Dec. 19, 1961 A. ACKERMAN 3,013,870

MANUFACTURE OF ABRASIVE BELTS AND COATED FABRICS THEREFOR

Filed June 30, 1958

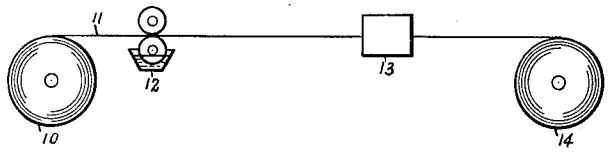


FIG.1.

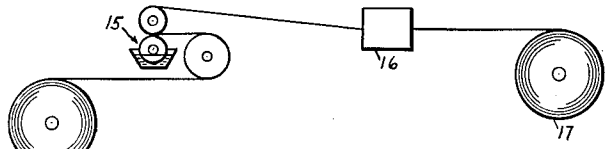


FIG.2.

FIG.3.

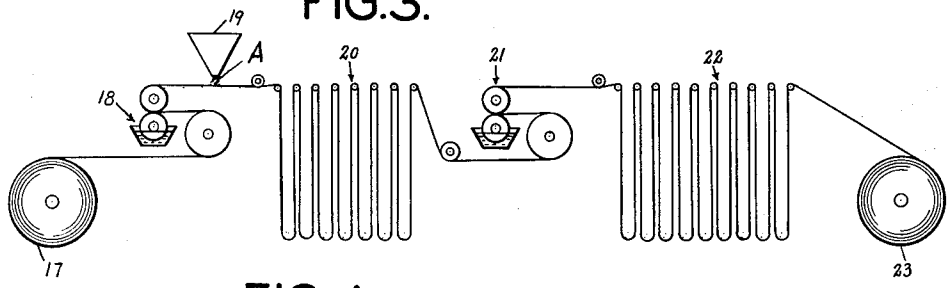


FIG.4.

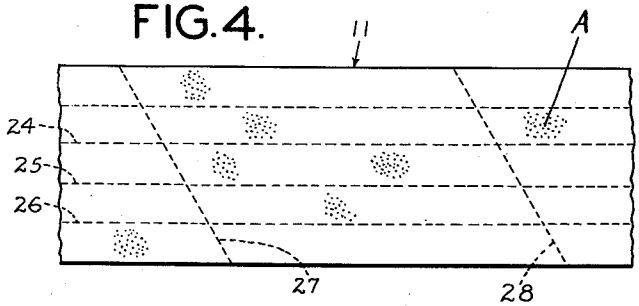


FIG.5.

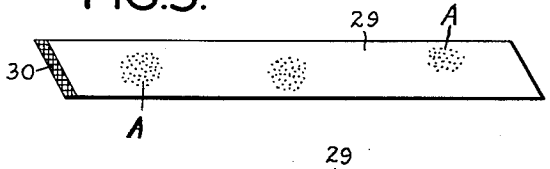
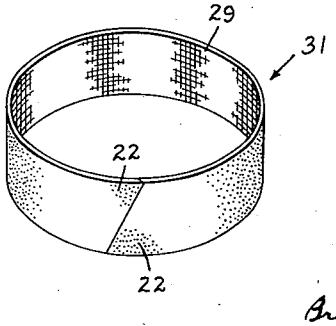


FIG.6.



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MANUFACTURE OF ABRASIVE BELTS AND COATED FABRICS THEREFOR

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13 Claims. (Cl. 51—295)

This invention relates to improvements in abrasive materials and the manufacture of such abrasive materials and it relates particularly to improvements in coated webs of woven or felted fabrics formed of natural or synthetic fibers, abrasive sheets and belts made from such fabrics, the compositions used in the coating of such fabrics and to methods of making the coated fabrics and abrasive sheets and belts.

The manufacture of abrasive cloths and belts for belt sanders and the like is an old and well known industry and involves certain techniques which are standard in the industry. Usually, the cloths used in the manufacture of abrasive belts are dyed and stretched to the proper width. Then the back or print surface of the cloth, such as a web of cotton grey goods is sized with a glue and starch size to fill the spaces between the yarns or fibers and provide a barrier for preventing penetration of the glue or resin used later for sizing the face side or bonding the abrasive particles or grits to the cloth. Following these treatments and after drying of the sizing coats, a layer of a suitable glue such as an animal glue, a synthetic resin glue or the like is applied to the face or front surface of the cloth for bonding abrasive grits to it. Inasmuch as this operation is usually accomplished on a calender roll, the presence of the back and face sizings on the cloth is important for the reason that they prevent penetration of the glue for bonding the abrasive grits through the cloth and thereby prevent the cloth from sticking to the calender roll.

Abrasive belts are made from cloth treated as described above by slitting the cloth into strips of a desired width, these strips then being cut, usually on a bias, to a desired length. It is then necessary to secure the bias-cut ends of the strips together so that they will not separate when subjected to the stresses which they encounter in normal use when operated on a polishing or belt sander. To achieve a strong bond, the abrasive, the glue and other sizing are removed from a narrow zone, usually about ⅜" wide, at one end of the strip by means of a skiving operation to expose the fibers of the cloth. Inasmuch as a starch size has very little strength, and is not very compatible with the glue used for securing the ends of the abrasive strip together, a strong bond cannot be obtained between the skived edge of the strip and the starch sized back of the strip. Accordingly, it is necessary to remove the size on the back or print surface of the strip in a zone band about ⅜" wide, at the opposite end of the strip from the skived end. This operation is accomplished by scrubbing, washing or brushing to lay open the fibers on the back of the cloth. When an adhesive such as an animal glue or synthetic resin glue is applied to the joint, the cleaned zone on the back surface and the skived, abrasive-free zone on the face of the strip will be bonded together strongly without producing an objectionably thick joint at the zone where the ends of the strip overlap.

The operation of removing the sizing from the back or print side of the cloth is expensive and time-consuming for the reason that it is done manually.

In accordance with the present invention, I have provided a method and coating compositions by means of which the porous surfaces of woven of felted fabrics formed of natural or synthetic fibers can be filled to render them especially effective for use in the production of abrasive sheets and belts.

More particularly, a glue size containing a filler of an unusual type has been provided by means of which it is possible to fill a fabric to provide a desired weight and tensile strength necessary for such fabric and to obtain a strong bond between the fabric and the abrasive particles thereon. Moreover, the coating compositions, according to the present invention enable the skived edge of the abrasive coated fabric to be united with the coated or sized back surface of the fabric without removal of the coating or size from the back surface of the fabric. In this way, the manual treatment of the belts prior to gluing their ends together is reduced substantially and a joint having increased strength and which can be produced more economically is obtained.

For a better understanding of the present invention reference may be had to the accompanying drawing in which:

FIGURES 1 to 3 are schematic illustrations of a typical method embodying the present invention;

FIGURE 4 is a plan view of a web of cloth coated with abrasive and illustrating the manner in which the web is cut into narrower strips and on a bias to form abrasive belts;

FIGURE 5 is a plan view of an abrasive belt showing the treatment of one end thereof; and

FIGURE 6 is a perspective view of a completed abrasive belt made in accordance with the present invention.

As shown schematically in FIGURES 1, 2 and 3, the abrasive cloth can be manufactured in a number of operations. As shown in FIGURE 1, a roll **10** of fabric **11** formed of woven or felted natural or synthetic fibers or yarns, which has been dyed and stretched to the desired width in the regular procedure used to accomplish this, is fed through a roller coating apparatus **12** wherein the back or print side of the fabric **11** is filled with a solution of a suitable glue or resin and a filler of an unusual type further described herein. Thereafter, the fabric **11** with the back filling is dried by passing it through a suitable dryer **13** and rolled up into a roll **14**.

As shown in FIGURE 2, the fabric **11** is unwound from the roll **14** and is passed through a roller coating device **15** which applies a size coat consisting of a solution of a suitable glue or resin and a filler of an unusual type further described herein. The fabric passes through dryer **16** and is wound into roll **17**.

While it is preferable that the back filling illustrated in schematic drawing in FIGURE 1 and the face sizing illustrated in schematic drawing in FIGURE 2 and described herein, be accomplished with one pass through the back filling and face sizing roller coating devices, it is understood that cloth **11** can be run a number of times through the back filling and face sizing operations when the specifications call for various cloth finishes of such weight and tensile strength that a plurality of passes through the back filling or face sizing operations are required.

As shown in FIGURE 3, after the cloth is ready for coating, fabric **11** is unwound from the roll **17** and is passed through roller coating device **18** which applies a coat of glue or resin to the face side of the cloth which is compatible with the glue or resin previously applied to the cloth, and thereafter abrasive grain A is deposited by means of a metering device on hopper **19** on the wet glue or resin on the face of the fabric. The fabric is partially dried on a festoon dryer **20**, then enters sizing machine **21** which applies a size coat of glue or resin over the grain on the face side of the cloth, and then the cloth is festoon dried **22** and rewound on roll **23**.

Subsequently, the fabric **11** with the abrasive A thereon is cut along lines **24**, **25**, **26**, etc. to form narrow strips of a desired width. Usually the strips are then cut to length on a bias as indicated by the lines **27** and **28** in

FIGURE 2, to form the individual abrasive strips **29** shown in FIGURE 3. The sizing and coating techniques described above are essentially the same as in the prior methods of manufacture and are susceptible to considerable modification in the sequence and number of coating steps.

In accordance with the present invention, the size applied by the coating apparatuses **12** and **15** is made up of an animal or synthetic resin glue (hereinafter referred to as glue) containing an inert filler known as "Laminar" which imparts increased strength to the glue, forms an excellent filling for the cloth and also bonds strongly to compatible glues which are commonly used for securing one end of a strip of abrasive cloth to the other to form a belt therefrom. "Laminar" is a finely ground oyster shell product manufactured by Laminar Corporation of Greenwich, Connecticut. The ground oyster shell is composed of thin, flat, irregularly shaped flakes or leaves having an average particle size of about one and one-half to seven microns. These flaky or leaf-like particles readily fill the interstices between the fibers and the yarns making up the cloth and cover the cloth, thereby forming a barrier to the penetration of the glue by means of which the abrasive grits are bonded to the face of the cloth. Several grades of Laminar are available. In one grade 98½% of the particles are smaller than 10 microns and 32% to 34% are smaller than one micron. In another grade 100% of the particles are smaller than 35 microns and 12% to 15% are smaller than one micron. Either grade is satisfactory and in practice, the larger particle sizes are preferred, principally on the basis of manufacturing economy. Inasmuch as the particles are thin and flaky, they form an overlapping shingle or scale-like layer which has excellent covering power and in which the particles are strongly bonded together by the thin layers of glue between the overlapping faces of the particles. It has been found that one pound of Laminar has a surface area of over .6 of an acre.

A typical sizing composition for back sizing the cloth **11** in the coating apparatuses **12** and **15** is composed of:

	Lbs.
Animal glue (dry weight), 114 millipoises	35
Laminar	40
Water	65

Another suitable size for back sizing the fabric **11** has the following composition:

	Lbs.
Animal glue (dry weight), 86 millipoises	40
Laminar	80
Water	65

A suitable size for face sizing the fabric in formation is as follows:

	Lbs.
Animal glue (dry weight), 114 millipoises	35
Laminar	35
Water	65

It will be understood that an equivalent proportion of a synthetic resin glue may be substituted for the animal glue in each of the preceding sizing compositions.

A suitable animal glue is hide glue. Suitable synthetic resin glues are the vinyl, melamine, polyester, phenol-formaldehyde and urea resins. It will be understood that best results are obtained when the sizes and other coatings applied to the fabric contain the same kind of glues, or, in any event, glues which are compatible with each other.

Moreover, the proportion of Laminar can be varied considerably. As little as one part of Laminar to one part of dry glue by weight or as much as three parts of Laminar to one part of dry glue by weight can be used. Also the amount of water can be varied depending on the desired viscosity of the sizing composition.

It has also been found helpful to include a proportion of Laminar in the glue applied from the glue fountain **18** inasmuch as the filler strengths the glue and affords a very strong bond between the abrasive grits and the cloth **11**. Typical glues for this operation are disclosed more particularly in the Gustaf A. E. Ackerman application Serial No. 462,614, filed October 15, 1954.

One end of the abrasive coated strip **29** is subjected to a skiving operation to remove the abrasive grits, the glue and the size from a narrow zone **30** at one end of the strip, thereby to expose the fibers and render them receptive to glue which is used to secure the opposite ends of the strip together to form an abrasive belt **31**, like that shown in FIGURE 4. Inasmuch as the back or print surface of the strip **29** has a coating of glue containing Laminar, it is completely compatible with a similar glue which is applied to the skived zone **30** of the strip **29**. Therefore, when the print surface at one end of the belt is brought into overlapping relation to the skived zone **30** of the strip **29** with an animal or synthetic resin glue applied thereto and the overlapping edges are subjected to heat and pressure, a very strong and durable bond is obtained between the overlapping edges.

Belts **31** of a type described herein operate for prolonged periods of time without failure of the bond between the ends of the abrasive strip even when used for polishing metal castings and the like. In such polishing operations, the belts are normally subjected to a tension of about 70 pounds or more when installed in the polishing machine. Greater tensile stresses are exerted on the belt and the joint between its overlapped and glued edges during polishing because of deflection of the belt by the pressure applied by the castings.

It will be understood that the process is susceptible to considerable variation in the sequence or order of steps of sizing, glue dipping and the like.

Moreover, the proportions of Laminar used in the various sizing operations can be varied considerably but should not be appreciably more or less than the proportions indicated above if optimum results are to be achieved.

From the foregoing, it will be understood that the examples of the sizing compositions are illustrative and should not be considered as limiting the scope of the following claims.

I claim:

1. A method of making abrasive belts comprising sizing one side of a web of fabric with a glue sizing containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns, adhering an abrasive grit to the other side of said fabric, cutting said fabric into strips, removing the abrasive grit from one end of a strip and gluing said one end of said strip directly to the sized side of said strip to form an endless belt.

2. A method of making abrasive belts comprising sizing one side of a web of fabric with a liquid glue sizing composition containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns, said ground oyster shell particles being present in an amount between about one part to about three parts to about one part of dry glue, by weight, adhering an abrasive grit to the other side of said fabric, cutting said fabric into strips, removing the abrasive grit from one end of a strip and gluing said one end of said strip directly to the sized side of said strip to form an endless belt.

3. A method of coating fabrics comprising back-sizing one side of a web of fabric with a liquid glue sizing composition containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns as a filler, said ground oyster shell particles being present in an amount not substantially exceeding about three parts by weight to about one part by weight of dry glue.

4. A method of making abrasive belts comprising sizing

one side of a web of fabric with a liquid glue sizing composition containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns as a filler, said ground oyster shell particles being present in an amount not substantially exceeding about three parts by weight to about one part by weight of dry glue, adhering an abrasive grit to the other side of said web, cutting said web into strips, removing the abrasive grit from one end of a strip and gluing said one end of said strip directly to the sized side of said strip to form an endless belt.

5. A method of making abrasive belts comprising sizing one side of fabric with a liquid glue sizing composition containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns, said ground oyster shell particle being present in an amount of about 40 to 80 parts by weight to about 35 to 40 parts by weight of dry glue, drying the sized fabric; sizing the opposite side of said fabric with a liquid glue sizing composition containing ground oyster shell particles having an average particle size between about one and one-half and seven microns, and adhering an abrasive grit to said opposite side of said fabric, the dry glue being present in about equal amounts by weight.

6. A method of making abrasive belts comprising sizing one side of fabric with a liquid glue sizing composition containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns, said ground oyster shell particle being present in an amount of about 40 to 80 parts by weight to about 35 to 40 parts by weight of dry glue, drying the sized fabric; and sizing the opposite side of said fabric with a liquid glue sizing composition containing ground oyster shell particles having an average particle size between about one and one-half and seven microns, said ground oyster shell particles being present in an amount of about forty parts by weight to about twenty-five parts by weight and dry glue being present in about equal amounts by weight; adhering an abrasive grit to the other side of said fabric, removing the abrasive grit from one end of a strip of said fabric, to expose a part of said other surface of said fabric, and gluing said one end of said strip directly to the sized surface at the other end of said strip to form an endless belt having abrasive grits on its outer surface.

7. An abrasive belt comprising a strip of fabric having abrasive grit bonded to its outer surface, the opposite side of said strip having a glue size thereon containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns, filling the interstices of said fabric, one end of said strip being free of said abrasive grit and being glued directly to the side of the fabric having the glue size thereon in overlapping relation thereto.

8. An abrasive belt comprising a strip of fabric having abrasive grit bonded to its outer surface, the opposite side of said strip having a glue size thereon containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns, said ground oyster shell particles being present in an amount between about one and three parts by weight to about one part of dry glue by weight filling the interstices of said fabric, one end of said strip being free of said abrasive grit and being glued directly to the side of the fabric having the glue size thereon in overlapping relation thereto.

9. An abrasive belt comprising a strip of fabric having abrasive grit bonded to its outer surface, the opposite side of said strip having a glue size thereon containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns, said ground oyster shell particles being present in an amount of about one to three parts by weight to about one part of dry glue by weight and filling the interstices of said fabric, one end of said strip being free of said abrasive grit and being glued directly to the side of the fabric having the glue size thereon in overlapping relation thereon.

10. An abrasive belt comprising a strip of fabric having abrasive grit bonded to one surface by a glue, the opposite side of said strip having a glue size thereon containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns filling the interstices in said cloth, a narrow zone at one end of said strip being substantially free of grit and being glued directly to the sized side of the other end of said strip in overlapping relation thereto.

11. Fabric for abrasive belts and sheets consisting essentially of a strip of fabric having a glue back-filling size thereon containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns, said ground oyster shell particles being present in an amount of about one to three parts by weight to about one part of dry glue by weight and filling the interstices of said fabric.

12. Fabric for abrasive belts and sheets consisting essentially of a strip of fabric having a glue back-filling size thereon containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns filling the interstices in said fabric.

13. Fabric for abrasive belts and sheets consisting essentially of a strip of fabric having on its opposite sides a glue size thereon containing flaky ground oyster shell particles having an average particle size of about one and one-half to seven microns, said ground oyster shell particles being present in an amount of about one to three parts by weight to about one part of dry glue by weight, the glue size filling the interstices of said fabric.

References Cited in the file of this patent

UNITED STATES PATENTS

2,322,154	Oglesby	June 15, 1943
2,431,035	Goepfert et al.	Nov. 18, 1947
2,794,726	Riedesel et al.	June 4, 1957
2,873,181	Hanford	Feb. 10, 1959