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ASPHALT ADHESIVE

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This invention relates to adhesively coated sheet materials of the character used, for example, in sealing and reinforcing cartons and similar containers.

A common method of manufacturing corrugated fiber board cartons includes the operations of scoring and folding the blank so as to bring two side edges into approximately abutting relationship where they are secured together by a strip of reinforcing tape which is adhesively united to the margins adjacent to said abutting edges. This reinforcing operation is performed while the carton blank is flat. Later when the carton is set up, filled and closed, the flaps are folded over in the proper order and they are then sealed in their closed condition by similar tapes. Tapes of this nature are also used for those reinforcing operations known as "staying," and they are variously referred to as sealing, reinforcing or staying tapes. Also, similarly coated sheet materials are used for carton linings and the like. For convenience such materials will usually be designated hereinafter generically as "sealing tapes."

While tapes of this nature in common use are usually secured in place by means of a water-soluble adhesive with which they are coated, there are many conditions under which it is highly desirable to use a waterproof adhesive instead of the water-soluble material. Important examples of such requirements occur in connection with ocean shipments and especially those through warm climates where the goods may be subjected to high humidities as well as high temperatures, for days, weeks, or in some cases for months. Sealing tapes coated with water-soluble adhesives cannot be used under these conditions for the reason that such adhesives become softened to such a degree that they will let go. But to devise a tape carrying a water-insoluble adhesive which will be thoroughly satisfactory also has proved to be an exceedingly difficult problem to solve, largely because of the variety of conditions and the severe usage which such a product must successfully withstand. Moreover, in order to be practical such an article must be relatively inexpensive to manufacture and the manufacturing operations involve problems peculiar to these waterproof adhesives. For example, the most satisfactory material for use as a base for the adhesive coating on such a tape, and at the same time coming

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within the allowable price range, is asphalt; but the hot application of melted asphalt is a troublesome process requiring expensive equipment, and while this difficulty may be overcome in a substantial measure by using asphalt emulsions alone, the latter also give much trouble due to their tendency to penetrate into the paper or fabric backing sheet instead of riding on the surface of that material where they will be useful in securing it to the carton or other article of work.

A further and serious difficulty in the manufacture of these tapes is their tendency to stick together or "cake" when rolled or stacked. This tendency is closely related to difficulties in handling in the machines for applying the tape to cartons, and it arises largely from the fact that the asphalt constituent of the coating on the tape must have a relatively low melting point, say from about 140° to about 180° F. in order to be emulsified. A film of asphalt of this character on the surface of a strip of sealing tape is so sticky at normal room temperatures as to be impractical to handle. Accordingly, one of the problems involved in making this sealing tape is to reduce the tacky characteristics of the adhesive to such a degree that the surface of the adhesive coating will be substantially dry and non-tacky up to temperatures of, say, 140° or 150° F. and at extremely high atmospheric humidities.

To attempt to solve this problem by selecting a much higher melting point asphalt is not practical for the reason that the temperature of this constituent must be raised considerably above its melting point during the application of the tape to a carton or other article of work in order to produce a satisfactory union to that article, and the temperature range which the work will withstand without injury is not sufficiently high to permit the use of these higher melting point asphalts. Usually the temperature of the heating plates or other devices relied upon to melt the adhesive and apply the desired pressure to produce a firm adhesion should not be over about 400° F. Consequently, a low melting point asphalt must be used.

A further complicating circumstance is the fact that asphalt alone does not make a very secure bond with the material of which shipping cartons are made. In other words, it does not have great adhesive strength. While it is satisfactory for

some uses, its weak adhesive properties limit its range of utility for many of the purposes with which this invention is concerned, and for most uses it is essential to supplement the adhesive strength of the asphalt in some way.

In addition to the fact that these sealing tapes must hold securely under conditions of high atmospheric temperatures and humidities, such as those encountered in the tropics, they must also withstand the rough handling operations incidental to shipment in cold countries when asphalt tends to become extremely brittle and to lose its tensile strength.

The present invention is concerned fundamentally with the foregoing considerations and its chief object is to meet the conditions above described. More specifically, the invention aims to devise an adhesive tape and an adhesive coating therefor in which asphalt will be used as the base of the adhesive coating and its characteristics will be so modified as to satisfy the complicated requirements above presented.

We have found that these objects can be accomplished very satisfactorily by using an aqueous emulsion of an asphalt having a softening point of, say, 140° to 180° F. and blending with it a higher melting point waterproof adhesive of a resinous nature. We prefer to use a grade of asphalt emulsion having a total solids content of around 50%, the solids having a softening point in the range above mentioned.

For example, very satisfactory results have been obtained with a mixture of such an aqueous asphalt emulsion and an aqueous dispersion of Burgundy pitch made in accordance with the following formula:

	Parts
Asphalt emulsion.....	20
Burgundy pitch.....	5
Ammonium hydroxide (28%).....	2
Water	20

(All parts are by weight.)

The last three constituents are heated moderately to dissolve and saponify or emulsify the pitch, and when this step has been completed the product is added to the asphalt emulsion and the two are stirred together until a homogeneous mixture has been produced. The proportion of pitch may be varied from about 3 to 6 parts (from about 30% to 60% of the dry weight of the asphalt solids) and the quantity of water and ammonium hydroxide used with it will be adjusted in accordance with the proportion of pitch and also to the end of producing a mixture having the desired viscosity and spreading properties.

Such an adhesive composition may be applied to a web of paper in coating machinery of the types customarily used for this purpose, the paper ordinarily being drawn from a roll, fed through the coating operation, then through a drying zone, and finally wound into a roll. Later, or if desired in the same machine, the paper may be split or slitted into strips of the desired width.

Such a product has been found very satisfactory. It is dry and substantially non-tacky at temperatures up to 150 F., adheres firmly to the carton stock if applied at suitable temperatures, such as those above mentioned, and the applying operation may be performed efficiently in machines such, for example, as that shown in Patent No. 1,969,660, granted August 7, 1934. This machine, however, should be equipped with

means for mechanically holding the tape on to the work until after the tape has passed into contact with one of the heating plates so that it is then held in place by the plate.

Another mixture which has been found to work satisfactorily is like that above described except that from 3 to 6 parts of powdered coal tar pitch are substituted for the Burgundy pitch and the dispersing agents for the latter. The coal tar pitch may be directly mixed with the asphalt emulsion and water added, if desired, to reduce the consistency of the mixture to produce the desired viscosity and spreading characteristics.

Still another variation of the invention consists in utilizing as the modifying adhesive an urea formaldehyde resin, such as that known commercially as Plaskon, preferably with a plasticizer, such as the liquid dihydro methyl abietate sold commercially under the name of Hercolyn. A typical formula is as follows:

	Parts
Asphalt emulsion.....	170
Plaskon	20
Water	20
Hercolyn	1
Ammonium hydroxide (28%).....	1

The last four ingredients are mixed together while cold and then are added to the asphalt emulsion with constant agitation while maintaining the temperature below, say, 150° F. in order to avoid reacting the Plaskon. The proportions of the Plaskon and Hercolyn may be varied as much as 25% above or below the figures given. That is, the Plaskon is present in from approximately 17% to about 30% of the dry weight of the asphalt solids in the emulsion. After this mixture has been applied to the tape and has dried, the urea formaldehyde constituent still remains in a non-reacted state (its reaction requiring a minimum temperature of about 200° F.) until it is heated up in connection with the operation of applying the tape to the carton under sufficient heat to melt the asphalt. It is then converted into its hard, stable, water-insoluble condition.

In all three of the formulae above given the resinous constituent has the effect of reducing the tackiness of the adhesive coating to workable values so that the coated sheet material does not cake and handles as conveniently as does ordinary gummed tape. It also performs the further and very important function of increasing the adhesive strength of the mixture, and thus supplying that degree of adhesion which the asphalt alone does not afford. Since the pitches are thermoplastic and the Plaskon is thermo-setting, and all blend readily with the asphalt, they cooperate with the latter in producing a firm adhesive bond. Such a combination also makes full use of the high waterproofing properties of the asphalt and, consequently, it makes a union between the backing of the tape and the carton which is substantially unaffected by water.

The backing material may consist of a strong paper, such as kraft stock, or fabric, or any other suitable sheet material. An exceptionally satisfactory article is produced by using a backing comprising two webs of kraft paper bonded together by an intermediate film of asphalt, with reinforcing fibers of some kind dispersed in the coating. These fibers may consist of sisal, hemp, jute, or the like. Such a sheet material is available commercially and it can be coated with any

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of the adhesive mixtures above described and then slit into suitable widths for use as sealing or reinforcing tapes. It produces an exceptionally strong product which, when bonded to a carton or the like by an adhesive of the nature above disclosed, makes a very reliable package.

Such compositions as those above described coat well on papers of the nature just mentioned, they ride well on the surface of the stock without an objectionable degree of penetration, and the material handles well during the entire manufacturing process.

Also, in applying the sealing tape to cartons, the initial tack can, if desired, be produced by coating the adhesive surface of the tape with an asphalt solvent, such as toluol.

Having thus described our invention, what we desire to claim as new is:

1. An adhesive consisting essentially of a mixture of the following constituents:

	Parts
Asphalt emulsion.....	20
Burgundy pitch.....	3 to 6

in which the asphalt emulsion has a solid content of approximately 50% and said solids having a softening point of between 140° F. and 180°

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F. and the Burgundy pitch is dispersed in several times its own weight of water.

2. An adhesive consisting essentially of a mixture of the following constituents:

	Parts
Asphalt emulsion.....	20
Powdered coal tar pitch.....	3 to 6

the asphalt emulsion having a solid content of in the neighborhood of 50% and said solids having a softening point of between 140° F. and 180° F.

3. An adhesive consisting essentially of a mixture of the following constituents:

	Parts
Asphalt emulsion.....	20
A pitch of the class consisting of Burgundy pitch and powdered coal tar pitch	3 to 6

in which the asphalt emulsion has a solid content of approximately 50% and said solid having a softening point of between 140° F. and 180° F. and the pitch is dispersed.

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