Feb. 8, 1944. C. WOLFSON ET AL 2,340,850

FLOCKING APPARATUS

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FIG. 1.

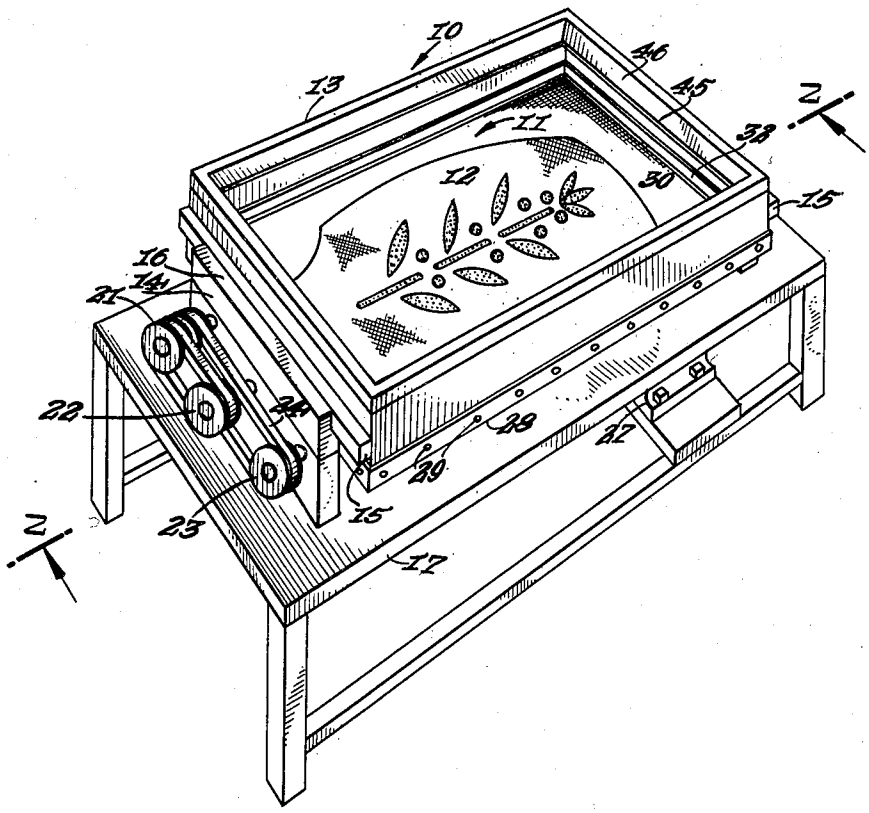
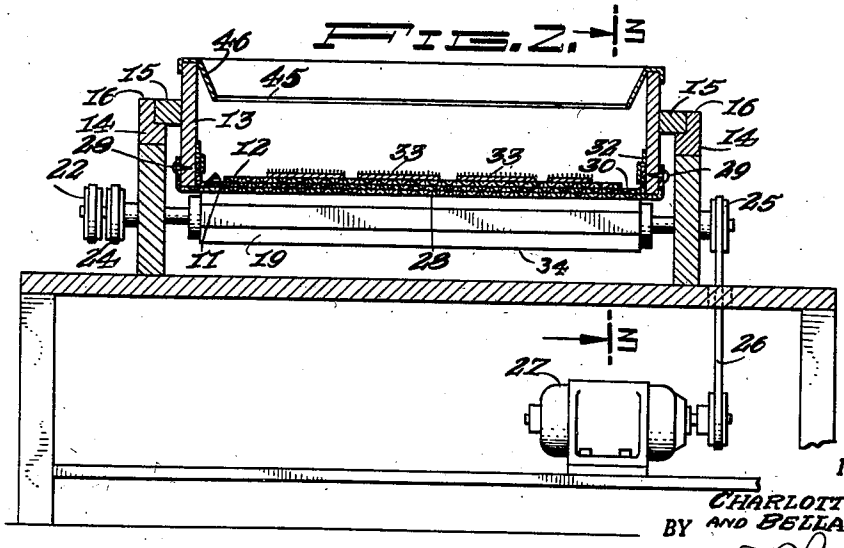


FIG. 2.



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FIG. 3.

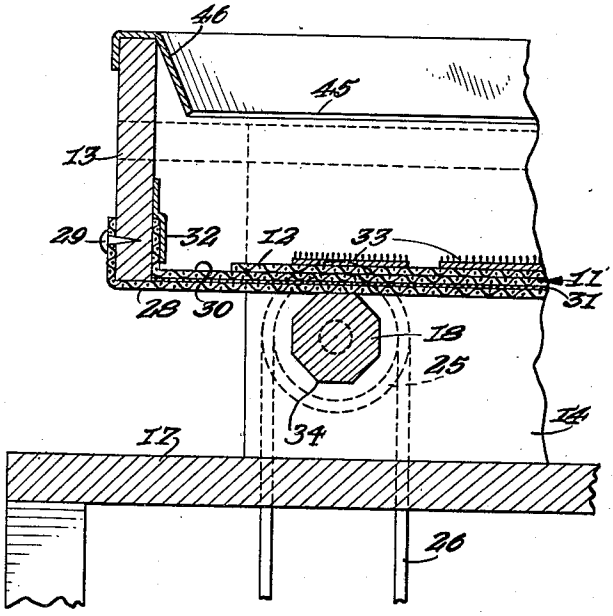
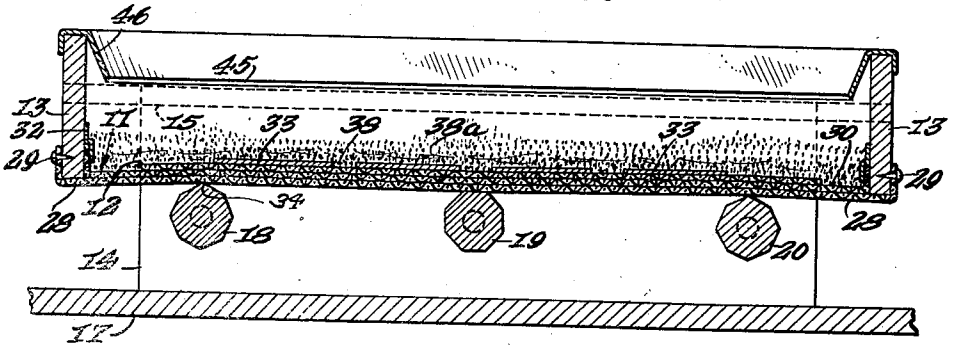


FIG. 4.



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FIG. 5.

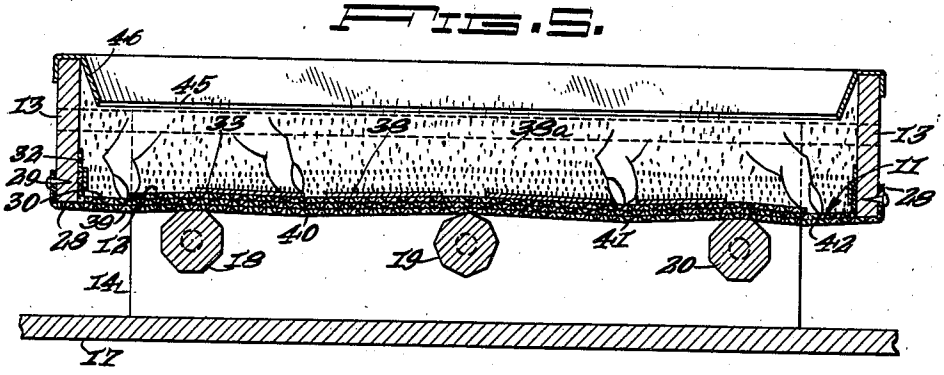


FIG. 6.

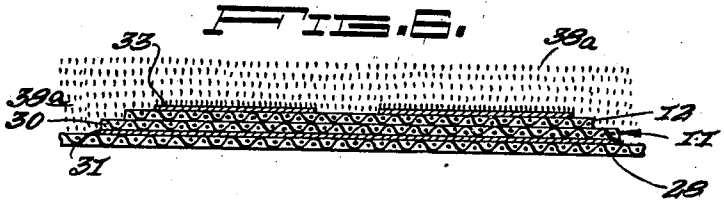


FIG. 7.

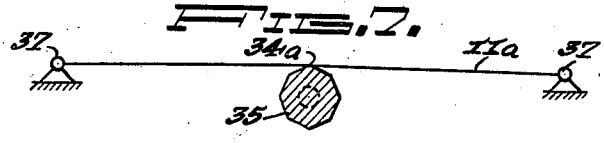


FIG. 8.

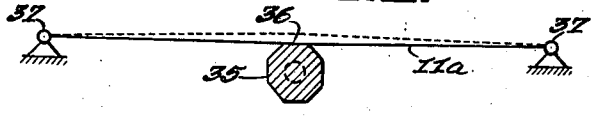
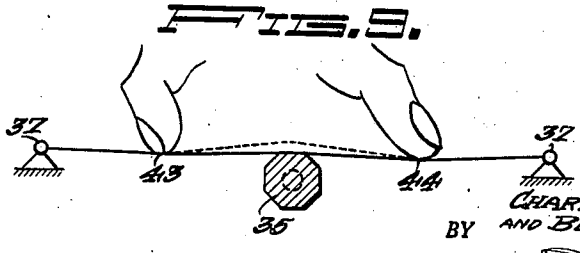


FIG. 9.



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UNITED STATES PATENT OFFICE

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FLOCKING APPARATUS

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Application July 2, 1943, Serial No. 493,292

7 Claims. (Cl. 91—8)

This invention relates to apparatus for flocking, and particularly to apparatus for applying quantities of flock to predetermined portions of selected materials for the purpose of producing a raised plush or velvet effect.

A commonly known method of applying flock is to dust or spray it on to the work to be processed at predetermined portions thereof, such portions having previously been coated with a mucilaginous substance to which the flock will adhere. Upon the completion of the process, the flocked portions of the processed material is distinguishable from other portions thereof by a more or less velvety texture. In employing such a system it has been found that the particles of flock are not always equally distributed over the area to which they are applied, and accordingly various vibrating methods have been resorted to with the intention of enabling a layer of flock to be evenly distributed.

According to certain known conventional methods of imparting a vibratory agitation to a layer of flock operatively deposited on the surface of the work being treated, a reciprocating motion is imparted to the work by placing it in a manually or mechanically reciprocated receptacle. It has, however, been found that due to the lightness of the fibers, the vibratory motion is insufficient to prevent clusters of the flock from being dislodged from the adhesive in which they happen to be embedded. To effect a better distribution of the flock, particularly when the work to be processed is of flexible material, polygonal bars are rotated against the underside of the work, or against the underside of a flexible support for the work. The polygonal surface of the bar causes a periodic raising of the work being processed every time a corner of the bar engages the material, the number of elevations of the work per revolution of the bar corresponding to the number of faces thereof. Although it has been found that with a number of such bars, in spaced relation, improved results are sometimes obtainable, this method, nevertheless, has not succeeded in eliminating clusters of flock and an uneven distribution of the flock fibers along the adhesive-coated areas. The reason for the failure of this method to effect a substantial improvement over the older known method has been due to the fact that the linear elevation of the work corresponds to the difference between the high and low points of the bar, that is, to substantially the difference between the short radius of the bar (to the flat surface thereof) and the long radius thereof (to the corner or intersection of two adjoining faces). Thus, with each rotation of the bar, there is imparted to the work a number of impulses raising the work only a relatively short distance, insufficient to cause a substantial disturbance of the flock adhesively held to the material. In other words, the impulses are not sufficient to dislodge the flock stuck to the mucilaginous material, causing only a re-arrangement of those particles of flock which are not securely held by the adhesive.

It is within the contemplation of this invention to improve upon the known conventional methods for effecting an equal distribution of flock, by causing the particles of flock to be dislodged from the adhesive by a succession of impacts of relatively great frequency, and whereby the intensity of each impact will be sufficient to disengage all but the most firmly anchored flock fibers from the adhesive. The method is such as to cause the flock particles to be projected upwardly into the air, whereupon they will return to the work being treated in the form of a shower. This shower of independent flock particles causes an equal distribution thereof over the entire area of the work being treated, clusters being disentangled from each other and properly redistributed. And in this aspect of our invention it is a further object to enable such equal distribution and redistribution to be effectuated without the use of any reciprocating or rocking action.

In the accomplishment of the above-referred-to objective of our invention, we employ, as a support for the work being processed, a material of such properties as to have its own frequency of vibration when subjected to a suitable amount of tension. By imparting periodic impulses to such vibratory material, the frequency of vibration can be made considerably greater than that heretofore produced by other methods. The action of such vibratory material is substantially like that of a stretched drum skin. It has been found that this high frequency, when transmitted to the flock-covered work, is sufficient to cause the superimposed flock to be projected into the air vertically in the form of a shower, in the manner above referred to, thereafter returning in an evenly distributed layer upon the work being processed. We have found it convenient to employ, in a preferred method of practicing our invention, an arrangement of polygonal bars similar to that known in the art, for imparting periodic impulses to the stretched vibratory material—thereby causing said vibratory material to vibrate in accordance with its own frequency between impacts. We have also found that with this method a greater tensioning of the vibratory material can be effected by applying manual pressure to selected portions of the vibratory material, the increased tension causing a correspondingly higher travel of the particles of flock, all in a manner to be more specifically hereinafter set forth.

It is another object of this invention to provide a smooth surface to the vibratory material, so as to prevent an adhesion between the work being

processed and the supporting vibratory material. We have found that with such an arrangement the oscillations of the vibrating material will be imparted to the work being processed, without interference, enabling haphazardly disposed flock to be reshuffled and straightened, and enabling the upwardly projected particles to travel a sufficient distance for best operative results.

It has always been a desirable objective in flocking processes to obtain a deep pile of flock so as to simulate an expensive velvet both in appearance and texture. It has, however, been found that the conventional vibratory methods have not been able to produce this effect because the impulses or vibrating action have not been sufficient to accomplish more than a limited displacement laterally of the fibers of flock. As a result, the flock was applied in random fashion, without any uniformity in their disposition along the treated area, some fibers being disposed horizontally, others diagonally and some vertically. In an effort to overcome this disadvantage, it has been attempted to generate static electricity among the flock particles by known frictional methods, imparting like electrical charges to the fibers, thereby making them mutually repellant to each other. However, it has been found that due to the firm anchorage of many of the particles within the glue, the mutual repulsion was not sufficient to cause the fibers to stand on end.

It is an important object of our invention to so apply the old and well-known method of electrically charging flock particles as to render the mutually repellant action of these particles effective in producing vertically disposed flock fibers adhesively secured to the work. By our method of imparting impulses to the flock so as to project them upwardly from the work, we have found that the charged particles are vertically disposed and parallel to each other upon returning, through the air, to the work being treated. The result of our method is a flocked surface of a very deep upstanding pile, simulating in appearance and texture a high grade of velvet.

It is another object of our invention to enable the flock to be firmly anchored to the adhesive-coated areas. This is effectively accomplished by our method due to the fact that the particles, after being projected upwardly, fall from a sufficient height to enable them to embed themselves into the mucilaginous surface.

Another object of our invention is to enable flock of different colors to be employed without any inadvertent or accidental mixture of colors. This is accomplished by providing the vibratory material with a smooth upper surface, which will enable previously employed flock to be readily and completely removed before employing new flock.

It is a further object of our invention to prevent the loss of flock without interfering with the operator's observation of the process and without interfering with such manual manipulation as may be necessary for properly practicing the method of our invention.

And a further object of our invention is to enable the aforesaid objectives to be obtained in a simple, inexpensive, and easily operable manner.

Other objects, features and advantages will appear from the drawings and the description hereinafter given.

Referring to the drawings,

Figure 1 is a perspective view of a preferred form of apparatus for practicing the system of our invention, the work to be processed being shown operatively in place.

Figure 2 is a section of Figure 1 taken substantially along line 2—2 thereof.

Figure 3 is an enlarged fragmentary section of Figure 2 taken substantially along line 3—3 thereof.

Figure 4 is an enlarged fragmentary semi-diagrammatic sectional view, taken substantially along line 3—3 of Figure 2, showing the position of the work and flock while the device is in operation.

Figure 5 is a view substantially like that of Figure 4, but showing the arrangement when the device is manually manipulated in accordance with a preferred method of practicing our invention.

Figure 6 is an enlarged diagrammatic representation of a fragment of Figure 5, with the hands removed, illustrating the shower of flock produced by our system and the position of flock particles within the work.

Figure 7 is a diagrammatic representation of a vibratory support for the work, the support being shown drawn taut and elevated by the high portion or corner of a rotating polygonal bar.

Figure 8 is a view substantially like Figure 7, illustrating diagrammatically the extreme positions of the vibratory support during an operative oscillation immediately after the polygonal bar had been operatively rotated from the position of Figure 7, and

Figure 9 illustrates diagrammatically a vibrating portion of the support of Figures 7 and 8 when engaged by the fingers of an operator.

Referring to the drawings which illustrate a preferred apparatus for practicing our invention, a receptacle 10 is provided, the bottom 11 of which consists of a vibratory support for the work 12 resting thereupon, the said support 11 being anchored to the lateral walls 13 of the receptacle and maintained in a taut condition, all in a manner to be more specifically hereinafter set forth.

The said receptacle is removably supported by the uprights 14, the particular arrangement illustrating bars 15 in slidable engagement with rail portions 16 of said uprights. The uprights are positioned upon a table 17 preferably of a height suitable for the convenience of the operators.

The said uprights support the three rotatable polygonal bars 18, 19 and 20 which are so disposed as to be frictionally engageable with the underside of said vibratory support 11 when operatively rotated. The said bars have mounted thereupon pulleys 21, 22 and 23, and are connected by belting 24 whereby the rotation of bar 18 will be operatively transmitted to the other two bars. Bar 18 is provided with another pulley 25 which is operatively connected by belt 26 to motor 27.

It is required that the vibratory support 11 be of such properties that when stretched it will be able to vibrate in accordance with its own natural frequency upon operatively receiving one or more impacts. The nature of such vibratory material is substantially like that of a stretched membrane or drum skin which will obviously vibrate when struck by some mechanical means. It is preferred, for best operative results, that the upper surface of said vibratory support be very smooth or glazed, inasmuch as we have found that such a smooth surface will enable the vibratory support 11 most effectively to transmit its oscillations to the work 12. It has been found

that a rough, coarse or fibrous upper surface of vibratory support would cause the work to adhere thereto to a sufficient extent to give unsatisfactory results. Furthermore, a glazed or smooth upper surface of the vibratory support will obviate the danger of particles of flock embedding themselves within the upper surface of the support, an occurrence which it has been found produces undesirable results when differently colored flock must be used. With a glazed or smooth surface, the entire receptacle 10 can be slidably removed from the uprights 14, and all flock particles dumped out by inverting the receptacle, there being no adhesion between the flock particles and the smooth upper surface. In this way, differently colored flock can be successfully employed without inadvertent mixture of colors.

We have found that a suitable vibratory support can be made from a sheet of duck, canvas or other structurally strong material, the upper surface of which is provided either with a rubber sheet of a material similar to that commercially known as "Pliofilm," or with a sheet of oilcloth properly secured in place. Due to the scarcity of suitable rubber materials, we have resorted to oilcloth, and found that it can be adhesively applied to a sheet of duck material, or the like, to produce a taut vibratory support provided the materials are properly treated and secured together.

In one method of practicing our invention, we attach a sheet of duck material 28 to the sides 13 of the receptacle 10 by means of tacks 29, although other suitable attaching means can be employed within the scope of this invention. The sheet 28 is then treated by applying thereto a suitable glue which upon drying will cause a contraction and thereby a stretching of the sheet, and which can also serve to adhesively hold a sheet of oilcloth 30. We have found that rubber latex or a rubber latex composition is suitable for this purpose, inasmuch as when it dries and sets it not only produces the desired tension within the sheet 28, but also remains highly flexible so that it will not interfere with the operative oscillations of said sheet 28. When the coating of glue or latex 31 has dried sufficiently to become tacky, the oilcloth 30 is applied thereto and pressed thereupon preferably by a hot flat iron, the smooth surface of the oilcloth being on top. This operation results in a complete drying of the said glue 31 thereby preventing any further contraction or tensioning of sheet 28. In this condition it is thus apparent that the sheet of oilcloth 30 and sheet 28 will continue to remain in fixed relation to each other, in view of the fact that no further tensioning occurs, as aforesaid. The two sheets are firmly secured together throughout their entire extent, the glue preventing the formation of air pockets which would adversely affect the operative efficiency of the device. The sheet of oilcloth 30 is then suitably attached to the sides 13 of the receptacle, thermoplastic tape 32 having been found suitable for such purpose.

In practicing our invention, the work 12 has applied thereto, by conventional stencil means not shown on the drawings, an adhesive in the predetermined pattern upon which the flock is to be applied. In the drawings the adhesive coated areas are identified by the reference numeral 33, the adhesive being of any composition capable of adhesively anchoring thereto particles of flock.

The work, with the adhesive coated pattern, is then placed within receptacle 10 upon the vibratory support 11, and the motor set into operation. The polygonal bars, 18, 19 and 20 will accordingly engage the undersurface of the vibratory support 11, and cause periodic elevations thereof whenever the corners 34 of the bars strike said support. In accordance with the method of our invention, the rotational speed of the bars is sufficient to produce successive impacts upon the vibratory support each time a corner 34 comes into engagement therewith. It has been found that when the vibratory support 11 is fully tensioned, each one of the impact sets the support into vibration according to its own natural frequency. By referring to Figure 7, which together with Figures 8 and 9 illustrate the principle of operation of our invention, it will be observed that corner 34*a* of bar 35 is shown in engagement with vibratory support 11*a*. In the position of bar 35 as indicated in Figure 8, a flat portion 36 of the bar is parallel to the support 11*a*, the said support being momentarily under less tension than in Figure 7. The effect of the continued rotation of bar 35 is then to produce a number of impacts of corners 34*a* upon the stretched supporting membrane 11*a*, per revolution, thereby setting it into vibration between the supports or anchors 37. The vibrational effect is diagrammatically shown by broken lines in Figure 8. The frequency of vibration of membrane 11*a* is greater than the frequency of impacts of corners 34*a*, there producing a plurality of oscillations of the membrane between each impact.

By referring back to Figure 4, it will accordingly be seen that each time the bars 18, 19 and 20 engage and leave the support 11, vibrations thereof will occur in accordance with its natural frequency. These vibrations are transmitted to the work 12, upon which is deposited a layer 38 of flock. We have discovered that due to the relatively high frequency of vibration, the particles 38*a* of the flock will be thrown upwardly, to return in the form of a shower, substantially as indicated in Figure 4. The more taut the material, the higher will be the projection of the flock particles into the air. The effect is to cause not only a considerable agitation of the layer of flock, but also a redistribution thereof over the surface of the work. And wherever the flock particles engage adhesive areas, the particles remain anchored thereto in a generally vertical direction.

For best operative results we have found it helpful to manually manipulate the vibratory support in such a manner as to increase the tension thereof, whereupon the particles of flock are thrust considerably higher. Figure 5 illustrates the position of the fingers of operators' hands causing depressions 39, 40, 41 and 42, therein. It will be seen that the distance between depression 39 and bar 18 is less than the distance between said bar 18 and the next adjacent wall 13. Similarly the distance between bar 18 and depression 40 is relatively small, as well as the distance between the other bars and the shown depressions. It is obvious that due to the shortened distances between the depressed portions and the impact-producing bars 18, 19 and 20, the frequency of oscillations will be correspondingly increased; and it is also apparent that the tension within the vibrating medium will also be increased. We have actually found that by such manual manipulation, a higher pitch and an in-

creased volume of sound are produced, thereby indicating an increased frequency and amplitude of vibration. By continuously manually manipulating various portions of the vibrating support with the work thereover, particles of flock are made to rebound upwardly a very considerable distance, to return in the form of a fine shower of independent particles 38*a*. The increased frequency and amplitude of vibration are apparently the cause of this fine shower of flock particles. In the preferred method of practicing our invention, we accordingly continually apply such manual means and produce more effective results.

By referring to Figure 9 this principle is further illustrated, the depressions 43 and 44 causing a reduction in the length of the vibrating medium to increase the frequency thereof.

Due to the frictional engagement of the rotating bars with the underside of the vibratory support, static electricity is generated, the particles of flock each receiving like electrical charges. This principle has been known for many years, but it has never been successfully applied in flocking in view of the fact that the force of repulsion between the electrically charged particles is generally insufficient to cause them to reform their positions when firmly anchored within the adhesive areas. But in our system, where the particles are projected upwardly in the form of a shower, the independent charged particles align themselves parallel to each other while in the air, as illustrated in Figure 6, and thereafter drop upon the work in vertical formation. The mutual repellant action is not interfered with while the particles are in the air thereby making such alignment possible.

The resultant flocked area is hence composed of upstanding fibers equally distributed, producing a deep pile and a uniform texture. It has been found that the results obtained by this method are far superior than heretofore obtained by other methods, and it is believed that this result is primarily due to the production of oscillations within a vibratory support for the work, according to the natural frequency of said support—the impact means producing such oscillations also providing the necessary friction to produce charges of static electricity within the flocked particles.

The height to which the particles of flock are projected is such that we have found it necessary to provide means to prevent such particles from being thrust out of the receptacle. We have accordingly provided a peripheral canopy 45 supported by the top of the receptacle 10, the canopy having downwardly and inwardly sloping walls 46 which prevent the flock particles near the sides 13 from leaving the receptacle.

It is of course understood that other additional forms and modifications of the apparatus and adaptations of the method constituting this invention can be employed beyond and in addition to those hereinbefore described, all within the scope of the appended claims.

What we claim is:

1. In a flocking device, an open-topped laterally enclosed receptacle, and a stretched vibratory support forming the bottom of the receptacle and adapted to support the work to be flocked said support having a smooth upper surface.

2. In a flocking device, an open-topped laterally enclosed receptacle, a stretched vibratory support forming the bottom of the receptacle and adapted to support the work to be flocked, impact means operatively engageable with and adapted to intermittently actuate the support, and means to actuate said impact means, said support having a smooth upper surface.

3. In a flocking device, a stretched vibratory support adapted to support the work to be flocked, walled means surrounding said support and extending upwardly therefrom, the support being operatively secured to said walled means, rotatable polyhedral impact means in operative engagement with the underside of said support, and means to rotate said polyhedral means at predetermined speeds, whereby the vibrations will be transmitted to the work, the period of vibration of the support being greater than the frequency of operative engagement of the impact means with the support, the upper surface of the support being smooth.

4. In a flocking device, a stretched vibratory support adapted to support the work to be flocked, a mounting for said support, impact means operatively engageable with and adapted to intermittently actuate the support, and means to actuate said impact means, said vibratory support comprising a lower layer of stretched fabric anchored to the mounting, and an upper layer of material adhesively secured to the lower layer along the entire extent thereof, the upper layer having a smooth upper surface, whereby there will be no adherence between the flocking material and the support.

5. In a flocking device, a stretched vibratory support adapted to support the work to be flocked, a mounting for said support, impact means operatively engageable with and adapted to intermittently actuate the support, and means to actuate said impact means, said vibratory support comprising a lower layer of stretched fabric anchored to the mounting, an upper layer of material, and an intermediate layer of flexible adhesive securing the upper layer throughout its extent to the lower layer, the upper layer having a smooth upper surface, whereby there will be no adherence between the flocking material and the support.

6. In a flocking device, a laterally enclosed receptacle containing a bottom wall comprising a stretched vibratory support adapted to support the work to be flocked, means removably supporting the receptacle, a plurality of spaced impact means operatively engageable with and adapted to intermittently actuate the underside of the support, and means to actuate said impact means, said vibratory support comprising a lower layer of stretched fabric anchored to the sides of the receptacle, an upper layer of material having a smooth upper surface, whereby there will be no adherence between the flocking material and said surface, and an intermediate layer of a glue of latex composition adhesively securing the upper layer throughout its extent to the lower layer.

7. In a flocking device, a stretched vibratory support adapted to support the work to be flocked, and walled means to which said support is permanently secured comprising four substantially vertical sides forming a rectangular enclosure for the work when operatively disposed upon the support, said support having a smooth upper surface.

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