June 9, 1942. H. P. FARIS ET AL 2,285,650

APPARATUS FOR MAKING CARPETS

Filed March 8, 1939 3 Sheets-Sheet 1

FIG. 1a.

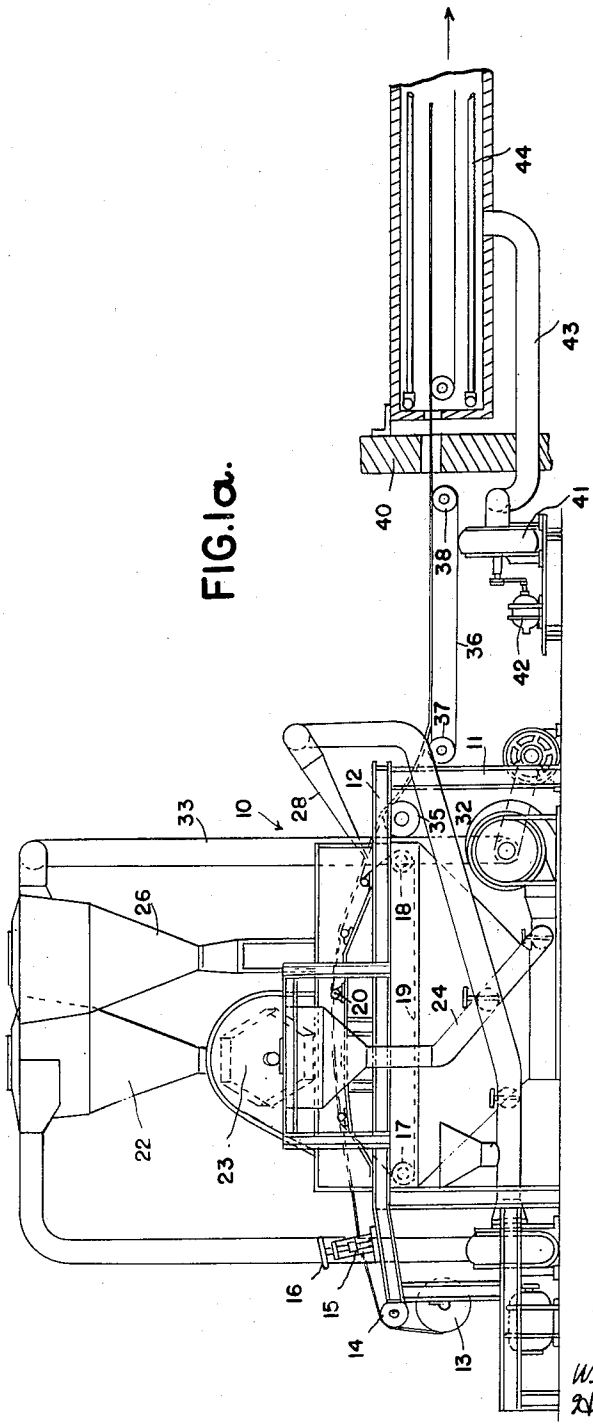
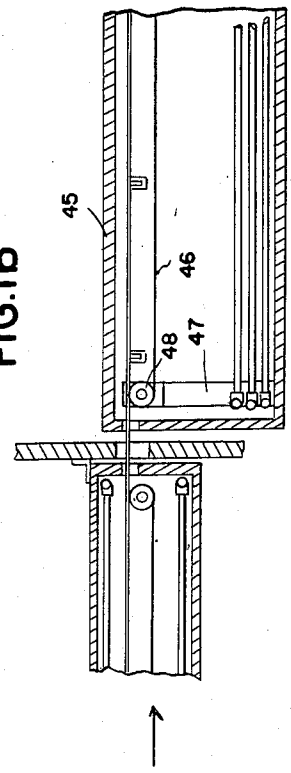


FIG. 1b



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FIG.2.

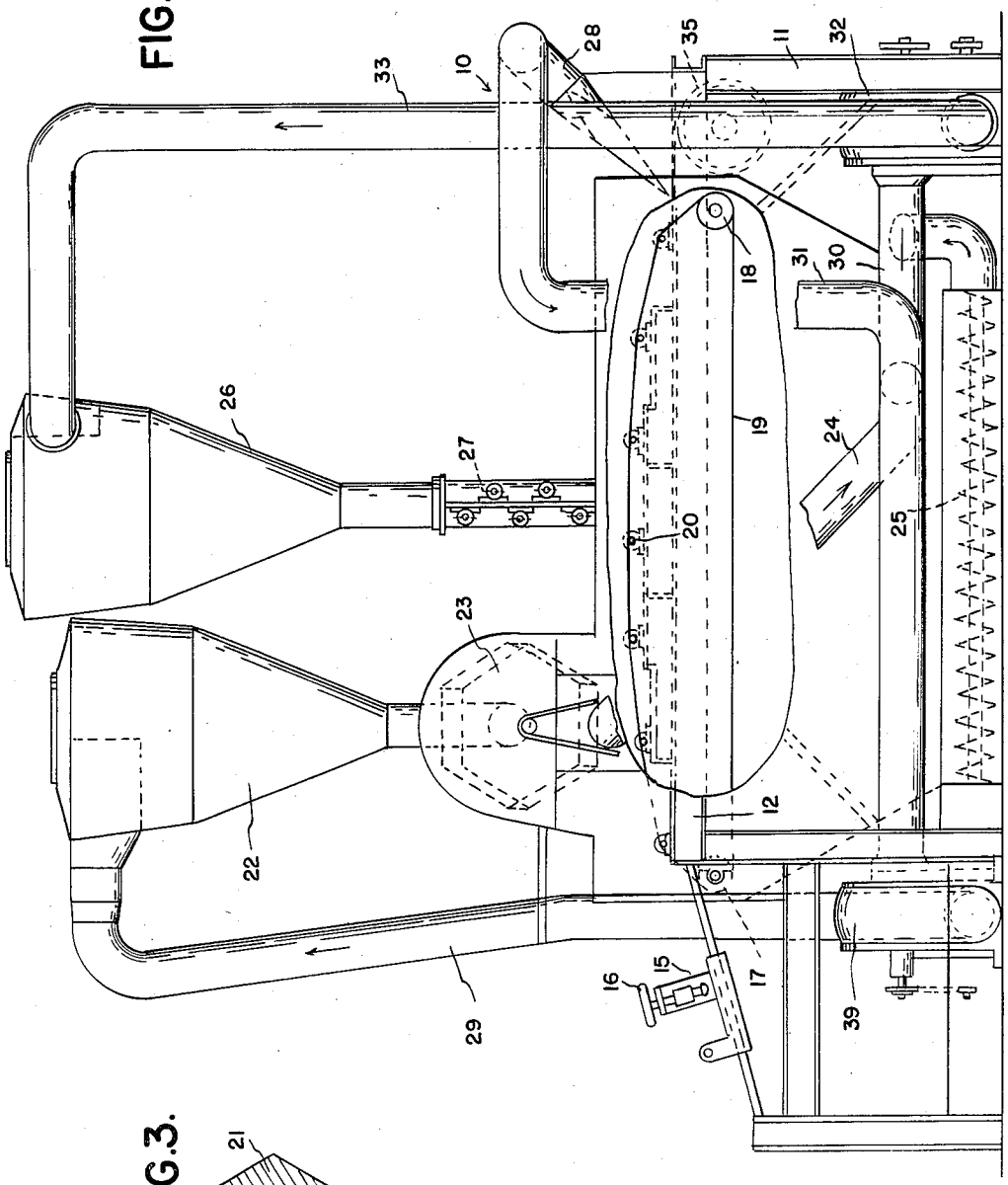
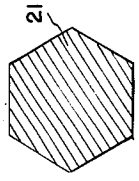


FIG.3.



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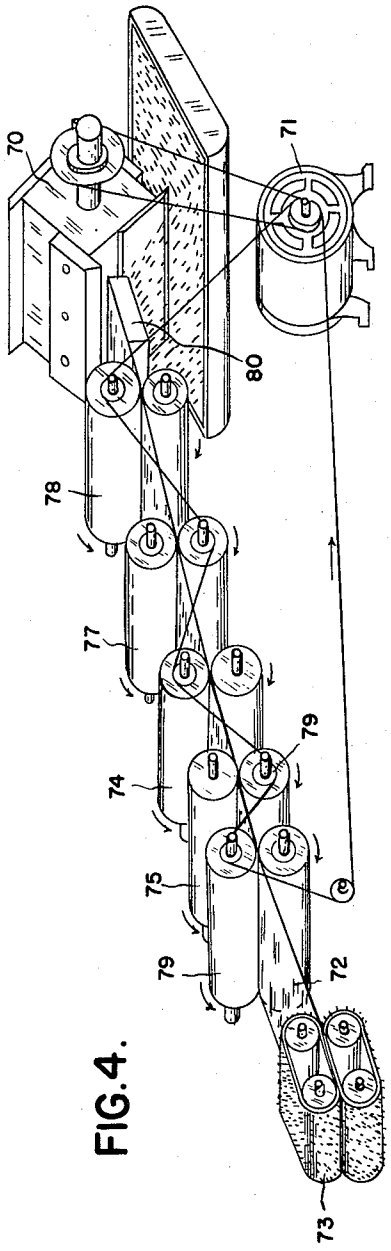


FIG.4.

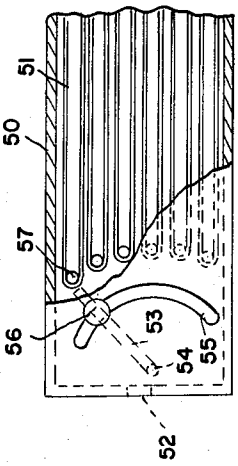


FIG.6.

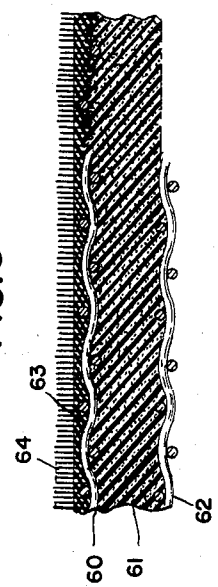


FIG.5.

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UNITED STATES PATENT OFFICE

2,285,650

APPARATUS FOR MAKING CARPETS

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Application March 8, 1939, Serial No. 260,664

3 Claims. (Cl. 91—8)

The present invention relates to floor covering and more particularly to a cemented flock carpet integrally combined with an under padding of sponge rubber.

In the manufacture of flock floor coverings one of the primary essentials is to secure the flock permanently to the floor covering. In the past, efforts to accomplish this result have been only partially successful for a number of reasons.

According to prior practices, flocked floor coverings have been manufactured and have been used with under paddings of various natures, such for example as felt pads. The pads have been used as an entirely separate element in some cases, and in other cases they have been adhesively secured to the flocked floor covering after completion of the floor covering.

We have found that it is possible to manufacture integrally formed padded flocked floor covering in which the under padding is a layer of sponge rubber. This results in a unitary structure, and further we have found that flock is much more securely anchored than in previously known constructions.

In order to carry out the manufacture of our novel floor covering, we have designed apparatus adapted to carry out our preferred method. This apparatus includes the novel mechanism for handling the floor covering during its assembly; novel apparatus for heat treating the assembled floor covering in a manner to avoid the formation of permanent bends or folds therein; and novel apparatus for preparing flock from generally unspinnable hair, or other fiber.

It is an object of the present invention to produce an integrally formed padded flocked floor covering.

It is a further object of the present invention to produce an integrally formed flocked floor covering combined with a sponge rubber under pad.

It is a further object of the present invention to provide a flocked floor covering characterized by the exceptional strength of the cemented bond which retains the flock in position.

It is a further object of the present invention to produce a flocked floor covering by a novel method.

It is a further object of the present invention to produce flocked floor covering by depositing flock on a moving adhesive coated web combined with a lower coating of blowing rubber stock and a lower protective web which advances synchronously with and is temporarily integrally attached to the blowing rubber stock.

It is a further object of the present invention to make a flocked floor covering employing generally unspinnable hair or fiber, and for this purpose to provide a novel method and apparatus for preparing the flock.

Other objects of the invention will be apparent as the description proceeds, and when taken in conjunction with the accompanying drawings wherein

Figs. 1*a* and 1*b* illustrate diagrammatically the complete apparatus;

Fig. 2 is an enlarged elevation with parts broken away of the mechanism for applying flock;

Fig. 3 is a section through one of the beater elements;

Fig. 4 is a diagrammatic perspective showing the apparatus for preparing flock;

Fig. 5 is a fragmentary broken section through our improved floor covering; and

Fig. 6 is a diagrammatic elevation of a modified vulcanizing chamber.

Briefly described, the apparatus for manufacturing our improved floor covering comprises: a mechanism for applying flock to an adhesive coated open-work fabric; mechanism for drying the adhesive; and a vulcanizing chamber for vulcanizing the sponge rubber stock.

In Figs. 1*a* and 1*b* we have illustrated the flock applying apparatus generally indicated at 10 and comprising a suitable frame having vertical frame members 11 and horizontal frame members 12. Means are provided on the frame for supporting a roll 13 of an open-work fabric, such for example as burlap, carrying a coating of a blowing rubber stock. The material is led through the machine around a roller 14 and past a device for applying adhesive, indicated at 15. This adhesive applying device comprises essentially a doctor blade for applying a predetermined thickness of cement to the burlap side of the fabric and the blowing rubber stock. Suitable means, such for example as a hand wheel 16, are provided for varying the thickness of the coating applied.

Within the machine are provided a pair of rollers 17 and 18, around which is positioned a protective webbing or belt 19. The protective webbing 19 passes over a plurality of beating elements 20 which are in the form of polygonal rods 21, as shown in Fig. 3. These rods may have any convenient number of sides, but in Fig. 3 are illustrated as hexagonal. Suitable mechanism (not shown) is provided for rapidly rotating the rods 21 in a manner to vibrate the webbing 19.

One of the important features of the present invention is the manner in which the rubber coated and adhesive coated fabric is advanced through the machine synchronously with the protective web or belting 19. As shown in Fig. 1, the floor covering as assembled advances into contact with the web 19. As previously stated the floor covering at this time has as its under surface a coating of blowing rubber stock. This

rubber stock adheres to some extent to the protective web or belting, and the assembly advances through the machine as a unit. The primary function of the protective web or belting is to protect the rubber stock from damage by the rotating beating rods 21. Preferably the web 19 is under such tension as to permit rapid vibration thereof, and the rubber coated fabric is under sufficient tension to prevent it being beaten away from the web or belting 19.

Flock is sifted downwardly through the hopper 22 into a rotating, open-ended screen 23, which distributes the flock evenly across the adhesive coated surface of the floor covering. At this time, due to the vibration imparted by the rollers 21, the flock is caused to stand on end and to become imbedded to a considerable degree in the soft coating of adhesive. Some of the flock passes through the lower end of the rotating screen 23 and is drawn downwardly through a conduit 24. Some of the flock which falls to the adhesive coated surface is displaced therefrom and falls downwardly to the bottom of the casing where it is picked up by a screw conveyor 25, shown in detail in Fig. 2. A second hopper 26 is provided for adding a second coating of flock to the advancing floor covering, and in this case a plurality of rotating blades, indicated generally at 27 (Fig. 2), serve to break up the flock and deposit it evenly over the floor covering.

As a final step, a suction nozzle 28 is located adjacent the floor covering as it leaves the machine and serves to pick up any loose or excess flock and return it to the flock distributing system.

In Fig. 1*a* we have illustrated apparatus for returning flock from the suction nozzle 28 to the first hopper 22, although, if preferred, it may be arranged to feed the flock to the second hopper 26. Also, if desired, suitable valves may be provided to return the flock to either the hopper 22 or the hopper 26, as preferred.

In Fig. 2 we have shown the flock applying apparatus in an enlarged scale. It will be noted that in Figs. 1*a* and 2 we have illustrated slightly different arrangements of flock distributing mechanism, but it will be appreciated that essentially the arrangement is such that flock is first applied through a rotating screen 23 and a second coating of flock is applied through a hopper 26, which cooperates with rotating blades 27.

In Fig. 2 a blower 39 is adapted to force flock upwardly through a conduit 29 into the first hopper 22. The flock which passes endwise through the screen and out the lower end thereof passes downwardly through a conduit 24. The flock which is displaced from the vibrating floor covering, as it passes through the machine, falls to the lower part of the casing and is conveyed by the screw conveyor 25 to a horizontal conduit 30. The suction nozzle 28 picks up the excess and unattached flock as it leaves the machine and feeds it downwardly through a conduit 31 to the blower 39 and hopper 22. A second blower indicated generally at 32 forces the flock received from conduit 24 and screw 25 upwardly through a conduit 33 to the second hopper 26.

This system of flock distribution is merely illustrative, and by the provision of suitable valves within the conduit the circulation of flock may be changed. For example, it may be desirable to return flock from the horizontal conduit 30 to the original blower 39 for passage through the first hopper 22.

As previously stated, it is essential that the adhesive coated and rubber coated fabric be advanced through the machine synchronously with the web or belting 19, and for this purpose suitable driving mechanism for the various feed rolls will be provided. These may be of conventional nature, and are accordingly not illustrated herein.

Referring again to Figs. 1*a* and 1*b*, the flock coated floor covering passes over a roller 35, while the protective web or belting passes over a separate roller 18. This causes positive mechanical separation of the web or belting 19 and the flock coated fabric. It will be appreciated that, if desired, the protective web or belting 19 could continue with the flock coated fabric through subsequent steps in the manufacture, but for convenience we prefer to separate the floor covering and the protective web or belting at this point.

A conveyor 36 comprising a pair of feed rollers 37 and 38 advance the flock covered fabric into a drying chamber, indicated generally at 40. It will be noted that the flock covered fabric is advanced without substantial change in direction, and at no point is the flock covered fabric caused to change direction substantially. This is for the reason that it has been found desirable to avoid excessive bending of the material.

While we have illustrated at 40 a chamber for drying the adhesive coated fabric to cause the flock to set therein, in some cases it may be possible to omit this step and to pass the floor covering assembly directly from the flocking apparatus to the vulcanizing chamber. In Fig. 1*a* however, we have illustrated a drying chamber as comprising a blower 41 operated by a motor 42 for forcing warmed dry air through a conduit 43 which passes a current of air through the chamber 40. Preferably heating means, such for example as steam pipes 44, are located in the chamber.

The partially dried flock covered fabric is next advanced into a vulcanizing chamber 45. At this time the blowing rubber stock is subjected to sufficient heat to cause the same to swell and form a sponge rubber, and at the same time to become firmly vulcanized to the open-work fabric. As will be subsequently described, at this time also the flock is firmly attached into the completed article. In order to avoid forming festoons or loops of the completed floor covering, which would result in imparting permanent bends in the completed fabric, we prefer to advance the floor covering horizontally in the same straight line into the vulcanizing chamber 45. For this purpose, we provide a plurality of conveyors 46. These conveyors are vertically adjustable in the housing 45, suitable ways 47 being provided therefor. If desired, automatic mechanism (not shown) may be provided to move the conveyors 46 vertically through the chamber 45.

The arrangement is such that as one conveyor 46 becomes filled with the flock coated fabric rotation of its rollers 48 will be arrested, and the conveyor moved vertically downward to permit the next succeeding conveyor of identical construction to be moved into position to receive a length of floor covering. Simultaneously therewith, and either manually or by appropriate automatic mechanism, the advancing floor covering is severed and the free end is led on to the second conveyor.

This permits continuous advance of the flock covered floor covering through the flock applying apparatus into the heating chamber without

the necessity of providing an excessively long heating chamber. It is necessary to retain the product in the heating chamber for a substantial length of time in order to effect swelling and vulcanization of the rubber stock. By the herein disclosed arrangement, a heating chamber of relatively short length may be employed. At the same time the product may be retained in the heating chamber for a substantial length of time.

Other mechanism for accomplishing this same purpose may be substituted, and we have illustrated in Fig. 6 such an arrangement. In this modification a casing **50**, which is provided with suitable heating means, such for example as steam pipes (not shown), is provided with a plurality of fixed conveyors **51**. The casing **50** is provided with an inlet opening **52**, and adjacent the opening is an apron **53** which may be in the form of a sheet metal plate. The plate **53** is pivoted, as indicated at **54**, and an arcuate slot **55** in the casing **50** is provided, concentrically arranged with the pivot point **54**. Suitable adjusting means, such as a handle **56**, extends through the arcuate slot **55** and connect to the plate **53**.

Lead rollers **57** of the conveyor belts **51** are also arranged generally concentrically of the pivot point **54**. As will be apparent from an inspection of Fig. 6, the arrangement is such that as the plate **53** is swung to adjusted positions, the advancing end of the floor covering may be directed to any one of the conveyor belts **51**. Thus when a predetermined length of floor covering has been deposited on one of the moving conveyors **51**, further advance of the conveyor is arrested, the floor covering is severed and the advancing free end is directed to another conveyor **51** by suitable adjustment of the plate **53**.

Preferably suitable mechanism is associated with the control handle **56** for automatically initiating movement of a conveyor **51** when the plate **53** is positioned to direct the floor covering thereto. This means may take the form of a switch to operate independent motors driving the various conveyors, or preferably will take the form of a clutch of suitable construction for connecting the constantly actuated driver to the feed roller **57** of the associated conveyor.

By this means, as soon as the conveyor **51** has received a predetermined length of fabric, its motion is arrested and the assembly is retained in the heating chamber **50** for a sufficient length of time to insure full swelling and complete vulcanization of the blowing rubber stock. By providing the proper number of conveyors in accordance with the length of time necessary, the floor covering on any given conveyor will have received its proper heat treatment at the time when its feed motion is again initiated, and the completed floor covering is fed therefrom while the raw floor covering is fed thereto. It will be noted that the floor covering throughout its entire length is subjected to a constant curing interval by this arrangement for the reason that discharge of the completed product from the heating chamber occurs at the same rate as introduction of the raw floor covering into the chamber.

In Fig. 5 we have illustrated the completed product which comprises a flock fabric **60**. This fabric may be a coarse burlap, or other material. Below the burlap and permanently vulcanized thereto is a relatively thick layer **61** of sponge rubber. At the left of this figure we have illustrated an under coating of fabric **62** which may, if desired, be employed, but which preferably is omitted. If employed, this lower fabric is permanently vulcanized to the layer **61** of sponge rubber. Immediately above the ply **60** of open-work fabric is a layer **63** of deposited rubber formed from the rubber adhesive applied. The flock is indicated at **64** and as shown is deeply embedded into the deposited rubber ply **63**.

We have found that the flock is retained with remarkable firmness in the deposited rubber, and tests indicate that a vulcanized bond exists between the flock **64** and the vulcanized sponge rubber **61**. This is clearly shown by tests. When a section of flock is mechanically torn from its base, we find that the bond is disrupted within the sponge rubber, indicating that there is a permanent vulcanized bond between the deposited rubber ply **63** and the sponge rubber ply **61**.

The exceptional characteristic of this bond is attributed to the particular method employed. The adhesive which is applied is preferably a rubber cement containing a petroleum or a coal tar solvent. This cement penetrates through the open-work fabric **60** and simultaneously softens the upper coating of the blowing rubber stock **61**. There is no definite separation between the upper surface of the blowing rubber stock **61** and the lower surface of the cement, but instead the two blend into each other. We have illustrated this condition at the right in Fig. 5.

The bond may be enhanced by employing separate adhesives. One of these may be a synthetic, such as Neoprene and Chlorprene. Where synthetic rubber is employed, the solvent may be a coal tar solvent. It has been found that the synthetic rubber cement forms a better bond with the fabric. A second coating of a normal rubber adhesive is applied over the synthetic rubber cement, or, if desired, the two may be mixed. In either case, the solvent penetrates the burlap and softens the upper coating of the blowing rubber stock.

Apparently this softening of the upper surface of the blowing rubber stock also explains to a considerable degree the strength of the bond with the flock. The flock during vibration is firmly embedded in the upper surface of the material and penetrates completely through the relatively thin coating of rubber cement into the upper surface of the softened blowing rubber stock.

The softening of the upper surface of sponge rubber stock has a further beneficial result in that it substantially improves blowing of the stock. We have found that it is essential that the stock be of such a nature that blowing is substantially completed before vulcanization takes place. It is further essential that the burlap and the adhesive coated fabric remain porous so long as blowing is taking place. Otherwise blowing of the sponge rubber stock causes a mechanical separation between the burlap and the stock.

In place of rubber cement various resinous materials may be employed, but in general it is found that the results obtained are less satisfactory than with rubber cement. This is probably due to the presence of oxidizing agents in the resin solvents which have a tendency to act adversely with the rubber.

The softening of the blowing rubber stock renders the material quite susceptible to injury prior to vulcanization by handling, and it is therefore essential in the present method that the material be handled in such a way as to avoid placing strains on the blowing rubber stock, such

as would result from a sharp change of direction, or the like.

It was previously stated that if desired the protective webbing 19 could be advanced with the floor covering throughout the subsequent steps. It is preferred, however, to advance the floor covering through the drying and heating chambers upon a substantially lighter and more porous conveyor. This permits the drying and heating effect to take place more readily on the sponge rubber stock.

We have illustrated in Fig. 4 apparatus for preparing flock for the present process. In this figure a rotating multiple bladed knife 70 is provided, driven from the motor 71. Flock is advanced along apron 72 to which it is fed from between a pair of opposed conveyors 73 provided with projections to pick the fibrous material from the mass. A plurality of rollers 74, 75, 76, 77 and 78 are provided, and as illustrated these are all driven from the motor 71. Arrangement is such that each succeeding roller has a slightly greater peripheral speed than the preceding roller. In other words, the roller 75 has a greater peripheral speed than roller 74, and the roller 76 has a greater peripheral speed than roller 75, etc. The increasing speed of successive rollers may be taken care of by increasing the diameter of the rollers, or by decreasing the diameter of the pulleys 79 progressively from first to last.

Due to the increased speed of successive rollers, the fibrous material is drawn into substantially parallelism, and the fibers are arranged substantially perpendicular to the rotating cutter 70. As the fibers advance over the block 80, the knife edges cut the fiber into predetermined lengths. The length of fiber may be varied by varying the rate of feed of the fibers, or the rate of rotation of the cutter 70, or both.

By this means it is possible to employ hair or other generally unspinnable fiber which it would otherwise be impossible to use. Thus the economy of the whole method is substantially increased since these unspinnable fibers are relatively inexpensive. At the same time it has been found that fibers of this nature are better suited to the product than fibers of spun yarn, such as wool, rayon, cotton, or the like.

It has further been found that the product resulting from the herein described method exhibits substantial important advantages over similar products known to the prior art. The padding material in the form of sponge rubber substantially increases the wear of the product. The surface appearance is improved due to the fact that it is absolutely uniform and is not streaked as sometimes occurs in woven fabric or cemented pile fabric made according to known methods. The flock pile exhibits superior wearing qualities due to the fact that it may be of a nature such for example as goat hair. The product further exhibits wearing qualities due to the superior strength of the bond resulting. The final product is absolutely self-leveling and need not be adhesively secured to a flat surface. It may be die cut to any predetermined size and shape, and if desired a binding may be applied, either sewed or otherwise secured. The floor covering is integral as opposed to some previous constructions in which a pad was adhesively secured to the carpet after completion of the carpet. The pad serves the double function of increasing wear of the completed product and also, as previously pointed out, increases materially to the strength of the bond with the flock. The texture of the product will vary with the nature of the fiber, and a proper selection may be made between stiff hard fibers or relatively soft fibers.

While we have illustrated and described several specific embodiments of our invention, it will be apparent to those skilled in the art that various additions, modifications, omissions, combinations and substitutions may be made which will be within the spirit and scope of our invention as defined by the appended claims.

What we claim as our invention is:

1. In carpet making apparatus, means for sifting cut fibers downwardly onto an advancing, adhesive coated web, said means comprising a polygonal rotating sieve open at its ends and inclined from the horizontal, a hopper for fibers, and means connecting said hopper and the upper end of said sieve for feeding fibers thereto, a conduit connecting to the lower end of said sieve to receive fibers which do not pass radially through the sieve, a trough beneath said web for receiving fibers which pass radially through said sieve and do not remain on said web, a distributor located above said web at a point further along in the direction of advance than said sieve, a second conduit connecting said first conduit and said trough with said distributor, and a blower for forcing fibers through said second conduit to said distributor.

2. In carpet making apparatus, means for sifting cut fibers downwardly onto an advancing, adhesive coated web, said means comprising a polygonal rotating sieve open at its ends and inclined from the horizontal, a hopper for fibers, and means connecting said hopper and the upper end of said sieve for feeding fibers thereto, a conduit connecting to the lower end of said sieve to receive fibers which do not pass radially through the sieve, a trough beneath said web for receiving fibers which pass radially through said sieve and do not remain on said web, a screw conveyor for conveying fibers along said trough, a distributor located above said web at a point further along in the direction of advance than said sieve, a second conduit connecting said first conduit and the discharge end of said trough with said distributor, and a blower for forcing fibers through said second conduit to said distributor.

3. In carpet making apparatus, means for sifting cut fibers downwardly onto an advancing, adhesive coated web, said means comprising a polygonal rotating sieve open at its ends and inclined from the horizontal, a hopper for fibers, and means connecting said hopper and the upper end of said sieve for feeding fibers thereto, a conduit connecting to the lower end of said sieve to receive fibers which do not pass radially through the sieve, a trough beneath said web for receiving fibers which pass radially through said sieve and do not remain on said web, a distributor located above said web at a point further along in the direction of advance than said sieve, a second conduit connecting said first conduit and said trough with said distributor, and a blower for forcing fibers through said second conduit to said distributor, said distributor including rotary blades for breaking up balls of fibers which have passed axially through said sieve or which have formed in said trough.

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