Sept. 28, 1948. A. J. HOMON 2,450,280

METHOD OF MAKING METAL SPONGES

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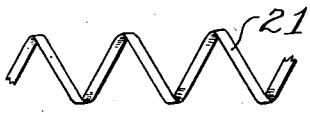


Fig. 1

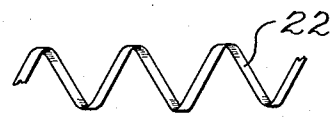


Fig. 2

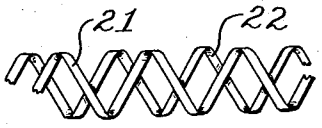


Fig. 3

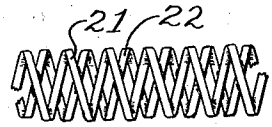


Fig. 4

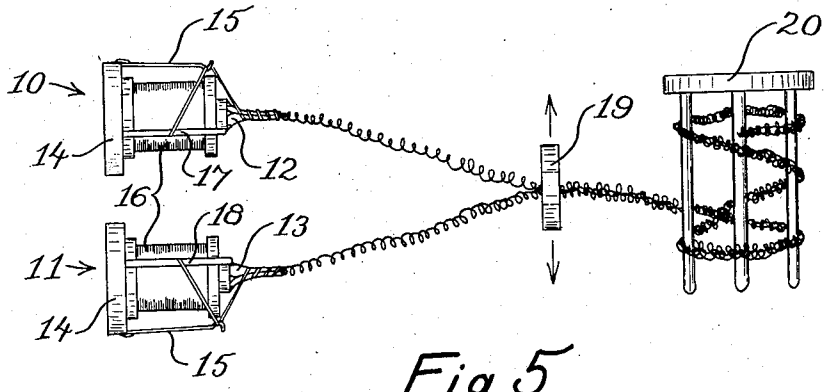


Fig. 5

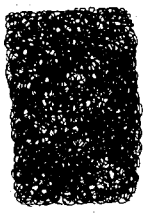


Fig. 6

Fig. 7

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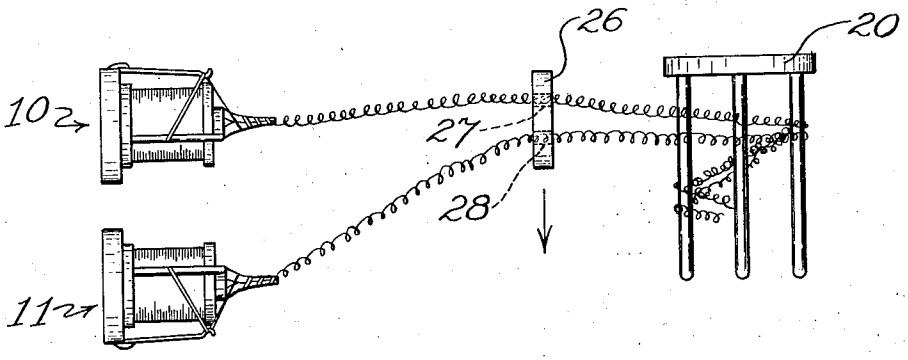
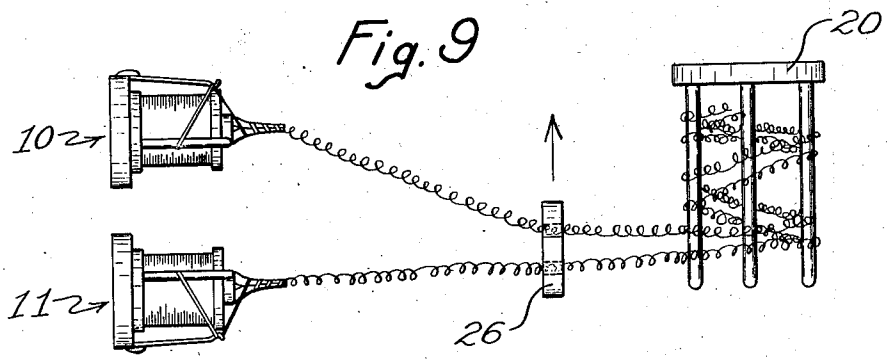


Fig. 8

Fig. 9



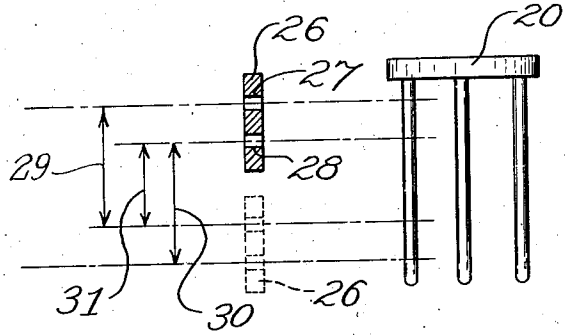


Fig. 10

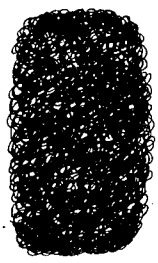


Fig. 11

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METHOD OF MAKING METAL SPONGES

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Application January 8, 1945, Serial No. 571,901

4 Claims. (Cl. 140—71)

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This invention relates to improvements in methods of making metal sponges. Metal sponges have been formed by winding, generally with a cross wind, more or less regular helices of thin metal ribbon or lahn under tension upon a form somewhat larger than the sponge desired, and then releasing the wound skein to permit it to contract. To speed up the winding operation two or more similar helices have been wound at the same time. The resulting sponge is loose in texture and can readily be pulled apart.

I have found that if two adjoining helices are formed of opposite hand and are simultaneously cross wound into a skein under tension and then released, a sponge is produced having a character wholly different from that of the former construction. The helices are more open, presenting more scraping edges, and the sponge is self-sustaining with no tendency to pull apart. The sponge also has a much firmer body in spite of its more open texture. I have also discovered that if a sponge is wound with two or more helical strands spaced apart axially of the skein with enough tension to keep the helices opened up, a very stable sponge of a spheroidal form is produced. This is particularly advantageous if the helices are of opposite hand as described above.

The invention will now be described with reference to the accompanying drawings, in which

Fig. 1 is a view of one of the adjacent helices;

Fig. 2 is a view of the second of the helices;

Fig. 3 shows the two helices brought together under a slight tension;

Fig. 4 shows the helices released;

Fig. 5 is a diagrammatic representation of the preferred way of forming the product;

Fig. 6 is a view of the completed sponge;

Fig. 7 is a diagrammatic representation of an alternative way of making the product;

Figs. 8 and 9 are views like Fig. 5 showing a method of producing a spherical sponge;

Fig. 10 is a diagram illustrative of the mode of operation shown in Figs. 8 and 9; and

Fig. 11 is a view of a sponge made in accordance with the method of Figs. 8 to 10.

The preferred manner of carrying out the process is illustrated in Fig. 5. In this figure two so-called spindles 10 and 11 are shown. These are in general of the type shown in the Montgomery and Mason Patent 1,386,350, August 2, 1921, but provided with tapered polygonal mandrels 12 and 13 as is customary when spindles of this type are to be used for making a coreless helix. The mandrels 12 and 13 are stationary

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and a flyer carrier 14 is mounted to revolve relative to each. Mounted on each flyer carrier is a so-called flyer 15 of bent wire which as shown in the Montgomery and Mason patent is pivoted and spring-pressed outwardly. Also rotatably mounted adjacent each mandrel is a spool 16 carrying flattened metallic wire. The two spindles are substantially identical in construction but are different in the direction of revolution and in the way that the wire is treated. In the upper spindle the flat wire is laid over a guide rod 17, over the loop or eye of the flyer 15, and then led with a half turn to the mandrel so that the curl given to the wire by rubbing against the eye of the flyer will tend to make the wire grip the mandrel. A similar arrangement is followed in the lower spindle except that the wire is wound reversely upon the spool 16 and is led over a guide rod 18 and the flyer 15 in such a way that the coil wound upon the mandrel will be left handed rather than right handed.

The left and right handed helices from the two spools are joined at a reciprocating guide 19 of any desired type which moves back and forth along a pin reel or windup 20 so as to produce a cross-wind. The reel is rotated at a speed somewhat higher than the speed in which the coils are led off the mandrels so that the coils are stretched out in winding as in the Mason Patent 2,121,527 June 21, 1938, in which a different manner of forming the curls is used. In this process the right handed helix 21 made upon the upper spindle is brought closely together with the left handed helix 22 as shown in Fig. 3, and wound upon the reel 20 in this condition. Due to the fact that a cross-wind is used, the composite strand formed by the union of the two helices is caused to interlock at the intersections of the winding, and when the completed sponge is removed from the reel it collapses into a compacted cylindrical mass as shown in Fig. 6.

As compared with prior constructions the degree of interlocking is greatly increased so that the sponge has greater inherent rigidity and resistance to being pulled apart. The coils are also more open so that more cutting edges of the strand are exposed, giving a greater cleaning action. A further advantage of this construction is that on account of the increased interlocking there is much less tendency for the strands to become free once they are broken during use. It will be understood that these sponges are used very largely in cleaning cooking utensils, and that as wear occurs some of the strands will be broken. In older constructions the strands were not suffi-

ciently interlocked and would therefore come out of the sponge mass to form loose tails or projections. With the increased interlocking of the present sponge this cannot occur.

A further modification of this is indicated in Fig. 7, where instead of a flyer construction the strands are pulled by draw rolls 23 over a pair of curling edges 24 and 25 which are slanted in opposite directions. The strands are in this case brought together through the guide 19 and wound up on the reel 20 as previously. By disposing the curling edges at an angle two effects are accomplished which are not present for example in the Mason patent referred to. A much more open helix will be produced for the reason that the pitch of a helix drawn over a curling edge is determined by the angle which the edge bears to the path of the travel of the wire, a right angle producing the closest pitch. This open construction is an advantage for the reasons pointed out above, but hitherto sponges made on curling edges were not controllable in this regard. Furthermore, a flat wire drawn over an angular curling edge will form a right or left handed helix depending upon the inclination of the curling edge relative to the path of the wire.

By inclining the curling edges oppositely one will produce a right handed helix and the other a left handed helix with the results described previously. It should be noted, however, that in any helix made by the curling edge method it is necessary for the curl to revolve in order to form the helix. With a curling edge at right angles to the path of the wire curls form alternately in right handed and left handed directions, which prevents the interlocking effect of the present invention taking place to any material extent. With angular edges, however, the necessary rotation of the helix during its formation can occur only by periodic kinking of the strand so that the product resulting from an arrangement such as in Fig. 7 does not have the uniform appearance of a product made by the spindles shown in Fig. 3, in which no such rotation of the strand is necessary to form the helix. The spindle method is therefore preferred since it makes a superior product.

Rather than passing the helices through a common guide eye as in Fig. 5 a novel effect can be obtained by the use of two guide eyes, one for each helix, spaced apart axially of the windup reel. The type of interlocking of the two strands shown in Figs. 3 and 4 will not result in this case, but instead the interlockings at crossing points will be multiplied and increased; due both to a larger number of crossing points and to the greater ease of interlocking at crossing points when the helices at their crossing points are single rather than double as in Fig. 3. The helices are, for the production of a product having the greatest stability and scouring effect, preferably of right and left hand as described above, but material advantages result even when this refinement is not employed.

In Figs. 8 and 9 the spindles 10 and 11 and the wind-up reel 20 may be the same as previously described, and need not be discussed further. Instead of the single eye guides 19 of Fig. 5, however, a guide 26 having spaced eyes 27 and 28 is employed. This reciprocates back and forth parallel to the axis of the wind-up reel 20 as indicated by arrows. As will be clear from Fig. 10, eye

27 reciprocates through the path 29 and eye 28 through the path 30, there being a region 31 in which the strands from the two eyes are both built up on the reel. The ends of the skein are thus of a decreased thickness as compared with its center, and the resulting sponge shown in Fig. 11 will be spherodial in form rather than substantially cylindrical as in the case of the sponge of Fig. 6.

I claim:

1. A method of making a metal sponge which comprises forming a continuous right handed helix and a continuous left handed helix, winding said strands under tension upon a rotating support, continuously traversing said strands back and forth along the support so that the strands continuously cross over those previously wound, and releasing the mass from the support.

2. A method of making a metal sponge which comprises forming a continuous right handed helix and a continuous left handed helix, winding said strands under tension upon a rotating support, continuously traversing said strands back and forth along the support so that the strands continuously cross over those previously wound, guiding said strands in spaced parallel relation during the winding operation whereby a substantially spheroidal mass is obtained, and releasing the wound mass from the support.

3. A method of making a metal sponge which comprises forming a continuous right hand and a continuous left hand helix, winding said strands under tension upon a rotating support, continuously traversing said strands back and forth along the support so that the strands continuously cross over those previously wound, guiding said strands in lateral contact one with another during the winding operation whereby a substantially cylindrical mass is obtained, and releasing the wound mass from the support.

4. A method of making a metal sponge which comprises forming a continuous right handed helix and a continuous left handed helix by winding separate strands on tapering polygonal mandrels and allowing the wound helices to slide off the ends thereof, winding said strands under tension upon a rotating support, continuously traversing said strands back and forth along the support so that the strands continuously cross over those previously wound, and releasing the wound mass from the support.

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