

Feb. 19, 1963

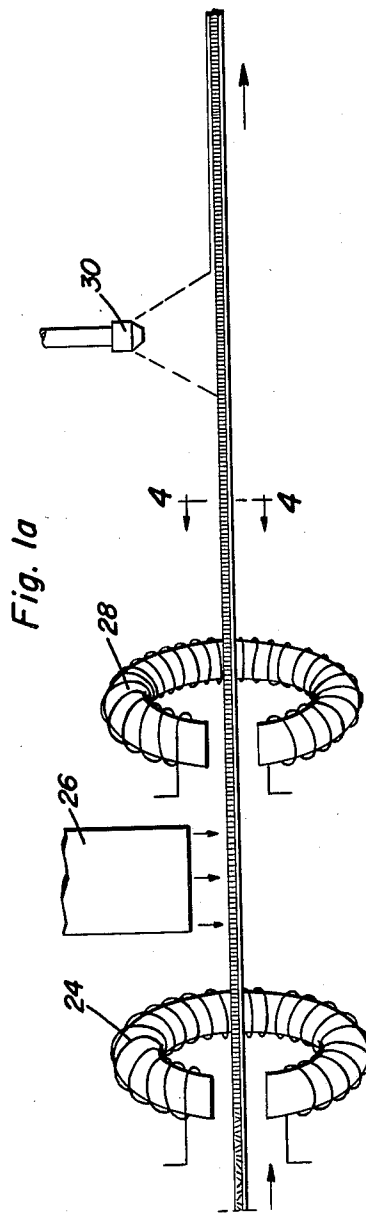
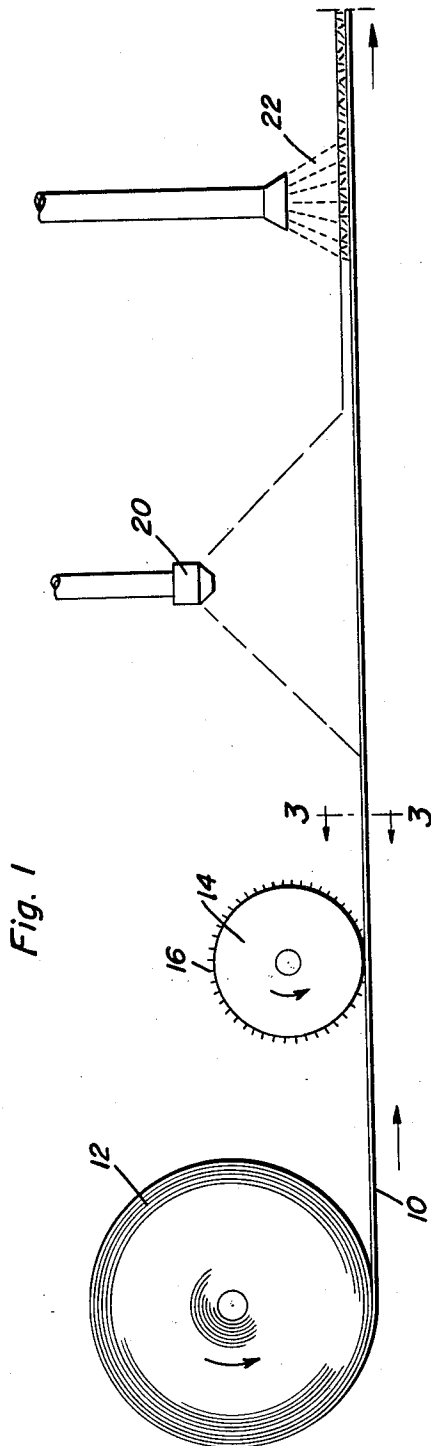
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3,078,183

ADHESIVE TAPE WITH PERMANENT MAGNETS THEREIN

Filed April 7, 1959

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 2

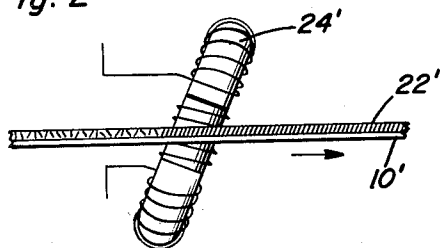


Fig. 3

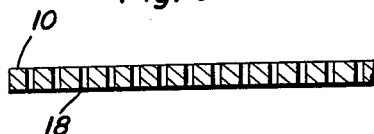


Fig. 4

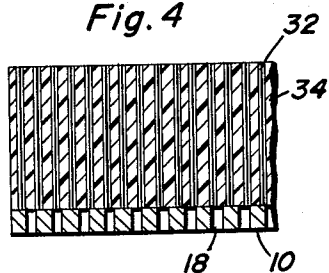


Fig. 5

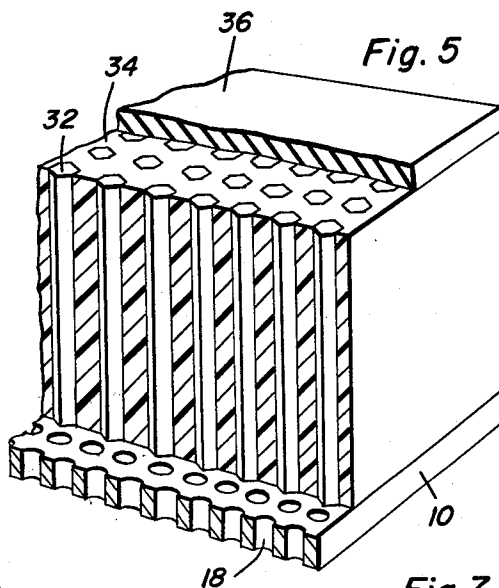


Fig. 6

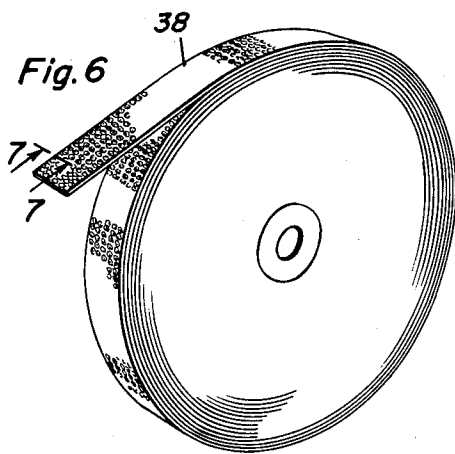


Fig. 7

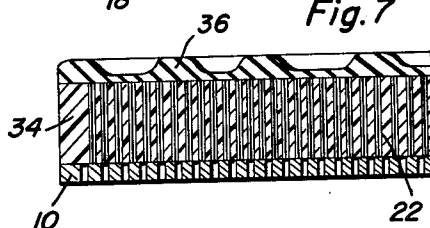
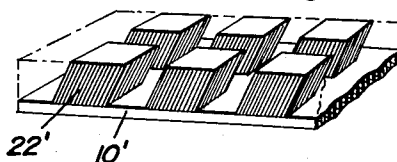


Fig. 8



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ADHESIVE TAPE WITH PERMANENT MAGNETS THEREIN

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3 Claims. (Cl. 117-122)

The present invention relates to a flexible carrier containing impregnated directional aligned permanent magnet particles coated with pressure sensitive adhesive or flexible impregnated directional aligned permanent magnet particles sealed with pressure sensitive adhesive and is a continuation-in-part of co-pending application Serial No. 563,628, filed February 6, 1956, and now abandoned.

It is well known that all pressure sensitive adhesive materials now available have one major drawback which involves a drying out process which starts from the outside edges and works itself toward the center thus rendering the adhesive material ineffective. The addition of magnet attraction will cause the edges and the entire area of the tape to be held more securely on any ferrous metal. Further, the addition of pressure sensitive adhesive to the permanent magnet particles adds a friction factor which is not found in any permanent magnet thereby giving a better magnet at substantially no increase in cost. It is well known that a magnet can be easily pushed sideways even though it may be quite powerful. Thus, by the addition of the pressure sensitive adhesive, this side movement may be totally eliminated. Therefore, it will be seen that the present invention eliminates the major drawbacks which are found in both magnetic attraction and pressure sensitive adhesion attraction.

The permanent magnet particles are aligned through the thickness of the carrier and may be perpendicular to the base of the carrier or aligned at an angle to the carrier. Thus, each thickness of tape will have a north polarity on the top side of the tape and a south pole polarity on the bottom side of the tape thus allowing the tape to be rolled up without any repelling forces.

Another object of the present invention is to provide a tape in accordance with the preceding objects which incorporate the use of strategically placed thin-line pressure sensitive adhesive which line would be used on the two edges of the tape and would also be used in providing a booster pressure sensitive action creating a stronger tape, strategically placed at the tapes weak points creating a better tape a minimum of cost.

The present invention and particularly the pressure sensitive adhesive sealer may be applied to both sides of the carrier thus producing a magnetic pressure sensitive surface for lamination of ferrous metals and the invention may be used in tape form and in sheet form.

Still other objects of the present invention resides in the simplicity of construction of the tape itself and many utilities and advantages of the tape and the combination of two known manners of adhesion which combination results in a product far superior to either taken alone.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURES 1 and 1A illustrate schematically the procedural steps in making the adhesive tape with permanent magnet particles therein;

FIGURE 2 is a partial elevation illustrating the alignment coil tilted for aligning the permanent magnet particles in inclined parallel relation;

FIGURE 3 is a transverse, sectional view taken substantially upon a plane passing along section line 3-3

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of FIGURE 1 illustrating the construction of the perforated carrier tape;

FIGURE 4 is a transverse, sectional view taken substantially upon a plane passing along section line 4-4 of FIGURE 1A illustrating the construction of the tape and permanent magnet particles after alignment and energization;

FIGURE 5 is a perspective sectional view illustrating the structural orientation of the tape including the carrier, the magnet particles and the pressure sensitive adhesive;

FIGURE 6 is a perspective view of a roll of tape incorporating an additional circular booster area of pressure sensitive adhesive having an adhesive suction cup action;

FIGURE 7 is a transverse, sectional view taken substantially upon a plane passing along section line 7-7 of FIGURE 6, on an enlarged scale;

FIGURE 8 is a perspective view illustrating permanent magnet particles arranged in inclined relation to the perpendicular in relation to the flexible carrier.

Referring specifically to the drawings, the flexible carrier 10 is provided from a supply roll 12 of any suitable construction and which may be supported in any manner desired. The flexible carrier 10 may be cloth, paper, plastic or rubber carrier or a cloth, paper, plastic or rubber flexible carrier which is to be or has been pierced by a roller 14 having a plurality of pins 16 thereon for producing cavities, holes or perforations 18 of 200 mesh size. Onto this carrier 10 is sprayed, by a suitable spray device 20, a thin coating from four to six microns in thickness of a pliable spray of lacquer or a plastic spray containing acrylic, vinyl or poly vinyl resins.

The permanent magnet particles 22 are sprayed onto the wet plastic spray covering the carrier 10 and the particles 22 completely cover the spray coating. The carrier 14 with the spray coating and the permanent particles are then passed through the alignment coil 24 which aligns the permanent magnet particles 22 perpendicular to the base or longitudinal axis of the carrier 10. The spray coating is fast setting and a dryer 26 is optionally provided for completely drying the spray coating thus setting the permanent magnet particles in aligned relation. After the permanent magnet particles are dried and stable on the carrier, the carrier 10 is passed through the energizing coil 28 which saturates the permanent magnet carrier with the maximum units of oersted that the permanent magnet particles can absorb and creating north polarity and south polarity. Subsequently, a layer of pressure sensitive adhesive approximately 1 mil in thickness is applied onto the permanent magnet carrier by a spray device 30 thus sealing the permanent magnet particles overcoming the corrosion problems and the pressure sensitive adhesive also adds a friction correlation to the permanent magnet carrier.

Referring to FIGURE 5, the carrier is designated by numeral 10 with the perforations or holes designated by numeral 18. The permanent magnet particles are designated by numeral 32 and are hexagonal in shape. The binding coating applied by the spray device 20 is designated by numeral 34 while the pressure sensitive adhesive coating is designated by numeral 36.

The permanent magnet particles used in this invention would be selected from the group including sintered bismonal (15,000 to 20,000 oersteds), sintered simonal (20,000 to 25,000 oersteds) or any other sintered or magnet material capable of producing flux lines. The physical characteristics of these permanent magnet materials are elongated or hexagonal in particle structural shape capable of producing a high cohesive force needed for permanent magnetism. The particle sizes of the permanent magnet materials will arrange in micron size.

Micron size material adapts itself to high coercive force saturation with the particles acting as magnets. Different applications of the device will require various micron sizes but regardless of the size, the material will always be a permanent magnet material.

The micron size magnet particles are air blown into a heated air chamber and also a fine heated spray of lacquer or plastic is injected into the heated air chamber, causing a coating of lacquer or plastic on each magnet particle. Also, the use of ultrasonic sound may be used to vibrate the magnet particles through the ultra fine heated lacquer spray or suitable plastic coating material. This coating of lacquer or plastic material on each magnet particle creates an isolated magnet particle with each isolated particle containing its own air gap which is highly desirous to produce strong flux lines. Thus, the magnet particles which are isolated and which will be separated from each other by their own plastic coatings provide an ideal magnet situation and this construction facilitates the method in that the binding spray coating need only serve to retain the isolated permanent magnet particles on the carrier.

The alignment coil 24 is constructed to provide a magnetic field of 400 oersteds or the necessary amount of oersteds needed for alignment of various permanent magnets. The air gap will be kept at a minimum for creating a sufficient magnetic field and letting the carrier pass through. Then after the permanent magnet particles are stable, the energizing coil provides 30,000 to 40,000 oersteds thus saturating the permanent magnet carrier with the maximum number or units of oersteds that the permanent magnet particle can absorb.

Due to the special alignment of the permanent magnet particles, the top side of the permanent magnet carrier has a north polarity and a bottom side has a south polarity thus, when the device is wound in to a roll, the adjacent surfaces will have north and south polarities respectively thus attracting each other rather than repelling each other thus allowing the permanent magnet carrier to be rolled in a roll.

The pressure sensitive adhesive is of the rubber base adhesive category and is approximately 1 mil in thickness. By using thermo-setting adhesive with sulphur added in place of rubber base pressure sensitive adhesive, the permanent magnet carrier of the present invention may be used in the electrical field as a tape wound magnet core.

As illustrated in FIGURE 9 and as will be caused by the construction of FIGURE 2, the permanent magnet particles are aligned at an angle to the base of the permanent magnet carrier with the north polarity at the top side of the carrier and the south polarity at the bottom side. More particles can be placed side by side vertically thus creating a heavy concentration of permanent magnet particles and particles placed end to end horizontally or in any other arrangement.

The present invention can also be employed with a thin layer such as a layer of one-half mil thickness of non-magnetic material such as lead, aluminum, spun glass and other similar materials which is fused to the base of the permanent magnet particles.

A thin-line booster pressure sensitive adhesive 33 may be applied to the tape of FIGURE 5 which will increase the adhesion at the weakest point such as along each side edge of the tape. Also, there may be provided a plurality of circles of booster pressure sensitive adhesive 36 having adhesive suction cup action. Since the permanent magnet carrier is of a nonporous nature and the circle of pressure sensitive adhesive is disposed over a layer of pressure sensitive adhesive, the trapped air in the circles will act as suction cups.

With modern methods of extrusion or molding ceramic, ferrous or organic permanent magnet particles may be mixed with plastic or rubber material ingredients to produce a flexible magnet carrier. These permanent magnet

particles will be aligned in any desired direction while the plastic, or molded rubber carrier is in a pliable state. Upon cooling, the plastic, rubber or molded carrier would be energized with magnetism creating a flexible permanent magnet carrier. This method would still use the alignment and magnet saturation of FIG. 1. The flexible permanent magnet carrier would then be sealed with pressure sensitive adhesive for more attraction or a sealer for gasket use.

The carrier 10 also may be an imperforate flexible tape since it can be a plain carrier. The thin line pressure sensitive booster adhesive is of stronger adhesion than the adhesion factor of pressure sensitive sealer and includes the possible use of 70 gauge nylon thread as a booster adhesion.

Further the invention is not limited to only isolated permanent magnet particles. All elongated or hexagonal permanent magnet particles may be used. Any flux producing permanent magnet material may be incorporated into this invention, isolated or not isolated.

The thin line booster adhesive may readily be one strand of thread nylon, cotton or such matter of 70 gauge nylon thread of ten pounds tensile strength (for example purposes) saturated with pressure sensitive adhesive of twice the pressure sensitive adhesion as the sealing adhesive thereby giving also a strategic placed thin line booster adhesion and at the same time strengthening the edge of all tapes at a very low cost applied to the edge of the pressure sensitive base.

At the present time all tape companies have strengthened their backing material. In my invention I have strengthened the pressure sensitive adhesive base.

This additional pressure sensitive thread when placed on the edge of tape will prevent bleeding of paint when used on masking tapes and also increasing the tensile strength of masking tape.

The addition of this pressure sensitive thread added to the edge of the pressure sensitive adhesive will increase the strength of the pressure sensitive edge by at least 10 pounds of tensile strength.

One immediate advantage of this new tape is to minimize the de-magnetizing effect of the magnetic elements on one turn of the tape by adjacent layers directly above and below it. Another advantage is a net increase in the magnetic intensity of the tape on the whole.

By computation it has been shown that the magnetic intensity of the new tape is increased as much as 60%.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A new permanently magnetized sheet-like article of manufacture, comprising a thin flexible elongate strip, a coating of permanent-magnet particles on one side of the strip, the polar axes of said particles being substantially normal to the plane of the strip, binding means on the said side of the strip, surrounding the permanent magnet particles and binding the same together against appreciable movement, said binding means holding the normal orientation of the magnet particles, and a pressure-sensitive adhesive disposed over the coating of permanent magnet particles.

2. An article as in claim 1, wherein the permanent-magnet particles are spaced from each other, said spacing being maintained by the binding means.

3. An article as in claim 1, wherein the strip is coiled into a roll whereby the unlike poles of adjoining layers of the strip are juxtaposed, tending to keep the strip from unrolling.

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