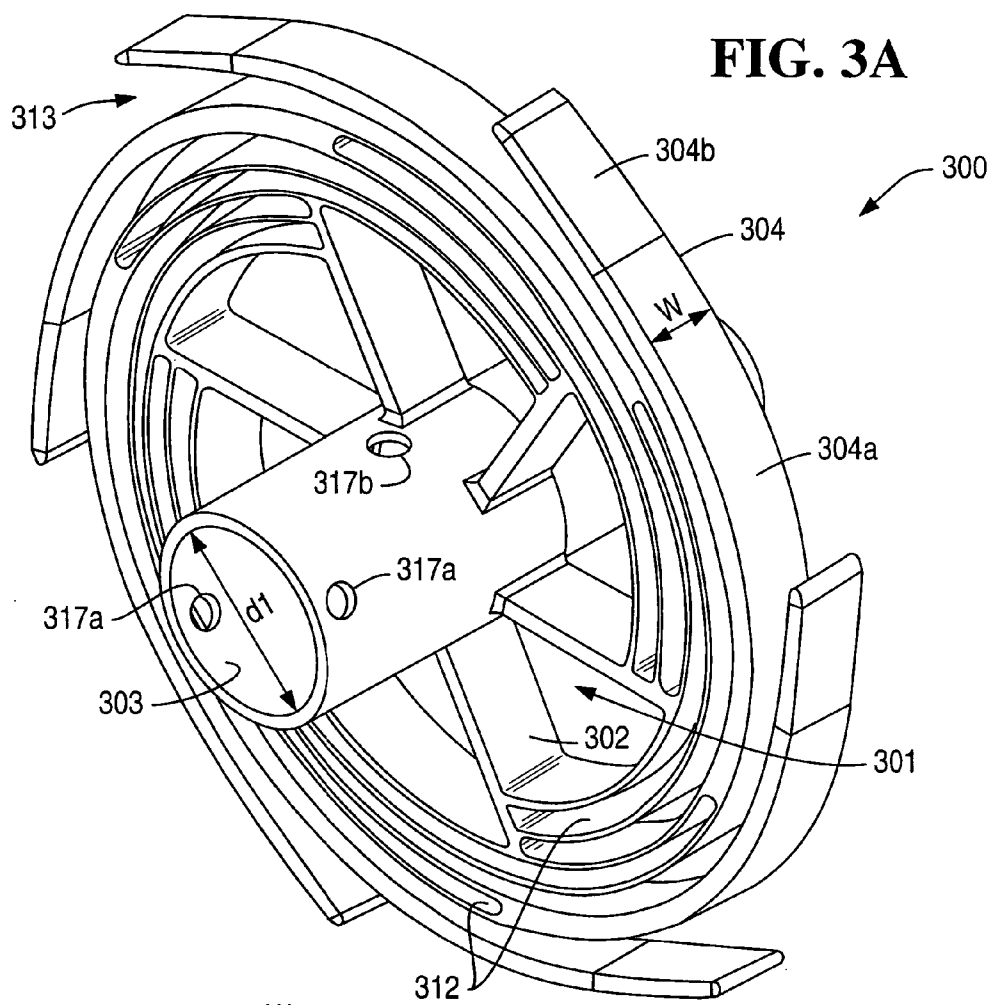


**FIG. 2A**



**FIG. 2B**





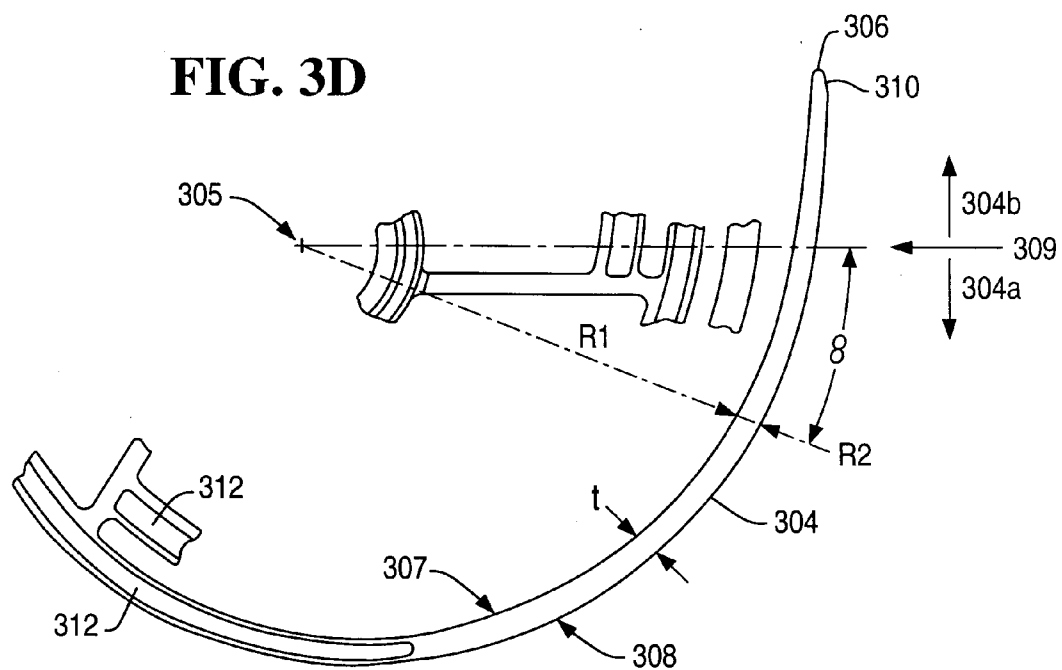
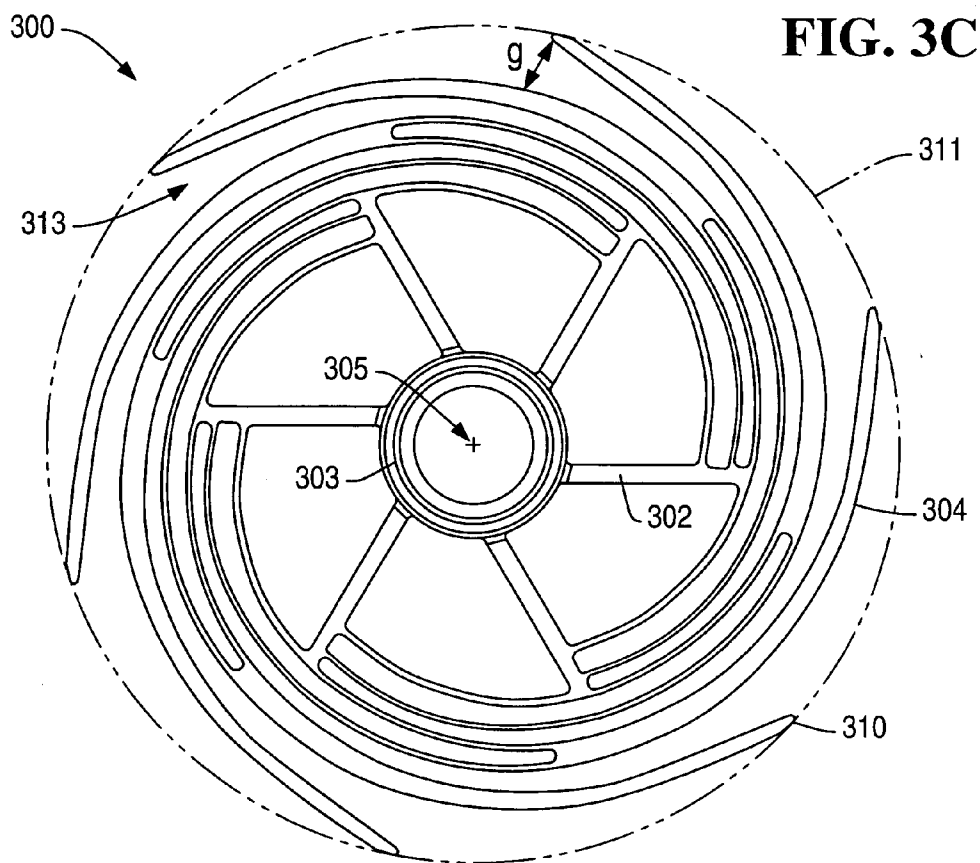
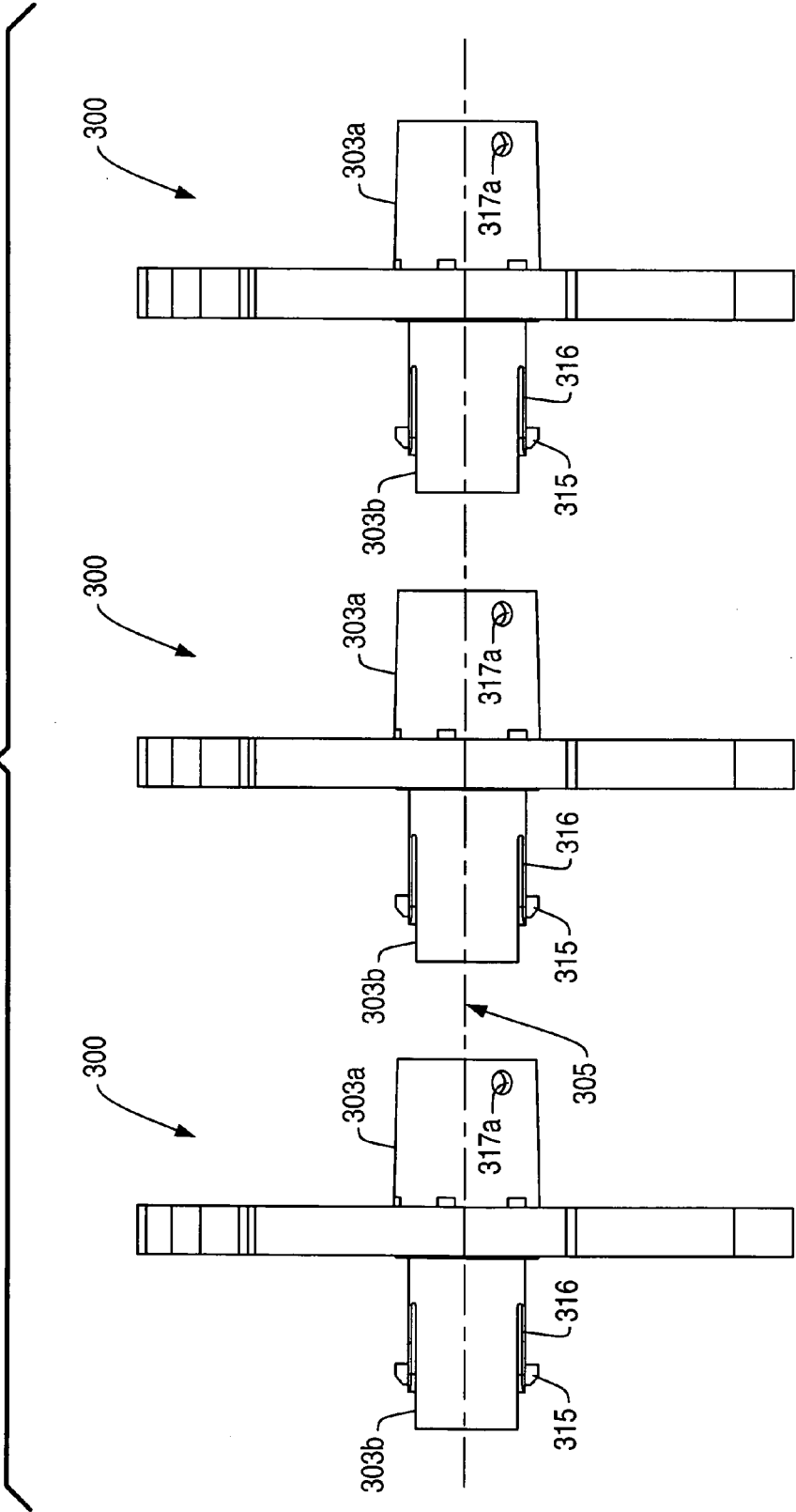
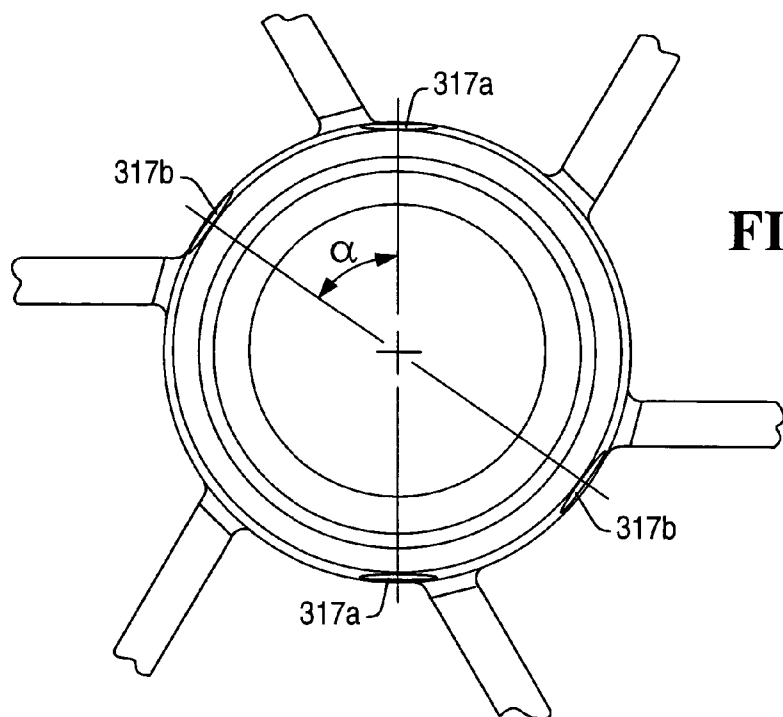


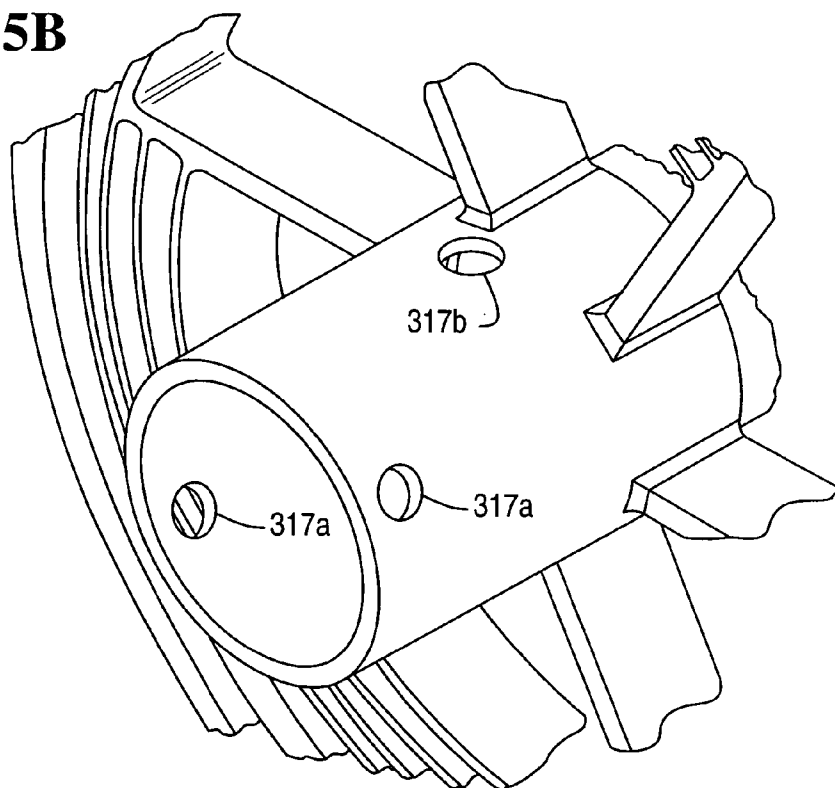
FIG. 4



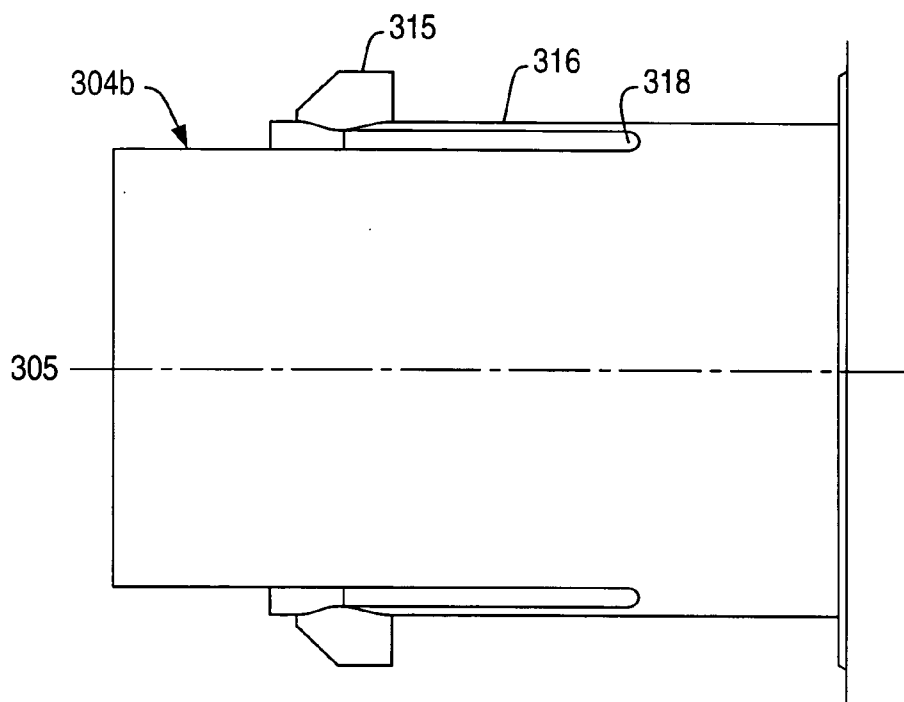


**FIG. 5A**

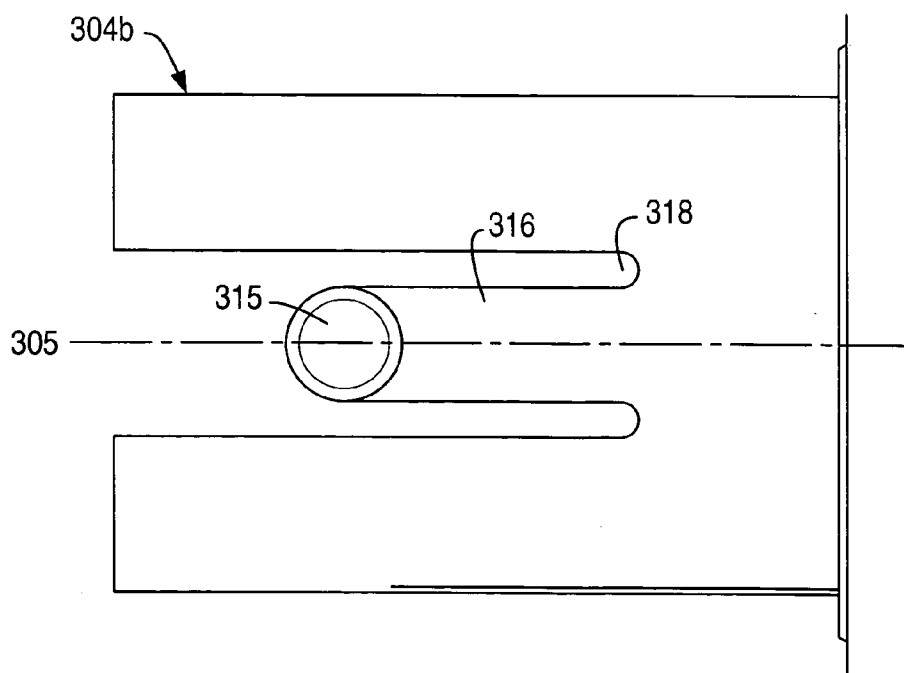
**FIG. 5B**



**FIG. 6A**



**FIG. 6B**





## STACKER WHEEL

[0001] The present invention relates to an improved stacker wheel. It is particularly related to, but in no way limited to, stacker wheels for handling media in an automated teller machine (ATM).

## BACKGROUND OF THE INVENTION

[0002] Stacker (or stacking) wheels are commonly used in automated teller machines (ATMs) to stack multiple currency notes prior to dispensing the stack of notes to a user of the ATM. The operation of a stacker wheel can be described with reference to FIG. 1 which shows a schematic side elevation view of a cash dispenser unit 73 of an ATM. The cash dispenser unit 73 includes a stacker wheel assembly 75. The stacker wheel assembly 75 comprises a plurality of stacker wheels 76 spaced apart in a parallel relationship along a shaft 77, each stacker wheel 76 having a plurality of curved tines 78.

[0003] The cash dispenser unit 73 holds a number of currency cassettes 89 each holding a stack of currency notes 68. When one or more notes are to be dispensed from a particular cassette, the pick mechanism 74 associated with the cassette draws a note from the cassette such that its leading edge is gripped between drive rollers 90. The note is then fed along the feed path 72 by further drive rollers 92, through a retard mechanism 10 to the stacker wheel assembly 75. In operation, the stacker wheel assembly 75 rotates continuously in a counter-clockwise direction (for the arrangement shown in FIG. 1) and the note is fed into a compartment 81 formed between adjacent tines 78. If more than one note is to be dispensed, each note is fed into a successive compartment 81 as the stacker wheel assembly 75 rotates. Having completed half a rotation, the note is removed from the stacker wheel assembly 75 by fingers 94 of a stripper plate assembly 96 pivotally mounted on a shaft 98. Once removed from the stacker wheel, the note is placed on a belt 100 resting against the stripper plate assembly 96 and any subsequent notes which are to be dispensed simultaneously with the first note are placed on top of the first note to form a bundle 68'. When the required amount of notes (which may be just one note) have been assembled into the bundle 68', a pair of belts 102 (only one of which is shown in FIG. 1) is rotated on a shaft 104 such that the bundle 68' is trapped between the belts 100, 102. The bundle is then fed between belts 100, 102, 106, 108 through a note exit slot 110 in the housing 112 of the cash dispenser unit 73 to a position where the bundle 68' can be collected by the user of the ATM. If a multiple feeding is detected in the course of stacking the bundle of notes 68' or one or more of the notes is rejected for any reason, the bundle is not fed to the note exit slot 110. Instead the stripper plate assembly 96 is pivoted into a position as shown by the dashed outline 96' and the belts 100, 102 are operated in the reverse direction to deposit the bundle 68' into a reject note container 114 via an opening 116.

[0004] FIGS. 2A and 2B show more detailed diagrams of a stacker wheel 201 comprising a plurality of curved tines 202 on a central hub 203. At the centre of the hub 203 is an aperture 204 that enables the stacker wheel 201 to be mounted on a metal shaft (not shown). Currency notes can be held by the stacker wheel in compartments 205 formed between adjacent tines. The width of the stacker wheel is very narrow (2.54 mm) compared to the diameter of the wheel (101.60 mm).

[0005] When a currency note is fed into a compartment 81, 205 between adjacent tines, the note is deformed into a curved shape such that it follows the shape of the compartment. Although currency notes are quite easily deformed, if thicker and/or stiffer media such as train tickets are to be dispensed, large stresses are exerted on the media which may result in damage to the media (e.g. scoring, creasing etc).

## SUMMARY OF THE INVENTION

[0006] The invention seeks to provide an improved stacker wheel that mitigates problems of known stacker wheels.

[0007] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

[0008] A first aspect provides a stacker wheel comprising a plurality of curved tines attached to a central hub, wherein each curved tine has a thickness which reduces with increased distance from the central hub over substantially the whole length of the tine, such that the spacing between adjacent tines increases with increased distance from the central hub over substantially the whole length of the tine.

[0009] Advantageously, as a result of the tapering thickness of each tine, the tines are flexible.

[0010] Further advantageously, this provides a larger opening to the spaces between adjacent tines, which makes insertion of media into these spaces easier.

[0011] Further advantageously, this allows media inserted into the spacing between adjacent tines to flatten itself out between the tines and find its own level. This minimizes the stress on the media and enables the stacker wheel to hold media gently with minimal deformation.

[0012] Preferably each curved tine comprises a curved portion attached at one end to the central hub and a straight portion attached to the other end of the curved portion.

[0013] Advantageously, this increases further the opening to the spaces between adjacent tines, which facilitates insertion of media into these spaces.

[0014] Preferably each curved tine has an inner surface and an outer surface, and wherein the outer surface of the straight portion is tangential to the curvature of the outer surface of the curved portion.

[0015] Preferably the diameter of the stacker wheel is 95 mm and the length of the straight portion is less than 20 mm.

[0016] Preferably the length of the straight portion is 15.5 mm.

[0017] Preferably the central hub comprises an axle.

[0018] Preferably the central hub further comprises a plurality of spokes attached to the axle.

[0019] Advantageously, this reduces the weight of the stacker wheel and makes it easier to manufacture.

[0020] Preferably the axle comprises alignment and connection features such that in use a plurality of similar stacker wheels can be connected together.

[0021] Advantageously, this simplifies the process of assembling a stacker wheel assembly from a plurality of similar stacker wheels.

[0022] Preferably the axle comprises a first portion extending parallel to an axis of rotation of the axle from one side of the central hub and a second portion extending parallel to the axis of rotation of the axle from the other side of the central hub, and wherein the alignment and connection features are provided on the first and second portions.

[0023] Preferably the alignment and connection features comprise a plurality of holes in the first portion and a plurality of lugs on the second portion such that at least two of the plurality of lugs are arranged to inter-engage in use with at least two of the plurality of holes on a similar stacker wheel.

[0024] Preferably each curved tine has a width of 7 mm.

[0025] Advantageously, the wide surfaces of the tine reduce the risk of damaging the media by contact with narrow edges and/or surfaces, whilst also providing a structure which is robust and can be easily manufactured.

[0026] Preferably each curved tine is provided with grooves in both sides of at least part of the tine.

[0027] Advantageously this makes the stacker wheel easier to manufacture.

[0028] Preferably the stacker wheel comprises 6 tines.

[0029] A second aspect provides a stacker wheel assembly comprising a plurality of stacker wheels as described above.

[0030] Preferably the stacker wheel assembly comprises 4 stacker wheels.

[0031] A third aspect provides a media dispenser including a stacker wheel as described above.

[0032] A fourth aspect provides an automated teller machine including a stacker wheel as described above.

[0033] A fifth aspect provides a stacker wheel substantially as described with reference to FIGS. 3A-3D, 5A, 5B, 6A and 6D of the drawings.

[0034] A sixth aspect provides a stacker wheel assembly substantially as described with reference to FIG. 4 of the drawings.

[0035] The preferred features may be combined as appropriate, as would be apparent to a skilled person, and may be combined with any of the aspects of the invention.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0036] These and other aspects of the invention will be apparent from the following specific description, given by way of example, with reference to the accompanying drawings, in which:

[0037] FIG. 1 is a schematic side elevation view of a cash dispenser unit;

[0038] FIGS. 2A and 2B are detailed diagrams of a prior art stacker wheel;

[0039] FIGS. 3A-3D are detailed diagrams of an improved stacker wheel;

[0040] FIG. 4 is a schematic diagram showing the connection of multiple stacker wheels;

[0041] FIGS. 5A and 5B are detailed diagrams of a first portion of the axle of the stacker wheel shown in FIGS. 3A-3D; and

[0042] FIGS. 6A and 6B are detailed diagrams of a second portion of the axle of the stacker wheel shown in FIGS. 3A-3D.

[0043] Common reference numerals are used throughout the figures to indicate similar features.

#### DETAILED DESCRIPTION

[0044] FIGS. 3A-3D are detailed diagrams of an example of an improved stacker wheel 300 for use in a media dispenser, for example as part of an automated teller machine (ATM). The improved stacker wheel 300 is capable of handling many different types of media including, but not limited to currency notes, tickets (e.g. train tickets), credit/debit cards and mobile phone top-up cards.

[0045] The wheel 300 has a central web-like hub 301 comprising a plurality of spokes 302 attached to an axle 303. Attached to the spokes 302 of the web-like hub 301 are a plurality of curved tines 304 (six tines in the example shown in FIGS. 3A-3D). Although the hub is shown in FIGS. 3A-3D as being web-like, it could alternatively be disk-like (i.e. a solid planar disk rather than discrete spokes). In use the stacker wheel 300 rotates about an axis of rotation 305 central to the axle 303.

[0046] The axle 303 is substantially cylindrical in shape and comprises a first portion 303a extending parallel to the axis of rotation 305 from one side of the stacker wheel, and a second portion 303b extending parallel to the axis of rotation 305 from the opposite side of the stacker wheel. The structure of the axle is described in more detail below with reference to FIGS. 4, 5A, 5B, 6A and 6B.

[0047] Each tine 304 has a substantially uniform width, w, as shown in FIGS. 3A and 3B and in the example shown w=7.0 mm. The width of a tine is measured in a direction parallel to the axis of rotation 305 of the stacker wheel. A width of 7.0 mm is considered an optimum width because the wide surfaces of the tine reduce the risk of damaging the media by contact with narrow edges and/or surfaces, whilst also providing a structure which is robust and can be easily manufactured, (as w increases, it becomes harder to remove the structure from a mould).

[0048] The thickness of each tine, t, (see FIG. 3D) decreases towards the tip 306 of the tine, i.e. the thickness decreases with increasing distance from the central web-like hub 301. The thickness of each tine, t, is measured radially to the axis of rotation 305 of the stacker wheel. As a result of the tapering thickness of each tine, the gaps or compartments 313 formed between adjacent tines increase in thickness with increasing distance from the central hub 301. As a further result of the tapering thickness of each tine, the tines are flexible. The combination of the flexibility of the tines and the increasing thickness of the compartments 313 allows media inserted into a compartment to flatten itself out between the tines and find its own level. This minimizes the stress on the media and enables the stacker wheel to hold media gently with minimal deformation.

[0049] Each tine 304 is curved over at least a portion of its length and comprises a spiral portion 304a adjacent to the hub 301 which is connected at one end to a spoke 302. At the other end of the spiral portion 304a is an optional straight portion 304b which extends from the spiral portion 304a to the tip 306 of the tine. In an embodiment in which the tines do not comprise a straight portion, the spiral portion 304a extends from a spoke 302 to the tip 306.

[0050] In the spiral portion 304a, the inner surface 307 and the outer surface 308 of the tine are curved and follow uniform spirals. In the example shown, these spirals are defined by the following equations:

$$\text{Inner spiral formula: } R1=42-K1\theta \quad (\text{Equation 1})$$

$$\text{Outer spiral formula: } R2=44-K2\theta \quad (\text{Equation 2})$$

[0051] where:

$$[0052] \quad K1=0.0916667,$$

$$[0053] \quad K2=0.0791667,$$

$$[0054] \quad R1, R2 \text{ are measured in millimeters, and}$$

$$[0055] \quad \theta \text{ is the angle, measured about the axis of rotation, from the point 309 at the end of the spiral portion distant from the hub (see FIG. 3D).}$$

[0056] And therefore, as shown in FIG. 3D, the thickness of a tine is given by:

$$t=R2-R1 \quad (\text{Equation 3})$$

[0057] Example values are shown in the table below:

Angle, $\theta$	Inner Spiral Radius, R1 (mm)	Outer Spiral Radius, R2 (mm)
10°	41.083	43.208
20°	40.167	42.417
30°	39.250	41.625
40°	38.333	40.833
50°	37.417	40.042
60°	36.500	39.250
70°	35.583	38.458
80°	34.667	37.667
90°	33.750	36.875
10	31.917	36.083
11	—	35.292
12	—	34.500
13	—	33.708
14	—	32.917
15	—	32.125
16	—	31.333
17	—	30.542

[0058] As shown in FIG. 3C and detailed in the table above, due to the arrangement by which a tine 304 is connected to a spoke 302, the outer surface 308 of the tine extends through a much larger angle, (i.e. a larger range of values of  $\theta$ ), than the inner surface 307 of the tine.

[0059] The values of the constants in equations 1 and 2 ( $K1$ ,  $K2$ ) and the maximum radii (42, 44 mm respectively) may be varied according to the overall size of the stacker wheel and the type of media to be carried in the stacker wheel. The stacker wheel 300 in the example shown has a diameter of 95.0 mm and has been designed to be suitable for all media types. This diameter is considered to be of an optimum size because whilst a larger diameter wheel has an

advantage that media is deformed less, it also has the disadvantage that the overall size of the dispenser unit is increased.

[0060] In the straight portion 304b, the inner and outer surfaces of the tine 307, 308 are not curved but planar. The outer surface of the tine 308 in the straight portion is tangential to the curve of the outer surface at the end of the spiral portion 304a (at point 309). The inner surface of the tine 307 in the straight portion is not parallel to the outer surface 308 but instead is angled with respect to the outer surface such that the thickness of the tine in the straight portion 304b continues to taper towards the tip 306.

[0061] The length of the straight portion 304b in the example shown is 15.5 mm. The length of the straight portion, for a 95.0 mm diameter stacker wheel should preferably be less than 20.0 mm. This is because a longer straight portion interferes with the media being inserted into the compartment 313 which is formed by that tine and the adjacent tine in a counter-clockwise direction and can cause the media to be damaged or not enter the compartment correctly.

[0062] The tip of the tine 306 is angled such that the angled face 310 traces a circle (shown by a dotted line 311 in FIG. 3C) as the stacker wheel rotates. In operation, the stacker wheel in the orientation shown in FIGS. 3A, 3C and 3D would be rotated in a clockwise direction. The end of the tip 306 is not a sharp point but rounded. This is for ease of manufacture and to minimize damage to media should it be inadvertently struck by the tip of a tine.

[0063] In another embodiment, the tip 306 of the tine may be straight rather than angled (e.g. the tip may be formed perpendicular to one of the surfaces 307, 308 of the tine).

[0064] The stacker wheel 300 shown in FIGS. 3A-3D has 6 tines. This is by way of example only and the wheel could have more tines or fewer tines. Six tines is however, considered an optimum number for a stacker wheel of this size. Larger numbers of tines result in narrower openings, g, to the compartments 313 between tines, making it more difficult to correctly feed media into the stacker wheel, whilst a smaller number of tines requires the speed of rotation of the wheel to be increased for a fixed delivery rate of notes to the stacker wheel (e.g. 1 note every 200 ms).

[0065] The tines are shown in FIGS. 3A-3D as being evenly spaced (e.g. one starts every 60°), however, they could be irregularly spaced such that some compartments between adjacent tines are larger than other compartments and therefore are more suitable for handling very thick and/or inflexible media.

[0066] Although, as described above, the tines have substantially uniform width, w, the sides of the tines may be provided with grooves 312. Such grooves may be provided in the thicker parts of the tines, as shown in FIGS. 3A-3D. Grooves may, in addition or alternatively, be provided in other parts of the stacker wheel such as the spokes and the axle. These grooves are beneficial as they reduce the cross-section of the material which makes the wheel easier to manufacture by molding.

[0067] The stacker wheel is arranged such that a plurality of identical stacker wheels 300 can be connected together in a modular manner with a common axis of rotation 305, as

shown in FIG. 4. FIG. 4 shows 3 stacker wheels being connected together by way of example only. However, more commonly 4 wheels are connected together to form a stacker wheel assembly.

[0068] The first portion **303a** of the axle has an inner diameter **d1** (see FIG. 3A) and an outer diameter **d2** (see FIG. 3B), whilst the second portion **303b** has an inner diameter **d3** (not shown in the figures) and an outer diameter **d4** (see FIG. 3B). The second portion **303b** of a first stacker wheel can be inserted into the first portion **303a** of a second stacker wheel and therefore:

$$d4 \geq d1 \quad (\text{Equation 4})$$

[0069] Once the second portion **303b** of a first stacker wheel has been inserted into the first portion **303a** of a second stacker wheel, the two are aligned and connected together by means of co-operating lugs **315** and holes **317**, as shown in more detail in FIGS. 5A, 5B, 6A and 6B.

[0070] The first portion **303a** of a stacker wheel **300** has two pairs of holes **317a**, **317b**, as shown in FIGS. 5A and 5B. FIG. 5A is an enlarged view of a part of FIG. 3C and FIG. 5B is an enlarged view of a part of FIG. 3A. Each pair of holes comprises two holes arranged opposite each other (see FIG. 5A) and the second pair of holes **317b** is arranged at an angle  $\alpha$  to the first pair of holes (in this example  $\alpha=60^\circ$ ) and is closer to the spokes of the wheel (see FIG. 5B). The value of  $\alpha$  is preferably a multiple of the angle between the tines, where for uniformly spaced tines, the angle between the tines is given by:

$$\text{Angle between the tines} = 360^\circ/n \quad (\text{Equation 5})$$

[0071] where  $n$ =number of tines

[0072] In the example shown,  $n=6$  and therefore the angle between the tines is  $60^\circ$ .

[0073] The second portion **303b** of a stacker wheel has a pair of lugs **315** mounted on resilient members **316** as shown in FIGS. 6A and 6B. FIG. 6A is an enlarged view of a part of FIG. 3B and FIG. 6B shows the second portion **303b** rotated by  $90^\circ$  about the axis of rotation **305**. The members **316** are resilient due to the slots **318** in the second portion **303b** of the axle which define the width and length of the members **316**.

[0074] A first and a second stacker wheel **300** can therefore be connected together in one of two orientations. In a first orientation, the lugs **315** on a first stacker wheel are located in the first pair of holes **317a** in a second stacker wheel. In a second orientation, the lugs **315** on the first stacker wheel are located in the second pair of holes **317b** in the second stacker wheel. In the first orientation there is a larger spacing between stacker wheels than in the second orientation.

[0075] The stacker wheel **300** has two pairs of holes by way of example only. In another embodiment, a stacker wheel could have one pair of holes, giving only a single possible orientation and spacing of stacker wheels when formed into a stacker wheel assembly. Alternatively, a stacker wheel could be provided with more than two pairs of holes to provide a larger number of options for spacing and/or rotational alignment of stacker wheels once connected together. In another example, a stacker wheel could be provided with more than two lugs mounted on resilient members, and a corresponding increase in numbers of holes,

e.g. three lugs on the second portion of the axle **303b** and then corresponding numbers of holes on the first portion **303a** depending on the numbers of different connection positions.

[0076] As the connecting lugs **315** are mounted on resilient members **316**, it may be possible to separate the stacker wheels once connected and reconnect them as required. This has benefits should one or more wheels of a stacker wheel assembly require replacement.

[0077] As described above the lugs **315** and holes **317** provide a dual function as they both serve to align two stacker wheels and to connect them together. Lugs and holes are only one example of an aligning and connecting mechanism that can be used. In another embodiment, the inside of the first portion **303a** of the axle could be provided with a series of grooves and ridges running parallel to the axis of rotation. The outside of the second portion **303b** of the axle could be provided with a corresponding series of grooves and ridges such that the ridges on the second portion **303b** fit into the grooves inside a first portion **303a** of a second stacker wheel. If the fit between parts **303a** and **303b** is sufficiently tight, the ridges and grooves could provide both alignment and connection functions or alternatively a separate connection mechanism could be provided.

[0078] As described above, in an alternative embodiment separate features could be used for aligning stacker wheels and connecting the stacker wheels together. For example the external cross-section of the second portion **303b** could be non-circular (e.g. hexagonal, elliptical etc) and the internal cross-section of the first portion **303a** could be the same non-circular shape. Therefore the second portion **303b** of a first stacker wheel could still fit within a first portion **303a** of a second stacker wheel in such a manner that they are aligned. A separate connection mechanism (e.g. hole and locking pin) could be provided.

[0079] In another embodiment, a stacker wheel could be provided with identical first and second portions of the axle and a special connecting element used to join and align stacker wheels to form a stacker wheel assembly.

[0080] Although FIG. 4 and the above discussion relates to connecting identical stacker wheels together to form a stacker wheel assembly, in another embodiment, stacker wheels having compatible connection and alignment features but non-identical tine arrangement could be connected together. This may be beneficial in a large dispensing unit with two (or more) feed paths handling different media and where the stacker wheel assembly has two sections, one for receiving media from the first feed path and one for handling media received from the second feed path.

[0081] The stacker wheel **300** shown in FIGS. 3-6 is integrally formed from a plastic material by molding or other suitable manufacturing process. The stacker wheel could alternatively be cast in metal or formed from any other suitable material.

[0082] The integral formation of the tines **304**, lugs **315** and holes **317**, the alignment of tines of each stacker wheel in a stacker wheel assembly is guaranteed. Furthermore, the integral molding of the axle minimizes the numbers of piece parts, makes assembly of a stacker wheel assembly both simple and quick and eliminates problems such as wear and differential thermal expansion which can be caused by material mismatch.

[0083] Any range or device value given herein may be extended or altered without losing the effect sought, as will be apparent to the skilled person.

[0084] The steps of the methods described herein may be carried out in any suitable order, or simultaneously where appropriate.

[0085] It will be understood that the above description of a preferred embodiment is given by way of example only and that various modifications may be made by those skilled in the art.

What is claimed:

1. A stacker wheel comprising a plurality of curved tines attached to a central hub, wherein each curved tine has a thickness which reduces with increased distance from the central hub over substantially the whole length of the tine, such that the spacing between adjacent tines increases with increased distance from the central hub over substantially the whole length of the tine.

2. A stacker wheel as claimed in claim 1, wherein each curved tine comprises a curved portion attached at one end to the central hub and a straight portion attached to the other end of the curved portion.

3. A stacker wheel as claimed in claim 2, wherein each curved tine has an inner surface and an outer surface, and wherein the outer surface of the straight portion is tangential to the curvature of the outer surface of the curved portion.

4. A stacker wheel as claimed in claim 2, wherein the diameter of the stacker wheel is 95 mm and the length of the straight portion is less than 20 mm.

5. A stacker wheel as claimed in claim 4, wherein the length of the straight portion is 15.5 mm.

6. A stacker wheel as claimed in claim 1, wherein the central hub comprises an axle.

7. A stacker wheel as claimed in claim 6, wherein the central hub further comprises a plurality of spokes attached to the axle.

8. A stacker wheel as claimed in claim 6, wherein the axle comprises alignment and connection features such that in use a plurality of similar stacker wheels can be connected together.

9. A stacker wheel as claimed in claim 8, wherein the axle comprises a first portion extending parallel to an axis of rotation of the axle from one side of the central hub and a second portion extending parallel to the axis of rotation of the axle from the other side of the central hub, and wherein the alignment and connection features are provided on the first and second portions.

10. A stacker wheel as claimed in claim 9, wherein the alignment and connection features comprise a plurality of holes in the first portion and a plurality of lugs on the second portion such that at least two of the plurality of lugs are arranged to inter-engage in use with at least two of the plurality of holes on a similar stacker wheel.

11. A stacker wheel as claimed in claim 1, wherein each curved tine has a width of 7 mm.

12. A stacker wheel as claimed in claim 1, wherein each curved tine is provided with grooves in both sides of at least part of the tine.

13. A stacker wheel as claimed in claim 1, comprising 6 tines.

14. A media dispenser including a stacker wheel comprising a plurality of curved tines attached to a central hub, wherein each curved tine has a thickness which reduces with increased distance from the central hub over substantially the whole length of the tine, such that the spacing between adjacent tines increases with increased distance from the central hub over substantially the whole length of the tine.

15. An automated teller machine including a stacker wheel comprising a plurality of curved tines attached to a central hub, wherein each curved tine has a thickness which reduces with increased distance from the central hub over substantially the whole length of the tine, such that the spacing between adjacent tines increases with increased distance from the central hub over substantially the whole length of the tine.

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