Dec. 9, 1941. D. E. HENNESSY 2,265,370

METHOD OF MAKING AIR FILTERING MATERIAL

Original Filed Nov. 18, 1939

Fig. 1.

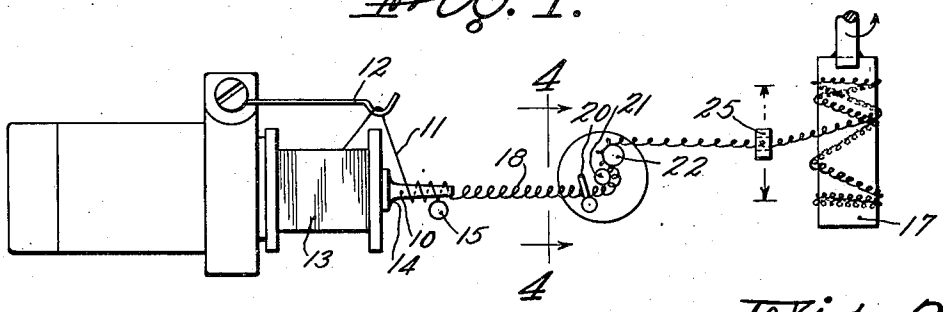


Fig. 2.

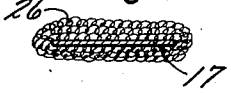


Fig. 3.

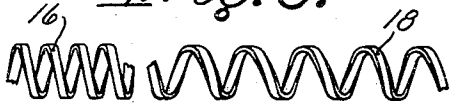


Fig. 4.

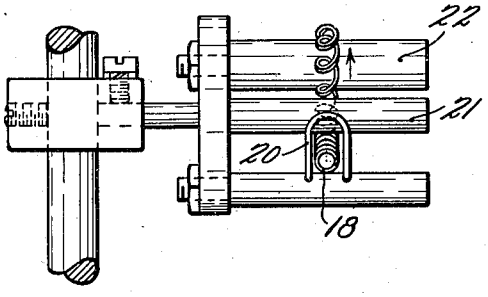


Fig. 5.

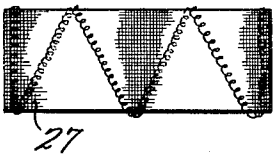


Fig. 6.

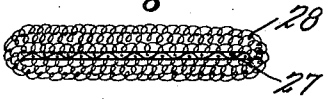
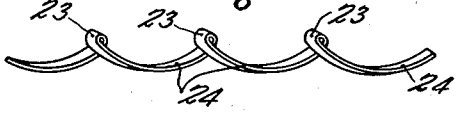


Fig. 7.



Fig. 8.



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METHOD OF MAKING AIR FILTERING MATERIAL

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Original application November 18, 1939, Serial No. 305,092. Divided and this application July 20, 1940, Serial No. 346,641

7 Claims. (Cl. 140—71)

This invention relates to improved methods of making material which may be used for air filtering, sound absorption, or similar purposes. The invention has particular reference to the production of material of this character which will have improved qualities of retaining and distributing oily substances.

In air filters it is customary to use a mat or pad of curled or shredded metallic wool coated with an oily substance for the purpose of retaining dust particles which may be carried by the air flowing through it. It has been found in practice that the oily substance has a tendency to drain off, particularly under warm conditions; and it is one object of the invention to improve the quality of the metallic material so that oil will be retained permanently throughout the entire body of the mat and will be distributed automatically as needed. A further object of the invention is to provide an improved method by which this improved material may be made in a continuous operation. Additional advantages and objects of the invention will appear from the following description and claims.

This application is a division of my prior application Serial No. 305,092, filed November 18, 1939.

Referring to the drawing:

Fig. 1 is a diagrammatic view showing one manner of making the improved product;

Fig. 2 is an end view, on an enlarged scale, of the product shown in Fig. 1;

Fig. 3 is a detail, on a greatly enlarged scale, of an intermediate product;

Fig. 4 is a detail, on an enlarged scale, on line 4—4 of Fig. 1;

Fig. 5 is a detail of a modified method of winding;

Fig. 6 is an end view, on an enlarged scale, of the structure shown in Fig. 5;

Fig. 7 is a plan view of the improved product on a greatly enlarged scale; and

Fig. 8 is a side elevation of the product shown in Fig. 7.

Before discussing the preferred method by which the product is obtained the ribbon-like material which forms the basis of the final mat will be considered. It has hitherto been proposed to impart corrugations of various forms to a wire in order to prevent undesirable compacting of the product when matted together. These corrugations, however, have not had the necessary property of assisting in the retention of oil. The product shown in Figs. 7 and 8 is made of flat wire, preferably copper or bronze only a few thousandths of an inch in thickness, having kinks or contracted bights at intervals along its length. The size of the wire has been exaggerated greatly in these figures to permit illustration. The product shown can best be conceived as being made by looping the flat wire and pulling the loops tight. The contracted bights or kinks thus formed serve as capillary pockets for the retention of oil. If a mat or pad formed of this material be sprayed with or immersed in oil and the excess drained off, there will be a small drop of oil held by capillary attraction in each of the kinks. Furthermore, the effect of the oil will not be confined to the kink itself as the oil will tend to spread over the wire and maintain an oily film upon the flat surfaces of the wire on each side of each kink.

While the nature of the product is best shown by conceiving it as having been made by the simple process described, a faster method is required in practice. I have shown diagrammatically in Fig. 1 a more rapid and economical method by which the product may be made as a continuous operation. In this figure, 10 represents a needle or mandrel held against rotation and of any desired cross-sectional form. Around this mandrel the wire 11 is carried by a flyer or guide 12 which rotates around the mandrel at high speed, drawing the wire from a spool 13 which is mounted to rotate under a frictional drag. This form of device is standard equipment for making helices of thin wire and for forming gimp or tinsel products, and need not be described in detail. One suitable construction will be found in the Montgomery and Mason Patent 1,386,350, dated August 2, 1921.

The heel of the needle is rounded as at 14 and, as the material is wound, this heel forces the wound material to slide longitudinally off the end of the mandrel in the form of a non-rotating helix. If the mandrel is of square or triangular cross-section the engagement of the corners of the mandrel with the wire will be sufficient to prevent the helix from slipping around, but if the mandrel is round it may be necessary to press a pad or roller against it as indicated at 15 and as shown in the French patent to Martin 57,945, March 13, 1863. The same result may be accomplished by holding the finger lightly against the side of the mandrel, the formed helix sliding off the mandrel underneath it. The product in this form would have somewhat the appearance indicated at 16 in Fig. 3, except that the wire is constantly being drawn

away by a rotating winding form 17 and is therefore partially stretched out as indicated at 18.

Intermediate the needle and the winding form the helix passes between slightly spaced surfaces in such a manner that the helix will be extended without permitting it to rotate. Since, if other means for producing the helix are substituted, a normally rotating helix may be produced, it may better be said that the helix is passed between the spaced surfaces without permitting its internal rotation; the rotation which is to be suppressed being relative only to the normal condition of the helix. The preferred form of device for stretching out the helix is indicated in Figs. 1 and 4. The helix is initially led through a guide 20 underneath a bar 21 and over a bar 22, and the speed of the windup 17 is so regulated that the helix will be almost completely stretched out on leaving the bar 22. This manner of passing the helix around the bar 22 keeps it from internal rotation and causes the loops which form the helix to be drawn out into contracted bights 23 as indicated in Figs. 7 and 8. It will be observed that the standing parts 24 of the flat wire on either side of each kink are laterally offset from each other, this being best shown in Fig. 7.

The resulting product may be merely tangled together to form a pad or mat, but it is preferred to cross wind it into a self-sustaining mass. For this purpose a traverse mechanism indicated generically by 25 is interposed between the bar 22 and the winding form 17 and is preferably reciprocated at a rate rather high with relation to the speed of the windup so that the strand is caused to travel from one end of the path of reciprocation of the traverse guide to the other at a considerable angle. The winding form 17 may be in the form of a round or flat mandrel, it being generally desirable to have it flat. In the case shown the product will be formed as a self-sustaining flattened mass 26, Fig. 2, of definite length, which may be removed from the mandrel after the desired thickness has been built up. If desired, the wound wire may be fed progressively off the mandrel as by mechanism described in my copending application, Serial No. 307,612, filed December 5, 1939, to form a continuous, self-sustaining rope-like product.

As a further refinement the material may be cross wound directly upon a piece of screening 27, Figs. 5 and 6, the latter figure showing the strand as having been built up by cross winding as indicated at 28. In this case the screen forms a pervious permanent support whether or not cross winding is used.

What I claim is:

1. A method of making air filtering or sound absorbing material which comprises forming a flat metallic ribbon into a helix, and extending the helix without internal rotation an amount sufficient to cause the formation of kinks and to impart a permanent set to the wire in the kinked portions.

2. A method of making air filtering or sound absorbing material which comprises forming a flat metallic ribbon into a helix, progressively drawing out the helix, restraining the helix without relative rotation between the part so restrained and the part being drawn out to cause the formation of kinks, and imparting a permanent set to the ribbon in the kinked portions so formed.

3. A method of making air filtering or sound absorbing material which comprises forming a flat metallic ribbon into a helix, and straightening out the helix by drawing it in a reversely curved path under sufficient tension to form kinks in the ribbon and to impart a permanent set to the wire in its kinked portions.

4. A method of making air filtering or sound absorbing material which comprises forming a flat metallic ribbon into a helix, and forming spaced kinks by elongating the helix into substantially ribbon form without substantial internal rotation of the helix and under sufficient stress to impart a permanent set to the ribbon in its kinked portions.

5. A method of making air filtering or sound absorbing material which comprises forming a flat metallic ribbon into a helix, forming spaced kinks by elongating the helix without substantial internal rotation of the helix and under sufficient tension to impart a permanent set to the ribbons in its kinked portions, and cross winding the resulting product.

6. A method of making air filtering or sound absorbing material which comprises winding a flat wire about a stationary mandrel to form a helix and drawing the helix directly from the mandrel between closely spaced surfaces to extend the helix and produce a kinked ribbon-like product.

7. A method of making air filtering or sound absorbing material which comprises winding a flat wire about a stationary mandrel to form a helix, drawing the helix directly from the mandrel between closely spaced surfaces to extend the helix and produce a kinked ribbon-like product, and cross winding the ribbon to form a mat.

DANIEL E. HENNESSY.