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R. C. BENNER ET AL

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PRODUCTION OF FLEXIBLE ABRASIVE ARTICLES

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Fig. 1.

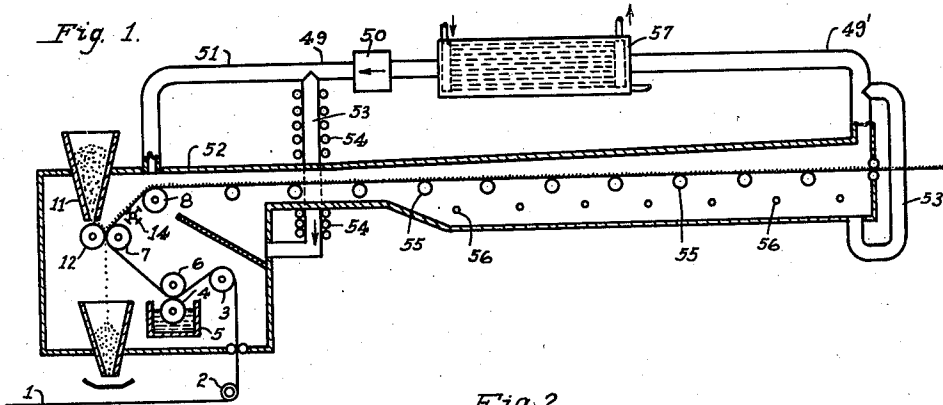


Fig. 2.

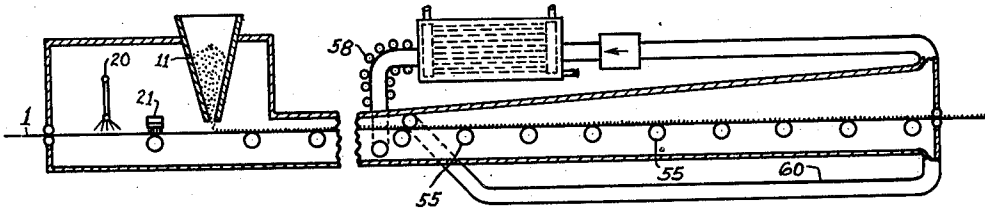


Fig. 3.

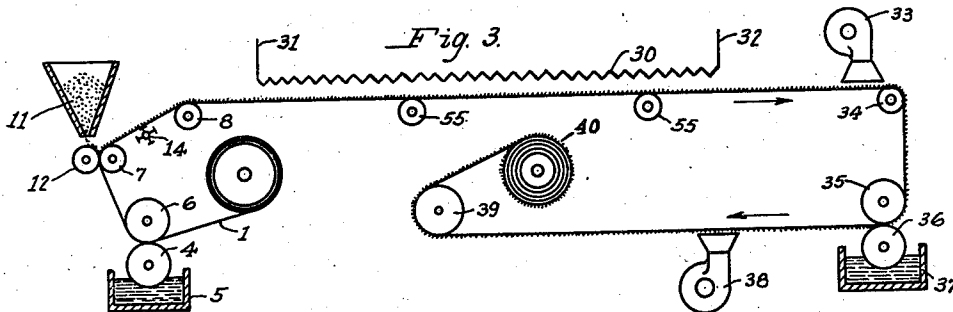
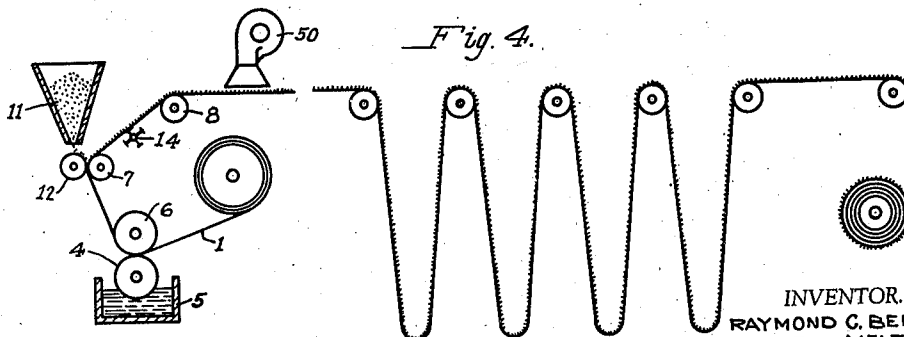


Fig. 4.



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PRODUCTION OF FLEXIBLE ABRASIVE ARTICLES

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Application December 20, 1935, Serial No. 55,341

3 Claims. (Cl. 91-70)

This invention relates to an improved method for manufacturing coated abrasive articles such as abrasive belts or sheets wherein a web of a backing material is coated with abrasive grains attached to the web by an adhesive. While the method is applicable to various types of adhesive or binder, it is particularly well adapted for the manufacture of abrasive coated webs wherein synthetic adhesives, i. e., a liquid resinous material or certain kinds of varnishes or lacquers are employed as the binder.

This application is a continuation in part of our copending application Serial No. 747,119, filed October 6, 1934, now Patent No. 2,053,361.

In manufacturing abrasive coated products it is customary to apply a coating of adhesive to a web, which is commonly spoken of as a "making coat", distribute abrasive grains over the adhesive coating, and then, after a suitable intermediate treatment to set up the making coat, as by drying out the glue which is commonly used as the adhesive, to apply a second coating of adhesive over the abrasive grains which is usually referred to as the "sizing coat". After the sizing coat has been applied the web is further dried to remove the moisture from the adhesive and the finished product can be wound into rolls, cut up into belts or sheets, or otherwise prepared for marketing.

The machines used in carrying out this process are operated at high speeds and the backing material commonly travels through the machines at upwards of 150 feet per minute. This necessitates provision for handling great lengths of coated web and to conserve space it is customary to festoon the product by draping it over suitably spaced rods which are carried along near the ceiling of a tall chamber. The rods are caused to travel at a rate which is synchronized with the speed of the backing material and the festooned product is thus moved through a chamber which is conditioned to set up and mature the adhesive.

The use of certain synthetic adhesives such as varnishes and lacquers in this process has resulted in a tendency of the coating to run or crawl during the drying operation. When a web is to be coated with the coarser grits of abrasive, it is necessary to use a comparatively thick coating of binder and these adhesives flow or crawl very readily when applied as a thick film.

It is an object of the present invention to overcome the difficulties discussed above. Another object of the invention is to provide a method of manufacturing coated webs which

will permit the use of adhesives which have heretofore been considered unsuitable because of the characteristics of the liquid adhesives. Still another object of the invention is to provide a method for manufacturing abrasive coated webs which makes it possible to produce satisfactory articles including coarse abrasive grits. Another object of the invention is to provide a method for manufacturing abrasive coated webs which conserves space and correspondingly reduces the cost of manufacture. Other objects will appear from a consideration of the description of the invention which follows.

We have found that the difficulties outlined above are largely obviated if the coated web is subjected to a treatment whereby the coat is set, either finally or in a preliminary manner, before the web is maintained out of the horizontal for any length of time.

Our invention will be described by reference to the accompanying drawing wherein:

Figure 1 is a diagrammatic side elevation of one form of the invention which is especially adapted for use where expensive solvents are used in the adhesive;

Figure 2 is a diagrammatic side elevation of a second form of the invention which is likewise provided with means for recovering solvent;

Figure 3 represents diagrammatically, in side elevation, a third form of the invention; and

Figure 4 represents still another modification of the invention.

Figures 1 and 2, which are Figures 5 and 7 respectively of the copending patent application Serial No. 747,119 now Patent No. 2,053,361, include means for recovering solvent from the adhesive. Obviously, the apparatus is also adapted for use where it is either unnecessary or economically undesirable to operate the solvent recovery part of the apparatus.

Referring to Figure 1, a web of backing material 1 is moved around suitable idler rolls 2 and 3, between an adhesive roll 4 and a pressure roll 6, around idler rolls 7 and 8 and along and above supporting rolls 55. The adhesive roll 4 is caused to rotate in an adhesive contained in a vat 5 by means not shown on the drawing, and applies adhesive to the backing 1. As the adhesive coated backing passes around idler roll 7 abrasive grains are fed onto the adhesive coated side of the backing from a grain hopper 11 and over grain feed roll 12. Excess grain is removed by the action of the beater 14 which is driven by means not shown on the drawing.

The solvent recovery portion of this form of

apparatus consists of a closed chamber having walls 52, a return pipe 49', connecting pipe 53', condenser 51, pump 50, feed pipes 49, 51 and 53, and heating elements 54 and 56.

5 In the operation of the solvent recovery apparatus, air is circulated into the chamber through pipe 51 which feeds along the top of the coated web, and pipe 53 which feeds to the under side of the coated web. This air is heated by elements 10 54, thereby assisting in the evaporation of solvent from the adhesive. Additional elements 56 may be provided in the chamber around the under side of the web to warm the article from the uncoated toward the coated side and thus facilitate 15 removal of the solvent at such a rate that the formation of a skin on the outer surface of the web is prevented. The air returns from contact with the web through return lines 53' and 49' and is fed into a condenser 51 where it is cooled 20 and the solvent is caused to condense from it. Circulation is maintained by a pump 50.

Referring to Figure 2, adhesive is sprayed onto a web 1 by a suitable spray gun 20 and is smoothed or leveled off by a brush 21. Abrasive grains are 25 fed onto the adhesive coated web from the hopper 11 and the abrasive coated web passes along on supporting rollers 55.

The solvent recovery system in this apparatus is slightly modified from that of Figure 1, the air 30 being first blown into the portion of the chamber underneath the web from which it returns through pipe 60 to the forward portion of the coated side of the web, whence it travels over the coated side of the web and then back to the condenser and the following heating elements 58.

35 In Figure 3 there is shown a modification which is adapted for use with adhesives which are capable of being hardened by heating such as the well-known heat-hardenable phenolic condensation products. In this form of apparatus the abrasive coated web is passed over supporting rolls 55 and beneath an electrical heating element 30 which is connected to a suitable source of electrical energy through leads 31 and 32. 45 After being subjected to heat from the heating element 31, the coated web travels under a blower 33 which cools the adhesive, causing it to harden, and then passes around rolls 34 and 35 and in contact with adhesive roll 36 where a second or 50 sizing coating of adhesive is transferred to the web from vat 37. The sized article is then passed over blower 38, which supplies air to chill the sizing adhesive, around suction drum 39, and is then wound into a roll 40.

55 Figure 4 shows a modification wherein the method of this invention is combined with the conventional method of festooning coated abrasives.

In this modification of the invention, the web 60 is coated with adhesive and abrasive grains as described in connection with Figure 1, is then cooled by air from blower 50 and after suitable other treatment indicated by the break, is festooned and finally wound into a roll as indicated.

65 Our invention is adapted for use with a variety of adhesives such as solutions of resins in volatile solvents, normally liquid resinous products such as the initial condensation product of phenol and formaldehyde, oxidizable adhesives such as varnishes containing drying oils, and permanently fusible resinous products which have been 70 liquefied either by heat alone or by the combination of heat and a solvent.

The type of treatment to be given the coated 75 article is dependent of course on the kind of ad-

hesive which is employed, the general principle being to treat the adhesive in such a manner as to cause it to thicken or harden or otherwise come to a condition such that it does not crawl 5 along the backing material if the coated article is suspended in a vertical position.

In some instances, such as where a melted thermoplastic resin is employed, or where a solution of a binder in a volatile solvent is used, it is necessary only to employ the treatment used 10 on the article while it is maintained in a horizontal position. In other cases where a thermosetting resin which requires considerable time to complete the hardening of the resin is used, the binder may be thickened up sufficiently during 15 the horizontal treatment to prevent it from running or crawling along the backing and the article may be subsequently treated to further set up the binder. As indicated, this may be done on the article which has been festooned in the conventional manner or on a roll of the material. 20

Our invention is adapted for use in manufacturing all kinds of abrasive coated products such as those commonly spoken of as sandpaper where 25 paper or cloth is employed as a backing material; abrasive belts employing either a paper or a cloth backing; and abrasive coated articles which are to be cut up into discs and which employ a combination of backing materials such as cloth coated onto a suitable cellulose product. 30

Similarly, the invention is adapted to a number of other modifications such as the inclusion of inert fillers in the adhesive material, the use of different types of making and sizing adhesives, and modifications of methods of applying the 35 adhesive material and the abrasive grain. For example, the invention is adapted to be used where the adhesive and the abrasive grain are mixed before they are applied to the backing, as well as to the more commonly used method 40 illustrated in the drawing.

We claim:

1. The method of manufacturing flexible abrasive coated webs which comprises applying 45 a layer of liquid resinous adhesive to a rapidly moving web backing material, said adhesive being of such character that it remains fluid until treated by heat to produce setting thereof, applying a layer of abrasive particles over the adhesive surface and maintaining the coated web 50 in a substantially horizontal position until the adhesive assumes a permanent set in such horizontal position, whereby any material longitudinal movement of the coating with respect to the web backing is prevented. 55

2. The method of manufacturing flexible abrasive coated webs which comprises applying a layer of liquid resinous adhesive to a rapidly moving web of backing material, said adhesive being of the type that becomes more fluid at the beginning of subsequent heat treatment which is required to cure the adhesive and produce a set thereof, applying a layer of abrasive particles over the surface of the adhesive and maintaining the coated web in a substantially horizontal position during the subsequent heat treatment thereof until the adhesive assumes a permanent set in such horizontal position, whereby the tendency of the adhesive to move relative to the surface of the web is obviated. 70

3. The method of manufacturing flexible abrasive coated webs which comprises moving the web backing material at a linear speed of approximately 150 feet per minute, applying a layer of liquid resinous adhesive to the moving web, 75

said adhesive being of the type that becomes more fluid at the beginning of subsequent heat treatment which is required to cure the adhesive and produce a set thereof, applying a layer of abrasive particles over the surface of the adhesive and maintaining the coated web in a substantially horizontal position during the subse-

quent heat treatment thereof until the adhesive assumes a permanent set in such horizontal position, whereby the tendency of the adhesive to move relative to the surface of the web is obviated.

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