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OIL IMPREGNATED PAPERS

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ABSTRACT OF THE DISCLOSURE

Perforator paper tape and punch card stock for use by punching out portions of the tape or card as used in association with automatic electric typewriters, teletypewriters, computer accounting machines, other data processing machines and the like is treated with a light mineral oil containing small amounts of iron soaps of organic carboxylic acids and optionally with small amounts of petroleum sulfonic acid alkali or alkaline earth metal salts in order to minimize, eliminate, or dissipate static charges, which, when present, attract the punched out tape or card particles to the tape or card where they adhere, thus, oftentimes, interfering with the proper functioning of the perforator tape or punched out card. Light oil impregnation of such stocks also aids in reducing wear on the metal punches but, without addition of an iron soap, does not alleviate the static charge build-up.

The present invention relates to the impregnation of paper and card stocks which are to be employed for perforated tape or punch cards. More particularly, the invention relates to the treatment of such paper and card stocks with light mineral oils and, more specifically, these light mineral oils used as impregnants for such stocks are compounded with small amounts of certain chemicals which, it has been found, tend to minimize, dissipate, or eliminate altogether the build-up of static charges during the perforating or punching operations.

In large scale operations, it has been found that the metal punches employed in perforating paper tapes or in punching out data cards require that an oil be used in order to reduce the wear on the metal punches. The use of such oil impregnated tapes and cards, while accomplishing the purpose of reducing wear on metal punches, nevertheless, gives rise to still another problem, namely, the undue build-up of static charges on the tape or card during the punching or perforating operations to such an extent that the punched out paper or card particles do not become permanently disassociated from the tapes or cards but tend to be attracted to and adhere to the tapes or cards in random fashion, thus giving rise to a complete or partial blocking of the perforations or punched out holes or slots so that such tapes or cards, when fed to the data processing machines or the automatic typewriters or teletypewriters, give rise to errors because of the complete or partial random blocking of the perforations or punched out slots. Such erratic functioning of the tapes and/or cards is bothersome, gives rise to errors, and, in the past, has caused need for a separate operation for the mechanical or pneumatic removal of such particles from the punched cards or perforated tapes. Blowing with air or application of a revolving brush or some such means is required in order to insure the permanent removal of the punched out paper or card stock particles from the respective tapes or cards.

The instant invention resides in the discovery that the addition of a small amount of an iron soap to the light mineral oil which has heretofore been applied to and used for impregnating such paper tapes and cards, tends to prevent, minimize, or eliminate altogether the build-up of static electricity charges during the punching and perforating operations while, at the same time, allowing for the lubrication of the punch machines or dies by reason of the presence of the light mineral oil.

Additionally and optionally, it has been found that, although the use alone of such iron soaps in such small amounts tends to reduce the static build-up so that the punched out particles do not have as great a tendency to adhere to the processed cards and tapes, even greater elimination of static build-up is accomplished if the oil employed has incorporated therein an additional ingredient, namely, an alkali metal or an alkaline earth metal salt of a petroleum sulfonic acid. By using both the iron soap and the petroleum sulfonate, both present in small amounts, the troublesome phenomenon of static charge build-up is eliminated altogether. Strangely enough, it has been found that only the iron soaps effectively work and that the corresponding zinc, magnesium, aluminum, copper, cobalt, and nickel soaps either do not work at all in eliminating static build-up or they only do so to a very minor extent. Any iron soap may be employed so long as it has appreciable oil solubility. This generally requires that the hydrocarbon portion of the iron soap contain as a minimum at least 8 carbon atoms and as a maximum 22 carbon atoms. Carboxylic acids having more than 22 carbon atoms per molecule may, of course, be employed but from a practical standpoint, such carboxylic acids are either in short supply and not readily available or they are generally too expensive and their use from a practical standpoint is not warranted.

As examples of the types of iron soaps which may be employed, the following may be mentioned: the iron soaps of naphthenic acids, tall oil, stearic acid, lauric acid, palmitic acid, myristic acid, linoleic acid, oleic acid, octoic acid, 2-ethyl hexoic acid, the rosin acids, the acids derived from the cocoanut oil fats, and mixed soaps of two or more of these acids or mixed acids.

The iron soaps are prepared by reacting the corresponding organic carboxylic acids with simple ferric compounds such as ferric hydroxide, ferric chloride, or ferric sulfide and a precipitation of the ferric soap followed by standard conventional recovery procedures. Another method of obtaining the soaps is to first form a simple sodium or potassium soap of the organic carboxylic acid and then by metathesis exchanging the ferric ion of ferric sulfate, for example, for the sodium ion of the carboxylate. These methods for the preparation of iron soaps are conventional and large quantities of these iron soaps for these purposes are manufactured conventionally and sold in commerce. The corresponding ferrous salts could also be used but there is little point in using them since they are usually more expensive and the reduced state of the iron atoms is of no particular advantage. The ferrous soaps would eventually be oxidized to the ferric state since no precaution is taken to prevent such oxidation from taking place.

Most all of the aforementioned iron soaps are readily available on the open market and a particularly preferred iron soap is one selected from the group consisting of ferric naphthenate, ferric octoate, ferric-2-ethyl hexoate, and ferric laurate.

The naphthenic acids are derived from petroleum stocks and are usually obtained from fractions having a boiling range at least as high as that of kerosene or lubricating oil cuts. The most desired naphthenic acids are those containing at least one cyclic nucleus and preferably containing more than 8 carbon atoms per molecule. Generally they are mixtures of naphthenic acids having a number average molecular weight between about 250 and about 600.

The iron soaps are used in the oil compositions to the extent of between about 0.05 and about 2.0 wt. percent,

preferably between about 0.2 wt. percent and about 0.8 wt. percent.

The petroleum sulfonates also are readily available on the open market and are used in large quantities as detergent imparting additives in mineral lubricating oils. They are generally derived from the mahogany, i.e., the oil soluble, acids normally occurring in petroleum fractions. Such fractions of the mahogany acids are sulfonated in conventional manner and neutralized with an alkali metal hydroxide or carbonate such as potassium or sodium, hydroxide or carbonate, or with an alkaline earth metal base or weak acid salt such as calcium or barium oxide, hydroxide or carbonate. In those instances where the petroleum sulfonates are employed, generally the sodium sulfonate is employed since it is readily available commercially but any of the other sulfonates, above stated, may also be employed. They are generally used in amounts ranging between about 0.5 and about 2.0 wt. percent of the total oil compositions, preferably between about 0.2 wt. percent and about 1.0 wt. percent.

The base mineral oil which is used in preparing the compounded composition must be one containing aromatic hydrocarbons. It may be a mixed base of paraffinic and/or naphthenic type oils but it must contain in its final composition at least 25 wt. percent of aromatic hydrocarbons. It is a light mineral oil, i.e., one having a viscosity of between about 50 and about 125 SUS (Saybolt Universal Seconds) at 100° F., or it may be a blend of two or more oils in which the final viscosity will fall within this range. It has been found that a preferred base oil for use in the present invention is one having between about 30 and about 80 wt. percent aromatic content. Base oils devoid of aromatic content do not give a satisfactory result so far as static charge reduction, dissipation, or elimination are concerned. For some unexplained reason, such aromatic hydrocarbon oils, when used in association with the iron soap with or without the petroleum sulfonate, tend to prevent or else dissipate the static charge build-up on the tape and card stock papers, whereas, when using a naphthenic, paraffinic, or mixed naphthenic and paraffinic mineral oil base stock devoid of aromatics or containing less than 25% aromatic content, such results are not attained.

Typical specific oils useful in the preparation of the oil composition are:

A hydrofined, phenol-extracted fraction obtained from a hydrofined, 80 SUS viscosity at 100° F., aromatic Coastal distillate. This oil contains about 80% of aromatic hydrocarbons and hsa a viscosity of 126 SUS at 100° F., a Cleveland Open Cup flash point of 330° F., and a pour point of −30° F. In the following examples, this oil is referred to as Oil A.

Oil B is a phenol-extracted, hydrofined, dewaxed oil from a paraffinic crude having a mid boiling point of 415° F. at 10 mm. pressure, a viscosity of 60 SUS at 100° F., and a Cleveland Open Cup flash point of 345° F. The blend of Oil A with Oil B in the amounts shown in Example 2, hereinafter set forth, gave an oil containing about 35 wt. percent of aromatic hydrocarbons and a viscosity of about 70 SUS at 100° F.

Three compounded oils were prepared each of which contained about 0.18 wt. percent iron in the form of ferric naphthenate and were tested to determine the degree of static charge elimination effected when impregnated into perforating tapes and punch cards by dipping the paper and card stocks into the oils and draining. One oil was a white oil, paraffinic in origin, having a viscosity of 50 SUS at 100° F. The second was a highly refined white oil, naphthenic in origin, having a viscosity of 90 SUS at 100° F. The third oil was a highly refined oil derived from an isoparaffinic crude and had a viscosity of 35 SUS at 100° F. None of these three oils possessed any aromatic hydrocarbon content and in each instance the compounded oil compositions of these three oil bases failed to accomplish the elimination or dissipation of static charges when impregnated in the aforementioned tape and card paper stocks. Similarly, even when using aromatic containing oils, the naphthenates of lead, cobalt, manganese, zinc, and calcium, present in about 0.2 wt. percent metallic content in the base oils, even with at least 25% aromatic content, failed to effect a satisfactory elimination or dissipation of electrostatic charges in the same paper stocks.

The following examples are illustrative of the invention but they are not to be considered as limiting the breadth of the invention thereto.

EXAMPLE 1

The following compounded oil composition was prepared:

	Wt. percent
Oil A	99.0
Ferric naphthenate concentrate, 0.018 wt. percent Fe	0.3
Sodium petroleum sulfonate, 60% concentration in lubricating oil, 0.42 wt. percent active ingredient	0.7

The sodium petroleum sulfonate had a molecular weight ranging between about 470 and about 500.

Sodium petroleum sulfonates of higher or lower molecular weights could also be used in this instance or a barium petroleum sulfonate in like amount and of similar molecular weight could be employed equally as well.

EXAMPLE 2

A second compounded oil for paper impregnation was prepared:

	Wt. percent
Oil A	42.4
Oil B	56.4
Ferric naphthenate concentrate, 0.024 wt. percent Fe	0.4
Sodium petroleum sulfonate concentrate as used in Example 1, 0.48 wt. percent active ingredient	0.8

EXAMPLE 3

The following compounded oil for paper impregnation was prepared:

	Wt. percent
Oil A	99.0
Ferric octoate, 0.022 wt. percent Fe	0.3
Sodium petroleum sulfonate concentrate as used in Example 1, 0.42 wt. percent active ingredient	0.7

Perforating paper tape stock was dipped into each of the three above-identified oil compositions and drained. The amount of oil incorporated or impregnated into the paper stock amount to about 15 wt. percent of the impregnated composition although anywhere from 5% to 20% of the oil may be incorporated therein. The three impregnated paper tapes were then subjected to electrostatic charge tests under conditions of relative humidity first at 15%–17% and finally at 5%–7%. In all instances all three paper tapes were free of retained electrostatic charge when an electrostatic charge was attempted to be applied to them. The test apparatus employed possessed a means of controlled rubbing of a strip of paper or card stock across a pair of static-generating (Teflon) bars and across a stainless steel bar which transfers the friction-generated charge to an electrostatic voltmeter for measurement.

Any number of methods can be used for impregnating the compounded oils into the tape and card paper stocks. The oil can be applied by rollers, dipping, followed by doctor blade treatment to remove excess oil, dipping, followed by gravity draining, by curtain coating, or by spraying the oil on the paper and card stocks. Machines which are ordinarily used for applying molten wax can be used for the purpose of applying the oil to the paper or card stock usually before it is cut into tape sizes and the desired card sizes.

Having now thus fully described and illustrated the invention, what is desired to be secured by Letters Patent is:

1. A punch paper stock impregnated with a mineral, aromatic hydrocarbon oil of 25 to 80 wt. percent aromatic content having a viscosity of between about 50 and about 125 SUS at 100° F. and containing at least one oil-soluble iron soap of an organic carboxylic acid material selected from the group consisting of naphthenic acid, tall oil, stearic acid, lauric acid, palmitic acid, myristic acid, linoleic acid, oleic acid, octoic acid, 2-ethyl hexoic acid, rosin acids, acids derived from coconut oil fats, and mixtures thereof in an amount sufficient to minimize retention of electrostatic charges on said punch paper stock.

2. A punch paper stock impregnated with from about 5 to 25 weight percent a mineral, aromatic hydrocarbon oil of 25 to 80 wt. percent aromatic content having a viscosity of between about 50 and about 125 SUS at 100° F., containing between about 0.05 and about 2.0 wt. percent of an oil-soluble iron soap of an organic carboxylic acid material selected from the group consisting of naphthenic acid, tall oil, stearic acid, lauric acid, palmitic acid, myristic acid, linoleic acid, oleic acid, octoic acid, 2-ethyl hexoic acid, rosin acids, acids derived from coconut oil fats, and mixtures thereof.

3. A paper stock as in claim 1 wherein the iron soap is selected from the group consisting of ferric naphthenate, ferric octoate, ferric-2-ethyl hexoate, and ferric laurate and is present in an amount ranging between about 0.05 and about 2.0 wt. percent of the oil.

4. A paper stock of matter as in claim 2 wherein the mineral lubricating oil constitutes between about 5 and about 25 wt. percent of the oil impregnated punch paper stock.

5. A paper stock as in claim 3 wherein the iron soap is ferric naphthenate present in the oil in the amount of about 0.3 wt. percent and the mineral oil contains about 35 wt. percent of aromatic hydrocarbons.

6. A paper stock as in claim 1 wherein the impregnating oil composition also contains between about 0.05 wt. and about 2.0 wt. percent of a metal petroleum sulfonate whose metal is selected from the group consisting of alkali metals and alkaline earth metals.

7. A paper stock as in claim 6 wherein the oil composition contains between about 0.05 wt. percent and about 2.0 wt. percent of the metal petroleum sulfonate.

8. A paper stock as in claim 7 wherein the oil composition contains about 0.4 wt. percent of sodium petroleum sulfonate.

9. A paper stock as in claim 3 wherein the oil composition contains between about 0.05 wt. percent and about 2.0 wt. percent of a petroleum sulfonate salt selected from the group consisting of alkali metals and alkaline earth metals.

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