Jan. 16, 1940. R. E. FOGG 2,187,617

MACHINE FOR FLOCKING

Filed Sept. 30, 1936 5 Sheets-Sheet 1

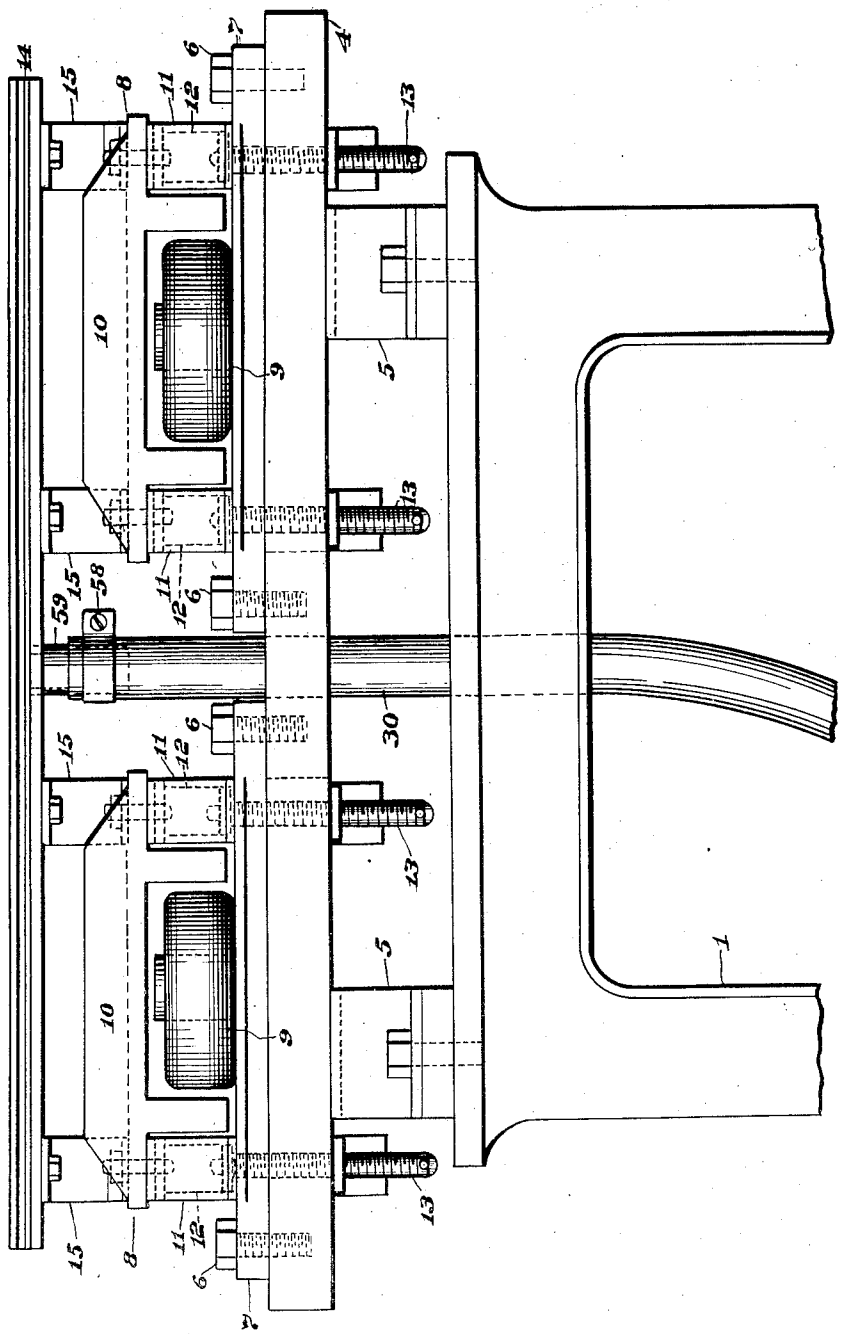


Fig. 1

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MACHINE FOR FLOCKING

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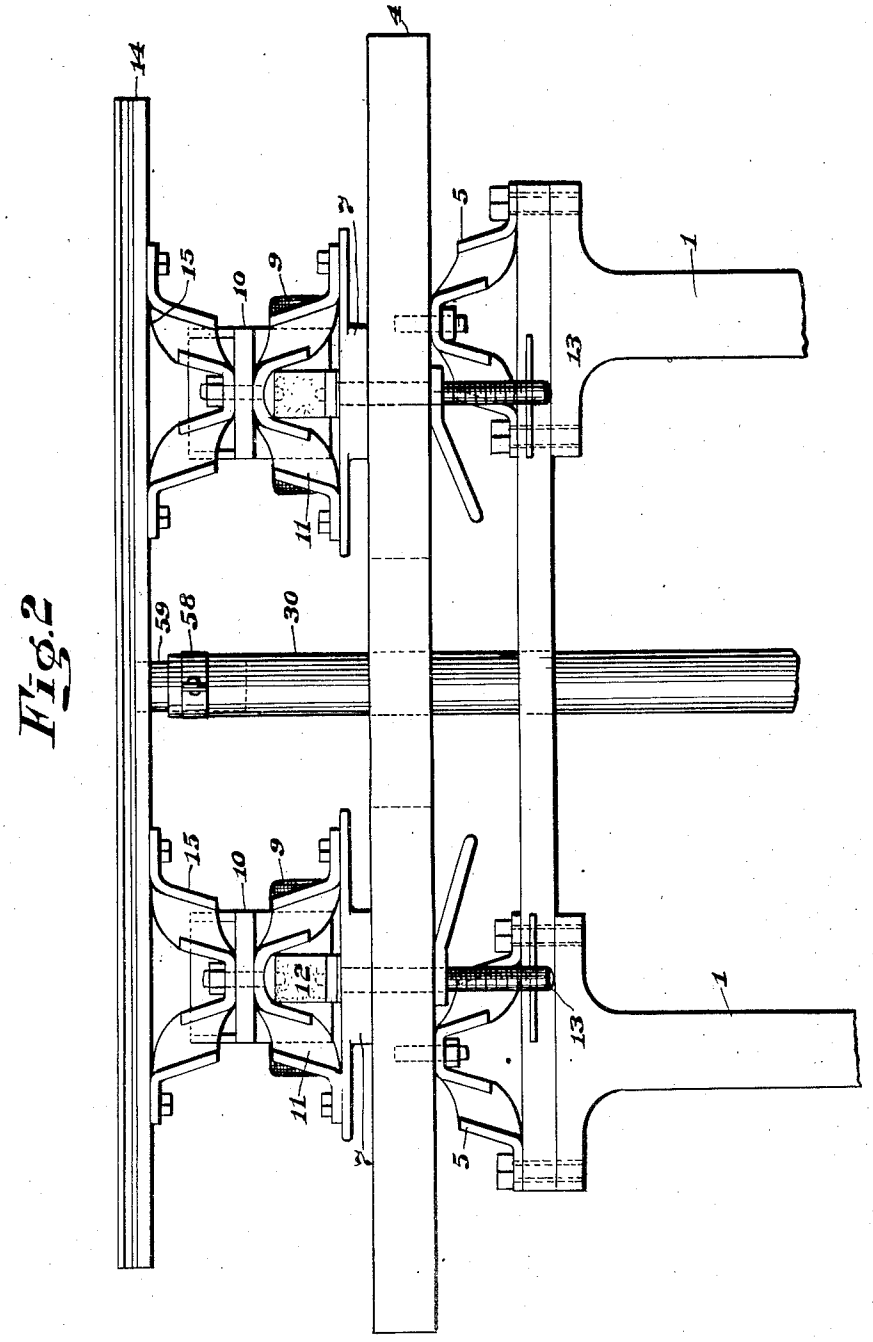


FIG. 2

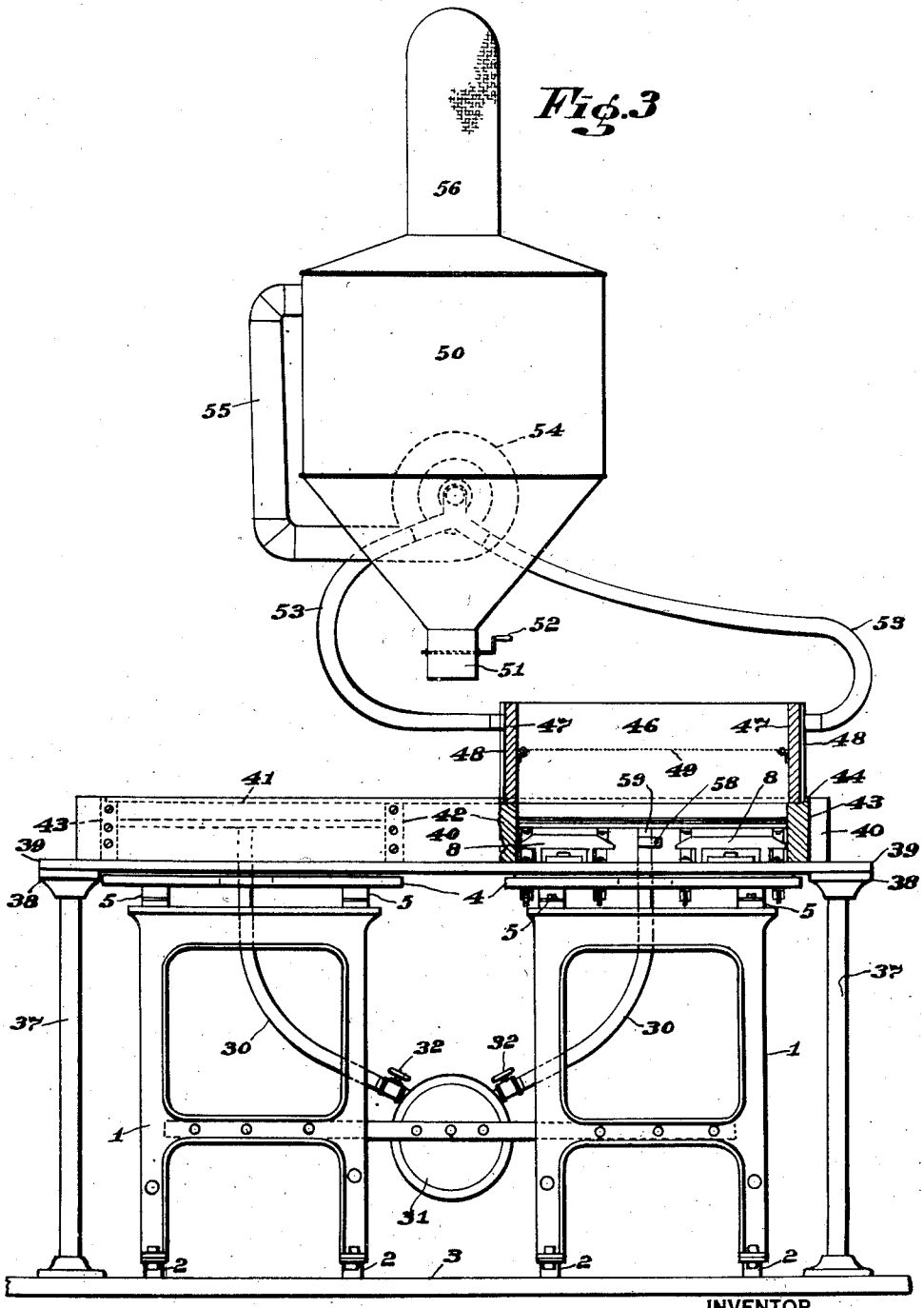
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MACHINE FOR FLOCKING

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Fig. 3



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MACHINE FOR FLOCKING

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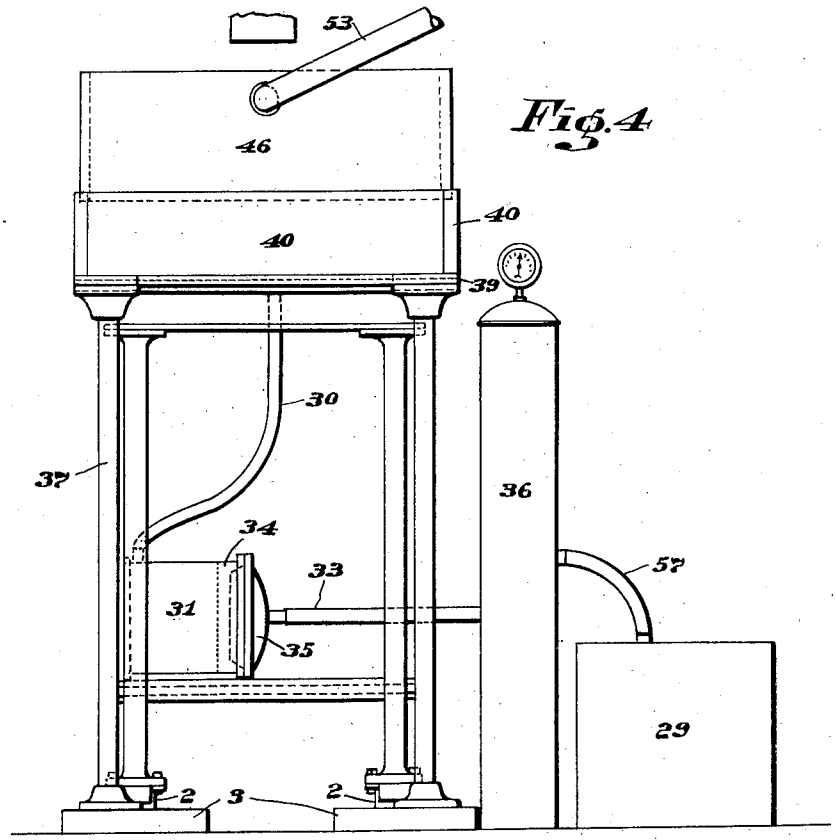


Fig. 4

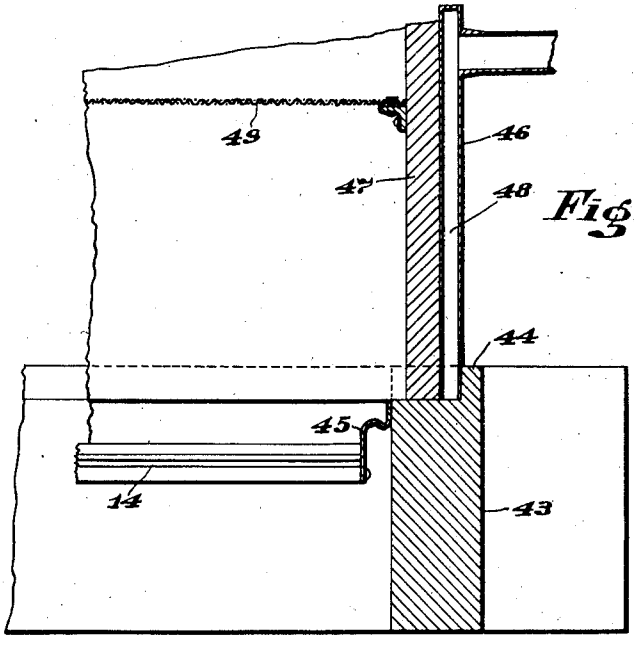


Fig. 5

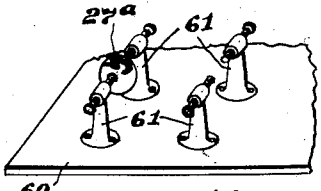


Fig. 10

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MACHINE FOR FLOCKING

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Fig. 6

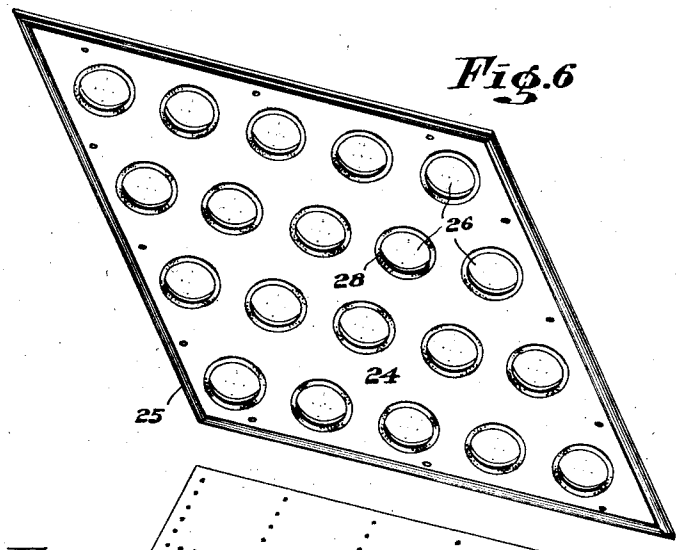


Fig. 7

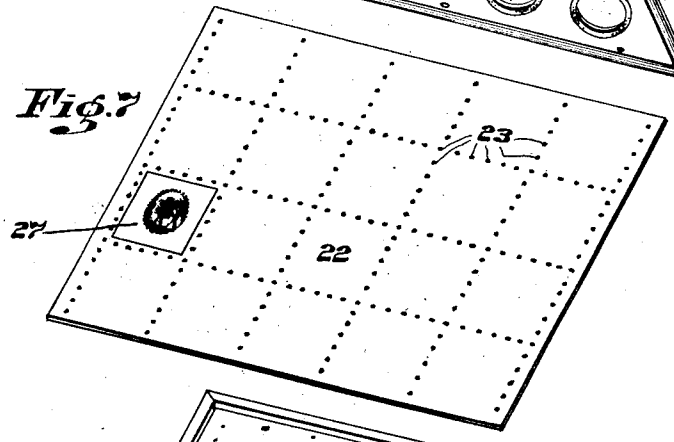
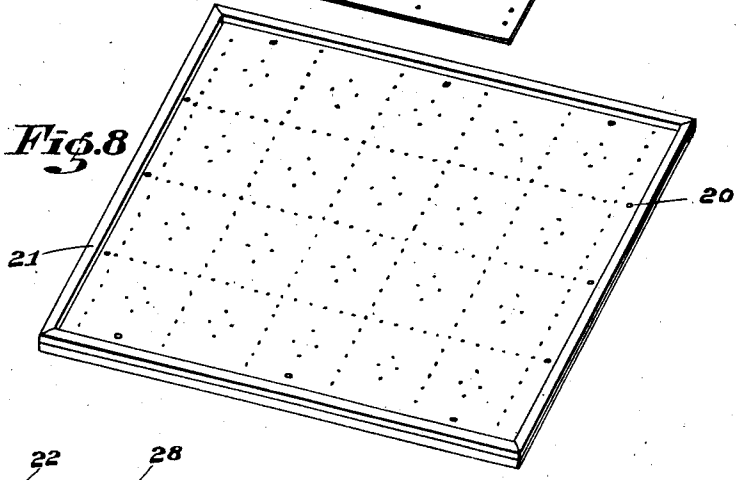


Fig. 8



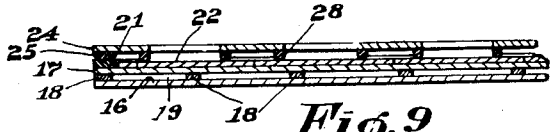


Fig. 9

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UNITED STATES PATENT OFFICE

2,187,617

MACHINE FOR FLOCKING

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Application September 30, 1936, Serial No. 103,321

11 Claims. (Cl. 91—8)

The present invention relates to the art of flocking adhesive treated portions of paper, fabric or other backing material and provides novel machines whereby large areas of such backing material may readily be flocked in whole or in portions to form design with a minimum of time and effort.

Flocking is the ornamentation of fabric, paper or other material by causing to adhere thereto, in closely adjacent vertical position, short rayon, wool, cotton or other fibres, known as flock. The flock is anchored to the backing material by means of a suitable adhesive and is driven into the adhesive, in vertical position, by rapidly vibrating the backing material during the flocking operation.

Heretofore, flocking has usually been accomplished in the following manner. Adhesive was applied to one surface of the backing through a stencil, a handful of flock was dropped on the adhesive treated surface and the backing was held with its other surface in contact with a rapidly rotating hexagonal bar. In this manner, so much of the backing as overlay the bar was caused to vibrate, and the backing was moved to and fro over the bar until the entire surface had been sufficiently vibrated to accomplish the flocking.

The above described practice of flocking is subject to the following and other limitations and defects. An operator can flock but one backing at a time, and the area of that backing effectively vibrated, and thereby flocked, at one time is small. The practice is time consuming and requires skilled operators. Only flexible backing can be successfully flocked and considerable quantities of flock are lost during the operation.

An object of the present invention is to provide a flocking machine having a novel vibrating device with which a number of backings or a single backing of relatively large area can be uniformly vibrated, and thereby flocked, at one time, and wherewith both flexible and inflexible backings may be effectively flocked. Other objects of my invention are to supply novel means for effectively securing the backings to the vibrator during the flocking and to provide mechanism by which flock may be automatically supplied to the backings during the flocking and in which flock in excess of that taken up by the adhesive treated backing portions is automatically retained in the flock supply system. A still further object of my invention is the provision of novel methods of flocking for use in conjunction with the mechanism of my invention.

With the foregoing and other objects in view, I shall now describe my invention in detail with reference to the accompanying drawings, in which:

Fig. 1 is a side view of the upper portion of a vibrator table of my invention;

Fig. 2 is an end view of the vibrator table portion shown in Fig. 1;

Fig. 3 is a side elevation partly in section, showing flock supplying mechanism of my invention in conjunction with two vibrator tables;

Fig. 4 is an end view at the right hand end of the machine shown in Fig. 3;

Fig. 5 is an enlarged section through the right hand end of the flock box, trough and vibrator plate shown in section at the right in Fig. 3;

Fig. 6 is a plan view of the under surface of the set-up;

Fig. 7 is a plan view of the upper surface of the tray;

Fig. 8 is a plan view of the top of the vibrator plate;

Fig. 9 is a section at one end of the vibrator plate with the set-up and tray assembled thereon;

Fig. 10 shows a modified top plate adapted to hold solid objects.

In the vibrator table shown in Fig. 1, an open framework 1 which may be of cast iron is cushioned in rubber supports 2 secured to a suitable base 3 (Fig. 3). Supports 2 serve to absorb vibration which may be imparted to frame 1 by the vibrator mechanism. A plate 4, which may also be of cast iron, is secured to the top of frame 1 by rubber supports 5. To the upper surface of plate 4 is secured, as by bolts 6, the bases 7 of electro-magnetic vibrators 8.

Each of the electro-magnetic vibrators shown in Figs. 1 and 2 comprises a coil 9 secured to base 7 and an armature 10 supported over coil 9 by rubber bridges 11 bolted at the ends to base 7 and supported centrally by rubber cylinders 12, adjustable vertically by screws 13 to which they are attached. Screws 13 are of sufficient length to extend through threaded openings in plates 7 and 4. Coil 9 is energized through a rectifier (not shown) connected to an electric current source. As the current makes in coil 9 armature 10 is drawn down, compressing rubber bridges 11 and 12, and when the current breaks the armature is forced upward by compressed supports 11 and 12. On a sixty-cycle current, armature 10 will thus vibrate sixty times per second which, in a

vibrator having approximately a $\frac{3}{32}$ inch stroke, is sufficient for purposes of my machine.

While I have shown and described a preferred form of vibrator, other types of vibrators such, for example, as compressed air vibrators, may also be employed, provided they are capable of imparting sufficient vertical vibration to plate 14.

Plate 14 rests on rubber supports 15, similar in form to bridges 11, bolted at the ends to plate 14 and in the central portion to armatures 10. Plate 14 vibrates with armature 10 but through the elasticity of rubber supports 15 its vibration stroke is approximately twice the length of that of armature 10. I have shown two vibrators operating in unison on a single plate but obviously the number of vibrators employed may be varied, depending on the size of the vibrating plate and of the vibrator.

To hold the backings securely on vibrating plate 14 during the flocking, I preferably employ a vacuum system designed to operate through the plate 14. For this purpose, plate 14, as shown in Fig. 9, is of hollow construction comprising a bottom plate 16, preferably of aluminum or other light-weight metal, and a top plate 17, united through gaskets 18 to provide cavities 19 in the interior. Top plate 17, which is preferably made of Bakelite, contains a number of small perforations 20 (Fig. 8) which are less than a tenth of an inch in diameter. A large number or all of these perforations should be arranged in lines located according to the shape and number of backings to be placed over plate 17, so that they will be between, and not directly under, the backings. Fig. 8 shows an arrangement of perforations 20 suitable where twenty small rectangular backings are to be flocked with the machine at one time. The upper surface of plate 17 is provided with a flat rubber rim 21.

Tray 22 (Fig. 7) which may be of inexpensive light-weight material such as cardboard, is dimensioned to fit within rim 21 of top plate 17, and is removably secured thereon during the flocking. Tray 22 has perforations 23 of somewhat larger diameter than perforations 20 in plate 17 and arranged in the same manner. The backings to be flocked are placed on tray 22 in such manner that a considerable number of perforations 23 are exposed, and tray 22 is then centered on top plate 17.

To complete one end of the vacuum system for securing the backings during vibration, I provide a cover plate, or set-up 24 (Fig. 6) of cardboard or other light-weight material, approximately the size and shape of top plate 20 and provided with a depending rim 25 of half-round rubber, which may have a radius slightly greater than the thickness of tray 22. Rim 25 is of such dimensions that it rests on rim 21 of top plate 17 and surrounds tray 22 when set-up 24 is centered over top plate 17. Set-up 24 is provided with apertures 26 of such size and so located as to permit the adhesive treated portions of backings 27 to be exposed when set-up 24 is centered over filled tray 22. The edges of apertures 26 are also provided with a depending rim of half-round rubber 28 of slightly smaller radius than rim 25.

In use, set-up 24 is placed over tray 22, with rim 25 resting on rim 21 and with rims 28 resting against backings 27 and surrounding the adhesive treated portions of said backings. Set-up 24 and its rims 25 and 26, thus form a seal against the entrance of air into plate 14 through apertures 20 and 23, and may be drawn firmly against plate 17 and backings 27 by exhausting the air from the cavities 19 in the plate 14. For this purpose I provide a vacuum pump 29 (Fig. 4) communicating with the interior of plate 14 through tube 30, which is secured as by clamp 58 over a stub pipe 59 opening into the hollow central portion of plate 14. As shown in Figs. 3 and 4, tube 30 communicates with cleaner tank 31, and is provided with a T valve 32, which may be adjusted alternately to open tube 30 to vacuum connection and close it to atmosphere or to close it to vacuum connection and open it to atmosphere, thus affording convenient means for applying suction to and releasing it from set-up 24. Cleaner tank 31 communicates with auxiliary tank 36 through a tube 33 and is provided with a fine mesh screen 34 to prevent any flock which may get into the vacuum system above it from reaching vacuum pump 29. Tank 31 is provided with an air tight removable head 35 to permit access to the screen 34 for periodic removal of accumulated flock. Auxiliary tank 36 communicates with pump 29 through tube 57 and serves to build up volume to take care of any leakage of air at the set-up.

In some cases it may be possible to omit the set-up and tray from the vacuum holding system, as where but a single backing, of sufficient size to cover all the perforations in plate 17, is flocked at a time. If such backing is of relatively air tight material, such as paper or heavy fabric, it may itself act as a top seal for and be held by the vacuum system. Ordinarily, however, as where a number of small cards are flocked in one operation, or the backing material is folded presenting a loose upper surface, it is essential to use a set-up.

In case several vibrator tables are employed in one machine, the tubes 30 may conveniently be connected to a single cleaner tank and thus to a single vacuum pump, as shown in Fig. 3.

The above described vacuum holding system is designed for use where relatively thin, flat backings, such as greeting cards, are to be flocked with my machine. While I have tried means other than the vacuum system for securing such backings to the plate, such, for example, as a set-up held by ordinary vise clamps at the edges of the plate, I have found the vacuum system described more satisfactory, particularly where a number of small backings of this type are to be flocked at one time. Where objects such, for example, as a cylinder or ball, are to be flocked with my machine, the vacuum system may be dispensed with and suitable holding means such as vise clamps provided on the top surface of plate 14, which then, of course, need not be hollow; or, if desired, such clamping means may be employed in conjunction with the vacuum system by substituting for set-up 24 and tray 22 in the system as described, a solid cover plate having its top surface equipped with clamps suitable for holding objects of that type. I have illustrated such a modification of my invention in Fig. 10 in which 60 is a plate, which may be directly connected to a vibrator 8 or substituted for set-up 24 and tray 22 as above described, and 61 are adjustable vise clamps secured to plate 60 and suitable for holding solid objects 27a.

The device for automatically applying flock to the vibrating backings is shown in Figs. 3–5. In the drawings the device is shown in conjunction with two vibrator tables, but it should be understood that it is equally applicable to use

with more than this number, or only one table. Uprights 37 are rigidly connected to base 3, and are provided at the top with flanges 38 to which are rigidly secured crossbars 39. The frames 1 of the vibrator tables are attached to base 3 between uprights 37. To the upper surface of crossbars 39 are secured, in vertical position, strips 40, which may be of wood or metal, and which form a rectangular trough, open at the top and bottom. Uprights 37 are of such height that vibrating plates 14 of the vibrator tables extend into, but not entirely through, the space enclosed by strips 40.

The inner surfaces of the two strips 40 which cross the vibrator tables are provided near the top with tracks 41. Cross strips 42 and 43 are secured at their ends to the track carrying strips 40, and are located one at each end of the vibrating plates 14 of the vibrator tables. The top surfaces of the inner cross strips 42 are flush with the top of track 41. The two end cross strips 43 have the inner portions of their top surface flush with the top of track 41, but the outer ends are raised above that level to provide stops 44. The edges of each vibrating plate 14 are connected by leather strips 45 to the adjacent inner surfaces of strips 40, 42 and 43.

Flock distributing box 46 is rectangular in shape and is adapted to fit within the trough formed by the strips 40 and to slide on track 41. Box 46 has an opening at the top for the reception of flock and is provided at each end with an inner wall 47 forming compartments 48, open at the bottom. Compartments 48 are of such width that each is closed by the top surface of a cross piece 42 or 43 when one end of box 46 abuts a stop 44. A flock distributing screen 49, preferably of wire and with meshes which may range from 40 to 100 per square inch, extends across the inner opening of box 46, between compartments 48. Box 46 is open at the top between compartments 48.

Flock storage hopper 50 is provided with a base outlet 51 which is positioned above the top of box 46 and approximately midway of the path of box 46 along track 41. Outlet 51 has a valve 52 which may be opened to permit flock to pass to screen 49 as the open top of box 46 passes beneath outlet 51.

Each compartment 48 of box 46 is provided with a flexible tube 53 which communicates at one end with a compartment 48 and at the other end with a blower 54, in such manner that blower 54 exerts suction through tubes 53 and compartments 48. As box 46 moves across a vibrating plate the suction in one of the compartments 48 draws up unused flock beneath it and transmits it to blower 54 by which it is returned, through a pipe 55 to hopper 50. An exhaust bag 56 in the top of hopper 50 permits the air from blower 54 to escape, leaving the flock which it carries in hopper 50. Flock may conveniently be supplied to hopper 50 by removing an end of one of the tubes 53 from box 46 and placing it in proximity to a supply of flock while operating blower 54, or, if desired, a suitable supply door may be provided in hopper 50.

When box 46 abuts against a stop 44 the mouths of suction compartments 48 are closed by strips 42 and 43 and the movement of air created by the vibration of plate 14 and the leather strips 45 sifts the flock down through screen 49 onto set-up 24 and the adhesive treated portions of backings 27, which portions are then flocked by the vibration of plate 14.

In operating the machine, a tray 22 is filled with backings to which a suitable adhesive has been applied in the portions where flocking is desired, the backings being arranged on tray 22 in the manner previously described. The filled tray is placed on top plate 17 of vibrator plate 14, a set-up 24 is located thereover and plate 14 is opened to the vacuum system by adjustment of the T valve 32. Box 46 is then moved along track 41 until it abuts against a stop 44, flock being supplied to screen 49 through valve 52 as box 46 passes beneath hopper outlet 51. The vibrator is then turned on, automatically sifting down the flock and flocking the adhesive treated portions of the backings, as previously explained. When the flocking is completed, thirty seconds' vibration generally being sufficient, box 46 is moved back along track 41, and unused flock is sucked up through a suction compartment 48 by blower 54 and returned to hopper 50, as previously explained. Plate 14 is then closed to vacuum and opened to atmosphere by adjustment of T valve 32, set-up 24 and tray 22 are removed from the machine and the flocked backings may then be racked.

Box 46 may be moved back and forth along track 41 by hand or, if desired, suitable mechanism may readily be supplied for the purpose. In case but one vibrator table is used in connection with my flock supplying apparatus, it is necessary, of course, to provide but one suction compartment 48, located at that end of box 46 which crosses back and forth over the vibrator plate 14.

With the machines and methods of my invention it is now possible to flock large areas of backing, such as twenty 4 by 5 inch greeting cards, in one operation consuming less time than is required to flock a small fraction of such area, such as one 4 by 5 inch card, with methods and machines heretofore available. Since the flocking is entirely automatic, operation of the machine does not require skilled labor, while a uniform and higher quality of flocking is produced than was possible in previous practice. Flock losses are materially reduced and the flocking of inflexible backings may be successfully accomplished.

While the flock supplying mechanism described facilitates and effects desirable economies in the use of the vibrating flocking tables of my invention, its use is not essential and may, if desired, be dispensed with. In such case, the vibrator and vacuum system for locking the backings thereto may be used in the manner previously described, the flock being supplied thereto by hand or in other convenient manner.

Having thus described my invention, what I claim is:

1. A vibrator table for flocking, comprising a frame, a hollow, flat top plate resiliently supported by the frame, means on the frame to vibrate said plate rapidly vertically, apertures in the upper surface of the plate and communicating with the cavity therein, a set-up adapted to fit on the top surface of the plate and over material to be flocked placed on the plate, said set-up, in conjunction with said material, sealing the top of the plate but exposing the material areas to be flocked, and means to create vacuum in the plate under the set-up.

2. A vibrator table for flocking comprising a frame, a hollow, flat top plate resiliently supported by the frame, means on the frame to vibrate said plate rapidly vertically, apertures

in the upper surface of the plate and communicating with the cavity therein, and means to remove air from said hollow plate, whereby to adhere to the top surface of said plate material to be flocked by the vibration of the plate.

3. A vibrator table for flocking comprising a frame, a hollow flat top plate resiliently supported by the frame, means on the frame to vibrate said plate rapidly vertically, apertures in the upper surface of said plate and communicating with the cavity therein, a set-up adapted to fit on the top surface of the plate and over material to be flocked thereon, said set-up, in conjunction with said material, sealing the top of the plate but exposing the material areas to be flocked, a vacuum pump, and a flexible tube connecting the cavity in said plate with an inlet to said pump.

4. A vibrator table for flocking comprising a frame, a hollow flat top plate resiliently supported by the frame, means on the frame to vibrate said plate rapidly vertically, apertures in the upper surface of said plate and communicating with the cavity therein, a set-up adapted to fit on the top surface of the plate and over material to be flocked thereon, said set-up, in conjunction with said material, sealing the top of the plate but exposing the material areas to be flocked, a vacuum pump, a flexible tube connecting the cavity in the plate with an inlet to said pump, and a valve for opening said tube alternately to vacuum pump connection and to atmosphere.

5. A machine for flocking comprising a vibrator table having a horizontally supported plate, means for vibrating said plate vertically, means for removably securing material to be flocked on the plate while exposing adhesive containing areas of said material, a trough supported over the table and surrounding the plate, a box slidably mounted in said trough, a screen in said box, an opening in the box to permit periodically supplying flock to the upper surface of the screen, and an opening in the box, under the screen, to permit flock to sift through the screen onto the plate.

6. A machine for flocking comprising a vibrator table having a horizontally supported plate, means for vibrating said plate vertically, means for removably securing material to be flocked on said plate while exposing adhesive containing areas of said material, a trough supported over the table and surrounding the plate, cross strips in the trough adjacent the ends of the plate, flexible strips connecting the plate to the trough and cross pieces, a box slidably mounted in said trough, a screen in said box, means for supplying flock to the screen, and an opening in the box, under the screen, to permit flock to sift through the screen onto the plate when the box is moved into position thereover.

7. A machine for flocking comprising a vibrator table having a horizontally supported plate, means for vibrating said plate vertically, means for removably securing material to be flocked on said plate while exposing adhesive containing areas of the material, a trough supported over the table and surrounding said plate, cross strips in the trough adjacent the ends of said plate, flexible strips connecting said plate to the trough and cross pieces, a box slidably mounted in the trough, a screen in said box, means for supplying flock to said screen, an opening in the box, under the screen, to permit flock to sift through the screen onto the plate, and suction means, operating through an end of the box, for removing unused flock from the plate.

8. A machine for flocking comprising a vibrator table having a horizontally supported plate, means for vibrating said plate vertically, means for removably securing material to be flocked on said plate while exposing adhesive containing areas of the material, a trough supported over the table and surrounding said plate, cross strips in the trough adjacent the ends of said plate, flexible strips connecting said plate to the trough and cross pieces, a box slidably mounted in the trough, a screen in said box, means for supplying flock to said screen, an opening in the box, under the screen, to permit flock to sift through the screen onto the plate, a suction chamber in the box having an opening toward said plate, means to create a suction in the chamber and means to close said opening in the chamber when the box is centered over the plate.

9. A machine for flocking comprising a vibrator table having a horizontally supported plate, means for vibrating said plate vertically, means for removably securing material to be flocked on said plate while exposing adhesive containing areas of the material, a trough supported over the table and surrounding said plate, cross strips in the trough adjacent the ends of said plate, flexible strips connecting said plate to the trough and cross pieces, a box slidably mounted in the trough, a screen in said box, a flock containing hopper having an outlet accessible the top of the screen, an opening in the box, under the screen, to permit flock to sift through the screen onto the plate, and suction means, having an end provided on the box, for removing unused flock from the plate and returning it to the hopper.

10. A machine for flocking comprising a plurality of vibrator tables each having a horizontally supported plate, means for vibrating said plate vertically, means for removably securing material to be flocked on each of said plates while exposing adhesive containing areas of the material, a trough supported over the tables and surrounding the plates, cross strips in the trough adjacent the ends of the plates, flexible strips connecting the plates to the trough and cross pieces, a box slidably mounted in the trough and movable over the plates, a screen in said box, a flock containing hopper having an outlet accessible the top of the screen, an opening in the box, under the screen, to permit flock to sift through the screen onto any one of the plates when the box is moved to position thereover, a suction chamber at each end of the box having an opening toward the plates, said openings in the chambers closed by the cross pieces when the box is in position over any one of the plates, and means to create suction in said chambers for removing unused flock from the plates and returning it to the hopper.

11. In apparatus for coating an adhesive treated sheet material with particles, an electro-magnetic vibrator, a resilient support on the armature of said vibrator, a plate mounted on said support, means for removably securing a sheet material tightly on said plate, and means for continuously showering the particles on the material on said plate while said plate is vibrated.

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