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PROCESS FOR PRODUCING PRESSURE SENSITIVE RECORD PAPER

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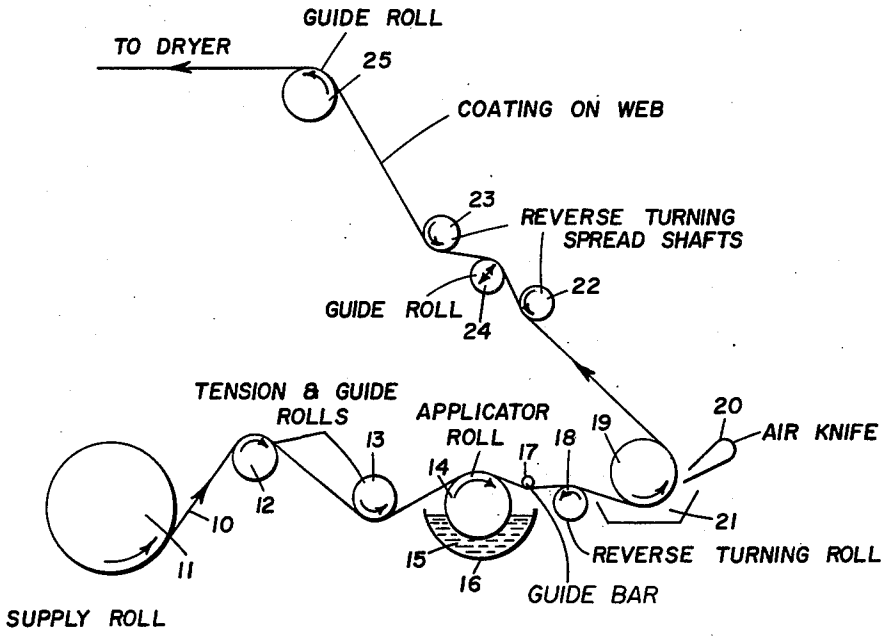

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PROCESS FOR PRODUCING PRESSURE SENSITIVE RECORD PAPER

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This invention relates to methods of applying coatings to paper in the production of pressure sensitive paper such as described in Patent No. 2,711,375, granted to Robert W. Sandberg on June 21, 1955.

As recognized in the said patent, coating compositions which include oil-containing microscopic capsules and which are applied to paper to produce a pressure sensitive manifold sheet, require a sizeable amount of relatively coarse material, such as cellulose fibers, to prohibit smudging of the desired manifold assembly. Suitable cellulose fibers are as much as 350 microns in length and present major problems when applying the capsule-containing composition to a web of paper so as to provide a smooth, uniform coated film and at the same time avoid premature rupture of the oil-containing capsules. Such problems result because the cellulose fibers inherently tend to interconnect into knots or clumps which produce a rough coating having a texture resembling sandpaper. And clumps in the coated film further interfere with the sharp definition of characters on multiple copies reproduced by marking or impact printing, so that, for example, a typed figure "8" may resemble a figure "3."

Many attempts to avoid such knots or clumps of cellulose fibers have been made, but, until the discovery of the process of this invention, all have been unsuccessful in fully overcoming the problem. Because of the pressure sensitive character of the oil-filled capsules, such coating compositions have generally been applied by an air-knife coating method in which an excess of coating material is applied to the web and the excess then removed by a stream or jet of air. And efforts to thereafter smooth the coating and disperse the fiber clumps by means of increased air velocity only resulted in the fiber clumps being blown out of the coating film and into the stream of recycled coating material. The resultant coated paper is deficient in smudge resistance and the presence of the fiber clumps in the recycled coating material causes a progressive increase in their concentration, thus augmenting the problem of obtaining the desired coating.

Moreover, use of coating methods other than an air-knife have likewise been unsuccessful in that they either applied forces sufficient to cause rupture of the capsules, or served to classify the fiber content of the coating and thus remove it from the film applied to the paper. For example, known reverse roll coaters almost completely remove the fiber component from the coating passing a metering gap and apply a substantially fiber-free film to the paper. The fiber concentration in the supply pool of coating material rapidly increases to the point where the normally fluid coating mixture becomes a pasty mass and the process becomes inoperable.

Accordingly, the primary object of the present invention is to provide a novel and improved process for producing a pressure sensitive transfer sheet.

Another object is to provide such a process which includes controlling the distribution of oil-containing microscopic capsule type coating compositions without adversely affecting the transfer characteristics of the sheet.

Another object of the invention is to provide a process for producing pressure sensitive record material which is characterized by having a dry surface of microscopic capsules containing a marking oil interpersed with smudge reducing cellulose fibers.

Still another object of the invention is to provide such a process which produces a pressure sensitive record material, relatively free from fiber clumps, and at relatively high speed operations.

A further object is the provision of a more efficient and economical method for the production of a pressure sensitive record material having improved appearance and smoothness to touch and improved legibility in multiple copies.

Other objects and advantages of the invention will be apparent from the following description.

Generally, the present invention comprises applying a desired amount of fluid coating mixture containing rupturable microscopic capsules and coarse solid material such as cellulose fibers to a web, distributing the coating and separating fiber clumps by means of reverse turning spread shafts operating on the wet film of coating, and subsequently drying the coated paper without further disturbance of the coating. Since such capsules are more readily ruptured while wet than dry, it would not be within the realm of expectation that spread shafts could be used to distribute such a coating without rupturing the microscopic capsules. However, the spread shafts as used in accord with this invention, surprisingly function to untangle and disperse fiber clumps so as to yield a film of greatly enhanced uniformity and smoothness, of improved sensitivity, and of adequate smudge resistance, without significantly rupturing the sensitive capsules.

The accompanying drawing illustrates one embodiment of the process used in practicing this invention, and referring thereto, a web of paper 10 is unwound from supply roll 11 and passes over tension roll 12 and under tension roll 13 to an applicator roll 14. At this point, a coating composition 15 as disclosed in Patent No. 2,711,375 (supra), containing the rupturable capsules and cellulose fiber material, picked up from the supply pan 16 by the applicator roll 14, is applied, in excess of the amount finally desired to the bottom side of the moving web of paper 10. The coated paper 10 then passes under a guide bar 17 and over a reverse turning roll 18 which operates to remove gross surface tension patterns from the film of wet coating. The coated paper then passes around a backing roll 19 and is acted upon by air knife 20 which removes the excess coating which, in turn, collects in pan 21 from whence it can be recycled into the supply pan 16. Due to the peculiar nature of the coating composition, the wet coating at this point is non-uniformly distributed over the surface of the paper and contains numerous clumps or knots of cellulose fiber which are retained upon drying and cause localized inequalities in the concentration of the capsules, thus reducing legibility of the records made with the resultant transfer sheet. In accord with this invention, such maldistribution is substantially eliminated by operation of the reverse turning spread shafts 22, 23 which operate on the wet coating following the air knife. The coated side of the paper web 10 contacts these shafts which turn in a direction opposed to the direction of the travel of the paper web at a surface speed somewhat greater than the speed of the paper web. A guide roll 24 is placed between the two reverse turning spread shafts 22, 23 and the paper passes as indicated between the guide roll 24 and the reverse turning spread shafts 22, 23. The guide roll 24 is adjustable to provide the desired wrap of the coated paper on the reverse turning spread shafts 22, 23. The coated paper then passes from the spread shaft 23 around a guide roll 25 and into a conventional dryer where the wet coated paper is dried without further disturbance of the coating.

Pressure sensitive transfer paper made in accordance with the above process has shown improved distribu-

tion and appearance of coating, improved coating smoothness, improved legibility of printed copies, and improved smudge resistance while retaining the other characteristics necessary for transfer papers of this type.

The applicator roll 14 may be operated in any manner commensurate with good coating practice. The speed and direction of travel of this roll in relation to the moving paper web are not critical.

The spread shafts 22, 23 and roll 18 may be surfaced with any relatively smooth non-wettable material. Polytetrafluoroethylene plastic, brass and hard rubber are among those successfully used. Preferably, reverse turning roll 18 should be placed as close as possible to applicator roll 14. Also, reverse turning spread shafts 23, 22 are preferably placed as close as possible to the air knife 20. The preferred locations insure sufficient fluidity in the coating layer to provide proper smoothing action.

In order to be effective, the reverse turning spread shafts 22, 23 are operated at surface speeds in excess of that of the moving paper web and may be as high as 2.5 times the surface speed of the web, rotating in a direction opposing the travel of that web. Properly operated, the reverse turning spread shafts 22, 23 effect a large measure of pattern improvement without noticeably influencing other important functional properties of the paper. The amount of wrap or surface contact around the spread shafts 22, 23 should be held to a minimum to prevent damage to the rupturable capsules, a contact distance of the order of ½" being suitable, and web tension should be as low as is commensurate with stable operation.

It will be obvious to those skilled in the art that various modifications of this process may be made without departing from the spirit of the invention. For example, the number of reverse turning spread shafts may be increased or decreased, so long as at least one is used to disperse fiber clumps and distribute the wet coating to a uniform film.

Since the methods herein described are for the purpose of illustration only, it is to be understood that the present invention includes all modifications and equivalents which fall within the scope of the invention which is defined by the appended claims.

What is claimed is:

1. A process for producing pressure sensitive record material having a dry surface of rupturable microscopic capsules containing a marking oil interspersed with smudge reducing cellulose fibers, comprising the steps of sequentially applying an excess of an aqueous dispersion of said capsules to a paper web, removing the excess of said aqueous dispersion with an air knife, dispersing resulting clumps of cellulose fibers, distributing the remaining dispersion by means of reverse turning spread shafts operated at surface speeds of the order of twice that of said web to produce a smooth uniform film on said web and thereafter drying said film on the paper web.

2. A pressure sensitive paper produced in accordance with the process of claim 1.

3. A process of coating paper to provide uniform distribution of a coating composition consisting essentially of oil-containing rupturable capsules and cellulose fibers comprising the steps of sequentially applying said coating to a moving web of paper, air-knife removing the excess of said coating, spread-shaft distributing said remaining coating with reverse turning rolls operated at surface speeds in excess of said web to provide a uniform film of coating, and drying the film on the paper web.

4. A process for producing pressure sensitive record material which has a dry surface of microscopic capsules containing a marking oil interspersed with smudge reducing cellulose fibers, which comprises the steps of sequentially applying an excess of an aqueous dispersion of said capsules and fibers to a moving paper web, removing gross surface tension patterns from the film of said aqueous dispersion by a reverse turning roll, removing the excess of said aqueous dispersion by means of an air knife, spreading and distributing said aqueous dispersion by means of a reverse turning spread shaft operating in contact with said aqueous dispersion and at a surface speed in excess of that of the moving paper web whereby clumps of cellulose fibers present in said dispersion are dispersed, and drying the film of said dispersion on the paper web.

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