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GRANULAR COATED ARTICLE AND ITS MANUFACTURE

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Fig. 2.

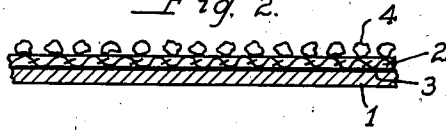


Fig. 1.

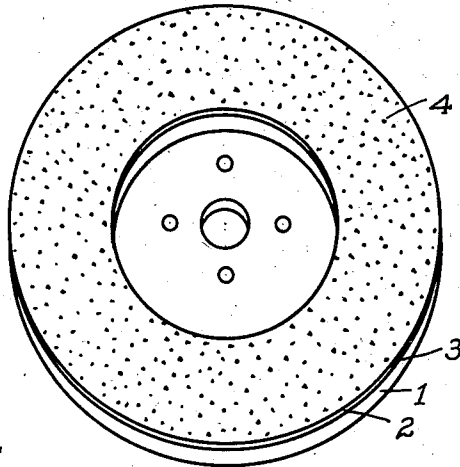


Fig. 5.

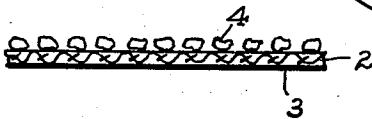


Fig. 4.

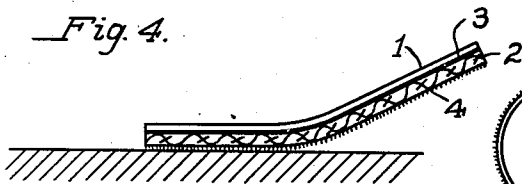


Fig. 3.

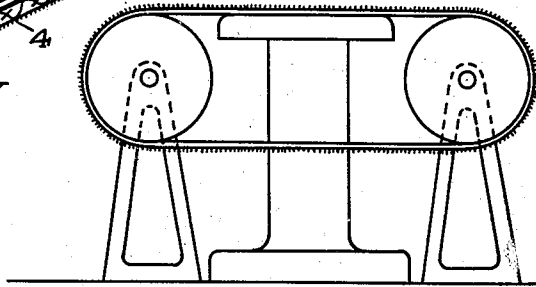
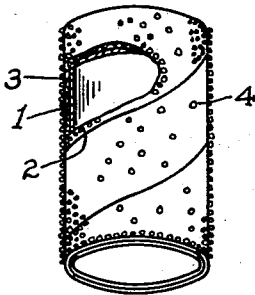


Fig. 6.



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GRANULAR COATED ARTICLE AND ITS MANUFACTURE

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Application December 3, 1940, Serial No. 368,339

9 Claims. (Cl. 51—197)

This invention relates to granular coated articles and more particularly to improved abrading apparatus including flexible abrasive articles such as abrasive coated discs, belts, tubes, cones and the like. This application is a continuation-in-part of application Serial No. 272,619, filed May 9, 1939.

Abrasive discs and belts, which are two of the articles with which the present invention is concerned, have heretofore ordinarily been made with backings which are very expensive. For instance, the backings most commonly used in discs of this type consist of a back portion of a hydrated cellulose material such as vulcanized fiber and a coated side consisting of cloth glued or otherwise cemented to the vulcanized fiber. The fiber backings are customarily from ten to fifteen thousandths of an inch thick and are relatively expensive. Abrasive belts are commonly made with a backing of a special type of cloth such as a drill or a jean, and sometimes with a heavy paper, which materials are also relatively costly.

The necessity of incorporating in these articles particular grades and costly backing material is due to the unusual stresses to which the articles are subjected in their operation. For example, discs are planed out over a portion of their surface corresponding to an arc of 90° or thereabouts. Consequently, the disc surfaces are alternately flexed into a plane at an angle to the main portion of the disc and then returned into the plane of that portion at each revolution of the disc. Under such working conditions where repeated flexing occurs, discs made with the ordinary paper or cardboard backings or the like are unsatisfactory since the backings delaminate. Abrasive belts are also subjected to repeated flexing caused by the change in direction of the belt as it moves about the rotating pulleys.

This invention overcomes these and other disadvantages, and enables the employment of less expensive backing material for the brasive coated sheet and permits the ready removal of such sheets from a permanent backing or support when they become worn. Materials which have strength-giving properties I have designated as "strength agents," and those imparting tackiness to the adhesive I have called "tack agents." The invention consists in providing a layer of pressure sensitive adhesive on either the back of the abrasive coated sheet or on a permanent backing, by means of which the abrasive coated sheet can be quickly and easily attached to the permanent backing and held in firm attachment

thereto during working operation, but which may be readily detached therefrom when the abrasive coated sheet becomes unduly worn or unfit for further service.

By "pressure sensitive adhesive" is meant an adhesive which under ordinary atmospheric conditions is tacky and nondrying and in a condition such that adhesion is secured by the application of slight pressure and without the necessity of activating the adhesive by solvents or otherwise treating it for firm adherence to, or removal from surfaces. Examples of such permanently tacky adhesives are as follows:

Example I

| | Percent |
|-----------------------------------|---------|
| Ethyl cellulose, medium viscosity | 10-20 |
| "Paraplex" RG 2 or RG 5 | 80-90 |

"Paraplex" is an alkyd resin manufactured and sold by the Resinous Products Company of Philadelphia, Pa.

Example II

| | Percent |
|------------|---------|
| Rubber | 80 |
| Rosin | 16 |
| Zinc oxide | 4 |

Example III

| | Percent |
|--------------------|---------|
| Pale crepe rubber | 45 |
| Zinc oxide | 35 |
| Hydrogenated rosin | 20 |

In these compositions, the rubber and the cellulose derivatives provide strength to the adhesives while the resins and the zinc oxide make the adhesives tacky.

The adhesives are dissolved in a suitable solvent and applied in solution, the solvent being removed by evaporation.

To facilitate an understanding of the invention, reference may be made to the drawing, wherein:

Fig. 1 is a plan view of a circular abrading disc;

Fig. 2 is a sectional view of a portion of an abrasive coated sheet attached to a permanent backing;

Fig. 3 is a side elevation of a machine provided with a belt made in accordance with the present invention;

Fig. 4 is a diagrammatic representation of a cut-off part of a disc in use illustrating the manner of use;

Fig. 5 is a sectional use of a portion of an abrasive coated sheet with the adhesive attached thereto; and

Fig. 6 is a perspective view of a spirally wound tube with portions broken away.

According to one modification of the invention, as shown in Figs. 1 and 2, the permanent backing 1, which may be vulcanized fiber or hydrated cellulose material having the combination of properties required in such products, or sheet spring steel, brass, copper, aluminum or the like, is coated in any manner well known in the art, on its upper surface with a layer of pressure sensitive adhesive to which is firmly applied by pressure a coated abrasive sheet consisting of fabric such as paper, cloth or vulcanized fiber 2 coated with abrasive particles 4.

The adhesive layer 3 may consist of two coatings, one of which is a highly adhesive material such as the modified rubber known in the trade as "Vulcalock" since it has been found desirable to first coat the material to which the pressure-sensitive adhesive is to be joined permanently with a highly adhesive material to which the pressure-sensitive adhesive will stick more firmly than it does to an ordinary surface. For example, in coating the permanent backing 1 with the pressure-sensitive adhesive, I prefer to first apply a thin coating of modified rubber, such as "Vulcalock," remove the solvent from the "Vulcalock" and then apply the pressure-sensitive adhesive to the exposed surface of the "Vulcalock." By employing such a combination, the pressure-sensitive adhesive is more firmly adherent to the backing than it is to the surface to which it is temporarily applied. By this procedure it is only necessary to apply one coat of "Vulcalock" and pressure-sensitive adhesive in order to attach an abrasive coated sheet and to replace it many subsequent times. When the abrasive coated sheet has become dulled or otherwise brought to a condition where it is desirable to remove it, it can be easily stripped or pulled from the permanent backing without removing the pressure-sensitive adhesive therefrom and still leave the pressure-sensitive adhesive in condition for further and repeated use.

According to another modification of the invention, as shown in Fig. 5 of the drawing, the pressure-sensitive adhesive is applied to the uncoated side of the abrasive coated sheet consisting of fabric 2 and abrasive particles 4. The abrasive coated sheet may then be firmly attached to the permanent backing by pressing the adhesive coated side against the permanent backing. With this modification, it is some times desirable to protect the adhesive coating by applying to it a protective coating. It is preferred to use for such protective coating a sheet of open mesh cloth which has been combined with cheap paper by means of an adhesive having a low affinity for the pressure adhesive, such as starch, lacquer (on rubber base adhesives) and the like. Other sheets of moisture-resisting paper such as Holland cloth, oiled or waxed paper may also be used. When the adhesive is thus protected by such a coating, the protective sheet is stripped from the adhesive immediately before the abrasive coated sheet is applied to the permanent backing.

The application of the pressure-sensitive adhesive directly to the uncoated side of the abrasive coated sheet consisting of fabric 2 and abrasive particles 4 is preferred in the manufacture of spirally wound tubes. In this case, as shown in Fig. 6, the abrasive coated sheet with the pressure-sensitive adhesive applied to the lower surface is wound about the tube and pressed into

contact with the backing 1. It is to be understood, however, that in this modification, as well as in the other modifications of the invention, the manner and method of applying the pressure-sensitive adhesive is a matter of choice and expediency and does not affect the quality of the resulting article.

The product of the present invention has numerous advantages over articles heretofore used. Abrasive discs of the type with which the present invention is concerned have been used in large quantities in the past, and it has been necessary to provide supporting pads in connection with them in order to provide sufficient support therefor. The provision of the certain types of permanent backings, such as spring steel, eliminates the necessity of such supporting pads.

Another feature of my invention which is of considerable value, especially in the use of abrasive belts, resides in the employment of a backing material for the the abrasive grains which is relatively non-yielding and impenetrable. The paper ordinarily used in the manufacture of abrasive paper is to some extent yielding so that when the abrasive grains are firmly pressed against a work-piece during operation, the grains are pressed, at least to some extent, into the yielding backing and the pressure which should be applied to the work-piece is correspondingly diminished. When the abrasive grains are coated onto a relatively hard and impenetrable surface, such as the surface of vulcanized fiber or other form of hydrated cellulose, they can not be pressed onto the backing and thus the abrasive products cut materially faster than is the case when ordinary paper is used as the backing. Similarly, it has been found that abrasive discs having unusual cutting properties are secured by employing a permanent steel backing to which is adhesively attached an abrasive coated vulcanized fiber. Such discs are especially desirable for use in disc sanding machines where steel backings are of advantage.

Furthermore, it has been found that the high cutting rate which is secured through the use of a relatively impenetrable backing material may be provided by the combination of a permanent backing of cloth to which is adhesively joined a thin layer of vulcanized fiber, and abrasive coated paper which is relatively thin and dense. Due to the fact that a thin and relatively unyielding and non-compressible paper may be used in this combination, most of the desirable properties of the combination in which the abrasive grains are coated directly on the vulcanized fiber are therefore provided. Similarly, thin highly compressed paper has been attached to steel backings for discs and belts to obtain the desired hard unyielding base for the abrasive grains.

Special advantages reside in employing a combination of permanent cloth backing for an abrasive belt, to which is adhesively attached an outer layer of vulcanized fiber having its outer surface coated with abrasive grains. Heretofore it has been necessary to provide a thick sheet of vulcanized fiber in order to secure a non-yielding backing. In the present combination, it is unnecessary to employ such a thick sheet of vulcanized fiber since the provision of a hard surface is sufficient to secure the necessary non-yielding backing. This fact not only reduces the cost of the abrasive coated product, but it also makes it possible to provide a belt which is relatively flexible and still has a relatively impenetrable surface. The vulcanized fiber in an abra-

sive belt consisting only of abrasive coated vulcanized fiber would have to be very thick in order to withstand the pull exerted on the belt, and such thickness would render the belt stiff and inflexible and wholly unsatisfactory. On the other hand, by employing a cloth liner, as in the present invention, which has the required strength, and flexibility, and covering it with abrasive coated fiber which is comparatively thin, the desired hardness of the surface layer inherent in the fiber is obtained and the desired flexibility maintained.

The use of a permanently tacky pressure-sensitive adhesive in a combination of the present invention is of decided advantage. If an ordinary adhesive, such as glue, which requires the employment of a solvent to make it tacky or sticky is used, there are two major disadvantages. In the first place, it is extremely difficult to remove all traces of the solvent from the adhesives which are employed to join two dense and impenetrable layers as described in the present invention. In the second place, when the abrasive coated product included in the combination has become worn or dulled, in order to replace it, it is extremely difficult, if not impossible, to remove all traces of the adhesive coating and thus be able to remove the abrasive product from the permanent backing without injuring the backing. By employing the adhesives described in the present invention, such difficulties are avoided.

While the invention has been described with particular reference to articles including only two plies of backing material, it will be understood that additional plies may be employed. In such cases, the intermediate ply or plies may be permanently attached to either the permanent backing or the abrasive article, or one or more of them may be attached by pressure adhesive. In any event, there is at least one layer of pressure-sensitive adhesive. An example of such article is a disc in which the permanent backing includes a layer of paper and a layer of cloth to which the abrasive coated sheet is removably attached.

It will be understood that various modifications may be made, as desired, without departing from the spirit of the invention and the scope of the following claims.

I. claim:

1. An unattached coated abrasive sheet adapted to be temporarily attached to a permanent backing comprising a backing material having a layer of abrasive particles attached thereto by a binder, and a thin layer of permanently tacky pressure-sensitive adhesive on the opposite side of said backing material.

2. An unattached coated abrasive sheet adapted to be temporarily attached to a permanent backing comprising a backing material having a layer of abrasive particles attached thereto by a binder, a thin coating of a highly adhesive material on the opposite side of said backing material, and a thin layer of permanently tacky pressure-sensitive adhesive on the coating of said highly adhesive material.

3. A flexible abrasive article comprising a flexible permanent backing, an abrasive coated fabric, and a thin layer of a water-insoluble pressure adhesive comprising a strength agent and a tack agent positioned between said backing and said abrasive coated fabric, said adhesive being capable of adhering to the backing without the application of heat or a solvent, being sufficiently strong and tenacious and so strongly adhered to

the said backing and fabric that the article is capable of being subjected to repeated flexing and distortion and to the stresses imposed upon it by high speed and severe abrading operations without delamination of the backing or substantial movement of the abrasive coated fabric with respect to the backing, and being of such character that the abrasive coated fabric can be stripped from the permanent backing without the use of heat or a solvent.

4. A coated abrasive article comprising a flexible fabric backing coated on one side with abrasive grains and on its other side with a thin layer of a water-insoluble pressure adhesive comprising a strength agent and a tack agent, said adhesive being sufficiently strong, tenacious and adhesive so that when the article is attached to a second backing by the adhesive without the use of heat or a solvent, the composite article thus formed is capable of being subjected to repeated flexing and distortion and to the stresses imposed upon it by high speed and severe abrading operations without delamination of the backing or substantial movement of the abrasive coated fabric with respect to the backing, and being of such character that the abrasive coated fabric can be stripped from the permanent backing without the use of heat or a solvent.

5. A coated abrasive article comprising a fabric backing coated on one side with abrasive grains and on its other side with a layer of a pressure adhesive comprising a cellulose derivative and a resin, said adhesive being sufficiently strong, tenacious and adhesive so that when the article is attached to a second backing by the adhesive without the use of heat or a solvent, the composite article thus formed is capable of being subjected to repeated flexing and distortion and to the stresses imposed upon it by high speed and severe abrading operations without delamination of the backing or substantial movement of the abrasive coated fabric with respect to the backing, and being of such character that the abrasive coated fabric can be stripped from the permanent backing without the use of heat or a solvent.

6. A coated abrasive article comprising a fabric backing coated on one side with abrasive grains and on its other side with a layer of a pressure adhesive comprising rubber and a resin, said adhesive being sufficiently strong, tenacious and adhesive so that when the article is attached to a second backing by the adhesive without the use of heat or a solvent, the composite article thus formed is capable of being subjected to repeated flexing and distortion and to the stresses imposed upon it by high speed and severe abrading operations without delamination of the backing or substantial movement of the abrasive coated fabric with respect to the backing, being of such character that the abrasive coated fabric can be stripped from the permanent backing without the use of heat or a solvent.

7. A coated abrasive article comprising a flexible but a relatively non-yielding and impenetrable fabric backing coated on one side with abrasive grains and on its other side with a thin layer of a water-insoluble pressure adhesive comprising a strength agent and a tack agent, said adhesive being sufficiently strong, tenacious and adhesive so that when the article is attached to a second backing by the adhesive without the use of heat or a solvent, the composite article thus formed is capable of being subjected to repeated flexing and distortion and to the stresses imposed upon it

by high speed and severe abrading operations without delamination of the backing or substantial movement of the abrasive coated fabric with respect to the backing, and being of such character that the abrasive coated fabric can be stripped from the permanent backing without the use of heat or a solvent.

8. A coated abrasive article comprising a flexible fabric backing coated on one side with abrasive grains and on its other side with an intermediate coating of highly adhesive material and a thin layer of a water-insoluble pressure adhesive comprising a strength agent and a tack agent, said adhesive being sufficiently strong, tenacious and adhesive so that when the article is attached to a second backing by the adhesive without the use of heat or a solvent, the composite article thus formed is capable of being subjected to repeated flexing and distortion and to the stresses imposed upon it by high speed and severe abrading operations without delamination of the backing or substantial movement of the abrasive coated fabric with respect to the backing, and being of such character that the abra-

sive coated fabric can be stripped from the permanent backing without the use of heat or solvent.

9. A coated abrasive article comprising a flexible fabric backing coated on one side with abrasive grains and on its other side with a thin layer of a water-insoluble pressure adhesive comprising a strength agent and a tack agent, said adhesive being sufficiently strong, tenacious and adhesive so that when the article is attached to a second backing by the adhesive without the use of heat or a solvent, the composite article thus formed is capable of being subjected to repeated flexing and distortion and to the stresses imposed upon it by high speed and severe abrading operations without delamination of the backing or substantial movement of the abrasive coated fabric with respect to the backing, and being of such character that the abrasive coated fabric can be stripped from the permanent backing without the use of heat or a solvent, and a protective coating adhesively attached to the pressure adhesive.

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