March 1, 1966 G. G. RUMBERGER 3,237,973

MAGNETICALLY ORIENTABLE WRAPPING MATERIALS AND METHOD OF MAKING AND USING SAME

Filed Oct. 10, 1962

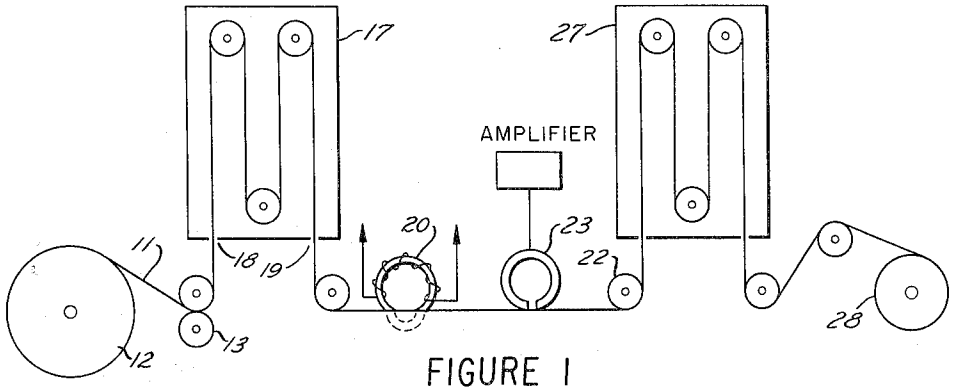

FIGURE 1

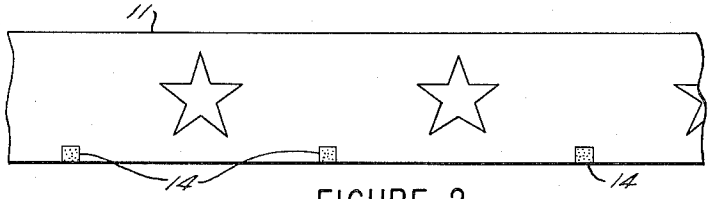

FIGURE 2

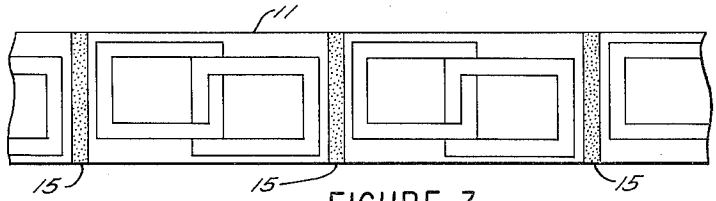

FIGURE 3

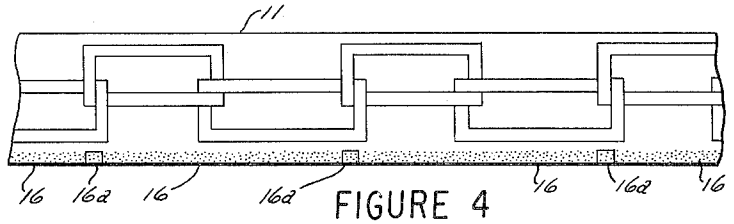

FIGURE 4

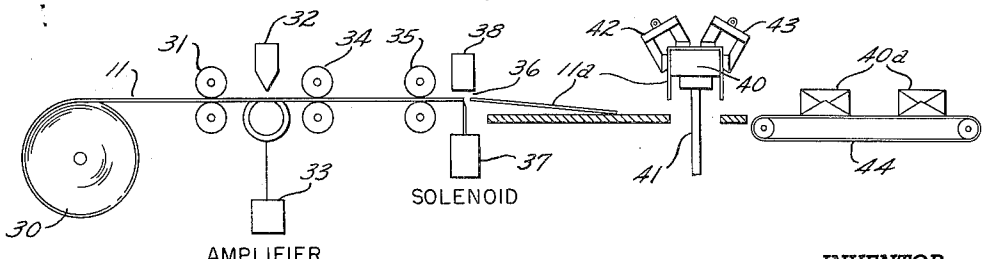

FIGURE 5

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MAGNETICALLY ORIENTABLE WRAPPING MATERIALS AND METHOD OF MAKING AND USING SAME

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The present invention relates to a method and means of controlling operations on a continuous web of sheet material in spaced relation to repeating indicia thereon, a method and means of providing a sheet material adapted to such operations, and a method and means of using said sheet material in such operations.

In a more specific applicaton, the invention relates to orientable sheet materials, and is more particularly concerned with a web of wrapping material having repeating areas of magnetizable particles affixed thereto for indexing thereof during subsequent operations.

In a particular embodiment the invention relates to the application of a magnetizable material in spaced relationship to a repeating design on a continuous web of wrapping material to index said web in relationship to the article to be wrapped.

In the wrapping of articles with printed sheet materials, it is frequently desirable to position the printed matter thereon in a definite relationship to the faces of the article or package. When a continuous web of wrapping material is fed into a packaging machine, it is cut into individual wrapper sheets in predetermined positions relative to the printed matter on the web so that the wrapped articles will have the design in proper register with the faces thereof. In some cases, this has been accomplished by punching or slitting the web of wrapping material in predetermined relationship to the design thereon and feeding it to the cutting device by means of indexing mechanisms. More recently, light sensitive apparatus in the form of light or color sensing devices have been employed to trigger the cutting or wrapping mechanisms. With certain printed designs, "eye markers," e.g., colored blocks, are printed on the web of wrapping material at predetermined intervals to trip a photoelectric cell.

Obviously, it is necessary in either procedure to deface the web of wrapping material either by removing some of the sheet material or by printing unwanted indicia of some sort thereon. In the case of printed "eye markers," it is necessary to have at least a color contrast available and, when it is desired to have over-all printed designs, this becomes a definite disadvantage. In addition to the defacing of the printed material, photoelectric processes have been at a distinct disadvantage when light sensitive materials or processes have been involved, such as in wrapping or processing photographic film or papers, in electrostatic printing processes, or in the wrapping or processing of similar light sensitive materials.

I have discovered that the foregoing disadvantages can be overcome by printing indicia on the sheet material in the form of magnetizable areas which can be sensed by suitable means and translated into mechanical means and action to cut, move, or position a continuous web, such as in a wrapping machine. In another aspect of the invention, a magnetizable material can be applied in a continuous stripe or strip in the moving direction of the web of material, and such portions of the stripe magnetized as are required to perform subsequent operations. In either case, the sheet material need not be defaced, and the magnetic spots, stripes or zones may if desired be completely covered by printed material.

Accordingly, it is an object of the present invention to provide a web of wrapping material with an area of magnetizable particles in register with each occurrence of a printed design thereon.

An additional object of the present invention is to provide a web of wrapping material with a longitudinal stripe of magnetizable particles having a magnetized area thereof in register with each occurrence of a printed design thereon.

Another object of the present invention is to provide a web of wrapping material with areas of magnetic particles for controlling the printing of a repeating design thereon.

A further object of the present invention is to provide a method for controlling the printing of repeating colored designs on a web of wrapping material by applying areas of magnetic particles with the first impression.

Still another object of the present invention is to provide a method for controlling the operations of a wrapping or printing machine with areas of magnetic particles disposed on the web of wrapping material.

A still further object is to provide means of activating repeating operations in spaced relation to repeating indicia on a continuous web of sheet material.

Additional objects and advantages of the present invention will be apparent to one skilled in the art and still other advantages will become apparent hereinafter.

To the accomplishment of the foregoing and related ends, the present invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, being indicative, however, of but several of the ways in which the principles of the invention may be employed.

Briefly, the present invention is concerned with a stripe or areas of magnetizable particles affixed to a web of wrapping material for controlling the repeating spaced operations on the web of material such as printing a design thereon or for controlling the operations of a wrapping machine. Instead of feeding the printed sheet to a packaging machine it may be fed to a punch press, sheeter, glue applicator, or any other operation requiring register with the printed material. Preferably, the magnetizable particles are applied to the web of wrapping material before or during the printing operation. When the particles are applied with the first impression on the web of wrapping material, the magnetic particles may be employed to register subsequent color impressions with the first impression as well as to register the printed design with respect to the faces of the article being wrapped. The magnetic particles are permanently affixed to the web of wrapping material by a suitable binder or vehicle, e.g., a printing ink vehicle, and are preferably magnetized in repeating areas.

If a number of designs are run side by side in a printing operation, to be later slit into individual side-by-side rolls or sheets, the magnetizable material my be suitably disposed both across and in lengthwise relation to the sheet so as to locate magnetizable areas in suitable spaced order on the sheet material.

For a better understanding of the present invention, reference may be had to the accompanying drawings in which all of the parts are numbered, the same numbers are used to refer to the corresponding parts throughout, and wherein:

FIGURE 1 is a flow sheet showing a method embodying the present invention of applying magnetic particles to a web of wrapping material during a printing operation;

FIGURE 2 is a fragmentary top plan view of a web of wrapping material having areas of magnetic particles disposed along one edge thereof in register with a printed repeating design thereon;

FIGURE 3 is a fragmentary top plan view of a web of wrapping material having transverse stripes of magnetic particles in register with a printed repeating design thereon;

FIGURE 4 is a fragmentary top plan view of a web of wrapping material having a continuous stripe of magnetic particles disposed along the entire length of the web of wrapping material, but having only portions of the stripe magnetized and in register with a printed repeating design thereon; and

FIGURE 5 is a flow sheet showing a method embodying the present invention of sensing, cutting, and wrapping an article in a wrapping machine.

Referring now to FIGURE 1 of the drawings, there is illustrated a web of sheet material or wrapping material, generally indicated at **11**, drawn from a supply roll **12** through a cylindrical printing roller **13** of a not shown rotogravure press where ground magnetizable particles dispersed in a solvent solution of a vehicle, e.g., a printing ink, are applied. Inasmuch as the mechanical components for controlling the angular velocity of the supply roll **12** and the cylindrical printing roller **13** are conventional and unimportant to the present invention, a detailed disclosure thereof is not shown in the drawings. The cylindrical printing roller **13** may, for example, be engraved to apply the vehicle containing the magnetic particles to small repeating areas **14**, to transverse repeating areas or stripes **15**, or in a continuous stripe **16** on the web of wrapping material as shown respectively in FIGURES 2, 3, and 4 of the drawings.

After the magnetizable particles are applied to either one or both sides of the web of wrapping material **11** by the cylindrical printing roller **13**, the web is fed into a conventional oven, schematically indicated at **17**, through an opening **18**, to dry the solvent solution of the vehicle containing the magnetic particles. The dried web of wrapping material carrying the magnetic particles is discharged through an opening **19** of the oven **17** and fed through a conventional magnetizing device, schematically indicated at **20**, to magnetize the areas **14**, the transverse stripes **15**, or portions **16***a* of the continuous stripe **16**. The magnetizable particles may be magnetized by a direct current source or by signals for storage of information, e.g., audio signals or high or low frequency pulses, or by modulating a continuous high frequency bias current.

The magnetic particles do not have to be magnetized in spaced apart areas, unless applied to the web **11** in a continuous stripe, since a variety of equipment is available for detecting magnetic particles. In some forms of the invention, however, the magnetizable particles are magnetized at proper intervals, especially if the ink or other vehicle contains any magnetizable pigments or the like which may be picked up by the equipment and cause improper register.

As the web of wrapping material carrying the magnetized areas of magnetic particles is drawn into a cylindrical printing roller **22** of another not shown rotogravure press, a conventional sensing means, schematically indicated at **23**, is employed to control and to register each occurrence of the first impression of a repeating design with one of the magnetized areas. The sensing means may be suitably advanced or retracted to obtain register. The web of wrapping material containing the first impression of the repeating design is fed into another conventional oven, schematically indicated at **27**, for drying the solvent solution thereon. The sequence is continued until the requisite number of impressions are applied to the web of wrapping material. All of the impressions are in exact correspondence with each other and each occurrence of the printed design is in register with the associated area of the magnetic particles. As the web of sheet material **11** is discharged from the last oven, it is wound on a supply roll **28**. The thickness of the coating containing the magnetic particles does not effect the winding of the web on the roll **28**. In general, the thickness depends upon the thickness of the web, and preferably the thickness of the coating is in the range of .00025 to .001 inch. The staggered nature on rollup also prevents the formation of a hard edge.

For a repeating design of a given length, the length of the magnetized zone should preferably not exceed $\frac{1}{15}$ of the length of the design, is preferably much less (e.g., $\frac{1}{30}$ or less) and may for example even be as short as .001 inch in the moving or longitudinal or "web" direction of the web. Within these ratios of length, there is no mixing of signals when in high speed operation. The dimension of each magnetizable area longitudinally of the web is thus preferably no greater than $\frac{1}{15}$ the dimension between centers of adjacent magnetizable areas. These ratios and lengths may be readily adjusted either by regulation at the time of application of the magnetizable material, or by regulation of the duration of magnetization or erasure.

If only a single color or a single impression repeating design is applied to a web of wrapping material, the magnetic particles may, of course, be simultaneously applied with the single impression, and a signal need not be applied to the magnetic material until the web of wrapping material is fed into a conventional wrapping machine employing suitable sensing means for enfolding articles in cut sheets of wrapping material so that the printed design is in register with one of the faces of the article.

As shown in FIGURE 5 of the drawings, the web of wrapping material **11** is drawn from a supply roll **30**, thence through a pair of tension rollers **31**, past a magnetic detecting head **32** connected to a converter-amplifier **33**, and through a pair of guide rollers **34**. The web is then fed through draw rollers **35** and through a cutting device **36** activated by the amplifier **33**. The cutting device **36** comprises a knife driven by the armature of a solenoid **37** against an anvil **38**. The sheets **11***a* thus formed are fed into a forming zone where article **40** is elevated by a movable means **41** under the sheet, folds are completed by folders **42** and **43**, and the finished packaged article **40***a* is delivered to take-off belt **44**. Magnetic head **32** may be advanced or retracted by suitable adjusting means to obtain the desired registration.

Although the application of magnetizable zones provides a convenient means of registering subsequent color impressions, other and more conventional means can be used to place the magnetizable zones on the sheet material in register with the repeating indicia. In some applications the magnetizable zones may be applied as a last or intermediate operation, as long as their spaced relation with the repeating indicia is maintained.

The magnetic particles may comprise any of the available ferromagnetic materials, such as iron oxide, finely divided iron or iron alloys, cobalt and derivatives thereof, cobalt-nickel-aluminum alloys, mixed oxides of iron and copper, and cobalt and iron oxides. In the preferred form of the invention, iron oxide particles are employed as they may be obtained in fine particle size and are readily milled.

To keep the magnetic particles in place on a web of wrapping material without offset when the web is rewound in a roll, it is necessary to employ a binder to permanently affix the magnetic particles to the web of wrapping material. The vehicles commonly used for printing inks are satisfactory and may comprise compositions of oleo-resins, alkyds, nitrocellulose, vinyls, cellulose esters, shellac, or any other composition which will permanently bind the magnetic particles to the web of wrapping material. The compositions may contain plasticizers, solvents, or even pigments, as long as the characteristics of the magnetic particles are not effected or obstructed. The binder should not only exhibit a good

adhesive bond between the web of wrapping material and the magnetic particles, but also to subsequent impressions or coatings applied thereto.

Since the application of my invention does not depend on light transmission, it may be conducted with transparent, colored or opaque materials, such as paper, cellophane, plastic films, aluminum or lead foil, fabrics, veneers, leather and the like, as long as the continuous web is not in itself magnetizable.

As heretofore stated, the magnetizable material may be applied to the entire sheet, in bands, or in spots or marks. When applied in predetermined bands transversely of the sheet, or in spots, the material may be magnetized before or during application. When applied continuously over the entire sheet or in bands running continuously the length of the sheet, the magnetizable material may be applied in the non-magnetized form, and a signal fed to the sheet only at desired control points. Conversely, if a continuous premagnetized material is applied to the sheet, it may be erased except at desired points by application of suitable means and procedure as well known in the art. In some cases it may be desirable to energize the magnetic material at the point of final use, such as on a wrapping machine, in order to obtain the maximum signal strength to energize sensing devices on the same machine.

The printed sheet materials may be further processed after application of the magnetic material. They may be waxed, coated with hot melts, lacquers, varnishes, organisols, or even laminated to other sheet materials.

It will be apparent to one skilled in the art that the present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof. It is, therefore, desired and intended that the embodiments herein specifically set forth be considered in all respects as illustrative and not restrictive, reference being made to the appended claims rather than the foregoing description and drawings to indicate the scope of the invention, which is to be understood as limited only by the scope of the appended claims.

I claim,

1. A web of material comprising a repeating design, and an area of magnetizable particles in register with an ocurrence of the design, whereby upon magnetization of said magnetizable particles an operation of a machine can be synchronized by means of a magnetic sensing device with the area of magnetized particles to cut, punch, or index the web of material in register with said occurrence of the design, the magnetizable particles forming a part of the design on the web of sheet material.

2. A web of material comprising a repeating design, and an area of magnetizable particles in register with an occurrence of the design, whereby upon magnetization of said magnetizable particles an operation of a machine can be synchronized by means of a magnetic sensing device with an area of magnetized particles to cut, punch, or index the web of material in register with said occurrence of the design, the magnetizable particles being covered by the design on the web of sheet material.

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