

[54] STEEL OBJECT HAVING HIDDEN  
MAGNETICALLY READABLE  
IDENTIFICATION AND THE METHOD FOR  
APPLYING THE IDENTIFICATION

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Manufacturing Company, St. Paul,  
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[21] Appl. No.: 165,892

[52] U.S. Cl..... 324/34 R, 117/235, 235/61.11 D,  
235/61.12 M, 340/146.3 K, 340/149 A,  
346/74 MP

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[58] Field of Search..... 324/34 R, 41;  
117/235, 237; 340/149 A, 146.3 K, 146.3 C;  
346/74 M, 74 MP; 235/61.12 M, 61.11 D

[57] ABSTRACT

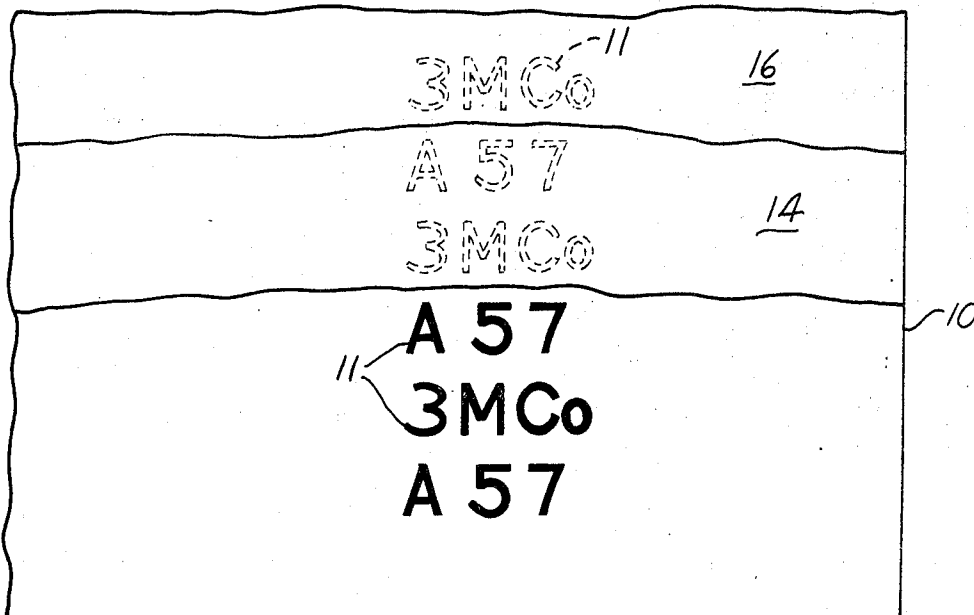
A vehicle, appliance or tool having a multiplicity of  
magnetizable identifying indicia hidden by an opaque,  
protective layer such as paint. The indicia may be read  
by the use of a magnetic reader.

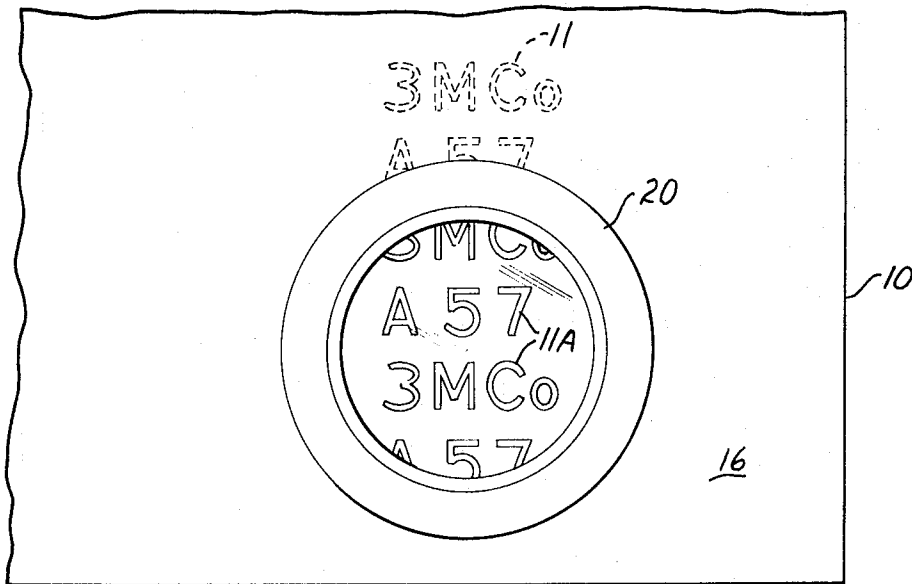
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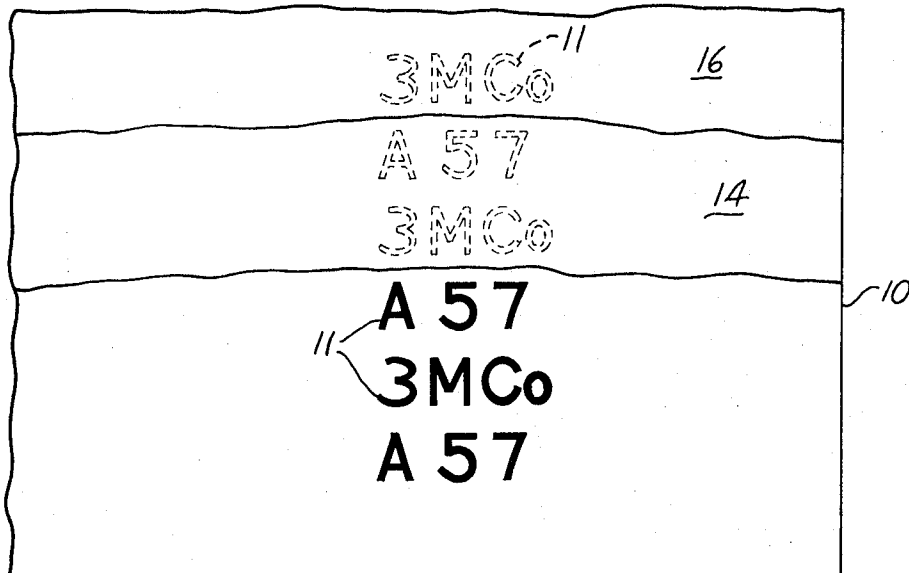
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7 Claims, 2 Drawing Figures





**FIG. 2**



**FIG. 1**

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# STEEL OBJECT HAVING HIDDEN MAGNETICALLY READABLE IDENTIFICATION AND THE METHOD FOR APPLYING THE IDENTIFICATION

## FIELD OF THE INVENTION

This invention relates to providing identification for a commercial article, especially a vehicle, appliance or tool.

## DESCRIPTION OF THE PRIOR ART

Articles of commerce are commonly identified by serial numbers, conventionally by attaching a printed plate or imprinting the article. When an article is stolen, its serial number often is altered or replaced with a different number to prevent subsequent identification.

On some automobiles the serial number is attached at several locations not easily located or accessible in an effort to frustrate attempts to alter or replace them. These inaccessible serial numbers do not provide a means for easily identifying an automobile on the street or at traffic checks.

## SUMMARY OF THE INVENTION

Commercial articles are provided with identification which cannot reasonably be altered or removed but which can be conveniently inspected. This novel identification is provided by a multiplicity of magnetizable identifying indicia which are hidden by an opaque, permanent protective layer of the article. The identifying indicia may include alphanumeric or other characters formed of magnetizable particles dispersed in a non-magnetizable binder. As the indicia are not visible beneath the protective layer, they may have easily accessible locations such as on the exterior of several body parts of an automobile without visually revealing their location or detracting from the appearance.

According to the present invention there is provided a vehicle, appliance or tool having on at least one part identification which cannot reasonably be altered or removed. The identification is provided by a multiplicity of identifying indicia having line widths of at least 0.005 inch and comprising magnetizable particles dispersed in a nonmagnetizable binder. The particles have a coercivity at least twice that of said part and have a remanent magnetism exceeding 5 emu per gram. A thin, opaque permanent protective layer is applied over the part and indicia providing a uniform surface hiding the identifying indicia. The magnetizable particles are present in sufficient amount to provide, when magnetized, a remanent magnetic moment exceeding 50 gauss at the surface of the protective layer.

Although not visible, the magnetized indicia may be read by placing a magnetic reader over the indicia. A convenient magnetic reader for this purpose is described in U.S. Pat. No. 3,013,206. This magnetic reader includes a visible suspension in a transparent liquid vehicle of flat, weakly ferromagnetic crystals which will visibly orient in the liquid in accordance with an adjacent magnetic field. When the magnetic reader is placed on the protective layer over the identifying indicia, the ferromagnetic crystals in the reader will visibly outline the magnetic indicia by aligning in response to the field gradients about the periphery of the indicia. Alternatively, the indicia could be revealed by distributing ferromagnetic particles (e.g. carbonyl iron or mag-

netite, either as a powder or in liquid suspension) on the protective coating above the indicia and allowing these particles to migrate to outline the magnetized indicia.

A multiplicity of the magnetizable identifying indicia may be applied to an article, thus requiring extensive removal of the protective layer on an article to remove all of the indicia. The requirement to remove the paint for removal of the indicia and to apply different indicia and new paint for falsifying serial number identification thereon will be a strong deterrent to removing or changing identifying indicia applied to automobiles according to the present invention.

A variety of magnetizable particles are useful, such as gamma  $\text{Fe}_2\text{O}_3$ , chromium dioxide, barium ferrite or powdered magnetizable metal. The magnetizable particles should have a coercivity of at least twice the coercivity of the part of the article to which the indicia are applied so that the particles may be selectively magnetized, either for initial magnetization of the indicia, or to afford remagnetization if the indicia should become demagnetized. Selective magnetization of the indicia may be accomplished by passing a permanent magnet adjacent the indicia, and then (if the part is magnetizable) demagnetizing the part with an A.C. magnetic field adjusted in intensity to exceed the coercivity of the part but to be less than the coercivity of the magnetized particles in the indicia.

Magnetizable particles in indicia applied to a part of structural sheet steel (such as a body part of an automobile having typically a coercivity of 40 oersteds) preferably are selected to have a coercivity of more than seven times the coercivity of the body part. This greater difference in coercivities affords selective demagnetization of the part with less accurately regulated sources of A.C. magnetic fields.

The identifying indicia when magnetized must provide a remanent magnetic moment at the surface of a protective layer which will afford a clear outline of the magnetized indicia. A remanent magnetic moment at the surface of the protective layer of 50 gauss has been found acceptable to provide a clear outline of the indicia in the magnetic reader previously described.

The remanent magnetism of the magnetizable particles should be above 5 emu per gram and preferably above 50 emu per gram so that the volume of the dispersion of magnetizable particles and binder or marking material used to form the indicia may be minimized while still producing the required remanent magnetic moment for activating a magnetic reader. The remanent magnetic moment of a given volume of marking material is directly dependent on the remanent magnetism of the magnetizable particles and the percentage of the magnetizable particles dispersed in the binder. The percentage of the magnetizable particles, however, should not be increased beyond the point at which the binder can contact essentially the entire surface area of the magnetizable particles to bond the marking material into an integral mass which will adhere to a part to which it is applied and will retain a desired shape of the indicia until the protective coating has been affixed. This maximum percentage by volume of the magnetizable particles is generally about 85 percent.

Each line of each character in the identifying indicia must be formed of a volume of marking material which will produce a sufficient remanent magnetic moment when magnetized to provide the required remanent

magnetic moment at the surface of the protective layer to clearly outline the indicia in the magnetic reader. The maximum thickness of each line of a character (measured normal to the surface on which the character is applied) and the width of each line may be limited, however. The thickness of the line should not cause a visible impression of the identifying indicia on the surface of a protective layer. Line thickness up to about one-fourth the thickness of the protective layer is generally acceptable. Line widths above 0.005 inch afford clear definition in the magnetic reader. The maximum width of the line is limited only by practical considerations, e.g., to permit inspection by a reasonably compact magnetic reader. Line widths below 0.1 inch are considered practical.

Thus, the remanent magnetism of the magnetizable particles, the percentage of magnetizable particles in the marking material, and cross sectional dimensions of the lines should be selected from within the indicated ranges to produce the required magnetic moment at the surface of the protective layer.

The identifying indicia may be applied with a rubber stamp or by spraying the magnetizable indicia onto the part with the use of a stencil. Other means of applying the indicia include forming indicia on a releasable liner as by stenciling or vapor coating and including, as at least a portion of the binder, a thin adhesive coating over the surface of the indicia opposite the liner. The indicia can then be transferred from the liner to a part by pressure or heat.

The protective layer which is applied to the part over the indicia should be opaque and should afford permanent protection for the part and the indicia. The protective layer may be one or several layers of paint, or may comprise an overlay of vinyl or the like. The protective layer should have sufficient thickness to provide a uniform exterior surface which may be smooth, rippled or crinkled, as long as it does not visibly reveal the indicia. If the protective layer is applied in liquid form, the binder of the indicia should be sufficiently resistant to the protective layer that the indicia are not substantially deformed on the part.

The identifying indicia may be magnetized after application to the part in the aforementioned manner, or prior to application of the marking material to the part if the particulate material has been bonded together in a fixed relationship as by forming the indicia on a releasable liner. Magnetization of the indicia in a direction perpendicular to the surface on which it is applied is preferred to provide uniformity of indicia outline in the magnetic reader. Magnetization across the indicia tends to stress character lines running at right angles to the direction of magnetization. Also, when the indicia is applied to a magnetically conductive part and the indicia is magnetized in a direction parallel with the surface of the part, the part will tend to short circuit the field lines emanating from the indicia, thereby reducing the remanent magnetic moment at the surface of a protective layer. When the indicia is magnetized in a direction perpendicular to the surface, however, the part will serve as a keeper for the magnetized indicia, and the remanent magnetic moment at the surface of the protective layer will not be reduced.

The present invention is useful for many types of vehicles such as automobiles, trucks, motorcycles, bicycles, snowmobiles, trailers, marine craft and railroad cars; many types of appliances including washers, dry-

ers, refrigerators, television sets, and vending machines; and many types of tools including generators, saws, drills, and thread cutters.

## BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a fragmentary view illustrating a part of an article according to the present invention having the protective layer broken away in part to reveal magnetizable indicia applied thereto; and

FIG. 2 is a fragmentary view of the part in FIG. 1 which illustrates the use of a magnetic reader to read the indicia.

## DESCRIPTION OF THE INVENTION

FIG. 1 shows a fragmentary part 10 of an article according to the present invention, which article may be a vehicle, appliance or tool having a multiplicity of magnetizable identifying indicia 11 in the form of letters and numbers applied thereto. The fragmentary part 10 may be of metal or fiberglass. A protective layer, illustrated as a prime coat 14 and a finish coat 16 of paint, in part broken away, has been applied over the part 10 and the indicia 11.

The magnetizable identifying indicia 11 are formed of a thin layer of marking material applied to the part 10 as by the use of a rubber stamp. The marking material comprises magnetizable particles dispersed in a nonmagnetizable binder as previously described.

FIG. 2 illustrates the same part 10 as FIG. 1. A magnetic reader 20 according to U.S. Pat. No. 3,013,206 has been placed on the finish coat 16 to inspect the magnetized indicia 11. The indicia 11 are shown by outlines 11A by the ferromagnetic crystal in the magnetic reader 20.

## EXAMPLE I

A marking material was prepared by dispersing 100 grams of  $\text{Fe}_2\text{O}_3$  having a coercivity of 300 oersteds and a remanent magnetism of 70 emu per gram in a binder comprising 2 grams of potassium tripolyphosphate, 2 grams of lecithin, one-half gram acetylenic glycol wetting agent dissolved in 2-ethyl-hexyl alcohol (Surfynol 104A), 35 grams acrylic thickening agent (Rhoplex ASE-95), 115 grams of a solution comprising 3 parts concentrated ammonium hydroxide in 200 parts water, and 165 grams alkaline, water-soluble acrylic ester (Carboset 525).

The marking material was applied with a rubber stamp to a sheet of 18-gauge steel having a coercivity of 40 oersteds. The characters on the stamp were sized to produce magnetizable indicia 11 in the form of letters and numbers, one-fourth inch in height, having line widths of one-sixteenth inch. The thickness of the characters was measured to be 0.0005 inch. A thin, opaque, permanent, protective coating was then applied over the surface of the steel sheet and magnetic indicia 11 by spraying on a 0.001 inch primer coat 14 of paint comprising titanium dioxide pigment in a cellulose nitrate and ketone vehicle (Spar-Var), and a 0.003 inch finish coat 16 of an acrylic automobile lacquer (DuPont Lucite Acrylic Lacquer). The indicia did not form a visible impression on the surface of the protective coating. The indicia were selectively magnetized after application, in the direction vertical to the surface, and the remanent magnetic moment at the surface of the protective coating was measured to be 400 gauss.

When a magnetic reader of the type described in U.S. Pat. No. 3,013,206 was positioned adjacent the surface of the protective coating over the indicia, the outlines of the letters and numbers were clearly distinguishable.

#### EXAMPLE 2

A sheet of 18-gauge steel having indicia applied thereto was prepared which was essentially identical to that of Example 1. An exterior coating comprising a 0.008 inch thick sheet of adhesive-backed vinyl material imprinted with a wood grain finish (Di-Noc) was applied to the frame over the magnetic indicia. The indicia did not form a visible impression on the surface of the vinyl material. When the magnetic reader was held adjacent the vinyl material over the magnetic indicia, the outline of the characters was clearly visible with the magnetic reader 20. The remanent magnetic moment of the indicia at the surface of the vinyl material over the indicia was measured to be 300 gauss.

What is claimed is:

1. A vehicle, appliance or tool having a steel body part; a multiplicity of discontinuous alphanumeric indicia scattered over the body part, each of said indicia providing complete identification of the vehicle, appliance or tool, said indicia having line widths of at least 0.005 inch and comprising magnetizable particles dispersed in a nonmagnetizable binder, the particles having a coercivity at least twice that of said part and having a remanent magnetism exceeding 5 emu per gram; and a thin, opaque permanent protective layer of paint over the part and indicia providing a uniform surface hiding the identifying indicia; said magnetizable particles being present in sufficient amount to provide, when magnetized, a remanent magnetic moment exceeding 50 gauss at the surface of the paint to permit the identifying indicia to be readily inspected using a magnetic reader; the combination of paint and indicia providing a theft deterrent in that the vehicle, appliance or tool cannot be provided with counterfeit identification without removal of the paint and indicia, application of a multiplicity of false magnetizable indicia, and repainting.

2. A method of applying to at least one painted steel body part of a vehicle, appliance, or tool identification which is a theft deterrent in that the vehicle, appliance or tool cannot be provided with counterfeit identification without removal and replacement of a significant portion of the paint, the method comprising the steps of:

preparing a dispersion of nonmagnetizable binder and magnetizable particles having a remanent magnetism above 5 emu per gram and coercivity at least twice that of said part;

applying the dispersion to the part to provide a multiplicity of discontinuous alphanumeric identifying indicia scattered over the part, each of said indicia providing complete identification of the vehicle, appliance or tool, and having line widths of at least 0.005 inch; and

applying over the identifying indicia a thin, opaque permanent protective layer of paint having sufficient thickness to provide a uniform exterior surface hiding the identifying indicia, the amount of magnetizable particles at all points of the indicia being selected to provide when magnetized, a remanent magnetic moment exceeding 50 gauss at the surface of the paint to permit convenient in-

spection of the identifying indicia using a magnetic reader.

3. A vehicle, appliance or tool according to claim 1 wherein said magnetizable particles have a coercivity of at least seven times that of said part and have a remanent magnetism above 50 emu per gram, and said indicia have a thickness less than one quarter the thickness of said protective layer of paint.

4. A method of providing hidden magnetically readable identification on at least one painted steel body part of a vehicle, appliance or tool, which identification is a theft deterrent in that the vehicle, appliance or tool cannot be provided with counterfeit identification without removal and replacement of a significant portion of the paint, the method comprising the steps of: preparing a dispersion of nonmagnetizable binder and magnetizable particles having a remanent magnetism above 5 emu per gram and coercivity at least twice that of said part;

applying the dispersion to the part to provide a multiplicity of discontinuous identifying indicia scattered over the part, each of said indicia providing complete identification of the vehicle, appliance, or tool, and having line widths of at least 0.005 inch;

applying over the identifying indicia a thin, opaque permanent protective layer of paint having sufficient thickness to provide a uniform exterior surface hiding the identifying indicia, the amount of magnetizable particles at all points of the indicia being selected to provide, when magnetized, a remanent magnetic moment exceeding 50 gauss at the surface of the paint;

magnetizing the particles in the indicia; and positioning adjacent the paint means for providing a visible image corresponding to the outline of the hidden indicia.

5. A system for hidden magnetically readable identification on at least one painted steel body part of a vehicle, appliance or tool which identification is a theft deterrent in that the vehicle, appliance or tool cannot be provided with counterfeit identification without removal and replacement of a significant portion of the paint, the system comprising:

a dispersion of nonmagnetizable binder and magnetizable particles having a remanent magnetism above 5 emu per gram and coercivity at least twice that of said part;

means for applying the dispersion to the part to provide a multiplicity of discontinuous identifying indicia scattered over the part, each of said indicia providing complete identification of the vehicle, appliance, or tool, and having line widths of at least 0.005 inch;

means for applying over the identifying indicia a thin, opaque permanent protective layer of paint having sufficient thickness to provide a uniform exterior surface hiding the identifying indicia, the amount of magnetizable particles at all points of the indicia being selected to provide, when magnetized, a remanent magnetic moment exceeding 50 gauss at the surface of the paint;

means for magnetizing the particles in the indicia; and

means positionable adjacent the opaque protective layer for providing a visible image corresponding to the outline of the hidden indicia.

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6. A system according to claim 5 wherein said magnetizable particles have a coercivity of at least seven times that of said steel body part, and have a remanent magnetism above 50 emu per gram.

7. An automobile having:

a steel body;

a multiplicity of discontinuous alphanumeric magnetizable indicia scattered over the body, each of said indicia providing complete identification of the automobile; and

a thin opaque permanent protective layer of paint over the body and indicia providing a uniform surface hiding the identifying indicia;

the combination of indicia and paint providing a theft deterrent in that the automobile cannot be provided with counterfeit identification without re-

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moval of the paint and indicia, application of a multiplicity of false magnetizable indicia, and repainting;

said indicia having a thickness less than one quarter the thickness of the layer of paint, having line widths of at least 0.005 inch and comprising magnetizable particles dispersed in a nonmagnetizable binder; and

said particles having a coercivity at least seven times that of said body, a remanent magnetism exceeding 50 emu per gram, and being present in sufficient amount to provide, when magnetized, a remanent magnetic movement exceeding 50 gauss at the surface of the paint to permit the identifying indicia to be readily inspected using a magnetic reader.

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