United States Patent

Brehm

[15] **3,650,243**

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[54] DEVICE FOR THE UNIFORM APPLICATION OF SMALL AMOUNTS OF A POWDERY MATERIAL ONTO SURFACE CONFIGURATIONS

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[30] **Foreign Application Priority Data**

Apr. 9, 1969 Germany ..... P 19 18 033.7

[52] **U.S. Cl.** **118/308,** 117/16, 117/21, 117/24, 117/104, 118/325

[51] **Int. Cl.** **B05b 7/14**

[58] **Field of Search** 117/16, 21, 24, 33, 104, 122; 118/230, 308, 313; 239/223, 224, 656, 667, 673, 682, 687

[56] **References Cited**

UNITED STATES PATENTS

2,804,309	8/1957	Sweet	239/687
2,962,381	11/1960	Dobry et al.	117/16
2,993,309	7/1961	Barnes et al.	117/16
3,014,812	12/1961	Sallie	117/24
3,342,415	9/1967	Point	239/223
3,478,969	11/1969	Lund	117/16

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Assistant Examiner—Raymond M. Speer
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[57] **ABSTRACT**

Apparatus for depositing particulate material onto a textile fabric, particularly thermoplastic adhesive particles onto a non-woven substantially continuous fabric, including means for depositing the particulate material onto a feeder disc with an inwardly directed spiral bead thereon and an aperture in the center thereof, a centrifugal spreader disc disposed beneath the feeder disc, means for, rotating the discs, and means for passing the fabric beneath the spreader disc whereby only part of the annular centrifuged particles are deposited on the textile fabric. 15

4 Claims, 11 Drawing Figures

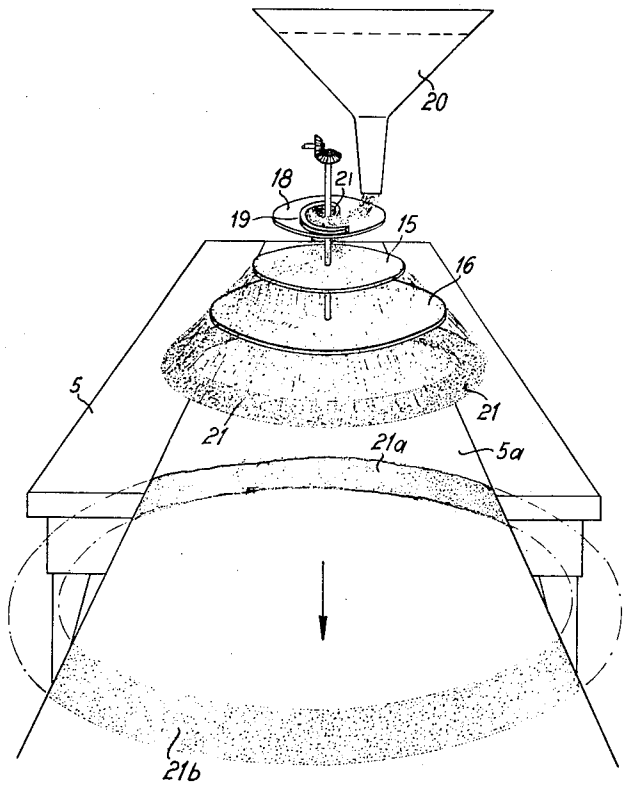

FIG. 1

PRIOR ART

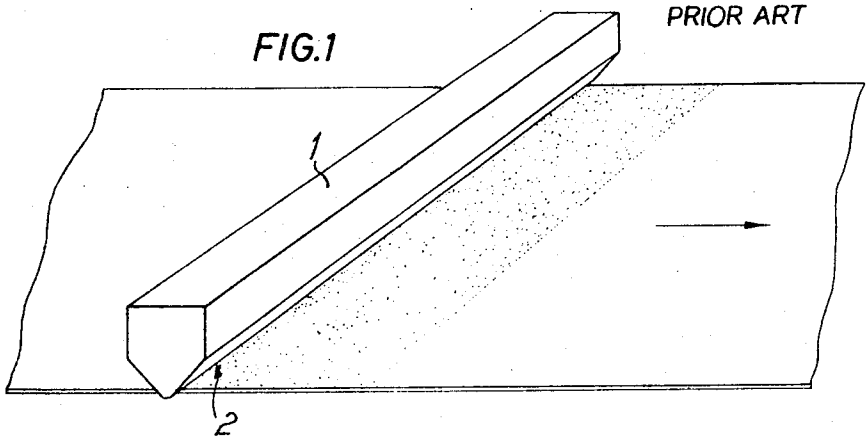

FIG. 2

PRIOR ART

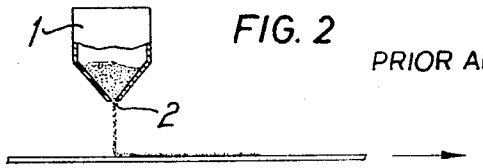

FIG. 3

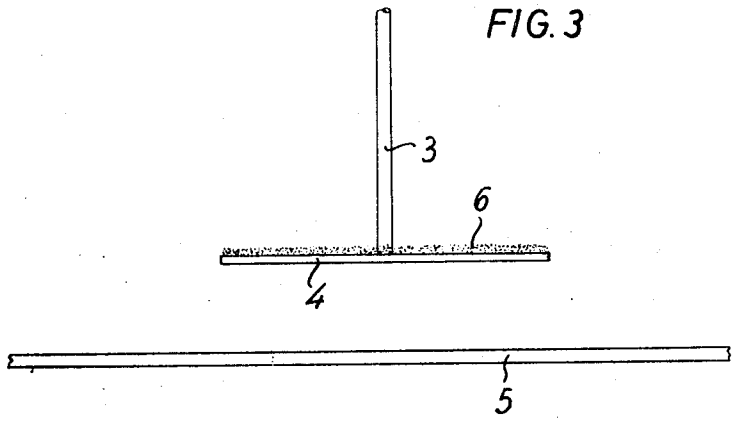

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FIG. 4

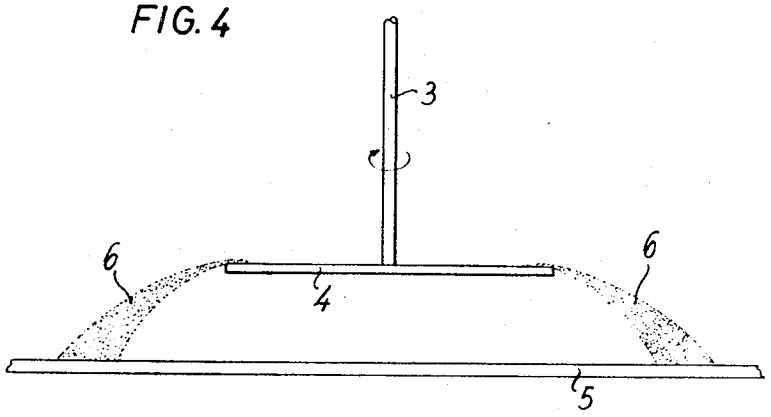

FIG. 5

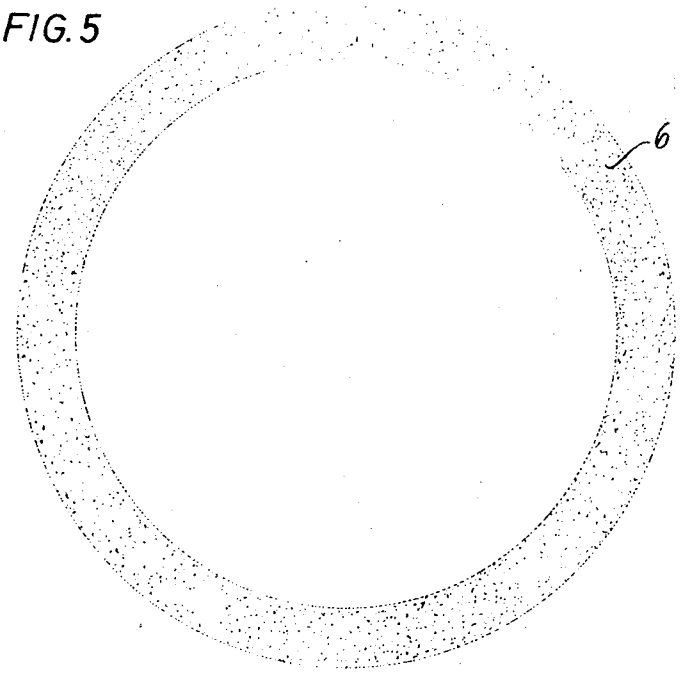

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FIG. 6

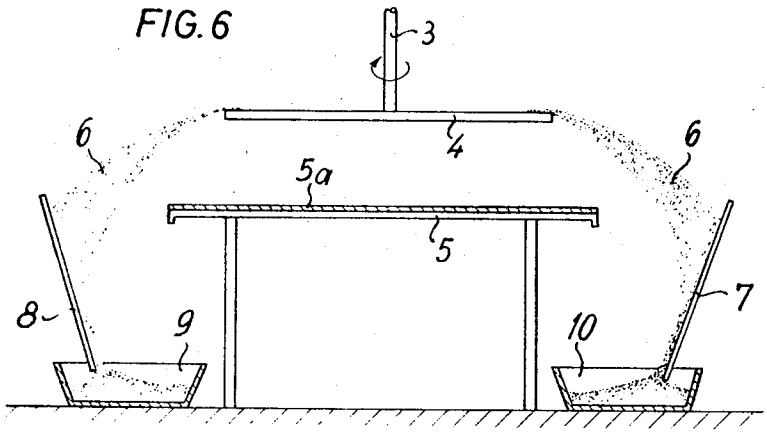

FIG. 7

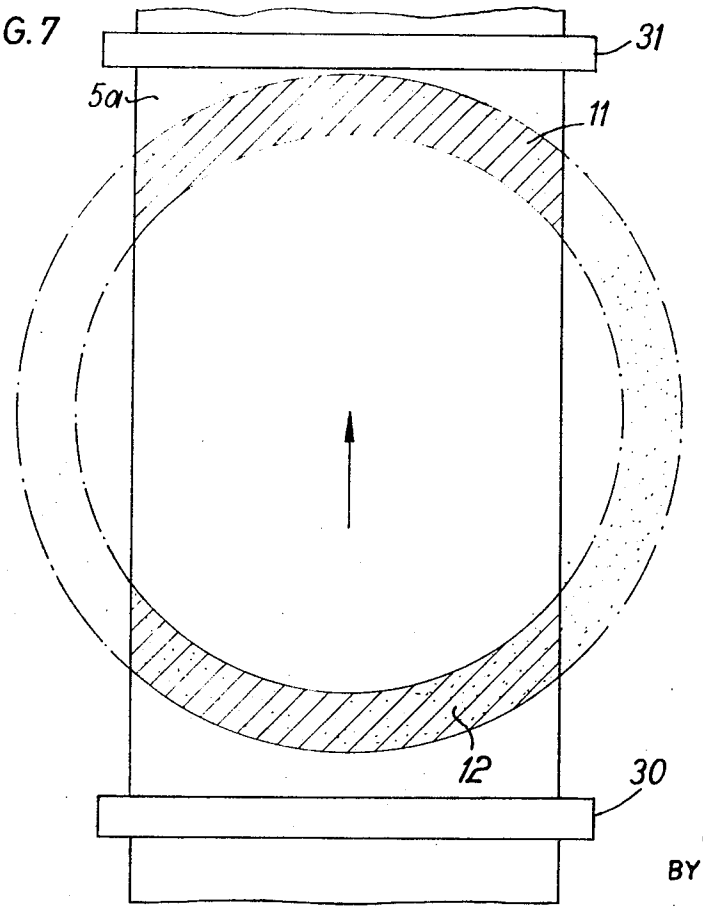

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FIG. 8

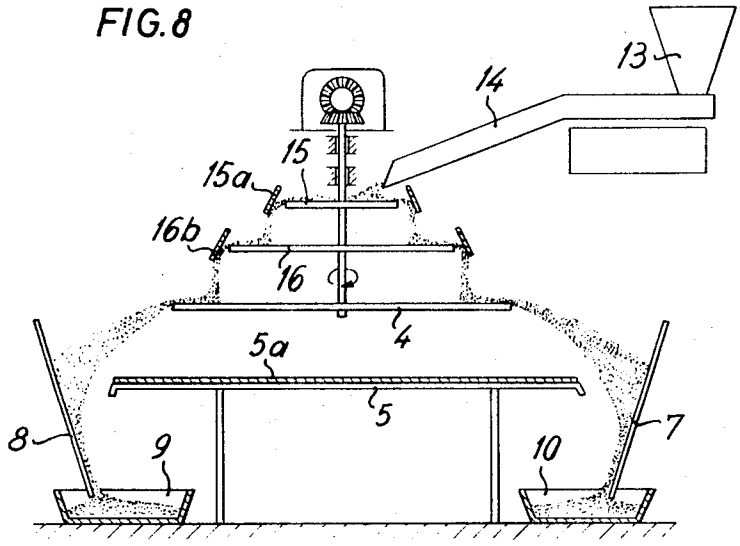
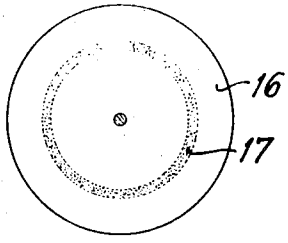


FIG. 9



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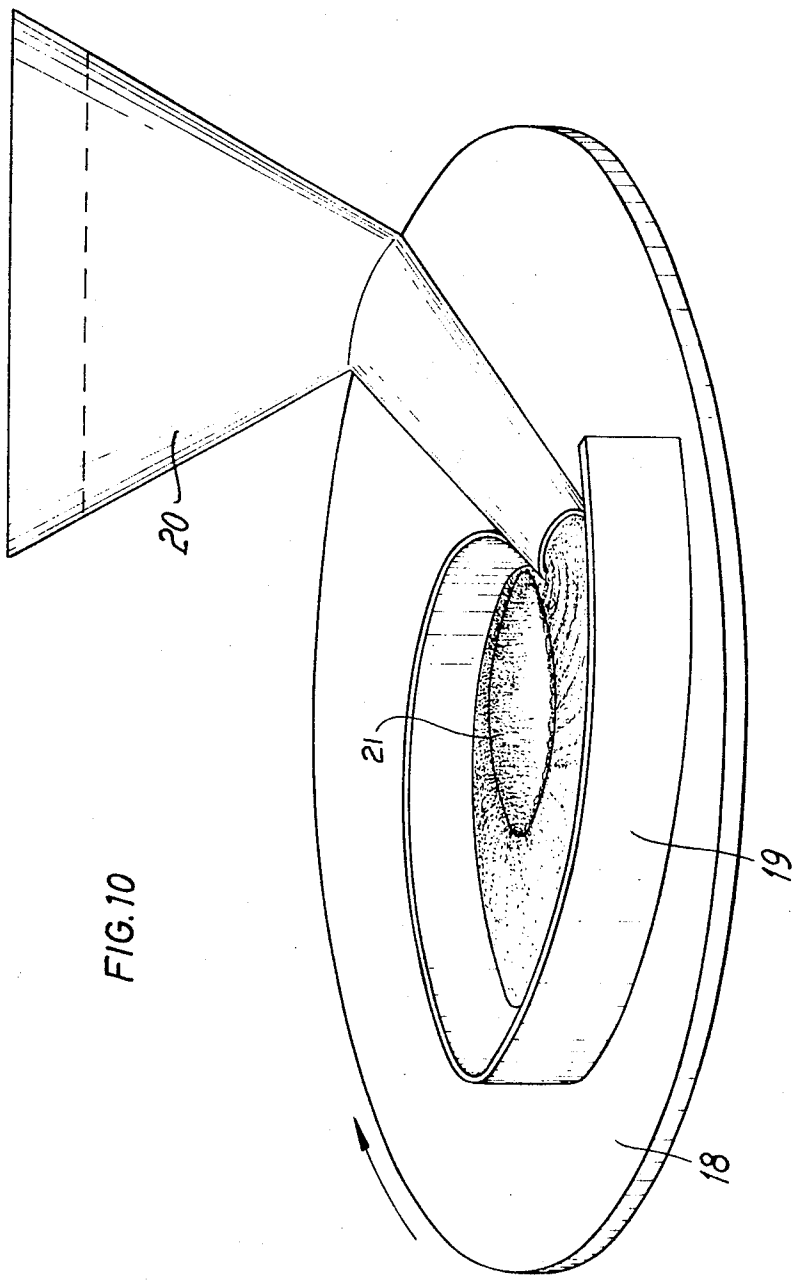

FIG. 10

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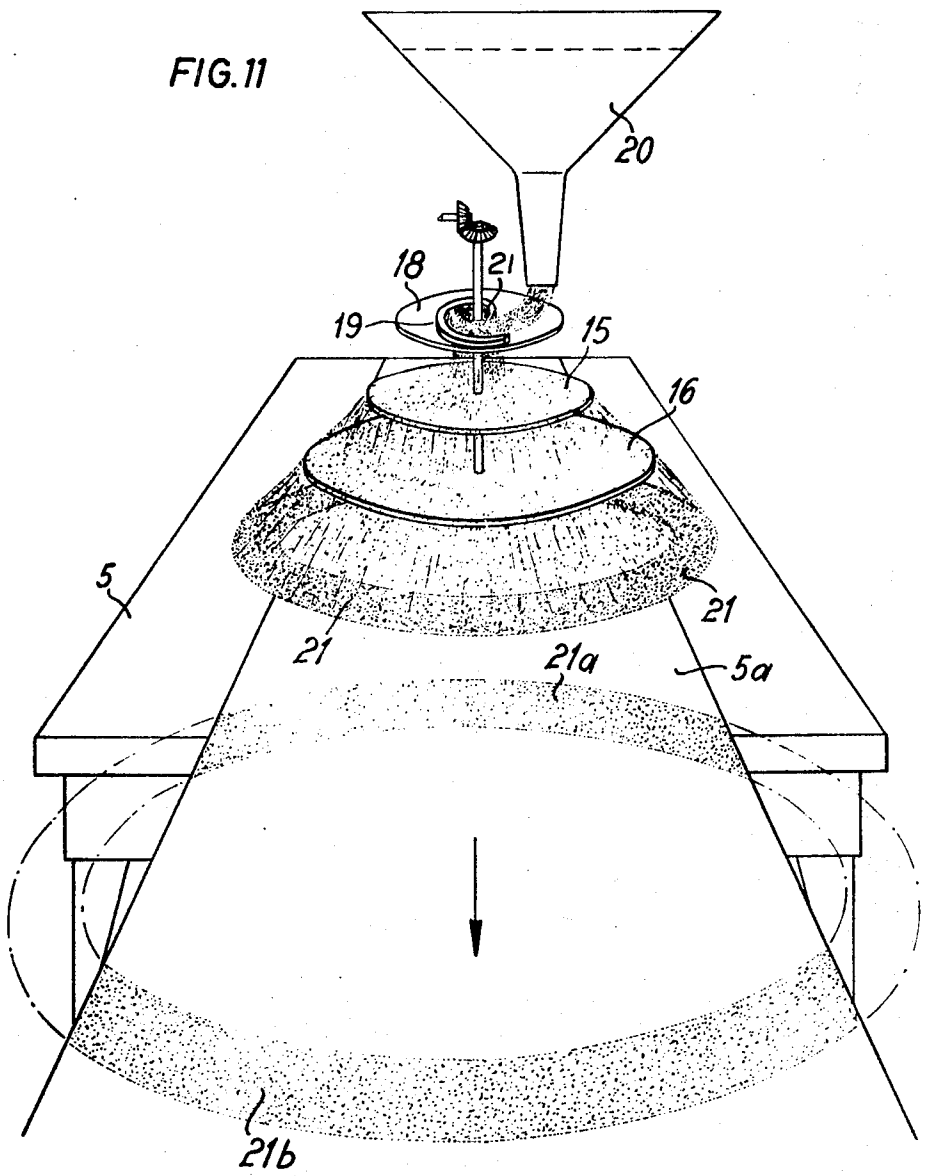
FIG. 11



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DEVICE FOR THE UNIFORM APPLICATION OF SMALL AMOUNTS OF A POWDERY MATERIAL ONTO SURFACE CONFIGURATIONS

For many purposes it is necessary to apply by powdering or dusting a powdery material in very small amounts, e.g., 5 to 30 g./sq.m., as uniformly as possible over an area. In particular, the manufacture of iron-on stiffening material according to the DAS 1,096,324 uses this type of operation. In that case, polyethylene powder is spread onto a fabric or a fleece. Then, the temperature was increased until the polyethylene grains were superficially softened. The grains are then permanently sintered onto the base fabric or fleece. Such a stiffening material can be joined to another fabric by placing its polyethylene containing side juxtaposed the other material to be reinforced and passing a hot iron over the back (non-polyethylene containing) side of the stiffening material. In the process, the polyethylene particles will soften once again and thus produce a firm bond between the two materials.

It is understood that in the manufacture of such stiffening materials as well as in many other instances, it is desirable to achieve as uniform an application of polyethylene or other particulate adhesive grains as possible. If the polyethylene would be applied, for instance, with an ordinary saltshaker, the distribution thereof would of course be very uneven. This, in turn, would result in points with an overconcentration whereat the polyethylene would, the moment the hot iron passes over it, penetrate into the upper material and even penetrate through it to its back side (face) whereby producing a greasy spot on the face of the material at that point. At locations where there is only a small amount of or no polyethylene, the bondings between the two fabrics is, or may be, inadequate. A delamination of the reinforcing and other layer or layers sometimes occurs in the areas of deficient polyethylene concentration.

It is particularly difficult to obtain uniform distribution of the thermoplastic adhesive grains in those cases in which only very small amounts of grain are to be applied, e.g., 5g./sq.m. In these cases, each grain is, for all practical purposes, separated from the other ones. However, satisfactory ironing requires that the distance from grain to grain be as uniform as possible.

This problem of uniform distribution just described has been overcome by the apparatus of the instant invention, which comprises means for depositing the particulate coating material onto a feeder disc with an inwardly directed spiral bead thereon and an aperture in the center thereof, a centrifugal spreader disc disposed beneath the feeder disc, means for rotating the discs, and means for passing a textile fabric beneath the spreader disc whereby only part of the annular centrifuged particles are deposited on the textile fabric.

In the drawing appended to the instant specification and constituting a part hereof several views are shown as follows:

FIG. 1 is a prospective view of a slot powder deposition means.

FIG. 2 is a partial sectioned end view of the slot deposition means of FIG. 1.

FIG. 3 shows an end view of centrifugal spreader disc.

FIG. 4 is similar to FIG. 3, showing the spreader disc in operation.

FIG. 5 is a plan view of particulate material spread between spreader disc of FIG. 4.

FIG. 6 is an end view of a spreader disc assembly.

FIG. 7 is a plan view of the particulate material spread as shown in FIG. 6.

FIG. 8 is similar to FIG. 6 but showing a more complicated spreader disc arrangement.

FIG. 9 is a plan view of an annular ring of a particulate material disposed on one of the intermediate spreader disc of FIG. 8.

FIG. 10 is a prospective view of a feeding means.

FIG. 11 is a prospective view of the entire apparatus of this invention.

The prior art procedure usually used for the uniform application of granular material on endless webs, was to place the powder into an elongated vibrator trough as shown in FIGS. 1 and 2, and vibrating the trough by means of a mechanism (not shown), which would cause powder to pour out of the slot 2 in the bottom of the trough onto a web of fabric or fleece material situated therebeneath and running at a uniform rate from left to right (or vice versa).

Many thermoplastic adhesive powders are known to tend to agglomerate. There are then formed large lumps in the initially fine-grained powders in the vibrator trough, which are no longer able to pass through the narrow slot. Thus, the slot is, in part, blocked and the web passing therebeneath does not receive any powder coating whatsoever in the areas corresponding to these blockage points. It is known to be possible to break up such lumps with a thin wire that is pressed, from the top, against the lumps situated in the trough over the slot 2; however, this action tends to, at least temporarily, cause an excessive amount of powder to be deposited on the web situated therebeneath.

According to the instant invention, these drawbacks can be obviated. This is achieved by means of distributor discs hereinafter described in greater detail.

For the purpose of a better comprehension of the invention, reference is had to the per se known vehicles used in the winter period for sandspreading icy roads. Only a few years ago it used to be customary to load a truck with sand. While the truck was travelling on the icy road, two men would then throw shovelfuls of sand from the moving truck onto the road. In recent years, increasing preference has been given to spreader vehicles equipped with a rapidly rotating disc at the end of the vehicle. The workers now shovel the sand no longer directly onto the road, but onto the rapidly rotating disc. From there, the sand grains are then, by centrifugal force, flung over the entire roadway. One thereby achieves a uniform distribution of the sand on the road. In view of the fact that, in addition, overconcentrations could be avoided (at the points at which a shovelful of sand dropped on the road there was naturally more sand than the amount absolutely necessary for eliminating the skidding hazard) it was also possible to save sand.

However, it is not possible to make a direct transposition of the spreader process just described to the uniform application of small amounts of powder onto an endless web. It would require excessive cost with regard to devices and structures in order to lay out a web of material of substantial length in a building and then to allow the spreader disc, which, in addition would have to be provided with a feeder device to be replenished with fresh powder, to glide over the entire length of the web of perhaps 100 meters. Even if it would be possible thus to apply the plastic powder uniformly onto the web, there arises the problem of additional processing. After all, initially, the powder lies only loosely uniformly distributed on the web. If the web would now be actuated in order to bring it into a hot air chamber for fixing the powder by means of sintering, the uniform arrangement of the powder would be destroyed as a result of the shaking motion during transport.

Now, the present invention obviates all of these drawbacks by a reversal of the spreader disc principle. If it has been the case, in the past, that a movable spreader disc was gliding over a web in movement, the very contrary is true in the case of the invention. The endless web to be powdered passes under a fixedly mounted spreader disc. This principle is to be explained by means of FIGS. 3 to 11.

FIG. 3 shows a spreader disc 4 capable of rotation around the shaft 3. If granular material is applied to the disc 4, without rotation of the disc, said material will of course first remain lying on the disc.

However, if the spreader disc 4 starts to rotate, as can be seen in FIG. 4, the powder 6 is, as can be expected, flung by centrifugal force over the edges of the disc 4 and drops then onto the table 5. The distribution pattern will then be present substantially in the shape of a wide ring, as can be seen in FIG. 5.

If a web is situated on the table 5, the powder will then naturally lie in an annular shape on said web.

It will of course be understood that a web cannot be homogeneously and uniformly powdered by means of the aforementioned technique. This is possible only when the web to be powdered is put into motion at a uniform rate. It is furthermore important that the table, or the web thereon, should be sufficiently narrow so that the grains flung off from the disc **4** will extend sideways a distance sufficient so that they will pass the left, or the right edge of the table as shown in FIG. **6**. At those points there are arranged deflector plates **7** and **8** allowing the grains flung off over the right and left table edge to glide into collector means **9** and **10**.

It is to be noted that the table, or the web thereon, is very long in the direction toward or away from the viewer in FIG. **6**.

If a spreader disc throws powder onto such a table, a closed ring will no longer be formed, because a part of the powder will pass too far to the right and to the left and will "drop" over the table. On the table there will then remain only the arc-shaped segments **11** and **12** shown hatched in FIG. **7**.

If the continuous web **5***a* moves across the table in the direction of the arrow in FIG. **7** and if the disc **4** continuously flings off powder **6**, the web will pass uninterruptedly through the two "rain regions" **11** and **12**. The grains will drop uniformly distributed within the zones **11** and **12**, and therefore downstream of the zone **11** will also consequently exhibit an extremely uniform application of grains. The web can then be passed through a heating chamber preferably as soon as possible, where the particles are softened and affixed by sintering onto the carrier web. The initially uniform application of the grains cannot be disturbed after sintering, and is not disturbed in the short transit between spreading and sintering of the grains. Such a disturbance would occur only if the web would have to run over a very long period prior to the fixing of the grain particles.

A uniform and constant delivery of particles within the zones **11** and **12** requires as a prerequisite, a uniform feeding of powder onto the spreader disc **4**. This is achieved in accordance with the invention by not directly applying onto the spreader disc **4**. Rather, auxiliary additional spreader discs are used, as can be seen in FIG. **8**.

The powder thus drops out of a standard vibrator trough **13** into a conduit **14** and from there onto a first rotating spreader disc **15**, from there onto the likewise rotating second spreader disc **16** which is wider than the first spreader disc and from there onto the principal spreader disc **4** from which the grains are finally spread onto the web in motion therebeneath, according to this invention, as described above in connection with FIGS. **3** to **7**. The primary and secondary discs **15** and **16** are respectively surrounded, at a distance of a few centimeters about their entire circumferences, by deflector plates **15***a* and **16***b*. The powder grains first applied to the primary disc **15** are then, due to the centrifugal force, flung against the deflector plate **15***a* and dropped from there onto the secondary disc **16**. Whereas the powder coming out of the conduit **14** may, for all practical purposes, still fall on any part of the primary disc **15**, the grains which fall from the primary disc **15** onto disc **16** fall in an annular ring as shown in FIG. **9**. Those parts that are situated directly beneath the primary disc **15** remain practically free of any powder grains. If the secondary disc **16**, in turn, did not rotate, the powder falling down thereonto from the plate **15***a* would collect thereon in the form of a very narrow ring **17** as shown in FIG. **9**. From there upon rotation of the secondary disc **16**, the powder grains are flung over its edge and against the deflector plate **16***b* from which the powder grains—once again in the form of a round band—fall onto the principal spreader disc **4**, also illustrated by the configuration of FIG. **9**. Because the round strip of powder grains on this disc **4** is now already very uniform with respect to its width and distribution of powder grains therein, a high degree of uniformity of distribution of powder grains is achieved within the segments **11** and **12** (of FIG. **7**).

In view of the fact that the webs **5***a* to be powdered are, in practice, very wide, e.g., 1 to 2 meters, the segments **11** and **12** will have substantially no arc therein. The two deposition zones **11** and **12** will be substantially rectangular.

Still greater uniformity in powder distribution on the web **5***a* can be achieved if the powder is allowed to drop first onto a slowly rotating disc **18** provided in its center with a large opening **21**, as can be seen in FIG. **10**. Onto this disc **18** there has loosely been mounted a bead **19**. This bead **19** is spiral shaped with one single spiral winding being present within 360° C. One end of the spiral **19** terminates at the edge of the hole **21** in the disc and the other at the outer edge of the disc **18**.

Powder falls from a hopper **20** onto the disc **18** rotating in the direction of the arrow (i.e., clockwise). The bead **19** does not rotate with the disc **18** but rather is stationary whereby guiding the powder grains from the hopper **20** toward the hole **21**.

The powder dropping out of the end of the hopper onto the disc **18** rotates with the disc. As the disc **18** rotates, the powder is pressed more and more against the wall of the bead **19** while at the same time, excess powder that has no more space on the increasingly smaller strip is pressed over the edge of the hole and drops from there onto the discs situated therebeneath where, due to centrifugal force in the manner described above, it will via a plurality of discs **15**, **16** and **4**, finally fall onto the web in the form of two strips **11** and **12**. The disc **18** rotates extremely slowly (preferred circumferential speed 10 m./min.) so that, substantially no noticeable centrifugal force is applied to the powder grains falling through the hole **21**. The discs **15**, **16**, and **4** rotate about 30 times faster than the disc **18**.

FIG. **11** schematically illustrates the entire preferred embodiment of this invention permitting maximum uniformity of grain deposition.

Out of the hopper **20** granular material falls uniformly onto the disc **18**. The powder drops through the hole **21** in the slowly rotating disc **18** in the form of a narrow annular band first onto the primary disc **15** from which it is flung against the deflector plate **15***a* (not shown), and then falls from there onto the secondary disc **16** and from which it is flung from there, again in the shape of a circular band **21**, onto the web **5***a* running over the table **5** in the direction of the arrow. The principal spreader disc **4** is omitted from FIG. **11** for simplicity and clarity purposes.

For the purpose of clarifying the relationships FIG. **11** shows the web **5***a* not running during production of the circular strip of grains **21**. The bands of grains **21***a* and **21***b* are illustrated as if the web **5** was moved out in the direction of the arrow, from under the spreader **16**. These bands **21***a* and **21***b* correspond to the segments **11** and **12** in FIG. **7**.

The grain particles being spread to the right and to the left beyond the width of the web are deliberately cast away in the process according to the application. These powder portions can be collected again in the manner illustrated in FIG. **8** and then reused by placing them in the hopper **20**.

What is claimed is:

1. Apparatus for applying particulate material to a substantially continuous textile fabric comprising: feed and takeup means for said textile fabric and textile fabric disposed therebetween; centrifugal spreader means assembly disposed above said textile fabric between said feed and takeup means; motive means operatively connected to said spreader means assembly to impart rotation thereto; feed means disposed above said spreader means assembly for depositing particulate material to be spread on said spreader means assembly, wherein said spreader means assembly includes at least one spreader disc, a distributor disc having at its center an aperture therein disposed above said spreader disc and a substantially stationary spiral bead means on said distributor disc for directing particulate material deposited on said distributor disc toward and through said aperture wherein said feed means is positioned to feed particulate material onto said distributor disc and said distributor disc feeds particulate material through said aperture onto said spreader disc, wherein the speed of rotation of said spreader disc and the maximum diameter of said spreader disc are sufficient to cause said particulate material to be centrifuged off said spreader disc in an annular pattern onto said textile fabric which annular pattern

has an inside diameter which is larger than the width of said textile fabric.

2. Apparatus as claimed in claim 1, including multiple spreader discs substantially parallel to each other of increasing diameter toward said textile fabric.

3. Apparatus as claimed in claim 2, including peripheral deflector means disposed about all of said spreader discs except the spreader disc closest to said fabric.

4. Apparatus as claimed in claim 2, wherein said spreader discs have a common axial drive shaft.

* * * * *