Sept. 5, 1944. M. H. KEMP 2,357,662

PROTECTIVE SHEET MATERIAL

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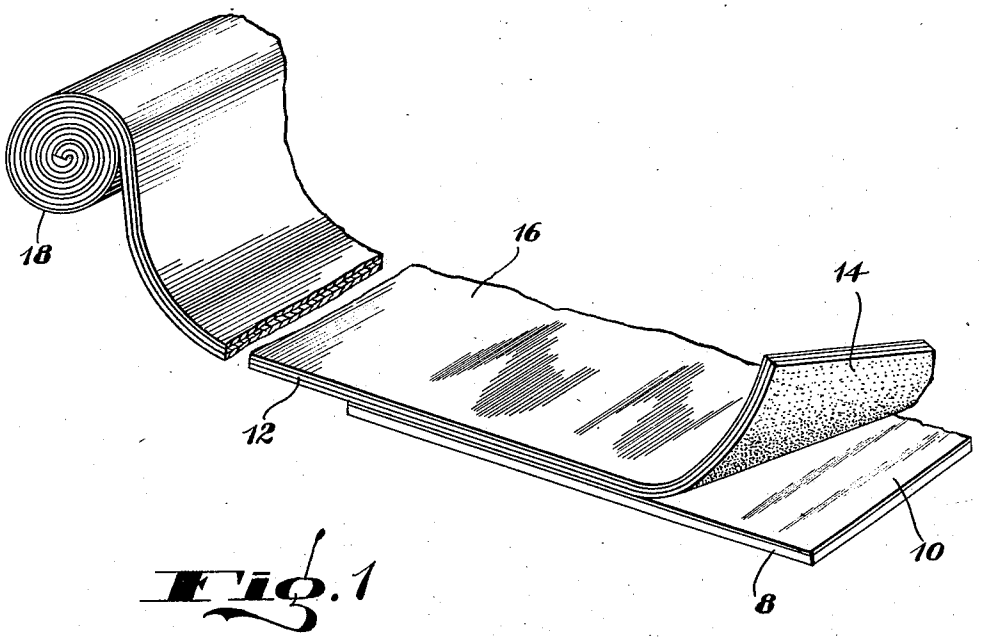


Fig. 1

INVENTOR

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PROTECTIVE SHEET MATERIAL

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6 Claims. (Cl. 117—122)

This invention relates to protective sheet material and more particularly to protective paper sheet coverings for polished metallic surfaces.

Sheet metal is often supplied on the market with a finished surface. In a common form, the product is sheet steel provided with a plated metallic surface and in many instances the metallic surface is given a high polish and the sheet material is then shipped and stored in sheet form pending manufacture of stampings therefrom.

Manufacturers of these products as well as users find it highly desirable to protect these polished surfaces after finishing and throughout transportation and storage, and the most advantageous type of protection is afforded by a cheap protective sheet material as of paper, bearing some sort of an adhesive coating which has a pressure adhesiveness to the finished surface so that it can be easily affixed over the surface. In some cases the sheet remains as a protective covering until subsequent cutting, stamping and even assembling operations have been completed.

Pressure sensitive adhesives of the type presently known have not been found wholly satisfactory by sheet metal manufacturers for these protective purposes, because, after continued contact with polished metal surfaces, these adhesives cannot be freely and readily removed from the metal, but leave considerable residues so firmly adherent as to require resort to some liquid or expensive solvent treatment to remove the residues. Such residues are caused by adhesive breakdown or decomposition resulting in adhesive delamination, and are due primarily to poor aging quality brought on by contact of the adhesive with metal which attacks the adhesive. Furthermore, the usual known types of pressure-sensitive adhesives adhere much too firmly to metal surfaces and are, therefore, not readily removable. Especially is this true when the adhesive is submitted to considerable pressure as it is when protected sheets of metal are stacked during shipment or storage.

Again, polished metal surfaces are susceptible to ready discoloration and staining, and it has been found that the staining and discoloration resulting from the use of usual pressure-sensitive adhesives is so serious as to amount to a commercially prohibitive number of rejects, which are so marred as to require complete refinishing.

It is therefore an object of this invention to provide a protective sheet material which, when used in manners required by sheet metal manufacturers for protecting metal surfaces, either polished or dull, will not adhere too firmly to the surface, will not break down or become mushy during storage, and will not leave adhesive residue when removed or otherwise mar the metallic surface, despite all normal pressures which may be encountered during shipment and despite contact therewith over long periods of time.

With these objects in mind, I have discovered that many compounds heretofore generally used in formulating pressure-aggressive or pressure-sensitive adhesives for securing proper tack and adequate aging qualities are advantageously discarded in preparing an adhesive for use with a backing as a protective sheet for metallic surfaces found on sheet materials of the type which have been described. Thus certain waxes, certain accelerators, certain anti-oxidants, and some of the well known types of plasticizers have been found to have deleterious effects. Waxes especially bloom to the surface and cause undesirable residual deposits, etching or staining.

Limitation as to acceptable ingredients has therefore created particular problems in securing an adhesive of proper tack and with good aging qualities to secure suitable adhesion without breakdown or residue and while preserving the non-staining characteristics found essential. Attempts to include certain ingredients, as anti-oxidants, to lessen the breakdown and secure better aging qualities usually produce unsuitable metal-staining or metal-discoloring adhesives.

I have found that natural rubber may be retained as a major ingredient in the adhesive mass for the purposes of this invention, provided that there is included as a protective agent for the rubber, a quantity of the synthetic material known as buna and more particularly Perbunan. The protection afforded by the Perbunan is against breakdown, thereby providing a stable adhesive even during long contact with polished metal surfaces. In addition to this protective quality, Perbunan also has the double capacity of imparting cohesion to the mass and, at the same time, of reducing the plasticity and tackiness imparted by the rubber. By a proper selection of the proportions of rubber and Perbunan, an adhesive mass is provided having satisfactory qualities of tackiness, plasticity and coherence. The use of such protective agent consequently permits the omission of ordinary age-resistance-producing and tack-reducing agents, which I have found to be unsuitable for metal because of their metal staining or discoloring properties. Thus, a highly satisfactory protective sheet material may be formed by coating a sheet backing such as paper with an adhesive comprising a mixture of pale crepe rubber and Perbunan (a mixed polymerizate comprising a mixed or co-polymer of butadiene and acrylic acid nitrile). Preferably the adhesive is prepared in accordance with the following formula:

	Parts by weight
Pale crepe rubber	200–800
Perbunan	100

This compound may be formulated on a rubber mill, and can be calendered in known manners onto a paper backing, or it may be solvent spread.

In general, the less the proportion of Perbunan to rubber the more sticky or tacky the mass will be.

I have found that an adhesive prepared in accordance with the above formula has the correct properties of tack and adhesion for use on polished or dull metallic surfaces such as nickel plate, chromium plate, copper or brass. When the protective material is applied to surfaces of dull or polished nickel or polished chromium, and subjected to the very exacting test of 48 hours at 70° C., the mass remains stable without breakdown or decomposition and without becoming mushy or "fly-papery" by loss of its cohesiveness or increase of its adhesiveness, indicating excellent aging quality and high resistance to metal attack. The material and adhesive after such a test may be removed from the surface by a stripping action without leaving a deposited adhesive residue, indicating high coherency and non-delaminating qualities, even after prolonged metallic contact. Even when applied to copper and brass, this adhesive is not decomposed under the same test, and the results on copper and brass, as well as on polished zinc, are, so far as breakdown and grab are concerned, equally successful and, as to residue, are a marked improvement, even in the absence of inhibitors, over previously known adhesives, especially inasmuch as any minute residues may be easily wiped off without liquid or solvent treatment such as previously required. In all of the above applications, no detrimental staining or etching of the polished or otherwise finished surfaces is encountered.

The accompanying drawing illustrates a roll of protective material and its application as a protective sheet on a sheet of metal 8, as of steel, bearing a plated polished metallic surface 10. The protective sheet comprises, as shown, an intermediate flexible backing material 12, as of paper, bearing on its under-surface the pressure-sensitive adhesive of this invention 14. The protective sheet shown also bears a back coating 16 of a repellant material in accordance with well known practice which requires no further description. The use of such a repellant coating 16 aids in the unrolling of the materials from the roll 18 without undue adhesion of the pressure-sensitive surface 14 to the roll.

As will be understood, the thickness of certain of the materials is exaggerated in the drawing for purposes of clarity, and the roll, the sheet material and the plate are broken away along their far edges.

While in its preferred use as a protective coating on finished sheet metal, the adhesive will very likely not encounter high temperatures, the adhesive of this invention does have high heat resistant qualities which would favor its use for protective purposes where elevated temperatures are required, for instance in masking metal or other surfaces during a japanning operation.

By and large, the adhesive of this invention is not considered as wholly satisfactory for use on resinous surfaces such as lacquered brass or copper, though, for some uses, it might prove entirely adequate and a decided improvement over protective tapes now offered.

I claim:

1. A protective sheet material for smooth polished metallic surfaces, comprising a flexible sheet backing having on one surface thereof a stable adhesive resistant to breakdown by metal attack and having slightly tacky qualities rendering the sheet material pressure-adherent to smooth metallic surfaces, said adhesive being formed of milled rubber from about 66 to 89% and, as the predominant remaining ingredient, a mixed polymerizate including polymerized butadiene, said adhesive being substantially free of metal-staining waxes and metal-staining anti-oxidants.

2. A protective sheet material for smooth polished metallic surfaces comprising a flexible sheet backing having firmly adherent to one side thereof a coating of a slightly tacky stable adhesive resistant to breakdown by metal attack and including as essential ingredients a major proportion of rubber and a minor proportion of a protective agent for said rubber consisting of a mixed polymerizate including polymerized butadiene, said adhesive being substantially free of metal-staining waxes and metal-staining anti-oxidants.

3. A protective sheet material for smooth polished metallic surfaces comprising a thin flexible sheet backing having firmly adherent to one side thereof a coating of a slightly tacky stable adhesive resistant to breakdown by metal attack and formed of from about 66 to about 89% rubber and, as the predominant remaining ingredient, a butadiene-acrylic acid nitrile mixed polymerizate, said adhesive being substantially free of metal-staining waxes and metal-staining anti-oxidants.

4. A protective sheet material for smooth polished metallic surfaces comprising a flexible sheet backing having firmly adherent to one side thereof a coating of a slightly tacky adhesive resistant to breakdown by metal attack and consisting essentially of a milled mixture of a major proportion of rubber and a minor proportion of a butadiene-acrylic nitrile mixed polymerizate, said adhesive being substantially free of metal-staining waxes and metal-staining anti-oxidants.

5. A pressure-sensitive adhesive comprising a slightly tacky mass resistant to breakdown by metal attack containing rubber from about 66 to 89% and an age-resisting protective agent for the rubber constituting the only other ingredient of the mass, said protective agent consisting of a mixed polymerizate including polymerized butadiene.

6. A protective sheet material for smooth polished metallic surfaces, comprising a thin flexible sheet backing having on one surface thereof a thin exposed coating of an age-resisting, non-delaminating adhesive having slightly tacky qualities rendering the sheet material pressure-adherent to smooth metallic surfaces and consisting essentially of rubber and of a butadiene-acrylic acid nitrile mixed polymerizate as a protective agent for said rubber in the proportions by weight of about one part of protective agent to two to eight parts of rubber, said adhesive being substantially free of metal-staining waxes and metal-staining anti-oxidants and resistant to breakdown by metal attack, and said sheet material being readily removable from a smooth metalllic surface after prolonged contact of said adhesive coating therewith without deposit of adhesive residue on said metallic surface.

MILTON H. KEMP.

CERTIFICATE OF CORRECTION.

Patent No. 2,357,662. September 5, 1944.

MILTON H. KEMP.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 5, claim 1, before "89%" insert --about--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 24th day of October, A. D. 1944.

Leslie Frazer

(Seal) Acting Commissioner of Patents.