AUSTRALIA
Patents Act 1990

PATENT REQUEST : STANDARD PATENT

The person identified below as the Applicant requests the grant of a patent to the person identified below as the nominated Person, for an invention described in the accompanying standard specification.

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Invention Title: A METHOD OF APPLYING A SUBSTANCE TO AN ARTICLE
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DIVISIONAL APPLICATION DETAILS

Original Appin No: 81308/91
Drawing number recommended to accompany the abstract: Fig. 4

DATED this 23rd day of November 1994

McNEIL-PPC, INC.
By their Patent Attorney

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A METHOD OF APPLYING A SUBSTANCE TO AN ARTICLE

1. A method of applying a flowable substance to an article, the method including the steps of:
   rotating a metering cylinder about a horizontal axis, the metering cylinder having on its outer surface a plurality of circumferentially spaced metering chambers adapted to receive a fixed quantity of the substance;
   feeding the flowable substance to a loading zone located above the cylinder so as to fill the metering chambers as these pass through the loading zone, each chamber containing a fixed quantity of the substance when exiting the loading zone;
   successively and individually extracting the fixed quantity of the substance from the metering chambers in a discharge zone located after the loading zone by means of negative pressure or suction;
   conveying the individually extracted quantity of substance to an application zone located above the article; and
   applying one or more of the individually extracted quantities of substance on a predetermined location on the article.
P/00/011
Regulation 3.2

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ORIGINAL
COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title: A METHOD OF APPLYING A SUBSTANCE TO AN ARTICLE

The following statement is a full description of this invention, including the best method of performing it known to us:

GH&CO REF: P20721-CK VNV:SY
This invention relates to a method of applying a flowable substance to an article. It relates also to an apparatus for applying such a substance to an article.

US patent 4,789,569 discloses a method of applying a substance to an article, which method comprises

rotating a plurality of circumferentially spaced metering chambers about an axis so that the chambers pass successively through a loading zone;

depositing a flowable substance in the chambers as they move through the loading zone so that each chamber contains a fixed quantity of the substance as it passes from the loading zone;

subsequently extracting the quantities of substance from the chambers in a discharge zone spaced from the loading zone, by means of negative pressure or suction; and

applying the extracted quantities of substance to an article.

US patent 4,789,569 also describes an apparatus for effecting the above method, in which the metering chambers are provided on a horizontal disc rotating about a vertical axis. Excess substance or material protruding from the chambers above the disc surface in the loading zone is removed by means of a scraper thereby providing the fixed or predetermined quantities of substance in the chambers.

DE-A1-1184976 discloses an apparatus for applying a substance to an article in which a plurality of chambers are provided on the outer surface of a cylindrical member rotating about a horizontal axis. The depositing of the substance onto the cylinder and in the chambers is effected by allowing the substance to flow under gravity from a bulk container through a feed conduit terminating in the loading zone above the cylinder.
Excess substance protruding from the chambers above the cylinder surface in the loading zone is then removed by a scraper blade as the filled chambers exit the loading zone during rotation of the cylinder.

The metered substance is removed from the chambers mainly by gravity action when the filled chambers pass the horizontal plane towards the exit duct arranged below the cylinder. Removal of substance from the chambers is enhanced by an air stream directed towards the cylinder surface in the extraction zone and by a brush arranged at the end of the extraction zone. Once removed from the cylindrical member chambers the substance is conveyed by an air stream and through conduits to be randomly deposited on a material.

The present invention aims to provide a useful alternative in which controlled deposits of the flowable material onto the material is further enhanced.

Accordingly, in a first aspect of the present invention, there is provided a method of applying a flowable substance to an article, the method including the steps of:

rotating a metering cylinder about a horizontal axis, the metering cylinder having on its outer surface a plurality of circumferentially spaced metering chambers adapted to receive a fixed quantity of the substance;

feeding the flowable substance to a loading zone located above the cylinder so as to fill the metering chambers as these pass through the loading zone, each chamber containing a fixed quantity of the substance when exiting the loading zone;

successively and individually extracting the fixed quantity of the substance from the metering chambers in a discharge zone located after the loading zone by means of negative pressure or suction;
conveying the individually extracted quantity of substance to an application zone located above the article; and
applying one or more of the individually extracted quantities of substance on a predetermined location on the article.

The extraction may be effected by sucking the quantities of substances from the chambers along a transfer conduit, and conveying the substance pneumatically along the transfer conduit. The transfer conduit outlet may discharge the substance onto the article. The method may include simultaneously effecting a negative airflow through the article, so that the substance is sucked onto the article.

In particular, the flowable substance may be in particulate, eg powdered or granular, form. The method may be used particularly but not necessarily exclusively, in applying a particulate, eg powdered, super-absorbent substance, ie an inorganic or organic hydrogel substance capable of absorbing fluids, such as silica gels and cross-linked polymers, eg polyvinyl alcohol, carboxymethyl cellulose, and the like; or an anti-odourant agent, such as sodium bicarbonate, to an absorbent batt, to form a component for a sanitary towel, napkin, disposable diaper, or the like.

According to a second aspect of the present invention, there is provided apparatus for applying a flowable substance to an article, the apparatus including a metering cylinder rotatable about a horizontal axis and having a plurality of circumferentially spaced metering chambers on the outside surface thereof, the metering chambers being adapted to contain a fixed quantity of flowable substance;
feed means for conveying the flowable substance to a loading zone located above the cylinder, the loading zone
being adapted to hold a quantity of the flowable material for filling the metering chambers as these move through the loading zone on rotation of the metering cylinder and providing a fixed quantity of the substance for each chamber as it exits from the loading zone;

vacuum extraction means for individually and successively extracting the quantities of the substance from the metering chambers in a discharge zone located after the loading zone and conveying the individually extracted quantities of the substance to an application zone; and

application means for applying the extracted quantities of substance to an article.

The feed means may comprise a bulk vessel for the substance and a feed conduit leading from the vessel, the feed conduit having a discharge opening in the loading zone. The vessel and feed conduit may be arranged such that the substance flows under gravity from the vessel through the feed conduit.

The vacuum extraction means may comprise a transfer conduit having an inlet opening in the discharge zone, and vacuum generating means for generating the vacuum or negative pressure at the inlet opening end of the transfer conduit. The vacuum generating means may be a venturi mounted at or in proximity to the inlet opening end of the transfer conduit and the transfer conduit inlet opening end being located adjacent the cylinder surface in the discharge zone at a position above the horizontal plane in which the axis lies.

The other outlet end of the transfer conduit may constitute at least part of the application means, with the transfer conduit outlet end being located in an application zone through which the article passes.
As mentioned hereinbefore, the substance may be a particulate anti-odourant substance such as sodium bicarbonate, with the article being a batt or layer of absorbent material, eg a batt or layer of ground pulp or the like, with the resultant batt or layer to which the sodium bicarbonate particles have been applied being suitable for use in forming personal hygiene or sanitary towels, napkins, diapers, or the like.

The metering cylinder may have only one set of circumferentially spaced chambers which may have the form of suitable indentations or recesses in the outer surface of the cylinder.

Preferably, however, at least one further set of circumferentially spaced metering chambers, spaced longitudinally from the first set of chambers, may also be provided. The feed means will then be adapted to deposit the substance simultaneously into at least one chamber of each set, and the extraction means will then be adapted to extract the fixed quantities of the substance preferably simultaneously from at least one chamber of each set, as hereinbefore described.

The metering chambers may be shaped to give a desired deposition pattern of the substance on the article. For example to obtain deposition of the substance in a central or similar zone of the article, the openings or recesses may be circular. However, to obtain other deposition patterns, other chamber shapes may be more suitable. For example, to have the substance deposited along the length of the article, the openings or recesses may be elongated and shingled in respect of one another so that at any given instant, one opening or recess or portions of adjacent openings or recesses are in register with the inlet opening of the transfer conduit so that a continuous stream of metered substance is deposited on the article.
The apparatus may include scraping means arranged in the loading zone for scraping excess substance protruding from the chambers as they exit from the loading zone. The scraping means may then include the lower peripheral edge of the feed conduit discharge opening located immediately above the cylinder surface.

The apparatus may also include further scraping means for scraping any excess substance present on the cylinder surface into the chambers as the chambers approach the loading zone. The further scraping means may include a scraper plate immediately above, ie in sliding contact with, the cylinder upper surface.

The invention will now be described by way of example with reference to the accompanying diagrammatic drawings.

In the drawings,

FIGURE 1 shows a side view of an apparatus for applying particulate sodium bicarbonate to an absorbent batt or layer;

FIGURE 2 shows an enlarged side view of part of the apparatus fo Figure 1;

FIGURE 3 shows a plan view of part of the apparatus of Figure 1;

FIGURE 4 shows a three-dimensional view of an apparatus for applying particulate super-absorbent substance to an absorbent batt, according to an embodiment of the invention;

FIGURE 5 shows a side view, similar to Figure 2, of part of an apparatus for applying particular particulate super-absorbent or anti-odourant substance to an absorbent batt or layer....

FIGURE 6 shows a plan view of the apparatus of Figure 5; and

FIGURE 7 shows a sectional view through VII-VII in Figure 6.
Referring to Figures 1 to 3, reference numeral 10 generally indicates an apparatus for applying flowable particulate anti-odourant agent to an absorbent batt or layer. This apparatus is the subject matter of Australian patent serial no. 655427 (application no. 81308/91).

The apparatus 10 includes a bulk vessel or hopper 12 for containing the particulate flowable anti-odourant agent such as sodium bicarbonate. The hopper 12 has a discharge nozzle 14 to which is fitted a flexible tube 16 defining a feed conduit.

The other end of the feed conduit 16 is attached to a feed tube 18 mounted, by means of a bracket/clamp 20, to a mounting plate 22. The anti-odourant agent can hence flow under gravity through the tubes 16, 18.

The lower end of the feed tube 18 terminates immediately above a rotatable metering disc 24, in a loading zone 36. The disc 24 is mounted to a boss 26, which is mounted to a vertical output shaft 28 of a right angle gearbox 30 having an input shaft 32. The input shaft 32 is operatively connected to apparatus 60, which is discussed in more detail hereunder, or to a suitable drive means (not shown) such as an electric motor. The disc 24 extends horizontally, and rotates about a vertically extending axis provided by the axle 28.

Through the disc 24 extends a plurality of openings 34, each opening defining a metering chamber. The openings 34 can be arranged in pairs, as indicated in Figure 3, with the pairs of openings being spaced circumferentially apart, or can be arranged singly as indicated at 38. The openings 34 are circular. However, in other embodiments they can be any other desired shape, as indicated at 38 and 40 in Figure 3, and which are described in more detail hereunder.
A scraper plate 42 is mounted adjacent the tube 18, and is in sliding contact with the upper surface of the disc 24. Hence, in use, as the disc 24 rotates in the direction indicated by reference numeral 44 in Figure 3, anti-odourant agent flowing from the hopper 12 into the feed tube 18, will fill the openings 34 immediately below the feed tube 18. A base plate 46 located below the disc 24 and in sliding contact with the undersurface thereof, prevents the anti-odourant agent from passing through the openings 34 in the zone 36. As the disc 24 rotates, excess material protruding above the openings 34 is scraped off the disc upper surface by means of the scraper plate 42. In this fashion, equal quantities of anti-odourant agent are loaded into each of the openings 34.

Immediately below the disc 24, in a discharge zone 48, is mounted a venturi 50. The venturi 50 has an inlet opening aligned with the openings 34 and hence, in use, suction is generated in the zone 48 with this suction extracting the metered doses of anti-odourant agent from the chambers. An air tube 52 for feeding microfiltered compressed air into the venturi as suction generating medium, is also provided, while a transfer tube 54, providing a pneumatic anti-odourant agent transfer conduit, is connected to the other end of the venturi. Part of the tube can be transparent, if desired, to monitor the 'slugs' of anti-odourant agent moving along it.

The tube 54 leads from the venturi 50 to an apparatus, generally indicated by reference numeral 60. The apparatus 60 is more or less conventional and is capable of forming a batt or layer of absorbent ground pulp particles, and includes a hammermill 62 in which large pulp particles are comminuted, and continuous vacuum forming belt 64 on which the comminuted pulp particles or fluff are deposited as the batt or layer 66.
The belt 64 is of mesh form, and the batt 66 is formed thereon by means of suction created by a vacuum fan 68. The tube 54 terminates in an application zone 70 in which the sodium bicarbonate is deposited on the batt 66.

In use, anti-odourant agent is transported along the tube 54 as hereinbefore described, in the form of separate 'slugs' passing along the tube 54. The tube 54 should be as short as possible, and preferably less than 2m, eg the apparatus 10 can be located immediately above the batt 66 so that the slugs do not dissipate as a result of the friction in the tube, and to minimise erosion of the tube. These slugs of anti-odourant agent are then deposited at predetermined intervals on the batt 66. The zone 70 in which the outlet of the tube 54 is located, is hence in an area which has a negative airflow through the layer 66 to which the anti-odourant agent is applied. This ensures that the anti-odourant agent is sucked down onto the product and not blown about by the transport air. Thereafter, the absorbent batt 66 will be cut into a desired shape to form components of sanitary towels, napkins, disposable diapers, or the like, in which the anti-odourant agent is located in a desired zone or position on each of the pads, eg at its centre.

The volume of the openings 34, ie their diameter and the thickness of the disc, naturally determines the amount of anti-odourant agent deposited onto each sanitary device, with each group of openings 34 representing one dose of anti-odourant agent per sanitary device. The shape of the openings and the relative arrangement of the openings 34, determine the size and shape of the zone in which the anti-odourant agent is deposited on the article. For example, with the circular openings 34 arranged as indicated in Figure 3 it will be possible to deposit anti-odourant agent in a central zone in each sanitary towel. Typically, the openings 34 are located in a circle having a diameter of 160 mm, with the
openings 34 each having a diameter of 6 mm, and 14 pairs of the openings being provided.

However, if it is desired to deposit the anti-odourant agent in a continuous line along the towel, then openings 34 similar to those indicated at reference numeral 40 in Figure 3 can be used. These openings 34 are in the form of elongate slots arranged in such a fashion that the one end of one slot overlaps the other end of an adjacent slot. Hence, when the slots 34 pass over the venturi 50, the venturi will continually be in register with at least a portion of one of the slots, so that the predetermined amounts of anti-odourant are transferred continually along the tube 54. To obtain a very short pulses, so that the anti-odourant agent is deposited in a relatively small zone of the pad, a kidney shaped opening such as the opening indicated at reference numeral 38 in Figure 3 can be used. By varying the configuration of the openings 34 on the disc the length of the dose is thus variable from short intermittent pulses to a continuous line. By changing the timing of the disc in relation to the movement of the layer along the belt 64 the position of the anti-odourant agent zones on the batt or layer 66 can thus be adjusted.

Referring now to Figure 4, reference numeral 100 generally indicates an apparatus for applying particulate flowable super-absorbent substance to an absorbent wad 66 according to an embodiment of the present invention.

Components of the apparatus 100 which are the same or similar to those of the apparatus 10 are indicated with the same reference numerals.

Instead of having a metering disc 24, the apparatus 100 has a rotatable cylindrical metering drum 102. The drum 102 is mounted to rotate about a horizontal axis 104 in the direction of arrow 106, and is driven to rotate by
suitable drive means (not shown).

A plurality of oval recesses 108 are provided in the cylindrical surface 110 of the drum, with each recess providing a metering chamber. The recesses 108 are arranged in rows extending longitudinally across the drum and a plurality of such rows being spaced circumferentially about the drum.

Instead of the feed tube 18, a feed chute 112, leading from the bulk hopper, is provided. A scraper plate (not shown), similar to the scraper plate 42, of Figures 1-3 may also be provided.

A venturi 50 and transfer tube 54 is provided for each recess in a row of recesses extending across the drum, with the venturis being located above a horizontal plane in which the axis 104 is located.

The apparatus 100 functions substantially similarly to the apparatus 10, save that, as a result of the plurality of recesses in each row, the super-absorbent substance can be deposited in discrete zones 114 spaced laterally across and longitudinally along the wad 66, which can be a diaper pulp panel, preformed by means of vacuum forming or by shaping a batt or layer.

Referring to Figures 5 to 7, reference numeral 200 generally indicates another apparatus for applying particulate flowable super-absorbent or anti-odourant substance to an absorbent batt.

Components of the apparatus 200 which are the same or similar to those of the apparatus 10, are indicated with the same reference numerals.

The apparatus 200 includes a rotatable metering disc
202. The disc 202 is similar to the disc 24 save that, instead of having openings 34 extending through it, it has a plurality of circumferentially spaced recesses or indentations 204 therein. Furthermore, in the apparatus 200, the venturi 50 is located above the disc so that the discharge zone 48 is located above the disc. The venturi 50 of the apparatus 200 is held in position by means of a venturi clamp 206.

In the apparatus 200, the lower peripheral edge of the feed tube 18 which is located immediately above, i.e. with sliding clearance from, the disc 202, constitutes scraping means for scraping excess material from the recesses 204 as the filled recesses move from the loading zone. However, the apparatus 200 also includes an angled scraper plate 208, mounted in position by means of a scraper support 210 connected to the bracket/clamp 20, ahead of the loading zone. As the disc 202 rotates, the scraper plate 208 scrapes any excess particulate substance present on the upper disc surface into the recesses or cavities 204 before they enter the loading zone. This reduces wastage, and also reduces contamination of the moving parts.

The apparatus 200 functions in similar fashion to the apparatus 10, save that the extraction of the particulate substance from the recesses 204 is effected in an upward direction by the venturi 50.

In the apparatus 10, 200 a plurality of loading and discharge zones, each comprising its own feed tube 18 and venturi 50 may be provided. In this manner large quantities of the particulate substance can be applied or quicker pulsing for high speed manufacture can be provided.

The Applicant believes that with the apparatus 10,
100, 200 described above super-absorbent or anti-odourant agent can be applied consistently and efficiently in accurate amounts, and in an accurately demarcated zones, on an absorbent batt, wad or layer, which can be processed further to form sanitary towels, napkins, disposable diapers, or the like. The apparatus 10, 100 200 also have the advantage of being relatively inexpensive to fabricate, and operate.

Although the invention has been described with reference to a specific example, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of applying a flowable substance to an article, the method including the steps of:
   rotating a metering cylinder about a horizontal axis, the metering cylinder having on its outer surface a plurality of circumferentially spaced metering chambers adapted to receive a fixed quantity of the substance;
   feeding the flowable substance to a loading zone located above the cylinder so as to fill the metering chambers as these pass through the loading zone, each chamber containing a fixed quantity of the substance when exiting the loading zone;
   successively and individually extracting the fixed quantity of the substance from the metering chambers in a discharge zone located after the loading zone by means of negative pressure or suction;
   conveying the individually extracted quantity of substance to an application zone located above the article; and
   applying one or more of the individually extracted quantities of substance on a predetermined location on the article.

2. A method according to Claim 1 wherein excess substance protruding from the metering chambers above the cylinder surface in the loading zone is scraped off when the metering chambers exit the loading zone.

3. A method according to Claim 1 or 2 wherein the individual extraction from the metering chambers is effected by sucking the fixed quantity of the substance from each metering chamber arranged in a circumferential row on the cylinder into a transfer conduit assigned to each such row as each metering chamber passes underneath an inlet of the conduit.
4. A method according to any one of Claims 1 to 3, wherein the fixed quantity of the substance sucked into the transfer conduit is discharged through an outlet of the conduit directly onto the article, and wherein a negative airflow is effected through the article so that the substance discharged from the transfer conduit is at least partly sucked into the article.

5. A method according to any one of Claims 1 to 4, wherein the flowable substance is a particulate super-absorbent substance or an anti-odourant substance, with the article to which the substance is applied being an absorbent batt.

6. An apparatus for applying a flowable substance to an article, the apparatus including
   a metering cylinder rotatable about a horizontal axis and having a plurality of circumferentially spaced metering chambers on the outside surface thereof, the metering chambers being adapted to contain a fixed quantity of flowable substance;
   feed means for conveying the flowable substance to a loading zone located above the cylinder, the loading zone being adapted to hold a quantity of the flowable material for filling the metering chambers as these move through the loading zone on rotation of the metering cylinder and providing a fixed quantity of the substance for each chamber as it exits from the loading zone;
   vacuum extraction means for individually and successively extracting the quantities of the substance from the metering chambers in a discharge zone located after the loading zone and conveying the individually extracted quantities of the substance to an application zone; and
   application means for applying the extracted quantities of substance to an article.
7. An apparatus according to Claim 6, wherein the metering cylinder has on its peripheral surface a plurality of recesses, with each recess providing a metering chamber, the recesses being arranged in longitudinal rows having a number of said recesses spaced longitudinally across the cylinder and in circumferential rows having a number of said recesses spaced circumferentially about the cylinder.

8. An apparatus according to Claim 6 or 7 the vacuum extraction means comprises at least one transfer means arranged with an inlet opening thereof in the discharge zone and vacuum generating means for generating vacuum or negative pressure at the inlet opening of the at least one transfer means.

9. An apparatus according to Claim 8, wherein the transfer means comprises one transfer tube for each recess in a longitudinal row extending across the cylinder, and the vacuum extracting means comprises one venturi mounted at or in proximity to the inlet opening of each transfer tube, the inlet openings being located above a horizontal plane in which the rotation axis of the cylinder is located.

10. An apparatus according to Claim 9, wherein the outlet openings of the transfer tubes at the end opposite the inlet openings form part of the application means, with the transfer tube outlets being located in the application zone in or through which the article is or passes in such a manner that deposition of the fixed quantities of the substance conveyed through the transfer tubes is effected onto the article in discrete zones in accordance with the recess arrangement in one longitudinal row.

11. An apparatus according to any one of Claims 7 to 10, wherein the recesses are circular or oval in shape.
12. An apparatus according to any one of Claims 7 to 10, wherein the recesses are elongate and shingled in respect to one another so that at any given instant, one recess or portions of adjacent recesses are in register with the inlet openings of the transfer conduits so that a continuous stream of metered substance can be deposited on the article.

13. A method of applying a flowable substance to an article substantially as herein described with reference to Figure 4 of the accompanying drawings.

14. An apparatus for applying a flowable substance to an article substantially as herein described with reference to Figure 4 of the accompanying drawings.

Dated this 23rd day of November 1994

McNEIL-PPC, INC.
By their Patent Attorneys
GRIFFITH HACK & CO
ABSTRACT

Apparatus 100 for applying particulate flowable super-absorbent or anti-absorbent substance to an article comprises a metering component 102 rotatable about an axis. A plurality of circumferentially spaced metering chambers 108 are provided in this component. The apparatus includes feed means 112 for depositing the flowable substance successively in the chambers in a loading zone as the chambers move through the loading zone on rotation of the metering component so that each chamber contains a fixed quantity of the substance as it passes from the loading zone. The apparatus also includes vacuum extraction means 50 for extracting the quantities of the substance successively from the chambers in a discharge zone spaced from the loading zone and application means for applying the extracted quantities of substance to an article.