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WAX DISPERSION AND METHOD OF
PREPARING SAME

Henry C. Thompson, Highland Park, Mich.

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This invention relates to water dispersions of wax for use as a protective and lustre giving agent on various surfaces, such as wood or linoleum floors or lacquered surfaces such as automobile bodies and is a continuation in part of my application Serial No. 42,462, filed September 27, 1935.

Wax dispersions for floor use are well known, but have hitherto been subject to numerous objections as will be pointed out below. As far as I am aware, no previous wax dispersions have been satisfactory for use on automobiles in place of the usual paste waxes. They would not stand up under the weather conditions imposed on them in this use, spotting badly under the first rain. Commercially, wax dispersions have been non-existent for automobile use. For use on linoleum floors certain of the prior dispersions have been generally satisfactory, except that they were not completely waterproof and were permanently injured by freezing during transportation; but no prior dispersions of which I am aware have had the capability of being used on a wood floor in satisfactory substitution for the standard paste waxes. One of the main objects of the invention is to produce a wax dispersion which within a comparatively short time after application will be permanently and absolutely waterproof; so that water spilled on a floor will not spot it and the wax finish on an automobile will not be spotted or streaked by rain.

Another object of the invention is to provide a wax dispersion which will not be injured by freezing, so that if it is frozen by transportation during winter it will regain its original properties when thawed out.

Another object is to provide a wax dispersion which will dry with a finish sufficiently bright and transparent so that it will produce upon an automobile body, merely upon drying and without any rubbing whatever, an effect at least equal to that obtained from the rubbed paste waxes formerly used. Another object is to provide a wax dispersion which will age rapidly, so that the interval between time of application and exposure to water need be at the most a matter of say three hours.

Another object is to provide a wax dispersion which has the correct surface tension so that when it is applied to a clean surface it will lie smoothly, without leaving any irregularities; and which for this reason can be applied so rapidly that there is no difficulty with lap marks where the applicator passes twice over the same spot.

Another object is to provide an improved applicator and a method of applying the dispersion, particularly upon lacquered surfaces like that of an automobile body.

Further objects of the invention are to provide a protective coating comprising a water disper-

sion of wax of this character which is of sprayable consistency; to provide a protective coating of this kind which air cures to a hard film that is insoluble in water; and to provide a protective coating which when cured comprises a thin even deposit which permits the luster of the under finish to show therethrough without altering the color of the under finish.

Still further objects of the invention are to provide an agent for emulsifying the wax content of the coating which forms only a small quantity of soap that is compatible with the finished product and which may be allowed to remain therein without injuring its clarity or water resisting properties; to provide in a coating of this kind a dispersion of casein which, when the coating is set, is insoluble in water; to provide volatile agents for bringing about a solution of casein in water and subsequently precipitating it in a finely divided insoluble state respectively so that the casein can be dispersed throughout the wax content of the coating and the agents may be disposed of by volatilization during the final curing of the coating; and to provide a volatile agent for facilitating the dispersion of the wax component of the coating in water which will also serve to render the casein soluble in water in order to avoid the addition of different agents for these purposes. Additional objects will appear from the following description and claims.

The preparation of a wax dispersion for use upon floors is a much less exacting task than the preparation of a dispersion for use as a coating for lacquered finishes. The evenness of texture of these finishes and the necessity of having perfect transparency of the wax film in order not to alter the color make the problem considerably more difficult, since the grain and irregularities of the floor and the lack of perfection of finish as compared with the lacquered surface mask any irregularities in the wax coating. For use on wood floors a slight lack of transparency and a slight color in the wax may even be desirable in order to darken any light places in the floor and to produce a coating having more apparent body. For these reasons the invention will first be described in its preferred and refined form suitable for use as an automobile wax, and the changes which may be made for floor use will then be indicated. It should be understood, however, that the preferred form of the invention is applicable unchanged as a floor wax, although in many cases it is preferable for this use to decrease the water content in order to increase the thickness of the deposited wax coating.

One other prefatory remark is necessary concerning the ingredients used. The waxes and fatty acids employed are not, in the form in which they can be bought commercially, definite chemical compounds. On the contrary, they are

mixtures of various waxes or of fatty acids, varying in proportions and in purity according to the source from which they are obtained and even differing when bought from the same source of supply at different times. While the practice of the invention requires a nice balance between the several ingredients it is not a balance which can be expressed in terms of fixed proportions. Different commercial brands of oleic acid, for one example, may differ as to the amount needed in the compound by thirty or forty per cent. The proportions of the ingredients given, therefore, must be taken as illustrative only; and reference must be made to the general principles indicated below for a guide to the determination of the exact quantity needed for the particular commercial materials used. Furthermore, as the composition of any one ingredient varies commercially, it may require changes in the other ingredients in order to preserve the proper balance. The present invention in some of its aspects relates to a novel conception of the proper balance between the ingredients, many of which have been used previously for similar purposes, by which results not heretofore possible have been attained. As the description proceeds, this balance will be indicated by numerous tests, most of them based upon the action of the film deposited from the dispersion, and the manner in which the different ingredients affect this balance will be pointed out.

The basis of the dispersion is carnauba wax which is customarily used for polishes but which has been generally mixed with a softer wax such as paraffin. For both floor use and for use on lacquered surfaces, the hard film produced by carnauba wax alone is very desirable, and the present invention permits its use in this form. If the product is to be used on a linoleum floor or on lacquered surfaces, transparency and comparative neutrality as to color are important in order not to mask or alter the clear color of the surface to which the wax is applied; and wax of a good grade should be used. If, on the other hand, the product is to be used on a wood floor, a wax of higher color and less transparency is sometimes more desirable in order to make a better showing on the floor and to color up worn spots. I have found, moreover, that some of the cheaper and therefore more highly colored carnauba waxes apparently contain some fatty acids and therefore affect the proportions of the fatty acids and alkalis used in the remainder of the formula; and that certain impurities which they contain may cause trouble from fermentation. It is generally desired, therefore, to use what is generally referred to as a pure refined carnauba wax. Instead of the carnauba wax, other synthetic or natural hard waxes may be used, with the differences in result to be expected from their nature. With the waxes at present available, carnauba wax will be found in general to be the most satisfactory. If a non-slipping wax is desired for floors, some of the carnauba wax may be replaced by candelilla wax but some of the luster will be sacrificed.

The emulsifying or dispersing agent which is utilized to hold the wax in suspension in the water is preferably composite, as will be indicated below. The basis of the dispersing agent is preferably a soap made by combining a fatty acid, preferably oleic acid, with an alkali, which may be entirely or in part composed of triethanolamine as is customary in wax dispersions. In addition to this fixed alkali, I have found it de-

sirable to employ a volatile alkali such as ammonia, as this will evaporate during the aging period and if the proper proportions have been used, as will be pointed out below, will render the dispersion irreversible once it has been set. As has been pointed out above, the commercial oleic acids vary widely in their specifications, and it will be understood that it is necessary to vary the alkaline reagents in accordance with the properties of the oleic acid. The saponification value is the closest measure of the alkali content necessary, the higher the saponification value the less the oleic acid which has to be used to produce the necessary emulsifying soap. The change in the amount of oleic acid required is not strictly proportional to the saponification value, but the requisite amounts can readily be determined by the application of the tests given below.

The soap forming alkali, as stated above, is divided between a fixed alkali and a volatile alkali. The fixed alkali may be composed of triethanolamine alone, but a somewhat harder and smoother film seems to be developed if triethanolamine is used in combination with an inorganic alkali such as caustic potash. Triethanolamine is an extremely effective dispersion agent, and it is preferable to retain some of this material in order to get a smooth, tough and readily obtainable emulsion. By the substitution of caustic potash for a portion of the fixed alkali requirements, the irreversibility of the dispersion seems to be increased and the rapidity with which the film becomes waterproof made greater. The triethanolamine seems to act also as a plasticizer, making the resulting coating much less brittle and giving it less tendency to peel off than if the entire alkali content were of a material such as caustic potash. If too much triethanolamine in proportion to the oleic acid is used, the dispersion will not spread evenly and the waterproof qualities of the film will be impaired. If too little is used the luster will be diminished and also there will be too little alkalinity to cause the dispersion to spread over a previously waxed floor. Proper spreading may be due to a slight cutting of the underlying wax, or may be due to a surface tension condition only. In the present description, I am more interested in the results secured than in the various and sometimes nebulous theories of the causation of these results. As stated above, the amount of triethanolamine which it is necessary to use will vary with the type of oleic acid, variations above and below the level determined by the particular fatty acid producing the variations in result mentioned previously.

The use of a volatile alkali such as ammonia is of importance in giving the desired waterproofing effect upon aging. If the soap-making alkali was altogether composed of triethanolamine, for example, the total alkali content would remain constant after the original water of suspension had evaporated, and the coating on the floor would show a tendency to reversibility, spotting badly when water was spilled on it. By making a part of the alkali volatile, this part will evaporate when the coating dried, and the tendency to reversibility of the dispersion will be avoided. If the deposited film is neutral or has a slight excess of fatty acid it will not be affected by water; but if the dispersion is in this condition it will tend to be milky, due to the incomplete dispersion of the wax in the water, and it will be flocculated on freezing so that it will be practically

useless after having been thawed out. I have found that excellent waterproof properties, combined with complete resistance to damage on freezing, can be secured by using enough fixed alkali to bring the dispersion substantially to neutrality and adding enough volatile alkali to carry the dispersion over into an alkaline reaction when tested with phenolphthalein. Preferably the reaction with this indicator should produce a slight pink color, and not a definite red; although with the waterproof booster hereinafter described, the range of permissible alkalinity on both the high and low side is somewhat greater.

In addition to the fatty acid and the basic material used for obtaining a dispersing soap for the wax, I preferably use other materials having specific effects in the film depositing action of the dispersion. I have found, for example, that the addition of a small quantity of borax improved the spreading qualities of the dispersion. Without the borax there is a tendency to show the equivalent of brush marks, or for the deposited film to be otherwise irregular in thickness. The use of borax counteracts this tendency, and produces a dispersion which is more easily distributed into even form and therefore produces a flatter and harder film.

As an assistance in obtaining a high luster, and to some extent in securing a waterproof film, I prefer to use a small amount of shellac in aqueous dispersion. While shellac cut with borax may be used, I prefer to use an ammonia cut shellac prepared in accordance with the following procedure, since ammonia cut shellac appears to give a smoother and more waterproof final film. In order to prepare what will be subsequently referred to as shellac solution, 24 oz. of water are brought to a boil. (In this and subsequent cases, quantities are given in avoirdupois weight.) To this water is added 1.475 oz. 26° ammonia and 5 oz. wax free orange shellac. The mixture is stirred until the shellac is dissolved. An additional 3 oz. of shellac is then added and after it has dissolved 18 oz. of boiling water is introduced in a thin stream while the mixture is being stirred. To this mixture 4 oz. additional of similar flake shellac is added and stirred until all the shellac is dissolved. Finally 22 oz. of boiling water is added gradually while the mixture is being stirred. The procedure outlined will produce what will be referred to hereinafter as shellac solution, which should be stored in a glass container until used.

I also preferably employ what may for convenience be referred to as a waterproofing booster, which has in practice given the product exceptional waterproofing properties particularly useful where the wax is to be applied in exposed locations such as on an automobile. For wood floor work, these requirements are not so severe and the booster may be omitted, but I prefer to use it in all cases since it seems not only to give remarkable waterproofing properties but to improve the film formation of the dispersion in many ways. In its preferred form, this booster comprises an insoluble substance carried like the wax in dispersed form and assisting the wax in film formation. I have found that the insoluble casein products, such as are obtained by treating an alkaline solution of casein with a precipitating agent are especially suitable. Many of these agents, such as formaldehyde, are known and will be found in the text books relating to casein technology; but I prefer to employ zinc sulphate as the precipitating and waterproofing material.

By the use of this agent the hardening and precipitating of the casein from alkaline solution can be carried on under such complete control that the precipitated casein compound will be retained in dispersed form in the solution. By using caustic potash and ammonia as the alkaline reagents, it will be unnecessary to remove them before adding the precipitated casein compound to the wax dispersion since, as elsewhere pointed out, these alkalis can both be made proper constituents of the final wax dispersion. If formaldehyde is used as the hardening agent, somewhat more care seems to be necessary in the preparation of the booster solution in order to prevent complete coagulation of the casein into insoluble lumps.

One way in which such a booster solution may be made will now be given. To one quart of cold water is added 5 oz. of casein. To this mixture, while being churned, is added 0.5 oz. caustic potash dissolved in 2 oz. of hot water. While continuing the churning, 1 oz. of 26° ammonia is added slowly in a thin stream, 0.8 oz. of zinc sulphate dissolved in 2 oz. of boiling water, and finally 0.25 oz. of steam distilled yellow pine oil. These materials should be added slowly while churning at a slow speed, and when the mass reaches the consistency of thick pudding 10 oz. of cold water are added. The resulting produce will be referred to hereinafter as the booster solution.

If instead of zinc sulphate, formaldehyde is used as a hardening agent the same general procedure is followed except that it is desirable to add the pine oil before the formaldehyde instead of at the end in order to slow down the rapidity of the hardening reaction. The proportions are as follows:

Cold water	quarts	1
Casein	ounces	5
Caustic potash	do	0.5
26° ammonia	do	1.0
Pine oil	do	0.25
Formaldehyde (40% solution in 2 oz. water)	drops	75
Cold water	ounces	12

I will now describe the manner of making one form of dispersion suitable for floors. It is preferred to make the floor compound with a higher solid content in order to give additional body to the coat even at the expense of the great smoothness which is given by the degree of dilution in the automobile wax formula. It is preferred that the automobile wax dispersion should contain from 20 to 25% more water than the compound intended for floors.

To make the floor wax dispersion in its preferred form 6 3/4 oz. of #3 refined carnauba wax is melted in a steam jacketed kettle and 3/4 oz. of oleic acid added in a thin stream while stirring. The oleic acid which was used in this example had an iodine value of 92/94, a saponification value of 192/196, a titre of 5°/8° C., an acid value of 192/196 and a free fatty acid content of 96/98%. The mixture of oleic acid and wax is stirred for two minutes and 0.65 oz. of triethanolamine is then added. To this mixture is added in a thin stream and during churning 0.13 oz. powdered borax dissolved in 3 1/2 oz. of hot water and 75 drops of 26° ammonia (equivalent to about 0.15 oz.). Boiling water to the total amount of 26 oz. is then added slowly. The shellac solution referred to above is then added slowly while the mixture is being churned, 5 3/4 oz. of the shellac solution being diluted with 5 3/4 oz. of water before being added. In a similar

manner 2¾ oz. of the booster solution is added, previously mixed with 5¼ oz. of hot water.

The total alkalinity of the dispersion is very important. If the alkalinity is too great, the waterproofing qualities of the film will be impaired, and when the product is used on a floor it cannot be applied well over an underlying coating of wax, digging into this underlying coating and rolling or balling it up. If the alkalinity is too low the dispersion will look milky due to the wax not being held properly in suspension, the wax will settle out irreversibly when the dispersion is frozen, and trouble will be met in applying the dispersion over a previously applied wax coating due to a tendency to collect in drops. The best test of proper alkalinity that I have found is a slightly pink color with phenolphthalein. A strongly pink or reddish color with this indicator shows that the alkalinity is too great under ordinary conditions. When the booster solution is used, as is preferable, the added waterproofing qualities and increased smoothness of application permits a slightly greater range of alkalinity than would otherwise be possible, and gives added protection against injury by freezing during transportation.

In the master formula given above, changes may be made in accordance with the nature of the raw materials used and the properties of the dispersion which it is desired to emphasize. A few of these changes will be indicated here, further changes being readily made by those skilled in the art in the light of these illustrative examples. The example given employed one type of commercial oleic acid. Other types are on the market possessing both higher and lower titre. Titre, measured in degrees centigrade, measures the solidification point of the oleic acid, and is a guide to the purity of the acid. The commonest impurity is stearic acid, so that titre is indirectly, although not in a proportional ratio, the measure of the stearic acid content of the material. For use on an automobile it is desirable to use oleic acid having a low titre, since a thin hard film is desired and the stearic acid in substantial quantities has a tendency to thicken the film and apparently to dull slightly the luster on drying. For use on wood floors, however, the additional body given by the stearic acid affords a much better appearance, as long as the stearic acid content is not carried to such a degree that the hardness or luster of the film is sacrificed. On automobile work, I have used successfully an oleic acid with a titre as low as 4°, and on floors an oleic acid with a titre of 10° or higher produces excellent results. For different uses the titre of the oil may be chosen as desired, or stearic acid may be added to the oleic acid where extra body is desired in the finish. If desired, the entire fatty acid content or a part thereof may be supplied with stearic acid, japan wax or the like, such a compound having some advantages as a floor wax, being waterproof and having a heavy body with some non-slipping properties. In general, however, it is preferred to use relatively high grade oleic acid in dispersions intended for automobile use, and a major proportion of oleic acid on floor wax.

The purer types of oleic acid, such as correspond generally to U. S. P. standards, are of low titre but have a high free fatty acid content and a high saponification value. The amounts of these acids can therefore be reduced in the formula given above. As an example, if oleic acid of substantially U. S. P. standard is substituted

for the commercial grade used in the master formula, the amount of oleic acid can be reduced to 0.65 oz., the other materials being unchanged. Another variation consists in replacing the 0.65 oz. of triethanolamine in the master formula with a mixture of 0.13 oz. of caustic potash and 0.31 oz. of triethanolamine. The greater alkaline strength of the caustic potash permits a considerable reduction in the total alkali content, and gives a somewhat smoother film, although it may be desirable to bring the ammonia up to 75 drops. I believe, however, that some triethanolamine or an equivalent organic soap-forming base is desirable in order to obtain the maximum waterproofing effect, and that as in the example given, the triethanolamine should be by preference at least equal to the caustic potash by weight for the best results. If desired, caustic soda may be used instead of the caustic potash, but I believe the combination of caustic potash and triethanolamine gives the most rapid waterproofing, the highest luster and the smoothest film. The master formula can be converted into an excellent waterproof floor wax, drying with a high luster, if the commercial oleic acid used in that case is reduced to ¼ oz. and ½ oz. of oleic acid having a titre of 10° is added; and if the final addition of water is omitted to give a slightly heavier dispersion. The other ingredients in this case remain the same. Another formula having especial utility for use on wood floors is:

Carnauba wax (only slightly refined)	6%
Oleic acid (titre about 7° C. and saponification value about 196)	0.70
Stearic acid (triple pressed)	0.08
Triethanolamine	0.65
26° ammonia	75
Borax, in 3½ oz. water	0.20
Water	26
Shellac solution in 5¼ oz. water	5%
Booster solution in 5¼ oz. water	2%

The final addition of water is here omitted.

If the ammonia content is varied it will be in most cases necessary to vary the other alkaline materials so that the total alkalinity remains substantially constant. The borax, shellac solution, and waterproof booster are what may be called special purpose materials, and may be varied in accordance with the emphasis which is to be placed on their several functions. They do, however, vary the proportions of the remaining materials necessary to keep the dispersion in proper balance. In particular, the shellac and booster solutions are alkaline in reaction, and thus will directly affect the amount of other alkali which it is necessary to have in the dispersion. Where a sufficient amount of the booster solution is added, it is possible to omit the ammonia entirely and still have a substantially waterproof film. This is apparently due to the protection given to the wax film by the insoluble casein compound. I prefer, however, to use the ammonia, as a product which ages to a definitely waterproof condition is thereby produced.

The manner in which the dispersed wax is applied to the surface to be treated is of considerable importance in obtaining the best results. Wood floors should be thoroughly cleaned, preferably with one of the non-explosive petroleum distillates used for dry cleaning. It will not be necessary to remove underlying coatings of wax, even when this is of the paste type, as when properly prepared the dispersed wax will lie

smoothly even over such a coating. For linoleum floors a convenient cleaning agent is ammonia water, which has the advantage that no free alkali is left on the floor. For automobile use, which is by far the most exacting, great care must be taken when the usual cleaners are used that the lacquered surfaces shall be clean, dry and free from any oil or free alkali. The presence of oil will cause rainbow-like colors to appear in the wax film, while alkali may destroy the waterproof character of the wax film.

The method of application of the dispersed wax is also of great importance. It has been found that if the usual applicators are employed there will be considerable difficulty due to streaks and laps. I preferably employ an applicator consisting of some very absorbent material such as cotton batting or, better yet, one of the extremely absorbent cellulosic materials which will absorb many times (20 or better) their own weight, the body of absorbent material being surrounded by a layer of smooth but porous cloth to keep it from disintegrating. The absorbent core of the applicator, when once saturated with the wax dispersion, will feed out just as much as is needed to apply a smooth coat for a very large section of the surface of the automobile without re-wetting it, thus avoiding the formation of laps where material has dried before the adjacent surface has been covered and greatly speeding up the waxing operation.

When once applied, the dispersion will dry rapidly due to its thinness, assuming a high gloss immediately without the need of rubbing down. Some time is required before the wax deposit is thoroughly waterproof, depending somewhat upon the extent to which the emulsion is thinned by the final addition of water. It is well to allow the film to set for two or three hours before exposing it to rain, although under favorable conditions, the film will become thoroughly waterproof in ten minutes. When once set, the film will not spot even though exposed to rain which dries on and inside of 48 hours the car can be washed and cleaned with a chamois without dulling the finish in any way. Tests thus far made indicate that even under the very unfavorable condition of sea air the finish will last for a long time, at least three times that of the best known paste waxes for similar purposes and probably more. On one test a car has retained the film two and a half months at the seashore under bad fog conditions without losing any apparent gloss or protection from the wax coating.

In order to show further the adaptability of the invention, I will give below another example of a dispersion having particular utility for use on automobile finishes:

Carnauba wax (#3 refined)	ounces	6%
Oleic acid (U. S. P. standard)	do	0.65
Caustic potash	do	0.13
Triethanolamine	do	0.31
Powdered borax	do	0.13
Ammonia (26°) in 3½ oz. water	drops	100
Shellac solution in 5¼ oz. water	ounces	5%
Water	do	26
Booster solution in 5¼ oz. water	do	2%
Water (final addition)	do	21

The method of mixing is that given above.

For use on automobile finishes it is generally desired to have a much thinner final film than on floors. A film which is too thick does not give the same waterproofing or wearing qualities as a film of proper thickness. To secure the desired

thinness of film it is necessary, as pointed out above, to dilute the dispersion as compared with the dispersion used on floors. In preparing the more dilute solutions it will in general be necessary to have a slightly higher proportion of dispersing soap base in order to have the wax properly dispersed in the thinner form, and in particular it is desirable to have the additional alkali in the form of ammonia. For this reason it will be noted that the ammonia content is somewhat greater in the automobile type of dispersion. It should also be noted that it may be necessary to increase the ammonia content somewhat in proportion to the length of time the batch is kept hot, as there is considerable evaporation.

I have also found that on account of its high saponification value, japan wax can be employed in substitution for at least a part of the oleic acid for either floor or automobile use. The resulting film seems to lay down more smoothly than when the japan wax is not used and, when employed for an automobile finish, the film has a softer gloss which is very pleasing in appearance. The japan wax also permits of some heightening of the luster of the film by rubbing or buffing, and makes the film even less subject to complete removal by localized rubbing. This latter object can also be accomplished by adding to the carnauba wax a softening agent such as paraffin wax, the dispersion being carried on in the manner described previously. One satisfactory formula for automobile use is as follows:

Carnauba wax (#3 refined)	ounces	3%
Oleic acid (U. S. P. standard)	do	0.52
Japan wax	do	0.27
Triethanolamine	do	0.31
Caustic potash	do	0.13
Powdered borax	do	0.13
Ammonia (26°) in 3½ oz. water	drops	100
Water	ounces	26
Shellac solution in 5¼ oz. water	do	5%
Booster solution in 5¼ oz. water	do	2%
Water (final addition)	do	21

The same formula, leaving out the final addition of water, makes an excellent floor wax.

My improved protecting coating may be produced in a condition suitable for spraying applications on automobiles and other finishes. To accomplish this, the wax dispersion is provided with wetting qualities which prevent running and sagging of the dispersion immediately after deposition thereon by a spray device.

The wetting properties of the sprayable coating material facilitate application of a thin, smooth layer which is sufficiently transparent and free from light deflecting deformities to facilitate the penetration of the luster of the surface on which it is applied.

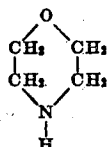
The sprayable protective coating, like the coatings heretofore set forth, includes an aqueous dispersion of wax in which is incorporated cut shellac and a substantially large quantity of an insoluble casein compound.

In order to introduce these substantially large quantities of insoluble casein in the wax dispersion without having present excessive quantities of substances which are not compatible with the finished produce, it is particularly desirable to employ as the agents for initially affecting the solution of casein in water and subsequently precipitating it reagents which will be removed by volatilization during air curing of the film. To this end, it is also desirable to employ an emulsi-

ifying agent for dispersing the wax which likewise includes substantially no reagents that remain in the finished film after curing and which have a detrimental effect thereon.

I have found that sufficiently large proportions of casein can be introduced into the wax dispersion when Morpholine is used as the alkaline reagent by which the emulsifying soap is formed from oleic acid and as the reagent for producing a solution of the casein in water prior to its precipitation.

Morpholine is the trade name of a product which has been, in some instances, called oxazine in the chemical literature. This compound has the following formula:



The following procedure has been found to produce commercially successful sprayable coating material of this character. While the specific proportions of the ingredients involved may be varied somewhat, it is particularly desirable to include a large insoluble casein content without introducing into the product excessive quantities of the reagents used to facilitate the dispersion of wax and incorporation of insoluble casein therein which have harmful effects upon the air cured film.

In manufacturing the sprayable coating composition a wax dispersion base is first formed preferably by heating together 6.66 oz. of carnauba wax and 40 grams of oleic acid (red oil), the oleic acid, as heretofore set forth, having a low titre. These ingredients are melted together in a double boiler and stirred for about 4 minutes after which 37 grams of Morpholine are added. After stirring the resulting batch for several minutes, 30 oz. of water at from 175° F. to 220° F. is slowly stirred into the melted wax and oleic acid. Since the addition of water to the melted wax and oil produces an amber colored jell, precaution should be taken to add the water slowly enough to avoid clouding of the jell. The contents of the kettle are removed from the boiler and allowed to cool to substantially 150° F. to 185° F. at which time the emulsion takes on a dark coloration.

To the above wax dispersion is added cut shellac solution preferably formed in a manner hereinafter set forth and referred to as a stock shellac solution. To 12 oz. of this stock shellac solution is added 9 oz. of water which is heated to substantially 175° F. This diluted stock solution is then slowly poured while stirring into the previously formed wax dispersion. Then 18 oz. of water at substantially 130° F. are added.

The stock shellac solution may be made in accordance with the formula heretofore set forth but for sprayable compounds it is preferred to produce the same by adding 1.75 oz. of triethanolamine to 24 oz. of water while the latter is maintained at substantially 200° F. 12 oz. of flake wax free shellac is then introduced in increments of 3 oz. each and 40 oz. of water is thereafter added in increments of 8 oz. each during constant stirring and while maintaining the batch at substantially 200° F.

The casein compound of the protective coating may be prepared by introducing 2.068 oz. of casein into 8 oz. of water at room temperature dur-

ing constant stirring to eliminate all lumps. Then 1.275 oz. of Morpholine are added during constant stirring and the resulting batch is covered and allowed to soak for 4 hours in order to dissolve the granular casein.

The casein of the resulting solution is then precipitated or jelled by the addition of .607 oz. of formaldehyde in 2 oz. of water. After addition of the formaldehyde solution, the batch is again covered and allowed to stand for 22 hours at the end of which time a heavy viscous jell is formed. The resulting jell is then thinned by the addition of 6 oz. of water in increments of 1 oz. each which are added only as fast as the water can be absorbed and stirred in. After thorough stirring the thinned jell is allowed to stand for 1 hour and should have a viscosity reading of 150 to 200 seconds at 80° F. as tested by a No. 4 Ford cup. The foregoing wax dispersion in which the shellac solution has been incorporated and the above described casein compound may be incorporated together in any suitable manner. As one example, 3 oz. of the wax base dispersion containing shellac may be diluted with 12 oz. of water at substantially 95° F. by placing the wax dispersion in a container and slowly pouring and stirring the water therein. The above proportions of diluted wax base are slowly poured into ¾ oz. of the casein compound above described during constant stirring. The resulting product is of sprayable consistency and may be applied in the form of a thin film by any suitable spray device and allowed to air cure. During air curing the volatile ingredients including any excess Morpholine introduced during solution of casein is eliminated by vaporization leaving a clear luster revealing protective coating on the surface on which it was applied. The casein content not only increases the wetting properties of the coating and facilitates the spraying thereof but also hardens the final film. The shellac also serves to harden the film and improve the gloss thereof and tends to stabilize the emulsion.

Although but several specific embodiments of the invention are shown, it is to be understood that various changes in the materials employed and in the sequence of steps, as well as in the temperatures and periods of heating, may be made without departing from the spirit of the invention.

I claim:

1. An aqueous wax dispersion for use in applying a film of wax to automobile finishes and the like, comprising carnauba wax, a dispersing soap formed of oleic acid having a titre of less than 8° C. a fixed alkali sufficient in amount to substantially completely saponify the oleic acid, and ammonia in sufficient quantity to give to the completed dispersion a slightly alkaline reaction when tested with phenolphthalein, and a waterproofing booster comprising a dispersed insoluble casein compound.

2. An aqueous wax dispersion for use in applying a film of wax to automobile finishes and the like, comprising carnauba wax, a dispersing soap formed of oleic acid having a titre of less than 8° C., a fixed alkali sufficient in amount to substantially completely saponify the oleic acid, and ammonia in sufficient quantity to give to the completed dispersion a slightly alkaline reaction when tested with phenolphthalein, a waterproofing booster comprising a dispersed insoluble casein compound, borax in sufficient quantity to cause the dispersion to lie down

smoothly, and a small quantity of ammonia cut shellac.

3. An aqueous wax dispersion for use in applying a film of wax to automobile finishes and the like, comprising carnauba wax, a dispersing soap formed of oleic acid having a titre of less than 8° C., a fixed alkali composed at least in part of triethanolamine and sufficient in amount to substantially completely saponify the oleic acid, and ammonia in sufficient quantity to give to the completed dispersion a slightly alkaline reaction when tested with phenolphthalein, a waterproofing booster comprising casein treated with an alkali and zinc sulphate, borax in sufficient quantity to cause the dispersion to lie down smoothly, and a small quantity of ammonia cut shellac.

4. An aqueous wax dispersion for use in applying a film of wax to wood floors comprising a hard wax, a dispersing soap formed of oleic acid having a sufficient stearic acid content to give the oleic acid a titre of 10° C. or higher, a fixed alkali in sufficient amount to substantially completely saponify the oleic acid, and ammonia in sufficient quantity to give to the completed dispersion a slightly alkaline reaction when tested with phenolphthalein, and a waterproofing booster comprising casein treated with an alkali and zinc sulphate.

5. An aqueous wax dispersion suitable for use on automobile finishes comprising in substantially the following proportions carnauba wax 6 $\frac{3}{4}$ oz., oleic acid (substantially U. S. P. standard) 0.68 oz., caustic potash 0.13 oz., ammonia (26°) 100 drops, borax 0.13 oz., triethanolamine 0.31 oz., shellac solution 5% oz., aqueous disper-

sion of an insoluble casein compound 2 $\frac{3}{4}$ oz. and water 61 oz.

6. A method of making an aqueous dispersion of wax comprising melting together carnauba wax and a soap-forming acid, adding an alkali consisting at least in part of an organic base such as triethanolamine, adding an aqueous solution of ammonia and borax, diluting with water, adding an aqueous dispersion of ammonia cut shellac, adding an aqueous dispersion of an insoluble casein compound, and diluting with water to the desired consistency.

7. The method of making an aqueous dispersion of wax comprising melting together carnauba wax and a soap-forming acid, adding an alkali consisting of an organic base selected from the group of organic bases consisting of triethanolamine and Morpholine, diluting with water, adding an aqueous dispersion of an alkali cut shellac, adding an aqueous dispersion of an insoluble casein compound, and diluting with water to the desired consistency.

8. The method of making a sprayable coating material which comprises emulsifying in water, carnauba wax by treating the latter with an emulsifying agent comprising a soap formed by the reaction of Morpholine and oleic acid, introducing a triethanolamine cut shellac solution into said emulsion, dispersing in the resulting mixture finely divided particles of insoluble casein derived by precipitation from a Morpholine solution of casein with a precipitating agent comprising formaldehyde, and diluting the resulting product with water to a sprayable consistency.

HENRY C. THOMPSON.