Oct. 12, 1965 M. P. LORENZO 3,211,634

METHOD OF PRODUCING ABRASIVE SURFACE LAYERS

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Fig. 1.

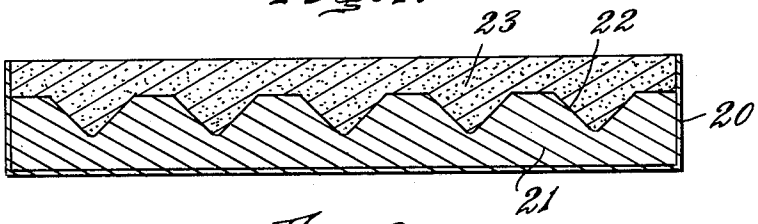

Fig. 2.

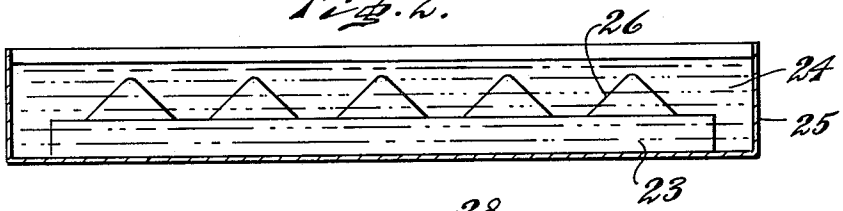

Fig. 3.

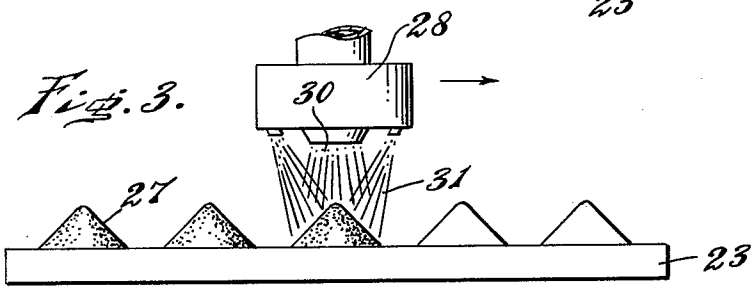

Fig. 4.

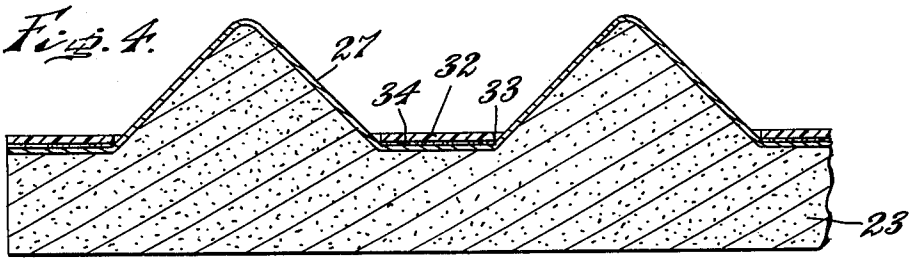

Fig. 5.

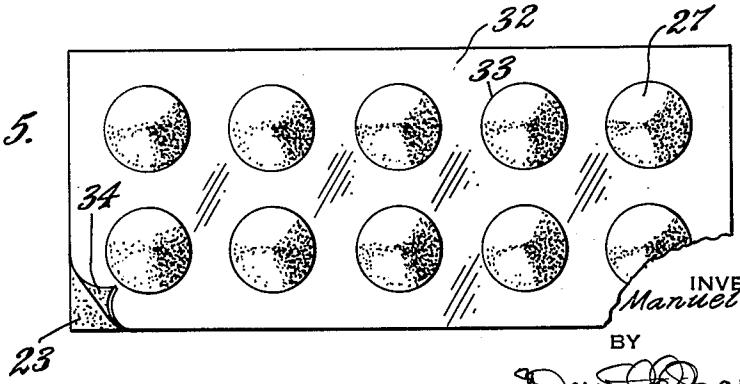

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Fig. 6.

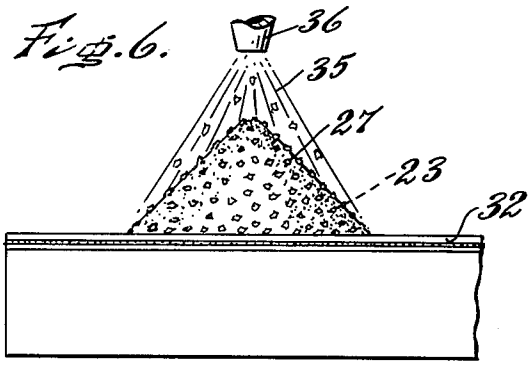


Fig. 7.

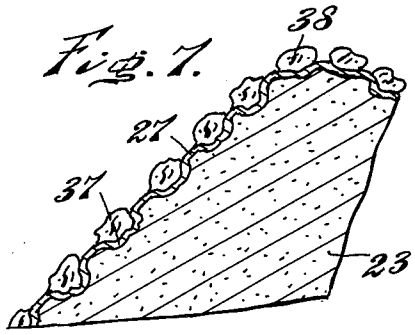


Fig. 8.

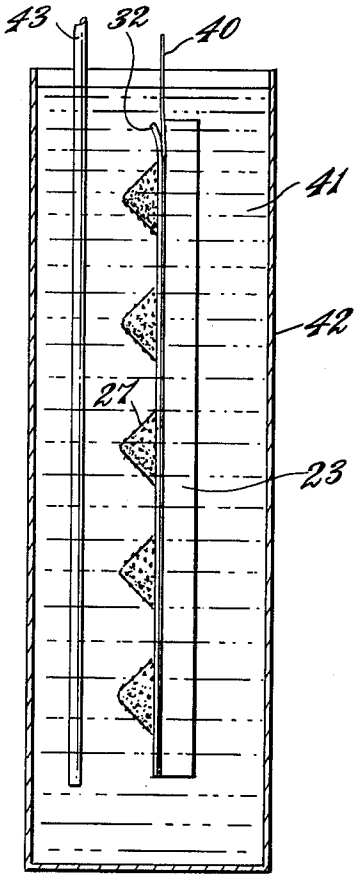


Fig. 9.

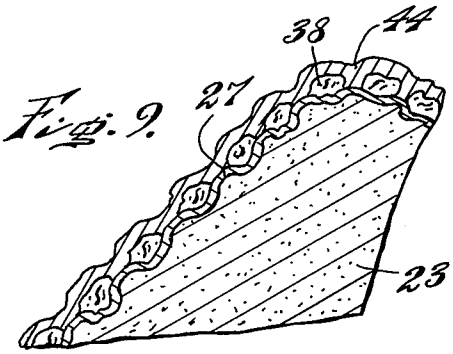
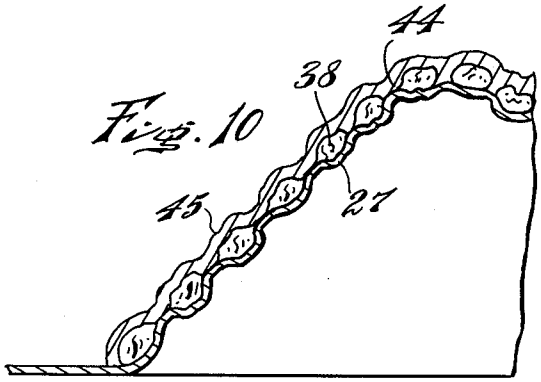


Fig. 10



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METHOD OF PRODUCING ABRASIVE SURFACE LAYERS

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3 Claims. (Cl. 204—16)

The present invention relates to methods of mounting abrasive particles.

A purpose of the invention is to simplify and facilitate the mounting of abrasive particles on a metallic backing.

A further purpose is to obtain more reliable and uniform distribution of abrasive particles on the mounting.

A further purpose is to anchor abrasive particles more effectively in the mounting.

Further purposes appear in the specification and in the claims.

In the drawings I have chosen to illustrate one only of the numerous embodiments in which my invention may appear, selecting the form shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

FIGURE 1 is a central vertical section showing the making of a soft matrix in accordance with the invention.

FIGURE 2 is a central vertical section showing the activation of the matrix.

FIGURE 3 is a diagrammatic side elevation showing the coating of the matrix with an electrically conducting layer.

FIGURE 4 is a central longitudinal section showing the application of a mask to the electricity conducting coating of the matrix.

FIGURE 5 is a fragmentary top plan view of the combination of the matrix and the mask of FIGURE 4 with the mask bent back to show the adhesive layer.

FIGURE 6 is a side elevation showing one method of applying abrasive particles to the electrically conducting layer of the matrix.

FIGURE 7 is an enlarged fragmentary longitudinal section through the matrix, the electrically conducting layer and the abrasive particles of FIGURE 6.

FIGURE 8 is a diagrammatic vertical section showing electroplating against the portions of the matrix provided with the electrically conducting layer and the abrasive particles.

FIGURE 9 is a fragmentary longitudinal section through the matrix, the electrically conducting layer, the abrasive particles and the electrodeposited layer produced in FIGURE 8.

FIGURE 10 is a fragmentary longitudinal section showing the complete abrasive mounting of the invention after removal of the matrix.

In the prior art the making abrasive tools having particles formed for example from diamond silicon carbide, tungsten carbide, boron carbide, boron nitride and the like, has been difficult and expensive.

In many cases extremely expensive precious metals have been required for the mounting.

In other cases the distribution of the abrasive particles has been wasteful and sometimes resulted in ineffective utilization of the abrasive.

By the present invention, the process of making the mounting is greatly simplified and the cost is reduced. Metals more expensive than silver are not required, and very small amounts of silver are used with some other metal such as nickel to provide the mounting.

Any one of said abrasive materials can form the particles, but diamond particles are preferred.

I first produce a soft matrix preferably of microcrystalline wax, but permissibly of polyethylene, polyvinyl

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chloride, polyvinyl chloride-acetate or other soft material. The matrix does not conduct electricity.

In FIGURE 1 I illustrate a mold **20** having a mold insert **21** suitably of steel provided with conical recesses **22**. Into this mold is cast a matrix **23** suitably of microcrystalline wax which will conform to the contour and enter the conical recesses **22**.

The matrix after it solidifies is stripped from the mold and next desirably activated to receive a conducting layer. The activation is desirably accomplished by stannous chloride solution **24** (suitably about 5 percent by weight in water) in a tank **25** which prepares the surface **26** to receive an electrically conducting layer.

After removal of the matrix from the tank **25** it is desirably rinsed with distilled water and dried.

Next an electrically conducting layer **27** is deposited on the matrix. Any suitable silvering technique may be used, the preferred being a silvering spray gun **28** which sprays a silver nitrate solution **30** through a central spray nozzle and sprays a reducing agent such as sugar solution **31** through a surrounding jet so as to deposit the electrically conducting layer **27** over the active face of the matrix. Silvering spray guns are available commercially and any suitable gun of this type may be used. The silvered layer **27** is next dried.

Next a mask **32** having openings **33** for receiving the conical projections is placed against the electrically conducting layer **27** at the active face of the matrix. The mask may suitably be of any material which will not be electrically conducting and not soluble, such as polyethylene, polyethylene chloride, rubber or the like, and is held in place by a pressure sensitive adhesive layer **34** on the surface directed toward the matrix.

Next the abrasive particles are applied so as to indent the electrically conducting layer **27** and deform the soft material of the matrix but still remain adjacent the surface. This may be accomplished by hand with or without the use of a roller to imbed the particles, but is preferably accomplished by blowing the abrasive particles in a stream **35** of air or other gas from a spray gun **36**. The particles will deform the electrically conducting layer creating sockets **37** into which the particles **38** rest.

The size of the abrasive particles will vary, but it is usual to employ particles of a size through 60 mesh per linear inch, through 100 mesh per linear inch or through 180 mesh per linear inch. Excess abrasive particles will be brushed off.

Next an electrically conducting lead **40** is applied, suitably by lifting the corner of the mask **32** and placing the lead against the electrically conducting layer **27** and pressing the adhesive of the mask down to hold the lead.

Then the matrix is placed in an electroplating bath **41** in a suitable tank **42** in spaced relation to a suitable anode **43**, and metal **44** is electrodeposited on the electrically conducting layer **27** and on the particles **38**, thus anchoring and holding the abrasive particles in place. The metal used for electroplating will preferably be nickel or may permissibly be copper, iron, lead or tin.

Finally the matrix **23** is removed, suitably by melting and the final product consisting of a series of generally conical mountings **45** is produced as shown in FIGURE 10.

Additional back-up metal can be applied by electroplating as desired.

The extremely thin electrically conducting layer **27** will of course readily be removed during service.

The mountings of the invention are very easily and inexpensively made, and are strong and serviceable. One of the great advantages is that a large amount, almost all of the valuable abrasive particles, are availble for use.

It will be evident that other contours of mountings may be produced by changing the shape of the matrix.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the method shown, and I therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. The method of producing an abrasive surface layer, which comprises producing a deformable electrically non-conducting matrix having the desired contour of the surface layer, coating the matrix with a thin deformable electrically conducting layer, mounting abrasive particles in the electrically conducting layer by deforming the matrix and the said conducting layer, after completing the mounting electrodepositing anchoring metal over the abrasive particles and the intervening portion of the electrically conducting layer, and removing the matrix so as to expose for use the surface of the abrasive particles which was formerly directed toward the matrix.

2. The method of claim 1, which further comprises mounting the abrasive particles in the electrically conducting layer against the matrix by blowing said particles in a stream of gas against the electrically conducting layer.

3. The method of claim 1, which further comprises covering selected portions of the electrically conducting layer with a mask before applying the abrasive particles to the electrically conducting layer.

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