Jan. 20, 1959 H. MARC 2,870,053

CUSHION PADS

Original Filed March 26, 1951 7 Sheets-Sheet 1

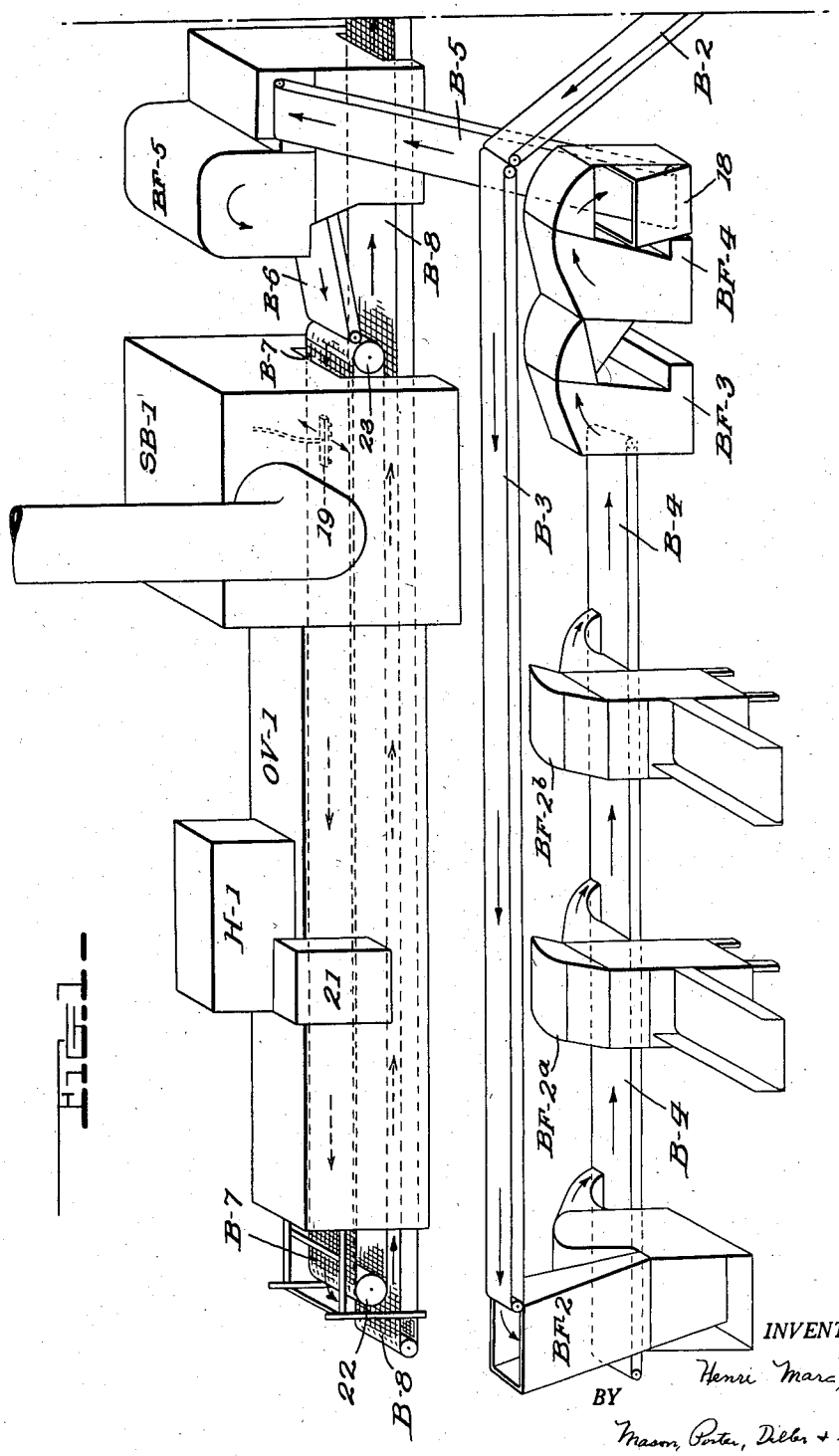

FIG. 1

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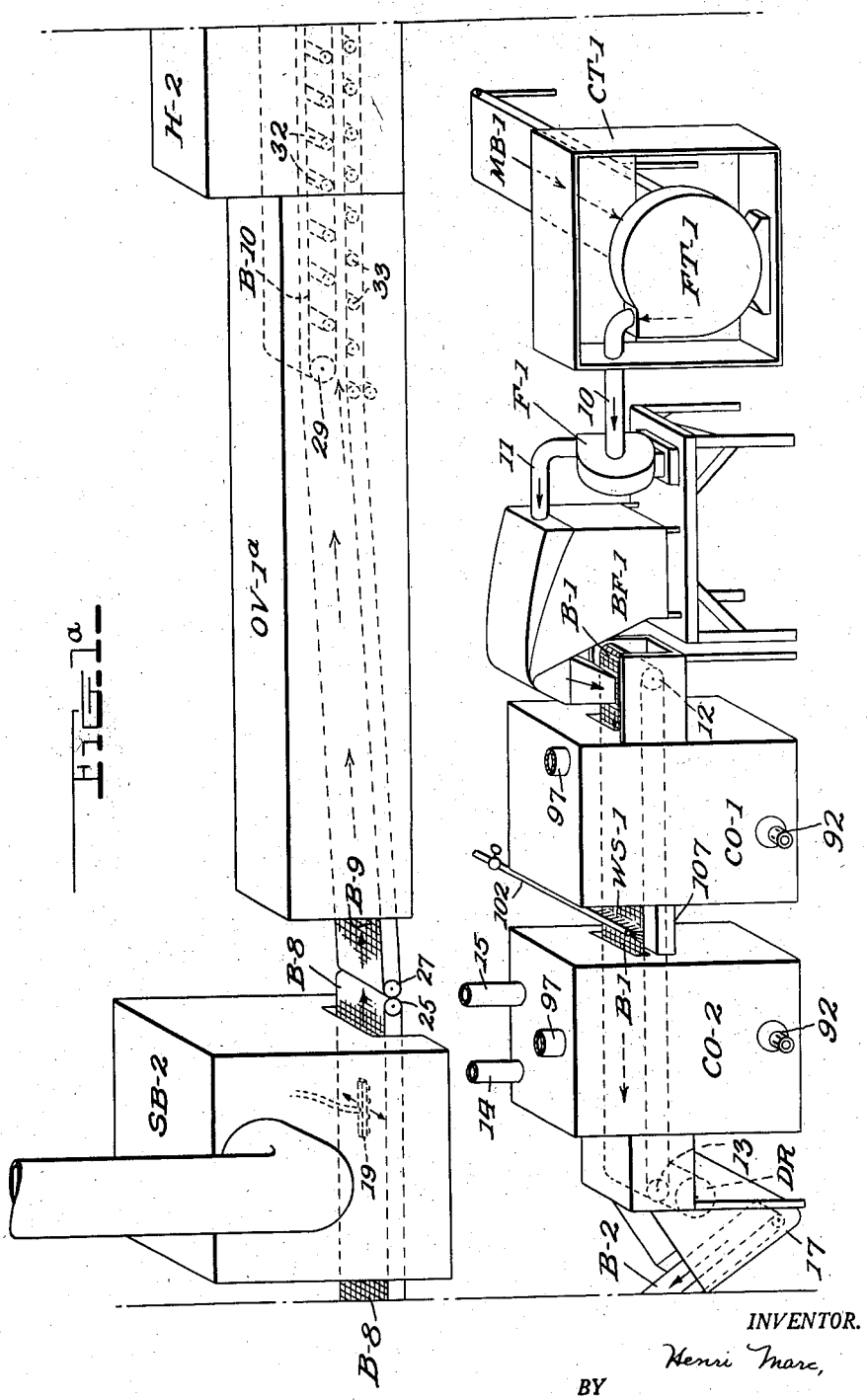

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CUSHION PADS

Original Filed March 26, 1951 7 Sheets-Sheet 3

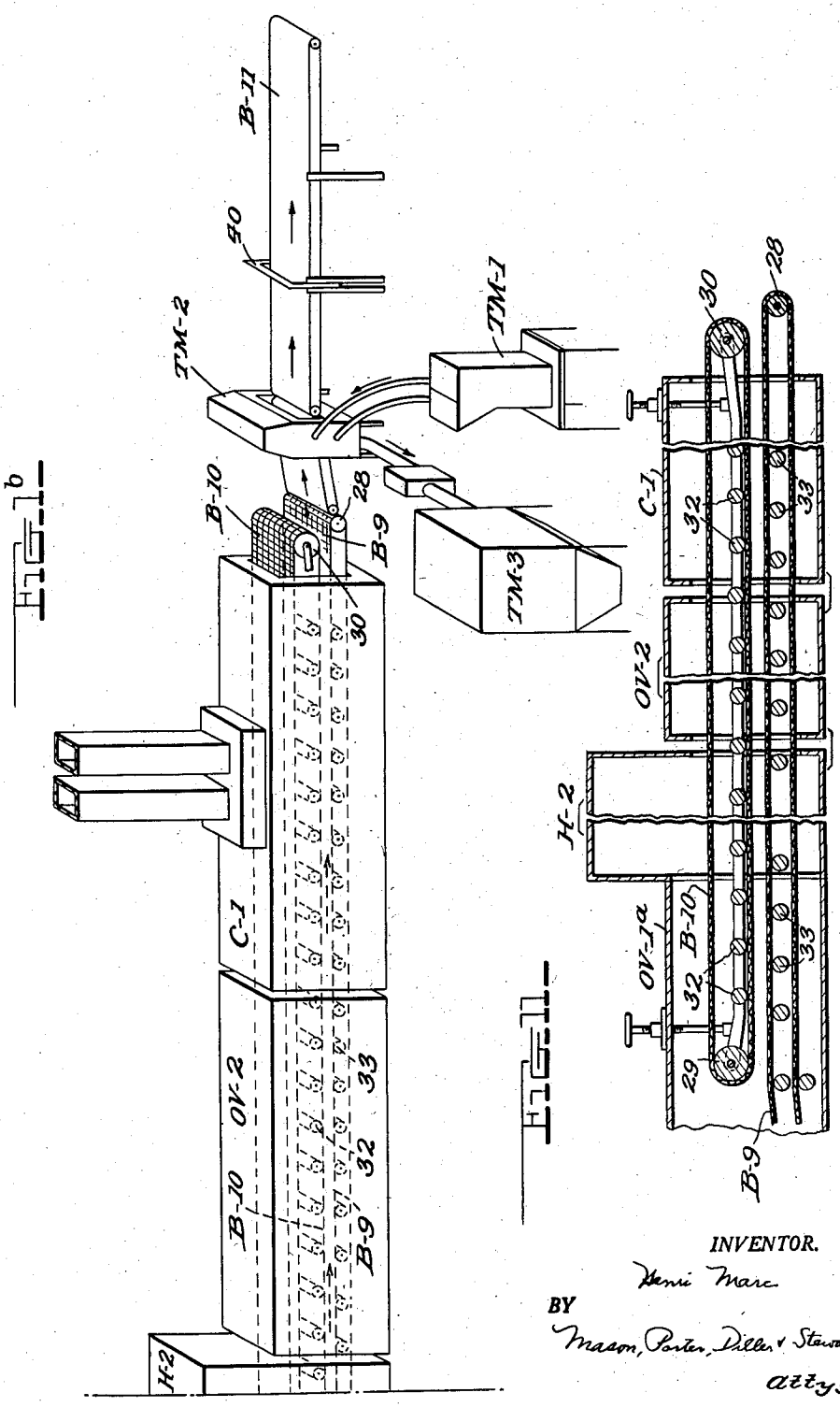

Fig. 11b

Fig. 11a

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CUSHION PADS

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FIG. 2

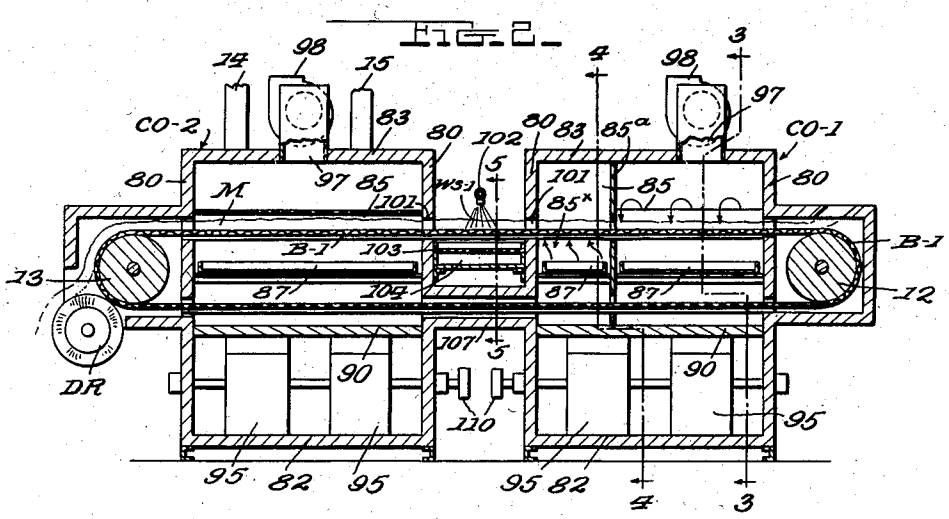

FIG. 3

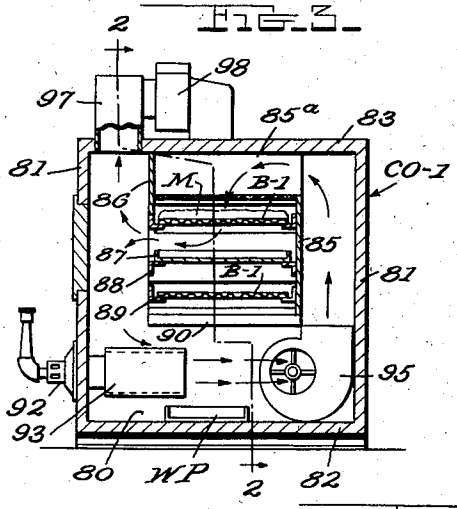

FIG. 4

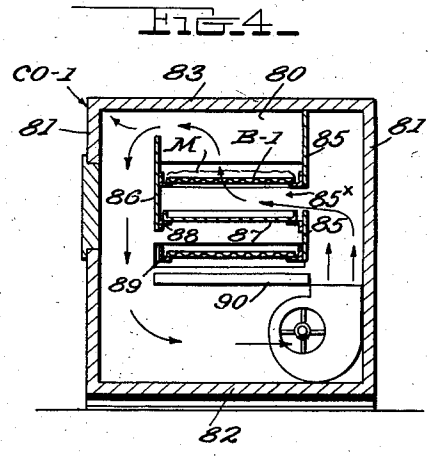

FIG. 5

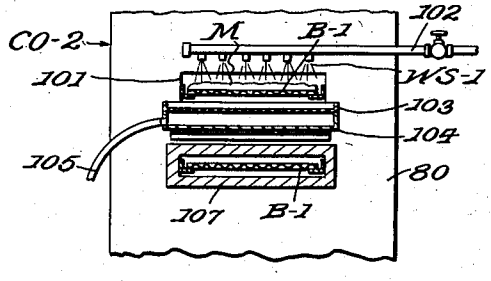

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FIG. 6

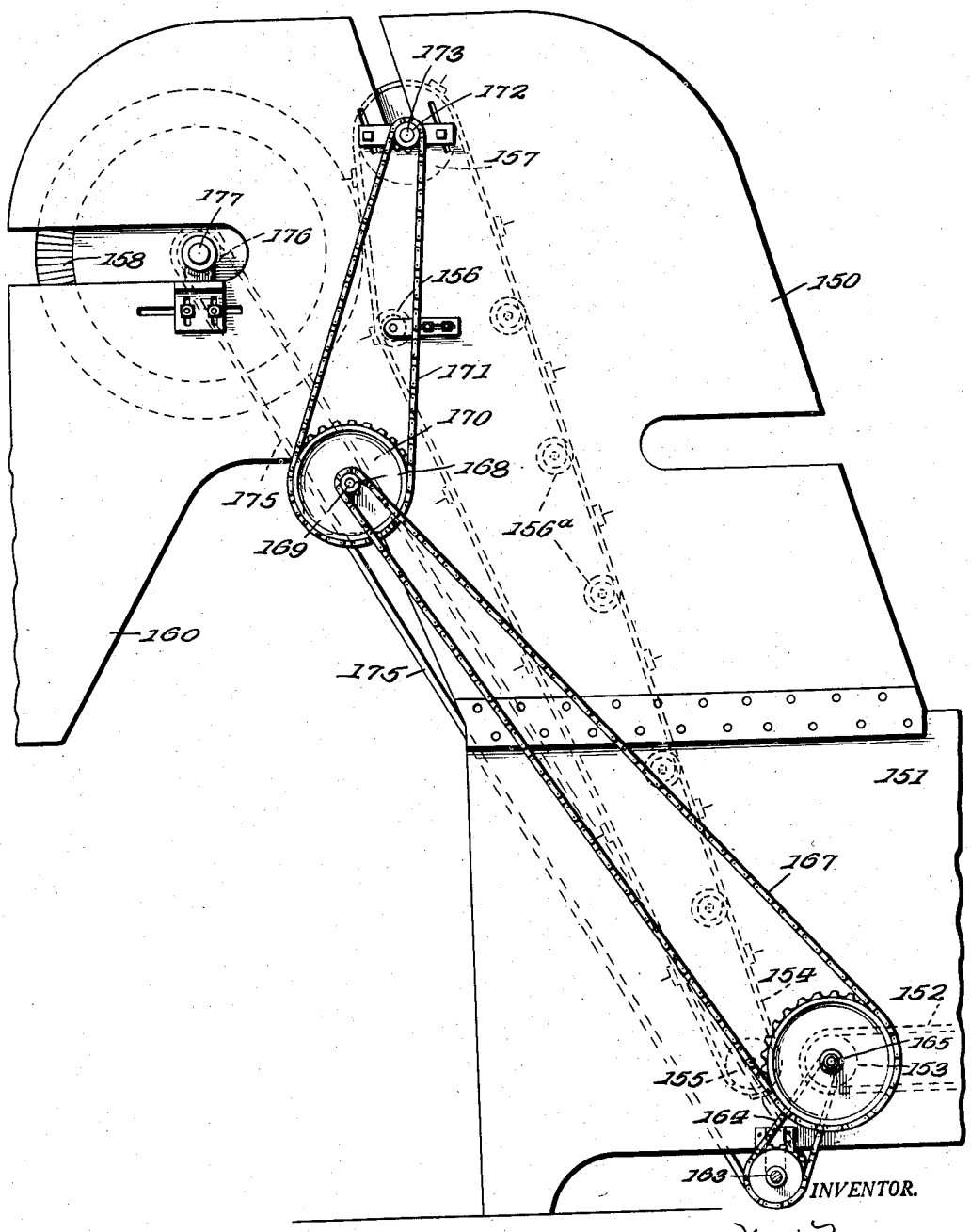

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FIG. 7

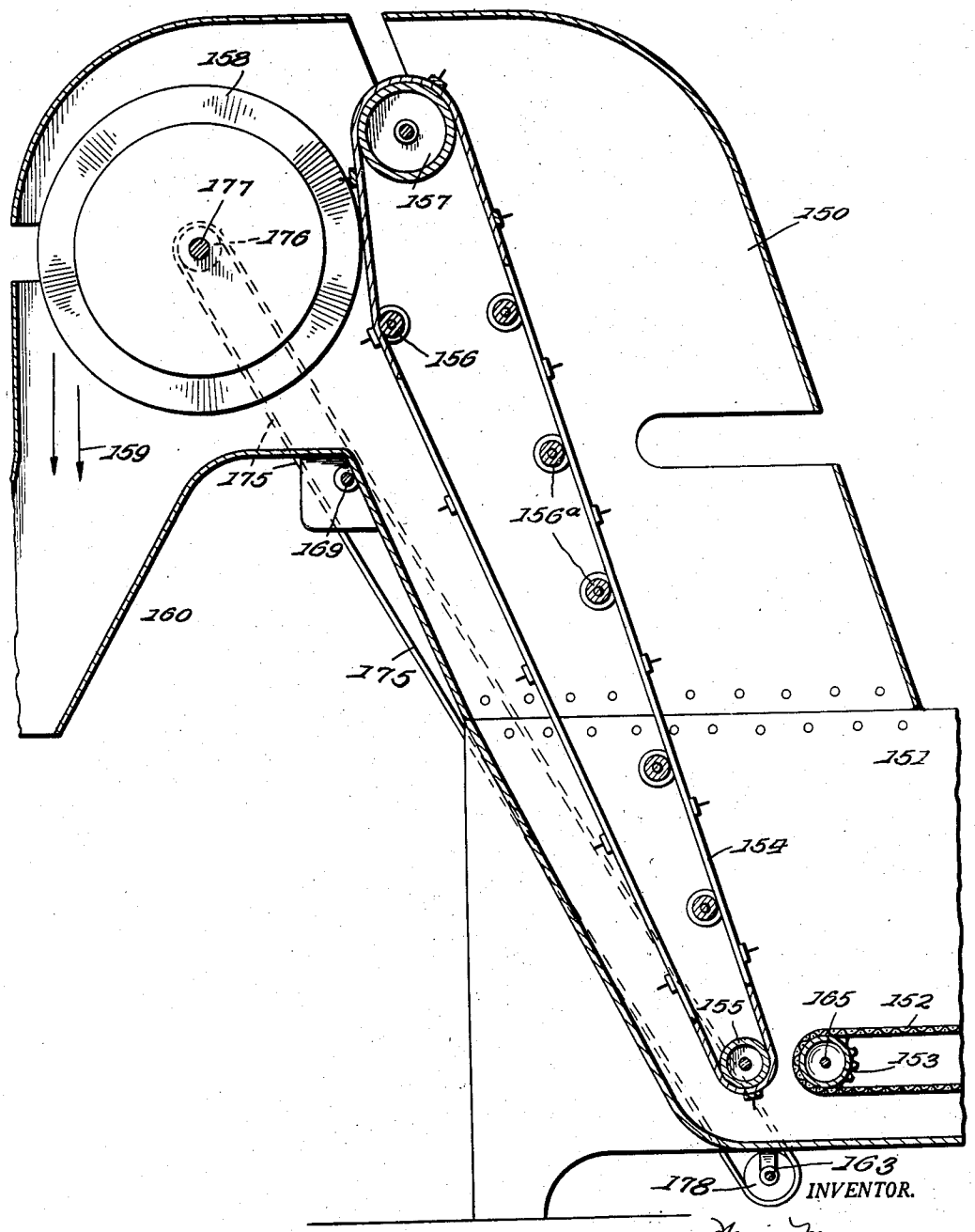

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FIG. 8

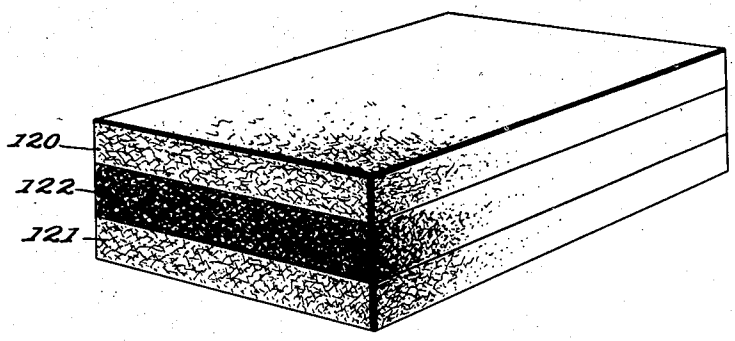


FIG. 9

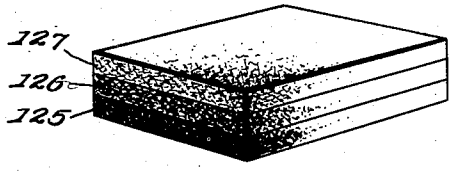
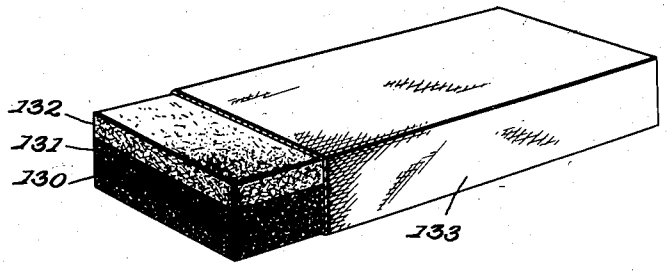


FIG. 10



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United States Patent Office 2,870,053 Patented Jan. 20, 1959

2,870,053

CUSHION PADS

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Original application March 26, 1951, Serial No. 217,439, now Patent No. 2,742,951, dated April 24, 1956. Divided and this application August 15, 1955, Serial No. 528,338

1 Claim. (Cl. 154—54)

This invention relates to the making of pads for cushions and like uses, with the pads composed of connected lengths of curled or kinked stretched filaments: and is concerned with pads made by the curling or kinking of such filaments, and their treatment to form pads of felts in which the individual curled or kinked filaments are connected from place to place.

This application is a division of my copending application, Serial No. 217,439, filed March 26, 1951, now United States Patent No. 2,742,951 which describes and claims the method and apparatus.

By "stretched filaments" are understood in the art certain synthetic filaments made by the extrusion of plastic compositions, followed by hardening of the same and by stretching to the extent of three to ten times the hardened length, or even more. It is assumed that such treatments convert the structure to a form having oriented crystals. Among the commercially available monofilaments of this type are those made from nylon and from vinylidene halide polymers, such as the commercially available vinylidene chloride:vinyl chloride polymer mixture: the commercial materials known as saran are included in this vinylidene halide polymer group. For example, a characteristic of a commercial vinylidene chloride:vinyl chloride polymer mixture is that of essential stability both dimensionally and chemically at atmospheric temperature, and at temperatures up to around 150 to 170° F.: but the material is subject to change at yet higher temperatures, above that of plastic recovery, such as 250 to 300° F., by which it tends to revert back to the unstretched form and length if unrestrained. Other stretched filaments behave in the same way.

A feature of the present invention is the provision of a cushion pad comprising cut lengths of stretched filaments of random curled or kinked form and connected together.

Another feature of the invention is the provision of a cushion pad comprised of stretched monofilament fibers having random unilateral relaxation at random points thereof, said fibers being connected by bonding material at points of contact, with the pad in a state of pre-compression between the upper and lower surfaces thereof.

A further feature is the provision of a cushion pad comprised of a plurality of layers, each layer being of stretched fibers having kinking or curling at random spaced points thereof, each layer having bonding material uniting the fibers thereof at points of contact and being in a state of pre-compression between the upper and lower surfaces thereof, one layer being formed of fibers of smaller diameter than the adjacent layer whereby it yields more readily to a load thereon than such adjacent layer.

With these and other features as objects in view, a procedure of making the pads is illustrated as practiced in a conventionalized apparatus for the purpose, on the accompanying drawings, in which:

Figs. 1, 1*a* and 1*b* are successive parts of an apparatus assembly for making the product, essentially in perspective and indicating in conventionalized and diagrammatic form the successive elements and steps employed in the apparatus and process.

Fig. 2 is an upright section through the kinking and cooling chambers, substantially on line 2—2 of Fig. 3.

Figs. 3 and 4 are upright sections through one of these chambers, substantially on lines 3—3 and 4—4 of Fig. 2.

Fig. 5 is an upright section through the water spraying apparatus, substantially on line 5—5 of Fig. 2.

Fig. 6 is a side elevation of a feeding and distributing mechanism.

Fig. 7 is an upright section through such a feeding mechanism.

Figs. 8–10 are perspective views of products made from the cushion pad material, in accordance with this invention.

Fig. 11 is a broken cross-sectional view of Figs. 1*a* and 1*b*.

The operation by which the stretched filament, originally essentially straight, is given an irregular form, may be called a kinking or curling, the words defining such a change that the filament no longer has a straight form when in unstressed condition at ordinary temperature, and hereinafter "kinking" will be employed to refer to such operation.

Stretched monofilament fiber material, which may be in continuous or short lengths, is placed on a table MB–1 and is fed into a guillotine cutter CT–1, which may be of ensilage cutting and throwing type, which severs it into lengths such as six to eight inches long for use in the preparation of cushion pads for automobiles, by way of example. The fiber preferably is of diameter from 2 to 15 mils, or 30 to 225 deniers, and may consist of various mixtures of fibers in which the range of diameters is limited so that fine fibers will not be unduly softened throughout before a satisfactory penetration of heat into the coarser fibers has occurred. Thus, a range of about 2 mils in diameter is desirable for fibers of 105 to 225 deniers, and a correspondingly lesser range when the fibers are smaller than 105 deniers. Thus, a mixture of fibers of 105 to 125 deniers can be employed. The feasible range is determined by the ratio of mass to surface area and by the heat conduction and softening range of the specific material. In the above ranges the largest filaments are not over about 28% greater in diameter than the smallest ones.

The cut lengths are delivered through a duct 10 which may be of any desired length, and are then delivered by a fan F–1 and duct 11 into a first Bramwell feeder BF–1. The material moves from the feed box of the feeder BF–1 and is distributed by this feeder onto a continuous metal-mesh belt B–1 which moves around the end turning rollers 12, 13. The purpose of the successive handling by cutters, throwers, fans and feeders is to separate the pieces from one another. The belt B–1 moves the deposited mass thereon through two separated chambers CO–1 and CO–2. These chambers have casings through which the flights of the belt B–1 move.

The chambers CO–1 and CO–2 may be connected as a unit as indicated in Figs. 2 to 5.

Each chamber has end, side, bottom and top walls 80, 81, 82, 83 which may be of insulating structure. Upright baffle walls 85, 86 are provided, essentially parallel to the direction of movement of the conveyor B–1: these walls have projections on which edges of the conveyor B–1 travel on the upper and operating flight. A collecting pan 87 may be supported from the baffle 85 and by an angle iron 88, for catching any fibers which fall from the upper flight of conveyor B–1. The lower flight of conveyor B–1 is also supported by a flange on the baffle

85 and by an angle iron 89. Beneath it may be positioned an insulating wall 90 to avoid excessive direct transfer of heat from the hot lower part of the chamber. A gas burner 92 can deliver hot gases into a sleeve 93, carrying steam formed by the combustion or into which steam may be injected through the pipe 93*a*: it is preferred to maintain a wet seam condition, and a water pan WP may be present in the chamber. These gases pass in the direction shown by the arrows to a circulating blower 95 which causes them to move upwardly in the space between the baffle 85 and the adjacent side wall 81, and then downwardly (Fig. 3) through the mass M of fibers on the upper flight of conveyor B–1, passing through the perforated conveyor, and then following the further course as indicated by arrows in Fig. 3, in part returning in a circulation, and in part passing to the outlet 97 which may be exhausted by a blower 98.

The first chamber CO–1, when working on finer sizes of filaments, may have (Fig. 3) an upright transverse partition 85*a* (Fig. 2) and the longitudinal baffle 85 extended to the top 83 while leaving a gap 85*x* beneath the upper flight of the conveyor B–1. The baffle 86 is also continued downward to the pan 87: and has a restricted top opening to the chamber space which leads downward to the lowermost chamber. This provides a reverse movement for a part of the circulating hot gases, so that they move relatively upward through the mass M after the latter has had a primary heating and kinking effect produced therein by the downward flow described for Fig. 3. In this way a better kinking effect, through the mass, is obtained in some instances.

It will be understood that when heating is being conducted in the chamber section, the gas burner 92 is lit and operating, and hot air is thus being circulated onto and through the mass M. When the chamber section is being used for cooling to below hot-gas temperature, the gas burner 92 is shut off, and cool outside air is permitted to enter and be circulated, being drawn off by the exhaust fan 98.

In Fig. 5, the upper flight of the conveyor B–1, with the mass M thereon, is shown as passing through on opening 101 in a chamber end wall 80. A valved water supply pipe 102 extends across the conveyor and has nozzles through which jets of cooling water may be directed downwardly upon the mass M. A catch screen 103 is located beneath the upper flight of conveyor B–1 to collect any fibers which fall therefrom: and a sump pan 104 is mounted beneath the screen 103, and may be provided with a drain hose 105 through which excess water may be withdrawn. The lower or return flight of conveyor B–1 is preferably located within an enclosing tubular structure 107 which extends from one oven to the other. The drive pulleys 110 for the blowers 95 may be located between the chambers.

The chamber CO–1 is heated by hot gases so that the cut lengths of monofilament on the belt B–1 are heated superficially to a temperature of 260 to 310° F. for an illustrative employment with vinylidene chloride filament material. It is preferred to introduce wet steam at atmospheric pressure with the air, to serve as a surface-moistening or anti-sticking agent and to increase the rate of heat transfer to the fibers. As a specific example with stretched vinylidene chloride polymer filament, the chamber CO–1 can have a length of about six feet, and the belt B–1 may move at the speed of about one foot per second, that is each fiber is exposed for a contact time of about six seconds: the pile of filaments deposited on a belt B–1 having a width of about 36 inches, by the feeder BF–1, may be about one-fourth to one-half inch. Under these conditions, the heated gases moving through the mass M and the belt B–1, which essentially extends from side to side of the chamber CO–1, act through the conductive metal of the belt and also directly to cause highly localized heatings of the fibers as they lay in random positions on the belt and upon one another, so that each fiber is heated at some points, and is essentially without heating to the stated high temperature at other and adjacent points: e. g. at crossing points, the fibers protect one another from heating by diverting the gas flow. Particularly, each fiber receives a highly variable heating effect at each radial plane therethrough, so that at one side it contracts while at the opposite side no such tendency occurs. Furthermore, the heat transmission of the fibers is low, so that the heat which is delivered against the fiber at one point is essentially active at that point only, and does not penetrate through the diameter of the individual fibers during the course of its passage through the chamber CO–1. As a result, the fibers kink in a highly irregular manner in the chamber CO–1 and, in actual practice, the fibers twist and more individually of one another, under the contraction effects, so that there is no repetition or regularity in the heating and kinking of these fibers.

As the belt B–1 continues in its movement, it carries the overlying mass of kinked fibers out of the chamber CO–1 and beneath a water spray WS–1 which is projected down upon all of the fibers, and rapidly brings their temperature downward to around 200° F. or below. The effect of this is to immediately fix the shape and form of the individual fibers, and stop any action toward excessive contraction of the fibers or toward fusion by which sticking or welding may result.

The wetted mass now continues into the second chamber CO–2, which is a drying oven and is maintained at a temperature below 212° F., for example. This chamber has a length of about six feet, and is provided with ducts 14, 15 by which hot or cold gases may be delivered into the chamber CO–2 to control and maintain its temperature. Thus, when the cooling spray WS–1 is so adjusted as to bring the temperature down to 200° F., it is customary to operate the ducts 15 for further reduction of the temperature of the individual fibers: whereas when the cooling effect is greater, and more water may be present in the mass, wherewith the temperature falls below 200° F., such as a temperature of 175° F., it is customary to employ hotter air from the duct 14, to make sure of the evaporation of the water from the mass, before it is given further handling treatment. A further desirable control in the process and apparatus is that of having the minimum temperature of the continuous belt B–1 very little below 200°, so that this belt requires only a minor warmup time as it enters the first chamber CO–1. The cooling occurring in the chamber CO–2 provides at least a superficial cooling throughout the fibers, so that they can be removed by the doffer roll DR of soft fibers, which serves to remove the kinked fibers from the mesh belt B–1; and this doffing can be accomplished without re-straightening the individual fibers of the mass.

In the illustrated arrangement, the fibers are brought to a temperature of about 200° before they are discharged from the belt B–1, in part by gravity and in part by the doffer roll DR, as the belt B–1 leaves the second chamber CO–2 and moves around the turning pulley 13. The mass is delivered into the hopper 17 sometimes as a continuous felting, and sometimes as pieces of greater or lesser lengths and of various shapes, along with some individual fibers which have been stripped by the doffer roll DR. From the hopper 17, the material is taken up by a canvas belt B–2 which leads it upwardly and delivers it onto a further horizontal canvas belt B–3, from which the material is delivered to a Bramwell feeder for disintegrating the material and depositing the individual fibers in the form of a mass which can be handled for further disintegration and distribution. Thus, the Bramwell feeder BF–2 disintegrates the material coming from the belt B–3 and delivers it to the canvas belt B–4, and this belt in turn passes it in succession beneath the Bramwell feeders BF–3 and BF–4, which may be fed with scraps obtained from the final cutting operation, whereby the net loss of input material is reduced.

Commercial Bramwell feeder structures, as employed on straight fibers such as cotton, may be utilized, but it is necessary to operate them at a much lower speed than employed in cotton service, so that the masses of tangled and kinked fibers are pulled apart gently instead of being torn violently, to avoid a condition by which the feeder pullers would tend to accumulate fibers without discharging them, even to a stage where the mass may bind the high speed roller to the stationary frame structure.

The loosely felted material is then deposited in a hopper **18** by the feeder BF–**4**, from which it is taken by the elevating belt B–**5**, which may be of canvas, and delivered into the final Bramwell feeder BF–**5**, by which it is again separated and intermixed, and deposited in the form of loosely piled fibers on a delivery belt B–**6**. At this point, the mass can be inspected, to determine that it is of uniform thickness and density and, if any serious "holes" are found therein, an operator can deposit a mass of the picked material at such a hole: in normal and regular operation this is not required.

From this belt B–**6**, the material is delivered onto a sprayer belt B–**7** which moves over the turning pulleys or rollers **22**, **23**, and passes through a first spraying chamber SB–**1** in which by a transversely reciprocating nozzle **19** it is given a spray of a bonding composition. The bonding composition enters the mass, and with preferred compositions is brought to crossing points of the filaments by flow and capillary action.

The belt B–**7** carries the sprayed mass forward through the oven OV–**1**, having a heater H–**1** and a duct **21** from the heater to points beneath the upper flight of belt B–**7**. The vehicle of the bonding composition is eliminated in the oven OV–**1**; and the mass is then delivered by the belt B–**7** over its turning roller **22** onto the lower belt B–**8**, the mass being reversed or turned upside down during this transfer operation, but still retaining essentially a coherent form due to the interlocking of the kinked filaments. The mass of deposited fibers, with latex thereon, is not of uniform consistency as the latex deposit does not penetrate consistently through the thickness of the matted felt.

The belt B–**8** carries the material back beneath the oven OV–**1** and the first spraying apparatus SB–**1**, and through a second spraying apparatus SB–**2**, where bonding composition is again sprayed thereon, but now from the opposite side due to the reversal. The belt B–**8** then delivers the loosely deposited, but now individually coated, mass of fibers onto a further metal-mesh belt B–**9** which travels around the end turning rollers **27**, **28** and carries the mass through a chamber OV–**1***a* in which the water vehicle of this second sprayed coating is dried away; and thence the belt B–**9** carries the material forward and beneath an upper belt B–**10** which moves about the turning rollers **29**, **30**, and also has pressure rollers **32** distributed along its length, to prevent undesired and excessive upward movement of the lower flight of this upper belt B–**10**. Similarly, pressure rollers **33** are employed for the upper or conveying flight of the belt B–**9**. The rollers **29**, **30**, **32** are preferably mounted on a frame (Fig. 11) which can be adjusted in height and downward pressure thereby exerted upon the mass which is traveling on the upper flight of the belt B–**9**. It is preferred, in present practice, to have the pressure upon the mass around 25 to 50 pounds per square inch under the stated illustrative conditions, wherewith the mass which was originally about two and one-half inches thick at the outlet of the feeder BF–**5**, is compressed downward to a thickness of about one and one-half inches. With finer sizes, lesser pressures may be employed: but is has been found undesirable to use higher pressures than, say, 200 pounds per square inch, with the coarsest stretched filaments used as a random mass.

Under this condition of pressure, between the two belts of metal-mesh or other reticulate material, the mass continues forward through a heater H–**2** and an oven section OV–**2**, in which the temperature is raised to 220 to 240° F., that is, a temperature adequate to accomplish the curing of the rubber particles delivered onto the individual fibers from the spraying chambers SB–**1**, SB–**2**, but below the temperature at which any significant softening of the individual fibers may occur.

As a result, the individual fibers are brought into contact with one another at crossing points, and under these conditions the blending of their coatings occurs, and coatings are then cured so that bonds are established at these points of crossing.

After this curing operation, the belts B–**9**, B–**10** convey the cured material, at its high temperature, into a cooling chamber C–**1**, in which it is reduced in temperature while still held essentially without relative movement between the individual fibers thereof, until it has cooled to a temperature at which the bonds are stable. Thereafter the compression pressure is removed, and the mass is then delivered by the belts B–**9**, B–**10** onto a delivery belt or platform B–**11**, passing beneath a talc-applying apparatus TM–**2** which is supplied with talc powder from a hopper and blower TM–**1**. This talc serves to prevent any prevailing tackiness of the cured rubber composition from causing undesired sticking. Unconsumed talc is recovered to a hopper TM–**3**.

The mass can then be carried forward beneath a cutting knife **40** by which the material, which theretofore has existed as an essentially continuous length from the feeder BF–**5** to the knife **40**, can be cut into proper lengths to form the cushion pads. The scrap may be returned to the feeders BF–**2***a* and BF–**2***b* for reincorporation.

The speed of transit of the material through the several zones, the length of these zones, and the temperature of the gases and material in these zones are interrelated, and in turn are related to the sectional shape and diameter of the filaments, the composition of the filaments in determining the softening and fusion points, and the heat conductivity of the material. For example, with the illustrative vinylidene chloride polymer, a speed of belt B–**1** of one foot per second or roughly sixty feet per minute, will produce a very satisfactory curling and kinking of fibers in the range of 10 to 12 mils, with a temperature of the gases and steam of 285° F. Filaments around 5 mils demonstrate some caking, but with such it is preferred to increase the gas temperature or to decrease the belt speed for a given length of softening oven. With fibers in the 4 to 5 mils range, the softening is excessive, and some fibers lose shape and stick to the belt under the first stated conditions, and correspondingly the belt speed should be increased or the temperature reduced; for example, a temperature of 250° may be employed for fibers at 2 to 3 mils diameter, about 285° for 10 to 12 mils fibers, and 310° to 320° for 15 mils fibers. The stated polymer has a thermoconductivity of the order of 2.2×10^{-4} cal./sec./cm.^{2}/° C./cm., and thus a high superficial temperature, produced by a high gas temperature, requires a greater time for satisfactory softening of a coarse fiber than for a fine fiber, noting that the fibers originally enter at essentially room temperature, and that the smaller fibers have a greater relative area per volume than the large fibers.

The purpose of the feeding and distributing mechanisms is to separate the fibers from one another and to provide a uniform deposit of individual fibers upon the respective conveyor. Commercially available types of structures can be employed for this purpose, and the following conventionalized description is of a commercial feeder and distributor of the so-called Bramwell type.

As shown in Figs. 6 and 7, the mechanism has a general housing including side plates **150** which at the bottom provide an open-top receiving box **151** in which

is located a conveying belt **152** which is advanced by the driven end roller **153**. The material upon the belt **152** is brought adjacent to the so-called spike apron **154** which engages the fibers and carries them in a generally upward direction. This apron is endless and moves about the idler rollers **155**, **156** and is moved by the upper driven roller **157**. Support roller **156***a* may be provided along its length. As the fibers are carried over the upper roller **157**, they come into the path of operation of the doffer roll **158** which engages them and disintegrates clumps, projecting the individual fibers in a general downward direction as indicated by the arrows **159**. A hood **160** may be used to confine the fibers to a general path. In Fig. 6, a driving system is shown in which a main driven shaft **163** has a sprocket for a chain **164** for driving a sprocket on the shaft **165** for the conveyor roll **153**. The shaft **165** also has a sprocket for the chain **167** which engages the sprocket **168** on the shaft **169**. The shaft **169** has a sprocket **170** by which it acts through chain **171** to drive the sprocket **172** on the shaft **173** of the upper apron roller **157**. A belt **175** connects the pulley **176** on the shaft **177** of the doffer roll **158** with the pulley **178** on the main power shaft **163**.

The employment of successive feeding and distributing devices assures uniformity in the final product. A characteristic of the feeders is that they are most effective in providing a uniform layer of material when they are operating upon fibers within a close range of diameter, length, and conformation, and their effectiveness also frequently depends upon the thickness of the deposit being made by the individual feeder. This is particularly true where the feeders and distributors are being employed also for breaking up semi-coherent masses of tangled fibers, as is the case for the feeder BF–2, which serves for disintegrating the material and then depositing the disintegrated fibers upon the belt B–4.

While the above operation has been described with employment of a latex, such as a water-dispersed oil-resistant natural or synthetic rubber composition including a vulcanizing agent, it is feasible to employ other bonding materials. In general, elastomers may be used, such as oxidizable oil, blown asphalt, and plasticized resins including vinylidene chloride and linear polyamide polymers themselves. For example, boiled linseed oil, made up as an emulsion, may be used in the sprayer chambers. A blown asphalt having a softening point of 180 to 220° F., made up as a suspension in water, can be utilized. The commercially available latex containing as solids a polymer with 95% of vinylidene chloride and 5% of vinyl chloride, and adjusted by plasticizer to a fluid point below the softening range of the stretched filament material itself, is useful. In general, the bonding agent can be selected from emulsions, solutions, or solids heated above the softening points thereof, in each of which the effective element is a substance which is cohesive and exhibits elasticity over the normal range of atmospheric temperatures and is essentially free of deterioration under ordinary atmospheric conditions, and more specifically under the conditions to which an article comprising the selected stretched filament materials may be made.

The foregoing apparatus and procedure has been set out by way of example of preparation of a continuous length of cushion pad material having a randomly felted mass of individually kinked stretched filaments, these filaments being interconnected at points of contact and being individually under initial stress in the pad, due to the curing of the bonding regions while the pad is under compression.

The apparatus and procedure have been described with respect to a presently preferred form of actual practice, in which the cushion pad is made of vinylidene chloride stretched filaments of 15 mils diameter bonded by cured latex composition and having a final thickness of about 1 inch. When a greater thickness of pad material is desired, several plies may be connected together by a light coating of the same latex composition at the surfaces to be abutted, followed by compressing and curing under pressure.

As indicated above, it is also feasible to prepare cushion pad material of other stretched filaments, and of filaments of other diameters. A particularly advantageous structure can be made up by preparing a layer of the above-indicated 15 mils vinylidene chloride stretched filaments, bonded into a cushion mass having a thickness of about 1 inch in cured and cooled condition: and then providing surface layers each having a thickness of about ¾ of an inch and formed from vinylidene chloride stretched filaments of 5 mils diameter:: the three thicknesses are bonded by applying latex composition, and curing while holding the part together under pressure: the product is a reversible cushion pad, having the desirable attributes that the outer layers of finer filaments yield more readily and establish a general conformation to the body being brought thereon, and finally the thicker central mass yields more as a unit than locally and hence the cushion pad tends to conform itself to the body and then yields over the general area of contact. Such a pad structure is indicated in Fig. 8 where the upper and lower layers **120**, **121** are of finer filament stock than the middle layer **122**.

Another desirable form of practice, for a one-sided or non-reversible cushion is to provide the layer of successively thicker stretched filament stock, as indicated in Fig. 9, for example, in which the lower layer **125** is about 1 inch thick and formed as described above from vinylidene chloride stretched filaments having a stretched diameter of 15 mils. The next higher layer **126** is an inch thick and similarly formed of vinylidene chloride stretched filaments having a stretched diameter of 10 mils; while the topmost layer **127** is an inch thick and of such filaments having a stretched diameter of 5 mils. This type of cushion pad likewise conforms rapidly to the body shape, and then successively greater resistance is built up over the general area of contact: so that the actual body weight is absorbed over the larger area and with essentially a uniform pressure in pounds per square inch per unit area of exposure.

A desirable form for a mattress or couch pad is shown in Fig. 10, in which the lower layers **130**, **131** are each 1 inch thick in the stressed normal condition and formed of 15 mils fibers: while the upper layer **132** is of 10 mils fibers.

It is also feasible to form such cushion pads as connected structures with their coverings. Thus, in Fig. 10, parts of the pad are shown as covered by woven vinylidene fabric **133**, which can be secured in place by applying latex bonding composition to the pad surface and to the inner surface of the covering, pressing into firm contact over areas of the top and bottom, and curing. This produces a structure which has, for example, all of the virtues of resistance to atmospheric and other influences which are exhibited by the pad material itself; and the outer covering also assists in maintaining the individual filaments in position. Likewise, cushions may be made from one or more layers of connected or disconnected material made as above, and enclosed within a woven fabric of like stretched filament material surrounding but not adhesively connected to the pad material.

Pads and mattresses so formed rely upon the springiness of the bonded and connected fibers, in lieu of the presence of air-filled cushion cells as in sponge rubber.

Accordingly, the springiness is essentially constant over a wide range of temperatures: and there is at all times a thorough ventilation, and dust is not trapped and held without escape from within the mass.

I claim:

An elastically compressible cushion pad comprised of a plurality of layers, each layer being a felted mass of

individually kinked fibers of synthetic polymer material, said fibers having stretched portions and random unilateral relaxation of the stretched condition at random points thereof, and bonding materially locally uniting said fibers at points of contacts thereof throughout the mass, each said layer being further characterized in having the fibers individually under initial stress in the layer and thereby exhibiting the effect of a pre-compression of 25 to 200 pounds per square inch between the upper and lower surfaces of the layer during the bonding of the fibers therein, the lower layer being comprised of fibers having a diameter of about 15 mils and the upper

layer being comprised of fibers having a diameter of 2 to 10 mils; and bonding material connecting surface-exposed fibers of adjacent layers together to provide a unitary structure.

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